GOS-UNDP-GEF PROGRAMME COORDINATION UNIT BIODIVERSITY MAINSTREAMING PROJECT

To support the formulation of an operational fishery management plan for the plateau fishery for demersal fish resources

FINAL REPORT, May 2015

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Table of Contents

Executive Summary

This report describes the processes for developing the first management plan for the Mahe plateau artisanal trap and line fishery. It also provides the basis for the key management strategies to be employed in implementing the plan as well as highlighting key issues and recommendations going forward.

The management plan was developed as a consultancy as part of a broader project called the '*Mainstreaming Biodiversity Management into Production Sector Activities*" project between the Government of Seychelles (GOS) and the United Nations Development Programme (UNDP), and funded by a Global Environment Facility (GEF) grant. The project started in February 2008 and its' key project objective is that "*Biodiversity conservation is integrated into key production sectors of the economy*".

The Mahe plateau supports a demersal artisanal fishery that is critically important in providing local food security and economic development in Seychelles. The main species targeted by the hand line fishery are snappers, groupers and emperors whereas the trap fishery targets rabbitfish, parrotfish and emperors. However, recently fishers have raised concerns over decreasing catch rates and sizes of target species, and this has been supported by recent risk and stock assessments. These assessment results demonstrated multiple lines of evidence that overfishing on some of the major plateau fishery species is likely to be occurring and that management intervention is an urgent need. Sustainable resource management is also consistent with the vision of the Seychelles Government. The main objective of this consultancy was to review and update an existing draft management plan for the plateau demersal fishery by incorporating decision control rules and identifying management measures to meet objectives.

Consistent with world's best practice the development of the plan followed principles of the Ecosystem Approach to Fisheries Management (EAFM), also a requirement of the Seychelles Government's *Fisheries Act 2014*. This approach considers bycatch species as well as target species and considers direct and indirect influences on the fishery in partnership with all relevant stakeholders. It also facilitates the progression of the plan to move towards a co-management model.

Development of the plan was facilitated by the international consultants in a number of key stages with a significant emphasis on stakeholder consultation and input into the development of all aspects of the management plan. Therefore, each stage involved close contact with stakeholders in workshops and meetings on Mahe, Praslin and La Digue Islands. Decisions and iterations of the plan were determined by the outcomes of these consultations, while also ensuring the plan adhered to the principles of EAFM. The three key development stages were: 1. Plan development, 2. Management strategy review, and 3. Full draft plan extension and review. In developing the management plan a total of 7 stakeholder workshops, 13 group stakeholder meetings, and numerous individual meetings were conducted.

Management strategies included in the plan were developed to address fishery issues identified and prioritized by stakeholders, and evolved based on stakeholder feedback during the process. The report here describes the development of the key elements of the management plan including: plan objectives, fishery issues, management strategies, implementation of the plan, the performance measurement system to assess the effectiveness of the plan, and a review process. Due to the urgency for the plans implementation and the need for considerable time to develop some of the key management strategies, the plan will be implemented in two phases over 24 months. We provide an action plan to guide the implementation of the plan over these phases. Further, we present guidance and recommendations on the development of the key Phase 2 management strategies based on our experience and also relevant feedback received during the course of consultations.

Finally, all records of consultations, stakeholder feedback and steps in the development of management strategies (in particular) are documented and provided as attachments to this report. This is to ensure transparency in the process of determining the key elements of the management plan.

Acknowledgements

We would like to acknowledge the Seychelles Government for recognizing the need for intervention in the Mahé plateau demersal fishery in order to put strategies in place to try and reverse the decline in targeted fish stocks and the impacts this has on communities. The funding to pursue this was made available through the GOS-UNDP-GEF Programme Coordination Unit, Biodiversity Mainstreaming project and the Seychelles Fishing Authority through the sector policy support funds of the EU/Seychelles Fisheries Protocols under the Fisheries Partnership Agreement. We also wish in particular to thank the individuals and stakeholder groups of Mahé, Praslin and La Digue Islands who dedicated their valuable time in developing the first fisheries management plan for the Seychelles demersal fishery. Jan Robinson also provided excellent feedback from consultations with individual stakeholder groups.

Introduction

The '*Mainstreaming Biodiversity Management into Production Sector Activities*" (or "*Mainstreaming Biodiversity*") full sized project was signed in October 2007 between the Government of Seychelles (GOS) and the United Nations Development Programme (UNDP), and was funded by a Global Environment Facility (GEF) grant. The project is part of the UNDP-GEF portfolio in Seychelles and is implemented under a Programme Coordination Unit (PCU), and headed by a Biodiversity Project Manager. The project started in February 2008 and has the following Project Objective: "*Biodiversity conservation is integrated into key production sectors of the economy*". This Objective is to be attained through the following Outcomes:

Outcome 1: "*Systemic and institutional capacities for mainstreaming biodiversity management within and across sectors are strengthened*".
Outcome 2: "*Methods and means for integrating biodiversity and artisanal fisheries management are in place*".
Outcome 3: "*The tourism industry is addressing biodiversity conservation as part of good practice in business operation*".

Under **Outcome 2**, the Project sought an **international consultant** to support the formulation of an operational fishery management plan that integrates an Ecosystem Approach to Fisheries (EAF) and decision control rules.

This process follows the successful drafting of a fishery co-management plan for the area around the islands of Praslin and La Digue. The Praslin initiative was the first time that a fishery co-management arrangement has been adopted in the Seychelles. The Mainstreaming Biodiversity Project makes provision for fishery co-management to be extended to cover the whole of the Mahé Plateau (55˚30'E, 4˚30'S), which is the purpose of this project. A first step towards extending fishery co-management to fully cover the Mahé Plateau is to draft a fishery management plan, with the involvement of resource users and other stakeholders.

The aim of this consultancy was to lead the consultation and plan drafting process through working in collaboration with the Seychelles Fishing Authority (SFA), resource users and other stakeholders to define the goals, objectives, management standards and decision control rules that specify management actions when indicators reach or exceed reference points. As a starting point for the development of a new operational fishery management plan was the use of the draft management plan *"Management plan for artisanal and recreational demersal fisheries"* developed with support by the EAF-Nansen Project "*Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries"* and the *"South West Indian Ocean Fisheries Project*". This consultancy was carried out between November 2014 and April 2015.

Context

The fisheries sector in Seychelles is critically important for ensuring both food security and economic development. The industrial marine fisheries have grown considerably over the last three decades, but the artisanal fisheries also remains of

great importance. Small-scale artisanal fisheries exploit a high diversity of species and habitats. Most of the small-scale artisanal fisheries are undertaken on the Mahé Plateau, an area of about 41,000 km^2, of which the greatest part lies at depths of between 50 – 65 m (Figure 1). The plateau is closed to industrial fishing but is fished by about 140 whalers and schooners and at least another 500 outboard vessels and sport/recreational fishing boats. The whaler and schooner fleet undertake fishing trips lasting several days and fish the whole of the plateau away from the near shore areas. Conversely, the outboard fleet operates on a day-to-day basis and tends to stay close to the central granitic islands. The whalers and schooners usually fish using hand lines or hand winch often with multiple hooks whereas the outboard fleet usually fish using hand lines with single hook and traditional bamboo traps. The main species targeted by the hand line fishery are snappers, groupers and emperors whereas the trap fishery targets rabbitfish, parrotfish and emperors (Nageon de Lestang, 2011).

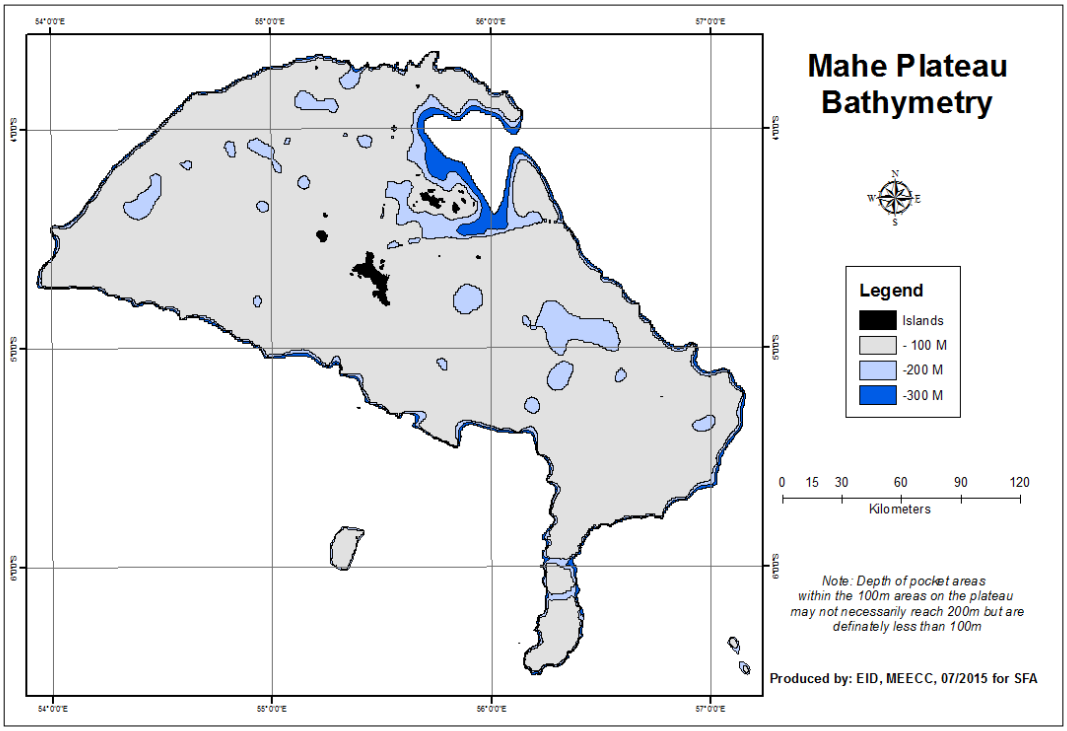

Figure 1. Bathymetry map showing the raised platform that is the Mahe plateau.

The Emperor red snapper (*Lutjanus sebae*; local name is Bourzwa) is the most sought after species in the plateau demersal fishery and is often used as an indicator of the general health of the demersal fish stock on the Mahé Plateau. Concerns over the status of *L. sebae* stocks were raised when catches of this species began to increase dramatically in 2004. Prior to 2004, this species had been harvested at around the estimated Maximum Sustainable Yield (MSY; 380 t; Lablache and Carrara, 1988) for over 10 years. By 2007 catch of this species had reached 1077 t per annum and had more than tripled MSY, suggesting that there were major risks if targeting continued at these levels. In response to the dramatic increase in Bourzwa catch, the SFA

embarked on a more detailed age-based stock assessment using rigorous and widely accepted methods (Grandcourt *et al.*, 2008). Their results suggested that previous assessments of bourzwa are likely to have overestimated their productivity potential and that the MSY should be closer to 208 t. From 2008 to 2012 a steady decline was observed in catches and the stock assessment concluded that the exploitation rate was still above the rate to achieve MSY and the stock status of emperor red snapper was described as **overexploited.** In 2012, the estimated catch had reduced significantly to only 209 t. Similarly, the catch of groupers peaked in 2007 when a total of 158 t was caught. Between 2008 and 2012 a steady decline has been observed in annual catch with only 71.6 t caught in 2012, raising concern on sustainability of stocks. This has been exacerbated in more recent years with the entrance into this fishery of a number of larger vessels that were previously targeting swordfish and tunas. These vessels are utilizing bottom-set long lines, which are inflating the catch per unit of effort (CPUE) and causing serious risk for the management of the demersal fish resources (Nageon de Lestang, 2011).

During the latter period of this consultancy risk assessments and stock assessments were carried out for a number of the plateau demersal species (Gutierrez, 2015). The outcomes of these analyses showed that all species tend to have a high susceptibility to capture and the highest risk species were those with low productivity (late maturing, long-lived). Of the key species taken in the Mahé plateau fishery the high risk species included Karang plat (*Carangoides fulvoguttatus*), Kaptenn blan (*Gymnocranius robinsoni*), Karang balo (*Carangoides fulvoguttatus*), Bourzwa (*Lutjanus sebae*), Zob Gris (*Aprion virescens*), Vara vara (*Lutjanus bohar*), and Bordmar (*Lutjanus sanguineus*). Stock assessments were also carried out for each of these species using a Schaefer biomass dynamic model. Maconde (*Epinephelus chlorostigma*) was also included in the stock assessments. Notwithstanding some concerns regarding data quality, the assessment outcomes showed that for most species, catch rates peaked during the early 2000's (Bourzwa CPUE peaked during the mid 2000's and Zob gris peaked during the late 2000's) and have subsequently shown a sharp decline in CPUE since. For all species assessed catches are currently either around or below MSY (Gutierrez, 2015). Where there was size information available (3 species), Gutierrez (2015) was also able to show that a high proportion of the catch of these species are juveniles. These assessment results demonstrate multiple lines of evidence that overfishing on some of the major plateau fishery species is likely to be occurring and that management intervention is an urgent need. The results also highlight key "at-risk" species to prioritise for management intervention.

The Seychelles Government's vision is to develop Seychelles blue economy and ensure sustainability of fisheries resources through improvement in fisheries management. With the recent development of a fishery co-management plan for the area around the islands of Praslin and La Digue, it is anticipated that a similar management plan will be developed for the coastal area around the island of Mahé. Overarching to these area/fleet based management plans, there is a need for resource-based management objectives and control rules for key demersal species that are shared among areas and users across the entire Mahé plateau.

Objectives

The main objective of this consultancy was to review and update an existing draft management plan for the plateau demersal fishery by incorporating decision control rules and identifying management measures to meet objectives. The existing draft management plan, *Management plan for artisanal and recreational demersal fisheries,* was developed with support by the EAF-Nansen Project *Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries* and the *South West Indian Ocean Fisheries Project*.

The consultancy directly contributed towards the Mainstreaming Biodiversity Project **outcome 1** *Systemic and institutional capacities for mainstreaming biodiversity management within and across sectors are strengthened,* and **outcome 2** *Methods and means for integrating biodiversity and artisanal fisheries management are in place.*

Subsequent to the review of the previous draft management plan the approach taken during this consultancy was to increase the focus on stakeholder engagement and to revise the management plan in its entirety, with consultation occurring throughout the process. For complete transparency, this report documents the development process of the management plan including all stakeholder input at each stage (see attachments), and the determination of the plans management strategies.

The formal deliverables for this consultancy were:

1. A short inception report and work plan within 10 days of commencing the assignment.
2. A revised *Management plan for artisanal and recreational demersal fisheries* with clear objectives set for the fishery, biological reference points and control rules to be implemented in the event that reference points are reached.
3. A technical report at the end of each session with stakeholders detailing the points discussed, issued raised and any particular points on which consensus was not reached.
4. A final mission report with main issues raised and deliberations from the stakeholders workshops/meetings, consultations undertaken and problems/difficulties encountered in the undertaking of the consultancy.

Development approach

Ecosystem Approach to Fisheries Management

Development of the Mahé plateau demersal fishery management plan follows the principles of an Ecosystem Approach to Fisheries Management (EAFM), which is now regarded as world's best practice for fisheries management (FAO, 2005). This is also a requirement of the Seychelles Government's *Fisheries Act 2014*. One of the key elements of EAFM is that management moves from the conventional 'top down' government imposed controls to a more stakeholder inclusive process at all stages of plan development (FAO, 2005). Further, it is the intention that this plan be

developed as a co-management plan, which also dictates that stakeholders are partners in the development and implementation processes. The benefits of consulting stakeholders early in the process are compelling and include greater stewardship which leads to better compliance of regulations, and greater understanding of the rationale for management measures, which in turn leads to further support for management. Indeed, in Seychelles having the support of stakeholders is likely to be a key factor to the success of the plan, particularly as it is the first management plan for the plateau fishery. To ensure consistency with EAFM, to accommodate a co-management framework and to maximize the likelihood of the success of the plan, consultation with stakeholders began at the very early stages of development of this plan.

Other aspects that the EAFM approach dictates is that the plan needs to consider not only the target species in the fishery but also the bycatch species and other potential effects fishing has on the food chain. EAFM advocates that ecosystem effects such as coastal development and up-stream influences (e.g. agriculture, land clearing, etc) are also incorporated into management where they are likely to impact on the ecosystem that supports the fishery. Further, the EAFM approach considers not only the ecological aspects of the fishery, although sustainability should be the underpinning principle, but also the social and economic aspects of the fishery so that stakeholders are also recognised under arrangements of management. Ensuring governance is effective is also important. Therefore, our approach was to develop a management plan that focused on four separate categories: Ecological, Social, Economic and Governance.

Co-management

Co-management is a partnership arrangement between government and the local community of resource users and other resource stakeholders to share the responsibility and authority for management of a resource (FAO, 2008-2015). Management of the resource is therefore a shared responsibility among the stakeholders that can be negotiated and delegated (FRDC, 2008). The *Fisheries Act 2014* also provides for the management of fisheries using co-management arrangements. For co-management to be successful significant time is needed to develop relationships and trust among stakeholder groups and government. Therefore, moving towards a true co-management arrangement takes time. A key factor for successfully moving towards co-management is that stakeholders are brought into the early phases of management plans and that a partnership approach is adopted.

Development of the Mahé plateau fisheries management plan in this consultancy invited stakeholders to participate at the very beginning and sought input at each step of the development stages along the way. With continued engagement, this will pave the way in the future for fisheries management on the plateau to adopt a full co-management model whereby fishers and other stakeholders may be involved in aspects of management such as surveillance, monitoring and data collection, data analyses and review phases. Already, stakeholders have played a key role in the development of this plan and fishers are already in partnership with SFA on several

data collection projects to better understand target species biology. A key strategy in ensuring a co-management model is realised is the appointment of stakeholder representatives on the ***Implementation Committee*** assigned to oversee the further development and implementation of the management plan. Continuing to move towards a fully operational co-management model will take considerable ongoing commitment from government and the respective stakeholder groups.

Plan development

The process for the development of a fisheries management plan consistent with the principles of EAFM is well documented and involves several iterative steps (Figure 2; FAO, 2005). Much of the background information for the plans development was provided in the "Baseline report" (Nageon de Lestang, 2011) and the recent risk and stock assessments (Gutierrez, 2015). As per the recommended process the entire plan was developed during this consultancy with the participation and consultation with the numerous stakeholder groups (see below). Implementation of the plan will be facilitated by Monitoring, Control and Surveillance (MCS) protocols. Development of these protocols for the Mahé plateau demersal fishery management plan is the subject of a complementary consultancy and will be reported on separately.

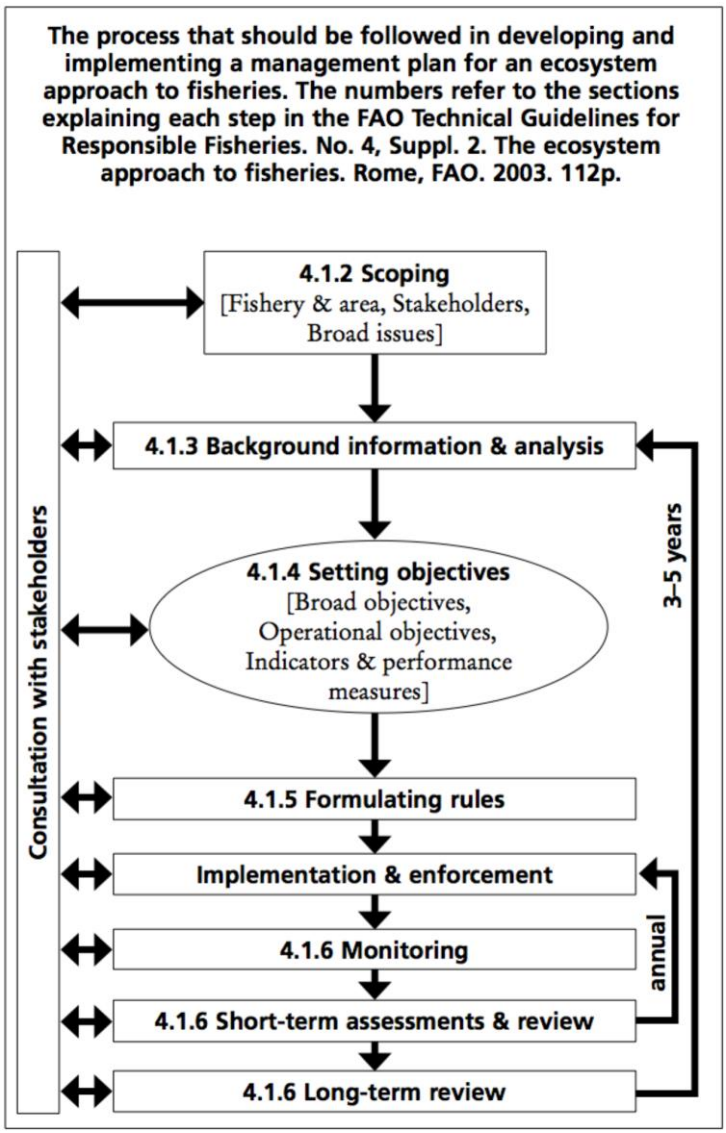

Figure 2. Overview of the process for the development of a fisheries management plan that is consistent with the principles of EAFM (FAO, 2005).

Consultation

"It is imperative that stakeholders are included in all stages of the process through consultation and participation" (FAO, 2005).

Process

Consultation was conducted in several phases during the course of the consultancy. We have defined these phases as: Plan development, Strategy review and Plan extension (Figure 3). Each phase was comprised of different types of engagement dictated by the developmental stages of the plan and in-country missions by the consultants. Ongoing during the entire process there was the opportunity for informal consultations as well as the formal consultations indicated.

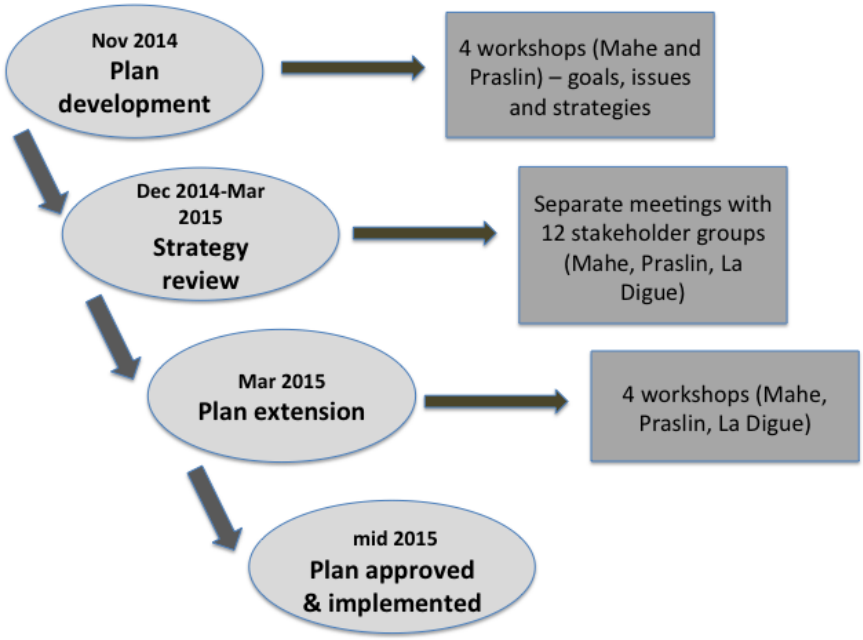

Figure 3. Timeline of the process with an overview of the number and types of the different stakeholder consultations during the development of the plan.

Plan development phase

The plan development phase of consultation was carried out during November 2014. During this period the two lead consultants travelled to Seychelles and conducted several informal meetings with SFA staff and four formal stakeholder workshops: 2 on Mahé Island and each repeated on Praslin Island. The purpose of workshop #1 was to provide necessary background of the project to stakeholders, explain the need for a management plan, seek stakeholder input into the development of the plans objectives (broad and operational), identify fishery issues and prioritise these issues. Preliminary management strategies were also identified during this workshop. Once the high level objectives of the management plan had been established and agreed on, while acknowledging government goals under the *Fisheries Act 2015* as well as international agreements, identifying the fishery issues was key to the development of all subsequent elements of the plan in ensuring the plan was able to be implemented; that is, operationalized (Figure 4).

The purpose of workshop #2 was to review outcomes from the first workshop, and develop a performance measurement system (PMS) for the highest priority issues. This included identifying potential indicators, reference points and decision control rules, and potential management strategies. The approach taken by the consultants in running these workshops was a combination of group 'brainstorming' ideas and opinions, as well as participants breaking into small groups to achieve the desired outcomes. Workshops were structured to complete development stages in a logical manner (see Appendix 1 for agendas) and following the steps outlined in Figure 1. For the two separate workshops there were a total of 51 and 43 individuals present on Mahé and 18 and 41 on Praslin Island respectively. Multiple stakeholder groups were represented at the workshops including commercial line and trap fishers, hire

craft operators, dive operators, several NGOs, seafood buyers and marketers, and multiple government agencies including SFA (see Appendix 2).

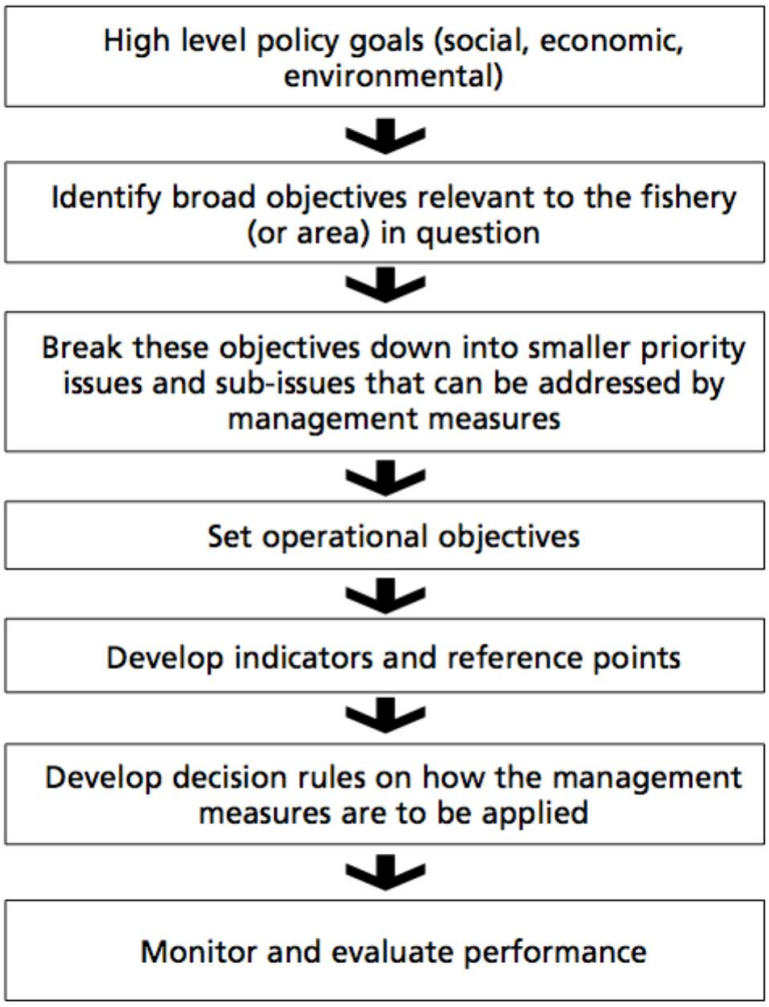

Figure 4. Process for translating high level policy and goals to operational objectives and management actions (FAO, 2005).

The outcomes from these workshops were collated into a 'consultation paper' comprised of draft plan objectives, a full list of fishery issues identified and their prioritized ranking, potential management strategies identified aimed to address the priority issues, and consultant notes on considerations and steps required for further development of some of the major management strategies proposed. Due to the high number of individual fishery issues identified (~180), and because many of the issues were very similar, we consolidated issues into logical groupings; these are called 'Issue themes' (see below). Full details of the stakeholder input during the plan development phase on objectives, fishery issues and prioritization, and the PMS, have been recorded and documented (see Attachments 1 – 7). These workshops are also summarized in a report prepared by SFA, which includes participants at each workshop and their stakeholder affiliation (Attachment 8).

Management option review phase

Based on the input from the November workshops, draft plan objectives, a range of management strategy options and a draft performance measure system were developed and presented to stakeholders for further consultations (see Consultation paper report – Attachment 9). These were conducted separately with individual stakeholder groups by a third consultant (Jan Robinson) between December 2014 and March 2015 inclusive. Feedback on the potential management strategies was of particular interest for stakeholders and in obtaining this feedback the 'traffic light' approach was used to determine the relative level of support for each particular strategy (Table 1). Comments from each stakeholder group were also recorded on each strategy.

Table 1. Traffic light approach showing the standard colour indicators and the respective definitions used in this project.

Definition	**Traffic light indicator**
Agree in principle, effective and feasible to implement, modifications minor	
Agree in principle, measure relevant and possibly effective, but contentious or substantial modification or more data needed	
Not feasible, irrelevant or ineffective	

Draft plan extension phase

This phase was conducted during March 2015 and primarily involved presenting the draft of the plan and explaining the key aspects, however also provided further opportunities for feedback to be incorporated into the final plan. Presentations were made to stakeholder participants at workshops held in Victoria on Mahé, on Praslin Island and on La Digue Island (see workshop agendas in Appendix 1). These workshops were well attended by stakeholders despite many also being consulted in previous days and/or weeks. Final strategies in the management plan incorporated all the comments received during these workshops.

A separate workshop was held on Mahé with SFA staff, including data collection and compliance staff, to discuss the Performance Measurement System with a specific goal to ensure that indicators are valid and collection of the appropriate data is feasible.

Outcomes

Plan objectives

From consultations it was agreed to adopt a single overarching goal of the management plan with second-tier individual broad objectives for each of the categories of Ecological, Social, Economic and Governance. The overarching goal of the management plan was agreed as:

A sustainable demersal fishery that delivers best possible ecological, economic and social benefits for the Seychelles through effective, ***TRANSPARENT*** *and participatory management.*

Stakeholders were particularly concerned with transparency in government and specifically requested that the word "transparent" be included in the goal, and that it also should appear in capital and bold letters to emphasise its importance.

The four broad objectives for each of the different categories are:
Ecological: ***To ensure ecological sustainability of the fishery resource and maintain healthy ecosystems that the fishery depends on.***

Economic: ***To optimise and sustain the economic benefit from the fishery.***

Social: ***To optimise and sustain the social benefit, and promote cultural values, for the Seychelles.***

Governance: ***To ensure management processes are transparent, accountable and participatory; and management measures are simple, effective and equitable.***

Fishery issues

Based on stakeholder workshops on Mahé and Praslin during November 2014, over 180 individual fishery issues (or variations of issues) were identified. The purpose of identifying the issues in the fishery was to try and address as many as possible in the management plan while making sure that the biggest issues are given highest priority. We need to also remember that it is not possible to address every single perceived issue as this would make the management plan too large, complex and ineffective. Therefore stakeholders were also asked to prioritise the issues during workshop breakout group sessions to enable efforts to focus on the highest priority issues first. Many of the issues raised were variations of the same or similar issues, and although all are documented (see Attachments 3-5), and because there were so many, for simplification we consolidated the many issues into several key *Issue themes* and grouped them according the respective categories of the plan that they belonged (Ecological, Social, Economic, Governance).

Prioritisation

During the workshops sessions participants broke into groups and ranked each of the individual issues (identified by that group) based on the level of risk they posed to the fishery. To derive a ranking for each of the Issue themes, when grouping individual issues into themes we took into account the median ranking of all issues being grouped *and* the number of individual issues being grouped. This meant that the overall ranking of an issue theme was given higher a weighting the more issues that it comprised. The method for ranking within each of the four key categories was:

i) Calculate the median ranking of each *Issue theme* based on the individual issues it contained.

ii) Order the *Issue themes* based on the median ranking with greater weight given to themes comprising more issues. That is, where the median was the same the one comprised of more individual issues was ranked higher.

iii) Calculate a total ranking score for each *Issue theme* by multiplying the number of issues in each theme with the ranking within that category in reverse order (e.g. Within Governance, the Issue theme ranked 1st where there are a total of 8 Issue themes, the reverse order means it will be ranked 8th). The highest priority Issue theme in each category will be the highest-ranking score. See Attachment 5 for all calculations.

Based on these calculations the highest priority issue themes for the Mahé plateau demersal fishery were determined for the four key categories and are indicated below (Tables 2 - 5). Note that some of the issues overlap with others. Several of these issues will be addressed through the Monitoring, Compliance and Enforcement plans (e.g. Poor enforcement capabilities) and so are not included further for consultation (these are noted in the supplementary spreadsheets).

Table 2. Major **Governance** *issue themes* in order of ranking. Focus should be on including management actions that address the highest priority fishery issues in the management plan.

Broad objective theme	Rank	Issue theme
GOVERNANCE	1	Poor enforcement capabilities
	2	Lack of communication
	3	Open access
	4	Lack of transparency/accountability by decision-makers
	5	Lack of monitoring (data collection)
	6	Lack of a recognised management plan with management actions
	7	Industry incentive system needs to be reviewed
	8	Lack of a co-ordinated fisher association
	9	Poor training for new/current fishers
	10	Inequitable licensing fee structure
	11	Foreign workers taking local jobs

Table 3. Major **Ecological** *issue themes* in order of ranking. Focus should be on including management actions that address the highest priority fishery issues in the management plan.

Broad objective theme	Rank	Issue theme
ECOLOGICAL	1	Localised depletion of demersal fish stocks
	2	Overexploitation of undersized juveniles of most reef fish species.
	3	Impacts on ecosystem: coastal development resulting in habitat loss; and impacts of climate change.
	4	Overfishing of key species
	5	Lack of control on fishing effort in trap fishery.
	6	Longliners (set bottom lines) putting too much fishing pressure on demersal plateau stocks
	7	Ghost fishing by metal traps
	8	Overfishing by charter industry, sports fishermen and longliners.
	9	Risk of significant increase in fishing effort by semi-pelagic longliners

Table 4. Major **Economic** *issue themes* in order of ranking. Focus should be on including management actions that address the highest priority fishery issues in the management plan.

Broad objective theme	Rank	Issue theme
ECONOMIC	1	High operational costs
	2	Market demands and poor market structure
	3	Need for diversification or alternative livelihoods (e.g. aquaculture)
	4	Security of access

Table 5. Major **Social** *issue themes* in order of ranking. Focus should be on including management actions that address the highest priority fishery issues in the management plan.

Broad objective theme	Rank	Issue theme
SOCIAL	1	Increasing price of fish due to increased operational costs and market structure.
	2	Inadequate standards for fishermen
	3	Aging of fishermen
	4	Lack of disciplined and professional labour force
	5	Poor perception of the industry
	6	Conflict among users
	7	Loss of traditional practices (cultural change)
	8	Piracy

Based on the rankings scores for the issues within each of the different categories, several issues stood out in terms of their relative importance based on the input and feedback from stakeholders (see Attachment 5). For each of the highest priority issue themes the strategies for addressing them are indicated below (Table 6).

Table 6. The highest priority issue themes and strategies for addressing these. Details in the specific management strategies to be implemented are later in this report and in the management plan document. MCS – Monitoring, Control and Surveillance plan.

ISSUE THEME	STRATEGY
GOVERNANCE	
Poor enforcement capabilities	MCS
Lack of communication	Phase 1 management strategy
Open access	Phase 2 management strategy
Lack of transparency/accountability by decision-makers	Phase 1 management strategies; ongoing stakeholder ***Implementation Committee*** (decisions documented and publicly available)
Lack of monitoring (data collection)	MCS, revision of Catch Assessment Survey (CAS)
Lack of recognised management plan with management actions	Formal recognition of this plan
ECOLOGICAL	
Localised depletion of demersal fish stocks	Phase 1 & 2 management strategies
Overexploitation of undersized juveniles of most reef fish species	Phase 1 & 2 management strategies
Impacts on ecosystem: coastal development resulting in habitat loss; and impacts of climate change	Phase 2 management strategy
Overfishing of key species	Phase 1 & 2 management strategies
Lack of control on fishing effort in trap fishery	Phase 1 & 2 management strategies
Longliners (set bottom lines) putting too much fishing pressure on demersal plateau stock	Phase 1 management strategy
ECONOMIC	
High operational costs	Phase 2 management strategy
Market demands and poor market structure	Phase 2 management strategy
SOCIAL	
Increasing price of fish due to increased operational costs and market structure	Phase 2 management strategy
Inadequate standards for fishermen	Phase 1 & 2 management strategies

Management strategy options

There were a total of 60 different management strategy options presented for the individual stakeholder group meetings (Table 8). These were presented to a total of 13 different stakeholder groups representing commercial fishermen, hire craft operators, sportfishers, government, and non-government agencies (Table 7). This was important so that individuals with a common interest in the fishery had the opportunity for input as opposed to a workshop setting where it can be confronting for many individuals to express their views. This was also a key stage of the consultation in obtaining feedback on potential management strategies that would most likely be supported and effective in the local context. The individual and summary feedback from each stakeholder group is provided as separate attachments (Attachments 10 & 11 respectively).

Table 7. List of the stakeholder groups individually consulted for feedback on the potential management options proposed during stakeholder workshops.

Stakeholder group/name	Stakeholder type
Indigo Boat Charter	Hire craft operators
Department of Environment	Government
G. Rassoul	Mahé "middleman"?
Islands Conservation Society	Conservation (Aride & Silhouette Islands)
La Digue Fishers Association	Fishers
Marine Conservation Society	Conservation
Ministry of Tourism	Government
Oceana Fisheries	Processor and exporter
Praslin Fishers Association	Fishers
Hire craft operators (Eden Island?)	Hire craft operators
Seychelles Fishing Authority	Government
Fishing Boat Owners Association	Fishers
Grant Heyer, Seychelles Sportfishing Club	Sportfishing

Some of the management options proposed were indicated to stakeholders as being critical for inclusion in the final management plan. These strategies included: a licensing framework, a communications strategy, minimum size limits for key species, recreational bag limits for some key species, a recreational combined bag limit, regulating longlining on the plateau, and a review of the fisher incentive scheme currently in place. These are all strategies that address some of the biggest issues stakeholders identified and were also strategies identified by stakeholders during the workshops. Another strategy regarded as a key inclusion in the plan was for an increase in the minimum mesh size on traps. The feedback we sought during the individual stakeholder meetings was very important for these strategies, as it would help to understand the level of stakeholder support and identify issues that may help guide how they may best be implemented.

A summary of the feedback provided and the rationale for inclusion (or otherwise) in the draft plan is provided in Table 9.

Table 8. Draft management strategy options identified by stakeholders during workshops and put forward for consideration during individual stakeholder group consultations. For each option information is also given on: the fishery issues that they address; their approximate timing given the need for further development or information gathering; and an indication of some of the requirements for implementation. Where shown: # indicates management actions the consultants deemed as necessary for the success of the management plan. * indicates actions requiring further development and planning.

#	Management action	Issues addressed	Timing	Requirements
1	**Develop and implement a licensing framework#***	- Lack of control of access to the fishery (i.e. no license to enter the demersal fishery)	Intermediate (within 3 years of the implementation of the Plan)	- Adequate time for careful and thorough development of an appropriate licensing framework - Clearly define resource allocation (license types and rights) - Clear and fair eligibility rules - Fleet history characteristics - Adequate resourcing to develop, implement and manage
2	**Develop and implement a stakeholder communications strategy#***	- Lack of communication about rationale for management, current regulations, current state of knowledge (fishery, species biology, etc) - Lack of transparency/accountability by decision-makers - Perceived lack of enforcement and monitoring - Conflict among users - Poor perception of the fishing industry - Lack of professional and disciplined labour force	Immediate and ongoing	- Development of an effective communications strategy - Identify key areas of communication (this strategy addresses several issues), audience and media to be used - Clearly identify timeframes to ensure regular and timely communication - Adequate resourcing - Needs to be implemented BEFORE the management plan measures
3	**Industry to form a single co-ordinated fishermen's association for Mahé**	- Poor perception of industry - Inadequate standards for fishermen (lack of facilities) - Lack of disciplined and professional labour force	Intermediate	- Would require an extended period of consultation among fishers, preferably facilitated by SFA (or an independent person) - This strategy (and many others) would

				benefit from SFA employing a full-time fishery liaison officer
4	**Industry to develop a Code of Conduct for licensed fishermen**	- Poor perception of industry - Inadequate standards for fishermen - Lack of disciplined and professional labour force - Overexploitation of juveniles of most reef fish species	Immediate-Intermediate	- Would require an extended period of consultation among fishers, preferably facilitated by SFA (or an independent person) - This strategy (and many others) would benefit from SFA employing a full-time fishery liaison officer
5	**Re-align training (Marine Training Centre) with needs of the industry (including ethics)**	- Poor perception of industry - Lack of disciplined and professional labour force	Immediate-Long-term	- Also would require a period of consultation/negotiation - This strategy (and many others) would benefit from SFA employing a full-time fishery liaison officer
6	**SFA assist where possible to ensure the industry is professional, safe and based on best practice**	- Poor perception of industry - Inadequate standards for fishermen - Lack of disciplined and professional labour force	Immediate	- This strategy (and many others) would benefit from SFA employing a full-time fishery liaison officer
7	**Hold a workshop between relevant stakeholders to discuss and resolve user conflict issues**	- Conflict among users	Immediate	- Need to identify the extent of the issue, key stakeholders, and clearly defined (desired) outcomes
8	**Implement a fisher incentive scheme that promotes partnerships in funding and managing landing site facilities**	- Inadequate standards for fishermen	Intermediate	See option #57
9	**Government to review and implement compulsory safety regulations**	- Inadequate standards for fishermen - Lack of disciplined and professional labour force	Immediate	- Could also be part of any incentive scheme
10-24	**Introduce minimum legal size limit set at L_{50} (size at 50% maturity) for the following species:** **Karang plat**	- Risk and stock assessment outcomes showing: declining catch rates, size structure of the catch, changes in catch composition, spatial shifts in catch	Immediate-Intermediate	- Need to review biological data on the respective species to determine appropriate sizes - May require making inferences based on

	Karang balo **Kaptenn blan** **Kalkal** **Somon** **Vyey goni** **Vyey mashata** **Vyey plat** **Laskar** **Zob gris** **Vyey baboon** **Vara vara** **Bordmar** **Bourzwa** **Maconde**	- Overfishing of key species - Local depletion of demersal fish populations - Overexploitation of juveniles of most reef fish species		similar species - May work best by placing species into groups based on similar biology and size limits - Would need extensive extension/education with the fishing community PRIOR to implementation (that said, the consultants regard these options as critical) - May require research on the growth and maturity of certain local species (but lack of this knowledge should not delay measures being put in place)
25-39	**Introduce *appropriate* recreational bag limits for the following species#:** **Karang plat** **Karang balo** **Kaptenn blan** **Kalkal** **Somon** **Vyey goni** **Vyey mashata** **Vyey plat** **Laskar** **Zob gris** **Vyey baboon** **Vara vara** **Bordmar** **Bourzwa** **Maconde**	- Risk and stock assessment outcomes showing: declining catch rates, size structure of the catch, changes in catch composition, spatial shifts in catch - Overfishing of key species - Local depletion of demersal fish populations - Overexploitation of juveniles of most reef fish species	Immediate-Intermediate	- Need to review relevant fisheries data on the respective species to determine appropriate limits - May work best by placing species into groups based on similar bag limits - Would need extensive extension/education with the fishing community PRIOR to implementation (that said, the consultants regard these options as critical)
40	**Combined bag limit for recreational**	- Risk and stock assessment outcomes	Immediate	- Would need to be determined with

	fishers including recreational fishers on charter vessels#	showing: declining catch rates, size structure of the catch, changes in catch composition, spatial shifts in catch - Overfishing of key species - Local depletion of demersal fish populations		consideration to the above species bag limits (NB. A combined bag limit should be significantly less than the combination of all species bag limits) - Would need extensive extension/education with the fishing community PRIOR to implementation (that said, the consultants regard this option as critical)
41	**Reduce effort on spawning sites during spawning aggregation times**	- Overfishing of key species	Intermediate	- Requires research into species spawning times and locations of aggregations - With the necessary information would require stakeholder consultation
42	**Spatial management of fishing effort i.e. temporal area closures.**	- Overfishing of key species - Local depletion of demersal fish populations	Intermediate-Long-term	- Would require a comprehensive analysis of spatial effort and catch followed by consultations with stakeholders
43	**Make bourzwa a line caught only species**	- Overfishing of key species - Local depletion of demersal fish populations	Immediate	- A simple, and potentially effective measure that could be implemented immediately
44	**No winches for trap hauling**	- Lack of control of fishing effort in the trap fishery	Immediate	- Requires consultation to evaluate practicality and use of winches for other fishing methods
45	**Not more than 2 traps per schooner or whaler**	- Lack of control of fishing effort in the trap fishery	Immediate	- Requires effective on-water compliance
46	**Introduce a maximum number of active traps of 30**	- Lack of control of fishing effort in the trap fishery	Immediate	- Need to define 'active' and also would need consultation/discussion to better determine the appropriate number of traps
47	**Allow only one trap for recreational fishers**	- Lack of control of fishing effort in the trap fishery	Immediate	- Requires effective on-water compliance
48	**Introduce regulations on vessel/gear size and target species/areas: Regulate longlining**	- Semi-industrial vessels fishing on the Mahé plateau	Immediate-Intermediate	- Need to review current regulations relating to this issue - Need to verify appropriateness of depth

	on the Plateau with no longlining in less than 100m#			(100m) contour as a spatial boundary (consultation)
49	**Habitat restoration**	- Ecosystem impacts	Intermediate-Long-term	- Requires costing and resourcing - Requires consultation with all relevant stakeholders including developers - May be made part of conditions of developments
50	**Ban sonde fishing method**	- Ecosystem impacts	Immediate	
51	**Identify hotpots where juvenile fish are captured/introduce closed area/closed season.**	- Overexploitation of juveniles of most reef fish species	Intermediate-Long-term	- Requires collection of relevant knowledge (e.g. fisher/diver anecdotal information; underwater visual survey data; fishery size structure data - Requires local consultation prior to implementation
52	**Do campaign to promote release of small fish with fishermen.**	- Overexploitation of juveniles of most reef fish species - Lack of communication about rationale for management, current regulations, current state of knowledge (fishery, species biology, etc)	Immediate	- Should be part of communication strategy specific to explain rationale for management, especially size and bag limits - Should be done before plan implementation
53	**Increase the minimum mesh size (currently 40mm) to e.g. to 60 mm, a size that results in reduced catch rates of juveniles#**	- Overexploitation of juveniles of most reef fish species	Immediate-Intermediate	- Would require specific consultation with trap fishermen and discussion of the appropriate (not preferred) mesh size - Likely to require a transition period for fishermen to modify their gear. This would be at a cost to fishers so there may need to also be an incentive/compensation scheme associated with this strategy
54	**Have a policy for fishermen to operate further outside the reef during the N.E monsoon.**	- Local depletion of demersal fish populations - Overexploitation of juveniles of most reef fish species	Immediate-Intermediate	- Need careful consideration of the basis for determining the distance outside the reef and making that easy to comply with (and enforce)

55	**Introduce annual rotational closures of spawning aggregation sites of kordonnyen (rabbitfish)**	- Lack of control of fishing effort in the trap fishery	Immediate-Intermediate	- Requires specific consultation with trap fishermen - Would also require good communication to ensure fishermen are clearly informed - Could be self-managed
56	**Support co-operatives (e.g. FBOA) to import and sell fishing gears, boat engines, etc. Look into more cost effective engines.**	- High operational costs	Intermediate-Long-term	- Requires adequate time for research and planning to determine cost-effectiveness before further development
57	**<u>Package:</u> Implement a revised incentives scheme to ensure that the subsidisation of a fishing businesses' operating costs provides net benefit to the Seychelles community. Achieved by a subsidy scheme that supports fishing businesses that supply fish primarily to the domestic market. Place annual quotas on fuel, motors and other major consumables. In order for registered vessel owners to get subsidies would need to submit receipts (i.e. receive subsidy through reimbursement). Maintain a database of vessel registrations and subisdies provided per vessel.#**	- High operational costs - Inadequate standards for fishermen - Lack of disciplined and professional labour force	Intermediate-Long-term	- Requires a review of the existing scheme, including identification of the issues - Requires adequate time for research and planning of a revised scheme (including consultation) - Requires adequate resourcing for ongoing management of the scheme
58	**Fishermen's associations to establish a series of cooperatives that market fish to improve the supply chain of fish from 'boat to plate'**	- Poor market structure	Intermediate-Long-term	- Requires good co-operation and co-ordination among fisher associations - Would benefit form having a single co-operative (see option #3) - This strategy (and many others) would benefit from SFA employing a full-time fishery liaison officer

59	**SFA to develop a policy to facilitate diversification into other fisheries**	- Need for diversification and alternative livelihoods	Intermediate-Long-term	- Linked with option #60. Requires adequate time to research options and their feasibility, as well as how any policy would be operationalised - This strategy (and many others) would benefit from SFA employing a full-time fishery liaison officer
60	**SFA to develop a policy to facilitate adoption of alternative livelihoods, in particular identify and facilitate sustainable aquaculture ventures**	- Need for diversification and alternative livelihoods	Intermediate-Long-term	- Linked with option #59. Requires adequate time to research options and their feasibility, as well as how any policy would be operationalised - This strategy (and many others) would benefit from SFA employing a full-time fishery liaison officer

Table 9. Summary of stakeholder feedback on the full range of management options provided and the rationale for inclusion (or otherwise) in the draft plan.

Management action	Summary feedback	Inclusion/exclusion
Develop and implement a licensing framework#*	High level of support. Include recreational sector in a new licensing system.	***Included***. Urgent need to control fishing effort using a licensing system. Needs time to develop.
Develop and implement a stakeholder communications strategy#*	Wide spread support; concerns over funding and implementation.	***Included***. Critical to the success of the plan will be education and extension. Needs sometime to develop overall strategy but needs to be in place well before the plan is implemented. The first year of implementation will be critical.
Industry to form a single co-ordinated fishermen's association for Mahé	Variable support; best framework would be a central national federation of reps from individual associations.	Would need time to establish, perhaps facilitated by a liaison officer role. Would best work for the commercial sector.
Industry to develop a Code of Conduct for licensed fishermen	In principle agreement. Effective codes in other industries. Suggested expand to all sectors (excluding rec sector).	***Included***. Can be a simple and effective tool and can be facilitated with a liaison officer.
Re-align training (MTC) with needs of the industry (including ethics)	General agreement as a need.	Not relevant as a strategy in the plan; may be best served through a liaison officer.
SFA assist where possible to ensure the industry is professional, safe and based on best practice	Good support. Need for industry support; via SFA liaison and extension. Recognised that industry and private sector could play a facilitative role with government.	Not necessarily relevant as a strategy in the plan; may be best served through a liaison officer.
Hold a workshop between relevant stakeholders to discuss and resolve user conflict issues	General agreement as a need.	Not relevant as a strategy in the plan; may be best served through a communication strategy & a liaison officer.
Implement a fisher incentive scheme that promotes partnerships in funding and managing landing site facilities	General agreement. Support needed to address issue of inadequate facilities for fishers in certain areas; partnership approach to encourage good stewardship of facilities.	Part of liaison officer role. Can be facilitated through having an industry federation.
Government to review and implement compulsory safety	Supported. Suggested it is necessary under the Act	Not relevant as a strategy in the plan. In part could be

regulations	and that any review needs to be SFA with SMSA. i.e. regulate safety through linking fishing license to seaworthiness certificate.	captured in a Code of Conduct.
Introduce minimum legal size limit set at L_m50 (size at 50% maturity) for the key species	Good support. Concerns raised re discard mortality from poor handling and barotrauma for some species. Need to justify Lm50 (science). Education and awareness critical, especially on best handling practices. Recognise impacts on industry. Phase in to Lm50 an option.	***Included***. This is a critical strategy for the management of the fishery. Used as an effective tool in fisheries worldwide and based on the principle that fish are allowed to breed at least once before capture thereby ensuring future generations of fish. In time should be introduced for all of the main harvested species.
Introduce *appropriate* recreational bag limits for key species	Mixed support. Most advocated a preference for a combined bag limit due to ease of both enforcement and compliance. Some also suggested a combined limit in conjunction with a species based limit on more vulnerable/impacted stocks. An issue is recs/yachties selling catch so need to have a "reasonable" limit. Sport fishers concerned about competitions being impacted. Importance of education/awareness highlighted.	***Included***. Only two species were included (bourzwa and zob gris) as the two most targeted individual species and demonstrated by recent assessments that they are being overfished. May be needed for highest risk species in the future however, given the reluctance by stakeholders along with a combined bag limit preference, this is a reasonable compromise. Still a good strategy to limit targeting of higher risk species by the recreation sector.
Combined bag limit for recreational fishers including recreational fishers on charter vessels#	Reasonably high support. All are worried about the limit set, especially sport fishers who would like a very high limit (based on kg). Need to define separately pelagic and demersal.	***Included.*** There is a need to control recreational harvest given the total number of recreational fishers, and this is a simple but generally effective strategy. It also removes an incentive to sell their catch.
Reduce effort on spawning sites during spawning aggregation times	Generally good support in principle but acknowledged that there is little information on where spawning sites are. Also was highlighted that a temporal closure would be	This strategy was put forward with bourzwa in mind. A potentially useful management strategy to protect spawning fish but requires information to be collected on spawning

	the most effective, perhaps rotational.	locations and times. With this information should be considered as a potential future strategy.
Spatial management of fishing effort, i.e. temporal area closures.	General support, however; the level of concern re sustainability of stocks does not justify the implementation of temporal closures; costs associated with effective enforcement (VMS some vessels, no control on mini-Mahé vessels).	Currently lacking information or the data analyses to inform this strategy. Would also need further specific consultation. Fisheries measures may be incorporated into the current marine spatial planning project.
Make bourzwa a line caught only species	Not well supported. Could also be hard to enforce where boats use both traps and line on same trips. Most thought it was redundant with the introduction of a MLS.	A clear lack of support with some valid issues raised.
No winches for trap hauling	Low level of support. Need to control effort in terms of limiting number of traps.	A clear lack of support with some valid issues raised.
Not more than 2 traps per schooner or whaler	Diverse views and mixed support. This would need to be based on information of reliance in traps on larger vessels, e.g. what proportion of their catch/income are from traps, how many do they currently carry, do they use them in coastal areas, etc. Could just ban them in coastal areas (distance from shore).	***Included.*** Feedback also suggested that very few whalers and schooners use more than 2 traps as mostly line. There is also a need to limit the potential for increases in trap effort across the plateau mainly because of the large proportion of juveniles likely in the catch.
Introduce a maximum number of active traps of 30	Generally good support. Most questioned the number proposed as being high and most only use a maximum of ~15. However, also noted that there needs to be an analysis of existing numbers used so that any regulation has a robust basis.	***Included***. There is a need to limit the potential for increases in trap effort across the plateau. Therefore such a measure should be based on estimates of current total effort (number of traps per vessel). Overall, stakeholders indicated that 30 was too high so the number was reduced in the final plan.
Allow only one trap for recreational fishers	General support but the number varied from 1 to 5 per person as many	***Included***. There is a need to limit the potential for increases in trap effort across

	thought introduction of size limits would be effective enough.	the plateau, including in the recreational sector.
Introduce regulations on vessel/gear size and target species/areas: Regulate longlining on the Plateau with no longlining in less than 100m	Generally high support. Most thought the use of bottom set longlines should be banned. Also, need to define fishing gear that's permitted on the plateau. For Mahé plateau limit gear to hook and line (specifiy max number of hooks and lines) and traps.	***Included***. The use of bottom set longlines on the egdes of the plateau was identified as a major source of conflict by competing with artisanal fleet. Also, longlines can quickly deplete stocks.
Habitat restoration	This was not specific enough for stakeholders to comment.	***Included.*** There is a need under EAFM to ensure ecosystem impacts are included as part of strategies to sustain the fishery. Included to manage future coastal developments impacts; requires liaison among relevant regulatory authorities.
Ban sonde fishing method	Not generally seen as a major issue, or limited practice.	If deemed necessary this can be dealt with through education via a liaison officer.
Identify hotpots where juvenile fish are captured/introduce closed area/closed season.	Generally agree in principle. Many agree that any areas closed should be based on data.	May need to have a project (student?) that idenitfies key coastal nursery areas around the coastlines of the major islands. Code of Conduct could encourage fishers to move on in areas where they start catching lots of small fish.
Do campaign to promote release of small fish with fishermen.	High support. Recommended done through CoC for ALL species. Education and awareness campaign to support the implementation of mls in particular.	Not really a management strategy for the plan. However, this could readily be addressed through a communication strategy and be part of a liaison officer role.
Increase the minimum mesh size (currently 40mm) to e.g. to 60 mm, a size that results in reduced catch rates of juveniles#	Range of views expressed. Larger mesh would allow all smaller fish to escape, not just regulated species, thereby encouraging best practice. Some say that larger mesh will weaken	Deemed as an important potential strategy as it reduces the capture of juvenile fish of species that do not have size limits. Requires research on the selectivity of different mesh

	traps and allow slender bodied species to escape (eg. goatfish, parrotfish). Some argued change not necessary if size limits introduced.	sizes.
Have a policy for fishermen to operate further outside the reef during the N.E monsoon.	Generally good support. CoC first, then upgrade to regulation as required. Recognised that some fishers do this already. Consult as to whether limit this to commercial sector. Consult as to whether apply restriction to trap and line and exclude nets.	May be a future potential strategy to reduce pressure on nearshore areas. Requires further research and consultation as to how this would work best in practice. One for the CoC initially.
Introduce annual rotational closures of spawning aggregation sites of kordonnyen (rabbitfish)	Variable responses. Noted that sites are not always absolute so site based closure may be ineffective. Suggestions range from close known sites for known spawning times to imposing a temporal closure only.	***Included*** is the reduction in days and # traps as per the Praslin plan. Having consistent strategies across the plateau will be important especially early in the implementation. Rotational closures are a possible effort reduction strategy for Kordonnyen spawning aggregations, however needs a review of known data for a more informed and detailed strategy.
Support co-operatives (e.g. FBOA) to import and sell fishing gears, boat engines, etc. Look into more cost effective engines.	Variable support. Concept supported but concerns about how it would work, especially management and accountability. Should be supported by strong project development, suggest initial government support but that it becomes a private venture run by cooperative/federation of fishing associations.	This is a complex initiative that would require significant development to work properly. Needs time for consultation as to what it needs to achieve and how it would work.
Package: Implement a revised incentives scheme to ensure that the subsidisation of a fishing businesses' operating costs provides net benefit to the Seychelles community. Achieved by a subsidy scheme that supports fishing	Mixed responses. Many highlighted that the current system is open to abuse. Certainly requires a review of the system to be fairer and better managed, but would require time, resources and consultation.	***Included***. The existing system is not working however there is strong support for an incentive scheme. Requires time to comprehensively review and restructure the scheme.

businesses that supply fish primarily to the domestic market. Place annual quotas on fuel, motors and other major consumables. In order for registered vessel owners to get subsidies would need to submit receipts (i.e. receive subsidy through reimbursement). Maintain a database of vessel registrations and subisdies provided per vessel.#		
Fishermen's associations to establish a series of cooperatives that market fish to improve the supply chain of fish from 'boat to plate'	Mixed support. Seen as an industry responsibility; suggest a project to scope potential benefits in the Seychelles context.	Developed to address the issue of poor market structure. If a continuing issue then this can be explored further during later reviews of the plan.
SFA to develop a policy to facilitate diversification into other fisheries	Generally supported. Noted that priority at present should be in providing better management of current fisheries. New fisheries should be encouraged but entered into in partnership with research and a conservative approach. Possible alternative species mentioned was squid and swordfish (sportfishers).	Not a very highly ranked issue; this is reflected in the feedback.
SFA to develop a policy to facilitate adoption of alternative livelihoods, in particular identify and facilitate sustainable aquaculture ventures	May be relevant for some species but planning is critical to minimise impacts of mariculture ventures on fisheries. Needs to be in alignment with Mariculture/Aquaculture Plan being developed	Not a very highly ranked issue; this is reflected in the feedback.

Management plan review

Although several of the key elements of the draft management plan were presented at these workshops stakeholders were particularly interested in the details of the proposed management strategies. Attachment 12 represents a summary of the feedback received during the workshops for each of the proposed management measures, while Attachment 13 are the translated notes taken based on discussions in Creole.

While for some of the strategies there were individuals who were not in favour, for all of the strategies there was overall support. Some strategies were modified based on the feedback (e.g. removal of Vyey goni and Vyey masata from individual strategies) and some were moved to Phase 2 implementation (e.g. introducing size limits for some target species). The management strategies for the final management plan are provided below with detail of each strategy also provided in the management plan policy document.

Issues arising

During the course of consultations during this consultancy there were many issues raised and discussed with stakeholders regarding the introduction of the management plan. There were also concerns regarding the process followed in the development of the management plan. Although we have documented all of the fishery issues and concerns during workshops in attached spreadsheets, there are several issues worthy of further note here so that they can duly acknowledged and adequately considered during future stages of the plans implementation.

Duration of consultation and plan development

From the very beginning the consultants identified that the initial period for consultation and development of the management plan were likely to be inadequate. Adequate consultation was articulated as the key to the ultimate success of the management plan as it creates trust and community ownership in the plan resulting in a more shared attitude of responsibility. This maximizes compliance with key strategies thereby maximizing the likelihood that the plans objectives will be met. The initial short timeframes related to funding timeframes, however, fortunately the consultation period could be extended by several months. Despite this, there are still several aspects of the management plan (e.g. determining the appropriate trap limits, identification of Mahe kordonnyen spawning sites, etc) that should be subjected to further consultation with the relevant stakeholders. Further, there are many individual stakeholders in Seychelles who will not be aware of the management plan nor of its' details and a longer consultation period with targeted efforts would help inform the wider stakeholder base. To emphasise the importance of consultation there was significant criticism from several individuals at the Mahe March workshop about the lack of consultation with Mahe stakeholders on any aspects of the Praslin co-management plan development. This created some level of distrust with the Mahe plan and the perception that it was influenced by contents of the Praslin co-management plan.

Although already a very important component of the management plan this has meant that further emphasis has been placed on the communication and education strategy. To further overcome the risks associated with short timeframes it is proposed to implement the management plan in two phases, separated by 2 years. This ensures that management can be put in place in the short term using management strategies that can be implemented straight away and that have had stakeholder input. It also allows an extended period of time for other strategies identified as being important to be implemented after a necessary extended period of development (e.g. licensing framework, incentive scheme review, etc).

Praslin Co-management plan

The recent and ongoing development and implementation of the Praslin Co-management plan, although a commendable initiative by all involved, created several issues in the development of the Mahe plateau fisheries management plan, mainly because the Mahe plan is to encompass the entire plateau area which incorporates the area of the Praslin co-management plan. This means that there is an imperative that management strategies implemented are consistent among the two plans. Management strategies determined for the Praslin plan were mainly the result of discussions with the stakeholders from Praslin Island. As mentioned above Mahe fishers were not involved in consultations which created some angst on Mahe since some fishers travel to the Praslin/La Digue area to fish. However, consultations for the development of management strategies for the Mahe plateau management plan involved ALL relevant stakeholder groups from Mahe, Praslin and La Digue Islands meaning that final strategies were a compromise of the respective views of the different stakeholders. This resulted in several management strategies that were different among the two plans; an outcome that would create further stakeholder conflict if implemented. During the course of the consultancy some of these inconsistencies were resolved. For example, an initial proposed size limit in the Praslin plan for bourzwa was significantly incompatible with the principles agreed upon for the Mahe plan and through further discussion and consultation a resolution was achieved; for this Praslin fishers should be commended.

However, there remain some strategies that are inconsistent and will need further consultation to resolve these to avoid stakeholder conflict and issues that would arise from this (e.g. the integrity of either plan is compromised). Two key examples are: a limit of 25 traps per fishing vessel (for schooners and whalers) in the Praslin co-management area, while for the wider Mahe plateau the limit is 20; different demersal species lists that apply to each plan (affects which species bag limits apply to).

Sport fishing competitions

During consultations sportfishers raised particular concern with the concept of demersal fish bag limits with respect to historical fishing competitions whereby a fishers performance is judged on the quantity of fish caught. Anecdotal reports suggest this can result in several tonnes being caught during a single competition. This type of competition format has been further justified in the past with the sale of all fish and proceeds going to charity. However, the recently revised *Fisheries Act 2014* states that recreational fishing cannot result in the sale of fish and also states that fishing competitions cannot result in the sale of fish. This means that competitions in their current format will need to adapt to the revised legislation.

More importantly however, is the need for competition fishers to acknowledge that demersal fish are a shared resource and their management needs to be a *shared* responsibility. Although there is the possibility for competitions to operate under temporary increases in individual bag limits, notwithstanding the above, there are many alternative competition formats that can be at least equally prestigious (e.g. species-based scoring, largest fish, highest average weight, “meritorious” fish

captures, etc). In adopting a shared approach to management and responsible fishing practices, fishing competitions around the world have successfully adapted to increasing fishing effort and increased pressure on fish stocks. The current reported demersal catches from Seychelles fishing competitions exceeds responsible standards especially given the reported overexploited status of some stocks and the evidence that overfishing is occurring for other stocks (Gutierrez, 2015).

Acceptance of size limits

Although there were many management strategies discussed during consultations the introduction of size limits was contentious for some. Size limits are a key strategy for the success of the ecological objectives of the management plan and so we have included it here, even though overall there was very strong support for size limits and, after some education; there was also strong support for the principles of size limits to be based on L_m50 (50% of the population is mature). Despite this support, there was concern among fishers and we raise it here as one of the new measures that is likely to experience poor acceptance initially. The key will be extensive, prolonged and targeted education to the wider community to improve acceptance.

Sale of pelagic species to local restaurants

With the industrial tuna fishing fleet predominantly marketing their catch for export or canned products, the local restaurant market for tuna has historically relied on their supply from the local hire craft or charter fishing fleet. This niche market would potentially no longer exist depending on the structure of the licensing system to be developed for the Mahe plateau fishery (Phase 2 management strategy), given that the Fisheries Act 2014 states that recreational fishing cannot result in the sale of fish. However, it is an important market given the value of tourism to Seychelles economy and one not provided for by other means. This could potentially be maintained in a licensing framework with careful consideration of the structure and endorsements for selling catch (or a portion thereof). In the development of this plan however, there are no interim measures proposed that would allow this practice to continue until development of the licensing framework. This is a potential issue for local hire craft or charter fishers during the Phase 1 of the management plan and may require special circumstances negotiated with SFA.

Non-compliance and intimidation by some foreign fishers

A serious issue that was raised repeatedly during the entire process was that of a perceived lack of equity and transparency in enforcement, particularly with respect to wealthy foreign fishers not following local regulations (e.g. spearfishing), and enforcement not following up on these complaints. Even worse, were claims of physical intimidation from these foreign fishers, sometimes with weapons, against locals either coming close to foreign boats or confronting them. All visitors to Seychelles need to be a target for the management plan education and awareness campaign, including education about the role and powers of enforcement officials. It will be critical to the success of the plan in achieving fisheries sustainability for the Seychelles, that the plan is supported and enforced at all levels of the community and government.

Transparency

Stakeholders identified transparency as one of the single biggest issue based on historical dealings with Government and were very vocal in requesting this to be addressed in the development and implementation of the Mahe plateau fisheries management plan. We have done our best to ensure that ALL consultations are documented and made available to stakeholders once this plan is completed. The timing of making sure that information is available will be important as the plan is implemented. A key issue identified during consultations was that despite there being a revised and accepted Fisheries Act for Seychelles very few if any stakeholders were involved in its revision nor knew of its content. Despite this, many of the elements of the *Fisheries Act 2014* are relevant to the Mahe plateau plan and to fishers generally. At the time of writing this report the *Fisheries Act 2014* is not yet publically available. This contradicts and compromises efforts to develop the current management plan while adhering to the stakeholders key request for transparency. The issue of transparency going forward will continue to be an important stakeholder issue that will require careful consideration and may require a review of current government administrative processes.

Management plan for the Mahé plateau demersal fishery

Overview

As an important long-standing legal document the Mahé plateau demersal fisheries management plan is attached separately as a supplementary document to this report. This section provides an overview of the plans contents, and its intent, as well as how we anticipate the plan is best implemented and the process for reviewing the management plan to ensure management is adaptive to emerging needs and information.

The plan is divided into several sections:

1. ***Purpose of the plan*** – describes the intent of the management plan.
2. ***Rationale*** – importance of a demersal fisheries management plan for Seychelles.
3. ***Legislative/policy framework*** – description of the legal basis of the management plan.
4. ***Development of the plan*** – an overview of the process undertaken in developing the management plan.
5. ***Scope of the plan*** – an overview description of the spatial extent of the plan and the fishery in that area.
6. ***Stakeholder engagement*** – describes the key stakeholders of the fishery and the minimum requirements for future engagement
7. ***Fishery background*** – provides a detailed description of the fishery as context for the management plan.
8. ***Objectives*** – describes the overarching goal and broad objectives of the management plan.
9. ***Fishery issues*** – lists the fishery issues identified by stakeholders.
10. ***Management strategies and implementation*** – describes the management strategies of the plan, their rationale, intent and timing of implementation.

11. ***Performance measurement system*** – describes how the success of the management strategies will be assessed against operational objectives using indicators and reference points.
12. ***Monitoring, Control and Surveillance*** – identifies the key risks in the fishery to inform the prioritising of surveillance/enforcement resources and monitoring/data needs to ensure the integrity of the fishery management plan.
13. ***Plan review process*** – outlines a process for the review of the management plan.
14. ***Appendices*** – supporting documentation to the plan, e.g. list of the demersal fish species to which the management plan applies.

Implementation

Implementation of the plan will follow a phased approach. This will be necessary given this is the first management plan for the fishery and will involve some changes that are confronting and challenging for fishers. Further, some of the management strategies require further development prior to implementation. This approach will better allow time for key management strategies to be understood and accepted (through education and awareness raising) by more gradually implementing changes, and for time to more comprehensively develop other key management strategies before implementation. For successful implementation of the management plan there are several key actions needed to take place in an efficient and timely manner (see implementation action plan). The timing if the different phases are outlined in Figure 5.

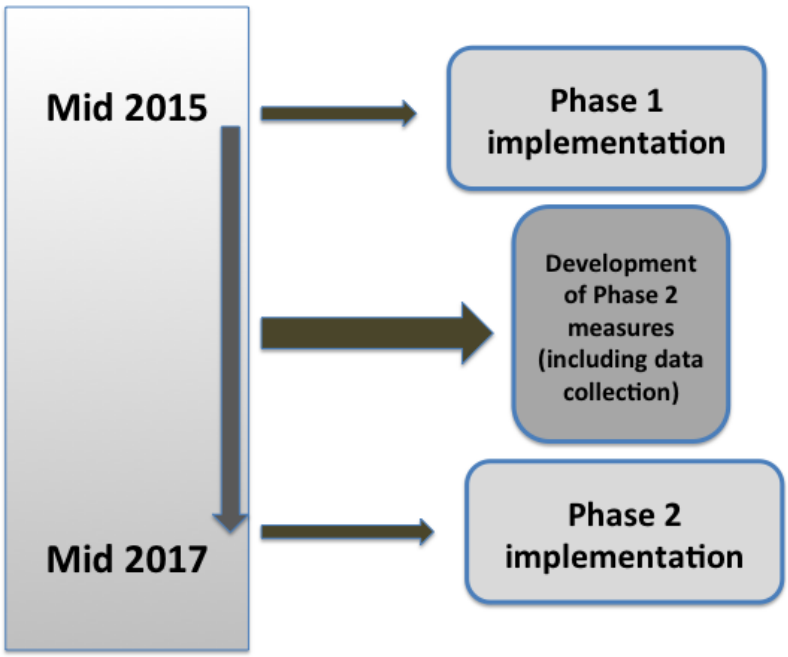

Figure 5. Outline of the timing of implementation of the Mahe plateau demersal fisheries management plan.

Key management strategies

Due to constrained project timeframes and the fact that this will be the first management plan imposed on stakeholders engaged in the Mahe plateau demersal fishery, a phased approach for implementation was determined to be prudent. The

management plan document provides detail of each management strategy including their intent and rationale. A summary of the management strategies to be applied in the management plan, and their timing, is given in Table 10. Phase 1 of the plan is scheduled for implementation by July 2015, with Phase 2 scheduled for implementation 24 months later.

Table 10. List of management strategies to be implemented in each of Phase 1 and Phase 2 of the Mahe plateau demersal fisheries management plan.

PHASE 1 (by July 2015)
Develop and implement a stakeholder communication strategy
SFA to appoint a full-time liaison officer
Introduce a minimum size limit of 32 cm FL for bourzwa and 32 cm FL for zob gris
Introduce recreational bag limits for: bourzwa = 5; zob gris = 5
Introduce a combined demersal species bag limit for recreational fishers (including recreational fishers on charter vessels) of 20 fish/person/day
Introduce a maximum limit of 20 traps per vessel for licensed (commercial) fishing vessels
Introduce a maximum vessel limit of 2 traps for recreational fishers
Introduce a demersal fish bag limit of 20 per semi-industrial vessel
Licensed fishers limited to max of 6 traps per boat per day for 7 days spanning full moon (3 days prior and 3 days post) on listed spawning sites Sept to April inclusive
No traps left in sea overnight on listed spawning sites Sept to April inclusive
PHASE 2 (24 months after Phase 1)
Develop and implement a licensing framework
Introduce a revised incentive scheme
Increase/Introduce minimum size limits to Lm50 (FL) for: Bourzwa; Zob gris; Karang plat; Karang balo; Vyey plat (*Epinephelus multinotatus*); Vara vara; Bordmar; Maconde
Schooners and whalers have a per vessel limit of 2 traps.
SFA to develop a framework to facilitate the ongoing capacity of fishing industry to engage with SFA on management issues
Industry to develop a Code of Conduct for licensed fishermen
Introduce offset provisions to compensate ecosystem impacts affecting the fishery
Introduce recreational demersal species bag limits for high risk species

Development of management strategies

Phase 1

Strategy: Develop and implement a stakeholder communication strategy

This strategy addresses many issues identified by stakeholders and is considered critical to the success of the plan. It also received very strong stakeholder support as a needed strategy as part of the plan. It must also be stressed that the timing of initiating this strategy is very important and must begin prior to the plans implementation to ensure all stakeholders are better prepared once management measures become enforceable. The more public support for the plan the more

successful it will be. This will therefore demand resources for initial strategy development in the very short-term. A Fishery Liaison Officer position at SFA would help ensure better communications and relationships into the future.

The initial priority for communication with stakeholders will be in alerting stakeholders that the management plan will come into effect and when, but also reasons why and how it affects fishers and other stakeholders. Stakeholders identified several issues associated with the overall theme of *Lack of communication*. These issues can therefore guide the elements that comprise a communications strategy in the longer term. The key elements identified are:

1. Adequately informing and consulting stakeholders of activities (e.g research) and/or specific issues relevant to the fishery
2. Educating stakeholders about the scientific basis for management actions
3. Informing stakeholders about new and existing management regulations (and their basis)

Development of a communications strategy would need to develop detailed strategies and their timing under the respective elements. This should be done as a priority for the plans implementation.

Strategy: <u>SFA to appoint a full-time liaison officer</u>

The role represents a critical resource to support the development and implementation of the communications strategy (above), but also to address in the long-term the issue of ongoing dialogue between stakeholders and SFA. The position is likely to also play a critical role in facilitating the development of other key management strategies identified to be implemented during Phase 2: licensing system, incentive scheme, engagement capacity of the fishing industry, Codes of Conduct, etc. Stakeholders were very supportive of this strategy.

Strategy: <u>Introduce a minimum size limit of 32 cm FL for bourzwa and 32 cm FL for zob gris</u>

Size limits are a major tool used in fisheries management around the world and are based on the premise that allowing fish to grow to a size that allows then to mature and breed at least once (most fish breed annually) ensures there are new fish recruits (babies) added to the population each year to help replace those that are caught (or died of other causes). In practice it means that fishers can only legally keep a fish that is longer than the minimum size limit (MSL). Fishing populations without size limits is like withdrawing money from your bank account without making any deposits. Eventually there will be nothing left!

Because the basis of setting MSL's is to allow fish to breed at least once it requires species-specific knowledge of their growth and maturity, i.e. what size (and age) do they reach sexual maturity. Generally, this is reported as the size at which 50% of the population is sexually mature (L_m50), and MSL's are generally adopted as L_m50 or higher. It is always preferable to use estimates derived from local fish stocks, however for species of the Mahé plateau availability of these estimates are limited. Where it is not known this can guide priorities for future research, however it should not be used as a reason to delay implementation of size limit regulations for species

identified at risk. It is reasonable to use L_m50 estimates obtained from the same or similar species elsewhere to guide setting a MSL. As a guide the process for using data for determining an appropriate size limit for a particular species should be: i. Data for local stocks, ii. Nearest available data for the same species, preferably the same ocean body, iii. Similar species or proxy estimates based on maximum size and longevity estimates (see Froese and Binohlan, 2000).

Other factors in considering using a MSL as a strategy include post-release survival, i.e. the likelihood that a fish will survive after it is released back into the water. This is generally determined by a number of factors including: species, depth, method of capture, location of hooking (e.g. lip, gills), handling, time out of water, etc. For example, research has shown that bourzwa have a very high survival rate even when caught from very deep water (~50 m) (Brown et al., 2010), while groupers tend to have a lower survival mainly due to non-rupturing of their swim bladder causing them to float away. There are, however, techniques that can help positively influence survival rates in species such as groupers and MSL strategies should be implemented in parallel with education of best practice release methods (such as correct deflation of the swim bladder using a needle for some species).

The concept of size limits received a very high level of support from stakeholder consultations, and once explained during workshops, the principle of adopting L_m50 as the basis for setting size limits received overall support from stakeholders for the Mahe management plan. Despite this, there was some disagreement over the size deemed to be appropriate, based on perceived impacts on catches and on a lack of available biological information for local stocks. This is one particular management strategy that is likely to take some time for fishers to get used to in practice, however based on worlds best practice for sustainability and the overall high level of stakeholder support, we advocate that L_m50 be always adopted as the basis for setting size limits for management in Seychelles in the future.

Bourzwa and Zob gris are two of the most important species taken in the Mahe plateau demersal fishery, as well as being identified as “at-risk”. It is acknowledged, based on current biological knowledge of these species from Seychelles and elsewhere that these sizes are likely to be significantly below L_m50. The size limit proposed here is influenced by the Praslin co-management plan negotiations that have already agreed on these sizes, and it would not be practical or equitable to impose different size limits for the same species across the plateau. However, current research will allow contemporary estimates of L_m50 for these species from Seychelles waters to be determined so that size limits can be altered to correspond with L_m50 during Phase 2 of the management plan.

Strategy: <u>Introduce recreational bag limits for: bourzwa = 5; zob gris = 5</u>
Bag limits are a common tool in fisheries management; they provide a strategy for sharing the (limited) resource among users while also, to some extent, limiting the capacity for overfishing. Bag limits provided acceptable maximum catch levels at an individual or vessel level given the landing of fish by recreational fishers is for the purposes of personal consumption only.

Importantly, bag limits cannot control total harvest levels of a species, as there is typically no restriction on the number of recreational fishers that can access the resource. Bag limits vary and are based on a number of factors including, the size of a species and what is appropriate for personal consumption, stock status and predicted discard mortality. They can also take into account catch history of recreational fishers to limit increased targeting however the availability of recreational fishing data is usually limited. Bourzwa and Zob gris are two of the most important species taken in the Mahe plateau demersal fishery, as well as being identified as "at-risk", and so are high priority species to implement strategies that limit catches from all sectors. Although there was an overall stakeholder preference for an overall bag limit, there was also recognition that some high-risk species may require individual bag limits. Based on this feedback the number of individual species for which bag limits will apply was reduced to the above two.

Strategy: Introduce a combined demersal species bag limit for recreational fishers (including recreational fishers on charter vessels) of 20 fish/person/day

Not only is it important to have limits on recreational catches of high-risk species it is also important to limit overall gravest to minimize significant impacts on sustainability. This is reasonable given the landing of fish by recreational fishers is for the purposes of personal consumption only. This management strategy requires that it is very clear to fishers which species are defined as demersal species under the strategy. This list is given below (Table 11) and in the management plan and is based on the historical catches of demersal species on tha Mahe plateau. There was general agreement among stakeholders that limiting recreational catch was important and that a combined bag limit was a reasonable option.

Table 11. List of demersal fish species for which this management plan applies to and is particularly relevant to the enforcement of bag limits.

SCIENTIFIC NAME	ENGLISH NAME	LOCAL NAME
Abalistes stellatus	Starry triggerfish	Bours
Acanthurus bleekeri	Bleekers Surgeonfish	Sirizyen
Acanthurus xanthoptexus	Yellowtail Surgeonfish	Sirizyen
Alectis indicus	Indian Threadfin	Karang plim
Anyperodon leucogrammicus	Slender Grouper	Seval Dibwa
Aphareus rutilans	Red Smalltooth Job	Zob Zonn
Aprion virescens	Green Jobfish	Zob Gri
Bodianus bilunulatus	Tarry Hogfish	Domeng
Bodianus macrourus	Black Banded Hogfish	Domeng
Bolbometopon muricatum	Green Humphead Parrotfish	Filanbaz
Caesio caerulaureus	Blue and Gold Fusilier	Makro Kannal
Caesio caeruleus		Makro Ble
Caesio xanthonotus	Yellowfin Fusilier	Makro Zonn
Carangoides chrysophrys	Longnose Trevally	Karang Monik
Carangoides fulvoguttatus	Yellowspotted Trevally	Karang Plat

Carangoides gymnostethus	Bludger	Karang Balo
Carangoides malabaricus	Malabar Trevally	Karang Monik
Caranx ignobilis	Giant Trevally	Karang Ledan
Caranx melampygus	Bluefin Trevally	Karang Ver
Caranx sexfasciatus	Bigeye Trevally	Karang Ledan
Cephalopholis argus	Peacock Grouper	Vyey Kwizinyen
Cephalopholis miniata	Vermilion Seabass	Vyey Zannanan
Cephalopholis sonnerati	Tomato Hind	Msye Angar
Chano chanos	Milkfish	Libine
Cheilio inermis	Cigar wrasse	Pies Madanm
Chelinus fasciatus	Red Breasted Wrasse	Kalam
Coryphaena hippurus	Common dolphinfish	Dorad
Crenimugil crenilabis	Fringelip Mullet	Mile Soter
Cryptotomus spinidens	Spinytooth parrotfish	Kalam
Diagramma pictum	Painted Sweetlips	Kaptenn di Por
Egalatis bipinnulata	Rainbow runner	Galate
Epinephelus areolatus	Areolated Grouper	Vyey
Epinephelus chlorostigma	Brown Spotted Grouper	Vyey Makonde
Epinephelus fasciatus	Redbanded Grouper	Madanm Dilo,
Epinephelus faveatus	Bigspot Grouper	Vyey Sat
Epinephelus flavocaeruleus	Blue & Yellow Grouper	Vyey Plat
Epinephelus fuscoguttatus	Brown Marbled Grouper	Vyey Goni
Epinephelus morruha	Contour Rockcod	Tioffe
Epinephelus multinotatus	White Blotched Grouper	Vyey Plat
Epinephelus polyphekadion	Marbled Grouper	Vyey Mashata
Epinephelus tukula	Potato Grouper	Vyey Tukula
Etelis carbunculus	Ruby Snapper	Job la Flamm
Etelis marshi	Ruby Snapper	Job la Flamm
Euthynnus affinis	Kawakawa	Bonit Fol
Gnathanodon speciosus	Golden Trevally	Karang Saser
Gymnocranius griseus	Grey Large-eye Bream	Sousout
Gymnocranius rivulatus		
Gymnocranius robinsoni	Bluelined Large-eye Bream	Kaptenn Blan
Halichoeres scapularis	Zigzag Sandwrasse	Tanmaren
Herklotsichthys punctatus	Sardine Herring	Sardin Ordiner
Herklotsichthys quadrimaculatus	Blueline herring	Sardin Ordiner
Hipposcarus harid	Candelamoa Parrotfish	Kakatwa Brino
Leptoscarus vaigiensis	Marbled Parrotfish	Marare
Lethrinus borbonicus	Snubnose Emperor	Toloy
Lethrinus caeruleus		
Lethrinus conchyliatus	Red Axel Emperor	Gel de Ven
Lethrinus crocineus	Yellowtail Emperor	Laskar
Lethrinus elongatus	Longface Emperor	Gel long
Lethrinus enigmaticus	Blackeye Emperor	
Lethrinus harak	Blackspot Emperor	Ziblo

Lethrinus lentjan	Redspot Emperor	Zekler
Lethrinus mahsena	Mahsena Emperor	Madanm Beri
Lethrinus microdon	Small Tooth Emperor	Bek Long
Lethrinus miniatus	Trumpet Emperor	Poul Kouve
Lethrinus nebulosus	Spangled Emperor	Kaptenn Rouz
Lethrinus variegatus	Variegated Emperor	Baksou
Lutjanus argentimaculatus	Mangrove Red Snapper	Karp
Lutjanus bengalensis	Bengal Snapper	Madras
Lutjanus bohar	Twospot Red Snapper	Vara Vara
Lutjanus coccineus	Humphead Snapper	Bordmar
Lutjanus fulviflama	Black-Spot Snapper	Ziblo
Lutjanus gibbus	Humpback Red Snapper	Terez
Lutjanus kasmira	Bluelined Snapper	Madras
Lutjanus monostigma	Onespot Snapper	Semiz
Lutjanus rivulatus	Scribbled Snapper	Bourzwa de Zil
Lutjanus sebae	Emperor Red Snapper	Bourzwa
Monodactylus argenteus	Natal Mony	Lime
Naso hexacanthus	Blacktongue Unicornfish	Korn Blan
Octopus vulgaris	Octopus	Zourit
Oedalechilus labiosus	Foldlip Mullet	Mile Laronn
Paracaesio xanthurus	Yellowtail Blue Snapper	Makro Zonn
Parupeneus barberinus	Dash and Dot Goatfish	Rouze Tas
Parupeneus cinnabarinus	Cinnabar Goatfish	Rouze Lokal
Parupeneus porphyreus	Rosy Goatfish	Rouze Rouz
Platax orbicularis	Orbicular Batfish	Poul Do
Plectorhinchus gaterinus	Balckspotted Rubberlip	Kaka Matlo
Plectorhinchus orientalis	Oriental Sweetlips	Vyey Sesil
Plectorhinchus schotaf	Minstrel	Marmite
Plectropomus laevis	Spotted Coral Trout	Vyey Babonn Sesil
Plectropomus maculatus	Leopard Coral Grouper	Vyey Zannannan
Plectropomus punctatus	Marbled Coral Grouper	Babonn Fey Koko
Priacanthus hamrur	Moontail bullseye	Lapo Soulye
Pristipomoides filamentosus	Bluespotted Jobfish	Batrikan, Kalkal
Pristipomoides multidens	Striped Jobfish	Sagresyen
Scarus falcipinnis	Sicklefin Parrotfish	Kakatwa Ver
Scarus ghobban	Yellowscale Parrotfish	Kakatwa Blan
Scarus rubrioviolaceus	Ember Parrotfish	Kakatwa Rouz
Scolopsis frenatus	Seychelles Monocle Bream	Batgren
Siganus argenteus	Streamlined Spinefoot	Kordonnyen Soulfanm
Siganus canaliculatus	Whitespotted Spinefoot	kordonnyen Brizan
Siganus corallinus	Bluespotted Spinefoot	Kordonnyen Lafimen
Siganus stellatus	Brownspotted Spinefoot	Kordonnyen Margrit
Siganus sutor	Shoemaker Spinefoot	Kordonnyen Blan
Sphyraena barracuda	Great Barracuda	Tazar
Sphyraena bleekeri	Sawtooth Barracuda	Bekin Vera
Sphyraena forsteri	Bigeye Barracuda	Bekin

Sphyraena jello	Pickhandle Barracuda	Bekin Karo
Sphyraena obtusata	Obtuse Barracuda	Bekin Gomon
Variola albimarginata	White-edge lyretail Grouper	Gran Queue
Variola louti	Lyretail Grouper	Krwasan
Zebrasoma veliferum	Sailfish Tang	Taba

Strategy: Introduce a maximum limit of 20 traps per vessel for licensed (commercial) fishing vessels

There is a need to limit the capacity for future effort increases in the trap fishery and also remove any latent effort currently existing in this sector of the fishery. The number of traps was determined by stakeholder feedback. Initial consultations proposed the limit to be 30 traps, however many stakeholders suggested 15 traps was more reasonable. There is a conflict with the Praslin co-management plan however, which has agreed to 25 traps. As a consequence we arrived at a limit of 20 to more accurately factor in the majority feedback from stakeholders, acknowledging that it conflicts with the Praslin plan. This will either need to be resolved before implementation of either plan or will require more weighting to education on this management strategy being different in different areas. This in itself could be the cause of conflict among fishers. Determination of a "fair" limit may require an analysis of existing trap effort data. The analysis would be to determine the historical number of active traps (mostly) used and set a limit that balances the need to prevent future increases in fishing capacity while also minimizing the impact on current fishermen.

Strategy: Introduce a maximum vessel limit of 2 traps for recreational fishers

The trap fishery is a separate sector altogether thereby requiring specific management strategies to control fishing effort. This strategy limits the capacity for future effort increases in the recreational sector while also allowing recreational fishers the opportunity to use traditional methods to catch fish for subsistence, as well as limiting the impact on juveniles of some species commonly caught in traps. Although many stakeholder groups were supportive of 1 trap, many also suggested 2-3 was reasonable. Further, the Praslin co-management plan has adopted a limit of 2 traps for recreational fishers. Overall, adopting a limit of two for the Mahe plateau plan was the most sensible option.

Strategy: Introduce a demersal fish bag limit of 20 fish per semi-industrial vessel

This strategy is to address the relatively recent and specific issue of "semi-industrial" longliners targeting demersal fish species on the edge of the plateau using bottom-set longlines. This is an extremely efficient technique at removing large quantities of fish very quickly and is not considered a sustainable practice and therefore impacts on the artisanal fishing fleet. It will be important to include this stakeholder group in extension of the management plan.

Strategy: Licensed fishers limited to a maximum of 6 traps per boat per day for 7 days spanning the full moon (3 days prior and 3 days post) on listed Kordonnyen spawning sites from September to April inclusive

Spawning aggregations make fish easy to target at a sensitive time in their life cycle. Globally the practice of fishing fish spawning aggregations has often led to overfishing and stock collapses, therefore limiting effort on spawning aggregation sites is a prudent measure. Although rotational closures of kordonnyen spawning sites was initially proposed as an option (because some Mahe fishers have suggested this), the proposed management strategy here is consistent with that being implemented in the Praslin co-management plan. Having consistent management across the plateau is preferable to ensure strategies are readily understood and easy to comply with. This strategy requires clearly identified spawning sites; this has been done in the Praslin area however it still requires sites to be identified around Mahe Island based on consultations with fishers. Nominated spawning sites then need to be clearly identified to stakeholders and marked.

Strategy: No traps may be left in the sea overnight on listed Kordonnyen spawning sites from September to April inclusive

Responses from stakeholders on this strategy were variable however it is included as an alternative measure to reduce effort on Kordonnyen spawning sites and because it is being implemented in the Praslin co-management plan. The rationale, based on discussions with the PFA, is that dinoflagellates attach to traps at night and fluoresce thereby scaring Kordonnyen away from spawning sites and potentially disrupt spawning and also reduce daytime catch rates.

Phase 2

Strategy: Develop and implement a licensing framework

Uncontrolled fishing effort leads to overfishing and in the Seychelles demersal fishery there is significant evidence that key fish stocks have declined and are continuing to do so (Gutierrez, 2015). This is largely due to a long history of uncontrolled fishing effort; anyone can fish anywhere, anytime, with almost any gear, using any vessel, and catch any species of any quantity limited only by capacity and/or desire. To reverse these declines and to achieve sustainability, controls on fishing effort levels need to be implemented. This can be achieved by placing controls on access to the fishery and the most effective way is through a licensing system. The design of the licensing framework will need to carefully consider the criteria to qualify for a fishing licence, with a view to ensuring fairness but also with a view to putting a cap on the number of licences. So, although this strategy doesn't reduce effort from current levels, it provides the mechanism for making the necessary significant effort reductions in the future (see further notes in the Recommendations section).

There was acknowledgement from all stakeholders that there needs to be a mechanism for controlling future effort in the fishery. There was also an overall high level of support for a licensing system to be implemented to help achieve this. This strategy is to be implemented in Phase 2 as it requires significant development with

stakeholder consultation to ensure a system that is appropriate, effective and equitable. It will also require ongoing resourcing commitments for implementation and management.

Strategy: Introduce a revised incentive scheme

This strategy is aimed at addressing concerns that participants abuse the current incentive scheme. This strategy is to provide incentives to fishers for adhering to the licensing system. The current incentive scheme provides discounted fuel and may or may not be part of a revised scheme. The intent is also that the old scheme be reviewed to introduce a revised version that is equitable and effective with meaningful incentives under a rights-based licensing system. This strategy will be implemented in Phase 2 as it requires time for a review of the current system and a revised system developed that addresses key issues effectively. All stakeholders were supportive of this strategy.

Fish stocks are a community resource, and licensed fishers have the right to access the fisheries resource on behalf of the community. Where an incentive scheme uses public money to subsidize a fishers' business operating costs, a significant proportion of the net benefits of those subsidizations should flow back through to the community. A revised incentives scheme should be based on the principle of delivering a net community benefit by ensuring adequate domestic supply of locally caught fish. Key to the success of any scheme is transparency, accountability, compliance and monitoring of the schemes' provisions.

Strategy: Introduce minimum size limits consistent with L_m50 (FL): Bourzwa, Zob gris, Karang plat, Karang balo, Vyey plat, Vara vara, Bordmar, Maconde

As stated above, stakeholders have indicated their support for the concept of size limits as a key aspect of the management plan, including the inclusion of the species listed here. These species represent the major species taken in the fishery, particularly by the hook and line sector, and each have been identified as high risk based on recent stock and risk assessments as well as their biological characteristics (Gutierrez, 2015). The species are: Bourzwa, *Lutjanus sebae*; Zob gris, *Aprion virescens*; Karang plat, *Carangoides fulvoguttatus*; Karang balo, *Carangoides gymnostethus*; Vyey plat, *Epinephelus multinotatus*; Vara vara, *Lutjanus bohar*; Bordmar, *Lutjanus sanguineus*; Maconde, *Epinephelus chlorostigma*. This strategy is included in Phase 2 to allow time for SFA to collect the necessary data to determine robust science-based estimates of L_m50 for local populations.

Strategy: SFA to develop a framework to facilitate the ongoing capacity of the fishing industry to engage with SFA on management issues

This strategy covers several issues identified by stakeholders and is essentially aimed at improving communication between SFA and the fishing industry, but places an obligation on SFA to ensure industry have the necessary capacity to do so effectively. It will be implemented in Phase 2 to allow time for the SFA to explore possible frameworks and the SFA liaison officer will likely play a key role in this.

Strategy: Industry to develop a Code of Conduct for licensed fishermen

Industry Codes of Conduct developed and agreed by fishers can be an effective tool to educate fishers, promote best practice fishing methods, create professionalism and credibility and improve safety at sea. In the Seychelles demersal artisanal fishery achieving these would address several key social issues identified by stakeholders. Having an SFA liaison officer and a co-ordinated industry organisation would help facilitate this strategy. Generally there was good support for this strategy and some of the reservations were based on the perception that some fishers would not adopt the Code. Being a voluntary measure this is to be expected however Codes of Conduct have proven to be effective tools in fisheries elsewhere in the world.

Strategy: Schooners and whalers may not carry more than 2 traps

This strategy is aimed at removing the potential for existing fishers to significantly increase their fishing operations in the future to the detriment of stocks. Unused potential is called latent effort and removing this helps to prevent future problems of overfishing, thereby helping to ensure sustainability. It is aimed at the larger vessels in the artisanal fleet who would normally use hook and line gear and have few traps on board. This was reflected in the stakeholder comments however there were mixed views with some individuals not supporting this strategy, particularly on Praslin Island, who argued that they wanted the option to carry more in the future. Given there is a need to avoid increases in fishing effort on the plateau fishery due to the evidence of overfishing already occurring, this strategy was included but not until Phase 2.

Strategy: Introduce offset provisions to compensate ecosystem impacts affecting the fishery

Some of the key issues identified were related to the extent of nearshore shallow habitat that has been impacted over the years due to coastal developments, particularly large tracts of reclaimed land areas. These habitats typically support significant populations of juveniles of demersal reef species. This strategy is aimed at ensuring that these types of impacts are negated in the future and if they do occur that the fishing community is duly compensated. This strategy is included in Phase 2 of the plan as it will require significant time to consult with other relevant agencies and the private sector and to explore a suitable model for this strategy to work best.

Strategy: Introduce recreational demersal species bag limits for high-risk species

There is a need to limit targeting on key species by all sectors, especially those species considered at risk due to historical high levels of fishing effort and/or their particular biological characteristics. This strategy is in Phase 2 to allow time for the concept of bag limits to become more accepted among the fishing community and to assess the need and level of individual species bag limits for high risk species, such as those identified earlier (see Gutierrez, 2015).

Performance measurement system

A transparent and robust means of measuring the performance of the management plan in meeting its objectives is critical to effective and responsive fishery management. The development of the PMS was informed by the outputs of

stakeholder workshops. The results of a Productivity Susceptibility Analysis (PSA), stock assessments on key species in the fishery (Gutierrez 2015) and issues raised by stakeholders informed the setting of the operational objectives for the Mahe Plateau demersal fishery PMS. The assessment of the status of the stocks identified consistent trends in declining CPUE for a number of key species over the last 10 years (Gutierrez 2015). The operational objectives in the PMS relate to the rebuilding of declining stocks of these species. Ecological operational objectives are limited to target species in the fishery due to data and information constraints on any by-catch (species discarded), impacts of fishery on ecosystem and status of fishery habitats.

A summary of the Performance Measurement System is provided in the management plan. A full PMS plan has been developed as a stand-alone document. SFA provided the main input into the development of the PMS plan. This represents an initial plan that will require refinement and updating as new fishery's data becomes available through the revised SFA annual Catch Assessment Surveys, biological data relating to key species (e.g. size at maturity) and fishery independent data allowing for fishing mortality estimates.

Critical to the effective delivery of the PMS is the reporting of the results of the assessment on an annual or biennial basis. Stakeholders have consistently raised concerns about the transparency of management processes therefore we strongly recommend that the SFA makes the results of the PMS available to stakeholders in an appropriate format as soon as practical.

Summary of Performance Measurement System

The Mahe Plateau Demersal Fishery Management Plan is being implemented in 2 phases. The Performance Measurement System is divided into the 2 phases. Phase 2 will come into effect 2 years following the implementation of the fisheries management plan. All the performance measures listed in phase 1 will carry over into phase 2.

Monitoring, Control and Surveillance protocols

A risk assessment and risk management approach was used to inform the development of the Monitoring, Control and Surveillance Protocol for the Mahe Plateau demersal fishery. The methodology that was used is current best practice, follows ISO31000 guidelines and has been adopted by many national and international fisheries agencies and organizations (e.g. FAO, Indian Ocean Commission, Australian Fisheries Management Authority) (International Standard 2009; AFMA 2013). In an environment where there are finite surveillance, enforcement and monitoring resources, the formal risk assessment approach provides a transparent and accountable process for priortising allocation of resources. The risk assessment process involves 5 steps; these steps include establishing the context of the risk environment; identifying the full spectrum of possible risks in the implementation of the fishery management plan; analyzing the risks; evaluating the risk assessment results; and treating the risks by identifying specific monitoring or surveillance/enforcement actions.

The commercial fishers, fishermen's associations, Fishing Boat Owners Association (FBOA), sports fishing/charter operators, recreational fishers, NGO's, Government Agencies notably SFA and the Coastguard represent the key stakeholders in the development and implementation of the Mahe Plateau Demersal Fishery Co-Management Plan. All sectors were engaged in, or had the opportunity to contribute to the risk assessment and prioritization process. Separate risk assessment workshops for the government agencies, and the fishing industry were conducted; 3 risk assessment workshops in total: 1) SFA and other government enforcement agencies; 2) Mahe fishing industry 3) Praslin/La Digue fishers. A final workshop was conducted with SFA research, data management, monitoring and enforcement staff to identify the category of risks that would receive dedicated surveillance/enforcement, identify resources needed to deliver the enforcement programs and implementation costs.

A full MCS Protocol has been developed as a stand-alone document. We recommend that the MCS protocol is reviewed by SFA on a biennial basis to ensure that the elements of the enforcement programs remain relevant and effectively deliver the management plan.

Review process

The process of reviewing the management plan is an essential component post-implementation to:

- Ensure that the plan is achieving its stated objectives.
- Identify emerging issues that may need to be incorporated into the plan.
- Review new data/information and incorporate as necessary into the management plan.
- Modify the plan as necessary based on the above.

We have proposed that the plan be reviewed biennially as a balance between limiting resources required to conduct a review and the likely timeframes for meaningful change to be experienced in the fishery and the management plan strategies. An essential component of the review process will be the application of the plans Performance Measurement System (PMS). This process will involve collating and analyzing relevant information and so will require the necessary personnel and time (see action plan). We also recommend that a plan ***Implementation Committee*** be established that comprises key stakeholder representatives and is responsible for overseeing the plans implementation and each subsequent review of the plan and the associated process. Finally, as part of the ongoing communication and extension strategy, the outcomes of any review process should be documented, advertised and made publically available.

Implementation action plan

The action plan developed for implementation provides the lists of key tasks required, the timing for completion, who is responsible and an approximation of costs (time, resources, costings) (Table 12). This action plan is a plan to ensure the management plan is put into practice, while the review process will incorporate the PMS and MCS protocols on an ongoing basis. Beyond the Phase 2 implementation of the management there is the need for consideration of continued funding and

support for: liaison/fisheries officer, communication, licensing, data management, data collection, enforcement, reporting, review events.

Table 12. Action plan for the implementation of the management plan.

Task	Timing	Who	Risk of action not taken	Time/Costings (SR)
Liaise with Mahe trap fishers to identify kordonnyen spawning sites for management	20/05/2015	SFA Fisheries technician in collaboration with Mahé fishermen	Plan integrity; stakeholder commitment	Nil
Management plan and relevant documents (eg. Fisheries Act 2014) made publicly available	22/05/2015	SFA	Legislative obligations; plan integrity; transparency	Nil
Review and finalise management plan	05/06/2015	SFA, stakeholders, C_2O Fisheries	Plan integrity	Nil
Draft communication and extension strategy developed, including extension material (brochures, posters, stickers, booklets)	30/06/2015	SFA Fisheries Officer through consultancy	Stakeholder commitment; transparency	5 days at US$ 250 p/day **Tot: SR 17,000**
Review of management plan by legal personnel before sending to Attorney General's Office.	30/06/2015	Independent legal practitioner and SFA's Deputy CEO.	Legislative obligations; plan integrity	5 days at US$ 400 per day. **Tot: SR 22,200**
Communication and extension strategy implemented; extension materials printed (needs to be some extension to the public of the process taking place and timelines, therefore this would start prior to government approval)	30/06/2015	SFA's Fisheries Officer through consultancy	Stakeholder commitment; transparency	**SR 250,000**

Management plan stakeholder Implementation Committee formed and terms of reference determined	20/07/2015	SFA Fisheries Officer	Stakeholder commitment; transparency	Liaison officer
Government approval of management plan	31/07/2015	SFA's CEO, Seychelles Government	Legislative obligations; plan integrity	Nil
Management plan implementation process and dates advertised publicly	01/08/2015	SFA Fisheries Officer	Stakeholder commitment; transparency; plan integrity	Advertising costs. **SR 25,000**
Full-time liaison officer employed	01/08/2015	SFA	Stakeholder commitment	Appropriate SFA annual salary
Plan gazetted; Phase 1 strategies implemented	20/09/2015	SFA, Seychelles Government	Legislative obligations; plan integrity	Nil
Draft licensing system developed	Start: 15/01/2016 Completion: 30/06/2016	SFA's Fisheries Officer	Legislative obligations; plan integrity	Consultant days (45 days at US$ 500 per day). SR 40,000 for workshops and other expenses. **Tot: SR 346,000**
Consult commercial fishers in developing an industry Code of Conduct	Start: 15/01/2016 Completion: 30/06/2016	SFA Fisheries Officer through consultancy	Stakeholder commitment; transparency; plan integrity	Fisheries Officer time Euro 5,000 **Tot: SR 76,000**
Consult sport fishers in developing an industry Code of	Start:	SFA Fisheries	Stakeholder	Fisheries Officer

Conduct	15/01/2016 Completion: 30/06/2016	Officer through consultancy	commitment; transparency; plan integrity	time Euro 5,000 **Tot: SR 76,000**
Consultation with fishers to develop a framework to facilitate 2-way engagement with government on management issues into the future	Start: 15/01/2016 Completion: 30/06/2016	SFA	Stakeholder commitment; transparency	Fisheries Officer time
Start implementation of targeted research programme to fill gaps in knowledge	15/01/2016	SFA's Chief Fisheries Officer	Stakeholder commitment; plan integrity	Research section budget under Seychelles/EU partnership agreement
Document maturity research results for Bourzwa	30/06/2016	SFA Chief Fisheries Scientist	Stakeholder commitment; transparency	Nil
Draft revised incentive scheme completed	30/09/2016	SFA's Chief Economist	Plan integrity	Consultant days. 20 days at US$ 500 per day. SR 20,000 for workshops. **Tot: SR 156,000**
Document maturity research results for Zob gris	16/12/2016	SFA Chief Fisheries Scientist	Stakeholder commitment; transparency	Nil (already funded)
Review of Phase 1 implementation initiated	28/02/2017	SFA's Fisheries Officer	Plan integrity	Euro 4,000 **Tot: SR 61,000**
Document maturity research results for: Karang plat,	30/06/2017	SFA Chief	Stakeholder	K. plat and K.

Karang balo, Vyey plat (*Epinephelus multinotatus*), Vara vara, Bordmar and Maconde		Fisheries Scientist	commitment; transparency	balo already funded. Others: Euro 15,000 **Tot: SR 229,000**
Consult stakeholders in proposing recreational bag limits for: Karang plat, Karang balo, Vyey plat (*Epinephelus multinotatus*), Vara vara, Bordmar and Maconde	30/06/2017	SFA Fisheries Officer	Stakeholder commitment; transparency	Liaison officer time
Review offset provision options; engage relevant government departments, agencies and businesses; introduce compensation guidelines for development impacts on fisheries habitats	30/06/2017	SFA, Seychelles Government, environmental and planning departments, private sector	Stakeholder commitment; transparency; plan integrity	

As the undersigned, we agree to this action plan and commit to its completion to ensure successful implementation of the Mahe plateau demersal artisanal fishery management plan.

Signed: ……

Date: ……
Name: ……
Position: ……

Signed: ……

Date: ……
Name: ……
Position: ……

Recommendations

Consultation

The importance of early and continued consultation with stakeholders during the process was demonstrated by the discontent apparent in Mahé due to the lack of consultation with them during the Praslin co-management plan, and also on La Digue who also felt they were not consulted enough or that they agreed with the elements in the Praslin co-management plan. Although there was a focus on extensive consultation during development of this plan for the Mahé plateau, there was still not enough time for adequate consultation with stakeholders on the detailed management strategies. Despite the focus on consultation, this was partially undermined due to the perceived lack of consultation on the Praslin plan. The integrity of the Mahé and Praslin management plans will be dependent on stakeholder support, particularly since the intention is to move towards full co-management. Without support of the Praslin plan by La Digue fishers a better approach would be to redraw the management boundary to exclude La Digue, and even this process should involve La Digue fishers. Ultimately, with concerted efforts on comprehensive consultation management can move more towards a co-management model whereby empowered stakeholders will reduce the need, and resources, for enforcement and monitoring.

Recommendation: That SFA facilitates dialogue between Mahé, Praslin and La Digue fishers to try and resolve conflicts regarding management measures in the Praslin plan and in doing so develop a strategy for continued dialogue.

Recommendation: That SFA ensure that consultation regarding the Mahé management plan is continued during the further development, implementation and review stages. This is particularly critical during the upcoming implementation phase and the development of a management ***Implementation Committee*** composed of key stakeholder representatives will ensure longer-term participation that will facilitate a co-management approach.

Education and extension

As articulated elsewhere in this report communication and extension is a critical determinant of the success of the management plan. Stakeholders identified this as critical also and identified key areas of this topic that are important to them that they believe have been lacking in the past. These include: knowledge of SFA research and activities, the basis for management decisions, updates on management and/or fisheries reviews, opportunities for consultation and involvement, and information on current management. In recognizing this importance we have included the development of a comprehensive communication and extension strategy as an integral part of the management plan.

Recommendation: That education, communication and extension continue to be a high priority activity for SFA going forward in relation to management and research of Seychelles fisheries.

Management strategy rationale and further development

Guidelines for development of a licensing framework

The new *Fisheries Bill 2014* paves the way for the implementation of a licensing framework for the Mahé plateau demersal fishery. Development of an appropriate, effective and equitable licensing framework will need adequate resourcing both in terms of staffing and time. The time for this development would be lengthy. An effective licensing framework can control the issues created by 'open access' fishing, and can also help mitigate other issues such as better controlling the local market and therefore prices of fish for consumers (both an economic and social issue). After initial implementation that recognizes individuals fishing history, the fishery should move towards being '*limited entry*', meaning that there is (eventually) an upper limit of commercial fishing licenses issued and no new ones can be issued. This may necessitate a fishery "investment warning" at some stage in the near future. There are a number of other elements that will need to be considered very carefully and below is a guide to some of these.

i. Background information: To inform the development of a licensing framework, as much information as possible about the fleet characteristics need to be obtained. This will inform, in particular, who has a history in the fishery (e.g. through regular licensing and/or evidence of selling fish as their main income) and provides justification for them to have continued access. This needs to be carefully considered to ensure equity and avoid impacts on fishers who do have a reliance on fishing as an income. Dealing with fishers who are part-time but who rely on this to supplement their income will need to be considered especially carefully as in many instances these fishermen are the most robust by not having a reliance on a single income stream, they provide important other services thereby having a diverse contribution to the local community, and their ecological "footprint" will be less than full-time fishers. The background data will also inform the types of fishers that operate in the fishery (e.g. charter, commercial, recreational, gear types used, vessel types, etc).

ii. Licence types: Based on the above information, and since it is a limiting resource, there is a need to clearly define resource access rights to ensure social and economic benefits among the different fishery sectors. This entails who can access the resource and defines their level and type of access. This may mean issuing licences based on the type of fisherman. In the Mahé plateau demersal fishery there are three major fishing sectors: commercial, charter, and recreational.

    a. Recreational fishing: defined as the activity of fishing for enjoyment or cultural reasons where catches are retained for **personal consumption only**. Although controlling recreational fishing through licensing is notoriously difficult, it is possible to phase in a 'Register of Recreational Fishers' based on cost recovery and provides benefits to the sector (e.g. proceeds go towards better infrastructure). This may not be suitable to the Seychelles situation in the short-medium term however.
    b. Commercial fishing: defined as the activity of fishing for the purpose of **selling fish as a source of income**. There is currently a requirement for this sector to be licensed in the Seychelles, however this system appears

to have low compliance and is poorly managed. Under a licensing system, if fishers wish to catch fish for sale then they would need to possess a commercial fishing licence, which may contain conditions (e.g. maintain a logbook of their catch and effort details (e.g. where, when, how long, what, how many, etc); provide the above information when requested (e.g. at landing sites), etc).

c. Charter fishing: defined as the activity of **taking paying customers (recreational fishers)** to participate in fishing activities. Recognised as a fishing business, that significantly increases the fishing efficiency of recreational fishers and the fishing effort on fish stocks. Although this sector primarily targets pelagic species for tourists on the plateau, they also conduct demersal fishing from time to time and therefore should be considered under a Mahé plateau management plan. Further, they provide product to a niche market by often selling their catch of pelagic fish. To cater to this unique local sectoral characteristic under a licensing framework, it is likely that charter fishers would need to hold a charter fishing licence (a current regulation) and, if they wish to sell part of their *pelagic* (only) catch, they must also hold a commercial licence (or special endorsement attached to their charter licence) that permits this. Conditions may also be placed on charter fishing licence holders, such as maintaining a fishing logbook.

iii. Eligibility rules: In order to implement a (revised) licensing framework that is equitable for existing fishers, there needs to be the opportunity for individuals to demonstrate a history in commercial and/or charter fishing. This may be determined from historical information. For example, if you have a demonstrated history of fishing using traps and you sell your catch, then you would be eligible for a commercial fishing licence that allows you to continue in the fishery using traps. For those who cannot demonstrate a history, and in the interests of being fair, there needs to be a period of time and mechanisms that allows fishers to demonstrate their level of reliance on fishing as a business (e.g. in the order of ~2 years).

iv. Communication and Extension: For transparency and to ensure equity, there also needs to be an ongoing education program. (This could be packaged as part of the overall stakeholder communication strategy as a key action of the management plan). Regarding the licensing framework key messages to be communicated include: a limiting resource and the need to limit catches (therefore the need to have controls on who catches what); needs to be done as a partnership between fishers and government; uncontrolled (un-licensed) selling likely to increase fish prices to consumers; and what the licensing regulations are (costs, application process, eligibility rules, licence conditions, sectoral differences), etc.

v. Resources: Finally, there needs to be adequate resourcing to develop, implement and manage the licensing system on an ongoing basis. The key to ensuring a cost-effective administrative system is the careful planning and development of an efficient database systems (relational database of licence holders and their catch and effort details), and processes that underpin the system. This includes managing licence renewals and fee collection, logbook receipt and data entry

(quarterly?), as well as surveillance for compliance (should be part of MCS plan implementation). Licensing fees can be used to offset administrative costs, but would require an ongoing budget.

Safety at sea

Stakeholders identified concerns over safety in the fishery with respect to safe vessels and safe operating procedures. It is suggested under the Act that there is a requirement for safe working conditions and given this and stakeholder concerns there may need to be a review of needs, which would need to involve SFA and SMSA. For example, an option may be to regulate safety through linking fishing license to seaworthiness certificate. Alternatively if a fisher doesn't have a fishing license then they are not eligible for incentives, which may include access to subsidized safety equipment. This is potentially important since fishers also noted that the cost and availability of safety gear to individuals was an issue.

Targeting spawning aggregation sites

This was an issue raised in relation to bourzwa however is relevant to any species. Where there is targeted fishing of spawning aggregation sites there is increased potential to overfish populations. A potentially useful management strategy that is used around the world is to protect spawning fish at the times and places they are aggregated to spawn but requires information to be collected on spawning locations and times. Currently this information is available for kordonnyen only. There is therefore a research need to identify these spawning sites where possible to inform the potential for future management strategies to protect them. Also, the continued practice of fishing kordonnyen spawning aggregation sites should be monitored carefully.

Controlling effort in the trap fishery

As outlined above for the development of a licensing framework, to inform appropriate and equitable management of the trap fishery into the future there is a need to analyse historical trap effort data. The management plan contains management strategies around controlling trap fishing effort based on stakeholder feedback during consultations. However, there were a range of views articulated and examination of the relevant trap fishing data would better inform the current management strategies. Monitoring trap catches is also a need given the high potential for catching immature fish.

Recreational fishing data

Understanding the recreational fishing sector is a common challenge in fisheries regions everywhere, however as a unique sector is critical in ensuring they are managed optimally and equitably. With the introduction of the management plan and a licensing framework in particular, there is a need to collect data from recreational fisheries in Seychelles. These data are often the hardest to obtain and include: catch characteristics, effort levels, behavior and motivations. Such an exercise would also help build better relationships between SFA and recreational fishers. This may be critical for the long term success of the plan since this fishing sector are often the most diffuse and therefore difficult to consult effectively, and were the fishers least consulted during the development of this plan.

Trap selectivity research

The current plan does not alter the mesh sizes of traps despite being numerous stakeholder suggestions that an increase in mesh size would be a good strategy to reduce the number of immature fish caught. Although there was support for such a measure it was not included as some groups were against the option, and importantly there was insufficient data on trap performance to apply this strategy effectively. There is a need to conduct research on the selectivity of traps, in particular to assess the effect of different mesh sizes on catch rates, catch composition and the size structure of catches. Also, such research should also assess different trap constructions. The results of such research would provide the necessary basis for any potential changes to mesh sizes of traps as a management regulation.

Understanding market structure issues

A recurrent issue raised by stakeholders was the rising price of fish and poor market structures. This was recognised as a complex issue and for which there was limited data to initiate management strategies to try and address the issue. Although some potential strategies were raised (e.g. Fishermen's associations to establish a series of cooperatives that market fish to improve the supply chain of fish from 'boat to plate'), it was recognised that to try and address the issue there was first a need for targeted research to try and understand the issue better.

Extending demersal management to the Seychelles EEZ

The current management plan only applies to demersal species of the Mahe plateau, however, as pointed out by several stakeholders there is currently no management for other areas of Seychelles EEZ outside the plateau. This is a pertinent point especially given the increasing catches coming from outer island groups, particularly bourzwa and groupers from outer island groups (eg. Amirantes). The Mahe demersal fishery management plan should be viewed as a key starting point to what can eventually be management of all demersal reef fish across the Seychelles EEZ.

Addressing issues into the future

This report documents all of the outcomes of stakeholder consultations including feedback and issues raised, as well as the process followed in the plans development. This represents an important recording that should be utilized in the future management of the Mahe plateau fishery, and potentially for the Outer Islands as it documents the results of extensive stakeholder consultation. Too many times agencies with limited resources "start all over again", however future reviews for management of Seychelles demersal fisheries should consult this documentation as a cost-effective first step. In particular, one would need to refer to the spreadsheets in future reviews to fully understand issues underlying each of the issue themes.

References

Brown, W. Sumpton, M. McLennan, D. Mayer, M. Campbell, J. Kirkwood, A. Butcher, I. Halliday, A. Mapleston, D. Welch, G. Begg and B. Sawynok. (2010). An improved technique for estimating short-term survival of released line-caught fish, and an application comparing barotrauma-relief methods in red emperor (*Lutjanus sebae* Cuvier 1816). Journal of Experimental Marine Biology and Ecology, 385: 1-7

FAO (2008-2015). Small-scale fisheries - Web Site. Co-management. FI Institutional Websites. In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated. [Cited 6 April 2015]. http://www.fao.org/fishery/topic/16625/en

FAO (2005). Putting into practice the ecosystem approach to fisheries. Food and Agriculture Organization of the United Nations, Rome, 2005. 76pp.

FRDC (2008). Co-management: Managing Australia's fisheries through partnership and delegation. Report of the Fisheries Research and Development Corporation's national working group on the fisheries co-management initiative, project no. 2006/068. 50pp.

Froese, R. and C. Binohlan. 2000. Empirical relationships to estimate asymptotic length, length at first maturity and length at maximum yield per recruit in fishes, with a simple method to evaluate length frequency data. J. Fish Biol. 56:758-773

Grandcourt, EM, Hecht, T, Booth, AJ, and Robinson, J (2008). Retrospective stock assessment of the Emperor red snapper (*Lutjanus sebae*) on the Seychelles Bank between 1977 and 2006. ICES Journal of Marine Science, 65: 889–898.

Gutierrez, NL (2015). To conduct a risk assessment to identify threats to demersal stocks and stock assessments for key demersal fish stocks. Report to the GOS-UNDP-GEF Mainstreaming biodiversity management into production sector activities, Seychelles. 70pp.

Lablache, G., and Carrara, G. (1988). Population dynamics of Emperor red snapper (*Lutjanus sebae*), with notes on the demersal fishery on the Mahe´ Plateau, Seychelles. In Contributions to Tropical Fisheries Biology: Papers by the Participants of FAO/DANIDA Follow-up Training Course on Fish Stock Assessment in the Tropics, Hirtshals, Denmark, 5 – 30 May 1986, and Manila, Philippines, 12 January–6 February 1987, pp. 171–192. Ed. by S. J. Venema, M. Christensen, and D. Pauly. FAO Fisheries Report. 389 pp. (ISSN 0429-9337).

Nageon de Lestang, J (2011). Baseline report for the establishment of the artisanal demersal hand line fishery in Seychelles. Report to the Seychelles Fishing Authority, EAF-Nansen project, 82pp.

Appendices

Appendix 1. Workshop agendas

Plan development phase

WORKSHOP No. 1 AGENDA
Mahe, Thursday November 6, 2014
Praslin, Saturday November 8, 2014

0900 Welcome and introductions
0910 Workshop overview
- a. Background of project
  - i. Project schedule
  - ii. Overview of the draft management plan
- b. Workshop goals
  - i. Expectations and input from participants

0925 Presentation
- a. Purpose of operational fishery management plans
- b. Explain EAFM
- c. Introduce concepts and terminology (e.g. decision control rules, reference points)

0955 Stakeholder engagement
- a. Review project schedule and key stages
- b. Discuss stakeholder involvement at each stage

1030 ***Morning tea***

1050 Management plan goals
- a. Review broad objectives (goals) for the fishery
- b. Seek stakeholder input on aspirations (ecological, social, economic)
- c. Revise management plan goals

1230 ***Lunch***

1330 Management strategies to achieve objectives
- a. Review key fishery issues (refer RA and prioritisation report)
- b. Discuss issues and group to broad objectives
- c. Discuss and identify operational objectives to address priority issues (evaluate need to prioritise objectives)
- d. Identify potential management strategies to address priority issues

1545 Review
- a. Revisit workshop goals
- b. Next workshop
- c. Wrap up

1600 Workshop close

WORKSHOP No. 2 AGENDA
Mahe, Wednesday November 12, 2014
Praslin, Saturday November 15, 2014

0900 Welcome and introductions, workshop goals
0910 Stock assessment outcomes (Nico Gutierrez)

1040 ***Morning tea***

1055 Review previous workshop (Mahe and Praslin)
- a. High level goal
- b. Broad objectives
- c. Summary of prioritized fishery issues

1120 Develop indicators and reference points
- a. Indicators and reference points
  - i. Rationale, concepts and terminology
- b. Review plan objectives
  - i. Review draft operational objectives
  - ii. Identify relevant potential indicators
  - iii. Discuss and identify appropriate reference points
  - iv. Discuss and document decision control rules
  - v. Identify potential management strategies

1230 ***Lunch***

1315 Identification of indicators, reference points, decision control rules and management strategies (continued)

1600 Review
- a. Revisit workshop goals
- b. Next workshop
- c. Wrap up

1615 Workshop close

Plan review phase

Management plan presentation

WORKSHOPS #1-3 AGENDA
Mahe, Thursday 12 March, 2015,
Praslin, Saturday 14 March, 2015
La Digue, Saturday 14 March, 2015

0900 Welcome and introductions
0910 Background
- a. Why do we need a management plan?
- b. Overview of development process
  - ii. Stakeholder consultation

1000 Mahe plateau fisheries management plan
- a. Plan overview
  - i. Praslin co-management plan
- b. Objectives
- c. Local fishery issues and management strategies
- d. Measuring success
  - i. Performance Measurement System
- e. Implementation
  - i. Schedule
  - ii. Monitoring, Control & Surveillance
- f. Review

1030 ***Morning tea***

1100 Management plan (continued)

1230 ***Lunch***

1330 Management plan (continued)

1430 Education and awareness

1500 ***Afternoon tea***

1530 Next steps
- a. Plan implementation (Short-term)
- b. Adaptive management and co-management (Longer-term)

1600 Workshop close

PMS presentation

WORKSHOP #4 AGENDA
Mahe, Tuesday 17 March, 2015,

0900 Welcome and introductions
   a. Workshop goals
0905 PMS overview
   a. What is it
   b. Terminology & definitions
0915 Mahe plateau fisheries management plan
   a. Key operational objectives & management strategies
      i. Indicators
      ii. Reference points

1030 ***Morning tea***

1050 Operational objectives & management strategies (continued)

1200 Workshop close

MCS risk assessment

WORKSHOP #5 AGENDA – SFA staff and other Government Agencies
SFA Mahe, Tuesday March 17 2015, 1300-1630
WORKSHOP #6 AGENDA – NGO'S and CONSERVATION SECTOR
SFA Mahe, Wednesday March 18 2015, 0900-1230
WORKSHOP #7 AGENDA – FISHING INDUSTRY
SFA Mahe, Saturday March 21 2015, 0900-1600
WORKSHOP #8 AGENDA – FISHING INDUSTRY
Praslin, Sunday March 22 2015, 1300-1630

1300 Welcome and introductions

1310 Workshop objectives and outputs
a. Expectations and input from participants
b. Overview of process to deliver MCS Plan for the Mahe Plateau Demersal Fishery
c. Overview Risk Assessment approach to prioritise inputs to MCS plan

1330 Presentation
a. Outline MCS risks to be addressed in the MCS Plan

1400 Workshop: Risk assessment
a. Likelihood and Consequence
b. Review prioritised risks and final Risk Ratings
c. Discuss resource needs to address risks above agreed threshold

1430 ***Afternoon tea***

1450 Workshop: Risk assessment (continued)

1630 Workshop close

MCS risk assessment review

WORKSHOP #9 AGENDA – SFA staff and other Government Agencies

SFA Mahe, Tuesday March 24 2015, 0900 - 1600

0900 Welcome, workshop objectives and outputs
iii. Expectations and input from participants

0910 Finalise MCS Elements and Risk Ratings
i. Average rankings from stakeholder workshops
ii. Determine Risk threshold for MCS action

0930 Monitoring: priorities, methodology, resources and costs to implement

1030 ***Morning tea***

1050 Monitoring: continued

1200 Surveillance: priorities, methodology, resources and costs to implement

1230 ***Lunch***

1330 Surveillance: priorities, methodology, resources and costs to implement

1430 ***Afternoon tea***

1450 Review MCS plan

1600 Workshop close

Appendix 2. Workshop participants

For November 2014 workshops see Attachment 8.

Appendix 3. Informal consultations

- Darell Green, Praslin Fishers Association, Saturday November 8 and Sunday November 9, 2014
- Teddy Stravens, Praslin Fishers Association, Sunday November 9, 2014
- Relix Barbe, Praslin Fishers Association, Sunday November 9, 2014
- Charles Savy, King Bambo Charter
- Florent Pool, Roche Caiman Fishers' Association

Appendix 4. List of attachments

Plan development phase

Workshop 1 (Mahé and Praslin): Concepts, goals and fishery issues

Outputs:

Attachment 1 – Mahé workshop objectives.xls
Attachment 2 – Praslin/La Digue workshop objectives.xls
Attachment 3 – Mahé workshop issues.xls
Attachment 4 – Praslin/La Digue workshop issues.xls
Attachment 5 – Issue themes and ranking summary.xls
Attachment 6 – Issue themes summary.doc

Workshop 2 (Mahé and Praslin): Indicators, reference points and management strategies

Outputs:

Attachment 7 – Mahé & Praslin/La Digue workshop PMS summary.xls
Attachment 8 – SFA workshop (1 & 2) summary report.pdf

Plan review phase

Consultations: Mahé, Praslin and La Digue

Outputs:

Attachment 9 – Consultation paper.pdf
Attachment 10 – Stakeholder consultation feedback.xls
Attachment 11 – Stakeholder consultation summary.xls

Plan extension phase

Workshops 1-3: Key elements of draft management plan

Outputs:

Attachment 12 – Mahé & Praslin/La Digue workshop draft strategy feedback.xls
Attachment 13 - Mahé & Praslin/La Digue workshop notes.doc (translated from Creole)

Workshop 4: Performance measurement system

Outputs:

Attachment 14 – Mahe March 2015 PMS workshop.xls