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Data Collection and Statistics in Mauritius

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Abstract

The main data source for the data collection system for Mauritius comes from harvest, that is at the level where the fish is caught. The catch, effort and fishing positions are recorded in logbooks by both foreign and local fishing vessels unloading at Port Louis which are submitted to the Port State Control Unit (PSCU) prior to unloading. As per license condition submission of logbook is mandatory and failure to submit logbook or submission of inaccurate logbooks may entail penalties such as payment of a fine or the vessel may become ineligible for any future licence.

Tuna statistics are derived from raw fishing data that are compiled from fishing logbooks obtained from fishing vessels. Prior to logbook entry in the database, the logbook catches are verified against the landing catches that are recorded by the Fisheries Protection Officers at the port during unloading and transshipment (Port State Control Unit). In addition, the fishing positions are also validated using the Vessel Monitoring System of the Fisheries Monitoring Centre. For the time being, data entry, compilation and analysis is done using the excel spreadsheet. Specific data sets are then prepared according to the demands of national, regional and international organizations. The Indian Ocean Tuna Commission (IOTC) has specific data submission requirements as per Resolution 15/02, involving various submission forms and deadlines.

Furthermore, the implementation of the observer programme on local purse seiners and longliners provide key information on fishing activities in logbooks and assist with monitoring compliance. Regular sampling exercises on the catch of foreign and local vessels are undertaken, whereby the length (fork length for tuna and operculum to keel length for swordfish) and weight of fish are collected. In the artisanal fishery, around anchored FADs (AFAD) which involves only small boats (7-8 meters), catches are not monitored by logbook program

but through regular inspections conducted by fisheries officers. Transshipment activities of vessels calling at Port Louis are also monitored.

Mauritius will soon embark on the development of a new software for the input and analysis of tuna data. Mauritius is also in the process of implementing the Electronic Reporting System (ERS) which will enable us to receive real time catch data of EU fishing vessels operating in our waters and on the operations of Mauritius-flagged vessels. Mauritius is already participating in the ePSM programme and will participate in forthcoming IOTC programmes to improve compliance to IOTC management measures related to quality of data.

1. Background information

Mauritius has an Exclusive Economic Zone (EEZ) of 1.9 million km² extending from the coasts of the islands of Mauritius, Rodrigues, St Brandon (Cargados Carajos Shoals), Agalega, Tromelin and Chagos Archipelago. The EEZ has a reasonable stock of various fish, including pelagic and demersal species. A large number of foreign fishing vessels that operate in the South West Indian Ocean region use Port-Louis harbour as a transshipment base making Mauritius a major transshipment centre for tuna in the region.

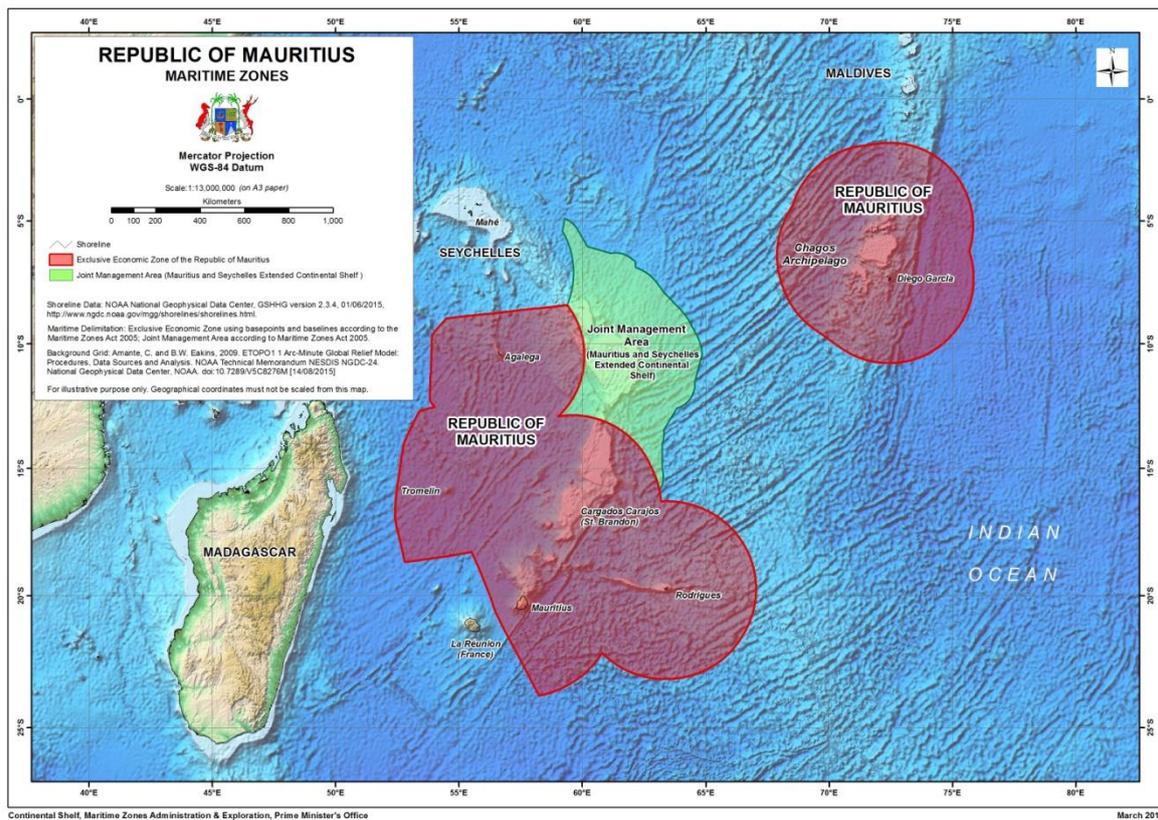


Figure 1: Map of the EEZ of Mauritius

Mauritius started operating in the commercial tuna fishery in 1970 when a longliner was operated by the local tuna canning factory. A first Mauritian purse seiner, 'Lady Sushil' was launched in 1979 and eight years later another purse seiner, the 'Lady Sushil II' joined the fleet. A third purse seiner, 'Cirn ', started operations in 1991. Until 1997, the three vessels were operating for the local canning factory. However, due to financial problems and change in the administration of the factory, the vessels were sold off and the factory has to rely on import of raw materials to meet its commitments.

In 2018 Mauritius had two purse seiners and thirteen semi-industrial longliners operating under its flag. The purse seiners are large freezer purse seiners of

more than 24M in length, each having a Gross Tonnage of 2667t. They operate mostly outside the EEZ of Mauritius, in the waters of other coastal states under fishing licences and in the high seas. The semi- industrial longliners are small vessels less than 24 metres in length. Five of them operate exclusively inside the EEZ whilst the remaining eight operate outside the EEZ.

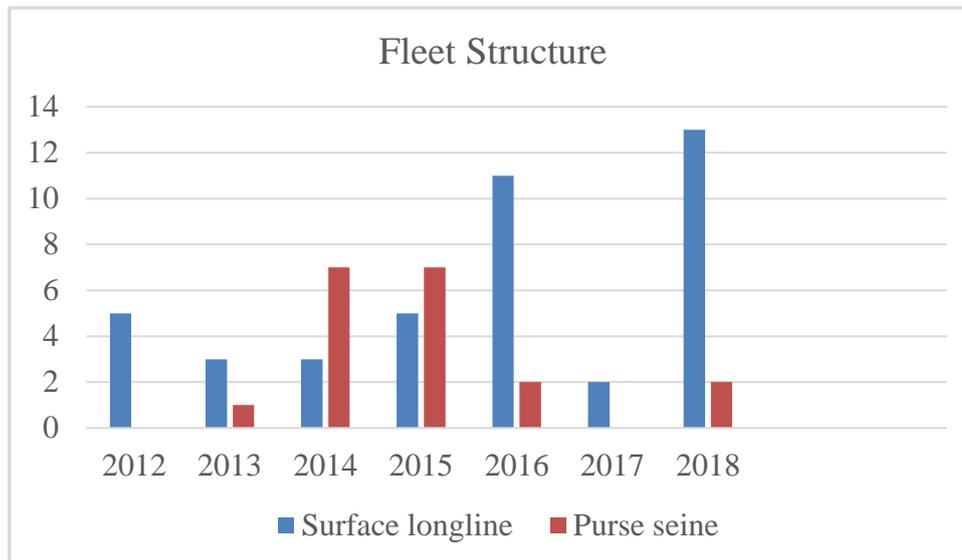


Figure 2: longline and purse seine fleet up to December 2018

Mauritius also has an artisanal fishery targeting pelagic species. About 350 fishermen are active in this fishery and they operate around anchored Fish Aggregating devices (AFADs) which are anchored in a ring around the island of Mauritius at distances ranging from 2nm to 12nm from the shore. These fishermen operate in small pirogues of 7-8 metres in length and go out for daily trips.

Mauritius is also an important hub for foreign longliners which call at Port Louis for various activities such as transshipment, bunkering, change of crew, repairs, provisions, etc.

In 2018, the 13 semi-industrial longliners in operation landed a total of 821 tonnes of fish. For the longliners operating inside the EEZ, the majority of the catch consisted of yellowfin (35.5%), followed by albacore (28.4%) and swordfish (16%). For the longliners operating outside the EEZ, the majority of the catch was swordfish (45%), followed by yellowfin (31%). The two purse seiners that operated in 2018 caught 22,529t of fish out of which 50% was composed of yellowfin tuna.

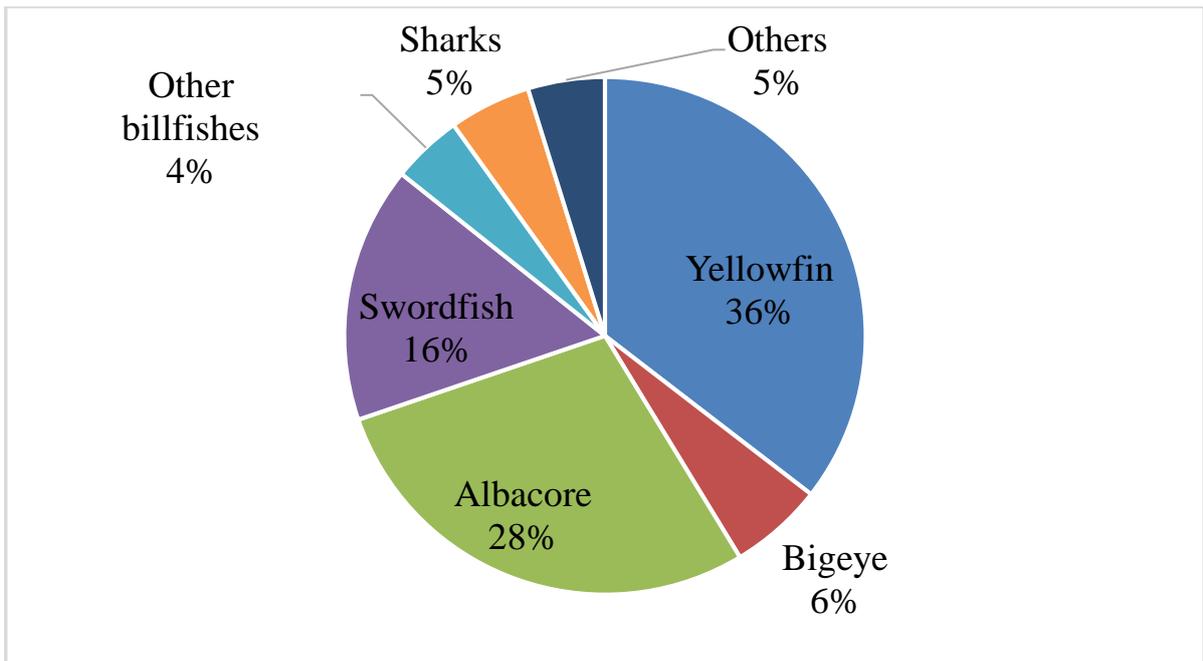


Figure 3: Species Composition of the catch of semi-industrial longliners operating inside the EEZ in 2018.

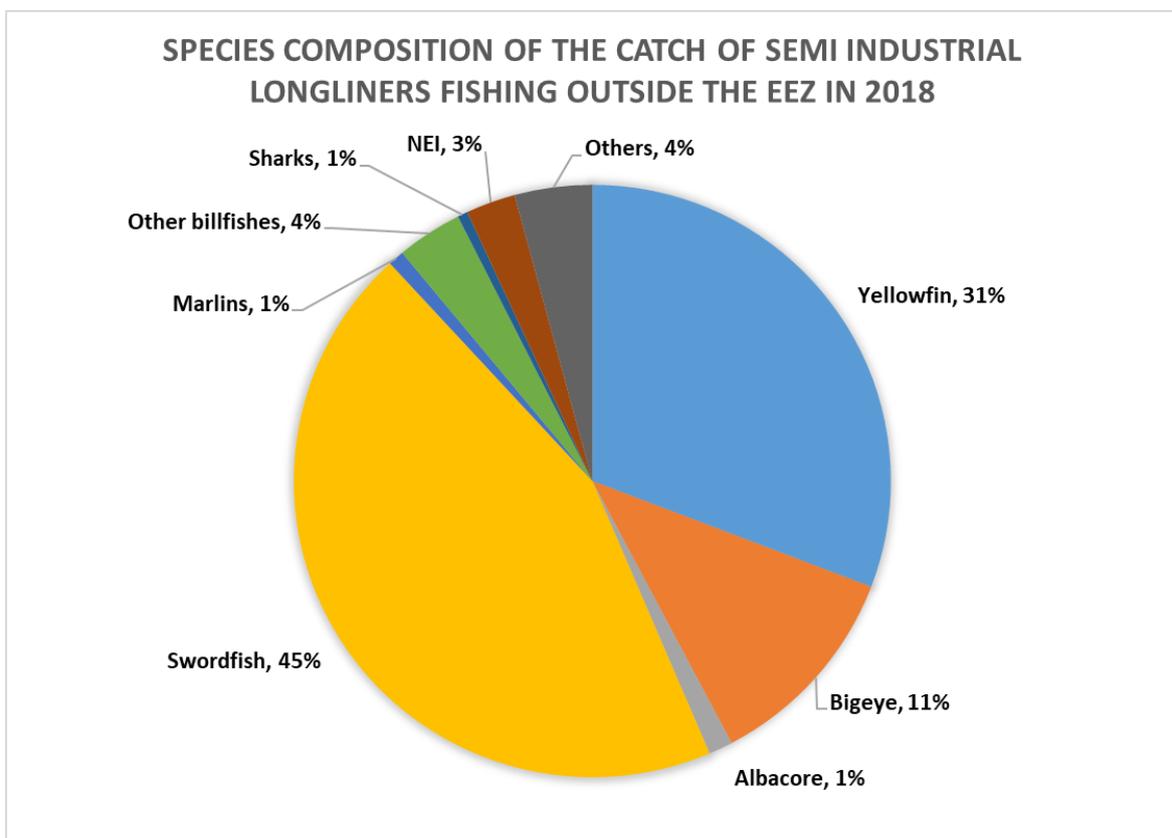


Figure 4: Species Composition of the catch of semi-industrial longliners operating outside the EEZ in 2018.

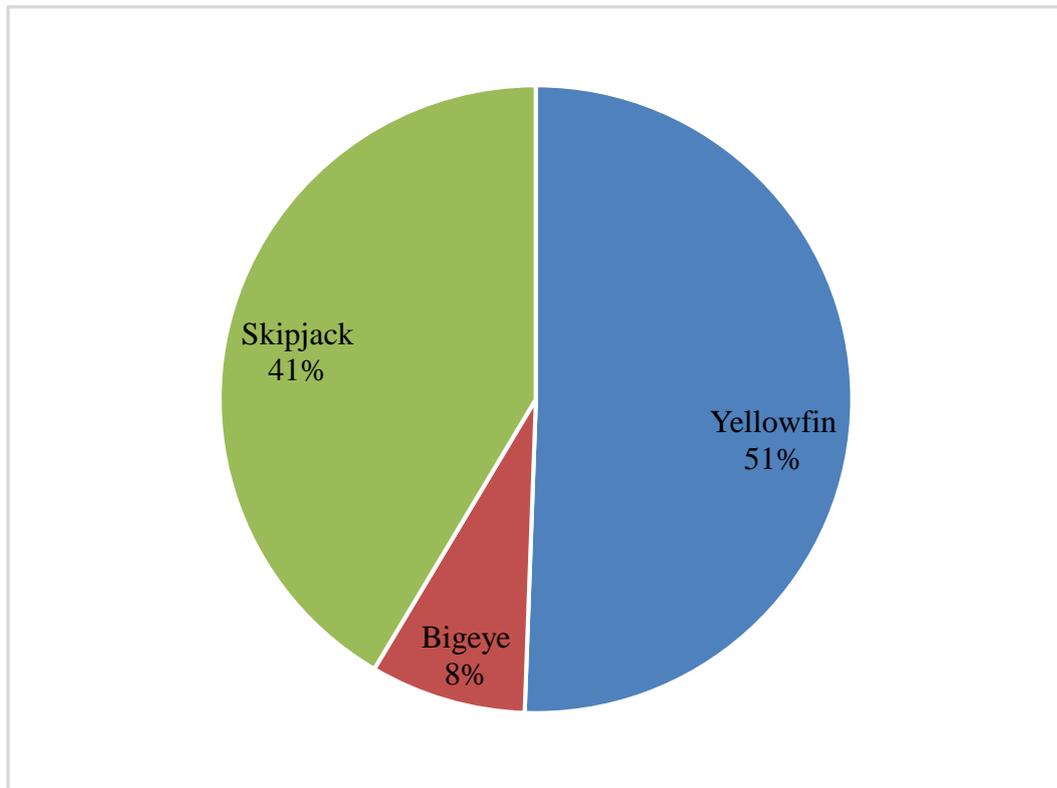


Figure 5: Species composition of the catch of purse seiners in 2018

An artisanal fishery around anchored Fish Aggregating devices (AFADS) exist since 1985. A number of anchored FADs are set at distances ranging from 2 to 12nm from the coast. There are approximately 350 fishermen that are registered to fish around the AFADs. In 2018, catch around the AFADs amounted to 252t. FAD fishery data is collected by enumerators posted at different landing stations around the island..

2. Data sources

(a) Logbooks

Data is being collected from the fishing logbooks since 2001. The main data source for local and foreign longliners and purse seiners comes from logbooks which record the daily activities of the vessels. The logbooks are collected from the master of fishing vessels by the officers of the Port State Control Unit when the vessels call at port. In case a Mauritius-flagged vessel lands at a foreign port, the logbook must be forwarded to the Competent Authority in Mauritius. The log information contained in the logbooks includes catch and effort (number of hooks/number of sets), fishing positions, hours at sea, sea temperature, association of tuna schools, wind and current direction and a

number of other information. The logbooks are collected on the arrival of vessels in port and a first verification is carried out by the fisheries inspectors at the Port State Control Unit (PSCU).

Data are collected from various sources to crosscheck for errors. For example, catch data collected through logbooks are cross-checked against reported landings obtained from Fisheries Inspectors based at the Port State Control Unit. The fisheries inspectors are empowered by law to carry out enforcement and surveillance according to fishing regulations. The inspectors play a very important role in verification of logbook data. Fisheries inspectors are also involved in data collection with respect to landings and transshipment of foreign vessels calling at Port Louis. The landings of licensed and non-licensed vessels are monitored daily and the landing data are recorded in Port Inspection Report (PIR). The PIRs are electronically transmitted to the IOTC Secretariat through the Electronic Reporting System (ePSM). Port Inspectors also monitor Landing or Transshipment (LAN/TRX) and the monitoring forms are transmitted to the IOTC.

Information on vessels characteristics, status of vessel with respect to IUU listing and relevant fishing authorisations are also collected by the port state inspectors. These data together with the corresponding landing data is converted in a computerized format using excel spreadsheet and regular reports on port callings and landings are generated based on the statistical requirements of concerned authorities. Moreover, the officers also interview the fishers in situations involving more complex questions.

(b) Register of tuna fishing vessels

Mauritius keeps a register of tuna fishing vessels authorised to fish in its EEZ. The licensing Unit of the ministry has a database of information derived from a register containing information on fishing vessels (number and type), companies, gear, licenses and individual fishers. Other variables, like vessel length or engine size, are also collected by the Licensing Unit through this registration system. Information on vessel and gear characteristics is regularly updated through the issuance and periodical renewal of licenses as fishing vessels are required to hold a valid fishing license to operate in the Exclusive Economic Zone (EEZ) of Mauritius. The licensing unit provides accurate information on the size and type of fishing fleet thus contributing to closer monitoring of fishing activities to ensure compliance with fishery regulations.

In 2018, a total of tuna 227 vessels were issued licences to fish in the Mauritius EEZ.

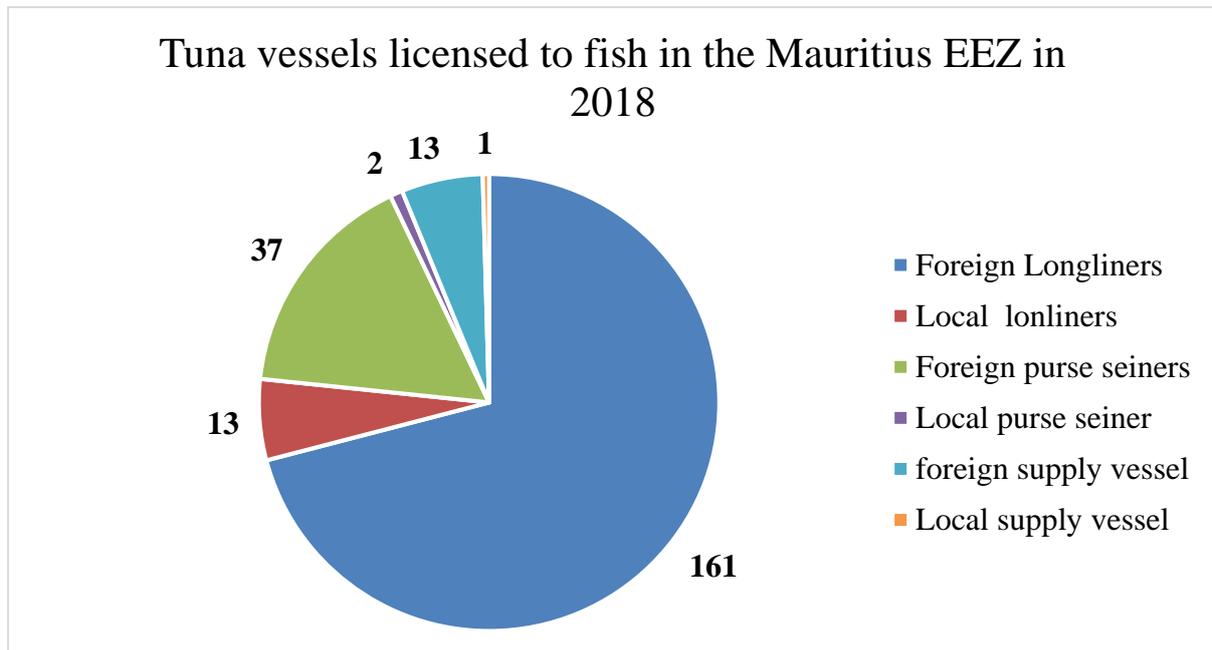


Figure 6: Number of Tuna fishing vessels licensed in 2018

(c) Sampling exercises:

Another source of data is from the sampling exercises which are conducted on the catch that are unloaded at the port. Sampling involves measuring the length (Fork length for tuna and Operculum to keel length for swordfish) and weight and noting the species composition. The data is then compiled and processed using the Excel spreadsheet for length frequency and length-weight analysis. A sampling form has been designed to record such variables as length, species, weight, name of vessel, etc. Sampling exercises are carried out on both local-flagged vessels and foreign vessels calling at Port Louis during transshipment and unloading. Table 1 shows the number and species of fish sampled by gear type.

Table 1. Number of individuals measured, by species and gear

| Species | Number of individual measured | | | |
|----------------|-------------------------------|------------------------|---------------|----------------------|
| | Longliners inside EEZ | Longliners outside EEZ | Purse seiners | Artisanal (handline) |
| Swordfish | 714 | 269 | 0 | 0 |
| Yellowfin tuna | 604 | 341 | 395 | 91 |
| Albacore tuna | 278 | 0 | 0 | 110 |
| Bigeye tuna | 263 | 152 | 68 | 0 |
| Skipjack tuna | 0 | 0 | 615 | 62 |
| Blue shark | 7 | 5 | 0 | 0 |
| Mako shark | 10 | 12 | 0 | 0 |
| Black Marlin | 5 | 5 | 0 | 0 |

| | | | | |
|----------------|---|---|---|---|
| Blue Marlin | 4 | 0 | 0 | 0 |
| Striped Marlin | 3 | 4 | 0 | 0 |
| Sailfish | 3 | 0 | 0 | 0 |

(d) Vessel Monitoring System

The Vessel Monitoring System (VMS) exists since 2005. The VMS network consists of a server which holds five workstations, out of which three are located at the Fisheries Monitoring Centre (FMC) and the remaining two at the National Coast Guard. The VMS network regularly receives information such as geographical positions of vessels, speed and corresponding date and time. A set of regulations was prescribed to provide the legal framework to support the VMS. All licensed fishing vessels are required to be equipped with the VMS system and to report to the FMC every two hours on fishing positions, speed and directions. 239 vessels were monitored during 2018.

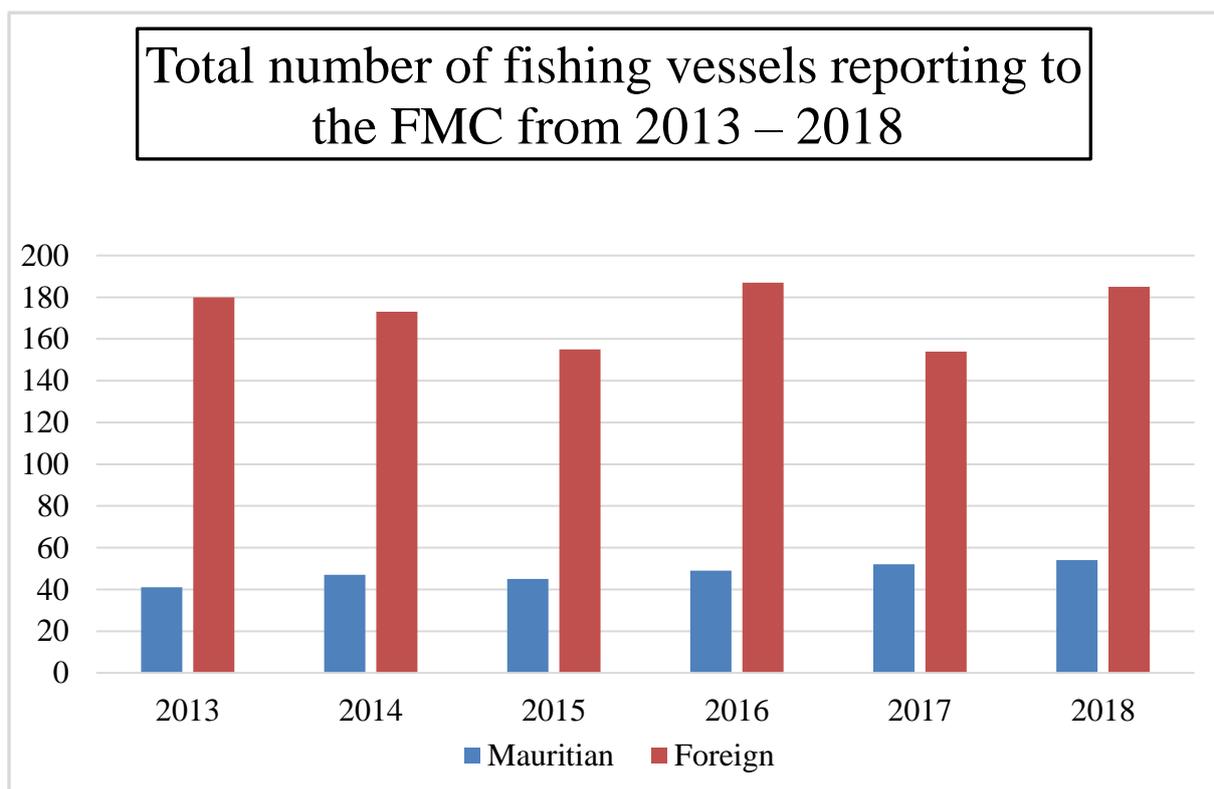


Figure 7: Number of vessels reporting to the Fisheries Monitoring Centre

(e) Observer reports:

Mauritius started its observer programme in 2015. 12 Observers were trained: 4 were trained under an SFA/Orthongel/IRD programme, 3 were

trained under an IOC (Indian Ocean Commission) programme and 5 were trained under a SWIOFP (Southwest Indian Ocean Fisheries Project) programme. Observers provide vessel detail and trip information, information on daily fishing activities relating to gears, FADs, number of sets, catch, species, by-catch and discards. They also observe and record incidental catch of marine mammals, sea turtle, seabirds and their release; The scientific observer does biological sampling of the catch to record weight/length frequency data. The deployment of the observers up to 2018 is as follows:

Table 2: Number of trips observed

| Year | Vessel | Number of trips observed |
|-------------|---------------|---------------------------------|
| 2015 | Purse seiners | 3 |
| 2016 | Purse seiners | 3 |
| 2017 | Purse seiners | 1 |
| 2018 | Purse seiners | 2 |
| | Longliners | 4 |

At present, the problems being faced regarding observers are: ageing of the observers, pool of trained observers is quite small, difficulty in obtaining training.

(f) Data collected by enumerators:

Data from the artisanal anchored FAD fishery is being collected by the enumerators working for the Coastal Fisheries Project. Data is collected by direct observation by the field staff enumerators (Fisheries Protection Officers). The enumerators record all landings made at the fish landing stations. The weights are noted. The number of landings and various parameters are recorded in a “daily catch assessment survey” form. Weight and length frequency data are also collected by officers of the Pelagic Fisheries Project.

There are sixty-one (61) fish landing stations operational around the island. These have been grouped into three regions/stratums i.e. North, East and

West for the processing of the landings and to produce catch estimates. The landing stations are selected at random.

(g) Transshipment data

Another source of data involving catch data is transshipment data. Mauritius has become a major transshipment hub due to its ideal geographic position and many vessels especially albacore targeting longliners uses its port for transshipment. In addition, one of the licence conditions requires all licensed longliners to unload their catch in the port of Mauritius. Transshipment data are obtained from the Mauritius Port Authority (MPA) and from vessels' agents. These two sets of data are then compared to ensure the viability of data. Hence we are able to monitor the amount and species of tuna and tuna-like species transhipped at Port Louis

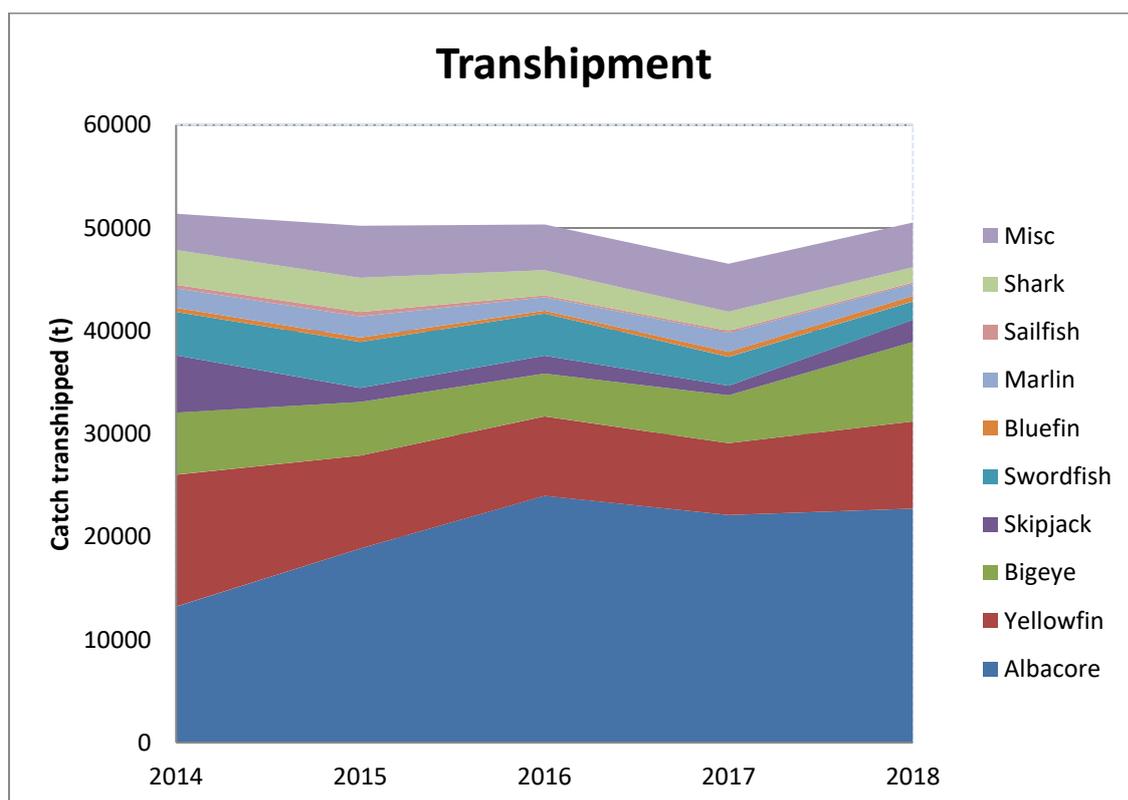


Figure 8: Species composition of fish Transhipped

3. Data Processing

For the time being logbook data is being input and processed using the Excel spreadsheet. Logbook catch and effort data which are estimated figures have to be corrected for estimation errors by comparison with actual landing data

recorded by the officers of the Port State Control Unit and from shipping agents. A correction factor is obtained by dividing the landed catch by the total catch from logbooks. This correction factor is then applied to the logbook data. Catch and effort statistics are then generated. Specific data sets are then prepared according to the demands of national, regional and international organizations. The Indian Ocean Tuna Commission (IOTC) has specific data submission requirements as per Resolution 15/02, involving various submission forms and deadlines. Mauritius is able to comply to the data requirements of the IOTC. All scientific data as per Resolution 15/02 are regularly submitted to the IOTC. Data is also submitted to the Statistics Department in Mauritius.

4. Developments in data collection and processing

(a) Introduction of the ePSM.

Mauritius has started using the electronic Port State Measures (ePSM) since 2016. This project was initiated by the IOTC. The e-PSM application is a web-based information system. The e-PSM application aims to collect, store, and report data, in order to assist the IOTC CPCs to implement the PSM resolutions. Data collected by port inspectors are input into the system and Port Inspection Reports (PIRs) are regularly transmitted to the Compliance Division of the IOTC. Monitoring of landing reports is also sent.

(b) Introduction of Electronic Reporting System.

Presently the European Union is assisting Mauritius in the implementation of an Electronic Reporting System (ERS). The system will allow the collection, storage, display and analysis of ERS data sent by European fishing vessels while they are conducting fishing operations inside the Mauritius EEZ. It will also allow the implementation of a National Electronic logbook for Mauritian purse seiners and establish a National Electronic Reporting System (national ERS).

(c) Development of a software for data input and analysis of Mauritius-flagged longliners and purse seiners.

Mauritius is the process of launching tenders for the development of a software for data reporting. The main aim of the project is to develop a software for data input and analysis for the purse seine, longline and artisanal tuna fishery so that the information, data and reports required by national, regional and international organizations such as the IOTC can be generated automatically from the database. The system will also enable the generation of graphs and maps showing spatial distribution.

(d) Participation in two IOTC programmes aiming at improving flag state implementation and compliance to Management measures.

Mauritius will participate in:

(i) programme of support to improve the implementation of IOTC management measures; and

(ii) the programme to strengthen the management of the Indian Ocean tuna fishery through improving flag State performance

Both programmes aim at improving the performance of the CPCs in relation to compliance to IOTC management measures, including improving the quality of the data and information submitted to the IOTC Secretariat.

References:

1. Data collection and Reporting system in Mauritius –IOTC- 2015- WPDCS 11-11
2. Tuna Data Collection and processing in Mauritius, D. Norungee and M. Munbodh (1999)
3. Development of an information system/web based application on poert state measures – feasibility report & technical specifications , s. Piredda and G.Pichenot