REVIEW OF THE STATISTICAL DATA AVAILABLE FOR INDIAN OCEAN BILLFISH (1950-2025)

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Discussions (for information and open discussion):

The paper is to inform meeting participants of the billfish data currently available at the IOTC Secretariat, including recent submissions and revisions, data coverage and quality, and remaining data gaps. It also provides an update on catches of billfish species subject to Resolution 18/05, including the continued exceedance of established catch limits for three of the four species concerned.

Abstract

This paper reviews the fisheries, catch, and size data available for the five billfish species under the IOTC mandate, together with available information for shortbill spearfish, for the period 1950-2025. Total reported billfish catches have increased substantially over time, reaching a record level in 2025, largely due to recent reporting of catches from Somalia. The composition of billfish fisheries has changed markedly, with declining contributions from high-seas longline fisheries and increasing contributions from gillnet and coastal line fisheries, which now account for the majority of reported catches. Recent data submissions and revisions since WPB23 have improved the completeness of catch statistics and updated the catch series used for stock assessment, particularly for swordfish. The review also evaluates catches of species subject to Resolution 18/05 and indicates that reported catches of black marlin, striped marlin, and Indo-Pacific sailfish have exceeded their established catch limits for more than two consecutive years, while blue marlin catches exceeded the adopted catch limit in 2025. Particular emphasis is placed on recent submissions and revisions received since WPB23, current fishery characteristics, and the availability of fishery-dependent and biological data for billfish species in the Indian Ocean.

Keywords: billfish | black marlin | blue marlin | Indian Ocean | IOTC | marlins | shortbill spearfish | striped marlin | swordfish | tuna fisheries

Introduction

This paper reviews the fisheries, catch, effort, and size data available for the five billfish species under the IOTC mandate: black marlin (*Istiompax indica*), blue marlin (*Makaira nigricans*), sailfish (*Istiophorus platypterus*), striped marlin (*Kajikia audax*), and swordfish (*Xiphias gladius*). It has been prepared for consideration by the 24th Session of the IOTC Working Party on Billfish (WPB24). The paper also presents available data for shortbill spearfish (*Tetrapturus angustirostris*), a species not managed by the IOTC but subject to the same data collection and reporting requirements as IOTC-managed billfish species.

The analyses are based on data available to the IOTC Secretariat as of September 2026 and cover the period 1950-2025. The catch data presented in this review are consistent with those used in the Indian Ocean swordfish stock assessment covering 1950-2024 and presented in paper IOTC-2026-WPB24-27. Data for 2025 should be considered preliminary and may be subject to revision.

Particular emphasis is placed on recent submissions and revisions received since WPB23, current fishery characteristics, and issues relevant to stock assessment and the provision of scientific advice.

Nominal Catch Data

Historical Catch Trends (1950-2025)

Total reported catches of the five IOTC billfish species have increased over time, largely reflecting the development of industrial longline fisheries targeting swordfish (**Fig. 1**). Preliminary data for 2025 indicate a record catch exceeding 130,000 t, mainly due to the reporting of approximately 20,000 t of billfish catches by Somalia, which had not previously reported billfish catches to the IOTC.

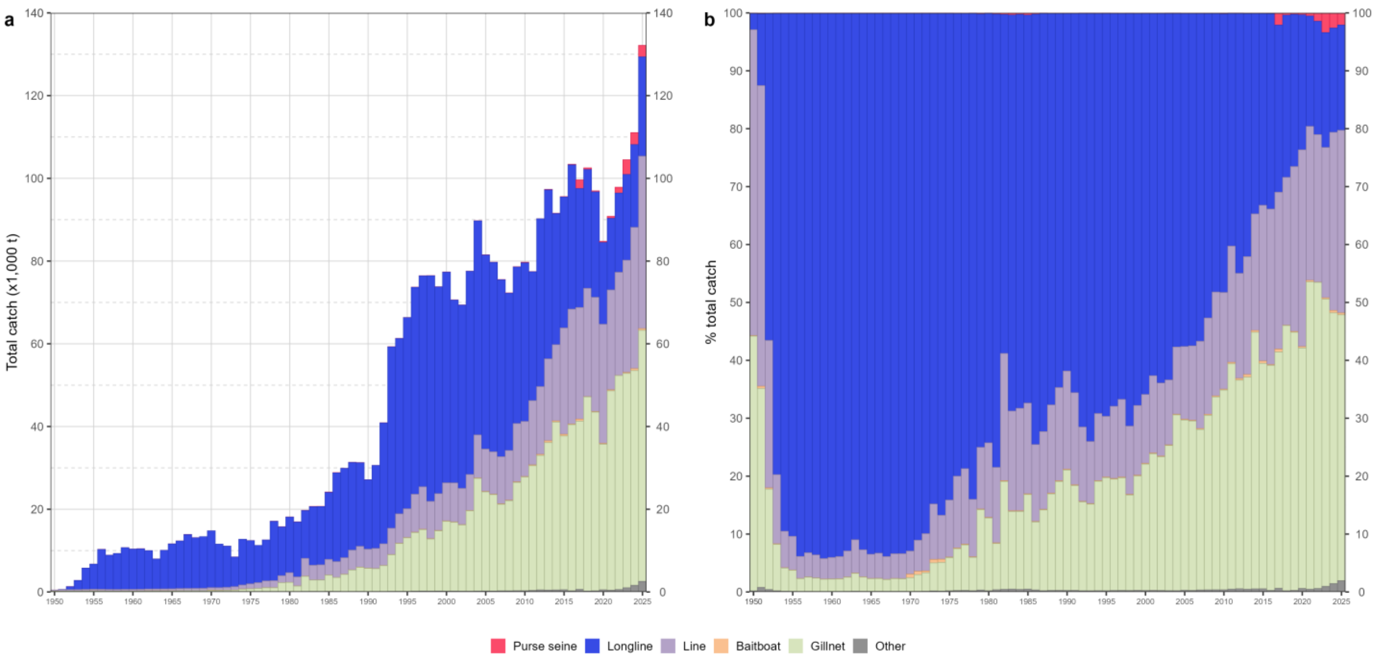

Figure 1: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of IOTC billfish by fishery group for the period 1950-2025

Catches of billfish from high-seas longline fisheries have declined over the past two decades, while catches reported from gillnet and coastal line fisheries have increased substantially (**Table 1**).

Table 1: Best scientific estimates of retained catches (metric tonnes; t) of the IOTC billfish species by decade and fishery for the period 1950-2025

Fishery	1950s	1960s	1970s	1980s	1990s	2000s	2010s	2020s
Purse seine | Other	1	2	8	44	32	51	338	1,904
Longline | Other	0	0	0	115	4,503	15,433	9,224	4,837
Longline | Fresh	64	107	244	970	5,235	7,169	10,653	7,540
Longline | Deep-freezing	5,041	10,448	10,551	15,630	30,662	22,563	13,331	7,777
Line | Coastal longline	188	251	457	1,465	3,269	5,894	13,993	15,184
Line | Trolling	116	180	348	945	1,995	2,939	3,327	5,755
Line | Handline	47	57	329	1,345	1,989	1,623	4,459	9,211
Baitboat	3	5	39	29	69	107	256	270
Gillnet	224	259	778	3,549	10,713	21,253	37,469	49,935
Other	6	10	24	82	138	215	394	1,111
Total	5,688	11,318	12,777	24,175	58,607	77,246	93,445	103,525

While shortbill spearfish (*Tetrapturus angustirostris*) is not currently considered an IOTC billfish species, it has been included in this review following recommendations from scientists. The relative contribution of the six billfish species reported from the Indian Ocean has varied considerably over time, with swordfish dominating catches from the 1990s to the 2010s and Indo-Pacific sailfish becoming the predominant species thereafter (**Fig. 2**). Although contributing only a small proportion of total billfish catches, reported catches of shortbill spearfish increased overall from the early 2010s and reached 4,700 t in 2025.

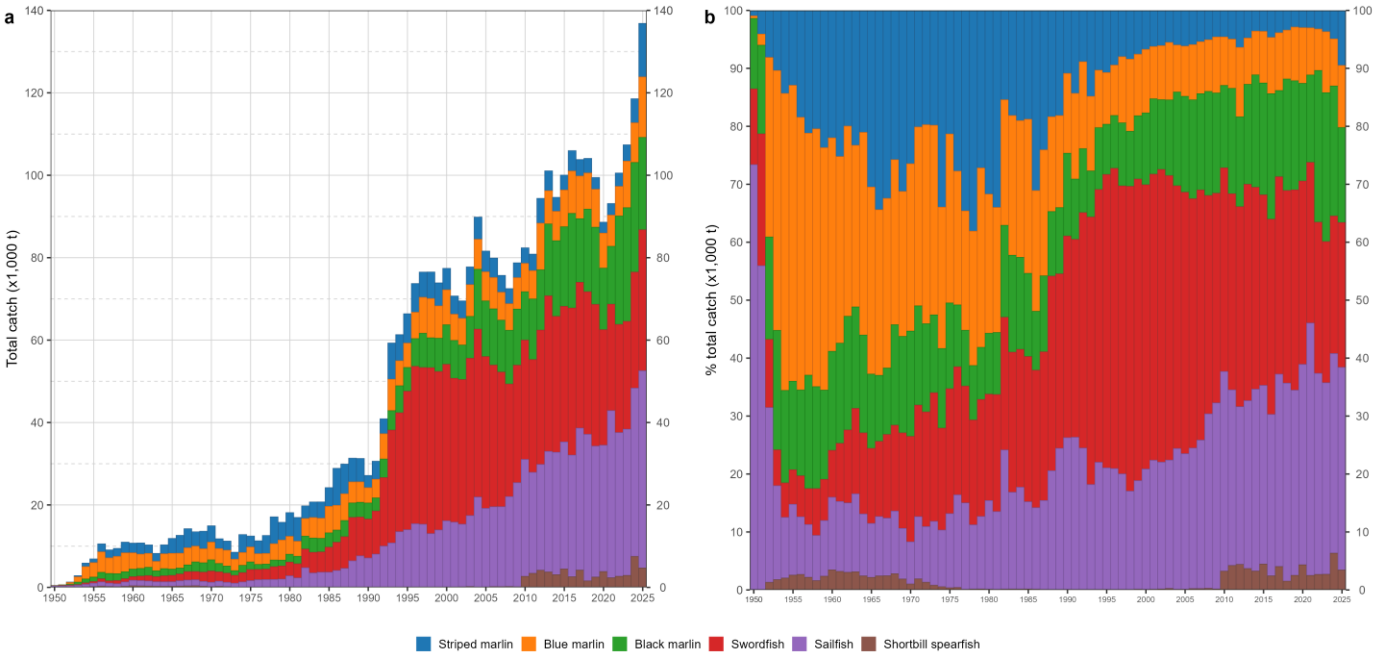

Figure 2: Annual time series of cumulative retained absolute (a) and relative (b) catches (metric tonnes; t) of IOTC billfish and shortbill spearfish by species for the period 1950-2025

Recent Fishery Features (2021-2025)

Over the recent period, gillnet fisheries accounted for approximately 50% of reported billfish catches (**Table 2**). Fisheries from I.R. Iran, India, Indonesia, and Sri Lanka were the main contributors to billfish catches, accounting for approximately two-thirds of the total catch reported between 2021 and 2025 (**Fig. 3**).

Table 2: 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 2021 and 2025

Fishery	Fishery code	Catch	Percentage
Gillnet	GN	52,880	49.3
Line | Coastal longline	LIC	15,341	14.3
Line | Handline	LIH	9,066	8.5
Longline | Fresh	LLF	7,635	7.1
Longline | Deep-freezing	LLD	7,542	7.0
Line | Trolling	LIT	6,011	5.6
Longline | Other	LLO	5,056	4.7
Purse seine | Other	PSOT	2,229	2.1
Other	OT	1,232	1.1
Baitboat	BB	282	0.3

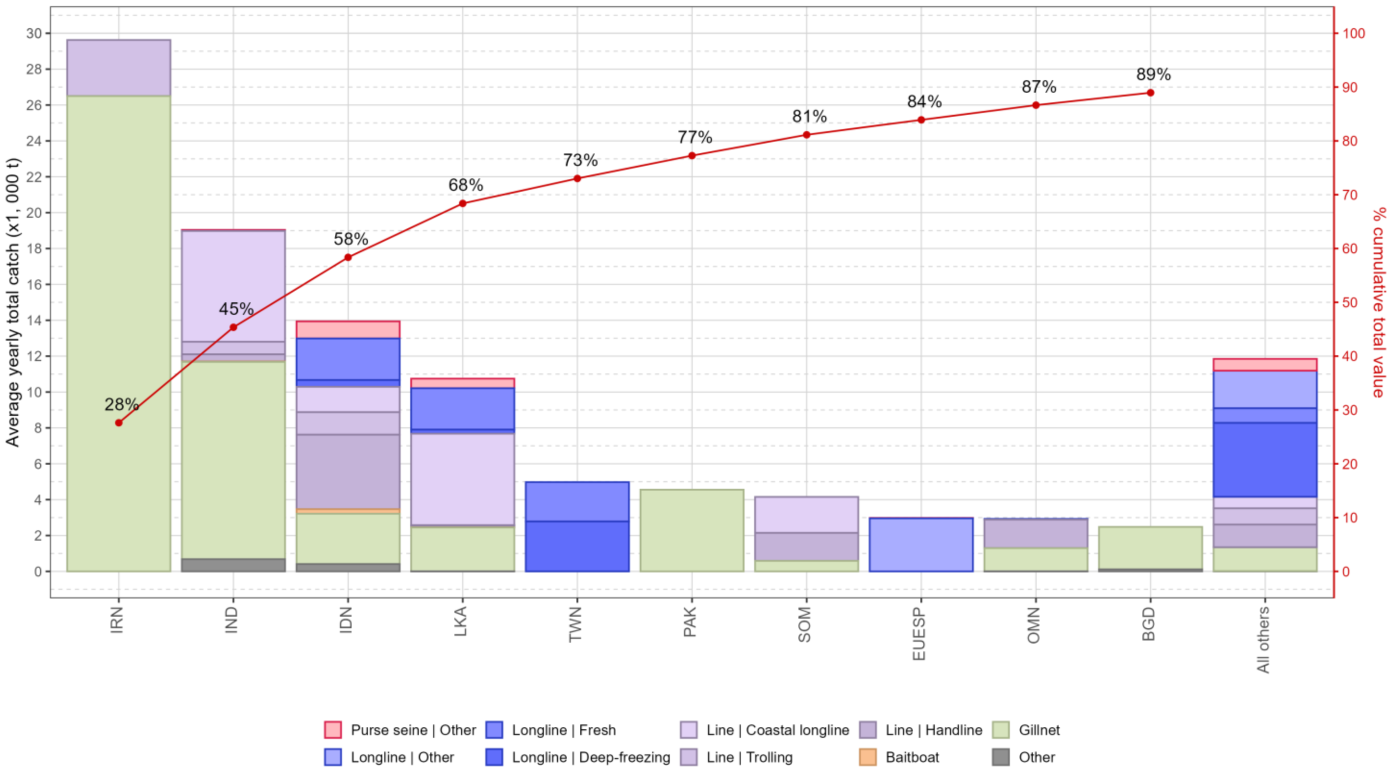

Figure 3: Mean annual catches of IOTC billfish species by fleet and fishery (metric tonnes; t) between 2021 and 2025 with indication of cumulative catches by fleet

Updates to Billfish Catch Data

Since the previous Working Party on Billfish in 2025 (WPB23), several CPCs have revised historical billfish catch statistics and submitted new data covering 2024 and 2025 (preliminary). These updates have resulted in modest changes to historical catch series while extending the time series available for all billfish species (Appendix III).

Given that swordfish is being assessed at WPB24, particular attention has been paid to changes in swordfish catches since the previous assessment conducted at WPB21 in 2023, which used data available up to 2021. New submissions and revisions have improved the coverage of recent years and revised catch estimates for some fleets and periods relative to those available to WPB21, particularly for Indonesia (see IOTC-2025-WPB23-07_6-SWO). The updated catch series therefore represents the best scientific information currently available on the fishery.

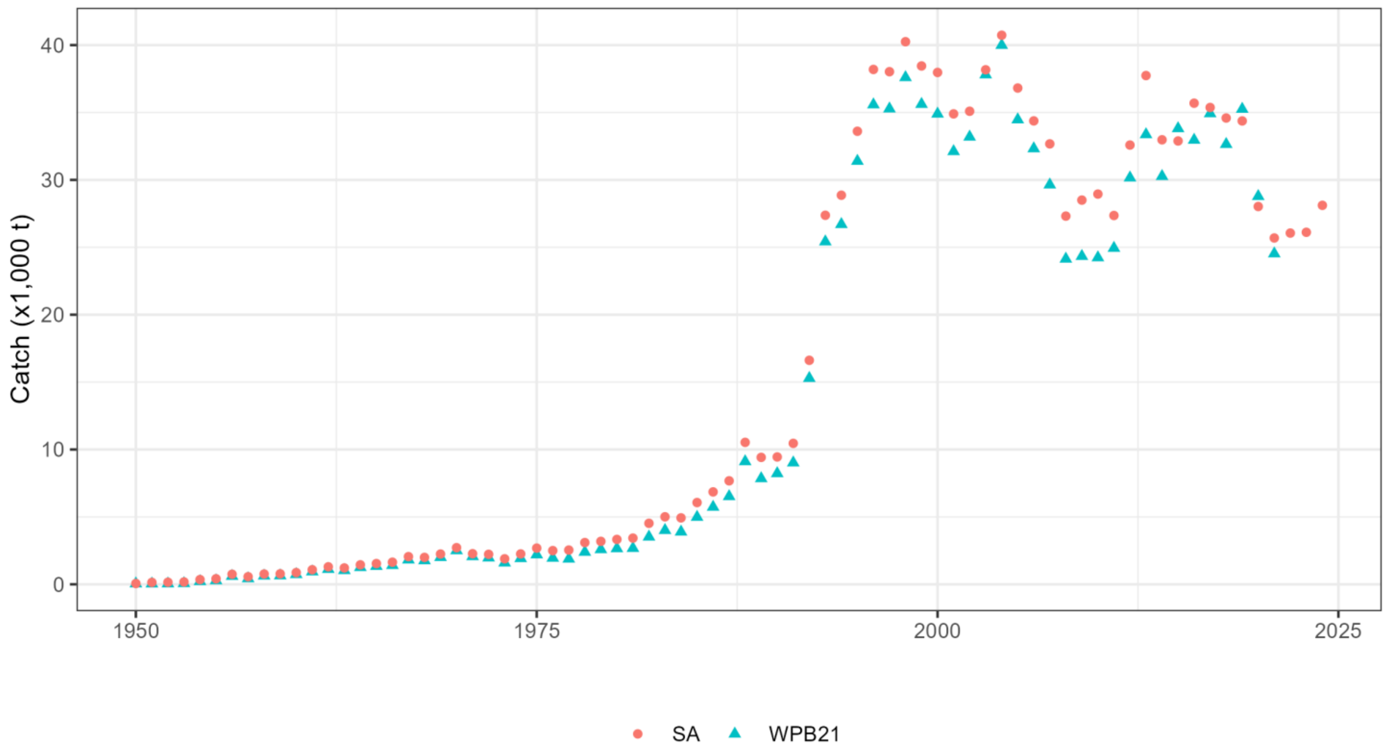

Figure 4: Differences in the available best scientific estimates of retained catches (metric tonnes; t) of swordfish used for the assessments of swordfish in 2023 (WPB21) and 2026 (WPB24)

Uncertainties in Retained Catch Data

The quality and completeness of billfish catch data reported to the IOTC Secretariat have improved substantially over the last three decades (**Fig. 5**). Improvements in national data collection programmes, increased reporting by major billfish-catching CPCs, and ongoing collaboration between CPCs and the Secretariat have reduced the reliance on estimated catches and increased the proportion of catch data reported at the species and fishery level.

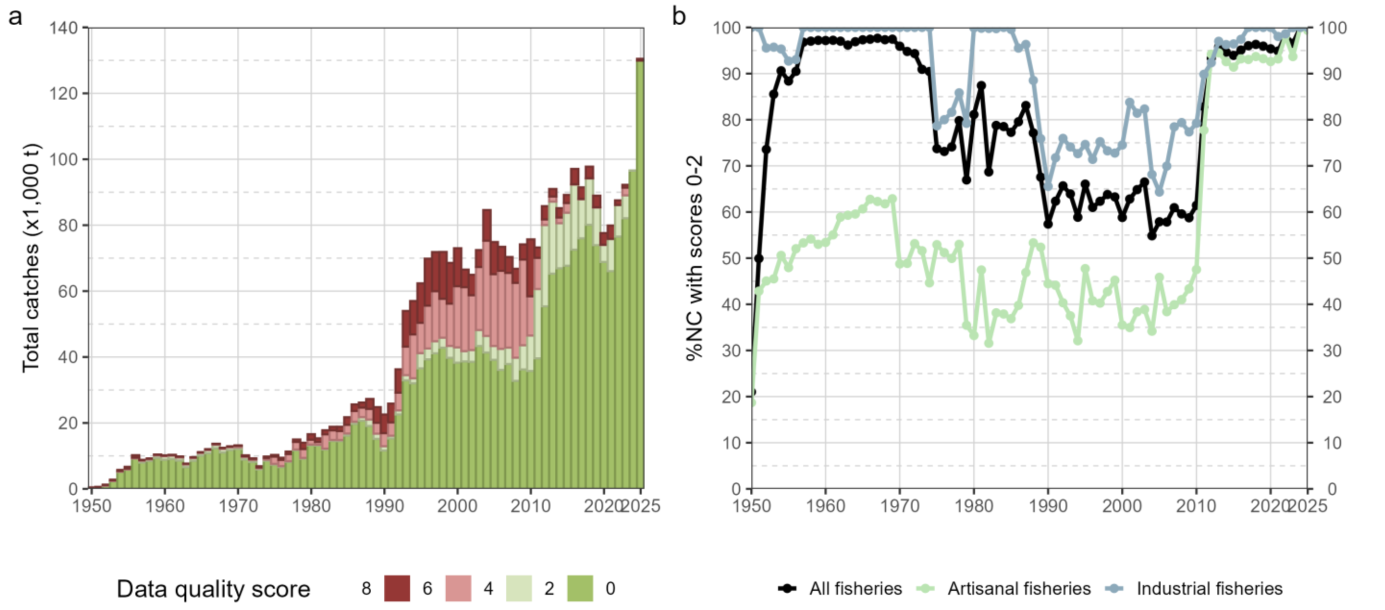

Figure 5: (a) Annual retained catches (metric tonnes; t) of IOTC billfish species estimated by quality score and (b) percentage of retained catches fully or partially reported to the IOTC Secretariat for all fisheries and by type of fishery, in the period 1950-2025

Despite these improvements, some uncertainty remains for historical datasets and certain fisheries, particularly where catches were reconstructed from alternative data sources or estimated using historical species and fishery compositions. Nevertheless, the overall trend indicates a marked increase in reporting quality and confidence in the nominal catch database used to support stock assessments and scientific advice.

Monitoring of Catch Limits Under Resolution 18/05

Paragraphs 2 and 3 of Resolution 18/05 require CPCs to endeavour to ensure that annual catches do not exceed species-specific limits ding to the estimated MSY level or, where unavailable, the lower limit of the MSY range of central values. The catch limits adopted by the Commission are 3,260 t for striped marlin, 9,932 t for black marlin, 11,930 t for blue marlin, and 25,000 t for Indo-Pacific sailfish.

The annual best scientific estimates of catch currently available to the Secretariat indicate that catches of black marlin, striped marlin, and Indo-Pacific sailfish have exceeded the limits established under Resolution 18/05 for more than two consecutive years (**Fig. 6**). In addition, blue marlin catches exceeded the catch limit by approximately 2,800 t in 2025. These results are relevant to Paragraph 4 of the Resolution, which calls for a review of the implementation and effectiveness of the measure where the average annual catch over any two consecutive years exceeds the established limit.

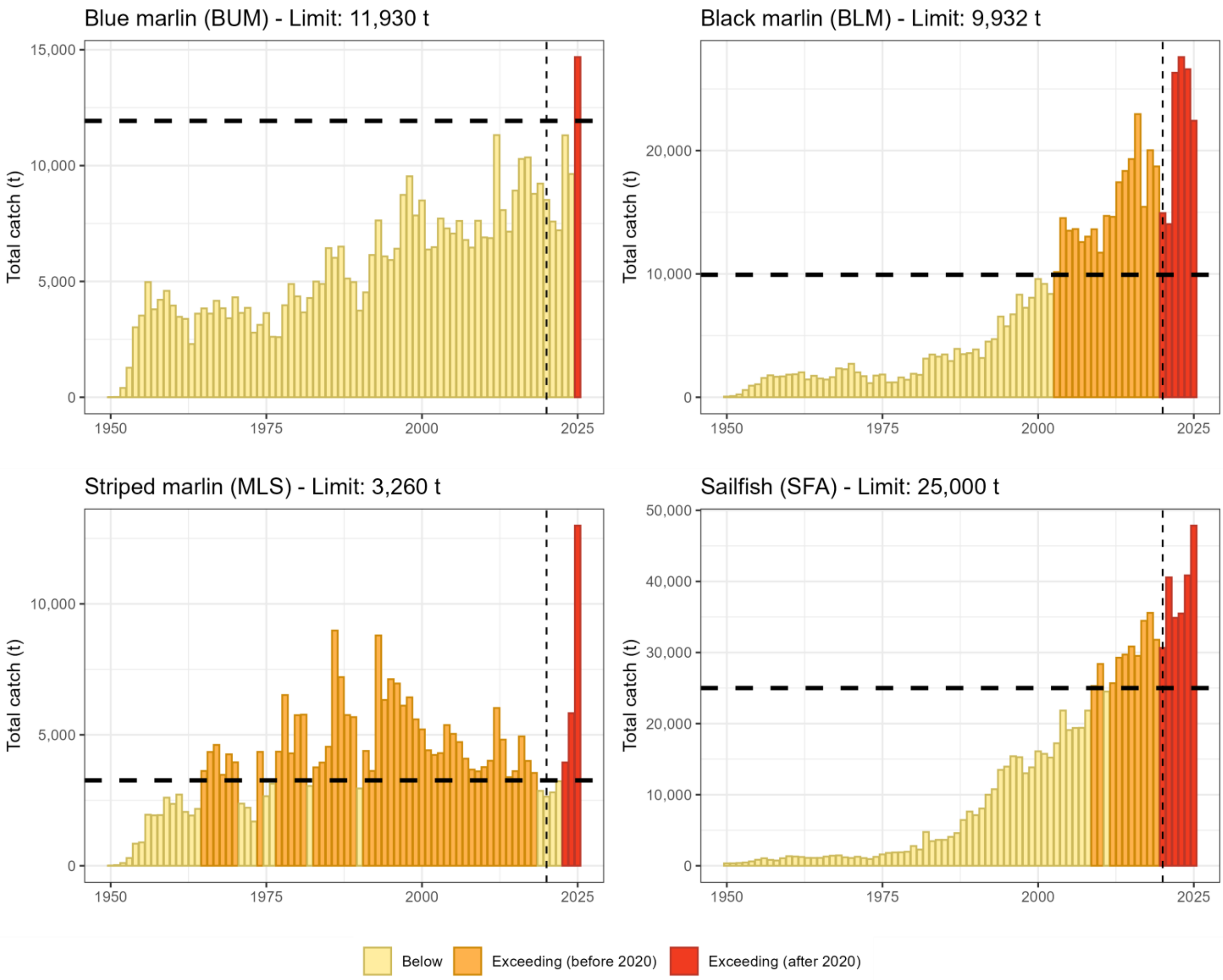

Figure 6: Best scientific estimates of retained catches (metric tonnes; t) of the four billfish species subject to catch limits under Resolution 18/05 for the period 1950-2025

Geo-Referenced Catch and Effort Data

Spatial Distribution of the Catch

The recent spatial distribution of billfish catches remains broadly consistent with previous reviews, with catches occurring throughout tropical and subtropical waters of the Indian Ocean. While longline fisheries continue to dominate reported catches across much of the high seas, improved reporting from gillnet fisheries has revealed a wider offshore distribution of catches in the northern Indian Ocean than previously documented.

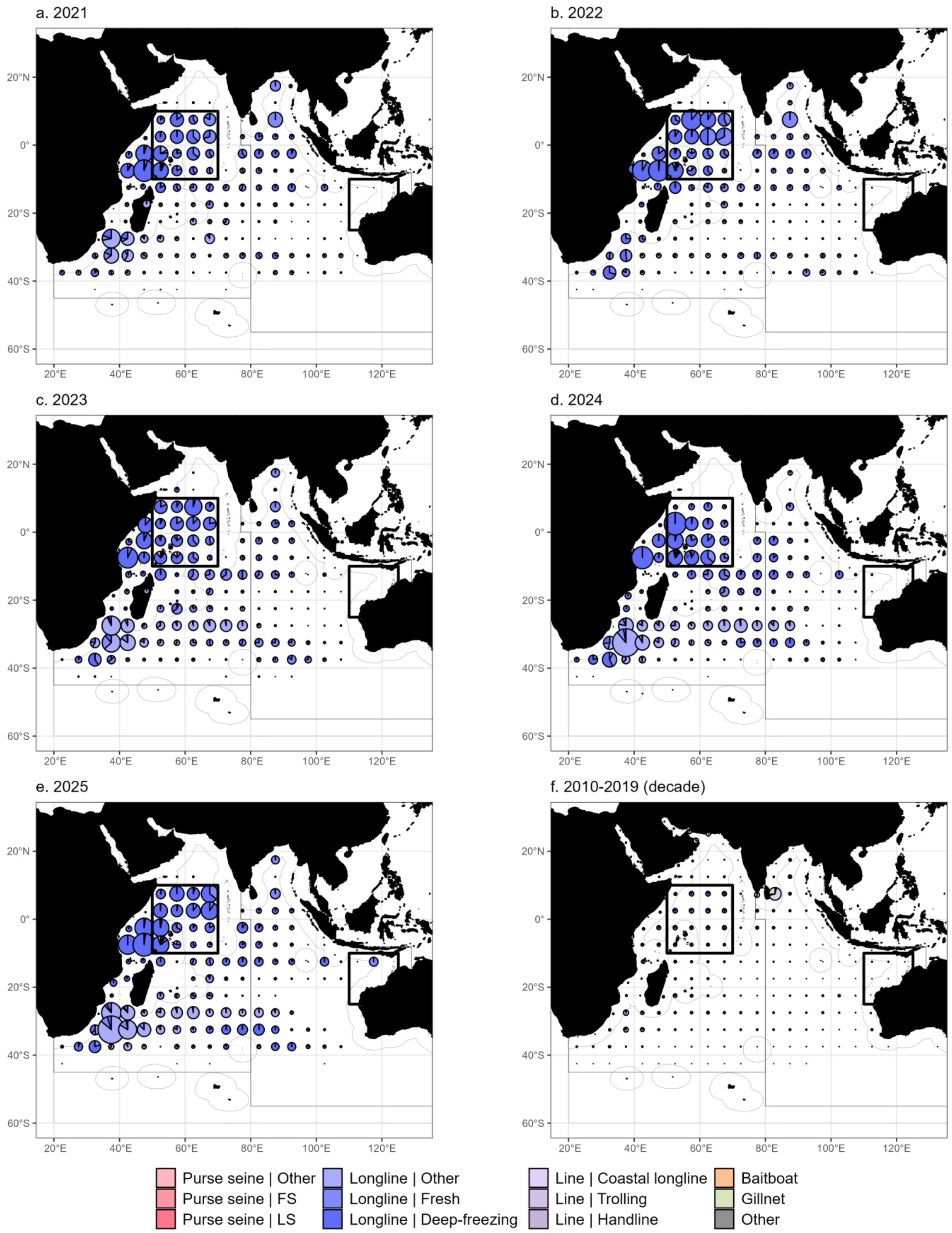

Figure 7: Mean annual time-area catches (in number of fish) of billfish for the last decade 2010-2019 and each year during the recent period 2021-2025. Black solid lines represent the marlin main longline fishing grounds identified by the IOTC WPB

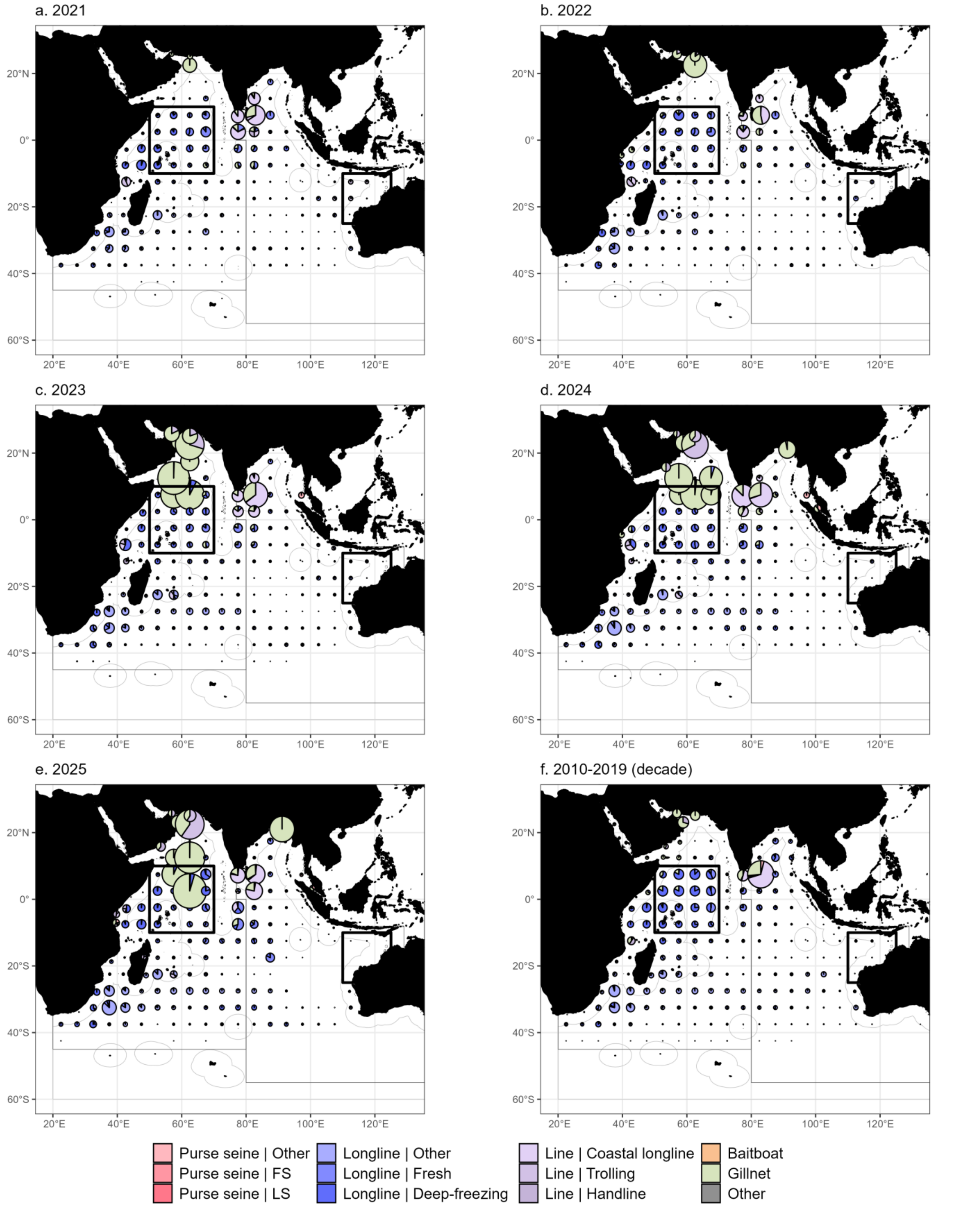

Figure 8: Mean annual time-area catches (metric tonnes; t) of billfish for the last decade 2010-2019 and each year during the recent period 2021-2025. Black solid lines represent the marlin main longline fishing grounds identified by the IOTC WPB

Uncertainties in Geo-Referenced Catch and Effort Data

The quality and availability of geo-referenced catch and effort data for billfish remain a source of uncertainty for stock assessments despite improvements in recent years (**Fig. 9**). The main gaps are associated with India, Indonesia, and Pakistan, which together accounted for approximately 35% of reported billfish catches in recent years.

During the period when billfish catches were dominated by industrial fisheries (1950-1990), more than 70% of catches were supported by geo-referenced data. Reporting quality declined in the 2000s as the contribution of coastal fisheries increased, reaching an average of 38% during that decade. More recently, improved data submissions from Sri Lanka and the Islamic Republic of Iran increased the proportion of geo-referenced catches to an average of 66% between 2021 and 2025.

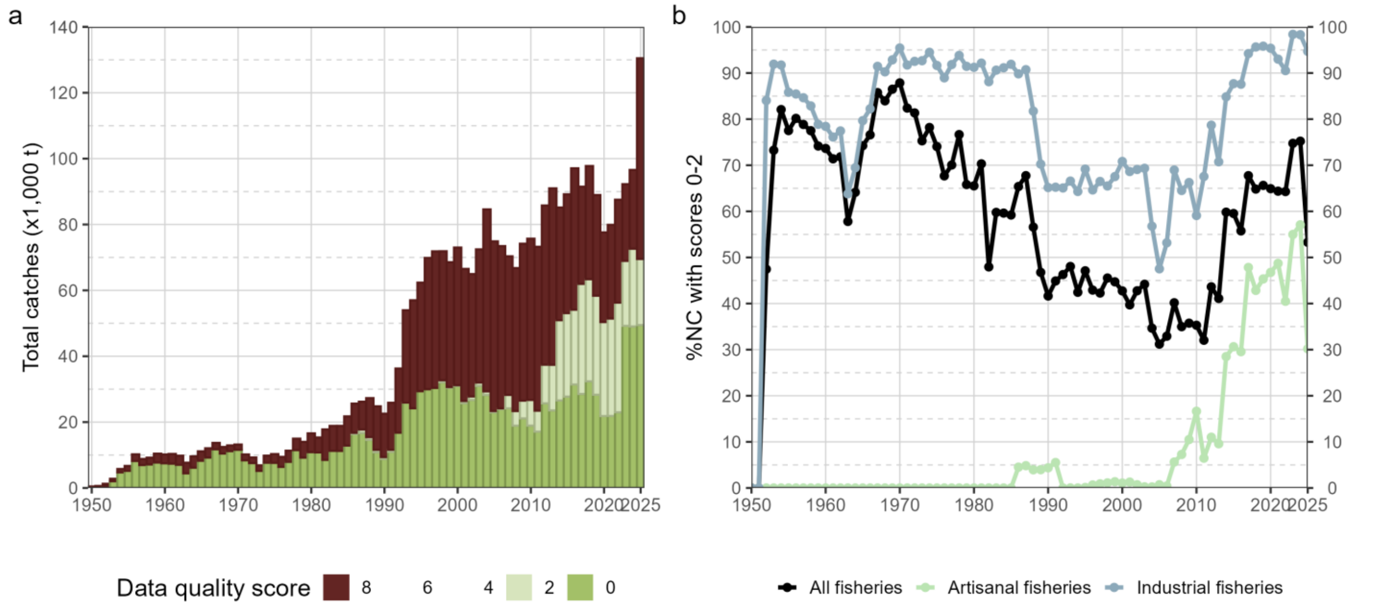

Figure 9: (a) Annual retained catches of IOTC billfish species (metric tonnes; t) estimated by quality score and (b) percentage of retained catches by type of fishery with good quality information (i.e., logbook coverage >30% and compliant with IOTC standards) for the corresponding geo-referenced catch and effort data reported to the IOTC Secretariat

Size-Frequency Data

Size Data Availability

Size-frequency data available to the Secretariat remain dominated by industrial longline fisheries (**Fig. 10**), particularly those of Taiwan,China, Japan, and Seychelles. In contrast, several CPCs with substantial billfish catches, including India, the Islamic Republic of Iran, Pakistan, and Sri Lanka, have reported little size-frequency data for billfish species over time. As a result, the available size data are not representative of the full range of fisheries exploiting billfish in the Indian Ocean.

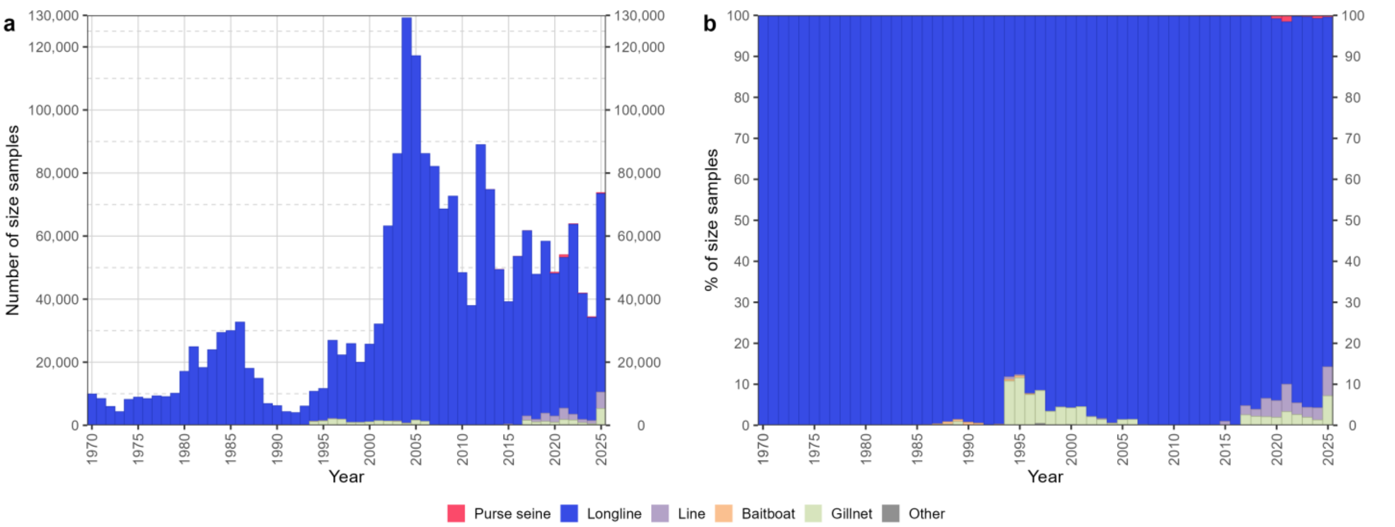

Figure 10: (a) Annual number and (b) relative proportion (%) of billfish standard size samples available by fishery group at the IOTC Secretariat. Samples only reported as raised to the strata are not included

Swordfish accounts for the majority of size-frequency samples available to the Secretariat, reflecting the relatively good sampling coverage achieved in industrial longline fisheries (**Fig. 11**). In contrast, species primarily caught in coastal and artisanal fisheries, particularly sailfish, remain poorly represented in the available datasets. The limited availability of size data from coastal fisheries continues to constrain analyses of population structure, size composition, and fishery selectivity. Furthermore, unusual patterns observed in some longline datasets highlight the need for a comprehensive review of billfish size data quality and reporting practices as done for tropical tunas ([Hoyle et al. 2021](#)).

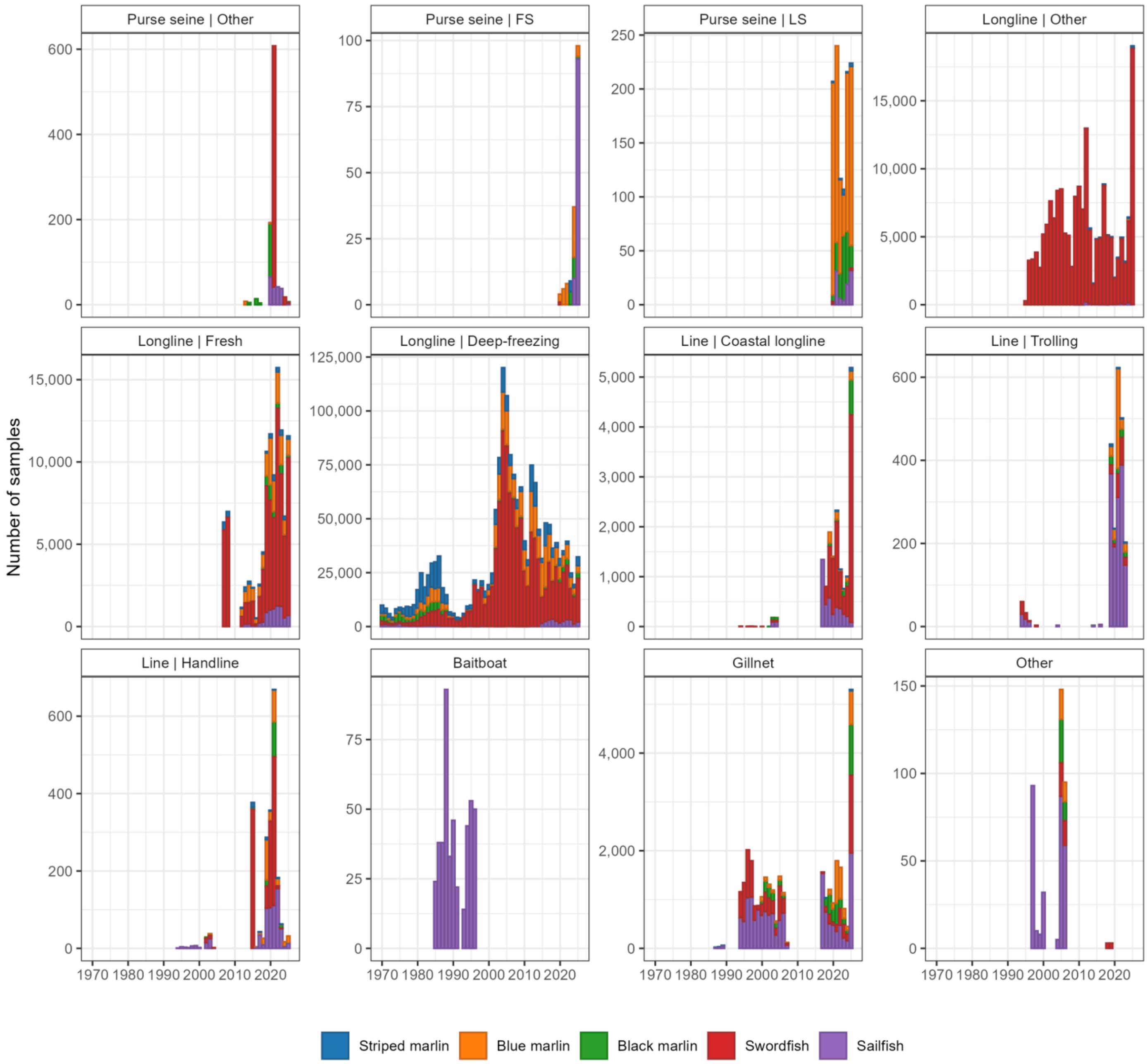

Figure 11: Annual number of billfish standard size samples by species and fishery based on unraised samples available at the Secretariat

Despite improvements in data availability, the coverage and representativeness of billfish size-frequency data remain highly variable among species and fisheries. Consequently, substantial uncertainty remains for some of the major billfish fisheries in the Indian Ocean.

Uncertainties in Size-Frequency data

The reporting quality of geo-referenced size-frequency data for billfish has varied considerably over time (**Fig. 12**). Coverage was generally highest during periods when industrial longline fisheries dominated billfish catches but declined with the increasing contribution of coastal fisheries. Following a marked reduction during the COVID-19 period, the quality of reported size-frequency data improved in recent years, although important gaps remain for several major fisheries.

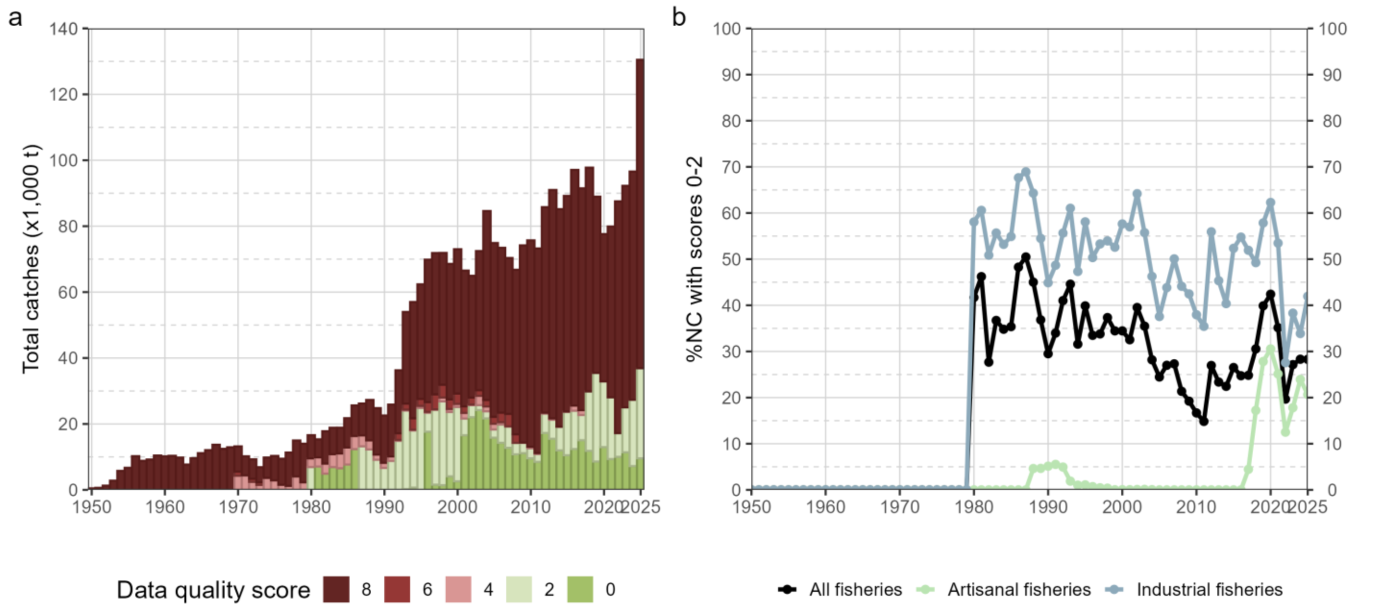

Figure 12: (a) Annual retained catches of IOTC billfish species (metric tonnes; t) estimated by quality score and (b) percentage of retained catches by type of fishery with good quality information (i.e., >1 fish per t caught and compliant with IOTC standards) for the corresponding geo-referenced size-frequency data reported to the IOTC Secretariat

References

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

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

Appendices

Appendix I: Disaggregation Process

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 4 species aggregates including IOTC billfish species have been used by some CPCs for reporting retained catch data (**Table 3**).

Table 3: Species groups including billfish species used for reporting retained catches to the IOTC Secretariat

Species code	Species name	BLM	BUM	MLS	SFA	SPF	SSP	SWO	WHM
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 (**Table 4**).

Table 4: 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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix II: Morphometrics for billfish

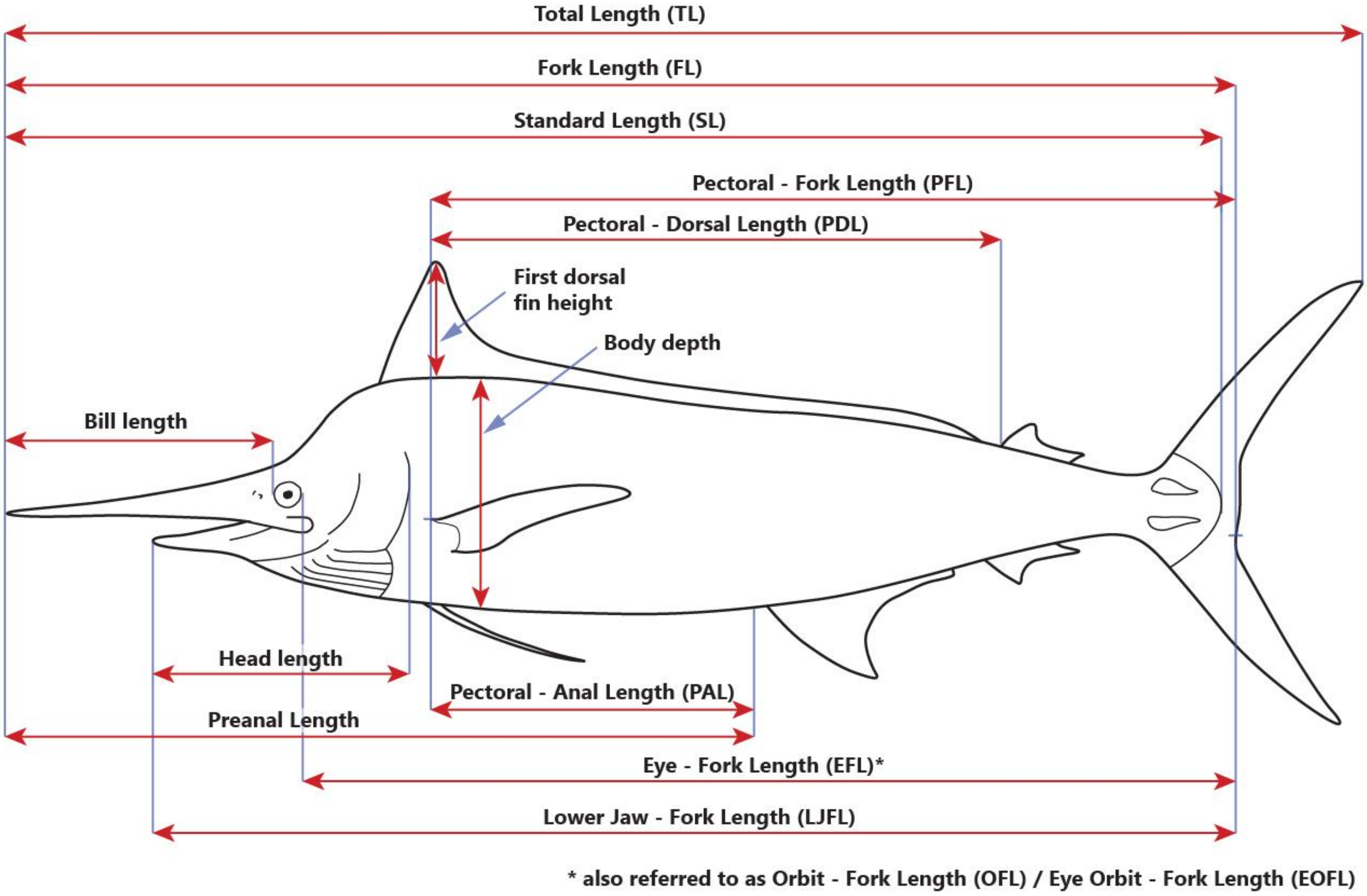

Figure 13: Types of length measurements used for billfish (source: Fishider). See Measurement code list from the IOTC Reference Data Catalogue

Table 5: 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 6: 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)*
		Indian	RD = a*LJFL^b	NA	NA		
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: Changes in Best Nominal Catches from Previous Working Party

Table 7: Changes in best scientific estimates of retained billfish catches (t), by year, fleet, fishery group, and main Indian Ocean area, between the datasets used for the current and previous WPB assessments. Only changes exceeding 10 t in absolute value are shown

Year	Fleet	Fishery group	Area	Current (t)	Previous (t)	Difference (t)
2023	IDN	Baitboat	Eastern Indian Ocean	236	0	236
		Gillnet	Eastern Indian Ocean	3,255	782	2,473
		Line	Eastern Indian Ocean	7,508	3,109	4,400
		Longline	Eastern Indian Ocean	2,939	913	2,027
		Other	Eastern Indian Ocean	995	103	892
		Purse seine	Eastern Indian Ocean	332	1,081	-748
	JPN	Longline	Eastern Indian Ocean	291	350	-59
		Longline	Western Indian Ocean	140	179	-39
	SAU	Gillnet	Western Indian Ocean	43	8	35
	TMP	Gillnet	Eastern Indian Ocean	29	114	-85
2022	BGD	Gillnet	Eastern Indian Ocean	1,610	1,534	76
		Other	Eastern Indian Ocean	306	0	306
	JPN	Longline	Eastern Indian Ocean	427	447	-20
		Longline	Western Indian Ocean	96	112	-16
2021	BGD	Gillnet	Eastern Indian Ocean	1,394	1,329	65
		Other	Eastern Indian Ocean	199	0	199