

---

## Development of the Fishery Satellite Account in the Seychelles

Kevin Bistoquet<sup>1</sup>, Michel Marguerite<sup>2</sup>, Trudy Lucas<sup>3</sup>, Sheriffa Morel<sup>4</sup>, Nichol J Elizabeth<sup>5</sup>,  
Phillippe Michaud<sup>6</sup>, Sachiko Tsuji<sup>7</sup>

### **Background and objectives:**

Fisheries and fish processing are one of the most important economic activities in the Seychelles. Seychelles fleets were composed of four components: industrial purse seine (13 boats, 88,740 tons), active industrial longline (42 boats, 12,518 tons), semi-industrial longline (11 boats, 195 tons) and artisanal fisheries (445 boats, 3,214 tons). The figures within the parentheses correspond to the number of licenses and catch production in 2015 for respective components and the former three rely on the IOTC resources, i.e. capturing mainly the large pelagics. There were also 7 Seychelles flagged supply vessels to service the purse seiners.

In addition, 36 purse seiners and 105 longliners under the foreign flags were licensed to operate within the Seychelles EEZ in 2015 and produced 37,396 tons and 7,379 tons from the area. Port Victoria provides an excellent hub for tuna industries in the West Indian Ocean and total 270 thousands tons of tunas were landed and transshipped in 2015. Fees and services provided at the port as well as the access fees to the Seychelles waters bring substantial economic benefit to the country.

Majority of landed tunas is processed within the Seychelles. Canned tunas dominate the Seychelles export in both value and volume, accounting for more than 95 percent of total export value of fish and fish products, and close to 70 percent of total export value (except re-export).

The Seychelles has continued its efforts to improve data collection and understandings on tuna-resource related industries, in particular on a dynamics and social/ economic contribution of industrial purse seine fleets and tuna processing. This includes the 2010 attempt of the National Bureau of Statistics (NBS) to estimate overall economic contribution of fisheries and fisheries-related activities to the national Gross Domestic Product (GDP) contribution through assigning an proportion that was estimated to be linked with fisheries and fishery-related activities for individual International Standard Industrial Classification (ISIC) categories. The result indicated that fishing and fisheries-related economic contribution ranged 6 – 9 percent of the total GDP for the period between 2004 and 2009 (Hass, 2016). The GDP contribution of fishing was 0.8 percent in 2015 and together with manufacture of food (mainly tuna canning), the contribution increased to 2.7 percent. In general, both estimates were considered to substantially underestimate an actual economic importance to the national economy.

The IOTC-OFCF Collaborative Project launched in 2017 aims to evaluate technical feasibility and usefulness of satellite account approach to evaluate an overall economic contribution originated from the utilization of IOTC fish resources and approached to the Seychelles seeking

---

<sup>1</sup>National Bureau of Statistics, Seychelles

<sup>2</sup>Seychelles Fishing Authority

<sup>3</sup>Central Bank of Seychelles

<sup>4</sup>Ministry of Fisheries and Agriculture, Seychelles

<sup>5</sup>Indian Ocean Tuna Ltd, Seychelles

<sup>6</sup>Blue Economy Department of Vice President's Office, Seychelles

<sup>7</sup>Overseas Fishery Cooperation Foundation of Japan

for the interests of developing the Fishery Satellite Account. The formal project agreement was made in March 2018 between the Ministry of Fisheries and Agriculture (MFAg) and Overseas Fishery Cooperation Foundation of Japan (OFCF). Then, the technical core team was established with the participations of NBS, MFAg, Seychelles Fishing Authority (SFA), Central Bank of Seychelles (CBS), Blue Economy Department of Vice President's Office (BED), and Indian Ocean Tuna Ltd (IOT), and a series of meetings were held under coordination by the OFCF Expert. Interested parties including the Institute de Recherche pour le développement, France (IRD), University of Nantes, France, and SWIOFish3 project of the World Bank, joined the team meetings occasionally.

Primary objective was set to evaluate an overall dependency of national economy on fishing activities, based on currently available information. Main focus was on identifying and evaluating economic flow among such activities directly supporting fishing operations (e.g. fuel, gear, and machinery supply, port services), and those relying on the products from fishing (e.g. processing, marketing, retailing). This document summarizes the initial compilation result of the Fishery Satellite Account for the year 2015.

### **Methods and Materials:**

In 2010, the NBS made an initial attempt to estimate an overall contribution of fisheries and fishery-related activities to national economy, by allocating a factor indicating an extent of contribution/ linkage with fisheries and fishery-related activities to each economic industrial category (SIC), based on expert judgment and stakeholders consultation. The NBS has maintained a set of SIC dependent factors developed for potential updates. However many modifications occurred in the organization, including staff changes since then, made it difficult to continue the project and keeping an organizational memory on the theoretical and factual basis of those factors.

Contrary to the 2010 attempt, the exercise here took a bottom-up approach, starting from the review of existing knowledge, perception, and available data and working toward re-building an overall economic flow surrounding fisheries. This would be a pragmatic way to build a system consistent with existing knowledge and data. At the same time, considering that our knowledge tends to be dependent to an extent of richness of available information, there could be a risk of failing to capture an aspect of critical importance simply because of a lack of corresponding information. It was considered that a comparison with the 2010 exercise could assist us in identifying un- or under-representing areas.

The components to be included in the Fishery Satellite Account were determined whether benefits of a certain economic activity would be affected when access to fishery resources, i.e. fishing, would be denied. This reflects our interest to evaluate an integrated economic dependency to aquatic (ocean) resources. Two types of economic contributions were considered: one is values derived from harvested fish and their parts, which includes fresh and frozen fish directly sold at markets, processed fish food, non-food products (e.g. fish meal and fish oils, chemical extracts), ornamental parts, etc. Another is economic activities providing essential support and services to enable fisheries and fishery-related activities, which includes an production and marketing of gears, fuel, machineries, port services, ingredients for processing, etc. In the System of National Account (SNA), the former is taken as value added of relevant activities, while the latter is considered as a cost, i.e. an intermediate, needed for production (of fish and fish commodities). The satellite account would help the latter type of contribution and economic flow more visible and transparent.

Although the statistics disseminated from the SFA indicates four fleet components, i.e. industrial purse seine, industrial longline, semi-industrial longline and artisanal fisheries, existing in the Seychelles, the current SNA only covers the production from semi-industrial longline and artisanal fisheries. As the first step of the exercise, the SNA was revised to include fishery production by all Seychelles fleet. Production statistics disseminated from the SFA were in catch quantity, which was converted into production in value using average landing price to the IOT in the case of industrial purse seine catch and average export price of fresh and frozen whole fish extracted from the CBS trade statistics in the case of industrial longline catch.

The current SNA does not distinguish the production from semi-industrial longline and that of artisanal fisheries. While the semi-industrial longline mainly targeting on the large pelagics, i.e. the IOTC resources, the artisanal fisheries do not rely on the IOTC resources, then, the disaggregation of two fisheries production would be required in order to evaluate a dependency on the IOTC resources. Since catch quantities of two fishery components were available from the SFA statistics, pro-rata allocation was made to disaggregate the production of two fleet components, though noting significant difference in species composition, and probably in average unit price, between them.

The price data of semi-industrial longline and artisanal fisheries were regularly collected at the domestic fish markets. The SFA statistics also indicates that the production of sea cucumbers and shark fins gained substantial economic values through export. They are almost exclusively aimed for export and less likely to go through domestic fish market. Even they are processed commodities, since no corresponding catch and processing information is available, their economic gains were decided to include in the artisanal fishery production.

Although recognizing that a wide variety of economic industrial activities would support fishing operations, including boat buildings, supply of gears, baits, other fishing and ship equipment, bunkering and other port services, administrative costs such as port access fee and fishing license fee, transportations of crews, engines and electricity, insurances, loan services, etc., this initial compilation was limited only to cover the cost relating to port services and administrative costs, where most of necessary data were regularly collected by the SFA.

Thanks to the kind contribution of the IOT, the largest tuna processing company in the Seychelles, the exercise could integrate quite comprehensive economic flow relating to fish processing activity and establish supply-use table in this part.

No consideration was made on economic linkage with recreational fishing and other water tourism related activities, and with aquaculture.

In summary, this initial compilation only covered:

- revision of fishery production, by adding production of two industrial fishery components and that of export oriented fish commodities;
- identification of portion utilized to support fishing activity through various port services and administrative services; and
- full compilation of economic flow of the IOT.

Revision of SNA estimate was limited to production values of fish and fish commodities. Economic values utilized to support fish and fish commodities production were adjusted to fit into the existing SNA values, keeping in mind that the cost generally corresponds to gross production values, not to value added. When necessary, the exchange rates disseminated by the CBS were used.

**Results:**

Table 1 shows the results of a revision of production value in fishery and fish processing activities together with the initial compilation result of Fishery Satellite Account, conducted for the year 2015 using current prices.

As a result of including the industrial fishery components, the production value added by fishing increased from 152 million SR to 2,261 million SR, with corresponding increase of Gross Value Added (GVA) contribution from 1 % to 12 %. Together with a revision of canned tuna production, the GVA was increased 22 %, from 15,200 million SR to 18,471 million SR.

The economic contribution of fisheries and fishery-related activities was estimated to be 4,923 million SR, accounting 27 % of the GVA, substantial increase from the estimate with 2010 procedure of 7 %. This was slightly higher than overall contribution of tourism and matched with the general perception of fishery and tourism to be two major activities supporting the Seychelles economy, noting that the Tourism Satellite Account is also under revision and that the figures are not comparable.

Extent of linkage of various industries to fish resource utilization resulted in this exercise was higher than those assigned in 2010, except two categories (“water transportation” and “other transportation and storage”). Activities covered under these two categories were reviewed in a context with a linkage to fisheries and fishery-related activities but nothing substantial was found.

The result indicated that 96 % of fishery-related economic benefits were originated from the utilization of IOTC resources. Considering the IOTC resource use accounting 91 % of value added of fishing, it looks like that the IOTC (large pelagic) resource use has broader impacts in the Seychelles economy than other fish resources. At the same time, this could be considered as an artifact reflecting that the compilation exercise mostly focused with activities relating with the industrial fisheries and did not cover adequately economic linkages of artisanal fisheries mainly due to a lack of quantitative data readily available. While catch from the IOTC resources accounting for 94% of total production value of fishing.

Total impact to national economy of fishing was estimated as 2.2 times of fishing production value. In the other words, for example around 10% of reduction or increase in fishing production would end of 22% change in national economy. Since many of important economic links (e.g. supply of fishing gears, boats, other equipment) have not yet been covered, the actual impact ratio could be higher.

**Discussion:**

Even though the compilation exercise was in fact a quick accumulation of existing data, it still succeeded to reveal a relative importance of fishery in the national economy, more consistent with the general perception by people. Fishery Satellite Account is not only effective to make economic linkages among various industries visible, but also would be a powerful tool in analyzing and forecasting potential impacts of policy decisions relating to fish resource and fishery management.

The NBS is in the process of revising its SNA starting from 2019 with the reference year of 2014. The major improvements planned include a revision of fishing production, a development of supply and utilization tables that was also used as a basis of this exercise, and further

development and regular compilation of two satellite accounts, Tourism Satellite Account and Fishery Satellite Account. Knowledge and lessons learnt through this exercise would be reflected into the next phase of the SNA structure.

Through the exercise, it was noted that the national economy heavily depends on the contribution from the rest of the World, not only directly through export, port services, and administrative services to the foreign fleet, but also indirectly through heavy reliance on foreign labour whose economic contribution may not remain within the country in a long run. Some of short-term benefits may end up with long-term burdens.

It also should be noted that the economic importance of activities is not always matched with its importance in social aspect. For example, the artisanal fisheries indicated a limited economic impacts comparing to other fishing components relying on the IOTC resources, but in fact provided quite substantive social benefits through involvement of many local fishers and provision of fish food directly to the domestic market. The relative importance of artisanal fisheries, which is minor in an economy, could be much bigger in social and food security aspects.

In any case, we need to establish better indicators to reflect actual benefits and impacts of aquatic resource use. Fishery Satellite Account is a powerful tool to understand the economic flows originating from fish resource use but it is not good enough. In the end, it would become important to develop a well-integrated monitoring system covering all aspects of social, economic, food security and environmental sustainability. Such system should be flexible enough to allow an integration of additional and newly developed activities relying on fish resources such as aquaculture and recreational fishing in a timely manner with clear visibility on relation and economic flows with other activities. Cross-collaboration through close communication among various agencies and stakeholders would be an essential to achieve this.

**References:**

- Hass, J.L. (2016): Final Report Improving economic information about fishing related industries in the Seychelles.
- National Bureau of Statistics (2017): Statistical Bulletin ANA.2016, 2016 Annual National Accounts Statistics.
- Seychelles Fishing Authority (2017): Fisheries Statistical Report, Year: 2016.

SIC	Economic Activities	Value Added (current price, SR million)		Note	2018 Compilation			2010 Estimate	
		2015 SNA	2018 revision		Fishery Account	IOTC resource contribution	FI related contribution	Fishery Account	FI related contribution
A01	Agriculture	223	223						
A03	Fishing	152	2,261		2,261	2,065	1	152	1
	<i>Artisanal</i>		196	<i>Pro-rata disaggregation (SFA) Addition of sea-urchin and shark-fin export value (SFA)</i>	196				
	<i>Semi-industrial longline</i>		9	<i>Pro-rata disaggregation (SFA)</i>	9	9			
	<i>Industrial purse seine</i>		1,147	<i>New addition [quantity (SFA)*price(IOT)]-[license fees, fuel, port service cost]</i>	1,147	1,147			
	<i>Industrial longline</i>		909	<i>New addition [quantity(SFA)*price(average price of fresh/frozen fish export)]-[license fees]</i>	909	909			
C10	Manufacture of food (IOT)	329	1,492	Recompiled based on data provided by IOT	1,492	1,492	1	329	1
	Manufacture of food (others)	30	30						
C11-12	Manufacture of beverages and tobacco	398	398						
C23	Manufacture of concrete, rock products, glass etc	102	102						
C13-22, 24-33	Manufacturing, other	239	239	FI: Fish meal/ fish oil export value (SFA/trade) subtract intermediate estimates based on IOT data	115	115	0.48	57	0.24
D	Electricity, gas, steam and air conditioning supply	420	420	FI: utilization by IOT (IOT)	85	85	0.20		
E	Water supply; sewerage, waste management and remediation activities	75	75	FI: utilization by IOT (IOT)	16	16	0.22		
F	Construction	575	575						
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	1,268	1,268		471	471	0.37	13	
	<i>Fuel domestic</i>	247	247	<i>FI: Bunkering to national fleet (SFA/ trade)</i>	81	81	0.33		
	<i>Fuel re-export</i>	264	264	<i>FI: Bunkering to foreign fleet (SFA/ trade)</i>	131	131	0.50	13	0.05
	<i>Others</i>	757	757	<i>FI: Food and other supply at port (SFA) FI: utilization by IOT (IOT)</i>	259	259	0.34		
H	Transportation and storage	2,057	2,057		31	31	0.01	558	
	<i>Tankers, air transportation</i>	808	808	<i>FI: utilization by IOT (IOT)</i>	7	7	0.02		
	<i>Port authority</i>	100	100	<i>FI: port access fees (SFA)</i>	24	24	0.24		
	<i>Water transportation</i>	505	505					436	0.8
	<i>Others</i>	605	605					121	0.2

I	Hotels, Restaurants & Beverage serving activities, Other food service activities	2,085	2,085	FI: utilization by IOT (IOT)	28	28	0.13		
J	Information and communication	911	911						
K	Financial and insurance activities	797	797						
L	Real estate activities, Residential rentals, Owner Occupied dwellings	2,511	2,511	FI: utilization by IOT (IOT)	17	17	0.01		
M	Professional, scientific and technical activities	480	480						
N	Car hire, Other Tourism related, Administrative and support service activities-Other	497	497						
O	Public administration and defence; compulsory social security	1,234	1,234	FI: EEZ access fee, fishing licenses (SFA)	409	409	0.33		
P	Education	392	392						
Q	Human health and social work activities	310	310						
R	Arts, entertainment and recreation	95	95						
S	Other service activities	95	95						
T	Activities of households as employers and undifferentiated producers								
	<b>Gross Value Added for all industries</b>	<b>15,200</b>	<b>18,471</b>		<b>4,923</b>	<b>4,727</b>	<b>0.27</b>	<b>1,108</b>	<b>0.07</b>

Table 1 Compilation result of revised SNA and corresponding fisheries satellite account for the year 2015, in comparison with the existing SNA estimates and disaggregation according to the 2010 exercise.