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Acquisition of catch-and-effort and size data from sport fisheries in the Western Indian Ocean

Julian Pepperell[1], Shane Griffiths[1] and Nelly Kadagi[2]

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1.Pepperell Research & Consulting Pty Ltd
2. African Billfish Foundation

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Executive summary

Gaps in information on sport fishing catches of IOTC species have long been an issue affecting comprehensive data collection in the Indian Ocean. Some countries such as Mauritius and Kenya have reported sport fishing data periodically to the IOTC Secretariat in the past, while for others, no data has been reported, data may be misreported or catches are known to be underestimated (e.g., Seychelles, La Réunion, Mozambique, and Oman). In many cases, this is due to the non-mandatory nature of reporting of sport fishing catches, often exacerbated by lack of technical and physical resources within National Fisheries Institutions to gather the data.

A Project was developed in response to recommendations from the 9th IOTC Working Party on Billfish (WPB) [1], endorsed by the IOTC Scientific Committee, aimed at enhancing data recovery from sports and other recreational fisheries in the region by facilitating the acquisition of catch, effort and size data from sport fisheries, by developing and disseminating reporting forms to Sport Fishing Centres in the region.

Due to delays in securing funding, the Project commenced in August 2016, with the main objectives being to:

- Build technical capacity (data collection and reporting mechanisms) for National Fisheries Institutions in the context of sports/recreational fisheries.
- Strengthen IOTC's awareness of sport fisheries operations in the Western Indian Ocean.
- Improve the management of IOTC species in the Indian Ocean.

Four pilot countries were selected: Kenya, Seychelles, La Réunion and Mauritius. Each of the pilot countries were visited by two IOTC consultants (Dr Julian Pepperell and Ms. Nelly Kadagi (on behalf of the African Billfish Foundation)) in October/November 2016 to describe and document sport fishing activities, provide an appraisal of historic data collected by fisheries institutions or sport fishing operators in each county, and determine how improvements in the data collection and reporting of sports fishery data might be implemented.

Prior to the country visits, an extensive review was undertaken of a wide range of methods used for gathering catch, effort and size data from sport fisheries in many jurisdictions around the world. These were considered during the country visits in relation to likely available resources and constraints for application of specific methodologies.

Country visits

Kenya has a particularly long history of mainly charter boat sport fishing. Currently there are an estimated 40 charter boats operating along the coast, and a smaller number of private boats. All boats are required to hold licences of various forms. Clubs and charter operators have voluntarily reported catch data for many years, which has been regularly reported by the Kenyan Association of Sea Anglers (KASA). The Kenyan Fisheries Department has digitized this data from 1989 to 2011 and produced reports and analyses to IOTC for different species groups (including tunas, mackerels, and billfish) based on funding made available by the IOTC-OFCF Project[2]. The data have been reported to IOTC, but not necessarily as sport fishing, and reporting ceased after 2010. The

[1] IOTC-2011-WPB09-R, available at: http://www.iotc.org/documents/report-ninth-session-iotc-working-party-billfish
[2] Overseas Fishery Cooperation Foundation of Japan.

Kenyan-based African Billfish Foundation (ABF) issues conventional tags to fishers for tag and release of billfish. Currently, there are more than 55,000 tag records recorded in the ABF database, mostly for sailfish and marlins (three species) released in Kenyan waters.

The Seychelles also has a very active sportfish charter fishery that caters to tourist fishing, including the high international end of the market. It is estimated that about 40 charter boats operate on a full time basis, and that there are at least a further 50 privately own vessels capable of targeting IOTC species. There is one relatively large, active sport fishing club on Mahé that participates in an international billfish tagging program. The Ministry of Tourism licences sport fishing boats. The Seychelles Fishing Authority (SFA) collects some size data from club competitions, and is currently in the process of implementing a licence frame survey of all fishing sectors, including the offshore pelagic sector, that may be provide a basis for a general data collection system.

La Réunion has a very active sport fishing charter industry based primarily in Saint-Gilles-les-Bains, but also other ports. It was estimated that about 40 charter boats are active on the island, although that number may be considerably higher. Because they may sell their catch, sport fishing charter operators on La Réunion are classified as professional operators and hold European commercial fishing licences. They are required to complete daily logs that are submitted monthly. During the course of the Project it was ascertained that the data are, apparently, already reported to IOTC but as handline-troll gear, not sport fishing. In addition, IFREMER has analysed 12 years of self-collected catch and effort data from competitions held by one fishing club on the island (CRPPS). While there are many hundreds of private (non-professional) boats on La Réunion capable of fishing for IOTC species, catches by this sector have not been estimated. A single 'snapshot' survey of private boat owners is recommended, which would provide an order of magnitude data for this sector over a 12 month period.

Mauritius has a strong international reputation as a centre for offshore sport fishing, especially for billfish. There are an estimated 40-50 active sport fishing charter vessels on Mauritius, with some companies operating around four to five vessels each. The number of private sport fishing vessels fishing for IOTC species was estimated at around 50 to 60 vessels. Le Morne Anglers Club is the largest recreational fishing club on the island, catering for 350 members and operating several game fishing tournaments each year. All sport fishing boats must hold a licence from the Tourist Authority and charter operators are permitted to sell fish. The Mauritius Ministry of Fisheries (Albion Fisheries Research Centre) has also collected sport fishing data in previous years (i.e., from around 2007 to 2011) but the data collection ended due to a lack of resources.

Following the country visits, two preferred methods for data collection were identified: An electronic logbook to be used by the sport fishing charter sectors, and a snapshot survey of owners of private vessels covering a 12 month period. The Project focused primarily on the design of the new logbook.

Electronic logbook

The logbook was designed in conjunction with the IOTC Secretariat. It is a macro-enabled Microsoft Excel file (.xlsm), which includes automated functions embedded within the file that assist the user in completing data entry. Entries are made for each fishing trip (day or part thereof) and the file is designed to be submitted to a National Fisheries officer each month, where the data

are extracted and stored in a secure Microsoft Access 'national database' within each country. Functionality is also provided to extract the data in a pre-defined format for submission to the IOTC Secretariat. Data entry is performed by key strokes, or by selecting from pre-defined responses in drop-down menus. The logbook and national database has undergone extensive testing on both Mac and PC platforms using Windows XP, 7 and 10.

A detailed manual has been written to accompany the logbook, from initial recording of catch data to compilation, error checking and export of data to National Fisheries and formal submission of data to IOTC (see Appendix I). At each step the manual provides a screen shot and an explanation of options for completing each field. Fishers may also complete the logbook in paper form, in which case, National Fisheries officers would transfer the data to the electronic form.

Training

A package of training materials were designed for in-country presentation to both National Fisheries personnel and sport fishing charter operators. For National Fisheries personnel, the training modules outline the background, aims and purpose of the Project, the electronic logbook and how data are compiled and exported from the logbook to National Fisheries Access databases, and ultimately submitted to the IOTC. For sport fishing charter operators, the training modules also outline the background, aims and purpose of the Project and step-by-step details of how to complete the log sheets and submit the data (e.g. at the end of each month).

A second round of country visits to the four pilot countries was undertaken between 13 August and 8 September 2017 to deliver the training packages and also to seek feedback from fisheries personnel and charter operators on the log design and the likelihood of adopting its use by the sport fishery sector in each country. Similar to the first round of visits, there was a general willingness among sport fishing charter operators in each of the pilot countries to provide daily catch data, and by National Fisheries Institutions to collect and enter the data. Each jurisdiction offered suggestions for possible changes to the log sheet, in particular for single pages per fishing trip. There was support for at least a trial of the charter logbook in three countries (Kenya, Seychelles and Mauritius) and by tournament organizers in La Réunion.

A series of recommendations was formulated, including:

- Trial the logbook in the Seychelles, Mauritius and Kenya. Provide both paper and electronic logs to a small cross section of the charter fisheries in each country (5 to 10 boats in each) and run the trial for 3 to 6 months.
- For La Réunion, following a feasibility study, conduct a snapshot survey of the non-professional, non-club fishing population to obtain a point estimate of the catch and effort of pelagic fish by that potentially large sector.
- If deemed successful, instigate a second phase of the Project by rolling out the system to other IOTC member countries with active pelagic sport fisheries.

All outputs from the Project, including the full report, training modules, electronic logbook, National Sport fishing database and user manual will form a package of materials that the Secretariat and pilot countries can use (and re-use in the case of additional countries interested in adopting a similar approach to collecting sports fishery data).

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Introduction

Background to the Project

The Indian Ocean Tuna Commission (IOTC) is an intergovernmental Regional Fisheries Management Organisation (RFMO) responsible for the management of tunas and tuna-like species in the Indian Ocean and adjacent seas under the *Agreement for the Establishment of the Indian Ocean Tuna Commission* that was entered into force in 1996. The principal objective of the IOTC, as defined in Article V of the Agreement, is to ensure "… through appropriate management, the conservation and optimum utilization of stocks covered by this Agreement and encouraging sustainable development of fisheries based on such stocks" (FAO, 1993). To achieve this objective, reliable information is required relating to the exploitation of fish stocks by all resource users, including commercial, artisanal and recreational sectors.

Recreational fishing (hereafter termed sport fishing) in particular, has generally received little attention in the assessment and management of tunas and billfish stocks managed by tuna RFMOs, including the IOTC. In comparison to the commercial fishery, sport fishing vessels have limited gear deployment capabilities and fish storage capacity and historically have been restricted to predominately coastal waters that are on the fringes of the distribution of most pelagic species. Consequently, sport fishing has been presumed to have a negligible impact on the stocks of commercially important tunas and billfishes caught by industrial vessels on the high seas (Griffiths and Fay, 2015).

However, over the past decade sport fishing has become an increasingly important component of global fisheries, with an estimated 11% of the population of industrialised countries participating in the activity (Arlinghaus et al., 2015). Once considered a benign coastal leisure activity, sport fishing has manifested into a specialised and sophisticated fishery that has directed increasing fishing effort towards many species that have traditionally been targeted by commercial fisheries on the high seas, such as broadbill swordfish, *Xiphias gladius* (Vojkovich and Barsky, 1998) and southern bluefin tuna, *Thunnus maccoyii* (Green et al., 2012). The expansion of the fishery has largely been facilitated by increases in the sophistication, affordability and availability of navigation (e.g. GPS), searching (e.g. sonar, bird radar) and tackle (e.g. electric reels, braided lines) technologies (McPhee et al., 2002; Cooke and Schramm, 2007; Griffiths et al., 2010c).

In the IOTC area of competence, there are numerous recreational fisheries that target species that are the responsibility of the IOTC including several species of tuna, billfish, and seerfish. The primary recreationally important IOTC species caught in the Indian Ocean are black marlin, blue marlin and striped marlin, Indo-Pacific sailfish, yellowfin tuna, skipjack tuna, kawakawa and longtail tuna, and in some locales, southern bluefin tuna, which are targeted in several countries throughout the IOTC area such as Kenya (Ndegwa and Herrera, 2011; Ndegwa and Kiilu, 2013; Ndegwa and Kirathe, 2015), Mozambique (Mutombene, 2013), La Réunion (Fleury et al., 2012) and India (Kar et al., 2015). In order for IOTC fishery managers to reliably assess the biological status of fish stocks and to manage fishery resources sustainably and to share resources equitably among stakeholders, it is important for the recreational fishery to be included in stock assessments as a mortality source. Griffiths and Fay (2015) recently showed that ignoring the recreational catch in a stock assessment of striped marlin in the Western Pacific Ocean would result in a significant overestimation of the total allowable catch (TAC) if the recreational catch was just 10% of the

commercial catch. The overestimate was Projected to worsen if the age structure of the recreational fishery was skewed towards older (i.e. trophy) fish in the population, which is often the case in recreational fisheries (Shiffman et al., 2014).

Unfortunately, collecting reliable recreational catch, effort and size frequency data for stock assessment is expensive, and logistically and statistically complex (Griffiths et al., 2010a). Stock assessment models are often driven by time series of commercial catch and effort data, which are routinely collected via compulsory logbooks and in some cases validated by on-board scientific observers as a requirement under conditions of their fishing licence. In contrast, recreational fishers are generally not required to report catch or effort, or in some cases even hold a licence to fish. As a consequence, fishery agencies requiring information on recreational fishing need to undertake customised surveys to obtain self-reported data with the cooperation from fishers (Griffiths et al., 2014). However, the often highly heterogeneous spatio-temporal distribution of recreational fishing effort and the existence of enormous numbers of access points to most fisheries (e.g. boat launching ramps, marinas, private moorings) makes intercepting fishers throughout the large managed area of tuna RMFOs to gather trip-specific data overly expensive and resource intensive using traditional on-site survey methods, relative to the importance of catches from recreational fishing. Therefore, alternative cost-effective approaches are required to collect recreational fisheries data that is compatible with existing stock assessment frameworks.

Need

Under the IOTC Agreement, the IOTC has a responsibility to ensure the long-term sustainability of 16 tuna and tuna-like species and their equitable allocation among resource users. Despite the continual growth and increasing efficiency of the recreational fishery over the past decade, this fishery has not been included as a potential mortality source in the most recent Indian Ocean stock assessments for the principal billfish species under the mandate of IOTC (i.e. striped marlin (Nishida, 2015), blue marlin (Wang and Huang, 2016), black marlin (Yokoi and Nishida, 2016), swordfish (Sharma and Herrera, 2014a), and Indo-Pacific sailfish (Andrade, 2015)), and also principal tuna species (yellowfin tuna (Langley et al., 2012), bigeye tuna (Langley, 2016), skipjack (Sharma and Herrera, 2014b) and albacore (Langley and Hoyle, 2016)).

Anecdotal evidence and limited survey data from national fisheries agencies indicate that striped marlin, blue marlin, black marlin and Indo-Pacific sailfish are important billfish species of the recreational fishery in Kenya (Ndegwa and Kirathe, 2015) and most likely several other neighbouring countries in the Indian Ocean. However, national level catch estimates for these species is lacking. This is a major concern given the recent status of billfish stocks in the Indian Ocean derived from stock assessments – that do not include fishing mortality from the recreational fishery – indicate they are overfished, overfishing currently occurring, or both. Striped and black marlin are currently most at risk of becoming unsustainable under current fishing effort with these stocks both being overfished and subjected to overfishing (Nishida, 2015; Yokoi and Nishida, 2016). Blue marlin has also become a concern for managers with a 2016 stock assessment revealing that overfishing is occurring in the Indian Ocean stock, but is currently not overfished (Wang and Huang, 2016). A preliminary stock assessment of Indo-Pacific sailfish showed the stock may be sustainable, however, significant uncertainty in commercial catches and biological parameters suggest that this species may also be overfished (Andrade, 2015).

In order for fishery managers to fulfil their obligations under the IOTC Agreement to ensure the sustainability of stocks, reliable stock assessments are required from which effective management measures can be based. Available evidence suggests that recreational fishing may potentially have a significant impact on the Indian Ocean stocks of tunas and billfish. Consequently, reliable data needs to be collected that is representative of the recreational fisheries in each country where the activity is undertaken. Not only will this improve the realism of stock assessments and improve the reliability of model outcomes, but it will also guide managers how recreational fisheries may be managed within the current IOTC management framework.

The IOTC has in the past, and does receive some sport fishing catch data from some member countries but the data vary considerably in their robustness and there are many gaps. Kenya has reported some data between 1987 and 2010 and Mauritius reported some data from 2007 to 2011, but both have ceased since then. For a number of key countries potentially important for sport fisheries, data are either underestimated, misreported or unreported. These include Seychelles, La Réunion, Mozambique and Oman.

Such gaps result from many causes including technical and/or resourcing issues such as lack of data collection and reporting systems by National Fisheries Institutions targeting sport fisheries, no frame surveys for boat operators and lack of enumerators or fisheries officers to compile catch data. Another important factor mitigating against routine collection of data from sport fisheries is that reporting such data is not mandatory in most, if not all jurisdictions.

The current the Project was developed in response to recommendations from the 9th IOTC Working Party on Billfish (endorsed by the IOTC Scientific Committee) in 2011:

WPB09.25 (para. 70): *The WPB **RECOMMENDED** that the IOTC Secretariat develop a Project aimed at enhancing data recovery from sports and other recreational fisheries in the region, in collaboration with Kenya and other interested parties, and to report progress at the next WPB meeting.*

WPB09.27 (para. 73): *The WPB **RECOMMENDED**…the IOTC Secretariat, participating billfish foundations and other interested parties, facilitate the acquisition of catch-and-effort and size data from sport fisheries, by developing and disseminating reporting forms to Sport Fishing Centres in the region and to report back to the WPB at its meeting in 2012.*

Aims

1. Develop a directory of sport fishing centres in the western Indian Ocean region (developing CPCs west of India: east Africa, Middle-East), including contact persons, emails and telephone numbers.

2. Develop and disseminate a database, using access or any other user-friendly software, and standardised recording and reporting forms adapted to Sport Fishing Centres in the western Indian Ocean region.

3. Implement and deliver the training materials to Sports Fishing Centers, national fisheries agencies, and any other relevant organisations.

4. Support the development of a network of Sport Fishing Centres, national fisheries agencies, IOTC scientists, and any other relevant organisations, so that they may improve their own outreach and awareness campaigns, in addition to data collection, management, exchange and analysis.

5. To document the work undertaken and to provide a draft report to the IOTC Secretariat no later than 6 months after the commencement of the Project.

6. To develop a presentation of the results for a third party to describe the work undertaken and the results to the next IOTC Working Party on Billfish.

Methodology

Existing information

A review of data collection methods in recreational (sport) fisheries around the world was undertaken. This covered the full range of methodologies used for gathering catch and effort data from sport fisheries, ranging from large scale (state, national) population surveys of sport fishing to specialized methodologies used in subsectors of the overall sport fishing sector, including sport fishing for pelagic oceanic fishes. With this information as background, four countries in the Western Indian Ocean were selected with a view to selecting the most suitable method(s) that might be used for collection of catch, effort and size data from sport fisheries in those locations.

Countries selected

Four countries were selected as pilots for the Project: Kenya, Mauritius, La Réunion and Seychelles. Selection of the pilot countries was based on the importance of sports fisheries amongst IOTC members, current data gaps in the IOTC database, and also logistical issues (e.g., geographic proximity, and limited time and funds available for the Project). Expanding the rollout of the charter logbook and national database to more countries could be a possibility if a second phase of the Project is approved based on an identified need by IOTC members.

Species

The species of focus of this Project are the 16 tuna and tuna-like species directly under the mandate of IOTC:

- ***Billfish***: Swordfish, striped marlin, black marlin, Indo-pacific sailfish, Indo-pacific blue marlin.
- ***Tropical and temperate tunas***: Albacore, bigeye tuna, yellowfin tuna, skipjack tuna, southern bluefin tuna.
- ***Neritic tunas***: Longtail tuna, kawakawa, bullet tuna, frigate tuna.
- ***Seerfish***: Narrow barred Spanish mackerel, Indo-pacific king mackerel.

All of these species are caught by sport fisheries in at least some IOTC countries. Because of the particular importance of billfish as target species for sport fishers, data on catches of billfish are a particular focus of this Project. Similarly, neritic tunas are also a particular focus of the Project. Striped marlin has been recently assessed as being overfished and in the process of overfishing in the Indian Ocean, so it is important to document as much data on this species as possible.

Preliminary contacting of key personnel

Prior to the country visits, letters were sent by the IOTC Secretariat to the National Fisheries Institutions of each of the four countries introducing the consultants, outlining the aims of the Project and detailing itineraries of country visits. The consultants also made contact with the sport fishing community in each country and arranged meetings with representatives.

First round of country visits

The four selected countries were visited by two consultants between 18 October and 6 November 2016. In Seychelles, La Réunion and Mauritius, all of the main ports, marinas and locations for sport fishing activities were visited in order to familiarise the consultants with the number of sport

fishing vessels (charter and private), the general size of vessels, standard of fishing gear and equipment, club structure, tournament schedules and so on. Due to the length of the coastline of Kenya, the sport fishing fact-finding part of the trip concentrated on the towns of Malindi and Watamu where at least 80% of that county's sport fishing fleet is concentrated. At each location, opportunities were taken to observe some catches by sport fishing vessels, either from charter operations or in one case (Kenya), during a small tournament.

Formal meetings were also held with staff of the National Fisheries Institutes of Kenya (in Mombasa), Seychelles and Mauritius. Timing of the visit to La Réunion included a weekend and a public holiday, negating a formal meeting there. However, an informal meeting was held with two members of the scientific staff of IFREMER. At these meetings, information was gathered on current Government regulations, data collection and management arrangements for sport fishing.

In each country, operators of sport fishing charter boats were interviewed to obtain information on such factors as the size of the fleet, frequency of fishing, target species, some estimates of catches over time and willingness to participate in a standardized logbook program. In the case of La Réunion, it was understood that operators of sport fishing charter vessels are classified as professional fishers, however for consistency, this subsector was treated as an equivalent fishery to the sport fishing charter fleets of the other three countries. Meetings were also held with representatives of sport fishing clubs in all four countries to obtain information on their structures and historic data collection, if any.

While in the Seychelles, several meetings were held with IOTC Secretariat staff regarding the overall Project and in particular, the requirements for any future sport fishing data to be error checked and integrated with the IOTC database.

Designing the charter logbook

Having determined that a standardized daily logbook system for data collection would be the best option for all countries, a logsheet was designed to incorporate all required fields. The log sheet interface, which can be used in paper form, or electronically, was based on a number of existing charter logbooks, including forms used in La Réunion by sport fishing charter operators that allow daily catch and effort data to be entered for eight separate fishing days, or part thereof. Considerable programming ensured that electronically entered data can be readily error-checked, transferred to National Fisheries Institutions' own Access database and submitted to IOTC annually, or more frequently, in the desired format. A detailed manual for data entry and transferring of data to the IOTC database was developed as part of the design of the logbook (see Appendix I).

Training and second round of country visits

Following the design of the log sheets and testing on different platforms, training packages were designed to be delivered to National Fisheries Institution staff, and to operators of sport fishing charter boats in each of the four countries. The packages consisted of five PowerPoint modules – (i.) Introductory and a Logbook module for sport fishing operators, and (ii.) Introductory, Logbook and compilation and exporting of data modules for National Fisheries Institutions. In each case, country-specific modules were designed. The detailed manual for logbook data entry and compiling and exporting of data was also included as part of the training packages.

The second round of country visits was undertaken between 13 August and 8 September 2017. The primary purpose of the visits was to deliver the training packages but the opportunity was also taken to confirm information collected on the first round of visits, and to assess willingness to:

i. Complete the logsheets by sport fishing operators, either in paper form or electronically;
ii. Undertake training in data entry, data compilation and exporting activities by National Fisheries Institutions.

Results

Country reports

The following reports are based on the first round of visits to each of the pilot countries in October-November 2016 by the IOTC Project consultants, Dr Julian Pepperell and Ms Nelly Kadagi (African Billfish Foundation). Meetings were arranged with Government personnel and representatives of the sport fishing community in each location.

Kenya

Sport fishing using primarily charter boats has a particularly long history in Kenya, extending from at least the 1950s (Williams, 1970). Of the four countries visited, Kenya has the longest history in active sport fishing, primarily by a fleet of well-equipped charter vessels along the coast. The fishery is well organized, with clubs and charter captains belonging to the Kenya Association of Sea Anglers (KASA) – formerly the Kenya Association of Sea Angling Clubs. This organization is currently reconstructing itself, but sport fishing captains periodically share their records and information on catches with the Watamu Sea Fishing Club which is voluntarily run by Captain Andy's Fishing Supply. KASA has maintained catch statistics from the main fishing centres for several decades as well as keeping a comprehensive list of Kenyan fishing records for many species of pelagic sports fish for all recognized line classes from 1 kg to 60 kg breaking strain, for both women and men.

In the past, tourist sport fishing has been regarded as having a positive impact on the coastal economy of the main centres, perhaps well illustrated by the logo of Kilifi County which depicts two billfish on either side of symbols of the natural resources of the region.

Main ports/locations for sport fishing

Watamu: A small fleet of charter vessels moors behind the fringing reef off 'Ocean Sports', a resort housing a large central bar/restaurant near the town of Watamu. The venue is an informal regular meeting place of sport fishing captains, crew and anglers. Captain Andy's Fishing Supply shop adjoins the resort; charter boats (and some private) have moorings inside a barrier reef (parallel to shore). Sport fishing boats are modern and well equipped, with designs that have evolved to suit the conditions (some, for example are twin hulled, providing stability in choppy seas).

The African Billfish Foundation (ABF) is a private organization that has operated a large pelagic fish tagging program since the 1980s. The ABF mainly collects data on billfish that are tagged and released across the East African Indian Ocean waters, as well as reported billfish recaptures. ABF is also based in Watamu and has taken advantage of the opportunity to regularly contact and interact with the sport fishing captains and crews at Ocean Sports.

Malindi: The Malindi Sea Fishing Club is a private clubhouse with a weighing gantry and access to the beach and to charter vessels at anchor behind the coastal reef. The club has a long history dating back to the early 1950s, and runs several annual local and international tournaments.

This is the primary club from which the Kenya State Department of Fisheries (now the Kenya Ministry of Agriculture, Livestock and Fisheries) has extracted records of fishing trips dating back to 1987 (see below).

At the time of the consultancy, it was agreed by charter operators that 80-85% of Kenyan charter boats are presently concentrated in Malinidi and Watamu. Other locations from which small numbers of charter boats still operate are Shimoni, Diani, Kilifi, Mtwapa/Mombasa and Lamu.

Sizes of fleets (charter, private)

Estimates from charter captains of the number of active charter boats varied a little, but it was generally agreed that there were about 40 charter boats actively fishing for tuna and billfish on the Kenyan coast. This was supported by the Kenya Department of Fisheries licensing records which indicated 42 charter boats registered in 2011.

Regarding private boats that actively fish for tuna and billfish, it was generally agreed that the number was quite small, and definitely less than the charter fleet. Several estimates put the figure at about 20 private boats.

Number of days fished per year (charter)

The number of days fished per year varies among charter operators, ranging from about 175 days to about 75 days per year. One operator estimated that before the tourism downturn in recent years, most of the fleet would fish for at least 180 days per year but most were now down to perhaps half that, on average.

Seasons

Fishing can be undertaken year-round, but the charter businesses close down from the start of the monsoon season – around mid-March/early April, to mid-July – although some boats may resume fishing in early July to target black marlin and blue marlin.

Tournaments

Regular tournaments are mainly held from both Watamu and Malindi with other clubs also hosting other tournaments. During the consultants' visit, a small tournament fished by eight charter boats was held at the Malindi Sea Anglers Club. A local fishing operator with a long history of fishing in the area was present at the tournament recording the weights of each fish weighed, who has performed this task for his own records for many years and which would potentially be a secondary source of data from Malindi tournaments.

Management and licensing

All sport fishing charter boats are required to hold a tourist licence, a fisheries licence (which does not allow for commercial exploitation of catches) and for larger boats, a maritime boat inspection licence. Private boats fishing for any species, including pelagic sport fish, must also have a fishing licence issued by the Kenya Ministry of Agriculture, Livestock and Fisheries.

Historic and current catch data

In previous years two non-government programs in Kenya have collected data from the Kenyan sport fishing charter fleet:

i.) Kenya Association of Sea Anglers (KASA)

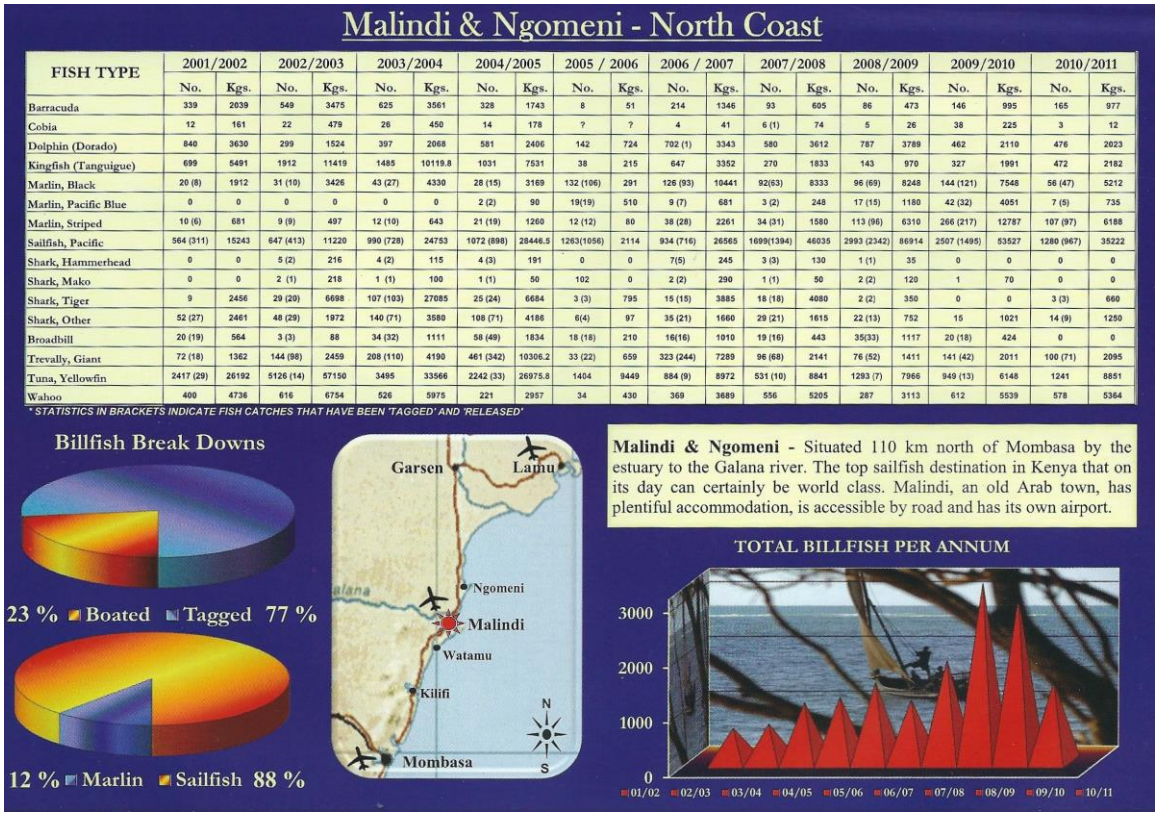
The KASA collected and collated catch and effort data from member clubs from the early 1980s up to 2014 when the Association cut back most of its activities due to a reduction in the number of memberships. The KASA published its own annual report containing some of these data between the early-1980s until the late 1990s, in an annual magazine titled 'Rainbow Runner'. The last issue or Rainbow Runner was published in 2014 and there are concerns among the sport fishing charter operators regarding the discontinuance of this long-term recording.

The published data are derived from individual sport fishing charter operators who recorded their daily catches in notebooks held at central locations in each area. For example, a notebook has been keep at Captain Andy's Fishing Supply tackle store adjacent to Ocean Sports for many years, and most if not all operators fill in simple catch and effort data there. One person with some computer skills then entered the data electronically from which the published tables in the annual Rainbow Runner magazine were derived. The published data are in the form of annual catches by species aggregated by number and weight of landed fish by coastal region. Numbers tagged are also usually included. Various graphics showing such data as seasonal catch rates by region, species composition of the catch and so on are also included in the annual reports.

The main target species are billfish, with sailfish historically caught in large numbers, followed by striped marlin, then black marlin, swordfish and blue marlin in smaller numbers. Other species caught in numbers include dolphinfish, yellowfin tuna, narrow-barred Spanish mackerel (called 'kingfish') (*Scomberomorus commerson*), giant trevally, wahoo and various sharks.

This continuous record of catch and effort dates back to at least 1985, quite possibly to the early 1980s. However, for a range of reasons, the collection and consolidation of data has fallen away in recent years. Fortunately, the African Billfish Foundation (ABF) is currently planning to take over the role of collecting and collating the same series of catch and effort data from charter operators and clubs – starting from October 2017, although no funding has been earmarked for this purpose.

Figure 1. Examples of summarised data derived from sport fishing charter operators and collated by the Kenyan Association of Sea Anglers (KASA). Top: Data from boats fishing from Malindi to Ngomeni, bottom: data from boats fishing from Lamu to Kiwayu. Source: Rainbow Runner Magazine, 2011-2012



Malindi & Ngomeni - North Coast

FISH TYPE	2001/2002		2002/2003		2003/2004		2004/2005		2005 / 2006		2006 / 2007		2007/2008		2008/2009		2009/2010		2010/2011	
	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.
Barracuda	339	2039	549	3475	625	3561	328	1743	8	51	214	1346	93	605	86	473	146	995	165	977
Cobia	12	161	22	479	26	450	14	178	?	?	4	41	6 (1)	74	5	26	38	225	3	12
Dolphin (Dorado)	840	3630	299	1524	397	2068	581	2406	142	724	702 (1)	3343	580	3612	787	3789	462	2110	476	2023
Kingfish (Tanguigue)	699	5491	1912	11419	1485	10119.8	1031	7531	38	215	647	3352	270	1833	143	970	327	1991	472	2182
Marlin, Black	20 (8)	1912	31 (10)	3426	43 (27)	4330	28 (15)	3169	132 (106)	291	126 (93)	10441	92(63)	8333	96 (69)	8248	144 (121)	7548	56 (47)	5212
Marlin, Pacific Blue	0	0	0	0	0	0	2 (2)	90	19(19)	510	9 (7)	681	3 (2)	248	17 (15)	1180	42 (32)	4051	7 (5)	735
Marlin, Striped	10 (6)	681	9 (9)	497	12 (10)	643	21 (19)	1260	12 (12)	80	38 (28)	2261	34 (31)	1580	113 (96)	6310	266 (217)	12787	107 (97)	6188
Sailfish, Pacific	564 (311)	15243	647 (413)	11220	990 (728)	24753	1072 (898)	28446.5	1263(1056)	2114	934 (716)	26565	1699(1394)	46035	2993 (2342)	86914	2507 (1495)	53527	1280 (967)	35222
Shark, Hammerhead	0	0	5 (2)	216	4 (2)	115	4 (3)	191	0	0	7(5)	245	3 (3)	130	1 (1)	35	0	0	0	0
Shark, Mako	0	0	2 (1)	218	1 (1)	100	1 (1)	50	102	0	2 (2)	290	1 (1)	50	2 (2)	120	1	70	0	0
Shark, Tiger	9	2456	29 (20)	6698	107 (103)	27085	25 (24)	6684	3 (3)	795	15 (15)	3885	18 (18)	4080	2 (2)	350	0	0	3 (3)	660
Shark, Other	52 (27)	2461	48 (29)	1972	140 (71)	3580	108 (71)	4186	6(4)	97	35 (21)	1660	29 (21)	1615	22 (13)	752	15	1021	14 (9)	1250
Broadbill	20 (19)	564	3 (3)	88	34 (32)	1111	58 (49)	1834	18 (18)	210	16(16)	1010	19 (16)	443	35(33)	1117	20 (18)	424	0	0
Trevally, Giant	72 (18)	1362	144 (98)	2459	208 (110)	4190	461 (342)	10306.2	33 (22)	659	323 (244)	7289	96 (68)	2141	76 (52)	1411	141 (42)	2011	100 (71)	2095
Tuna, Yellowfin	2417 (29)	26192	5126 (14)	57150	3495	33566	2242 (33)	26975.8	1404	9449	884 (9)	8972	531 (10)	8841	1293 (7)	7966	949 (13)	6148	1241	8851
Wahoo	400	4736	616	6754	526	5975	221	2957	34	430	369	3689	556	5205	287	3113	612	5539	578	5364

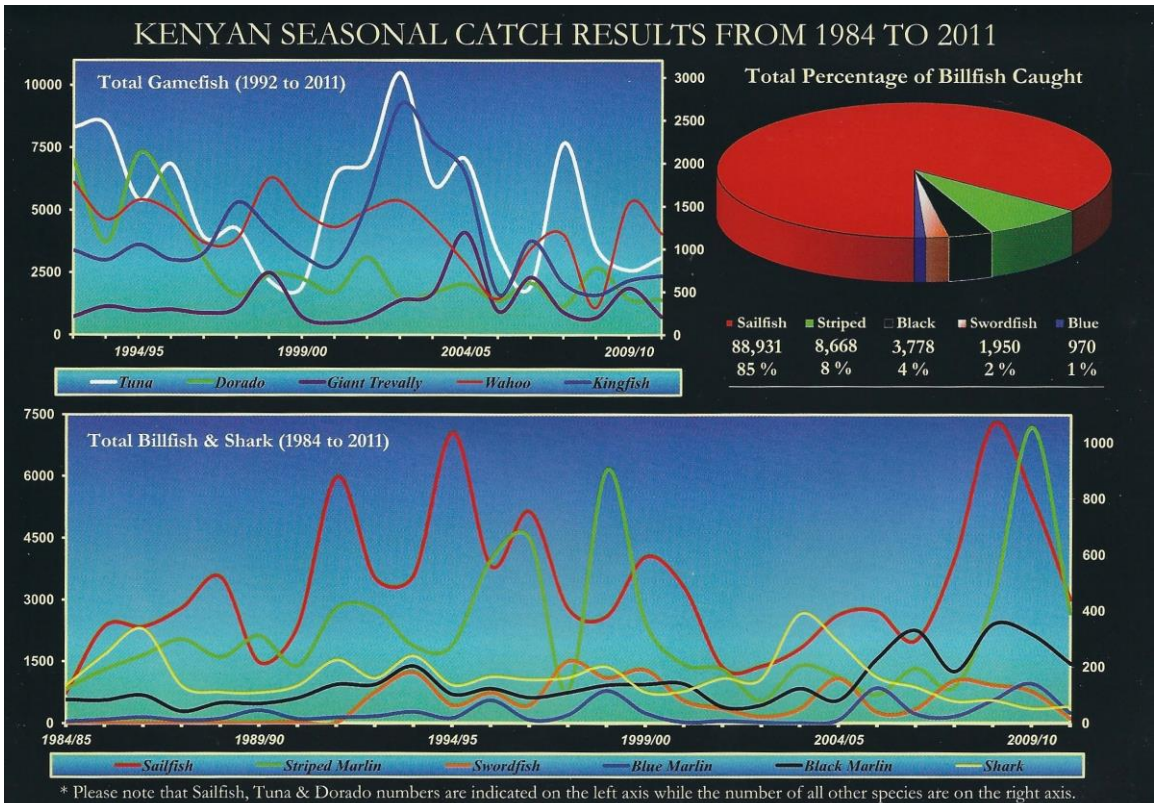
* STATISTICS IN BRACKETS INDICATE FISH CATCHES THAT HAVE BEEN 'TAGGED' AND 'RELEASED'

Lamu & Kiwayu - North Coast

FISH TYPE	2001/2002		2002/2003		2003/2004		2004/2005		2005 / 2006		2006 / 2007		2007/2008		2008/2009		2009/2010		2010/2011	
	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.	No.	Kgs.
Barracuda	20	153	13	62	27	143	70	215	15	91	18	84	9	63	7	0	33	131	24	179
Cobia	0	0	0	0	2	20	0	0	0	0	0	0	0	0	1	0	0	0	1	8
Dolphin (Dorado)	102	494	69	348	71	342	132	243	79	352	112	373	58	340	54	0	96	402	101	426
Kingfish (Tanguigue)	40	302	82	733	112	1033	59	363	56	325	62	399	67	463	33	0	34	201	51	292
Marlin, Black	2 (2)	0	0	0	6 (6)	0	5 (5)	250	6 (6)	0	5(5)	0	11(11)	0	12(7)	960	8(4)	0	5 (5)	49
Marlin, Pacific Blue	2 (2)	0	0	0	0	0	0	0	1 (1)	0	0	0	0	0	1(1)	1100	0	0	2 (2)	150
Marlin, Striped	8 (8)	0	3 (3)	?	7 (7)	0	11 (10)	554	1 (1)	0	4 (4)	0	2 (2)	0	2(2)	100	32(5)	173	7 (7)	423
Sailfish, Pacific	202 (193)	237	208 (205)	95	81 (79)	47	174 (170)	4320	96 (91)	0	145(142)	0	353 (349)	1038	158(156)	4108	172(134)	615	278 (277)	6392
Shark, Hammerhead	0	0	0	0	0	0	1	12	0	0	0	0	0	0	0	0	1	40	0	0
Shark, Mako	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shark, Tiger	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shark, Other	1	89	0	0	1	20	3	50	2	110	5 (1)	330	1	10	0	0	0	0	6 (1)	97
Broadbill	7 (7)	0	0	0	3 (3)	0	12 (11)	302	0	0	0	0	0	0	13(12)	290	0	0	0	0
Trevally, Giant	5	77	7	73	3	75	27	180	20	83	19	154	10	74	18	0	5	60	22	117
Tuna, Yellowfin	316	3650	657	6995	253	2478	355	2217	197	1496	147	1689	196	1597	259	224	301	3019	593	3857
Wahoo	45	542	53	759	94	1114	37	389	26	302	31	340	59	573	34	10	77(1)	638	52	498

* STATISTICS IN BRACKETS INDICATE FISH CATCHES THAT HAVE BEEN 'TAGGED' AND 'RELEASED'

Figure 2. Graphed summaries of catch data for the Kenyan sport fishing charter fleet for billfish (1984/85 to 2010/11) and other pelagic gamefish species (1992/93 to 2010/11). Source: Rainbow Runner Magazine, 2011-2012



ii.) <u>African Billfish Foundation</u>

A second set of data relevant to sport fishing catches in Kenya is a tag-and-release database held by the ABF. Tagging of billfish in Kenya began in 1987, using US National Marine Fisheries Service tags. This function was taken over by the ABF, formed in Kenya in 1990 with a primary focus on tag and release of billfish by sport fishing charter boats. Conventional plastic dart tags are provided to sport fishing charter boats, and up to the year 2013 about 55,000 billfish have been tagged under the program (Kadagi and Harris 2016). Sailfish is the dominant species tagged (83%) followed by striped marlin (10.2%), black marlin and swordfish (2.6% each) and blue marlin (1.5%) (Kadagi et al., 2011). The proportion of billfish tagged to billfish landed by the charter fishery has fluctuated over time. In the early 1990s, about 20% of billfish caught were tagged, climbing to about 90% in 2008. Over 2,500 recaptures of tagged billfish have been reported, the majority being sailfish, which have either shown limited movement or movement along the east African coast. A number of long distance recaptures of marlin have been recorded, including a Kenya-tagged black marlin to the southern Indian coast and a Kenya-tagged striped marlin to near the western Australian coast. The tagging database includes release data from both charter and some private boats in Kenya, and also on a smaller scale, several other locations in the western Indian Ocean region.

The Kenya Ministry of Fisheries has been collecting at least some data from the charter sport fishery since 1940, although data to 1987 was not digitized and since then, data for some years is missing (Ndegwa, 2010).

A data capacity building project was implemented as part of the IOTC-OFCF Project between April 2002 to March 2007 (Anon., 2007;2010),which included the electronic transfer of historical size data from Kenya Sport Fishing Club. The activity occurred from August to December 2006 during which centralised notebooks from Watamu Sea Sport Fishing Club and Malindi Sea Sport Fishing Club were borrowed, scanned and returned. From the scans, data from Malindi for 1987 through 2006 were entered, in addition to data from Watamu for 2000 through 2006, with various missing years and months noted. These data did not just contain size information, but also catch (numbers) and effort, as recorded by individual sport fishing charter boats for each day's fishing.

The data were disseminated in a series of IOTC Working Party papers which summarised and analysed catch and effort for tuna (Ndegwa, 2010), kawakawa and frigate tuna (Ndegwa, 2011; Ndegwa et al., 2013), sailfish (Ndegwa and Herrera, 2011), narrow barred Spanish mackerel (Wekesa and Ndegwa, 2013) and marlins (Ndegwa and Kirathe, 2015). The data were also partially used in a study of seasonality, morphometrics and feeding behaviour of sailfish (Ndegwa and Kiilu, 2013). Table 1 summarises the data sources described in these papers, which are largely consistent but mainly emphasise the data held by the Malindi Sea Fishing Club only.

As far as can be determined, the data that was digitized under the IOTC-OFCF Project is essentially the same as that coordinated and collected by KASA and published annually in Rainbow Runner magazine in the form of tables and graphs. It is recommended that these two data sets be compared for consistency and verification purposes. Since the conclusion of the IOTC-OFCF Project, data has apparently continued to be collected from Watamu and Malindi by the Fisheries Department, but it is unclear whether this is being entered in the same database for continuity.

Willingness to cooperate in a data program

The consultants met with numbers of charter boat owners at both Watamu and Malindi. A presentation providing an overview of the Project was also given one evening during a fishing tournament at Malindi. There was general consensus among the charter operators that they would be willing to complete a daily log, and to submit the information on a monthly basis. The charter operators are already familiar with collecting data (although this has been done in the past by filling in books at key places, like the tackle shop, and data was always electronically entered by one keen person) and were generally receptive to the idea of transitioning to a formal charter logbook that could be submitted to fisheries officers at regular intervals.

At a meeting held with officers of the Kenya Department of Fisheries and the Kenya Marine Fisheries Research Institutes in Mombasa, a willingness to service a logbook program for sport fishing was indicated, although concerns were expressed regarding possible lack of resources to ensure continuation of the data collection activities after completion of the Project.

Other observations

There has been a notable downturn in coastal tourism in Kenya due mainly to terrorist incidents in Nairobi and in the northern coastal region. This has had a marked effect on client numbers for the charter sportfish fishery and consequently, on the number of days fished by charter operators.

In addition, it was reported that the past three or four seasons have been very poor for sailfish fishing, the species which, in the past, has been the mainstay of the fishery with respect to catch rates of billfish. Some charter operators ascribe this downturn to increased coastal gill netting in Somalia, although evidence for this was anecdotal.

Challenges regarding data collection

The main challenge to data collection in Kenya appears to be adequate resourcing of the Ministry of Agriculture Livestock and Fisheries (MALF) to undertake this role. Following agreement of the new constitution in Kenya, the fisheries staff involved in data collection are under the responsibility of the county government and under the new Fisheries Act, sport fishing activities are devolved. From the operation point of view, many boats undertaking sport fishing operate outside the territorial waters, which poses a challenge to the monitoring of sports fisheries in Kenya and which needs to be addressed in the ongoing fisheries regulations.

On the positive side, access to the charter fleet is very good for the two main sport fishing locations. Charter operators regularly gather at the two venues and tournaments also offer opportunities to access most operators at the same time and place. In fact, the African Billfish Foundation has been accessing charter operators in this way since it began its operations.

Table 1: Reports by the Department of Fisheries, Kenya derived from data collected by the Kenya Association of Sea Anglers with details of source of data from each report.

IOTC REPORT	Species	Methods	Years covered	Missing data	Incomplete data
Ndegwa and Herrera 2009. IOTC–2011–WPB09–09	Sailfish	Data is recorded by Malindi Sea Fishing Club on a daily basis in a hard cover note book . Includes date, name of boat, species of fish caught; number caught total weight per species, and remarks on whether tagged, released, or retained	1987-2006	1988, 1989	2002, 2003
Ndegwa 2010. IOTC-2010-WPTT-42	Tuna	Data is recorded by Malindi Sea Fishing Club on a daily basis in a hard cover note book . Includes date, name of boat, species of fish caught; number caught total weight per species, and remarks on whether tagged, released, or retained	1987-2006	1988, 1989	2002, 2003
Ndegwa 2011. IOTC–2011–WPNT01–28	Kawakawa & Frigate tuna	Data is recorded by Malindi Sea Fishing Club on a daily basis in a hard cover note book . Includes date, name of boat, species of fish caught; number caught total weight per species, and remarks on whether tagged, released, or retained	1987-2006	1988, 1989	2002, 2003
Ndegwa et al. 2013. IOTC–2013–WPNT03–22	Frigate tuna & kawakawa	Catch and effort data set (1990-2009) available in the Malindi sport fishing club	1990-2009		1995, 1996, 2002, 2003, 2009
Wekesa and Ndegwa 2013 IOTC–2013–WPNT03–28 Rev_1	Narrow barred Spanish mackerel	Daily vessel records kept by with the support of IOTC-OFCF project this data was stored in a database respective sport fishing club using a systematic data recording protocol that is coordinated by the KASA	1990-2009		1995-96, 2002-03
Ndegwa and Kirathe 2015. IOTC–2015–WPB13–15	Marlins	State Department of Fisheries and sport fishing clubs located in Malindi. Records of Marlins caught during sport fishing are taken and maintained in the boat's logbook and subsequently archived by the respective Sport Fishing Club. The information recorded is then availed to the State Department of Fisheries. Records of important data such as the date of capture, weight (actual or estimated), boat name, fishing area, species caught and general remark i.e. whether fish was tagged, released or retained are obtained and recorded in the boat's logbook.	1987-2012	1988, 1989	

Figure 3. Map of the Kenyan coast with key sport fishing locations mentioned in text

Figure 4. Photos from Kenyan country visit. Clockwise from top left: 1. Logo of Kilifi County showing billfish. 2. Swordfish cast at Ocean Sports, Watamu. 3. Fishing tackle shop where sport fishing data is recorded in book. 4. Speaking at Malindi Sea Anglers Club. 5. Meeting with Fisheries Department staff, Mombasa. 6. Group photo, Fisheries Department, Mombasa. 7. Sport fishing charter fleet at anchor off Ocean Sports, Watamu. 8. Reception at Driftwood Hotel, Malindi, showing game fishing flags and cast of black marlin.

Seychelles

Sport fishing is active in the Seychelles, with large and smaller well-equipped vessels available for charter. There is active promotion of sport fishing for pelagic fish on the internet, in hotels on Mahé and on Beau Vallon beach. Billfish are key target species, but other pelagic species such as tunas, wahoo and dolphinfish are actively sought.

Main ports/locations for sport fishing

The main ports or locations from which sport fishing operates on Mahé are:

Eden Island marina: Situated on the eastern side of the island, this is a large, modern marina where many charter and private boats are berthed. The charter boats here tend to be large to very large, modern and very well equipped for sport fishing. Some are owned by companies that operate two or three boats (for example, Bluewater Charters) while several other large charter boats (50' to 60') are privately owned and employ a full time captain and crew.

Bel Ombre harbour: A small, public harbour on the northwest side of the island with good access to pelagic fishing grounds. A range of sport fishing and private boats are moored there. There are 10 to 12 charter vessels operating from Bel Ombre, three of which are well appointed and well equipped for tuna and billfish fishing. Other boats there that advertise charters are more basic, but nevertheless quite active.

Beau Vallon: A beach resort area, adjacent to Bel Ombre. Several charter operators have permanent or temporary offices there for taking bookings for charters.

Sizes of fleets (charter, private)

There was general agreement that about 40 sport fishing charter boats were active around Mahé. Another 7-10 boats capable of fishing for billfish and tuna are located on Praslin Island, but only one of those is regarded as a serious sport fishing boat. Sport fishing for pelagic fish is also conducted from La Digue although the number of active boats based there was reported to be very small. Some boats from the Seychelles Sport Fishing Club travel from Mahé to La Digue to fish an annual tournament there.

It was difficult to obtain an estimate of the number of private boats that might fish for tuna and billfish in the Seychelles. A list provided by the Seychelles Sport Fishing Club showed 20 member boats based on Mahé, of which 5 were charter, 4 were charter/private and 11 were private. Another 6 member boats, all private, were based on Praslin. The number of private boats fitted out for sport fishing that were observed around the island was relatively small – probably no more than 50.

Clubs

There is one major sport fishing club in the Seychelles – the Seychelles Sports Fishing Club[3], which meets regularly at the Seychelles Sailing Club in Victoria. This is an active club that holds various competitions through the year and actively takes part in tagging and research programs.

Number of days fished per year (charter)

Several operators of charter boats in the Bel Ombre area indicated that they fish 200 to 300 days per year, although in addition to trolling for pelagic fish, a typical charter may also commonly involve bottom fishing and snorkelling. Charter boats based at Eden Island tend to be larger and with full time professional crews. The number of days fished by these boats was not able to be determined, but would vary depending on demand. The cost to charter these larger vessels was of the order of 6,000 Euros per day, a very high rate by international standards which would be expected to have a limiting effect on the number of days fished in a given year.

Management and Licensing

The Seychelles Ministry of Tourism 'manages' sport fishing, but in effect this simply involves the collection of a licence fee. Nevertheless, the resulting licence frame could be very useful for a survey of private boat owners who fish for tuna and billfish.

The Seychelles Fishing Authority (SFA) is involved in a number of activities relevant to sport fisheries over the next few years. These include an assessment of sport and recreational fishery importance to the economy, integrating these fisheries in monitoring for the MSP sustainable use zones, support for the tag and release program being undertaken by the Seychelles Sport Fishing Club, education and awareness support and development of electronic apps for reporting and tag and release data.

The SFA is also currently developing a Fishing Fleet Management and Licensing System. A consultancy for this was due to commence in July 2017 and is due to be completed by the end of 2017. The aims of the Project are to:

- Estimate national fishing capacity across sectors and develop a fishing boat and gear registry.
- Develop a fleet management plan based on recommended capacity limits for major fisheries.
- Develop a fishery-specific licensing system that links to the boat and gear registry.

This work will involve the design and planning of a fishing unit frame survey encompassing commercial, recreational and sport fishery sub-sectors and also develop a fishing boat and gear registry for integration in SIH and other information systems.

It will also provide guidance and oversight for the adoption of fishery-specific licenses in addition to the currently prescribed fishing boat licenses, prioritising the demersal line and trap fisheries, the sport fishery and semi-industrial longline fishery.

[3] www.ssfc.sc/

The results of this survey would be of considerable benefit to the current Project, especially in assessing the success of the frame survey in being able to contact private sport fishing boat owners who regularly fish for pelagic species.

Historic and current catch data

A logbook program for sport fishing was apparently in operation in the early 1980s but was discontinued a number of years ago. The Seychelles Sport Fishing Club keeps records of tournament catches (and presumably number of boats fishing each day of a tournament). One very active angler based on Praslin has kept good records of catches by most boats on that island for the past four years and agreed to provide these data on request. Some charter captains stated that they keep their own personal records of catches, but others do not. Such data would need to be examined in detail to determine its utility.

The Seychelles Fisheries Authority (SFA) noted that it does have some length frequency data from game fishing tournaments, but no information on catch and effort data. These data appear to be most likely collected at competitions run by the Seychelles Sport Fishing Club on an ad hoc basis.

Willingness to cooperate in a data program

All of the charter operators spoken to at both Eden Island and Bel Ombre indicated a willingness to complete daily logs and be contacted monthly for submitting of data.

A meeting with the Seychelles Sport Fishing Club was held at which the purpose and benefits of the pilot Project was outlined. The official Club position was that they chose not to cooperate at this stage, nor provide any of the data collected by the club in previous years. As noted, membership of the club includes both private boat owners (out of scope of this Project) and some charter operators (in scope).

A meeting with SFA also indicated support for the pilot program. Given that SFA is planning a frame survey and possible mandatory data collection from the recreational fishing sector, this Project would likely fill a gap in data collection in the short term until that process was implemented.

Other observations

As noted, the Seychelles Sport fishing club is very active in tagging of billfish, for which purpose they use tags supplied by the US-based Billfish Foundation. About 600 billfish, mainly sailfish, had been tagged by the club as of October 2016. The club is also actively involved in a billfish popup satellite tagging Project, with the support of the SFA.

Challenges regarding data collection

Ideally, the cooperation and active participation of the Seychelles Sport Fishing Club in any proposals for a data collection program would be highly desirable since the club is a centre of sport fishing activity for both private and at least some charter boats. This will require some further discussions.

Contact with the larger charter vessels moored at Eden Island was via Captains who were employed by owners, some of whom may reside overseas. The Captains indicated willingness to fill in log sheets, but this would depend on the agreement of the owners.

Figure 5. Map of Mahé showing key sport fishing locations mentioned in text


FISHING
CORAL STRAND
Leisure
Pro
TROPHY

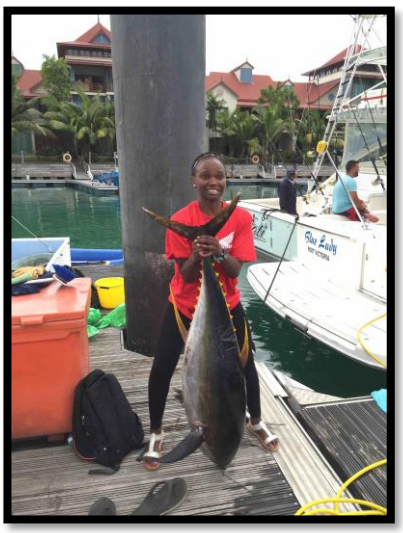


Figure 6. Photos from Seychelles country visit. Clockwise from top left: 1. Large charter vessels, Eden Island. 2. Three charter vessels owned by one company, Eden Island. 3. Charter vessel at public wharf, Bel Ombre. 4. Large yellowfin tuna caught by charter vessel, Eden Island. 5. Meeting with SFA staff, Mahe. 6. Advertising charter fishing in Hotel, Beau Vallon. 7. Interviewing charter captain, Eden Island.

La Réunion

La Réunion is a region of France, but for the purposes of this report, we use the term 'country' for ease of comparison with the three other countries visited during the Project (Seychelles, Mauritius and Kenya). The Project consultants were accompanied in La Réunion by an interpreter, Aude Gauthier, who was born in La Réunion and completed a Master of Marine Science degree at the University of Queensland, Australia and who proved to be a valuable asset for our discussions and fact finding.

As opposed to the three other countries covered by the Project, where charter fisheries targeting billfish, tuna and other pelagic fish are understood and accepted as undertaking *sport fishing* (that is, *recreational* fishing) these same kinds of vessels are instead classified in La Réunion as *professional* fishing vessels and their catch data are mandatorily reported by fishermen, and included within the official catch data for that specific sector (Manach et al 2015, S. Bonhommeau *pers. comm*.)

Even so, charter operators regard their activities at least partly as sport fishing, hence the many 'big game fishing' ('Peche au Gros') references and common depictions of billfish as logos, as well as photographs of billfish and tuna in their advertising material and signs. One long standing charter company even calls itself the La Réunion Game Fishing Club and operates a well-stocked fishing tackle shop selling typical sport fishing equipment. The charter boats in La Réunion use standard sport fishing gear seen in similar fisheries around the world and advertise their businesses in the same way as do sport fishing charter businesses in the other three countries, and in fact, around the world.

From a government perspective, in La Réunion the term 'sport fishing' (pêche sportive) is usually associated with private, non-professional activities. These would include non-organized personal fishing by individuals, as well as those fishing during competitions organized by members of fishing clubs (see below).

Main ports/locations for sport fishing

The main ports from which sport fishing charter boats operate are:

Saint-Gilles-Les-Bains: Port de Plaisance is a protected harbour within the village of Saint-Gilles on the west coast of La Réunion with well-equipped marinas, berthing and on shore facilities. Charter

boats advertise their businesses around the harbour with signs and placards, and fish are unloaded onto docks so that the public can see the catch (and perhaps be persuaded to book a trip). On the consultant visits, catches included dolphinfish, yellowfin tuna, bigeye tuna, skipjack tuna, wahoo and a black marlin.

Le Port: This is a large port berthing many mixed vessels on a number of pontoons and jetties. There is apparently one charter vessel that operates from Le Port, which is also the site of the club house of CRPPS (Comité Regional des Pecheurs Plaisanciers et Sportifs de La Réunion, a non-professional fishing club which runs competitions for members through the year).

Saint-Pierre: This port was not visited. It was indicated by other operators that there was only one charter boat at that location.

Sizes of fleets (charter, private)

Charter operators in Saint-Gilles stated that there are nine charter boats at that location (although several other non-charter boats were observed fitted out for game fishing). As noted, one charter boat is based in Le Port and one in St Pierre.

In both Saint-Gilles and Le Port, large numbers of private boats can be observed moored in the marinas, many of which would be capable of short trips to the ocean. These are typically 4 to 5 metres in length, with outboard motors, but most are not obviously fitted out for sport fishing, especially for targeting billfish and other pelagic species.

Regarding the numbers of private boats that might actually fish for billfish, tuna and other pelagic species, there were mixed opinions. A past chairman of the Comité Regional des Pecheurs Plaisanciers et Sportifs de La Réunion (CRPPS) was of the opinion that even though there may be as many as 2,000 private boats in La Réunion, only perhaps 300-500 would be used for fishing, of which, less than 100 would regularly target pelagic fish such as large tuna and billfish. CRPPS membership numbers 30 to 50 boats, 6.5 to 14 m in length, all of which are private (i.e. non-professional).

Number of days fished per year (charter)

Because they can legally sell their catch, charter boat captains fish as often as possible, with or without paying clients. One captain reported that he fished 360 days per year. For a system wishing to record the catch and effort of the sport fishing sector, it would be important to distinguish between those trips of charter boats that carry paying anglers from those that do not.

Management and licensing

As noted above, sport fishing charter boats are classified as commercial (professional) and carry a European commercial fishing licence as well as a permit to transport passengers. They sell their catch, and as noted, some operators indicated that they fish nearly every day, weather permitting, even if without have paying clients on board.

There are about 30 Fish Aggregating Devices (FADs) around the island of La Réunion which are deployed mainly for the use of professional fishermen (including charter boats). Private boats are only permitted to fish around FADs on weekends and public holidays.

It is illegal for private fishermen to sell fish, but it was the opinion of some charter operators that many do. By law, fish caught by non-commercial fishers must have one lobe of the caudal fin, and one pectoral fin cut off. The level of compliance is unknown, but is considered at least a measure to discourage illegal sales.

Historic and current catch data

Charter operators are required by law to complete log books that record catch and effort, which are reported to IFREMER (via the French Ministry). The primary sport fishing club on La Réunion, the Comité Regional des Pecheurs Plaisanciers et Sportifs de La Réunion (CRPPS), holds about 25 one-day competitions per year, with an average of about 10 boats fishing each day. Members fish under International Game Fish Association (IGFA) rules, and do not fish around the government FADS in competitions.

In the past, club members had tagged and released 100-150 billfish with tags supplied by the US Billfish Foundation but this practice has fallen away since little feedback was received on recaptures (if any). As with the charter operators, club members also release marlin estimated at less than 80kg in size. Full details of billfish tagged could be obtained from the Billfish Foundation, if required.

The records of CRPPS fishing competitions from 2000 to 2012 have been analysed in some detail but not yet fully published (Fleury et al., 2012; Fleury et al., 2013). A total of 133 fishing days of competition consisting of 1,600 fishing trips were analysed. The main species caught are dolphinfish (dorade), skipjack tuna (large specimens are called 'bonite kalou'), yellowfin tuna and wahoo. All three Indo-Pacific species of marlin are also caught, although these do not appear to be separated in club statistics. Sharks are no longer included in club competitions, but club members indicated that mako sharks caught outside competitions were more common in the past but have largely disappeared over the past ten years.

The proprietor of the charter company *Maevasion* indicated that his boats each catch about 40 blue and black marlin (combined) per year of which, about 5 are released since they would weigh less than 80kg. This is a 'self policy' of releasing smaller marlin which is apparently the case for other charter operators as well.

The proprietors of the charter company, *La Réunion Game Fishing Club*, have over 30 years of self-maintained catch data on billfish and tuna from their two vessels. These data are in the form of hand-written note books and, although not directly observed by the consultants, the owners indicated their willingness to have this material accessed, digitized and analysed.

The proprietor of Maevasion has four years of similar data in the form of his own diary, and also indicated willingness for the data to be accessed. It is likely that other charter operators also maintain personal logs or diaries.

Willingness to cooperate in a data program

The several charter boat operators spoken to were quite amenable to filling in log sheets because, as noted, they already do complete a daily record that is similar to the one designed for use in this study, but they were also supportive of the concept of a specific sport fishing log.

Other observations

There was a general belief among charter operators that fishing success had declined over the past decade, or so. High levels of commercial (purse seine) fishing around the Seychelles was attributed as the cause of perceived declines in numbers of all species of pelagic fish as well as in the average sizes of skipjack and yellowfin tuna. Large yellowfin tuna are allegedly rare to catch these days, while the perceived declines in marlin catches were attributed in part to a decline in skipjack tuna in the region, but also to domestic longline vessels.

Challenges regarding data collection

The fact that sport fishing charter operators already complete daily fishing log sheets may cause issues and possible confusion with requests to fill in an additional similar logsheet in the future. Charter operators are apparently already providing copies of their daily logsheets to IFREMER (via the French Ministry), from which data is also already being submitted to the IOTC – albeit not on a consistent basis, and catches are not necessarily being reported correctly as sport fishing. Data for charter operators have been reported to IOTC periodically as troll line, hand line or hand line and troll line combined.

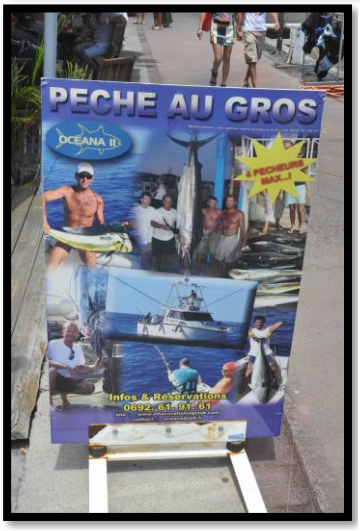
There was therefore a general understanding that the proposed IOTC logbook and database should not be targeting charter operators, given that there appears to be a data collection and reporting mechanism already in place.

In the case of the non-charter operators, there appears to be a role for the Project to assist – given no formal procedures for data collection are currently in place.

Figure 7. Map of La Réunion with key sport fishing locations mentioned in text


Saint-Denis
Sainte Clotilde
Sainte-Suzanne
Le Port
Saint-André
Saint-Paul
Bras-Panon
Grand Ilet
Arrondissement of Saint-Benoît
Hell-Bourg
Saint-Gilles
L'Ermitage-Les-Bains
La Saline-Les-Bains
Piton des Neiges
Forêt de Bébour
Sainte Anne
Sainte-Rose
Cilaos
Bras des Calumets
Piton Sainte-Rose
Saint-Leu
La Plaine des Cafres
Piton de la Fournaise
Entre-Deux
l'Etang-Salé les Bains
Le Tampon
Forêt Départemento Domaniale du Volcan Sud
Saint Pierre
Matouta
Saint-Philippe
Saint-Joseph


ABACO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Infos & Réservations
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REUNION

Figure 8. Photos from La Réunion country visit. Top row, L to R: 1. Sport fishing charter boats at Saint Gilles. 2. A view of private boats in marina at Le Port. **Second row, L to R**: 1. Advertising sign at Saint Gilles. 2. Mixed catch of yellowfin tuna and dolphinfish. 3. Club house of sport fishing club, Le Port. **Third row, L to R**: 1. Black marlin caught by charter boat, Saint Gilles. 2. Interviewing charter captain, Saint Gilles. **Bottom**: Fish caught by charter boats are sold direct to the public.

Mauritius

There is an active and internationally regarded sportfish fishery in Mauritius with a long history and strong reputation, especially for catching large blue and black marlin. One of the early studies on age and growth of blue marlin was based on 223 fish landed at sport fishing tournaments on Mauritius in the mid-1980s (Cyr et al., 1990).

Charter operations in Mauritius are concentrated in several locations, mainly on the western side of the island. A number of companies own and operate multiple vessels (two to five). Boats are generally large (8 metres and above) and the standard of the fishing equipment on boats is high. Interestingly, many of the charter boats observed with similar hull designs were built on Mauritius.

Main ports/locations for sport fishing

The main landing sites from which sport fishing charter boats operate are:

Grand Baie: A large bay on the north-eastern tip of the island providing anchorage on moorings for many vessels. However, very few of these were fitted out as sport fishing vessels. There is one main jetty (a floating pontoon) in Grand Baie which is used by charter operators. The main charter operators in this area are Sportfisher (5 boats), Horizon and Le Performant. The latter maintains an office in Pereyebere and anchors its vessels off Pereyebere Beach, located to the north of Grand Baie.

Black River: Several charter businesses operate from this area. The main one is J.P. Henry Charters, with three large, modern vessels berthed at La Balise Marina in Black River estuary. Another charter company, La Carangue Centre de Pêche, operates from a jetty just to the north of Black River. Le Morne Anglers Club, the largest club associated with sport fishing on the island, is located near the jetty of La Carangue. It is a private club which operates its own marina for the use of members.

Trou d'Eau Douce: Royal Big Game Fishing is the main charter operator on the eastern side of the island. The company has three large well-equipped sport fishing vessels with professional skippers and crew and caters mainly to overseas clients. There are also a number of other smaller operators, e.g., MAO Big Game Fishing, which were visited by the Project team.

Fishing areas: On the west coast, a fishing chart showing the permitted area of fishing for the 2016 South Indian Ocean Billfish Competition extends about 15 nautical miles to sea.

Two companies, Sportfisher and Le Performant, are about to commence dedicated live-aboard charters for long distance sport fishing trips to remote atolls within the Mauritian EEZ.

There is one active charter operator on Rodrigues Island, which was not visited. A company there, Rod Fishing Club, operates one vessel. Its website indicates a mixed fishery, including reef fish, inshore sportfish such as carangids and some offshore pelagic catches including billfish and tuna.

Sizes of fleets (charter, private)

Charter operators and club officials estimated that there are around 40 to 50 charter boats on the island. This was generally agreed by Fisheries Department personnel. The most experienced charter operator on Mauritius who has been in the business for 40 years, estimated there were approximately 25 charter boats in Mauritius in the 1990s, but that number had now grown to 40 charter boats. He also estimated that there were 50-60 active private boats that were capable of catching billfish and tuna. These numbers were supported by others, including independently by one very active private boat owner and sport fisherman.

Le Morne Anglers Club has 350 members, half of whom are active recreational fishers. It is the only club on Mauritius registered with the International Game Fish Association (IGFA). The main competition run by the club is the National Billfish Tournament which attracts about 20 boats with 80 anglers, most of which are charter vessels.

Number of days fished per year (charter)

On average, each of J-P Henry's three boats are now fishing a minimum of 120 days per year. However, clientele has definitely declined as a result of a perceived decline in fish numbers and therefore, success rate. A four or five year decline in tourist numbers from Europe was alluded to, but not sourced. The three charter boats owned and operated by Le Performant each fish 200-300 days per year.

Seasons

The overall season for pelagic sport fishing is October to April with the peak season for marlin and yellowfin tuna being February to March. December to February is a particularly busy time, whereas the slowest period is June through August.

Tournaments

Mauritius has a number of regular tournaments for sport fishing, notably:

- Grand Baie Yacht Club tournament. This is an annual one day event attracting around 40 boats, 80% of which are private and 20% charter. During tournaments, marlins are released if estimated at less than 300lb; outside of tournaments, marlins are rarely released.
- The annual International Offshore Billfish Tournament is an annual even run from Le Morne Anglers Club.
- Mauritius Billfish Release International Tournament. The next tournament to be fished over four fishing days was scheduled for January 2018, from La Balise Marina.

Management and licensing

In Mauritius, all sport fishing boats, both private and charter, must have a licence from the Tourist Authority, plus a Mauritius skippers' permit, and a mooring permit. Such permits would be very useful for a survey of private boat owners who fish for tuna and billfish. While there is currently no legal framework for monitoring sport fishing in Mauritius, provision for monitoring and managing sports fishery catches will be institutionalised under the new Fisheries Bill. Charter and private boats are all licensed under the Ministry of Tourism, not Fisheries.

The type of licence is based on the size of the vessel and the number of persons it may carry. Sport fishing boats are restricted as to the distance offshore they are permitted to operate. The Fisheries Department issues licences to sell fish to fish mongers, which includes charter operators. The market is not regulated.

Historic and current catch data

Most of the operators and boat owners that were interviewed during the Project reported that they kept some form of records of the fish weighed, which they occasionally published on their website, as this information is frequently requested by clients. The Le Morne Anglers Club does keep records of numbers and weights of fish landed during tournament and indicated that these data would be made available on request.

In the office of J-P Henry, a senior employee estimated that their three boats catch about 500 marlins per year. The commonest species is blue marlin, followed by black marlin, followed by striped marlin. The average size of blue marlin is 150 lb (70 kg), but range up to 1,000 lb (450 kg). J-P Henry is also promoting Tag and Release of Billfish species, and there is an agreement to pay the skippers a percentage of the fish cost they tag and release, as skippers normally sell their catches.

It was believed that catches of sharks had dropped by 90% compared with several decades ago, and that marlin and tuna catches were down by 70%, although these comments were anecdotal in nature.

Mauritius was reporting Sport fishing data to the IOTC until relatively recently, but this activity ceased due to a lack personnel resources.

Willingness to cooperate in a data program

The Albion Fisheries Research Centre[4] personnel were highly supportive of the proposed data monitoring program and were enthusiastic and most helpful in contacting charter operators and arranging meetings.

All charter operators interviewed indicated their willingness for captains to complete catch forms and be contacted on a monthly basis. The main operator at Black River, J-P Henry, agreed to have his three boats fill in monthly forms if this would assist the fishery. Similarly, the response of smaller operators was also positive – who in many cases are already keeping some form of record keeping of fishing activities.

Both the Manager and the Chairman of the Le Morne Anglers Club agreed to assist in having sport fishers fill in monthly forms, indicating that the club would indeed be a good point of contact for a proportion of charter boats. Some private boats in the club may also be interested in completing log sheets.

[4] Research Centre of the Ministry of Oceanic Economy, Marine Resources, Fisheries, Shipping and Outer Islands.

Challenges regarding data collection

Mauritius would appear to be an excellent choice for one of the countries to trial a charter log system. The consultants were received very well by most charter operators, captains and club officials and all indicated willingness to take part. In addition, the Ministry of Fisheries personnel also embraced the concept of the program, and generally appeared to have good relationships within the sport fishery sector.

Other observations

Marlin (usually smoked) is a staple on the menu at most restaurants and hotels in Mauritius which is not often the case in other areas. This suggested to be a mainly frozen (-60°C) by-product of foreign longliners which are required to sell bycatch in Mauritius including sailfish, dolphinfish, wahoo and swordfish. There are also five local longliners (<24 metres) that also supply the market. Others interviewed thought that charter boat operators selling their catch was also a significant source of marlin consumed locally, including the product sold at the local market and supermarkets.

Even though an unrecorded proportion of billfish are released by charter boats, it appears that none take part in any tagging programs. One operator in particular indicated enthusiasm in becoming involved in tagging of billfish.

As indicated by an experienced captain, the general method of fishing for billfish in Mauritius is to stop the boat when a hook-up occurs, with the captain inside the cabin rather than driving the boat from the flybridge. This would be considered rather unusual in other countries and likely to result in a higher rate of loss of hooked fish compared with the normal method of driving the boat from a higher vantage point and manoeuvring the boat in order to help the angler to retrieve line from time to time. Such subtle differences in fishing techniques would need to be taken into account if comparing catch rates of sport fishing in different countries of the Indian Ocean.

Figure 9. Map of Mauritius with key sport fishing locations mentioned in text.

Figure 10. Photos from Mauritius country visit. Clockwise from top left: 1. Clients being ferried to shore after a half day charter. 2. Part of the fleet of J.P. Henry at Black River. 3. Charter vessel of Royal Big Game Fishing. 4. Interview with owner of Le Perfomant game fishing company. 5. Meeting with staff of the Albion Fisheries Research Centre. 6. Interview with manager of Royal Big Game Fishing. 7. Wahoo and yellowfin tuna caught on half day charter.

Survey design options

Understanding recreational (sport) fisheries involves a distinctly different scientific process compared to that of commercial fisheries research. Because recreational fishers participate for the primary purpose of recreation and social engagement rather than to harvest food (Henry and Lyle, 2003), they are generally not mandated to report on their activities, such as catch and effort. In many countries, recreational fishing is free and does not require a licence or permit, and thus there can be many thousands of undocumented participants distributed disparately in space and time (Cooke and Cowx, 2004). As a result, a census of fishers is generally not possible, or at least cost-effective. Instead, human populations are required to be sampled, from which individuals are self-identified as fishers, and requested to provide scientifically accurate self-reported information. Although fishers generally have no legal obligation to divulge fishing-related information, they often freely cooperate with researchers under a presumed moral obligation to provide useful information that can be used to ensure the long-term sustainability of fishery resources (Copeland et al., 2017).

Of course, the extent of, and motives for, cooperation and the ability to accurately recall specific details of fishing events (e.g. number of undersized fish released) can vary significantly among fishers (Tarrant et al., 1993). Therefore, understanding the psychology of fishers and being able to quantify and correct for specific cognitive biases – such as rounding large numbers in multiples of 5 or 10, or over-reporting catch numbers due to enhance one's social status among their peers – has been a necessary component of recreational fisheries research for increasing the accuracy and precision of self-reported data (Tarrant and Manfredo, 1993).

Recreational fisheries research therefore concentrates far more heavily on representatively sampling the demographic and behavioural characteristics of human populations, as opposed to the operational aspects and exploitation dynamics (e.g. gear selectivity, spatial fleet dynamics) that are often the focus of commercial fisheries research. As such, the methods required to sample recreational fisheries are quite different, and oftentimes more expensive to implement, to what would normally be used in the study of commercial fisheries.

Because entire recreational fishing populations cannot generally be surveyed by a census, sampling of the population is required. The sample is expanded to the number of participants in the fishery to provide estimates that are representative of the entire population. This normally involves a 'complimented' survey design, where for example, one method may be used to collect information from fishers (e.g. catch and effort), while a second method is used to estimate the total size of the population to which the information from the first survey method can be expanded to represent the overall population.

Traditional recreational fishing survey designs

A number of basic survey methods have been used to collect recreational fisheries data worldwide including mail surveys, door-to-door and telephone surveys, fisher diaries, and access point, roving, and aerial surveys. Pollock et al. (1994) details the full range of survey methods are used to gather catch, effort and socio-economic data from recreational fishers and their potential shortcomings.

This short review aims to provide a basic overview of the main survey methodologies used to collect data on various aspects of recreational fisheries, with an emphasis on methodologies that may be applicable to large-scale jurisdictions such as the IOTC Area of Competence.

Survey methods used to collect recreational fishing data broadly fall into one of two categories, which largely depend upon where the data is collected. “Off-site” surveys are generally conducted away from fishing sites. They also rely upon the fisher to report their own catch and effort in the absence of a trained interviewer. The remaining three methods are commonly referred to as “on-site” methods because data is collected at the fishing site by trained survey staff. Historically, these methods have been used as stand-alone methods as they were initially developed for surveying fishers on relatively small water bodies. However, through time, there has been increasing need to survey larger-scale, and more complex, recreational fisheries. To effectively deal with these types of fisheries, it is now common practice to use a combination of basic survey methods, known as ‘complemented surveys’, such as using an on-site access point survey to estimate catch rates and an off-site telephone survey to estimate total effort in the fishery.

Whichever method is used, it is important to understand that the accuracy and precision of data collected will depend on the level of resources available, and will not be without uncertainty. Some of this uncertainty may arise due to variability in the data provided by fishers (non-sampling error), while other parts may be due to uncontrollable or unknown biases in the way the data are collected (sampling errors). It is important to understand the sources of uncertainty as this error can propagate through each stage of sampling and significantly bias the final estimates of important parameters such as total catch of a particular species (Pollock et al., 1994).

Off-site survey methods

Off-site surveys are undertaken away from the fishing site and generally involve selecting individuals from a list of participants (e.g. fishing licence holders), or ‘sampling frame’, and inviting them to complete a questionnaire by mail or telephone. Fishers can also be selected at the fishing site and invited to complete fishing diaries or questionnaires once they have left the fishing site. The primary advantage of off-site methods is that they can cost-effectively gain access to a large number of fishers, or sample across large spatial scales, where it may be cost prohibitive to have field staff at fishing sites. However, the main disadvantage is that they rely on fisher-reported data, for which the quality and legitimacy can often not be verified without conducting expensive ancillary surveys (Tarrant et al., 1993; Fisher, 1996).

Mail and telephone surveys

Mail and telephone surveys are two distinctly different survey methods, but are similar in that they both rely on a sampling frame whereby the researcher selects a representative sample of households in which to mail or call to administer a questionnaire. This can be done by using non-specific or specific sampling frames. A non-specific list frame may be a general population telephone directory, whereby a probability sample of households is selected to survey. A questionnaire is posted to the household, or residents called by telephone, in hope that at least one fisher resides in the household, and completes the questionnaire over the phone with a trainer interviewer, or returns the questionnaire to the researcher in the case of a mail survey. Although inexpensive, mail and telephone surveys using non-specific list frames often yield very

poor response rates – particularly for specialised fishing activities – as eligible fishers generally reside in a reasonably low proportion of contacted households (Pollock et al., 1994).

In contrast, specific sampling frames are lists of individuals or households of direct relevance to the fishing activity of interest. For example, the Highly Migratory Species permit in the United States may be a useful list to access specialised fishers who target large pelagic species. Having access to specific list frames can significantly reduce the cost involved in contacting eligible respondents. However, in the case of mail surveys, response rates are often low due to the time burden to complete and mail the questionnaire back to the researcher. The percentage of surveys returned is generally not the main concern, but rather the potential difference in the types of responses between respondents and non-respondents, which can bias results if the two groups have different demographic and/or fishing characteristics. In contrast, once eligible fishers are contacted during telephone surveys, the response rate is generally high, often exceeding 90% (Weithman and Haverland, 1991; Lyle et al., 2002).

Both mail and telephone surveys are generally not suitable for collecting data for individual fishing trips. For mail surveys, this is due to the time required for questionnaires to be posted to and returned from recipients. For telephone surveys, it is costly to dedicate personnel to contact large numbers of fishers, particularly if non-specific list frames need to be used each time. Instead mail and phone surveys have generally been used for recall surveys, where fishers are asked to recall the details of specific trips over periods of weeks to months, and sometimes the past year. Unfortunately, recall surveys rarely yield reliable data due to problems associated with recall bias; the accuracy of specific details of a fishing event that progressively diminishes after around two months (Pollock et al., 1994; Hart and Reynolds, 2002). Other potential biases may also be apparent in particular fisheries, such as intentional deception and under-reporting where possession limits apply, or 'prestige bias' where fishers may intentionally exaggerate the number or size of fish caught.

Nevertheless, mail or telephone recall surveys may be a cost-effective method in some circumstances for collecting trip-specific data, such as in a fishery that extends across a large spatial scale where the target population has a complete list frame and targets trophy species where catches are reasonably infrequent and memorable, such as gamefish fisheries.

Telephone surveys are particularly useful for large scale recreational fishing surveys where the objective is to either estimate the total number of fishers in the general population, or as a screening tool to recruit fishers to more specific surveys like longitudinal diary surveys where trip-specific data is required (Henry and Lyle, 2003; Higgs and McInnes, 2003). However, in some countries like the United States, response rates in telephone surveys have been dramatically declining due to a number of factors including telemarketing saturation, suspicion by the public, and the attrition of home land-lines due to the increasing use of mobile phones (N.R.C. 2006).

One of the main problems with mail and telephone surveys is that even available specific list frames (e.g. licence holders) are often incomplete in terms of representing the full spectrum of fishery participants. For example, it is common for fishery agencies to grant licence exemptions related to age, race or socio-economic status (e.g. unemployed or pension). There are also fishers who simply do not purchase a licence and fish illegally. Therefore, not including 'out of frame' fishers in the sample can significantly bias survey results if their fishing activities differ from in-

frame respondents (Ryan et al., 2009). Ancillary surveys using specialised sampling designs are therefore required to study out of frame fishers to resolve the bias, but adds significant expense to the research (Fisher, 1996; Teixeira et al., 2016).

Diaries and logbooks

Angler diaries (sometimes referred to as logbooks) are used when detailed information for individual fishing trips is required from a large number of fishers over a long period. Traditionally, diaries are supplied in paper form with instructions for the fisher to follow in data recording. When completed, the diaries are mailed back to survey staff. Despite being inexpensive and simple to apply, they have the disadvantage of collecting fisher-reported data. Problems associated with prestige bias, misidentification of fish species, and incorrect recording of fish lengths and weights can make the data unreliable if diarists are not sufficiently trained.

Recall bias can be a major problem in diary surveys but can be minimised if diaries are completed immediately after a fishing trip is completed. Non-response, decrease in participation, and accuracy/completeness of data are other common problems in voluntary diary surveys, especially when the survey period is long (Pollock et al., 1994). For example, in New Zealand, diarists admitted during an exit survey for the 2000–2001 national survey that they did not record all of their fishing trips or all of their catch (Gowing and Boyd, 2004). This is not only due to diarists simply forgetting to complete diaries, but also due to the time burden of completing too many data fields over a long study period.

In recent years there has been increased used of telephone diary surveys, particularly by Australian researchers, to reduce respondent burden and reduce some of the major biases such as recall bias (Webley et al., 2015; West et al., 2015; Lyle and Tracey, 2016). Instead of diarists receiving a physical diary to complete, survey staff maintain frequent contact with each diarist via telephone. When the diarist indicates an intention to undertake a fishing trip in the near future, the survey staff schedules a telephone call within days of the trip being completed. Staff then record all details of the fishing trip relating to catch and effort and other information pertinent to the particular study.

Charter logbooks

Sport fishing charter operations may fall between definitions of both sport and commercial fishing and are therefore not always included in recreational fishing surveys. Alternatively, they may be classed as commercial fishing and therefore included under mandatory commercial logbook systems.

Charter logbooks are physical books of forms, usually self carboning for multiple copies, which are designed to gather daily catch information. Electronic logbooks are increasingly being used in commercial fisheries, where submission of catch data is mandatory, but have not been widely used in sport fisheries.

Logbooks have been designed for use in sport fishing charter fisheries in a number of countries and jurisdictions. These have nearly always been designed for specific use for that fishery, not for merging with large commercial fishery databases as would ideally be the case of the current Project. For example, New Zealand, New South Wales Fisheries, Australian Institute of Marine Science charter logbooks were primarily designed to record catch/effort information on billfish.

Some jurisdictions require the mandatory completion of logbooks by charter operators, although if these are mixed fishing operations, they are not always useful for pelagic fish catches which may be rare events compared with demersal catches.

Door-to-door surveys

Door-to-door surveys are generally not considered to be a suitable option for surveying large-scale recreational fisheries as they are labour intensive, expensive and logistically cumbersome. However, in the case of IOTC Area of Competence, there may be countries where such as survey would be feasible and highly effective. Door-to-door surveys generally involve probability sampling of households within spatial strata using a list frame, which may be derived from licence or postal frames. Survey staff physically visit households and ask to interview eligible resident fishers. Similar to other off-site methods, the major disadvantage of door-to-door surveys is that data is recalled and self-reported, resulting in many of the aforementioned biases. However non-response bias is often greatly reduced compared to surveys conducted by phone or mail (Pollock et al., 1994). Although there have been reasonably few large-scale door-to-door recreational fishing surveys, probably due to high cost, the Ministry for Primary Industries in New Zealand recently employed the method in their national survey of recreational fishing. The main reason for choosing the method was to 'future proof' the survey design so that the results of future surveys could be comparable in the face of increasing non-response biases in other common survey methods such as telephone (Heinemann et al., 2015).

On-site survey methods

Creel surveys

Creel surveys are probably the most commonly used recreational fishing survey method, especially for specific fisheries in defined water bodies (Newman et al., 1997). Sampling involves survey staff intercepting fishers at specific times and locations to record data relating to completed or current fishing trip, such as catch and effort, and size of retained fish.

Creel surveys can take the form of an access point or roving creel survey. Access point surveys are useful where the majority of fishers use publicly accessible sites to access the fishery, such as public boat ramps, piers and marinas and where a limited number of access points exist that can be sampled adequately with available staff resources. In contrast, roving surveys are used when a fishery can be accessed from too many points that can be visited by a traditional access point design, or where there are inaccessible private access points. The roving creel survey involves survey staff stopping at designated access points on a predetermined time schedule. These surveys are conducted by boats to intercept on-water fishers (Pascoe et al., 2014), or by foot, bicycle or car to intercept shore-based fishers (Beckley et al., 2008; Smallwood et al., 2011).

Access surveys have a distinct advantage over off-site methods in that catches can be inspected by trained staff to collect accurate species and size composition data. Because fishers are generally interviewed on completion of a trip, recall accuracy of fishing effort and details of released fish can also be maximised. However, the main disadvantage of creel surveys is they are labour-intensive and expensive. A further disadvantage of roving creel surveys is that fishers are usually interviewed before their trip is complete, which can affect catch and effort estimates (Hoenig et

al., 1997; Pollock et al., 1997). 'Length of stay' bias is a related problem whereby fishers who fish for longer periods—often more avid fishers—have a greater likelihood of being interviewed and thus bias effort and catch rate estimates.

As a result, most studies undertaken by fisheries agencies are small-scale or short-term 'snapshots' of the recreational catch (e.g. Malseed et al., 2000; Morton and Lyle, 2003; Steffe et al., 2005a; Steffe et al., 2005b; Rangel and Erzini, 2007; Smallwood and Sumner, 2007), but a few multi-year studies have been completed (Steffe et al., 1996; McGlennon, 1999; Reid and Montgomery, 2005). However, when used in conjunction with well-designed less expensive off-site surveys (e.g. telephone and diary), detailed catch and effort information collected in on-site surveys can be scaled up to provide species-specific catch estimates for the entire recreational fishing community. Specific examples of these will be discussed in detail in Section 0.

Aerial surveys

Recreational fishing effort that is dispersed across very large spatial scales can be effectively quantified by aerial surveys counting boats and shore-based fishers (Hardie et al., 2002; Volstad et al., 2006). Aerial surveys are usually combined with another on-site method (e.g. creel survey) that can estimate catch rates, which can be scaled up to the effort estimated by aerial surveys (Hartill and Edwards, 2015). Aerial surveys are particularly useful for recording large numbers of fishers or boats over large geographic areas in a relatively short period of time.

The obvious disadvantage of aerial surveys is the high cost involved with the use of an aircraft, although the use of drones after thorough testing may dramatically lower costs (Kopaska, 2014). A number of factors have the potential to compromise fishing effort estimates from aerial surveys. For example, effort may be underestimated if fishers are obscured, or overestimated if counted boats are used for other activities other than fishing. The inability to fly on randomly selected days due to poor weather may also create bias (Fraidenburg and Bargmann, 1982).

Complemented survey designs

A complemented survey refers to the concurrent or sequential use of two or more survey methodologies. The primary reason for the use of two methods is that one survey method can account for some of the shortcomings of another. The primary use of complemented surveys in recreational fisheries is to estimate total catch and effort in large-scale fisheries with a large number of participants (Lyle et al., 2002).

The combination of methods used in particular studies varies depending on the fishery characteristics, availability of sampling frames, and the level of resourcing available. For example, studies in Canada (Hardie et al., 2002), the US (Volstad et al., 2006) and New Zealand (Hartill et al., 2008) used aerial-access point surveys to make instantaneous counts of all fishers from the air and concurrent access point surveys to estimate catch rates by intercepting fishers. The effort estimates derived from the air were used to scale up catch rates from the access point interview data to estimate the catch for the entire fishery.

In recent years, many of the large-scale recreational fishing surveys in industrialised countries have used what is referred to as the telephone-telephone diary approach (Henry and Lyle, 2003; USFWS, 2014; Rocklin et al., 2014). This is mainly owing to the growing number of studies refining

the method to improve its cost-effectiveness and resolution of common sampling biases (Teixeira et al., 2016), and the availability of standardised analytical tools (Lyle et al., 2010). The approach consists of a general population telephone 'screening' survey where a random sample of households are contacted for the presence of eligible fishers, from which the participation rate is estimated. A subset of eligible fishers is recruited to a diary survey, usually for a period of one year, where diarists are requested to provide trip-specific details of their fishing activities. However, a telephone diary is used in conjunction with a traditional paper diary, whereby survey staff maintain contact with each diarist and record trip-specific information within days of each trip being completed. This approach has been shown to reduce recall bias, respondent burden, and diarists exiting the survey before completion (Lyle et al., 2002). The high resolution data from the diary survey are expanded to the level of effort estimated from the telephone survey to estimate the total catch of species of interest.

Although the costs of a telephone-telephone diary survey are slightly higher than a traditional telephone-diary survey, the quality of data is greatly increased. Furthermore, one of the main disadvantages of the method is that species identifications and fish lengths cannot be verified from fisher-reported data. However, with increased use of smartphones, costs may be reduced if diarists can be periodically contacted by phone and directed to report their trip catch via a customised smartphone app (Papenfuss et al., 2015; Venturelli et al., 2016) or simple text messaging (Baker and Oeschger, 2009). Similarly, an app that allows photo submissions of captured fish alongside a scale reference, may alleviate data quality issues (Jiorle et al., 2016).

Case studies in gamefish fisheries

In the United States for example, the National Marine Fisheries Service (NMFS) conducts the Large Pelagics Survey (LPS) using a complemented survey design consisting of an access point survey to collect catch rates for large pelagic species – such as tunas, billfish, sharks, wahoo, and dolphinfish—from private and chartered vessels and a telephone survey using the Highly Migratory Species licence frame. Weekly or fortnightly telephone surveys are used to contact a subset of fishers on the licence frame list to estimate effort, which is scaled up to the size of the entire directory. The access point surveys are conducted on randomly selected days at randomly selected access points to collect catch and effort data from completed trips. This survey involves real-time monitoring of the fishery which is labour-intensive and therefore expensive, but produces reliable species-specific catch, effort and some size data.

In Australia, the New South Wales Department of Primary Industries Gamefish Tournament Monitoring Program uses a two on-site complemented survey approach to estimate catch rates for gamefish species caught only during major tournaments (Lowry and Murphy, 2003; Lowry et al., 2007). Data from scheduled hourly radio reports from game boats are used to record the fishing location and species-specific catch, estimated weights if not landed and whether fish were tagged. In most years, on-site interviews also take place at boat ramps, weigh stations and marinas to not only validate reported catches, but to also measure landed fish (length and weight). Unfortunately, this data is not representative of the catch or effort of the entire game fishing sector as it only covers club boats fishing in major tournaments. However, the data provides is a standardised measure of catch rates, from same locations and time periods, which may provide an index or relative abundance for target species (e.g. tuna, billfish and sharks) and bait species (e.g. blue mackerel) (Lowry et al., 2006).

Novel survey designs for specialised recreational fisheries

The increased availability and affordability of new fishing technologies has led to a rapidly diversifying recreational fishery whereby fishers are increasingly efficient at targeting and catching species that were not previously accessible by recreational fishers (Griffiths, 2012). These specialised fisheries, like gamefish fisheries, are often comprised of a relatively small number of participants relative to the broader recreational fishery, but are likely to make a disproportionate contribution to the total recreational catch of species of IOTC managed species, such as striped marlin. This poses a significant challenge for researchers who are tasked with cost-effectively gathering representative catch, effort and size frequency data from these small but important fisheries.

The traditional survey approaches previously discussed are primarily designed to gather general recreational fisheries data. For highly specialised sport fishing, alternative survey methods that are specifically tailored to the particular fishery are required to overcome the low probability of encountering specialised fishers in general population surveys. As such, for fisheries that incorporate multiple jurisdictions, it is critical that either the relevant jurisdictions recognise the need for information about the fishery as a whole and collaborate in collecting data or the IOTC facilitate targeted cross-jurisdictional surveys of species for which they have management responsibility.

Researchers in Australia in particular have begun to explore new cost-effective survey methods for sampling 'hard-to-reach' specialised recreational fishers (Griffiths et al., 2010a; Griffiths et al., 2010b; Zischke and Griffiths, 2014). Two methods that have been identified that may be of relevance to recreational fisheries are Respondent-Driven Sampling (RDS) and Time-Location Sampling (TLS). Both methods have been widely used in epidemiology and social sciences to access members of populations who are rare, hidden, or physically difficult to locate within the general population, such as the homeless and illicit drug users (see reviews by Magnani et al., 2005; Griffiths et al., 2010c). Although these methods are still in various stages of development, after adequate testing they may be useful alternatives to expensive traditional survey approaches.

Time-Location Sampling

Time-Location sampling is a method that may be used to cost-effectively sample hard-to-reach components of recreational fisheries. Many hard-to-reach populations tend to gather or congregate at certain types of locations at particular times. For example, epidemiologists found that hidden populations of illicit drug users tend to congregate at specific locations where drug or needle transactions take place, and most often during the night. TLS capitalises on such predictable behaviours of the target population, whereby a researcher identifies aggregation sites within a study region, or sampling 'universe', and a subset of the sites is chosen as a probability sample (Muhib et al., 2001; Stueve et al., 2001). The researcher then interviews individuals entering or leaving a sampling site within a pre-defined sampling interval (e.g. a randomly chosen 3-hour period on a randomly chosen day).

TLS is a similar concept to traditional recreational fishing access point surveys. However, access point surveys at boat ramps, for example, can only account for fishers who fish from vessels that can be launched from a trailer. Land-based fishers and fishers owning larger vessels berthed in

marinas, on moorings or on private property are missed using boat ramp access point surveys. This may cause a significant bias in total catch and effort estimates for the overall fishery if the fishing characteristics of each component differ. In contrast, TLS may be used to sample the specialised component of the fishery if locations can be found where a representative cross-section of all fishers congregates. One such approach is to conduct a survey of customers at fishing tackle stores, since most fishers, regardless of ability, fishing experience, avidity or mode of fishing, need to purchase fishing tackle at some point. TLS was shown to be an effective sampling method in a national survey of fishers who target Longtail Tuna (Griffiths et al., 2010b), as well as a survey of offshore sport fishers in south eastern Queensland (Zischke, 2013).

Respondent-driven sampling

RDS is a non-random chain-referral sampling method, similar to that of snowball sampling, that works by an initial set of subjects from the target population—or "seeds"—receiving a small number (e.g. 3-5) of uniquely coded coupons to pass on to eligible peers within a target population. Subjects receiving a coupon contact the researcher, complete a survey, are provided with a small reward for completing the survey, and serve as the first 'wave' of recruits. Each recruit is provided with coupons and offered small incentives to recruit further subjects. This process continues, creating rapidly expanding recruitment chains until the sample is considered 'stabilised', whereby the proportion of groups within the population (e.g. males and females) defined *a priori* varies by less than 2% in the overall sample, regardless of how many further waves are recruited (Heckathorn, 1997; Salganik and Heckathorn, 2004). The final sample is then is modelled with appropriate sample weightings to compensate for the non-random sampling of subjects and the various biases introduced by the tendency of subjects to recruit peers with similar characteristics similar to themselves (Heckathorn, 1997;2002). At this point, the post stratified sample is considered to have a sample composition that is representative of target population.

Because respondents are responsible for recruiting eligible peers, a sample can be cost-effectively obtained from populations that are hidden, rare, or only accessible by insiders (Wejnert, 2009). The efficacy of RDS can be attributed to its dual-incentive recruitment process that creates group-mediated social control—a form of peer pressure—strengthened by the desire of recruiters to redeem their reward (Heckathorn, 1990). Therefore, non-response bias is often very low and also not skewed towards more affluent peers, since subjects who may have little interest is recompense often participate as a favour to a peer (Magnani et al., 2005).

Although RDS has not yet been used in recreational fisheries research, a current Project in Australia is trialling RDS on various specialised recreational fisheries in Tasmania (Griffiths et al., 2015). If successful, there may be options to further decrease the cost of RDS surveys and increase recruitment speed in future using online implementation of RDS (see Wejnert and Heckathorn, 2008). Despite the apparent efficacy of RDS in other disciplines, RDS would require pilot studies in major recreational fishing locations before considering widespread implementation throughout the IOTC Area of Competence.

Recommended methods for the pilot study

Having reviewed the range of methods available for collecting catch and effort data for sport fisheries, visited each of the four pilot countries to examine sport fisheries, and cognisant of funding and resource limitations, the recommended methods for collection of sport fishing catch and effort data for all four countries as follows:

Charter fishery log book

Instigate a sport fishing charter logbook. The logbook would—ideally—be consistent across each country. National Fisheries officers would collect the logs once per month by one of four methods, or a combination:

i. Telephone the charter operators and enter data to Excel
ii. Face to face visit, transcribing manually completed data on log sheets to Excel on the spot, or taking copy of log back to office for later entering.
iii. Receive manually completed paper log sheets through the mail and transcribe to Excel
iv. Receive Excel files emailed from charter operators

Receipt of electronic files would be the most cost-effective method of receiving data but some ongoing contact with charter operators would still be highly desirable to maintain their willingness to continue to provide log sheets on a voluntary basis. It is also likely that a proportion of charter operators would prefer to complete paper log sheets for a variety of reasons.

A charter fishery logbook is strongly recommended for the following reasons:

Charter operators are often familiar with filling in daily catch records if fishing in other jurisdictions, or through keeping their own records in the form of a personal log or diary. In the case of La Réunion, captains and/or operators are required by law to complete a daily log, since they are classified as commercial fisheries. The forms can be filled in manually, and copies kept by the operator for his/her own records, which is an incentive. Alternatively (and preferably), operators could complete the log on a laptop or PC. As noted further in the report, the proposed electronic log has been carefully designed for ease of use by charter operators with respect to completing for each day's fishing, for exporting to the relevant fisheries agency and for retaining electronic copies for their own use.

Pros

There are, coincidentally, approximately 40 sport fishing charter vessels active in each of the four countries. This is not a large number to service on a regular basis, especially if at least some of the data were routinely entered digitally by the operators themselves. Also, in each country, some companies own and operate more than one boat, in which case, obtaining log sheets would be facilitated through cooperation and coordination with such companies.

It is estimated that the time taken for one Fisheries officer to collect data from the charter fleet in each country (assuming a mix of the methods of data collection listed above) would amount to perhaps 5 days per month. This would be less if all data were collected by telephone (say, 3 days per month) or if much of the data were emailed (or mailed) by the charter operators themselves (say, 3 days per month). This would be time well spent since the National Fisheries organizations

would be able to retain previously unavailable, ongoing data from the sport fishing sector for their own management purposes.

The resultant data from the logbooks would be readily transferred to the IOTC fisheries database (see Design and use of Charter Logbook).

Provides very good catch effort data of the charter sector, broken down to individual fish if necessary.

Cons

Because completion of logbooks by charter operators would not be mandatory, it is unrealistic to expect that all of them will provide the data. This is not seen as a major problem though since the log sheets that are completed, provided that they represent a cross section of the fishery, can be used to extrapolate to the rest of the fleet, with appropriate caveats etc.

A charter logbook should provide reliable estimates of the total catch, catch per effort and size composition of the catch of the sport fishing charter fleet in each country. However, it will not deliver an estimate of total catch by the entire sport fishing sector since private boats which also undertake some directed fishing towards the pelagic species of interest in each location would not be covered by the logbook system. Even so, some assumptions could be made regarding the relative fishing efficiency of the charter vs the private sectors and an order of magnitude estimate of total catch could then be made.

Private fishery survey

If a more complete estimate of the total sport fishing catch of not just the charter sector, but also the private sport fishing sector in a particular country is deemed highly desirable, a specifically designed off-site survey of that sector is recommended.

The lowest cost survey would take the form of a 'snapshot' telephone survey of owners of private boats. Fortunately, licence frames of one form or another exist in each of the pilot countries which would obviate the need for a general screening telephone survey to initially locate owners of sport fishing boats (a process which can be very expensive). Using the appropriate licence frame, a stratified random sample of boat owners would be contacted by telephone.

Each boat owner would be asked a series of questions regarding their fishing activities in their respective country over the past 12 months. In its simplest form, the survey would ask:
Have you fished on your boat for billfish, tuna, mackerel or other pelagic fish in the past 12 months?
If so, how many days did you fish?
How many fish did you catch? (Checked from a provided list; size of fish would also be elicited).
Of course, more questions could be asked for information of particular interest to the National Fisheries agency.

Of the four pilot countries, it is considered that La Réunion would benefit most from such a survey since the number of private boats there is very large (e.g., as high as 2,000), and the proportion

that may catch pelagic species, while unknown, may also be high (possibly hundreds of boats). Also, as noted in the country report for La Réunion, the professional charter boats that cater to sport fishing clients already complete daily logbooks, although these data are not currently separated from overall professional catch data. If separation of such data were to occur, then a snapshot survey of the potentially large number of private vessels would provide a single one-off estimate of the overall catch and effort of IOTC species by this hitherto unknown sector. If the results indicated that the catch of this sector was significant, the survey could be repeated at regular intervals, ideally annually, but more practically, every three years.

Pros

Once designed, a snapshot survey can be conducted quite quickly, and would provide catch, catch and effort and possibly size data from a previously cryptic sector of the sport fishery.

The numbers of private sport fishing boats in each of the pilot countries that would be included in the 'universe' of boats that target or catch billfish, tuna and other pelagic species at least sometimes are not large – of the order of perhaps 100 at the most (although as noted, in the case of La Réunion, due to the large 'population' of private boats, a larger snapshot survey may be necessary depending on the actual proportion of private boats that do target the key pelagic species.

Cons

A proportion of boat owners may not own a phone (this would be readily checked on the licence database, and it is considered likely that a high proportion would in fact own a cell/mobile phone)

Respondents who are asked to recall fishing activities over the past 12 months may provide biased data due to either lack of recall of events or to 'telescoping' of recall – i.e., including events that occurred more than 12 months ago. It is because of these potential biases that large scale recreational fishing surveys in Australia have been designed to have respondents keep a diary of their fishing activities, and then to report those data via monthly phone calls from a survey operator over a 12-month period.

Funds would need to be allocated for such surveys. Assuming a cost of, say, $50 to $100 per interview (although this may be lessened if using National Fisheries officers to conduct the interviews), a snapshot survey in each country might cost of the order of $15,000 to $20,000. More accurate surveys in which fishers were contacted monthly over a 12-month period would, of course, cost considerably more.

Design and use of Charter Logbook

A new logbook was initially designed for use by sport fishing charter operators in each of the four pilot countries. This took into account the data requirements of IOTC and was based on various logbooks already in use. The logbook currently being used in La Réunion was used as a guide to the design, since it was already in use in one of the countries and contained many of the elements desired by IOTC.

The captain or operator of a sport fishing vessel may fill in either the paper version of the log, or enter data directly into an (Excel-based) electronic version. If filling in the paper version, the sheets are either mailed to the National Fisheries Institution monthly, or a National Fisheries officer collects the sheets. The officer then enters the data into the electronic version of the logsheet.

A full manual for use of the logbook is presented as Appendix I of this report. The main features of the log sheet include:

Instructions: Detailed instructions included as the first tab in the electronic version of the log and would be printed at the front of a paper version of the logbook.

Identifiers: Name of vessel, Port, Name and contact details of captain, vessel length and horsepower

Trip Details: A 'trip' is defined as a day's fishing, or part thereof. Details include: Date, Area fished (as per IOTC-supplied grids), Number of hours fished, Number of fishers on board, Primary fishing method (bait, lure etc.); and whether or not **any** fish were caught that day (either retained or released). The last field is important since prior experience suggests that charter operators tend not to complete a log sheet if no fish are caught, thereby confounding the measurement of actual fishing effort data.

Catch Details: For retained fish, operators would record the species and the FAO code for that species. Note below that the electronic version of the log makes this easier via use of a dropdown menu for both common name and FAO code. They then record the number of that species retained on that trip and their total weight. Similarly, for 'released alive' fish and 'discarded dead' fish, the operator records species, numbers and an estimate of the aggregate weight of the catch of that species on that trip. During the field visits most sport fishing operators indicated that they never discard dead fish, however for completeness the decision was made to retain this field in the logsheet. There may also be some circumstances (albeit rarely), when this may be a valid category, for example, when an unwanted species such as a tiger shark dies before it is brought to the boat, and is then discarded.

The 'paper' log sheet was then used as a template for designing the electronic version of the log sheet. This was developed through multiple versions, in close consultation with the IOTC Secretariat.

The electronic log has the following features:

As noted, for ease of entry, Dropdown menus are provided for recording many factors, including: Area fished, Number of hours fished, Number of fishers on board, Primary fishing method, Whether or not any fish at all were caught (or released) that day, Species retained, Species released alive and Species discarded dead (in each case, common name on dropdown menu, then records FAO code for that species. A copy of the blank sheet as it appears for the electronic version is shown in Figure 11 and a 'dummy' completed sheet covering eight days of fishing in Figure 12.

Figure 11. The newly designed log for sport fishing charter vessels. The electronic front page, shown here, shows all the data fields required, most of which have embedded dropdown menus. Coloured cells turn white when the required data are entered. Space for eight separate fishing Trips (full day or part thereof) are provided on each sheet. The sheet may also be used in paper form.

Recreational Fisheries Logbook Program

Reporting country: **Seychelles**

Contact: Steve Jones on email: sjones@net.com

Indian Ocean Tuna Commission

iotc ctoi

NAME OF VESSEL:		PORT:		CAPTAIN:	NAME		RESET TRIP DATA
					ADDRESS		
					PHONE		
					EMAIL		
VESSEL LENGTH OVERALL (M)							
ENGINE CAPACITY (HP)							

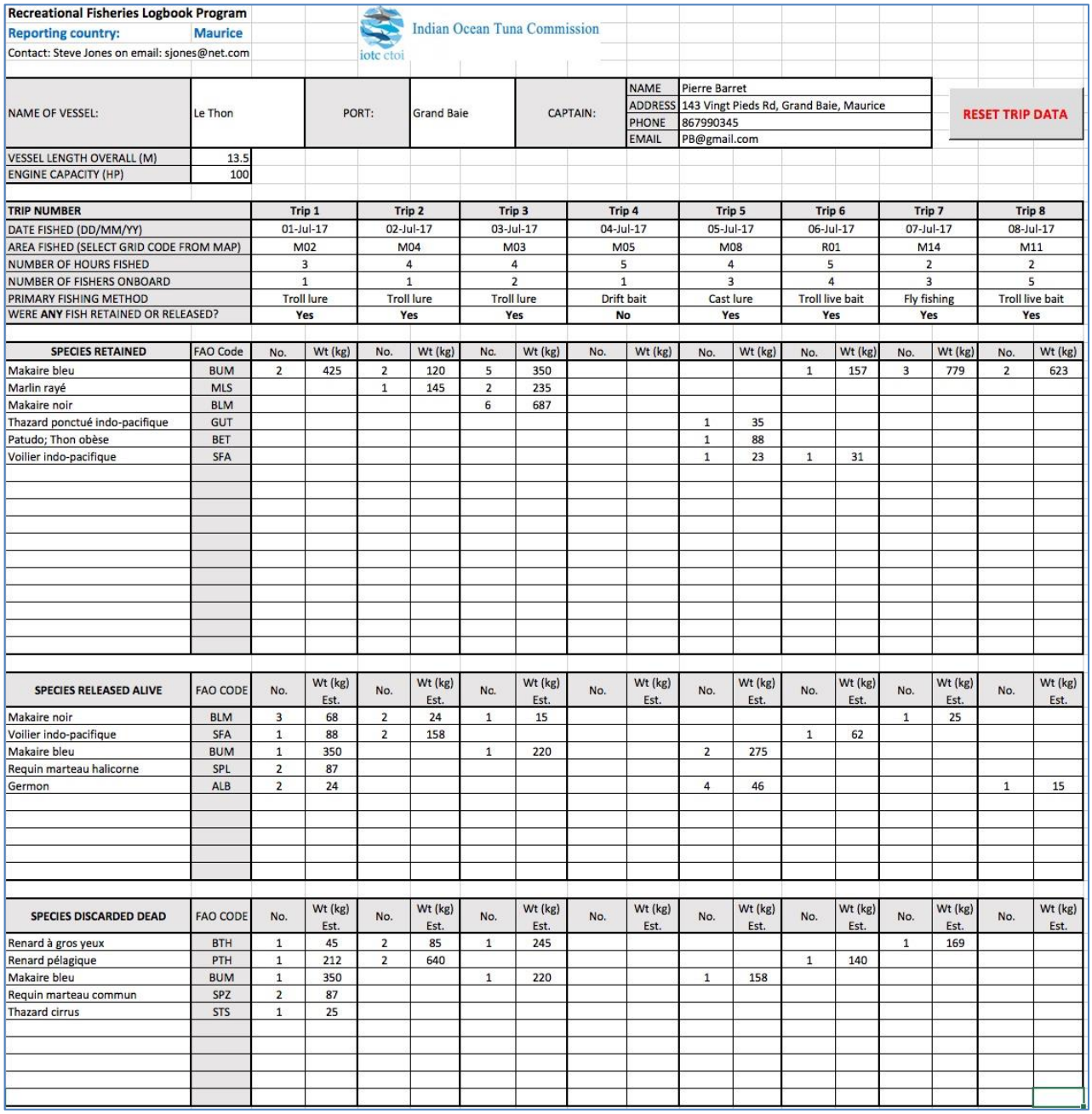
TRIP NUMBER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8
DATE FISHED (DD/MM/YY)								
AREA FISHED (SELECT GRID CODE FROM MAP)								
NUMBER OF HOURS FISHED								
NUMBER OF FISHERS ONBOARD								
PRIMARY FISHING METHOD								
WERE **ANY** FISH RETAINED OR RELEASED?								

SPECIES RETAINED	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)

SPECIES RELEASED ALIVE	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.

SPECIES DISCARDED DEAD	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.

Figure 12. The newly designed log sheet with 'dummy' data entered.



Recreational Fisheries Logbook Program

Reporting country: Maurice

Contact: Steve Jones on email: sjones@net.com

Indian Ocean Tuna Commission

iotc ctoi

NAME OF VESSEL:	Le Thon	PORT:	Grand Baie	CAPTAIN:	NAME	Pierre Barret
					ADDRESS	143 Vingt Pieds Rd, Grand Baie, Maurice
					PHONE	867990345
					EMAIL	PB@gmail.com

RESET TRIP DATA

VESSEL LENGTH OVERALL (M)	13.5
ENGINE CAPACITY (HP)	100

TRIP NUMBER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8
DATE FISHED (DD/MM/YY)	01-Jul-17	02-Jul-17	03-Jul-17	04-Jul-17	05-Jul-17	06-Jul-17	07-Jul-17	08-Jul-17
AREA FISHED (SELECT GRID CODE FROM MAP)	M02	M04	M03	M05	M08	R01	M14	M11
NUMBER OF HOURS FISHED	3	4	4	5	4	5	2	2
NUMBER OF FISHERS ONBOARD	1	1	2	1	3	4	3	5
PRIMARY FISHING METHOD	Troll lure	Troll lure	Troll lure	Drift bait	Cast lure	Troll live bait	Fly fishing	Troll live bait
WERE **ANY** FISH RETAINED OR RELEASED?	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**

SPECIES RETAINED	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)
Makaire bleu	BUM	2	425	2	120	5	350					1	157	3	779	2	623
Marlin rayé	MLS			1	145	2	235										
Makaire noir	BLM					6	687										
Thazard ponctué indo-pacifique	GUT									1	35						
Patudo; Thon obèse	BET									1	88						
Voilier indo-pacifique	SFA									1	23	1	31				

SPECIES RELEASED ALIVE	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.
Makaire noir	BLM	3	68	2	24	1	15							1	25		
Voilier indo-pacifique	SFA	1	88	2	158							1	62				
Makaire bleu	BUM	1	350			1	220			2	275						
Requin marteau halicorne	SPL	2	87														
Germon	ALB	2	24							4	46					1	15

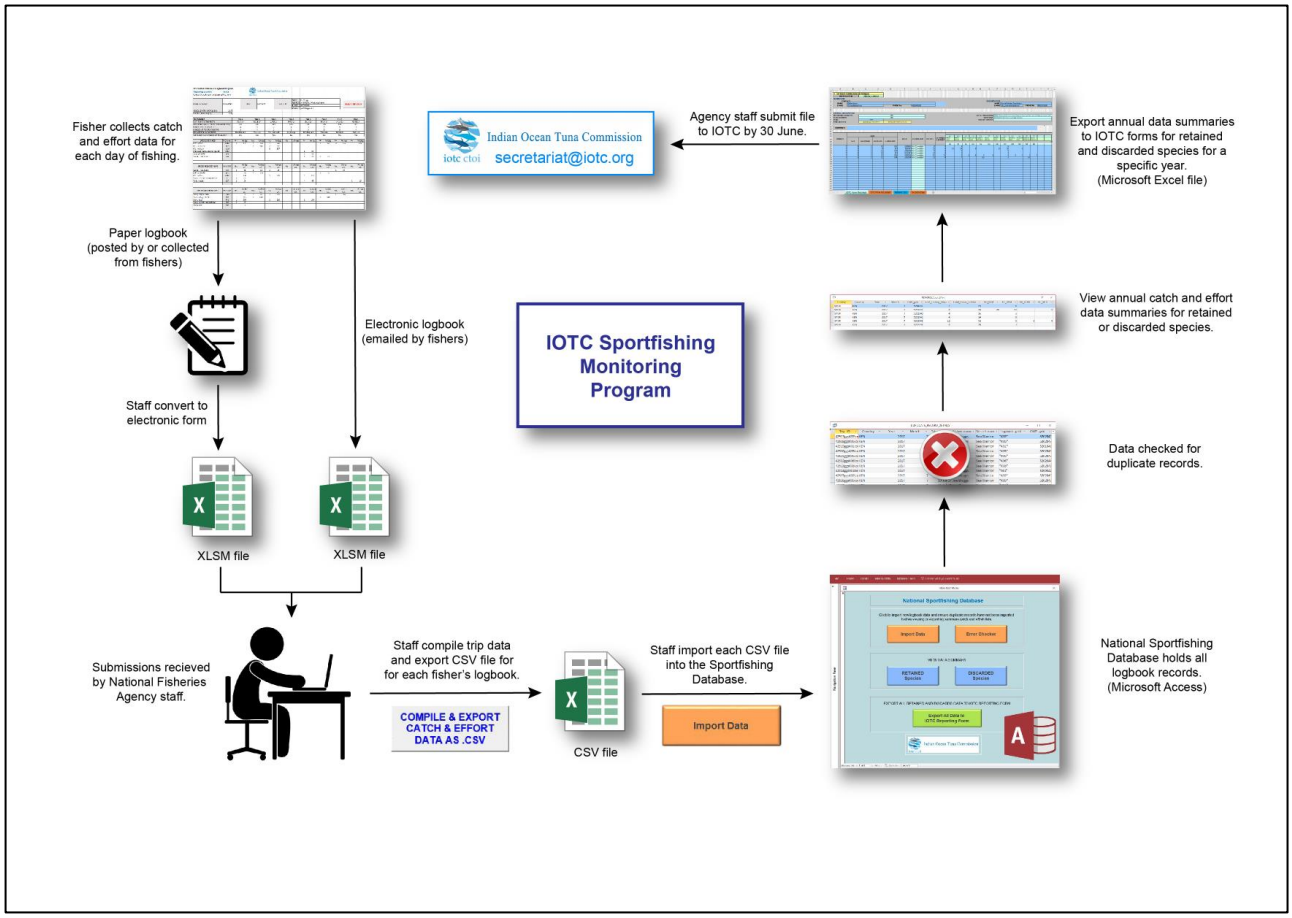
SPECIES DISCARDED DEAD	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.
Renard à gros yeux	BTH	1	45	2	85	1	245							1	169		
Renard pélagique	PTH	1	212	2	640							1	140				
Makaire bleu	BUM	1	350			1	220			1	158						
Requin marteau commun	SPZ	2	87														
Thazard cirrus	STS	1	25														

Monthly submitting of data: At the end of each month, regardless of how many days were fished, the fisher, or the National Fisheries Officer, saves that month's entries as a unique file, and then resets the logbook for the next month via a specific one-click button.

Compilation and export of data: The National Fisheries Officer can then produce catch summaries of entered data and importantly, can check for any errors in entered data prior to compiling and exporting. Errors are colour flagged in red. These might include such elements as incomplete details of vessel, fisher or country, mismatches between species name and entered data or catch and trip data and so on.

After fixing errors, catch summaries are automatically generated which may then be exported in a single step and saved as .csv format in a chosen location from where it can be imported into the National Sport Fishing Access Database for that country as set up for this Project. Finally, either annually or more frequently if desired, catch/effort data can be exported to the IOTC database by undertaking a series of simple queries, addition of the source of the data onto the IOTC_Form_Retained sheet, saving as an Excel workbook and emailing to the IOTC.
A pictorial representation of the process, from data entry by the fisher, to receipt by IOTC, is shown in Figure 3.

Figure 13. Schematic sequence of steps in the use of the electronic logbook, from monthly completion by fisher to National sport fishing database to IOTC database.



Training Packages

Following the design of the log sheets and thorough testing on different platforms, training packages were designed to be delivered to National Fisheries Institution staff, and to operators of sport fishing charter boats in each of the four countries. These modules consisted of:

National Fisheries Institutions package

Module 1: Introduction

- Background
- Purpose of Project
- Outputs from Project
- Methods of collection of sport fishing data
- Results of country visit
- Recommendations
- Challenges

Module 2: The electronic logbook

- Logsheet flow chart
- Step by step completion of logsheet
    - Vessel and operator information
    - Entering trip information (catch, retained, discarded alive/dead
- Submitting monthly data
- Resetting for next month of trips

Module 3: Compiling and exporting data to National Fisheries database, and to IOTC

- Logsheet flow chart
- Exporting data by National Fisheries officers
- Catch summary and error checking
- Catch export
- Importing data to National Sport fishing Database
- Performing data queries and exporting to IOTC

Charter Operators package

Module 1: Introduction

- Background
- Purpose of Project
- Outputs from Project
- Methods of collection of sport fishing data
- Results of country visit
- Recommendations
- Challenges

Module 2: The electronic logbook

- Logsheet flow chart
- Step by step completion of logsheet
    - Vessel and operator information
    - Entering trip information (catch, retained, discarded alive/dead
- Submitting monthly data
- Resetting for next month of trips

The full training modules and training manual accompanying the electronic logbook are available upon request from the IOTC Secretariat (secretariat@iotc.org).

Second round of country visits

The second round of visits to the four pilot countries took place between 13 August and 8 September 2017. The visits were undertaken by Ms Nelly Kadagi, accompanied by IOTC Secretariat personnel. While the logbook had been circulated to National Fisheries personnel shortly beforehand, little feedback had been received. Therefore, in addition to training purposes, the visits were also intended to seek feedback from fisheries personnel and charter operators on the log design and on the likelihood of adopting its use in the sport fishery of each country. In some cases, information received during the second visit supplemented or clarified information from the first visit.

The following section summarises the results of training sessions and discussions regarding use of the electronic logbook with Government and sport fishing sector representatives during the second round of visits.

Seychelles

Seychelles Fishing Authority
Unfortunately, most of the senior officers of the Seychelles Fishing Authority were off island at the time of the second country visit. However, the opportunity was taken to meet with some staff, including Ms Juliette Dorizo who was shown through the electronic logbook. She reported that the fishing boat frame survey, which was flagged during the first visit, had commenced about two weeks prior. The Project is headed by a locally hired consultant and among other aims, plans to document all the sport fishery boats on the three main Islands (Mahé, Praslin and La Digue). In addition, the Project's goal is to design a licensing structure for all fishing operations that target pelagic species. Currently, sport fishing operators are licensed by the Ministry of Tourism and SFA has very little to do with the sector.

Importantly, an overall objective of the Project is to incorporate all the fishing sectors for pelagic species under one database (artisanal, commercial and sport fishing that target pelagic species) to streamline the management of different fisheries by SFA since they are currently under-staffed.

The concept of the electronic logbook was welcomed and a request made for a copy of it for reviewing by the SFA team, with a view to possibly trialling the logbook, or tailoring it to suit the requirements for data reporting at the national level. However, the concept of a National Sport Fishery Database was seen as possibly problematic since SFA already uses other databases, and the end-goal is to incorporate all sectors targeting pelagic species into one unit/database. Therefore, a database like the one proposed by IOTC might not be suitable in their context.

Sport fishing charter operators
Several charter operators located at Eden Island and Bel Ombre were shown the electronic log book. As was the case on the first visit, they were again interested in using the log and supplying the requested information. Given this response, it would be relatively easy to for SFA to trial the logbook with a sample of the sport fishing operators at these two locations. The added advantage of such a trial is that IOTC, based in the Seychelles, would also be able to readily monitor its progress.

Issues to follow up

1. To understand the full scope and aim of the Project in relation to the sport fishing for pelagic species. It would be important to work together before and after boat frame survey completion in order for SFA to meet IOTC requirements on sport fisheries operations.

2. Determine if SFA will be implementing monitoring of sport fishing operations, or would the sport fishery still be under the Ministry of Tourism? To reiterate, at present, the Ministry of Tourism simply licenses the sport fishing operators, but does not collect any data on catches.

3. Follow up on IOTC reporting requirements for sport fishery data. It is not certain how SFA's on-going survey and data collection procedures will meet the reporting requirements for sport fisheries at National Fisheries Institution level. The suggestion would be to work with SFA regarding the possibility of standardizing data collection and reporting to IOTC.

La Réunion

Definition of "Sport Fishery" for La Réunion

The definition of 'sport fishery' in the context of La Réunion has been somewhat clouded. During our first country visit two groups were identified: sport fishing charter operators (usually thought of as part of the sport fishing sector in other countries) and owners of private sport fishing boats that fish for pelagic species. Charter sport fishing operators are licensed to take guests on board and to sell their fish, while private fishers only fish for recreation and leisure and catch just enough for their own consumption (and are not permitted to sell their fish).

IFREMER considers the definition of sport fisheries to apply only to independent non-professional (private) fishers. This definition excludes non-fishing boats. The general understanding is that the terminology "sport fishing boat" applies to boats used by professional fishermen as well as some of the regular non-professional fishermen. In this case, the regular non-professional fishermen are those who are not obligated to declare their catch to Affaire Maritime and Direction de la Sud Ocean Indian (DDSOI) and therefore to IFREMER.

Even though some professional fishermen may take anglers/guests/charters for fishing in La Réunion, they do still sell their fish and in this case, they are termed commercial fishermen and treated as such for data collection purposes.

Data collection using the electronic logbook

Given that IFREMER already collects information from charter / professional fishers (although this is not reported to IOTC as 'sport fishing', but rather as hand line fishing), there was no need to undertake training of Government or charter personnel. For this reason, the chosen approach was to share the proposed electronic logbook format with the non-professional, private sector and provide an overview of the envisaged data collection and reporting workflow. Thus, the second visit to La Réunion was largely spent contacting and speaking liaising with non-professional fishers about the use of the electronic logbook. A representative of Big-Game Fishing La Réunion confirmed that the electronic logbook would could probably work well if it is endorsed by tournament organizers. Several other members of the club (as well as tournament participants) were also willing to provide information through the club itself and during the tournaments.

IFREMER as a focal point or National Fisheries Institution for La Réunion

The possibility of IFREMER acting as a National Fisheries Focal Point for La Réunion was discussed. Unfortunately, IFREMER has limited capacity and resources to take on the full responsibility of collating the data from the fishing club and non-professional operators, therefore an alternative approach should be considered. Noting this, it was agreed that it would be useful for data from charter vessels (already collected and reported by IFREMER to IOTC) to be able to be disaggregated in some way as a sub-sector of the 'professional fishing' fleet, in order to be able to compare catches and catch rates with those of similar sport fishing charter fleets in other Indian Ocean countries.

Possible action(s)

One possible way that the electronic logbook might be used in La Réunion would be through coordination with tournament organizers: ideally, they would be requested to fill in the logbooks during tournament periods (end of September – March each year) but this approach was deemed to be too heavily time-dependent. Another possibility would be for tournament participants and for club members to voluntarily share their daily catch information with the club, and have someone at the club itself collate this information together. It would be at this stage that anonymized individual or club records would be entered into the electronic logbook and then transferred every month to the central national database (developed as part of this project) that IFREMER could take over responsibility for managing and reporting the data to the IOTC.

Issues arising:

Most of the contacted fishing club members showed genuine interest in participating to the sport fishery data collection, but they also explicitly requested anonymity—in particular that any possible information allowing their (or their vessels') identification be recovered from the submitted forms.

In addition to the non-professional fishers who participate in the tournaments, there is the second group of non-professional fishers who catch fish on personal outings outside the club/tournament structure. There are clear and well-known difficulties in quantifying the number of fishers and number of boats belonging to this sector.

As indicated elsewhere, a recommended approach to gathering data from this sector would be through a 'snapshot' survey, based on the boat registration system in place in La Réunion. One suggestion is the collaboration between the national fisheries institution and boat licensing department to improve the estimate of number of boats that fish recreationally for tunas and billfish. The availability of improved information on the number of boats that conduct sport fishing would then pave way for the use of better correction factors to estimate the catch for tuna and tuna-like species in La Réunion.

Mauritius

Progress on Sport fisheries data collection for Mauritius:

The need for a standardized data collection and reporting system was evident in this second country visit. Mr. Sheik Mamode and his team at The Albion Fisheries Research Centre showed great interest throughout the mission. The first two days involved training the Fisheries Survey Officers and the team at Albion on the three main components: (i) Project Background, Aims and Outputs, (ii) Sport Fishery Electronic Log, and (iii) the National Sport Fisheries Database and IOTC Submission Forms. The last section of the training mainly involved Mr. Sheik Mamode's team as they are tasked with the responsibility of ensuring that the sport fisheries data is entered and compiled in a form that would meet the IOTC reporting requirements – as the electronic logbook has been designed to achieve.

Fisheries Officers: Questions, Issues, and Suggestions:
A number of questions and suggestions from Fisheries Officers arose during the training sessions, including:

1. Whether the forms filled in by fishers could be made anonymous by excluding any details that would identify the sport fishing operator.
2. In the case of the paper forms, the preference would be for one form per trip instead of having 8 trips on one form (see Fig 4). The daily trip forms would then be collected, e.g., every two weeks and the information transferred to the electronic logbook by the Albion Fisheries Research Centre team.
3. An alternative method of reaching out to sport fishing operators via phone call to update catch records was also suggested; as long as the data from daily log sheets was then transposed to the electronic logsheet.
4. It was suggested that instead of 'area fished', use the fish landing sites or area near the FADs given that most fishing activity was concentrated around the FADs. However, if it was decided to use the 1 degree by 1 degree grid map supplied, then most areas fished by sports operators would all fall into zones M07 and M12 on the map of Mauritius.
5. It was also suggested to create/develop a phone "APP" that can be distributed to all operators for ease of entering data.

Electronic logbook and database:
Parallel to the IOTC Sports Fishing Project, the Albion Fisheries Research Centre has also begun developing and distributing their own data collection and reporting form to sport fishers, and so there was some discussion about how to synergise the outputs of the IOTC Project and logsheet developed by Albion. It was requested that an improved/simplified daily trip form should follow an almost similar version (see Figure X below). [Note: The sheet would need to be modified to enable inclusion of released fish, and whether or not FAD fishing was being undertaken on each day fished]. Positive feedback was received from the majority of the sport fishing operators that were visited with most of the operators suggesting they would be happy to fill in the electronic logbook. The majority of operators confirmed that they already keep some form of record keeping on the weights measured and/or total catches, either electronically or in notebooks, and therefore the transition to a formal logbook was not perceived as a significant additional burden.

In the case of the Le Morne Anglers' Club, the club manager suggested a trial run of sport fisheries data collection during the tournament season. He was also interested in the electronic logbook to record fish catches/releases for the boats that would participate in the tournaments.
It would be the responsibility of the Albion Fisheries Research Centre to ensure that the data entered is cross-checked and exported into the national sport fisheries database.

Figure 14. 'Simplified' daily log sheet suggested by Mauritius Fisheries staff during second country visit and training.

SPORT FISHING DATA COLLECTION FORM

Sport Fishing Permit No.:…………………

Landing place:……………….

Name of fishing club / centre:………………………………………… .

Vessel's name:………………………………

Vessel's length:……..……………………

Name of skipper:…………..…..…………

Number of persons on board:……....……

Fishing on FAD's: √ x   Open-sea fishing: √ x

Date	Fishing zone	Time		Fishing method	Bait	Catch			Sea condition	Observation (Other vessels, presence o birds, marine mammals, etc
		Start	End			Species	Weight (Kg)	Length (cm)		

Sport Fishing Operators: Questions, Issues, and Suggestions:

There was a request for two formats of data collection: Firstly, a daily trip and catch form (the simplified version), and secondly, the current proposed electronic logbook with some modifications. Most of the operators requested to remain anonymous on forms that are filled by every boat/captain for each trip. In this case, they requested that the general identification section to be omitted. There was also a suggestion to omit the 'discarded fish' tab section of the electronic log sheet. Most operators confirmed that they do not discard any dead fish.

Follow-up actions:

1. Ensure that the proposed National Database and the electronic logbook are functioning and fully tested by Mauritius (i.e., compatibility issues resolved).
2. Finalize the design of the revised daily fishing trip data sheet, if this is to be the preferred tool for data collection.
3. Follow-up with the Albion Fisheries Research Centre on the training of sport fishing operators on the use of the electronic logbook, or in case of issues raised related to completion of the logbook by the fishing operators.

Kenya

Fisheries Officers' feedback:
Two days were spent training staff on the genesis of the Project and the electronic logbook in the Mombasa at the Fisheries Offices and receiving feedback on current data collection and future needs. Four officers from the Kenya Fisheries Service (KFS) and two from the Kenya Marine and Fisheries Institute were present.

The first day focused on the Project introduction and familiarizing with the electronic logbook followed by discussion of the present sport fisheries data needs for Kenya. Clarification of the source of sport fishing data used in the past by Kenya Fisheries was sought as to whether it was derived mainly from the Malindi Fishing Club or included the whole Kenya Coast. It was reported that most of the data used in analyses and for papers presented at the WPB meetings had come from the Malindi Sea Fishing Club. There were some discrepancies in the way the sport fisheries data has been reported (e.g. as sport fishing, or trolling/handline) which do need to be clarified and rectified where necessary.

As was the case in Mauritius, the participants suggested some changes to the logbook format, in particular, requesting that a single sheet per day be used (similar to the request in Mauritius, and see Figure 5 below). The suggested one-day sheet would need some minor work such as indicating the FAO Codes on the back of the form and perhaps options for fishing methods and other items that are on the drop down menus of the electronic sheet. As is the case for Mauritius, such a 'simplified' sheet could be used, provided that it contained the required fields, and provided that the data were transferred to the electronic log format by trained Fisheries officers.

Figure 15. 'Simplified daily log sheet suggested by Kenyan Fisheries staff during second country visit and training.

State Department for Fisheries & The Blue Economy (Kenya) – Coast Region
Recreational Logbook Program

Name of Captain:……**Date (DD/MM/YR)**……												
County:	**Fish Landing site:**			**Date Fished (DD/MM/YR):** ____/ _____ / _____								
Boat name: **Licence number:**	**Boat length (m):**	**Engine Capacity (HP):**		**Registration no.**								
Area fished:	**No of fishers onboard:**			**No of crew:**								
Primary Fishing Method:	**Other Fishing Method:**			**Time out:** **Time in:**								
Were any fish retained or released: YES / NO	**Target species:**			**Number of Hours Fished:**								
Species retained	**FAO CODE**	**No.**	**Species Tagged**	**Weight (Kg)**								
Species released (Alive)												
Species Discarded (Dead)												

It was reported that KFS are in the process of developing a one-stop database for marine fisheries. They hope that all the data entry will be done online (in the near future). They have been working with IOTC and their database developer on this process.

Regarding the utility of the new electronic log sheet, the Department would still be willing to use this system in the meantime, and at the same time will be working with IOTC to streamline their databases to meet IOTC reporting standards.

Regarding the printed log sheets, the goal is to sensitize and encourage sport fishing captains to fill in daily log sheets, which would then be physically collected at a specified time on a regular (weekly, fortnightly) basis. There were plans to meet with sport fishing captains in the near future to discuss this possibility.

Sport Fishing Operators: Questions, Issues, and Suggestions:

Three centres for sport fishing were visited – Malindi, Watamu and Diani (the last was not visited on first round) and spoke to a number of charter boat captains. The objective as we had initially agreed was to get their views about the electronic logbook, and seek collaboration. Same as our initial visit, they are happy to work with the fisheries office, but mentioned that it will be challenging to expect a daily trip summary. The Watamu captains suggested that Fisheries Office sends someone every Friday to obtain the data from the Club given that they already record on daily basis.

Having viewed the electronic logbook, most of the captains indicated their preference for a paper version of the logbook for recording daily catches, with the responsibility for entering the data electronically being with the Kenya Fisheries Service.

Another important point made by most of the captains was that they while they certainly release many live fish, they do not discard dead fish, making that part of the log sheet redundant. This point was also made in Mauritius, although experience in sport fisheries in some locations suggests that on occasion, some undesirable fish, such as those considered inedible, may well be discarded dead. This could readily be tested during a trial period of the use of the log

Summary Table for all Countries

Following the two visits to each of the four countries, the following table was prepared to summarise aspects of sport fishing in each that need to be considered in any future data collection programs.

Table 2. Comparison of aspects of sport fishing in each of the four pilot countries that are especially pertinent to future potential data collection.

Country	Number of Billfish Tuna Charter Vessels	Number of Private Rec Fishing Vessels	Number of Private Billfish/Tuna Vessels	Clubs	Tournaments	Willingness to keep logs	Possible Sampling Frame for Private Boats	Historic Data?	Any Data submitted to IOTC?
Kenya	~40	<50	20	Two large clubs, several smaller	Yes	Yes	Licences	Excellent self-collected, 1987-2015	Ceased after 2011, possibly wrongly reported
Seychelles	~40	>100?	<50?	One main, active club	Yes	Yes among charter operators. Club tentative	Licences (Possible fishing licence to be introduced	Very little. Some size data from comps.	No
Reunion	~40	2000	500?	Two active sport fishing clubs	Yes	Charter operators complete logs for L'Affaire Maritime	Boat registration system	One club comp. data 2000-2011	With commercial data. No 'sport fishing' data
Mauritius	~40-50	100+?	50-60	One large very active club	Yes	Yes	Licences	Logbooks 2007-2011	Ceased after 2011

Presentation to the IOTC Working Party on Billfish

A summary of the Project was presented to the IOTC Working Party on Billfish meeting (WPB15), San Sebastian Spain, 10-14th September 2017. This was well received, with the audience very interested and keen to know about the progress made by the Project. Overall, there was a general consensus regarding the importance of the Project.

The presentation in Powerpoint format is available from requested from IOTC Secretariat, upon request. The submitted paper (IOTC-2017-WPB15-13_Rev1[5]) represents an earlier draft of this report.

[5] http://www.iotc.org/documents/facilitating-acquisition-catch-and-effort-and-size-data-sports-fisheries-western-indian

Conclusions and Recommendations

Sport fishing has long been underreported to Regional Fisheries Management Organizations. There is a general tendency to assume catches are not significant compared with commercial methods, but this is not necessarily the case, especially for some pelagic species such as billfish. Sport fisheries can be extremely varied, and many methods have been devised in order to attempt to quantify them with respect to numbers of participants (anglers/boats), fishing effort and catch.

This Project reviewed all such methods and, following fact-finding visits to four pilot countries in the Western Indian Ocean, determined that two methods would be best suited for gathering such data in those countries:

i. A standardized paper/electronic logbook for the use of sport fishing charter operators to collect daily catch/effort data.
ii. For countries with a large population of privately-owned recreational fishing boats, a snapshot survey to provide a point estimate of catch and effort for a 12-month period.

It was considered that the logbook could be integrated into the sport fishing charter sectors of Seychelles, Mauritius and Kenya, while the latter method was deemed most suitable for La Réunion.

A logbook was therefore designed for completion by sport fishing charter operators, with features designed for ease of completion, either on paper or electronically. The design then allowed the integration of sport fishing data into a National Fisheries database and the export of data in the required format for submission to the IOTC Secretariat.

During the first and second round of country visits, there was a general willingness among sport fishing charter operators to provide daily catch data, and by National Fisheries Institutions to collect the data and enter it into the suggested electronic format, or modifications thereof. However, it cannot be overstressed that, because in most cases there is no legal obligation for sport fishers to provide fishing-related information, involvement in any data collection exercise by charter operators is by definition, voluntary, and dependent to a large extent on current and historical relationships with the National Fisheries Institutions.

As might be expected, some differences were evident in attitudes of sport fishing operators (and fishing club representatives) towards such a program, and among National Fisheries Institutions depending on their own needs and available resources. Sport fishers may also have differing attitudes, and relationships, towards their own National Fisheries Institutions and IOTC. For example, the internationally managed large-scale tuna fisheries operating near their countries and effects on fishing success was a common concern among sport fishing charter operators and sport fishing club members. The country level visits uncovered varied levels of engagement between sport fishing operators and National Fisheries Institutions within each of the four pilot countries which pre-determined, to a large extent, the willingness to cooperate in the voluntary charter logbook program.

If adopted and/or modified in relation to country's wishes, the use of the new data collection system developed through this Project will improve management since it will provide indices of abundance from a hitherto largely unmonitored sector of the pelagic fisheries of the Indian Ocean.

The Project has also heightened awareness of the importance of sport fishing data among the National Fisheries Institutions of the four pilot countries and focused attention on suitable methods for ongoing monitoring, in addition to countries' mandatory obligations to report catches, fishing effort, and size data from sports fisheries in compliance with IOTC Resolution 15/02.

All outputs from the Project, including the full report, training modules, electronic logbook, National Sport fishing database and user manual form a package of materials that the Secretariat and countries can use (and re-use in the case of additional countries interested in adopting a similar approach to collecting sports fishery data).

Cognisant of the practical and logistic challenges entailed in collecting reliable data from single sport fisheries, let alone across multiple jurisdictions, the following actions are recommended, moving forward:

Recommendations for follow-up actions by IOTC

- Provide access to the outputs of this Project by all member countries via the IOTC website.

- Trial the logbook in the Seychelles, Mauritius and Kenya. Provide both paper and electronic logs to a small cross section of the charter fisheries in each country (e.g., 5 to 10 boats in each country) and run the trial for 3 to 6 months.

- For the Seychelles, while the trial is under way, monitor the progress of the current fishing boat frame survey and plans to integrate all fishing sectors into one database, especially in relation to sport fishing.

- For Kenya and Mauritius, review the suggested single daily log sheets and, if deemed suitable, use these for the trial instead of the logbook, bearing in mind that the data would still be entered onto the new electronic log from those sheets.

- For La Réunion, investigate disaggregation of catch/effort from the charter sector (currently lumped with other professional vessels), so that equivalent data might be collected for comparison with that from charter fisheries in other countries.

- For La Réunion, following a feasibility study, conduct a snapshot survey of the non-professional, non-club fishing population to obtain a point estimate of the catch and effort of pelagic fish by that potentially large sector. If the catch is found to be significant, plan to repeat such a survey on a regular basis.

- Following the trial of the new logbook, review its utility as a viable tool for ongoing collection of data from the sport fisheries in each of the pilot countries.

- Report on the results of the piloting of the logbook and national database; including review of the quality of sport fishing data submitted to the IOTC Secretariat as a result of the new data collection, and assess improvements in the compliance of IOTC mandatory data reporting requirements.

- If deemed successful, instigate a second phase of the Project by rolling out the system to other IOTC member countries with active pelagic sport fisheries.

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Appendix

User Manual for Electronic Sport Fishing Charter Logbook

FACILITATING THE ACQUISITION OF CATCH-AND-EFFORT AND SIZE DATA FROM SPORT FISHERIES OPERATING IN THE WESTERN INDIAN OCEAN

User Manual for Electronic Sport Fishing Charter Logbook

Background to the user manual development

Recreational fisheries are becoming an increasingly important component of global fisheries. This manual provides step-by-step instructions for implementing a logbook survey using an electronic logbook developed in Microsoft Excel. At each step in the survey the manual provides a screen shot and an explanation of data fields. The file is submitted to a national fisheries officer each month, where the data are extracted and stored in an accompanying Microsoft Access database, where the data can later be extracted in an appropriate format to submit to the IOTC.

System requirements

The electronic logbook is a macro-enabled Microsoft Excel file (.xlsm), allowing for a number of automated features that will assist the user in completing data entry.

Data entry is performed by key strokes, or by selecting from pre-defined responses in drop-down menus. The logbook has undergone extensive testing on both Mac and PC platforms using Windows XP, 7 and 10. Users should undergo their own testing on other platforms before attempting to administer surveys.

Starting the survey

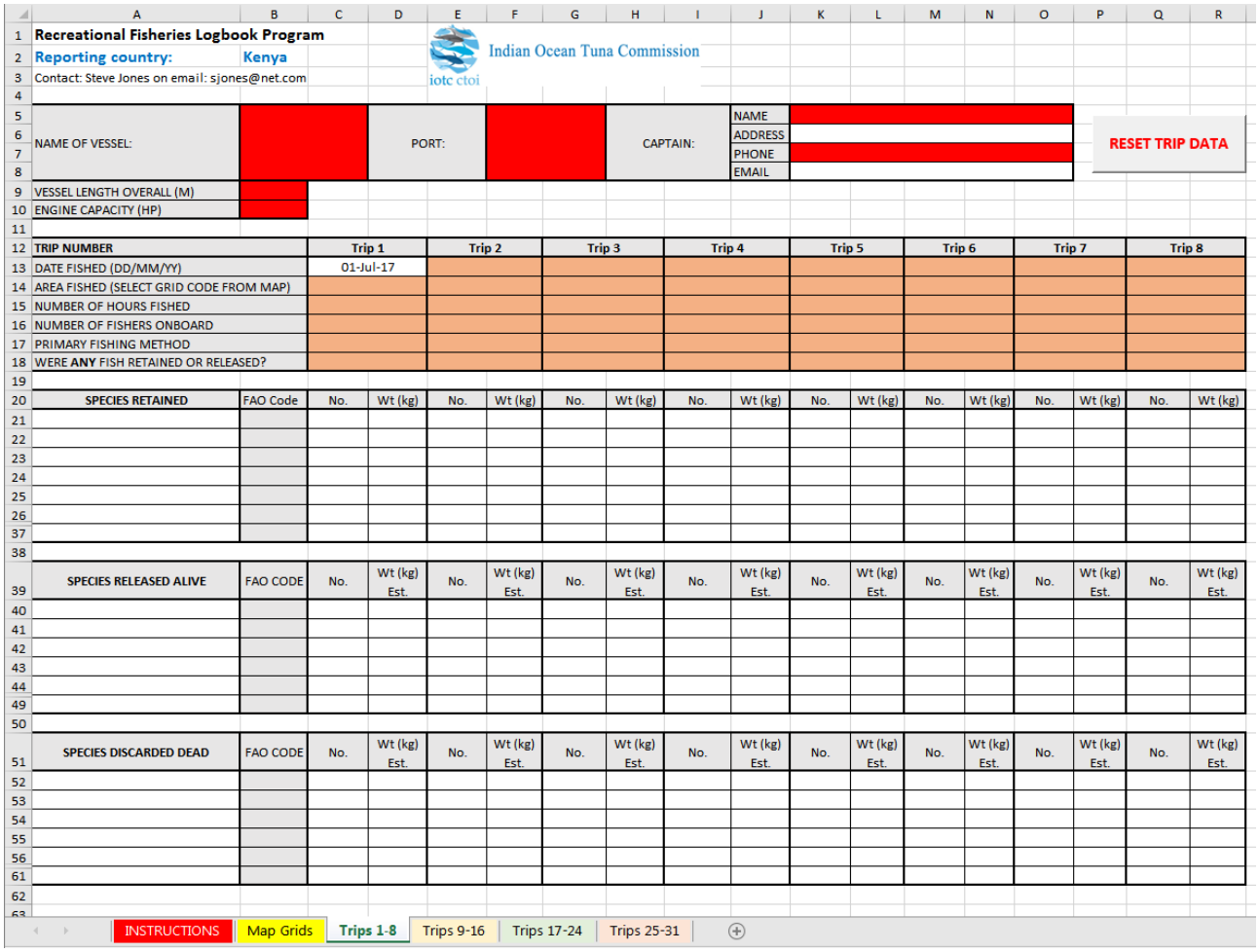
1. This logbook is a “macro-enabled” file, meaning there are automated programs embedded within the file to minimise user errors. To ensure all these features work, you may be prompted by Microsoft Excel with a “Security Warning” saying some content has been disabled. You need to select “ENABLE CONTENT” before proceeding.

2. A new file MUST be used for each MONTH of fishing. Select “Save As” and name your file as “SURNAME_MM_YYYY”, where MM is the month fished and YYYY is the year. For example, if you surname is Smith and you are reporting data for April 2017, you file would be “SMITH_04_2017”. Make sure you save as an “Excel Macro-Enabled Workbook” with the file extension “.xlsm”.

3. This file has 4 sheets where your fishing activity can be entered. Each DAY of fishing is regarded as a “TRIP”. There are 8 trips per sheet. If you fished every day, you will have filled all 4 sheets.

Entering fisher contact details and vessel specifications

Completion of a new month of trips begins by selecting the first trip sheet called “Trips 1-8” (with highlighted text). In the top part of sheet contain red cells are required to be completed to help fisheries officers contact you if an error is found after data submission. In the red cells, users provide their name, telephone number and/or current email address. Vessel information, including length (in metres) and engine power (in HP), is then entered. Personal details and vessel specifications only need to be entered on the first sheet as it will automatically appear on the three other trip sheets. Upon entering information, the red cells turn white once they contain an entry. Cells for each Trip (e.g. Trip 1) should all be orange at this point as they should contain no data.



Recreational Fisheries Logbook Program
Reporting country: Kenya
Contact: Steve Jones on email: sjones@net.com
Indian Ocean Tuna Commission
iotc ctoi

NAME OF VESSEL:		PORT:		CAPTAIN:	NAME		RESET TRIP DATA
					ADDRESS		
					PHONE		
					EMAIL		
VESSEL LENGTH OVERALL (M)							
ENGINE CAPACITY (HP)							

TRIP NUMBER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8
DATE FISHED (DD/MM/YY)	01-Jul-17							
AREA FISHED (SELECT GRID CODE FROM MAP)								
NUMBER OF HOURS FISHED								
NUMBER OF FISHERS ONBOARD								
PRIMARY FISHING METHOD								
WERE **ANY** FISH RETAINED OR RELEASED?								

SPECIES RETAINED	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)

SPECIES RELEASED ALIVE	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.

SPECIES DISCARDED DEAD	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.

INSTRUCTIONS | Map Grids | Trips 1-8 | Trips 9-16 | Trips 17-24 | Trips 25-31

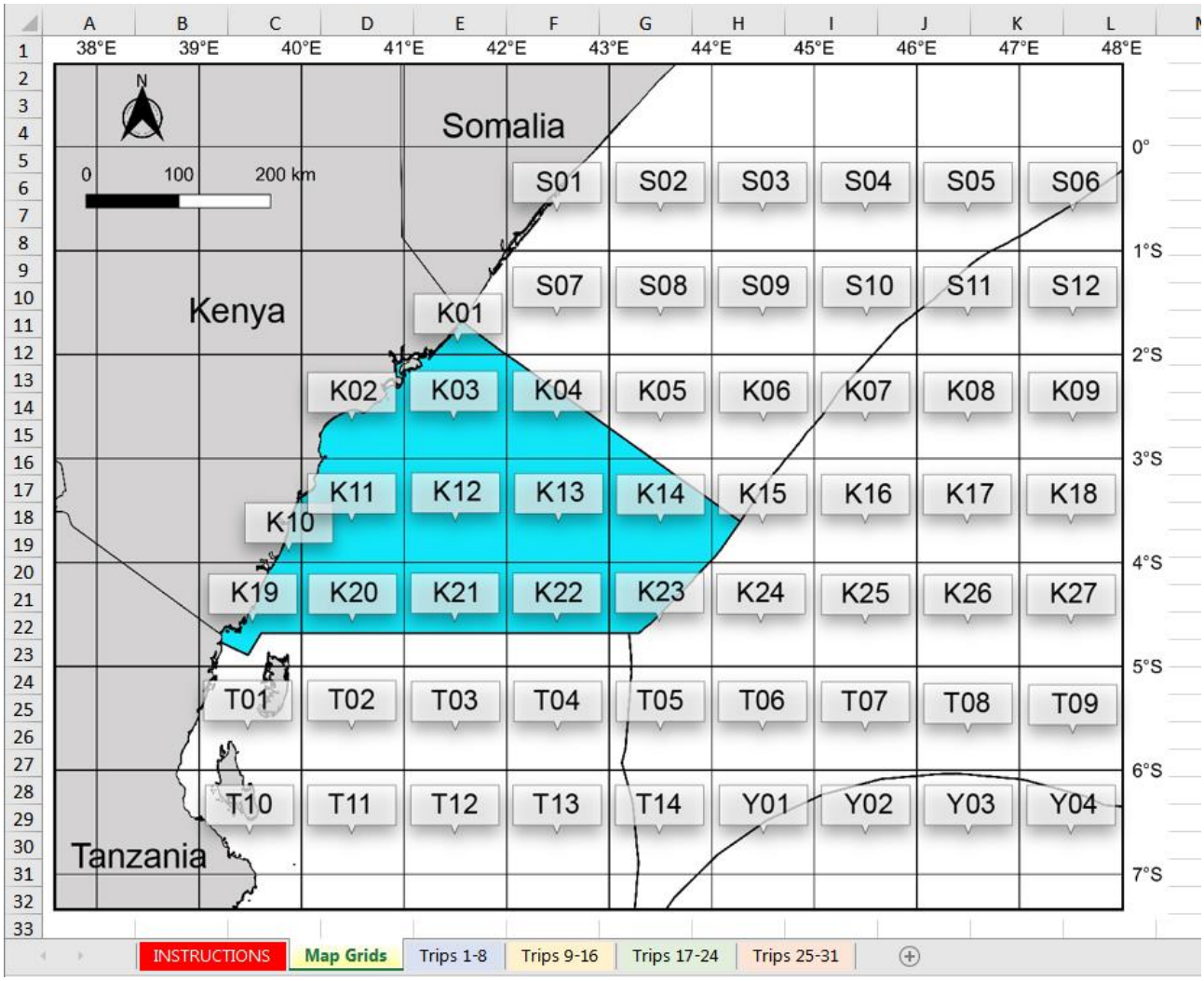
Entering trip information

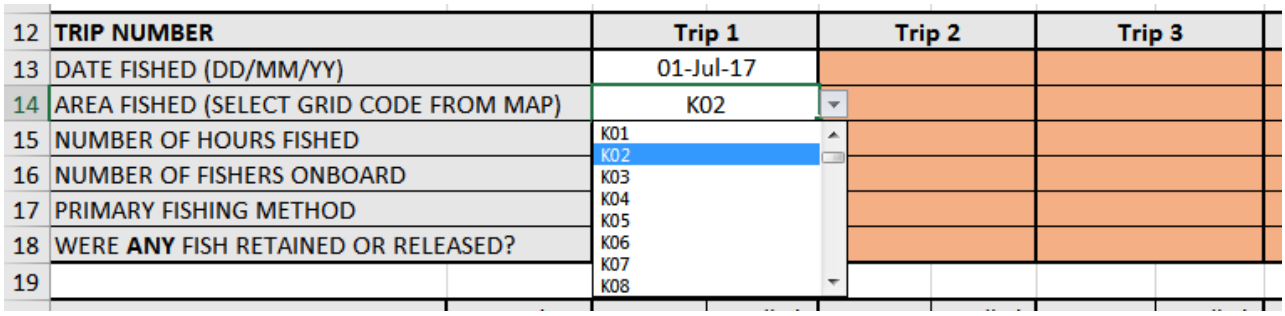
Once personal contact information and vessel specifications have been entered, the fisher is able to begin to enter information regarding a trip. In this logbook program, a “trip”, is simply defined as a single day of fishing. A new “Trip” column must be used for EACH DAY OF FISHING. If a fishing trip was 3 continuous days, 3 columns are required to be completed.

For the first trip of the month, navigate to the column labelled “Trip 1”. All incomplete cells will be ORANGE in colour. Once information is entered, the colour will disappear. Next to the “DATE FISHED” row, enter the date of the trip in the format DD/MM/YYYY. The date will be displayed as DD-MMM-YY (e.g. 04-Jul-17) to avoid ambiguous date formats between countries.

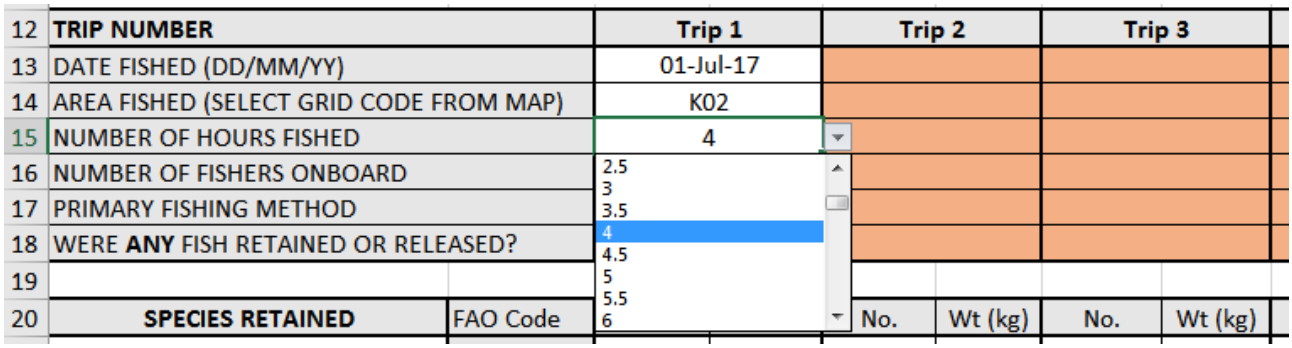
12	TRIP NUMBER	Trip 1	Trip 2	Trip 3
13	DATE FISHED (DD/MM/YY)	01-Jul-17		
14	AREA FISHED (SELECT GRID CODE FROM MAP)			
15	NUMBER OF HOURS FISHED			
16	NUMBER OF FISHERS ONBOARD			
17	PRIMARY FISHING METHOD			
18	WERE **ANY** FISH RETAINED OR RELEASED?			

Next, you will need to enter the general area where the fishing trip took place. Before you enter any information in the **area fished** field, click on the "Map Grids" tab to reveal a map of your country waters with a 60 x 60 nm grids. Note down the appropriate grid code (e.g. K03). Go back to the "Trip 1-8" tab and click on the area fished cell. Click on the downward facing arrow to the right of the cell. A list of area (or grid) codes will appear. Click on the most appropriate region and it will be entered into the cell.

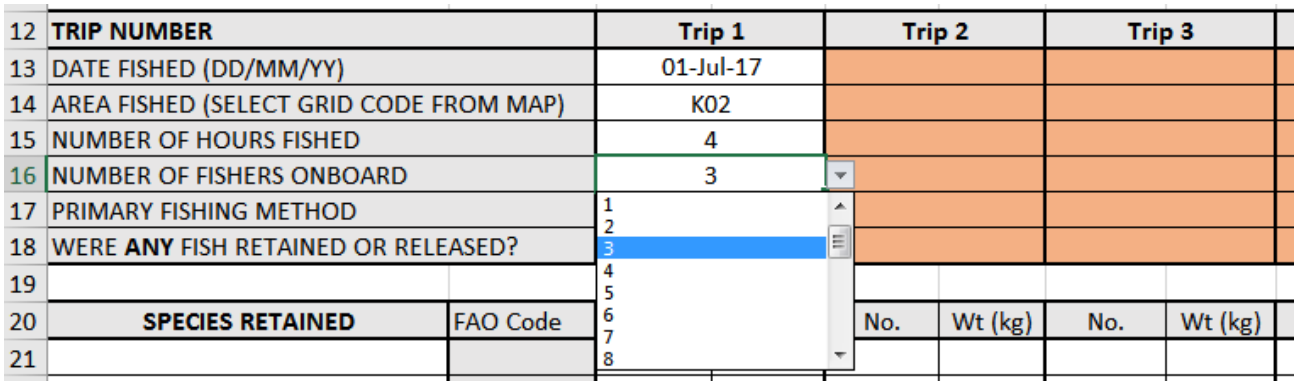




Now, specify the total number of hours fished by clicking on the cell and then clicking on the downward facing arrow to the right of the cell. Fishing duration will be listed in increments of 0.5 hours. Click on the most appropriate duration and it will be entered into the cell. Fishing hours is defined as any time a line is in the water, or the crew is actively seeking surface schools of feeding fish or birds by sight, on an echo sounder or radar.



The total number of participating fishers onboard the vessel is then specified by clicking on the cell and then clicking on the downward facing arrow to the right of the cell. Number of fishers will be listed in the drop-down menu. Click on the most appropriate number of fishers and it will be entered into the cell.



Next, select the primary fishing method used for the trip by clicking on the cell and then clicking on the downward facing arrow to the right of the cell. A range of fishing methods will be listed in the drop-down menu. Click on the method that was used for the majority of the trip and it will be entered into the cell.

12	TRIP NUMBER		Trip 1	Trip 2		Trip 3	
13	DATE FISHED (DD/MM/YY)		01-Jul-17				
14	AREA FISHED (SELECT GRID CODE FROM MAP)		K02				
15	NUMBER OF HOURS FISHED		4				
16	NUMBER OF FISHERS ONBOARD		3				
17	PRIMARY FISHING METHOD		Troll live bait				
18	WERE **ANY** FISH RETAINED OR RELEASED?						
19							
20	**SPECIES RETAINED**	FAO Code		No.	Wt (kg)	No.	Wt (kg)
21							
22							

Troll lure
Troll live bait
Troll dead bait
Drift bait
Cast lure
Cast bait
Fly fishing

The final data field for trip information relates to whether ANY fish were caught or released during the trip by selecting “Yes” or “No”. It is very important that zero catch trips are recorded. If zero catch trips are not recorded, the catch estimates for the fleet will be overestimated, implying the recreational fishery has a much larger impact on fishery resources than is actually does.

12	TRIP NUMBER		Trip 1	Trip 2		Trip 3	
13	DATE FISHED (DD/MM/YY)		01-Jul-17				
14	AREA FISHED (SELECT GRID CODE FROM MAP)		K02				
15	NUMBER OF HOURS FISHED		4				
16	NUMBER OF FISHERS ONBOARD		3				
17	PRIMARY FISHING METHOD		Troll live bait				
18	WERE **ANY** FISH RETAINED OR RELEASED?		**Yes**				
19							
20	**SPECIES RETAINED**	FAO Code		No.	Wt (kg)	No.	Wt (kg)

No
Yes

Entering data for SPECIES RETAINED

Once the trip information is complete, the user is required to enter information regarding species that were caught and retained onboard. This includes fish either taken back to port, or utilized at sea for food, bait or chum. If any fish were released (either tagged or not tagged), they are to be recorded in the following section.

In the left column named "**Species Retained**", specify the first species retained on the trip by clicking on the cell and then clicking on the downward facing arrow to the right of the cell. A long list of common species names will appear in groups (e.g. billfishes, tunas, mackerels, sharks) within the drop-down menu. Click on the correct species name and it will be entered into the cell. The "FAO Code" in the adjacent column will automatically appear after species has been selected, so there is no need for the user to enter a code.

On the same row as the species name, navigate across to the correct trip column. In the column "**No.**" enter the total number of fish representing this species that was retained during the trip. In the adjacent "**Wt (kg) Est**" column, enter the total weight, in kilograms (kg), of all fish representing this species that were retained. For example, if you retained 2 blue marlin that were 100kg and 150kg, then you would enter 250kg. Ideally, weights would be actual measured weights, but estimated weights are acceptable.

Proceed to enter further species retained during the trip. In the example below, the fisher has undertaken four trips during the month of July in 2017, with the remaining trip columns coloured orange, indicating that they currently contain no data.

12	TRIP NUMBER		Trip 1		Trip 2		Trip 3		Trip 4		Trip 5		Trip 6	
13	DATE FISHED (DD/MM/YY)		01-Jul-17		02-Jul-17		03-Jul-17		04-Jul-17					
14	AREA FISHED (SELECT GRID CODE FROM MAP)		K02		K05		K04		K02					
15	NUMBER OF HOURS FISHED		4		6		7		4					
16	NUMBER OF FISHERS ONBOARD		3		4		3		3					
17	PRIMARY FISHING METHOD		Troll live bait		Troll lure		Troll dead bait		Fly fishing					
18	WERE **ANY** FISH RETAINED OR RELEASED?		**Yes**		**Yes**		**Yes**		**No**					
19														
20	**SPECIES RETAINED**	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt
21	Marlin, blue	JM	2	425	2	120	5	350						
22	Marlin, blue Marlin, striped	LS			1	145	2	235						
23	Marlin, black	M					6	687						
24	Sailfish, Indo-Pacific	DM												
25	Spearfish, shortbill Spearfish, longbill	T												
26	Swordfish	A												
37														

Entering data for SPECIES RELEASED ALIVE

The bottom table of the logbook is reserved for species that were released alive, regardless of whether they were tagged or not tagged.

In the left column named "**Species Released Alive**", specify the first species released on the trip by clicking on the cell and then clicking on the downward facing arrow to the right of the cell. As with the retained species table, select the relevant species from the list of common species names in the drop-down menu. Again, the "FAO Code" in the adjacent column will automatically appear.

On the same row as the species name, navigate across to the correct trip column. In the column "**No.**" enter the total number of fish representing this species that was released alive during the trip. In the adjacent "**Wt (kg) Est**" column, enter the total estimated weight, in kilograms (kg), of all fish representing this species that were released alive. For example, if you released 2 black marlin that were estimated to weigh 50kg and 100kg, then you would enter 150kg.

12	TRIP NUMBER		Trip 1		Trip 2		Trip 3		Trip 4		Trip 5		Trip 6	
13	DATE FISHED (DD/MM/YY)		01-Jul-17		02-Jul-17		03-Jul-17		04-Jul-17					
14	AREA FISHED (SELECT GRID CODE FROM MAP)		K02		K05		K04		K02					
15	NUMBER OF HOURS FISHED		4		6		7		4					
16	NUMBER OF FISHERS ONBOARD		3		4		3		3					
17	PRIMARY FISHING METHOD		Troll live bait		Troll lure		Troll dead bait		Fly fishing					
18	WERE **ANY** FISH RETAINED OR RELEASED?		**Yes**		**Yes**		**Yes**		**No**					
19														
20	**SPECIES RETAINED**	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt
21	Marlin, blue	BUM	2	425	2	120	5	350						
22	Marlin, striped	MLS			1	145	2	235						
23	Marlin, black	BLM					6	687						
24	Mackerel, Narrow-barred Spanish	COM												
25	Tuna, yellowfin	YFT												
26	Sailfish, Indo-Pacific	SFA												
37														
38														
39	**SPECIES RELEASED ALIVE**	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt Es
40	Sailfish, Indo-Pacific	SFA	3	68	2	24	1	15						
41	Marlin, striped	LS	1	88	2	158								
42	Marlin, blue	JM	1	350			1	220						
43	Marlin, striped	L	2	87										
44	Marlin, black	T	2	24										
45	Sailfish, Indo-Pacific													
49	Spearfish, shortbill													
50	Spearfish, longbill													
	Swordfish													

Entering data for SPECIES DISCARDED DEAD

The last table of the logbook is reserved for species that were discarded dead. For example, if an undesirable species died before reaching the boat.

In the left column named "**Species Discarded Dead**", specify the first species released on the trip by clicking on the cell and then clicking on the downward facing arrow to the right of the cell. As with the retained species table, select the relevant species from the list of common species names in the drop-down menu. Again, the "FAO Code" in the adjacent column will automatically appear.

On the same row as the species name, navigate across to the correct trip column. In the column "**No.**" enter the total number of fish representing this species that was discarded dead during the trip. In the adjacent "**Wt (kg) Est**" column, enter the total estimated weight, in kilograms (kg), of all fish representing this species that were discarded dead. For example, if you discarded 2 bull sharks that were estimated to weigh 50kg and 100kg, then you would enter 150kg.

	A	B	C	D	E	F	G	H	I	J	K	L	M	
12	**TRIP NUMBER**		**Trip 1**		**Trip 2**		**Trip 3**		**Trip 4**		**Trip 5**		**Trip 6**	
13	DATE FISHED (DD/MM/YY)		01-Jul-17		02-Jul-17		03-Jul-17		04-Jul-17					
14	AREA FISHED (SELECT GRID CODE FROM MAP)		K02		K05		K04		K02					
15	NUMBER OF HOURS FISHED		4		6		7		4					
16	NUMBER OF FISHERS ONBOARD		3		4		3		3					
17	PRIMARY FISHING METHOD		Troll live bait		Troll lure		Troll dead bait		Fly fishing					
18	WERE **ANY** FISH RETAINED OR RELEASED?		**Yes**		**Yes**		**Yes**		**No**					
19														
20	**SPECIES RETAINED**	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt
21	Marlin, blue	BUM	2	425	2	120	5	350						
22	Marlin, striped	MLS			1	145	2	235						
23	Marlin, black	BLM					6	687						
24	Mackerel, Narrow-barred Spanish	COM												
25	Tuna, yellowfin	YFT												
26	Sailfish, Indo-Pacific	SFA												
37														
38														
39	**SPECIES RELEASED ALIVE**	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt E
40	Sailfish, Indo-Pacific	SFA	3	68	2	24	1	15						
41	Marlin, striped	MLS	1	88	2	158								
42	Marlin, blue	BUM	1	350			1	220						
43	Shark, scalloped hammerhead	SPL	2	87										
44	Tuna, longtail	LOT	2	24										
45														
49														
50														
51	**SPECIES DISCARDED DEAD**	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt E
52	Shark, longfin mako	MA	1	45	2	85	1	245						
53	Shark, blue	H	1	212	2	640								
54	Shark, shortfin mako	G	1	350			1	220						
55	Shark, longfin mako	Z	2	87										
56	Shark, tiger	H	1	25										
61	Shark, porbeagle Shark, great white													
62														

Completed logbook sheet

The screenshot below shows a completed worksheet for Trips 1-8. In this example, the fisher (Joe Bloggs) made a total of 8 trips and retained, released and discarded various species. An exception is Trip 4 where no fish were retained or released during 4 hours of fishing.

Note there are now no trip columns that are coloured orange, since all trips have been completed. The user would then move on to completing trips on the next tab "Trips 9-16".

Recreational Fisheries Logbook Program

Reporting country: Kenya

Contact: Steve Jones on email: sjones@net.com

Indian Ocean Tuna Commission

NAME OF VESSEL:	Sea Warrior	PORT:	Mombasa	CAPTAIN:	NAME	Joe Bloggs
					ADDRESS	34 Billfish St, Mombasa, Kenya
					PHONE	867990006
					EMAIL	joe@bloggs.com

RESET TRIP DATA

VESSEL LENGTH OVERALL (M)	15.4
ENGINE CAPACITY (HP)	120

TRIP NUMBER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6	Trip 7	Trip 8
DATE FISHED (DD/MM/YY)	01-Jul-17	02-Jul-17	03-Jul-17	04-Jul-17	05-Jul-17	06-Jul-17	07-Jul-17	08-Jul-17
AREA FISHED (SELECT GRID CODE FROM MAP)	K02	K05	K01	K05	K05	K06	K03	S01
NUMBER OF HOURS FISHED	4	6	7	4	3	5	6	7
NUMBER OF FISHERS ONBOARD	3	4	3	3	3	5	6	4
PRIMARY FISHING METHOD	Troll live bait	Troll lure	Troll dead bait	Fly fishing	Troll live bait	Troll lure	Troll lure	Cast lure
WERE **ANY** FISH RETAINED OR RELEASED?	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

SPECIES RETAINED	FAO Code	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)	No.	Wt (kg)
Marlin, blue	BUM	2	425	2	120	5	350					1	157	3	779	2	623
Marlin, striped	MLS			1	145	2	235										
Marlin, black	BLM					6	687										
Mackerel, Narrow-barred Spanish	COM									1	35						
Tuna, yellowfin	YFT									1	88						
Sailfish, Indo-Pacific	SFA									1	23	1	31				

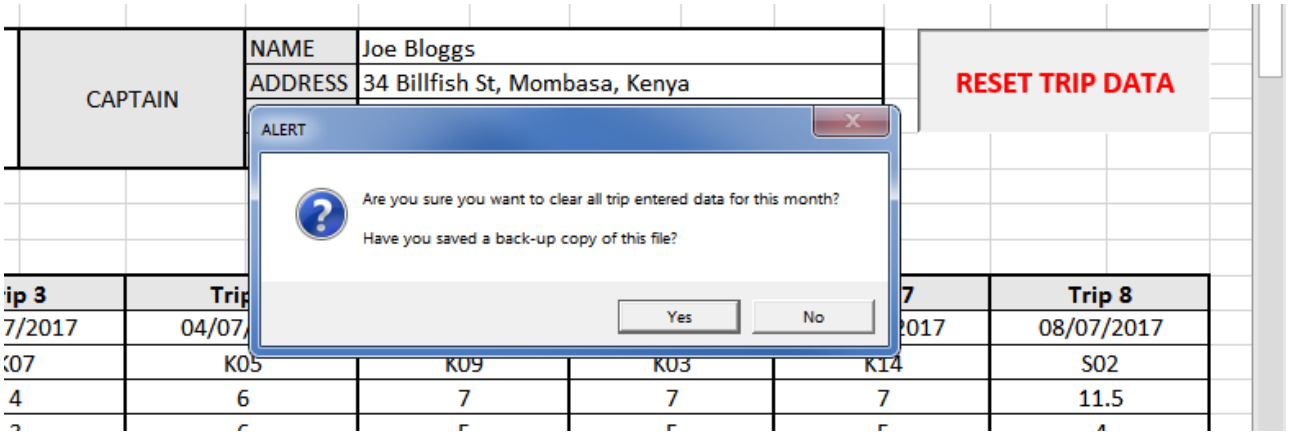
SPECIES RELEASED ALIVE	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.
Sailfish, Indo-Pacific	SFA	3	68	2	24	1	15							1	25		
Marlin, striped	MLS	1	88	2	158							1	62				
Marlin, blue	BUM	1	350			1	220			2	275						
Shark, scalloped hammerhead	SPL	2	87														
Tuna, longtail	LOT	2	24							4	46					1	15

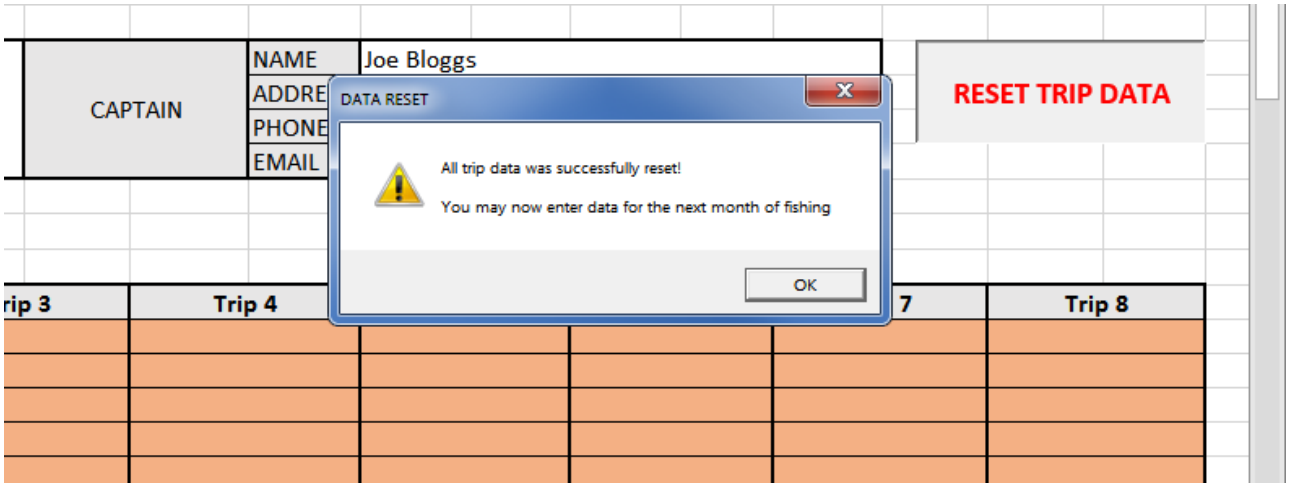
SPECIES DISCARDED DEAD	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.
Shark, longfin mako	LMA	1	45	2	85	1	245							1	169		
Shark, pelagic thresher	PTH	1	212	2	640							1	140				
Shark, tiger	TIG	1	350			1	220			1	158						
Shark, smooth hammerhead	SPZ	2	87														
Shark, blue	BSH	1	25														

INSTRUCTIONS | Map Grids | Trips 1-8 | Trips 9-16 | Trips 17-24 | Trips 25-31

After submitting monthly logbook data

At the end of each month, fishers participating in the logbook program will be contacted by a local fisheries officer and reminded to submit their monthly logbook file. Once the fisheries officer confirms they have safely recorded the data, users can use the "save as" function to save the logbook as a new name for the next month. After it is saved (e.g. "SMITH_05_2017") it is important to reset all values in the file. To do this, go to the first trip sheet ("Trips 1-7") and find the large RED button "RESET TRIP DATA" at the top right of the page. Click the button and you will see an alert message asking if you want to clear all trip data for the month. Make sure you have a back-up copy of the data first. Click "Yes" and a message will appear, "All trip data was successfully reset" indicating all data was cleared and ready for new data to be entered. At the end of the year, fisheries officers will provide each logbook program participant with a complete database of every fishing trip submitted over the previous year to keep for your personal use.

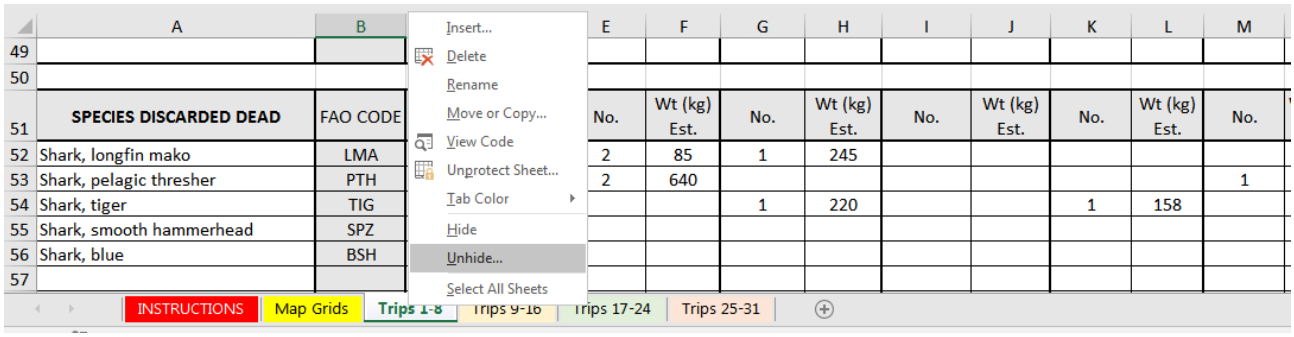




Compiling and exporting data to the National Sportfishing Database

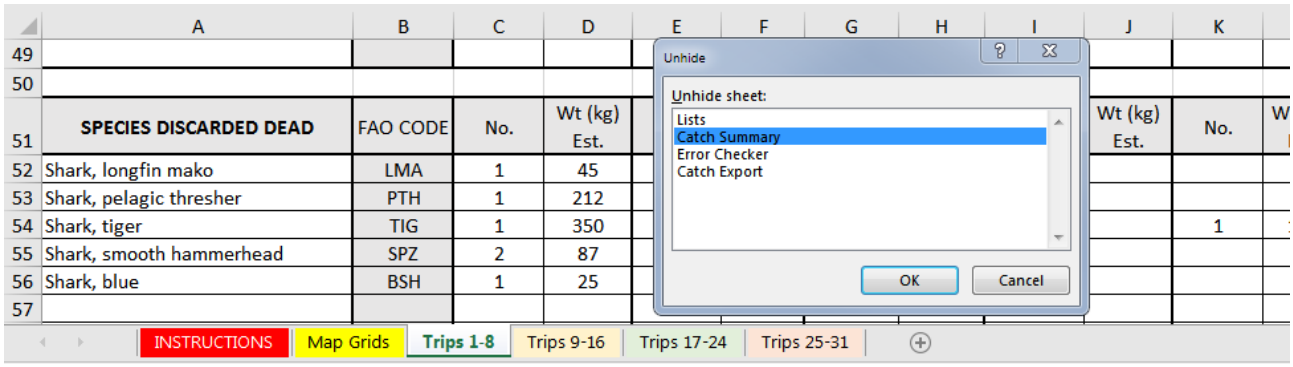
At the end of each month, fisheries officers will obtain monthly logbook files from fishers participating in the logbook program to export data into their National Sportfishing Database. The fisheries officers should confirm with the fisher when a copy of the file is safely stored to allow the fisher to reset their logbook to begin data collection for the next month.

The fisheries officer will need extract all trip data in a format that can be imported into National Sportfishing Database. The logbook submitted by fishers has four (4) hidden sheets. Three (3) of these sheets need to be unhidden before data can be compiled and exported. These sheets are hidden from the fishers to avoid confusion and to prevent complex formulas being compromised. To unhide sheets, click on any of the sheet tabs at the bottom of the workbook, use mouse right-click, and select "Unhide" from the menu.



	A	B	E	F	G	H	I	J	K	L	M
49											
50											
51	SPECIES DISCARDED DEAD	FAO CODE	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.	Wt (kg) Est.	No.
52	Shark, longfin mako	LMA	2	85	1	245					
53	Shark, pelagic thresher	PTH	2	640							1
54	Shark, tiger	TIG			1	220			1	158	
55	Shark, smooth hammerhead	SPZ									
56	Shark, blue	BSH									
57											

A window will pop up showing all sheets that are currently hidden. Click on "Catch Summary" and click "Ok". The sheet will now appear. Repeat the process to unhide the sheets called "Error Checker" and "Catch Export". Do not unhide the "Lists" sheet.

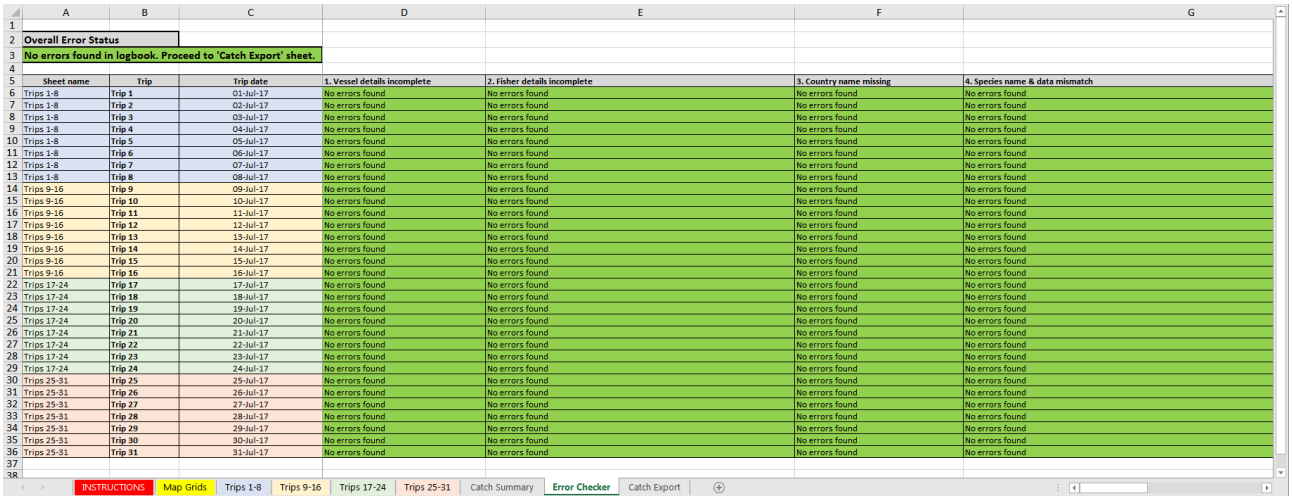


	A	B	C	D	E	F	G	H	I	J	K
49											
50											
51	SPECIES DISCARDED DEAD	FAO CODE	No.	Wt (kg) Est.						Wt (kg) Est.	No.
52	Shark, longfin mako	LMA	1	45							
53	Shark, pelagic thresher	PTH	1	212							
54	Shark, tiger	TIG	1	350							1
55	Shark, smooth hammerhead	SPZ	2	87							
56	Shark, blue	BSH	1	25							
57											

Error checking before compiling and exporting data

Referring to the "Error Checking" sheet is very important to identify any data errors before compiling and exporting the logbook data into a .CSV file that will be imported into the National Sportfishing Database.

At the top left of the sheet you will see the "Overall Error Status" with cell A3 coloured either green or red. If the cell is green there are no errors in the logbook and may proceed to the "Catch Export" sheet to compile data from all trips and export as a .CSV file.



Overall Error Status

No errors found in logbook. Proceed to 'Catch Export' sheet.

Sheet name	Trip	Trip date	1. Vessel details incomplete	2. Fisher details incomplete	3. Country name missing	4. Species name & data mismatch
Trips 1-8	Trip 1	01-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 2	02-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 3	03-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 4	04-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 5	05-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 6	06-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 7	07-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 1-8	Trip 8	08-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 9	09-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 10	10-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 11	11-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 12	12-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 13	13-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 14	14-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 15	15-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 9-16	Trip 16	16-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 17	17-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 18	18-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 19	19-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 20	20-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 21	21-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 22	22-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 23	23-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 24	24-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 25	25-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 26	26-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 27	27-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 28	28-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 29	29-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 30	30-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 31	31-Jul-17	No errors found	No errors found	No errors found	No errors found

INSTRUCTIONS | Map Grids | Trips 1-8 | Trips 9-16 | Trips 17-24 | Trips 25-31 | Catch Summary | Error Checker | Catch Export

If cell A3 is red, there will be a message indicating "ERROR FOUND!". This means that one or more errors have been found somewhere across the 4 sheets where the fisher entered data.

Columns D through K scan the logbook for 8 types of errors:

1. Vessel details incomplete. The fisher did not recorded details in cell B5 in sheet "Trips 1-8".

2. Fisher details incomplete. The fisher has not recorded their name and/or contact details in cell B5 in sheet "Trips 1-8". This error will identify which cell(s) is missing data.

3. Country name missing. The fisher did not recorded country in cell B2 in sheet "Trips 1-8".

4. Species name & data mismatch. The fisher: a) recorded somewhere in column A that a species was caught, but failed to enter a number or weight in any of the trips on the sheet, or b) recorded catch in numbers or weight on a row, but failed to record the species name in column A.

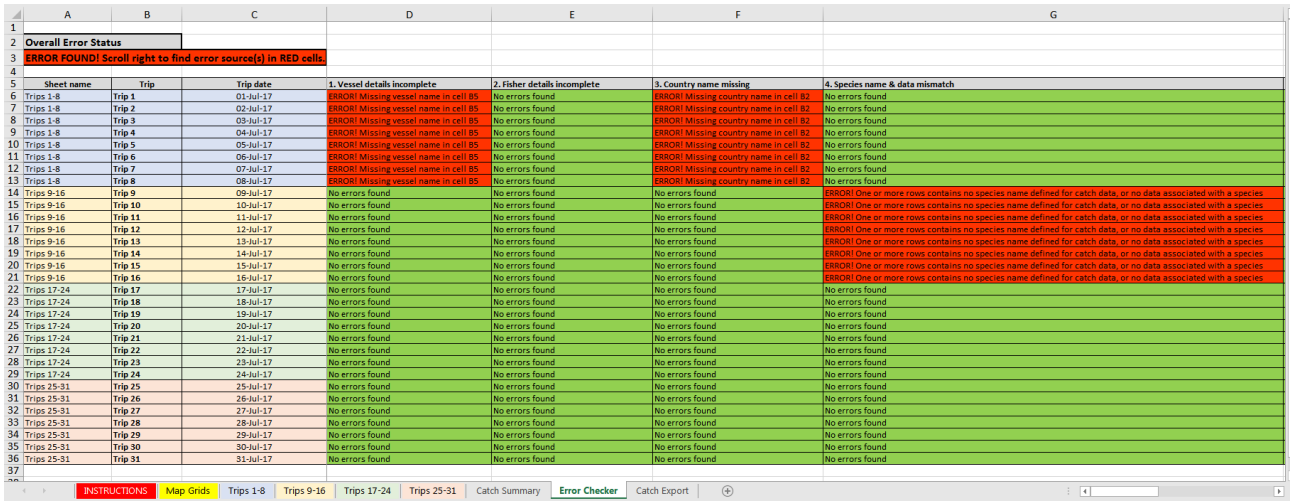
5. Incomplete trip data reset. The fisher most likely failed to click the "Reset Trip Data" on sheet "Trips 1-8" after submitting data for the previous month. Therefore, there may be catch and/or effort data for trips on later sheets (e.g. trips 20-23) but all trips have not been completed on earlier sheets (e.g. only trips 1-4 have been completed).

6. Catch and trip data mismatch. This error mainly relates to cells on row 18 of each trip sheet, whereby a) catch data was recorded for a trip but the cell on row 18 is blank or "No", or b) cell on row 18 for a trip is "Yes", but no catch data was recorded.

7. Trip success not defined. This error also relates to cells on row 18 of each trip sheet, where there were trip details entered for rows 13-17, but no entry in row 18.

7. **Trip data check where catch data exists.** The fisher has recorded catch for a trip, but did not enter data for one or more trip fields in rows 13-18. This error will specify the exact error such as "ERROR! Hours fished missing for trip reporting catch".
8.

Errors identified in each sheet, trip number and trip date are highlighted in red cells. For some error types, specific details will be given as to what the error is, while other errors are more generic. Once a cell is red and showing an error message, follow the row to the left to and look at columns A to C to determine where to look for the error in the logbook. In the example below, cell A3 is red, so we know there is at least one error somewhere in the logbook. We then scroll across the sheet to check columns D to K and see there are errors relating to "1. Vessel details incomplete", "3. Country name missing", and "4. Species name & data mismatch". We then look to the left and see that error types 1 and 3 both occur in sheet "Trips 1-8", in trip numbers 1 to 8, on dates 1 July to 8 July. Error type 4 occurred in sheet "Trips 9-16", in trip numbers 9 to 16, on dates 9 July to 16 July.



Overall Error Status

ERROR FOUND! Scroll right to find error source(s) in RED cells.

Sheet name	Trip	Trip date	1. Vessel details incomplete	2. Fisher details incomplete	3. Country name missing	4. Species name & data mismatch
Trips 1-8	Trip 1	01-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 2	02-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 3	03-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 4	04-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 5	05-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 6	06-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 7	07-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 1-8	Trip 8	08-Jul-17	ERROR! Missing vessel name in cell B5	No errors found	ERROR! Missing country name in cell B2	No errors found
Trips 9-16	Trip 9	09-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 10	10-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 11	11-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 12	12-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 13	13-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 14	14-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 15	15-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 9-16	Trip 16	16-Jul-17	No errors found	No errors found	No errors found	ERROR! One or more rows contains no species name defined for catch data, or no data associated with a species
Trips 17-24	Trip 17	17-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 18	18-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 19	19-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 20	20-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 21	21-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 22	22-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 23	23-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 17-24	Trip 24	24-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 25	25-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 26	26-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 27	27-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 28	28-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 29	29-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 30	30-Jul-17	No errors found	No errors found	No errors found	No errors found
Trips 25-31	Trip 31	31-Jul-17	No errors found	No errors found	No errors found	No errors found

INSTRUCTIONS | Map Grids | Trips 1-8 | Trips 9-16 | Trips 17-24 | Trips 25-31 | Catch Summary | Error Checker | Catch Export

It is recommended that you choose only one error to fix at a time. In the example above, let's investigate error type 1 "Vessel details incomplete". This error type actually identified the exact location in the sheet where the error occurred as it says "ERROR! Missing vessel name in cell B5". We look across the row to columns A to C and see that the error is only present in sheet "Trips 1-8", but for all trips. Many errors relate to a single reference cell, so once the cell is fixed, errors for all trips and sheets will be fixed.

5	Sheet name	Trip	Trip date	1. Vessel details incomplete	2. Fisher
6	Trips 1-8	Trip 1	01-Jul-17	ERROR! Missing vessel name in cell B5	No errors
7	Trips 1-8	Trip 2	02-Jul-17	ERROR! Missing vessel name in cell B5	No errors
8	Trips 1-8	Trip 3	03-Jul-17	ERROR! Missing vessel name in cell B5	No errors
9	Trips 1-8	Trip 4	04-Jul-17	ERROR! Missing vessel name in cell B5	No errors
10	Trips 1-8	Trip 5	05-Jul-17	ERROR! Missing vessel name in cell B5	No errors
11	Trips 1-8	Trip 6	06-Jul-17	ERROR! Missing vessel name in cell B5	No errors
12	Trips 1-8	Trip 7	07-Jul-17	ERROR! Missing vessel name in cell B5	No errors
13	Trips 1-8	Trip 8	08-Jul-17	ERROR! Missing vessel name in cell B5	No errors
14	Trips 9-16	Trip 9	09-Jul-17	No errors found	No errors
15	Trips 9-16	Trip 10	10-Jul-17	No errors found	No errors

The best approach is to start at the top and work down. So go to sheet "Trips 1-8" and you will find that there is no vessel name in B5. Enter the correct vessel name and click save. Now go back to the "Error Checker" sheet to see if the cells have turned green, indicating the error has been removed.

5	Sheet name	Trip	Trip date	1. Vessel details incomplete	2. Fishe
6	Trips 1-8	Trip 1	01-Jul-17	No errors found	No erro
7	Trips 1-8	Trip 2	02-Jul-17	No errors found	No erro
8	Trips 1-8	Trip 3	03-Jul-17	No errors found	No erro
9	Trips 1-8	Trip 4	04-Jul-17	No errors found	No erro
10	Trips 1-8	Trip 5	05-Jul-17	No errors found	No erro
11	Trips 1-8	Trip 6	06-Jul-17	No errors found	No erro
12	Trips 1-8	Trip 7	07-Jul-17	No errors found	No erro
13	Trips 1-8	Trip 8	08-Jul-17	No errors found	No erro
14	Trips 9-16	Trip 9	09-Jul-17	No errors found	No erro
15	Trips 9-16	Trip 10	10-Jul-17	No errors found	No erro

Work through each column where there are red error cells in a similar process until all cells are green, especially cell A3, indicating that the logbook data is free of user input errors. You may now proceed to the "Catch Export" sheet to compile and export all data from the logbook.

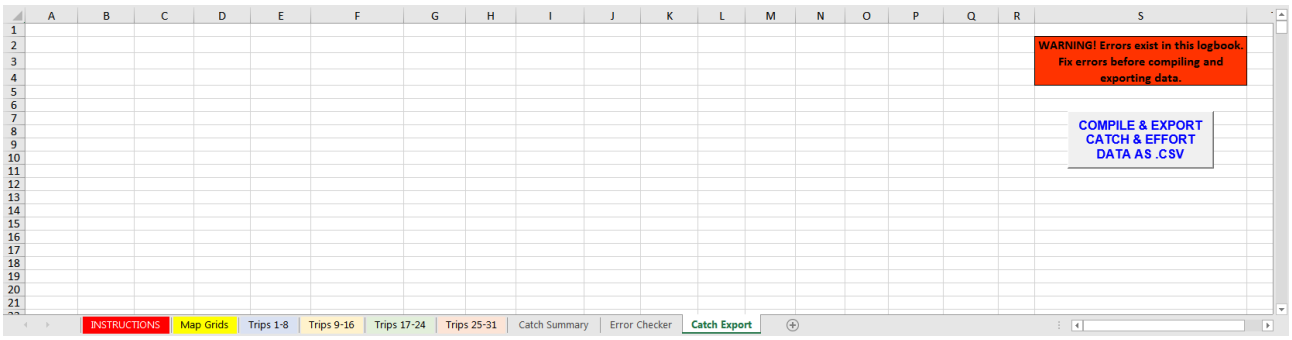
Compiling and exporting catch and effort data

The "Catch Summary" sheet has automatically summarised all trip and fisher details and catch and effort data that have been entered by the fisher in the four trip sheets. This sheet is completely locked for editing as it contains many complex formulas. Note that there are many blank rows. This is normal, and they will be removed in the subsequent steps when the data is compiled. Also, ignore the colour of the cells, these are merely a visual guide to differentiate each trip. Do not attempt to edit this sheet.

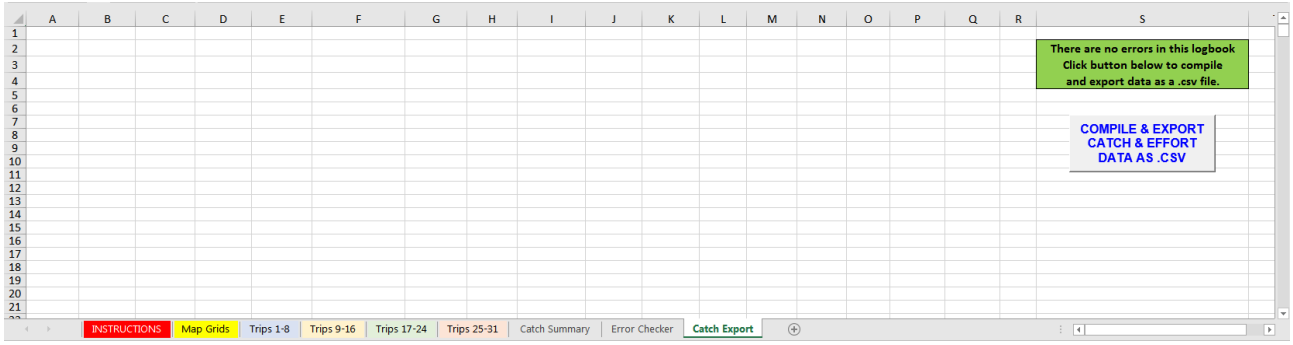
	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Fishery	Fisher_name	Vessel_name	Logbook_grid	CWP_grid	No_Hours_fishing	No_fishers	Method	Catch_made	Scientific_name	FAO_code	No_caught	Weight_kg	Fish_status
2	SPOR	Joe Bloggs	Sea Warrior	K02	5202040	4	3	Troll live bait	Yes	Makaira nigricans	BUM	2	425	Retained
19	SPOR	Joe Bloggs	Sea Warrior	K02	5202040	4	3	Troll live bait	Yes	Istiophorus platypterus	SFA	3	68	Released
20	SPOR	Joe Bloggs	Sea Warrior	K02	5202040	4	3	Troll live bait	Yes	Tetrapturus audax	MLS	1	88	Released
21	SPOR	Joe Bloggs	Sea Warrior	K02	5202040	4	3	Troll live bait	Yes	Makaira nigricans	BUM	1	350	Released
22	SPOR	Joe Bloggs	Sea Warrior	K02	5202040	4	3	Troll live bait	Yes	Sphyrna lewini	SPL	2	87	Released
23	SPOR	Joe Bloggs	Sea Warrior	K02	5202040	4	3	Troll live bait	Yes	Thunnus tonggol	LOT	2	24	Released
29	SPOR	Joe Bloggs	Sea Warrior	K05	5202043	6	4	Troll lure	Yes	Makaira nigricans	BUM	2	120	Retained
30	SPOR	Joe Bloggs	Sea Warrior	K05	5202043	6	4	Troll lure	Yes	Tetrapturus audax	MLS	1	145	Retained
46	SPOR	Joe Bloggs	Sea Warrior	K05	5202043	6	4	Troll lure	Yes	Istiophorus platypterus	SFA	2	24	Released
47	SPOR	Joe Bloggs	Sea Warrior	K05	5202043	6	4	Troll lure	Yes	Tetrapturus audax	MLS	2	158	Released

INSTRUCTIONS | Map Grids | Trips 1-8 | Trips 9-16 | Trips 17-24 | Trips 25-31 | Catch Summary | Error Checker | Catch Export

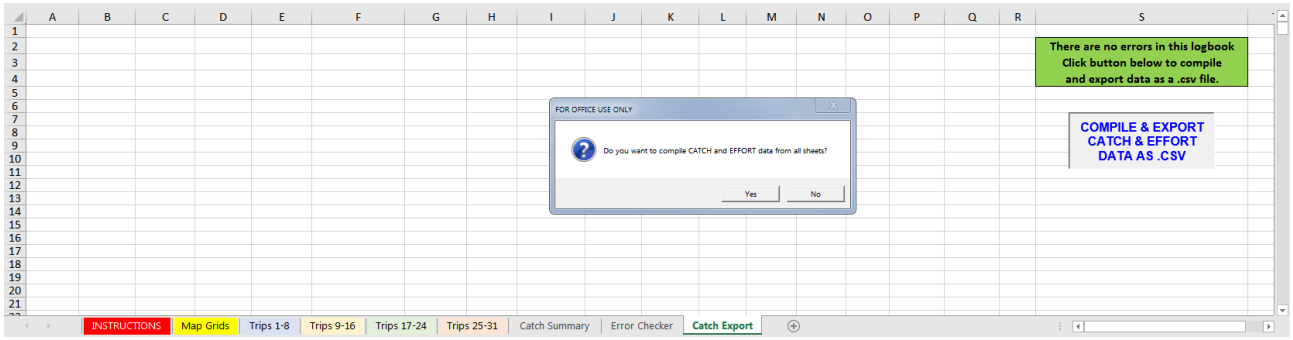
The data compilation and export process is automated in a single step through clicking the button on the "Catch Export" sheet. First, check column S on the top right side of the screen for any final error messages. If there is a large red box present, your logbook still contains errors or missing information. You will need to go back to the "Error Checker" sheet to identify and fix the errors.



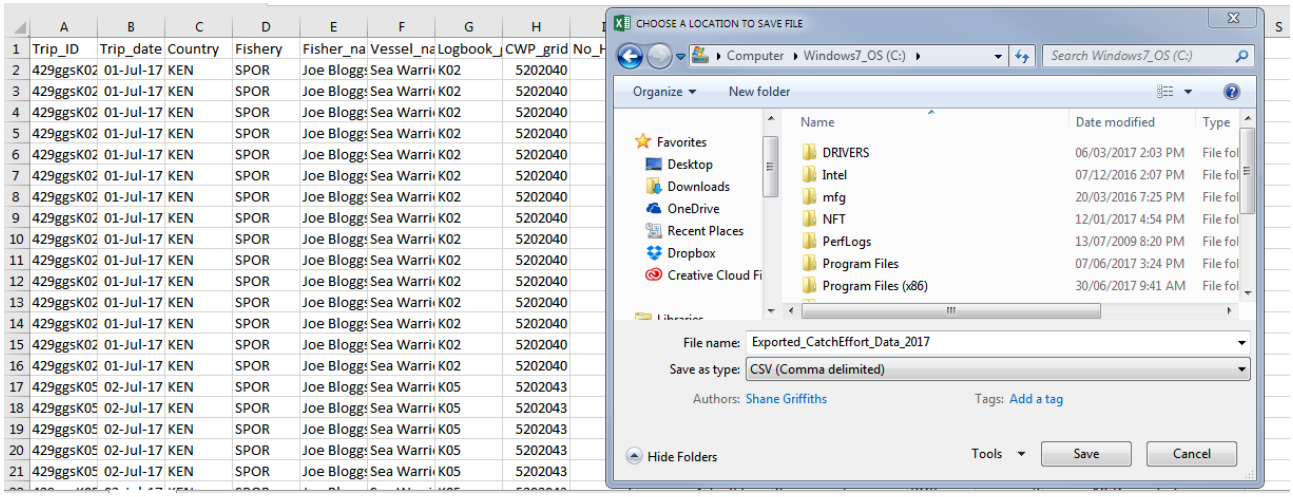
When all errors have been removed, return to the "Catch Export" sheet where the box will now be green, meaning there are now no errors present.



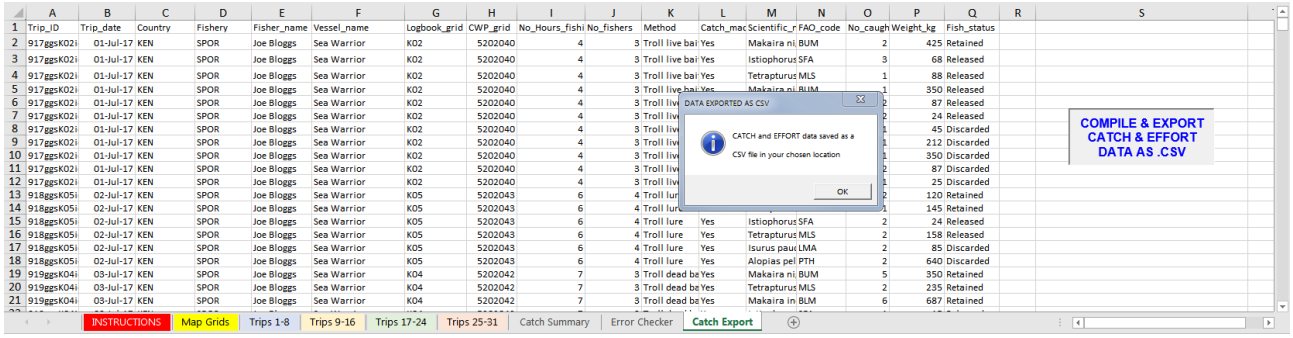
To compile catch and effort data for all trips in the logbook simply click the blue "Compile & Export Catch & Effort Data AS .CSV" button on the right side of the sheet (the button may be slightly hidden on a reduced screen view, so scroll to the right to find it). You will be asked to confirm if you want to compile the data. Click "Yes".



Wait a few seconds and the data will automatically be compiled, formatted and ready to export as a .csv file. You will be prompted to give your file an appropriate name, select the location where you'd like the file to be saved on your computer. Make sure the file is within the same folder as your Microsoft Access National Sportfishing Database. Now click "Save".



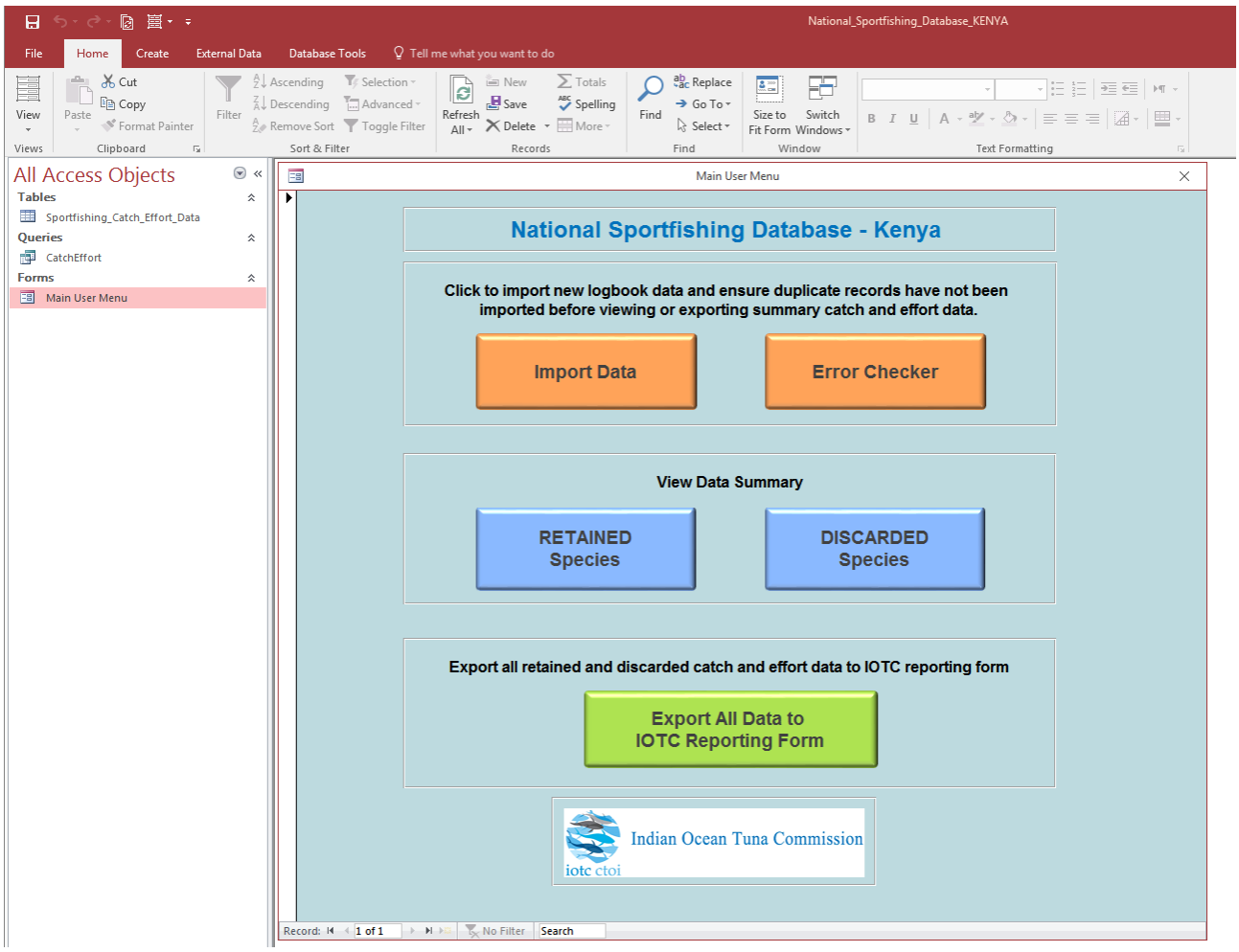
A message will then appear confirming that the catch and effort data has been saved as a CSV in the chosen location. The file is now ready to be imported into National Sportfishing Database.



Importing logbook data into the National Sportfishing Database

To this point, the data submitted from a single vessel for a single month has been checked for user errors and formatted in preparation to be imported into a central Microsoft Access National Sportfishing Database that will contain trip data for all sampled fishers for all months and years for the sport fishery in your country. Having all data in a database allows the user to quickly and easily query the dataset. Although you are free to create your own data queries to extract specific data you may be interested in at the national or local level, a number of specific queries have been created that are needed to clean and check data for errors, and to extract the information required for to assist countries with their reporting of catch (retained and discards) and effort data to the IOTC.

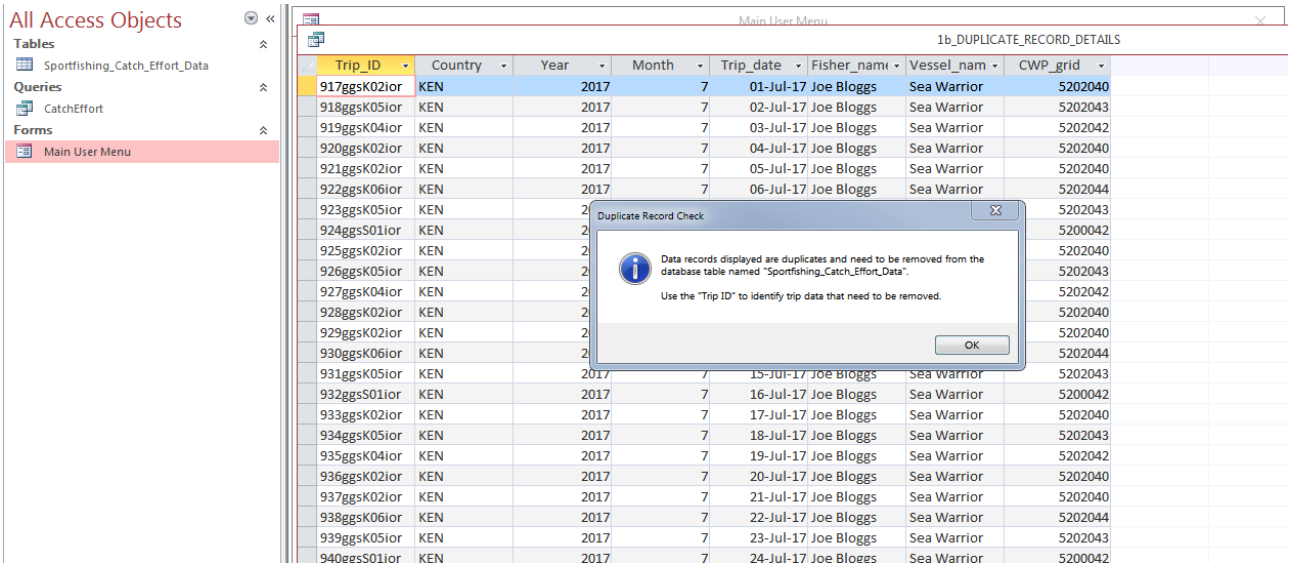
To begin, find and double-click the MS Access file named "National_Sportfishing_Database". After opening, you will see three objects on the left panel. The first is a table called "Sportfishing_Catch_Effort_Data", which is where all of logbook data will be imported to. The second object is a data query that you may be required to use to customise your data summaries. The third is the "Main User Form", which is the central console (the blue/green frame with the coloured buttons) where automated database functions can be performed by simply clicking a button. There are several tables, queries and complex macros in the database, but most have been hidden, since they are not useful for most users.



We now want to import each CSV file that was exported from each fisher's logbook. This is an important process and you should take care not to accidentally import the same CSV file twice, so be patient when importing. Click on the orange "Import Data" button on the Main User Menu. You will be asked to confirm that you wish to import data to the database table. Click "Ok". A dialog box will appear prompting the user to select the file to import. Find the logbook CSV file that was just exported, often with a name like "Exported_Logbook_Data.csv". After the file is selected the data will be imported and appended to the Sportfishing data table and cleaned for any import errors. Now that the data has been successfully imported, you will to check for duplicate record import errors before generating data summaries.

Error checking after importing multiple files

Since you will be continually importing new logbook data into the database, there is a chance that you may accidentally import the same logbook file more than once. On the Main User Menu, simply click on the orange button named "Error Checker", which will run a query to identify any duplicate trips. A table will open called "Duplicate_Record_Details". If the rows are blank, this is good as no duplicate records have been identified. Simply click "Ok and close the table. If the table contains data (see below), then duplicate records have been identified that will need to be deleted.



Trip_ID	Country	Year	Month	Trip_date	Fisher_nam	Vessel_nam	CWP_grid
917ggsK02ior	KEN	2017	7	01-Jul-17	Joe Bloggs	Sea Warrior	5202040
918ggsK05ior	KEN	2017	7	02-Jul-17	Joe Bloggs	Sea Warrior	5202043
919ggsK04ior	KEN	2017	7	03-Jul-17	Joe Bloggs	Sea Warrior	5202042
920ggsK02ior	KEN	2017	7	04-Jul-17	Joe Bloggs	Sea Warrior	5202040
921ggsK02ior	KEN	2017	7	05-Jul-17	Joe Bloggs	Sea Warrior	5202040
922ggsK06ior	KEN	2017	7	06-Jul-17	Joe Bloggs	Sea Warrior	5202044
923ggsK05ior	KEN	2					5202043
924ggsS01ior	KEN	2					5200042
925ggsK02ior	KEN	2					5202040
926ggsK05ior	KEN	2					5202043
927ggsK04ior	KEN	2					5202042
928ggsK02ior	KEN	2					5202040
929ggsK02ior	KEN	2					5202040
930ggsK06ior	KEN	2					5202044
931ggsK05ior	KEN	2017	7	15-Jul-17	Joe Bloggs	Sea Warrior	5202043
932ggsS01ior	KEN	2017	7	16-Jul-17	Joe Bloggs	Sea Warrior	5200042
933ggsK02ior	KEN	2017	7	17-Jul-17	Joe Bloggs	Sea Warrior	5202040
934ggsK05ior	KEN	2017	7	18-Jul-17	Joe Bloggs	Sea Warrior	5202043
935ggsK04ior	KEN	2017	7	19-Jul-17	Joe Bloggs	Sea Warrior	5202042
936ggsK02ior	KEN	2017	7	20-Jul-17	Joe Bloggs	Sea Warrior	5202040
937ggsK02ior	KEN	2017	7	21-Jul-17	Joe Bloggs	Sea Warrior	5202040
938ggsK06ior	KEN	2017	7	22-Jul-17	Joe Bloggs	Sea Warrior	5202044
939ggsK05ior	KEN	2017	7	23-Jul-17	Joe Bloggs	Sea Warrior	5202043
940ggsS01ior	KEN	2017	7	24-Jul-17	Joe Bloggs	Sea Warrior	5200042

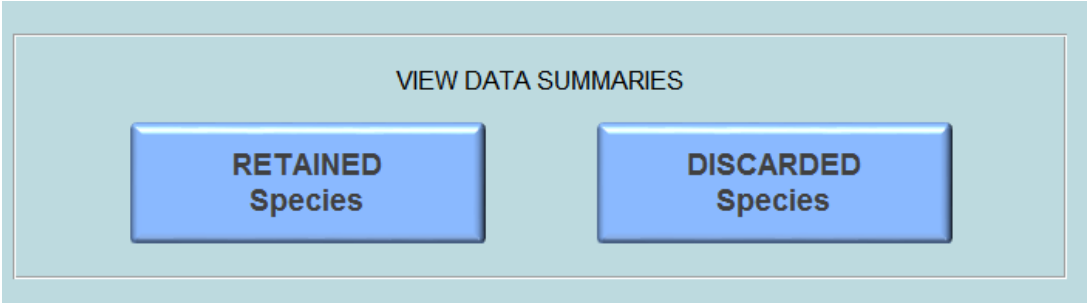
We now want to find the details of the duplicate trips (identified by the unique Trip ID) so we can go back and find the CSV file that was imported twice. The query has provided the details of all trips that were duplicated, including the country, year, month, date, fisher and vessel names and grid fished. Write down the details of the duplicate Trip IDs and find the CSV files you used to originally import the trips.

The easiest way to eliminate duplicates from the database is to delete all records containing the duplicate Trip ID from the main data table named "Sportfishing_Catch_Effort_Data". Once the duplicate records have been deleted, click the "Error checking" button again. If there are no records listed, then you have successfully deleted all duplicate records. If records are still listed, repeat the above steps until all duplicates have been removed. Now go ahead and re-import the data from the CSV for the Trip IDs you just deleted.

Performing data queries for reporting to IOTC

At a minimum, the IOTC requests catch and effort data for the sport fishery to be submitted each year—preferably more frequently—in a standardised format. A series of simple data queries have been built in the National Sportfishing Database to make this very quick and simple for National fisheries agencies to extract the data summaries required by IOTC. The data are separated as retained species and discarded (discarded dead + released alive) species.

To view a data summary for retained species or discarded species, simply click one of the blue buttons named "Retained species" or "Discarded species".

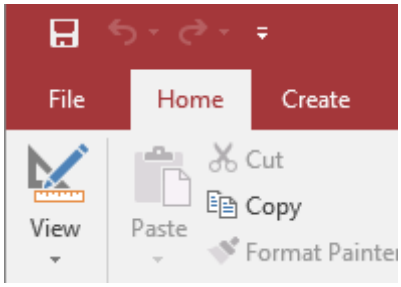


After clicking on the button, a data table will appear that has summarised all catch and effort information in the database for all years, months and reporting grids. The columns to the right contain total catches in both numbers (donoted by "No_") and weights ("Wt_) for each species (as an FAO code). For example, numbers and weights of bigeye tuna are in the columns "NO_BET" and "Wt_BET", respectively.

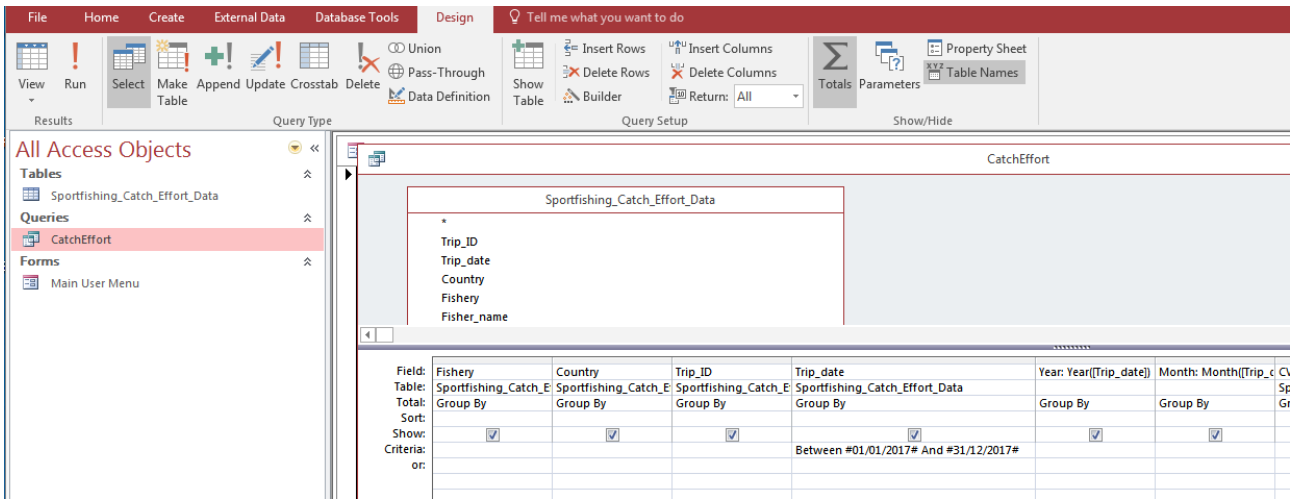
RETAINED_Catch_Effort

Fishery	Country	Year	Month	CWP_grid	Total_Fishing_Days	Total_Hours_Fished	No_ALB	No_BAU	No_BET	No_BLM	No_BUK	No_BUM	No_COM	No_DBM	No_
SPOR	KEN	2017	8	5200045	1	7						6			
SPOR	KEN	2017	8	5200046	1	2				6			1		
SPOR	KEN	2017	8	5201041	3	16	1		60			1		2	
SPOR	KEN	2017	8	5202041	2	9						1			
SPOR	KEN	2017	8	5202042	3	10				2	1			1	
SPOR	KEN	2017	8	5202043	2	8				2		3			
SPOR	KEN	2017	8	5202044	2	9						1			
SPOR	KEN	2017	8	5202045	3	11				5		3			
SPOR	KEN	2017	8	5202046	1	7				6		5			
SPOR	KEN	2017	8	5202047	2	11		16				4			
SPOR	KEN	2017	8	5203039	3	19				1		2			
SPOR	KEN	2017	8	5204039	1	2				3					

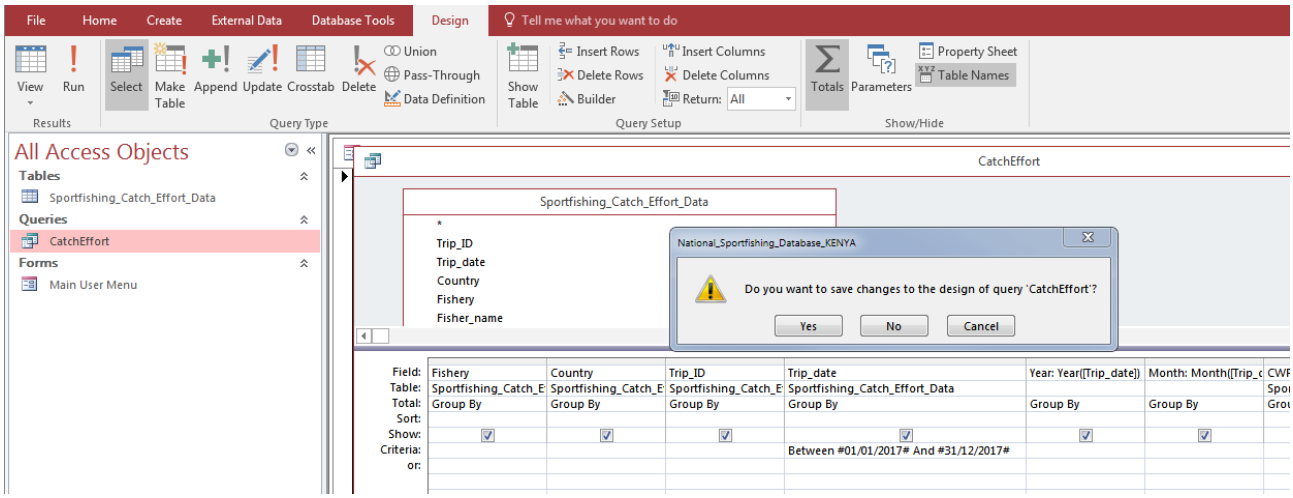
When reporting annual data summaries to the IOTC, the data need to be summarised for all trips conducted between 1 January of a particular year to 31 December of the same year. For example, the reporting year of 2017 will extend from 1 January 2017 to 31 December 2017. In order to narrow the data summary, double click the "CatchEffort" object under "Queries" on the left panel. Once open, click the "Home" tab and click the "View" button.



This will change the view of the data table to reveal database fields. In the bottom panel of the frame, find the column called "Trip_date". In the row labelled "Criteria", enter the date range you are interested in. For example, if you wish to restrict your data summary between 1 January 2017 and 31 December 2017, then type "Between #01/01/2017# And #31/12/2017#". Please do not edit any other field if you are not an experienced database user.

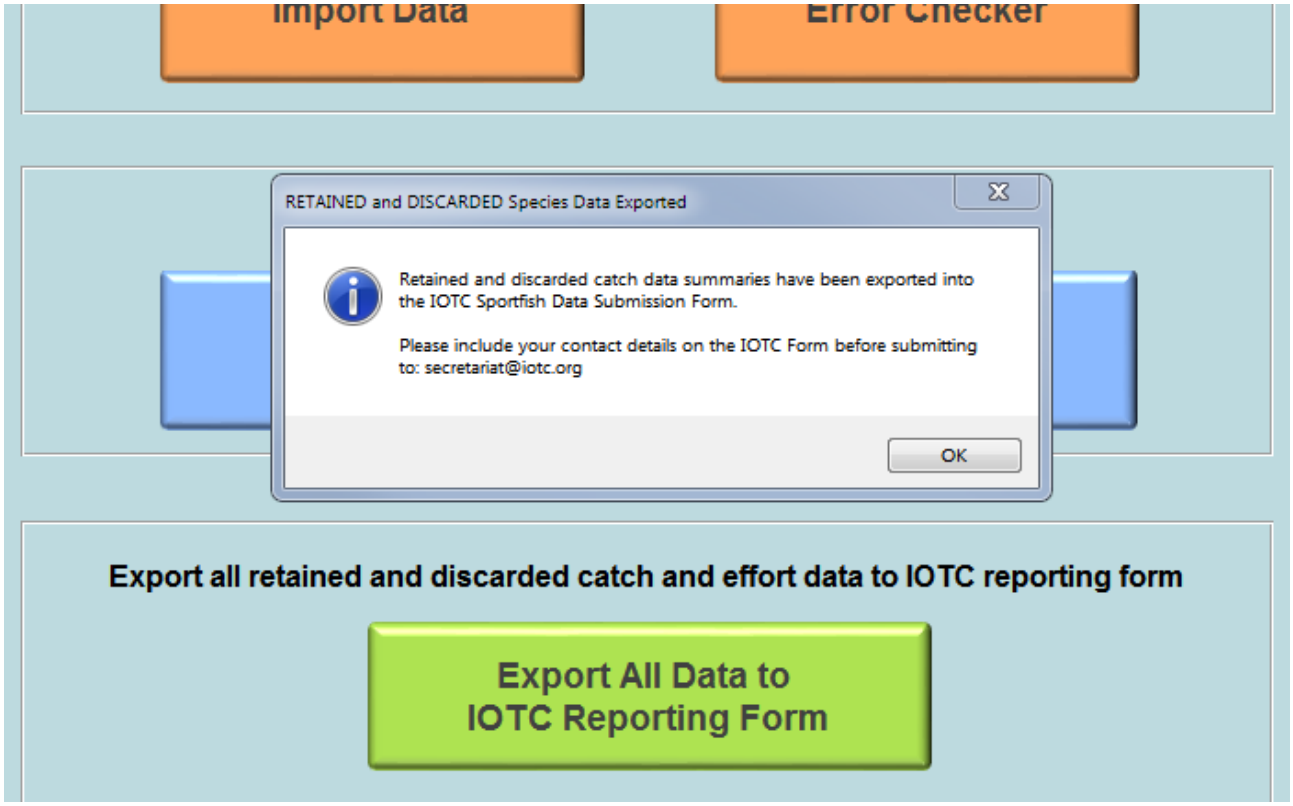


Once you have specified your data range, click the top right corner of the window to close the query. You will be prompted if you want to save changes to the query. Click "Yes". All catch and effort data for subsequent data summaries will now be limited to the date range you specified.

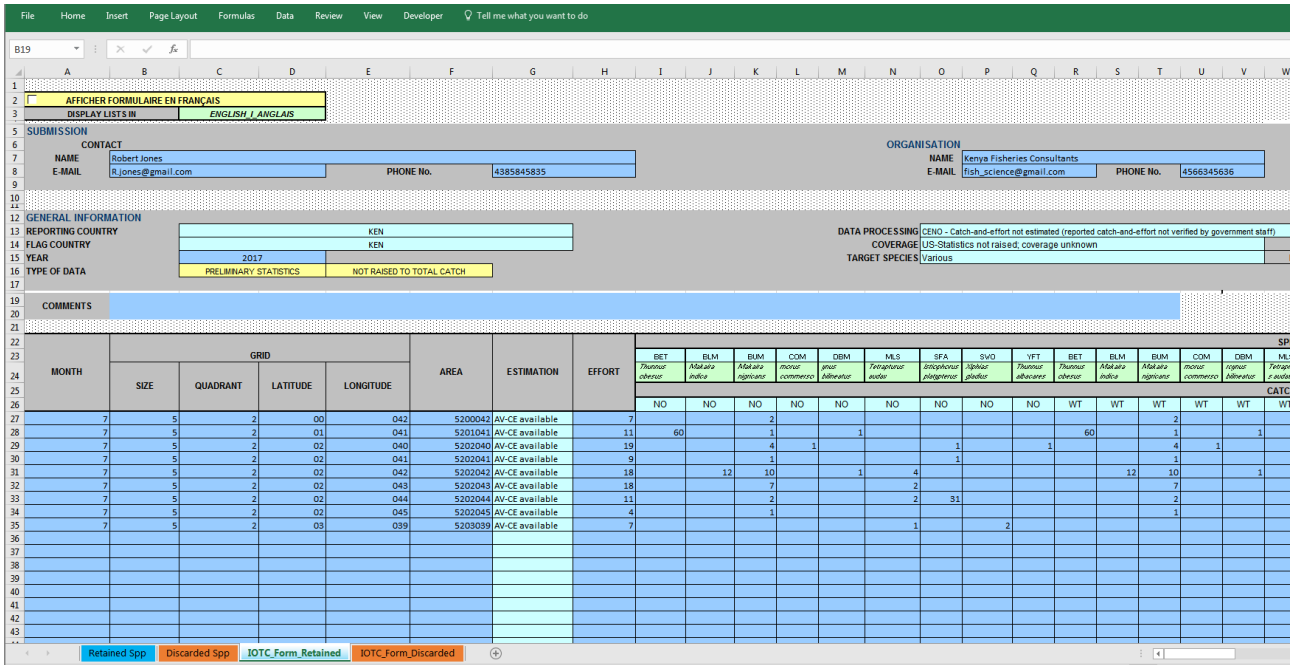


You can now go back to the Main User Menu and click a blue button to view your newly summarised data for retained or discarded species. Once you are satisfied that the data are in the correct format to report to the IOTC close the data summary table and prepare to export the data.

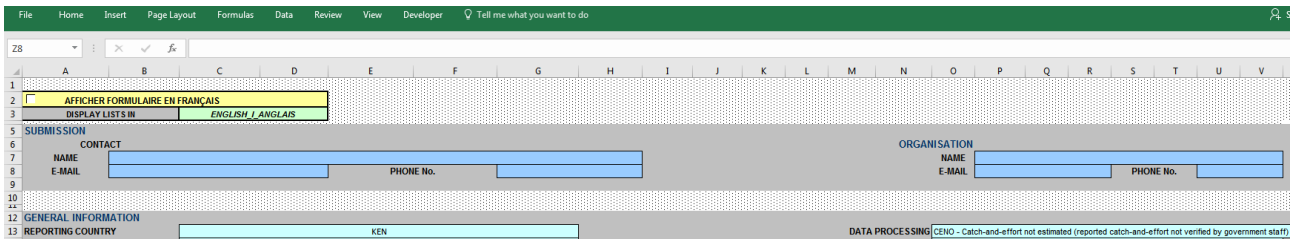
The IOTC reporting form (IOTC Catch Effort Form_3CE) requires catch and effort data for retained species to reported in numbers and weights in a separate row for each month and grid. The same process is required for discarded species (all fish released alive or discarded dead). Completion of these forms has been completely automated by simply clicking the green "Export All Data to IOTC Reporting Form" button on the Main User Form. After clicking, wait up to 20 seconds for the process to summarise the data and automatically export and save the data to the Excel file named "IOTC Sportfishing Submission Form". The Excel file will automatically open at the end of the process, including a confirmation message and directions for submitting the file to the IOTC Secretariat.



All the data has now been summarised and exported into the two sheets "Retained Spp" and "Discarded Spp", which has automatically completed the IOTC forms "IOTC Form Retained" and "IOTC Form Discarded". Click on these forms to ensure your data transferred correctly.



There is now only one very simple step to complete the process. In the "IOTC_Form_Retained" sheet, insert the name, email and phone number of the appropriate person for the IOTC to contact regarding the data submitted. Also insert the name, email and phone number of the organisation submitting the data. There is no need to complete these details on any other sheet as they are automatically transferred. In fact, all other cells on the sheet are locked for editing.



Now save the file as an Excel workbook (.xls or .xlsx) using "save as". Give the file a meaningful name that describes the data. For example, if the form describes sportfishing data from Kenya for the year 2017, save as "KEN_SPOR_2017". Now you can email the form to the IOTC (secretariat@iotc.org) and the process is complete. All IOTC data submission are required to be received by the IOTC by 30 June each year.

Manual compiled by S. Griffiths, for Pepperell Research & Consulting Pty Ltd.