OVERVIEW OF INDIAN OCEAN ALBACORE FISHERIES

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Highlights

- The Indian Ocean (IO) represents ~15% of the global catch of albacore (*Tunnus alalunga*)
- Annual catches of IO albacore have steadily increased since the 1950s to reach ~40,000 t in recent years
- Industrial longline fisheries contribute to the bulk of albacore catch in the IO
- Longline fisheries are dominated by Taiwan,China, followed by China, Japan, Malaysia, and Seychelles
- Longline catches are distributed all over the IO with high concentrations in the southwest in recent years
- Catches from artisanal fisheries have increased over time, reaching about 20% of all albacore catch in 2020
- Most artisanal catches of albacore come from line fisheries operating along the coasts of Indonesia
- Indonesian coastal fisheries catches are however estimated by the IOTC Secretariat and highly uncertain
- Overall levels of albacore discards are considered to be small or negligible in most fisheries
- Information available on fishing grounds and size composition is considered to be of good quality
- Size data show that smaller fish are found at high latitudes while larger individuals occur in tropical areas
- Albacore average weight in the catch has decreased from >20 kg in the 1950s to ~15 kg in the late 1990s
- In recent years, albacore average weight has been fairly stable, fluctuating around 17.7 kg

Keywords: albacore, canning, Indian Ocean, longline fisheries

Introduction

The global catch levels of albacore (*Thunnus alalunga*; ALB) have been relatively stable over the last decade at around 250,000 metric tons (t) per year (FAO 2021). During that period, the Indian Ocean represented about 15% of the total catch of albacore (**Fig. 1**). The overarching objective of this paper is to provide participants at the assessment meeting of the 8th Session of the IOTC Working Party on Temperate Tunas (WPTmT08(AS)) with a summary of the main information available for albacore at the IOTC Secretariat that covers the period 1950-2020. A first and more detailed version of this document including the description of materials and methods as well as data reporting quality was presented at the Data Preparatory meeting of the WPTmT08 held in April 2022 (IOTC 2022).

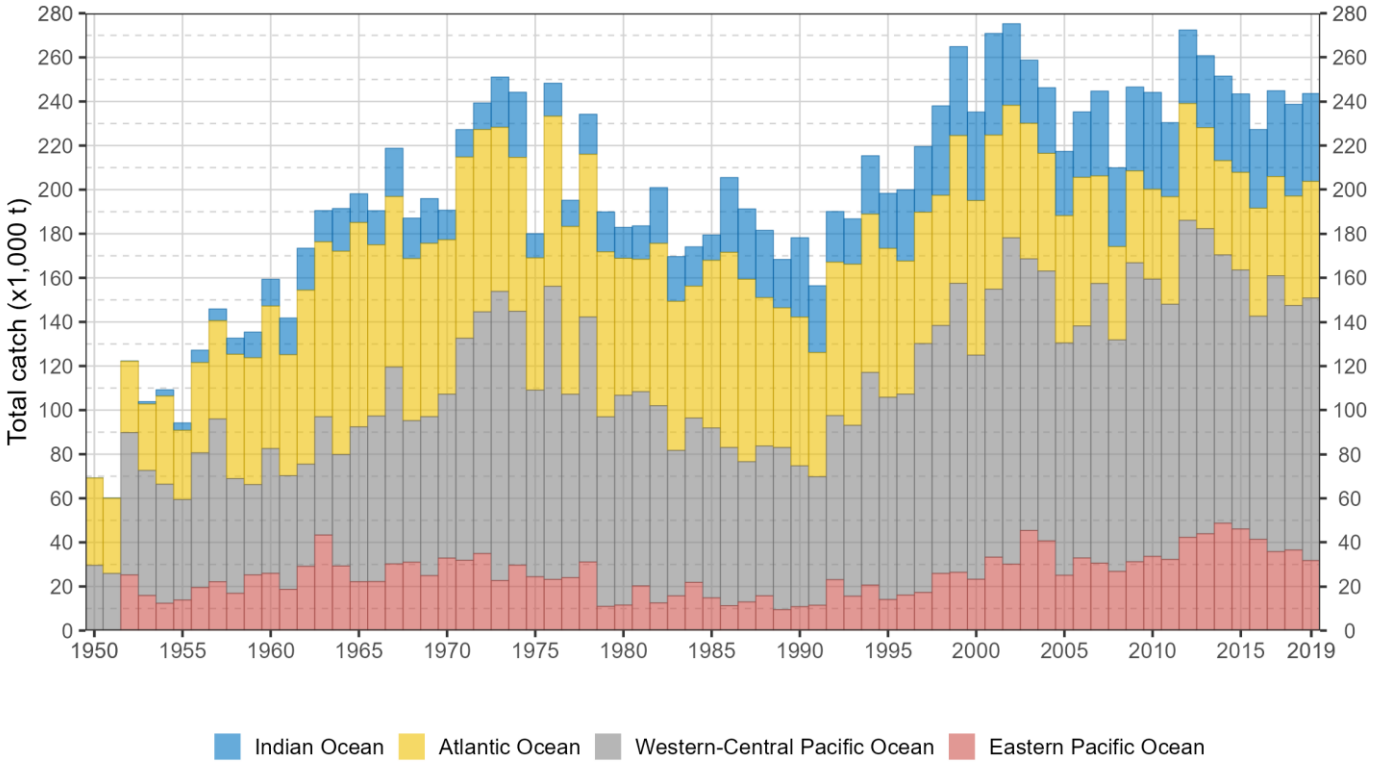

Figure 1: Annual time series of cumulative nominal catches (t) of albacore by ocean basin, 1950-2020. Source: FAO global capture production database

Nominal catches

Historical trends (1950-2020)

Nominal catches of albacore have increased from about 14,000 t in the early 1950s to about 45,000 t in the 2010s (**Fig. 2**). Industrial fisheries represent the bulk of the catch since the development of high-seas longline fisheries in the early to mid-1950s, although catches from artisanal fisheries have shown an increase in recent years, reaching a maximum contribution of about 20% to total catches of albacore in 2020.

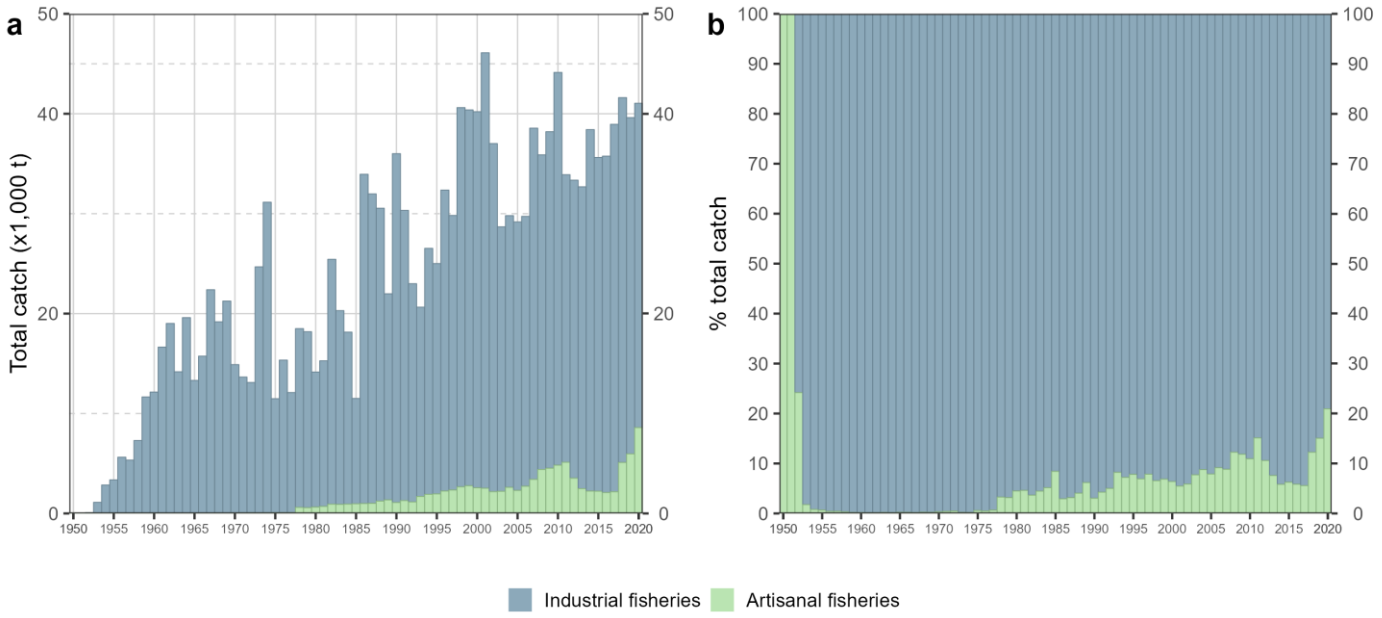

Figure 2: Annual time series of cumulative nominal absolute (a) and relative (b) catches (t) of albacore by type of fishery for the period 1950-2020

Over the last seven decades, albacore has been essentially caught by large-scale longline fisheries, except for the years between 1986 and 1991, when a large-mesh driftnet fishery (mostly operating in the high seas) was responsible for a substantial part of the total catches for the species (**Fig. 3**). After a major increase in catches throughout the 1990s, which went from about 15,000 t in 1990 to 45,000 t in 2001, the deep-freezing longline fishery showed a substantial decline that brought down catches to about 13,000 t in 2007, with catch levels fluctuating around 14,000 t since then. Meanwhile, a fresh longline fishery quickly developed during the 2000s to reach annual catch levels of around 20,000 t over the last decade (**Fig. 3**).

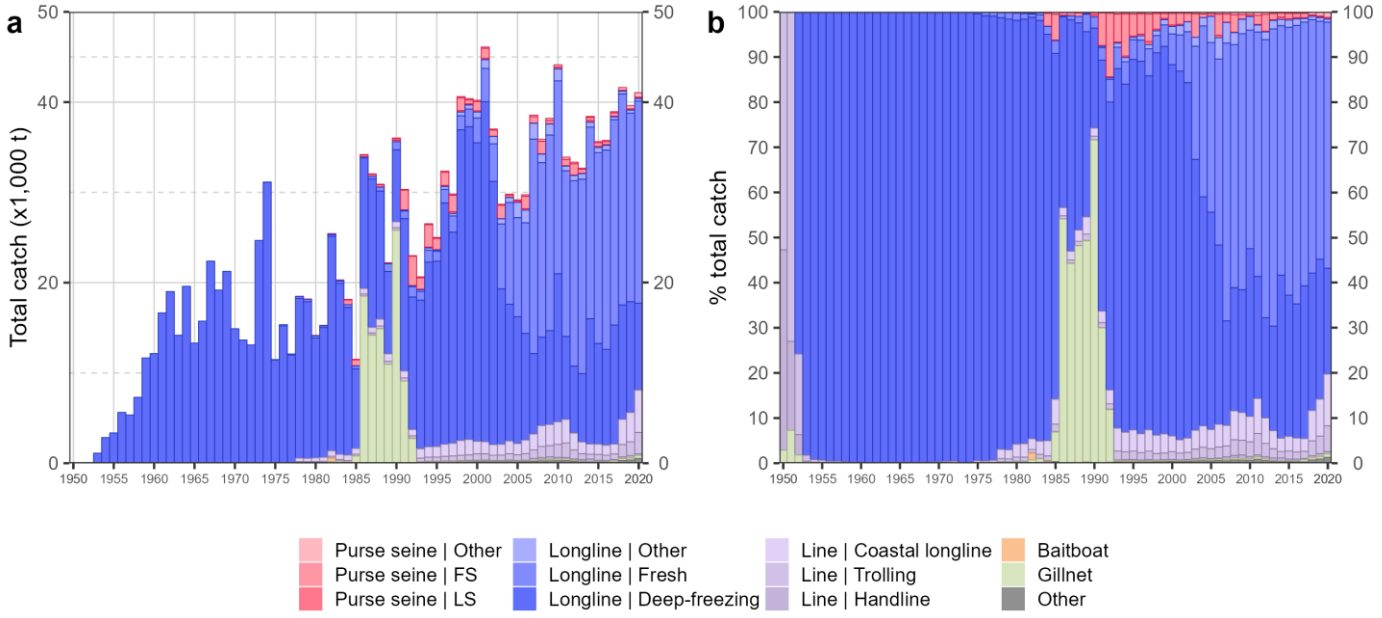

Figure 3: Annual time series of cumulative nominal absolute (a) and relative (b) catches (t) of albacore by fishery for the period 1950-2020. FS = free-swimming schools; LS = schools associated with floating objects

The available nominal catch data for albacore show the predominance of the fresh longline fishery during the last decade, with a contribution of almost 60% of the total catches of albacore on average each year. The catches of this fishery have slightly increased during the last decade, from about 19,000 t in 2011 to about 24,000 t in 2020. Meanwhile, catches of the deep-freezing longline have varied between a minimum of 10,000 t in 2012 to a maximum of 16,000 t in 2014, with total landings of albacore for the deep-freezing longline fishery accounting for less than 10,000 t in 2020.

Main fishery features (2016-2020)

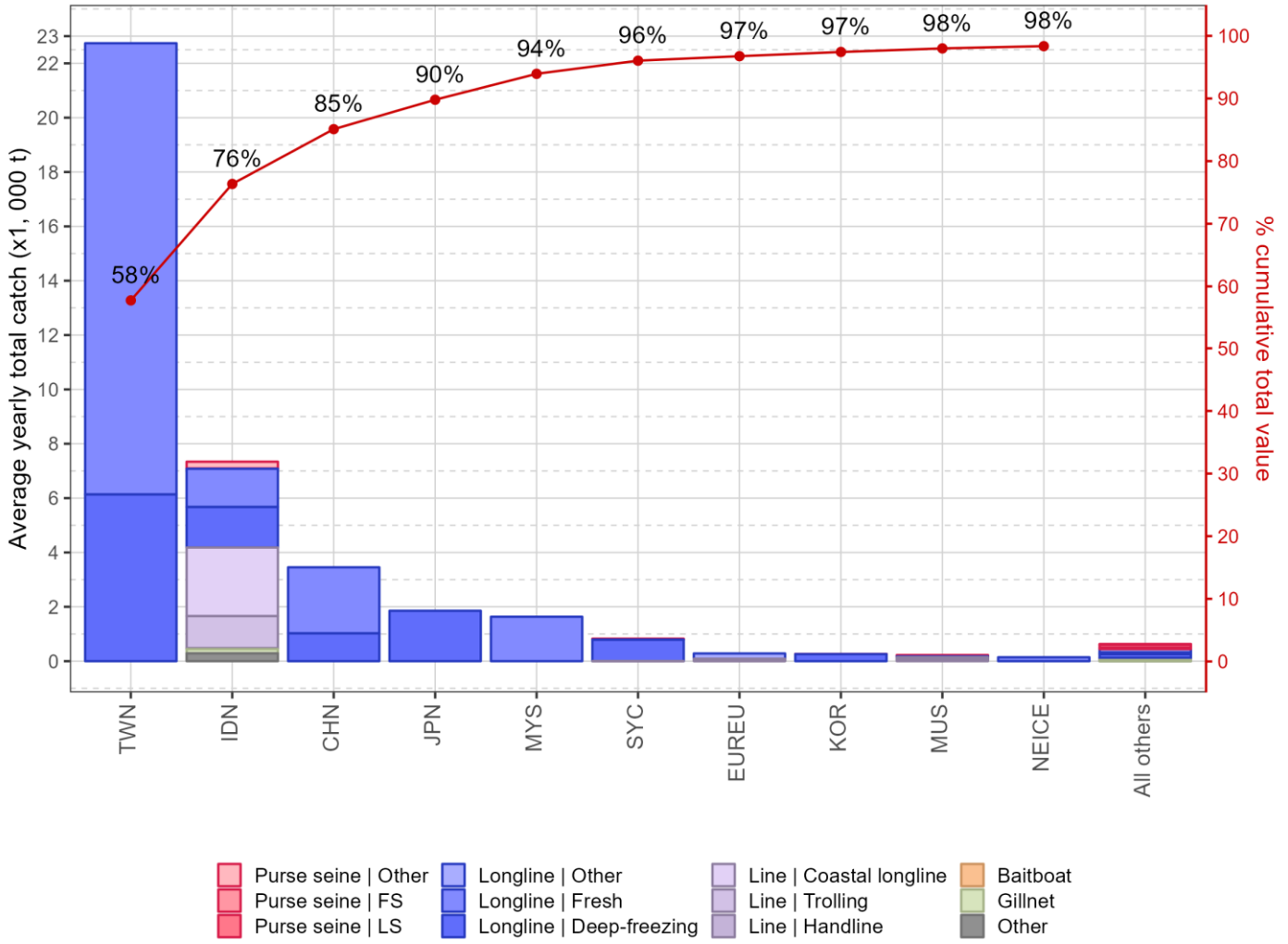

Figure 4: Mean annual catches (t) of albacore by fleet and fishery between 2016 and 2020, with indication of cumulative catches by fleet. FS = free-swimming schools; LS = schools associated with floating objects

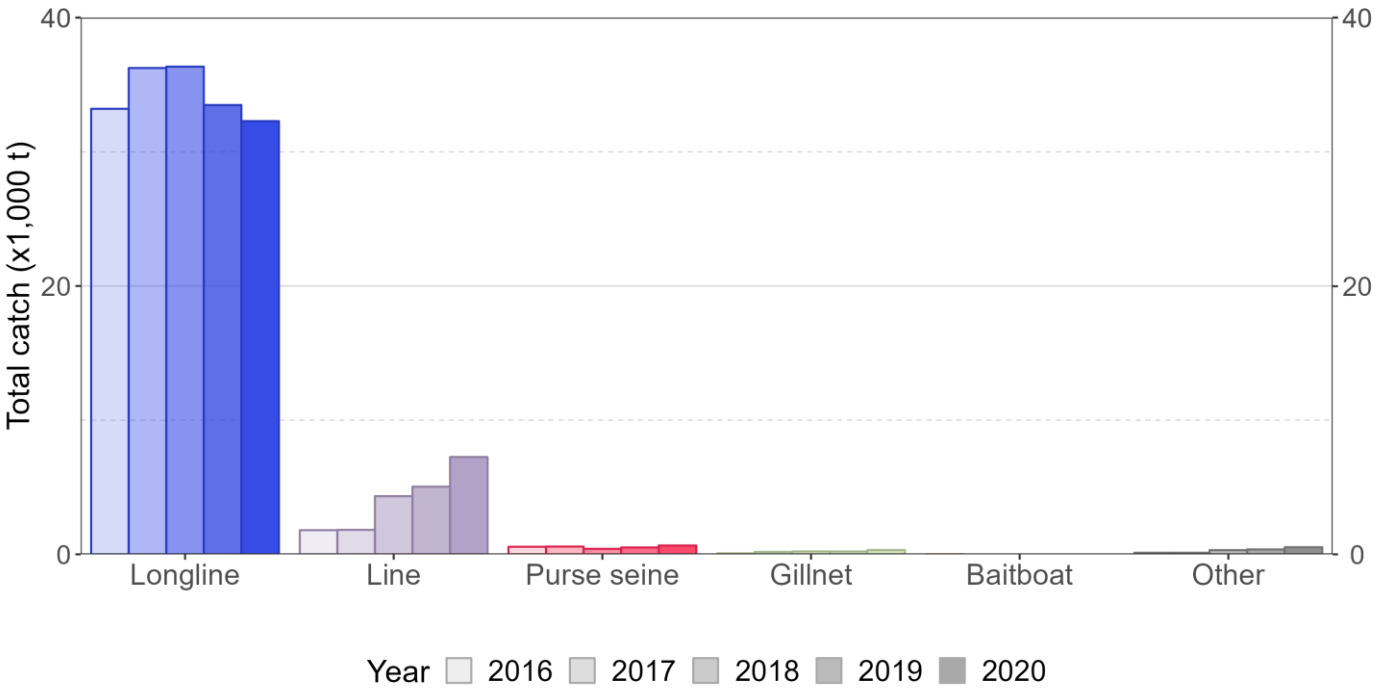

Figure 5: Annual catch (t) trends of albacore by fishery group between 2016 and 2020

Uncertainties in nominal catch data

Several key issues need to be noted when considering the historical time series of nominal catches of albacore:

- Catches of albacore from longliners operating under flags of non-reporting countries (e.g., Belize, Honduras, Indonesia, Malaysia) have been estimated by the Secretariat between 1985 and 2016 based on some strong assumptions on the numbers of vessels and their annual catch rates (Herrera 2002a, 2002b). While the estimates of non-reported catches were moderately high during the 1990s and early 2000s (up to almost 10,000 t in 1999), they have substantially decreased from the mid-2000s and have been considered nil in recent years in consequence of the reduced practice of reflagging, the implementation of port state measures, and the improved monitoring of vessels activities and data reporting by the concerned CPCs (such as Malaysia);
- In the past, catches of albacore from the longline fisheries of Philippines (1999-2010), India (2004-2011), and Oman (2017-2018) were re-estimated by the Secretariat as they appeared only partially reported based on i) the inconsistencies observed between the levels of bigeye tuna reported in the catches and monitored through the IOTC Statistical Document Programme in the case of Philippines, and ii) to the number of vessels available in the Record of Authorized vessels (RAV) and the Active List of Vessels (AVL) for India, and also because of the lack of detailed catch by species reported by Oman;
- Catches of albacore for both the artisanal and industrial fisheries of Indonesia have been estimated by the Secretariat in collaboration with Indonesia to overcome some major issues in data collection and reporting identified for the country (Herrera 2002a; Proctor et al. 2003; IOTC 2013; Yuniarta et al. 2017). The estimation methodology developed for Indonesian fresh longliners in the early 2010s and revised in 2018 is considered to have improved the nominal catch statistics between 2013 and 2018 while estimates prior to 2013 continue to remain highly uncertain (Moreno et al. 2012; Geehan 2018). It is useful to note that the estimation method has not been applied to the industrial longline and purse seine fisheries in recent years but is still in use for Indonesian artisanal fisheries (IOTC 2022);
- The catches of albacore estimated for the fresh-tuna longline fishery of Taiwan,China are only available from 2001 onward: prior to 2001, catches for the Taiwanese fleet remain relatively uncertain.

Geo-referenced catch data

Spatial distribution of the catch

During the last decade (2010-2019), hotspots of albacore catches appeared to have emerged in the fishing grounds east of Mozambique (including their adjacent high seas), in the southeastern waters of Indonesia, and in the high seas south of 25°S in the southwestern Indian Ocean (**Fig. 6**). This latter area now represents the main fishing grounds of albacore in the Indian Ocean, with most of the catch in recent years coming from longline fisheries operating between 40-80°E and 10-40°S.

Although recent catches of albacore taken with coastal longlines and troll lines from Indonesia show a substantial increase, this trend should be considered with caution due to the uncertainties associated with the current catch re-estimation process applied to these fisheries (IOTC 2022).

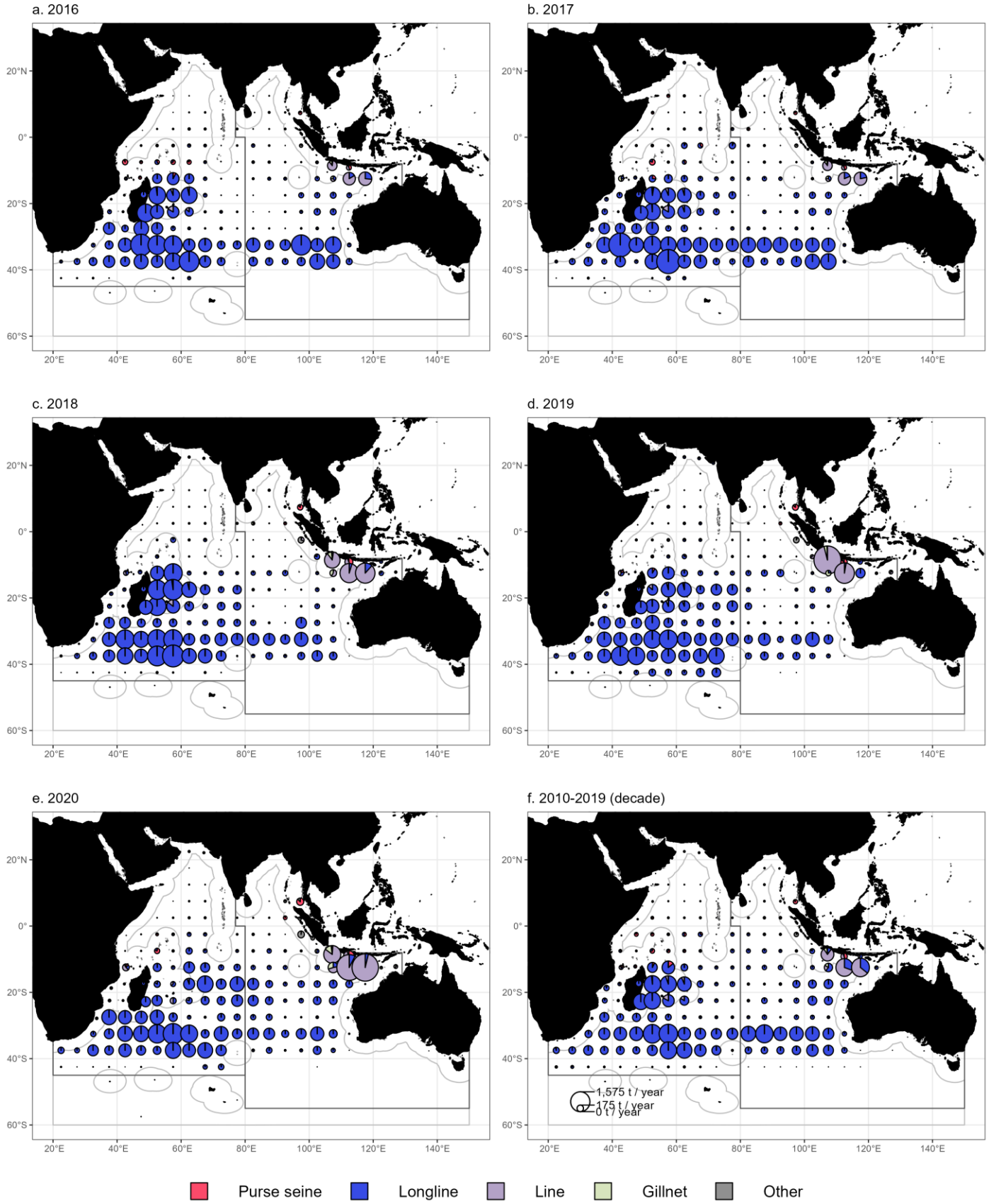

Figure 6: Mean annual time-area catches (in weight) of albacore raised to the nominal catches for the last decade (2010-2019) and for each year during the recent period (2016-2020). Source: raised time-area catches dataset (1950-2020)

Uncertainties in geo-referenced catch and effort data

The following uncertainties in catch and effort data for albacore should be noted:

- Very little information on catch and effort has been reported for the industrial longline fishery of Indonesia over the last decades. In 2015 an IOTC-OFCF mission was conducted to assist Indonesia with the reporting of catch-and-effort data, and some information has been received for the period 2018-2020 following the implementation of the One Data Initiative in 2017. The coverage remains however quite low with the geo-referenced catch representing about 17% of the nominal catch of albacore caught between 2018 and 2020 in the Indonesian longline fishery;
- Catch and effort data for the fresh-tuna longline fishery from Taiwan,China are only available since 2007, compared to nominal catches from 2001. Estimates of total catches, and time-area catches, prior to these periods therefore remain highly uncertain;
- Although some catch and effort data are available for the longline fisheries of India, Malaysia, Oman, and Philippines, they are usually incomplete and fall short of the IOTC data reporting standards of Resolution 15/02.

Size composition of the catch

Temporal patterns and trends in estimated average weights

Average weights of Indian Ocean albacore were derived from the geo-referenced catches by fleet, gear, fishing mode, year, month, and grid raised to the nominal catch (IOTC 2022). Considering the limitations in the original data sets and the assumptions required by the estimation process (e.g., use of proxy fleets), the estimated average weights should be considered with caution. This is particularly true for most coastal fisheries considering the paucity or absence of their original size data which cause the estimates of average weights to be based on strong assumptions. As such, we only show here the time series of average weights for industrial longline and purse seine fisheries which represent between 80% and 100% of the annual total catch of albacore since the mid-1950s.

The average weight of fish caught by the deep-freezing longline fishery shows a steady decrease between the early 1950s and 1990s, from about 22.9 kg in 1952 to a minimum of 12.3 kg in 1996, oscillating around a mean value of 16.7 kg (without any clear trend) thereafter (**Fig. 7**). Although shorter, the time series of average weights of fish caught by fresh tuna longliners shows some synchronicity with the average weight estimated for the deep-freezing longline fishery until the early 2000s when it increased to an average of 22.1 kg and largely exceeded the sizes reported for the deep-freezing longline component of Taiwan,China (**Fig. 7**).

Albacore caught in purse seine fisheries are larger than in longline fisheries in the Indian Ocean, with average weights of fish caught by purse seine on free-swimming schools and by deep-freezing longline fisheries between 1984 and 2020 estimated at 26 and 16.1 kg, respectively. The average weights in the purse seine catches of free-swimming schools and schools associated with drifting floating objects showed a similar decreasing trend since the mid-1990s, from about 29.7 kg in 1989 to 25.3 kg in 2020 (**Fig. 7**).

Due to their contribution to the total catch, deep-freezing and fresh longline fisheries drive the temporal patterns of average weight in the catch of Indian Ocean albacore since the 1950s (**Fig. 7**). Overall, average weight of albacore in the catch of the main fisheries targeting albacore showed a decreasing trend between 1952 and 1997, before increasing to more than 20 kg in 2009 and showing a decreasing trend thereafter, reaching 18.6 kg in 2020.

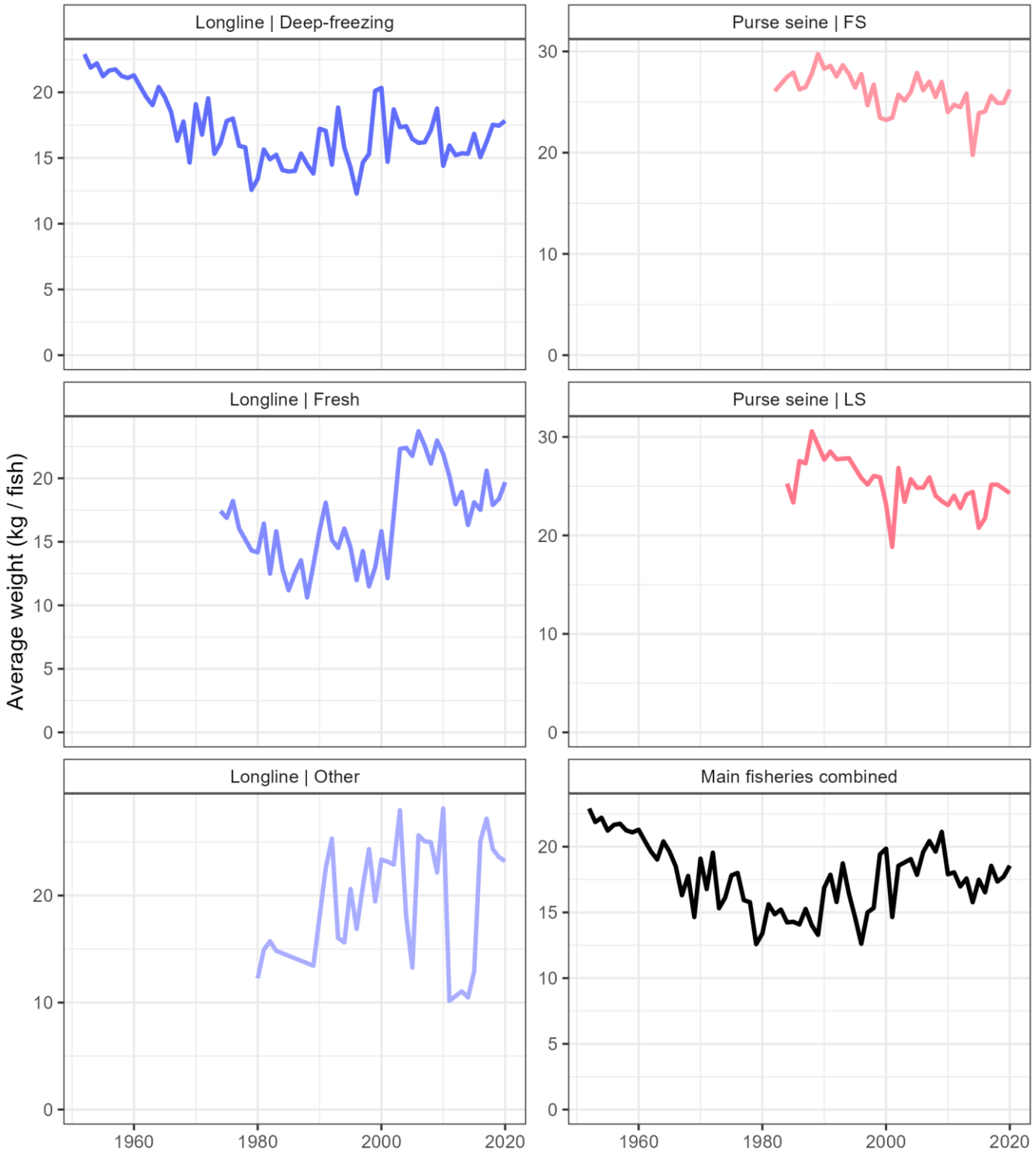

Figure 7: Annual time series of estimated average weight (kg/fish) of albacore for the fisheries described by a good coverage of size data. Longline | Other includes swordfish and shark-targeted longlines; FS = Free-swmming schools; LS = schools associated with floating objects

Spatial distribution of estimated average weights

The distribution of estimates weights of albacore over the last decades shows a strong spatial pattern in the sizes of fish caught in the Indian Ocean (**Fig. 8**). Larger albacores are found in tropical waters, while their smaller counterparts occur in temperate waters in the southern Indian Ocean. Although albacores are caught at different sizes according to the fishing gear (IOTC 2022), the distribution of the average weight of albacore caught with longlines confirms this pattern with a clear distinction between juveniles occurring south of 25°S (average weights of 10-15 kg) and adult albacore larger than 20-25 kg distributed along the equatorial area, this pattern being consistent across decades (IOTC 2022).

The recent annual distribution of average weights of albacore appears to be very consistent across the years, with fish less than 15 kg located in the southern Indian Ocean, along the coasts of Indonesia, and in the Bay of Bengal (**Fig. 9**). The larger individuals (>25 kg) are found in the catches located in the tropical area, in particular in the western Indian Ocean with a predominance in the Gulf of Oman and off the coasts of Somalia, except for 2019 (**Fig. 9**).

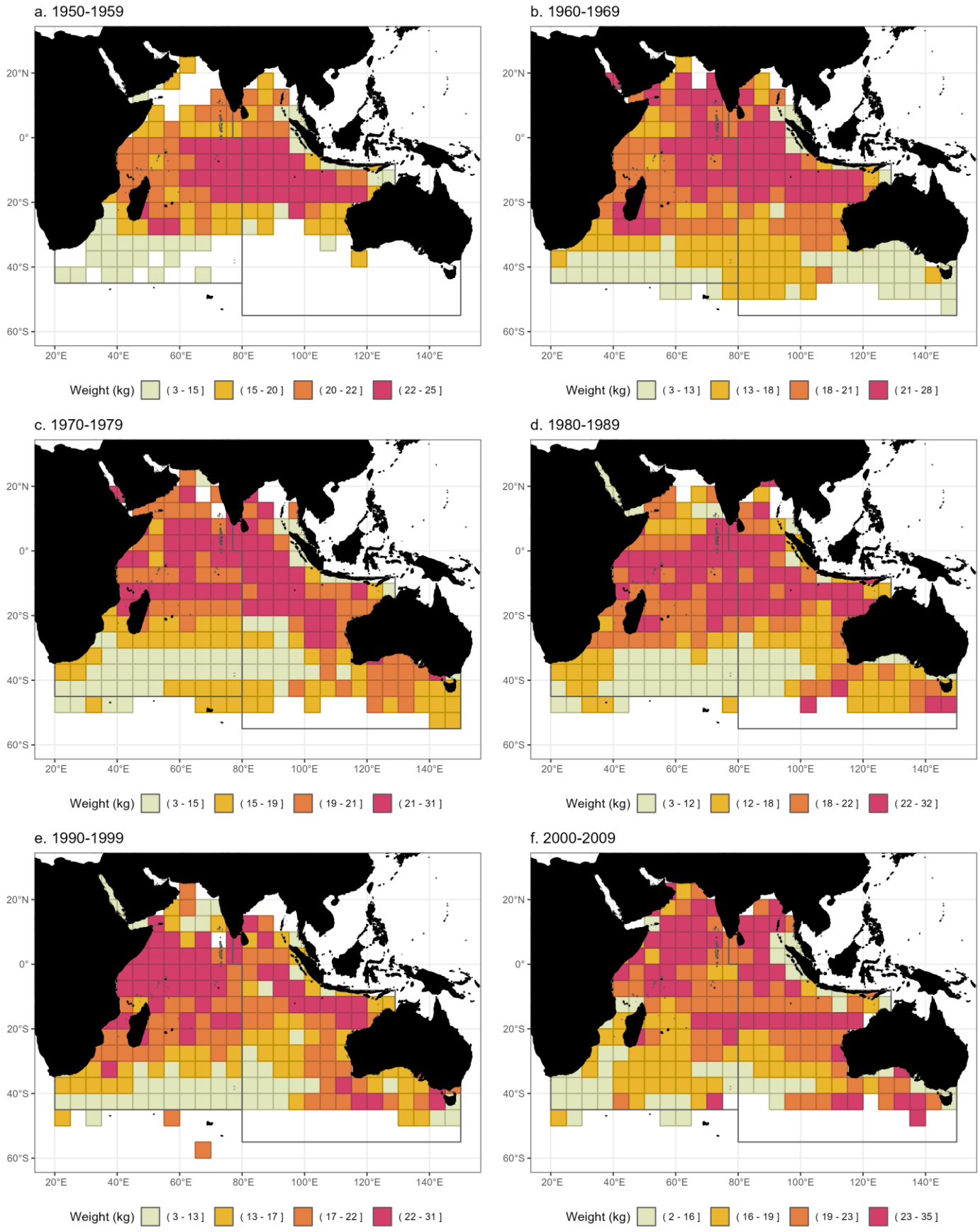

Figure 8: Estimated average weight (kg / fish) in the catch of Indian Ocean albacore by decade and 5x5 grid, all fisheries combined, 1950-2009

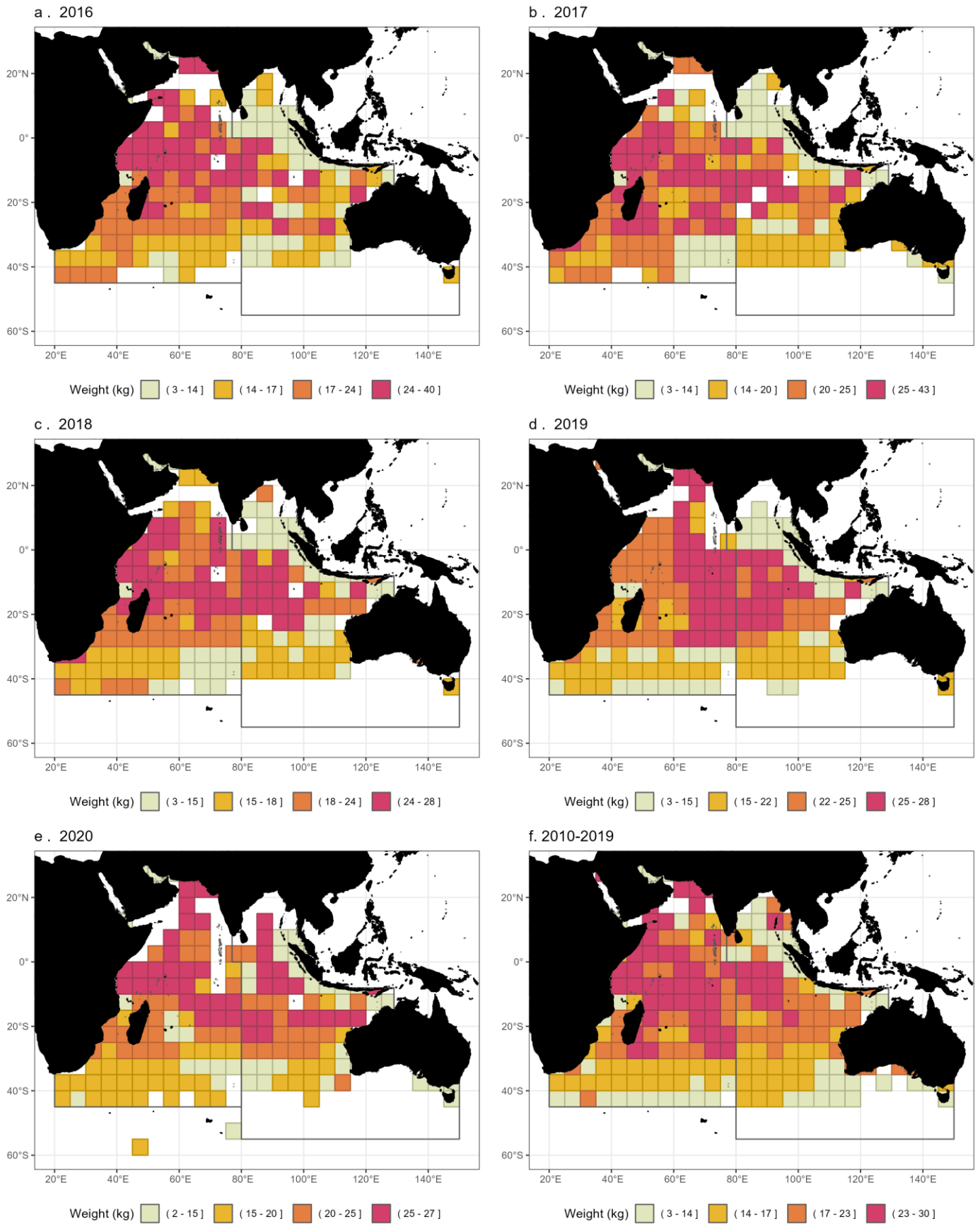

Figure 9: Estimated average weight (kg / fish) in the catch of Indian Ocean albacore by 5x5 grid and year during 2016-2020 and for the decade 2010-2019, all fisheries combined

Uncertainties in size data

The following points of uncertainty in the size-frequency data of albacore should be noted:

- Although some size data are available for the large-mesh size driftnet fishery of Taiwan,China that operated over the period 1982–92, the sampling coverage was low and well below the sampling target of 1 fish per metric ton for all years of activity of the fishery;
- Size data for the fresh-tuna longline fishery of Indonesia have been reported for a limited number of years, during the mid-2000s. However samples, where available, cannot be fully disaggregated by month and fishing area (5x5 grid) and refer mostly to the component of the catch that was unloaded fresh. For this reason, the quality of the samples in the IOTC database is considered low;
- A large data set of size samples is available for the deep-freezing longline fishery of Taiwan,China since 1980. However, the length distributions of albacore available from 2003 have been found to be different when compared to earlier years (Geehan and Pierre 2013). In addition, since 2003 higher average weights derived from length data have also been reported, compared to average weights from catch and effort (for the same time-periods and areas), which suggests changes in the sampling protocols of specimens measured for lengths – particularly the proportion of smaller sized fish (Hoyle et al. 2021). Size data collected by observers since 2002 are considered to be of better quality and have been given preference over the size data collected by the crews since the early 2000s;
- The number of size samples available for the Japanese deep-freezing longline fleet has shown large fluctuations over the years following a large decline in the late 1980s and was well below the sampling target between 1994 and 1996;
- No size data have been reported to the Secretariat for the longline fisheries of India (2004-2011), Oman (2014-2020), and Philippines (1998-2014) while Malaysia (2005-2020) only started reporting data in 2018.

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