MINISTRY OF FISHERIES AND BLUE ECONOMY

THIRD SOUTH WEST INDIAN OCEAN FISHERIES GOVERNANCE AND SHARED GROWTH PROJECT (SWIOFISH3)

DELIVERABLE VI

FINAL TECHNICAL REPORT

ASSESSMENT OF THE ECONOMIC AND SOCIAL IMPORTANCE OF SEYCHELLES' SPORT AND RECREATIONAL FISHERY

(**CONTRACT NO.: N22/SWIO3/C/2021**)

ADVANCE AFRICA MANAGEMENT SERVICES

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Glossary

Boat-based angling	A form of recreational angling targeting large game fish and bottom fish from a vessel.
Catch-and-release	Catch-and-release angling refers to the release of a fish following capture.
Expenditures	any spending associated with the activity of a recreational fishing, including durable goods, and the costs incurred during the duration of a trip that involved fishing. The total expenditures associated with the fishery can be viewed as the **Economic Activity associated** with recreational fishing. For non-residents that participated in recreational fishing, this includes their Seychelles trip expenditures.
Economic Contribution	The gross change in global economic activity associated with recreational fishing as initial expenditures cycle through the global economy. It is estimated using an Output Multiplier and assigning it to the economic activity estimate. Economic contributions of an expenditure may take years to be fully realised.
Economic Impact	The net changes in new economic activity associated with recreational fishing. That is, new money entering the Seychelles economy that otherwise would not have if it were not for the existence of the recreational fishery. Resident anglers are excluded as their spending does not constitute new money in the Seychelles economy.
Output Multiplier	The total (direct and indirect) additional spending (output) produced by all industries in response to a unit increase in economic activity related to recreational fishing. *example:* As a Rupee is spent on recreational fishing/trip associated items, it circulates through industries *and/or* households changing hands multiple times.
Income Multiplier	Coefficient that expresses the amount of income generated by a unit of recreational fishing expenditures, accounting for economic leakages and taxes.
Income Contribution	Applying the Income Multiplier to the Expenditures associated with recreational fishing reveals the Income Contribution, or the amount of money from the activity

	that directly contributes to income within the Seychelles economy.
Fly fishing	A type of angling using artificial lures called flies and a weighted line. Fly fishing in Seychelles typically takes place on the Outer Island flats.
Non-resident anglers	Foreign visitors to Seychelles partaking in recreational angling.
Resident anglers	Local recreational anglers permanently residing in Seychelles.
Sport and recreational fishing	Recreational or sport fishing is defined as the fishing of aquatic animals (mainly fish) that do not constitute the individual's primary resource to meet basic nutritional needs and are not generally sold or otherwise traded on export, domestic or black markets
Shore-based angling	A form of recreational angling targeting fish accessible from the shore.

Acronyms and Abbreviations

AUD	Australian Dollar
BSS	Blue Safari Seychelles
CA	Conjoint Analysis
CEO	Chief Executive Officer
CPI	Consumer Price Index
CPUE	Catch Per Unit Effort
CV	Contingent Valuation
DCE	Discrete Choice Experiment
EAF	Ecosystem Approach to Fisheries
EUR	Euro
FAO	Food and Agriculture Organisation
FCP	Fisheries Comprehensive Plan
FL	Fork Length
GDP	Gross Domestic Product
GEM	Gross Expenditure Method
HPM	Hedonic Pricing Method
I/O	Input-Output
IDC	Islands Development Company
MPA	Marine Protected Area
MPP	Mahé Plateau Trap and Line Fishery Co-management Plan
NBS	National Bureau of Statistics
NGO	Non-governmental Organisation
NPO	Non-profit Organisation
SBS	Seychelles Bureau of Standards

SCAA	Seychelles Civil Aviation Authority
SCR	Seychellois Rupees
SEYCCAT	Seychelles Conservation and Climate Adaptation Trust
SFA	Seychelles Fishing Authority
SIDS	Small Island Developing States
SMA	Seychelles Maritime Academy
SMSP	Seychelles Marine Spatial Plan
SRC	Seychelles Revenue Commission
SSFC	Seychelles Sports Fishing Club
UNDP-GEF	United Nations Development Programme Global Environment Facility
USD	United States Dollar

Exchange Rates

Average forex rate for the previous 12-month period

EUR: USD	1.0633
GBP: USD	1.2562
MUR: USD	0.0228
RUB: USD	0.0134
SCR: USD	0.0725
ZAR: USD	0.0627
RSD: USD	0.0083
CZK: USD	0.0432

Executive Summary

1. The Government of Seychelles has recognised that Seychelles' sport and recreational fishery (hereafter recreational fishery) may contribute to both the fisheries and tourism sectors that underpin its Blue Economy. However, there is a lack of information on its social and economic importance. This study is a critical first step toward understanding the recreational fishery in Seychelles.

2. The overall aim of the study was to evaluate the economic and social importance of the recreational fishery sub-sector in Seychelles and to understand the opportunities that the sub-sector provides in meeting the vision of a Blue Economy.

3. Data collection was conducted during the period March 2022 to October 2022. Primary data were collected using questionnaires administered to (1) resident recreational anglers; (2) non-resident recreational anglers; (3) Seychelles residents; and (4) Seychelles visitors. Secondary data were collected through engagements with various stakeholders including the Seychelles Fishing Authority, the Islands Development Company, the Seychelles Marine Spatial Planning Initiative, and various NGOs, NPOs, private fishing charter operations and fishing retail operations.

4. The data collected from the questionnaire surveys and stakeholder engagements were collated and analysed to assess multiple aspects of the recreational fishery, including:
    - Participation levels
    - Annual expenditures by resident and non-resident anglers
    - Total expenditure per angler
    - The sectoral distribution of expenditures
    - The geospatial distribution of fishing effort and expenditures
    - Target species/consumption/angling types
    - Employment supported by the recreational fishery
    - Perceived quality of the recreational fishery
    - Social importance of the recreational fishery
    - Economic contribution and economic impact of recreational fishing expenditures

Key Findings

1. The total potential expenditures of the recreational fishery are undeniably substantial, whether it relates to new money introduced to the Seychelles economy based on the existence of a popular recreational fishery and associated tourism, or the fishing-related expenditures of resident anglers.

2. The total annual expenditures related to the fishery amounted to between USD 167.3 million and USD 196.4 million.

3. The total economic impact of the Seychelles recreational fishery amounted to between USD 36.0 million and USD 48.5 million per annum.

4. The total contribution of the recreational fishery to income in Seychelles amounted to between USD 80.0 million and 93.9 million per annum.
5. The total direct and indirect economic contributions associated with recreational angling amounted to USD 303.7 million to USD 356.4 million (N.B.: this is not an annual contribution and can take several years to circulate in the Seychelles economy).

	Non-resident Anglers		Resident Anglers
	Outer Islands	**Inner Islands**	
Annual expenditures (USD million)	9.6	62.8 – 91.9	94.9
Annual economic impact (USD million)	8.9	27 – 39.5	-
Annual income contribution (USD million)	4.6	30 – 43.9	45.4
Total annual expenditures (USD million) associated with the recreational fishery	**167.3 – 196.4**		
Total annual economic impact (USD million) of the recreational fishery	**36 – 48.5**		
Total contribution to annual income (USD million) from recreational fishery associated expenditures	**80 – 93.9**		
Total direct and indirect economic contribution of expenditures (USD million)	**303.7 – 356.4**		

6. The economic expenditures of the Seychelles recreational fishery and their contribution to the country's economy is in-line with other island nations of Costa Rica, and states of Galicia (Spain) and Hawai'i (USA).

7. The recreational fishing sector may account for approximately 2.2% of employment in Seychelles, or 1 153 jobs.

8. The value chain of the recreational fishery is closely tied to the rest of the tourism industry. Expenditures are primarily placed within the accommodation, restaurant/bar and retail industries.

9. While much of the money spent by recreational anglers feeds into tourism value chains, which are typically reserved for Seychellois employment, large hotels, large boat charters (>50 ft), restaurants, and live-aboard boat/yacht hire are characterised by a large share of

foreign ownership. This foreign ownership directly contributes to the leakage of primarily non-resident expenditures within Seychelles.

10. Non-resident anglers made the largest contributions to Seychelles' economy. Non-resident anglers were typically very satisfied with their fishing trip experience, and primarily enjoyed the catchability of fish, as well as the exclusivity of fishing destinations, notably the Outer Islands.

11. The existence of the recreational fishery provides a recreational outlet for Seychelles residents. Residents' motivations for angling were primarily related to being close to nature, and the tranquillity and escape from normal life associated with angling. The sale of fish was of little importance in motivating fishing participation amongst resident anglers.

12. On average (and likely an underestimate as catches are often underreported), recreational fishers keep approximately 144 kg of fish per angler per year, comprised predominantly of demersal species. This equates to a theoretical total catch by resident recreational anglers of over 1 200 tonnes per annum (or about one third of the total artisanal catch).

13. Emperor red snapper and green jobfish represented two of the top three species caught in the "resident" fishery and are retained in 90.9% and 89.9% of cases, respectively. These species will be protected by the MPP if compliance levels are good and if the regulations are adequately enforced.

14. Most non-residents were unperturbed by the introduction of regulations whereas resident anglers were likely to push back against the regulations.

15. The total potential loss associated with the introduction of bag limits was between USD 5.4 million and USD 21.0 million. The total potential loss associated with the introduction of size limits was between USD 1.04 million and USD 15.22 million. These impacts represent short-term losses and are likely to decrease as species recover.

16. Under the current SMSP framework, the closure of fishing in Zone 1 areas is unlikely to lead to a significant reduction in economic contribution or income associated with the recreational fishery.

17. Stakeholders generally agreed that a permitting/licensing scheme would contribute towards the sustainable management of the recreational fishery. The average price that non-resident anglers were willing to pay for continued access to the fishery was USD 231 amongst Outer Islands anglers, and USD 36 amongst Inner Islands anglers. The average price that resident anglers were willing to pay for continued access to the fishery was USD 61.

Key recommendations

1. Recreational fisheries should be recognised by the Government of Seychelles as a key component of Seychelles' Blue Economy Strategy and prioritised accordingly.

2. A comprehensive monitoring programme of the sport and recreational fishery should be developed and implemented. It is highly likely that the sport and recreational fishery has a higher economic value than the artisanal fishery and this warrants the institution of a monitoring programme. It is recommended that SFA establishes a dedicated sport and recreational fishery monitoring unit such that the fishery can be monitored on a continuous basis, inclusive of competitions.

3. Given that the major demersal target species of the sport and recreational fishery are the same as those targeted by the artisanal fishery, it stands to reason that stock assessments of these species must incorporate biological, length frequency, as well as catch and effort data for both fisheries.

4. The impacts of catch-and-release on the survival of fish should be assessed further through physiological and physical impairment studies. This will augment the results of acoustic telemetry studies (Moxham et al., 2019), which have suggested that mortality of bonefish in the form of post-release predation was at least 43%. Such data will be of immense value to guide regulation on the increasingly popular practice of catch-and-release as well as advocate for better handling practises by guides and anglers.

5. Due to the extractive nature of the recreational fishery, particularly by resident anglers, the resource would benefit from the introduction of regulatory measures for all species. Measures could include size or slot limits, species and total bag limits, closed seasons and catch-and-release only zones. The concerns of resident anglers should be carefully considered when developing regulations that may discourage their participation in large numbers. Investment in angler education and prioritising transparency will be critical to achieve the long-term benefits from appropriate regulations and management.

6. Based on the success, 'lessons learnt' and outcomes of the MPP, a review of angler compliance should be conducted to understand the uptake and adoption of management decisions and policy formulations.

7. A more comprehensive assessment of the level of resident angler participation should be undertaken. This will ensure that future regulations are appropriately aligned to the current context. In addition, understanding and quantifying the reliance of anglers on recreational fishing for food and sustenance will better guide policy and management of the fishery.

8. An assessment of the role of boat yards in the value chain (outboard sales, boat sales, boat building, repairs and maintenance and imports) should be undertaken. This was not

included in the present study but should be investigated to provide a more holistic economic picture of the recreational fishery.

9. A comprehensive assessment of employment in the sub-sector should be undertaken. In this study it was not possible to consider the number of deckhands and stewards serving the big game fishing boats, or the catering agencies servicing these vessels.

10. Increased angler participation in the Inner Islands and Mahé Plateau in the form of guided charters may be a beneficial recruitment strategy. This can apply to both resident and non-resident anglers. Tourism marketing should not only focus on the exclusive Outer Islands, but the many guided charters offered on the Inner Islands. Importantly, charters in the Inner Islands should be encouraged to practice and promote catch-and-release and other pro-environmental behaviours. This could attract 'release-oriented' anglers who cannot afford to fish the Outer Islands and also increase the share of economic contributions directly benefiting the Inner Islands.

Many of these components should be explored to ensure that policy is appropriately and adaptively formulated. Adaptive policy formulation will ensure that regulations can be adjusted based on successes, learning and importantly, the provision of new and updated fisheries data. Recreational fisheries and their participants are dynamic, and a permanent monitoring programme needs to be implemented to fully understand the dynamics, characteristics and scale of the fishery.

1. Background

The Government of Seychelles has recognised that the sport and recreational fishery may contribute towards both the fisheries and tourism sectors that underpin its Blue Economy. However, there is a lack of information on its social and economic importance. This study was a first step towards understanding the economic and social importance of the sport and recreational fishery in Seychelles with the overall aim of understanding the opportunities that it provides in meeting the vision of a Blue Economy. Broadly, the objectives of the study were to:

1. Understand the catch composition, expenditure, revenues, employment, and contribution to livelihoods and households;
2. Evaluate the social and economic impacts of the Mahé Plateau demersal fisheries management plan, the Seychelles Marine Spatial Plan (SMSP), and the Third Outer Island Development Plan (2018-2023) on the sport and recreational fishery sub-sector;
3. Understand the potential for enhanced performance, expansion, and diversification of the sub-sector supply chains.

This Final Technical Report (D6) contains the results of the study and outlines the next steps towards successfully achieving the project objectives.

2. Progress to Date

Project progress is summarised in Table 1.

Table 1: Project progress against submission of deliverables.

Deliverable	**Status**
Monthly Progress Reports	**Ongoing**
Inception Report (D1)	**Submitted** 16 December 2021
Technical Report Detailing Methods and Data Management (D2)	**Submitted** 4 March 2022
Mid-Term Progress Report (D3)	**Submitted** 9 May 2022
Draft Technical Report (D4)	**Submitted** 4 November 2022
Policy Memorandum (D5)	**Submitted** November 2022
Final Technical Report (D6)	**This report** December 2022
Completion Report and Handover of Datasets (D7)	January 2022

3. Methods

3.1. Data Collection

Data were collected during the period March 2022 to October 2022. Primary data were collected using:

1. A **resident recreational angler expenditure questionnaire** (Appendix A) that targeted resident anglers and was administered at boat launch areas, landing sites, ports, fishing access areas, and marinas on Mahé, Praslin, and La Digue, and by means of online and partner-facilitated distribution.
2. A **non-resident recreational angler expenditure questionnaire** (Appendix B) that targeted non-resident anglers and was administered in person and/or by means of online and partner-facilitated distribution.
3. A **Seychelles visitor questionnaire** (Appendix C) that targeted outbound tourists and was administered at the Seychelles International Airport on Mahé.
4. A **Seychelles resident questionnaire** (Appendix D) that targeted Seychelles residents and was administered at households on Mahé, Praslin, and La Digue.

In addition to the questionnaire surveys, a stakeholder analysis exercise was conducted to identify key stakeholders. These stakeholders were then interviewed to provide additional secondary data on the recreational fishery.

3.1.1. Recreational Angler Expenditure Questionnaires

The objective of both the resident and non-resident recreational angler expenditure questionnaires was to identify the amount of time and money spent on recreational fishing (i.e., expenditure per angler) in Seychelles. The questionnaire also identified the different recreational fishing types employed, general locations of recreational fishing trips, preferred target species, catch retention and consumptive uses. To determine angler preferences and other social characteristics of recreational fishing, various items were included in the questionnaire that aimed to qualify fishing trip satisfaction, angler motivation, the avidity of the angler, and their likelihood of participating in the recreational fishery should new regulations be imposed.

The recreational angler expenditure questionnaire was administered face-to-face and online. Face-to-face surveys specifically targeted anglers at boat launch areas, landing sites, ports, fishing access areas, and marinas on Mahé, Praslin, and La Digue. Survey clerks intercepted as many anglers as possible that they encountered, who were engaging in boat- or shore-based recreational fishing activities. Respondents were identified as those boarding or disembarking from boats with recreational fishing equipment or by means of the charter boat branding on vessels. In addition to in-person angler surveys, anglers who had fished in Seychelles during the last 12 months were encouraged to complete an online version of the questionnaire. Respondents were also recruited by targeted local radio and newspaper advertisements.

For resident recreational anglers, two categories of expenditures were measured, viz. trip costs and fixed costs. Trip costs included all non-durable items purchased pertaining to a specific fishing trip (e.g., boat hire fees, fuel for boat, food and beverages, car fuel, ice, transport to boat launch/site, bait, accommodation, and any other per trip item). Fixed costs included all items that could be considered durable goods or goods that last beyond a year. These included fishing tackle/lures, tools used for fishing, fishing clothing, fishing rods, fishing reels, cooler boxes, freezers for fish or bait, motorised boats, fish finders/GPS, tournament fees, fishing charters, fishing gear rental, non-motorised boats, fishing magazines/books, and other items specified by respondents. Responses to report amounts were open-ended and reported in Seychellois Rupees (SCR).

For non-resident recreational anglers the two categories of expenditures were, viz. those incurred prior to arriving in Seychelles and those incurred in Seychelles. The expenses incurred prior to arriving in Seychelles included package trips (i.e., all-inclusive accommodation), airfare, charters, and other items purchased for the Seychelles trip. Expenses incurred within Seychelles included transportation, charters, fishing equipment, fish processing, hotels/accommodation, groceries, restaurants/bars, souvenirs, island tours, personal items, nature reserve fees, and any other expenses. Responses to report amounts were open-ended and reported in the respondents' preferred currency.

3.1.2. Airport Questionnaire

The overall aim of the airport survey was to determine the proportion of the total visitors to Seychelles that engaged in recreational fishing. Upon receiving permission from the Seychelles Civil Aviation Authority (SCAA), survey clerks intercepted departing non-resident visitors as they entered the Seychelles International Airport and asked them to voluntarily participate in the survey. Only one person per travel group was interviewed. However, the interviewer did record the total number of travellers within the group. The airport questionnaire included questions on the type of fishing the visitor engaged in, whether it was a primary motivation for visiting Seychelles, their level of satisfaction with their trip to Seychelles, which alternate recreational activities they engaged in, and the number of dependents in their travel group (Appendix C).

3.1.3. Stakeholder Engagements

Information on some aspects of the spatial distribution of recreational fishing effort (which would normally require substantial survey efforts or a long-term monitoring effort), domestic fishing participation, and the value chain linkages of the fishery was gleaned through various key stakeholder interviews. Stakeholder meetings were held with representatives of government organisations, the private sector (e.g., retailers, boat charters, hotels), and non-profit organisations (NPOs) (Table 2). All meetings commenced with an introduction to the study, and its objectives and methods, either by means of a formal presentation (e.g., in the case of government and NGOs) or a semi-structured walk-in discussion (e.g., private retailers). Discussions were held on various aspects relating to the development and management of the recreational fishery, for example, the SMSP initiative, policies and regulations, and/or sales and bookings. Stakeholders' views were noted and, where relevant, incorporated into the

questionnaires and the survey approach. Support for the study was requested from the stakeholders, and, in several cases, they were asked to provide additional assistance, such as follow-up meetings, provision of existing data and/or studies, and distribution of questionnaires (e.g., to contacts/members/clients). The resident angler expenditure questionnaire was also administered to stakeholders where relevant.

Table 2: Details of stakeholder meetings held during the survey.

Stakeholder/s	Date	Description	Specific outcomes
SMSP Initiative (Government)	14 March 2022	Discussed potential policy scenarios and questionnaire design to align study with SMSP objectives.	Obtained inputs on survey methods and questionnaire design.
Island Castaway Vessel Charter (Private charter)		Presented project and research objectives. Discussed recreational fishing in Seychelles and chartering vessels to access the Outer Islands.	Obtained information on charter fishing. Confirmed availability for a follow-up meeting to discuss chartering vessels to access the Outer Islands.
The Fishing Specialist (Pty) Ltd (Private retail)	15 March 2022	Discussed sales of recreational fishing gear.	Obtained information on the proportion of fishing gear sales to recreational anglers/tourists.
Private recreational angler and boat owner	16 March 2022	Presented project and research objectives. Discussed recreational fishing in Seychelles.	Obtained support and buy-in for the project. Provided background on recreational fisheries: participation, target species and fishing types.
Eden Bleu Hotel (Private hotel)	17 March 2022	Discussed fishing charter requests and bookings from hotel residents.	Obtained information on participation in recreational fishing and charters organised through the hotel.
CSS Marine Store (Private retail)	18 March 2022	Presented project and research objectives. Discussed retail sales of recreational fishing gear.	Obtained information on the proportion of fishing gear sales to recreational anglers/tourists.
SSFC (NPO)	19 March 2022	Presented project and research objectives, and requested inputs and assistance. Feedback was provided on the alignment of the project with the objectives of the Billfish Foundation.	Obtained support and buy-in for the project. SSFC agreed to encourage charter boat members to participate in the project.
Billfish Foundation (NPO)			Obtained support and buy-in for the project. Obtained feedback on similar projects carried out by the Billfish Foundation on other islands.

Soolyman Charters (Private charter)			Obtained support and buy-in for the project. Soolyman Charters agreed to assist in distributing questionnaires to charter guests.
Blue Safari (NPO)	20 March 2022	Discussed the project and requested assistance with data collection. Discussed Outer Islands activities and participation.	Blue Safari agreed to assist with data collection for the Outer Islands, and to provide historical data as requested and where available.
University of Seychelles (Public University)	21 March 2022	Presented project and research objectives. Discussed existing marine resource valuation in Seychelles and linkages to recreational fishing.	Provided input on survey methods and contact details of key stakeholders. Offered to assist in assembling a future data collection team.
Devotion Charters (Private charter)	22 March 2022	Provided an overview of the project, discussed participation in recreational fishing on the Outer Islands, and policy perceptions/ business goals related to the study.	Provided background on Seychelles' recreational fishery and Praslin fishing charters. Agreed to assist in distributing questionnaires to charter guests.
IDC (Parastatal Company)	6 April 2022	Provided an overview of the current study, discussed participation in recreational fishing on the Outer Islands, and policy perceptions/ business goals related to the study.	IDC gave approval for the study team to carry out research on the Outer Islands. IDC agreed to provide the Consultant with any available historical data (e.g., economic assessment of the recreational fishery conducted in 1997/98). IDC agreed to provide the Consultant with additional relevant points of contact.

3.2. Data Analyses

The data collected from the questionnaire surveys and stakeholder engagements were collated and analysed to assess multiple aspects of the recreational fishery including:

- Participation levels
- Annual expenditures by resident and non-resident anglers
- Total expenditure per angler
- The sectoral distribution of expenditures
- The geospatial distribution of fishing effort and expenditures
- Target species/consumption/angling types

- Employment supported by the recreational fishery sub-sector
- Perceived quality of the sport and recreational fishery
- Social importance of sport and recreational fishing
- Economic activity and contributions of recreational fishing expenditures

Non-resident angler expenses were reported in numerous currencies, including Euros, United States Dollars (USD), Mauritian Rupees, Seychellois Rupees, Russian Rubles, Serbian Dinar, Czech Koruna, and Great Britain Pounds. All expenses were converted to USD (See Exchange Rates: Page 9).

3.2.1. Participation Levels

Using the data collected from the airport questionnaire survey, a proportional estimate of visitors to Seychelles that participated in recreational fishing was calculated as:

$$\rho = \frac{x}{n}$$

where *x* represents the number of identified recreational fishery participants and *n* represents the number of visitors surveyed. The variable *p* is the proportion of total visitors that participate in recreational fishing.

This estimate was combined with the average number of annual visitors to Seychelles to derive a total annual participation estimate for non-resident recreational anglers. Using a five-year dataset (2016-2021) and omitting 2020 as an outlier year (based on COVID-19 travel restrictions) with the average of the reported international visitors to Seychelles, an estimate of annual participation ($\hat{p}$) was determined by applying the proportion of visitors that fish (p) to the average number of visitors ($\bar{x}$):

$$\hat{p} = p(\bar{x})$$

Resident angler participation was estimated using a household survey questionnaire administered at each district on Mahé, Praslin, and La Digue as:

$$\rho = \frac{x}{n}$$

where *x* represents the number of identified recreational fishery participants and *n* represents the number of members in the household. The variable *p* is the proportion of total residents that participate in recreational fishing.

3.2.2. Expenditures

The annual expenditures of each angler group were assessed by first taking the total angler expenditures (E) revealed by the survey respondent group and dividing it by the number of survey participants (n) to derive the average per-angler expenditure ($\bar{E}$):

$$\bar{E} = \frac{E}{n}$$

The average per angler expenditure was then multiplied by the estimate of annual participation ($\hat{p}$) to calculate the total annual expenditures of each angler group (*AE*):

$$AE = \bar{E}(\hat{p})$$

Average expenditures were then broken down further to derive an estimate of expenditure per recreational angler per day. This was estimated by dividing the average angler expenditure by the average number of days spent in Seychelles by respondents (D). D was calculated as:

$$D = \frac{Đ}{n}$$

where Đ is the total number of days that survey respondents spent in Seychelles, and *n* is the total number of respondents. Average daily expenditure by angler (d) was calculated as:

$$d = \frac{E}{D}$$

To estimate annual sectoral expenditures (E^x), the proportion of total expenditures attributed to a specific sector (p^x) was estimated using the following equation:

$$p^x = \frac{E^x}{E}$$

where E^x is the total expenditure per sector based on the respondents, divided by total expenditures *E*. Then, the proportion of total expenditures attributed to the sector was multiplied by the total annual expenditure (*AE*), to estimate the total annual expenditure contribution to the sector (AE^x):

$$AE^x = p^x(AE)$$

Expenditures were assessed geospatially to determine contributions of the different regions of Seychelles to the total annual expenditures relating to sport and recreational fisheries by first assessing the proportion of visitors that visited each region (p^R):

$$p^R = \frac{V^R}{TV}$$

where V^R is the total visits to each region, and TV is total visits to all regions combined. Once this proportion has been estimated, it can be applied to the total annual expenditures (*AE*) to estimate the annual contribution of each region (AE^R) to total expenditures:

$$AE^R = p^R(AE)$$

3.2.3. Target Species and Angling Types

Preferences for various species among recreational anglers were ranked based on an assessment of the number of respondents who indicated that they targeted each species. These were then further analysed based on the type of fishing method employed (e.g., boat-based, shore-based, fly fishing).

3.2.4. Perceptions of Quality and Importance

Recreational angler perceptions of the quality and importance of the sport and recreational fishery were analysed using Likert scoring (Likert, 1932) for a given question. Questions relevant to this component of the data analysis were based on a 5-point scale, where respondents were required to provide an answer from 1 to 5. As such, a mean response level indicates the average preference level of respondents (L) calculated as:

$$L = \frac{\Sigma L}{R^L}$$

where ΣL is the sum of all Likert responses levels for each question, and R^L is the total number of responses to that Likert question.

3.2.5. Employment

The employment contributions associated with tourism expenditure are typically calculated using an existing employment multiplier. However, estimates of the proportion of employment supported by tourism were not available. As a rough estimate of the direct contribution to employment of the non-resident fishery participant's expenditures (D^c), we used the NBS (2022) estimate of 22% (being the percent employment related to the tourism industry, E^c), multiplied by the proportion of tourists that engage in recreational fishing in Seychelles (F^c).

$$D^c = E^c * F^c$$

3.2.6. Direct and indirect contributions

With input/output (I/O) multipliers, it is possible to assess the contribution of recreational angler expenditure on the local economy. This is typically explored in terms of contribution to gross domestic product (GDP).

Sales are directly related to angler expenditures, which provide income to businesses or individuals who re-spend the money within the country on items such as goods and production or salaries which are also used to make further purchases within Seychelles. Essentially, the expenditure of recreational anglers has the ability to grow or multiply. If output multipliers have been assessed, the amount of economic activity that occurred as a result of recreational fishing can be determined by multiplying total annual expenditures by the output multiplier. Pratt (2015) determined the overall GDP multiplier for tourism in Seychelles, to which the recreational fishery is inherently linked, to be 1.81499 as a weighted average of the major sectors corresponding to the activity. The term "economic contribution" is used to address the broader and more general case of how an economic activity cycles through the economy. An

economic contribution can thus be viewed as the gross changes in a region's existing economy that can be attributed to the recreational fishery. It is important to note that economic contributions can take multiple years to fully reach expectations.

3.2.7. Income Effects

The total economic contributions of the direct and indirect effects of expenditures do not provide an accurate picture of the contributions of spending within the Seychelles economy and how it relates to income generation within the economy. Expenditures, especially in Small Island Developing States (SIDS), are highly prone to the effects of taxes and leakages. Leakages refer to money that is spent on goods or services and not retained within the local economy. This is largely due to the reliance on foreign goods and services by SIDS. To account for the effects of leakage on expenditures, an income multiplier was applied to the estimated expenditures associated with the recreational fishery. The most recent income multipliers are provided by Pratt (2015) who estimated that for every unit of currency spent within Seychelles, 0.478201 is retained within the economy.

4. Results

4.1. Non-Resident Anglers – Outer Islands

4.1.1. Participation and Demographics

From 2018-2021, an average of 555 non-resident anglers visited the Outer Islands annually (IDC, 2022). Data on the origin of these anglers were not available. Non-resident anglers that visited the Outer Islands and responded to our questionnaire were from 11 countries, including the United States of America (23.8%), France (14.3%), South Africa (14.3%), Germany (9.5%), the United Kingdom (9.5%), and Belgium, Canada, Croatia, Mauritius, Russia, and Zimbabwe (4.8% each). The respondents were predominantly male (90.9%) with an average age of 53 ± 12.1 years (n = 22). The majority (77.3%; n = 17) were university educated. Approximately 92.9% (n = 26) of the respondents indicated that fishing was the primary motivation for their trip to Seychelles.

4.1.2. Fishing Activities

Non-resident anglers visited Alphonse, Farquhar, Cosmoledo, Astove, Bird Island, Providence and Denis, with Alphonse being the most frequently visited Outer Island. The average trip duration was 12.17 ± 4.89 days.

Anglers primarily fly fished on intertidal flats (81.8%) on foot or from skiffs (63.6%) (Figure 1). Big game/deep sea angling was also practised on liveaboard yachts (27.3%).

Figure 1: Non-resident anglers that visited the Outer Islands primarily participated in skiff-based- (left), and shore-based fly fishing (right) (Photos: Ryan Foster).

4.1.3 Target and Capture Species

Anglers primarily targeted giant trevally (*Caranx ignobilis*), bonefish (*Albula vulpes*), permit (*Trachinotus blochii*), and other trevallies (*Caranx* spp.). These four species were also the most frequently caught (Figure 2).

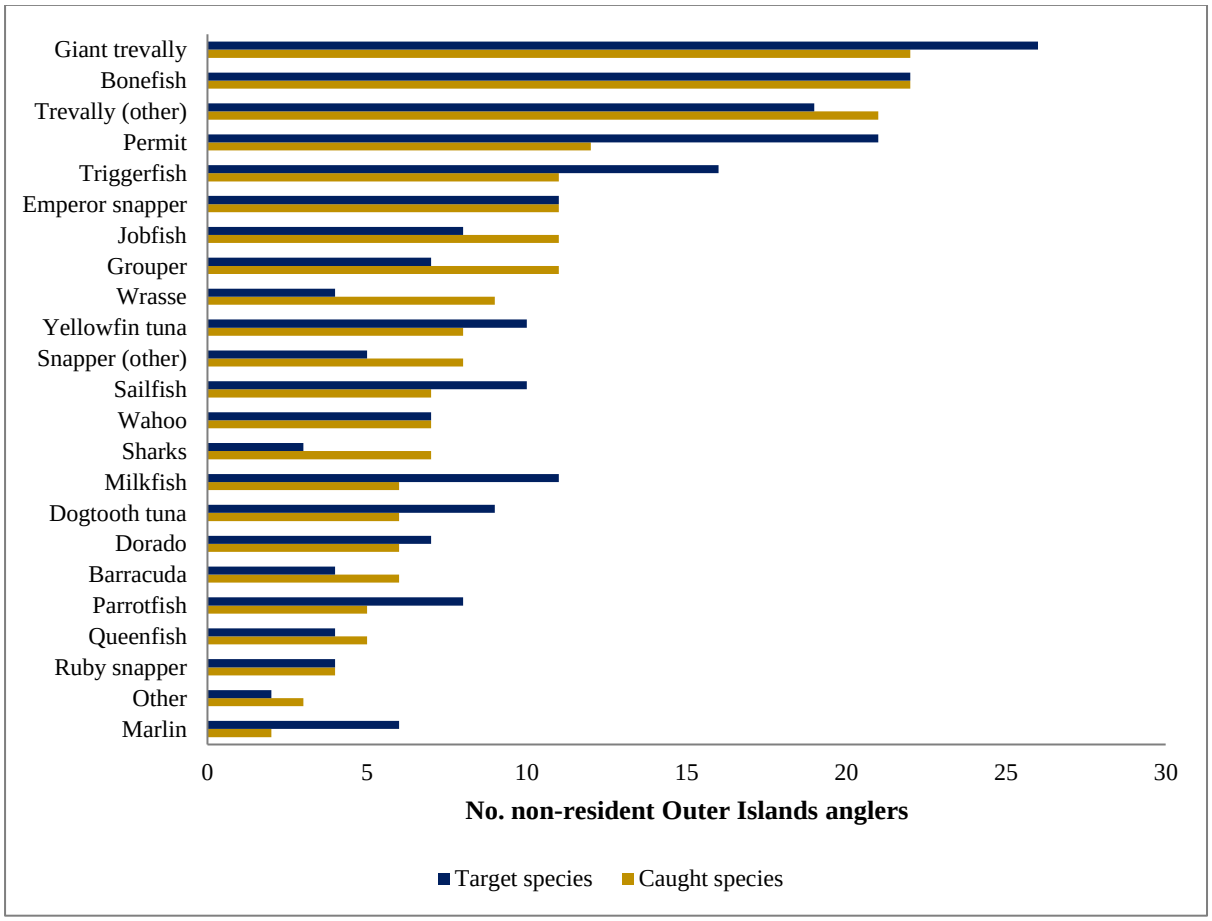

Figure 2: Target species and catch of non-resident Outer Island anglers.

4.1.4 Post-capture Actions

The majority (60.5%) of anglers that fished the Outer Islands indicated that they released their catch, while a smaller proportion indicated that they consumed (24.9%) or gave away (10.4%) their catch. No respondents indicated that they sold their catch. Consumptive action from the Outer Islands fishery was mostly prevalent on liveaboard hire vessels originating from the Inner Islands.

All milkfish (*Chanos chanos*) (100%), and most bonefish (95.5%), permit (91.7%), triggerfish (Balistidae) (90.9%), wrasses (Labridae) (88.9%), and giant trevally (87%), were released. However, the majority of yellowfin tuna (*Thunnus albacares*) (88.9%), wahoo (*Acanthocybium solandri*) (85.7%), and dorado (*Coryphaena hippurus*) (75%) were retained (Figure 3).

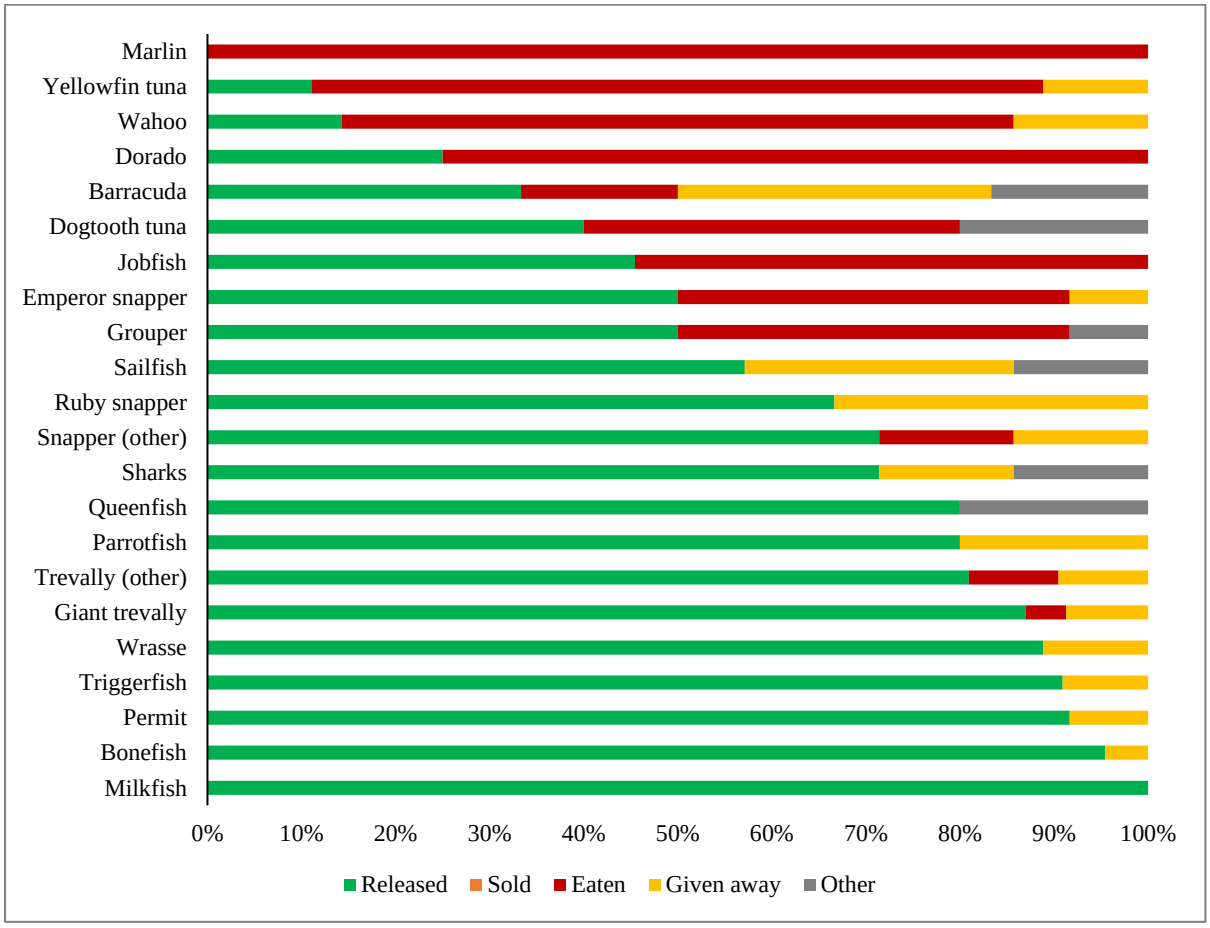

Figure 3: Post-capture actions by non-resident Outer Islands anglers for different species.
(Note: Percentages refer to the proportion of anglers who took each action for each species, not the proportion of each fish species that was released, sold, eaten, given away or other.)

4.1.5. Angler Satisfaction

The majority (90.9%) of anglers were either "very satisfied" (68.2%) or "somewhat satisfied" (22.7%) with their Outer Islands fishing experience. No anglers indicated that they were "extremely dissatisfied" with their experience.

4.1.6. Willingness to Pay for an Angling Licence

All anglers that visited the Outer Islands indicated that they were willing to pay for a licence to fish in Seychelles. On average, these anglers were willing to pay approximately USD 231 for a licence.

4.1.7. Likelihood of Change in Behaviour with Policy Changes

The majority (82.6%) of anglers who visited the Outer Islands indicated that they were extremely likely to continue to fish in Seychelles if bag limits were introduced for their target species. A further 8.7% were somewhat unlikely to continue to fish in Seychelles if bag limits were introduced. No anglers who visited the Outer Islands indicated that they would be "extremely unlikely" to continue to fish in Seychelles if bag limits were introduced for their target species.

The majority (88.5%) of anglers who visited the Outer Islands indicated that they would be either "somewhat likely" (11.5%) or "extremely likely" (76.9%) to continue to fish in Seychelles if size limits were introduced for their target species, while 3.8% were somewhat unlikely to continue to fish in Seychelles if size limits were introduced. A further 7.7% indicated that this would not affect their participation in the fishery. No anglers who visited the Outer Islands indicated that they would be "extremely unlikely" to continue to fish in Seychelles if size limits were introduced for their target species.

Under the hypothetical scenario of a complete ban on angling, 95.5% of anglers who visited the Outer Islands indicated that it was either "very unlikely" that they would have visited Seychelles (27.3%) or that they "would not have visited" Seychelles (68.2%), while only one angler (4.5%) indicated that they would still be "very likely" to visit Seychelles following a prohibition of sport and recreational angling.

4.1.8. Pre-Arrival Expenditures

The average pre-arrival expenditures of non-resident anglers that visited the Outer Islands are shown in Table 3. Of these pre-arrival expenditures, package trips (average USD 10 946), airfares (average USD 2 495), and charters (average USD 157), equating on average to a total of USD 13 598, contribute to the Seychelles economy.

Table 3: Pre-arrival expenditures of non-resident anglers that visited the Outer Islands.

Pre-arrival expenditure	**USD (average/angler)**
Package Trips	10 946.00
Airfare	2 495.38
Charter	157.25
Fishing equipment	843.30
Other	185.60

Almost all (96.2%) non-resident anglers that visited the Outer Islands incurred pre-arrival expenditures. Of those who provided further details on these pre-arrival expenditures, almost all (95.5%) had spent money on airfares, fishing equipment (81.8%) and package trips (77.3%),

while 45.5% incurred other pre-arrival expenditures. Only one non-resident Outer Islands angler reported spending money on charter boats prior to arrival in Seychelles.

4.1.8. In-country expenditures

In-country expenditures of non-resident anglers that visited the Outer Islands are shown in Table 4. On average, a non-resident angler spent USD 3 736.04 in Seychelles. As respondents spent an average of 12.17 days in the Outer Islands, the average daily spending within the country amounts to USD 306.99/angler.

Table 4: In-country expenditures of non-resident anglers that visited the Outer Islands.

In-country expenditure	**USD (average/angler)**
Hotels/accommodation	1 131.14
Charters	1 104.04
Restaurants/bars	582.89
Souvenirs	279.68
Transportation	244.69
Fishing equipment	151.82
Groceries	134.43
Nature Reserves	86.40
Island tours	20.95
Fish processing	0.00
Personal items	0.00

In-country expenditures mainly consisted of food and/or drinks from restaurants and bars, transportation, charters, fishing equipment and accommodation. Most respondents spent money at restaurants and bars (91.3%), transportation (82.6%), charters (73.9%), fishing equipment (69.9%) and accommodation (65.2%). One respondent indicated that they did not incur any in-country expenses during their Outer Islands fishing trip, with the exception of fishing guides' tips, as their package trip was all inclusive.

4.1.9. Expenditures and Income

Based on the annual average number of visitors (n = 555), and their average pre-arrival (USD 13 598) and in-country expenditures (USD 3 736), the total expenditures of non-resident Outer Islands anglers were estimated at USD 9.62 million per year.

The total direct and indirect economic contribution associated with non-resident angling on the Outer Islands amounted to USD 17.46 million - based on Pratt's (2015) output multiplier (1.81499). It is important to note that this is not an annual contribution and can take years to circulate in the Seychelles economy.

Given that 93% of anglers indicated that fishing was the primary motivation for their visit to the Outer Islands, the economic impact of expenditures associated with the Outer Islands recreational fishery was USD 8.95 million per year. When accounting for tourism expenditures that go towards leakage and taxation (~52% based on the Pratt (2015) input multiplier (0.478201)), the contribution made by the Outer Islands recreational fishery alone to income in the Seychelles economy was estimated at USD 4.60 million per year (Table 5).

Table 5: Summary of economic impact of non-resident angling on the Outer Islands.

Parameter	Value
Annual average number of anglers (n)	555
Average pre-arrival expenditures/angler	USD 13 598
Average in-country expenditures/angler	USD 3 736[1]
Annual expenditures of non-resident Outer Islands anglers	USD 9 620 742
Total direct and indirect economic contributions of expenditures	USD 17 461 551[2]
Proportion of anglers for whom fishing was primary motivation	93%
Annual economic impact of Outer Islands recreational fishery expenditures	USD 8 947 290[3]
Leakage and taxation rate (income multiplier =0.4782)	52%
Contribution of the Outer Islands recreational fishery to income in Seychelles	USD 4 600 648[4]

4.2. Non-Resident Anglers – Inner Islands

4.2.1. Participation and Demographics

Respondents were from 17 countries including the USA and Italy (13.3% each), the UK (10.0%), the Czech Republic, Ireland, Serbia, South Africa and Spain (6.7% each), and France, Georgia, Hong Kong, Israel, Moldova, Netherlands, Poland, Taiwan and Zimbabwe (3.3% each). Respondents were predominantly male (80.6%) with an average age of 40.4 years. The majority (80.6%) were university educated. Approximately 39.4% of respondents indicated that fishing the Inner Islands was the primary motivation for their trip to Seychelles.

In the 12-month period prior to the expenditure and airport surveys being initiated (between 1 May 2021 and 31 April 2022), a total of 270 802 international visitors travelled to Seychelles by air (NBS, 2022). When using the 10% participation assumption derived from the airport survey, this suggests that approximately 27 080 visitors participated in recreational fishing in Seychelles in that 12-month period, comprising the upper bound estimate. Of these, approximately 9 207 visitors were primarily motivated to travel to Seychelles because of the ability to participate in fishing. Using the lower bound (6.9%) assumption from Larue et al. (2019), it can be estimated that 18 685 non-resident visitors to Seychelles engaged in "sport fishing", with fishing participation being a primary motivation for 6 353 visitors to visit Seychelles.

Data from the Seychelles' Islands Development Company (IDC) suggests that approximately 555 recreational anglers visit the Outer Islands to engage in fishing on average per year over a 3-year period[5]. To correct for the differences between the Outer and Inner Islands participant

[1] Expenditures refer to all spending associated with a trip to Seychelles that involved recreational fishing (see Glossary).

[2] The total potential contributions of expenditures as they flow through the economy (global) (see Glossary).

[3] New money that enters the economy due to the existence of recreational fishing (see Glossary).

[4] Amount of expenditure retained within the Seychelles economy which contributes to income.

[5] Time period from 2018 – 2021 with 2020 data omitted due to extreme outliers created by the global COVID-19 pandemic and corresponding travel restrictions.

characteristics, we can subtract the known Outer Island population (n=555) from the upper and lower bound estimates to derive an Inner Islands upper and lower bound estimate. Thus, the lower bound non-resident participation estimate for Inner Islands fishing is 18 130 and the upper bound estimate is 26 525.

4.2.2. Fishing Activities

The average duration of non-resident angler trips to the Inner Islands was 7.22 days on Mahé, 2.36 days on Praslin, and 2.5 days on La Digue. All non-resident Inner Islands anglers participated in boat-based fishing (deep sea/game fish). Shore-based and boat-based fly fishing was practiced by 7.1% and 3.6% of non-resident Inner Islands anglers, respectively. No non-resident Inner Islands anglers that were surveyed participated in shore-based angling using methods other than fly fishing. However, shore-based anglers using conventional rods and reels with artificial lures and baited hooks were observed during the survey.

4.2.3. Target and Capture Species

Non-resident anglers primarily targeted emperor red snapper (*Lutjanus sebae*) (62.5%) and dorado (62.5%). Emperor red snapper (65.6%) and groupers (Serranidae) (56.3%) were the most commonly caught species (Figure 4).

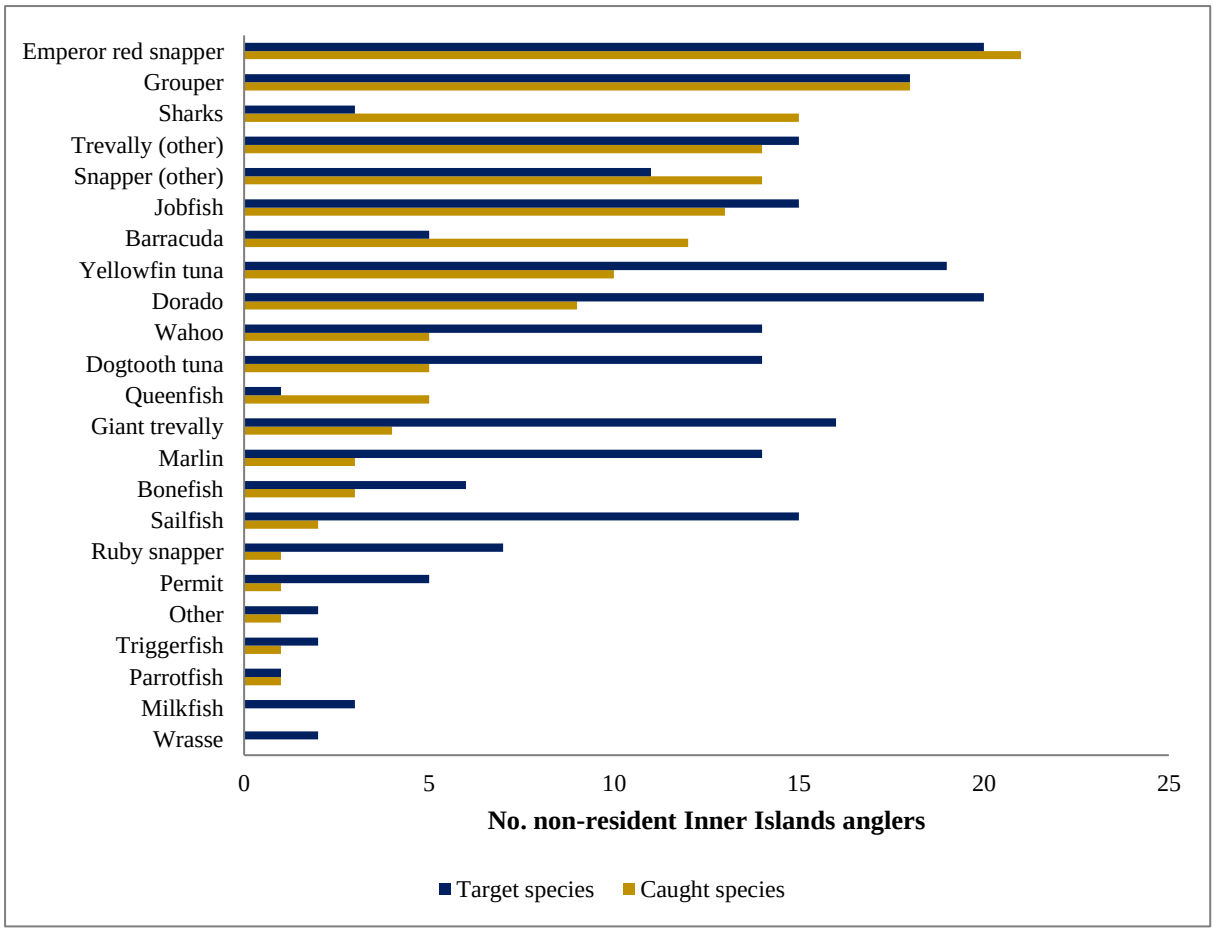

Figure 4: Target species and catch of non-resident Inner Island anglers.

4.2.4. Post-capture Actions

The majority (54.4%) of non-resident anglers indicated that they released their catch, while a smaller proportion indicated that they gave away (24.4%), consumed (19.4%), or carried out some "other" action (1.7%) with their catch (Figure 5). No respondents indicated that they sold their catch.

All triggerfish, bonefish, sailfish (*Istiophorus platypterus*), marlin (*Istiompax* spp.), parrotfish (Scaridae), and permit were released. The most commonly retained species were emperor red snapper (84.0% of responses indicated that emperor red snapper were kept), yellowfin tuna (72.7%) and dorado (72.7%) (Figure 5).

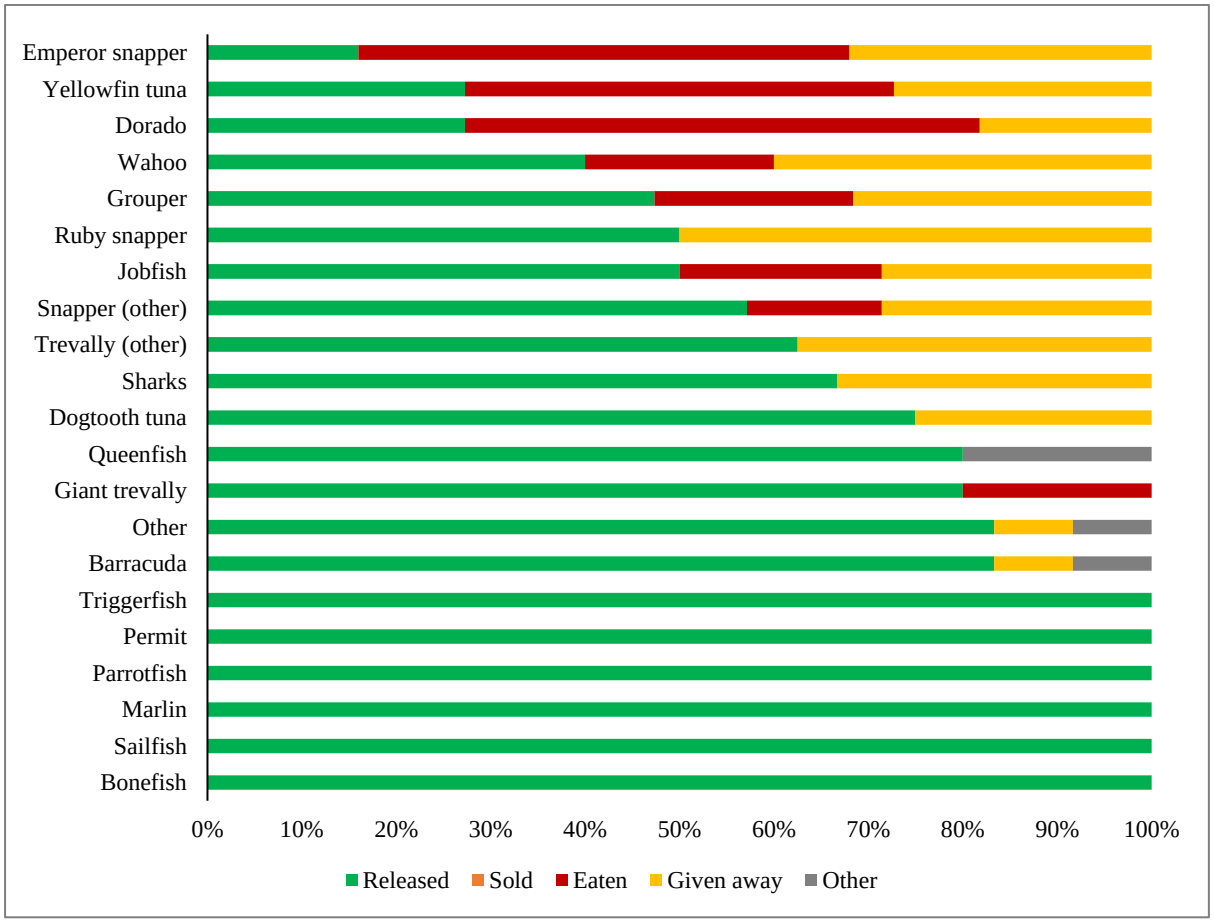

Figure 5: Post-capture actions by non-resident Inner Islands anglers for different species.
(Note: Percentages refer to the proportion of anglers who took each action for each species, not the proportion of each fish species that was released, sold, eaten, given away or other.)

4.2.5. Angler Satisfaction

The majority (64.5%) of non-resident anglers were either "very satisfied" (19.4%) or "somewhat satisfied" (45.2%) with their most recent Inner Islands fishing experience. A further 9.7% were "neither satisfied nor dissatisfied", while 25.8% were "somewhat dissatisfied". No non-resident anglers were "extremely dissatisfied" with their Inner Islands fishing experience.

4.2.6. Willingness to Pay for an Angling Licence

The majority of non-resident Inner Island anglers (93.3%) indicated that they were willing to pay for a licence to continue to fish in Seychelles. On average, these anglers were willing to pay approximately USD 36.44 on average for a licence.

4.2.7. Likelihood of Change in Behaviour with Policy Changes

Fewer than half (46.7%) of the non-resident anglers that fished the Inner Islands indicated that they would be either "somewhat likely" (30.0%) or "extremely likely" (16.7%) to continue to fish in Seychelles if bag limits were introduced for their target species, while another 30.0% indicated that this would not affect their participation in the fishery. The remaining 23.3% were "somewhat unlikely" to continue to fish in Seychelles if bag limits were introduced for their target species. No non-resident anglers indicated that this would make them "extremely unlikely" to continue to fish in Seychelles.

Half of the non-resident anglers that fished the Inner Islands indicated that they were either "somewhat likely" (28.1%) or "extremely likely" (21.9%) to continue to fish in Seychelles if size limits were introduced for their target species. A further 31.3% indicated that this would not affect their participation in the fishery, while 18.8% were "somewhat unlikely" to continue to fish in Seychelles. No non-resident anglers indicated that they would be "extremely unlikely" to continue to fish in Seychelles if size limits were introduced for their target species.

Under the hypothetical scenario of a complete ban on angling, approximately half (48.3%) of non-resident anglers that fished the Inner Islands indicated it was either "very unlikely" that they would have visited Seychelles (27.6%) or that they would not have visited Seychelles (20.7%). A further 24.1% were "neither likely or unlikely" to visit Seychelles following a prohibition of sport and recreational angling, while 27.6% would still be "very likely" to visit Seychelles.

4.2.8. Pre-Arrival Expenditures

Pre-arrival expenditures of non-resident anglers that fished the Inner Islands are shown in Table 6. Of these pre-arrival expenditures, package trips (average USD 451.11), airfares (average USD 1 156.14), and charters (average USD 135.84), equating on average to a total of USD 1 743.09, contribute to the Seychelles economy.

Table 6: Pre-arrival expenditures of non-resident anglers that fished the Inner Islands.

Pre-arrival expenditure	**USD (average/angler)**
Package Trips	451.11
Airfare	1 156.14
Charter	135.84
Fishing equipment	17.59
Other	39.09

The majority (90.6%) of non-resident anglers that fished the Inner Islands reported spending money on their trip prior to arriving in Seychelles; only 9.4% did not spend money prior to

arrival. Of those who provided further details on their pre-arrival expenditures, all had spent money on airfares, while 26.8% spent money on package trips, 14.3% spent money on charter boats, 7.1% spent money on fishing equipment, and 17.9% spent money on other expenses prior to arriving in Seychelles.

4.2.8. In-Country Expenditures

In-country expenditures of non-resident anglers that fished the Outer Islands are shown in Table 7. On average, a non-resident angler that fished the Inner Islands spent USD 1 721.62 in Seychelles. As respondents spent an average of 9.97 days on the Inner Islands, the average daily spending within the country amounts to USD 173.90/angler.

Table 7: In-country expenditures of non-resident anglers that visited the Outer Islands

In-country expenditure	USD (average/angler)
Hotels/accommodation	779.79
Charters	268.51
Restaurants/bars	202.77
Souvenirs	104.34
Transportation	163.27
Fishing equipment	29.62
Groceries	109.99
Nature Reserves	5.44
Island tours	23.14
Fish processing	3.28
Personal items	31.47

In-country expenditures mainly consisted of food and/or drinks from restaurants and bars, transportation, charters, groceries, souvenirs and accommodation. Most respondents spent money at restaurants and bars (93.1%), on transportation (89.7%), charters (82.8%), groceries (79.3%), souvenirs (79.3%), and accommodation (55.2%). More than half (55.2%) spent money on fishing equipment whist in Seychelles.

4.2.9. Expenditures and Income

Based on the lower (n = 18 130) and upper bound (n = 26 525) participation estimates, and the average pre-arrival (USD 1 743.09) and in-country (USD 1 721.62) expenditures, the total expenditures of non-resident anglers that fished the Inner Islands were estimated at USD 62.82 million to USD 91.90 million per year.

The total direct and indirect economic contributions associated with non-resident angling on the Inner Islands amounted to USD 114.01 million to USD 166.80 million - based on Pratt's (2015) output multiplier (1.81499). It is important to note that this is not an annual contribution and can take years to circulate in the Seychelles economy.

Given that 43% of anglers indicated that fishing was the primary motivation for their visit to the Inner Islands, the economic impact of expenditures associated with the non-resident Inner Islands recreational fishery was USD 27.01 million to USD 39.52 million per year.

When accounting for tourism expenditures that go towards leakage and taxation (~52% based on the Pratt (2015) input multiplier (0.478201)), the contribution made by non-resident recreational angling on the Inner Islands to income in the Seychelles economy was estimated at USD 30.04 million to USD 43.95 million (Table 8).

Table 8: Summary of economic impact of non-resident angling on the Inner Islands.

Parameter	**Value**
Annual average number of anglers (lower bound participation estimate) (n)	18 130
Annual average number of anglers (upper bound participation estimate) (n)	26 525
Average pre-arrival expenditures/angler	USD 1 743.09
Average in-country expenditures/angler	USD 1 721.62
Total annual expenditures of non-resident Inner Islands anglers (lower bound participation estimate)	USD 62 815 192[6]
Total annual expenditures of non-resident Inner Islands anglers (upper bound participation estimate)	USD 91 901 433[6]
Total direct and indirect economic contribution of expenditures (lower bound participation estimate)	USD 114 008 945[7]
Total direct and indirect economic contribution of expenditures (lower bound participation estimate)	USD 166 800 182[7]
Proportion of anglers for whom fishing was primary motivation	43%
Economic impact of non-resident recreational angling on the Inner Islands (lower bound participation estimate)	USD 27 010 533[8]
Economic impact of non-resident recreational angling on the Inner Islands (upper bound participation estimate)	USD 39 517 617[8]
Leakage and taxation rate	52%
Income from the non-resident Inner Islands fishery (lower bound participation estimate)	USD 30 038 288[9]
Income from the non-resident Inner Islands fishery (upper bound participation estimate)	USD 43 947 357[9]

** expenditures include package trips, airfares, and charters and excludes fishing equipment, clothing and other items purchased outside of Seychelles*

[6] Expenditures refer to all spending associated with a trip to Seychelles that involved recreational fishing (see Glossary).

[7] The total potential contributions of expenditures as they flow through the economy (global) – see Glossary

[8] New money that enters the economy due to the existence of recreational fishing. – see Glossary

[9] Amount of expenditure retained within the Seychelles economy which contributes to income.

4.3. Resident Anglers

4.3.1.1. Participation and Demographics

The average age of resident anglers was 39 years, younger than that of non-resident anglers (52 years). Resident anglers were primarily male (81%). In addition, resident anglers were not as highly educated as the non-resident sample, with 58.9% having less than a university degree.

The results of the household survey showed that approximately 11% (n = 8 543) of the adult population engages in recreational fishing.

4.3.1.2. Fishing Activities

Resident anglers mainly participated in boat-based fishing (82.1% of resident anglers) (Table 9). Shore-based angling was practiced by 39.3% of resident anglers, followed by fly fishing (14.3% of resident anglers), and other forms of fishing (9.8% of resident anglers), which included octopus diving, netting, or hand harvesting. On average, resident anglers fished for 24 days per year (Table 9). The average number of fishing days was highest for "other" forms of fishing (37 days), such as octopus fishing, though this was based on a small subsample. An average of 22 days, 20 days, and 18 days per year were spent boat-based fishing, fly fishing and shore-based fishing, respectively.

Table 9: Proportion of resident anglers that participated in each fishing type.

Fishing type	Proportion of resident anglers (%)	Average days
Boat-based	82.1	22.35
Shore-based	39.3	17.95
Fly fishing	14.3	20.36
Other	9.8	36.67
	Total	**23.56**

The major fishing areas for resident anglers were offshore areas on the Mahé Plateau (36.3%) and inshore areas around the Inner Islands (Mahé, Praslin, La Digue) (25.6%; Figure 6). To a lesser extent, resident anglers also fished around the Outer Islands, including the Amirantes (13.1%) and Ile Platte (8.9%). The furthest and more difficult to reach areas of Cosmoledo and Astove (1.2%), and Aldabra Atoll (0.6%) were not commonly fished by resident anglers.

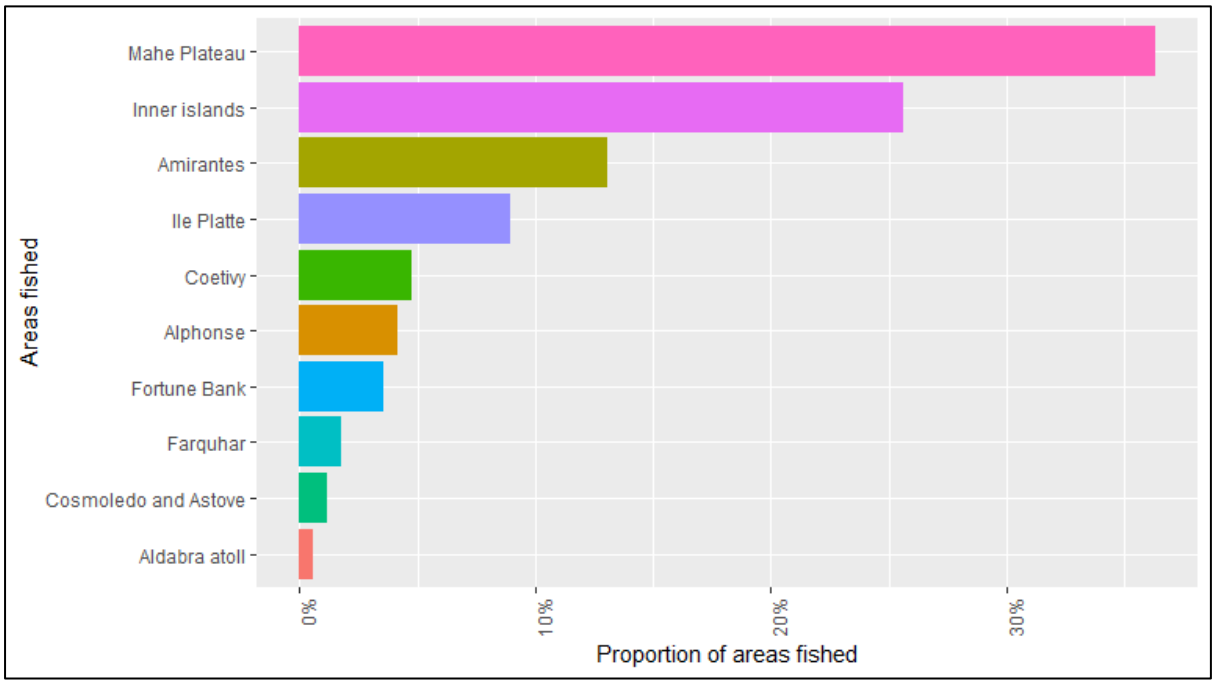

Figure 6: Proportion of areas that resident anglers indicated fishing at in the 12 months prior to being surveyed.

4.3.1.3. Target and Capture Species

Resident anglers primarily targeted emperor red snapper (79.8%), grouper (72.4%) and jobfish (*Aprion virescens*) (69.7%). These three species, together with trevallies (other than giant trevally) were also the most commonly caught by resident anglers (Figure 7).

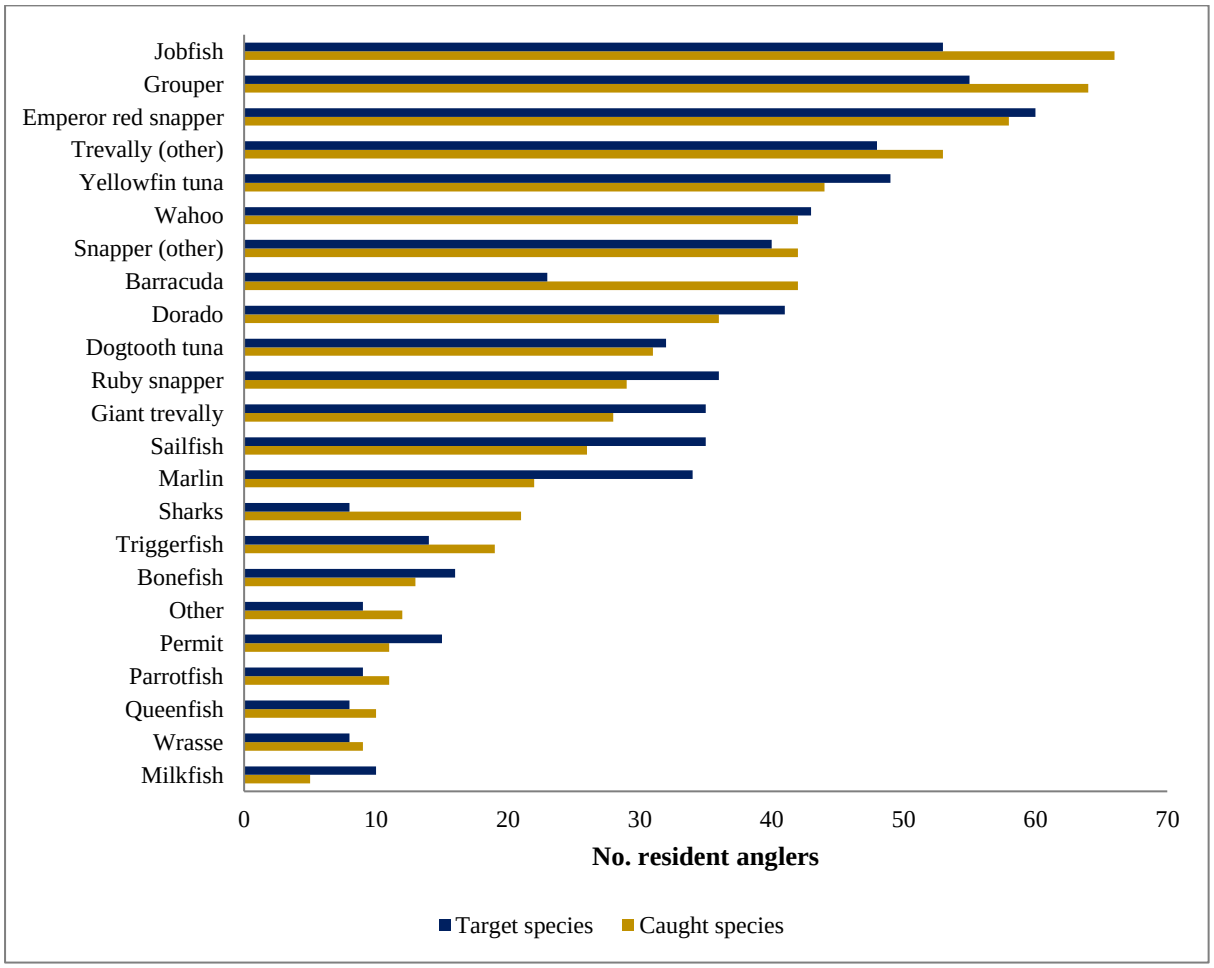

Figure 7: Target species and catch of resident anglers.

4.3.1.4. Post-capture Actions

Most resident anglers (96.1%) indicated that they consumed at least part of their catch. A smaller proportion gave away (53.9%), released (53.9%), and sold (14.5%) part of their catch.

All anglers reported that permit were released, with no other post-capture actions taken for this species. The most commonly retained species were wahoo, dorado, grouper, emperor red snapper and jobfish (Figure 8).

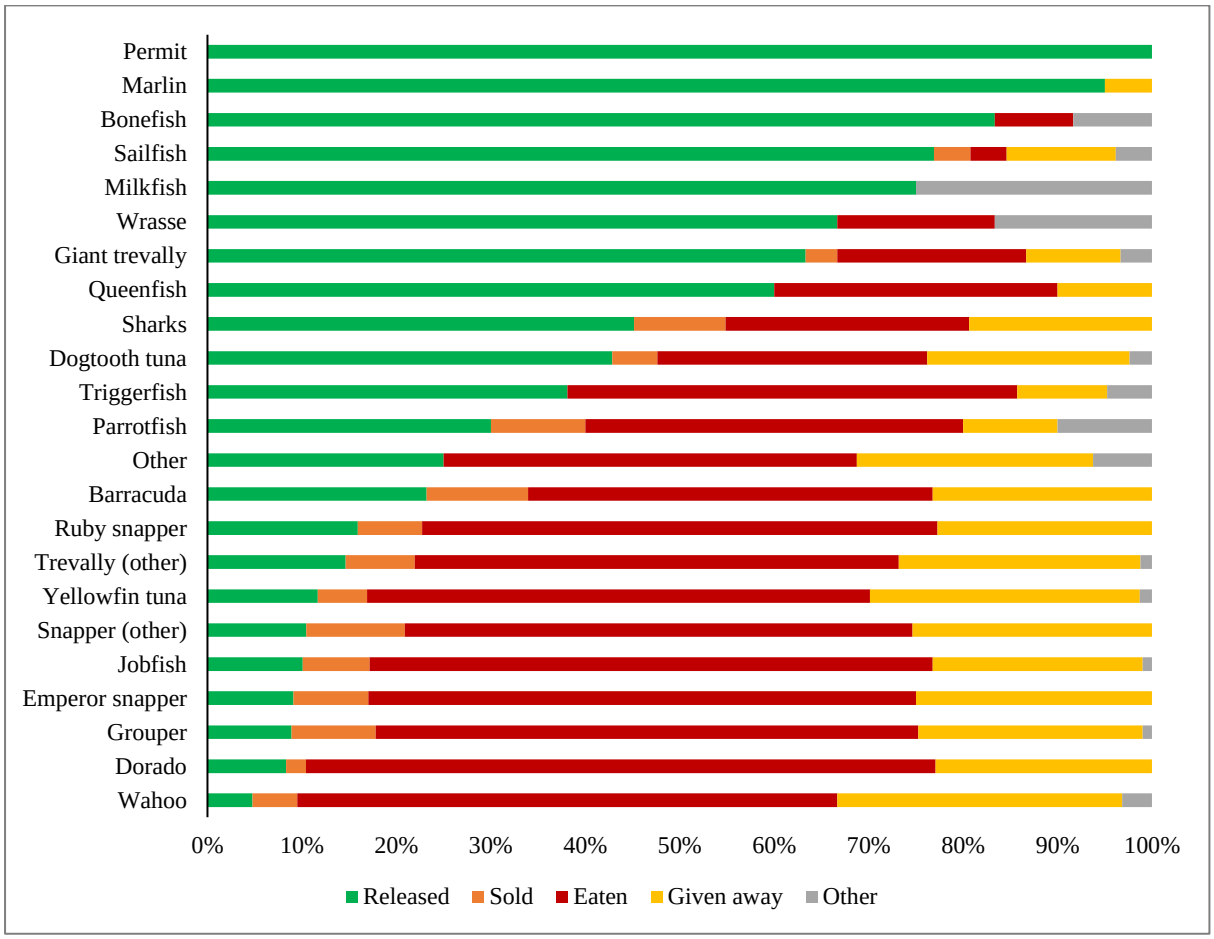

Figure 8: Post-capture actions by resident anglers for different species.
(Note: Percentages refer to the proportion of anglers who took each action for each species, not the proportion of each fish species that was released, sold, eaten, given away or other.)

4.3.1.5. Angler Motivations

The most important motivations for resident angler participation were related generally to themes such as "To be close to nature" (90.9% of respondents), "To experience tranquillity" (essential or important to 88.1%), and "To get away" (86.6%), and "To feed family" was still essential or of importance to more than half (51.5%) of the resident anglers. The least important motivation was to sell fish, although 6.0% indicated that this was an essential or important motivation (Figure 9).

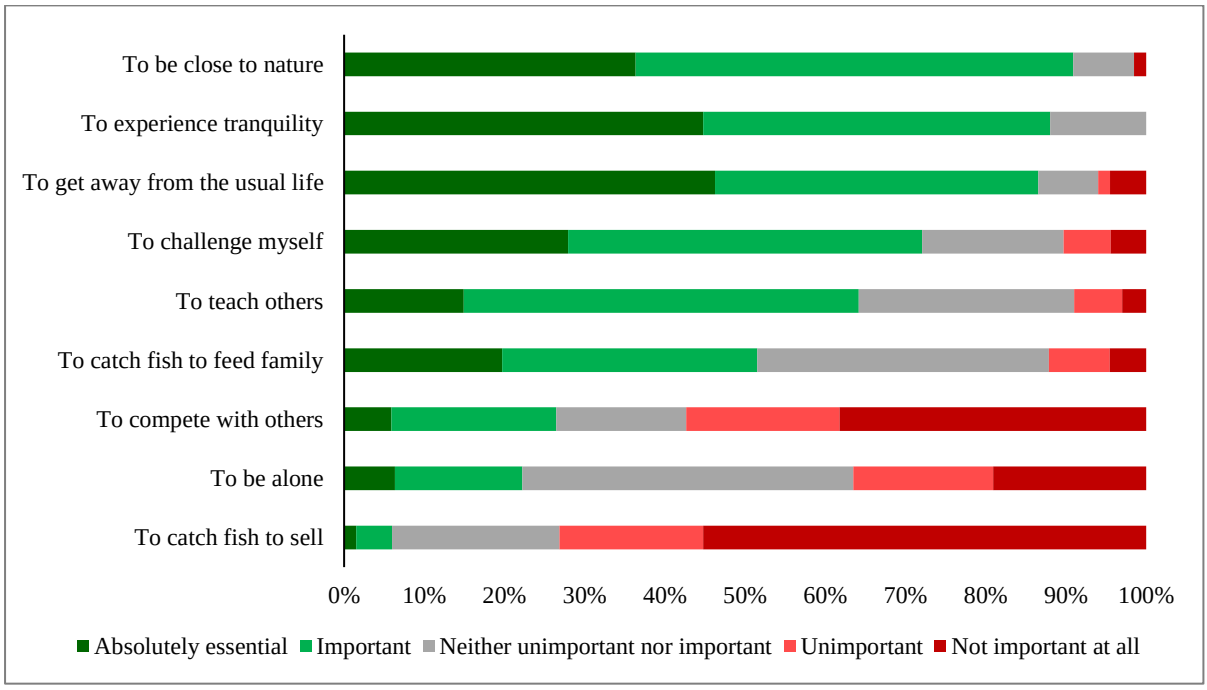

Figure 9: Relevant importance of various recreational fishing motivations to resident anglers.

4.3.1.6. Willingness to Pay for an Angling Licence

The majority of resident anglers (78.0%) were willing to pay for a licence to fish in Seychelles, while 22.0% indicated that they were not willing to pay for a fishing licence. The average maximum amount that resident Inner Islands anglers were willing to pay for a licence was USD 60.60.

4.3.1.7. Likelihood of Change in Behaviour with Policy Changes

The majority of resident anglers (83.5%) indicated that the introduction of size limits for their target species would not affect their fishing frequency, while 6.3% indicated they would fish more frequently. A further 8.9% would fish less frequently, and one angler (1.3%) indicated that they would stop fishing.

With the introduction of bag limits, 64.5% of resident anglers indicated that their fishing frequency would not be affected; while 25.0% would fish less frequently, and 6.6% would stop fishing. A further 3.9% would fish more frequently with the introduction of bag limits.

4.3.1.8. Expenditures and Income

Expenditures of resident anglers were measured in terms of long-term use purchases that generally last longer than a single fishing trip (likely a year or longer), considered durable goods in fishing terms, and per trip expenses (non-durable goods).

Durable goods expenditures of resident anglers over the last 12 months are shown in Table 10. Durable goods that resident anglers most frequently spent money on in the 12 months prior to

being surveyed were fishing tackle and lures (54.0%), tools for fishing (e.g., pliers, knives, bait hammers) (51.6%), fishing clothing (43.7%), fishing rods (42.1%) and fishing reels (38.9%).

Table 10: Average fishing-related expenditures by resident anglers in the 12 months prior to the survey, excluding boat-associated costs.

Expenditure item	Proportion of resident anglers that incurred expense (%)	Average annual expenses per item (USD)
Fishing tackle/lures	54.0	362.88
Tools used for fishing	51.6	173.36
Fishing clothing	43.7	2 201.43
Fishing rods	42.1	730.90
Fishing reels	38.9	1070.00
Cooler boxes	24.6	315.00
Freezers for fish or bait	21.4	279.87
Motorised boats	20.6	22 230.47
Fish finders/GPS	15.9	1 505.00
Tournament fees	13.5	559.62
Fishing charters	10.3	8 492.51
Fishing gear rental	8.7	2 910.00
Non-motorised boats	7.9	979.69
Fishing magazines/books	6.3	118.13
Spent no money on these items	3.2	-

On average, resident anglers spent a total of USD 2 811 annually on durable goods associated with recreational fishing, excluding boats and boat related costs. Annual recreational fishery related expenditures of resident anglers that owned and/or maintained motorized boats (~21.25%) were approximately USD 43 196.67. However, as many of the reported boat costs may not pertain solely to the purpose of recreational fishing, they were left out of the final calculations of expenditures. Based on the current resident angler participation rate (11%; n = 8 543), annual expenditures on durable goods related to fishing amounted to USD 24.01 million.

Non-durable goods were measured as a "per-trip" (day) expense. The average per trip expenditures per respondent were USD 345.55. Those that incurred boat-related expenses spent an average of USD 878.55 per trip, whereas those that did not incur boat-related expenses spent USD 28.44 per trip. Boat hire (USD 471.45) and boat fuel (USD 461.94) were the highest costs. However, food and beverage costs (USD 115.03), as well as other costs associated with boats (including oil and skipper fees), were also high (USD 85.24). The average number of trips reported by respondents in the 12-month prior to being surveyed was ~24 fishing days. Based on the current resident angler participation rate (11%; n = 8 543), annual expenditures on non-durable goods related to fishing amounted to USD 70.85 million.

The total direct and indirect economic contributions associated with resident angling amounted to USD 172.18 million (based on Pratt's (2015) output multiplier (1.81499)). It is important to note that this is not an annual contribution and can take years to circulate in the Seychelles economy.

When accounting for tourism expenditures that go towards leakage and taxation (~52% based on the Pratt (2015) input multiplier (0.478201)), the contribution made by resident recreational angling to income in the Seychelles economy was estimated at USD 45.36 million (Table 11).

Table 11: Summary of economic impact of resident angling in Seychelles.

Parameter	**Value**
Average annual number of anglers	8 543
Average annual durable goods expenditures/angler	2 811
Average annual non-durable goods expenditures/angler/trip	345.55
Average annual number of trips	24
Total annual durable goods expenditures	USD 24 014 373[10]
Total annual non-durable goods expenditures	USD 70 848 808[10]
Total annual expenditures	USD 94 863 181[10]
Total direct and indirect economic contribution of expenditures	USD 172 175 724[11]
Leakage and taxation rate	52%
Contribution of the resident recreational fishery to income in Seychelles	USD 45 363 668[12]

4.4. Total Economic Contribution of the Seychelles Sport and Recreational Fishery

The total potential expenditures of the recreational fishery are undeniably substantial, whether it relates to new money introduced to the Seychelles economy based on the existence of a popular recreational fishery and associated tourism, or the fishing-related expenditures of resident anglers.

Total annual non-resident angler expenditures (including the Outer Islands and Inner Islands) ranged from USD 72.44 million (lower bound participation estimate) to USD 101.52 million (upper bound participation estimate), while resident angler expenditures were estimated at USD 94.86 million per annum. The total annual expenditures related to the Seychelles recreational fishery amounted to USD 167.3 million to 196.39 million (Table 12).

Table 12: Total annual expenditures related to the Seychelles recreational fishery – (see Glossary for definition of expenditures).

	Annual Expenditures (USD)
Non-Resident (Outer Islands)	9 620 742
Non-Resident (Inner Islands)	62 815 192 – 91 901 433
Resident	94 863 181
Total	**167 299 115 – 196 385 356**

[10] Expenditures refer to all spending associated with a trip to Seychelles that involved recreational fishing (see Glossary).

[11] The total potential contributions of expenditures as they flow through the economy (global) (see Glossary).

[12] Amount of expenditure retained within the Seychelles economy which contributes to income.

The total direct and indirect economic contributions associated with recreational angling amounted to USD 303.65 to USD 356.44 million (based on Pratt's (2015) output multiplier (1.81499)) (Table 13). As mentioned previously, it is important to note that this is not an annual contribution and can take several years to circulate in the Seychelles economy.

Table 13: Total direct and indirect economic contributions associated with recreational angling in Seychelles – (see Glossary for definition of economic contributions).

	Total Economic Output Contributions (USD)
Non-Resident (Outer Islands)	17 461 551
Non-Resident (Inner Islands)	114 008 945 – 166 800 182
Resident	172 175 724
Total	**303 646 220 – 356 437 457**

The total economic impact of the Seychelles recreational fishery amounted to USD 35.96 million to 48.46 million per annum (Table 14).

Table 14: Total annual economic impact of the Seychelles recreational fishery – (see Glossary for definition of economic impact).

	Economic Impact (USD)
Non-Resident (Outer Islands)	8 947 290
Non-Resident (Inner Islands)	27 010 533 – 39 517 617
Resident	0
Total	**35 957 823 – 48 464 907**

The total contribution of the recreational fishery to income in Seychelles amounted to USD 80 million to USD 93.91 million per annum (Table 15).

Table 15: Total annual contribution of the recreational fishery to income in Seychelles – (see Glossary for definition of income contribution).

	Contribution to income (USD)
Non-Resident (Outer Islands)	4 600 648
Non-Resident (Inner Islands)	30 038 288 – 43 947 357
Resident	45 363 668
Total	**80 002 604 – 93 911 673**

The economic expenditures of the Seychelles recreational fishery and their contribution to the country's economy is in-line with many other island nations but much lower than the totals derived for large countries (Table 16). While total expenditures are much lower than in countries such as Spain, France, and South Africa, they compare closely to the island nations of Costa Rica, and states of Galicia (Spain) and Hawai'i (USA).

Table 16: Economic estimates of recreational fishing impacts in other regions. CPI = Consumer Price Index.

Location	Economic Contribution (expenditures)	Income Contribution	CPI adjusted income (2022)	Context	Reference
Seychelles	**USD 167 million - USD 196 million**	**USD 80 million – USD 94 million**	**-**	**Marine recreational fishing – All species**	**This report**
Hawai'i	USD 146 million	USD 45 million	USD 54 million	Marine recreational fishing – All species	Lovell et al. (2020)
Florida Everglades	USD 517 million	USD 270.5 million	USD 371 million	Marine recreational fishing – All species	Fedler (2009)
France	EUR 1.26 billion	-	-	All recreational angling and species	Herfaut et al. (2013)
South Africa	USD 1.3 billion	-	-	All recreational angling and species	Potts et al. (2022)
Majorca	EUR 57.1 million	-	-	Marine recreational resident anglers only - All species	Morales-Nin et al. (2015)
Europe	EUR 5.9 billion	-	-	Marine recreational fishing – All species	Hyder et al. (2018)
Galicia	EUR 86.5 million	-	-	Marine recreational fishing – All species	Pita et al. (2018)
Bahamas	USD 70 million	-	-	Flats fishing	Fedler (2010)
Martinique	EUR 68 million	-	-	Marine recreational fishing – All species	Bouaziz (2016)

Costa Rica	USD 279 million	USD 279 million	USD 376.6 million	Marine recreational fishing – All species	The Billfish Foundation (2010)

4.5. Contribution of Sport and Recreational Fishery to Employment

Currently, there is no information available on the relationship between expenditure and job creation in Seychelles. This measure is usually denoted as the "employment multiplier" for input-output assessments. Nevertheless, expenditure by recreational anglers generally contributes to the hospitality sectors, which include accommodation, food and beverage, retail, and, to some extent, transportation, and energy sectors. It is likely that the expenditure contributions to employment from the recreational fishery closely mirror those of the tourism sector. As such, a rough estimate of the contribution of non-resident recreational fishing to employment can be calculated based on the existing estimated proportion of total employment supported by the tourism sector, multiplied by the share of tourists that engaged in recreational fishing. In Quarter One of 2022, the tourism sector accounted for 22% of all employment in Seychelles, or 11 535 jobs. Assuming that as many as 10% of tourists participate in the recreational fishery, the sector may account for approximately 2.2% of employment in Seychelles, or 1 153 jobs.

Based on stakeholder engagements, much of the employment in the Outer Islands is supported by the recreational fishery, including jobs in accommodation, retail, guiding, charters, and restaurants/bars. The expenditures of Outer Island participants are not likely to provide much support to the manufacturing sector within Seychelles based on expenditure items. The expenditures of resident fishery participants contribute to employment within various industries, including transportation, retail, insurance and financial, energy and fisheries industries.

5. Discussion

Avenues to engage in recreational angling include vessel hire, guided charters, personal boat use, shared boat use, or accessing Seychelles' coastline from the shore. Vessel hire ranges from small boat (<8 m) rental to live-aboard boat hire. Small boat hire is prevalent among resident recreational fishers, while the live-aboard vessels typically cater to non-resident visitors. Live-aboard vessel clients typically target species to feed themselves while touring the Outer Islands or cruising around the Inner Islands. Small vessels (personal and hired) typically remain close to the Inner Islands of Mahé, Praslin and La Digue. Guided charters launch from all three Inner Islands but also have a substantial presence on the Outer Islands. From Mahé, the larger charter boat operators typically launch from Eden Island and Victoria Harbour. Smaller charter operators launch from all over the island, with higher densities at Anse a la Mouche and Bel Ombre (as well as Victoria). Personal boats are common throughout Seychelles, with boats typically anchored near the shore on the Inner Islands.

5.1. Angler Profiles

Recreational anglers participate in various types of fishing, including shore-based fishing and boat-based fishing with traditional handline, rod and reel, fly fishing on the flats, from the shore or from a boat, and the use of traps (although rare in the recreational fishery). The boat-based fishers predominantly fish for game fish, or for demersal species (traditional handline or rod and reel). The nature of boat-based fishing from the Inner Islands is mainly extractive, except for big game fish species such as marlin. Fly fishing is almost exclusively catch-and-release, and the preferred species include trevallies, permit, bonefish, and milkfish, although some big game species are also targeted. Shore angling targets a number of species that are often retained, but also several species that are generally released.

The non-resident anglers interviewed were predominantly engaged in Outer Islands fishing. These anglers typically arrive in Mahé where they spend at least a night before flying to the Outer Islands on an IDC aircraft. They spent, on average, 12 days on the Outer Islands before returning to Mahé to leave on an international flight. While on Mahé, these anglers often stay in luxury hotels. However, based on personal communication with stakeholders, they do stay in bed and breakfasts on Mahé as well. The most prominent locations for these respondents to have fished were Alphonse and Cosmoledo. Most Outer Islands anglers launched from the Outer Islands for fishing trips, indicating they were likely clients of the Alphonse Fishing Company (Blue Safari) which provides accommodation on five of the Outer Islands (Desroches, Alphonse, Farquhar, Cosmoledo and Astove). However, some Outer Islands anglers indicated that their trip originated from Mahé (~16%), suggesting they were likely engaged in live-aboard vessel hire activities.

Resident anglers spent an average of ~24 days per year engaging in recreational fishing activities. These trips were primarily boat-based, and occurred on the Mahé Plateau and around the Inner Islands. However, some resident anglers also engaged in fishing around the Outer Islands. The majority of anglers engaged in multiple forms of fishing, including both boat-based and shore-based fishing. Shore-based fishing occurred mostly in Mahé.

In the context of recreational angling, “motivations” are defined as expected psychological benefits that are sought by anglers when they decide to go angling or to go to a particular fishing site (Manfredo et al., 1996). The motivations for participating in fishing by resident anglers suggest that it provides important social benefits to participants. The most common drivers (motivations) behind participation relate to being close to nature, followed by the experiences linked to escape, enjoying tranquillity or being away from normal life. There were also motivations relating to teaching others, personal challenges, and feeding family, which can provide social benefits. Competition and the sale of fish were of little importance in motivating fishing participation amongst Seychellois residents. The motivation of anglers can be used to infer satisfaction levels. Angler satisfaction is considered to be the reward anglers receive from their fishing experience (Arlinghaus, 2006). In essence, angler satisfaction denotes the difference between what anglers expect, and what they receive from the fishing experience. In recreational fisheries, anglers are motivated to achieve physical, cognitive and psychological outcomes, and their satisfaction then depends on these outcomes being achieved (Gundelund

et al., 2022). However, it has been noted that while motivations typically pertain to being in nature and escapism, satisfaction often relates to catching quality (e.g., an intended target species) (Birdsong et al., 2018).

5.2. Potential Impacts of the Mahé Plateau Trap and Line Fishery Co-management Plan and the Seychelles Marine Spatial Management Plan on the Sport and Recreational Fishery

Our results indicate that non-resident angler participation in the Seychelles recreational fishery will not be affected by the introduction of size and bag limit regulations through the MPP. However, non-resident anglers who fished around the Inner Islands were "less likely" to continue fishing in Seychelles if size and bag limits were introduced for their target species, compared to those who fished on the Outer Islands. While a proportion of fish caught by Inner Islands anglers was consumed (notably demersal species), this was not a primary factor driving participation in the fishery by non-resident anglers. In contrast, resident angler participation in recreational fishing was more likely to be impacted by size and bag limit regulations. This is probably a result of higher catch retention rates, suggesting that consumption may be a primary driver of resident angling participation.

The hypothetical scenario of a blanket ban on recreational fishing was presented in the non-resident questionnaire, to assess the effect of such a ban on the likelihood of respondents visiting Seychelles. While such a blanket ban is not proposed in the MPP, the responses to this question can inform the potential impacts of fishing closures in certain areas as proposed in the SMSP Initiative. On the Outer Islands, where fishing was the primary motivation for visiting Seychelles amongst non-resident respondents, most anglers (95%) indicated that they would not visit, or would be unlikely to visit, if fishing was not allowed. On the Inner Islands, 43% of non-resident anglers indicated that they would not visit, or would be unlikely to visit, if fishing was not allowed.

Under the SMSP, the following Outer Islands have been classified as Zone 1 (High Biodiversity Protection Areas where no extractive activities including fishing are permitted):

- Aldabra Group
- Bird Island (Île aux Vaches)
- D'Arros Atoll
- D'Arros to Poivre Atolls
- Amirantes South including the islands of Boudeuse, Desnoeufs, Etoile and Marie-Louise

While our survey showed that the majority of angling on the Outer Islands takes place on Alphonse, Farquhar, Cosmoledo, Astove and Providence, some angling does take place on Poivre Atoll and Bird Island. Broadly, the socio-economic impacts of prohibiting fishing in these areas are likely to be minimal. Although Poivre is historically an important angling destination, the Amirantes Group offers other alternative and popular angling destinations including St Joseph and Desroches. In addition, the popularity and quality of the fly fishing

experience on other Outer Islands means the closure of Poivre is unlikely to lead to significantly reduced numbers of anglers. In the case of Bird Island, this is not considered a prime angling destination, best illustrated by the fact that there are no major outfitters offering fly fishing on the island.

These results suggest that, under the current SMSP framework, the closure of fishing in Zone 1 areas is unlikely to lead to a significant reduction in economic contribution or income associated with the recreational fishery.

With the introduction of bag limits, the potential loss in non-resident angler expenditures was estimated at between USD 0.00 and USD 865 867 for the Outer Islands, and between USD 0.00 and USD 14.7 million for the Inner Islands (Note: this was calculated based on the total expenditures of non-resident anglers that indicated they would be unlikely to visit Seychelles based on bag and size limit restrictions). Combined with the potential loss in resident angler expenditures of USD 5.4 million, this amounts to a total potential loss of between ~USD 5.4 million and ~USD 21 million if bag limits were to be introduced. With the introduction of size limits, the potential losses in non-resident angler expenditures range from USD 0.00 to USD 384 829 on the Outer Islands, and USD 0.00 on USD 13.79 million on the Inner Islands, while resident expenditures could be reduced by as much as USD 1.04 million, amounting to a potential loss of up to USD 15.22 million. Together, the potential economic impact associated with the introduction of these regulations ranges from USD 6.44 million to USD 36.22 million. However, these policies are intended to improve stock biomass and therefore the catchability of fish species in the long run. Therefore, these impacts are likely to represent short term losses.

The MPP also introduces a licensing system for recreational anglers. There was generally no aversion to a user-pay system for recreational fishing by non-residents. The average price that non-resident anglers were willing to pay for continued access to the fishery was USD 231.26 amongst Outer Islands anglers, and USD 36.44 amongst Inner Islands anglers. Resident anglers were less accepting of the potential introduction of a user-pay scheme within the fishery, with willingness to pay ranging from SCR 0.00 (USD 0.00) (i.e., unwilling to pay) to SCR 15 000.00 (USD 1 088.18). Approximately 20% of resident anglers indicated an unwillingness to pay to participate in the fishery. Amongst resident anglers who were willing to pay for a fishing licence (i.e., did not record a protest response), the average price they were willing to pay was SCR 834.90 (USD 60.57), considerably lower than the average willingness to pay recorded for Outer Islands non-resident participants, but higher than that recorded for non-resident Inner Island participants.

There was scepticism among stakeholders regarding the implementation of regulations for the recreational fishery. Overall, stakeholders felt that the recreational fishing sector had little impact on fisheries resources compared to the artisanal, semi-industrial, and industrial fishing sectors. This “blame game” scenario is common to all fisheries (Nguyen et al., 2016). However, stakeholders generally agreed that a permitting/licensing scheme would contribute towards the sustainable management of the recreational fishery.

Several stakeholders expressed concern about how the regulations under the MPP would be enforced, and felt that recreational fishers would push back against these regulations as they "don't like government telling (them) what to do". They felt that a heightened regulatory environment would reduce participation, and that other avenues for minimising the catch of sensitive species should be pursued. More specifically, it was proposed that fishery participants and managers should explore a "self-policing" approach instead of increasing formal regulations. Some self-policing has already taken shape in the form of social sanctions, including disqualification from tournaments, membership revocations, and normative pressure. Normative pressure refers to "nudges", which are unenforceable and non-compulsory behaviour-guiding measures that provide positive reinforcement and indirect suggestions as ways to influence behaviour. Mackay et al. (2018) suggest that nudges can be an inexpensive and potentially highly effective tool for recreational fisheries management. In addition to normative pressure, a study conducted on angling guides by Farthing et al. (2022) in Angola's recreational fishery suggests that fisheries managers have an opportunity to influence angler behaviour through focussed behavioural interventions with angling guides (for example, through improved handling practices and pro-environmental behaviour). This could be emulated by recreational angling operators in Seychelles, in line with stakeholders' "self-policing" suggestion. Similar to self-policing, the inclusion of stakeholders in discussions around regulations will not only promote a transparent management environment, but educate anglers on their role and impact on the fishery. As shown by Farthing et al. (2022), anglers involved in transparent stakeholder engagements can positively influence other anglers who do not agree with regulations imposed upon them.

5.3. Conservation Concerns

The general consensus among stakeholders was that the ecological impacts of recreational fishing pale in comparison to artisanal, semi-industrial, and industrial fishing. It is important to note that this perception has frequently been shown as not being in line with scientific evidence (Potts et al., 2020), which recognises the biological impact of recreational fisheries on the environment (Cooke and Cowx, 2006). In the case of the Seychelles recreational fishery, impacts are mainly associated with the extractive nature of the resident angling population, and the species targeted for consumptive purposes. Although the non-resident Outer Islands fishery is primarily catch-and-release, there was concern about the activities of non-resident anglers that charter boats from the Inner Islands and cruise down to and fish the Outer Islands.

At-risk species that aim to be protected by the MPP are amongst the highest extracted by recreational anglers (predominantly by the resident angling group) (Figure 10). Emperor red snapper and green jobfish were both regulated in Phase 1 of the MPP, through bag limits (five per person per day) and size limits (minimum 32 cm FL). They represent two of the top three species caught in the "resident" fishery and are retained in 90.9% and 89.9% of cases, respectively. In Phase 2 of the management plan, additional species will be afforded minimum size limit protections. These include groupers, trevallies, and snapper species, all of which are targeted by the recreational fishery, and often retained by resident anglers for consumption.

Resident recreational anglers primarily target demersal species (mostly for consumption), which are to be protected by means of bag limits under Phase 2 of the MPP. Based on stakeholder engagements, some angling groups have stated their intentions to limit their catch, while others are caught in a "race to the bottom" where their perceptions of overfishing by others have led to an increase in their own catch retention behaviour.

Figure 10: Seychelles recreational angler landings of various species, including emperor red snapper and green jobfish which will be afforded some protection during Phase 1 of the Mahé Plateau Trap and Line Fishery Co-management Plan (MPP).

When referring to the live-aboard boat/yacht hire clients (non-resident anglers), the fishing charter guiding community and resident recreational fishing community were concerned about the combination of their consumptive behaviour and lack of economic contributions around the Mahé Plateau and Outer Islands. However, the greatest concern was the angling behaviours of these clients. Stakeholders indicated that the retention of fish and the pressure they put on highly sought-after species is of serious detriment to the fishery as a whole. Outer Islands stakeholders further indicated that the behaviour of the live-aboard boat hire clients is reducing the desirability to fish the Outer Islands. They argue that participants of the exclusive Outer Islands fishery, which demands substantial expenditure, are often discouraged by the amount of pressure that boat hire clients place on their target species. In addition, the perception was that boat-based fishing pressure reduces the catchability of various species and leads to lower satisfaction among these catch-and-release-only fishery participants, particularly on the flats.

Closer to the Inner Islands, charter boat operators and guides expressed similar distaste for the live-aboard boat hire clientele. Their concerns were for big game and demersal species that these anglers target "indiscriminately", as one stakeholder put it. Stakeholders suggested the introduction of a special permit system with separate requirements for these participants. It should be noted that the impacts of these clients have not been verified in any scientific way, and these concerns are those of stakeholders within the fishery.

The boat hire operator stakeholders have not yet responded to requests for an interview.

5.4. Value Chain Linkages

The value chain of the recreational fishery is closely tied to the rest of the tourism industry. Expenditures are primarily placed within the accommodation, restaurant/bar and retail industries. However, some industries receive considerably more revenue from recreational fishing than they do in the rest of the tourism sector. These include boat ownership (i.e., maintenance, parts, accessories, and petroleum), charter/guides, and the retail fishing industry.

Identifying areas for improving value retention within Seychelles for these sectors can be done through the lens of Value Chain Analysis (VCA). This involves analysing the transactions in the value chain to identify where salient opportunities exist for increasing Seychellois participation and where there are opportunities for reducing leakage and thus retaining recreational fisheries expenditures within Seychelles' economy. While much of the money spent by Seychelles' recreational fishing participants feeds into tourism value chains, which are typically reserved for Seychellois employment, large hotels, large boat charters (>50 ft), restaurants, and live-aboard boat/yacht hire are characterised by a large share of foreign ownership. This foreign ownership directly contributes to the leakage of primarily non-resident expenditures within Seychelles.

Fishing equipment and gear retail represents another industry that receives a large share of angler expenditures with little contribution to Seychelles' economy. While Seychelles has a few fishing equipment suppliers to support the recreational fishery, nearly all of the products sold are imported, representing a high margin of leakage. Additionally, importing adds substantial overhead costs. As a result, non-resident fishers are more likely to purchase these items overseas at a lower cost, prior to visiting Seychelles. Several stakeholders felt that there would not be a high enough demand to make local production of fishing equipment a feasible venture.

5.5. Perceptions of the Recreational Fishery

Stakeholders and questionnaire respondents commonly referred to the quality of fishing and fish species in Seychelles as a motivation for participating in recreational angling. This was especially true for the Outer Islands, where stakeholders expressed a deep level of appreciation for the management of the fishery and the overall abundance of target species promoted by the IDC and to some extent SFA. However, the notion of the quality of the fishery did not always equate to the participants' experiences.

Non-resident anglers were typically very satisfied with their fishing trip experience, although 17% indicated that their most recent experience had been unsatisfactory. Engagements with stakeholders revealed that poor weather and fishing conditions during the Southeast monsoon (May – September) were the most common factors that contributed to dissatisfaction among non-resident anglers with their fishing trip experience. Other reasons included the occasional lack of big game fish or other species that a client had expected to catch. Finally, the charter operators themselves were not faultless, as there were occasions when accommodation, guide, or other factors contributed to angler dissatisfaction.

Willingness to pay to continue participating in the recreational fishery is an indicator of fishing quality. The fact that non-residents were willing to pay a substantial fee, on average, to participate in the fishery speaks to the high-quality of angling in Seychelles. Indeed, motivations of non-residents for engaging in angling in Seychelles related to the quality and catchability of fish, as well as the perception that the management of the Outer Islands fishery was "world-class". It is likely that this perception was based on the "conservation" measures implemented and publicised by Alphonse Fishing Company in collaboration with the Island Conservation Society.

There may be a link between the perceptions of quality and the exclusivity of the Outer Islands fishery. In economics, the principle of scarcity refers to the fact that only a finite amount of human and non-human resources exists, which the best technical knowledge is capable of using to produce only limited maximum amounts of each economic good. In social psychology, it is noted that humans place a higher value on scarce objects, and a lower value on those that are in abundance. Indeed, Outer Island fishery participants typically spend much larger amounts of money on angling than those (resident and non-resident participants) that keep to the Inner Island areas. Therefore, restricting participation in angling on the Outer Islands could derive as much or more economic benefit with less ecological impacts than an increase in participation levels would achieve.

Based on stakeholder engagements, the existence of the recreational fishery provides a recreational outlet for Seychelles residents. Interviews with guides, charter operators, and boat owners generally indicated a great appreciation for the fishery as it provided their families, friends, and clients with valuable benefits such as improved mental states, bonding experiences, mentorship, and the opportunity to "keep the young ones from getting involved with drugs". More work should be conducted to fully understand the social and psychological impacts of the recreational fishery on participants.

5.6. Conclusions

1. Seychelles' recreational fishery is a significant contributor to the Blue Economy.
2. The total annual expenditures related to the fishery amounted to between USD 167.3 million and USD 196.4 million.
3. The total direct and indirect economic contributions associated with recreational angling amounted to USD 303.7 million to USD 356.4 million (N.B.: this is not an annual contribution and can take several years to circulate in the Seychelles economy).
4. The total economic impact of the Seychelles recreational fishery amounted to between USD 36.0 million and USD 48.5 million per annum.
5. The total contribution of the recreational fishery to income in Seychelles amounted to between USD 80.0 million and 93.9 million per annum.
6. The recreational fishing sector may account for approximately 2.2% of employment in Seychelles, or 1 153 jobs.

7. The value chain of the recreational fishery is closely tied to the rest of the tourism industry. Expenditures are primarily placed within the accommodation, restaurant/bar and retail industries.
8. While much of the money spent by recreational anglers feeds into tourism value chains, which are typically reserved for Seychellois employment, large hotels, large boat charters (>50 ft), restaurants, and live-aboard boat/yacht hire are characterised by a large share of foreign ownership. This foreign ownership directly contributes to the leakage of primarily non-resident expenditures within Seychelles.
9. Non-resident anglers made the largest contributions to Seychelles' economy. Non-resident anglers were typically very satisfied with their fishing trip experience, and primarily enjoyed the catchability of fish, as well as the exclusivity of fishing destinations, notably the Outer Islands.
10. The existence of the recreational fishery provides a recreational outlet for Seychelles residents. Resident angler motivations were primarily related to being close to nature and the tranquillity and escape from normal life associated with angling. The sale of fish was of little importance in motivating fishing participation amongst resident anglers.
11. On average (and likely an underestimate as catches are often underreported), recreational fishers keep approximately 144 kg of fish per angler per year, comprised predominantly of demersal species. This equates to a theoretical total catch by resident recreational anglers of over 1 200 tonnes per annum (or about one third of the total artisanal catch).
12. Emperor red snapper and green jobfish represented two of the top three species caught in the "resident" fishery and are retained in 90.9% and 89.9% of cases, respectively. These species will be protected by the MPP.
13. Most non-residents were unperturbed by the introduction of regulations whereas resident anglers were likely to push back against the regulations.
14. The total potential loss associated with the introduction of bag limits was between USD 5.4 million and USD 21.0 million. The total potential loss associated with the introduction of size limits was between USD 1.04 million and USD 15.22 million. These impacts represent short-term losses and are likely to decrease as species recover.
15. Under the current SMSP framework, the closure of fishing in Zone 1 areas is unlikely to lead to a significant reduction in economic contribution or income associated with the recreational fishery.
16. Stakeholders generally agreed that a permitting/licensing scheme would contribute towards the sustainable management of the recreational fishery. The average price that non-resident anglers were willing to pay for continued access to the fishery was USD 231 amongst Outer Islands anglers, and USD 36 amongst Inner Islands anglers. The average price that resident anglers were willing to pay for continued access to the fishery was USD 61.

5.7. Recommendations

1. Recreational fisheries should be recognised by the Government of Seychelles as a key component of Seychelles' Blue Economy Strategy and prioritised accordingly.
2. A comprehensive monitoring programme of the sport and recreational fishery should be developed and implemented. It is highly likely that the sport and recreational fishery has a higher economic value than the artisanal fishery and this warrants the institution of a monitoring programme. It is recommended that SFA establishes a dedicated sport and recreational fishery monitoring unit such that the fishery can be monitored on a continuous basis, inclusive of competitions.
3. Given that the major demersal target species of the sport and recreational fishery are the same as those targeted by the artisanal fishery, it stands to reason that stock assessments of these species must incorporate biological, length frequency, as well as catch and effort data for both fisheries.
4. The impacts of catch-and-release on the survival of fish should be assessed further through physiological and physical impairment studies. This will augment the results of acoustic telemetry studies (Moxham et al., 2019), which have suggested that mortality of bonefish in the form of post-release predation was at least 43%. Such data will be of immense value to guide regulation on the increasingly popular practice of catch-and-release as well as advocate for better handling practises by guides and anglers.
5. Due to the extractive nature of the recreational fishery, particularly by resident anglers, the resource would benefit from the introduction of regulatory measures for all species. Measures could include size or slot limits, species and total bag limits, closed seasons and catch and release only zones. Investment in angler education and prioritising transparency will be critical to achieve the long-term benefits from appropriate regulations and management.
6. Based on the success, 'lessons learnt' and outcomes of the MPP, a review of angler compliance should be conducted to understand the uptake and adoption of management decisions and policy formulations.
7. A more comprehensive assessment of the level of resident angler participation should be undertaken. This will ensure that future regulations are appropriately aligned to the current context. In addition, understanding and quantifying the reliance of anglers on recreational fishing for food and sustenance will better guide policy and management of the fishery.
8. An assessment of the role of boat yards in the value chain (outboard sales, boat sales, boat building, repairs and maintenance and imports) should be undertaken. This was not included in the present study but should be investigated to provide a more holistic economic picture of the recreational fishery.
9. A comprehensive assessment of employment in the sub-sector should be undertaken. In this study it was not possible to consider the number of deckhands and stewards serving the big game fishing boats, or the catering agencies servicing these vessels.

10. Increased angler participation in the Inner Islands and Mahé Plateau in the form of guided charters may be a beneficial recruitment strategy. This can apply to both resident and non-resident anglers. Tourism marketing should not only focus on the exclusive Outer Islands, but the many guided charters offered on the Inner Islands. Importantly, charters in the Inner Islands should be encouraged to practice and promote catch-and-release and other pro-environmental behaviours. This could attract 'release oriented' anglers that cannot afford to fish the Outer Islands and also increase the share of economic contributions directly benefiting the Inner Islands.

5.8. Limitations

It is important to note that there were several limitations to the current study. The study period occurred partially during the global COVID-19 pandemic, which created travel restrictions. During the 12 months prior to the commencement of the angler expenditure survey, there was a prohibition of travel to Seychelles from several tourism-associated countries. This, coupled with the accompanying economic downturn that followed the pandemic, may have resulted in expenditures representing an artefact of expenditures during periods not impacted by global economic factors. In addition, the time period available for data collection was limited, and much of the peak fishing season was missed. Therefore, the estimated numbers from this study may be an underestimate of total annual expenditures. Typically, a longer study period would account for the fluctuations in participation and expenditure during the Southeast and Northwest monsoons.

Many of the anticipated stakeholder engagements did not take place. Stakeholders were often unreachable for workshops and interviews as they tried to make up for both lost time due to weather and lost revenue due to COVID-19 restrictions from prior seasons. Nevertheless, this report forms a valuable baseline for continuing with more targeted studies on the Seychelles recreational fishery.

6. Next Steps

6.1. Data Management System

Development of an electronic data management system to upload, store, process, and manage the data collected during the angler expenditure survey and the visitor survey is ongoing and will be completed prior to the final handover (Deliverable 7). The data management system is being designed such that it can be enhanced in the next phase of this project, for example, through the integration of data capture software with cloud-based data storage and analysis solutions. Developing such a system in the next phase is highly recommended as it will greatly aid decision-making processes by providing near real-time access to the data, automated data collation and data analyses functions, automatic reporting and workflows, dashboards that display relevant statistics for managers and stakeholders, and rapid report generation and document sharing/dissemination capabilities. If the fishery is to be developed as an economic sector under the Blue Economy, proactively developing and implementing such a data system in the short term is critical for implementing sustainable management practices from the outset.

6.2. Policy Memorandum

Based on the findings of this report (Deliverable 6), a Policy Memorandum (Deliverable 5) has been prepared and will be submitted together with this report. The memorandum outlines policy implications of the study, and provides recommendations.

6.3. Stakeholder Workshops

In January 2023, a stakeholder workshop will be held to present and validate the results and main findings of this study.

6.4. Final Handover

Following the stakeholder workshop, a handover meeting will be held with the Client. The project will conclude with the submission of a completed report and the handover of all datasets and other information to the Client (Deliverable 7).

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Appendix A: Angler Expenditure Questionnaire: Resident Respondents

Date:

Location:

Surveyor:

Q1. Which types of recreational fishing do you participate in while in Seychelles? (select all that apply)

☐ Boat-based angling ☐ Shore-based angling ☐ Flyfishing ☐ Other (please specify) _____

Carry Forward Selected Choices from Q1

Q2. How many days in the past 12 months did you spend fishing for each of these fishing types? Please enter in the boxes below.

	No. days spent fishing
Boat-based angling	
Shore-based angling	
Flyfishing	
Other (please specify)	

Skip to Question 5 if respondent DOES NOT participate in boat-based fishing

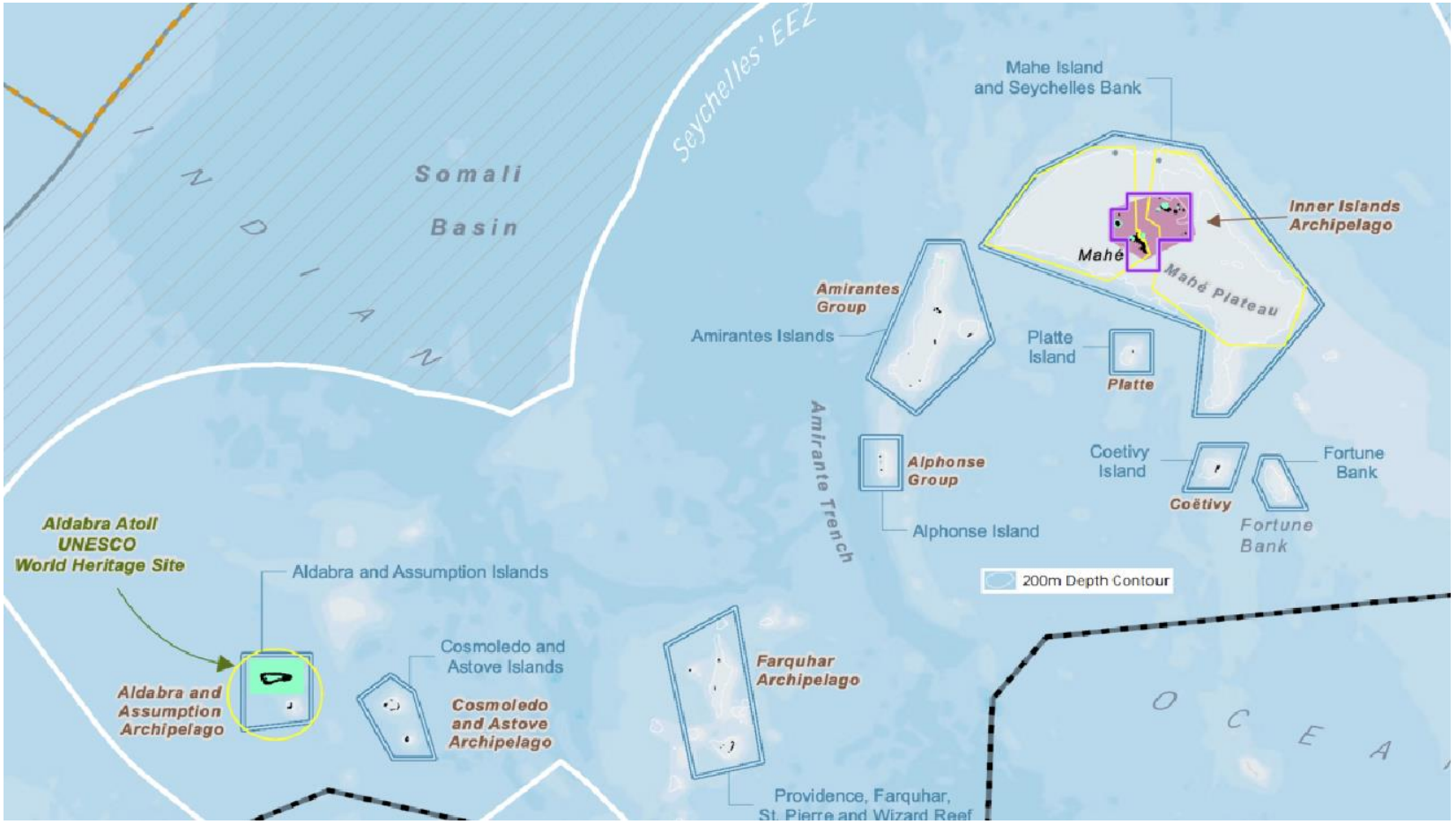
Q3. When boat-based fishing, do you target fish at the surface, midwater, or bottom? (select all that apply)

☐ Surface ☐ Midwater ☐ Bottom

Q4. When fishing the following, how deep on average are you targeting fish? (Only ask about selected choices from Q3)

	Depth (metres)
Surface	
Midwater	
Bottom	

Q5. Which areas around Seychelles have you fished in the previous twelve months? Place an X in the general regions where you have fished. Does not have to be perfectly accurate, just within the vicinity of the fishing location.



Q6. Which of the following fish species do you typically target on trips and which did you catch? (Choose all that apply)

Species	Target	Catch	What did you do with the fish you caught?				
			Release	Eat	Sell	Give away	Other (Specify)
Barracuda (Bekin/Tazar)							
Trevally (Karang)							
Bonefish							
Dogtooth Tuna (Ton Ledan)							
Dorado/Dolphinfish (Dorad)							
Giant Trevally (Karang Ledan)							
Grouper (Vyey)							
Indo-Pacific Sailfish							
Jobfish (Zob)							
Marlin (Esparadon)							
Milkfish (Libine)							
Parrotfish (Filanbaz)							
Permit/Pompano							
Queenfish							
Red snapper (Bourzwa)							
Triggerfish							
Ruby snapper (Job la Flamm)							
Sharks (Reken)							
Snapper (other)							
Triggerfish (Bours)							
Wahoo/Kingfish							
Wrasse							
Yellowfin tuna (Ton Zonn)							
Other (Please specify) _____							

7.) Please estimate how many total kilograms (kgs) of fish you have kept in the last 12 months. _____

Q8. If the fish you typically target were required to reach a minimum size before you could keep them, how frequently would you continue to fish in Seychelles?

- ○ I would stop fishing
- ○ Less frequently
- ○ Same amount as I currently fish
- ○ More frequently

Q9. If the fish you typically target had limits (ex. two fish per day) on the amount you were allowed to keep per day, how frequently would you continue to fish in Seychelles?

- ○ I would stop fishing
- ○ Less frequently
- ○ Same amount as I currently fish
- ○ More frequently

Q10. How much have you spent on the following items in the last twelve months?

	Rupees spent
Fishing Rods	
Fishing Reels	
Tackle (hooks, lines, sinkers, lures, etc)	
Tools for fishing (knives, bait hammer, pliers, etc.)	
Cooler boxes	
Freezers for fish/bait	
Fish finders/GPS	
Motor boats	
Kayaks, canoes, or other non-motorised vessels	
Fishing clothing or accessories (ex. shirts, hats, sunglasses etc.)	
Tournament fees	
Gear rental (boats, tackle, etc.)	
Fishing charters	
fishing magazine subscriptions or books	
I did not spend any money on these items in the last 12 months	

Q11. How much do you spend on average on the following items during a day of fishing?

	Rupees spent
Car fuel to fishing site or boat launch	
Transportation to fishing site or boat launch if not in personal vehicle	
Fresh bait	
Ice	
Food and beverage	
Boat fuel	
Boat hire	
Accommodation	
Any other expenses per fishing day (please specify)	

Q12. Do you own or maintain a boat in Seychelles?

○ Yes ○ No

Skip To Question 16 they DO NOT own or maintain a boat in Seychelles

Q13. How much have you spent on the following boat related items in the last twelve months? If none, leave blank

	Rupees spent
Boat motors, safety equipment, or other accessories	
Insurance	
Repair and maintenance	
Harbour and marina fees	
Licensing fees	
Other (please specify)	

Q14. Have you chartered or rented your boat out to anyone in the past 12 months?

○ Yes ○ No

Skip To Question 16 if they HAVE NOT chartered or rented out their boat

Q15. Approximately how much money in total did you receive from chartering or renting out your boat in the last 12 months? _____

Q16. How important are the following in motivating you to participate in recreational fishing?

	Not important at all	Unimportant	Neither unimportant nor important	Important	Absolutely essential
To compete with others					
To be alone					
To be close to nature					
To get away from the usual life					
To experience tranquillity					
To catch fish to feed family					
To catch fish to sell					
To teach others					
To challenge myself					

Q17. If a fishing license or permit were required for to continue to participate in recreational fishing in Seychelles, what is the highest amount you would be willing to pay for one to continue to have the ability to fish? _____

Q18. What is your age? _____

Q19. What is your gender?

- ○ Male
- ○ Female
- ○ Non-binary / third gender (please specify) _____
- ○ Prefer not to say

Q20. What is the highest level of education you have completed?

- ○ Pre-high school
- ○ High school
- ○ Diploma / Professional certificate
- ○ Bachelors degree
- ○ Postgraduate degree
- ○ Other _____

Appendix B: Angler Expenditure Questionnaire: Non-Resident Respondents

Date:

Location:

Surveyor:

Q1. Was fishing a primary motivation for visiting Seychelles?

○ Yes ○ No

Q2. What is the main reason you wanted to fish in Seychelles? _____

Q3. How many days have/will you spend in Seychelles on your most recent trip? _____

Q4. Which of the following areas did/will you visit while on your most recent trip? (choose all that apply)

☐ Mahé ☐ Praslin ☐ La Digue ☐ Outer Islands (specify) _____

Only ask how many days they spent in locations that they visited

Q5. How many days did/will you spend in these areas on your most recent trip?

	No. days in each area
Mahé	
Praslin	
La Digue	
Outer Islands (specify) _____	

Q6. Where did you launch from on your fishing trips? (choose all that apply)

☐ Mahé ☐ Praslin ☐ La Digue ☐ Outer Islands (specify) _____

Q7. Which types of recreational fishing do you participate in while in Seychelles? (select all that apply)

☐ Boat-based angling ☐ Shore-based angling ☐ Flyfishing ☐ Other (please specify) _____

Q8. Which of the following fish species did you hope to target when you planned your, and which did you catch? (Choose all that apply)

Species	Target	Catch	What did you do with the fish you caught?				
			Release	Eat	Sell	Give away	Other (Specify)
Barracuda (Bekin/Tazar)							
Trevally (Karang)							
Bonefish							
Dogtooth Tuna (Ton Ledan)							
Dorado/Dolphinfish (Dorad)							
Giant Trevally (Karang Ledan)							
Grouper (Vyey)							
Indo-Pacific Sailfish							
Jobfish (Zob)							
Marlin (Esparadon)							
Milkfish (Libine)							
Parrotfish (Filanbaz)							
Permit/Pompano							
Queenfish							
Red snapper (Bourzwa)							
Triggerfish							
Ruby snapper (Job la Flamm)							
Sharks (Reken)							
Snapper (other)							
Triggerfish (Bours)							
Wahoo/Kingfish							
Wrasse							
Yellowfin tuna (Ton Zonn)							
Other (Please specify) _____							

Q9. If the fish you were targeting were required to reach a minimum size before you could keep them, how likely would you be to continue to fish in Seychelles?

○ Extremely unlikely ○ Somewhat unlikely ○ Neither likely nor unlikely ○ Somewhat likely ○ Extremely likely

Q10. If the fish you were targeting had limits (ex. two fish per day) on the amount you were allowed to keep per day, how likely would you be to continue to fish in Seychelles?

○ Extremely unlikely ○ Somewhat unlikely ○ Neither likely nor unlikely ○ Somewhat likely ○ Extremely likely

Q11. On your most recent trip, did you spend money in your home country, before you left for Seychelles, for travel packages, transportation, fishing or services while here?

○ Yes ○ No

Skip to Question 14 if Q11 answer is NO

Q12. How much was spent for the following items PRIOR to arriving in the Seychelles? Please only report how much you spent for your share of expenses, and not the amount spent for any others in your travel party. Please include any expenditures made by others for you. (Specify Currency)

	Amount spent (specify currency)
Package Trips or Tours	
Airfare	
Charter boats (before arrival)	
Fishing equipment	
Other Seychelles-related purchases made prior to departing home. Please briefly describe:	

Q13. What do you estimate the total amount of money spent on your trip while in Seychelles was/will be? Please do not report any expenditures made outside of Seychelles, or expenditures you made for others in your travel party. (Specify Currency)

_____

Q14. How much did you spend on the following items? Again, only report expenses incurred while in Seychelles.

	Amount spent in Seychelles (specify currency)
Transportation (car hire, taxis, buses, ferries, petrol, local flights, etc.)	
Charter boat fees, fishing guides	
Fishing expenses (except charters): tackle, ice, sun screen, bait, and any other expenses associated with your fishing trips	
Fish cleaning, processing, or taxidermy	
Accommodation	
Groceries, food, liquor bought in stores (not in restaurants or bars)	
Food and beverages from restaurants, bars, takeaways	
Gifts & souvenirs of any type	
Personal items (toiletries, clothes, medicine, etc.)	
Island Tours	
Admission to nature reserves	
Any other expenses made in Seychelles. (Please specify):	

Q15. Do you own or maintain a boat in Seychelles?

○ Yes ○ No

Skip to Question 17 if Q15 answer is NO

Q16. How much do you spend on maintaining the boat (repairs, licensing, insurance etc.)

_____

Q17. How many trips to Seychelles did you take for fishing in the last 12 months? _____

Q18. How satisfied were you with your fishing experience during this trip to Seychelles?

○ Very dissatisfied ○ Somewhat dissatisfied ○ Neither satisfied nor dissatisfied ○ Somewhat satisfied ○ Very satisfied

Q19. If a fishing license or permit were required for international visitors to continue to participate in sport fishing in Seychelles, what is the highest amount you would be willing to pay for one? _____

Q20. If you were not allowed to fish, how likely would you have been to take this trip to Seychelles?

○ I would not have come	○ Very unlikely	○ Neither likely nor unlikely	○ Very likely	○ Definitely would have come

Q21. Where do you get your information about Seychelles sport fishing?

○ Fishing club or other social group	○ Friends/Family	○ Printed fishing related media	○ Web-based fishing related media
○ Non-fishing related media	○ Travel agents	○ Other (Specify):	

Q22. What is your nationality? _____

Q23. What is your age? _____

Q24. What is your gender?

○ Male	○ Female	○ Non-binary / other _____	○ Prefer not to say

Q25. What is the highest level of education you have completed?

○ Pre-high school	○ High school	○ Diploma / Professional certificate
○ Bachelors degree	○ Postgraduate degree	○ Other _____

Appendix C: Seychelles Visitor Questionnaire

Q1.What was the main purpose of your visit to the Republic of Seychelles?

○ Holiday	○ Business	○ Conference	○ Wedding
○ Visiting Friends	○ Honeymoon	○ Workshop	○ Holiday/Business
○ Transit	○ Crew	○ Sports	○ Other _____

Q2. Did you participate in any sport or recreational fishing while in Seychelles?

○ Yes ○ No

Q3. If yes, which types of fishing did you participate in? (select all that apply)

☐ Charter boat	☐ Personal boat	☐ Shore based
☐ Fly fishing	☐ Other: _____	☐

Q4. Was fishing a primary motivation for visiting Seychelles?

○ Yes ○ No

Q5. How satisfied were you with your fishing experience in Seychelles?

○ Very dissatisfied	○ Somewhat dissatisfied	○ Neither satisfied nor dissatisfied	○ Somewhat satisfied	○ Very satisfied

Q6. Which recreational activities did you participate in, besides fishing, while in Seychelles? (Select all that apply)

☐ Visiting beaches	☐ Boat tours	☐ Island tours
☐ Snorkelling/Diving	☐ Hiking	☐ Nature tours/Wildlife watching
☐ Sailing	☐ Surfing	☐ Other _____

Q7. Who travelled with you in your travel party? (Select all that apply)

☐ I travelled alone	☐ Spouse/Life Partner	☐ Boyfriend/Girlfriend
☐ Children (no. children) _____	☐ Other family members (no. members) _____	☐ Friends, co-workers, other (no. members) _____

Q8. How many individuals in your travel party fished in addition to yourself? _____

Q9. How satisfied are you overall with your visit to Seychelles?

○ Very dissatisfied	○ Somewhat dissatisfied	○ Neither satisfied nor dissatisfied	○ Somewhat satisfied	○ Very satisfied

Q10. Please provide an email address or phone number so that we may follow-up with you about your fishing experience.

Email:_____

Phone:_____

Appendix D: Seychelles household fishing participation survey

Consent/script

Hello, my name is ……... I'm conducting a survey on behalf of the Seychelles Ministry of the Blue Economy. We are trying to understand the amount of recreational fishing participation in Seychelles. Can I have a moment of your time to answer three questions about fishing participation in your household? **(Y/N)**

If Yes: Your participation is voluntary, and you may refuse to not answer any of the questions. Also, you must be at least 18 years of age to participate. You may ask any questions at any time. If you wish to contact the lead researchers, we can provide you with their details. Do you still agree to participate? **(Y/N)**

1. How many people are in your household?

   _____

2. How many days did members of the household spend recreational fishing in the past 12 months?

   _____

3. Was the fishing along the shore or from a boat? If both, please indicate how many days were spent fishing along the shore and how many days were spent fishing from a boat.

   _____

4. What is the estimated value of fish that were brought home from a fishing day?

   _____

5. What did it cost per day to go fishing?

   _____