

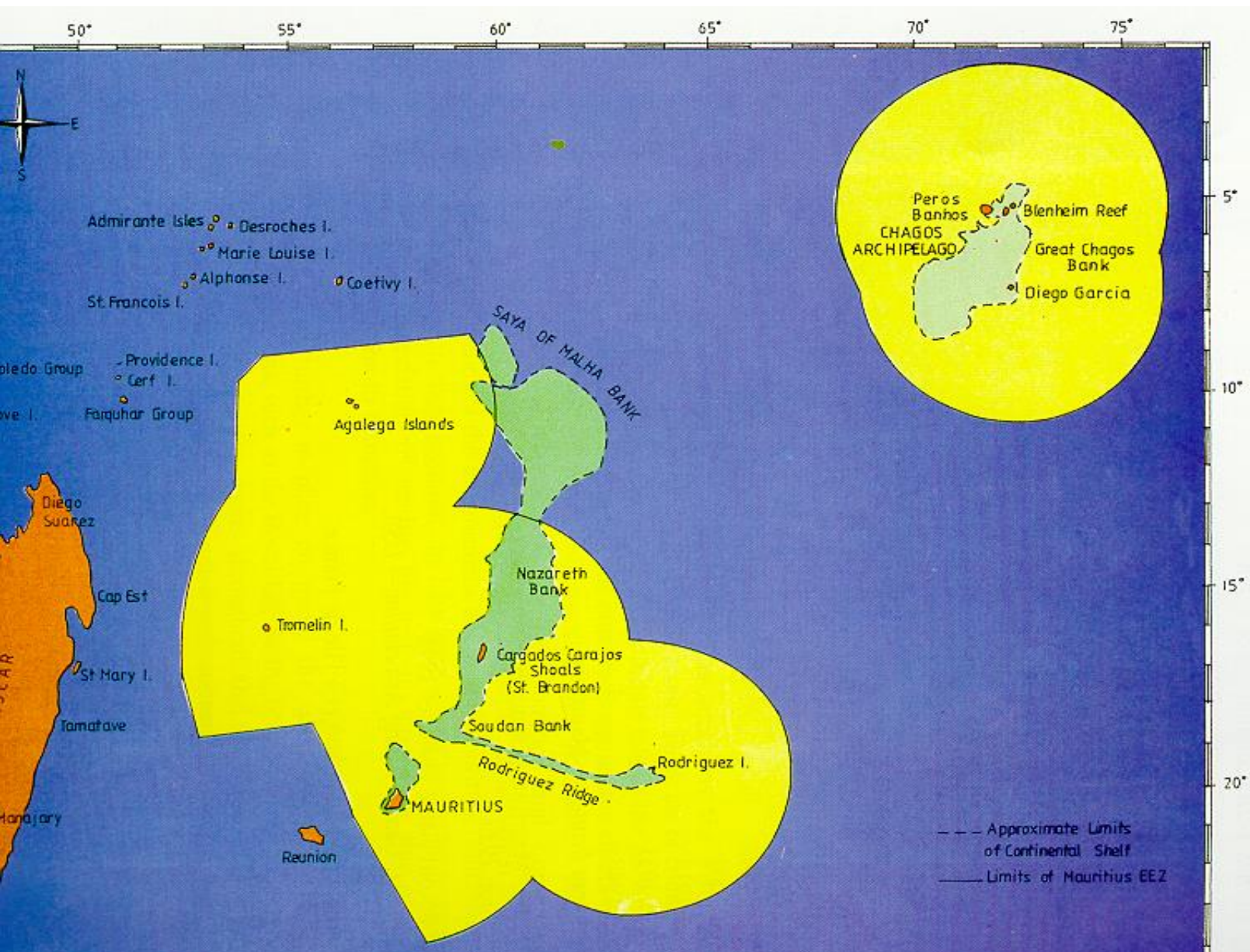
Working Party on Data collection and Statistics - Montpellier, France 2015**Data collection and Reporting System in Mauritius****Abstract**

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Tuna fishing in the waters of Mauritius are mainly practiced by foreign longliners (mostly Asian) and purse-seiners (mostly European) operating under fishing licence against payment of a licence fee. The local tuna fishery is relatively small as compared to the foreign tuna fishery with a local fleet consisting of 3 longliners (< 24 meters) and seven purse seiners. Every year the national database is updated by incorporating the catch and effort data obtained from logbook submitted by both local and foreign 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. The foreign longline fishery statistics collated by the Marine Resources Division (MRD) of the ministry are then integrated into one data set whereby the catch data are provided by species, effort (number of hooks), 5° latitude by 5° longitude rectangles (daily reported fishing positions were aggregated into a format of 5° latitude by 5° longitude rectangles) and month. The data set for foreign and local purse seine fisheries consists of catch data provided by species, effort (number of sets), 1° by 1° and month. The implementation of the observer programme on local purse seiners which started this year will provide key information on fishing activities in logbooks and assist with monitoring compliance. The MRD also undertakes regular sampling exercises on the catch of foreign and local vessels whereby the length (fork length for tuna and operculum to keel length for swordfish) and weight of fish are collected. The catches of the anchored FAD fishery (aFAD) which involves only small boats (7-8 meters) are not monitored by logbook program but through regular inspections conducted by fisheries protection officers at fish landing stations.

Introduction:

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. Mauritius is an important fish transshipment base in the South-West Indian Ocean. 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. Tuna fishing in the Western Indian Ocean is mainly practiced by distant water fishing fleets from Europe (purse-seiners and longliners) and countries of the East and South East Asia (longliners). All vessels licensed to fish in the EEZ of Mauritius are required to submit duly filled logbooks prior to unloading. The Mauritian tuna fishing fleet in 2014 was comprised of three semi-industrial longline fishing vessels less than 24 metres in length and seven purse seiners. A system has been designed for collection and analysis of data based on the different types of fishery, namely, the local semi-industrial longline fishery, the local purse seine fishery, the foreign longline fishery and the foreign purse sine fishery. The fisheries are monitored through the collection, processing and analysis of fishing data obtained through the logbooks submitted by the local and foreign licensed vessels. Data is also collected from vessels calling at Port Louis by the Port State Control Unit, from fishing companies representing foreign vessels calling at Port Louis and from the Mauritius Ports Authority.



THE MAURITIUS EEZ

1. Vessel Registration data.

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 static 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 knowledge on the size and type of fishing fleet thus contributing to closer monitoring of fishing activities to ensure compliance with fishery regulations. 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.

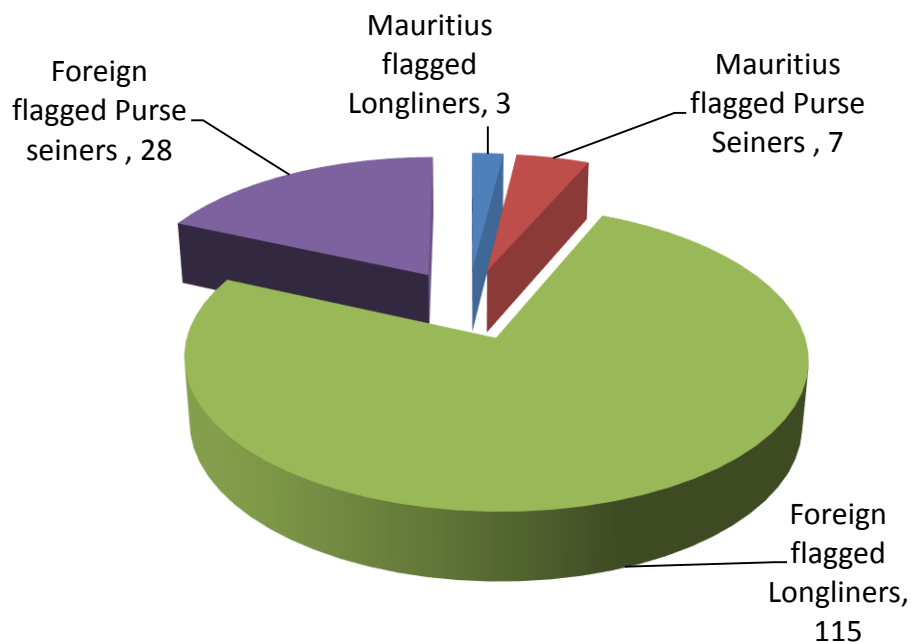


Figure 1: Number of Mauritian flagged and foreign flagged vessels operating in 2014.

2 Data collection through logbooks

The main data source for the data collection system for Mauritius comes mainly from harvest that is at the level where the fish is caught. Extremely dynamic variables, like catch and effort (number of hooks and number of sets) are obtained through daily records involving logsheets. The catch, effort and fishing positions are recorded in logbooks by both foreign and local fishing vessels and submitted to the port state control unit (PSCU) prior to unloading. The logbook

submitted are expected to contain detailed information on individual fishing operations, including fishing grounds, type and duration of operation, catch by species and other types of data relating to weather and sea conditions. As per license condition submission of logbook is mandatory and failure to submit logbook or submission of inaccurate or incomplete logbooks may entail penalties such as payment of a fine or the vessel may become ineligible for any future license.

The logbook data are compiled using excel spreadsheet and reports are prepared as per national and international data submission requirements using ARCGIS and SPSS softwares. The ARCGIS software imports data (fishing positions) from excel spreadsheets and plot these data on the Mauritius EEZ map. The grouping of variables (fishing position) is done through SPSS software, an important step during the processing of statistical report for 5° latitude by 5° longitude rectangles. The major drawback in the present data collection system of the fishery is the lack of appropriate software for the collection, analysis and management of raw data.

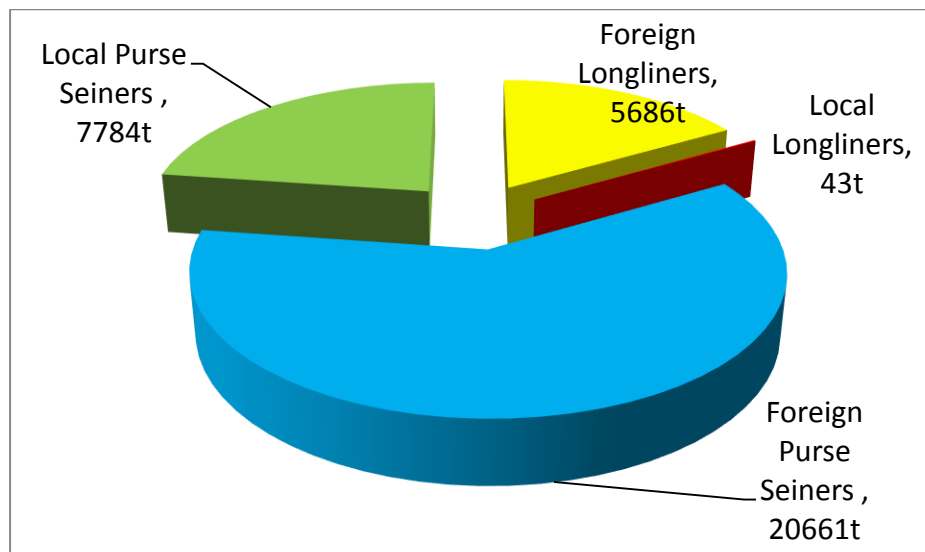


Figure 2: Catch of the local and foreign fleet (longline and purse seine) obtained from logbook for year 2014

The actual data collection system calls for major improvements that will allow, for example, easy extraction and visualisation of raw data, including size samples. Among others, the process of generating monthly spatially-aggregated catch, effort, and size data is not possible without

proper tools thereby affecting the monitoring of process of the fishery. At present, the software ARCGIS is being used to generate spatial distribution of catch and fishing effort as shown in figure 3.

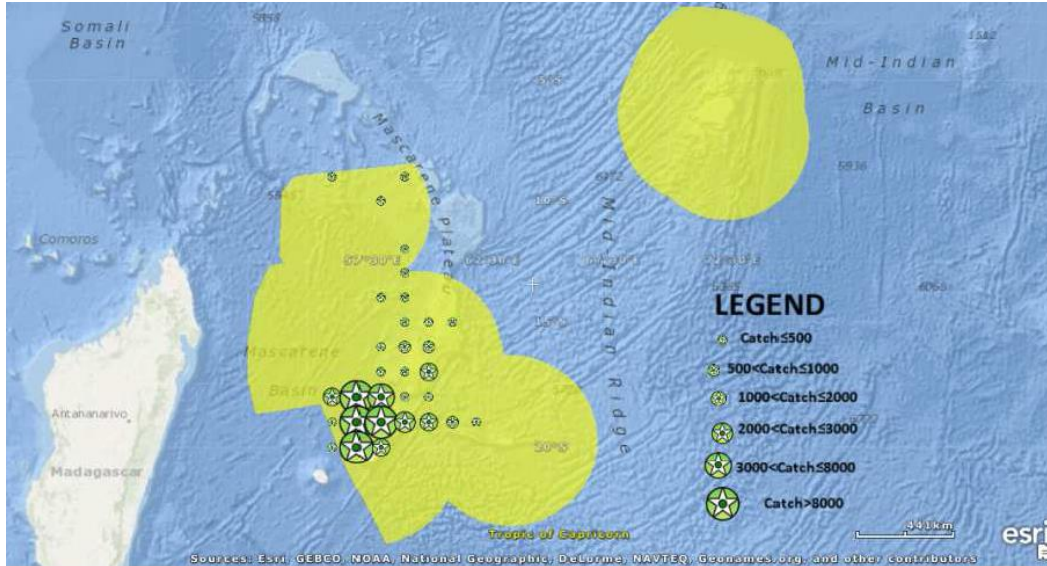


Figure 3: Map of distribution of fishing catch for the national longline fleet, in the IOTC area of competence (for the period 2010–2014).

3 Collection of sampling data

The sampling programme consist of data collection sheets designed accordingly to enable the recording of variables such as length frequency, species composition and weight data simultaneously, during unloading of catch form both foreign vessels and local boats. The vessels name and date of unloading is also recorded during sampling. Sampling exercises are carried out on the catch of tuna unloaded by licensed longliners and purse seiners. Fork length measurements and weight data are recorded for tunas while operculum to keel measurements and weight taken for swordfish that are unloaded by local longliners. After each sampling exercise, the recorded data are then input in excel spreadsheet and used for the generation of length frequency and regression analysis graphs.

4 Vessel Monitoring System database

The VMS network consists of a server which holds five workstations, out of which three are located at the Fisheries Monitoring Centre and the remaining two at the National Coast Guard. All licensed vessels are required to be equipped with a VMS transponder. The VMS units found on board fishing vessels are activated based on a two hourly reporting program thereby allowing the transmission of regular data reports consisting of position, speed and course by means of Inmarsat and Argos satellite-based tracking systems to the FMC. These data reports are stored in a database from which data pertaining to fishing positions, speed and course of any vessel for a particular period can be extracted as and when required. VMS is also used as a tool against illegal, unreported and unregulated (IUU) fishing. A register of vessels is also integrated in the software “Saffire” and the FMC updates this register as and when new fishing licences are issued.

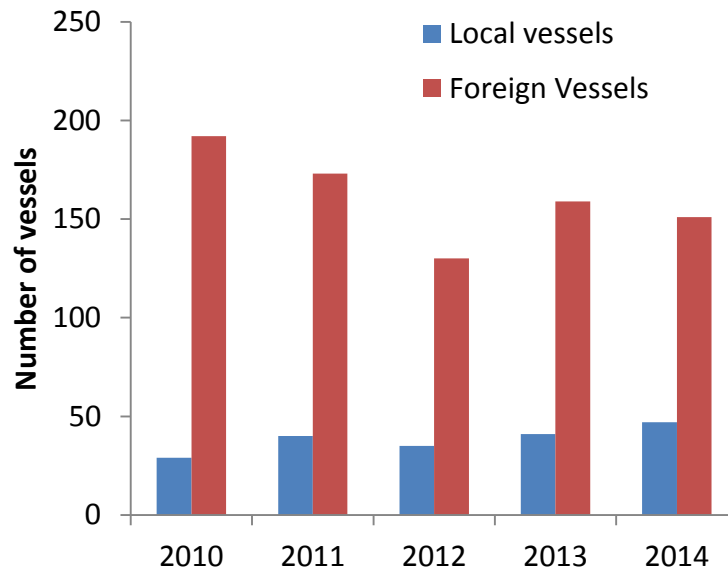


Figure 4: Number of local and foreign vessels reporting to the FMC (Year 2010-2014)

At present, remotely sensed position is being checked against recorded position allowing logsheet records to become more representative of real vessel activities at sea. This activity allows the identification of deliberate distortion of data, especially fishing ground and catch related information. However, since information on variables such as deployment of gear and catch is not provided by the satellite system we have to rely on logbooks and

observers/inspectors for such data. It is envisaged to seek support from fishing management organizations for the development of a programme that will allow the automatic transmission of information on fishing activities to databases through satellite communications.

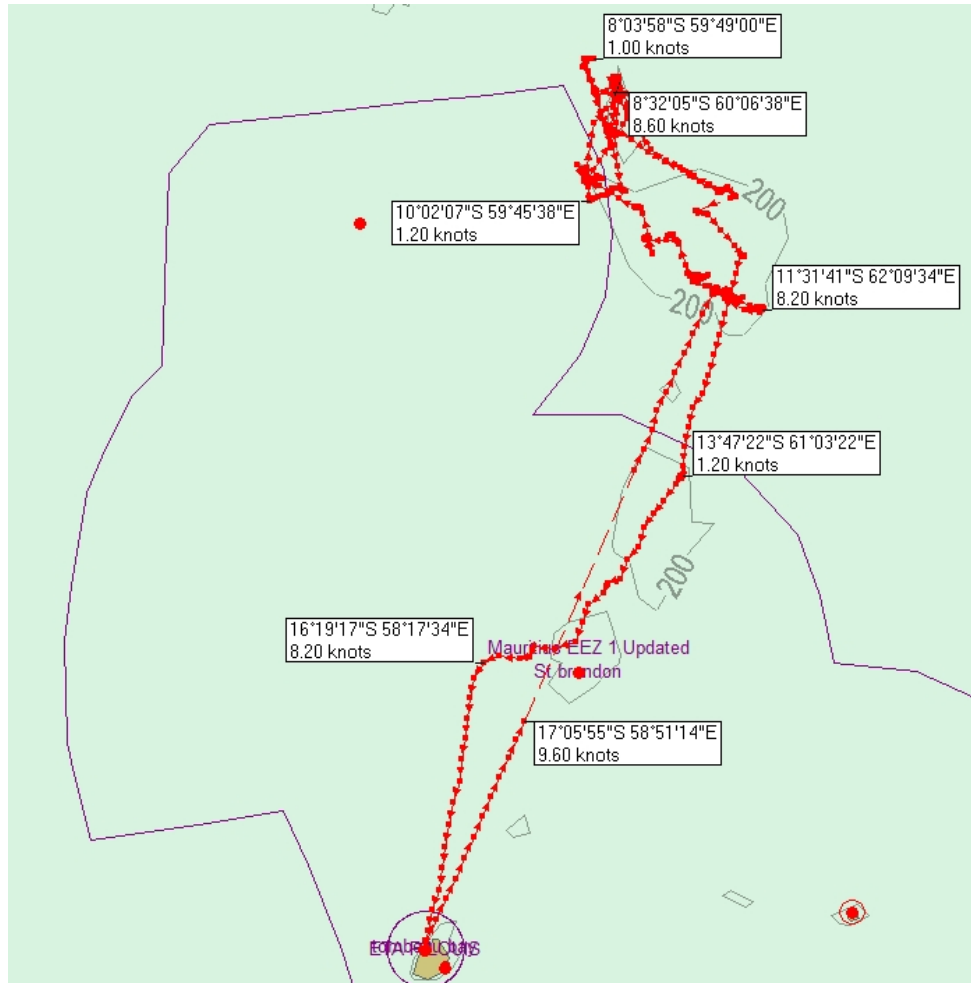


Figure 5: Fishing positions of a local vessel transmitted by the Immarsat satellite-based tracking system

5 Transshipment: Tangible source of data

Another source of data is transshipment data. Mauritius has become a major important 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, at species level, are obtained from the Mauritius Port Authority and from vessels' agents and

they constitute a more precise form of data as these are weighted. These two sets of data are then compared to ensure the viability of data provided by the vessels' agents. Processing of transshipment reports is much more reliable as compared to logbook data as the transshipment data are compiled by agents and are more accurate because actual landed catch are recorded by the Agents.

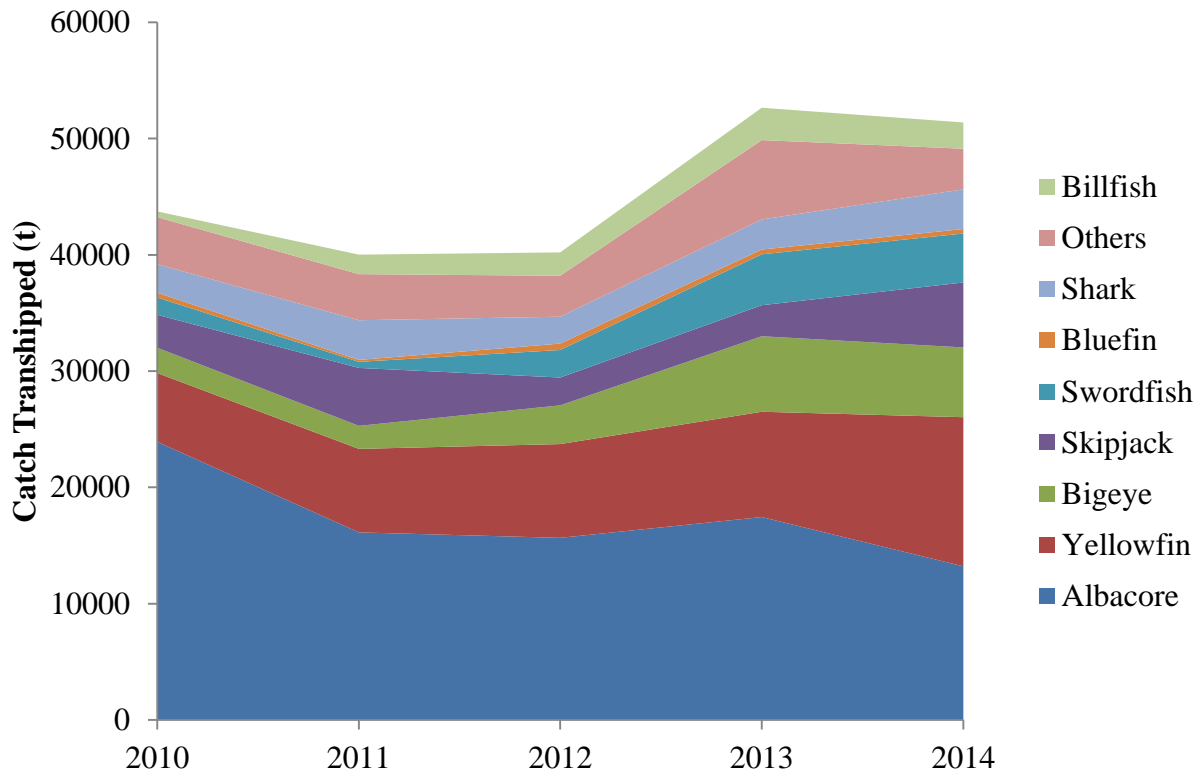


Figure 6: Species composition of fish transhipped (t) by licensed and non-licensed longliners and purse seiners from 2010-2014

6 Data collection by Inspectors and observers

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 fishing regulations. Fisheries inspectors are also involved in data collection with respect to landings and they play a very important role in verification of logbook data. The landings of licensed and non-licensed vessels are monitored

daily and the landing data are recorded in FAO Port State Measures Form A, B and C. 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 are 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, low literacy, language problem or little co-operations.

Mauritius has implemented its observer programme and a total of three observers have been deployed so far this year. A coverage 5 % of the total number of operation for the purse seine fleet is targeted. The observer ensures the proper recording and reporting of fishing activities. Data collection with regard to observations and estimation of catches is being carried out with a view to identify catch composition and monitoring discards, by catches and size frequency. In addition observer data is also being used to cross check entries made in logbooks.

7 Collection of Data from the anchored FAD fishery

Fish Aggregating Devices are anchored within distances ranging from 2 nautical miles to 12 nautical miles from the coast. These FADs are visited by approximately 380 fishermen engaged in this fishery. Catches are landed at prescribed fish landing stations scattered around the island. Data on FAD fishery is collected by enumerators include catch, species, gear and effort using random-based data collection system.,

8. Major shortcomings of the data collection system.

The actual system for the registry of vessels for different fisheries is very simple (excel spreadsheet) and deprived of effective data storage and processing mechanisms for complex data organization, storage and processing. For instance, the registry is deficient in terms of the ability to automatically indicate the inactivity of a particular vessel in cases where a fishing company has ceased fishing operations.

At present, the majority of data (logbook data, sampling data and landing data are input in spreadsheets and the latter are not flexible as relational databases. Moreover quality of data cannot be verified using spreadsheets and data entry in is prone to errors, thereby requiring a lot of cleaning effort. There is an urgent need for the development of a normalized database that

should be maintained and supported by database managers on a regular basis. Establishment of an efficient database will allow the coupling of mobile applications (phones and tablets) with online databases to ease data entry and verification of information by fisheries inspectors that work mostly at the port.

Also training is required for efficient data management through databases. Training should also focus on the methodology for standardization of reference data such as species names, geographic and regions, boat and gear types. This aspect is vital for comparisons and cross results thereby, enabling the officers to better analyse catch data.