# REVIEW OF THE STATISTICAL DATA AVAILABLE FOR INDIAN OCEAN BILLFISH (1950-2023)

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## Abstract

Billfish species are among the lease captured pelagic species globally. With only 3% of total tuna and tuna-like species, and most of the catches coming from the Indian Ocean in recent years (40%). Five billfish species remain under the IOTC management mandate, although there are discussion to include other commonly caught billfish species. Swordfish is the main billfish species, and longline (rods and reels) fisheries are the principal fisheries catching billfish species. In recent years however, substantial catches of billfish are coming from gillnet fisheries. The document provides an overview of the consolidated knowledge about fisheries catching billfish in the Indian Ocean since the early 1950s based on a range of data sets collected by the Contracting Parties and Cooperating Non-Contracting Parties (CPCs) of the IOTC and curated by the IOTC Secretariat. This includes analysis of the billfish fisheires, quality of the reporting data sets, and geo-referenced distribution of the effort, and size of the billfish in general. Additional information papers of the five species provide detailed analysis of each species.

**Keywords**: billfish | Indian Ocean | tuna fisheries

# Introduction

Billfish are migratory species found in temperate and tropical waters. They are predatory fish characterized by elongated snouts, which can be either flat and sword-like or rounded and spear-like, and are used as weapons to capture prey (https://www.sydneyfishmarket.com.au/Home/Seafood/Species-Information/List/category/billfish).Various organizations define billfish species based on different characteristics, including taxonomy and shared traits with other Scombroid fishes (Collette et al. 2006). While taxonomic classifications recognize several species of billfish, only five fall under the management mandate of the Indian Ocean Tuna Commission (IOTC). These include : *Istiompax indica*, *Makaira nigricans*, *Kajikia audax*, *Istiophorus platypterus*, and *Xiphias gladius* (**Appendix I**). The Billfish foundation advocates for the conservation of billfish species and also supports the global recreational fishing community by conducting research and providing educational resources. In the past, the IOTC has collaborated with the Billfish Foundation to collect data on billfish caught in recreational fisheries.

Billfish have been exploited for millenia (Ward et al. 2000)but time series data on fisheries statistics have only been available since the early 1950s for major fishing areas reported by the Food and Agriculture Organisation (FAO). Higher-resolution spatio-temporal data are available from the tuna Regional Fisheries Management Organizations (tRFMOs), which are responsible for managing billfish species within their respective ocean basins. Data compiled by both the FAO and tRFMOs indicate a long-term increasing trend in global billfish catches.However, between 2016 and 2021, global catches declined by approximately 24%. In the past two years, though, catches have shown signs of recovery and are increasing again (**Fig.** 1**a**). The Indian Ocean has been the primary fishing ground for billfish, accounting for approximately 43% of global billfish catches in recent years (**Fig.** 1**b**)

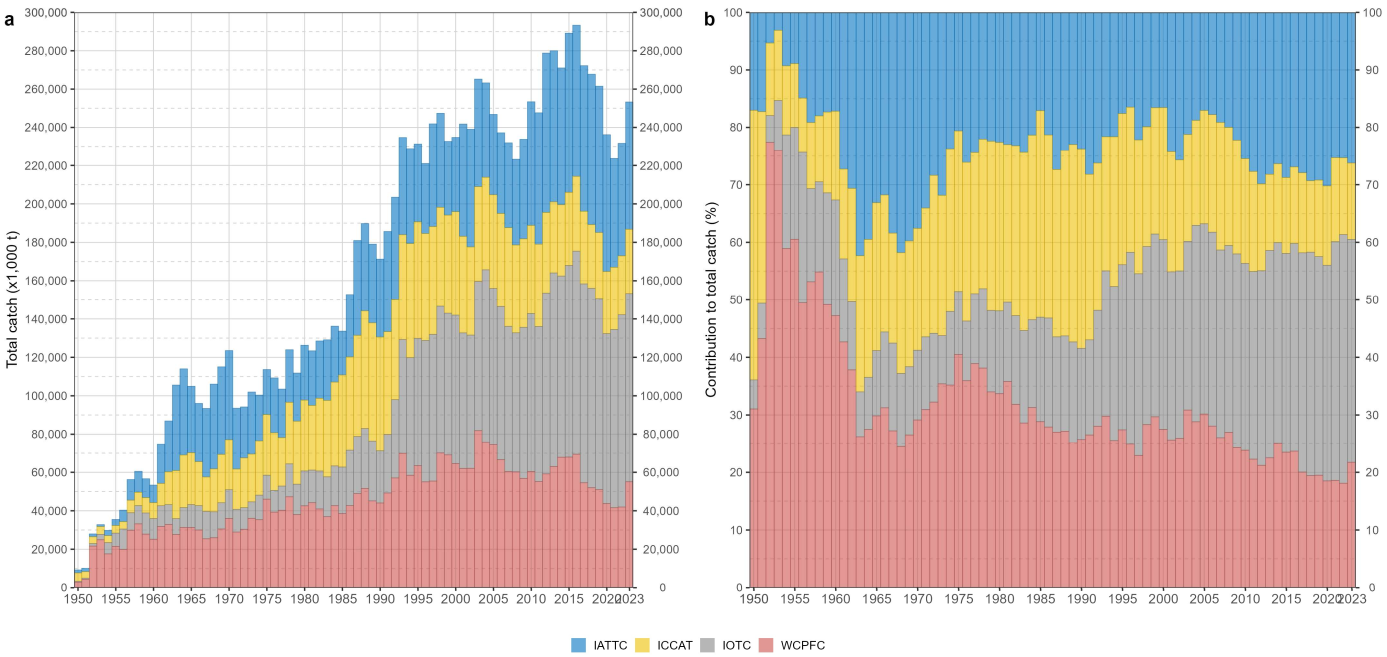


Figure 1: Annual time series of (a) cumulative retained catches (metric tonnes; t) and (b) contribution to the total retained catches (percentage; %) of billfish by ocean basin for the period 1950-2023. Source: FIRMS Global Tuna Atlas (GTA)

The fundamental objective of this paper is to provide participants in the 23rd Session of the IOTC Working Party on Billfish (WPB23) with a review of the status of available information on the five billfish species under IOTC mandate. The datasets used in this document cover the period from 1950 to 2023 and reflect data available to the IOTC Secretariat as of June 2025. This paper reviews the methods used to process, assessing the reporting quality of the main datasets, and presents an overview of the key trends and characteristics of billfish fisheries in the Indian Ocean over the past seven decades. Data submitted for 2024 are still under review and are unlikely to be included in the current analysis for WPB23 due to the following challenges:

(i) assessment datasets were finalized prior to the submission of 2024 data;

(ii) preliminary 2024 submissions are incomplete; and

(iii) the short timeframe between data submission and the WPB23 meeting limits the ability to incorporate the information.

# Materials

Data submitted by Contracting Parties and Cooperating Non-Contracting Parties (CPCs) are based on the requirements outlined in relevant IOTC Conservation and Management Measures (CMMs), which vary depending on the species and fisheries involved. For billfish species, two key resolutions are applicable: the IOTC Res. 15/02](https://www.iotc.org/cmm/resolution-1502-mandatory-statistical-reporting-requirements-iotc-contracting-parties-and) which outlines mandatory statistical reporting requirements and Resolution 18/05 which establishes management measures for the conservation of billfish, including catch limits (**18/05?** doc). These resolutions provide the basis for assessing CPC compliance using the data collected and analyzed by the IOTC Secretariat.

In recent years, the IOTC Secretariat has developed several user-friendly interactive tools to assist CPCs in improving data reporting quality and increasing awareness of reporting requirements. The Secretariat has also worked closely with CPCs through training workshops to enhance their understanding of these obligations.Among the latest resources are the IOTC Reporting guidelines and online detailed IOTC forms description and requirements,which are available to all countries operating in the Indian Ocean. The use of these forms for data submission is expected to facilitate more efficient data curation and management by the Secretariat. Additionally, CPCs can now use the online validator tools to check the quality and completeness of their data before submission. Data sets used for analysis in this paper include retained catch, geo-referenced catch and effort, and size samples of the billfish species.

## Retained (nominal) catch data

Retained catches, which refer to the landed weight of fish kept for various purposes such as commercial and subsistence use, FAO Catch and landings, correspond to the total retained catches (in live weight) per year, Indian Ocean major area, fleet, and fishing gear type (IOTC Res. 15/02). The retained catch data reporting requirements are described in 1RC form webpage and can be reported through IOTC form 1RC template.

Updates in the IOTC consolidated data sets of retained catches (i.e., raw and best scientific estimates) may be required as a result of:

i. updates received by December 30th each year, of the preliminary data for longline fleets submitted by June 30th of the same year (IOTC Res. 15.02);

ii. revisions of historical data by CPCs, including corrections of errors, additions of previously missing data, or changes in data processing, etc.

iii. modifications to the estimation process performed by the Secretariat based on evidence of improved methods and/or assumptions (e.g., selection of proxy fleets, updated morphometric relationships) and upon endorsement by the Scientific Committee.

## Discard data

The IOTC follows the definition of discards adopted by FAO in previous reports (Alverson et al. 1994, Kelleher 2005) which considers all non-retained catch, including individuals released alive or discarded dead.Decisions to discard are influenced by several factors, such as market conditions, regulatory measures, catch quality, and storage capacity on board (Suuronen & Gilman 2020). Estimates of total annual discard levels in live weight (or number) by Indian Ocean major area, species and type of fishery shall be reported to the Secretariat as per IOTC Res. 15/02. Nonetheless, descriptions of the discarded data requirements are explained in 1DI form webpage, and data can be submitted through 1DI form template. The final data should be extrapolated to represent the total level of discards by fisheries, fleet, species concerned, including turtles, cetaceans, and seabirds for the year.

Nevertheless, discard data reported to the Secretariat through the 1DI form template are generally scarce, not raised, and not complying with all IOTC reporting standards. For these reasons, the most accurate information available on discards comes from the IOTC Regional Observer Scheme (IOTC Res. 22/04) that aims to collects detailed information (e.g., exact location in space and time of the sets and interactions, including the fate of observed individuals) on discards of IOTC and bycatch species for industrial fisheries (see below).

## Geo-referenced catch and effort data

Catch and effort data refer to finer-scale data, usually from logbooks, reported in aggregated format and stratified per year, month, grid, fleet, gear, type of school, and species (IOTC Res. 15/02). The reporting requirements for the catch and effort are described in 3CE form webpage, if for submission of all fisheries through the 3CE form template. Otherwise for updated submissions, descriptions in 3CE form update, and submission through 3CE form update webpage. Furthermore, CPCs with surface fisheries should collect and report geo-referenced data on the use of fish aggregating devices (FADs), depending on the type of FAD used. Activities related to anchored FADs the requirements are described in 3DA form webpage and submission through the 3DA form template. Whereas for activities on drifting floating objects, detailed description of the requirements are in 3DA form webpage, and submission through 3DA form template

To support the reporting of effort from support vessels that assist industrial purse seiners, CPCs should use the 3CE form template, which provide the required fields for reporting geo-referenced effort data.

Catches of billfish species in fish aggregating device (FAD) fisheries are rare and typically recorded as bycatch or discarded catch. They are infrequently reported in regular logbooks, as billfish are not a major component of FAD-targeted fisheries. However, observer data do indicate occasional interactions with billfish species.

## Size-frequency data

Accurate assessment of population biomass depends on the availability of size sampling data, which provide the necessary information on the size structure of the stock. Size sample data is one of the key datasets required to be reported to the Secretariat. The size composition of catches can be derived from individual body length or weight measurements, which are collected either at sea or during the unloading of fishing vessels. Detailed descriptions of the data reporting requirements for size frequency data are in 4SF form webpage for the submission of full data for all fisheries and species, through the 4SF from template. However, CPCs can also provide updated information for several reasons, with the requirements descriptions in 4SF form upate webpage, and submitting the data updated data through 4SF form update template. The new format allows CPCs to report several information related to size frequency as requested by IOTC Res. 15/02, including type of data, if retained or discarded, source of data (logbook, research institutions or observers) and the sex of the species.

## Socio-economic data

Fisheries have been a primary socio-economic resource for many coastal countries for centuries. However, as described in the “tragedy of the commons” (Hardin 1968), the ongoing depletion of what were once considered the inexhaustible resources of the oceans is pushing many marine species toward extinction. To address this, common management approaches include the establishment of quotas and other regulatory measures, such as fishing restrictions, to help prevent further resource depletion. While these management measures are essential for conservation, they can significantly affect the livelihoods of coastal communities, particularly those in Small Island Developing States (SIDS), which rely heavily on fisheries for food security and economic development. Despite this, socio-economic indicators have often been underrepresented in fisheries management decision-making, even though such decisions can have considerable social and economic consequences. In recent years, as the IOTC has continued discussions on quota allocations, socio-economic considerations have increasingly come to the forefront, reflecting growing recognition of their importance (Secretariat 2025e). Although many countries have implemented national monitoring and evaluation programs, the outcomes often fall short of influencing fisheries policy effectively. Greater attention is therefore needed to ensure that adaptive fisheries management processes incorporate socio-economic dimensions, with the aim of improving both human well-being and sustainability outcomes (Bennett 2021).

In spite of the working party meetings held on socio-economic, minimal information are available on the socio-economic dimension of fisheries catching billfish species in the Indian Ocean, though quota allocations could also impact the capturing of billfish species. Currently, the IOTC Secretariat is only collecting fish price data from various sources on a voluntary basis.Detailed reporting requirements are outlined on the 7PR form webpage which supports submission of fish price data in IOTC Form 7PR, designed to provide price data by market types, product type, and purposes. Being voluntary data to report, not all members provide the information although collected. However, since the submission of price data is not mandatory, many CPCs do not provide this information, even when it has been collected nationally. Among the available data, some variation in billfish prices is evident, which may reflect differences in local markets, product forms, or fishing methods

## Regional Observer Scheme

IOTC Res. 22/04 on the ROS makes provision for the development and implementation of national observer schemes among the IOTC CPCs starting from July 2010 with the overarching objective of collecting *"verified catch data and other scientific data related to the fisheries for tuna and tuna-like species in the IOTC area of competence"*. The ROS aims to cover *"at least 5% of the number of operations/sets for each gear type by the fleet of each CPC while fishing in the IOTC Area of competence of 24 meters overall length and over, and under 24 meters if they fish outside their EEZs shall be covered by this observer scheme"*. Observer data collected as part of the ROS include: (i) fishing activities and vessel positions, (ii) catch estimates with a view to identifying catch composition and monitoring discards, bycatch, and size frequency, (iii) gear type, mesh size and attachments employed by the master, and (iv) information to enable the cross-checking of entries made to the logbooks (i.e., species composition and quantities, live and processed weight and location). In addition, the ROS database includes morphometric data (i.e., lengths and weights) collected at sea by fisheries observers which are of particular interest for deriving morphometric relationships. A full description of the ROS data requirements for each fishing gear is provided in IOTC Secretariat (2021a).

A comprehensive description of the status, coverage, and data collected as part of the ROS is provided in IOTC Secretariat (2021b). Although incomplete and characterized by a large variability in coverage between fisheries and over space and time, observer data include information on the fate of the catches (i.e., retained or discarded at sea) as well as on the condition of the discards. Observer data are also the main source of spatial information on interactions between IOTC fisheries and seabirds, marine turtles, cetaceans, as well as any other species encountered.

The Secretariat recently developed new template to address issues with reporting of ROS data. Although several CPCs submitted ROS reports, not all could be uploaded in the ROS regional database due to reporting format. The new template, in excel would capture more of the data reporting requirement and ease the pressure of processing the data. To date, the ROS regional database contains information for a total of 1,764 commercial fishing trips (1013 from purse seine vessels and 751 from longline vessels of various types) made during the period 2005-2022 from 7 fleets: Japan, EU,France and Sri Lanka for longline fisheries and EU,Spain, EU,France, Japan, Korea, Mauritius, and Seychelles for purse seine fisheries. In addition, in the past, some observer reports have been submitted to the Secretariat by some CPCs (e.g., Taiwan,China) but data sets were not provided in electronic format at the operational level following the ROS standards, *de facto* preventing the entry of these data in the ROS regional database. Currently, more CPCs, including Taiwan,China, are using the new template to report the ROS data.

## Morphometric data

Conversion factors for billfish species depend on the availability of morphometric data, which are typically collected either in the field or during fish processing. The IOTC Secretariat uses this information to perform length-length and length-weight conversions during data processing. However, the morphometric data currently available to the Secretariat are not always sourced from the Indian Ocean, nor are they available for all species, measurement types or fisheries. For instance, the IOTC reference relationships dataset includes historical morphometric relationships for billfish collected in the eastern Pacific Ocean (Uchiyama & Kazama 2003). In recent years, several research and monitoring programs, both at sea and on land, have focused on the collection of morphometric data for billfish species (e.g., Setyadji et al. 2016, Bonhommeau et al. 2019). As a result, multiple morphometric relationships have been established for billfish, based on data from different size ranges, areas, and time periods (**Appendix I**))

Given the frequent processing of billfish on board fishing vessels, it is often difficult to identify and measure specific body parts upon landing. To address this challenge, Sri Lanka initiated a research program aimed at identifying processed billfish body parts using species-specific morphological characteristics. This ongoing study emphasizes the need for a regional biological database to support accurate species identification and morphometric analysis (Bandaranayake et al. 2024).

Furthermore, the Secretariat is developing procedures to collect morphometric data from CPCs on a voluntary basis. The objective is to gather sampling data on key IOTC species to improve the quality and scope of available morphometric information and to establish a biological database accessible to data users.

# Methods

The release of the curated public-domain data sets for billfish species is done following some processing data steps which are briefly summarized below.

## Data processing

The Secretariat has recently developed tools enable CPCs to conduct preliminary checks on the data, ensuring the accuracy of reference codes and completeness before submission. Once the Secretariat received the submissions additional control checks are performed, as detailed below. First, standard controls and checks are performed to ensure that metadata and data submitted to the Secretariat are consistent and include all mandatory fields (e.g., dimensions of the strata, etc.). The controls depend on each data set and may require the submission of revised data from CPCs if the original ones are found to be incomplete.

Second, a series of processing steps is applied to derive the best scientific estimates of retained catches for the 16 IOTC species (see **Appendix V** of IOTC (2014)), by implementing the following rules:

a. When retained catches are not reported by a CPC, catch data from the previous year may be repeated or catches may be derived from a range of sources, e.g., partial catch and effort data, the FAO global capture production database, data on imports of tropical tunas from processing factories collaborating with the International Seafood Sustainability Foundation, etc.;

b. For some specific fisheries characterized by well-known, outstanding issues in terms of data quality, a process of re-estimation of species and/or gear composition may be performed based on data available from other years or areas, or by using proxy fleets, i.e., fleets occurring in the same strata which are assumed to have a very similar catch composition, e.g., Moreno et al. (2012) and IOTC Secretariat (2018);

c. Finally, a disaggregation process is performed to break down the catches by species and gear when they are reported as aggregates (IOTC Secretariat 2016). Briefly, the process derives the catch proportion of each IOTC species of an aggregate in a given stratum from past reports of catches where the species and gears were reported separately following a substitution scheme.

A total of 5 species aggregates including IOTC billfish species have been used by some CPCs for reporting retained catch data between 1950 and 2021 (**Table 1**).

Table 1: Species groups including billfish species used for reporting retained catches to the IOTC Secretariat

| Species code | Species name | BLM | BUM | MLS | SFA | SWO |
|---|---|---|---|---|---|---|
| AG01 | Black marlin and striped marlin | ✓ | | ✓ | | |
| AG02 | Indo-Pacific sailfish and shortbill spearfish | | | | ✓ | |
| BIL | Marlins,sailfishes,etc. nei | ✓ | ✓ | ✓ | ✓ | ✓ |
| BXQ | Marlins nei | ✓ | ✓ | ✓ | | |
| TUX | Tuna-like fishes nei | ✓ | ✓ | ✓ | ✓ | ✓ |

A total of 5 gear aggregates including IOTC billfish species have been used by CPCs to report retained catch data of any billfish species between 1950 and 2023 (**Table 2**).

Table 2: List of gear aggregates with their component gear codes (limited to gear aggregates that have reported catches of billfish species)

| Aggr. code | Gear aggregate | Category | BB | GILL | HAND | LIFT | LL | LLCO | PS | PSS | RR | SPOR | TRAW | TROL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GIHT | Gillnet and hand line and troll line | Gillnet | | ✓ | ✓ | | | | | | | | | ✓ |
| HATR | Hand line and Troll line | Trolling | | | ✓ | | | | | | | | | ✓ |
| HOOK | Hook and line | Trolling | | | ✓ | | | ✓ | | | | | | ✓ |
| LLTR | Coastal Longline and Troll line combination | Longline | | | | | | ✓ | | | | | | ✓ |
| UNCL | Unclassified | Other | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Details on the results of the estimation process used to produce the 2023 best scientific estimates and changes in time series of retained catches relative to the previous Working Party on Billfish are provided in Appendix III and Appendix IV, respectively.

Third, and applying to all 16 IOTC species plus the most common shark species defined in the appendices of IOTC Resolution 15/01, filtering and conversions are applied to the size-frequency data in order to harmonize their format and structure and remove data which are non-compliant with IOTC standards, e.g., when provided with size bins exceeding the maximum width considered meaningful for the species (IOTC Secretariat 2020). The standard length measurements considered at IOTC are the eye fork length (EFL; straight distance from the orbit of the eye to the fork of the tail) for black and blue marlins and the fork length (FL; straight distance from the tip of the lower jaw to the fork of the tail) for all other species subject to mandatory size measurements (IOTC Secretariat 2020). All size samples collected using other types of measurements are converted into FL and EFL by using the IOTC equations Appendix II, considering size range and intervals that may vary with species. If no IOTC-endorsed equations exist to convert from a given length measurement for a species to the standard FL and EFL measurements, the original size data are not disseminated but kept within the IOTC databases for future reference.

## Data quality

A scoring system has been devised to assess the reporting quality of retained catch, catch and effort, and size-frequency data submitted to the Secretariat for all IOTC species. The determination of the score varies according to each type of data set and aims to account for reporting coverage and compliance with IOTC reporting standards (**Table 3**). Overall, the lower the score, the better the quality. It is to note that the quality scoring does not account for sources of uncertainty affecting the data such as issues in sampling and processing as well as under- or misreporting.

Table 3: Key to IOTC quality scoring system

| Data set | Criterion | By species | By gear |
|---|---|---|---|
| **Retained catch** | Fully available | 0 | 0 |
| | Partially available | 2 | 2 |
| | Fully estimated | 4 | 4 |
| **Catch and effort** | Available according to standards | 0 | 0 |
| | Not available according to standards | 2 | 2 |
| | Low coverage (<30% logbooks) | 2 | |
| | Not available | 8 | |
| **Size frequency** | Available according to standards | 0 | 0 |
| | Not available according to standards | 2 | 2 |
| | Low coverage (<1 fish per ton caught) | 2 | |
| | Not available | 8 | |

# Results

## Retained catches & discards

Catches of billfish reported by CPCs have not always been well represented, leading to discrepancies between raw data submissions and the best scientific estimates of retained catches. Historically, fisheries targeting billfish species in the Indian Ocean often failed to provide detailed catch information disaggregated by species and/or fishery. As a result, scientific estimates were required, processing the raw data in which aggregated catches are disaggregated into individual billfish species and fisheries, often using proxy fleets as a basis for estimation.

However, more recent data show a decrease in catch aggregation, reflecting improvements in the availability and resolution of billfish catch data. For the purposes of this report, only the best scientific estimates have been used to provide more accurate estimates of billfish catches. Historically, billfish have been caught across a range of fisheries, with industrial longline fleets being the predominant source. Notably, swordfish became a major target species in the 1990s, particularly in these longline operations.

### Historical trends (1950-2023)

Among the 16 species under the IOTC management mandate, billfish species have historically contributed the least to the total catch. Their contribution fluctuated between 1–8% during the early years, with average annual catches of around 24,000t between 1950 and 2000 (**Fig. 2**). Although billfish still account for a relatively small proportion of total catches (~5%) over the last 20 years, total catch volumes have increased, similar to trends observed for other species caught in tuna fisheries. Between 2005 and 2023, the average billfish catch rose to approximately 85,000t.

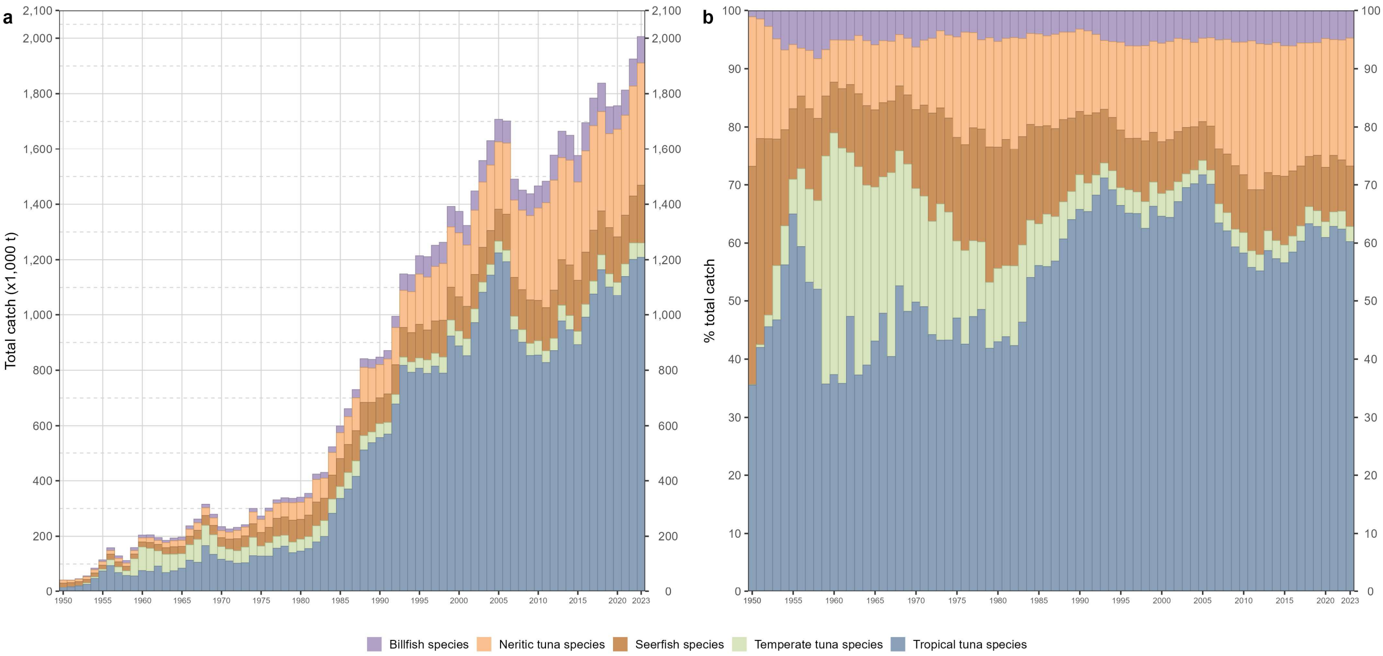


Figure 2: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of all IOTC tuna and tuna-like species by species category for the period 1950-2023

Historically, industrial fisheries dominated billfish catches, particularly industrial longline fleets, which accounted for approximately 69% of the total billfish catch between 1950 and 2007 (**Fig. 3**). This dominance is attributed to: (i) the nature of the gear (hook-and-line techniques suitable for billfish), and (ii) the fact that other fisheries did not primarily target billfish. In more recent years, with the expansion of other fishing techniques in the high seas, particularly gillnet fisheries and longlines shifting to targeting tuna for high-quality markets, the contribution of gillnet fisheries to billfish catches has significantly increased. Gillnets account for around 40% of the total billfish catch, averaging about 37,000t in 2010s (**Table 4**). The rise in billfish catches from gillnet fisheries in this decade (2010s), largely reflects increased catches of marlin species, especially black marlin and sailfish species from Iranian gillnet fisheries, and other gillnet fleets. Additionally, in the mid-2000s, several longline vessels ceased operations in the western Indian Ocean due to piracy threats (Pillai 2012), which, along with broader economic constraints, affected industrial fishing efforts in the region (Chassot et al. 2012).

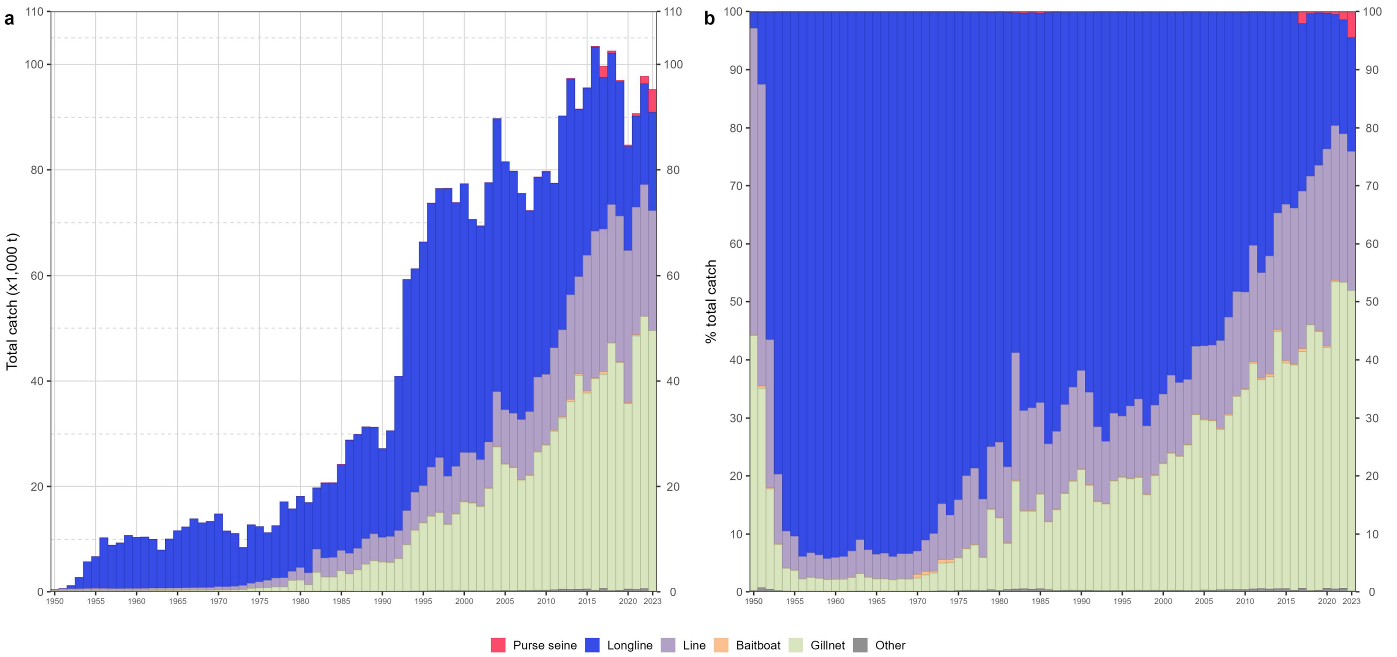


Figure 3: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of IOTC billfish by fishery group for the period 1950-2023

Apart from the growing contributions from gillnet fisheries, billfish catches have also increased in line fisheries, particularly coastal longline operations. Catches from coastal longline fisheries tripled in the 2010s (**Table 4** & **Fig. 4**), largely due to the increasing number of longline vessels operating in coastal areas of Sri Lanka. This shift was driven by the conversion of gillnet vessels into longliners, which yield higher-quality fish products (Jathunga et al. 2015, Sri Lanka - National Report 2018 IOTC 2018). Around the same time, Sri Lanka significantly improved the quality of its fisheries data through the introduction of logbooks. This improvement led to better disaggregation of catch data by fishery type (i.e. separating coastal and offshore components) (Herath & Maldeniya 2013). As a result, reported billfish catches from Sri Lanka's coastal longline fleet increased dramatically, from just 37 t in 2013 to 4,426 t in 2014, peaking at 9,632 t in 2019.

India also undertook a nationwide effort starting in 2003 to convert trawlers into longline vessels. This was part of a strategy to reduce seabed damage from trawling and lower operational costs (National Report – India IOTC 2013). The conversion resulted in increased billfish catches from Indian coastal longline fisheries, which rose from 1,332 tonnes in 2010 to 5,293 tonnes in 2019.

Although billfish catches from coastal longline fisheries continued to increase in 2023, rising by 66% compared to 2022, they remain below the peak levels recorded in 2017.

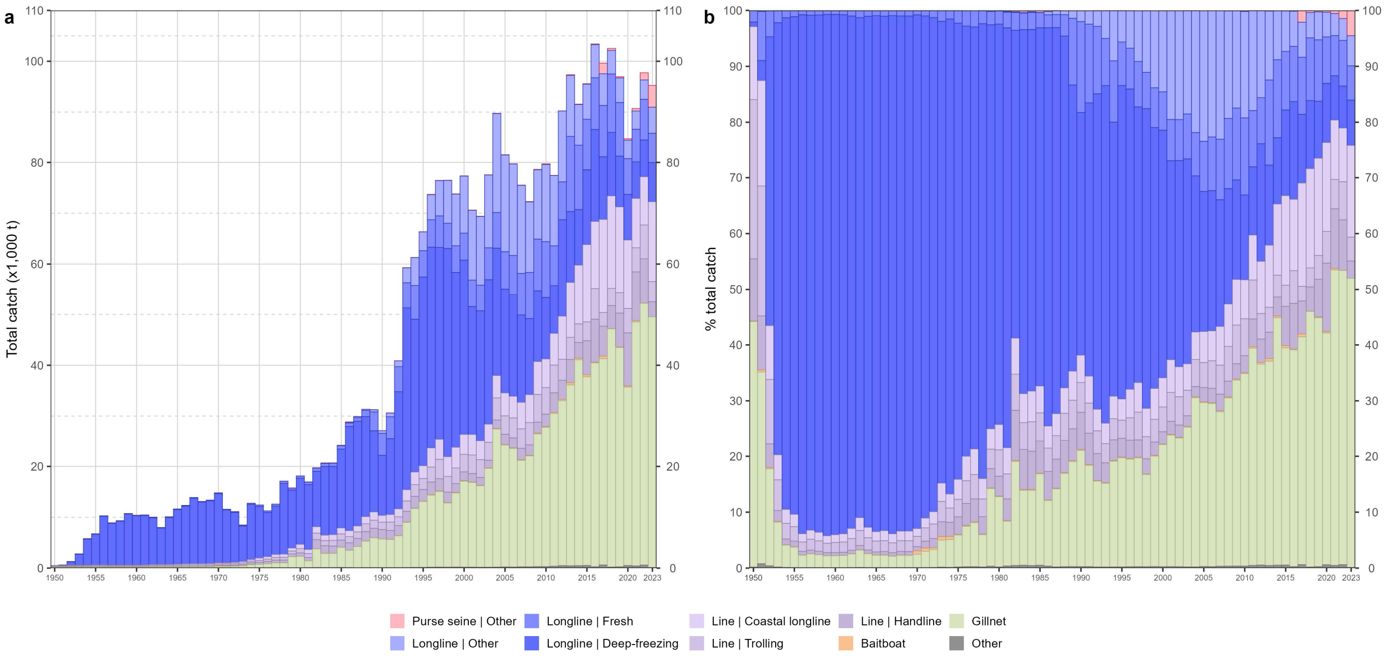


Figure 4: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of IOTC billfish by fishery for the period 1950-2023

These shifts in the fisheries targeting billfish species have altered the overall contribution of different fishery categories to total billfish catches. Artisanal fisheries, in particular, have significantly increased their share, peaking at 68% in 2021 (**Fig. 5**). In total, billfish catches in 2023 declined slightly, by 3% compared to 2022.

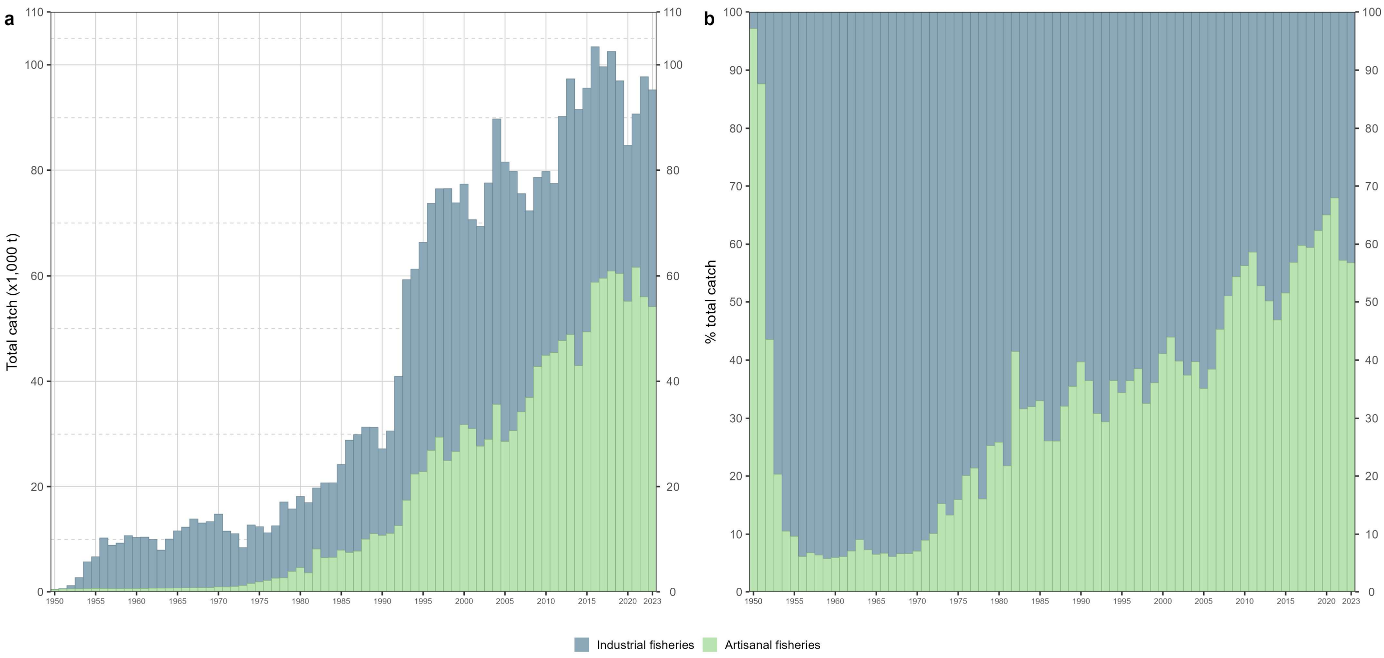


Figure 5: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of IOTC billfish by fishery category type for the period 1950-2023

Table 4: Best scientific estimates of retained catches (metric tonnes; t) of the IOTC billfish species by decade and fishery for the period 1950-2023

| Fishery | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2010s |
|---|---|---|---|---|---|---|---|
| Purse seine \| Other | 1 | 2 | 7 | 42 | 32 | 51 | 338 |
| Longline \| Other | 0 | 0 | 0 | 115 | 4,503 | 15,433 | 9,224 |
| Longline \| Fresh | 64 | 107 | 244 | 970 | 5,235 | 7,169 | 10,653 |
| Longline \| Deep-freezing | 5,041 | 10,448 | 10,551 | 15,630 | 30,662 | 22,563 | 13,331 |
| Line \| Coastal longline | 131 | 194 | 397 | 1,165 | 2,731 | 4,591 | 12,485 |
| Line \| Trolling | 161 | 225 | 396 | 1,185 | 2,426 | 3,995 | 4,301 |
| Line \| Handline | 58 | 68 | 341 | 1,405 | 2,096 | 1,868 | 4,994 |
| Baitboat | 3 | 5 | 39 | 29 | 69 | 107 | 256 |
| Gillnet | 224 | 259 | 778 | 3,549 | 10,713 | 21,254 | 37,469 |
| Other | 6 | 10 | 24 | 85 | 138 | 215 | 394 |
| Total | 5,688 | 11,318 | 12,777 | 24,175 | 58,607 | 77,246 | 93,445 |

Among the five billfish species managed by the IOTC, swordfish has been the primary target since the 1950s, accounting for 37% of the total cumulative 3.2million metric t of billfishes caught in the Indian Ocean between 1950 and 2023 (**Fig. 6**). This is followed by sailfish, which represent 26%, with 82% of that coming from coastal fisheries. Historically, black and stripped marlins have been the least caught species, contributing 15% and 16%, respectively, over the period 1950 to 2020. . Blue marlin, primarily caught by industrial fisheries, accounted for around 21% during the same period. In recent years, catch data show a notable increase in black marlin landings, contributing approximately 24% over the last three years, with majority (~50%) of the catch coming from Iranian gillnet fisheries.

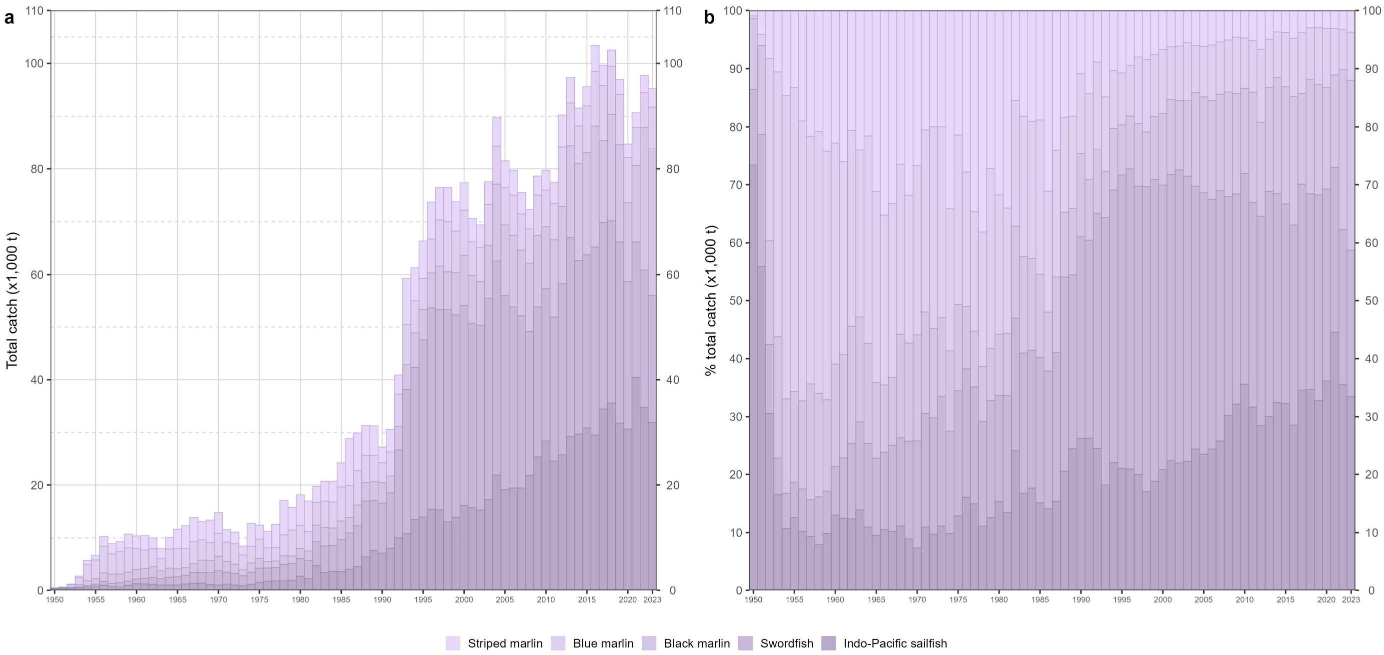


Figure 6: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of IOTC billfish by species for the period 1950-2023

**Black marlin (BLM)**: Catch trends for black marlin show a gradual increase from 1950 to 2016, peaking at approximately 23,000 t in 2016, , before declining with some interannual variability. The 2016 peak reflected a sudden increase in black marlin catches reported by Indian fisheries, which dropped significantly in the subsequent years. However, BLM catches from India, have shown signs of recovery over the past three years, reaching 7,000t in 2023. In recent years, BLM catches have been predominantly from Iranian gillnet fisheries, contributing an average of 15,000 t between 2022 and 2023, a substantial increase compared to previous years. According to Iran, regulations are in place that prohibit the capture of small billfish (less than 60 cm lower jaw fork length) (Rajaei & Naderi 2024). Historically, the increase in catches during the early 2000s was partly attributed to the development of gillnet-longline fisheries in Sri Lanka (IOTC 2025), although recent data show a decline in BLM catches from Sri Lanka.Overall, black marlin catches have shown a steady upward trend, increasing by approximately 300 tonnes per year. Between 2015 and 2020, the average annual catch was around 20,000t, primarily from gillnet and line fisheries. In 2023 the total BLM catch reached 28,000 t, the highest on record, representing roughly double the volume recorded in 2021 (**Fig. 7a**).

**Blue marlin (BUM)**: Unlike the steadily increasing trend observed for black marlin, historical catches of blue marlin (BUM) have fluctuated considerably and continue to show variability in recent years. These fluctuations present a two-phase pattern over time: an average annual catch of around 4,000 t between 1955 and 1990, and approximately 8,000 t between 1995 and 2023 (Secretariat 2025a). BUM catches are predominantly from industrial longline fisheries, mainly operated by distant-water fishing nations. Historically, Japan was the dominant fleet, accounting for over 81% between 1950 and 1970. However, overall catches declined during the 1970s, following a reduction in the number of Japanese longline vessels operating in the Indian Ocean. The subsequent increase in Taiwanese longline operations in the late 1970s contributed to a resurgence in BUM catches. Taiwan, China has remained the leading fleet catching BUM, with catches peaking at 7,000 t in 2012. Around 2015, many industrial longline fleets shifted their target species, resulting in a reduction in billfish catches, including BUM. Since then, BUM catches have gradually declined due to this shift in target species. Recent data from Sri Lanka and Indonesia, however, indicate signs of recovery in BUM catches over the past year. In 2023, the total catch was estimated at 8,000 t, slight increase compared to 2022 (**Fig. 7b**).

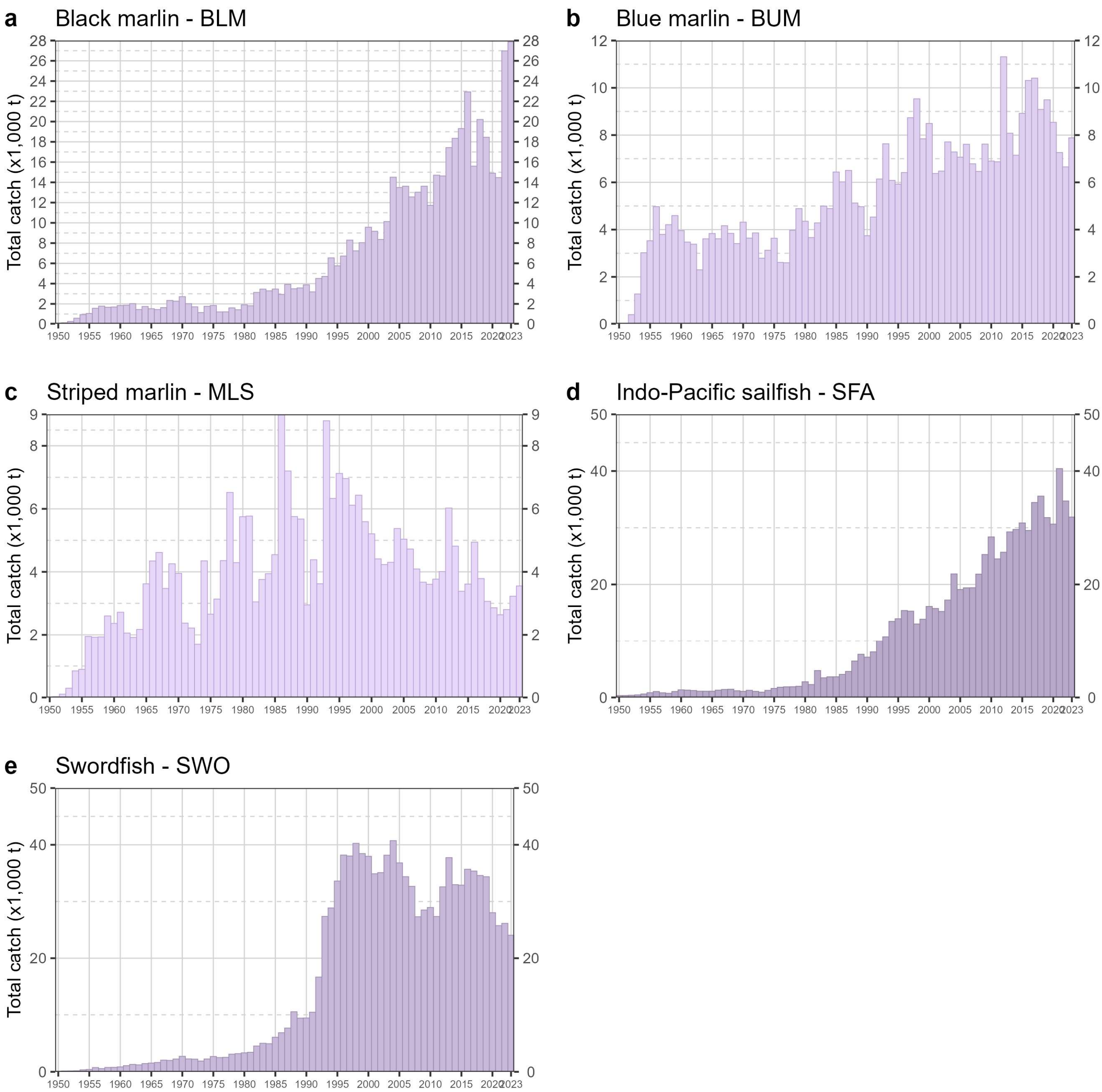


Figure 7: Annual time series of cumulative nominal catches (metric tonnes; t) of IOTC billfish by species for the period 1950-2023

**Striped marlin (MLS)**: Similar to blue marlin, striped marlin (MLS) was historically caught primarily by industrial longline fisheries, though at lower volumes. Catch trends show a distinct pattern, with notable peaks in 1986 (9,000t) and 1993 (8,800t), separated by a period of low catches (**Fig. 7c**). From the 1950s through the 1990s, Japan and Taiwan,China were the principal fleets targeting MLS, together contributing approximately 74% of the total catch during that period. However, catches declined significantly from the late 1990s, reflecting a reduction in fishing effort by these major longline fleets, although a brief recovery was observed in 2012. The emergence and expansion of gillnet fisheries, particularly offshore gillnet operations, led to increased MLS catches from the early 2000s onward. In recent years, the dominant gillnet fleets have been from the Islamic Republic of Iran and Pakistan, contributing 35% and 24%, respectively, between 2018 and 2023. In 2023 , the total MLS catch was estimated at 4,000 t, continuing an upward trend observed over the past few years (IOTC Secretariat 2023b).

**Indo-Pacific sailfish (SFA)**: The catch trend for Indo-Pacific sailfish (SFA) shows a steady increase from 1950 and 2023, similar to that observed for black marlin. Catches peaked at 40,000t in 2021 (**Fig. 7d**). SFA are caught predominantly by coastal fisheries, which have contributed approximately 82% of total catches to date. In the early period (prior to 1970), industrial longline fleets accounted for most of the SFA catch, averaging around 1,000t annually,while coastal fisheries contributed only about 500t per year.Catches began to rise from the mid-1990s, largely driven by the expansion of gillnet fisheries operating offshore and within national jurisdictional areas (NJAs), particularly from Pakistan, the Islamic Republic of Iran, and Sri Lanka. Among these, Iranian gillnet fisheries have sustained an increasing trend in SFA catches, while other gillnet fleets have shown a general decline in billfish catches overall. In addition to gillnet fisheries, line fisheries have also contributed significantly to SFA catches in recent years, although with large annual fluctuations, particularly from India.Catches from gillnet and line fisheries peaked at 31,000t in 2021t and 12,000t in 2022t, respectively. Fleet wise, between 2015 and 2023, Iranian fisheries contributed approximately 38%, SFA catch, followed by India 22%. In 2023 , the total SFA catch was estimated at 32,000 t, a downward trend observed over the past few years (IOTC Secretariat 2023a).

**Swordfish (SWO)**: Swordfish (SWO) catch trends show a sharp increase beginning in the mid-1990s, driven by the expansion of gillnet-longline fisheries and targeted longline operations across the region (**Fig. 7e**). Catches peaked at 40,300t in 1998, with Taiwanese fleet representing 46% of the total SWO catch between 1990 and 2000. Although catches have fluctuated since then, a general declining trend is observed, with annual catches remaining above 34,000t for most of the period from 2000. From the mid-2000s, fleets such as the EU-Spain longliners, Sri Lankan gillnet-longliners, and Indonesian longliners contributed significantly to SWO catches. Longline fisheries continue to be the primary method for catching swordfish, although in recent years, gillnet and line fisheries have also reported substantial SWO catches. Taiwanese longline catches of SWO have declined since the mid-2000s, averaging around 6,000t. This drop is attributed to a reduced number of Taiwanese longliners operating in coastal state areas beyond national jurisdiction (ABNJ), coupled with a shift in target species from billfish to tunas. During the mid-2000s, there was also evidence that some European longline fleets targeting swordfish, contributing approximately 13%, were recording higher bycatch levels, with blue shark (BSH) catches equalling or exceeding swordfish catches. This pattern suggests that these fleets may have been actively targeting blue shark, consistent with similar practices by the same fleets in the Atlantic Ocean (García-Cortés & Mejuto 2005). Besides longline, line fisheries also caught significant catches of SWO. Line fisheries in Sri Lanka have shown increasing swordfish catches since 2018, reaching as high as 8,000 tonnes in 2019, which was followed by a sharp drop In recent years, overall swordfish catches have declined, reaching 24,100t in 2023, the lowest level recorded since the year 2000 (IOTC Secretariat 2023c).

## Recent fishery features (2019-2023)

Recent catch trends for billfish species have shown fluctuations, with total catches peaking at 97,000t in 2019, followed by a decline to 85,000 t in 2020. The drop in 2020 is primarily attributed to reduced billfish catches from India and Sri Lanka, which together accounted for 28.9% of total catches in recent years. Catches of the two fleets declined by 48% and 27%, respectively.Between (2019-2023), the average annual retained catch of all billfish species combined was approximately 93,100 t. Gillnet, longline, and line fisheries contributed 48.9%, 21.6%, and 27.6% of these catches, respectively (**Table 5**)

Table 5: Mean annual retained catches (metric tonnes; t) of the IOTC billfish species by fishery and contribution (%) to the total catch of all IOTC billfish species between 2019 and 2023

| Fishery | Fishery code | Catch | Percentage |
|---|---|---|---|
| Gillnet | GN | 45,504 | 48.9 |
| Line \| Coastal longline | LIC | 13,063 | 14.0 |
| Longline \| Deep-freezing | LLD | 8,239 | 8.9 |
| Line \| Handline | LIH | 7,705 | 8.3 |
| Longline \| Fresh | LLF | 7,606 | 8.2 |
| Line \| Trolling | LIT | 4,886 | 5.2 |

| Fishery | Fishery code | Catch | Percentage |
|---|---|---|---|
| Longline \| Other | LLO | 4,228 | 4.5 |
| Purse seine \| Other | PSOT | 1,347 | 1.4 |
| Other | OT | 382 | 0.4 |
| Baitboat | BB | 126 | 0.1 |

In recent years (2019 and 2023), fisheries operating within areas of national jurisdiction (ANJ) and beyond national jurisdiction (ABNJ) have dominated billfish catches. The Islamic Republic of Iran, India, and Sri Lanka, each with substantial gillnet and line fisheries, emerged as the three leading billfish fleets, landing approximately 26,000 t, 14,000 t and 13,000 t, respectively (**Fig. 8**).

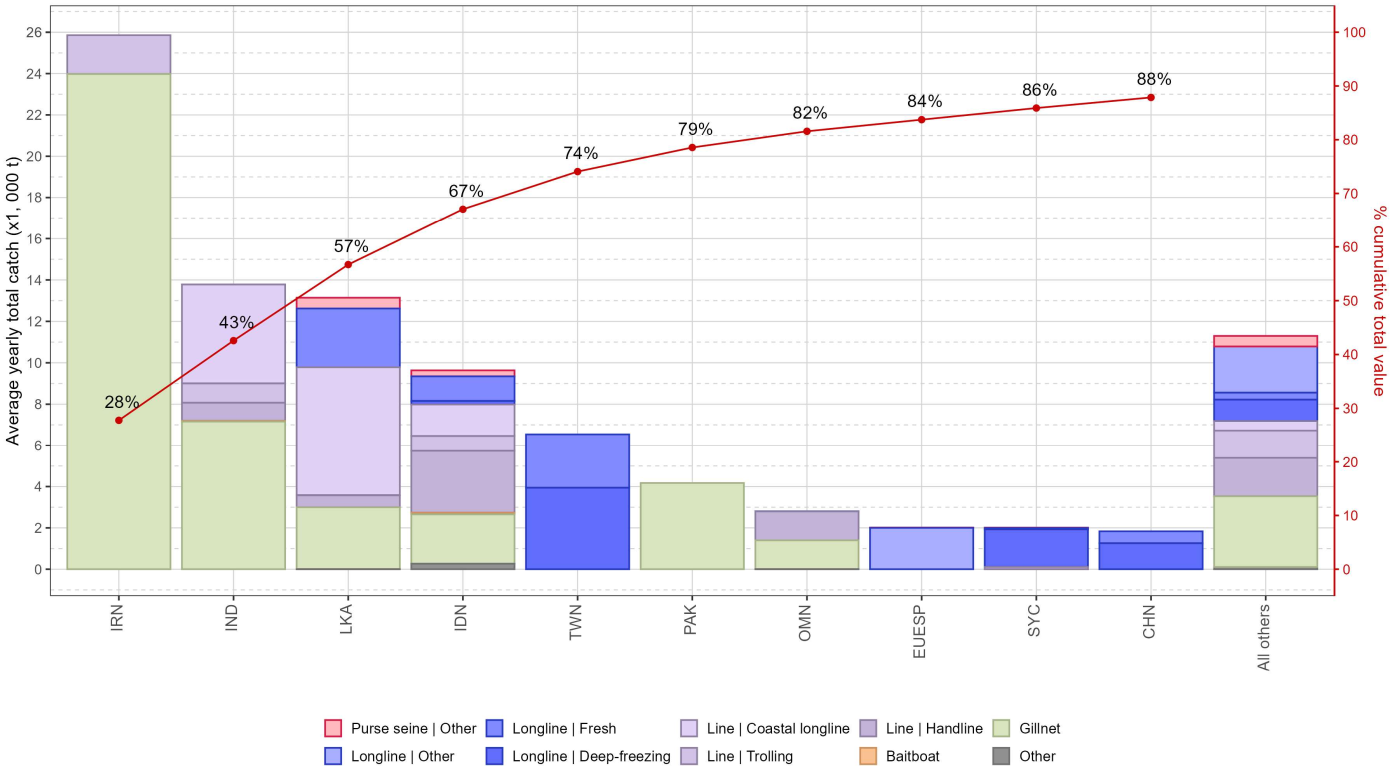


Figure 8: Mean annual catches of IOTC billfish species by fleet and fishery (metric tonnes; t) between 2019 and 2023 with indication of cumulative catches by fleet

As shown in **Table 5**, gillnet fisheries have been the primary contributor to billfish catches in recent years, with an increasing trend observed since 2020. Catches rose from below 40,000 t in 2020 to approximately 50,000 t annually between 2021 and 2023.In contrast, line and longline fisheries have shown a slow declining trend over the same period, with average annual catches of 25,700 t and 20,100 t, respectively (**Fig. 9**). Aside from a slight increase in billfish catches by purse seine fisheries in 2023, contributions from other gear types have remained negligible (**Fig. 9**)

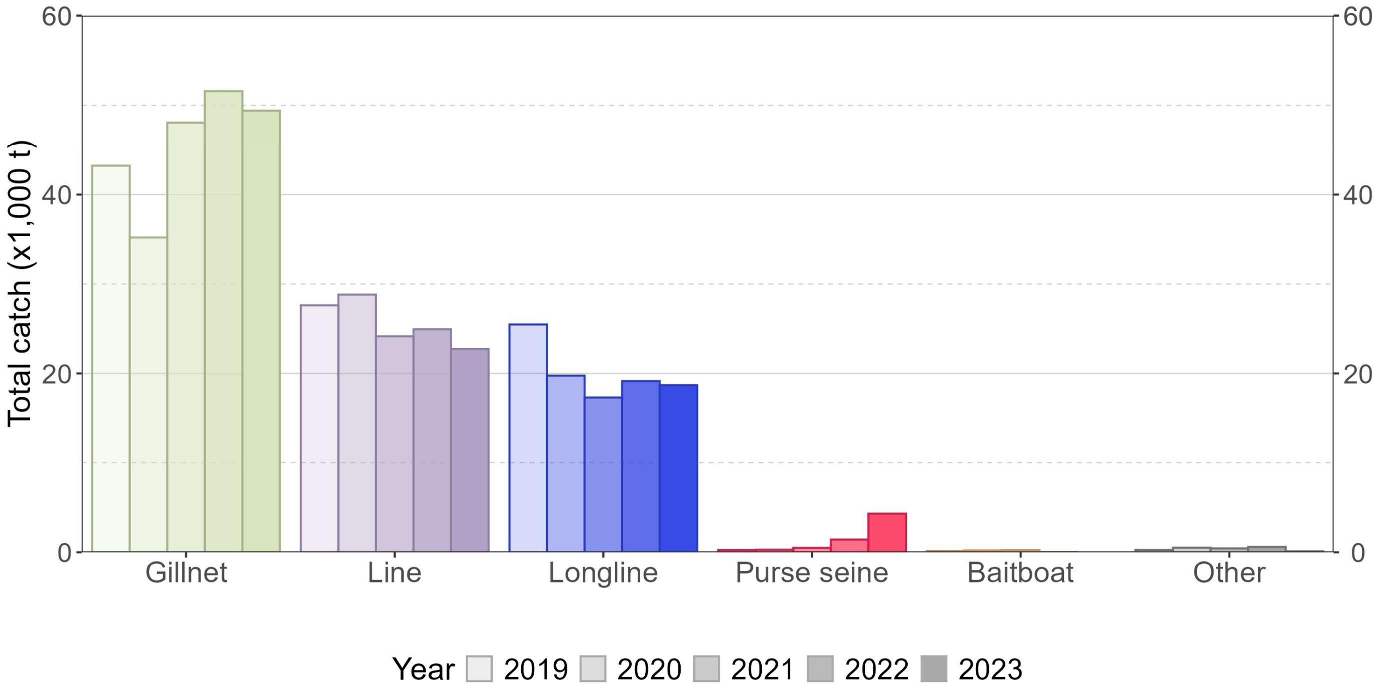


Figure 9: Annual catch (metric tonnes; t) trends of IOTC billfish species by fishery group between 2019 and 2023

The trends observed in recent years vary significantly across fleets and fishery groups. TFor gillnet fisheries, the Islamic Republic of Iran, the primary contributor, exhibited fluctuating catches, peaking at 31,500 t in 2022, an increase of around 31% compared to 2021. India's gillnet fisheries, after reaching a low of 2,700 t in 2020 increased to an average of 8,000 t annually between 2021 and 2023 (**Fig. 10a**). Other fleets such as Pakistan and Sri Lanka reported average catches of approximately 4,200 t and 3,000 t, respectively, with slight increases observed in the most recent year despite some variability. Catches from other gillnet fleets peaked in 2021, reflecting increased landings from Indonesia and Oman, as well as new reported billfish catches from Bangladesh starting in 2021. However, the subsequent decline in catches from other fleets is mainly attributed to revisions in Tanzania's coastal fishery data and a reduction in reported catches from Yemen.

Longline fleets with historically high billfish catches have shown an overall declining trend. The Taiwanese longline fleet, in recent years, landed a maximum of 9,000t in 2019, but this declined to an average of 5,500 t, between 2021 and 2023. Sri Lanka's longline catches likewise dropped substantially from 5,000t in 2019 to an average of 2,100 during the same recent period, reflecting a reduction in the number of Sri Lankan industrial longline vessels. In contrast, EU-Spain showed a significant increase in 2023, following reduced catches during the COVID-19 period due to lower fishing effort and operational activity. The Seychelles, another major longline fleet, experienced a steep decline, with catches falling from 3,000t in 2019 to 1,000t in 2023. On the other hand, other longline fleets, particularly Indonesia, recorded increasing trends, with a notable high in 2022, 3,700t (**Fig. 10b**).

Catch trends in line fisheries show variation across fleets. The dominant fleet, Sri Lanka, saw catches fall to a low of 3,000t in 2022, but a recovery was observed in 2023, with landings doubling to 6,000t. India's line fisheries also recovered, reaching 7,100t in 2023 following a dip in 2021 (5,000t). In contrast, Indonesia's line fishery catches declined from 6,700t in 2021 to 3,100t in 2023, reflecting updated estimates through 2022. Iran's line fisheries, primarily using troll lines, saw a significant drop in 2021 (1,000t), followed by an increase in 2022 (3,300t), before declining again in 2023 (**Fig. 10c**).

Other fishery groups recorded minimal billfish catches. In recent years, purse seine, baitboat, and other fisheries contributed 1.4, 0.1 and 0.4, of the total billfish catch, respectively. Notably, Sri Lanka reported over 2,000 tonnes of billfish from ringnet fisheries in 2023. Additionally, EU-France and Indonesia showed increasing catches from seine fisheries (**Fig. 10d**). Although baitboat and other small-scale fisheries are not traditionally associated with large billfish catches, increasing landings have been reported from Indonesia and India, particularly in baitboat operations (**Fig. 10e**). Moreover, other fisheries in Indonesia recorded over 100 tonnes of billfish (**Fig. 10f**).

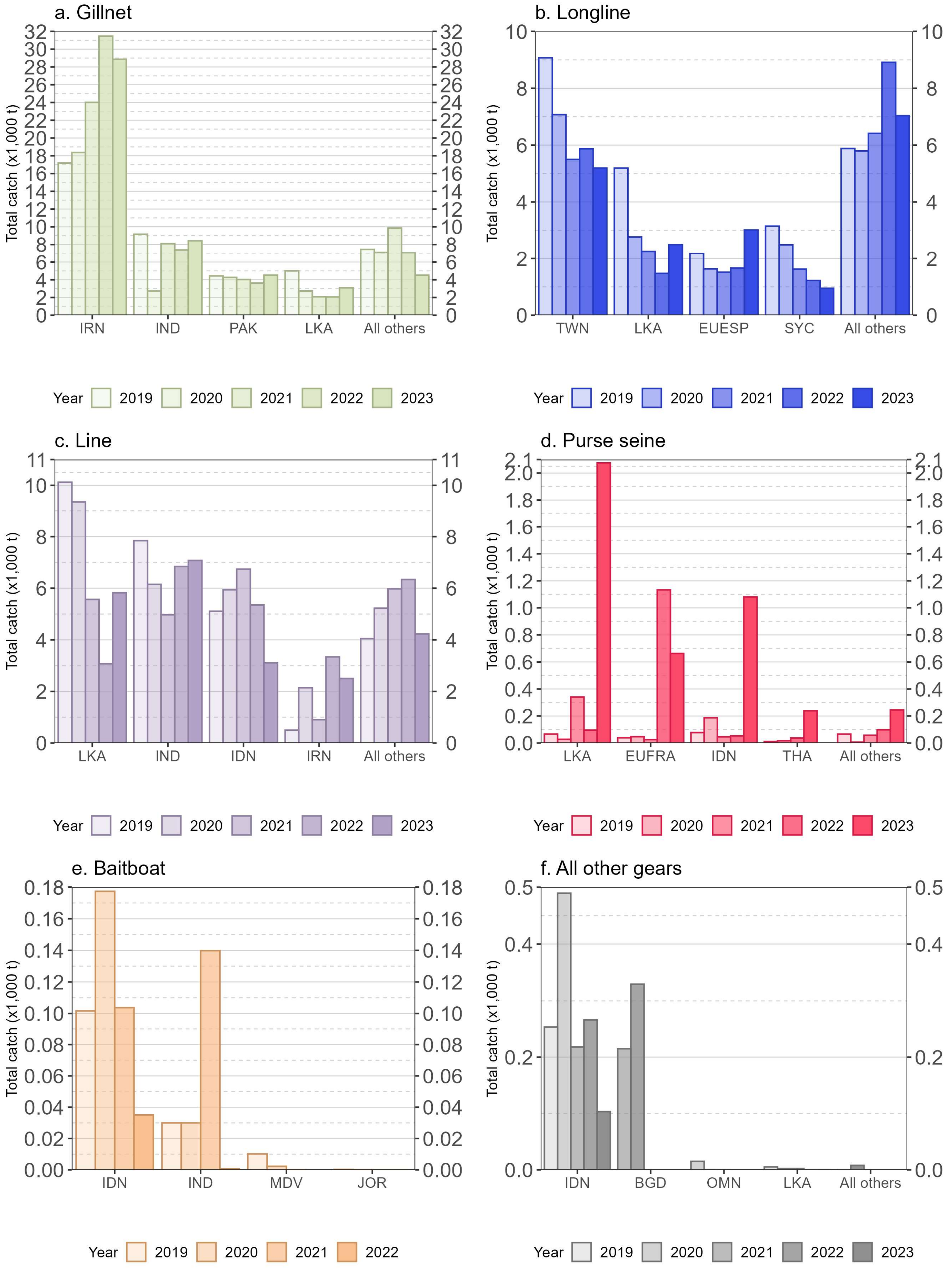


Figure 10: Annual catch (metric tonnes; t) trends of IOTC billfish species by fishery group and fleet between 2019 and 2023

## Changes from previous Working Party

The billfish catch data presented during the 22nd Working Party on Billfish (WPB22) in 2024 has undergone revisions due to several key updates and reviews submitted since that meeting. Between WPB22 and the current session (WPB23), the IOTC Secretariat received major revisions, leading to adjustments in historical billfish catch records in the IOTC database. While the Secretariat typically receives updates related to retained catches, significant changes, particularly from major industrial fleets, may also include geo-referenced catch and effort data. In such cases, the fleets undertake comprehensive updates to ensure consistency across datasets. For example, Japan is currently updating both retained and geo-referenced catch data for the past three years, following the delayed recovery of logbook records.

In 2024, a major revision was made to Indonesia's historical catch data (1950–2022), using a re-estimation methodology endorsed by the 27th Scientific Committee (SC27). These updates led to an increase in reported billfish catches from coastal fisheries, while industrial longline fisheries, which previously contributed higher historical catches, showed a significant decline.

Beyond the updates from Japan and Indonesia, Bangladesh and Yemen also revised their retained catch data. Bangladesh has improved its species-level reporting, now providing more detailed breakdowns that include several billfish species(SWO, BLM, BUM & SFA). In contrast, Yemen's reported catches, extracted from the FAO global capture production database, have seen reductions in historical catches, with some recent years showing no reported billfish catches at all. The effect of these changes in the last decade result in an average annual increase of approximately 5164 t in billfish catches between 2012 and 2022, with a peak of approximately 9,100t in 2013 (**Fig. 11**).

Updates from other fisheries, particularly non-CPCs, were minor. Their catch data are published in the FAO global capture production database, which is typically updated one year behind the IOTC database.A detailed comparison of the differences in catch data between WPB22 and the current Working Party meeting is provided in Appendix IV.

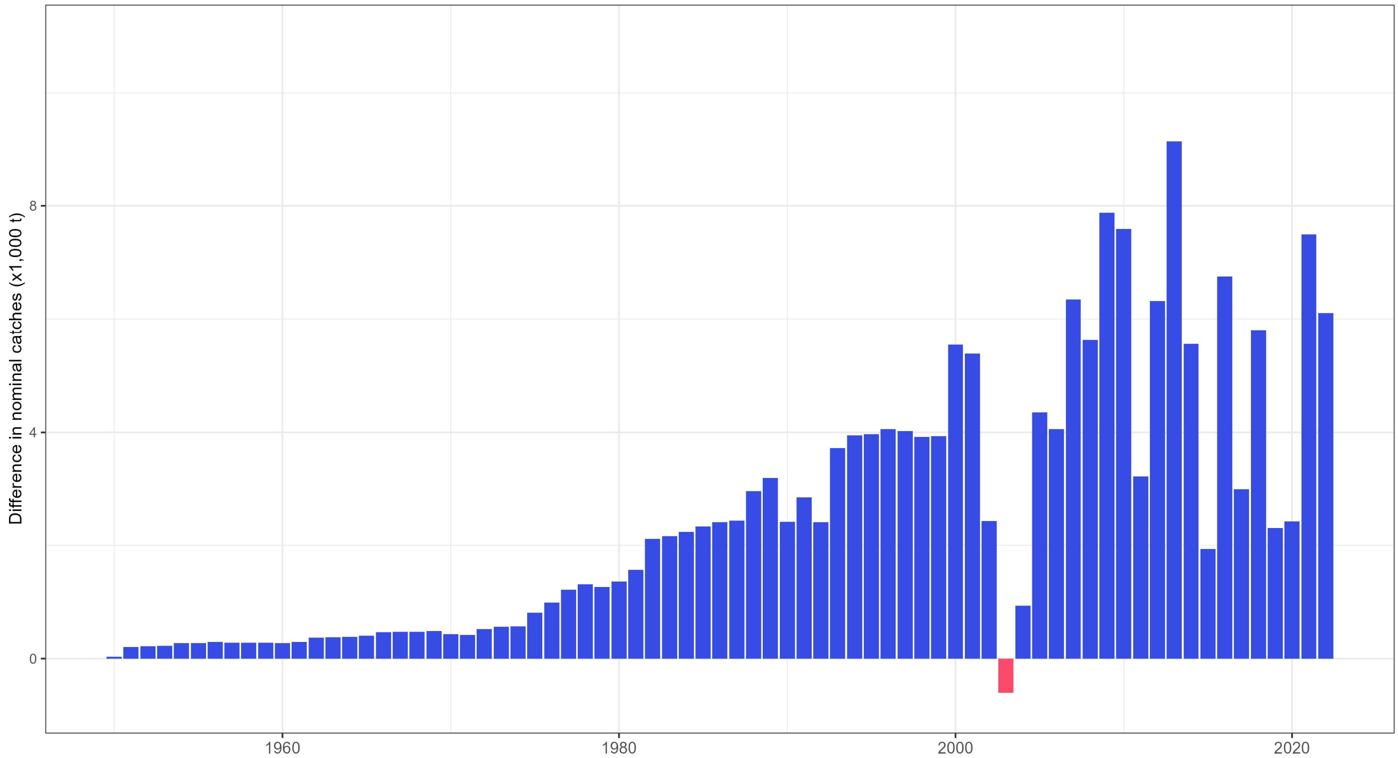


Figure 11: Differences in the available best scientific estimates of retained catches (metric tonnes; t) of billfish between the 20th and 21st sessions of the IOTC Working Party on Billfish

## Uncertainties in retained catch data

The quality of data collected and reported to the Secretariat can be influenced by a range of factors. As fisheries become more diverse and complex, the challenges associated with data collection and reporting increase. Additionally, the socio-economic impact of fisheries on a country underscores the critical importance of accurate data collection.The accuracy and precision of the catches may be affected by under-reporting or misreporting, low sampling coverage, poor data resolution (e.g., due to mis-identification of species), and errors in processing and reporting.

The quality of billfish data collected and reported to the IOTC Secretariat is influenced by a range of factors. As fisheries become increasingly diverse and complex, the challenges associated with accurate data collection and reporting have grown. Moreover, the socio-economic importance of fisheries in many coastal states further underscores the critical need for reliable and precise data. Billfish catch data can be affected by under-reporting or misreporting, low sampling coverage, poor data resolution (e.g., species misidentification), and errors in data processing and reporting. While industrial fisheries, which are the primary source of billfish catches, are generally well covered through logbooks and other structured data collection systems, the quality of data is still highly dependent on the type of fishery involved. Interestingly, coastal fisheries, which have shown a rising trend in billfish catches in recent years, are increasingly collecting and providing detailed, quality data. Despite the increasing improvement in some coastal fisheries data quality, some small-scale artisanal fisheries often face challenges in data collection, particularly when data is recorded only at landing sites. Many billfish caught in these fisheries are partially processed (e.g., headed or gutted) before landing, making accurate species identification difficult. By comparison, fisheries employing logbooks and onboard recording systems typically generate more reliable data.

The improvement in data quality and reporting can be observed in the trend between 1950 and 2023. In recent years, only 5% of reported billfish catches were assigned lower-quality scores, between 4 and 6, (**Table 3**)), indicating the need for estimation by the Secretariat. This is a substantial improvement from the 42% recorded in the 1990s ((**Fig. 12**), when much of the data were aggregated and lacked species or gear-specific details.

This improvement is largely attributed to:

1. Higher quality data submitted by the Islamic Republic of Iran, currently a major contributor to billfish catches;
2. Continued enhancements in reporting from Sri Lanka; and
3. Replacement of IOTC-estimated catches for Indonesia with revised national catch estimates, significantly reducing uncertainty in the database.

As a result, 90% of billfish data reported in 2023 were either fully or partially complete (**Fig. 12**), representing a major advancement in data reliability.

However, despite improvements in overall data quality, species-specific accuracy can still vary, depending on the fleet and fishery involved. Detailed evaluations of data certainty by species are available in the review papers of individual billfish species: black marlin (IOTC 2025), blue marlin (Secretariat 2025a), striped marlin (Secretariat 2025c), Indo-Pacific sailfish (Secretariat 2025b), and swordfish (Secretariat 2025d).

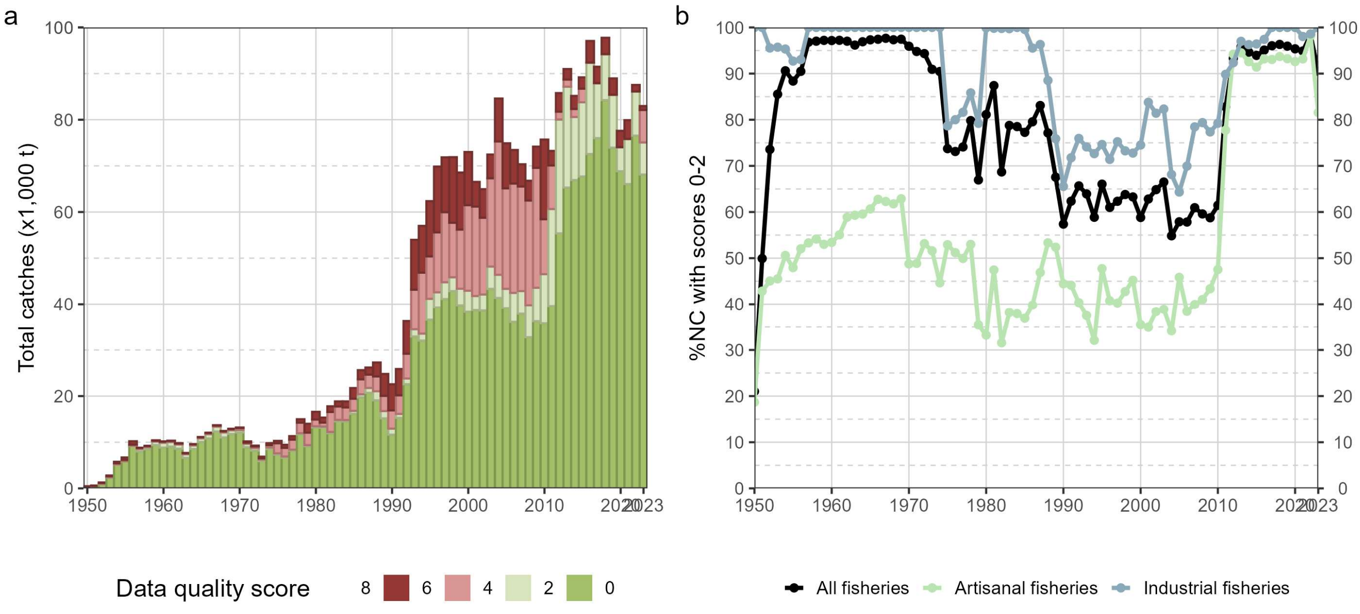


Figure 12: (a) Annual retained catches (metric tonnes; t) of IOTC billfish species estimated by quality score and (b) percentage of retained catches fully or partially reported to the IOTC Secretariat for all fisheries and by type of fishery, in the period 1950-2023

In 2023, 82% of the retained catches of billfish was fully reported to the Secretariat while the rest had to be partially or fully estimated. Part of the catches was derived from alternative sources of catch data for both non-IOTC members and IOTC CPCs that have not reported data to the Secretariat (Appendix III). In addition, a re-estimation process was applied to the catches from the artisanal fisheries of India, which are known to be affected by data quality issues, in particular regarding the reporting of catch data for gear aggregates.

In terms of fully completed reporting, approximately 82% of the retained billfish catches were directly reported to the Secretariat in 2023. The remaining had to be either partially or fully estimated. Some of these estimates were derived from alternative data sources, including catches from both non-IOTC members and IOTC CPCs that did not submit catch data to the Secretariat (Appendix III). In addition, a re-estimation process was applied to artisanal fisheries in India, which are known to face data quality issues, particularly with the gear-catch variations. More recently, several CPCs have been collaborating with the Secretariat to revise and improve the estimation methodologies used for generating catch data by species and fishery type across both industrial and artisanal sectors, either through in-country missions conducted by the Secretariat or online meetings, which focus on enhancing national capacity and improving the overall quality and completeness of data reporting.

espite these collaborative efforts, concerns remain regarding the accuracy and completeness of the collection of some retained catch data submitted by CPCs. These issues need to be noted and addressed to ensure the continued improvement of the IOTC database and the robustness of billfish stock assessments:

- Artisanal fisheries (including sport fisheries)

  +High level estimation of billfish catches for India. Fisheries catches are estimated using methodology derived in 2012 by a consultant for secveral fisheries in the Indian Ocean (Moreno et al. 2012).While Indonesia is implementing a number of improvements to the collection and validation of data for artisanal fisheries, such as electronic logbooks and complete enumeration of catches at key landing sites, catches are still considered to be uncertain for Indian fisheries. Although all the effort in data collection, irregularities and inconsistencies in estimating the final retained catches remained. The Secretariat planned tp work with India to address the issues.

  - Sport fisheries of Australia, France (La Réunion), India, Indonesia, Madagascar, Mauritius, Oman, Seychelles, Sri Lanka, Tanzania, Thailand and United Arab Emirates: data have either never been submitted, or are available for only a limited number of years for sport fisheries in each of the referred

CPCs. Sport fisheries are known to catch billfish species, and are particularly important for catches of blue marlin, black marlin and Indo-Pacific sailfish. Although some data are available from sport fisheries in the region (e.g., Kenya, Mauritius, Mozambique, South Africa), the information cannot be used to estimate levels of catch for other fisheries. In 2017 the IOTC Secretariat commissioned a pilot project to develop tools and training materials for CPCs to improve the collection and reporting of catch-and-effort and size frequency from sport fisheries in the Western Indian Ocean (Pepperell et al. 2017). The project focused on trialling specifically-developed data collection tools on a small number of CPCs, including La Réunion, Kenya, Mauritius and Seychelles – however data reporting continues to be an on-going issue for sports and recreational fisheries.

- The gillnet fisheries of I.R. Iran pre-2011 and Pakistan historical catches are estimated on the account of revised improved quality data submitted for recent years. However, catches for these components remain uncertain for several reasons:
    - In recent years (from 2011 onwards) I.R. Iran has reported catches of marlins and swordfish for their gillnet fishery which significantly revised the species-specific catch previously estimated by the Secretariat. While the IOTC Secretariat has used the new catch reports to re-build the historical series for its offshore gillnet fishery (pre-2011), the resulting estimates are thought to be highly uncertain;
    - In 2019, the IOTC WPDCS and SC endorsed the revised catch series (from 1987 onwards) officially provided by the Pakistan government for its gillnet fleet, based on the results of the work from the data collection programme supported by WWF-Pakistan. These revised catch series introduced large differences in the reported catches of billfish species, in particular for swordfish, striped marlin and Indo-Pacific sailfish that are now far lower than what originally reported (IOTC Secretariat 2019). As a consequence, current catch estimates for Pakistan account for around 6% of the total catches of billfish in the Indian Ocean, and still suffer from the lack of detailed per-species information for several years, using “generic” billfish species to report for billfish catches. However, from 2018, Pakistan began submitting catches of individual billfish species.
- Industrial longline fisheries
    - Following issues with the reliability of catch estimates of Indonesia’s fresh longline fleet in recent years, in 2018 the IOTC Secretariat developed in collaboration with Indonesia a new methodology of catch estimation that mostly affects Indonesia’s catches of swordfish, striped marlin, and blue marlin (Geehan 2018). The revised catches are significantly lower for Indonesia’s fresh longline fleet in recent years, compared to previous IOTC estimates, while total catches across all fleets have also been revised downwards by as much as 30% for each species as a consequence of the new estimation methodology. The methodology has not been applied to the industrial component of Indonesian longline catches since 2018;
    - Despite a decrease in the number of fresh-longline vessels from Taiwan,China by around 30% between 2013-2016, catches have remained at similar levels, or even marginally increased as average catches per vessel have risen from 100 t per vessel in 2013 to around 175 t per vessel in 2016. Over the same period, the proportion of swordfish reported by the fresh longline fleet from Taiwan,China has risen from around 8% to over 30% - due to improvements in the estimation of catches by species, according to official sources. Both these issues (i.e., the sharp increase in average catches per vessel and changes to the species composition) require further clarification to ensure that the recent increase in average catches is valid.
- Industrial purse seine fisheries
    - Although considered to be small, catches of billfish recorded by all industrial purse seiners are thought to be a fraction of those retained on board. Due to the species being a bycatch, catches are seldom

recorded in the logbooks although information collected through the ROS shows that some purse seine fleets do retain billfish for marketing.

### Discard levels

The total amount of billfish species discarded at sea remains unknown for most fisheries and time periods despite the obligation to report these data as per IOTC Res. 15/02. Furthermore, the implementation of IOTC Res. 18/05 that bans the release of specimens of billfish smaller than 60 cm lower jaw fork length may have modified discarding practices in recent years. Despite the lack of information available, discarding of billfish species is overall considered to be limited in most coastal and industrial fisheries targeting tuna and tuna-like species in the IOTC area of competence.

#### Purse seine fisheries

The levels of bycatch of billfish in Indian Ocean large-scale purse seine fisheries have been shown to be low and dominated by marlins, although sailfish may occasionally be caught (Romanov 2002, Ruiz et al. 2018). Part of the billfish has been shown to be discarded at sea despite the entry in force of IOTC Res. 19/05 that bans the discard of non-targeted species caught with purse seine.

Information available from the ROS regional database covers the period 2005-2022 and the whole fishing grounds of the purse seine fishery (**Fig. 13**). Data show that only ~28% of billfish caught are discarded, indicating that a substantial component of billfish catch is retained onboard, particularly marlin species (**Fig. 13**). Based on a large data set of observations at sea collected during the period 2008-2017, the annual catch levels of billfish in the main component of the Indian Ocean purse seine fishery were estimated to vary between 100 and 400 t per year (Ruiz et al. 2018), providing an upper limit for the discard levels.

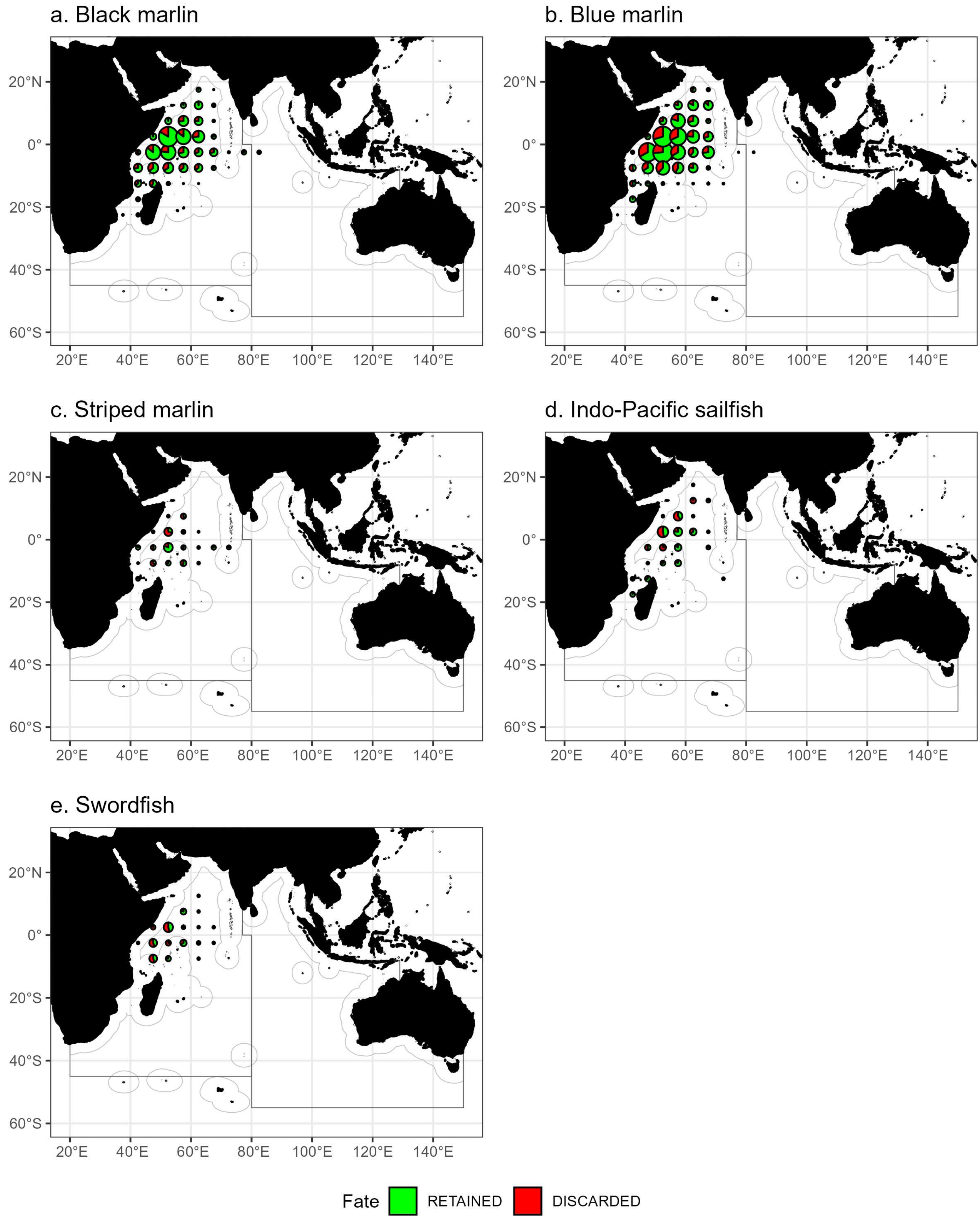


Figure 13: Distribution of all observations of billfish caught in the western Indian Ocean purse seine fishery with information on fate (i.e., retained or discarded) as available in the ROS regional database

ROS data show that purse seine discards are dominated by black and blue marlins while discards of Indo-Pacific sailfish and swordfish are very small, in line with their bycatch levels. Data collected by observers further show that the very large majority of the discarded billfish end up dead (~95.8%). Interestingly, the data also show that the level of discarding depends on the fleet, with an overall percentage of discarding of 42.1% for EU,France and 13.6% and 25.5% for Seychelles and EU,Spain, respectively. For the three fleets, the proportion of discards shows a decrease over time, indicating the growing tendency of the industry for marketing billfish species.

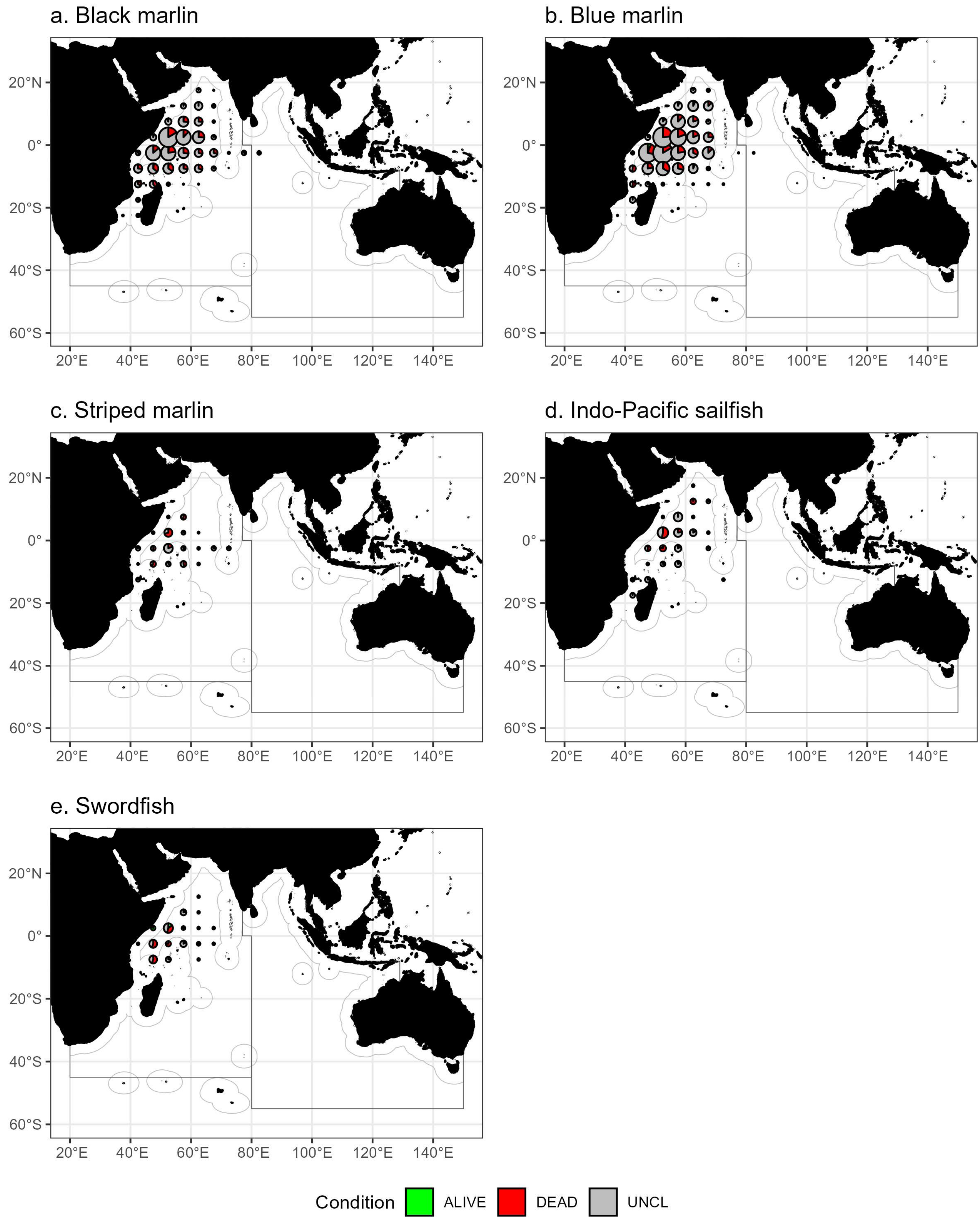


Figure 14: Distribution of all observations of billfish discarded at sea in the western Indian Ocean purse seine fishery with information on condition as available in the ROS regional database

Size data collected by observers at sea for billfish caught in the purse seine fishery show no significant difference between retained and discarded specimens (**Fig. 15**). The size of the three marlin species is very similar across species. The median fork length is about 215-230 cm, with the capture of the largest individuals showing larger sizes in black marlin (75% quantile = ~270 cm FL), followed by blue marlin (75% quantile ~250 cm FL), and striped marlin (75% quantile = ~235 cm FL). The median sizes of Indo-Pacific sailfish and swordfish are 177.5 cm FL and 202 cm FL, respectively.

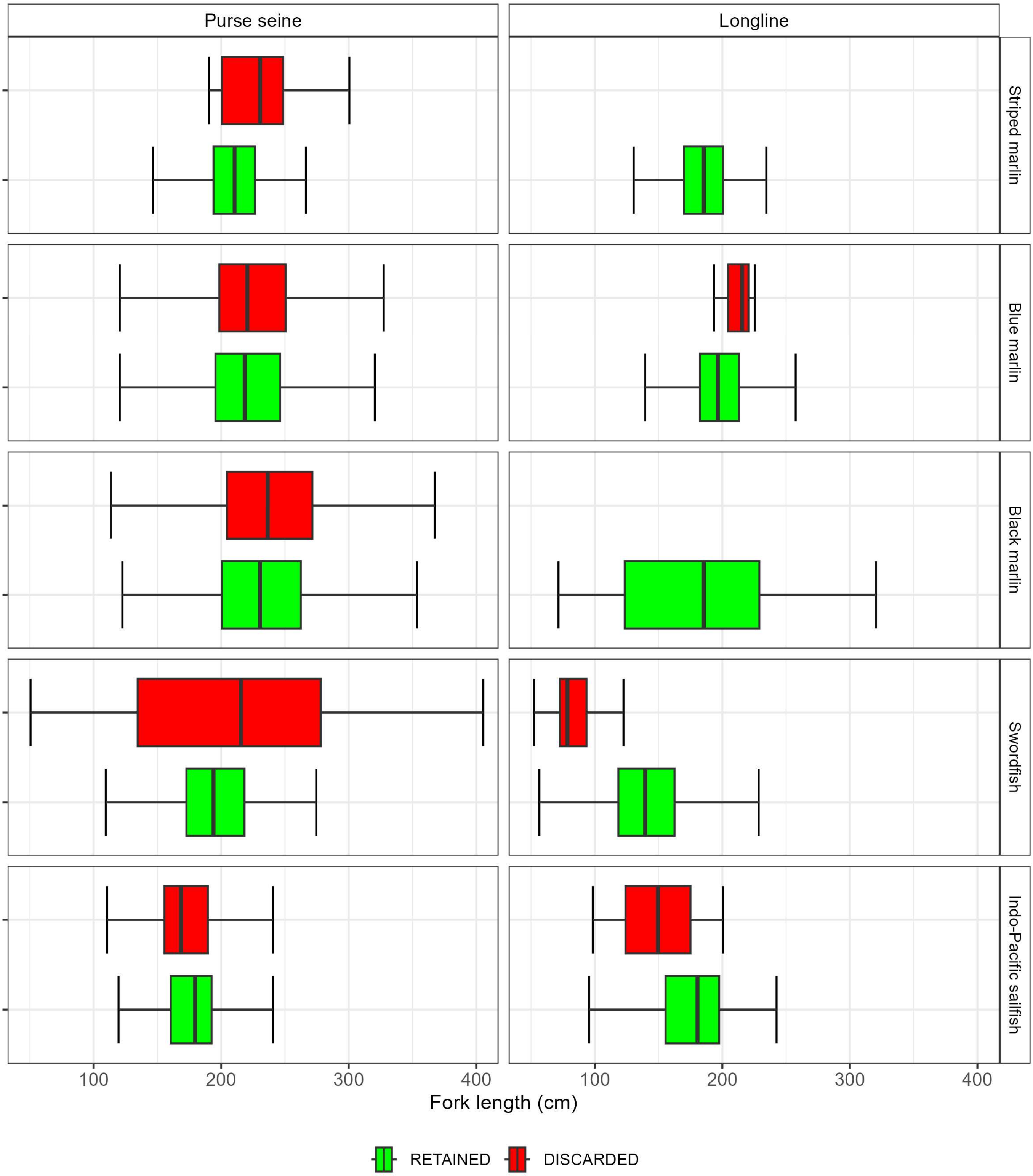


Figure 15: Boxplots of size measurements (fork length; cm) of billfish species discarded at sea in purse seine and longline fisheries as available in the ROS regional database

### Longline fisheries

Information from the literature indicates that levels of discards of billfish are low in Indian Ocean longline fisheries (Huang & Liu 2010, Gao & Dai 2016). Discarding is mainly due to under size, damaged condition, and depredation by whales and sharks that has been shown to be substantial in some longline fisheries of the western Indian Ocean (Munoz-Lechuga et al. 2016, Rabearisoa et al. 2018).

Information available in the ROS regional database for longline fisheries covers the period 2009-2021 and a small part of the longline fishing grounds as the data are limited to EU,France, Japan, and Sri Lanka. The discards of billfish in these fisheries appear to be low for billfish, i.e., from 0% discard in the longline fishery of Sri Lanka to a maximum of about 5% for blue marlin and swordfish in the longline fishery of Japan. Discarding appears to be the highest for swordfish in the swordfish-targeted longline of Reunion Island where the overall discarding rate during 2009-2019 was about 14.3%. This apparent high discard rate may be partly explained by the high levels of depredation observed in this fishery (Romanov et al. 2013, Rabearisoa et al. 2018). However, size data available in the ROS show a significant difference between the swordfish retained and discarded in the fishery, with the latter being ~60 cm smaller than the former, on average (**Fig. 15**). Further analysis accounting for the variability of discarding in space and time and other factors such as vessel attributes (e.g., size) is required to accurately assess the extent of and causes of discarding in this fishery and other longline fisheries when data become available.

### Gillnet fisheries

In absence of market value, marlins and swordfish have been assumed to be discarded in some important gillnet fisheries such as from I.R. Iran although information available for this fishery suggests that most billfish may be retained and landed (Rajaei 2013, Shahifar et al. 2013).

# Geo-referenced catch and effort

## Time series of nominal effort

The revised IOTC code lists and reporting guidelines provide detailed instructions on data submission requirements, including the minimum standards for geo-referenced catch and effort data, and recommended effort unit by fishery. However, not all fleets fully adhere to these requirements. While several fleets argue that they have submitted geo-referenced catch data, the quality and structure of the submissions often prevent the data from being processed or used effectively. As a result, there are significant inconsistencies in the nominal effort data reported by both artisanal and industrial fisheries targeting billfish. These inconsistencies affect both the effort time series and the type of effort metrics reported (e.g., trips, days, sets), leading to challenges in assessing and comparing fishing effort over time (**Tables 6-7**). Although some artisanal fisheries maintain continuous data collection, the effort metric used can vary between years. This variation complicates efforts to quantify and standardize fishing effort, especially when trying to assess trends or conduct historical comparisons across fleets or gear types. In addition to these issues, the spatial and temporal resolution of the reported data often varies across years, resulting in incomplete or inconsistent coverage. These gaps reduce the reliability of geo-referenced datasets for use in stock assessments and fisheries management decisions.

Table 6: Geo-referenced data on artisanal fishing effort available at the IOTC Secretariat for each fishery group with information on the number of years and spatial fishing grounds used for reporting the data. FDAYS = Fishing days; FHOURS = fishing hours; MD = men-day; MH = men-hours

| Fishery type | Fishery group | Unit | Years | Start year | End year | Fishing grounds |
|---|---|---|---|---|---|---|
| Artisanal fisheries | Purse seine | FDAYS | 4 | 2020 | 2023 | 9 |
| | | SETS | 1 | 2021 | 2021 | 3 |
| | | TRIPS | 11 | 1986 | 2023 | 64 |
| | Line | BOATS | 10 | 2001 | 2013 | 8 |
| | | DAYS | 27 | 1985 | 2022 | 27 |
| | | FDAYS | 24 | 2000 | 2023 | 189 |
| | | FHOURS | 4 | 2012 | 2016 | 1 |
| | | HOOKS | 29 | 1995 | 2023 | 356 |
| | | MD | 1 | 2016 | 2016 | 1 |
| | | MH | 2 | 2021 | 2023 | 1 |
| | | NG | 1 | 2023 | 2023 | 1 |
| | | TRIPS | 19 | 1985 | 2023 | 19 |
| | Baitboat | FDAYS | 8 | 2013 | 2022 | 29 |
| | | TRIPS | 1 | 1987 | 1987 | 1 |
| | Gillnet | BOATS | 3 | 2011 | 2013 | 5 |
| | | DAYS | 5 | 1979 | 2018 | 11 |
| | | FDAYS | 6 | 1987 | 2023 | 11 |
| | | SETS | 1 | 2019 | 2019 | 2 |
| | | TRIPS | 37 | 1985 | 2023 | 77 |

| Fishery type | Fishery group | Unit | Years | Start year | End year | Fishing grounds |
|---|---|---|---|---|---|---|
| | Other | BOATS | 2 | 2011 | 2012 | 3 |
| | | DAYS | 1 | 2002 | 2002 | 1 |
| | | TRIPS | 33 | 1985 | 2023 | 8 |

Table 7: Geo-referenced data on industrial fishing effort available at the IOTC Secretariat for each fishery group with information on the number of years and spatial fishing grounds used for reporting the data. FDAYS = Fishing days

| Fishery type | Fishery group | Unit | Years | Start year | End year | Fishing grounds |
|---|---|---|---|---|---|---|
| Industrial fisheries | Purse seine | FDAYS | 3 | 2021 | 2023 | 81 |
| | | SETS | 11 | 2013 | 2023 | 348 |
| | | TRIPS | 10 | 2014 | 2023 | 144 |
| | Longline | BOATS | 2 | 2010 | 2011 | 1 |
| | | DAYS | 10 | 1998 | 2008 | 184 |
| | | FDAYS | 16 | 1998 | 2015 | 631 |
| | | HOOKS | 72 | 1952 | 2023 | 1,681 |
| | | SETS | 5 | 2003 | 2008 | 37 |
| | | TRIPS | 22 | 2001 | 2023 | 65 |
| | Line | FDAYS | 6 | 2018 | 2023 | 17 |
| | | TRIPS | 3 | 2014 | 2016 | 9 |
| | Baitboat | FDAYS | 4 | 2018 | 2022 | 9 |
| | Gillnet | FDAYS | 1 | 2023 | 2023 | 4 |
| | | NETS | 6 | 1986 | 1991 | 76 |
| | | TRIPS | 17 | 2007 | 2023 | 536 |

Although there is a growing number of coastal fisheries recording billfish catches, geo-referenced catch and effort data are still not systematically collected or compiled across all fleets. Some of the largest coastal fleets, notably India and Pakistan, with a combined average catch of approximately 18,000t in recent years, are yet to provide geo-referenced data as required. The available data from these fleets are aggregated annually and lack spatial and gear-specific effort information, of not provided for some fisheries. In contrast, the Islamic Republic of Iran has made notable progress in improving its geo-referenced data submissions, providing more detailed spatial, gear, and species-specific data, along with associated effort. Iranian geo-referenced catch and effort data are available from 2007 to the present, with increased completeness in the last two years. Indonesia also submitted geo-referenced data from some of its coastal fisheries; however, coverage remains limited. Not all fisheries maintain logbooks, and sampling does not uniformly cover all gears or regions. In Sri Lanka, geo-referenced catch and effort data are available for the entire coastal fleet, making it one of the most comprehensive datasets among coastal fisheries, since 2014. However, despite this improvement in availability, issues persist regarding the type of effort unit used, which limits the utility of these data in stock assessment models. One of the main concerns is the use of “fishing trips” as an effort unit, particularly in Sri Lankan and Iranian fisheries, where trip duration can vary widely between vessels and over time (Fu et al. 2019). In addition, historical data from Sri Lanka indicate that vessels frequently used a combination of longline and gillnet gears, without consistent records of gear-specific effort (Herath & Maldeniya 2013), reducing the accuracy of long-term effort time series. For Indonesia, effort data are expressed in multiple formats, including fishing days, sets, and other units, which further complicates standardization. Beyond these key coastal fleets, little to no effort information is available for other artisanal or semi-industrial fisheries catching billfish. The exception lies with a few industrial longline fleets, particularly from Australia, EU-Spain, EU-France (Reunion), EU-Portugal, Seychelles, and Mauritius, which primarily target swordfish, although some fleets may have shifted target species (e.g., to sharks or tunas) during certain periods.

As a result, most available time series of catch-per-unit-effort (CPUE) for billfish originate from industrial longline fisheries. These datasets are often characterized by high proportions of zero catches, which must be accounted for during CPUE standardization (Lin et al. 2022, Matsumoto et al. 2022).

**Spatial distribution of the catch**

Geo-referenced catch data for billfish species have been reported to the Secretariat in numbers, weights, or both, depending on the CPC. However, these data have not been systematically raised to represent total catches, despite IOTC Resolution IOTC Res. 15/02, which explicitly calls for raising procedures and the submission of documentation detailing the extrapolation methods used. As a result, the maps of catch distribution by number and weight presented below should be interpreted with caution, as reporting coverage varies across years and species. These maps primarily serve to illustrate spatial patterns of fishing activity rather than provide definitive estimates of total catch. Species-specific spatial catch maps are available in the respective data review papers: black marlin (IOTC 2025), blue marlin (Secretariat 2025a), striped marlin (Secretariat 2025c), Indo-Pacific sailfish (Secretariat 2025b), and swordfish (Secretariat 2025d)

Most spatial information available on billfish catches between 1950 and 1999 comes from large-scale longline fisheries of Japan, Taiwan,China, and Korea. In contrast, geo-referenced catch data from artisanal fisheries—which play a significant role in billfish catches, are limited, with the notable exception of Sri Lanka, which began reporting geo-referenced data for coastal gillnet and longline fisheries from the mid-1980s (**Figs. 16-17**) Historical catch maps reveal a wide distribution of billfish throughout the Indian Ocean, with a prominent hotspot for black and blue marlins located off northwestern Australia during the 1950s and 1960s (**Fig. 16**). The significance of this hotspot declined in subsequent decades, while new areas of high catch density emerged, particularly off the coast of Somalia during the 1990s and 2000s.

More recent geo-referenced catch data reveal a shift in fishing activity and hotspot areas between the last decade (2010–2019) and recent years. The traditional longline hotspots around Somalia and the Seychelles have diminished, while longline activity has increased in the southwestern Indian Ocean. In contrast, recent years show a clear rise in gillnet catch hotspots in the northwestern Indian Ocean, particularly linked to fleets from Iran, and line fisheries hotspots have become more evident in the eastern Indian Ocean, (i.e., between 20°S and the equator and 40-70°E) (**Figs. 18-19**).

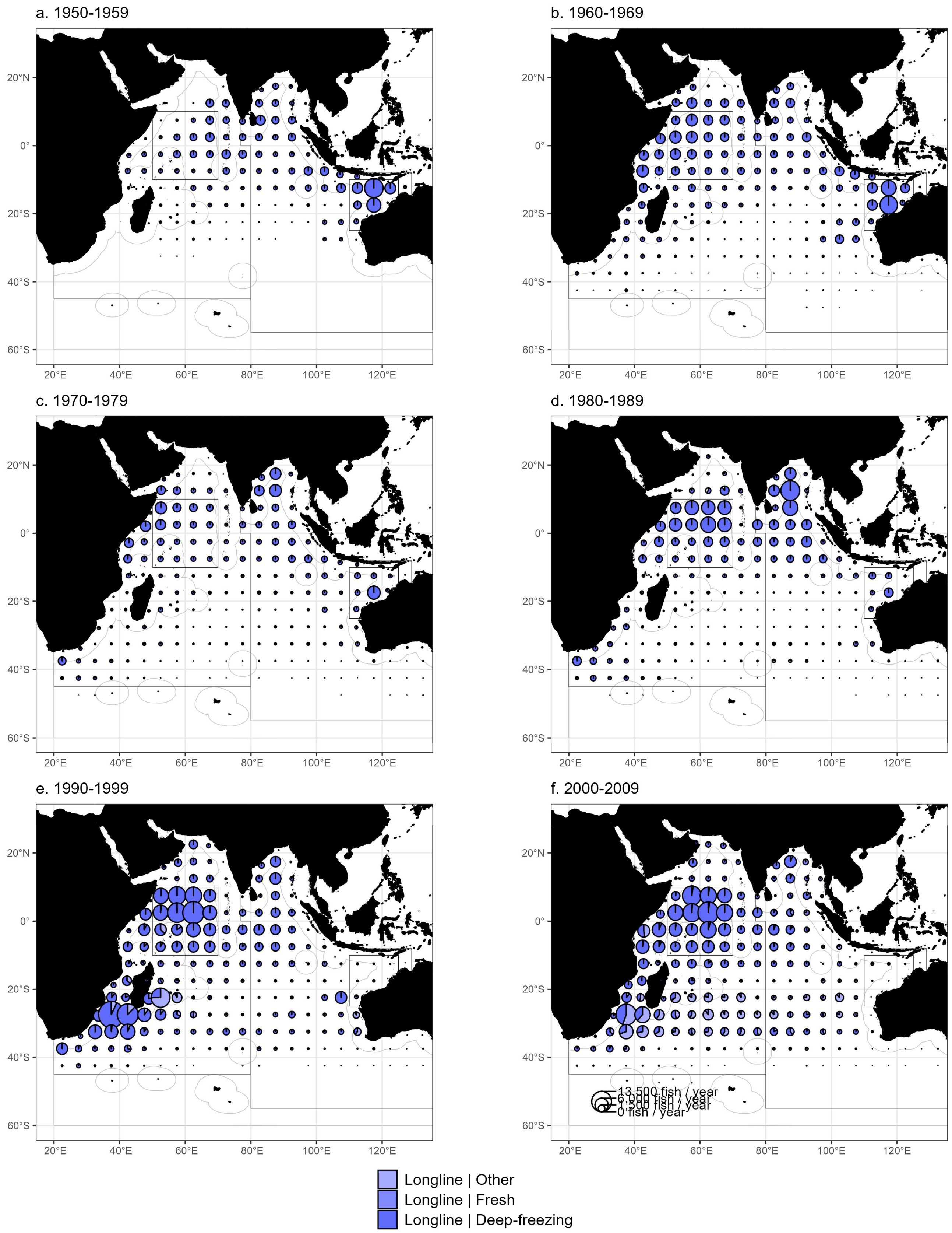


Figure 16: Mean annual time-area catches (in number of fish) of billfish for the period 1950-2009, by decade and fishery. Black solid lines represent the marlin main longline fishing grounds identified by the IOTC WPB

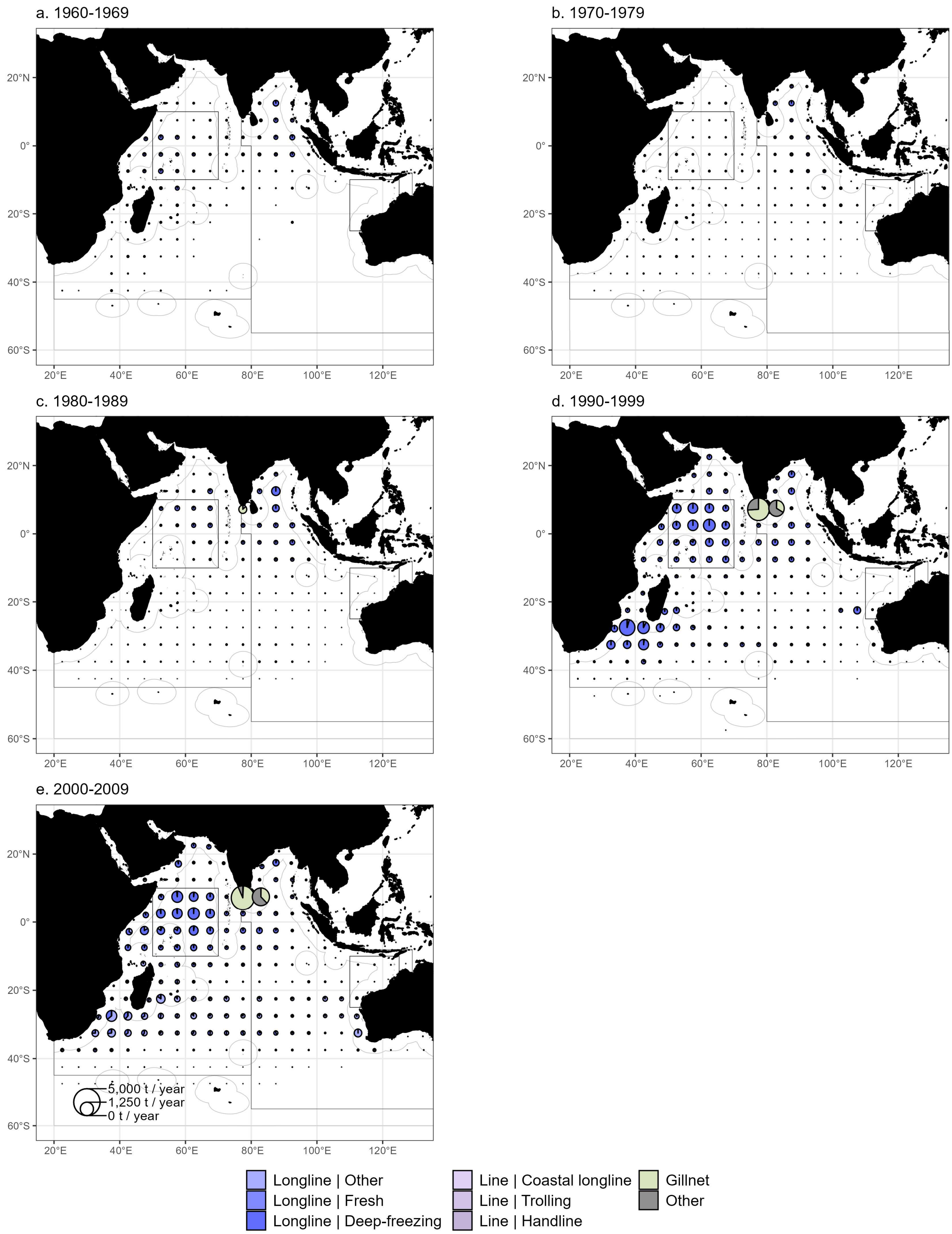


Figure 17: Mean annual time-area catches (metric tonnes; t) of billfish for the period 1950-2009, by decade and fishery. Black solid lines represent the marlin main longline fishing grounds identified by the IOTC WPB

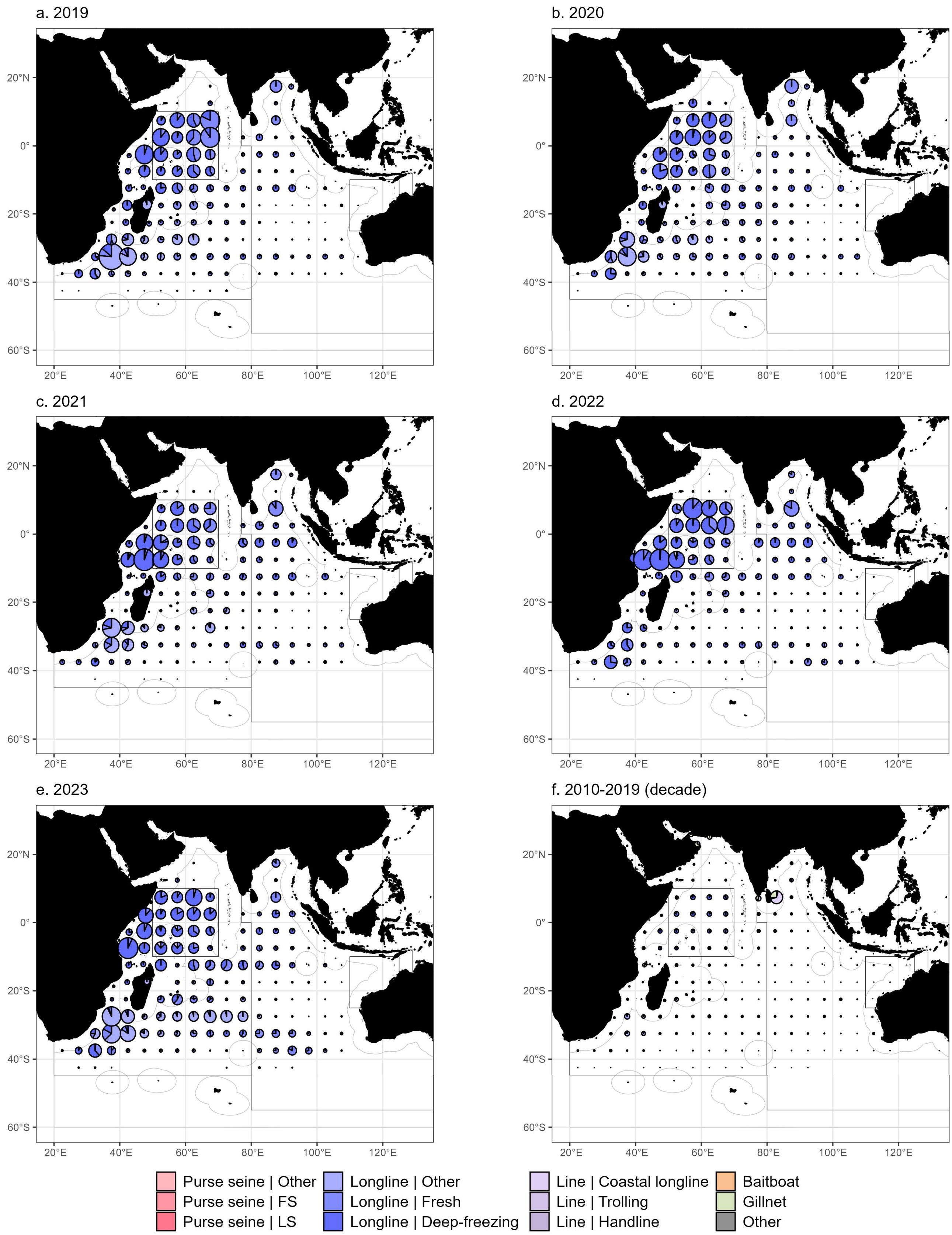


Figure 18: Mean annual time-area catches (in number of fish) of billfish for the last decade 2010-2019 and each year during the recent period 2019-2023. Black solid lines represent the marlin main longline fishing grounds identified by the IOTC WPB

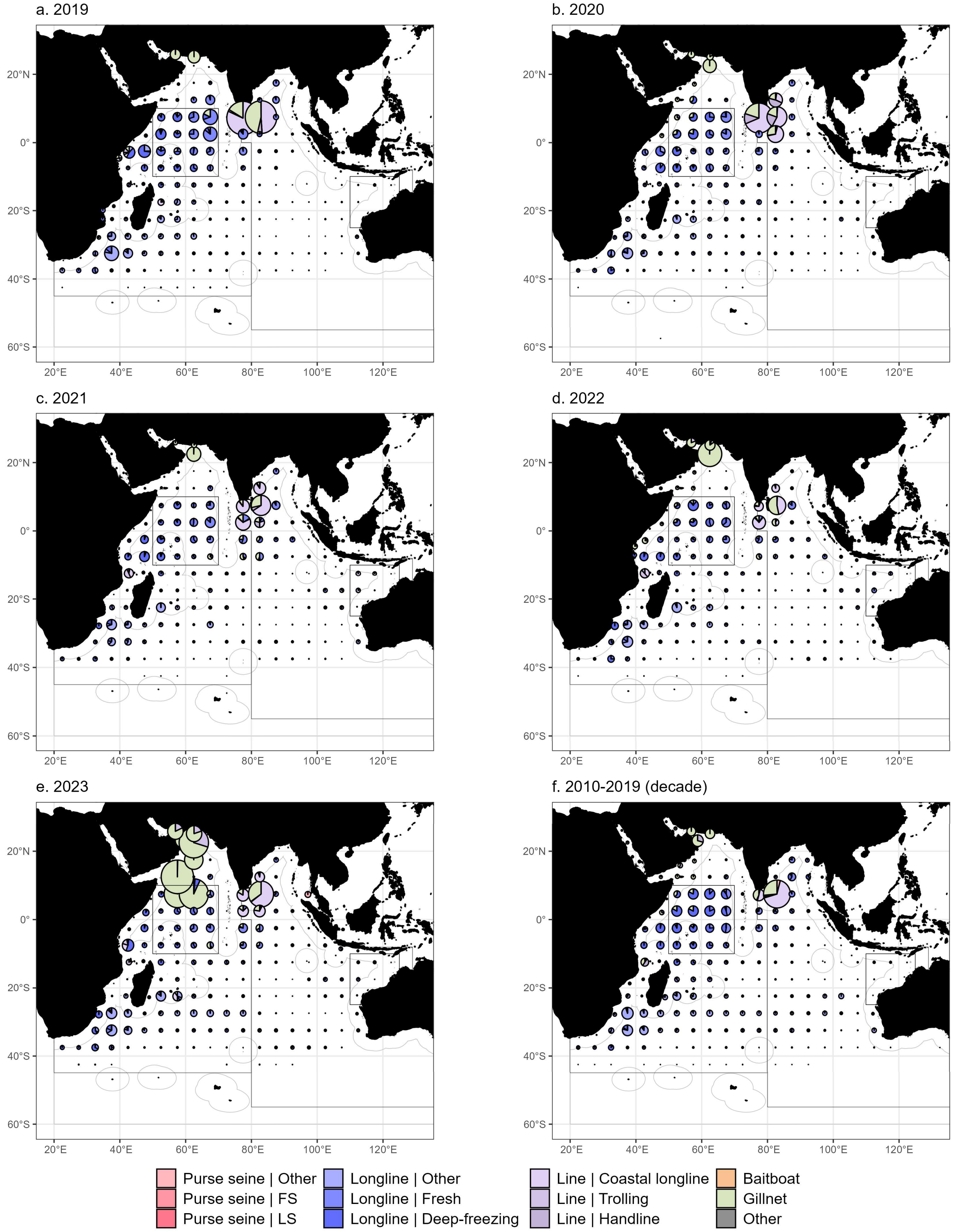


Figure 19: Mean annual time-area catches (metric tonnes; t) of billfish for the last decade 2010-2019 and each year during the recent period 2019-2023. Black solid lines represent the marlin main longline fishing grounds identified by the IOTC WPB

## Uncertainties in catch and effort data

Despite the improvement in the quality of retained catches, there are still some lack of reporting quality geo-referenced data by some main fleets catching billfish species. although there are some process in recent years, the historical data revealed the lack of geo-referenced data, which are data that could be difficult to recovery. The gaps remain from the lack of geo-referenced data of India, Indonesia and Pakistan, which contributed 30% of total billfish catch in recent years. In the early decades, where billfish were mainly caught by industrial fisheries, over 61% of geo-referenced data were available. In the early 2000s, with the rise of catch of biifish from coastal fisheries, th quality and availability of geo-referenced catch of billfish declined to 19%. the improvement of data from Sri Lanka and Islamic Republic of Iran, shifted the quality of data, with 65% availability of geo-referenced catch (**Fig. 20**). The reporting quality of geo-referenced catch and effort data varies between species and over time and information on quality on a species-specific basis is available from the data review papers on black marlin (IOTC 2025), blue marlin (Secretariat 2025a), striped marlin (Secretariat 2025c), Indo-Pacific sailfish (Secretariat 2025b), and swordfish (Secretariat 2025d).

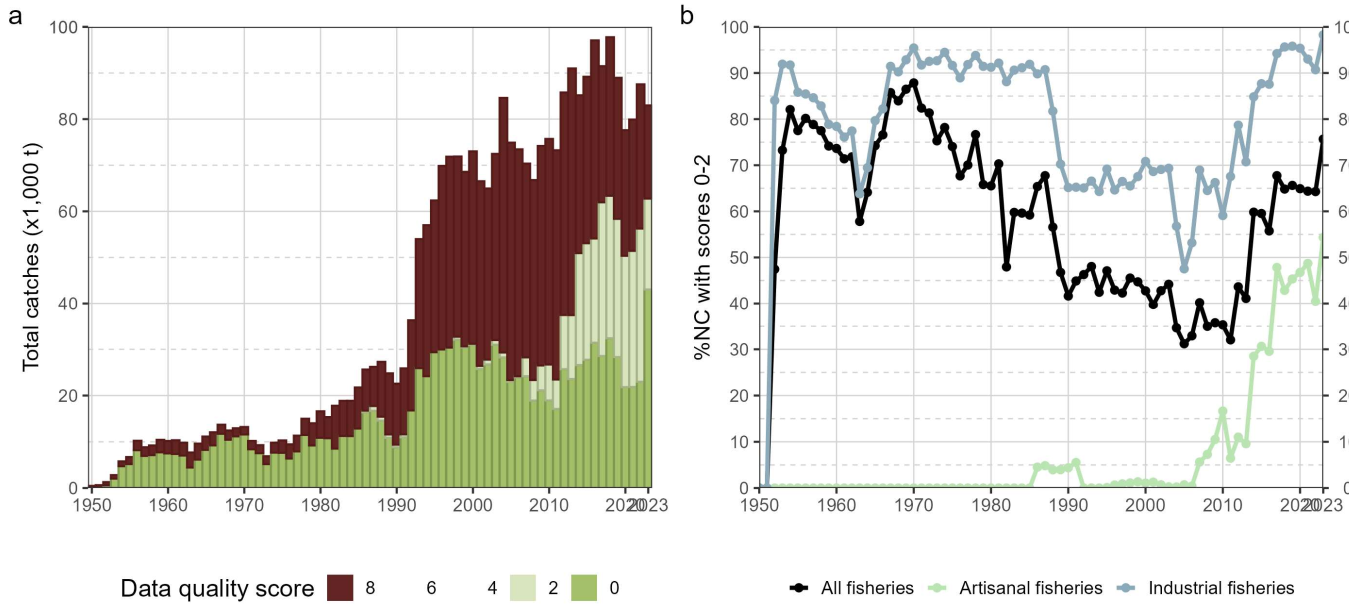


Figure 20: (a) Annual retained catches of IOTC billfish species (metric tonnes; t) estimated by quality score and (b) percentage of retained catches by type of fishery with good quality information (i.e., logbook coverage >30% and compliant with IOTC standards) for the corresponding geo-referenced catch and effort data reported to the IOTC Secretariat

## Size composition fo the catch

### Size sample availability

Sampling of billfish species remains challenging due to the nature of landings and on-board processing, where billfish are often cut or processed before any biological measurements can be recorded. These challenges are particularly pronounced in artisanal and coastal fisheries, where data collection is constrained by limited infrastructure, low sampling coverage, and inconsistent species identification at landing sites. In industrial fleets, sampling is generally more feasible. These fleets typically have greater storage capacity, on-board observers, and structured sampling programs, allowing for the regular collection of size frequency data, often while still at sea. In contrast, artisanal fisheries rely heavily on shore-based data collection, where enumerators sample fish only after landing. However, because billfish are commonly landed already processed (headed and dressed), the biological data (e.g., length) and even species identification can be unavailable or unreliable.Several CPCs, including the Islamic Republic of Iran, Sri Lanka, India, and Pakistan, which together accounted for 61% of billfish catches in recent years, do not currently report size frequency data for billfish species. These CPCs usually conduct port sampling.

Size frequency data for billfish are predominantly reported by longline fleets, especially from China, Taiwan (Province of China), Seychelles, Republic of Korea, and the EU, which together represented 97.2% of the total size frequency samples in recent years. However, even within these fleets, the number of samples collected has declined substantially, reflecting the overall reduction in retained catches (see Section: Retained Catches and Discards).

Historically, size data were also collected from gillnet fisheries, notably during the Indo-Pacific Tuna Programme (IPTP) in Sri Lanka in the 1980s and 1990s (**Fig. 21**). However, systematic size sampling from gillnet fleets has not continued in recent decades. To help address this gap, Sri Lanka has recently launched a project aimed at improving post-landing species identification. The initiative focuses on training data collectors to recognize distinct morphological features of processed billfish, enabling more reliable identification even when specimens are partially processed (Bandaranayake et al. 2024). In recent years, some size sampling has begun from coastal gillnet and longline fisheries, although the coverage remains very low and is not yet sufficient for stock assessment purposes.

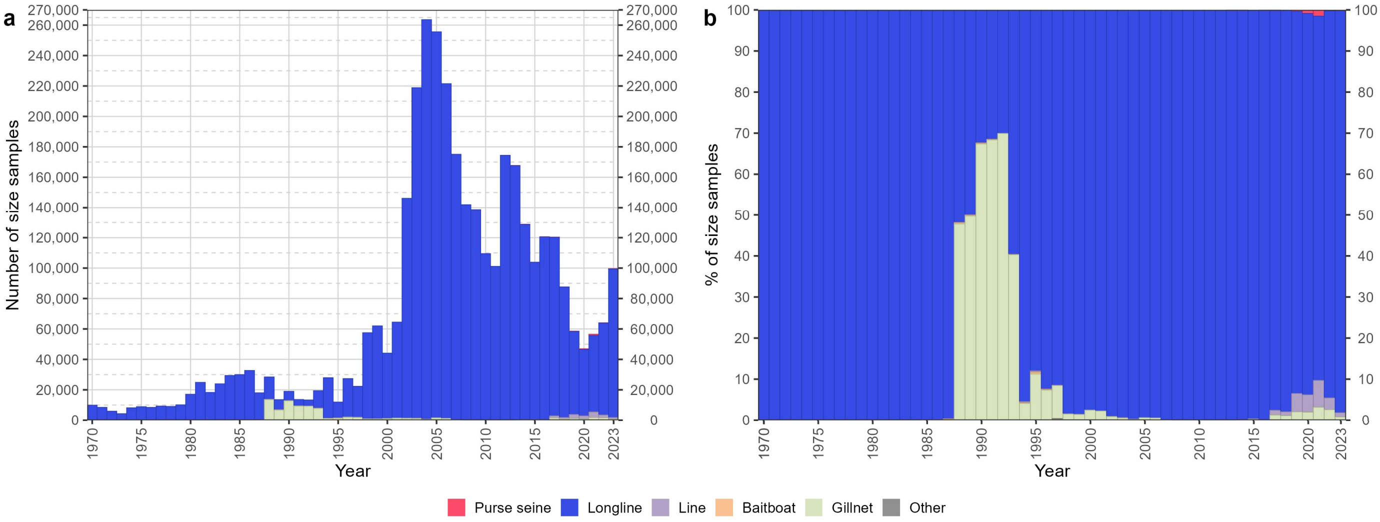


Figure 21: (a) Annual number and (b) relative proportion (%) of billfish standard size samples available by fishery group at the IOTC Secretariat

Swordfish remains the dominant billfish species for which size frequency data are available, despite a decline in catches in recent years. In contrast, the size data available for Indo-Pacific sailfish are not representative of the retained catch. Only 3% of the total size frequency samples collected pertain to sailfish, compared to 79% for swordfish (**Fig. 22**). This disparity reflects the fact that swordfish are primarily caught by industrial longline fisheries, which are subject to more stringent data reporting requirements and better sampling coverage, whereas sailfish are mainly caught in coastal and artisanal fisheries, where biological data collection remains limited.

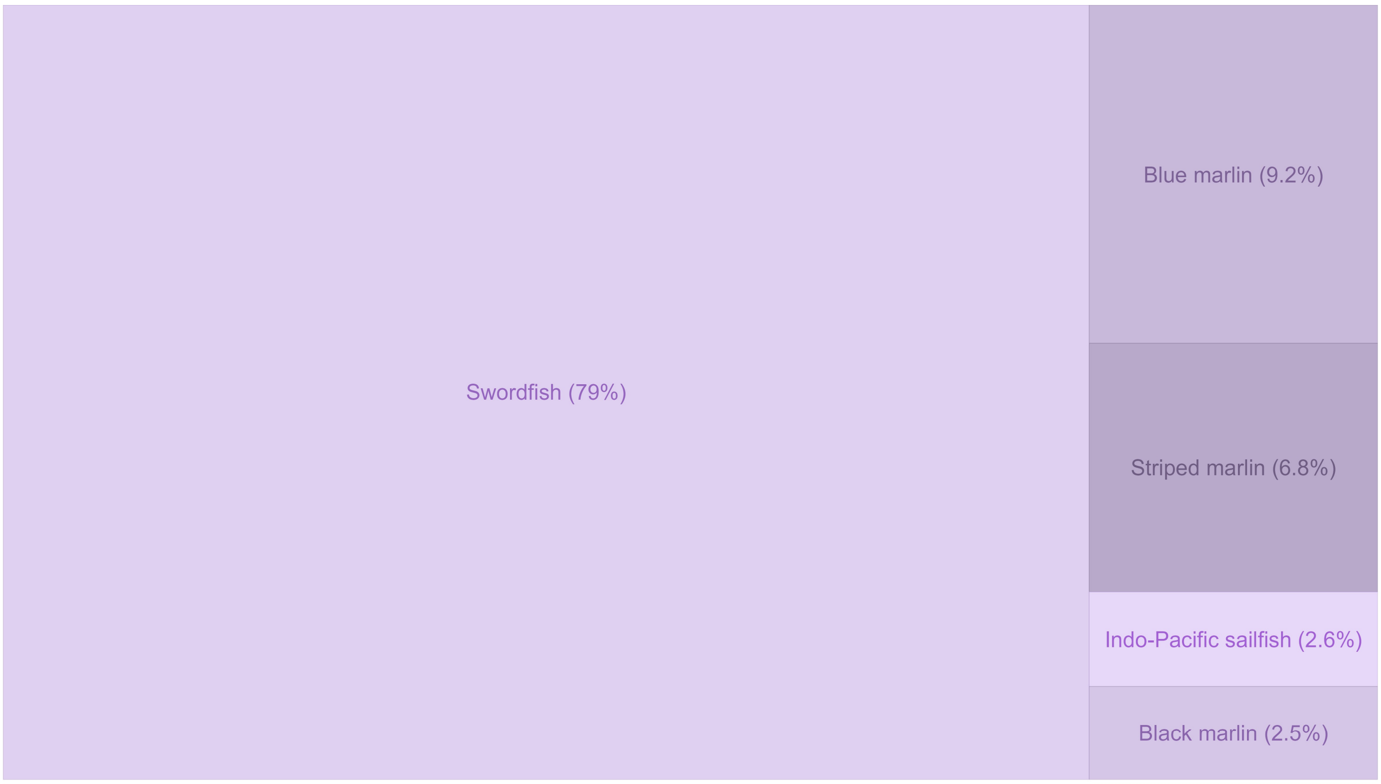


Figure 22: Percentage of size samples by species for all standard size samples available at the IOTC Secretariat

Combining the size-frequency data available at the Secretariat, which includes both logbook and observer-based data submitted as part of regular CPC reporting, provides an overview of size distributions by species, and fisheries where such data are provided. As expected, size-frequency data are predominantly available from industrial longline fisheries, where size distributions vary across species, but show limited variation within fisheries for each species. The lack of data from coastal fisheries, however, hinders any comprehensive analysis of size distributions from these fisheries (**Fig. 23**).

Cumulative size-frequency distributions generally demonstrate consistent patterns for marlins and swordfish caught by longlines. However, unusual spikes observed in some fresh longline fishery datasets suggest potential issues with sampling methods and/or data reporting. It is worth noting that a comprehensive review of longline size data for tropical tunas (Hoyle et al. 2021) revealed inconsistencies and quality concerns that limited the data's utility for stock assessments. A similar review focused on billfish would be instrumental in evaluating the quality and reliability of size data for scientific analyses and assessments.

In addition to the routine data submissions by CPCs, the Secretariat also holds at-sea size-frequency data collected by scientific observers, primarily from industrial purse seine and longline fisheries (see section Discard levels). More detailed information on the availability and distribution of size data by species can be found in the respective data review papers on black marlin (IOTC 2025), blue marlin (Secretariat 2025a), striped marlin (Secretariat 2025c), Indo-Pacific sailfish (Secretariat 2025b), and swordfish (Secretariat 2025d).

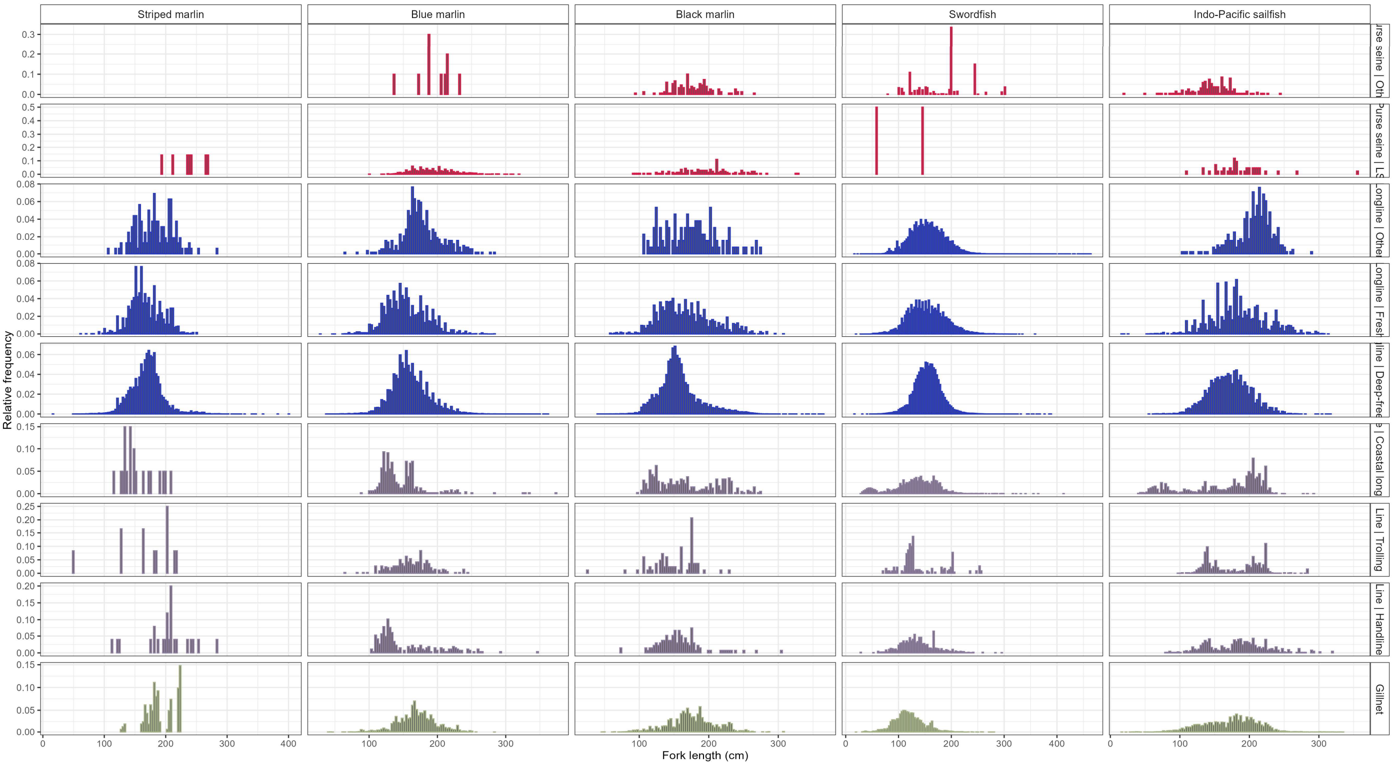


Figure 23: Relative size distributions (fork length; cm) by billfish species and fishery based on all samples available at the Secretariat. Fisheries with less than 500 samples are not shown

## Uncertainties in size-frequency data

The availability of geo-referenced size-frequency data for billfish species began in the 1970s, although catches were reported earlier. In the period prior to 1970, most data collection, primarily by Japan, was based on aggregated catch numbers, which limited the collection of size data (Yokawa 2007). Size data available for the early period were with limited spatial and temporal stratification, with very low sampling coverage (fewer than one fish per tonne caught).

The availability of geo-referenced size frequency data of billfish species began in the 1970s, although there were catches reported for the early years. In the early years before 1970, the data collection by he Japanese in general were based on catch number aggregate(Yokawa 2007), which could have limit the to collection of size sample. The data collected from 1970, though, were poorly available, not well spatial-temporal stratified and the coverage was low (<1 fish per t). Improvements were observed from the 1980s, with more fleets initiating size sampling of billfish species. In addition to Japan, Taiwan,China began submitting size-frequency data for longline fisheries in 1980. The Indo-Pacific Tuna Programme (IPTP) also contributed significantly from the mid-1980s by supporting size sampling from several coastal fisheries, including those of Sri Lanka, Maldives, the Islamic Republic of Iran, Pakistan, and Indonesia. Furthermore, development of swordfish-targeted longline fisheries in the 1990s, particularly by EU–Spain, EU–France (La Réunion), and Seychelles, led to an increase in billfish size data collection. However, the availability of size-frequency data sharply declined from the mid-2000s, mainly due to a significant reduction in swordfish catches reported by deep-sea longline fleets of Taiwan, China and other swordfish-directed longliners (**Fig. 24**). This decline in effort was partly driven by concerns over mercury levels in pelagic species, especially swordfish, in the Western Indian Ocean, which prompted reduced fishing activity (Kojadinovic et al. 2006)

The overall quality of size-frequency data improved between 2019 and 2020, reaching around 41%, but dropped sharply to 19% in 2022 due to reduced sampling and limited observer coverage during the COVID-19 pandemic. In 2023, a modest recovery in data availability was observed, reaching 29%.

The reporting quality of geo-referenced size-frequency data continues to vary across species and over time. Detailed, species-specific assessments of data quality are available in the data review papers on black marlin (IOTC 2025), blue marlin (Secretariat 2025a), striped marlin (Secretariat 2025c), Indo-Pacific sailfish (Secretariat 2025b), and swordfish (Secretariat 2025d).

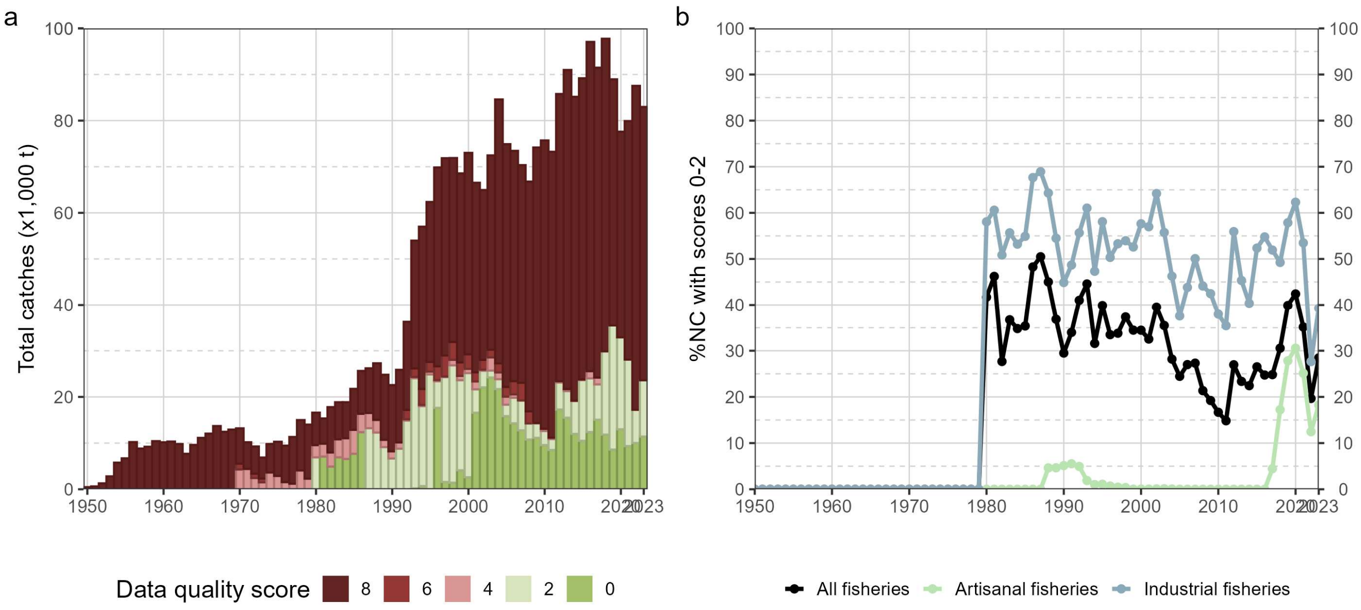


Figure 24: (a) Annual retained catches of IOTC billfish species (metric tonnes; t) estimated by quality score and (b) percentage of retained catches by type of fishery with good quality information (i.e., >1 fish per t caught and compliant with IOTC standards) for the corresponding geo-referenced size-frequency data reported to the IOTC Secretariat

# References

Alverson DL, Freeberg MH, Murawski SA, Pope JG (1994) A global assessment of fisheries bycatch and discards. FAO, Rome, Italy.

Bandaranayake K, Herath J, Prasad J, Haputhantri S, Jayasinghe R (2024) Billfish fishery resources; present context and research challenges IOTC. Seychelles

Bennett NJ (2021) Socio-Economic Monitoring and Evaluation in Fisheries. Fisheries Research.

Bonhommeau S, Brisset B, Evano H, Huet J, Chapat M, Varenne F, Le Foulgoc L, Richard E, Tessier E, Chanut J, Nieblas A-E (2019) Biometric Data for Large Pelagic Fish in the Indian Ocean.

Chassot E, Guillotreau P, Kaplan D, Vallee T (2012) Chassotetal2012_piracyandtunafisheries_submittedversion.pdf. Piracy in Comparative Perspective.

Chiang W-C, Sun C-L, Yeh S-Z, Su W-C (2004) Age and Growth of Sailfish (*Istiophorus Platypterus*) in Waters Off Eastern Taiwan. Fishery Bulletin 102:251–263.

Collette BB, McDowell JR, Graves JE (2006) Phylogeny of Recent Billfishes (Xiphioidei). Bulletin of Marine Science 79:455–468.

Fu D, Nergi SK, Rajaei F (2019) CPUE standardisations for neritic tuna species using Iranian gillnet data 2008–2017. IOTC, Victoria Seychelles, 01-05 July 2019, p 25

Gao C, Dai X (2016) Estimating the composition and capture status of bycatch using Chinese longline observer data in the Indian Ocean. IOTC, Victoria, Seychelles, 12-16 September 2016, p 13

García-Cortés B, Mejuto J (2005) Scientific estimations of bycatch landed by the Spanish surface longline fleet targeting swordfish (*Xiphias gladius*) in the Indian Ocean: 2001 – 2003 period. IOTC, Phuket, Thailand, 20 July 2005, p 9

Geehan J (2018) Revision to the IOTC scientific estimates of Indonesia's fresh longline catches. IOTC, Cape Town, South Africa, 4 - 8 September 2018, p 13

Hardin G (1968) The Tragedy of the Commons: The Population Problem Has No Technical Solution; It Requires a Fundamental Extension in Morality. Science 162:1243–1248.

Herath HLNS, Maldeniya R (2013) A review on billfish fishery resources in Sri Lanka. IOTC, La Réunion, France, 18-22 September 2013, p 10

Hoyle S, Chang S-T, Fu D, Itoh T, Lee S-I, Lucas J, Matsumoto T, Yeh Y-M, Wu R-F, Lee MK (2021) Review of size data from Indian Ocean longline fleets, and its utility for stock assessment. IOTC, Online meeting, 25 - 30 October 2021, p 95

Huang H-W, Liu K-M (2010) Bycatch and Discards by Taiwanese Large-Scale Tuna Longline Fleets in the Indian Ocean. Fisheries Research 106:261–270.

IOTC (2014) Report of the 10th IOTC Working Party on Data Collection and Statistics. IOTC, Eden Island, Seychelles, 2-4 December 2014.

IOTC (2025) Review of the statistical data available for Indian Ocean black marlin (1950-2023) IOTC. In: *23rd Working Party on Billfish (WPB23)*. France

IOTC Secretariat (2016) Improving the core IOTC data management processes. IOTC, Victoria, Seychelles, 6 - 10 September 2016, p 38

IOTC Secretariat (2021a) IOTC Regional Observer Scheme (ROS) data collection fields. IOTC, Online meeting, 29 November - 3 December 2021, p 61

IOTC Secretariat (2020) Review of detected anomalies in size frequency data submitted to the Secretariat. IOTC, Online meeting, 30 November - 3 December 2020, p 8

IOTC Secretariat (2019) Review of Pakistan's reconstructed catch series for tuna and tuna-like species. IOTC, Karachi, Pakistan, 27-30 November 2019, p 17

IOTC Secretariat (2023a) Review of the statistical data available for Indian Ocean Indo-Pacific sailfish (1950-2021). IOTC, La Saline-les-Bains, Réunion, 6 - 9 September 2023, p 34

IOTC Secretariat (2023b) Review of the statistical data available for Indian Ocean striped marlin (1950-2021). IOTC, La Saline-les-Bains, Réunion, 6 - 9 September 2023, p 24

IOTC Secretariat (2023c) Review of the statistical data available for Indian Ocean swordfish (1950-2021). IOTC, La Saline-les-Bains, Réunion, 6 - 9 September 2023, p 39

IOTC Secretariat (2018) Revision to the IOTC scientific estimates of Indonesia's fresh longline catches. IOTC, Victoria, Seychelles, 29 November - 1 December 2018, p 14

IOTC Secretariat (2021b) Update on the implementation of the IOTC Regional Observer Scheme. IOTC, Online meeting, 29 November - 3 December 2021, p 22

Jathunga MI, Wickramaratne IU, Liyanage NPP (2015) A Comparative Study on the Effectiveness of Gillnet and Longline Fishing Methods Used by Multi-Day Fishermen in Matara Fisheries District.

Kar AB, Ramalingam L, Govindaraj K (2015) Age and Growth of Indo- Pacific Sailfish, *Istiophorus Platypterus* (Shaw and Nodder, 1792) in the Andaman and Nicobar Waters. IJMS Vol44(01) [January 2015].

Kelleher K (2005) Discards in the world's marine fisheries. An update. FAO, Rome, Italy.

Kojadinovic J, Potier M, Le Corre M, Cosson RP, Bustamante P (2006) Mercury Content in Commercial Pelagic Fish and Its Risk Assessment in the Western Indian Ocean. Science of The Total Environment 366:688–700.

Lin C-Y, Wang C-P, Xu W-P (2022) CPUE standardization of blue marlin (*Makaira nigricans*) caught by Taiwanese large-scale longline fishery in the Indian Ocean. IOTC, Online meeting, 12-16 September 2022, p 34

Matsumoto T, Taki K, Ijima H (2022) Standardized CPUE of blue marlin (*Makaira mazara*) caught by Japanese longline fishery in the Indian Ocean: Analysis between 1979 and 2021. IOTC, Online meeting, 12 - 16 September 2022, p 25

Moreno G, Herrera M, Pierre L (2012) Pilot project to improve data collection for tuna, sharks and billfish from artisanal fisheries in the Indian Ocean. Part II: Revision of catch statistics for India, Indonesia and Sri Lanka (1950-2011). Assignment of species and gears to the total catch and issues on data quality. IOTC, Victoria, Seychelles, 10-15 December 2012, p 6

Munoz-Lechuga R, Rosa D, Coelho R (2016) Depredation in the Portuguese pelagic longline fleet in the Indian Ocean. Victoria, Seychelles, 12-16 September 2016, p 14

National Report – India IOTC (2013)

Pepperell JG, Griffiths S, Kadagi N (2017) Acquisition of catch-and-effort and size data from sport fisheries in the Western Indian Ocean. IOTC, San Sebastian, Spain, 10 - 14 September 2017, p 59

Pillai P (2012) Impacts of Piracy on Fisheries in the Indian Ocean. Fishing Chimes 32:25–27.

Poisson F, Taquet M (2001) L'espadon : De La Recherche à l'exploitation Durable.

Prager MH, Prince ED, Lee DW (1995) Empirical Length and Weight Conversion Equations for Blue Marlin, White Marlin, and Sailfish from the North Atlantic Ocean. Bulletin of Marine Science 56:201–210.

Rabearisoa N, Sabarros PS, Romanov EV, Lucas V, Bach P (2018) Toothed Whale and Shark Depredation Indicators: A Case Study from the Reunion Island and Seychelles Pelagic Longline Fisheries. PLOS ONE 13:e0202037.

Rajaei F (2013) Fishery in Iran with particular reference to billfish. IOTC, La Réunion, France, 18-22 September 2013, p 10

Rajaei F, Naderi R (2024) Iran: National report 2024 IOTC. Cape Town, South Africa

Romanov E, Sabarros PS, Le Foulgoc L, Richard E, Lamoureux J-P, Rabearisoa N, Bach P (2013) Assessment of depredation level in Reunion Island pelagic longline fishery based on information from self-reporting data collection programme. IOTC, La Réunion, France, 12-16 September 2013, p 21

Romanov EV (2002) Bycatch in the Tuna Purse-Seine Fisheries of the Western Indian Ocean. Fishery Bulletin 100:90–105.

Ruiz J, Abascal F, Bach P, Baez J-C, Cauquil P, Grande M, Krug I, Lucas J, Murua H, Lourdes Alonso ML, Sabarros PS (2018) Bycatch of the European, and associated flag, purse seine tuna fishery in the Indian Ocean for the period 2008-2017. IOTC, Cape Town, South Africa, 10-17 September 2018, p 15

Secretariat I (2025a) Review of the statistical data available for Indian Ocean blue marlin (1950-2023) IOTC. In: *23rd Working Party on Billfish (WPB23)*.

Secretariat I (2025b) Review of the statistical data available for Indian Ocean Indo-Pacific Sailfish (1950-2023) IOTC. In: *23rd Working Party on Billfish (WPB23)*.

Secretariat I (2025c) Review of the statistical data available for Indian Ocean striped marlin (1950-2023) IOTC. In: *23rd Working Party on Billfish (WPB23)*.

Secretariat I (2025d) Review of the statistical data available for Indian Ocean Swordfish (1950-2023) IOTC. In: *23rd Working Party on Billfish (WPB23)*.

Secretariat I (2025e) Simulation tool for allocation criteria: Data, assumptions, and output IOTC. Zanzibar, Tanzania

Setyadji B, Jatmiko I, Wujdi A (2016) Modelling Several Morphometric Relationships of Swordfish (*Xiphias Gladius*), Black Marlin (*Makaira Indica*) and Blue Marlin (*Makaira Nigricans*) Caught from Indonesian Longliners in the Eastern Indian Ocean. Journal of Fisheries 4:371–376.

Shahifar R, Barghani HR, Noori RD, Khorshidi S (2013) Estimation of bycatch and discard by Iranian fishing vessels (gillnets) In IOTC competence of area in 2012. IOTC, La Réunion, France, 12-16 September 2013, p 6

Speare P (2003) Age and Growth of Black Marlin, *Makaira Indica*, in East Coast Australian Waters. Marine and Freshwater Research 54:307–314.

Sri Lanka - National Report 2018 IOTC (2018) Seychelles

Sun C-L, Hsu W-S, Su N-J, Yeh S-Z, Chang Y-J, Chiang W-C (2011) Age and growth of striped marlin (*Kajikia audax*) in the watesr off Taiwan: A revision. WCPFC, Chinese Taipei, 24 May - 1 June 2011, p 12

Sun C-L, Yeh S-Z, Liu C-S, Su N-J, Chiang W-C (2015) Age and Growth of Black Marlin (*Istiompax Indica*) Off Eastern Taiwan. Fisheries Research 166:4–11.

Suuronen P, Gilman E (2020) Monitoring and Managing Fisheries Discards: New Technologies and Approaches - ScienceDirect. Marine Policy 116.

Uchiyama JH, Kazama TK (2003) Updated weight-on-length relationships for pelagic fishes caught in the central north Pacific Ocean and bottomfishes from the northwestern Hawaiian islands. Pacific Islands Fisheries Science Center, NMFS, NOAA, Honolulu, Hawaii, USA.

Ward P, Porter Jm, Elscot S (2000) Broadbill Swordfish: Status of Established Fisheries and Lessons for Developing Fisheries. Fish and Fisheries 1:317–336.

Yokawa K (2007) Some information on the Japanese billfish catches in the north Pacific. ISC Marlin; Swordfish Working Group Workshop, Korea

# Appendices

## Appendix I: Taxonomy

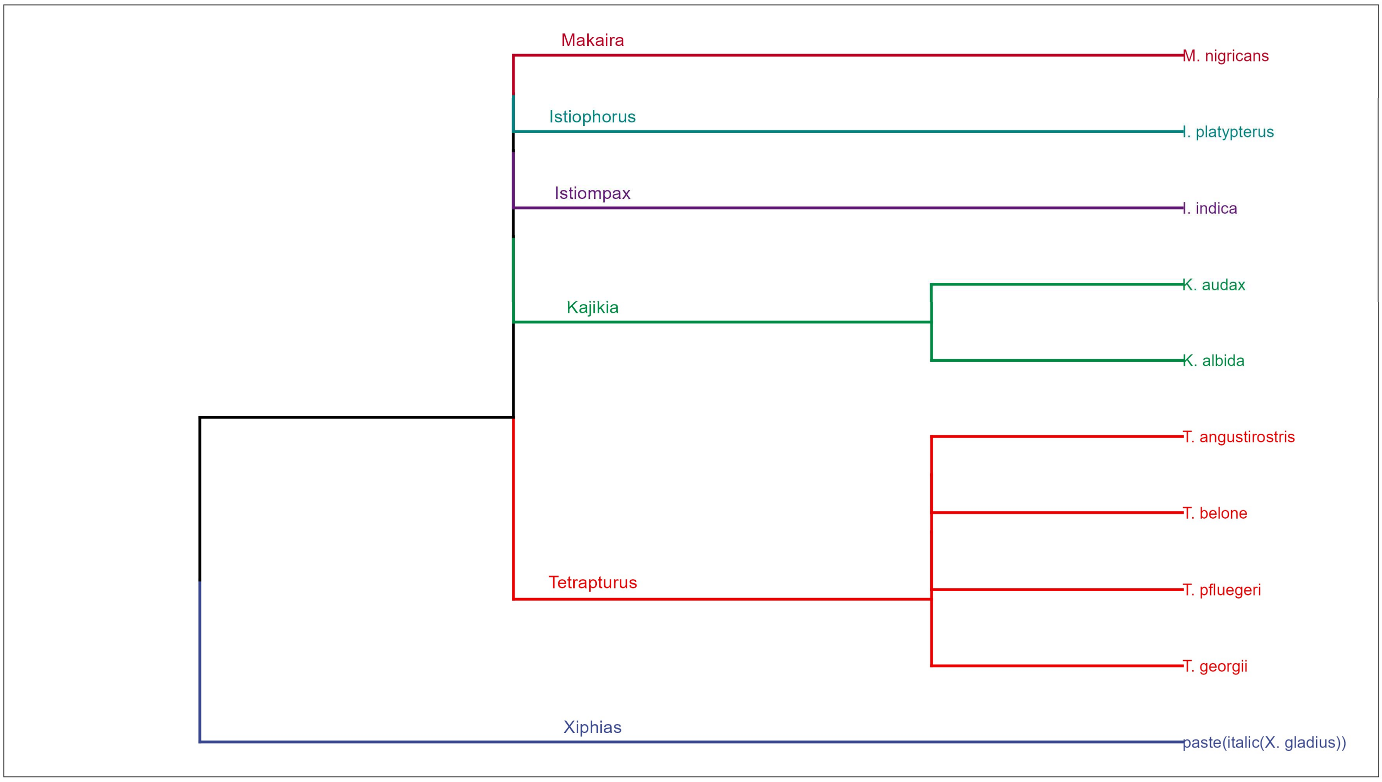


Figure 25: Phylogenetic dendogram of billfish species where Atlantic sailfish (*Istiophorus albicans*) is considered to be synonym of Indo-Pacific sailfish (*Istiophorus platypterus*) according to Collette et al. (2006). Source: Integrated Taxonomic Information System

## Appendix II: Morphometrics for billfish

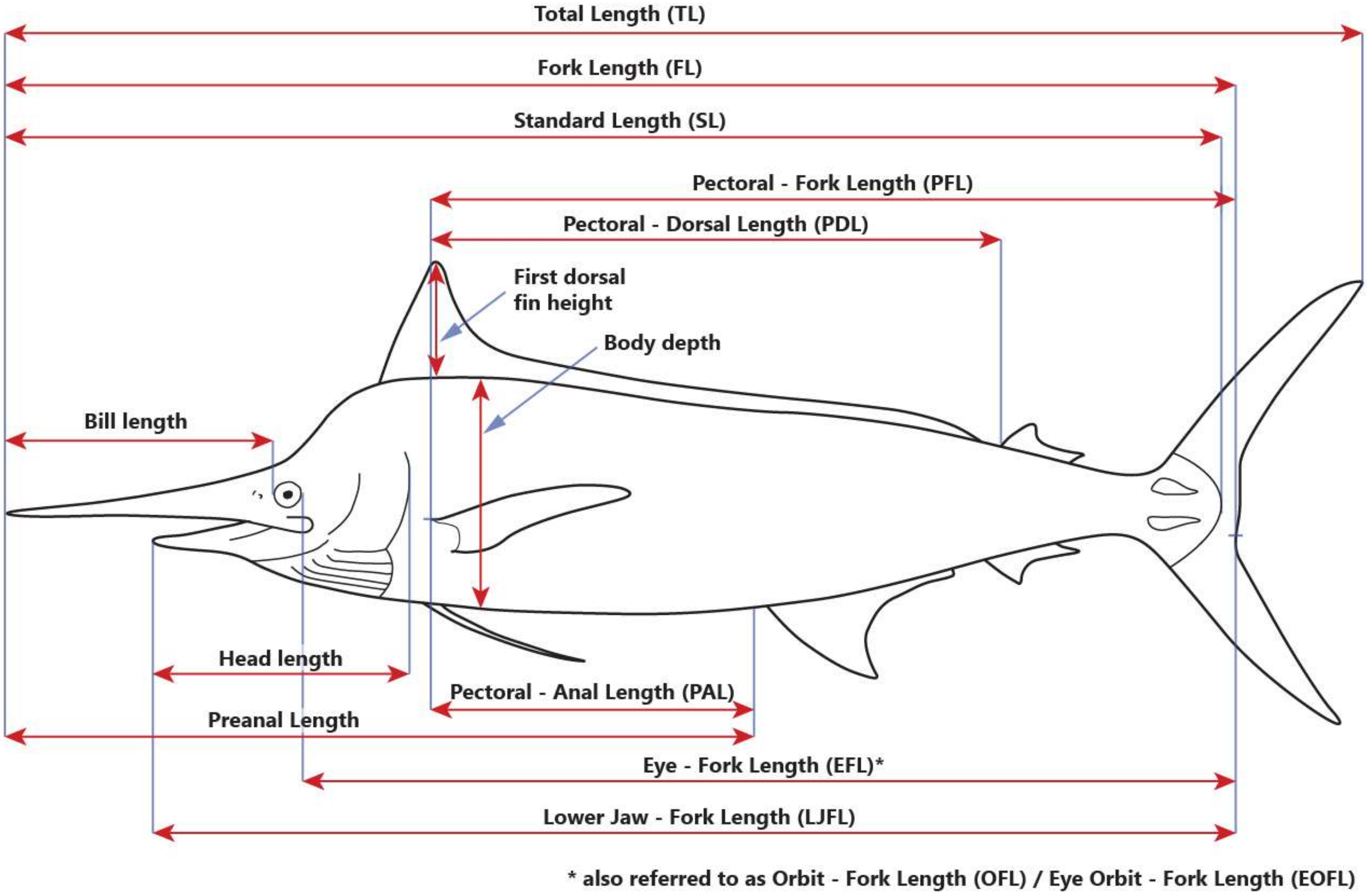


Figure 26: Types of length measurements used for billfish (source: Fishider)

Table 8: Length-length linear relationships for billfish (see Fig. 24 for definitions of measurement types). * indicates current IOTC relationships

| Code | Species | Ocean | Equation | a | b | N | Reference |
|---|---|---|---|---|---|---|---|
| MLS | Striped marlin | Indian | LJFL = a*EFL+b | 1.334000 | 0.839500 | 443 | Ward (pers. com) |
| | | Western-Central Pacific | LJFL = a*EFL+b | 1.120000 | 7.330000 | 397 | Sun et al. 2011 |
| | | Western-Central Pacific | LJFL = a*EFL+b | 0.834000 | 36.610000 | 301 | Kopf et al. 2011 |
| BUM | Blue marlin | Atlantic | LJFL = a*TL+b | 0.763000 | 2.000000 | 258 | Prager et al. (1995) |
| | | Atlantic | LJFL = a*PFL+b | 1.261000 | 7.696000 | 732 | Prager et al. (1995) |
| | | Atlantic | LJFL = a*EFL+b | 1.096000 | 8.887000 | 250 | Prager et al. (1995) |
| | | Atlantic | LJFL = a*PAL+b | 2.156000 | 61.656000 | 453 | Prager et al. (1995) |
| | | Indian | LJFL = a*EFL+b | 0.983000 | 28.630000 | 53 | Setyadji et al. (2016) |
| | | Indian | LJFL = a*PFL+b | 1.115000 | 31.674000 | 53 | Setyadji et al. (2016) |
| | | Indian | EFL = a*PFL+b | 1.163000 | -1.019000 | 53 | Setyadji et al. (2016) |
| | | Indian | LJFL = a*EFL+b | 1.106317 | 8.018586 | 26 | Ward (pers. Com)* |
| BLM | Black marlin | Indian | LJFL = a+EFL*b | 5.202073 | 1.114579 | 13 | Ward (pers. Com)* |
| | | Indian | LJFL = a*PFL+b | 1.249000 | 11.299000 | 37 | Setyadji et al. 2016 |
| | | Indian | LJFL = a*EFL+b | 1.060000 | 14.185000 | 37 | Setyadji et al. (2016) |
| | | Indian | EFL = a*PFL+b | 1.195000 | -4.367000 | 37 | Setyadji et al. (2016) |
| SWO | Swordfish | Indian | LJFL = a*EFL+b | 1.060000 | 9.027000 | 160 | Setyadji et al. (2016) |
| | | Indian | LJFL = a*PFL+b | 1.241000 | 12.440000 | 160 | Setyadji et al. (2016) |
| | | Indian | EFL = a*PFL+b | 1.168000 | 3.532000 | 160 | Setyadji et al. (2016) |
| | | Indian | LJFL = a*EFL+b | 1.066000 | 10.449000 | 123 | Poisson and Taquet (2001) |
| | | Indian | LJFL = a*CKL+b | 1.541100 | 19.605000 | 801 | Poisson and Taquet (2001)* |
| | | Indian | LJFL = a*PAL+b | 2.540700 | 25.698000 | 1,806 | Poisson and Taquet (2001)* |
| SFA | Indo-Pacific sailfish | Western-Central Pacific | LJFL = a*EFL+b | 0.884500 | -3.702500 | 1,166 | Chiang et al. (2004)* |

Table 9: Length-weight power relationships for billfish (see Fig. 24 for definitions of measurement types). * indicates current IOTC relationships

| Code | Species | Ocean | Equation | a | b | N | Reference |
|---|---|---|---|---|---|---|---|
| MLS | Striped marlin | Pacific | RD = a*EFL^b | 1.3326e-06 | 3.413 | 17 | Uchiyama and Kazama (2003) |
| | | Pacific | GUT = a*EFL^b | 3.0393e-06 | 3.329 | 1,427 | Uchiyama and Kazama (2003)* |
| | | Western-Central Pacific | RD = a*EFL^b | 4.6800e-06 | 3.16 | 1,037 | Sun et al. 2011 |
| | | Western-Central Pacific | RD = a*LJFL^b | 3.2000e-07 | 3.56 | 170 | Shimose et al. 2013 |
| | | Western-Central Pacific | RD = a*LJFL^b | 1.0120e-07 | 3.55 | 214 | Kopf et al. 2011 |
| BUM | Blue marlin | Atlantic | RD = a*FL^b | 1.1955e-06 | 3.366 | 5,245 | Prager et al. (1995) |
| | | Indian | GUT = a*EFL^b | 1.0000e-05 | 3.064 | 324 | Setyadji et al. (2016) |
| | | Pacific | RD = a*EFL^b | 2.7223e-06 | 3.31 | 154 | Uchiyama and Kazama (2003)* |
| BLM | Black marlin | Indian | GUT = a*PFL^b | 9.0000e-06 | 3.118 | 390 | Setyadji et al. (2016) |
| | | Pacific | RD = a*EFL^b | 1.4422e-06 | 2.989 | 24 | Uchiyama and Kazama (2003)* |
| | | Western-Central Pacific | RD = a*FL^b | 6.6100e-06 | 3.336 | 117 | Speare (2003) |
| SWO | Swordfish | Atlantic | GUT = a*LJFL^b | 8.5703e-08 | 3.918 | 16 | Garcia-Cortés and Mejuto 2002 |
| | | Indian | GUT = a*PFL^b | 3.0000e-05 | 2.94 | 1,429 | Setyadji et al. (2016) |
| | | Indian | GUT = a*LJFL^b | 5.8641e-06 | 3.085 | 334 | Poisson and Taquet (2001)* |
| | | Indian | RD = a*LJFL^b | 3.8150e-06 | 3.188 | 3,608 | Mejuto et al. (1998)* |
| SFA | Indo-Pacific sailfish | Indian | RD = a*EFL^b | 4.0000e-05 | 2.52 | | Kar et al. (2015) |
| | | Indian | RD = a*LJFL^b | 5.0000e-05 | 2.589 | 101 | Hoolihan (2006) |
| | | Pacific | RD = a*EFL^b | 6.9010e-05 | 2.524 | 35 | Uchiyama and Kazama (2003)* |

## Appendix III: Best scientific estimates of retained (nominal) catches for 2023

The overall amount of retained catches fully estimated in 2023 is 928 t, for 4 distinct fleets, representing 0.97% of total catches of IOTC billfish species for the final year of the time series (**Table 10**).

The estimation of the catch data includes three processing steps. First, retained catches are estimated by the Secretariat for IOTC CPCs as well as non-members that either did not report any catch for 2023 or whose catches were available from other sources. For non-members (i.e., Djibouti) and Yemen, catches were preferentially extracted from the FAO Global Capture Production database and further broken down into species (when necessary) and fishing gears based on knowledge of the fisheries present in each of the countries (**Table 10**). For IOTC members with inconsistent data (Madagascar and Kenya) for some of their fisheries in 2023, retained catches were repeated from 2022 (**Table 10**).

Table 10: Data source and final estimates of catches (metric tonnes; t) of IOTC billfish species for non-members (NM) and members (MP) of the IOTC that reported no or inconsistent data for some or all of their fisheries for the year 2023

| Fleet code | Fleet | Status | Source | Catch |
|---|---|---|---|---|
| DJI | Djibouti | NM | FAO | 42 |
| JOR | Jordan | NM | FAO | 30 |
| MDG | Madagascar | MP | IOTC | 842 |
| OMN | Oman | MP | IOTC | 14 |
| ALL | All fleets | - | - | 928 |

Second, a re-estimation process was applied to catches reported by the artisanal fisheries of India and Indonesia which builds on a comprehensive review conducted in the early 2010s with the purpose of revising the time series of catch from these specific artisanal fisheries and improve the information available to the IOTC (Moreno et al. 2012). In the case of India, the process modifies the catch composition of the gears by Indian Ocean major area for the gillnet, hook and line, and trolling fisheries. In 2023, the total catch of billfish taken by India was 15,504 t, by which catches taken in coastal longline and gillnet fisheries are estimated by gear. In the case of Indonesian coastal fisheries, a fixed proportion of total catch for each species and fishing gear is used to derive the catches of each of the IOTC billfish species based on samples of catch composition available for the period 2003-2011 (Moreno et al. 2012). The process results in a decrease of total billfish catches from 14,510 t (reported through official submissions) to 5,988 t (estimated), with catches increasing for swordfish and decreasing for the four other species (**Fig. 27**). Indonesia however, is working with the Secretariat to re-estimate the catch data of 2023, to be in line with previous years data.

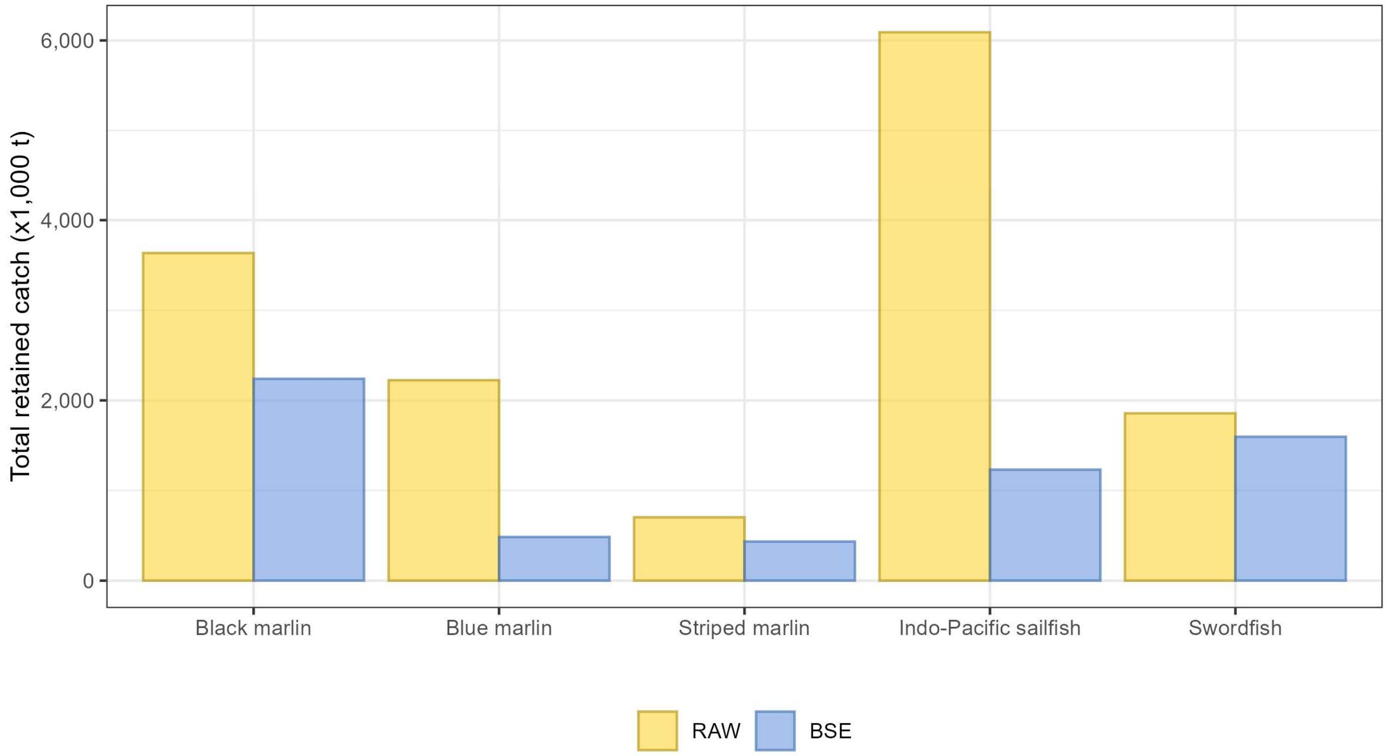


Figure 27: Comparison between the total catches (metric tonnes; t) of IOTC billfish by Indonesia as submitted to the Secretariat (RAW) and estimated following the current methodology used to derive the best scientific estimates (BSE)

Third, nominal catches reported as species aggregates including IOTC billfish species are further broken down into their single species components to generate the IOTC best scientific estimates (**Table 1**). In 2023, this breakdown by species resulted in the addition of a total of 12,290 t to the catches reported at species level for the five species of interest, corresponding to 12.9% of the final catch estimates (**Fig. 28**).

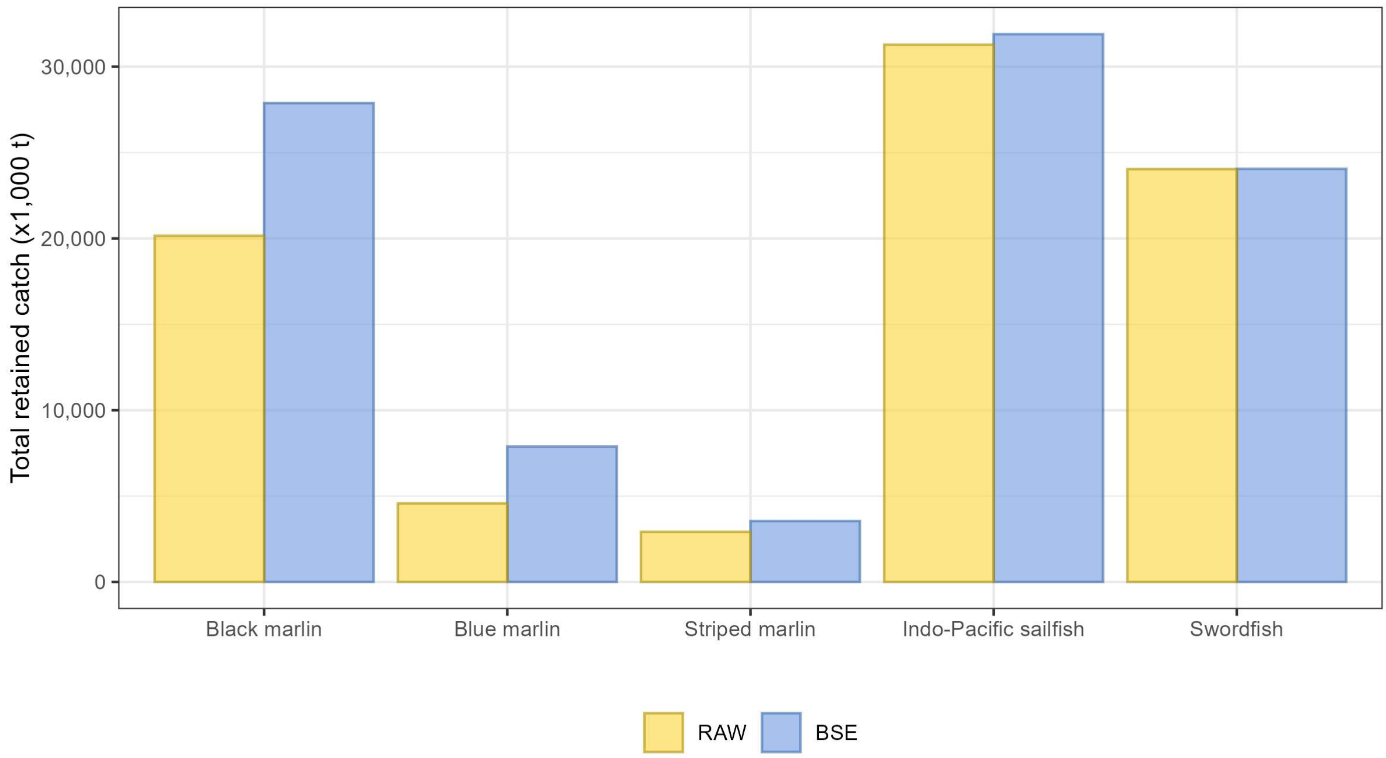


Figure 28: Total catches (metric tonnes; t) of IOTC billfish species as reported (RAW) and estimated (BSE) after accounting for the catches added through the breakdown of species aggregates

## Appendix IV: Changes in best nominal catches from previous Working Party

Table 11: Changes in best scientific estimates of retained catches (metric tonnes; t) of billfish by year, fleet, fishery group, and main Indian Ocean area, limited to absolute values higher than 10 t. Data source: best scientific estimate of retained catches as estimated annually from 2012 to 2023 for the preceeding statistical year (https://www.iotc.org/WPB/23/Data/03-NC)

| Year | Fleet | Fishery group | Area | Current (t) | Previous (t) | Difference (t) |
|---|---|---|---|---|---|---|
| **2022** | BGD | Gillnet | Eastern Indian Ocean | 1,465 | 339 | 1,126 |
| | | Other | Eastern Indian Ocean | 329 | 0 | 329 |
| | DJI | Gillnet | Western Indian Ocean | 45 | 34 | 12 |
| | IDN | Baitboat | Eastern Indian Ocean | 35 | 0 | 35 |
| | | Gillnet | Eastern Indian Ocean | 2,937 | 741 | 2,196 |
| | | Line | Eastern Indian Ocean | 5,354 | 3,750 | 1,604 |
| | | Longline | Eastern Indian Ocean | 3,688 | 2,795 | 893 |
| | | Other | Eastern Indian Ocean | 267 | 104 | 163 |
| | | Purse seine | Eastern Indian Ocean | 53 | 977 | -924 |
| | JPN | Longline | Eastern Indian Ocean | 427 | 475 | -48 |
| | | Longline | Western Indian Ocean | 96 | 110 | -14 |
| | TMP | Gillnet | Eastern Indian Ocean | 18 | 0 | 18 |
| | YEM | Gillnet | Western Indian Ocean | 880 | 649 | 230 |
| | | Line | Western Indian Ocean | 1,805 | 1,333 | 473 |
| **2021** | BGD | Gillnet | Eastern Indian Ocean | 1,269 | 260 | 1,008 |
| | | Line | Eastern Indian Ocean | 0 | 123 | -123 |
| | | Other | Eastern Indian Ocean | 215 | 0 | 215 |
| | IDN | Baitboat | Eastern Indian Ocean | 104 | 0 | 104 |
| | | Gillnet | Eastern Indian Ocean | 3,157 | 712 | 2,445 |
| | | Line | Eastern Indian Ocean | 6,740 | 3,034 | 3,706 |
| | | Longline | Eastern Indian Ocean | 1,109 | 708 | 400 |
| | | Other | Eastern Indian Ocean | 218 | 101 | 117 |
| | | Purse seine | Eastern Indian Ocean | 46 | 760 | -714 |
| | JPN | Longline | Eastern Indian Ocean | 440 | 476 | -36 |
| | TMP | Gillnet | Eastern Indian Ocean | 21 | 0 | 21 |
| | YEM | Gillnet | Western Indian Ocean | 572 | 486 | 86 |
| | | Line | Western Indian Ocean | 1,763 | 1,496 | 267 |
| **2020** | IDN | Baitboat | Eastern Indian Ocean | 177 | 0 | 177 |

| Year | Fleet | Fishery group | Area | Current (t) | Previous (t) | Difference (t) |
|---|---|---|---|---|---|---|
| | | Gillnet | Eastern Indian Ocean | 2,271 | 892 | 1,379 |
| | | Line | Eastern Indian Ocean | 5,940 | 3,802 | 2,138 |
| | | Longline | Eastern Indian Ocean | 734 | 1,712 | -978 |
| | | Other | Eastern Indian Ocean | 489 | 126 | 363 |
| | | Purse seine | Eastern Indian Ocean | 187 | 962 | -775 |
| | TMP | Gillnet | Eastern Indian Ocean | 108 | 0 | 108 |
| **2019** | IDN | Baitboat | Eastern Indian Ocean | 102 | 0 | 102 |
| | | Gillnet | Eastern Indian Ocean | 2,788 | 610 | 2,178 |
| | | Line | Eastern Indian Ocean | 5,107 | 2,600 | 2,508 |
| | | Longline | Eastern Indian Ocean | 353 | 2,339 | -1,986 |
| | | Other | Eastern Indian Ocean | 253 | 86 | 167 |
| | | Purse seine | Eastern Indian Ocean | 77 | 807 | -729 |
| | TMP | Gillnet | Eastern Indian Ocean | 61 | 0 | 61 |
| **2018** | IDN | Baitboat | Eastern Indian Ocean | 48 | 0 | 48 |
| | | Gillnet | Eastern Indian Ocean | 2,137 | 523 | 1,613 |
| | | Line | Eastern Indian Ocean | 5,034 | 2,230 | 2,804 |
| | | Longline | Eastern Indian Ocean | 2,176 | 219 | 1,958 |
| | | Other | Eastern Indian Ocean | 159 | 74 | 85 |
| | | Purse seine | Eastern Indian Ocean | 64 | 792 | -728 |
| | TMP | Gillnet | Eastern Indian Ocean | 25 | 0 | 25 |
| **2017** | IDN | Baitboat | Eastern Indian Ocean | 468 | 0 | 468 |
| | | Gillnet | Eastern Indian Ocean | 2,530 | 824 | 1,706 |
| | | Line | Eastern Indian Ocean | 5,435 | 3,511 | 1,923 |
| | | Longline | Eastern Indian Ocean | 647 | 1,436 | -788 |
| | | Other | Eastern Indian Ocean | 603 | 117 | 487 |
| | | Purse seine | Eastern Indian Ocean | 63 | 868 | -806 |
| **2016** | | Baitboat | Eastern Indian Ocean | 101 | 0 | 101 |
| | | Gillnet | Eastern Indian Ocean | 3,315 | 661 | 2,654 |
| | | Line | Eastern Indian Ocean | 7,853 | 2,815 | 5,038 |
| | | Longline | Eastern Indian Ocean | 938 | 1,517 | -579 |

| Year | Fleet | Fishery group | Area | Current (t) | Previous (t) | Difference (t) |
|---|---|---|---|---|---|---|
| | | Other | Eastern Indian Ocean | 255 | 94 | 161 |
| | | Purse seine | Eastern Indian Ocean | 68 | 696 | -628 |
| **2015** | | Baitboat | Eastern Indian Ocean | 261 | 0 | 261 |
| | | Gillnet | Eastern Indian Ocean | 2,808 | 695 | 2,113 |
| | | Line | Eastern Indian Ocean | 5,807 | 2,963 | 2,844 |
| | | Longline | Eastern Indian Ocean | 1,302 | 4,332 | -3,030 |
| | | Other | Eastern Indian Ocean | 516 | 98 | 418 |
| | | Purse seine | Eastern Indian Ocean | 64 | 733 | -669 |
| **2014** | | Baitboat | Eastern Indian Ocean | 288 | 0 | 288 |
| | | Gillnet | Eastern Indian Ocean | 2,348 | 707 | 1,641 |
| | | Line | Eastern Indian Ocean | 6,797 | 3,014 | 3,783 |
| | | Longline | Eastern Indian Ocean | 2,871 | 2,718 | 154 |
| | | Other | Eastern Indian Ocean | 477 | 100 | 377 |
| | | Purse seine | Eastern Indian Ocean | 62 | 745 | -683 |
| | YEM | Gillnet | Western Indian Ocean | 3,213 | 3,247 | -34 |
| | | Line | Western Indian Ocean | 132 | 98 | 34 |
| **2013** | IDN | Baitboat | Eastern Indian Ocean | 364 | 0 | 364 |
| | | Gillnet | Eastern Indian Ocean | 2,073 | 803 | 1,270 |
| | | Line | Eastern Indian Ocean | 11,402 | 3,422 | 7,980 |
| | | Longline | Eastern Indian Ocean | 5,762 | 5,845 | -83 |
| | | Other | Eastern Indian Ocean | 450 | 114 | 336 |
| | | Purse seine | Eastern Indian Ocean | 116 | 846 | -730 |
| | YEM | Gillnet | Western Indian Ocean | 3,212 | 3,294 | -82 |
| | | Line | Western Indian Ocean | 408 | 326 | 82 |
| **2012** | IDN | Baitboat | Eastern Indian Ocean | 265 | 0 | 265 |
| | | Gillnet | Eastern Indian Ocean | 2,673 | 687 | 1,986 |
| | | Line | Eastern Indian Ocean | 9,320 | 2,929 | 6,391 |
| | | Longline | Eastern Indian Ocean | 3,822 | 5,838 | -2,016 |
| | | Other | Eastern Indian Ocean | 490 | 97 | 392 |
| | | Purse seine | Eastern Indian Ocean | 23 | 724 | -701 |

| Year | Fleet | Fishery group | Area | Current (t) | Previous (t) | Difference (t) |
|---|---|---|---|---|---|---|
| | YEM | Gillnet | Western Indian Ocean | 2,762 | 2,917 | -155 |
| | | Line | Western Indian Ocean | 1,022 | 867 | 155 |
| **2011** | IDN | Baitboat | Eastern Indian Ocean | 191 | 0 | 191 |
| | | Gillnet | Eastern Indian Ocean | 2,411 | 690 | 1,720 |
| | | Line | Eastern Indian Ocean | 7,128 | 2,941 | 4,187 |
| | | Longline | Eastern Indian Ocean | 3,690 | 6,154 | -2,463 |
| | | Other | Eastern Indian Ocean | 368 | 98 | 270 |
| | | Purse seine | Eastern Indian Ocean | 37 | 727 | -690 |
| | YEM | Gillnet | Western Indian Ocean | 1,843 | 2,042 | -199 |
| | | Line | Western Indian Ocean | 2,107 | 1,908 | 199 |