



## REVIEW OF THE STATISTICAL DATA AVAILABLE FOR INDIAN OCEAN BLACK MARLIN (1950-2020)

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### Abstract

The document provides an overview of the consolidated knowledge about fisheries catching black marlin (*Istiompax indica*) in the Indian Ocean since the early 1950s based on a range of data sets collected by Contracting Parties and Cooperating Non-Contracting Parties (CPCs) of the IOTC and curated by the IOTC Secretariat. The available fisheries statistics indicate that black marlins are mostly caught in artisanal fisheries which represented more than 70% of the total catch of black marlin in 2020. Total catches of black marlin with gillnets and small longlines in the coastal waters of I.R. Iran, India, Sri Lanka, Indonesia, Pakistan, and Oman have shown a major increasing trend over the last decade with catches from large-scale longline fisheries experiencing a major decline since 2008. Information available on discarding practices of black marlin in industrial fisheries indicates that discard levels are small in longline fisheries while black marlins are more often discarded in large-scale purse seine fisheries, although in small quantities. Discarding in coastal fisheries interacting with the species is poorly known but considered to be negligible. Information available on the spatial distribution of catch and effort has substantially improved over the last decade and shows that black marlins are mostly caught in the north west part of the Indian Ocean, with important catches reported along the coasts of the Arabian Sea, India, and Sri Lanka. The reporting of size-frequency data has slightly improved over the last decade but remains very limited for most artisanal and industrial fisheries.

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

## Introduction

The overarching objective of this paper is to provide participants in the data preparatory meeting of the 20<sup>th</sup> Session of the IOTC Working Party on Billfish ([WPB20](#)) with a review of the status of the information available on black marlin (*Istiompax indica*), in the Indian Ocean through temporal and spatial trends in catches and their main recent features, as well as an assessment of the reporting quality of the data sets. A full description of the data collated and curated by the Secretariat is available in IOTC ([2022](#)).

## Nominal catch

### Historical trends (1950-2020)

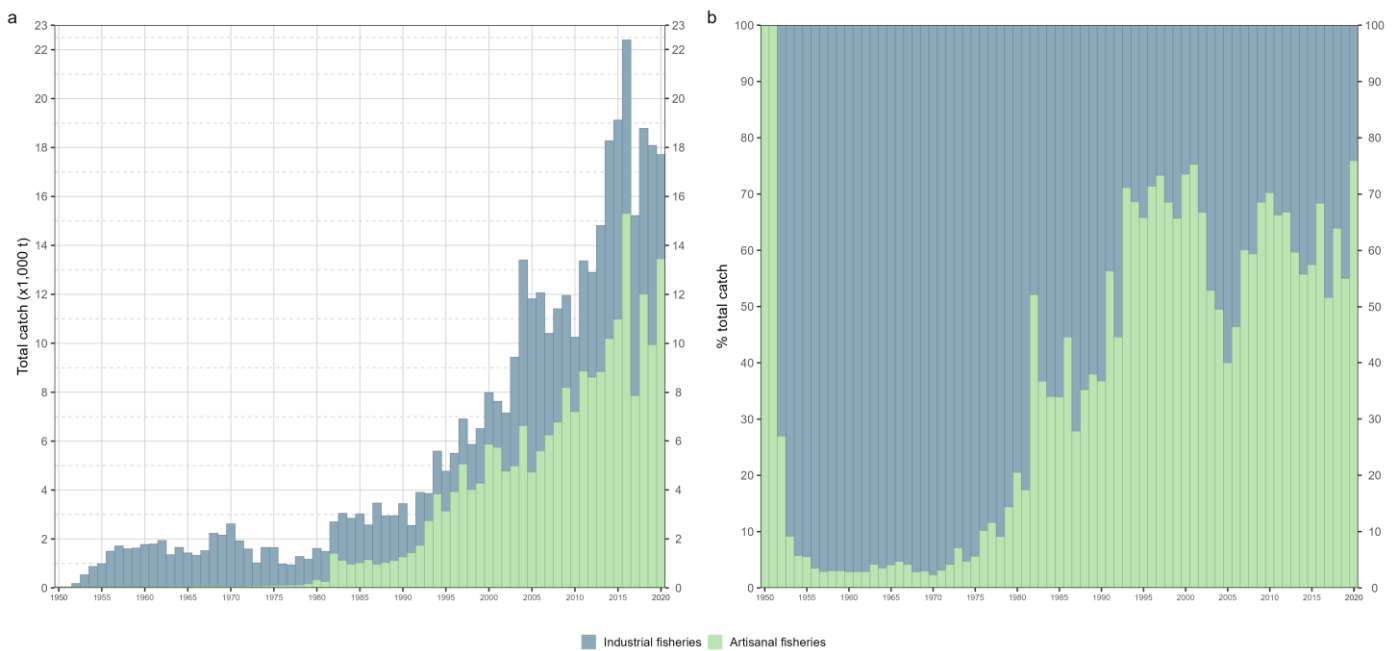


Figure 1: Annual time series of cumulative nominal absolute (a) and relative (b) catches (metric tons; t) of black marlin by type of fishery for the period 1950-2020. Data source: [best scientific estimate of nominal catches](#)

Table 1: Best scientific estimates of average annual nominal catches (metric tons; t) of black marlin by decade and fishery for the period 1950-2019. The background intensity color of each cell is directly proportional to the catch level. Data source: [best scientific estimate of nominal catches](#)

Fishery	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Purse seine   Other	0	0	4	65	96	193	481
Longline   Other	0	0	0	30	866	1,809	692
Longline   Fresh	0	0	24	55	596	1,236	1,165
Longline   Deep-freezing	862	1,661	1,367	1,669	962	724	842
Line   Coastal longline	16	15	21	163	302	705	3,558
Line   Trolling	8	11	20	25	63	122	330
Line   Handline	1	1	1	259	361	197	516
Baitboat	0	0	0	0	0	0	1
Gillnet	26	31	44	368	1,628	5,306	8,667
Other	0	0	2	32	17	33	71
<b>Total</b>	<b>912</b>	<b>1,719</b>	<b>1,483</b>	<b>2,667</b>	<b>4,891</b>	<b>10,325</b>	<b>16,322</b>

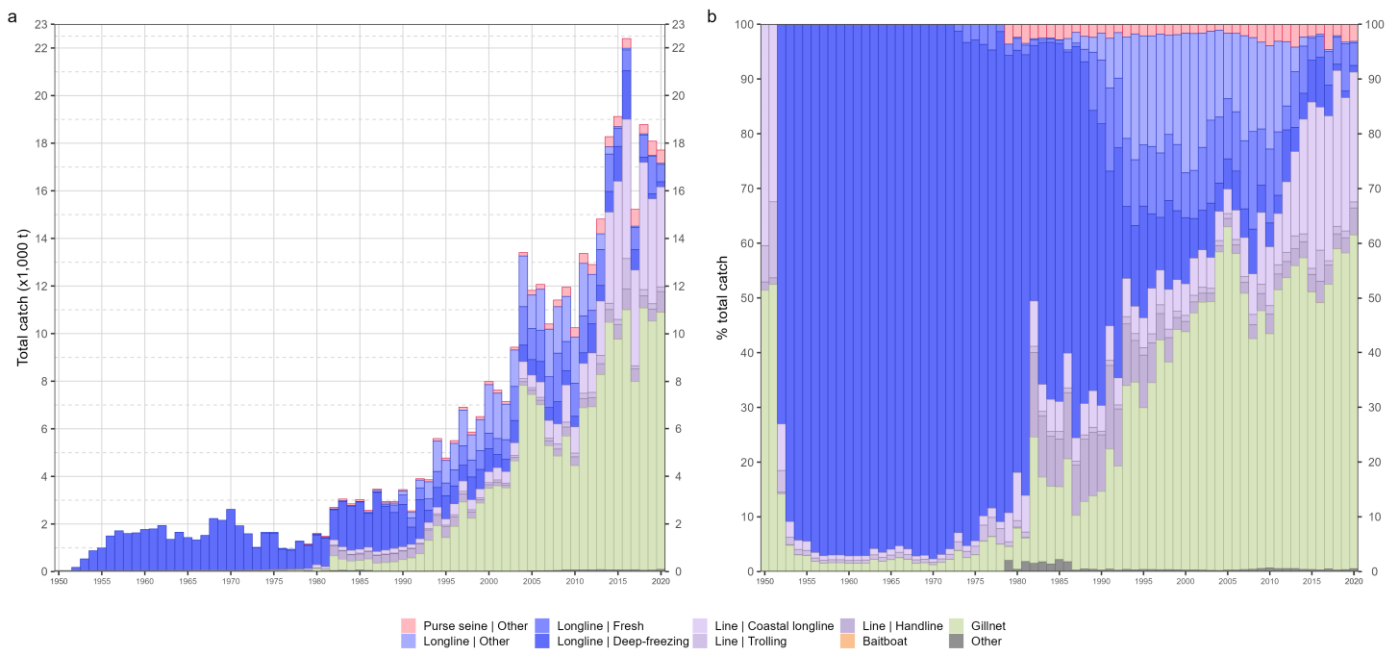


Figure 2: Annual time series of cumulative nominal absolute (a) and relative (b) catches (metric tons; t) of black marlin by fishery for the period 1950-2020. Data source: [best scientific estimate of nominal catches](#)

Table 2: Best scientific estimates of annual nominal catches (metric tons; t) of black marlin by fishery for the period 2011-2020. The background intensity color of each cell is directly proportional to the catch level. Data source: [best scientific estimate of nominal catches](#)

Fishery	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Purse seine   Other	417	412	621	428	429	406	707	393	590	555
Longline   Other	2,212	1,516	661	304	60	73	55	48	54	50
Longline   Fresh	1,549	562	1,510	1,572	770	874	932	932	1,566	730
Longline   Deep-freezing	445	1,223	653	866	1,461	2,038	857	216	216	215
Line   Coastal longline	1,254	1,662	2,285	3,831	5,810	5,856	4,028	5,347	4,407	4,201
Line   Trolling	223	218	347	263	212	1,275	117	261	224	194
Line   Handline	386	383	458	536	606	872	540	511	504	875
Baitboat	0	0	0	0	6	5	0	1	0	1
Gillnet	6,810	6,854	8,197	10,400	9,696	10,930	7,910	11,020	10,463	10,799
Other	72	71	82	74	73	69	77	55	64	94
<b>Total</b>	<b>13,370</b>	<b>12,902</b>	<b>14,813</b>	<b>18,276</b>	<b>19,122</b>	<b>22,397</b>	<b>15,222</b>	<b>18,785</b>	<b>18,088</b>	<b>17,714</b>

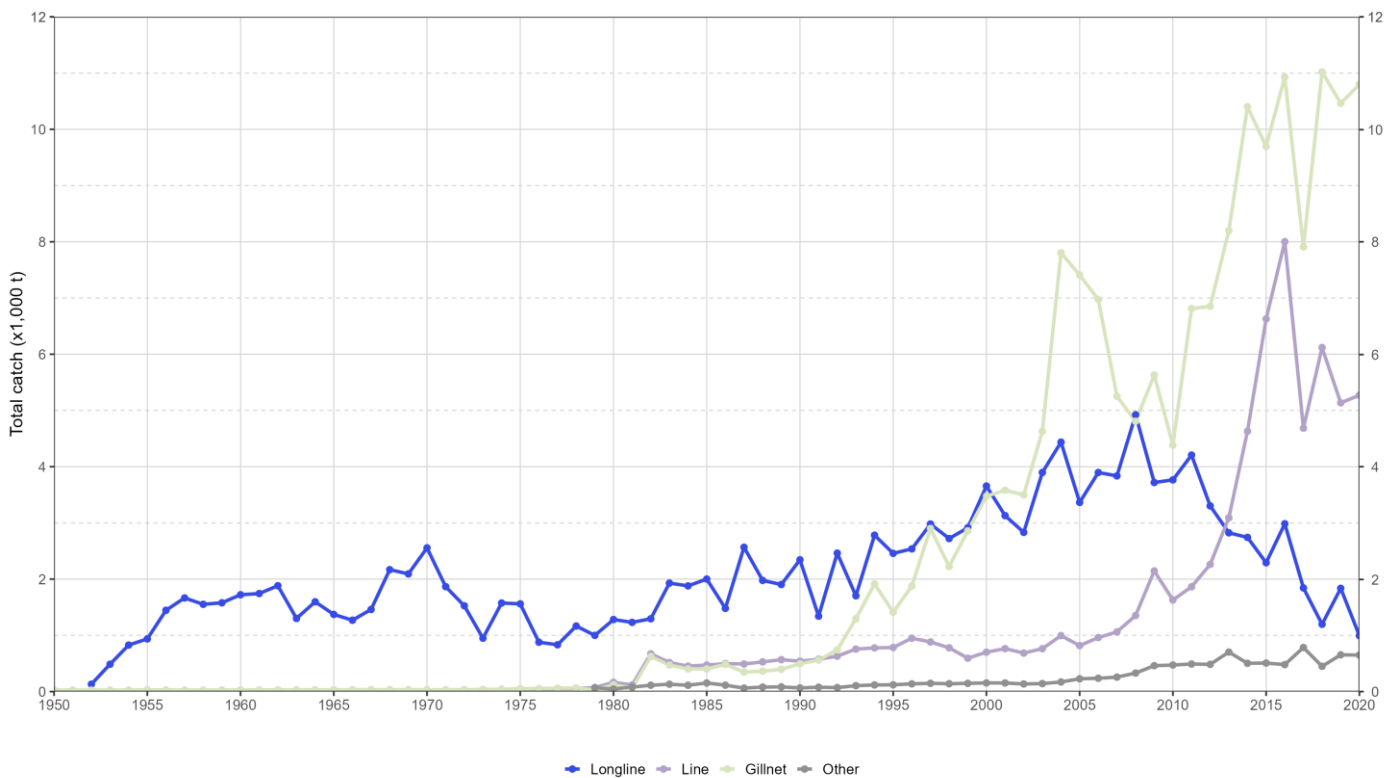


Figure 3: Annual time series of nominal catches (metric tons; t) of black marlin by fishery group for the period 1950-2020. Data source: [best scientific estimate of nominal catches](#)

### Main fishery features (2016-2020)

Table 3: Mean annual catches (metric tons; t) of black marlin by fishery between 2016 and 2020. Data source: [best scientific estimate of nominal catches](#)

Fishery	Fishery code	Catch	Percentage
Gillnet	GN	10,224	55.4
Line   Coastal longline	LIC	4,768	25.9
Longline   Fresh	LLF	1,007	5.5
Longline   Deep-freezing	LLD	708	3.8
Line   Handline	LIH	660	3.6
Purse seine   Other	PSOT	530	2.9
Line   Trolling	LIT	414	2.2
Other	OT	72	0.4
Longline   Other	LLO	56	0.3
Baitboat	BB	1	0.0

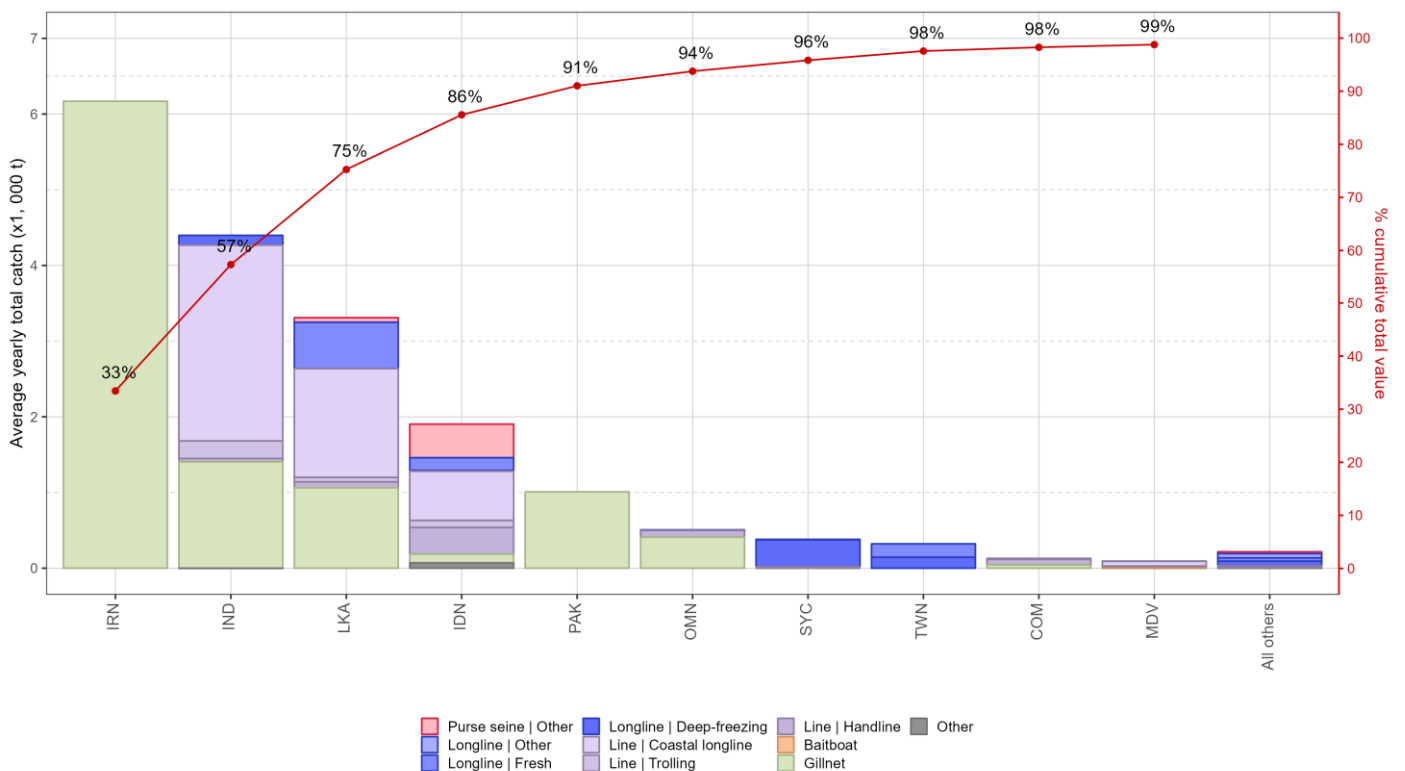


Figure 4: Mean annual catches (metric tons; t) of black marlin by fleet and fishery between 2016 and 2020, with indication of cumulative catches by fleet. Data source: [best scientific estimate of nominal catches](#)

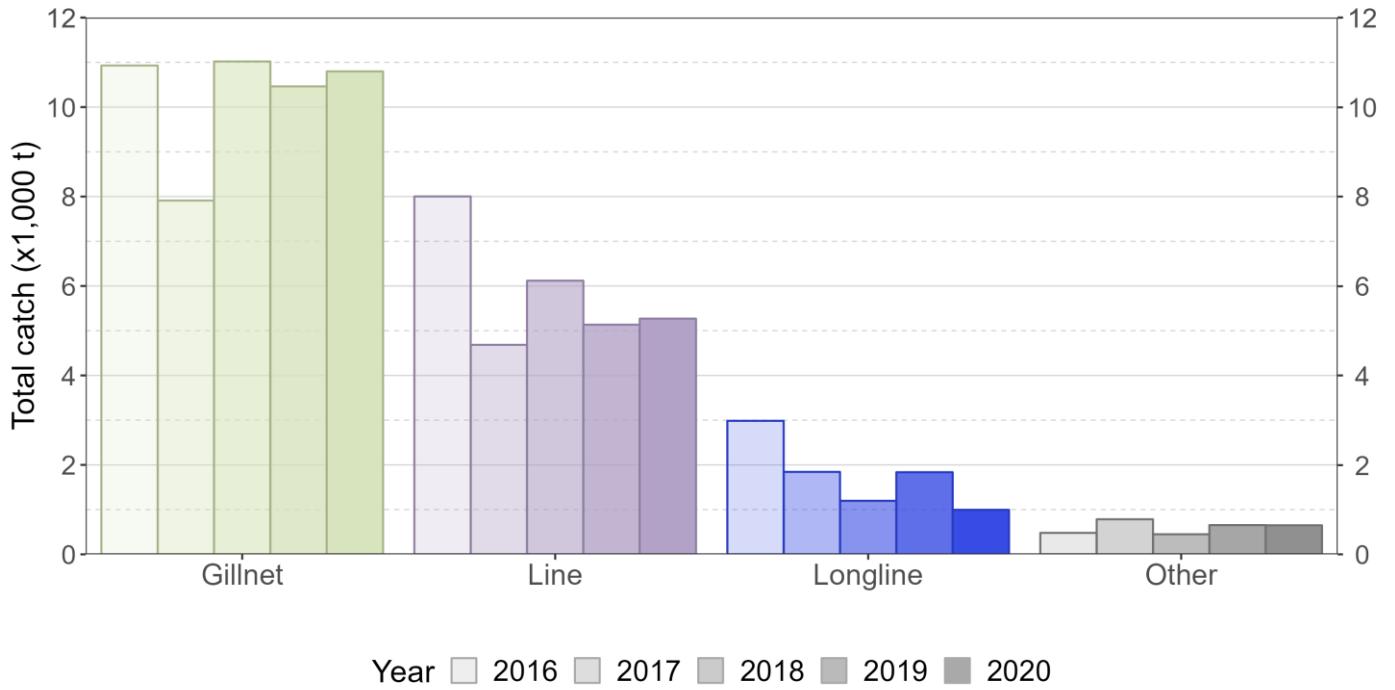


Figure 5: Annual catch (metric tons; t) trends of black marlin by fishery group between 2016 and 2020. Data source: [best scientific estimate of nominal catches](#)

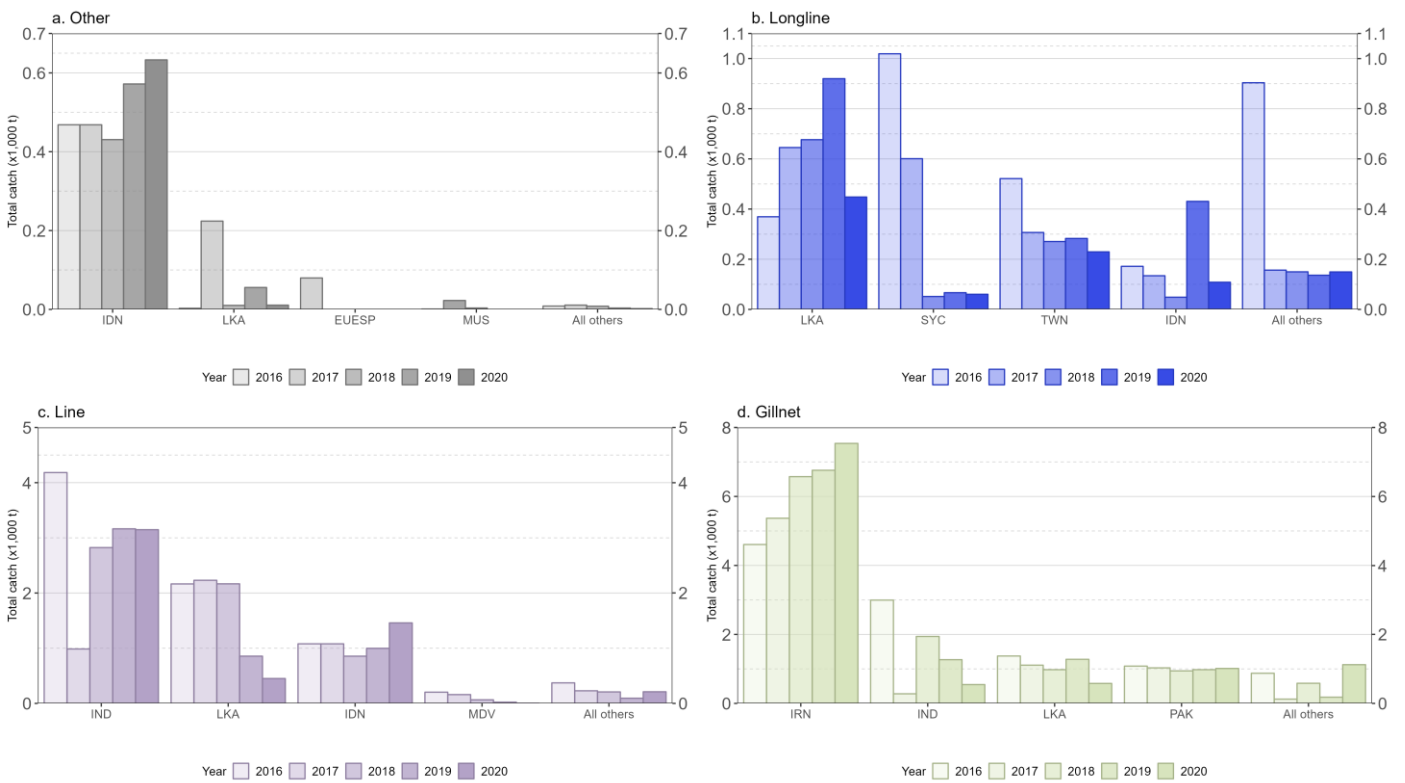


Figure 6: Annual catch (metric tons; t) trends of black marlin by fishery group and fleet between 2016 and 2020. Data source: [best scientific estimate of nominal catches](#)

## Changes from previous WPB

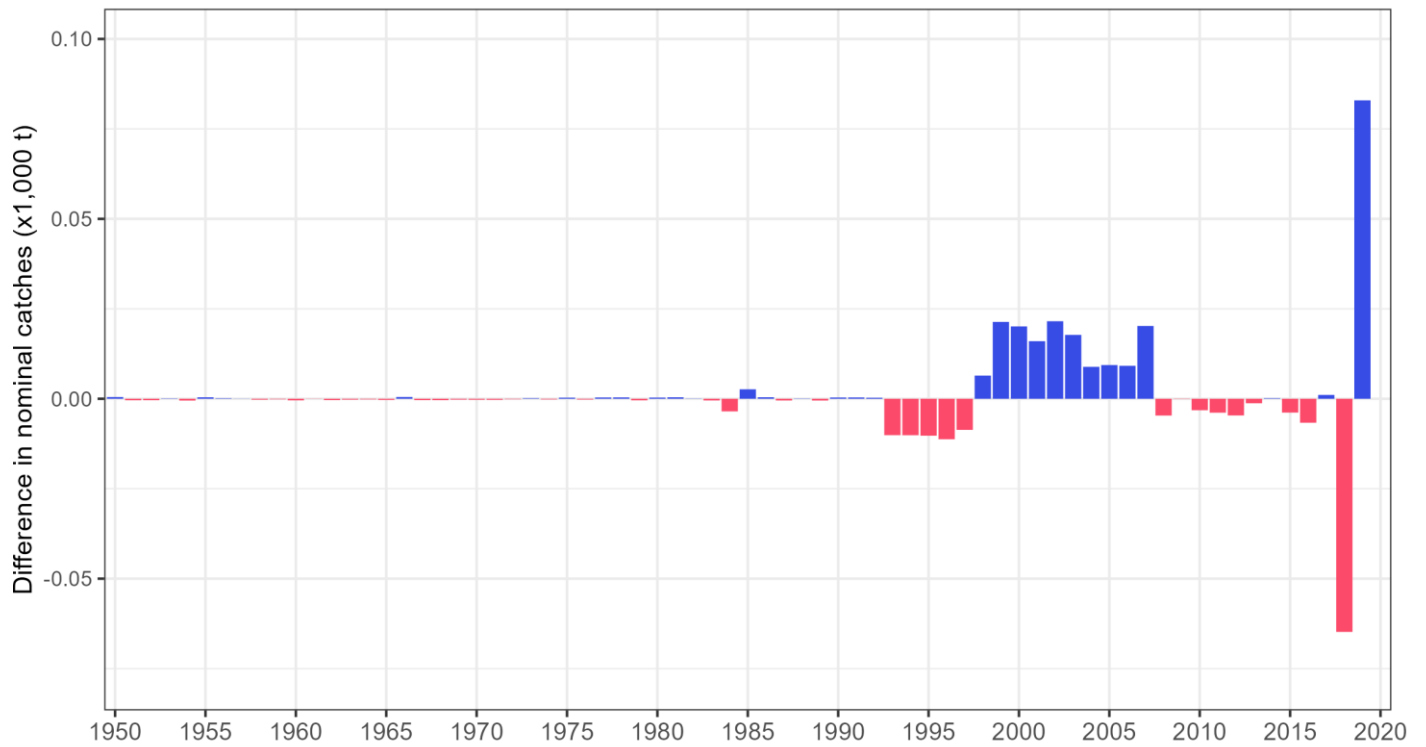


Figure 7: Differences in the available best scientific estimates of nominal catches (metric tons; t) of black marlin between this WPB and its previous session ([WPB19](#) meeting held in September 2021)

### Uncertainties in nominal catch data

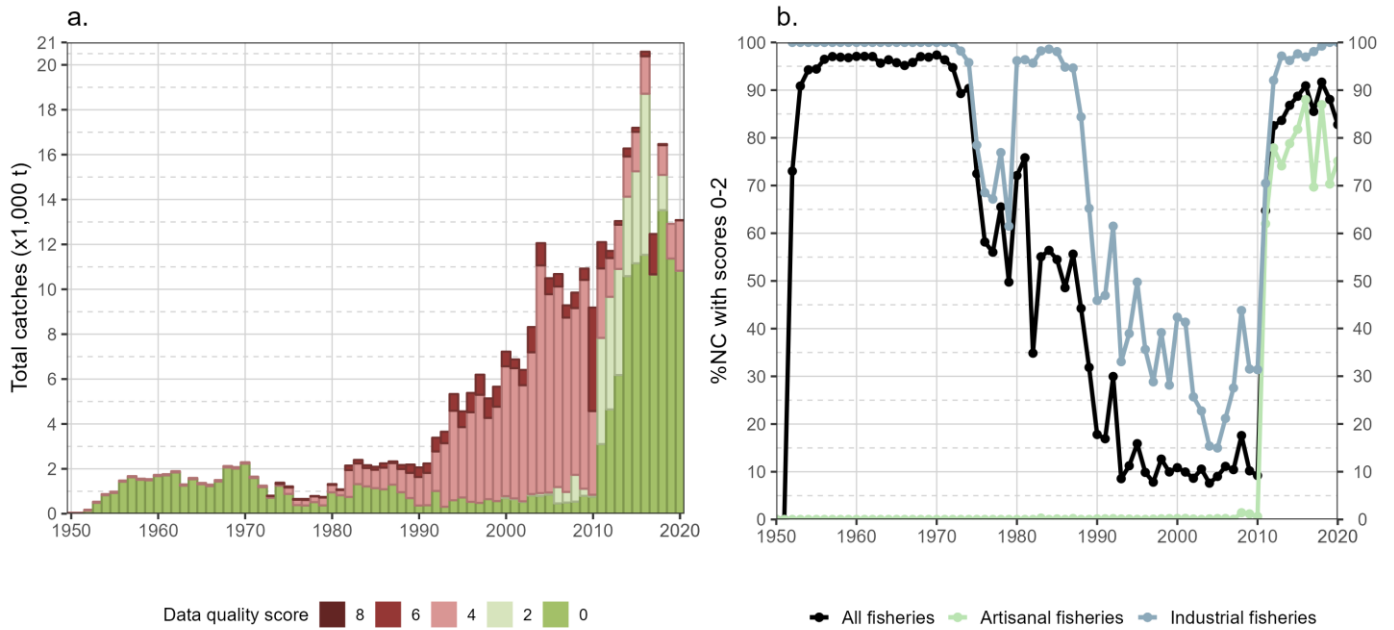


Figure 8: (a) Annual nominal catches (metric tons; t) of black marlin estimated by quality score and (b) percentage of nominal catches fully or partially reported to the IOTC Secretariat for all fisheries and by type of fishery, in the period 1950-2020

### Discard levels

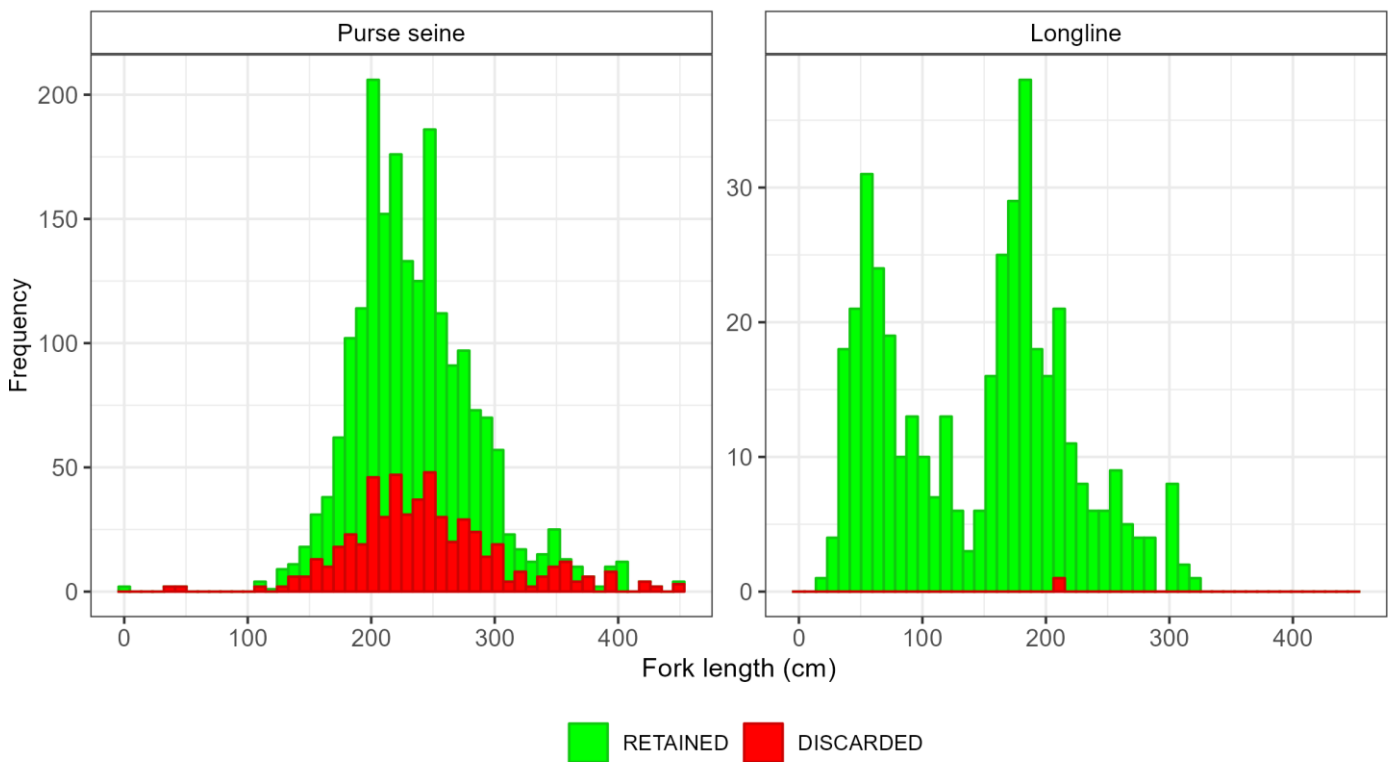


Figure 9: Size (fork length; cm) frequency distribution of black marlin retained and discarded at sea in purse seine and longline fisheries as available in the ROS regional database



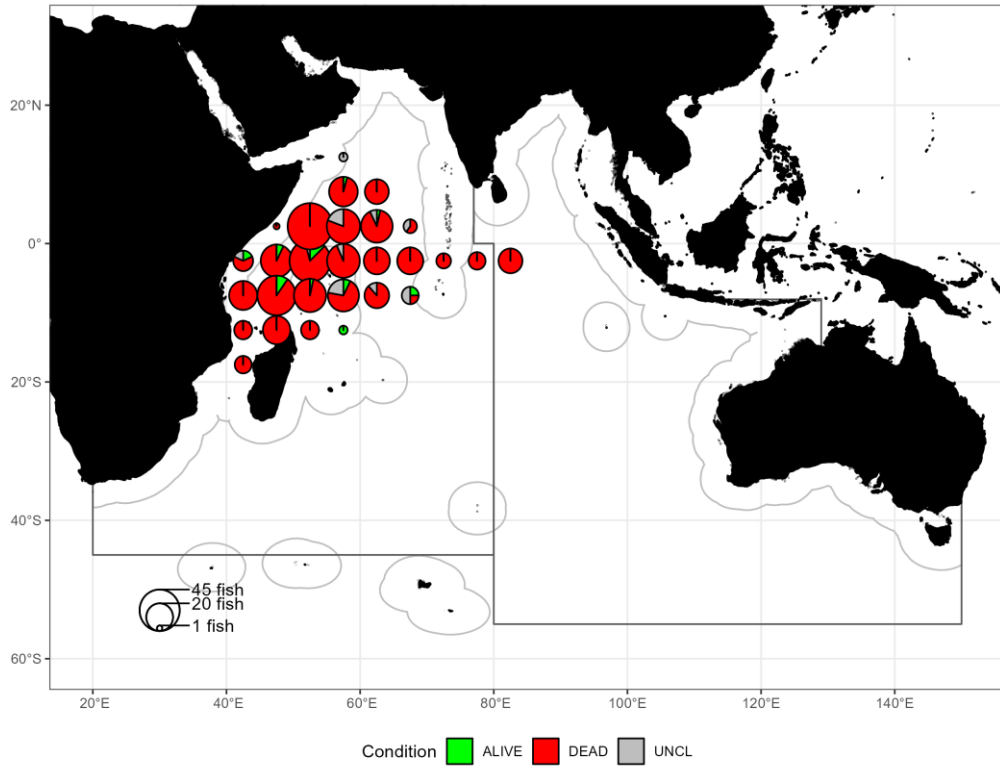


Figure 10: Distribution of black marlins discarded at sea in the western Indian Ocean purse seine fisheries with information on condition at release as available in the ROS regional database

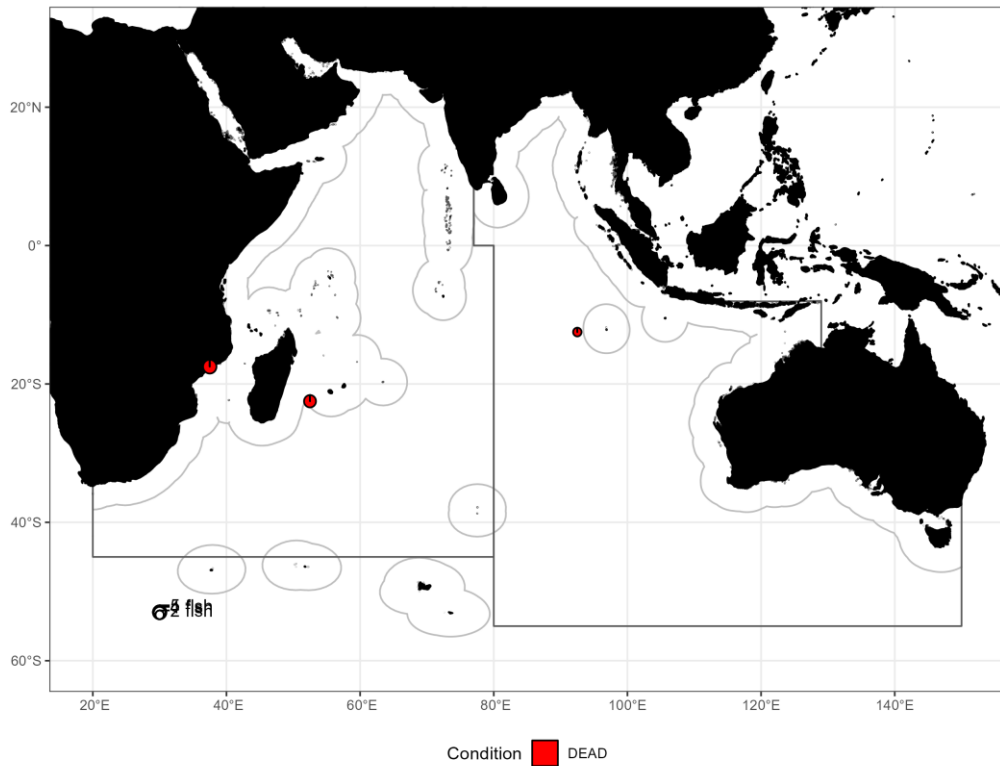


Figure 11: Distribution of black marlins discarded at sea in the Indian Ocean longline fisheries with information on condition at release as available in the ROS regional database

# Geo-referenced catch

## Spatial distribution of catches

### Geo-referenced catches by fishery and decade (1950-2009)

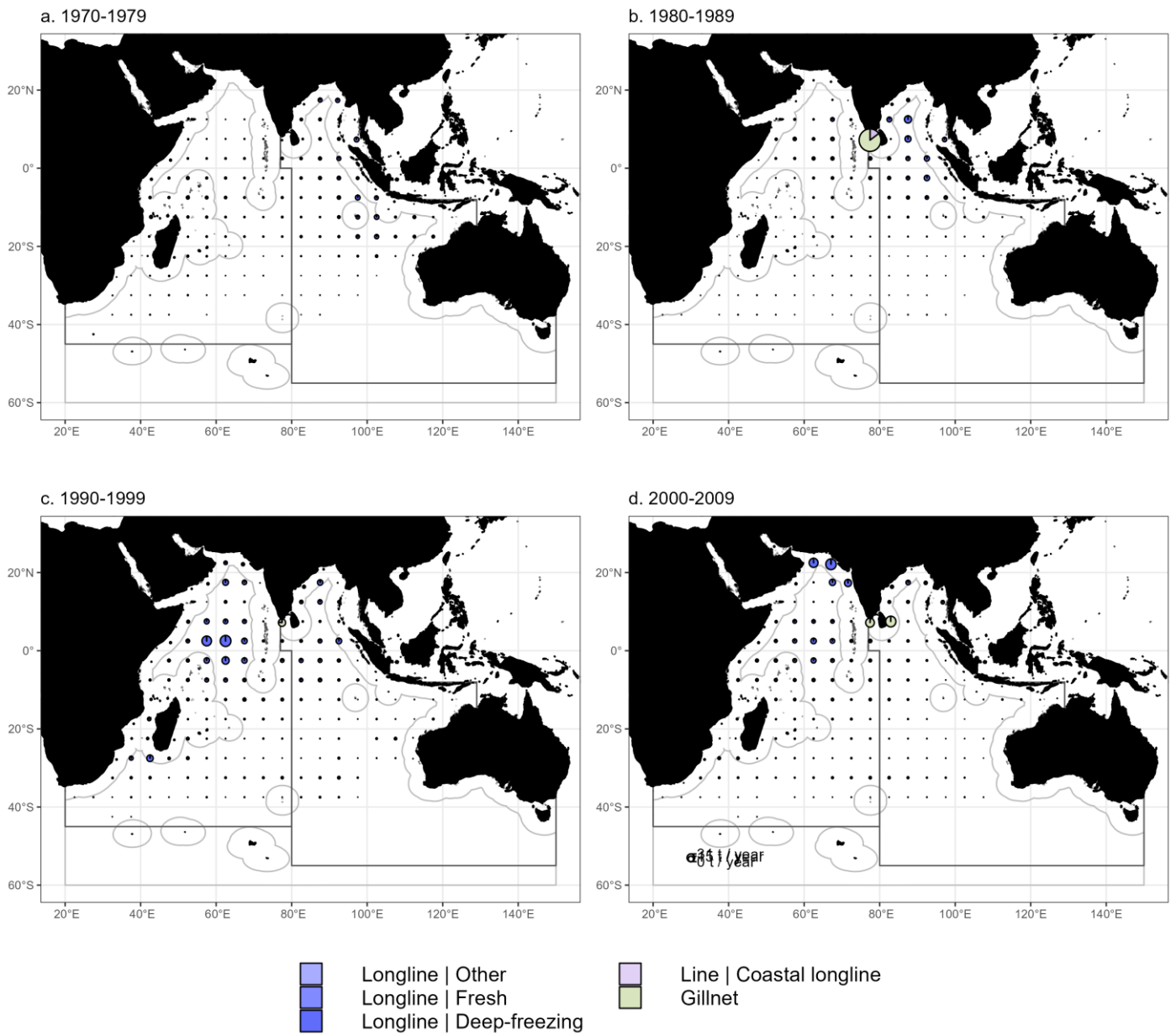


Figure 12: Mean annual time-area catches in weight (metric tons; t) of black marlin, by decade, 5x5 grid, and fishery. Data source: [time-area catches](#)

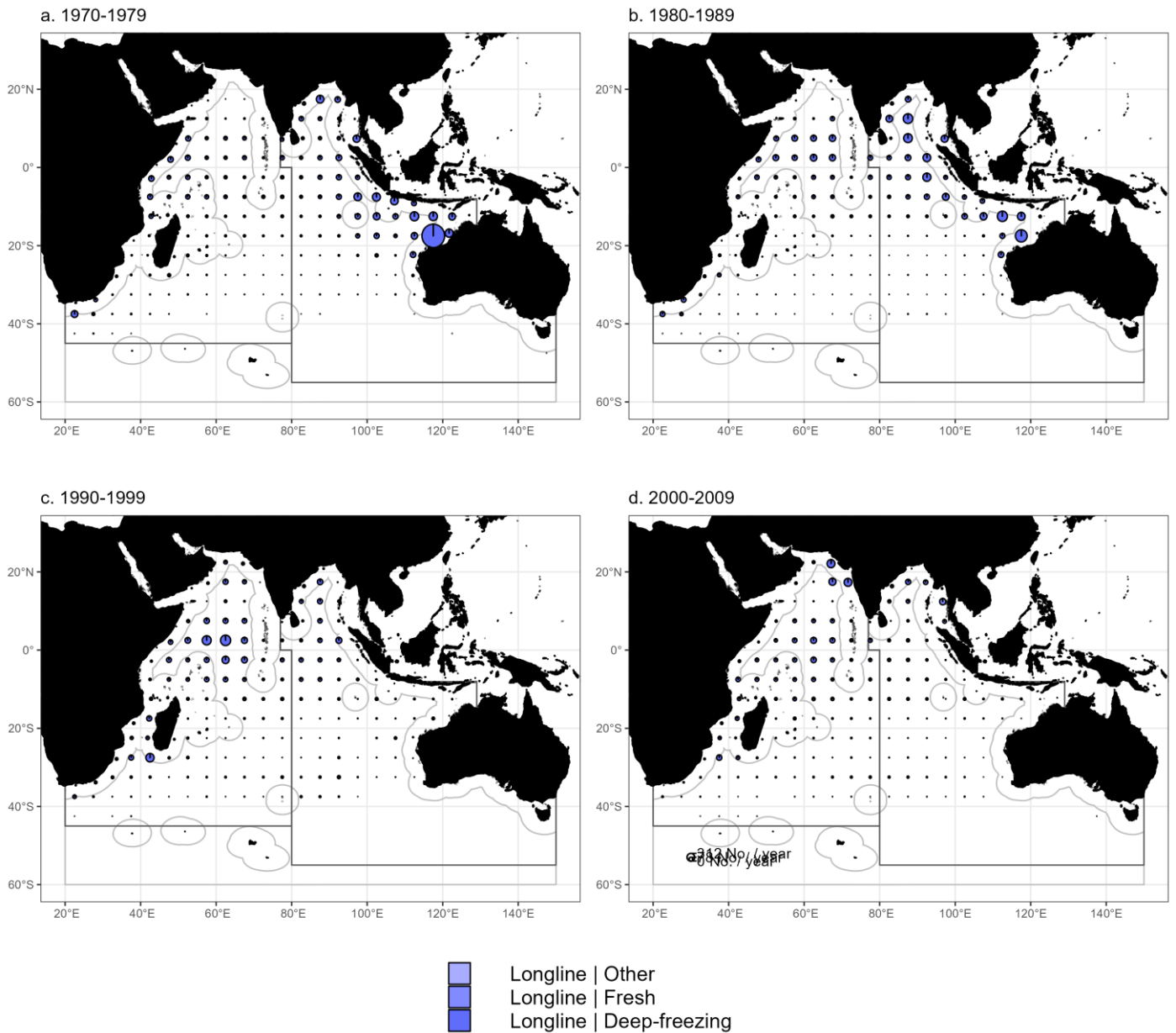


Figure 13: Mean annual time-area catches in numbers of black marlin, by decade, 5x5 grid, and fishery. Data source: [time-area catches](#)

Geo-referenced catches by fishery, last years (2016-2020) and decade (2010-2019)

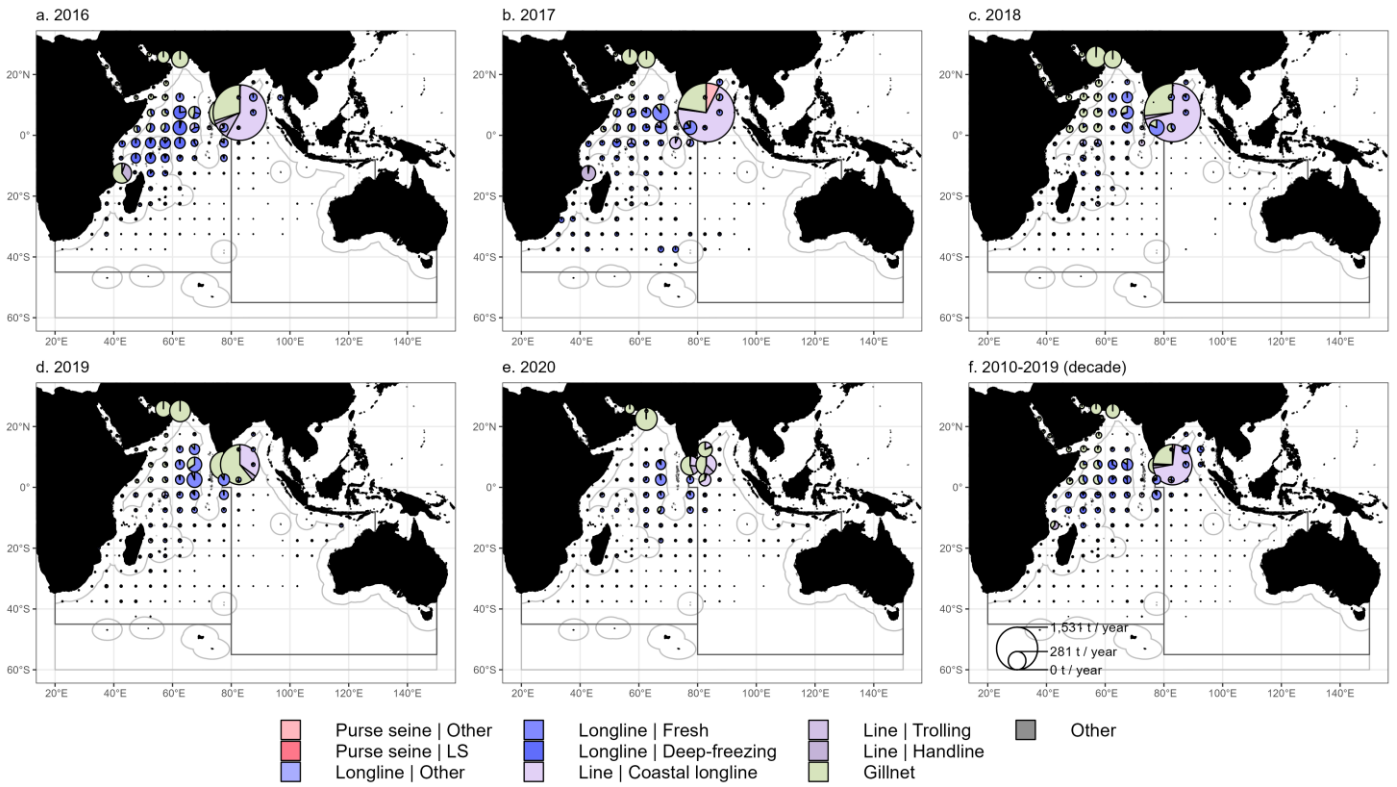


Figure 14: Mean annual time-area catches in weight (metric tons; t) of black marlin, by year / decade, 5x5 grid, and fishery. Data source: [time-area catches](#)

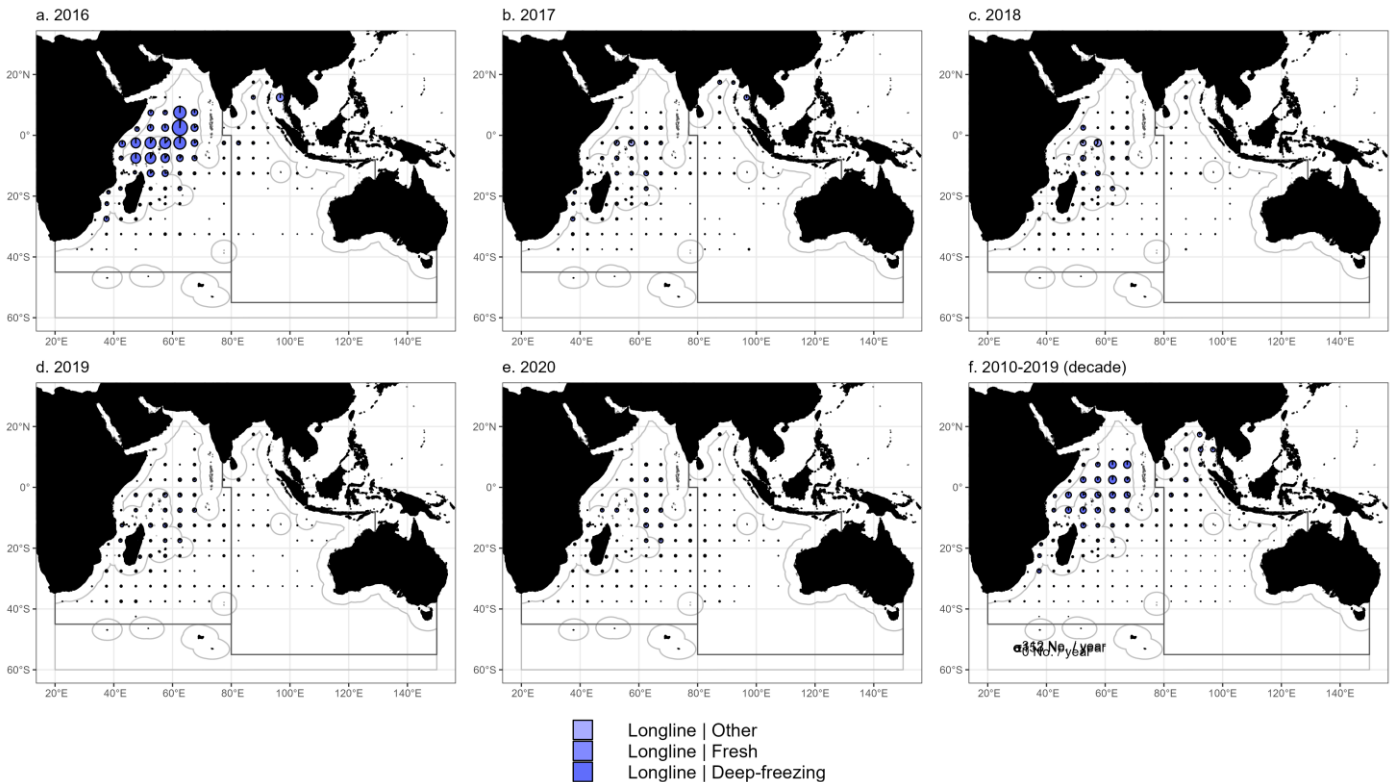


Figure 15: Mean annual time-area catches in numbers of black marlin, by year / decade, 5x5 grid, and fishery. Data source: [time-area catches](#)

## Uncertainties in catch and effort data

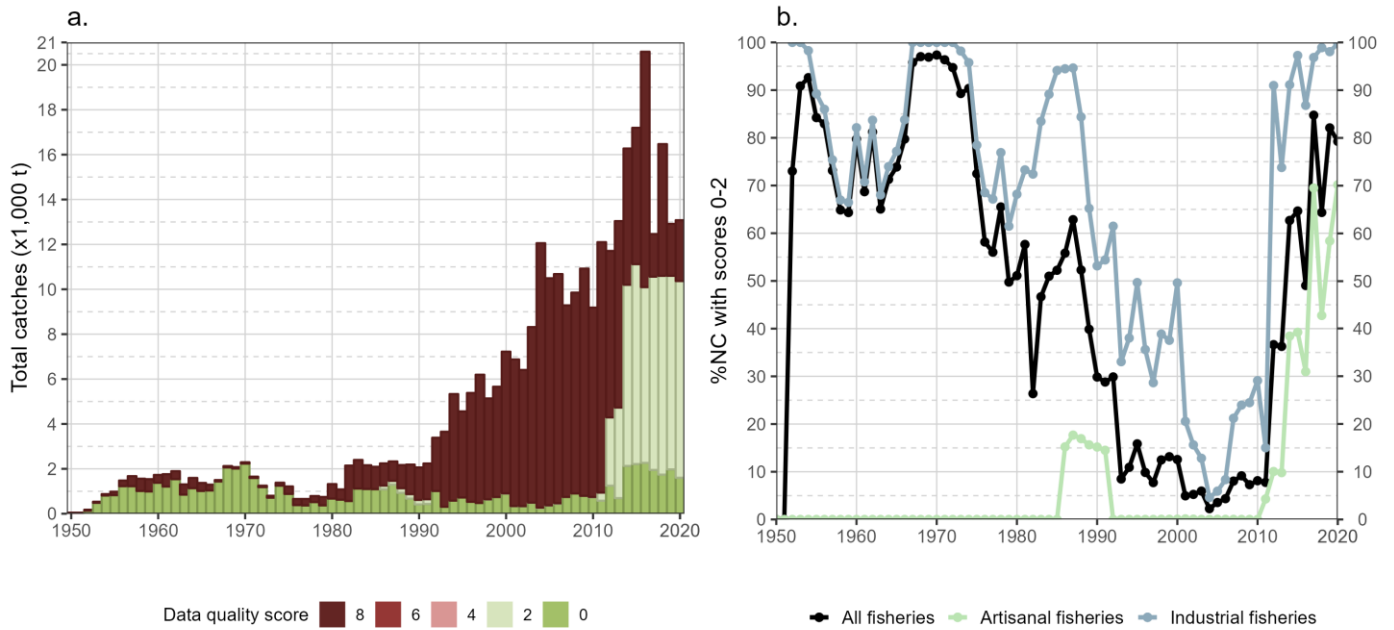


Figure 16: (a) Annual nominal catches (metric tons; t) of black marlin estimated by quality score and (b) percentage of nominal catch for which geo-referenced catches were reported to the IOTC Secretariat in agreement with the requirements of Res. 15/02 for all fisheries and by type of fishery, in the period 1950-2020

## Size composition of the catch

### Samples availability

#### By fishery group

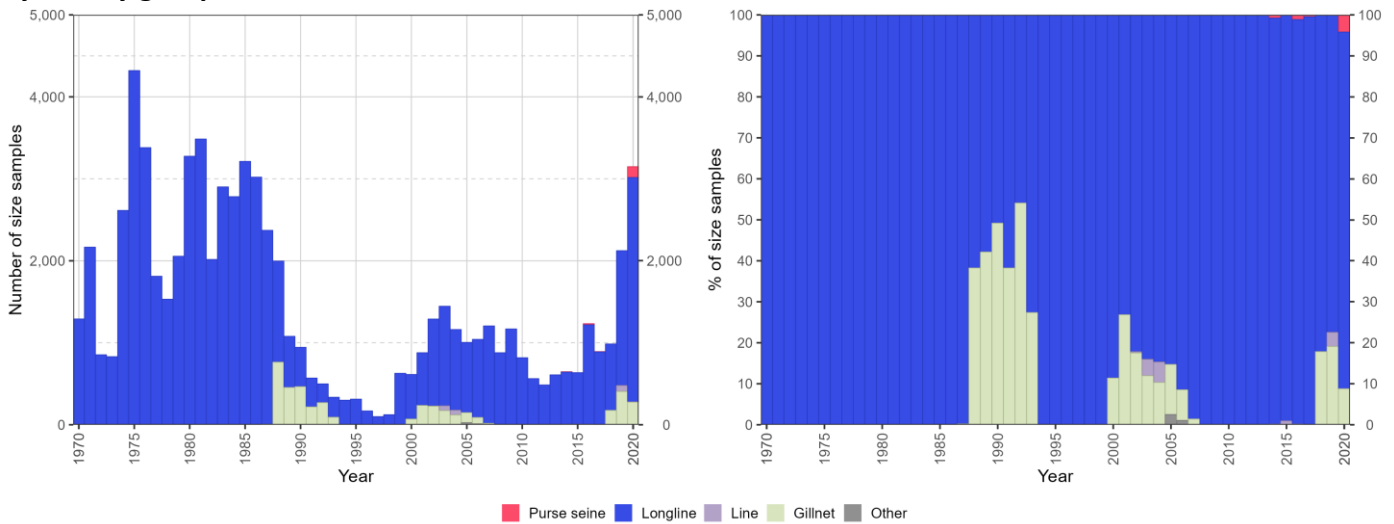


Figure 17: Availability of black marlin size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and fishery group. Data source: [standardized size-frequency dataset](#)

## Longline fisheries

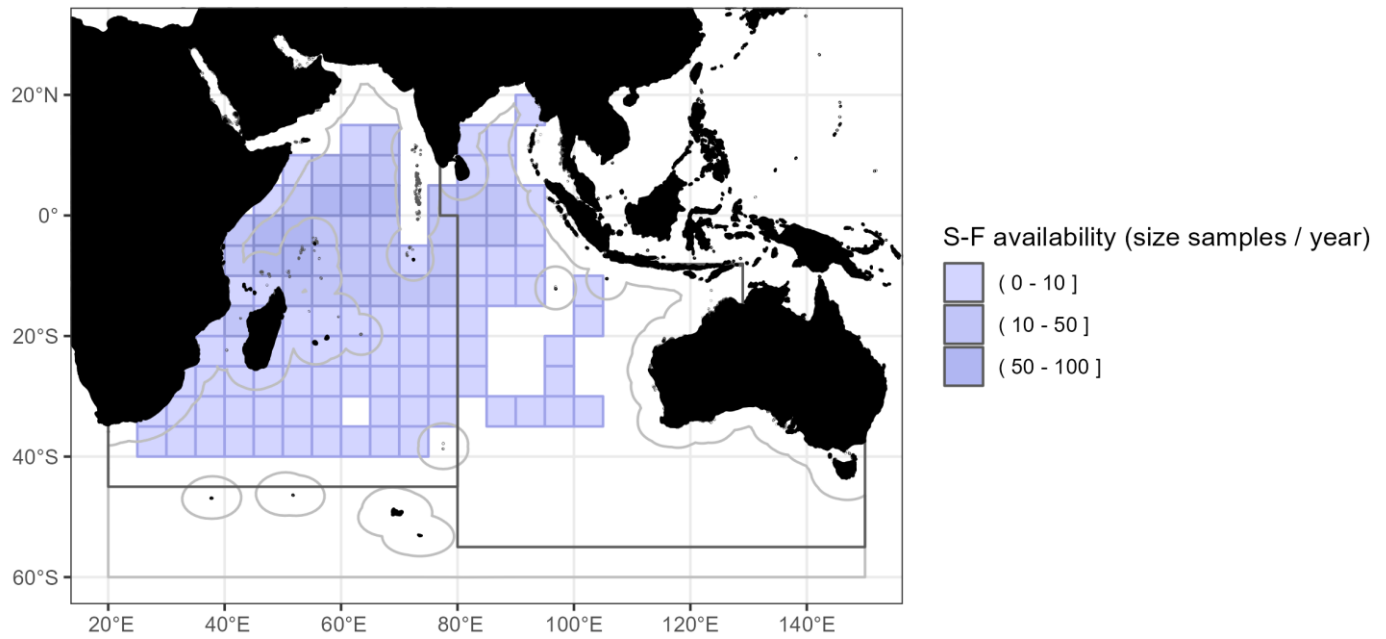


Figure 18: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data for longline fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

## Gillnet fisheries

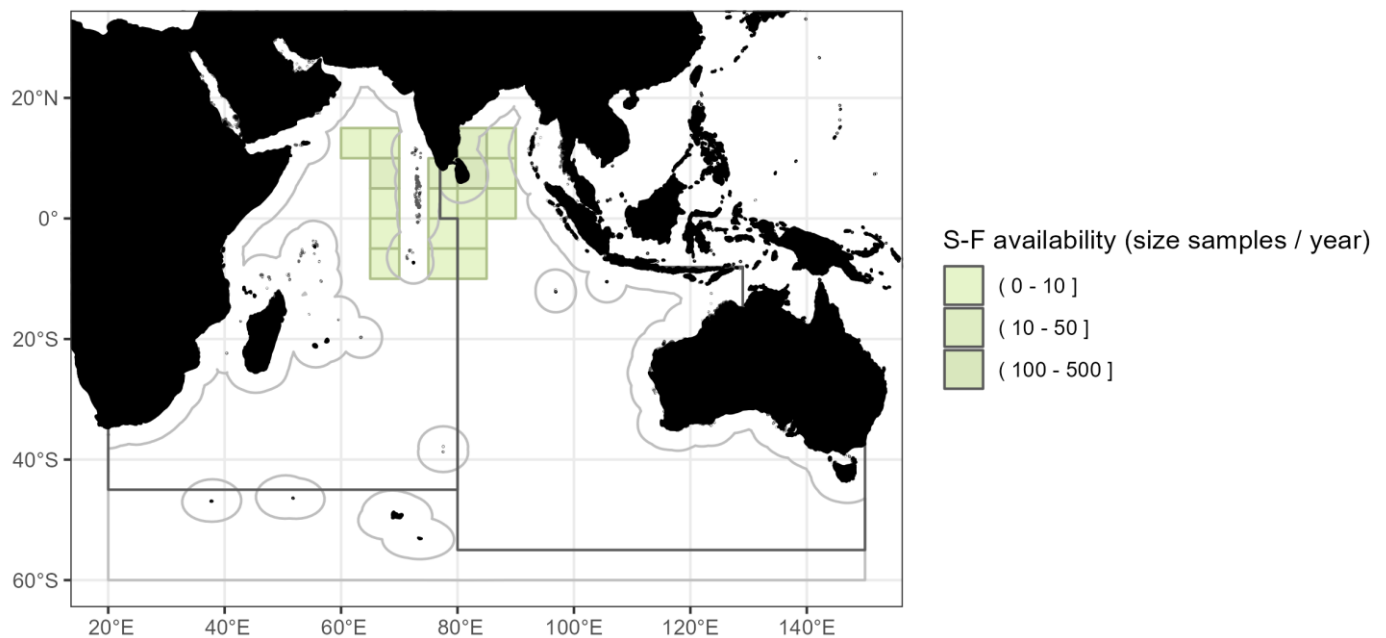


Figure 19: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data for gillnet fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

## Line fisheries

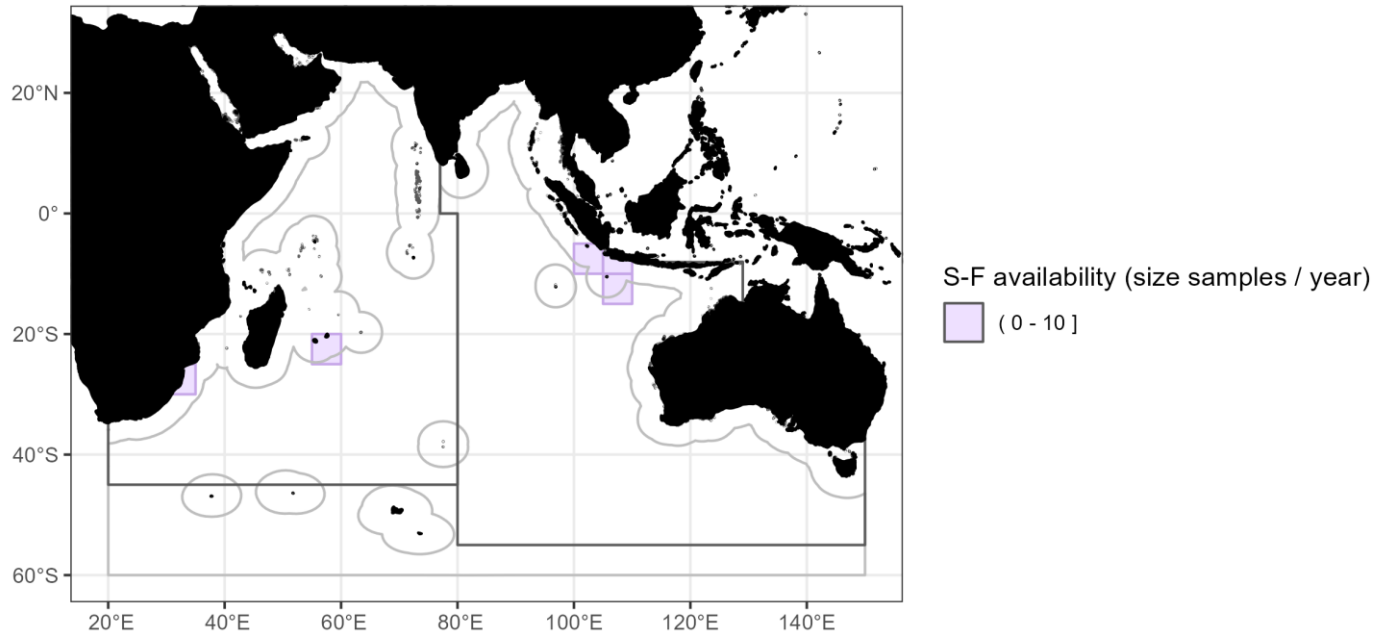


Figure 20: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data for line fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

## Purse seine fisheries

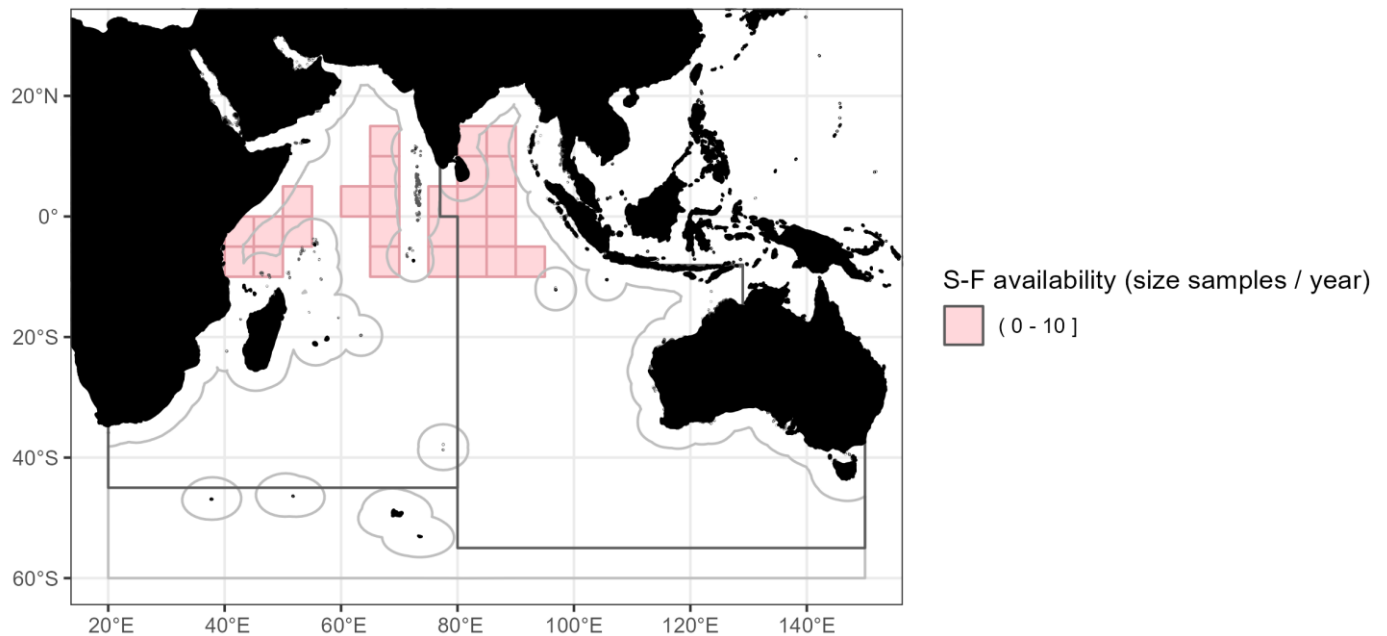


Figure 21: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data for purse seine fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

**By fishery**

**Longline fisheries**

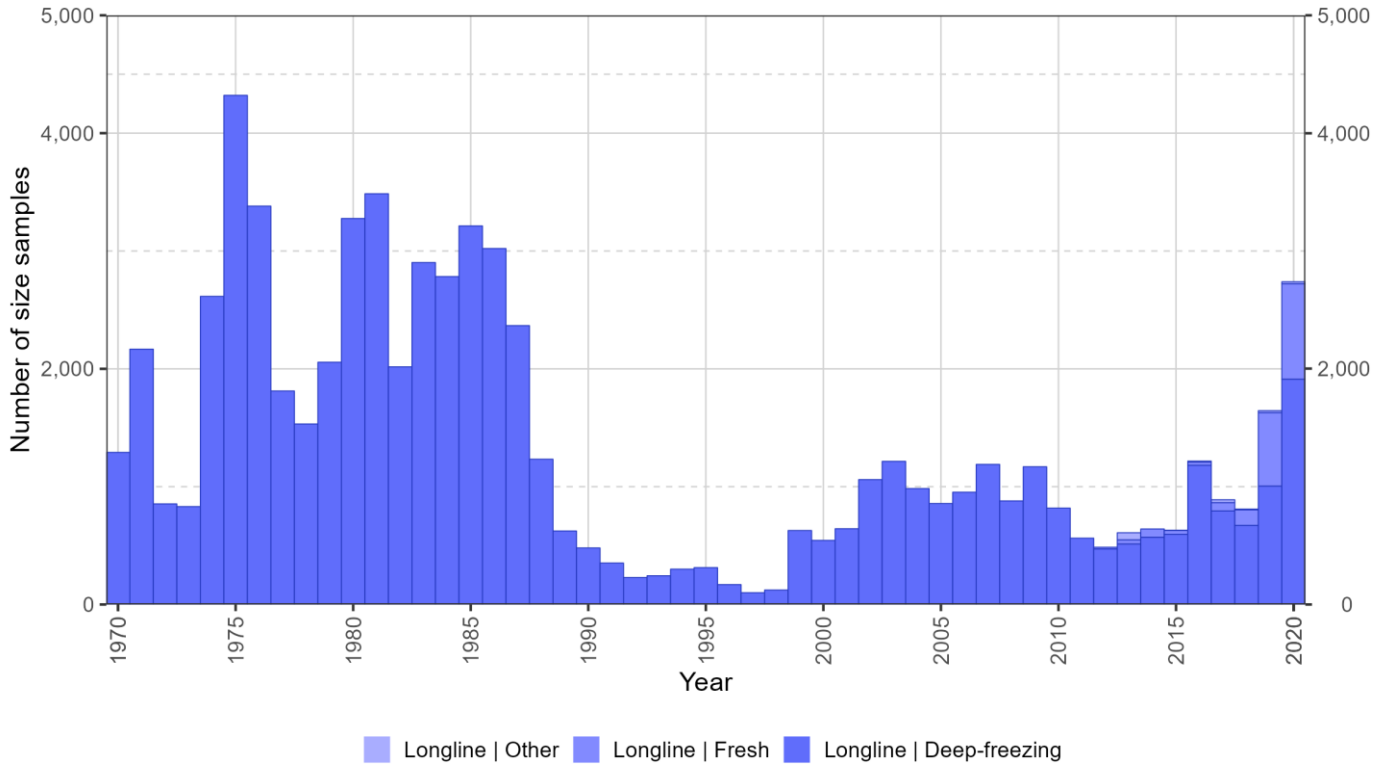


Figure 22: Availability of black marlin size-frequency data as absolute number of samples per year longline fishery. Data source: [standardized size-frequency dataset](#)

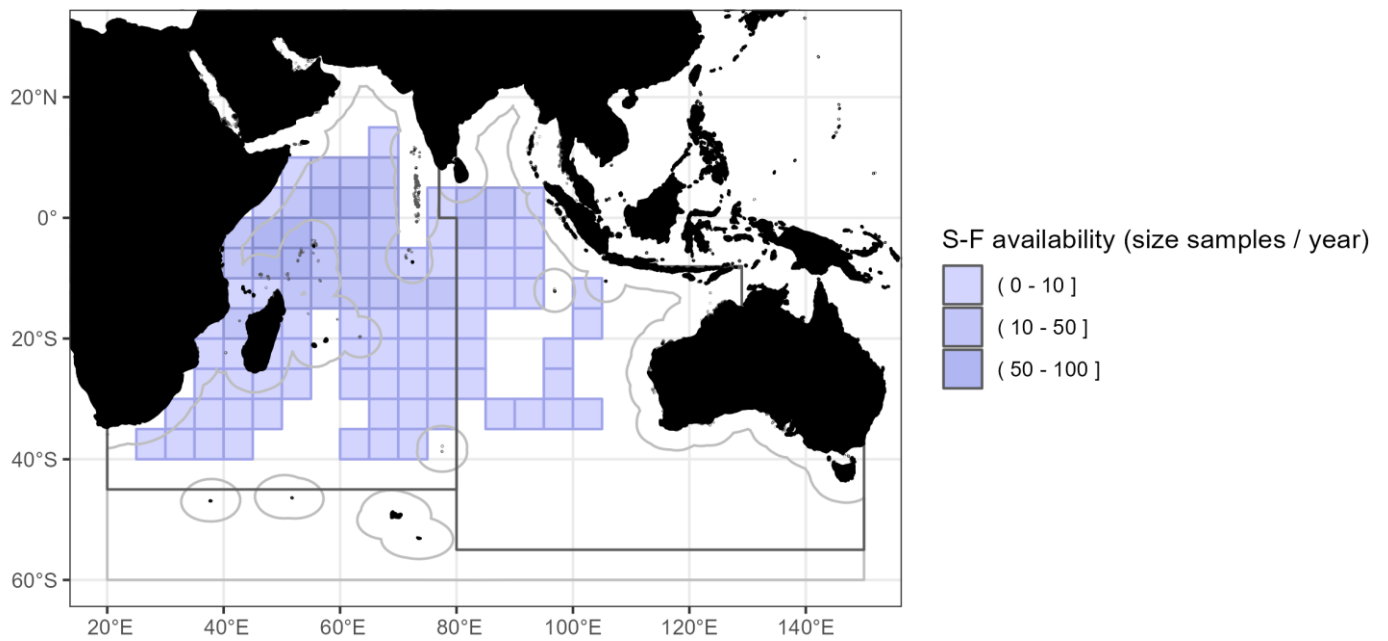


Figure 23: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data in deep-freezing longline fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)



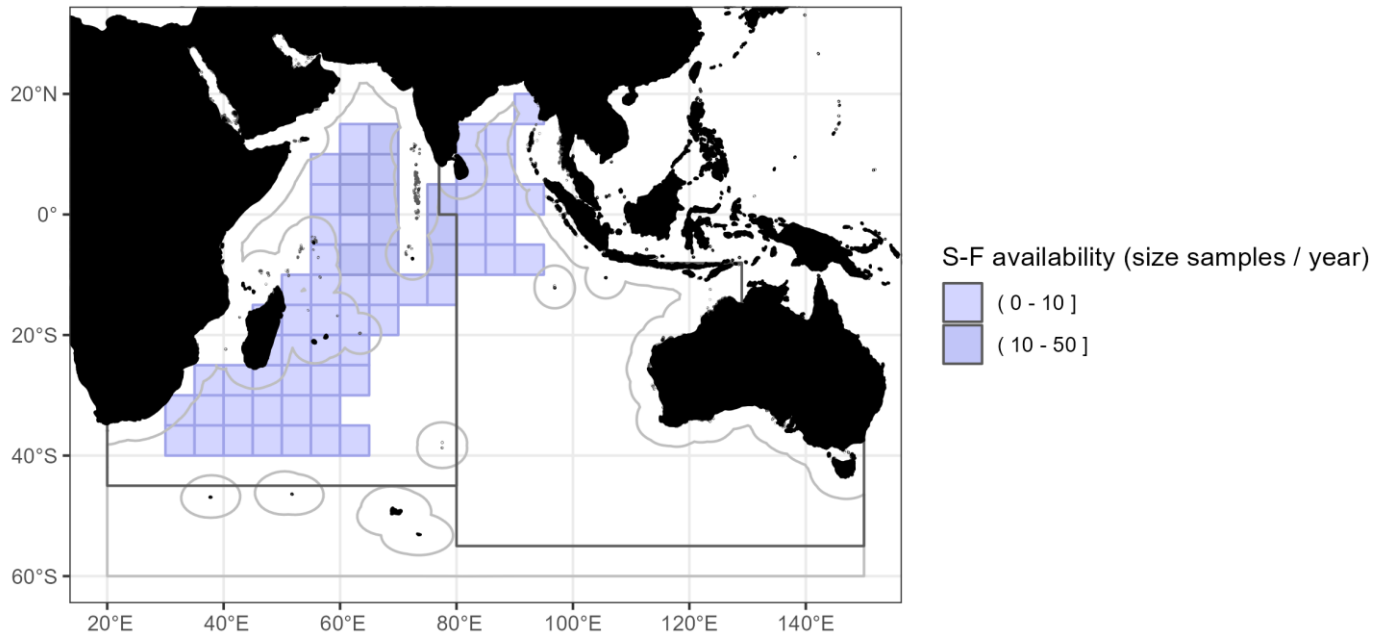


Figure 24: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data in fresh longline fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

Gillnet fisheries

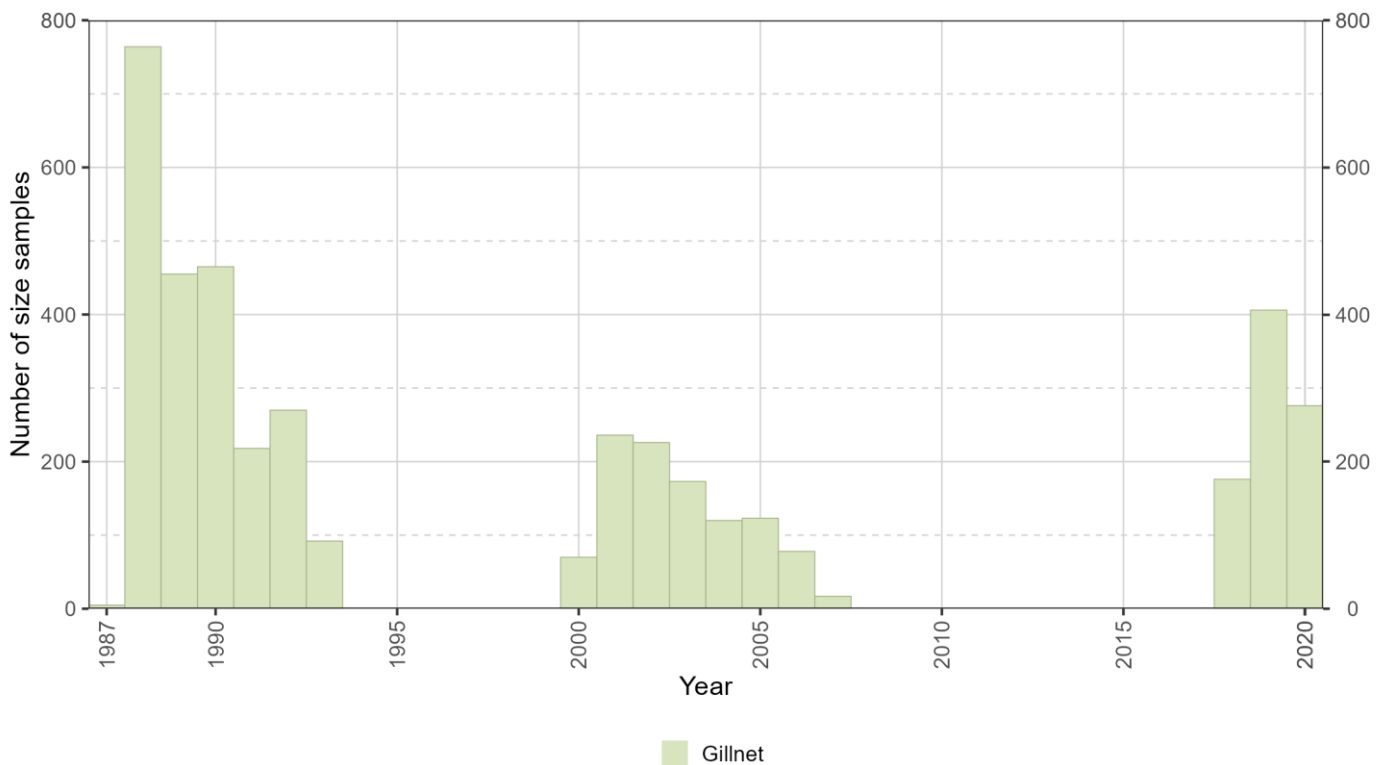


Figure 25: Availability of black marlin size-frequency data as absolute number of samples per year and gillnet fishery. Data source: [standardized size-frequency dataset](#)

Line fisheries

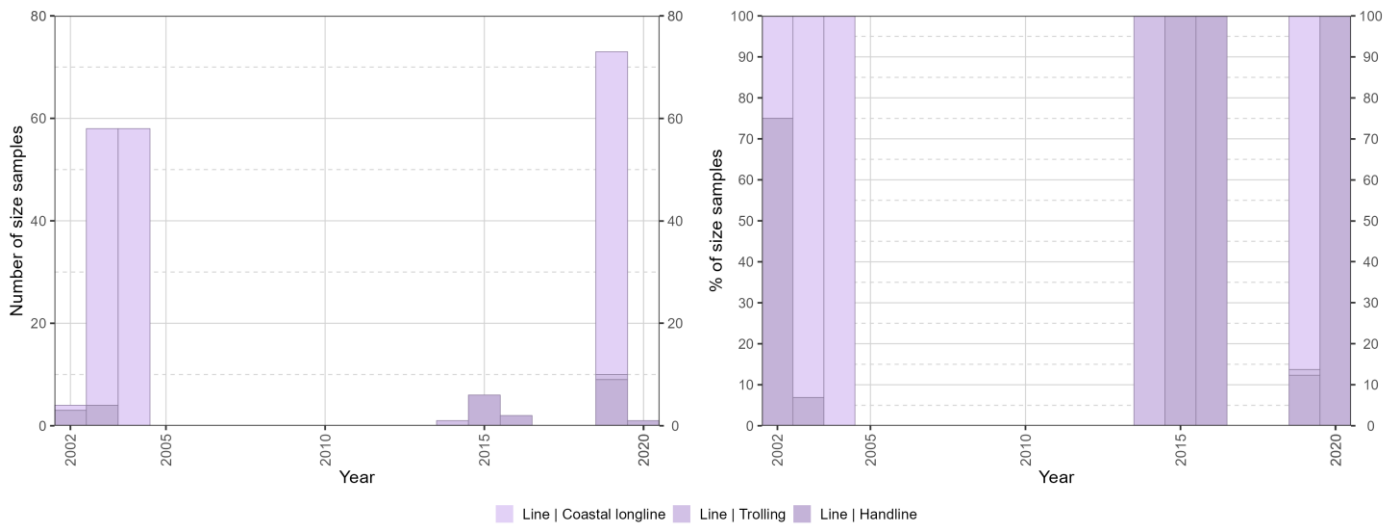


Figure 26: Availability of black marlin size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and line fishery type. Data source: [standardized size-frequency dataset](#)

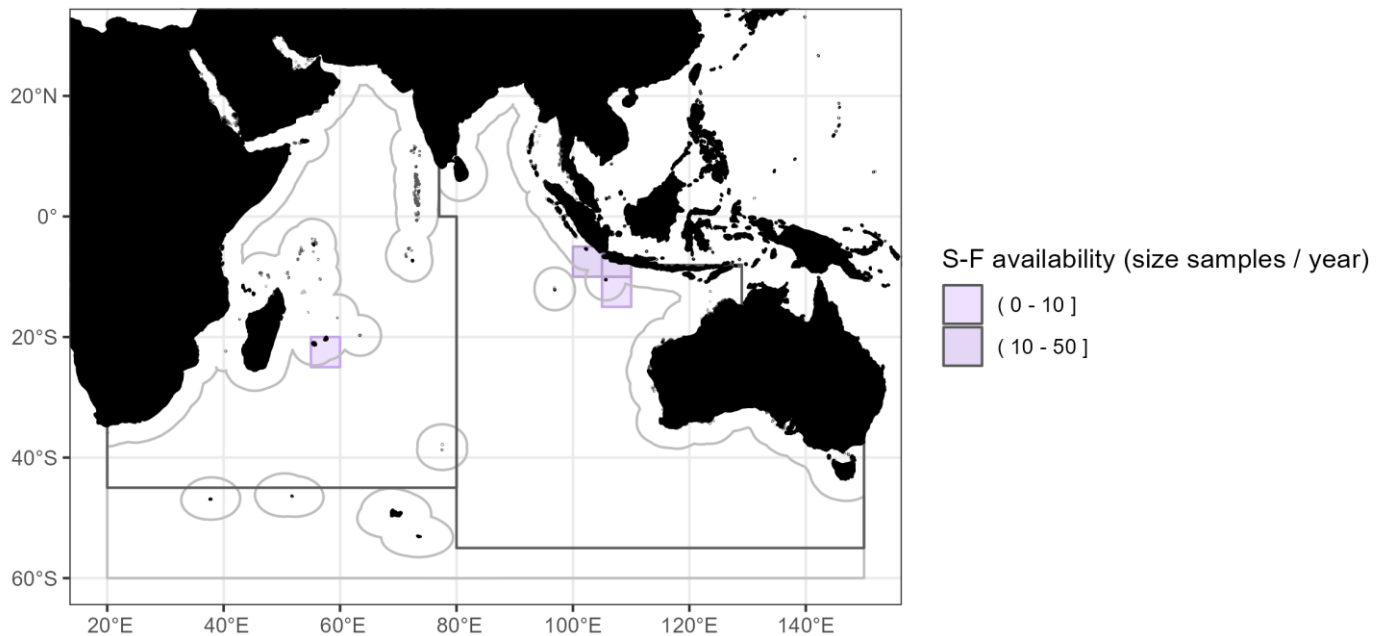


Figure 27: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data by line (coastal longline) fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

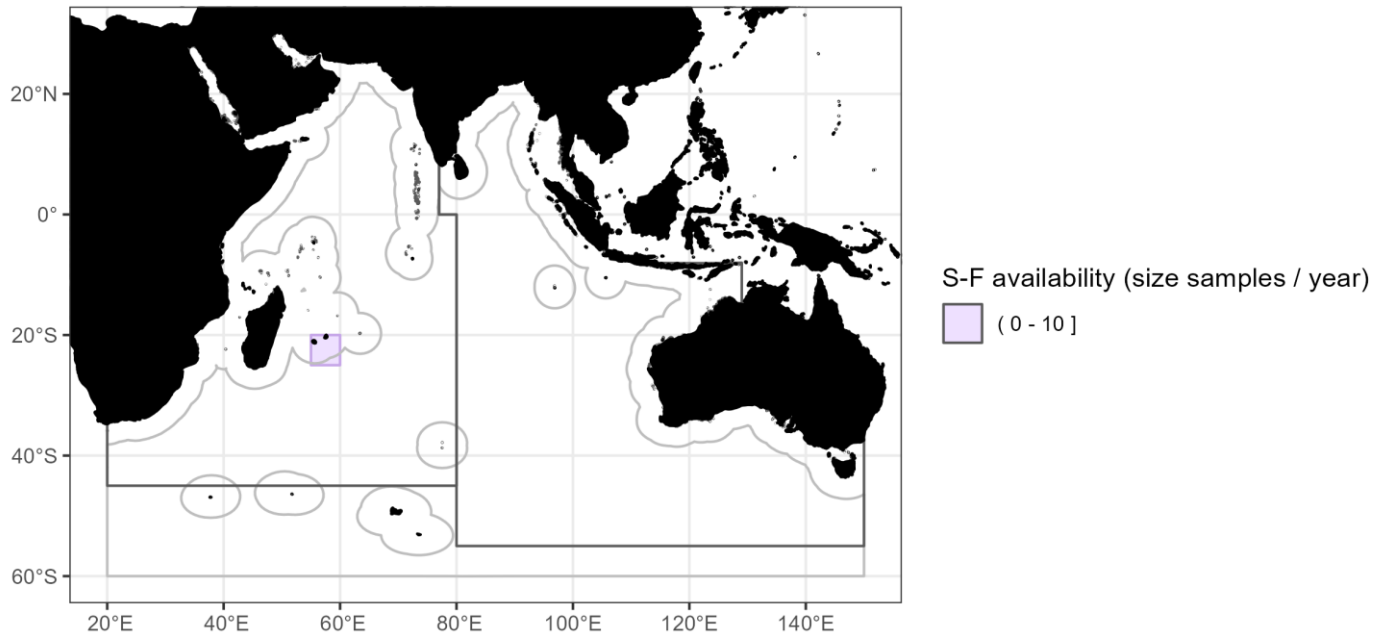


Figure 28: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data by line (handline) fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

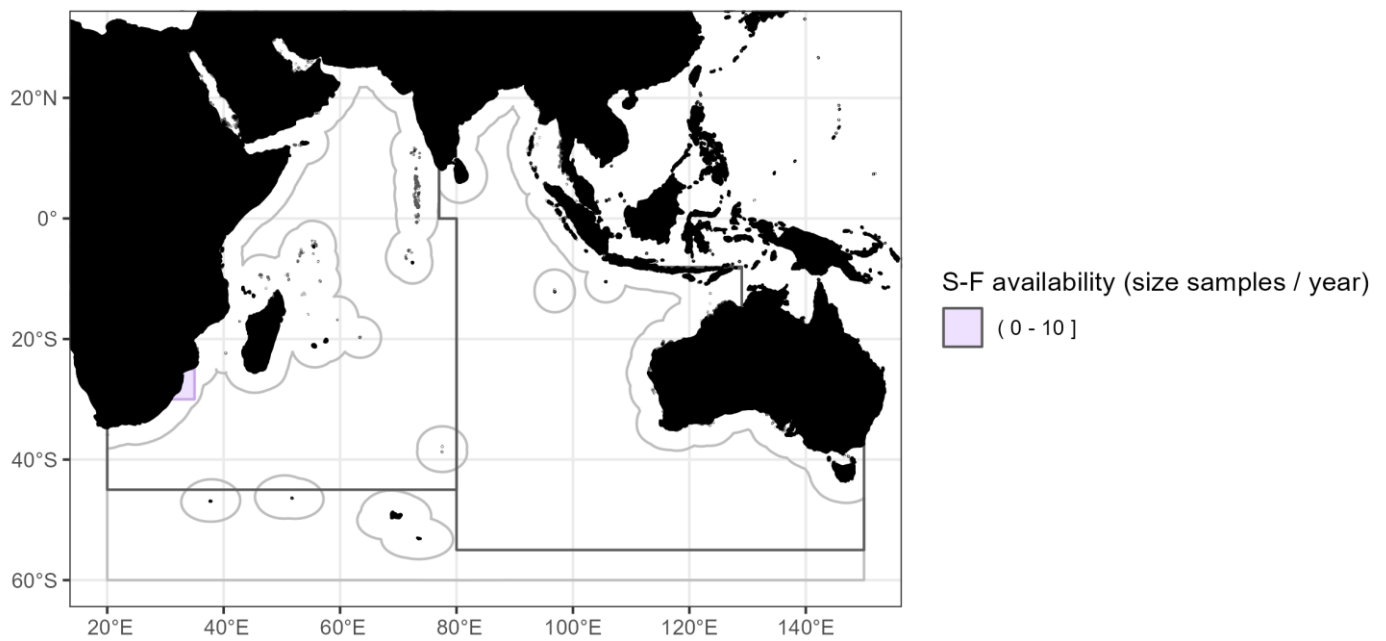


Figure 29: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data by line (trolling) fisheries in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

Purse seine fisheries

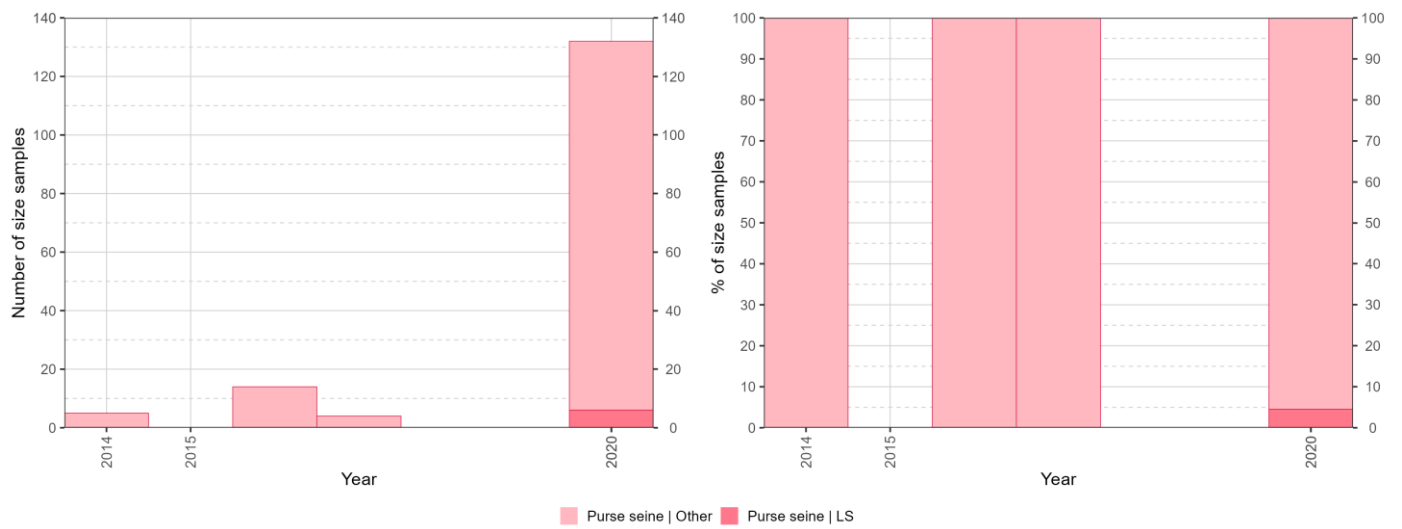


Figure 30: Availability of black marlin size-frequency data as absolute number of samples per year and purse seine fishery. Data source: [standardized size-frequency dataset](#)

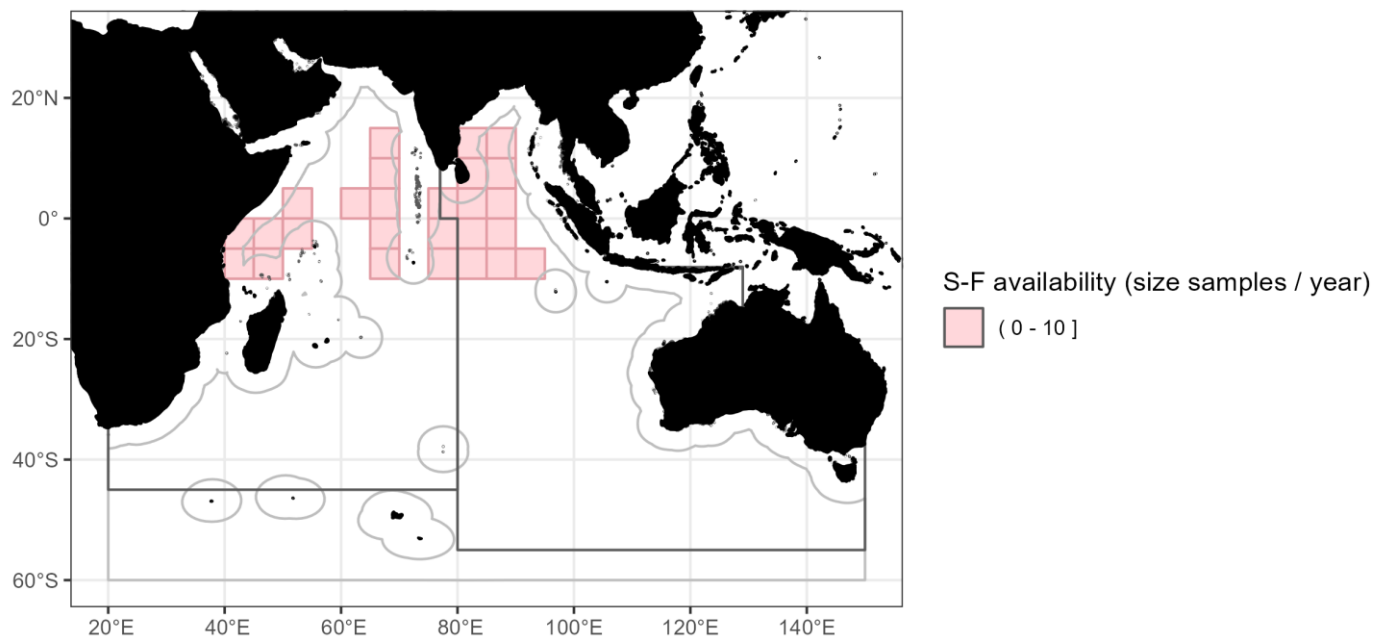


Figure 31: Spatial distribution (average number of samples per grid per year) of available black marlin size-frequency data by purse seine fisheries (other) in the period 2016-2020. Data source: [standardized size-frequency dataset](#)

### Temporal patterns and trends in size distributions

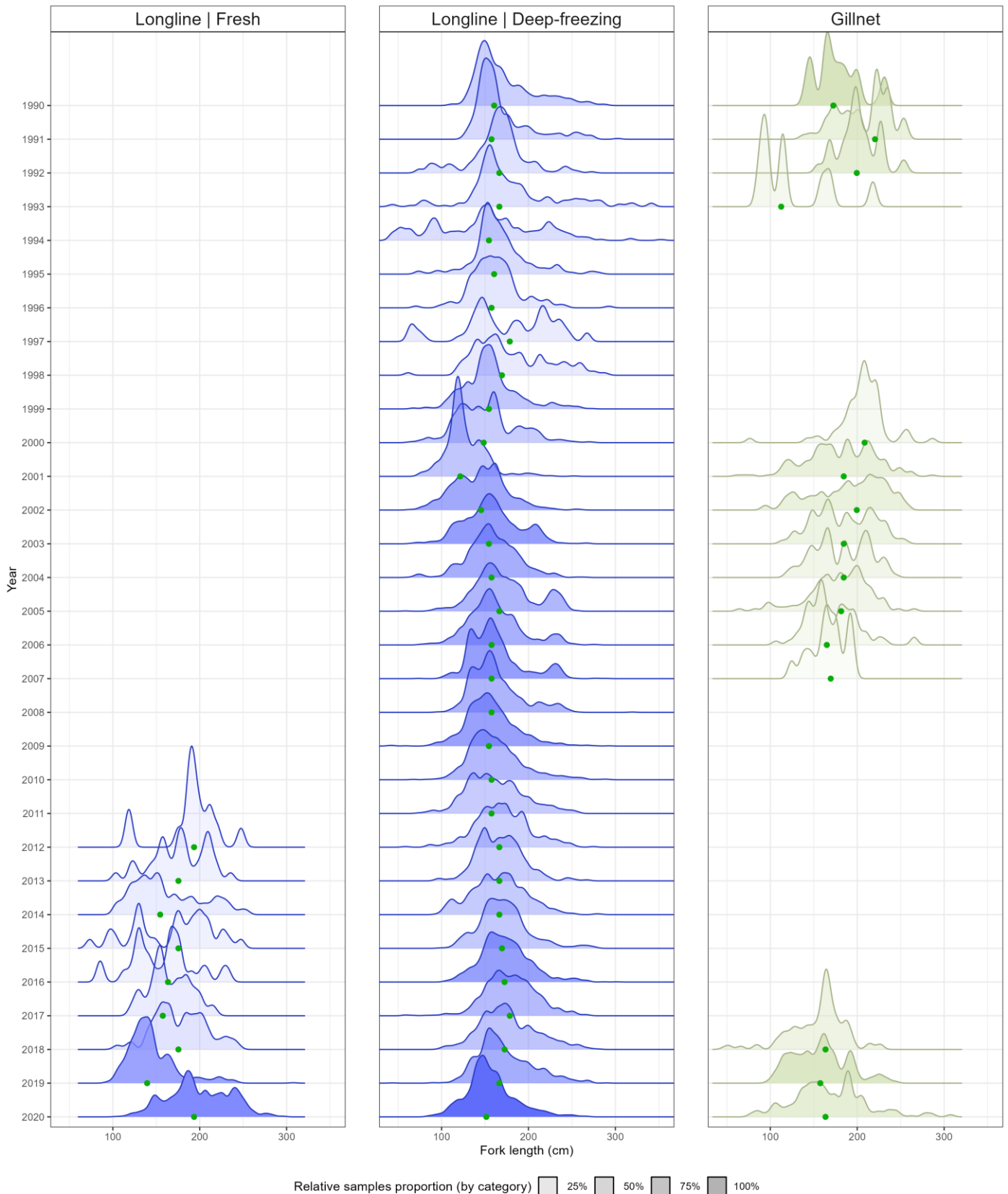


Figure 32: Relative size distribution (fork length; cm) of black marlin caught by purse seine (Other) and gillnet fisheries. Other = no information provided on school association. Fill intensity is proportional to the number of samples recorded for the year, while the green dot corresponds to the median value. Data source: [standardized size-frequency dataset](#)

Size distribution by fishery and fleet

Gillnet fisheries

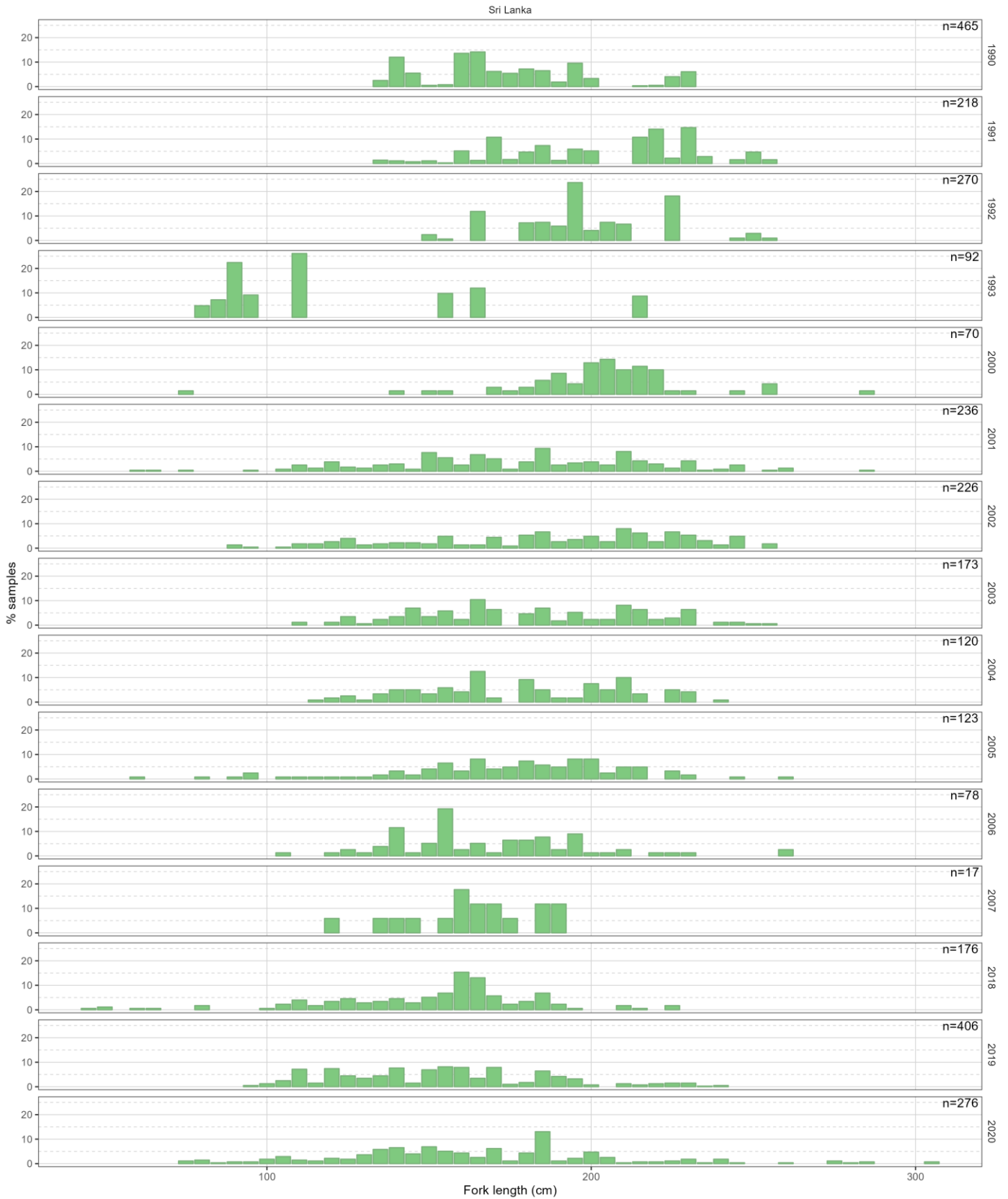


Figure 33: Relative size distribution of black marlin (fork length; cm) recorded for gillnet fisheries by year and main fleet. Data source: [standardized size-frequency dataset](#)

### Uncertainties in size-frequency data

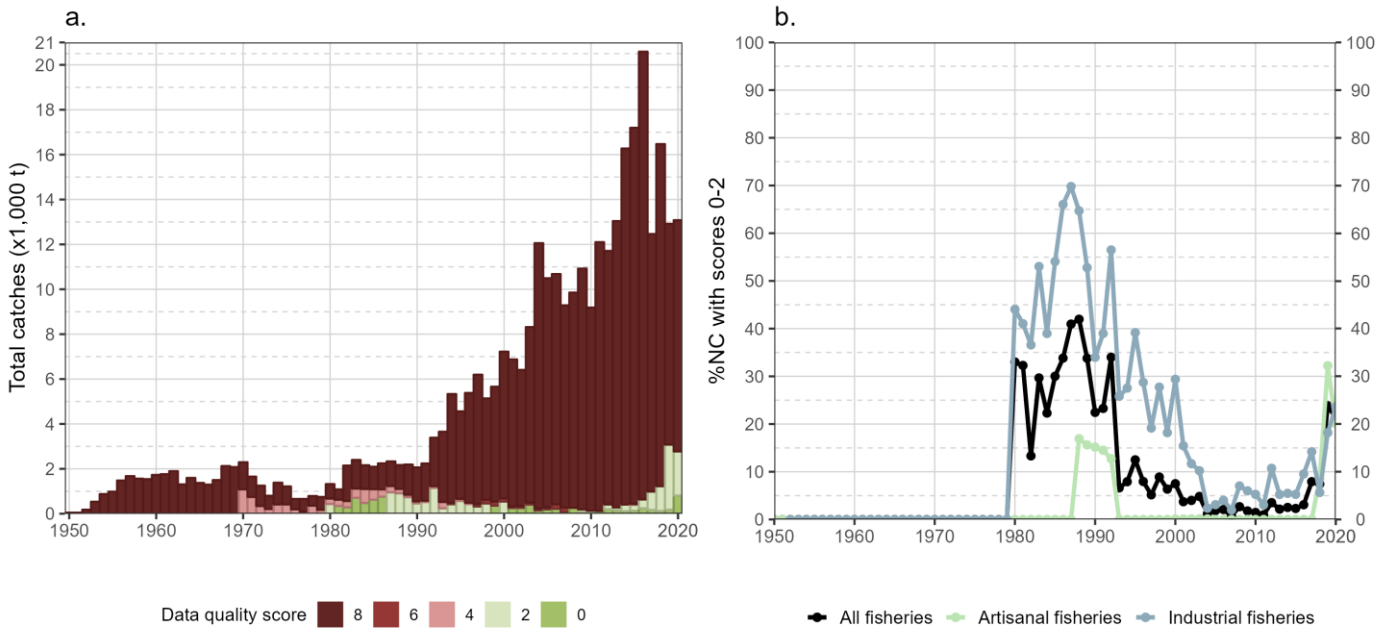


Figure 34: (a) Annual nominal catches (metric tons; t) of black marlin estimated by quality score and percentage of nominal catches for which geo-referenced size-frequency data were reported to the IOTC Secretariat in agreement with the requirements of Res. 15/02 for all fisheries and by type of fishery, in the period 1950–2020

## References

IOTC (2022) [Review of the statistical data available for Indian Ocean billfish](#). IOTC, Virtual meeting, 12-15 September 2022

## Appendix

### Appendix I: Changes in best scientific estimates of nominal catches from previous WPB

Some improvements were made to the best scientific estimates of nominal catches of black marlin since the 19<sup>th</sup> session of the IOTC Working Party on Billfish ([WPB19](#)), with overall small modifications in the time series of annual catches (**Fig. 7**). The changes covering the period 2016-2019 were due to: (i) some revision of the Seychelles (SYC) longline and line catches, (ii) updates of billfish catches by Yemen (YEM) as available in the [FAO global capture production database](#), (iii) changes in the Indian Ocean major areas for longline fisheries from China (CHN) and most fisheries from Sri Lanka (LKA), (iv) re-assignment of line catches from the fleet EU,France (EUFRA) to EU,Mayotte (EUMYT), and (v) assignment of catches from EU,United Kingdom (EUGBR) to the new CPC *United Kingdom of Great Britain and Northern Ireland* (GBR) following the withdrawal of the United Kingdom from the European Union (**Table 4**).

Table 4: Changes in best scientific estimates of average annual nominal catches (metric tons; t) of black marlin by year, fleet, fishery group and main Indian Ocean area, limited to absolute values higher than 10 t



Year	Fleet	Fishery group	Area	Current (t)	Previous (t)	Difference (t)
2019	EUGBR	Longline	Western Indian Ocean	0	13	-13
	GBR	Longline	Western Indian Ocean	13	0	13
	IND	Gillnet	Eastern Indian Ocean	522	568	-46
		Line	Eastern Indian Ocean	3,105	2,991	114
		Line	Western Indian Ocean	58	84	-26
	LKA	Gillnet	Eastern Indian Ocean	1,202	848	353
		Gillnet	Western Indian Ocean	76	430	-353
		Line	Eastern Indian Ocean	856	534	322
		Line	Western Indian Ocean	0	322	-322
		Longline	Eastern Indian Ocean	159	58	101
		Longline	Western Indian Ocean	761	862	-101
		Purse seine	Eastern Indian Ocean	56	8	48
		Purse seine	Western Indian Ocean	0	23	-23
	SYC	Line	Western Indian Ocean	19	0	19
2018	EUGBR	Longline	Western Indian Ocean	0	15	-15
	GBR	Longline	Western Indian Ocean	15	0	15
	IND	Gillnet	Eastern Indian Ocean	905	965	-60
	LKA	Gillnet	Eastern Indian Ocean	939	816	123
		Gillnet	Western Indian Ocean	39	162	-123
		Line	Eastern Indian Ocean	2,167	2,150	17
		Line	Western Indian Ocean	0	17	-17
		Longline	Eastern Indian Ocean	271	105	166
		Longline	Western Indian Ocean	405	571	-166
	SYC	Line	Western Indian Ocean	30	0	30
		Longline	Western Indian Ocean	51	81	-29
2017		Line	Western Indian Ocean	31	0	31
		Longline	Eastern Indian Ocean	0	11	-11
		Longline	Western Indian Ocean	601	615	-15
2016		Line	Western Indian Ocean	22	0	22
		Longline	Western Indian Ocean	1,015	1,037	-22