REVIEW OF INDIAN OCEAN YELLOWFIN TUNA STATISTICAL DATA

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Introduction

The overarching objective of the paper is to provide participants at the preparatory meeting of the 24th Session of the IOTC Working Party on Tropical Tunas (WPTT24(DP)) with a review of the status of the information on yellowfin tuna (*Thunnus albacares*; YFT) available at the IOTC Secretariat as of May 2022. The document provides an overview of the fisheries catching yellowfin tuna 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)

Table 1: Best scientific estimates of average annual nominal catches (t) of yellowfin tuna 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: yellowfin tuna raised time-area catches

Fishery	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Purse seine | Other		4	143	1,170	2,185	3,590	7,224
Purse seine | FS			18	31,552	64,938	89,204	43,728
Purse seine | LS			17	17,597	56,279	61,890	90,214
Longline | Other				354	5,677	14,454	7,164
Longline | Fresh			615	4,286	47,612	34,150	20,588
Longline | Deep-freezing	21,990	41,352	29,589	33,824	66,077	56,671	17,927
Line | Coastal longline	168	1,262	1,771	3,488	6,185	11,146	28,153
Line | Trolling	1,004	1,821	4,191	6,641	11,136	13,258	17,678
Line | Handline	624	643	2,951	8,071	20,156	34,540	70,176
Baitboat	2,111	2,318	5,810	8,295	12,803	16,072	17,528
Gillnet	1,572	4,115	7,928	12,034	39,199	58,819	77,350
Other	80	189	310	674	1,133	1,746	2,566
Total	27,548	51,704	53,344	127,986	333,380	395,540	400,296

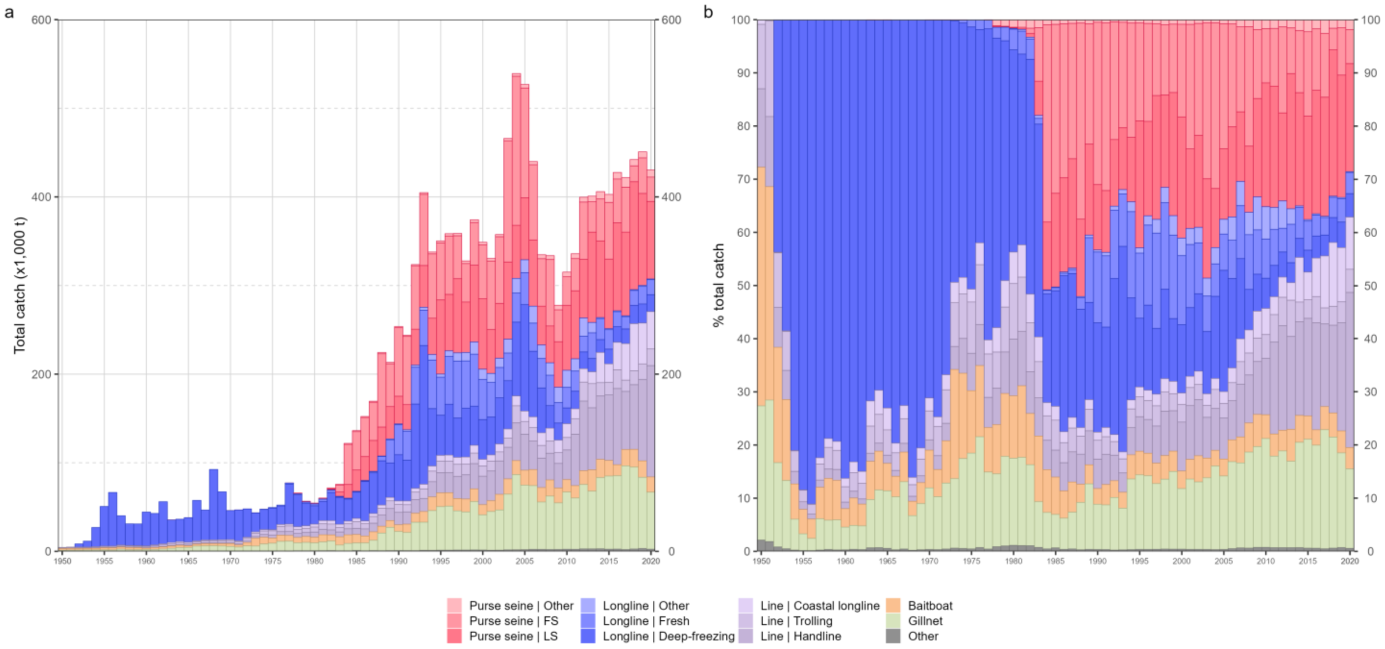

Figure 1: Annual time series of cumulative nominal absolute (a) and relative (b) catches (t) of yellowfin tuna by fishery for the period 1950-2020. LS = schools associated with floating objects; FS = free-swimming schools. Data source: yellowfin tuna raised time-area catches

Table 2: Best scientific estimates of annual nominal catches (t) of yellowfin tuna by fishery for the period 2011-2020. The background intensity color of each cell is directly proportional to the catch level. Data source: yellowfin tuna raised time-area catches

Fishery	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Purse seine | Other	5,516	5,479	6,235	8,323	9,102	7,390	10,855	7,145	6,876	8,040
Purse seine | FS	36,453	64,593	34,459	47,426	63,963	49,460	50,700	17,944	40,147	27,557
Purse seine | LS	76,659	66,166	101,898	86,417	78,395	99,268	94,479	121,699	103,774	87,479
Longline | Other	13,889	20,599	11,667	1,077	1,189	1,036	923	954	1,111	643
Longline | Fresh	22,709	17,808	28,981	23,763	21,987	16,817	13,959	16,827	19,787	17,137
Longline | Deep-freezing	19,814	18,849	15,028	14,523	16,608	17,740	16,519	20,697	21,629	19,019
Line | Coastal longline	11,283	15,204	13,288	34,082	20,923	30,992	41,234	53,066	45,948	42,198
Line | Trolling	17,359	21,379	27,313	15,096	14,150	21,135	12,728	15,767	17,742	18,789
Line | Handline	58,071	78,565	70,023	71,484	73,901	86,023	65,584	72,966	91,742	125,583
Baitboat	14,009	15,512	24,055	20,542	17,642	12,391	18,370	20,030	18,625	17,228
Gillnet	57,848	72,749	65,191	80,416	82,572	82,881	94,515	92,437	80,359	64,358
Other	2,318	2,744	2,748	2,839	2,397	2,484	1,994	2,626	3,161	2,420
Total	335,928	399,646	400,885	405,987	402,828	427,619	421,861	442,158	450,900	430,449

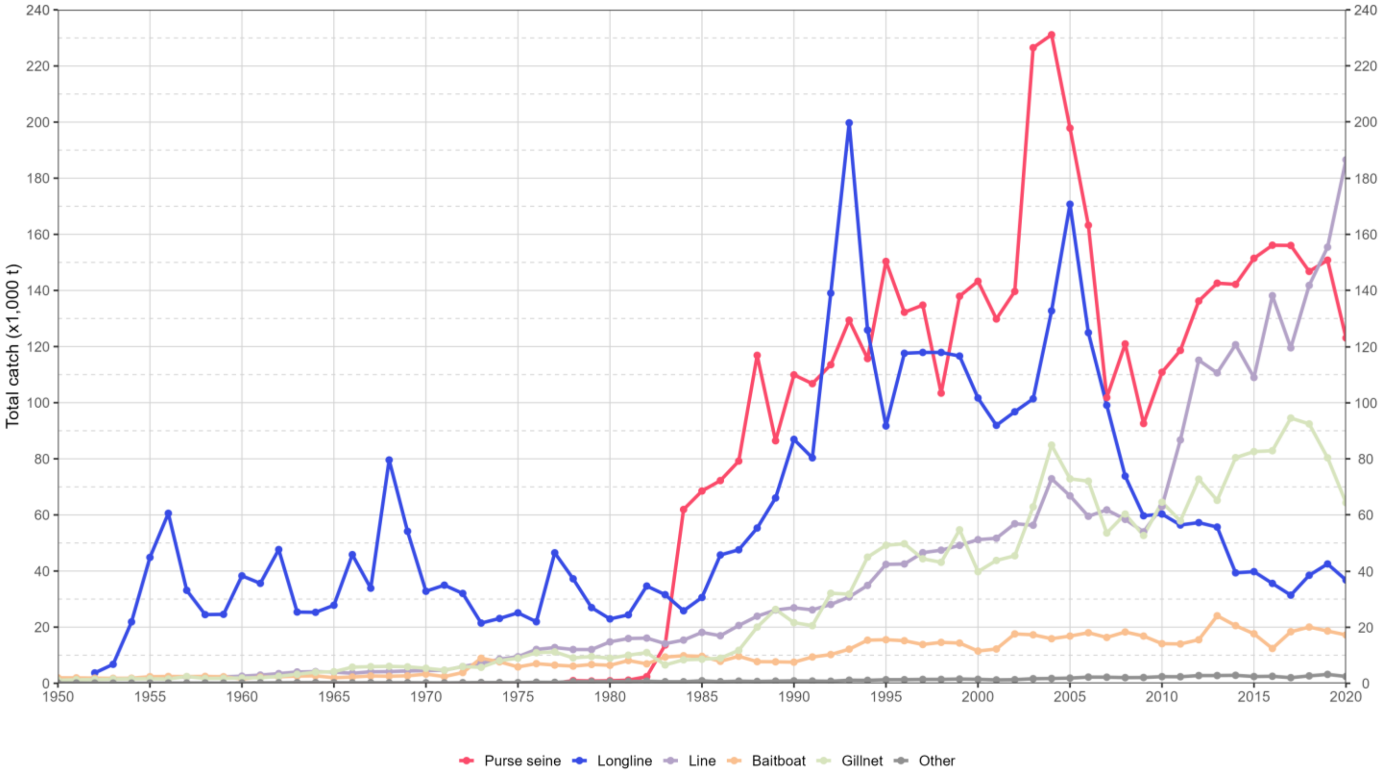

Figure 2: Annual time series of nominal catches (t) of yellowfin tuna by fishery group for the period 1950-2020. Data source: [best scientific estimate of nominal catches]

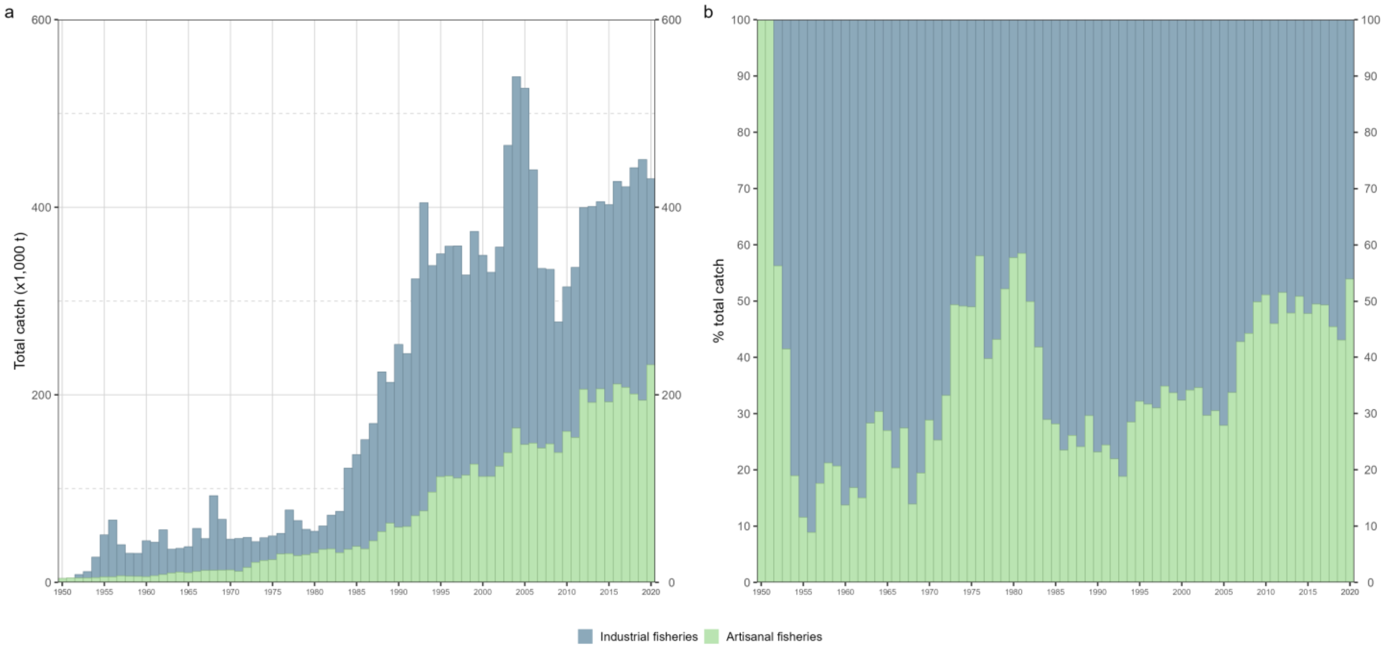

Figure 3: Annual time series of cumulative nominal absolute (a) and relative (b) catches (t) of yellowfin tuna by type of fishery for the period 1950-2020. Data source: [best scientific estimate of nominal catches]

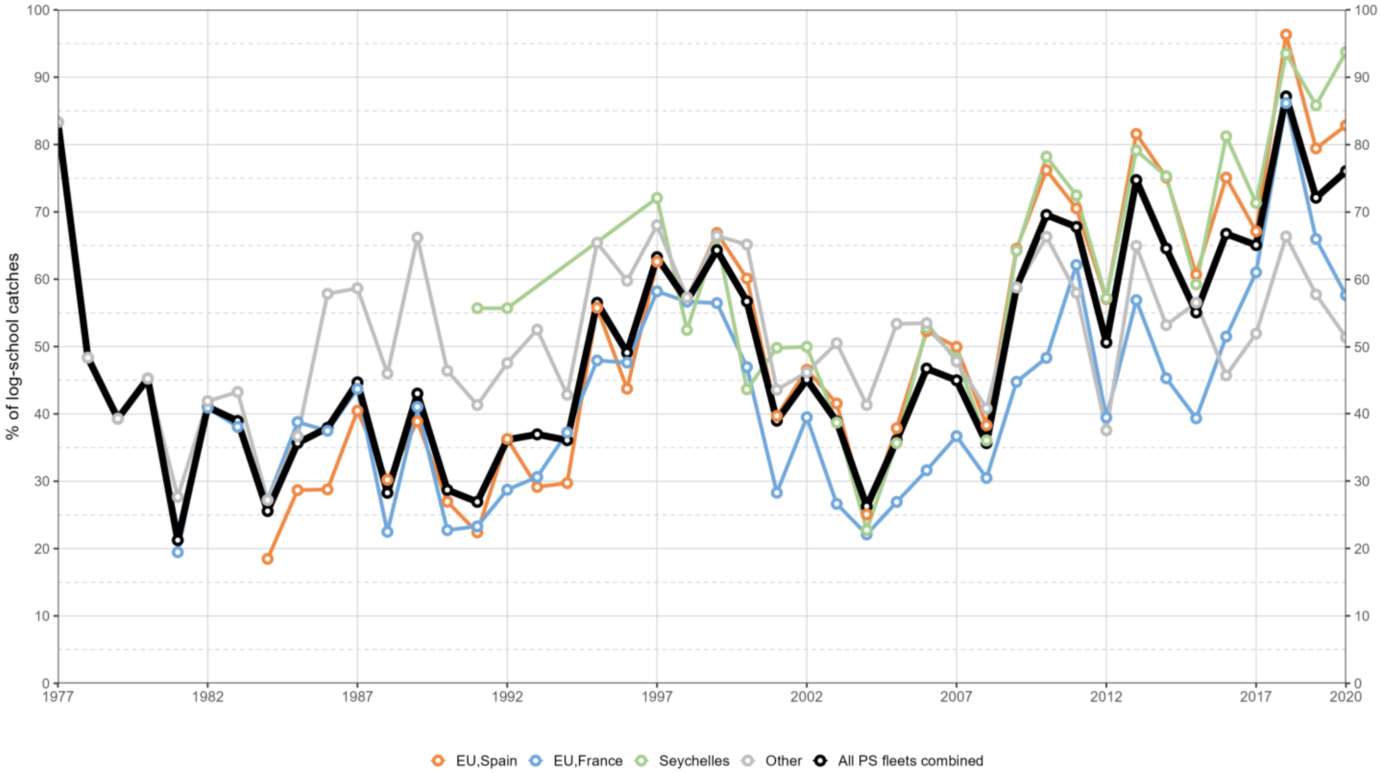

Figure 4: Annual percentages of purse seine FOB-associated catches of yellowfin tuna by fleet for the period 1977-2020. *Other* includes purse seine fleets such as ex-Soviet Union, I.R. Iran, France (Mayotte), Mauritius, Japan, Korea, Indonesia, Thailand, EU,Italy, Belize and others. Data source: time-area catch dataset for purse seine fisheries (Res. 15/02)

Main fishery features (2016-2020)

Table 3: Mean annual catches (t) of yellowfin tuna by fishery between 2016 and 2020. LS = schools associated with floating objects; FS = free-swimming schools. Data source: yellowfin tuna raised time-area catches

Fishery	Fishery code	Catch	Percentage
Purse seine | LS	PSLS	101,340	23.3
Line | Handline	LIH	88,380	20.3
Gillnet	GN	82,910	19.1
Line | Coastal longline	LIC	42,688	9.8
Purse seine | FS	PSFS	37,162	8.6
Longline | Deep-freezing	LLD	19,121	4.4
Baitboat	BB	17,329	4.0
Line | Trolling	LIT	17,232	4.0
Longline | Fresh	LLF	16,906	3.9
Purse seine | Other	PSOT	8,061	1.9
Other	OT	2,537	0.6
Longline | Other	LLO	933	0.2

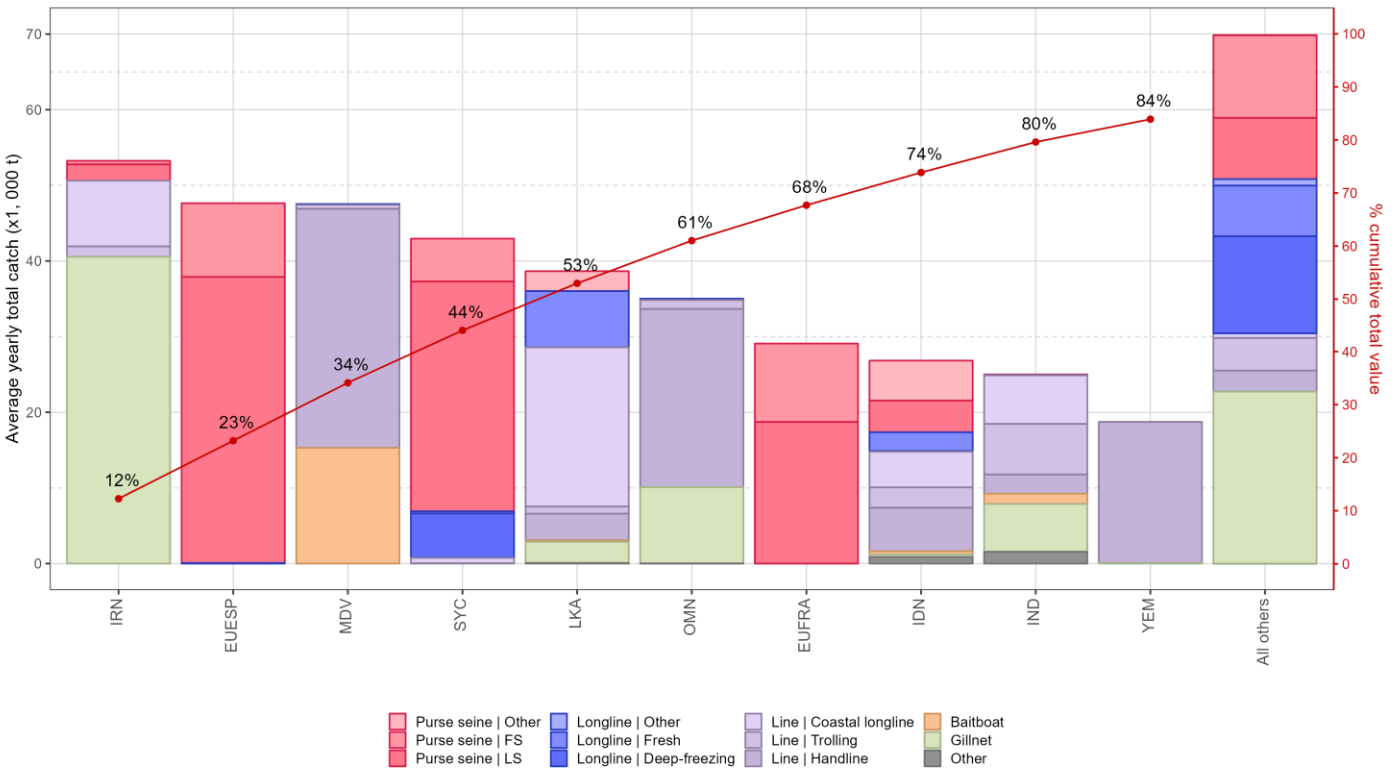

Figure 5: Mean annual catches (t) of yellowfin tuna by fleet and fishery between 2016 and 2020, with indication of cumulative catches by fleet. FS = free-swimming schools; LS = schools associated with floating objects. Data source: yellowfin tuna raised time-area catches

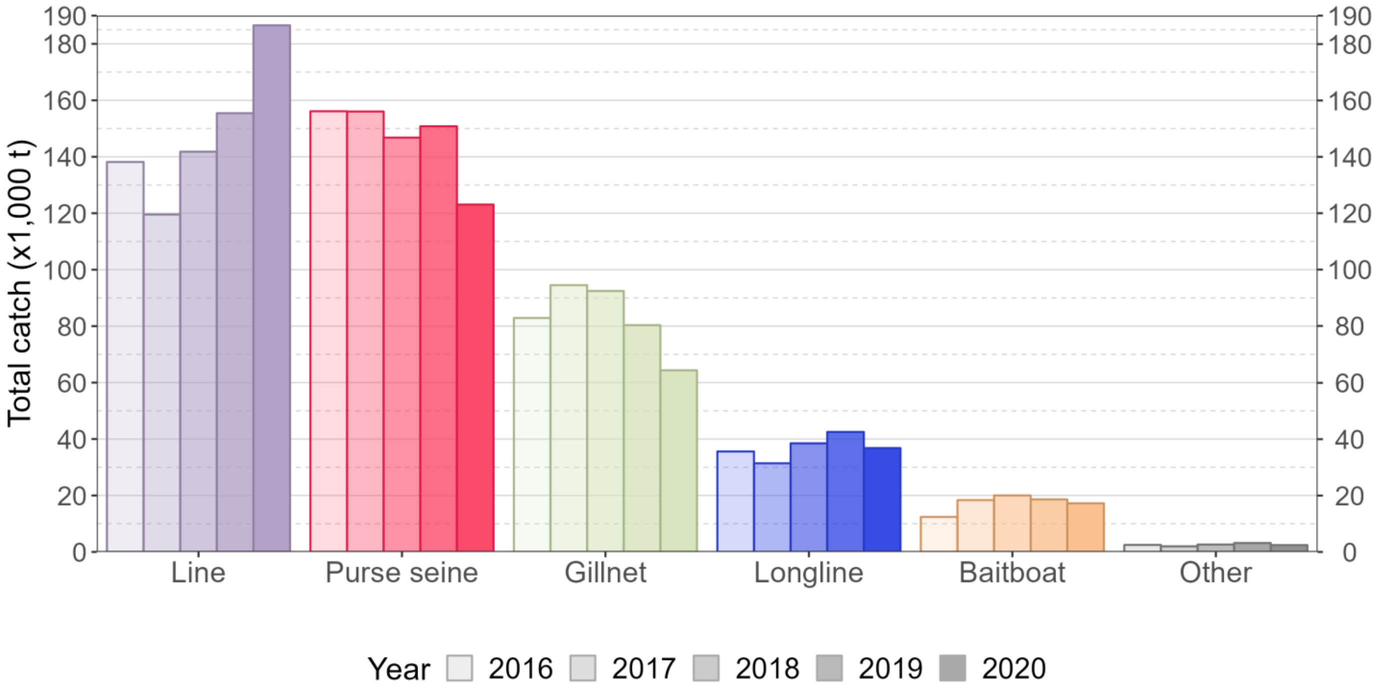

Figure 6: Annual catch (t) trends of yellowfin tuna by fishery group between 2016 and 2020. Data source: best scientific estimate of nominal catches

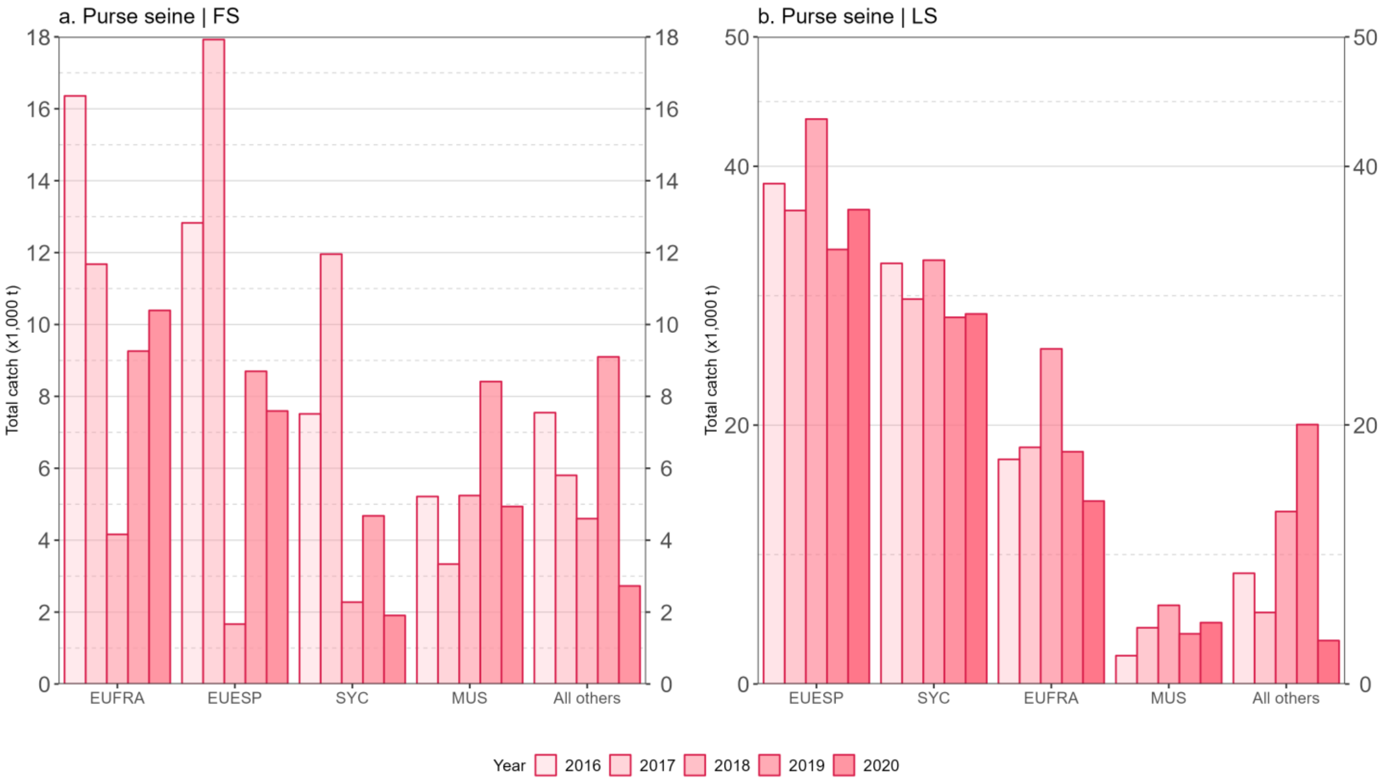

Figure 7: Annual purse seine catch (t) trends of yellowfin tuna by fishing mode and fleet between 2016 and 2020. FS = free-swimming schools; LS = schools associated with floating objects. Data source: yellowfin tuna raised time-area catches

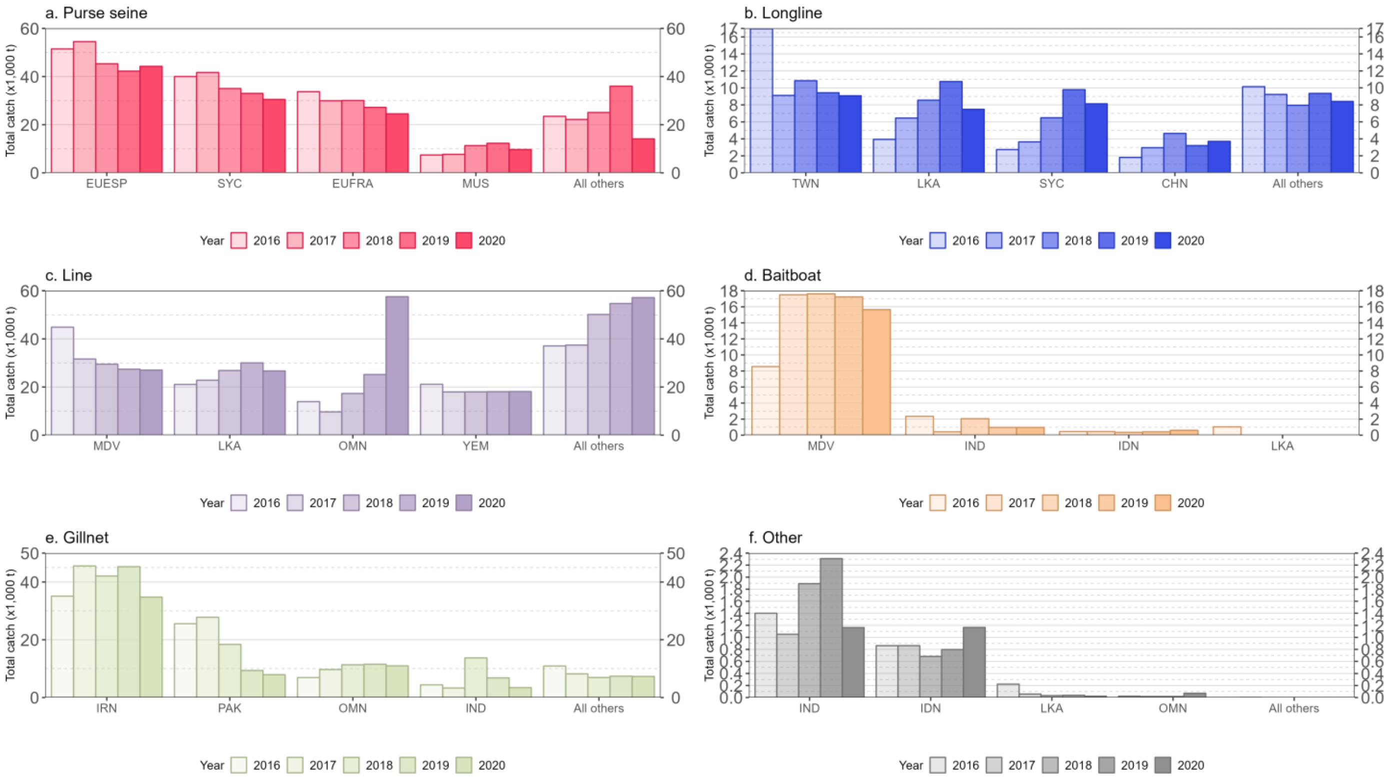

Figure 8: Annual catch (t) trends of yellowfin tuna by fishery group and fleet between 2016 and 2020. Data source: [best scientific estimate of nominal catches]

Changes from previous WPTT

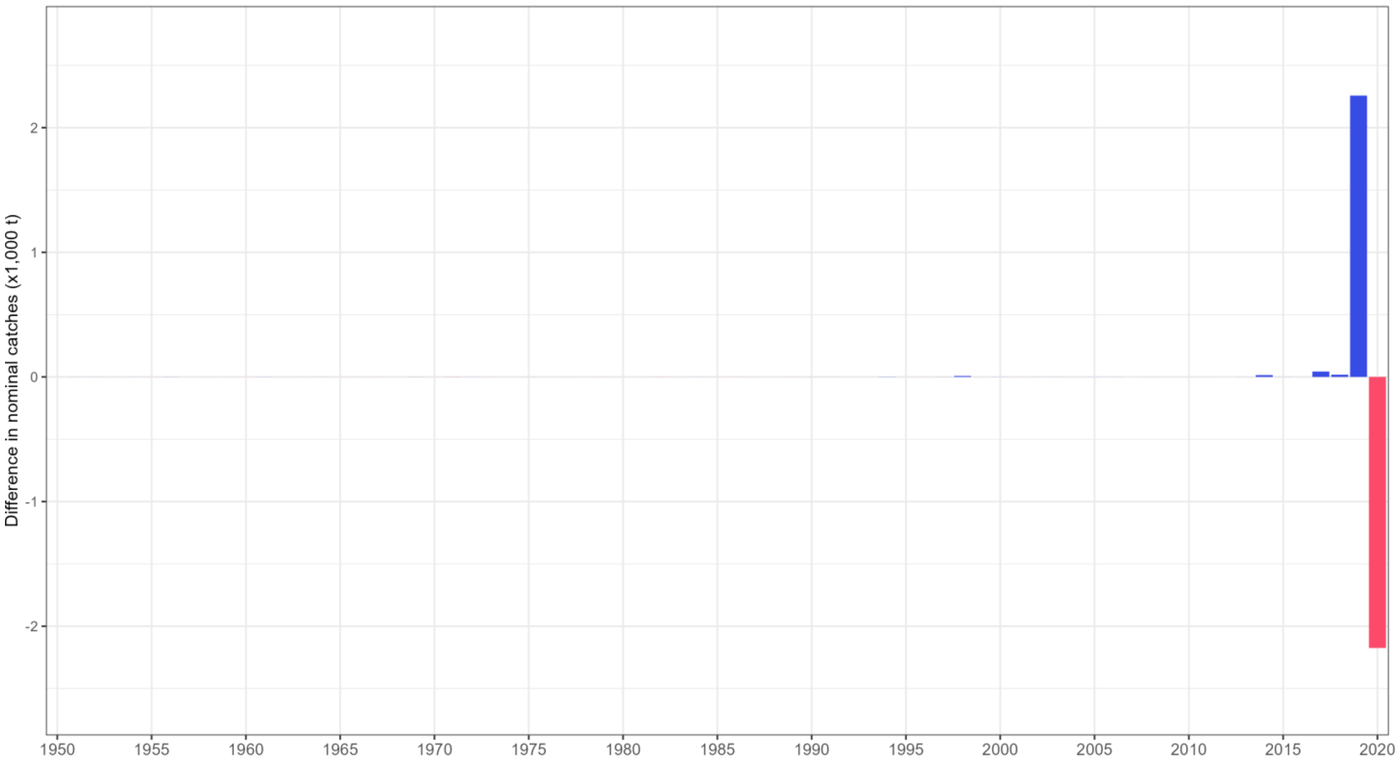

Figure 9: Differences in the available best scientific estimates of nominal catches (t) of yellowfin tuna between this WPTT and its previous session (data preparatory meeting held in May 2021)

Table 4: Changes in best scientific estimates of average annual nominal catches of yellowfin tuna by year, fleet, fishery group and main Indian Ocean area, limited to absolute values higher than 10 t. Data source: best scientific estimate of nominal catches 2019 and 2020

Year	Fleet	Fishery group	Area	Current (t)	Previous (t)	Difference (t)
2020	EUMYT	Line	Western Indian Ocean	78	156	-78
	IDN	Baitboat	Eastern Indian Ocean	608	373	236
		Gillnet	Eastern Indian Ocean	429	263	166
		Line	Eastern Indian Ocean	17,524	10,733	6,791
		Longline	Eastern Indian Ocean	3,648	4,179	-531
		Other	Eastern Indian Ocean	1,165	713	451
		Purse seine	Eastern Indian Ocean	7,781	20,256	-12,476
	KEN	Gillnet	Western Indian Ocean	982	0	982
		Line	Western Indian Ocean	2,481	0	2,481
		Longline	Western Indian Ocean	99	0	99
	LKA	Gillnet	Eastern Indian Ocean	1,869	1,907	-38
		Gillnet	Western Indian Ocean	38	0	38
		Longline	Eastern Indian Ocean	1,037	7,481	-6,444
		Longline	Western Indian Ocean	6,444	0	6,444
	PAK	Gillnet	Western Indian Ocean	7,898	9,547	-1,649
		Line	Western Indian Ocean	21	0	21
	SYC	Line	Western Indian Ocean	975	927	48
		Longline	Western Indian Ocean	8,126	6,821	1,305
	YEM	Gillnet	Western Indian Ocean	26	13	12
		Line	Western Indian Ocean	18,108	18,141	-32
2019	CHN	Longline	Eastern Indian Ocean	67	10	57
		Longline	Western Indian Ocean	3,145	3,202	-57
	GBR	Longline	Western Indian Ocean	14	0	14
	LKA	Gillnet	Eastern Indian Ocean	2,005	1,111	894
		Gillnet	Western Indian Ocean	20	913	-894
		Line	Eastern Indian Ocean	30,039	21,081	8,958
		Longline	Eastern Indian Ocean	2,269	1,336	933
		Longline	Western Indian Ocean	8,476	9,410	-933
		Other	Eastern Indian Ocean	37	14	24
		Purse seine	Eastern Indian Ocean	1,909	1,812	96

Year	Fleet	Fishery group	Area	Current (t)	Previous (t)	Difference (t)
		Purse seine	Western Indian Ocean	0	97	-96
	SYC	Line	Western Indian Ocean	959	9	950
		Longline	Western Indian Ocean	9,790	8,450	1,340

Uncertainties in nominal catch data

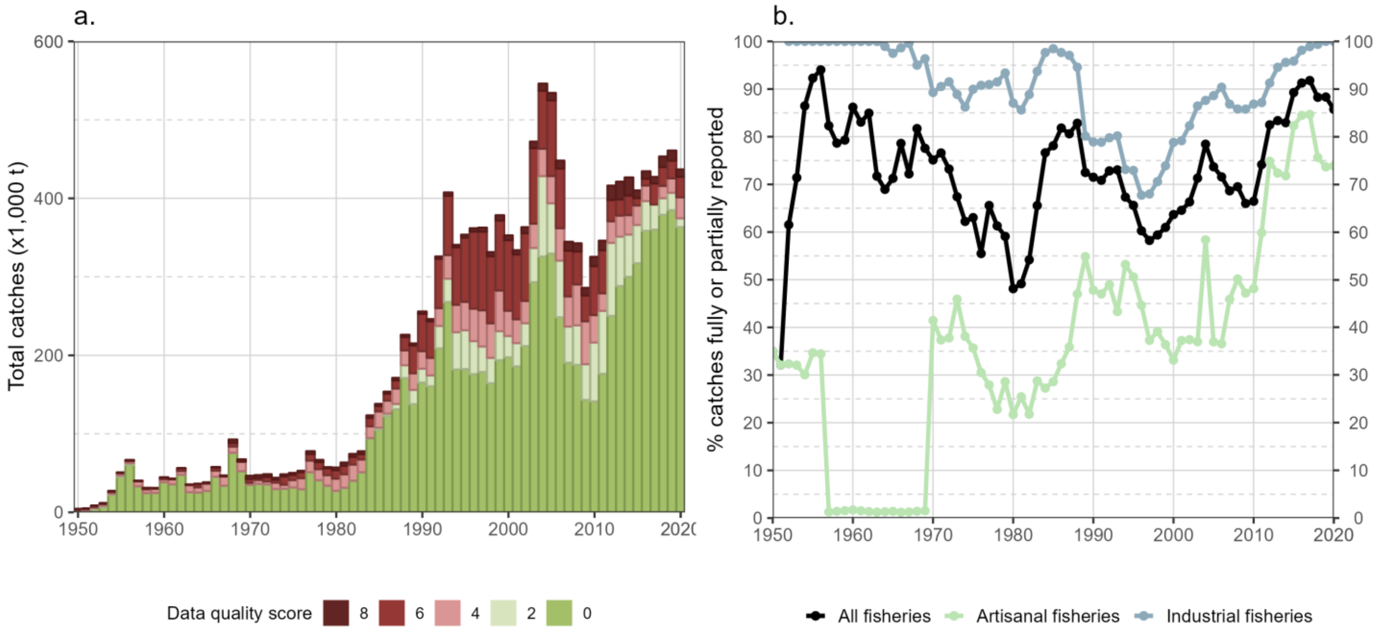

Figure 10: Annual nominal catches (t) of yellowfin tuna estimated by quality score (barplot) and percentage of nominal catch fully/partially reported to the IOTC Secretariat (lines with dots) for all fisheries (a) and by type of fishery (b), in the period 1950-2020

Discard levels

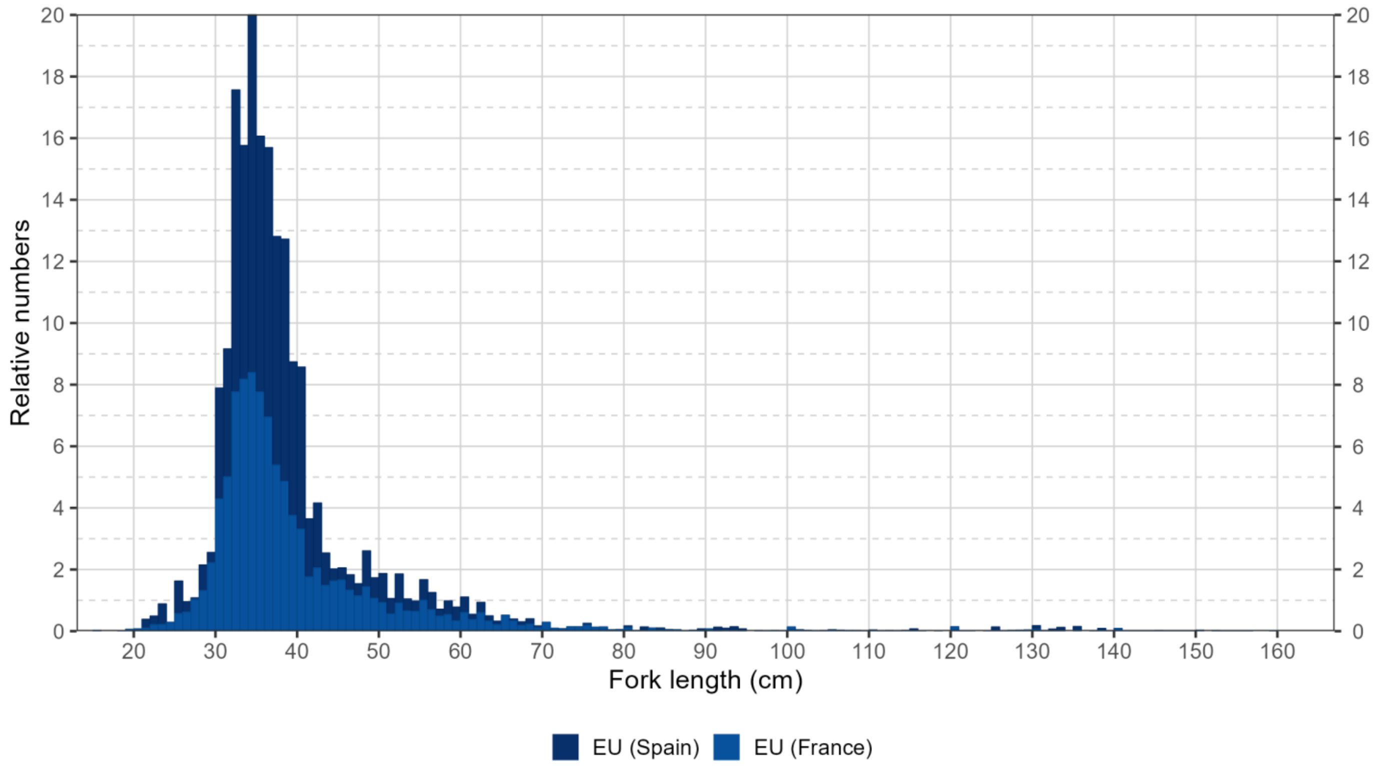

Figure 11: Fork length (cm) distribution of yellowfin tuna discarded at sea in purse seine fisheries during the period 2016-2020 (n = 129,520). Data source: IOTC ROS database

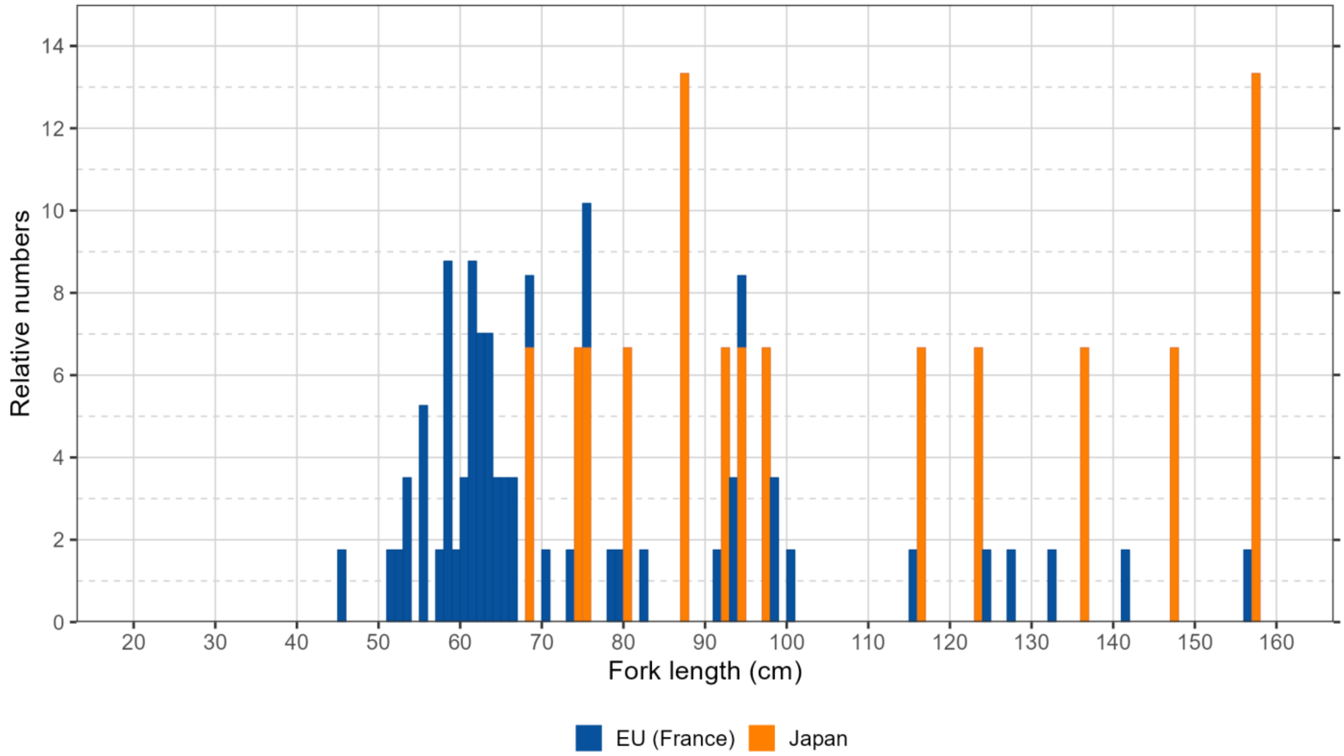

Figure 12: Fork length (cm) distribution of yellowfin tuna discarded at sea in longline fisheries during the period 2009-2020 (n = 516). Data source: IOTC ROS database

Geo-referenced catch

Spatial distribution of catches

Georeferenced catches by fishery and decade (1950-2009)

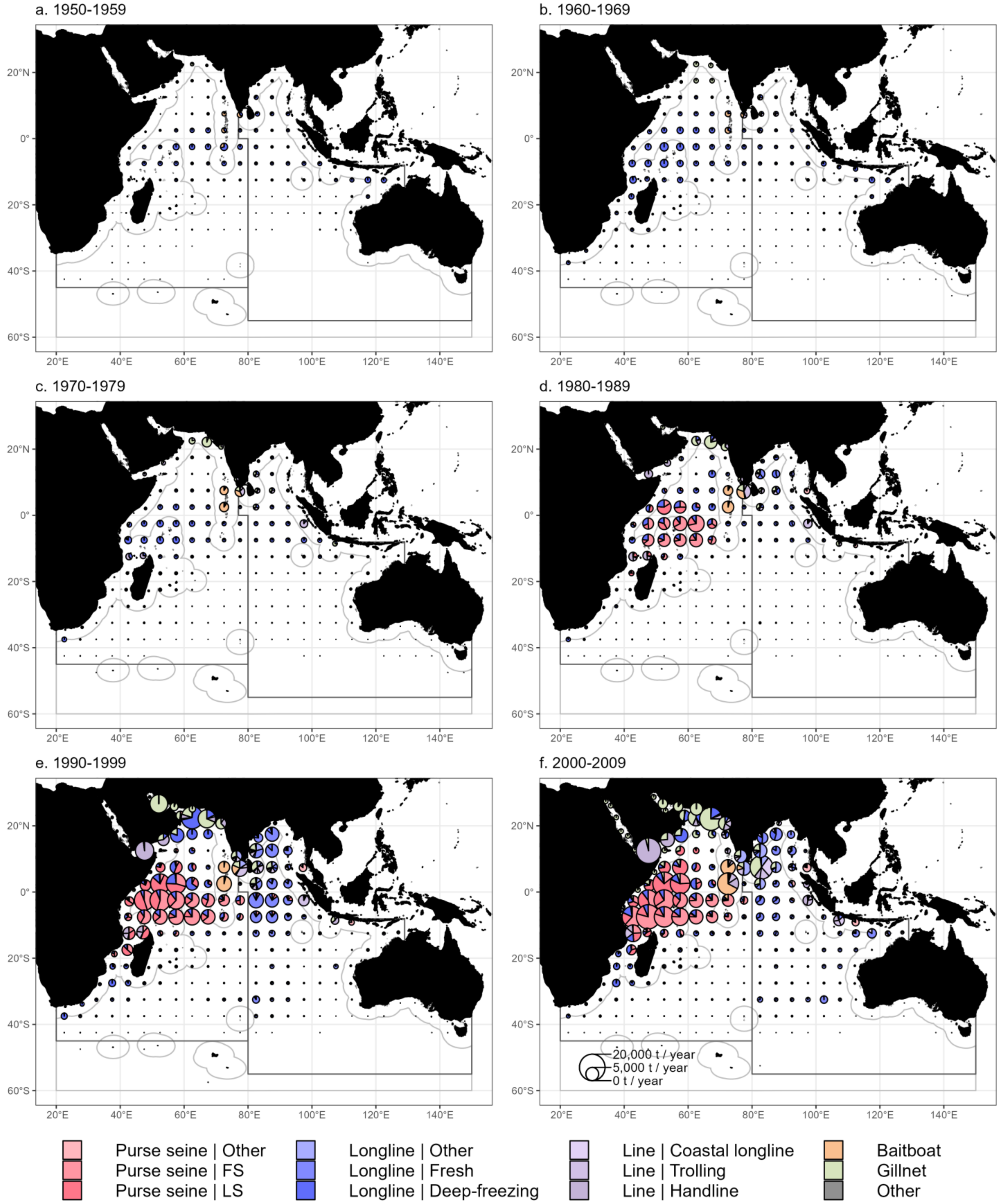

Figure 13: Estimated mean annual time-area catches (t) of yellowfin tuna by decade, 5x5 grid, and fishery. Data source: yellowfin tuna raised time-area catches

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

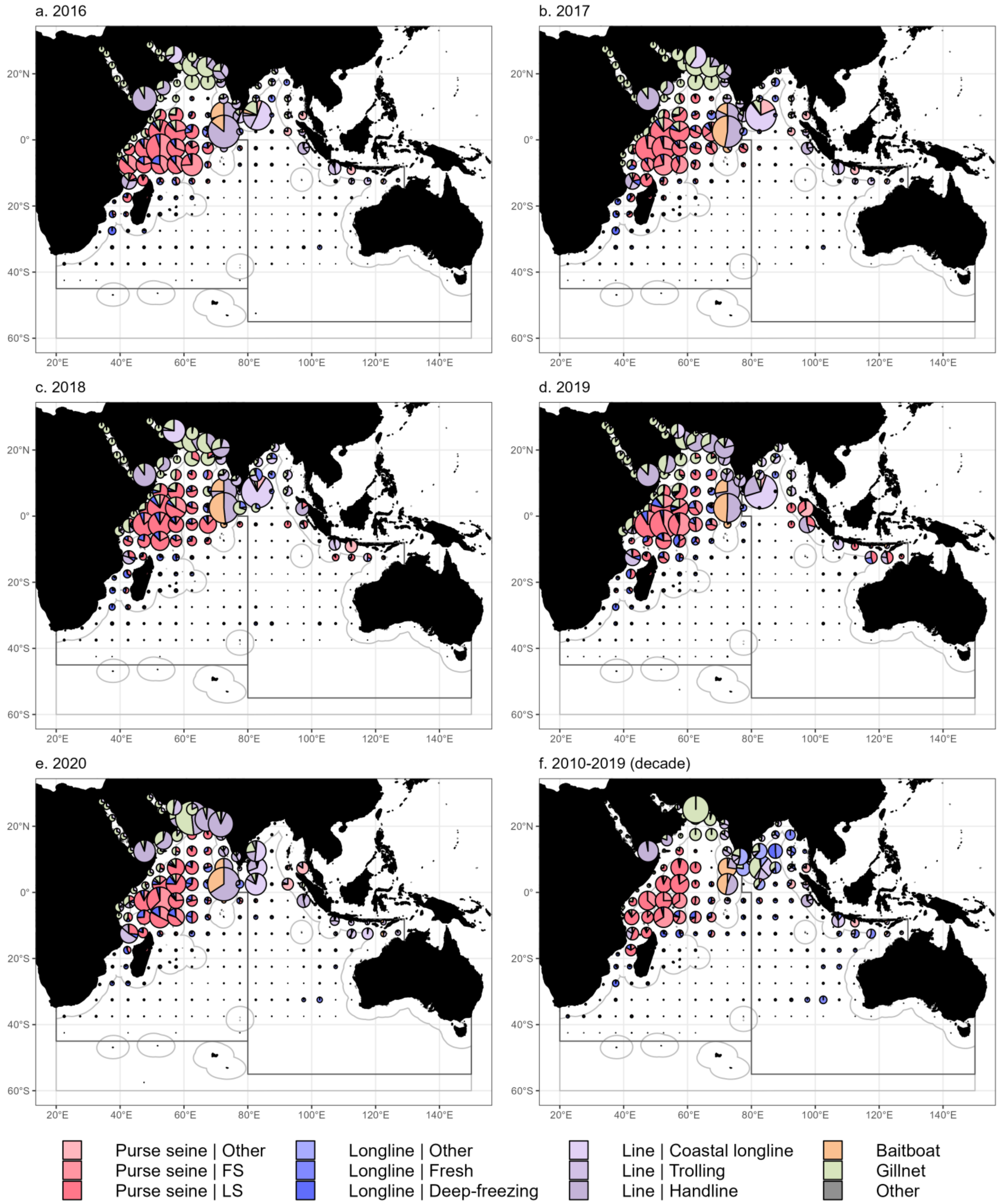

Figure 14: Estimated mean annual time-area catches (t) of yellowfin tuna by year / decade, 5x5 grid, and fishery. Data source: yellowfin tuna raised time-area catches

Uncertainties in catch-and-effort data

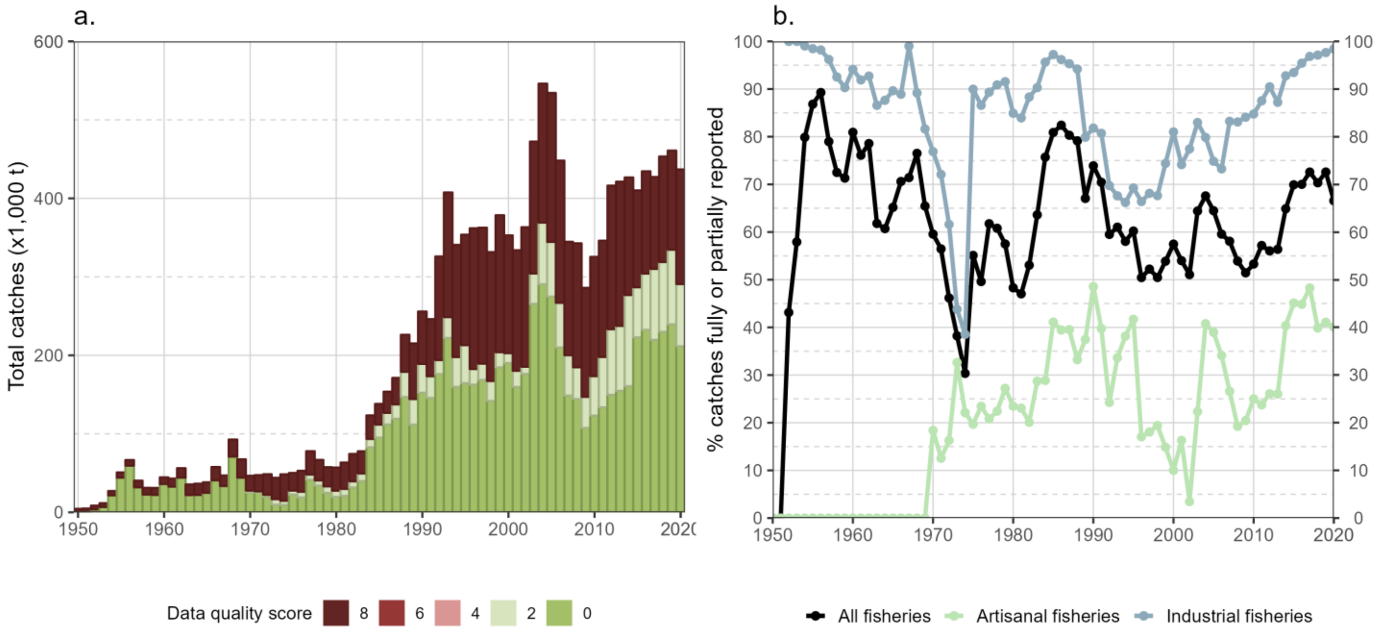

Figure 15: Annual nominal catches (t) of yellowfin tuna estimated by quality score (barplot) and percentage of geo-referenced catches reported to the IOTC Secretariat in agreement with the requirements of Res. 15/02 (lines with dots) for all fisheries (a) and by type of fishery (b), in the period 1950-2020

Size composition of the catch

Samples availability

By fishery group

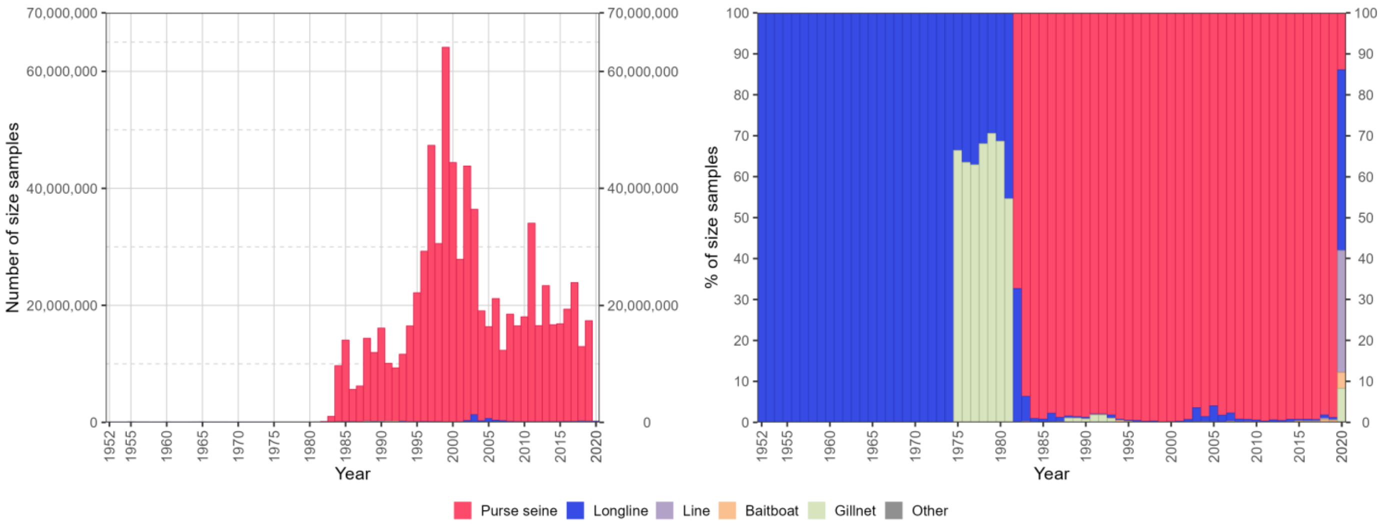

Figure 16: Availability of yellowfin tuna size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and fishery group. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

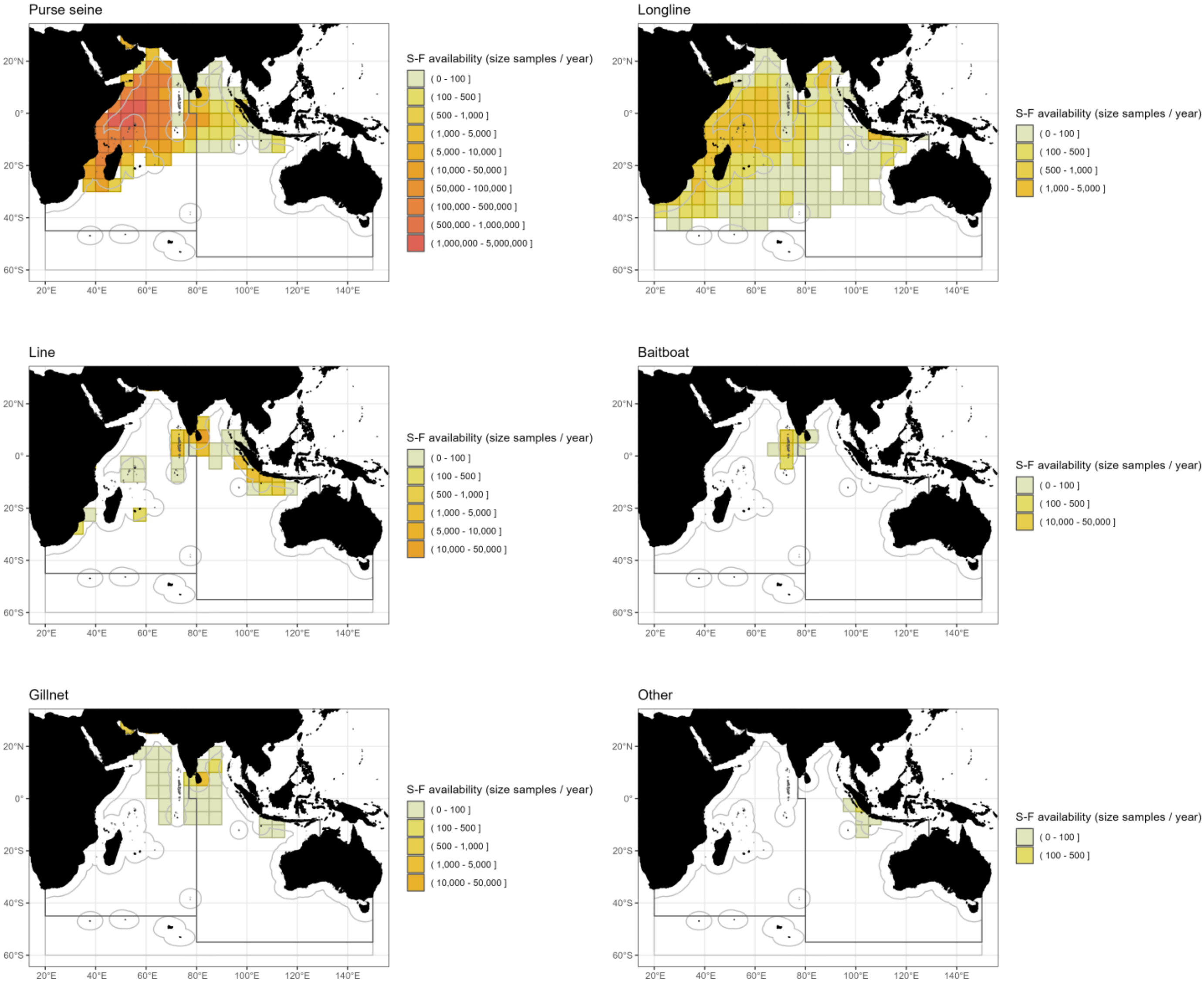

Figure 17: Spatial distribution (average number of samples per grid per year) of available yellowfin tuna size-frequency data for each fishery group in the period 2016-2020. Data source: standardized size-frequency dataset (Res. 15/02)

By fishery

Purse seine fisheries

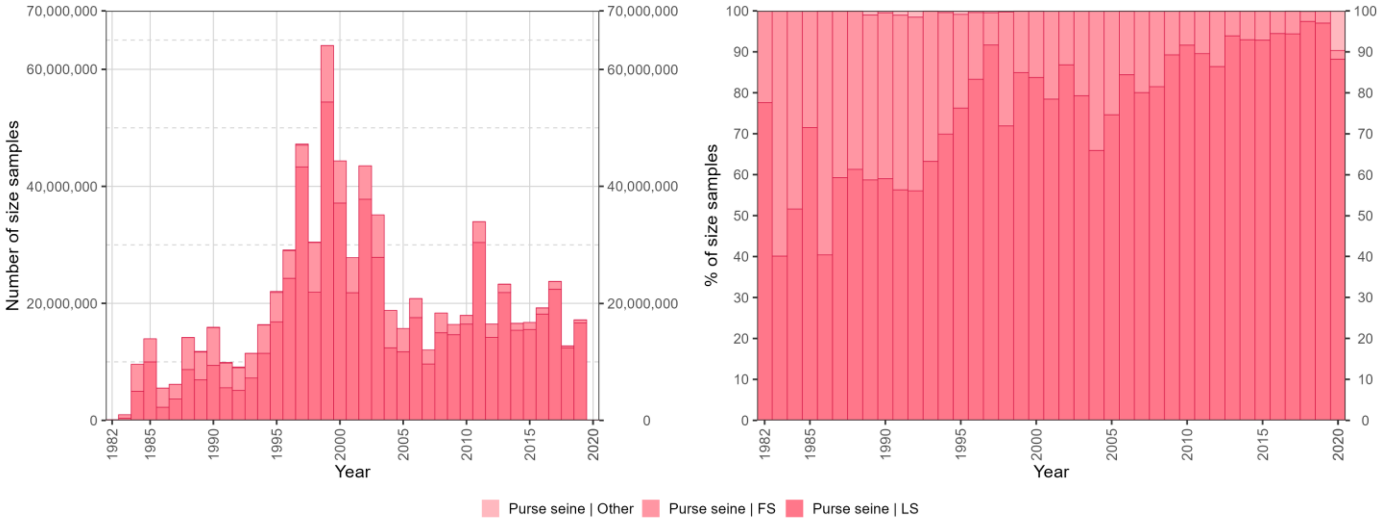

Figure 18: Availability of yellowfin tuna size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and purse seine fishery type. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

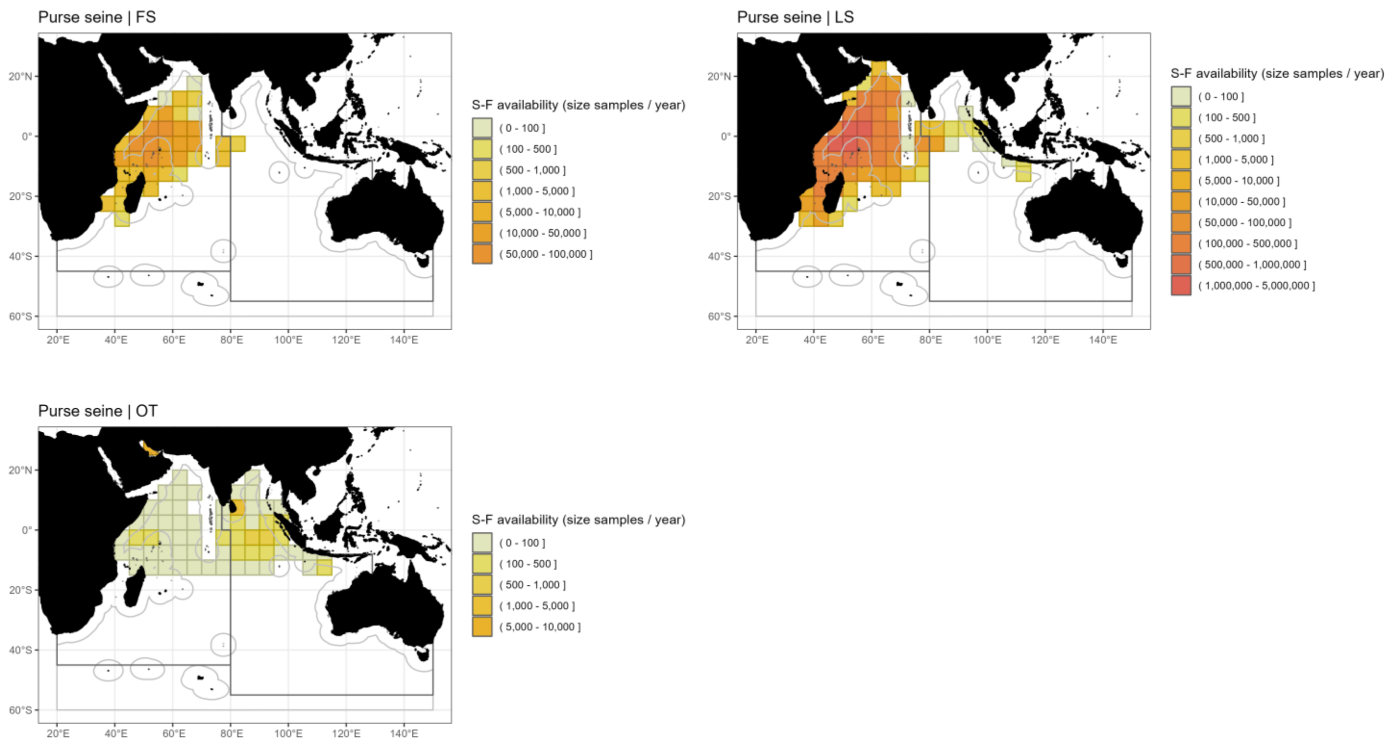

Figure 19: Spatial distribution (average number of samples per grid per year) of available yellowfin tuna size-frequency data by purse seine fishery types in the period 2016-2020. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

Longline fisheries

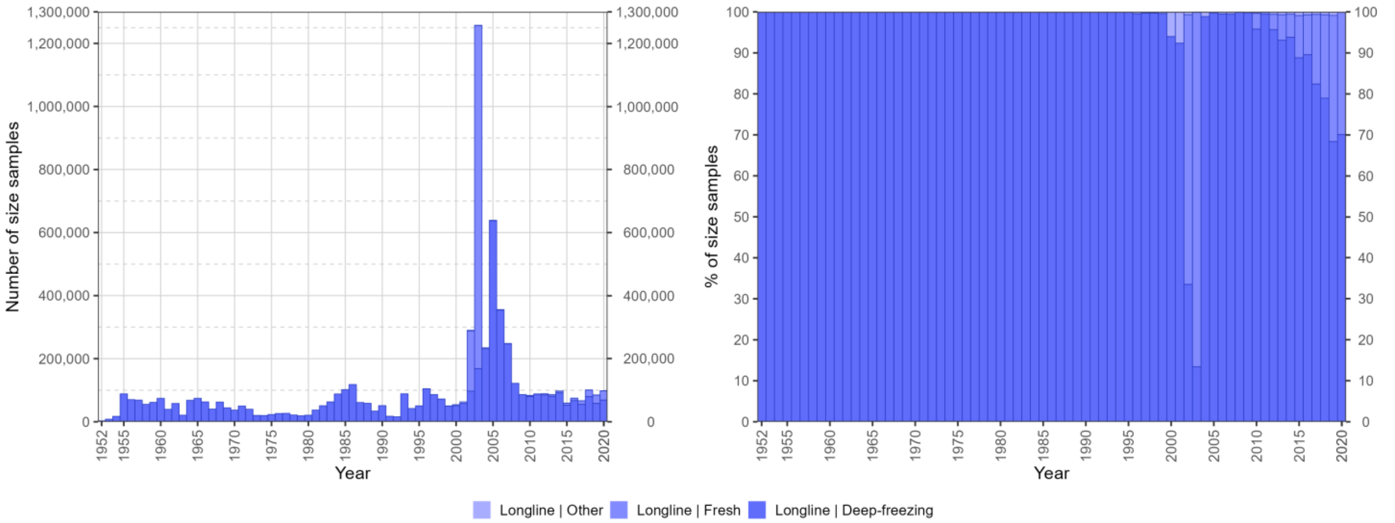

Figure 20: Availability of yellowfin tuna size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and longline fishery type. Data source: standardized size-frequency dataset (Res. 15/02)

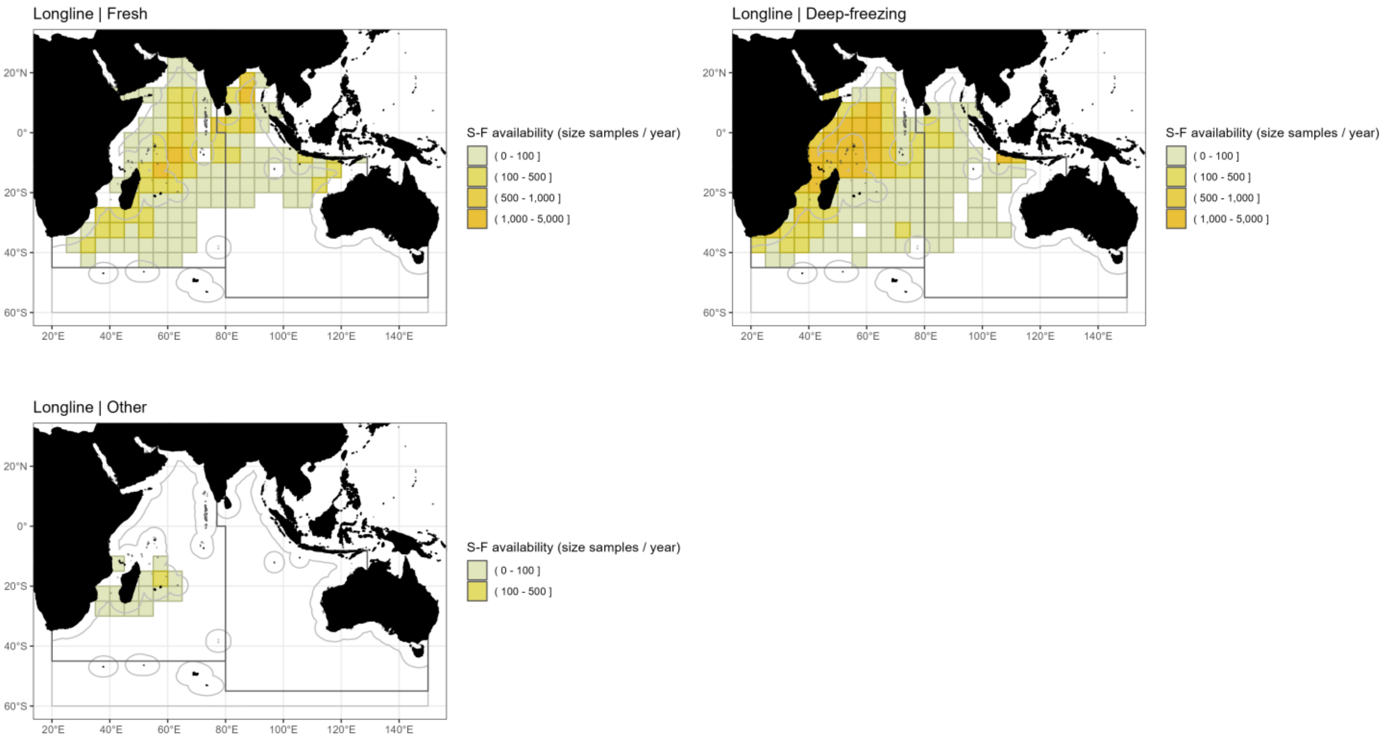

Figure 21: Spatial distribution (average number of samples per grid per year) of available yellowfin tuna size-frequency data by longline fishery types in the period 2016-2020. Data source: standardized size-frequency dataset (Res. 15/02)

Line fisheries

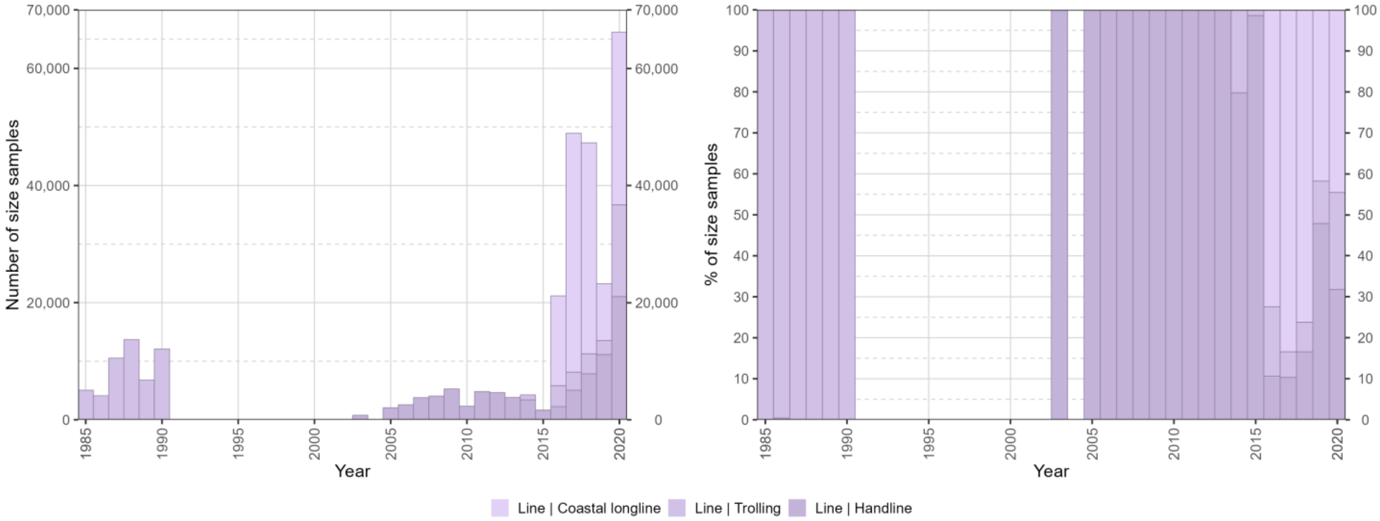

Figure 22: Availability of yellowfin tuna size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and line fishery type. Data source: standardized size-frequency dataset (Res. 15/02)

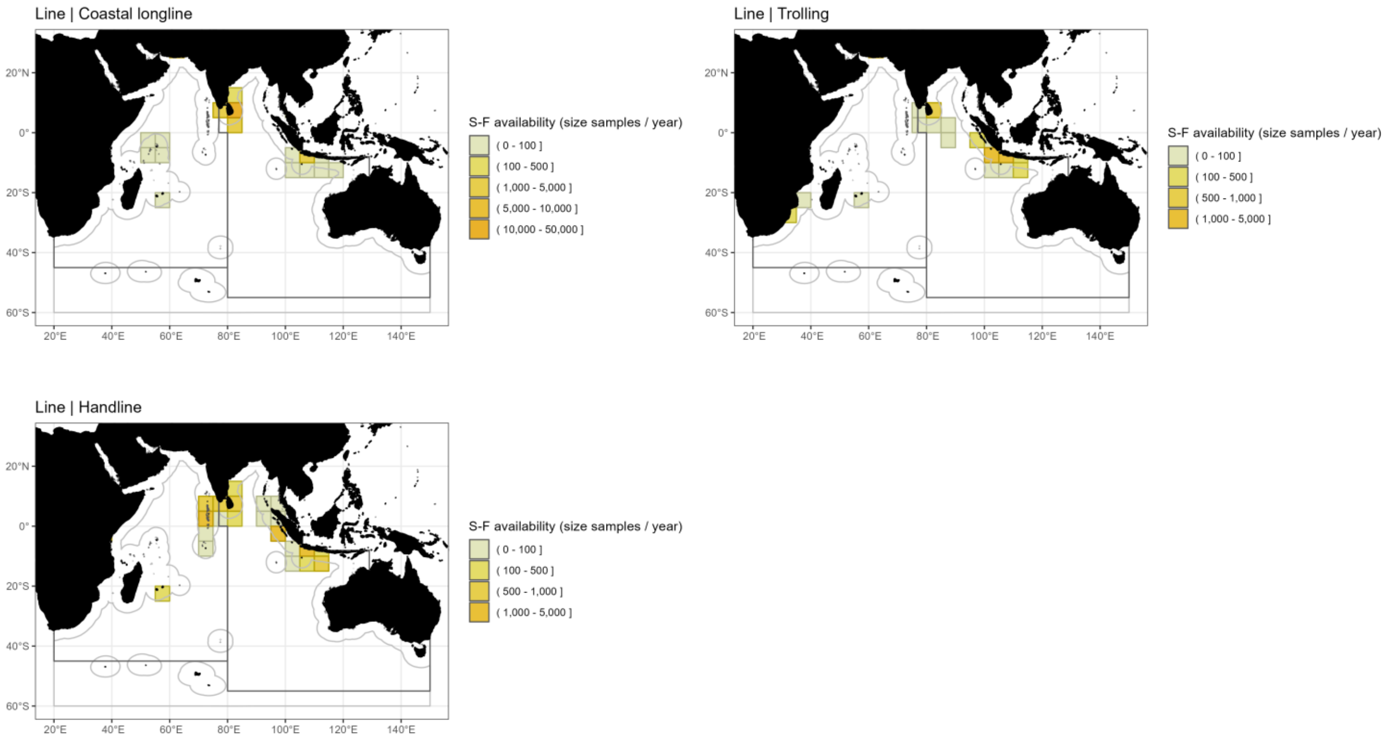

Figure 23: Spatial distribution (average number of samples per grid per year) of available yellowfin tuna size-frequency data by line fishery types in the period 2016-2020. Data source: standardized size-frequency dataset (Res. 15/02)

Other fisheries

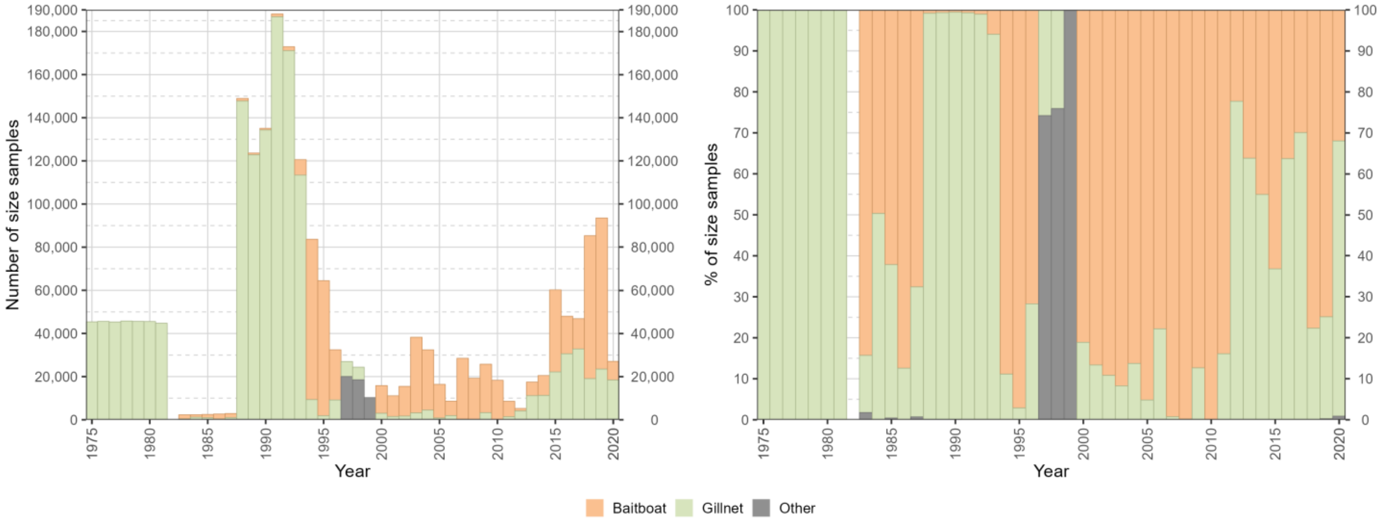

Figure 24: Availability of yellowfin tuna size-frequency data as absolute number of samples (left) and relative number of samples (right) per year and all other fishery types. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

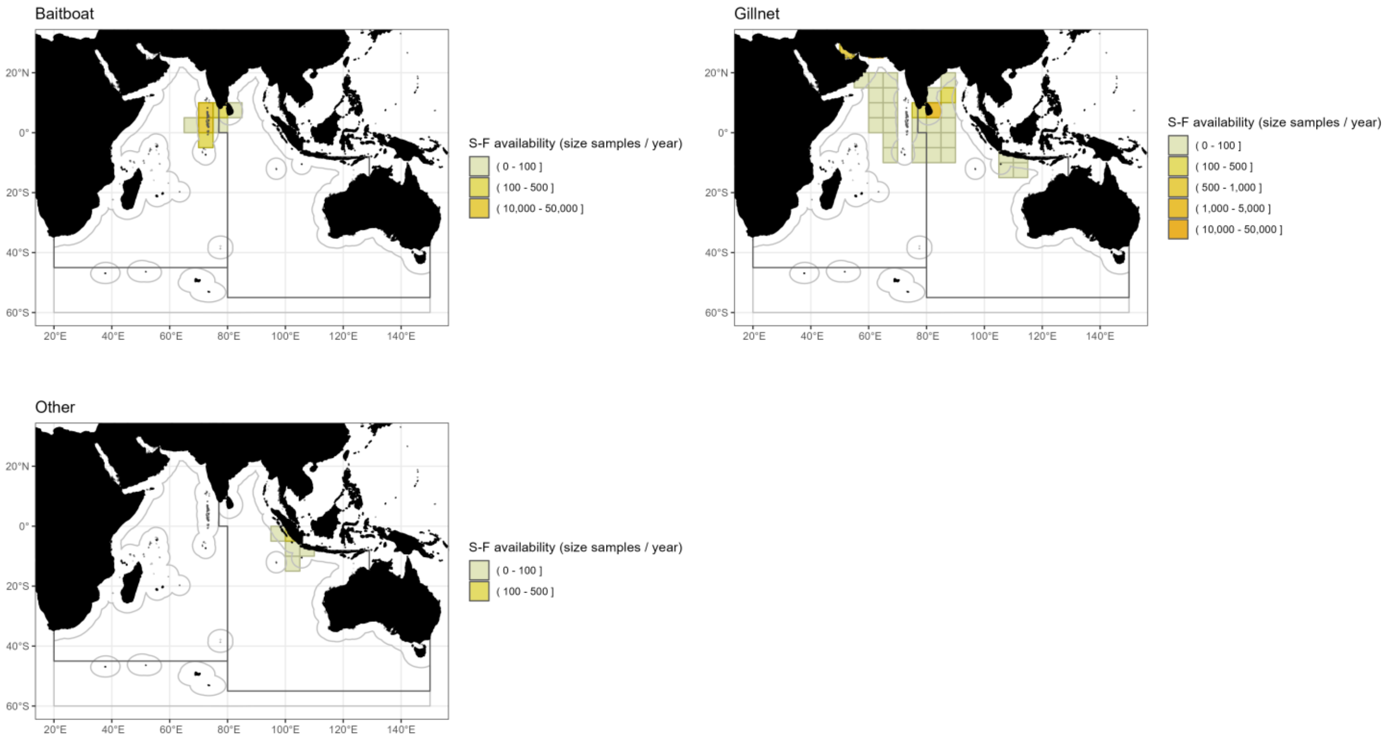

Figure 25: Spatial distribution (average number of samples per grid per year) of available yellowfin tuna size-frequency data by all other fishery types in the period 2016-2020. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

Temporal patterns and trends in size distributions

Industrial purse seine fisheries

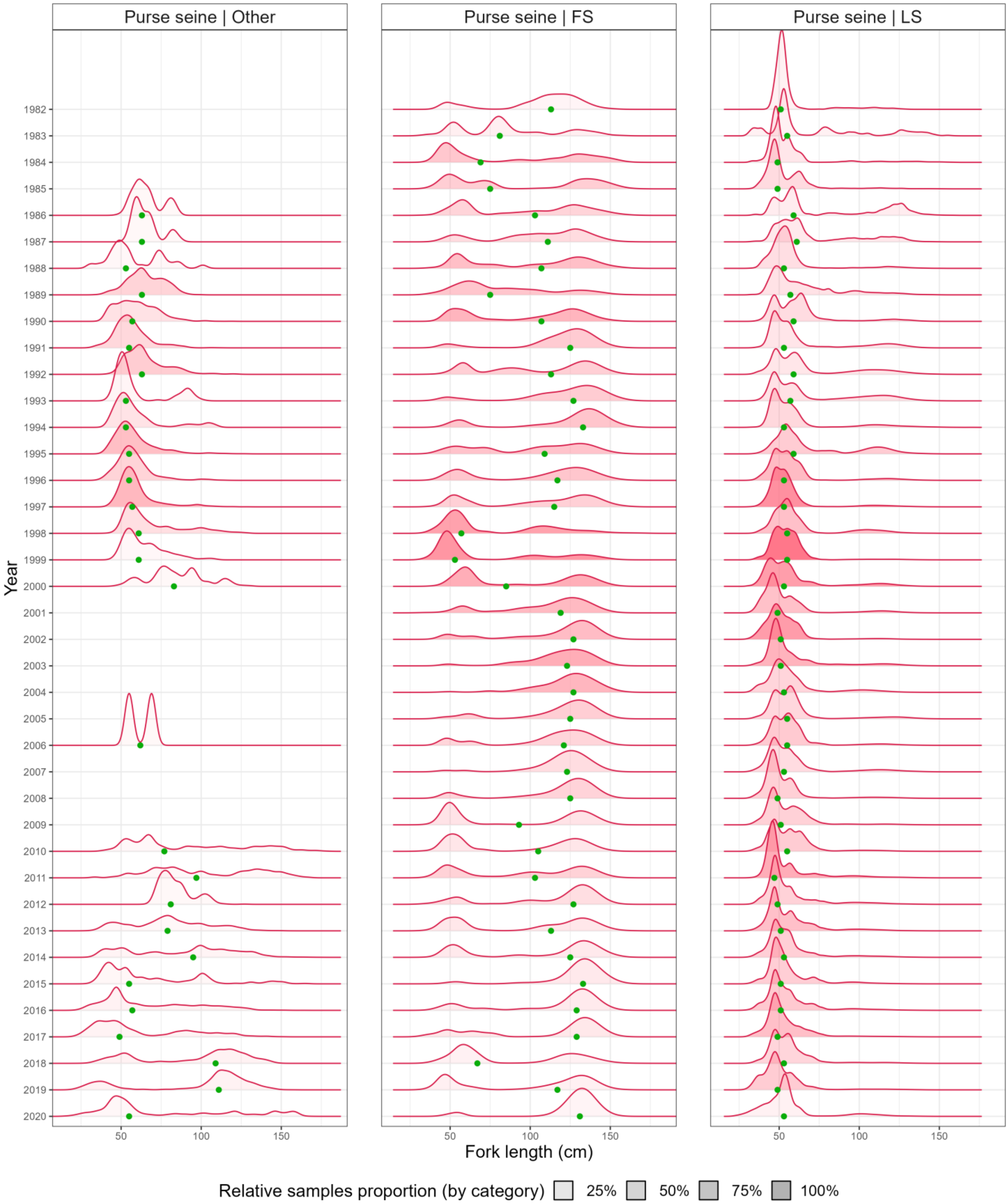

Figure 26: Relative size distribution (fork length in 2 cm size bins) of yellowfin tuna caught by all purse seine fleets for the period 1982-2020. Other = no information provided on the school association; FS = free-swimming schools; LS = schools associated with floating objects. Fill intensity is proportional to the number of samples recorded for the year, while the green dot corresponds to the median value. Data source: [yellowfin tuna standardized size-frequency dataset](#) (Res. 15/02)

Industrial longline fisheries

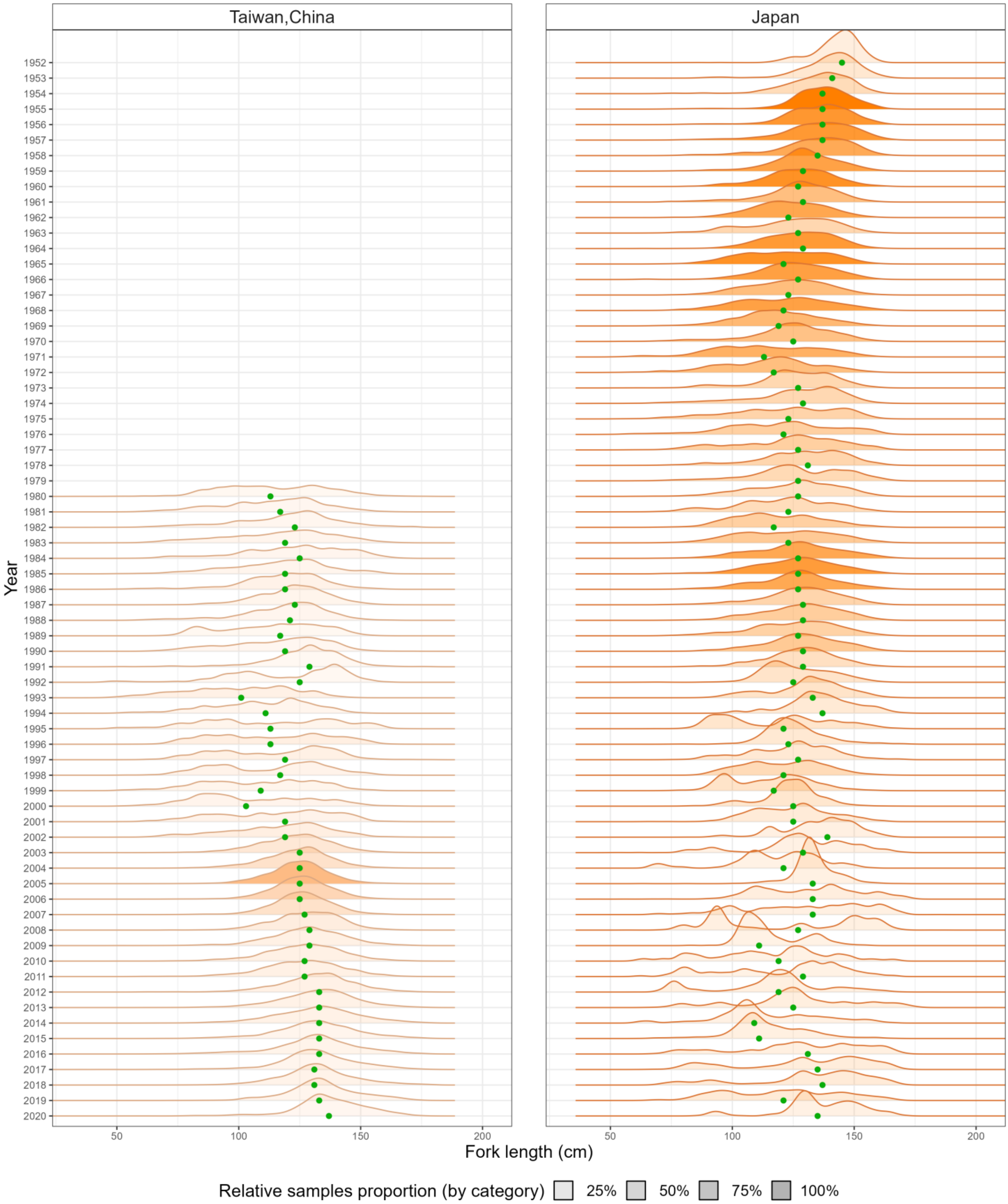

Figure 27: Relative size distribution (fork length in 2 cm size bins) of yellowfin tuna caught by the main deep-freezing longline fleets for the period 1952-2020. Fill intensity is proportional to the number of samples recorded for the year, while the green dot corresponds to the median value. Data source: [yellowfin tuna standardized size-frequency dataset](#) (Res. 15/02)

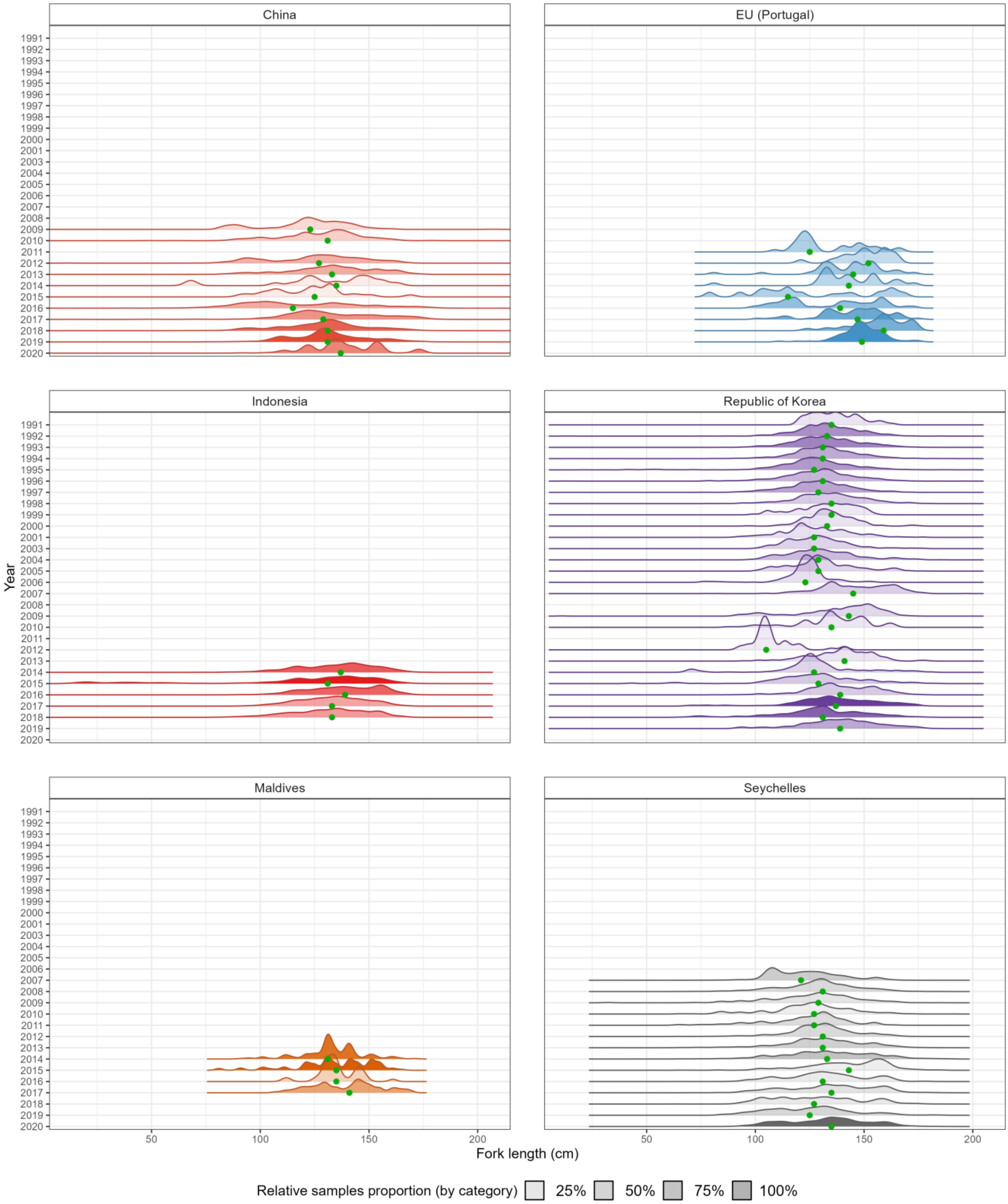

Figure 28: Relative size distribution (fork length in 2 cm size bins) of yellowfin tuna caught by all other longline fleets (excluding Japan and Taiwan,China), by fleet for the period 1991-2020. Data source: [yellowfin tuna standardized size-frequency dataset]() (Res. 15/02)

Temporal trends in estimated average weights

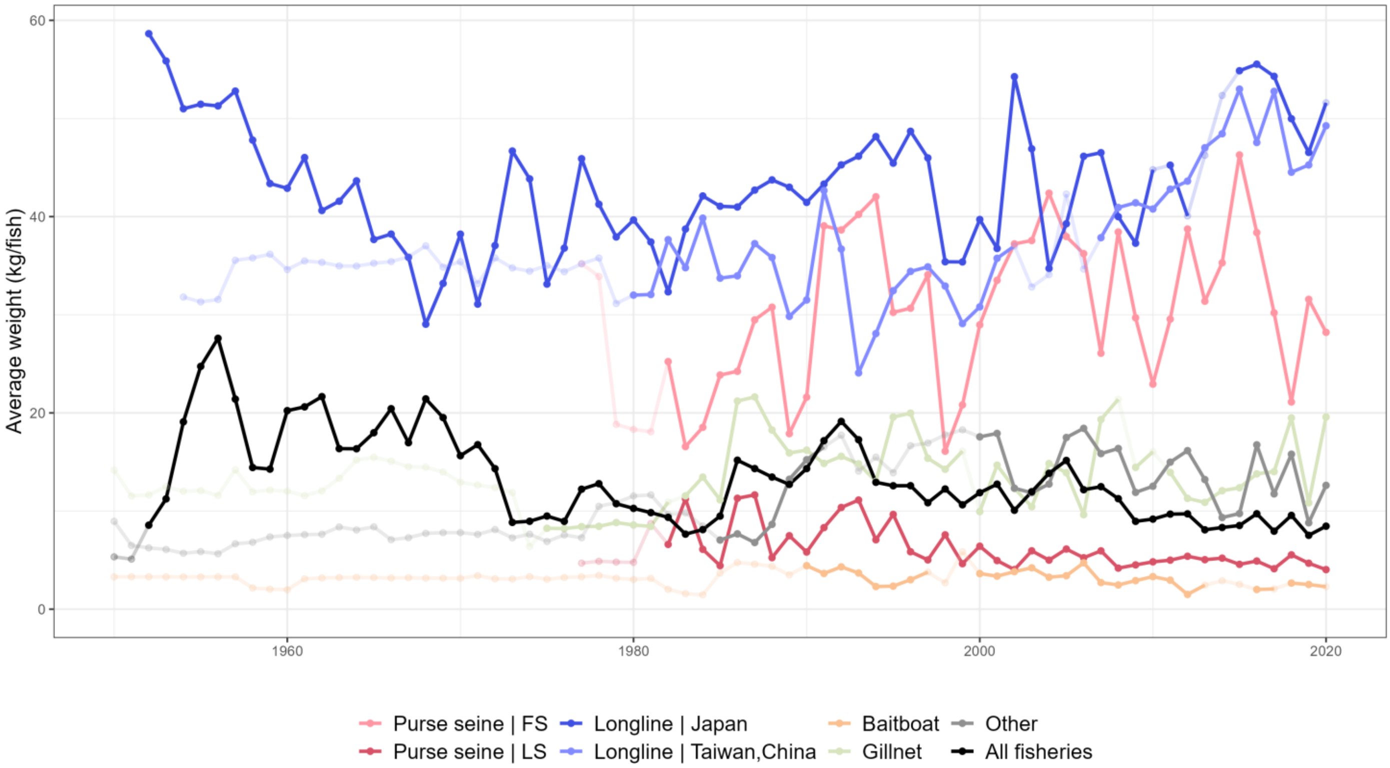

Figure 29: Combined estimated yellowfin tuna average weight (kg/fish) in the catch by fishery and year. Semi-transparent points correspond to years for which the original size samples cover strata with reported catches (by year and fishery) **lower** than 50 t. LS = schools associated with floating objects; FS = free-swimming schools. Longline | Japan = includes data from longliners flagged by Japan, Rep. of Korea and Thailand; Longline | Taiwan = includes data from longliners flagged by Taiwan,China and all other flags not otherwise mentioned. Data source: raised time-area catches

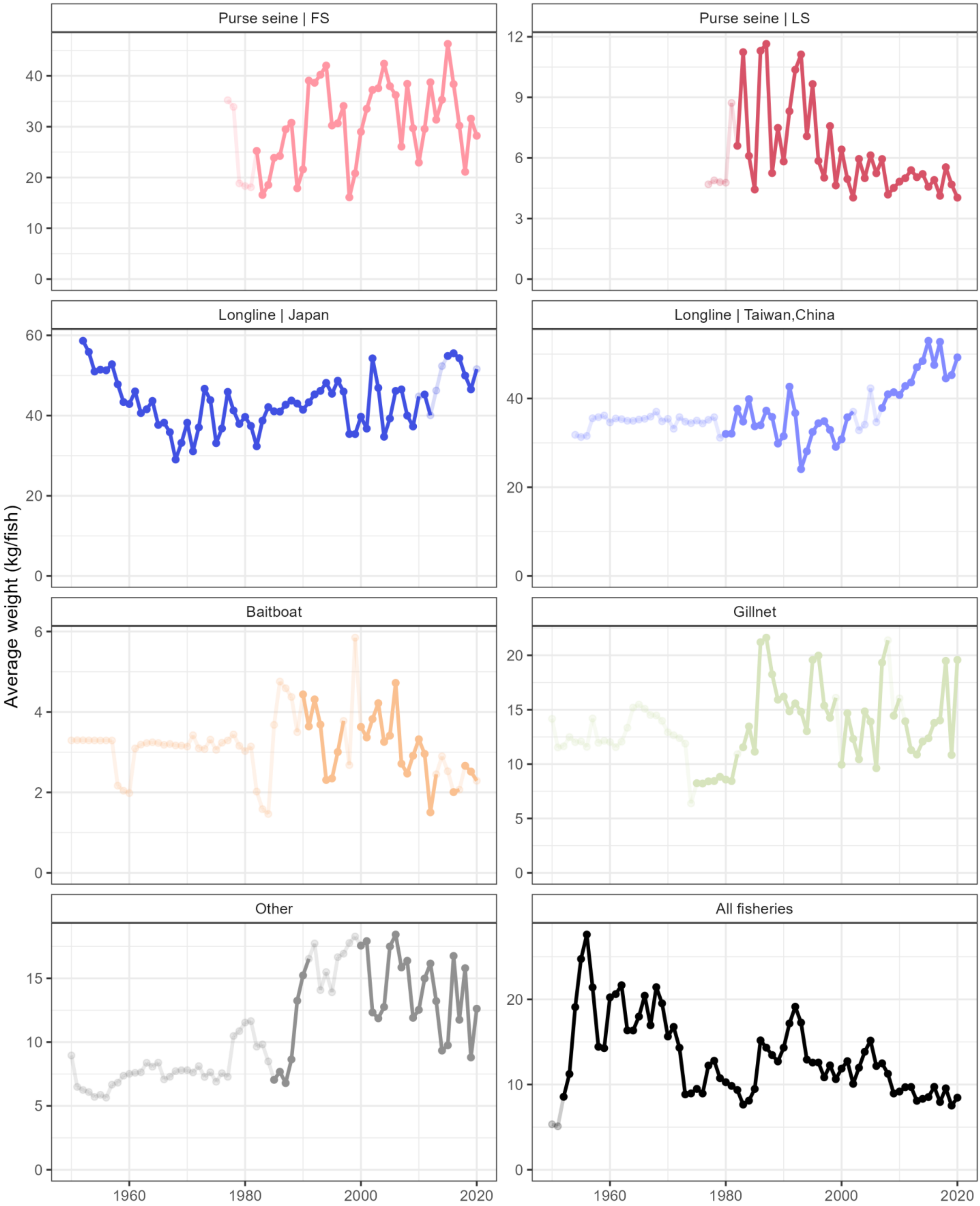

Figure 30: Estimated yellowfin tuna average weight (kg/fish) in the catch by fishery and year. Semi-transparent points correspond to years for which the original size samples cover strata with reported catches (by year and fishery) **lower** than 50 t. LS = schools associated with floating objects; FS = free-swimming schools. Longline | Japan = includes data from longliners flagged by Japan, Rep. of Korea and Thailand; Longline | Taiwan = includes data from longliners flagged by Taiwan,China and all other flags not otherwise mentioned. Data source: raised time-area catches

Spatial distribution of average weights

Estimated average weights by decade (1950-2019)

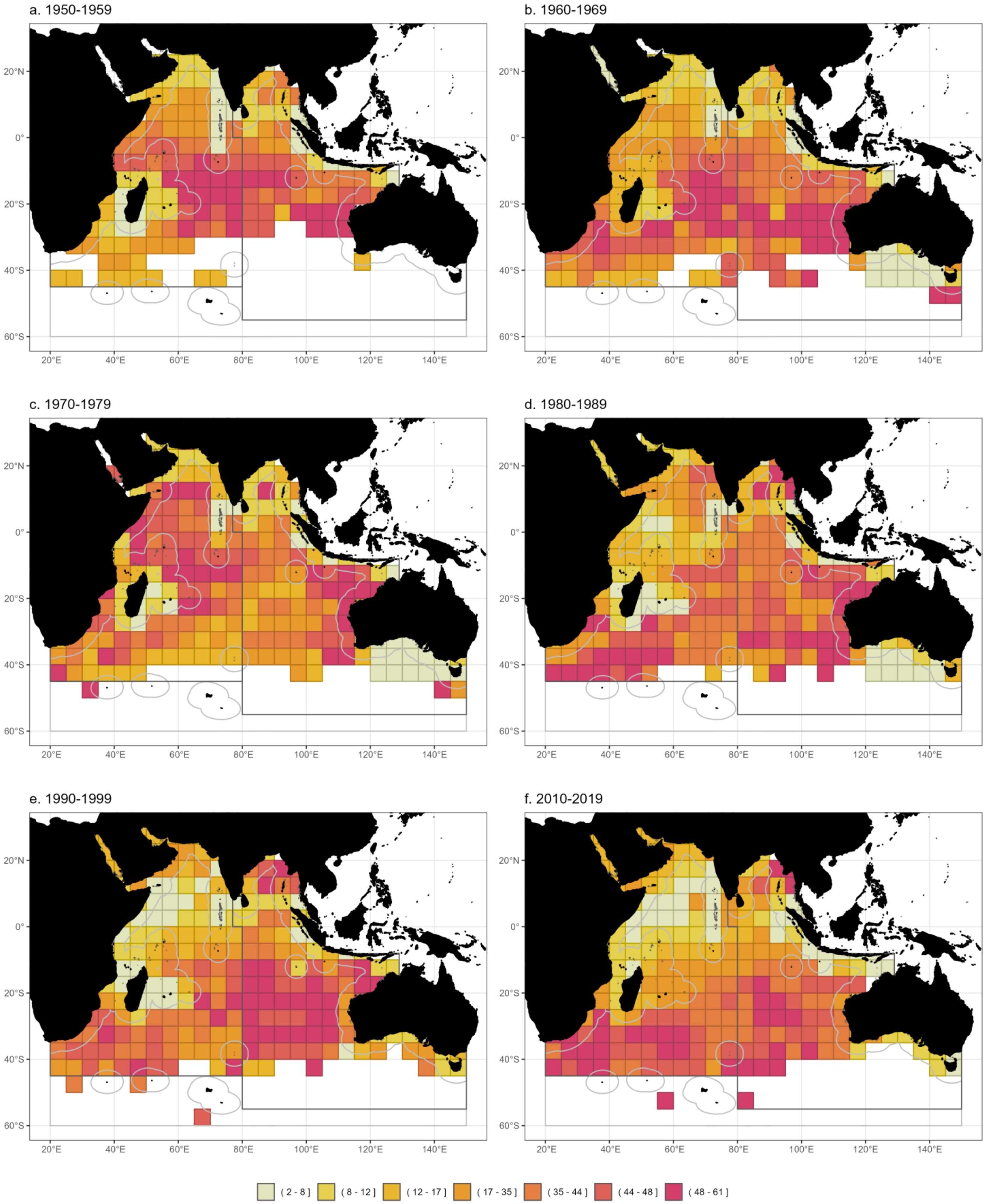

Figure 31: Estimated yellowfin tuna average weight (kg/fish) in the catch by decade and 5x5 grid, for all fisheries combined for the period 1950-2019. Data source: raised time-area catches

Estimated average weights by year (2016-2020) and last decade (2010-2019)

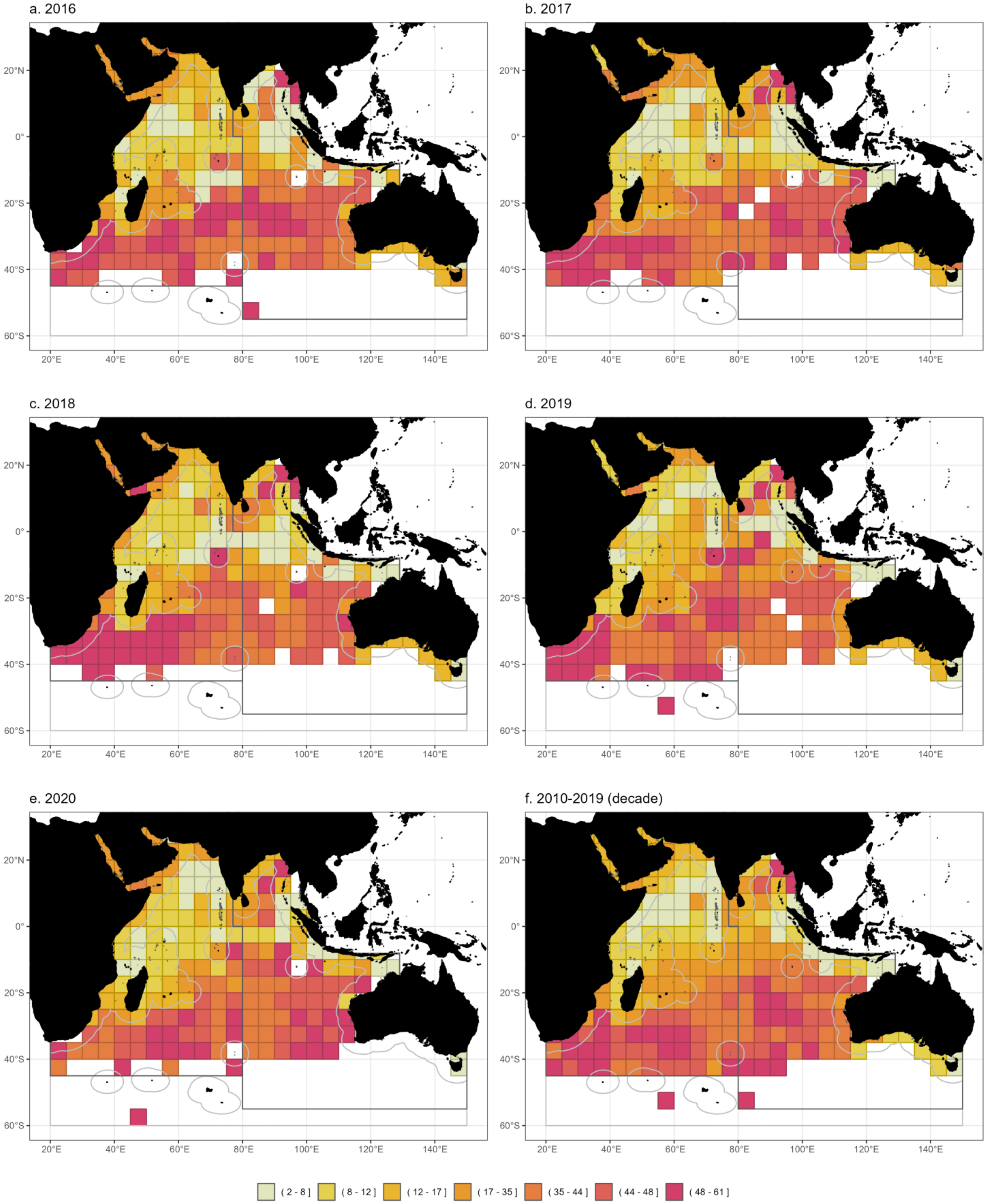

Figure 32: Estimated yellowfin tuna average weight (kg/fish) in the catch by year and 5x5 grid, for all fisheries combined for the period 2016-2020 and for the decade 2010-2019. Data source: raised time-area catches

Estimated average weights by fishery group in recent years (2016-2020)

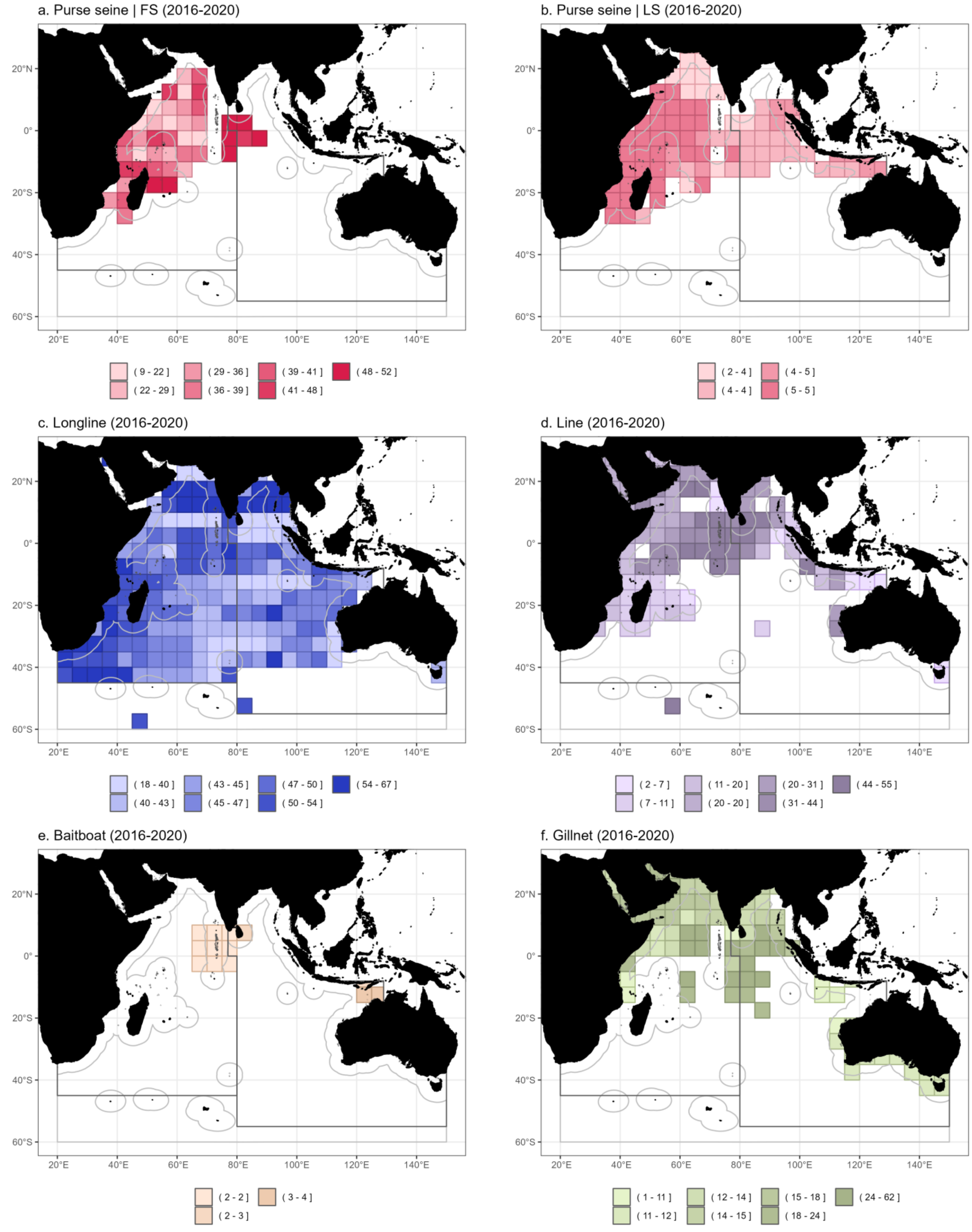

Figure 33: Estimated yellowfin tuna average weight (kg/fish) in the catch by 5x5 grid and fishery group for the period 2016-2020. LS = schools associated with floating objects; FS = free-swimming schools. Data source: raised time-area catches

Uncertainties in size-frequency data

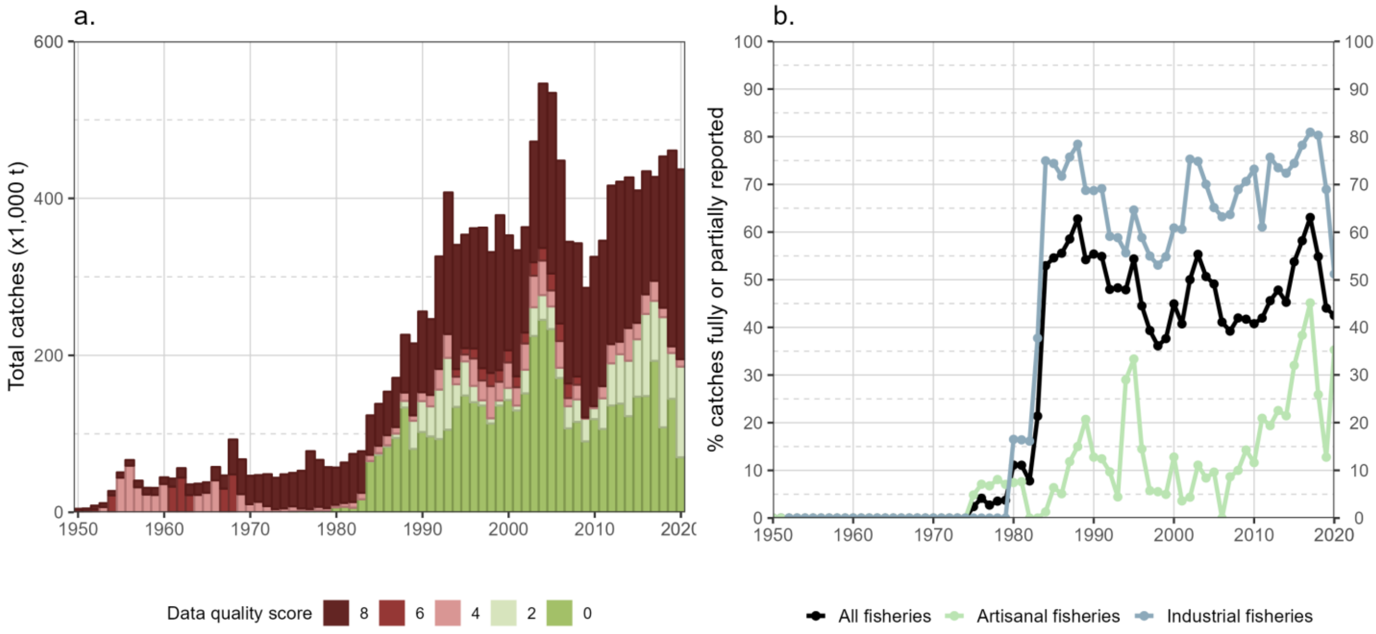

Figure 34: Annual nominal catches (t) of yellowfin tuna estimated by quality score (barplot) and percentage of geo-referenced size-frequency data reported to the IOTC Secretariat in agreement with the requirements of Res. 15/02 (lines with dots) for all fisheries (a) and by type of fishery (b), in the period 1950–2020

Industrial purse seine fisheries

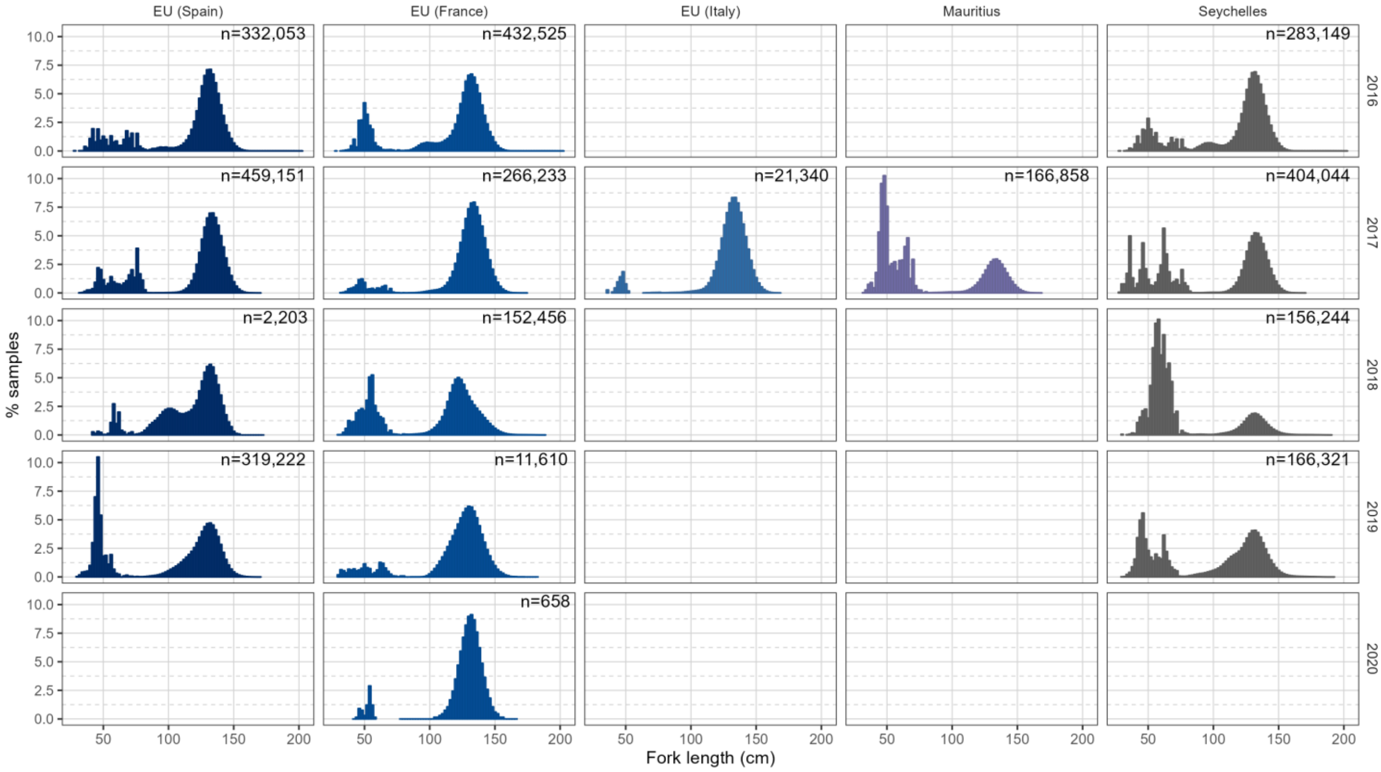

Figure 35: Relative size distribution of yellowfin tuna (fork length in cm) recorded for free-swimming schools, by year (2016–2020) and main purse seine fleet. Data source: standardized size-frequency dataset (Res. 15/02)

Table 5: Percentage of sampled yellowfin tuna with fork length below 75 cm recorded by the major purse seine fleets fishing on free-swimming schools, as reported for the period 2016-2020. Data source: standardized size-frequency dataset (Res. 15/02)

Fleet	2016	2017	2018	2019	2020
EUESP	20	21	9	37	
EUFRA	21	10	36	14	8
MUS		66			
SYC	20	42	77	41	

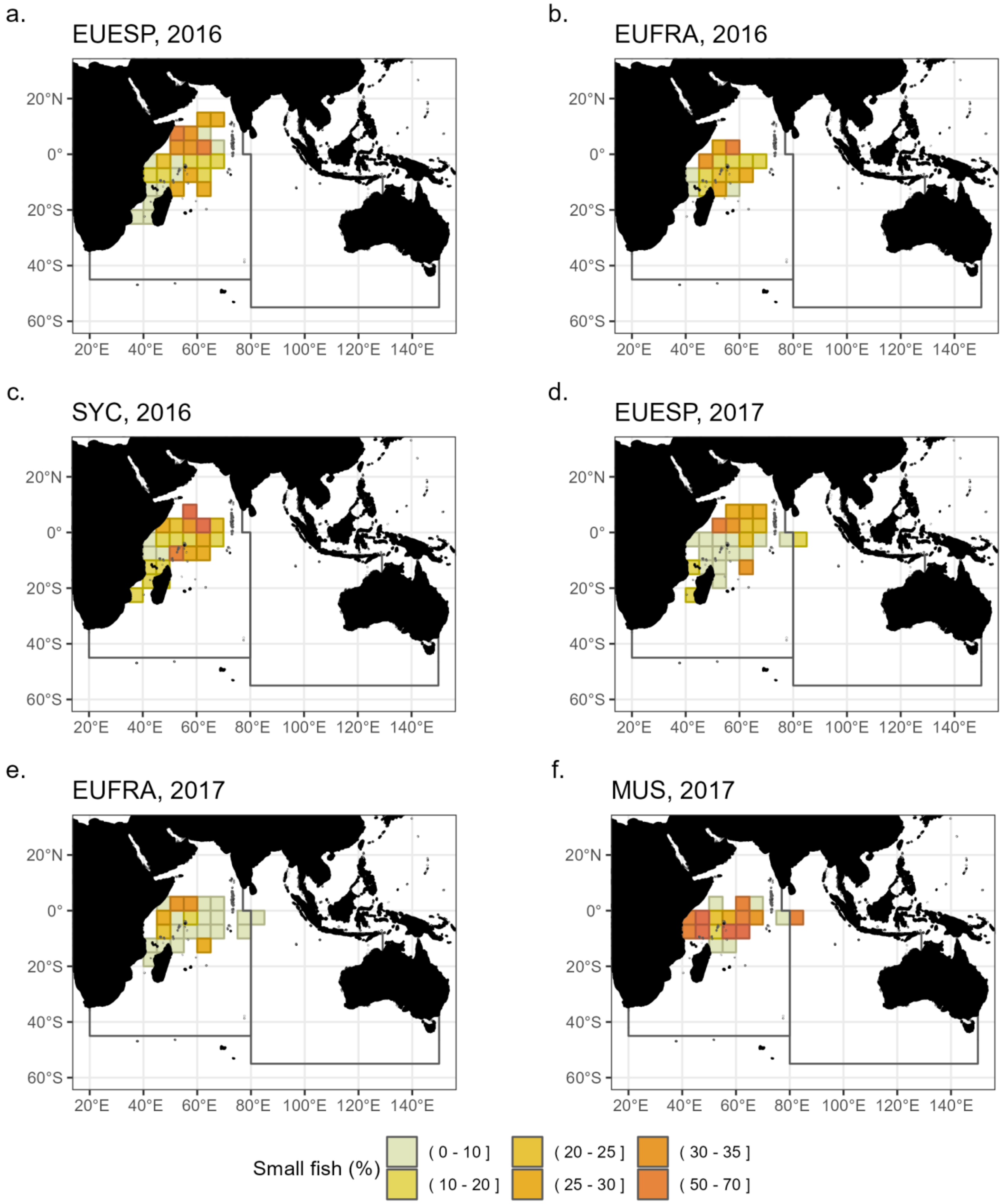

Figure 36: Spatial distribution of sampled yellowfin tuna with fork length below 75 cm recorded by the major purse seine fleets fishing on free-swimming schools, as reported for the period 2016-2020. Data source: standardized size-frequency dataset (Res. 15/02)

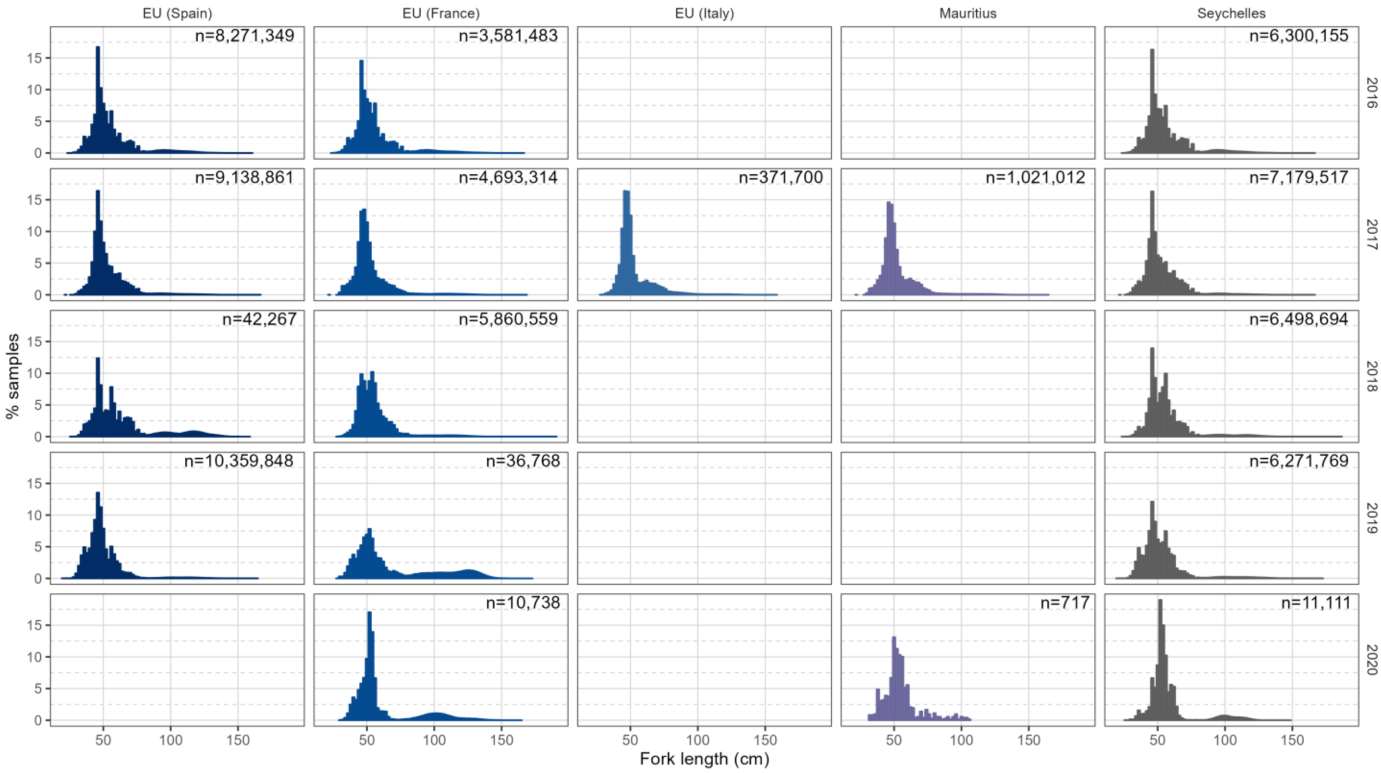

Figure 37: Relative size distribution of yellowfin tuna (fork length in cm) recorded for FOB-associated schools, by year (2016–2020) and major purse seine fleet. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

Table 6: Percentage of sampled yellowfin tuna with fork length above 75 cm recorded by the major purse seine fleets fishing on FOB-associated schools, as reported for the period 2016-2020. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

Fleet	2016	2017	2018	2019	2020
EUESP	9	6	18	4	
EUFRA	9	6	7	29	17
MUS		6			8
SYC	9	5	7	6	8

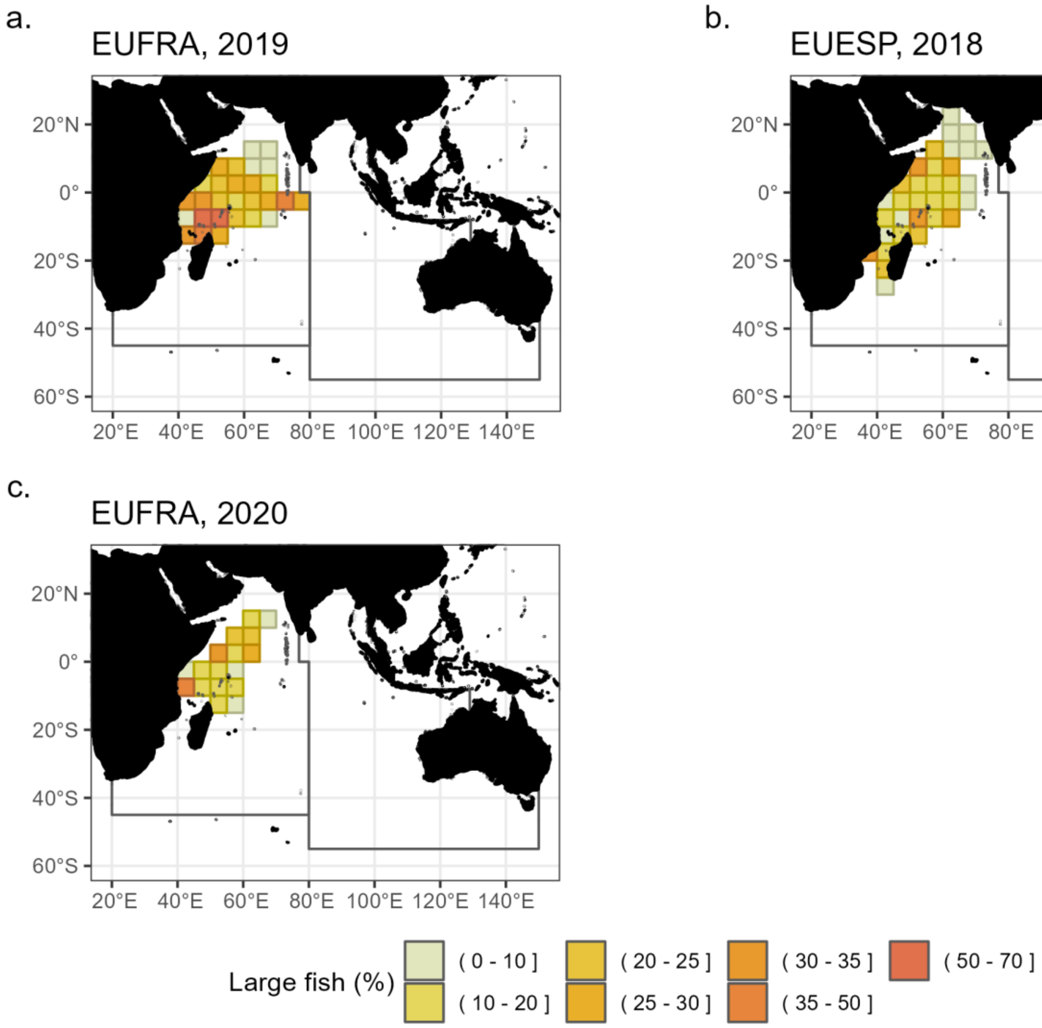

Figure 38: Spatial distribution of sampled yellowfin tuna with fork length above 75 cm recorded by the major purse seine fleets fishing on FOB-associated schools, as reported for the period 2016-2020. Data source: [standardized size-frequency dataset](#) (Res. 15/02)

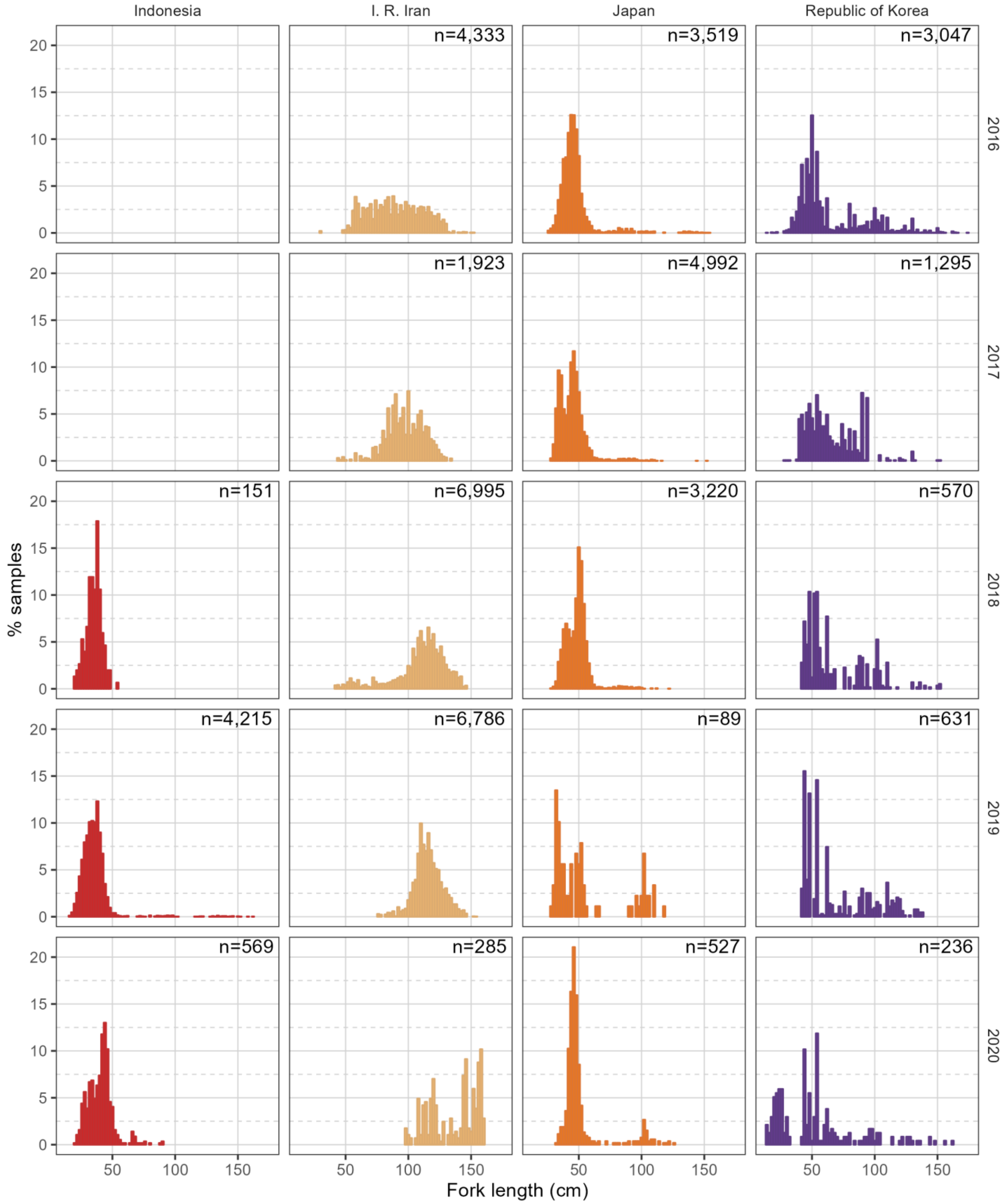

Figure 39: Relative size distribution of yellowfin tuna (fork length in cm) recorded for unclassified schools, by year (2016–2020) and other purse seine fleet. Data source: standardized size-frequency dataset (Res. 15/02)

Industrial longline fisheries

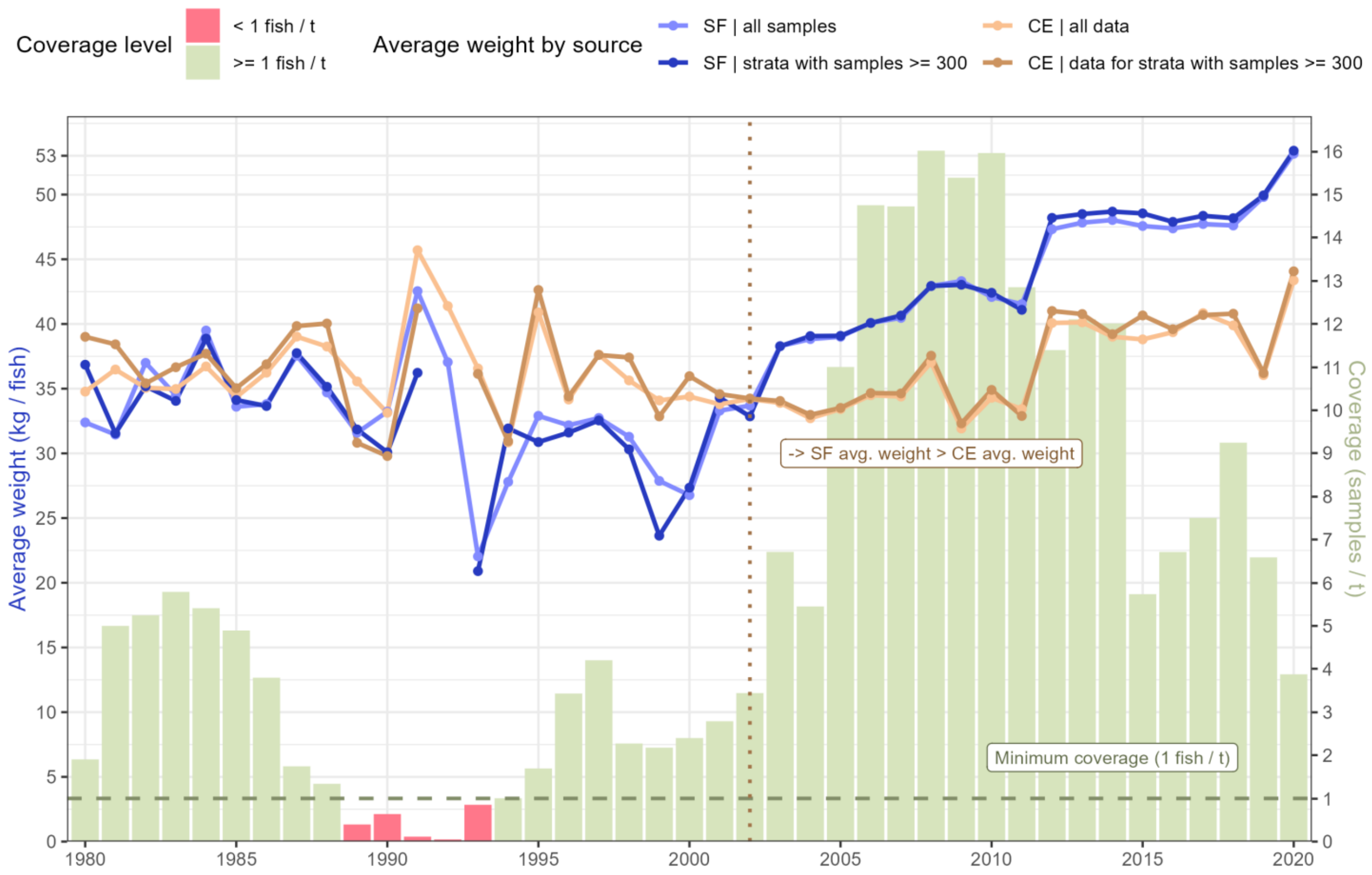

Figure 40: Difference in average weights of yellowfin tuna caught by the deep-freezing fleet of Taiwan,China as calculated from the available size-frequency and catch-and-effort data (1980-2020). Data source: standardized size-frequency dataset and time-area catch dataset for longline fisheries (Res. 15/02)

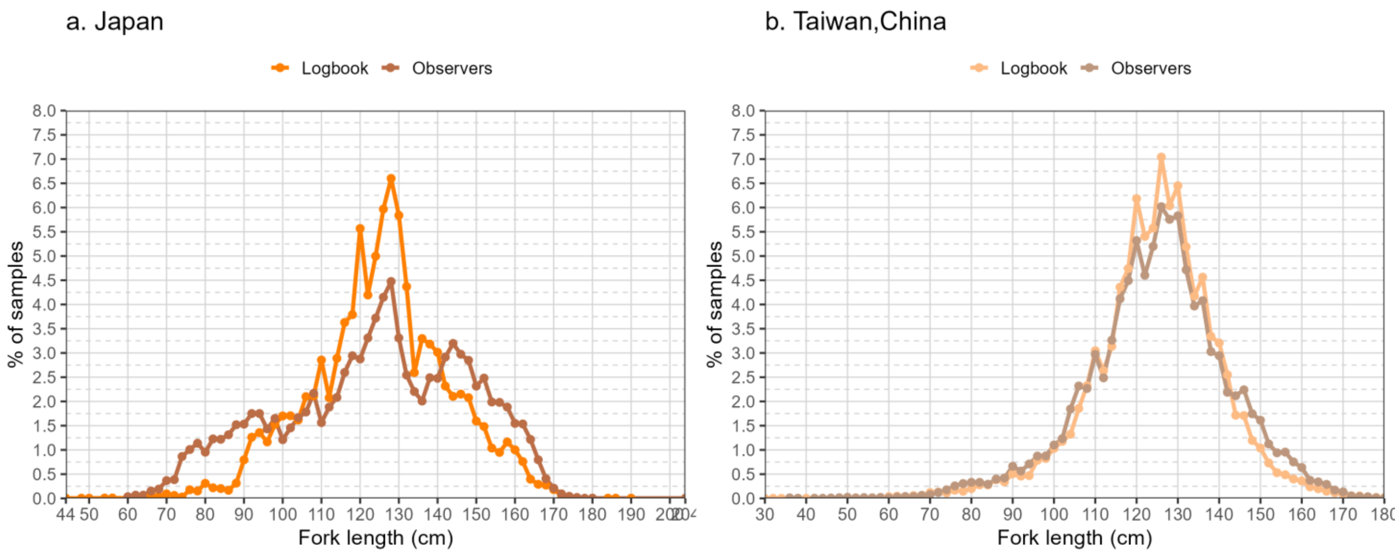

Figure 41: Relative size distribution (fork length in 2 cm size bins) of yellowfin tuna caught by the deep-freezing longline fleets of Japan and Taiwan,China, by fleet and origin. Data source: standardized size-frequency dataset (Res. 15/02)

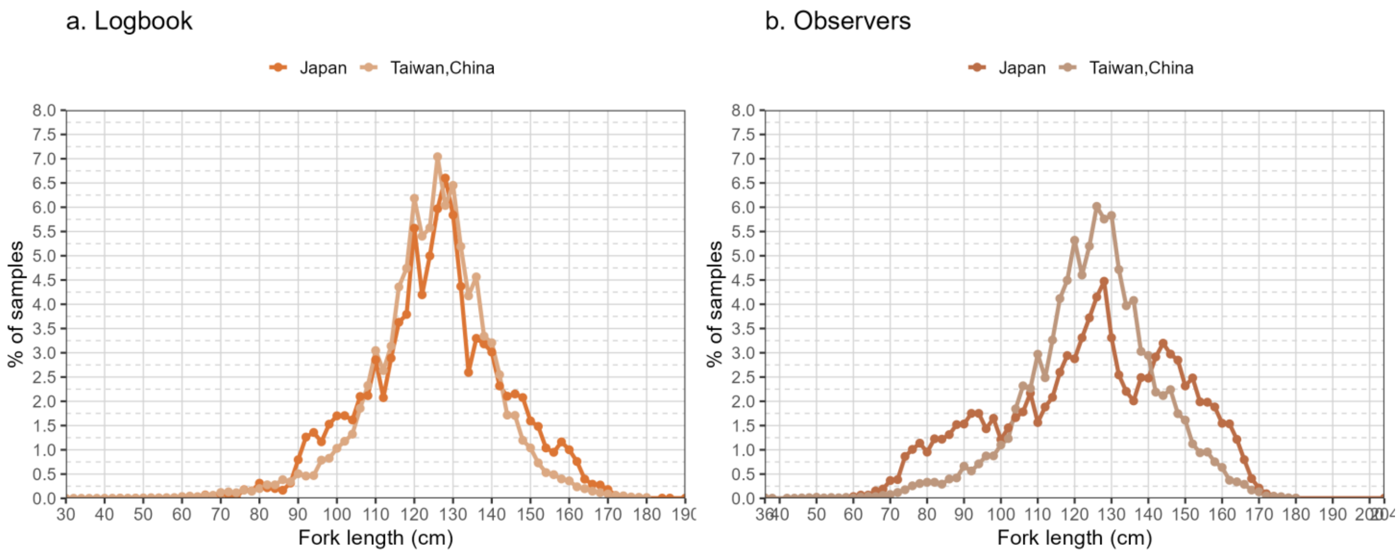

Figure 42: Relative size distribution (fork length in 2 cm size bins) of yellowfin tuna caught by the deep-freezing longline fleets of Japan and Taiwan,China, by origin and fleet (2000-2019). Data source: [standardized size-frequency dataset](#) (Res. 15/02)

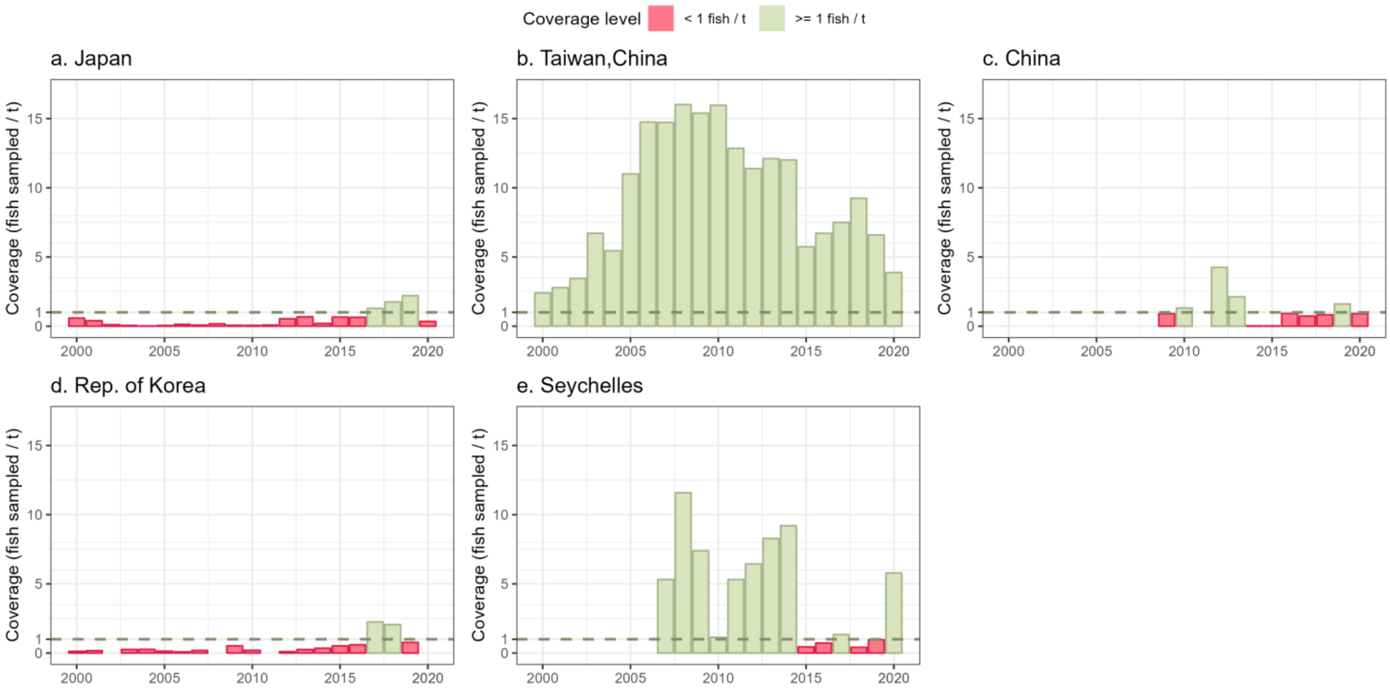

Figure 43: Size-frequency samples coverage (number of fish measured by t of retained catches) of yellowfin tuna caught by the deep-freezing longline fleets of Japan (a), Taiwan,China (b), China (c), Rep. of Korea (d) and Seychelles (e), by fleet and year (2000-2020). Data source: [standardized size-frequency dataset](#) (Res. 15/02)

References

IOTC (2022) Overview of indian ocean tropical tuna fisheries. IOTC, Virtual meeting, 30 May - 03 June 2022, p 26