Non-Technical Report

Socio-economic impact assessment of the Mahé Plateau trap and line fishery co-management plan

Submitted to:

Seychelles Fishing Authority
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It was prepared and submitted by:

Fisheries & Marine
Consultancy Services

Jude P. BIJOUX (PhD)
Fisheries and Marine Consultancy Services (FMCS)
P.O. Box 1235, Victoria, Mahe, Seychelles Registration: B8414971; TIN: 863165860
Tel: +248 2711477; Email: judebijoux@gmail.com

Executive Summary

This report is the non-technical report for the consultancy on "Socio-economic impact assessment of the Mahé Plateau trap and line fishery co-management plan" commissioned by the Seychelles Fishing Authority (SFA) and funded by the Third South West Indian Ocean Fisheries Governance and Shared Growth Project (SWIOFish3), financed by the World Bank and the Global Environment Facility. It summarises the technical report and provide results of the study implemented as part of the consultancy in a succinct format. The study on which the report is based was undertaken between February and May of 2024. It assessed the socio-economic impact of the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 on fishers operating in the demersal fisheries over the Mahe Plateau, semi-industrial longline vessel owners and members of the public. The new regulations introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 include:

- A minimum retained length of 32 cm (fork length) for Emperor Red Snapper (*Lutjanus sebae*; Bourzwa) and Green Jobfish (*Aprion virescens*; Zob Gri).
- Recreational fishing bag limits of 20 demersal fishes per person per day including 5 Emperor Red Snapper and five Green Jobfish per person per day.
- Semi-industrial longline fishing vessels bag limits of 20 demersal fishes per vessel per fishing trip including 5 Emperor Red Snapper and five Green Jobfish.
- Maximum use of 25 fish traps per Commercial fishing vessel (outboards and mini-Mahes).
- Maximum use of 2 traps per recreational activity fishing vessel.
- Maximum use of 6 traps per commercial fishing vessel on listed Siganus [*Siganus sutor*, Eng: Spinefoot shoemaker, SCr: Kordonyen blan] spawning spawning aggregation sites per day for 7 days spanning the full moon including three days prior to the full moon, the day of the full moon and three days after the full moon from September to April.
- Prohibition to leave fish traps in the sea overnight from 6pm to 6am between September to April. at listed Siganus spawning aggregation sites.
- Prohibition from deploying, maintaining, recovering or otherwise using a trap, including for commercial, recreational or sport purposes unless: (a) it has been registered in accordance with procedures publicly notified by the SFA, and (b) a licence for the use of the trap has been issued by the SFA.

The socio-economic impact assessment (SEIA) study was expected to provide the required information to help in determining the socioeconomic impacts of the Plan and to augment understanding of the demersal fisheries. The purpose of the SEIA was to:

- Determine the direct and indirect impacts of the new measures under the management plan.
- Develop a sensitivity analysis featuring pessimistic, realistic, and optimistic scenarios that could serve as a basis to examine future changes in measures.
- Evaluate stakeholder perceptions that may affect compliance with the measures.
- Determine mitigation strategies to reduce the adverse effects of the measures.

The expected outcome of the SEIA was to determine if a Livelihood Restoration Plan (LRP) will be required for the full compliance of fishery regulatory measures under the Mahé Plateau Trap and Line Fishery Co-Management Plan.

To assess the socio-economic impacts of the Regulations we analysed historical length frequency data for Emperor red snapper and Green Jobfish collected by the SFA Research Team between 2003 and 2023. Three survey questionnaires were designed and administered. Questionnaire 1 was for the

artisanal fishers' survey. It contained 56 questions and was administered with 51 fishers participating in the outboard/mini-Mahe, schooner and whaler fishery. Questionnaire 2 was for the semi-industrial longline vessel owners survey. It contained 39 questions and was administered with five semi-industrial vessel owners. Questionnaire 3 was for the public perception survey. It contained 15 questions and was administered with 225 members of the public.

The artisanal fishers survey indicated strong level of support from fishers for the introduced regulations. It documented financial lost that fishers from the outboard, schooner and whaler fishing fleets could be facing as a result of the introduced minimum size restrictions on Emperor red snapper and Green Jobfish. It documents that many fishers were already releasing small Emperor red snapper and Green Jobfish and that as a result of this practice, the financial losses resulting from the new regulations are largely minimised. Most fishers surveyed indicated that these regulations have had no negative impacts on them economically, socially, culturally, mentally or physically. The low level of impacts that fishers said the new regulations were having on them, together with the fact that the majority of fishers said that they can easily find other jobs if they cannot go fishing, do not support the need to have a Livelihood Restoration Plan (LRP) at this stage to counteract the socio-economic impacts that could have resulted from the implementation of the new regulations.

The semi-industrial vessel owners survey recorded strong support from vessel owners for the regulation that restricts the catch of semi-industrial vessels to 20 demersal fish per fishing trip. Vessel owners said that these measures are not affecting them or their fishers because they are not dependent on demersal fishes for their business.

The public perception survey revealed that most members of the public were supportive of the regulations apart from a few who said that were frustrated by some regulations as it limits their catch.

The study provides a whole series of new data that can be used in decision making concerning the management of the demersal fishery operating over the Mahe Plateau.

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1. Introduction

This document is the Non-Technical Report submitted as part of the implementation of the assignment "**Socio-economic impact assessment of the Mahé Plateau trap and line fishery co- management plan**". It summarizes the technical report and provide results of the study implemented as part of the consultancy in a succinct format. The assignment was commissioned by the Seychelles Fishing Authority (SFA) and is funded by the Third South West Indian Ocean Fisheries Governance and Shared Growth (SWIOFish3) project. SWIOFish3 is part of a long term, regional program, which aims to increase the economic, social, and environmental benefits to the countries of the Southwest Indian Ocean from sustainable marine fisheries. It is financed by the World Bank and the Global Environment Facility.

The purpose of this assignment was to undertake a socio-economic impact assessment (SEIA) to determine the socioeconomic impacts of The Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 on fishers operating in the demersal fisheries over the Mahe Plateau, as well as semi-industrial longline vessel owners and the Seychellois public. The objective of these Regulations is to implement the Mahé Plateau Trap and Line Fishery Co- management Plan, published in Government Notice No. 68 of 2020, and pursuant to the Fisheries Act, 2014 section 5(4) which permits the Authority to enter into co-management arrangements for the management of a fishery, and section 6(1) of the Act which empowers the Minister to make regulations prescribing measures for the proper management of a fishery.

The preparation of the Mahé Plateau Trap and Line Fishery Co- management Plan was financed under the Global Environment Facility Mainstreaming Biodiversity Management into Production Sector Activities Project. Extensive stakeholders' consultations were undertaken in 2014 and 2015 as part of the co-management plan' s preparation. Stakeholders' workshops were used to identify priority issues to be addressed by the plan, and to develop the plan's goal, objectives, management measures, performance measurement system and the monitoring, control and surveillance protocol (Welch & Kerrigan, 2015). Between 2015 and 2021, before the co-management plan was gazetted, additional stakeholders' consultations were undertaken to address unresolved issues.

The Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 introduced seven management measures (**Table 1**) that has the potential to limit the catch of fishermen. From the onset it was expected that the measures will decrease the revenue of fishermen. The unanswered question was by how much. Out of these measures the minimum retained size limit for Emperor red snapper (*Lutjanus sebae*; Bourzwa) and Green Jobfish (*Aprion virescens*; Zob Gri) were seen as having the highest likelihood of resulting in economic impacts for local hook and line and trap fishermen. New bag limits of 20 demersal fish per fishing trip for semi-industrial vessels licensed to fish for tuna and tuna-like species was seen as unlikely to affect vessel operators but could impact fishermen who catch demersal fish during some fishing trips to supplement their income. Bag limits with species specific catch limits for Emperor red snapper and Green jobfish for recreational and sport fishers were seen as unlikely to have major financial impacts for individuals as the bag limits are likely to be sufficient for household consumption, whereas sports and charter fishing are prohibited from selling their catch and are not dependent on revenue from the sale of fish as a significant form of income.

Since the implementation of the Seychelles Mahé Plateau Trap and Line Fishery Co-management Plan has benefitted from financial support from the World Bank financed SWIOFish3 Project and because the management plan is restricting access to certain marine resources, it automatically triggers the World Bank's Safeguard Policy OP 4.12 on involuntary resettlement detailed in the SWIOFish3 Project

Environmental and Social Management Framework (ESMF) and Process Framework (PF). The PF provides the criteria and procedures to be followed when a sub-project activity is identified as having a potentially adverse socioeconomic impact on existing rights, assets or livelihoods: for example, as a result of new management measures to an open access fishery. In this case, fishers and associated communities are no doubt the Project Affected Persons (PAPs). PAPS are people directly affected by restriction measures through the loss of part or all of their assets or livelihoods whether temporarily or permanently.

Table 1. Fishery management measures introduced in the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 with the potential of affecting the revenue of fishermen operating in the demersal fisheries.

Fishery management measures	
Output controls	**Article**
Minimum retained length: Any person who catches, assists or is associated with the catching of (1) an Emperor Red Snapper (*Lutjanus sebae*; Bourzwa) and (2) Green Jobfish (*Aprion virescens*; Zob Gri) that is less than the minimum fork length of 32 cm shall (a) immediately release it back into the water; and (b) not retain onboard, possess, tranship, land, buy or sell such fish, or attempt any such activities.	Paragraph 6 (a) and (b) and First Schedule.
Bag limits: Prohibition for any person engaged as a commercial, recreational, competition sport or sport fisher from: (a) exceeding the bag limits of 20 fish per person per day including 5 Emperor Red Snapper and five Green Jobfish per person per day, (b) retaining onboard, tranship or land fish that exceed such bag limits or attempt any such activities.	Paragraph 7 (a) and (b) and Second Schedule.
Bag limits: Bag limit of 20 demersal fish per fishing trip, including on board at any time and at landing for semi -industrial fishing vessels licensed to fish tuna and tuna- like species.	Paragraph 7 (a) and (b) and Second Schedule.
Technical measures	
Trap limit: Maximum use of 25 fish traps per Commercial fishing vessel.	Paragraph 8 (2) and Third Schedule.
Trap limit: Maximum use of 2 traps per recreational fishing vessel.	Paragraph 8 (2) and Third Schedule.
Trap limit: Maximum use of 6 traps per commercial fishing vessel on listed Siganus spawning aggregation sites per day, for 7 days spanning the full moon including three days prior to the full moon, the day of the full moon and three days after the full moon from September to April.	Paragraph 8 (2) and Fourth Schedule.
Gear/time restriction: Prohibition to leave fish traps in the sea overnight from 6 pm to 6 am between September to April at listed Siganus spawning aggregation sites.	Paragraph 8 (2) and Fourth Schedule.
Registration of fish traps: Prohibition from deploying, maintaining, recovering or otherwise using a trap, including for commercial, recreational or sport purposes unless: (a) it has been registered in accordance with procedures publicly notified by the SFA, and (b) a licence for the use of the trap has been issued by the SFA.	Paragraph 8 (1) (a) and (b).

The direct socio-economic impacts on the Project Affected Persons (PAPs) are however yet to be determined. This study analyse historical length frequency data and makes use of three surveys targeting: (1) artisanal fishers, (2) semi-industrial longline vessel owners, and (3) the public to collect data and to identify possible social and economic impacts to fishers affected by these measures, their family that depends on revenue from fishing and on the public, which may be affected by scarcity of fish, higher prices or being restricted by the number of fish that they can land when they participate in recreational fishing trips.

2. Objectives

The overall objective of this assignment, as defined in the Terms of Reference (ToR), was to undertake a socio-economic impact assessment (SEIA) of the management measures introduced by the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 on fishers operating in the demersal fisheries over the Mahe Plateau. The SEIA was expected to provide the required information to help in determining the socioeconomic impacts of the Plan and to augment understanding of the demersal fisheries. The specific objectives as defined in the ToR were to:

- Determine the direct and indirect impacts of the new measures under the management plan (**Sub-objective 1 (SO1)**.
- Develop a sensitivity analysis featuring pessimistic, realistic, and optimistic scenarios that could serve as a basis to examine future changes in measures **(Sub-objective 2 (SO2).**
- Evaluate stakeholder perceptions that may affect compliance with the measures **(Sub-objective 3 (SO3).**
- Determine mitigation strategies to reduce the adverse effects of the measures **(Sub-objective 4 (SO4).**

It was expected that the outcomes of the SEIA would determine if a Livelihood Restoration Plan (LRP) will be required for the full compliance of fishery regulatory measures under the Mahé Plateau Trap and Line Fishery Co-Management Plan.

3. Methods

The full methods for undertaking the study are detailed in the Technical Report. In short, we made use of historical length frequency data collected by the SFA Research Team between 2003 and 2023 to determine the importance of small (<32 cm fork length) Emperor red snapper and Green jobfish in the catch of artisanal fishers. We also made use of three different questionnaires to collect data.

- **Questionnaire 1:** Targeted fishermen in the demersal fishery. The questionnaire contained 56 questions divided intro 10 sections. Fifty-one fishers were interviewed: 31 operating on outboard/mini-Mahe boats, 9 on schooners and 12 on whalers.
- **Questionnaire 2:** Targeted semi-industrial longline vessel owners. It contained 39 questions divided into 6 sections The semi-industrial longline fishery survey questionnaire had 39 questions divided into 6 sections. Five vessel owners were interviewed.
- **Questionnaire 3:** Targeted members of the public. It contained 17 questions, and were administered by seven enumerators, each surveying in the districts in their assigned zones. A total of 225 people were interviewed.

Once the surveys were completed, responses were captured in Excel spreadsheets, the data was quality checked, cleaned where required, and analysed.

4. Results

4.1 Analysis of historical length frequency data

4.1.1 Bourgeois length frequency

Analysis of historical length frequency data collected by the SFA indicates that the mean (**Figure 1**) and median (**Figure 2**) length of bourgeois landed by month closely followed each other and fluctuated in what appears to be 10-year cycles. The mean size of bourgeois landed over this period was 62.3 cm and the median length was 63.0 cm.

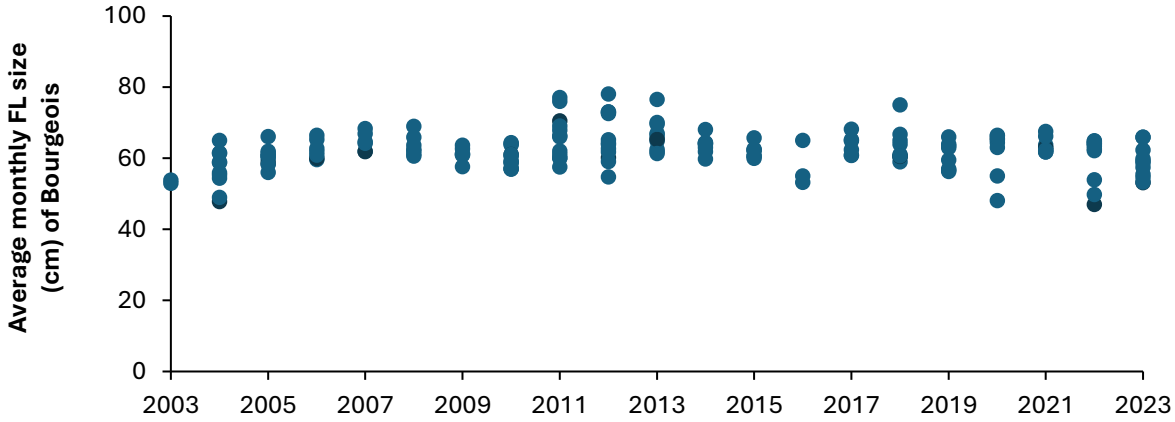

Figure 1. Distribution of the average monthly fork length (cm) of Bourgeois sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

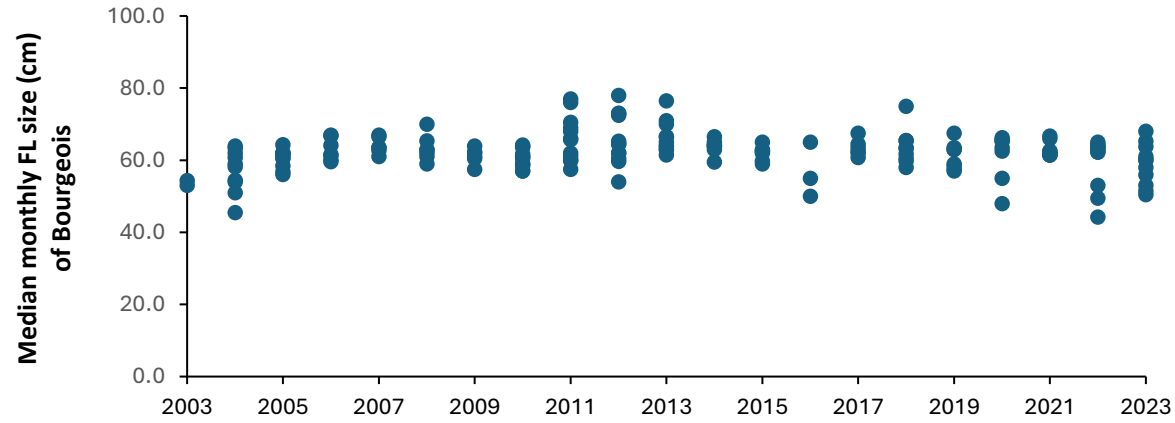

Figure 2. Distribution of the median monthly fork length (cm) of Bourgeois sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

Size distribution of bourgeois sampled over the 21-year period followed a normal distribution with the highest frequency of bourgeois sampled falling within the 60 – 65 cm size category (**Figure 3**). Size distribution of fish sampled over the years followed the normal distribution curve during most years (**Figure 4**). However, there are some years (2003 and 2016) that stends out during which the distribution was skewed towards smaller size fish with both the mean and median size of fish sampled during these two years being in the low 50s as opposed to the low 60s during normal years. From the data it does not appear that there is any major variation among months in the size of fish that were landed and sampled (**Figure 5**). It is interesting to note that only 0.09% of the Emperor red snappers

sampled by the SFA team were less than the 32cm minimum fork length retention size introduced by the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021, indicating that small Emperor red snappers of less than 32 cm fork length might not form a large percentage of the Emperor red snappers that are caught in the demersal fishery operating over the Mahe Plateau. However, there is a caveat that needs to be considered since a large proportion of the fish sampled, for which sample location data were available, were sampled at Oceana Fisheries or at the Port Victoria Artisanal Fishing Port which mostly caters for whalers and schooners that fish away from the coastline.

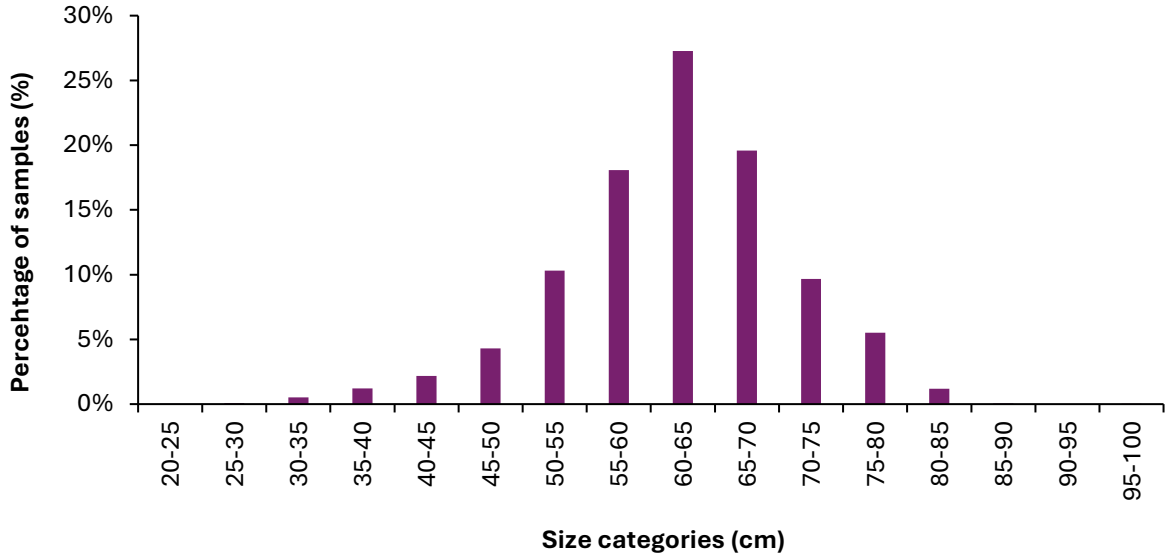

Figure 3. Percentage distribution of bourgeois sampled by the Seychelles Fishing Authority research team between 2003 and 2023 by 5 cm size categories.

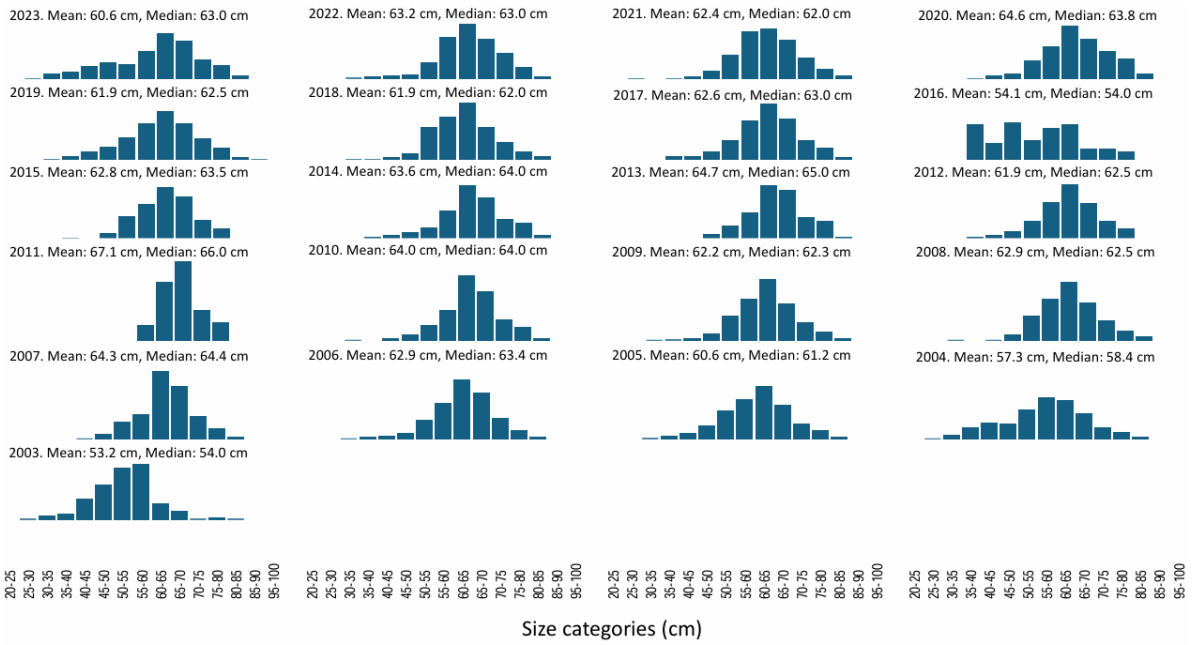

Figure 4. Annual distribution of the length (fork length) of bourgeois sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

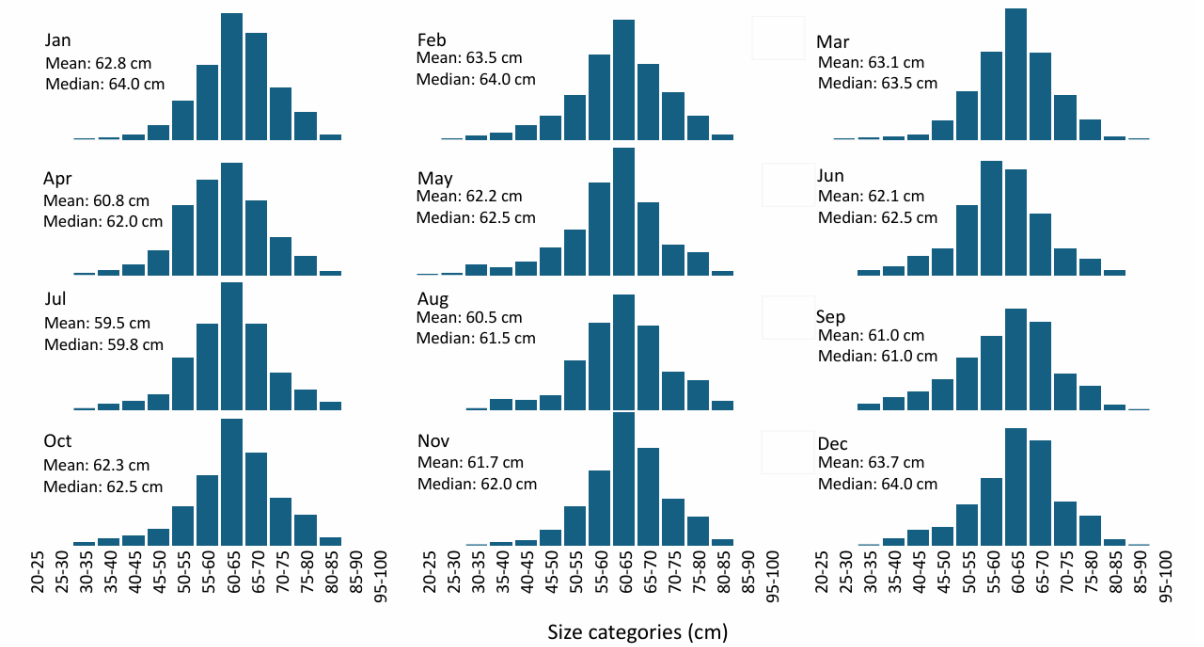

Figure 5. Monthly distribution of the length (fork length) of bourgeois sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

4.2.2 Green jobfish length frequency

Similar to results obtained for bourgeois above, analysis of historical length frequency data from the SFA indicates that the mean (**Figure 6**) and median (

Figure *7*) length of Green jobfish landed by month closely followed each other and fluctuated over the years with signs of widening and decreasing monthly average and median size of fish sampled in the last three years. The mean size of Green jobfish sampled over this period was 63.5 cm and the median length was 66.0 cm.

The 70-75 cm size category had the highest frequency of Green jobfish sampled (

Figure *8*). The analysis found that the size distribution of Green jobfish sampled over the 21-years period was skewed towards the left with 64.1% of fish measuring less than or equal to 70 cm fork length. In 2023, two large jobfish measuring 115 cm and 116.5 cm were recorded in the sample. These lengths are higher

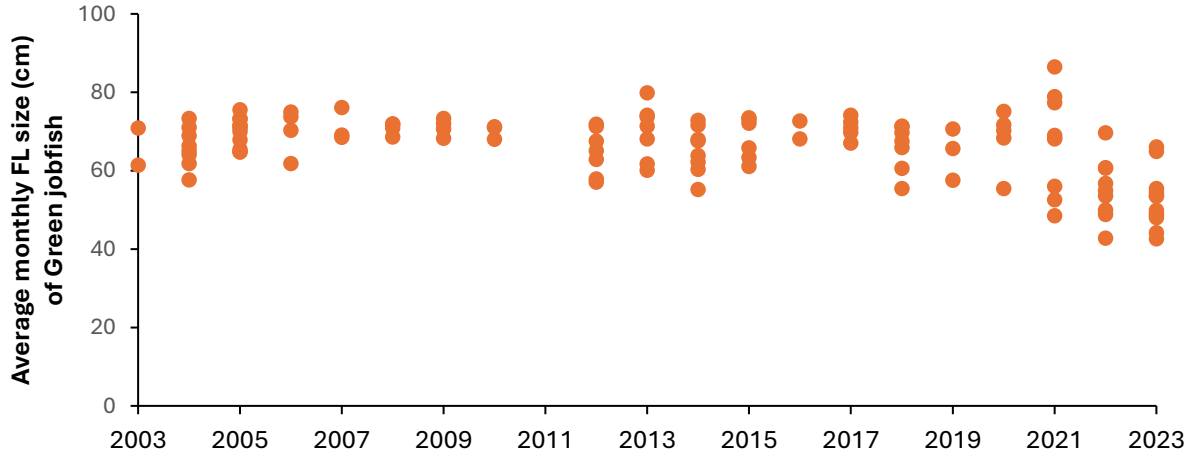

Figure 6. Distribution of the average monthly fork length (cm) of Green jobfish sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

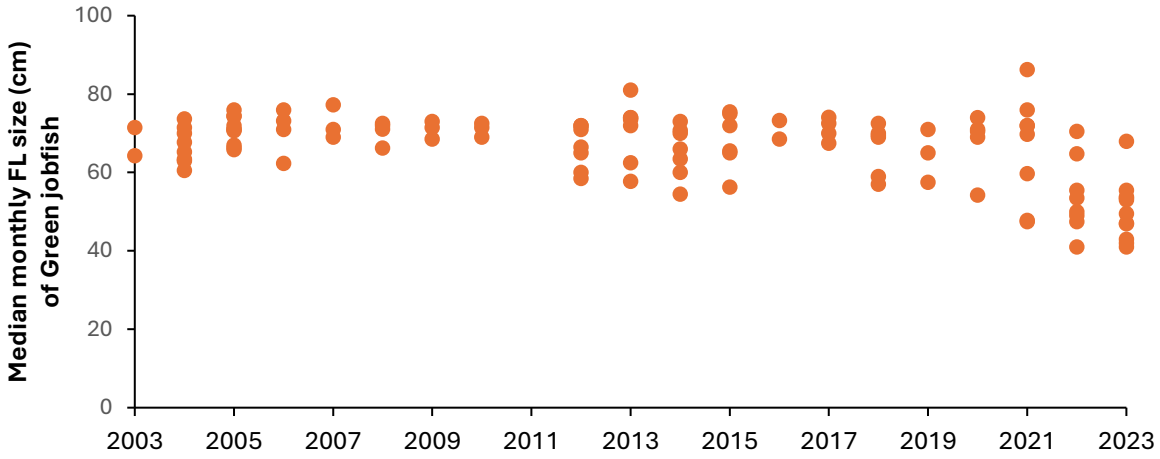

Figure 7. Distribution of the median monthly fork length (cm) of Green jobfish sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

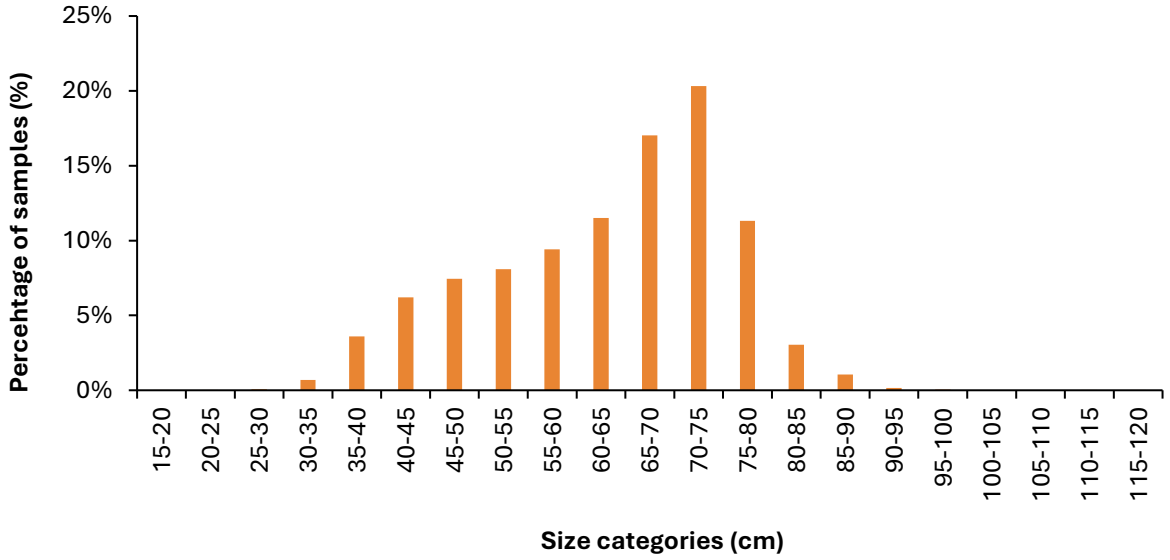

Figure 8. Percentage distribution of Green jobfish sampled by the Seychelles Fishing Authority research team between 2003 and 2023 by 5 cm size categories.

than the 112 cm total length reported for this species by fishbase (Froese & Pauly, 2010). The maximum total length for this species reported by fishbase is from samples collected in Seychelles by de Moussac (1988). Before these two records, the longest Green jobfish in the SFA length frequency data based measured 99 cm and was sampled in 2021. The results could indicate new maximum size for this species or mistakes in taking the measurements or recording data.

The annual size distribution curves of Green jobfish sampled by the SFA over the years varied extensively among years with average annual mean fork length ranging between 53.8 cm (2023) and 71.5 cm (2016), and annual median fork length ranging between 52.5 cm (2023) and 73.0 cm (2015,

2016) (**Figure 9**). This does not necessarily mean changes in actual size of Green jobfish landed and could be an artefact of the non-standardised sampling strategy that is being used.

The monthly distribution of Green jobfish fork length indicates that the Southeast Monsoon period, from June to October, is associated with smaller average fork length of fish sampled with average fork length during this period being in the high 50s and low 60s, while during other periods of the year the monthly average fork length of fish sampled is in the high 60s (**Figure 10**).

The SFA's historical length frequency data indicates that only 0.08% of the Green jobfish sampled by the SFA team were less than the 32cm minimum fork length retention size introduced by the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021. This is about the same percentage of the samples that was reported for bourgeois and once again suggest that small Green jobfish of less than 32 cm fork length might not form a large percentage of the Green jobfish that is caught in the demersal fishery operating over the Mahe Plateau. The same caveat previously identified for Bourgeois is relevant here and as a result this data should be interpreted with caution.

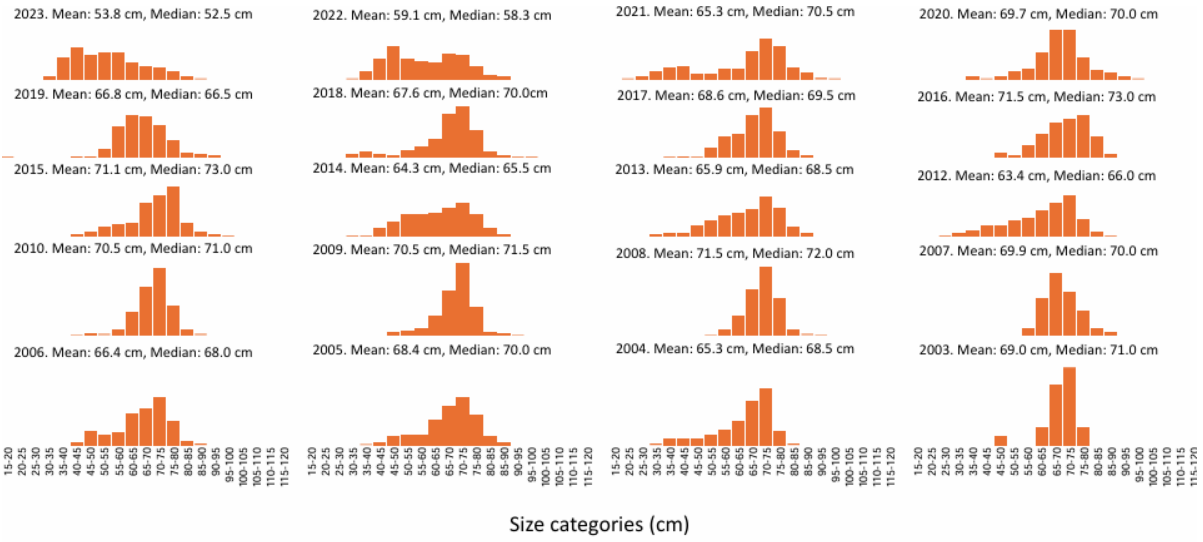

Figure 9. Annual distribution of the length (fork length) of Green jobfish sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

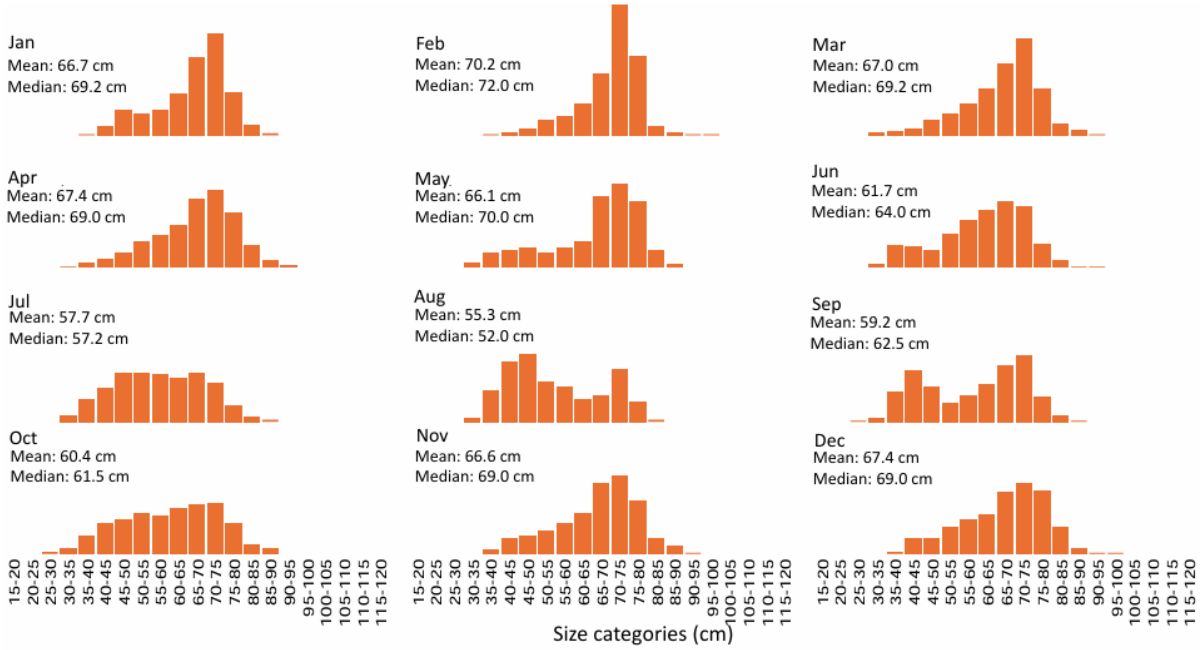

Figure 10. Monthly distribution of the length (fork length) of Green jobfish sampled by the Seychelles Fishing Authority research team between 2003 and 2023.

4.2 Artisanal fishers' survey

This section summarises the results from the artisanal fishers' survey. As much as possible information have been summarised using bullet points to improve clarity.

4.2.1 Number of surveys undertaken by fleet and landing sites

A total of 51 fishers interviewed on Mahe and Praslin as part of the artisanal fishers' survey. The break down per artisanal fishing fleet is as follows (
Figure 11):

- **Outboard/mini-Mahe:** 30 fishers
- **Schooners:** 9 fishers
- **Whalers:** 12 fishers

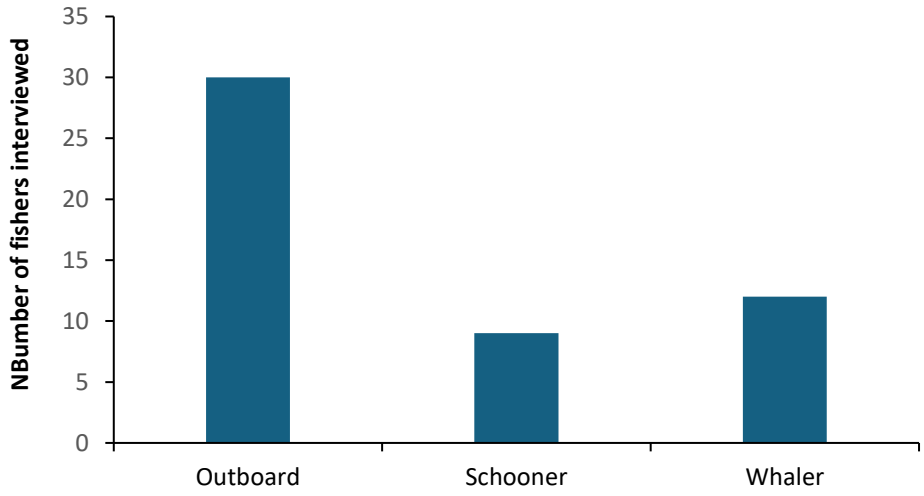

Figure 11. The number of fishermen from each of the three artisanal fishing vessel fleets that were interviewed as part of the artisanal fishermen survey.

Surveys were conducted at 11 different landing sites (**Figure 12**).

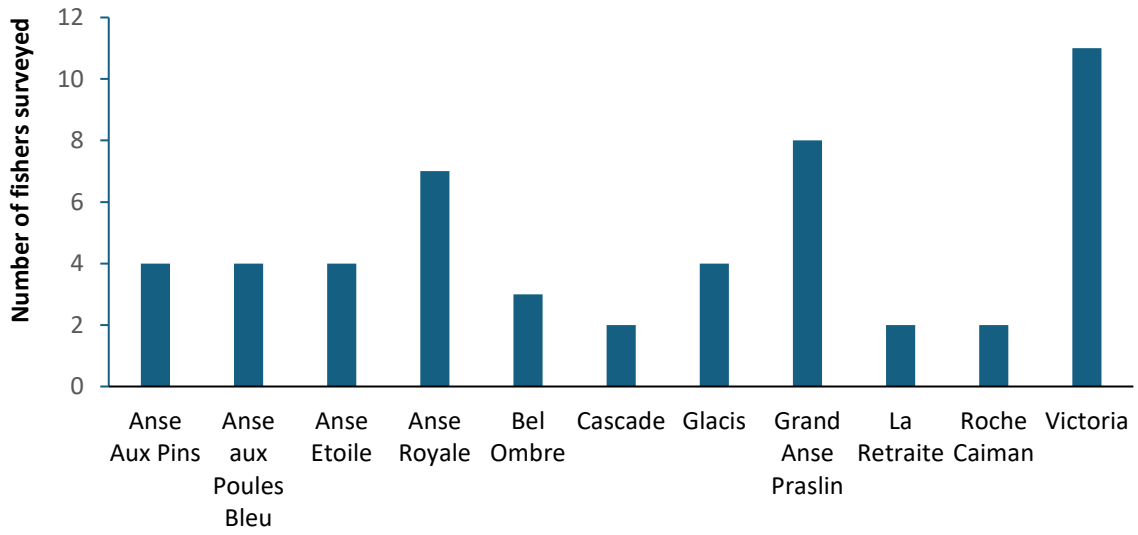

Figure 12. The number of fishers interviewed stratified by landing sites as part of the artisanal fishermen survey.

4.2.2 Fishers' Opinions on Fish Stock Health

When surveyed on their opinion about the state of demersal fish stocks targeted by small-scale fisheries on the Mahe Plateau, fishers provided the following responses:

- **Healthy:** 22 % of fishers thought the stocks were healthy.
- **Degraded:** 69% of fishers believed the stocks were degraded.
- **Severely Degraded:** 8% of fishers considered the stocks to be severely degraded.

There was a general agreement among fishers from different fleets regarding the state of the fish stocks:

- **Schooner Fishery:** Fishers in this group were the most pessimistic, with a higher percentage indicating that the stocks were degraded or severely degraded.
- **Outboard Fishery:** This group had a higher percentage of fishers who believed the stocks were healthy.

Overall, the majority opinion across all fleets was that the demersal fish stocks on the Mahe Plateau are in a degraded state (**Figure 13**).

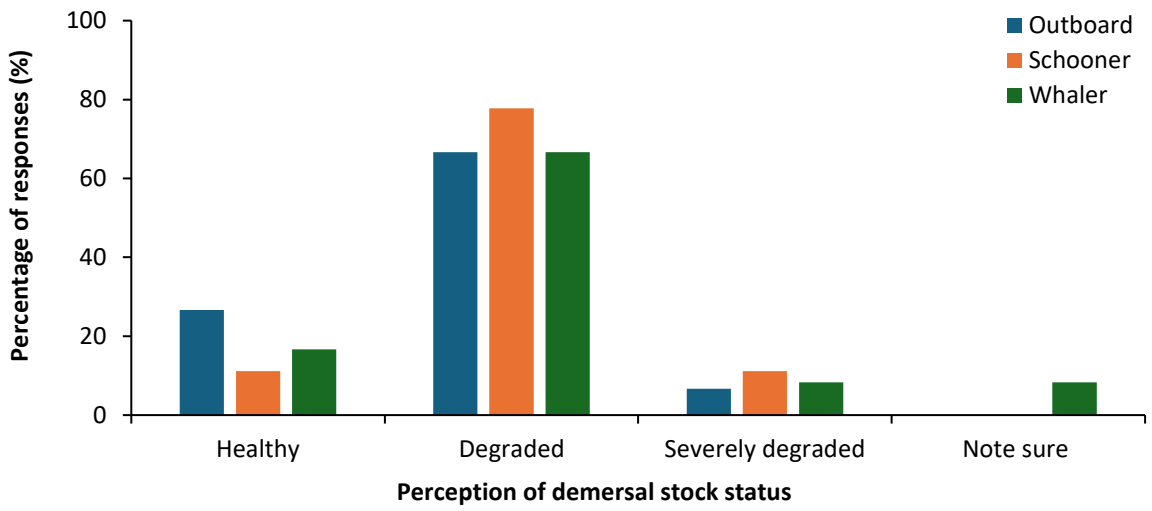

Figure 13. Perception of artisanal fishermen from the three artisanal fishing fleets about the state of the

4.2.3 Fishers' support for fisheries management

The majority of fishermen support the continued management of demersal fisheries:

- **Supportive:** 78% of fishermen are in favour of fisheries management.
- **Not Supportive:** 18% are opposed to implementing management measures.
- **No Opinion:** 4% did not have an opinion or chose not to answer (**Figure 14**).

The highest level of support for fisheries management came from fishers operating in the schooner fishery, followed by those in the whaler fishery and the outboard fishery (**Table 1**).

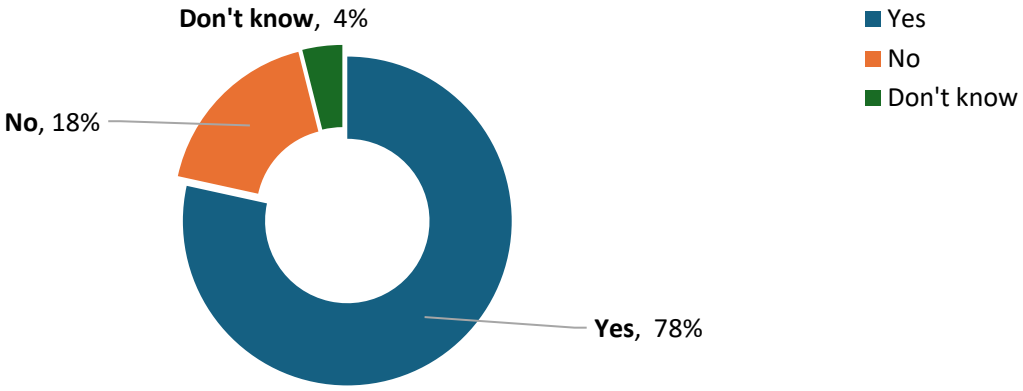

Figure 14. Perception of artisanal fishers participating in the survey on whether the Seychelles' demersal fish stocks should be actively managed.

Table 1. Level of support for the management of Seychelles demersal fish stocks from the percentage of responses of fishermen taking part in the artisanal fisheries survey. Note that some table row sums do not add up to 100% due to number rounding effects.

Fleet	Percentage of responses (%)		
	Yes	No	Don't know
Outboard	73	23	3
Schooner	89	11	0
Whaler	83	8	8

4.2.4 Measures to control commercial fishers' activities

When asked whether their own fishing activities should be managed, fishers responded as follows:

- **Supportive:** 78% of respondents agreed that their activities should be managed.
- **Not Supportive:** 22% felt there was no need for management.
- **Agreement among fleets:** There was similar level of agreements among respondents from different artisanal fishing fleets on the need to implement measures to control the catch of demersal fishers.

Table 2. Level of support for implementing measures to control the catch of fishers involved in the demersal fisheries based on percentage of responses of fishermen taking part in the artisanal fisheries survey.

Fleet	Percentage of responses (%)	
	Yes	No
Outboard	80	20
Schooner	78	22
Whaler	75	25

Fishers provided several reasons for supporting management measures to control the activities of commercial fishers. The top two included:

- **Resource sustainability:** Protecting fish stocks for future generations.
- **Order in the Fishery:** Ensuring fair practices, as many fishers feel affected by the actions of others. Without management, some fishers might operate without control, negatively impacting fish stocks and those dependent on them.

4.2.5 Measures to control the catch of the public and visitors.

All but one respondent believe that measures should be implemented to control the catch of the public and visitors. Most often provided rationale included:

- **Non-Compliance:** Fishers believed that despite of the demersal fishing recreational bag limits and legal prohibitions, fish from recreational fisheries are often sold to hotels, restaurants, fishmongers, and along the side of the road.
- **Market Impact:** Fishers claimed that catch from recreational fisheries are often sold at lower prices, affecting the market price and revenue for artisanal fishers.

Overall, there was strong support for fisheries management targeting all types of fishers and fisheries among fishermen, with a focus on sustainability and fair practices within the fishery community.

4.2.6 Awareness of Fisheries Regulations

The awareness levels regarding the different measures introduced by the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021, varied significantly among survey respondents (**Figure 15**).

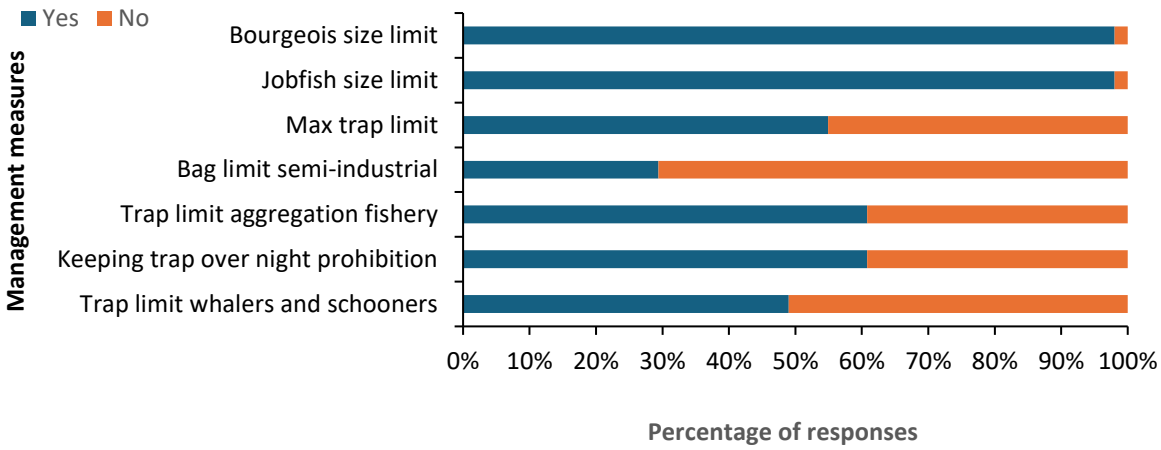

Figure 15. Level of awareness about different *measures* to control the demersal fishery over the Mahe Plateau that were introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021.

Measures with High Awareness:

- **Minimum Size Limit:** A very high awareness was observed for the minimum size limit for both Emperor red snapper and Green Jobfish, with 98% of respondents being aware of this regulation.

Measures with Moderate Awareness:

- **Fish Trap Usage:** About 61% of respondents knew about the limit of six fish traps per boat during the spinefoot shoemaker rabbit fish spawning aggregation fishery on specified sites along the south and west coast of Praslin Island.

- **Prohibition of Fish Traps at Night:** Respondents were also aware of the prohibition against leaving fish traps on listed spawning aggregation sites at night during spawning periods.

Measures with Lower Awareness:

- **Maximum Fish Traps:** Slightly more than half (55%) of the respondents were aware of the regulation limiting the use of 25 fish traps at any one time per outboard/Mini-Mahe vessels.

- **Trap Limits for Whalers and Schooners:** Only 49% knew about the maximum limit of two fishing traps for whalers and schooners.

Measures with Least Awareness:

- **Demersal Fish Bag Limit:** The least known measure was the demersal fish bag limit of 20 fish per semi-industrial vessel per trip, with only 29% of respondents being aware of this regulation.

The varying levels of awareness highlight the need for more targeted communication and educational efforts to ensure all regulations are well known and understood by the fishing community.

4.2.7 Support for Minimum Size Limits for Snapper and Jobfish

All survey respondents expressed support for the 32 cm minimum size limit for Emperor red snapper and Green Jobfish.

4.2.8 Pre-Regulation Fish Release Practices

When survey respondents were asked about whether they used to release small Emperor red snapper and small Green Jobfish before the regulations came into effect, their response was as follows:

- **Emperor Red Snapper:** 73% of respondents used to release small Emperor red snapper before the regulations were introduced.

- **Green Jobfish:** The same percentage (73%) used to release small Green Jobfish before the measure was implemented.

Some respondents would release one species but keep the other, although most released both.

Though the survey did not specifically ask about the reasons for releasing small fish, respondents often volunteered their motivations, with the most cited reason being the need to protect fish stocks for future generations.

With regards to **size specific release practices** before the Regulations were introduced, survey respondents responded as follows:

- **Emperor Red Snapper:** 80% of respondents said that they released snapper smaller than 20 cm. The percentage decreased with size: 65% for fish between 20 and 26 cm, 29% for fish between 26 and 32 cm, 4% for fish between 32 and 38 cm, and 0% for fish over 38 cm (**Figure 16a**).

- **Green Jobfish:** 76% of respondents said that they released jobfish smaller than 20 cm. The decrease in release percentages was less steep compared to Emperor red snapper, but no respondents released fish larger than 38 cm (**Figure 16b**).

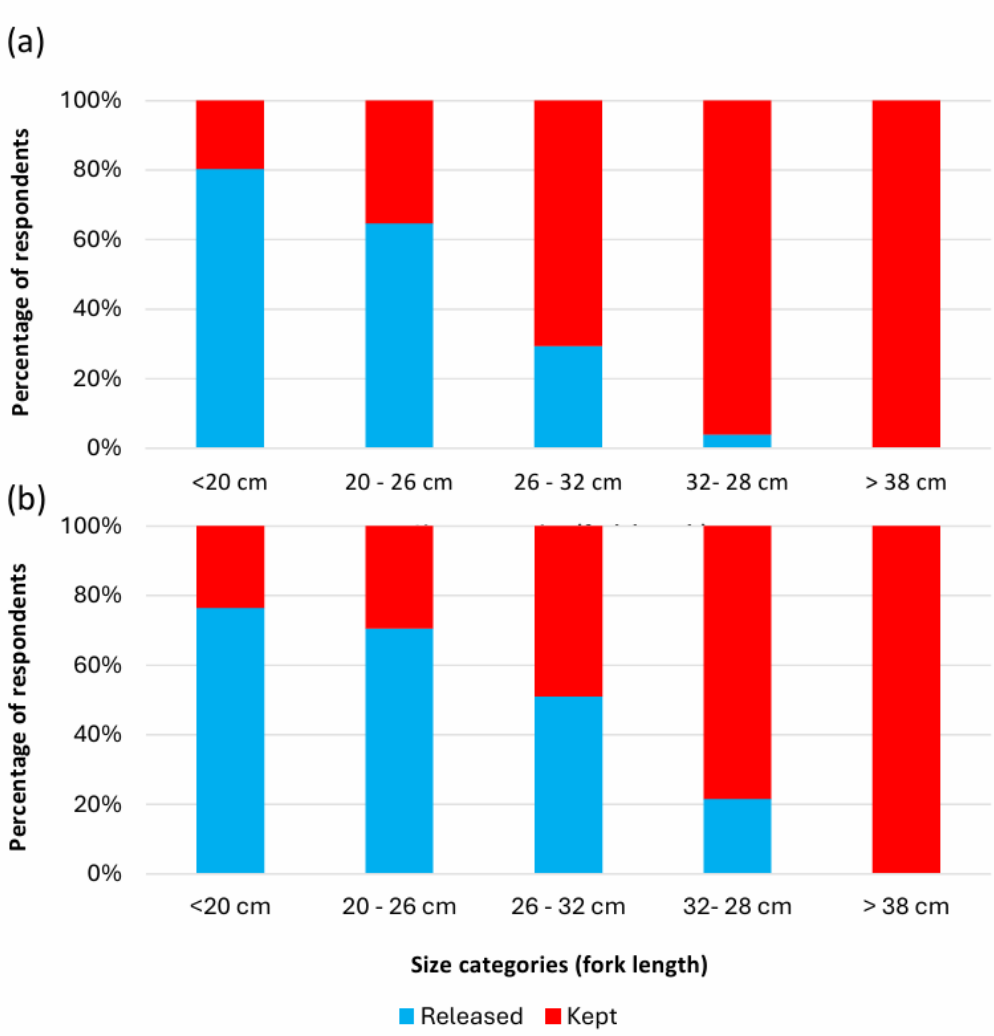

Figure 16. Percentage of survey respondents claiming that they used to release (a) small Emperor red snapper and (b) small Green Jobfish in different size categories before the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 came into force.

Future Intentions

When asked about whether they would release an Emperor red snapper and Green Jobfish which is slightly less than 32 cm as the law requires, artisanal fishers surveyed responded as follows:

- **Green Jobfish:** 88% of respondents stated they would release a slightly undersized Green Jobfish (<32 cm) as required by the regulations.

- **Emperor Red Snapper:** 84% would do the same for an undersized Emperor red snapper.

Factors in decision making.

Important factors in decision making on whether to keep or release a slightly undersized Emperor red snapper and Green Jobfish included:

- **Conformity with Law:** Most respondents cited legal compliance and allowing fish to grow as their main reasons for releasing undersized fish.

- **Personal consumption**: Some fishers said that they would keep some undersized fish for personal consumption, but not for sale.
- **Effort and return:** Fishers said that they prefer to fish in areas with larger fish, as it takes the same effort to catch a small fish as a legal sized one, but the economic return is higher for larger fish.
- **Pre-Regulation Practices:** Many respondents indicated they would move to a different site if they started catching many small fish, reflecting practices they had followed even before the regulations.
- **Post-release survival:** Survey respondents mentioned they would keep fish if they appeared damaged and unlikely to survive after being released.

The survey indicates strong support for the minimum size limit regulations and a general awareness of sustainable fishing practices. Most respondents were already releasing small fish before the regulations and plan to continue doing so, motivated by both legal compliance and economic considerations. The findings suggest that these regulations are well-received and are likely to be adhered to by the fishing community.

4.2.9. The market value of small snapper and jobfish

The survey tried to establish the market value of small Emperor red snapper and Green jobfish. Several findings were made:

- **Emperor Red Snapper:** 94% of survey respondents agreed that including an Emperor red snapper in a packet of fish increases its value and ease of sale. The most often cited reason was the attractiveness of the red colour to clients. In Seychelles, red-coloured fish such as humphead snapper (*Lutjanus sanguineus*), two-spot red snapper (*L. bohar*), and groupers are popular because they have white, soft flesh and good taste.

- **Green Jobfish:** Most respondents did not believe that adding a Green Jobfish to a packet of fish increases its value. The most often cited reasons are that: they are typically sold in separate single species packets, only large ones have good value, and that despite having white flesh, Jobfish are seen as cheap and less flavourful compared to the Emperor Red snapper. Additionally, it was mentioned that when cooked, their flesh firms up more than that of Emperor red snapper.

There were challenges in determining the value of small Emperor red snapper and Green jobfish. For small Emperor red snapper, they are usually sold mixed with other fish in packets, making it difficult to determine their individual value. For Green jobfish., small ones are not usually kept and sold by fishers.

To estimate the value of small fish, fishermen were asked to make and price packets containing small Emperor red snapper and Green Jobfish of different sizes (20 cm, 26 cm, and 32 cm). The price per fish was calculated by dividing the total packet price by the number of fish in the packet. Average prices were then determined for each fish size. Reluctance to make these packets was noted, with willingness increasing as fish size increased.

- **Price Range:** Prices for Emperor red snapper and Green Jobfish varied greatly among fishers (**Table 3**).
- **Normalized Prices:** Average prices helped normalize the wide range and gave a good indication of market value when sold directly to the public.
- **Price per kg:** Small fish often sold to the public above the typical price per kg that fishers sell fish to processors and mongers. For Emperor red snapper maximum price to processors is SCR

130 per kg, whereas for Green jobfish it is SCR 65 per kg. When calculated at cost per kg Green jobfish tends to be much more over valued when sold to the public than Emperor red snapper.

Table 3. Calculated minimum, maximum and average price of small Emperor red snapper and job fish of 20 cm, 26 cm and 32 cm and average price per kilogram derived from costing of species and size specific packets of fish made by fishers during the survey.

Species	Fish size	Calculated price per fish (SCR)			Price per kg (SCR)
		Min.	Max	Average	Average
Emperor red snapper	20 cm	10	33	24	171
Emperor red snapper	26 cm	17	125	40	126
Emperor red snapper	32 cm	14	250	68	112
Green Jobfish	20 cm	15	20	17	199
Green Jobfish	26 cm	14	63	30	160
Green Jobfish	32 cm	17	83	36	103

4.2.10 Number of undersized Emperor red snappers and Green jobfish released

Fishermen reported releasing a low average number of small Emperor red snapper and Green Jobfish per month, but the numbers varied extensively (**Table *4***). Average number of fish released per month are as follows:

Emperor red snapper

- **Outboard/mini Mahe:** 18 fish
- **Schooner:** 16 fish
- **Whaler:** 40 fish

Green Jobfish

- **Outboard/mini Mahe:** 41 fish
- **Schooner:** 42 fish
- **Whaler:** 67 fish

Table 4. Maximum and average number of small Emperor red snapper in three different size categories that fishermen claim they release per month.

Fleet	Indicator	Emperor red snapper length (cm)			Green Jobfish length (cm)		
		<20	20-26	26-32	<20	20-26	26-32
Outboard	Maximum No.	40	25	20	100	50	50
Outboard	Average No.	9	6	3	20	12	9
Schooner	Maximum No.	50	20	25	100	100	100
Schooner	Average No.	7	4	5	13	14	15
Whaler	Maximum No.	100	100	50	200	200	50
Whaler	Average No.	16	17	7	31	28	8

Client's preferences for under-sized Emperor red snapper and Green jobfish

Fishers were asked whether they have any clients that were being affected by the minimum retained size limit for Emperor red snapper and Green jobfish. Their responses were as follows:

- **Non-affected clients:** Seventy six percent of survey respondents said that they did not have particular clients that wanted small Emperor red snapper that were affected by the 32 cm minimum size limit.

- **Affected clients:** When clients were affected, they were typically restaurants or takeaways interested in smaller plate-sized fish.

- **Continued demand:** Some clients still preferred small Emperor red snapper, but generally for fish slightly larger than 32 cm.

Overall, the survey highlights the differing perceptions of value between Emperor red snapper and Green Jobfish among fishermen, the challenges in pricing small fish, and the implications of size limits on their fishing practices and market dynamics.

4.2.11 Sensitivity Analysis of Revenue Loss Due to Releasing Undersized Fish

The sensitivity analysis estimated the potential revenue loss for fishermen caused by releasing small Emperor red snapper and Green Jobfish. The input data, including fish prices and quantities, were collected from survey responses where fishermen provided prices for fish of three sizes: 20 cm, 26 cm, and 32 cm, and the quantity of fish in each size classes that they claimed to release on average per month.

The objective of the sensitivity analysis was to:

- Assess how changes in fish prices impact total revenue.
- Evaluate how variations in the number of undersized fish caught and released affect revenue.

Revenue Loss Calculation

Total revenue loss from releasing undersized fish was calculated using the following formula:

Total Loss in Revenue = $(P_{20\,cm} * Q_{20\,cm}) + (P_{26\,cm} * Q_{26\,cm})\,(P_{32\,cm} * Q_{32\,cm})$,

where $P_{20\,cm}$, $P_{26\,cm}$ and $P_{32\,cm}$ are the price in Seychelles rupees of a 20 cm, 26 cm and 32cm Emperor red snapper respectively, and where $Q_{20\,cm}$, $Q_{26\,cm}$ and $Q_{32\,cm}$ are the average quantity of 20 cm, 26 cm and 32 cm Emperor red snapper that fishers said they are releasing each month per vessel for each fleet.

Scenarios for potential loss in revenue

For each species and each fleet, we modelled seven different scenarios.

- **Realistic scenarios:** Based on average selling price of fish in the 3 size categories and the average number of fish that fishers from each fleet said that they were releasing per month.
- **Most optimistic Scenarios*:*** Decrease in catch and selling price by 20%.
- **Most pessimistic scenario:** Increase in catch and selling price by 20%.
- **Intermediate scenarios:** Changing either the catch or selling price of undersized fish by ±20%.

Sensitivity analysis findings

Financial losses calculated from the release of under-sized Emperor red snapper and Green jobfish per month from the three scenarios were estimated as follows and are summarised in **Error! R eference source not found.** and **Table *5***.

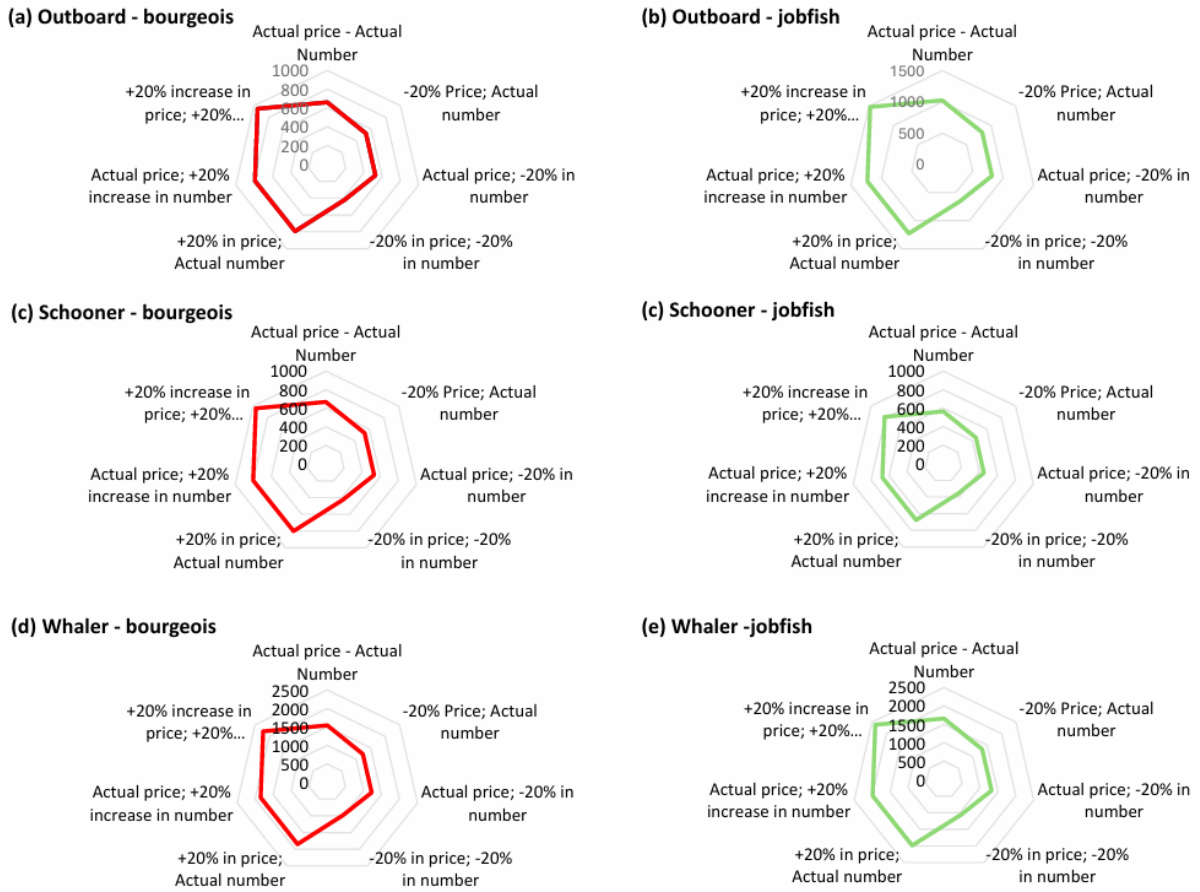

Figure 17. Radar plots of different scenarios on possible loss of revenue by fishermen from the different artisanal fishing fleets resulting from the need to release under-sized Emperor red snapper and Green Jobfish as required by Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021.

- **Outboard:** SCR 1,684 per vessel or SCR 674 per fisher.
- **Schooner:** SCR 1,231 per vessel or SCR 212 per fisher.
- **Whaler:** SCR 3,195 per vessel or SCR 864 per fisher.

In the optimistic scenario loss per month:

- **Outboard:** SCR 1,077 per vessel or SCR 431per fisher.
- **Schooner:** SCR 788 per vessel or SCR 136 per fisher.
- **Whaler:** SCR 2,045 per vessel or SCR 553 per fisher.

In the pessimistic scenario loss per month:

- **Outboard:** SCR 2,425 per vessel or SCR 970 per fisher.
- **Schooner:** SCR 1,773 per vessel or SCR 306 per fisher.
- **Whaler:** SCR 4,600 per vessel or SCR 1,243 per fisher.

Table 5. Calculation of average monthly loss per fishing vessel and per fisher resulting from the need to release under-sized Emperor red snapper and Green Jobfish as required by Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 based on realistic, optimistic and pessimistic scenarios from average actual market

price of small Emperor red snapper (collected during the survey) and average number of Emperor red snapper and Green Jobfish that fishers from the different vessel fleets claim they are realising on an average month.

Fleet	Scenario	Average monthly loss per vessel (SCR)		Average No. fishers	Average loss per fisher (SCR)
		Emperor red snapper	Green Jobfish		
Outboard	Realistic	660	1,024	2.5	674
Outboard	Optimistic	422	655	2.5	431
Outboard	Pessimistic	950	1,475	2.5	970
Schooner	Realistic	668	563	5.8	212
Schooner	Optimistic	428	360	5.8	136
Schooner	Pessimistic	962	811	5.8	306
Whaler	Realistic	1,540	1,655	3.7	864
Whaler	Optimistic	986	1,059	3.7	553
Whaler	Pessimistic	2,218	2,382	3.7	1,243

The analysis is based on average prices and quantities. Some fishermen reported selling fish at much higher or lower prices, and some reported releasing more or fewer fish than average. These variations could lead to higher or lower revenue losses than those presented in this analysis.

4.2.12 Support for maximum of 25 traps per vessel

Trap Fishing Participation

Slightly more than half of the respondents (51%) reported engaging in trap fishing, with 60% of respondents from the outboard fishery saying that they are also engaged in trap fishing and 33% of respondents from the whaler and schooner fisheries.

Number of Traps Used

The number of fish traps used by the outboard vessels involved in trap fishing are as follows:

- **Range:** 4 to 25 traps
- **Average:** 11 traps
- **Median:** 10 traps

The number of traps used by whaler and schooner vessels involved in trap fishery was typically only one trap. The exception was one schooner fisher who claimed that he was using 10 traps. This is a fisherman who has multiple vessels and is also involved in the whaler and outboard fishery. In all likelihood, it appears that these traps were being used in the outboard fishery.

Types of Traps Used

The majority of survey respondents fishing on outboard vessels (72%) that were participating in the trap fishery said that they were making exclusive use of static traps (kazye dormi), with smaller percentages (11%) saying that they were making exclusive use of active traps (kazye lavol), while 17% of respondents said that they were making use of both active and static traps (**Figure 17**). Fishers on schooners mostly used active traps while those on whalers used both types of traps.

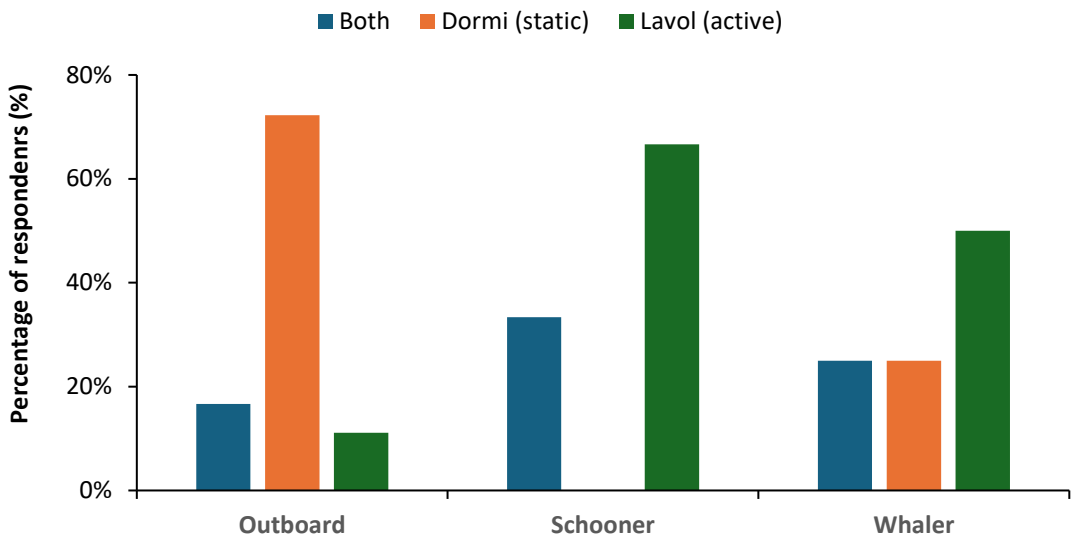

Figure 17. Percentage of respondents who said they were also doing trap fishing from the three boat fleets and the types of fish traps they said they were using.

Support for Maximum Active Trap Limit (25 traps per vessel)

Support for the regulation that allows the use of a maximum of 25 traps per commercial outboard vessels were as follows:

- **Supportive:** 75%
- **Opposed:** 20%
- **Indifferent:** 6%

Most cited reasons for supporting the 25-trap limit included: concern about habitat destruction and stock sustainability, and a belief that 25 traps were already excessive for a single vessel.

The most cited reasons for not supporting the regulation included: The desire for open use of traps for business flexibility, and the need for a higher number of traps for a good catch. It is to be noted that only one survey respondent reported using more than 25 traps.

Perception of Revenue Impact resulting from maximum trap limits

Many respondents felt that the 25-trap limit is not affecting their revenue as they are already using less than 25 traps. Many said that operating 25 traps per day is labour-intensive. Those who felt that the maximum trap limit had the potential to affect their revenue claimed that it could affect “potential” revenue. However, none of the fishers who claimed this was using anywhere near the maximum trap limit. As a matter of fact, 86% of survey respondents said that they did not know any fisher who were making use of 25 traps at any one time.

Among the few who knew fishers using more than 25 traps, three respondents independently identified the same individual, suggesting a social stigma against those using a large number of traps.

4.2.13 Demersal fish bag limit for semi-industrial vessels

Eighty-six percent of survey respondents said that they had never fished on a semi-industrial longline vessel. Th remaining 14% of respondents said that they have had some experience on semi-industrial longline vessels.

Support for Semi-Industrial Vessel Bag Limit

Support for the regulation on the demersal bag limit fir semi-industrial longline vessels were as follows:

- **Supportive:** 90%
- **Opposed:** 4%
- **Indifferent:** 6%

Reasons provided of why respondents supported the measure emphasised on the need for each vessel to focus on the types of fish specified in their fishing license conditions. The majority of survey respondents were in favour of these semi-industrial long fishermen fishing within their bag limit for consumption on board or to take home for personal consumption.

Reasons provided by those who said they opposed the regulation mostly hinged on the fact that 20 fish when divided among the 6 or 7 fishers on a boat is not sufficient. Respondents mentioned that semi-industrial longline vessels typically do not target demersal resources on most fishing trips.

Perception of Revenue Impact resulting from bag limit

The majority of survey respondents (88%) were of the opinion that the bag limit was not impacting the income of semi-industrial longline fishermen, with 6% of respondents feeling otherwise while an additional 6% were unsure of the answer. The most often cited response for no financial impact was that semi-industrial longline fishers were not dependent on demersal resources as their primary source of income.

4.2.14 Rabbit fish Spawning aggregation fishery trap limit

The survey found that 22% of respondents participated in the rabbitfish spawning aggregation fishery. Fishing of rabbitfish spawning aggregations are usually carried out from outboard vessels at sites located principally around Praslin and Mahe island. One of the respondents said that he sometimes fish rabbitfish spawning aggregations around the island of Coëtivy using a schooner.

Support for Trap Limitation Measures

Eighty-two percent of survey respondents supported the regulation that limits the number of fish traps per vessel at spawning sites around Praslin. There was common consensus among respondents that six traps are sufficient, based on the good catch rates that are usually reported at these sites during spawning aggregation periods, as well as the need to also allow space for other fishers and to allow some fish to spawn. All fishermen involved in Praslin's rabbitfish spawning aggregation fishery at the listed sites around Praslin where the measures are in force reported no negative impact on revenue due to the trap limit. These fishers mentioned that they also set traps at other locations during spawning periods to target other reef fish, supplementing their income.

Awareness of other rabbitfish spawning aggregation sites

There are lots of other known rabbitfish spawning aggregation sites apart from the listed ones at Praslin, with 57% of survey respondents claiming that they were aware of other sites. Other mentioned spawning aggregation locations included: The Amirantes, Coëtivy, Grand Rochers, Petit Grand Rochers,

Anse Aux Pins, Fregate, Île aux Récifs, Denis Island, Bar de l'Est, Mamelles, Brizarre (Wizard Rock), La Digue, Baie Lazare, Anse Forbans, Casuarina Hotel Area, between Île Sèche and Grand Rochers, Pti Bar, Gran Bar, between Praslin and Mahe, Maternité (Andan Brizarre), Cascade, Anonyme, and other areas near Praslin with patch reefs.

Opinions on extending trap limitation measures to other spawning aggregation sites

Sixty-three percent of survey respondents supported extending trap limitations to other known rabbitfish spawning aggregation sites. Common reasons given was that the same measures should apply everywhere. Of the survey respondents, 12% were opposed to extending the measures to other sites, whereas 25% of respondents were undecided. The main reasons given by those who were opposed to extending the measures included: (1) local fishers should create their own rules, (2) There should be no restrictions so that revenue could be maximized, (3) There is a need to discuss these measures again before they are extended to other sites, and (4) It would be difficult to enforce the measures at other sites.

Support for Prohibiting Overnight Trap Deployment

There was high level of support among respondents for the measure that prohibits fishers from leaving their traps overnight on spawning aggregation sites during the spawning aggregation periods with 75% of respondents saying that they were in agreement with the measure. Reasons provided for supporting this measure related particularly to: (1) prevent the attraction of sharks to the reef at night (attracted by bait in traps or fish caught) that chases spawning rabbitfish away or damages fish traps, (2) prevent fish from dying due to high number of them in traps over long period of time, (3) limit destruction of habitat as a result of trap movement in currents, and (4) reduce the navigation threats caused by trap lines getting caught in boat propellers. Only 6% of respondents said that they were opposed to this measure, while 25% were undecided or unopinionated. Opponents to this measure cited potential reduction in catch and revenue as reasons against the measure. All fishers participating in the Praslin rabbitfish spawning aggregation trap fishery supported the measure, noting positive impacts on their income.

4.2.15 Trap limit for whalers and schooners

Support for trap limitation measures for whalers and schooners were as follows:

- **Supportive:** 78%
- **Opposed:** 18%
- **Indifferent:** 4%

Details of responses according to the fishing fleet on which survey respondents were fishing are provided in **Figure 18**. Some of the arguments in support of the measure included: (1) that two traps are adequate as more would take up too much space on the boat, (2) whalers and schooners, which set traps far away from the coastlines, do not affect coastal fishers' catch, (3) whaler and schooner fishermen should focus on line fishing for bigger fish rather than trap fishing, (4) excessive trap fishing on the outer banks could destroy the habitat, and (5) fish trap catch could provide a backup for fishers when fish are not biting.

Eight out of nine respondents who were against the measure felt there should be no trap limit or that the limit should be higher than two traps per vessel. One respondent felt that two traps was too much for these vessels and that it should be reduced down to one.

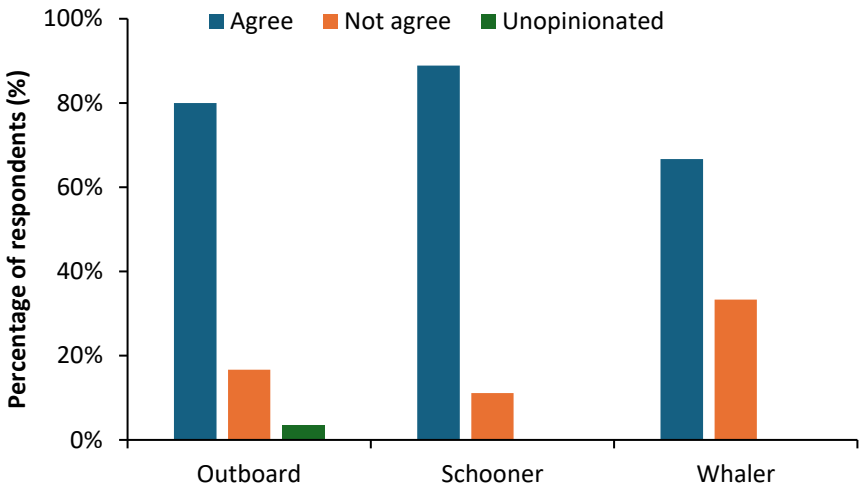

Figure 18. Percentage of respondents from each of the three artisanal fishing fleets agreeing and not agreeing to the maximum trap limit for whalers and schooners.

4.2.16 Trap limit for recreational vessels

Support for trap limitation measures for recreational fishing vessels among artisanal fishers interviewed were as follows:

- **Supportive:** 78%
- **Opposed:** 20%
- **Indifferent:** 2%

The main argument for limiting the number of traps provided by survey respondents was that catch from recreational fishing should be for personal consumption only, and not for sale, and that two traps were adequate for this. Those who were against the measure were of the opinion that recreational vessels should not be allowed to set fish traps as trapping should not be considered a recreational activity.

Impact on Income from Trap Limitation Measures

While 71% of survey respondents believed limiting the number of traps for whalers and schooners fishers would not significantly affect their income, 14% thought that it might have some negative impacts, while 16% of respondents were unsure or had no opinion. Those who believed the measure would not limit income noted that trap fishery catches on whalers and schooners contribute only a small part of their total revenue.

4.2.17 Compliance with introduced measures

Most survey respondents said that they were respecting measures that were relevant to the fishery that they were undertaking (**Figure 19**). Claims of non-compliance to introduced measures was low across all the measures.

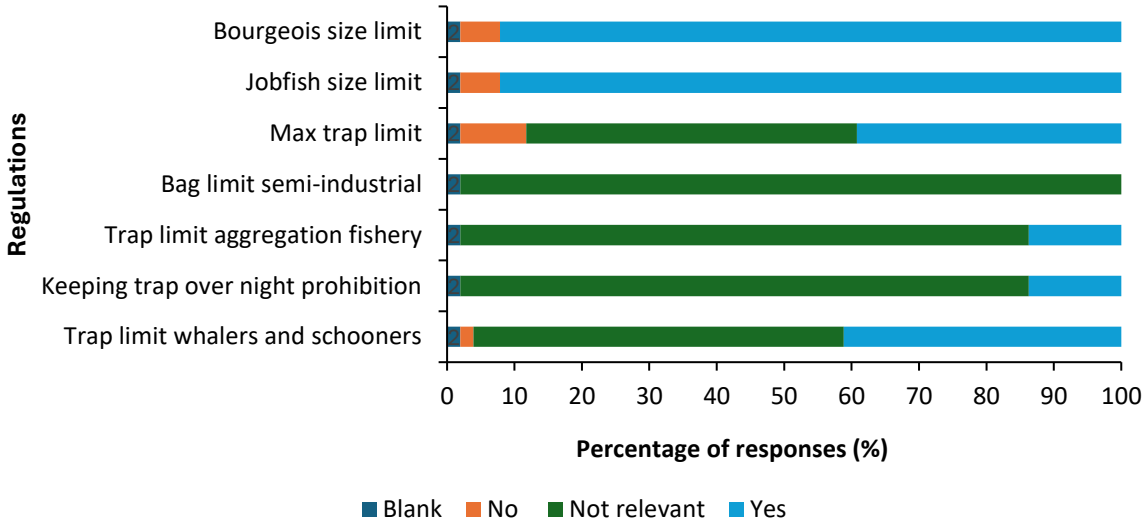

Figure 19. Responses from survey respondents on whether they were abiding to the different measures in the Fisheries (Mahe Plateau) Regulations, 2021.

Fishers claims of compliance to the different measures are detailed below.

- **Minimum Size Limit for Emperor red snapper and Green jobfish:** Compliance to the 32cm minimum size limit for both Emperor red snapper and Green Jobfish was high with 92% of respondents claiming that they are and would continue to abide to the measures. However, 6% of respondents openly said that they are not abiding and would not abide to the measure.

- **Maximum Limit of Active Traps:** The measure with the highest level of respondents saying that they would not abide to is the one concerning the maximum limit of 25 active traps, with **10% of respondents saying that they are not abiding or would not abide to the measure**. This is despite the fact that only one survey respondent had claimed that he was using more than 25 traps.

- **Bag limit for semi-industrial vessels:** None of the fishers interviewed were fishing on semi-industrial longline vessels, as a result the measure concerning the semi-industrial vessel bag limit was not relevant for the survey respondents.

- **Rabbitfish spawning aggregation fishery trap limits:** All fishers who had previously claimed that they target rabbitfish spawning aggregations at listed sites around Praslin Island said that they were respecting the trap limit.

- **Prohibition from leaving traps overnight at listed rabbitfish spawning aggregation sites:** All fishers who had previously claimed that they target rabbitfish spawning aggregations at listed sites around Praslin Island said that they were respecting the prohibition to leave fish traps overnight at listed spawning aggregation sites during the spawning periods.

- **Trap Limit for Whalers and Schooners:** Only one respondent (2% of respondents) claimed that he was not complying with the measure limiting traps for whalers and schooners.

Reasons provided for complying with new measures

The primary motives provided by survey respondents for abiding to the measures ranked by frequency of responses (**Figure 20**.) are:

- **Law abiding:** consider themselves law-abiding citizens.
- **Future benefits:** Believe measures will benefit fish stocks and fishers in the future.
- **Vessel owners' mandate:** Compliance insisted upon by vessel owners.
- **Avoid legal trouble:** Desire to avoid legal issues.
- **Preserve Incentives:** Fear of losing incentives from the Seychelles Fishing Authority (SFA).
- **Peer Pressure:** Observing that everyone else is complying.

Reasons for Non-Compliance

Primary reasons provided for non-compliance included disagreement with the measures or logistical/financial constraints preventing adherence.

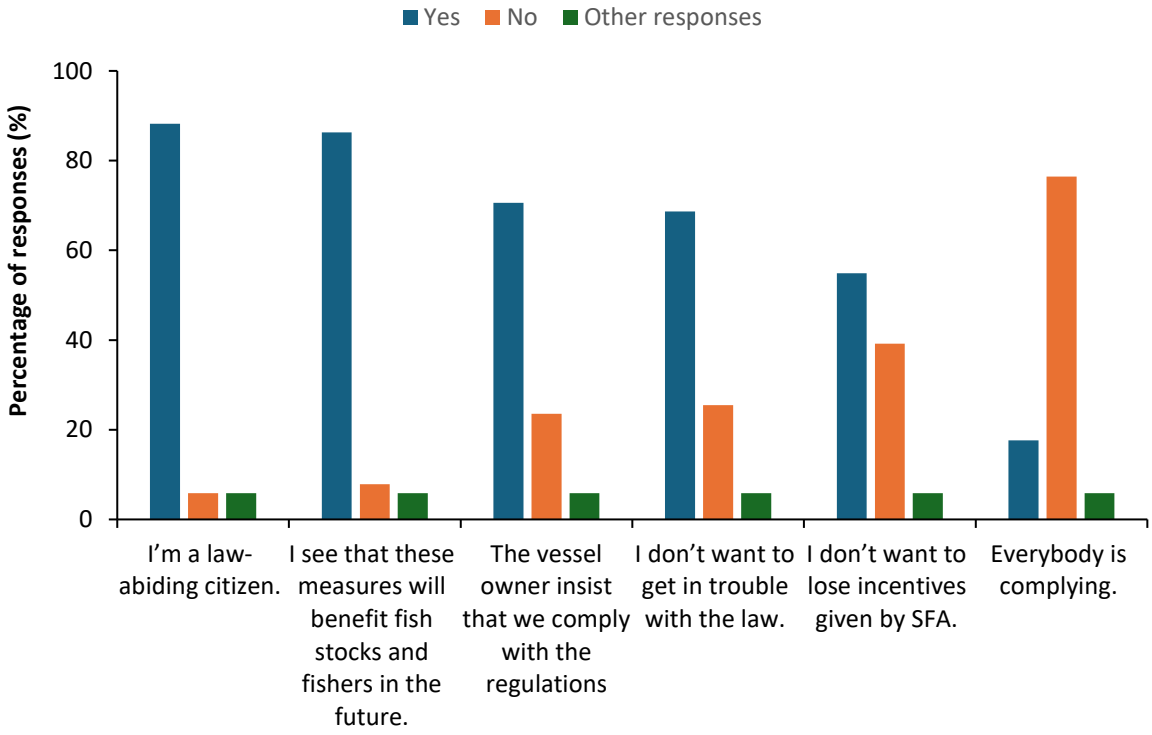

Figure 20. Percentage responses of reasons why survey respondents are complying with the Fisheries Management Regulations, 2021.

4.2.18 Survey respondents' demographics

Age distribution

The age distribution (**Figure 21**) of the artisanal fishers' survey respondents was as follows:

- **45+ years old:** 50% of respondents
- **31 - 45 years old:** 33% of respondents
- **15 and 30 years old:** 16% of respondents.

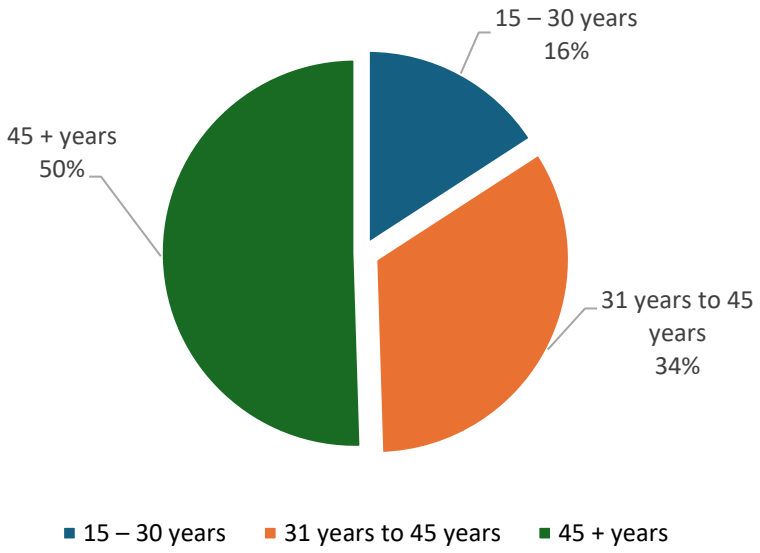

Figure 21. Age distribution of respondents participating in the artisanal fishers' survey.

Years of fishing experience

Survey respondents had a wide range of experience in terms of the number of years that they have been fishing with 73% of them having more than 10 years of fishing experience (**Figure 22**).

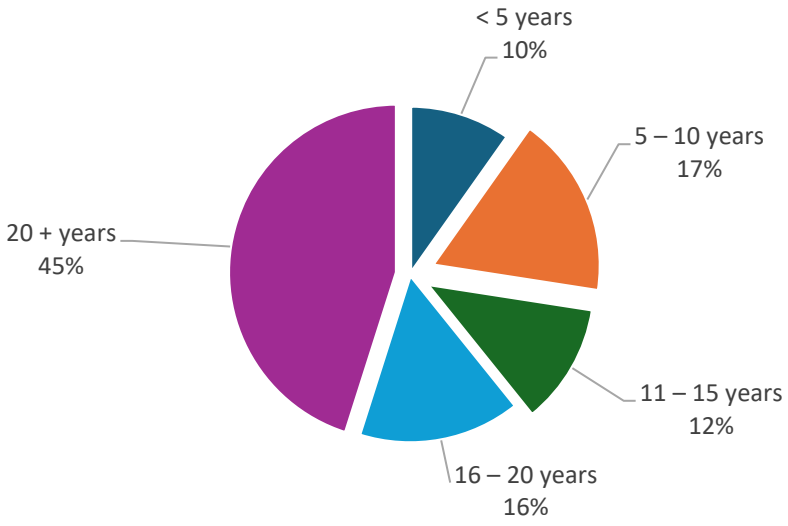

Figure 22. Years of fishing experience of respondents who participated in the artisanal fisheries survey.

4.2.19 Artisanal fishers' income and employment

Employment Status

- 90% of respondents worked full-time as fishers.
- 10% of respondents worked part-time.

Sources of income

- 71% of respondents relied solely on fishing for income.

- 29% of respondents had additional income sources, including casual labour, farming, construction, diving, stevedoring, octopus fishing, and cleaning.
- Two older respondents received social security and pension payments.

Income from fishing

- **Part-Time Fishers:** Fishing income ranged from 10% to 75%of their total income, averaging 42%.
- **Full-Time Fishers:** Fishing income ranged from 50% to 100% of their total income, with 76% of respondents reporting that fishing accounted for 100% of their income.

Monthly Income distribution of fishers

Monthly income distribution of fishers interviewed as part of the survey is illustrated in **Figure *23***. The following can be summarised from the data collected with regards to fishers' income:

- 68% of survey respondents claimed to earn less than or equivalent to SCR 15,000 per month.
- 17% of survey respondents claimed to earn over SCR 20,000 per month.
- Income range was narrowest for outboard vessel fishers and was between SCR 6,000 to SCR 20,000 per month.
- Whaler fishers' income ranged from SCR 6,000 to SCR 25,000 per month.
- Schooner fishers' income ranged from SCR 10,000 to SCR 25,000+ per month.
- The average monthly income increased with vessel size from outboard to whaler to schooner.

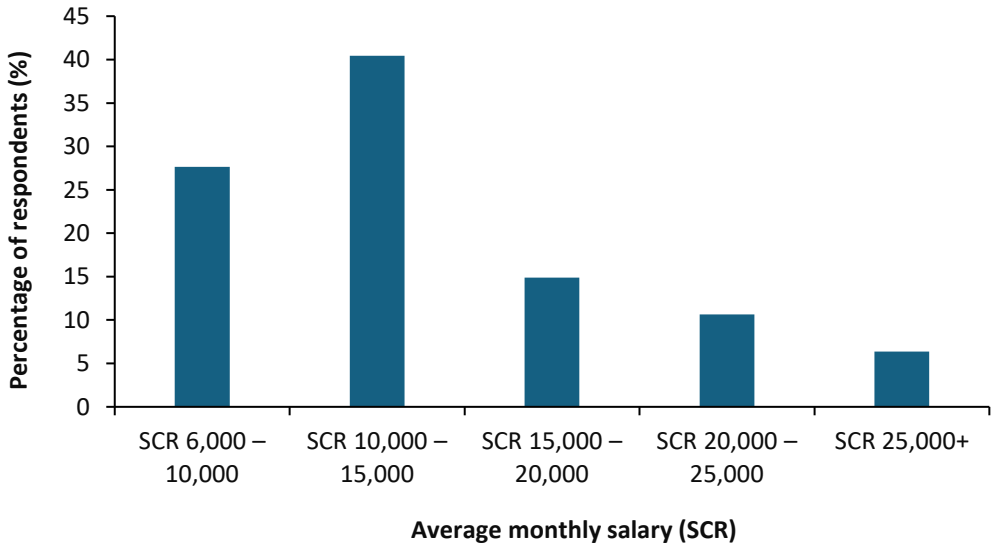

Figure 23. Monthly declared salaries of fishermen who participated in the survey.

Impact of new measures on income

- 88% of survey respondents reported no change in income since the introduction of regulations.
- 12% of survey respondents reported a reduction in income.

- Only one survey respondent attributed the reduction in income directly to the new measures, specifically the requirement to release small Emperor red snapper and Green jobfish during the Southeast monsoon period.
- Other reasons for income reduction included:
    - High cost of fishing inputs (bait, ice, repairs).
    - Perceived decrease in fish prices (not supported by market data).
    - Increasing operational costs.
    - Declining fish populations.
    - Harsh Southeast monsoon season.
- Some respondents noted increased living and operational costs despite no change in income.

Employment alternatives

When asked about the ease of finding other jobs if they were no longer able to go fishing, the following information was recorded based on the responses:

- 63% of survey respondents believed they could easily find other employment if they were unable to fish.
- 37% believed it would be difficult to find other work.
- Those optimistic about finding other work mentioned possible jobs such as casual labour, farming, construction, skipper, tourist guide, stevedore, driving, and motor mechanic.
- Those pessimistic about finding other work cited reasons such as lifelong fishing experience, difficulty finding equivalent salaries, age, selectiveness in job type, and personal attitudes and lifestyles.
- No respondent reported knowing fishers who stopped fishing due to the new regulations.
- Some respondents indicated that any departures from fishing were due to personal issues such as laziness or substance abuse, rather than regulatory impacts.

4.2.20 Social, cultural, and mental impacts of new regulations

Positive social and cultural impacts

- 92% of fishers interviewed reported that the newly introduced measures had not significantly affected their social or cultural practices.
- Most fishers did not provide additional details on this topic.
- The general sentiment was that little had changed for them. The primary difference was that they now had to release small Emperor red snapper and job fish, which constituted only a small portion of their catch.
- The newly introduced measures were seen as protective of fishing culture, emphasizing that without fish, nobody benefits from fishing.

Negative social and cultural impacts

- Among the minority (8%) who perceived social or cultural impacts, half of them used to take small Emperor red snapper home for food and sell the larger ones. The new minimum size limit now hindered their food security at home.
- The other half expressed that fish had become more expensive due to the regulations.
- It remains unclear whether the mentioned increase in price positively impacted fishers' revenue from fishing or negatively affected their earnings by preventing fish sales.

Mental and physical health impacts:

- A slightly higher percentage (10%) of fishers claimed that the regulations negatively affected their mental or physical health compared to social and cultural impacts.
- Common health-related concerns included frustration, feelings of unfairness, financial pressure, and fear.
- Some fishers felt the regulations unfairly affected coastal fishers more than those fishing farther offshore.
- Others experienced fear related to taking small Emperor red snapper home for food, worrying about potential violations.
- Financial pressure arose when fishers felt compelled to keep small fish, especially during poor catch periods.
- Interestingly, there were contrasting frustrations: some fishers disliked having to release small Emperor red snapper and Green Jobfish, while others were frustrated that the regulations took so long to implement.

4.3 Semi-industrial longline vessel owners survey

4.3.1. Semi-industrial longline vessel owners' perception on the state of the demersal fish stocks

Perceptions of semi-industrial longline vessel owners surveyed about the state of demersal fish stocks and management of demersal fishing activities yielded the following results:

State of the demersal fish stocks:

- **Healthy:** 20 % of semi-industrial longline vessel owners thought the stocks were healthy.
- **Degraded:** 80% of vessel owners thought the stocks were degraded.

4.3.2 The need to manage demersal fisheries and fishing activities

- Eighty percent of vessel owners surveyed were of the opinion that the demersal fisheries should be managed, with all of them stating reasons related to resource sustainability and the need to preserve the fish stocks for future generations.
- The same 80% of vessel owners surveyed were of the opinion that the fishing activities of commercial fishers should be managed, once again mostly for reasons related to the sustainability of the stocks and to ensure that the resources are not abused.
- All survey respondents were of the opinion that measures should be implemented to control the catch of the public and visitors who goes fishing.
- Survey respondents were of general opinion that recreational fishers catches a lot of fish, as a result of their faster boats and more sophisticated equipment for locating fish onboard and that their activities should all fall under the fisheries management framework that control the activities of commercial fishers.

4.3.3. Targeting of demersal fishes

Frequency of fishing for demersal fishes by semi-industrial longline vessels

- 80% of semi-industrial vessel owners reported that their vessels do not fish for demersal species on every trip.
- Vessel owners said that when their crew target demersal fish, it's primarily for onboard consumption.
- Four out of five vessel owners indicated that demersal catch is consumed exclusively at sea.

- Sometimes semi-industrial longline fishers do bring demersal fish to port but this is generally for their personal consumption while in port.

Time spent fishing for demersal fish

- Vessel owners claimed that on average, their crew would spend about **2.6 hours per trip** fishing for demersal species.
- The minimum number of hours for which vessel owners said that their fishermen fish for demersal fish ranged from 0 hours to 8 hours per trip.
- One vessel owner said that he strictly prohibits fishing on the Mahe Plateau.

Diet Preferences of semi-industrial longline vessel crew

- There was agreement among vessel owners, with them stating that their semi-industrial fishers tended to eat mostly pelagic species that they catch in the longline fishery, and that when they fish for demersal fishes, they like to target species like small emperors.

4.3.4 Level of awareness about new regulations

The level of awareness of the new measures was quite good among semi-industrial longline vessel owners (**Figure 24**).

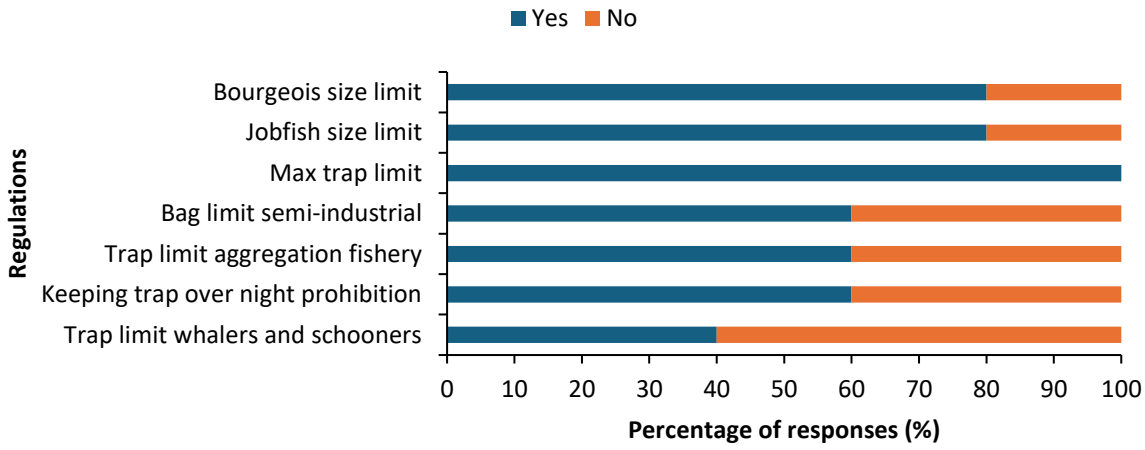

Figure 24. Level of awareness of semi-industrial vessel owners about different regulations to control the demersal fishery over the Mahe Plateau that were introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021.

- 80% of them said they were aware of the minimum retention size limit for Emperor red snapper and Green Jobfish.
- 100% of them claimed that they were aware of the maximum trap limit for small fishing vessels.
- 60% of them said that they were aware of the bag limit for semi-industrial longline fishing vessels, which is the regulation which is most pertinent to them.
- Out of the new measures, the trap limit for whalers and schooners was the less known with only 40% of survey respondents claiming that they were aware of it.

4.3.5 Support for demersal fish bag limit for semi-industrial vessels

Support for Bag Limit:

All vessel owners were in favour the bag limit of 20 fish per semi-industrial vessel per trip. The main reasons provided for being in favour of this measure included that:

- At present semi-industrial longline crew are all non-Seychellois and they do not have the same tendency to fish for their home like Seychellois fishers do. As a result, they do not have pressure from the crew to fish for demersal fish.
- The regulation doesn't directly impact their longline fishing activity.
- Less time spent on demersal fishing allows more focus on pelagic species (their core activity).
- They prefer their fishers not to target demersal species at all.

Pre- regulation catch and landing of demersal fishes

- Only one vessel owner reported landing demersal fish before the regulations. He claimed that the catch was used by the fishers and company employees and were never sold.
- The other vessel owners said that whatever demersal fishes were caught at sea was eaten at sea and were never landed.
- All vessel owners said that both Emperor red snapper and Green Jobfish featured very low on the target species for their fishermen when they do actually fish for demersal fishes.
- Vessel owners stated that their foreign crew do not like Emperor red snapper and Green Jobfish like Seychellois do, and that they prefer to eat small emperors.

4.3.6 Effect of the bag limit for semi-industrial vessels on fishers and vessel owner's livelihood

- All vessel owners said that they did not feel that the introduction of the demersal bag limit for semi-industrial vessel was affecting the livelihood of their fishers or their livelihood as vessel owners.
- One vessel owner said that fishing for demersal fishes does not help with the livelihood of his fishers as their payment conditions is based on the catch of tuna and tuna like species. He provided further information and said that the fishers on his vessels get a monthly salary and on top of that a commission based on the amount that they catch. He said the higher is their tuna catch, the better is their income.
- All vessel owners said that for them the measure concerning the demersal fishes' bag limit is not having an impact on their livelihood as they are dependent on the catch of tuna and not demersal fishing for their business.

4.3.7 Compliance with regulations

Briefing on of crew on minimum retained sizes for Emperor red snapper and Green jobfish

- Vessel owners said that they had not specifically briefed their fishers about releasing small Emperor red snapper and Green Jobfish below 32 cm fork length.
- They said that they considered this requirement irrelevant to their fishery since they had never observed their fishers landing such small specimens before.
- All vessel owners said that they do not encourage their fishers to engage in demersal fishing.

Compliance with Regulations

Despite not providing specific briefings to their crew on the 2021 Regulations, vessel owners said that their fishers were complying with the three relevant regulations for their fishery. They said that this was somehow automatic as their fishers rarely fished for demersal fish.

4.3.8 Survey respondents' demographics

Age of semi-industrial vessel owners interviewed

The age of vessel owners interviewed were distributed as follows:

- **15-30 years old:** 1 owner.
- **31-45 years old:** 2 owners.
- **45+ years old:** 2 owners.

Vessel owners experience in the semi-industrial longline fishery

The experience of vessel owners interviewed in the semi-industrial longline fishery varied greatly and were as follows:

- One was a new entrant (less than 5 years).
- One had 5-10 years of experience.
- Two had 11-15 years of experience.
- One had over 20 years of experience.

Crew Members

All vessel owners interviewed as part of this survey were operating more than one semi-industrial longline vessels.

- Four owners had vessels with 6 crew members.
- One owner had larger vessels with 7 crew members and smaller ones with 6 crew members.

Number of dependents and Income:

- Average number of dependents per vessel owner: 2.5.
- Dependents ranged from 0 to 5.
- Most owners had income sources beyond fishing.
- One owner's fishing contributed to 25% of their monthly income.
- Monthly income: Most owners said that they earned above SCR 25,000, and one owner claimed that he earned between SCR 20,000 and 25,000.

Impacts of Regulations on income

When the semi-industrial vessel owners were asked about whether the new regulations were having any impact on their income. The following results were obtained.

- Four owners reported no change in monthly income since the regulations were introduced.
- One owner experienced decreased income without specifying the cause.
- Owners believed it would be challenging to find alternative employment if they couldn't fish.

4.4 Public perception survey

Total of 225 members of the public interviewed in February 2024, 11 during pilot survey and 214 during actual survey. No change was made to the questionnaire after the pilot survey. As a result the pilot results were included in final data set.

Gender breakdown of respondents

- **Female:** 57%
- **Male:** 38%
- **Gender not recorded:** 5%

Age distribution of respondents:

- **18-35 years:** 26%
- **36-50 years:** 40%
- **50+ years:** 28%
- **Age not recorded:** 7%

4.4.1 Purchasing of fish and factors influencing what fish to buy.

The survey identified that both men and women participated in the purchasing of fish for home consumption with balanced participation among men and women (**Figure 25**).

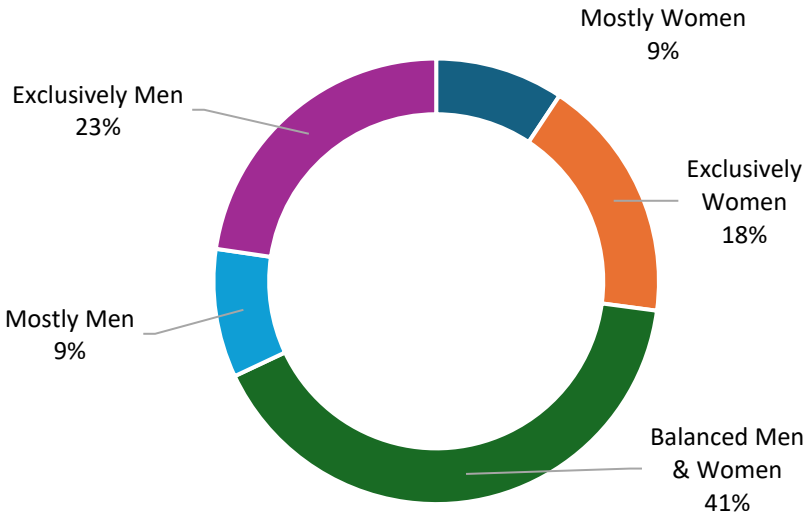

Figure 25. Percentage distribution of survey respondents' response on who was responsible for buying fish in their household.

Factors considered when selecting what fish to buy

The public survey generated the following results concerning the decision process of Seychellois clients when purchasing fish:

- Individual clients considered up to six different factors when buying fish.
- On average, clients consider 2.8 factors, with a median of 3 factors.

The most important factors considered included:

- **Fish price:** 74%
- **Fish size:** 62%
- **Type of fish flesh:** 60%
- **Fish diversity:** 41%
- **Fish colour:** 14%
- **Other factors:** 27%
- **Freshness of fish:** Although freshness was not listed in the questionnaire, it was identified by 18% of survey respondents as important. Respondents said that indicators of freshness that they used include: the colour of the eyes, smell, firmness, absence of bruises.

Included in other factors that people consider when buying fish include the amount of bones and the hygiene of the selling location.

4.4.2 Fish consumption

When the public survey respondents were asked about how many days that they would eat at least one meal containing fish, the results were as follows:

- **Fish consumption frequency:** 71% of survey respondents eat fish at least four days per week (**Figure 26**).
- **Health considerations of fish consumption:** 89% of respondents consider fish to be a healthier than meat, 9% said that they saw no difference in health benefits between fish and meat, while only 2% of respondents did not consider eating fish to be a healthier option.
- **Fish type preference:** 33% of survey respondents were not concerned about the type of fish, as long as it is fish, while 67% of respondents had specific preferences for certain types of fish.
- **Reasons for selectivity in fish type included:** Avoidance of fish with dark flesh (e.g., trevallies, bonito), not eating rabbitfish, avoidance of fish with many bones, not eating fish that requires skin removal before cooking, preference for pelagic over demersal species, or vice versa, and the dislike of fish with a coral smell (e.g., emperors).
- **Health concerns influencing fish type preferences:** Some respondents associated certain types of fish to health issues. For example, the consumption of rabbitfish was linked to high blood pressure and dizziness, while the consumption of fish with dark flesh was linked to gout.
- **Consumption level:** Green Jobfish is more frequently consumed than Emperor Red Snapper (**Figure 27**):
    - 44% of respondents said that they eat Green Jobfish at least once a week.
    - 18% of respondents said that they eat Emperor Red Snapper at the same frequency.
    - 31% of respondents said that they only eat Emperor Red Snapper during social occasions or celebrations. Celebratory consumption of Emperor red snapper by certain portion of the population is is believed to be linked to the high price of Emperor red snapper, which often cost about SCR 130 per kg, and sometimes goes even higher when their catch is low.
- **Prestige:** 49% of survey respondents considered eating Emperor Red Snapper as prestigious, while only 24% of respondents felt the same way about Green Jobfish.
- Reasons given for prestigious considerations of Emperor Red Snapper included: great taste, white flesh, and high price.
- Green Jobfish was seen by many survey respondents as being hard-fleshed, tasteless, and cheap compared to Emperor Red Snapper.

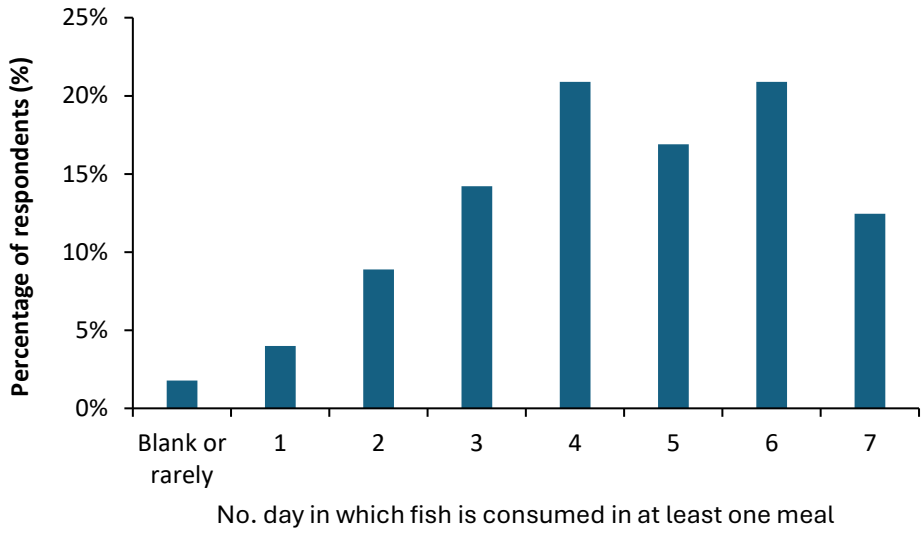

Figure 26. Percentage responses of survey respondents on the number of days per week that they eat fish in at least one meal per day.

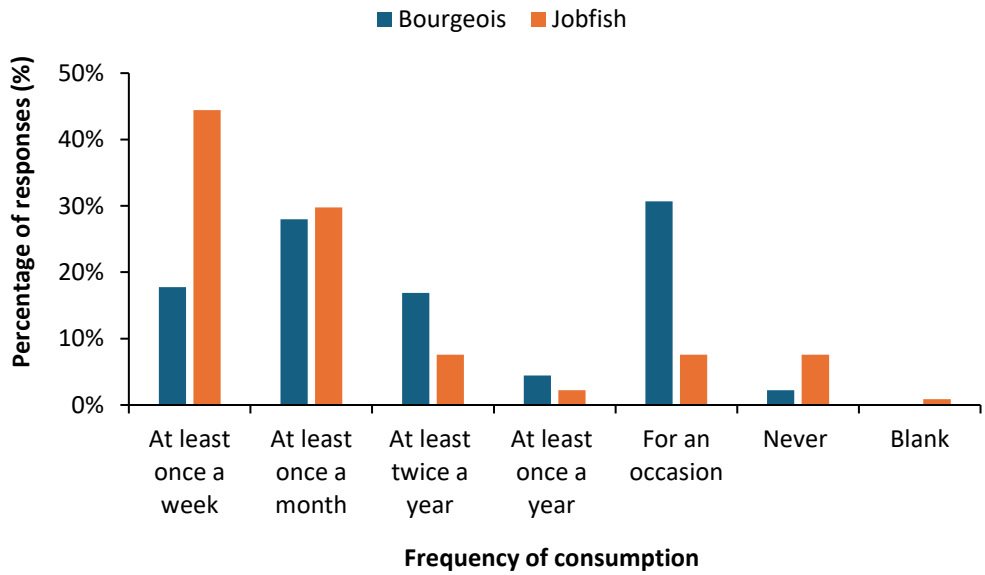

Figure 27. Percentage responses of survey respondents on how often they eat Emperor red snapper and Green Jobfish.

Size related preference of Emperor red snapper and Green Jobfish

When asked about the size of Emperor red snapper and Green Jobfish that they like to eat at home, survey respondents answered as follows (**Figure 28**):

Emperor red snapper

- **Preference for small (<32 cm) individuals:** 28%
- **Preference for medium (32-50 cm) individuals:** 69%
- **Preference for large (>50 cm) individuals:** 42%

Green Jobfish

- **Preference for small (<32 cm) individuals:** 20%
- **Preference for medium (32-50 cm) individuals:** 67%
- **Preference for large (>50 cm) individuals:** 39%

Note that for the above the total summed percentage does not add up to 100% as respondents could selected one or more size categories that they prefer.

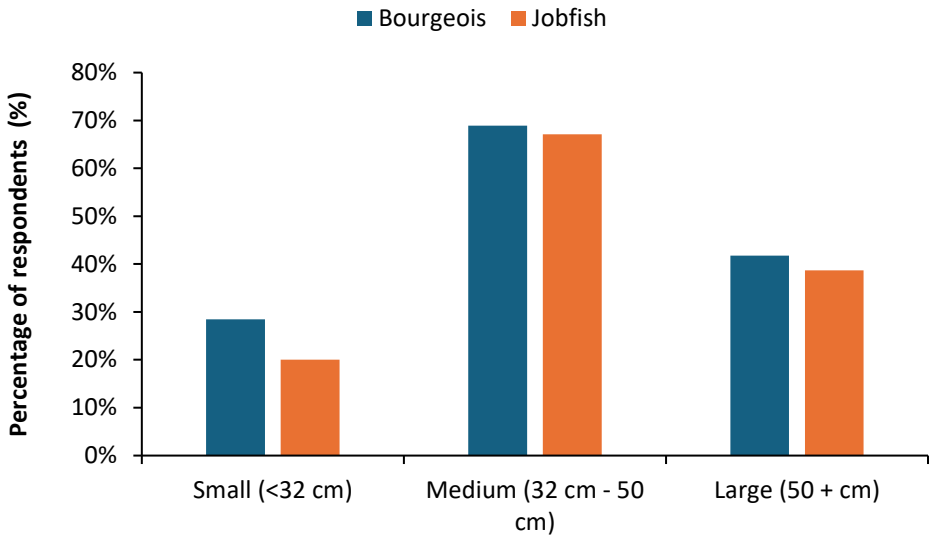

Figure 28. Percentage responses of survey respondents on the size of Emperor red snapper and Green Jobfish that they prefer eating at home.

The results also indicate that:

- **Preference based on size:**
  - 72% of respondents avoid small Emperor Red Snapper.
  - 80% of respondents avoid small Green Jobfish.
  - 13% of respondents were indifferent to the size of Emperor Red Snapper that they purchase.
  - 8% of respondents were indifferent to the size of Green Jobfish that they purchase.
  - For those who prefers small and medium-sized Emperor red snapper and Green Jobfish, reasons provided included: Higher affordability, small family size, ease of cooking, tastier and softer flesh, and the ability to grill a whole fish.
  - For those who prefers large sized Emperor red snapper and Green Jobfish, reasons provided included: greater versatility for cooking different dishes, better value for money (price per kg), having large family, the fact that large Green Jobfish provides nice fillets.

- **Preparation of specific dishes:**
  - 67% of survey respondents said that they do not require small Emperor Red Snapper for any specific dishes
  - 70% of survey respondents said that they do not require small Green Jobfish for any specific dishes
  - Some survey respondents claimed that they need small fish for specific dishes:

- Small Emperor Red Snapper: 30% of respondents made that claim. Specific dishes: grilling, “bouyon blan”. Both dishes can be prepared with Emperor red snappers longer than 32 cm.
- Small Green Jobfish: 27% of respondents made that claim. Specific dishes: Jobfish in butter garlic sauce. This dish is actually better when prepared wit larger Green Jobfish.

- **Association with social and cultural events**
  - 51% of survey respondents associated the consumption of Emperor red snapper with special events and celebrations, whereas only 25% of respondents associated consumption of Green Jobfish with these events (**Figure 29**).

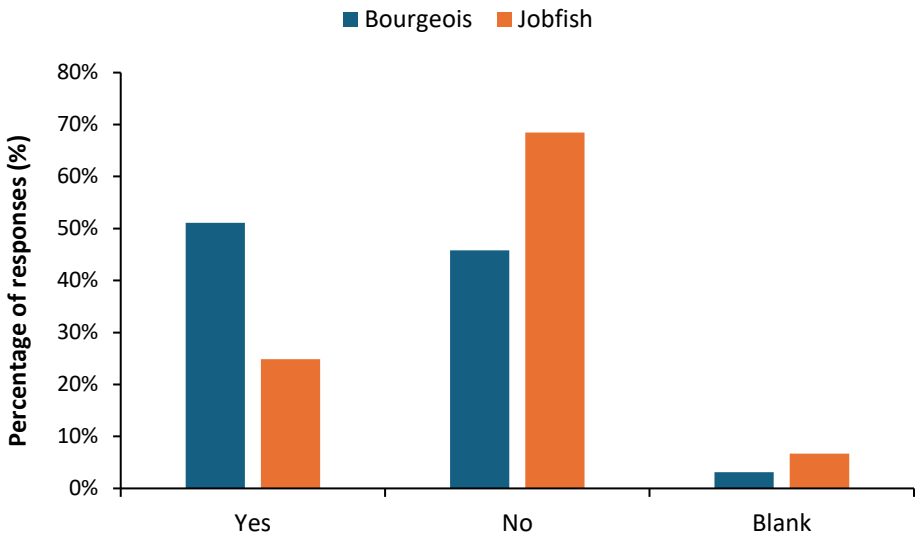

Figure 29. Percentage responses of survey respondents on whether they associate the eating of Emperor red snapper and Green Jobfish with particular social or cultural activities.

4.4.3 Social and cultural impacts of Emperor red snapper and Green Jobfish minimum size limits

When survey respondents were asked about the social and cultural impacts of not eating small Emperor red snapper and Green Jobfish, the following responses were obtained:

- **Emperor red snapper:** 95% of respondents reported no social or cultural impact, whereas 4% claimed some form of impacts.

- **Green Jobfish:** 93% of respondents reported no social or cultural impact, whereas 2% Claimed some form of impact.

4.4.4 Knowledge of new regulations

Awareness about management measures

When asked whether they were aware of the three measures (minimum retention size limits for Emperor red snapper and Green Jobfish, and demersal species bag limits for recreational fishers) that directly affects the public, results show that the minimum retention size limit for Emperor red snapper was the best known of the three measures.

- **Emperor red snapper minimum size limit:** 74% of respondents were aware.
- **Green Jobfish minimum size limit:** 68% of respondents were aware.
- **Demersal species bag limits for recreational fishers:** 39% of respondents were aware.

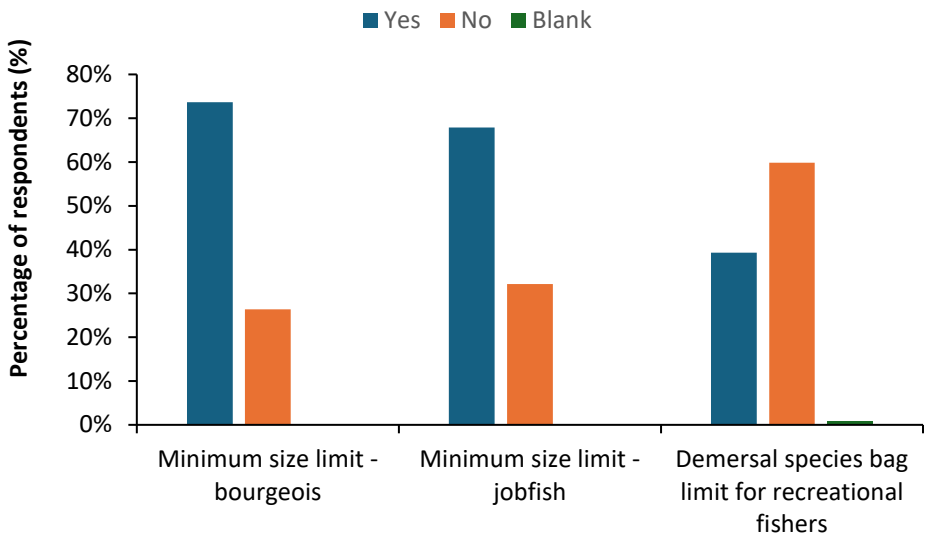

Figure 30. Level of awareness about the three regulations with the potential to directly affect members of the public introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021.

Frustration with regulations

Frustration with the demersal fisheries regulations among the public was generally low, and were as follows:

- **Minimum size limit for Emperor red snapper:** 16% of respondents were frustrated.
- **Minimum size limit for Green Jobfish:** 12 % of respondents were frustrated.
- **Demersal bag limits for recreational fishers:** 12 % of respondents were frustrated.

Economic, social and cultural impacts of demersal fisheries regulations

- 92% of respondents claimed that the new regulations have not affected their household economically, socially, or culturally.
- 7% of respondents felt an impact, primarily noting that Emperor red snapper and Green Jobfish have become more expensive to buy.

4.4.5 General comments from the public

Generally, comments from the public were very positive with many members of the public saying that the regulations were necessary to ensure sustainability of fish stocks and to give time for fish to grow and reproduce. Many respondents referred to the health benefit of consuming fish and said that they encouraged Seychellois in general to eat more fish. There were concerns with regards to the awareness of the public of the regulations with some respondents recommending that there should be more education and awareness about the issue and other issues of importance for Seychelles fisheries. A few survey respondents (n=6) had negative comments. Some of them said that the regulations were unfair with regards to the recreational fishery bag limit and that there should be more debate about this.

5. Discussion and Recommendations

This study has made use of historical length frequency data collected by the SFA and three survey questionnaires targeting: (1) artisanal fishermen fishing on three artisanal fishing fleets, (2) semi-industrial longline vessel owners, and (3) members of the public to for the first time assess the possible social and economic impacts of the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021. The study provides new insights in the Seychelles demersal fin fish fishery, with special emphasis on two targeted species: the Emperor red snapper and the Green Jobfish, as well as on the operation of semi-industrial longline vessels, and public perception with regards to the management of Seychelles fisheries and patterns in the consumption of fish.

5.1 Historical length frequency data

Analysis of historical length frequency data of Emperor red snapper and Green Jobfish indicates that fish of less than 32 cm fork length represents less than 0.1% of individuals of these two species sampled by the SFA research team between 2003 and 2023. This result suggests that Emperor red snapper and Green Jobfish of less than 32 cm accounts for only a very small portion of the catch of demersal fishers and that, as a result, they might not have contributed to a significant portion of demersal fishers' revenue. This corroborates results from the artisanal fishers' survey that revealed that small Emperor red snapper and Green Jobfish are released at sea by the majority of fishers even before any regulations were introduced. The low percentage of individual of these two species of less than 32 cm fork length in the historical samples also suggests that the minimum size limit of 32 cm may not be having much impact on the efforts for rebuilding the stocks of the two species as they have historically not featured extensively in the landed catch. The 32 cm fork length limit is less than the size at first sexual maturity Lm_{50} for both species, with Fishbase documenting Lm_{50} for Emperor red snapper as 54.2 cm (range 49 - ? cm) and as 45.0 cm (range 42 – 50 cm) for Green Jobfish (Fishbase, 2024). During the stakeholders' consultations undertaken when the demersal fishery co-management plan was being prepared it was highlighted that the 32 cm minimum proposed fork length retention limit for the two species is substantially below the size of first sexual maturity and that it was unlikely to have any major impact on the rebuilding of the stock. The guidance from stakeholders then was for the SFA to undertake additional research to determine the size at sexual maturity for the local stocks of these two species and to present the results to stakeholders to look at the possibility of revising the minimum retention size limit upwards. The SFA have been undertaking the additional research that were recommended but as yet have not officially published the results obtained. It is hence recommended that the SFA officially publish the results and make use of it to propose a biologically more significant minimum retention size limit for the two species.

5.2 Results from questionnaire surveys.

The general perception of the majority of fishers interviewed as part of this study that the demersal fish stocks are in a degraded state justifies the need for the new management measures introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021. These measures recorded high level of support from the majority of the artisanal fishers' survey respondents as well as from semi-industrial longline vessel owners and members of the public who were interviewed during this study.

It is interesting to note the very high level of agreement among artisanal fishers to actively manage the demersal fisheries, including the need to manage the activities of both commercial artisanal and semi-industrial fishers as well as recreational fishers. Arguments for managing fisheries had a lot to do

with sustainability of resources and the need to protect for future generations and indicated that the majority of artisanal fishers are concerned about resource sustainability issues.

One thing that came out strongly from the surveys is that fishers and members of the public were in a large part aware of the regulations concerning the minimum retention size limit for Emperor red snapper and Green Jobfish, but that the other regulations were much less known. There is thus a need to strengthen awareness and communication not only about these regulations but also other development happening in the fisheries sector. This is something that should be considered by the SFA now that they have a strong communication team in-house. One idea that came from a fisherman, was to have information boards at different landing sites for passing information to fishers.

While the support for the regulations were strong from across the different groups surveyed, there were call from many fishers in particular for stricter implementation of fisheries regulations and for increased presence of SFA enforcement staff, and on-land and at sea patrols to improve checks and compliance to different fisheries regulations and not just the ones introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021.

The majority of fishers who took part in the survey said that the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 have not had any kind of impacts on them including impacts that are financial, social, cultural, physical health or mental health related. Many fishers called for more measures to be introduced to ensure sustainability of the stock, but also highlighted the need for the authorities to consult with fishers before introducing measures.

The sensitivity analysis on financial loss resulting from the minimum retention size limit for Emperor red snapper and Green Jobfish indicates that in a realistic scenario the measure concerning the minimum retention size for Emperor red snapper and Green Jobfish could result in theoretical loss of between SCR 212 and SCR 864 per month per fisher if they were to sell all the small Emperor red snapper and Green Jobfish they catch while fishing. However, the actual loss is believed to be less than this since many fishers claimed that they were already releasing small Emperor red snapper and Green Jobfish even before the regulations took effect. As a consequence, this lessens the true economic impact of the measure. In the future, the economic impact could be the reversed of what is documented here if the small Emperor red snapper and Green Jobfish released survive and contribute substantially to the stock biomass through growth and reproduction.

Support for the maximum number of 25 traps per fishing vessels was very high, and most fishers said that they believed that 25 traps were too much, with some of them saying that fish traps cause destruction of habitats at fishing grounds. They mentioned issues that they were facing with the theft of fishing traps and took note of the process that has been initiated by the SFA to register fishing traps. The registration of fishing traps is a good way of keeping track of the number of traps that are being utilized and is a gross indicator of total effort exerted by traps.

The demersal fishing bag limit for semi-industrial longline vessels is something that has received wide ranging support from both artisanal fishers and semi-industrial longline vessel owners. The issue of excessive demersal fishing by semi-industrial longline vessels does not seem to be a problem for now since all semi-industrial fishing vessels have 100% foreign crew who tends to prefer eating pelagic species, and less prized demersal species such as Emperors.

The per vessel trap limit for the rabbitfish spawning aggregation fishery around Praslin Island is well supported, especially by fishers who are active in this fishery. There has been strong support for regulations to protect rabbitfish spawning aggregation sites similar to those off Praslin Island to be introduced at other locations where rabbitfish spawning aggregations are known to form. However,

survey respondents, reiterated the need to consult with fishers to raise awareness and get buy-in before the introduction of new regulations.

Survey respondents who openly said that they would not comply with certain regulations were few. Most survey respondents said that the 2021 regulations are good and that it will help to ensure sustainability.

The public perception survey was the first survey that has looked at consumption patterns of Emperor red snapper and Green Jobfish in the Seychelles. It has once again been quantitatively confirmed that Emperor red snapper is much liked by the population. However, this species is eaten less than many other species of fish due to its high selling price, that many people find to be outside of their budget. It was interesting to note that Green Jobfish is more regularly eaten than Emperor red snapper by the majority of members of the public who participated in the survey. Higher consumption of Green Jobfish compared to Emperor red snapper has a lot to do with the cheaper price for this species.

Small Emperor red snapper and Green Jobfish of less than 32 cm still featured on the size of fish that people would like to eat despite of the awareness campaign that has been implemented to educate the population on the need to refrain from eating small Emperor red snapper and Green Jobfish. There is thus a need to further integrate the benefits of allowing the juveniles of these two species to grow into future fisheries communications efforts. While the knowledge of the public about the minimum retention size limit for Emperor red snapper and Green Jobfish was high, it was evident that there was a need to do more communication on the other regulations.

5.3 Negative impacts of the new regulations.

The low level of impacts that survey respondents said the new regulations were having on them, together with the fact that the majority of fishers said that they can easily find other jobs if they cannot go fishing, do not support the need to have a Livelihood Restoration Plan (LRP) at this stage to counteract the socio-economic impacts that could have resulted from the implementation of the new regulations. **Table 6** documents these limited reported impacts and considers whether mitigation measures are required to reduce the intensity or eliminate the impacts. It indicates that in the majority of cases impacts were infrequently reported and that no specific mitigation measures are required at this stage. The majority of fishers interviewed as part of this study said that these measures are not having any major impacts on them and urged the authority to look at other factors that are affecting their fishing livelihoods such as the availability of bait and ice for them to go fishing, issues regarding the congestions of unloading sites, and issues with high number of sharks. Frustration level of the public was low, with most of concerns related to the recreational fishing bag limit for demersal species.

Table 6. List of limited impacts reported through the three questionnaire surveys implemented as part of the study and whether there are any needs to implement dedicated mitigation measures to reduce the intensity or eliminate reported impacts.

Reported impacts	Level of impact/Rationale	Persons affected	Mitigation measures
Loss of revenue resulting from the requirement to release small Emperor red snapper and Green Jobfish of less then 32 cm fork length.	**Very low.** Release of small Emperor red snapper and Green Jobfish was being practiced by the majority of fishermen even before the regulations were introduced.	All artisanal fishers, with higher level of impacts on outboard fishers	There is no need for any mitigation measure to address this issue as the actual revenue loss is not a significant portion of fishers income.

Loss of revenue resulting from prohibition to operate more than 25 traps per outboard vessels.	**Very low.** The artisanal fishers survey found that there are very few fishers that are making use of more than 25 traps for fishing. There is also broad agreement that fish traps cause physical destruction of habitats.	Limited number of outboard artisanal fishers.	There is no need for any mitigation measure to address this issue as using 25 fish traps per outboard vessel is already seen by the majority of fishers, including trap fishers as being too much. Encouraging the use of high number of fish traps will cause more negative socio-economic impacts on artisanal fishers than positive ones.
Loss in fishers' revenue resulting in having to take larger Emperor red snapper and Green Jobfish home for food instead of selling them since they do those less	**Very low.** Emperor red snapper and Green Jobfish of less than 32 cm size are very small and do not have much flesh for eating. Fishermen taking larger fish home could actually be improving nutrition at household level.	Artisanal fishers and their family.	There is no need for any mitigation measure to address this issue. There are already national schemes for poor families in place that helps with food security at the household level.
Feeling of unfairness as minimum retention size limit affects coastal fishers more than other fishers who fishes further away from the coast.	**Very low** It is true that coastal fishers are more affected by the minimum retention size limit than fishers who fishes further away. However, it is difficult to get around this issue due to juvenile fish being more common in coastal waters.	Coastal fishers operating in outboard vessels.	It is difficult to mitigate this issue through non-monetary measures.
Fear from getting caught taking small Emperor red snapper and Green Jobfish of less than 32 cm home for food.	**Very low** This fear of getting caught was mentioned by only one survey respondent. Fear of getting caught is an important component of effective compliance.	Artisanal fishers not adhering to minimum retention size limits.	No mitigation measure required. Fear of getting caught form an important part of fostering compliance to fishing regulations and should be exploited.
Financial pressure to keep small Emperor red snapper and Green Jobfish of less than 32 cm, especially when catch is not good.	**Very low** Reported by only one survey respondent.	Artisanal fishers	No mitigation measure required. Difficult to predict timing of when catch may not be good and remove financial pressures.
Frustration from sometimes catching a lot of small Emperor red snapper and Green Jobfish	**Very low** Reported by only one survey respondent. The majority of other fishers mentioned that when they start catching a lot of small	Artisanal fishers	No mitigation measure required at this stage. Future work should focus on identification of Emperor red snapper and Green Jobfish

of less than 32 cm that must be released.	Emperor red snapper and Green Jobfish they change fishing location.		nursery grounds and informing fishers of their locations and timing of use so that they can refrain from fishing in these areas.
Loss of options for food at household level in not being able to purchase small Emperor red snapper and Green Jobfish of less than 32 cm.	**Very low** Mostly related to being able to cook a whole fish.	A small percentage of consumers.	No mitigation is required as the long-term objective is to increase the minimum retention size limit from its current 32 cm fork length.
Perceived cultural impact of not being able to purchase and cook small Emperor red snapper and Green Jobfish of less than 32 cm.	**Very low** There are no cultural practices in the Seychelles that are only associated with Emperor red snapper and Green Jobfish of less than 32 cm.	A small percentage of consumers.	No mitigation is required as there are no cultural practices in the Seychelles that are only associated with Emperor red snapper and Green Jobfish of less than 32 cm.
Frustration with demersal fishing bag limit for recreational fishers.	**Low** Reported by a few members of the public that does recreational fishing. They feel dissatisfied with the demersal fishing bag limit of 20 fish of which no more than 5 Emperor red snapper and 5 Green Jobfish.	Recreational fishers	Recreational fishing is for recreational purpose and recreational fishers should not be looking at recouping the money that they spent for going fishing through the catch that they make. No mitigation measures are required. More education and awareness on the rational for this measure recommended.

5.4 Monitoring and evaluation

Even though the study reported very low level of negative impacts of the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 on fishers and members of the public it is important for the SFA and Ministry of Fisheries and Blue Economy to periodically monitor and evaluate the social and economic impacts of this Regulation and other fisheries law on fishers and members of the public. We propose that similar surveys using questionnaires are undertaken every three to four years to monitor key socio-economic indicators. The surveys should ideally be funded by the SFA and implemented by independent consultants. Future surveys should be structured in ways that would allow for direct comparisons of results with those obtained in this study. **Table 7** provide details of some key indicators that should be considered for monitoring and provide the baselines obtained through this study against which future changes can be assessed.

Table 7. Proposed key indicators that could be monitored as part of a longer-term monitoring and evaluation programme to monitor the impact of the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 on artisanal fishers and the public.

Indicator	Indicator type	Group to monitor	2024 baseline
Percentage of fishers falling in different revenue categories.	Economic	Artisanal fishers	SCR 6,000 – 10,000: 28% SCR 10,000 – 15,000: 40% SCR 15,000 – 20,000: 15% SCR 20,000 – 25,000: 11% SCR 25,000+: 6%
Perception of artisanal fishers on the status of demersal fish stocks	Environmental	Artisanal fishers	Healthy: 21.6% Degraded: 68.6% Severely Degraded: 7.8% Not sure: 2.0%
Percentage of fishers supportive of fisheries management	Fisheries governance	Artisanal fishers	Supportive: 78.4% Not supportive: 17.6% Don't know: 3.9%
Percentage of artisanal fishers being aware of Emperor red snapper minimum size regulation.	Awareness	Artisanal fishers	Aware: 98% Not aware: 2%
Percentage of artisanal fishers being aware of Green Jobfish minimum size regulation.	Awareness	Artisanal fishers	Aware: 98% Not aware: 2%
Percentage of artisanal fishers being aware of 25 traps maximum limit	Awareness	Artisanal fishers	Aware: 55% Not aware: 45%
Percentage of artisanal fishers being aware of bag limit of 20 demersal fish for semi-industrial longline vessels.	Awareness	Artisanal fishers	Aware: 29% Not aware: 71%
Percentage of artisanal fishers being aware of trap restrictions for listed rabbitfish spawning aggregation sites.	Awareness	Artisanal fishers	Aware: 61% Not aware: 39%
Percentage of artisanal fishers being aware of trap restrictions against leaving fish traps overnight at listed rabbitfish spawning aggregation sites.	Awareness	Artisanal fishers	Aware: 61% Not aware: 39%
Percentage of artisanal fishers being aware of maximum trap limits for whalers and schooners.	Awareness	Artisanal fishers	Aware: 49% Not aware: 51%
Age of artisanal fishers	Demographic	Artisanal fishers	< 5 years: 10% 5 – 10 years: 18% 11 – 15 years: 12% 16 – 20 years: 16% 20 + years: 45%
Trends in revenue after introduction of Regulations	Economic	Artisanal fishers	No change: 88% Reduced: 12%
Number of artisanal fishers reporting social and cultural impacts of regulations.	Social	Artisanal fishers	No impact: 92% Impact: 8%
Number of artisanal fishers reporting physical health or mental impacts of regulations.	Health	Artisanal fishers	No impact: 90% Impact: 10%
Number of days fish is consumed in at least one meal.	Consumption	Public	1 day: 4% 2 days: 9%

			3 days: 14% 4 days: 21% 5 days: 17% 6 days: 21% 7 days: 12%
Frequency of Emperor red snapper consumption.	Consumption	Public	At least once a week: 18% At least once a month: 28% At least twice a year: 17% At least once a year: 4% For an occasion: 31% Never: 2% Blank: 0%
Frequency of Green Jobfish consumption.	Consumption	Public	At least once a week: 44% At least once a month: 30% At least twice a year: 8% At least once a year: 2% For an occasion: 8% Never: 8% Blank: 1%
Percentage response of members of the public preference for eating Small (< 32 cm), medium (32 – 50 cm), and large (50+cm) emperod red snapper and Green Jobfish	Consumption	Public	**Emperor red snapper** Small: 28% Medium: 69% Large: 42% **Green Jobfish** Small: 20% Medium: 67% Large: 39% Note total does not add up to 100% as respondents can choose multiple fish sizes simultaneously.
Percentage of members of the public being aware of Emperor red snapper minimum size regulation.	Awareness	Public	Aware: 74% Not aware: 26%
Percentage of members of the public being aware of Green Jobfish minimum size regulation.	Awareness	Public	Aware: 68% Not aware: 32%
Percentage of members of the public being aware of demersal species bag limit for recreational fishers.	Awareness	Public	Aware: 39% Not aware: 60% Blank: 1%
Level of public frustration with regulations.	Fisheries governance	Public	**Bourgeois minimum size limit:** Frustrated: 16%, Not frustrated: 84%. **Jobfish minimum size limit.** Frustrated: 12%, Not frustrated: 848%. **Demersal fish bag limit.** Frustrated: 12%, Not frustrated: 88%.

5.5 Institutional arrangements

Institutional arrangement for overseeing the implementation of the Mahé Plateau Trap and Line Fishery Co-Management Plan falls with the Mahé Plateau Trap and Line fishery Co-Management Plan Committee. The committee meets quarterly, or more regularly if required. The Co-management Plan Implementation Committee was set up in January 2019 and is made up of stakeholders that are concerned with fisheries, including the authorities, fishers and fisher associations, fish processing businesses, local non-governmental organisations. It is proposed that this committee continues to provide the institutional arrangement for the management of the demersal fishery operating over the Mahe Plateau and to address issues that may arise. The secretariat of the committee is located in the Fisheries Management Department of the SFA.

5.6 Policy and legislative recommendations

The results of this study do not suggest that there is any policy or legislative changes that are required with regards to the management of the demersal fishery operating over the Mahe Plateau at present. The management measures introduced through the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 do not appear to be having any major impacts on fishers or members of the public. The Seychelles is already addressing gaps in its fisheries management regulations through the Gazetted Fisheries and Aquaculture Bill and associated regulations. The new Bill has already incorporated major concerns that stakeholders had with regards to fisheries management. In its effort to strengthen fisheries management, the SFA should go ahead and implement the second phase of the Mahé Plateau Trap and Line Fishery Co-Management Plan.

5.7 Summarized recommendations

This section summarizes the recommendations which have been made in this report. Its purpose is to ensure that all recommendations are clearly listed and can be easily referred to. It is recommended that the SFA should:

- Publish the results of surveys to determine the length at 50% maturity Lm50 for Emperor red snapper and Green Jobfish and make use of it to reach agreement with stakeholders to increase the minimum retention size of the two species.
- Re-design its length frequency sampling programme at ports and landing sites to ensure that it is representative of the fish that are being landed. At present this programme appears to be concentrated mostly at the Victoria artisanal fishing ports and at Oceana Fisheries.
- Strengthen awareness and communication about lesser-known management measures in the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021. Awareness and communications initiatives about the Regulation should target both fishers and members of the public.
- Consider installing information boards at fishing ports and important landing sites for artisanal and semi-industrial fishers on which to post information about what is happening in Seychelles fisheries and use it as a tool to increase the awareness of fishermen.
- Set up a monitoring and evaluation (M & E) programme to continually monitor the impacts of the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021 on artisanal fishers and members of the public. Suggestions are provided under section 5.4 of key indicators that should be monitored. The M & E programme should be used to regularly assess whether policy or legislative changes are required with regards to the Fisheries (Mahé Plateau Trap and Line Fishery) Regulations, 2021.
- Increase monitoring, control and surveillance at sea and at artisanal fishing landing sites. This is something that a large number of fishers mentioned that they would like to see.

- Continue to engage with fishers and consult them before introducing any new fisheries management measures and laws.
- Address other issues that fishermen said was affecting their fishing livelihoods such as the availability of bait and ice for them to go fishing, congestion of unloading areas at artisanal fishing ports, and high number of sharks.
- Decide on whether to allow the use of bottom-set longlines in the demersal fishery. Fishers said that the use of bottom-set longline was increasing and that it posed a danger to the sustainability of demersal fishes. There was also mention of the use of metal tracers in bottom-set longlines, which was seen as a major sustainability issue.

6. References

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