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The western and central Pacific tuna fishery: 2024 overview and status of stocks

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Preface

The Tuna Fisheries Assessment Report (TFAR) provides current information on the tuna fisheries of the western and central Pacific Ocean (WCPO) and the fish stocks (mainly tuna) that are impacted by them. The information provided in this report is summary in nature, but a list of references (mostly accessible via the internet) is included for those seeking further details. As this report is a smart PDF, you may click on a reference within the document and it will take you to the figure or section; to return to the page you were on, press alt and the left arrow key (command key and left arrow on a Mac).

This report focuses on the primary tuna stocks targeted by the main WCPO industrial fisheries – skipjack (*Katsuwonus pelamis*), yellowfin (*Thunnus albacares*), bigeye (*T. obesus*) and South Pacific albacore (*T. alalunga*).

The report is divided into three parts: the first section provides an overview of the fishery, with an emphasis on developments over the past few years; the second summarises the most recent information on the status of the stocks; and the third summarises information concerning the interaction between the tuna fisheries, other associated and dependent species and their environment. The data used in compiling the report are those that were available to the Oceanic Fisheries Programme (OFP) at the time of publication, and are subject to change as improvements continue to be made to recent and historical catch statistics from the region. The fisheries statistics presented are typically complete through the end of the year prior to publication. However, some minor revisions to statistics may occasionally be made for recent years. The stock assessment information presented is the most recent available at the time of publication.

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Further information, including a French version of this report, is available at the FAME webpage.

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1 The western and central Pacific tuna fishery

The tuna fisheries in the western and central Pacific Ocean (WCPO), encompassed by the Western and Central Pacific Fisheries Commission Convention Area (WCPFC-CA) (Figure 1), are diverse, ranging from small-scale, artisanal operations in the coastal waters of Pacific states, to large-scale, industrial purse-seine, pole-and-line and longline operations in the exclusive economic zones (EEZs) of Pacific states and in international waters (high seas). The main species targeted by these fisheries are skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), bigeye tuna (*T. obesus*) and albacore tuna (*T. alalunga*).

The current fishery characterisation includes updates to historical data, which show that the 2024 catch of 3,059,005 metric tonnes (hereafter abbreviated as "t") was the highest catch year in history, and represented an increase of 15% from 2023. We expect revisions to the 2024 catch estimates in next year's report, as estimates in the most recent year are preliminary. The WCPFC-CA tuna catch for 2024 represented 56% of the global tuna catch (Figure 2, the provisional estimate for 2024 being 5,498,369 t, which represents a record catch and is 2.1% greater than the previous record year 2019 global catch of 5,386,131 t).

Annual total catch of the four main tuna species in the WCPFC-CA increased steadily during the 1980s as the purse-seine fleet expanded, and remained relatively stable during most of the 1990s until a sharp increase in catch occured in 1998. Total tuna catches continued to increase until 2012, primarily due to increases in purse-seine catches, and have been relatively stable over the past decade (Figure 3, and Table 1), at a total catch level of 2.6 to 3.0 million t. The provisional total WCPFC-CA tuna catch for 2024 was estimated at 3,059,005 t, which was a record catch, and an increase of 15% from 2023. In 2024, the purse-seine fishery accounted for an estimated 2,146,139 t (70% of the total catch), which was 2.2% greater than the previous record high of 2,099,221 t estimated in 2019 for this fishery. The pole-and-line fishery landed an estimated 139,405 t (5% of the total catch), which is just 34% of the high of 415,016 t recorded in 1984, a time of much greater pole-and-line fishery participation. The longline fishery in 2024 accounted for an estimated 247,350 t (8% of the total catch) – also lower than the highest value of 284,849 t recorded in 2004, but represented a 6% increase over the 2023 longline catch. Troll gear accounted for <1% of the total catch (7272 t), well below the highest value (25,750 t) recorded in 2000. The remaining 17% (518,840 t) was taken by a variety of artisanal gear, mostly in eastern Indonesia, the Philippines and Vietnam, and is now the highest value on record, exceeding the previous high of 440,821 t recorded in 2023.

Box 1 – Summary of the 2024 WCPFC-CA tuna catch by gear type.

Gear type	Catch (1000 t)	% of total gear catch	Change from 2023	Notes
Purse-seine	2146	70%	+15%	highest catch ever
Longline	247	8%	+6%	8% higher than 5 yr avg.
Pole-Line	139	5%	+27%	21% below 5 yr. avg.
Troll	7	0.2%	+5%	19% below 5 yr avg.
Other	519	17%	+18%	highest catch ever
Total	3059	100%	+15%	highest catch ever

The 2024 WCPFC-CA skipjack catch (2,045,720 t – 67% of the total catch) was the highest value in history, surpassing the previous high of 2,044,549 t in 2019; this represented an increase of 24% from 2023 (Figure 3 and Table 2). The WCPFC-CA yellowfin catch for 2024 (741,473 t – 24% of the total catch) was 3% below the highest value (763,008 t), which was achieved in 2021, and was a decrease of 1.5% from the 2023 catch. The WCPFC-CA bigeye catch for 2024 (151,611 t – 5% of the total catch) was 22% below the highest value (195,052 t) achieved in 2004, and a 4% increase over the 2023 catch. The WCPFC-CA albacore catch for 2024 (120,201 t – 4% of the total catch) was also well below the highest value (148,051 t) recorded in 2002, but a 19% increase from the 2023 catch.

Total tuna catch within the WCPFC-CA is also presented by the exclusive economic zone (EEZ) of individual countries EEZ (and on the high seas) and by flag nation, for the period of 1990–2024 (Figure 4). In 2024, the top 10 EEZs (one of which is the high seas area) in terms of catches accounted for 94% of the total catch while the top 10 flag states accounted for 84% of the total catch. In 2024, Papua New Guinea was the top EEZ (with 28% of the total tuna catch taken in their EEZ), supplanting Kiribati from 2023 (when 22% of the tuna catch was taken there). As has been the case for the past decade, Indonesia remained the top flag nation in catch, accounting for 16.2% of the total catch. Tuna catches in the high seas comprised approximately 12% of the total, a sharp decrease from the 2023 total of 17%, and well below the levels seen during the period 1990–2007 when high seas catches accounted for at least 25% of the annual total WCPFC-CA tuna catch.

Within the WCPFC-CA, South Pacific and North Pacific albacore are assessed separately; SPC[1] and the IATTC[2] jointly conduct the South Pacific albacore assessment while the ISC[3] conducts the North Pacific albacore assessment. Both albacore assesments span the Pacific, including the waters of the IATTC Convention Area. The albacore tuna catch in the WCPFC-CA north of the equator was 45,886 t in 2024, which is 20% higher than the average of the previous five years, and less than half of the highest catch of 104,798 t, taken in 1976 (Table 9). North Pacific albacore is not discussed further in this report; details of the latest assessment can be found in the ISC ALBWG report (2023).

Box 2 – Summary of 2024 WCPFC-CA tuna catch by species.

Species	Catch (1000 t)	% of total tuna catch	Change from 2023	Notes
Albacore	120	4%	+19%	17% above 5 yr avg
Bigeye	152	5%	+3%	4% above 5 yr avg
Skipjack	2046	67%	+24%	highest catch ever
Yellowfin	741	24%	-1%	3% above 5 yr avg
Total	3059	100%	+15%	highest catch ever

A South Pacific-wide stock assessment was first conducted for albacore in 2021 and continued in 2024. The assessment was conducted jointly by SPC and IATTC, utilising data from both convention areas (Table 8). The South Pacific albacore catch in the South Pacific totalled 74,591 t in 2024, which was roughly 2% lower

[1]The Pacific Community, formerly Secretariat of the Pacific Community.
[2]The Inter American Tropical Tuna Commission.
[3]The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, and the Albacore Working Group.

than the average of the previous five years, and 21% lower than the highest value (94,499 t), recorded in 2017. This value will change (increase) as 2024 data for the IATTC-CA are incomplete. South Pacific albacore catches within the WCPFC-CA totaled 74,259 t, noting that this value includes catch within the overlap area with the IATTC-CA.

Several indices of annual fishing effort for the major gear types employed in the commercial tuna fisheries are summarised in Table 3, Figure 5 (purse-seine), Figure 6 (longline) and Figure 7 (pole-and-line). For the purse-seine fleet, excluding the domestic fleets of Indonesia, the Philippines and Vietnam, the number of active vessels peaked in 2014 and 2015 at 313. The percentage of purse-seine vessels flagged to, or chartered by, Pacific Island countries and territories has steadily increased from 0 as late as 1979 to a high of 59% (145 out of 247) in 2024. The increase in number of purse-seine sets and purse-seine fishing days has mirrored the rise in the number of vessels, although the peak in both measures of fishing effort, sets and days, occurred a decade earlier (2011 for days and 2014 for sets) at around 65,000 days (or sets). While, on average, around one purse-seine set is conducted in a fishing day, purse-seine vessels can make more than one set per day, and a day of searching (with no sets made) is counted as a fishing day.

The 2024 purse-seine skipjack catch (1,716,190 t – 84% of the total skipjack catch) was a new record high and 25% higher than the 2023 catch (Table 4). The 2024 purse-seine catch of yellowfin tuna (376,533 t) decreased 12% from 2023 and represented 51% of the total yellowfin catch (Table 5). The 2024 purse-seine catch of bigeye tuna (50,118 t) was an 11% decrease from 2023 and represented 33% of the total 2024 bigeye catch (Table 6). It is important to note that the purse-seine species composition for 2024 will be revised once all observer data for 2024 have been received and processed and, therefore, the current estimate should be considered preliminary. Note, however, that due to lingering COVID-19-related[4] reductions in trained observers and, therefore, observer placements, coverage levels were only around 60%. While this represents a sharp increase from coverage levels of the prior three years, the revised estimates are expected to be correspondingly imprecise relative to the pre-pandemic years (Peatman and Nicol 2021). Observer coverage of the purse-seine and longline fleets is further discussed in subsection 3.1 Observer coverage.

The commercial longline fleet (excluding Vietnamese and Indonesian domestic vessels and Japanese coastal longline vessels) peaked in size in 1994 at 5130 vessels (Table 3 and Figure 6). The fleet has steadily declined since then, and totalled 2,158 vessels in 2024 which was a decrease of 60 vessels from 2023. The percentage of longliners flagged to Pacific Island countries and territories has steadily increased from zero in the mid-1970s to just over 23% in 2018, and has fluctuated between 17% and 20% since; in 2024, 359 of the 2,158 longline vessels (17%) were flagged to Pacific Island countries and territories. While the number of longline vessels has declined over the history of the fishery, a more direct measure of effort – hooks fished – has shown a different trend. Total hooks fished in the WCPFC-CA increased from 400 million in the mid-1970s to 600 million in

[4] Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. Severe acute respiratory syndrome-related coronavirus: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat Microbiol* **5**, 536–544 (2020). https://doi.org/10.1038/s41564-020-0695-z

the early 2000s, to 800 million in the early 2010s. The peak year in hooks fished was 2012 at 888 million hooks reducing to 666 million hooks in 2024, which was an increase of 12% from 2023, and 0.5% higher than the average of the previous five years.

Box 3 – Summary of the 2024 commercial fishing effort in the WCPFC-CA.

Gear	Unit	Number	Change from 2023	Notes
Purse-seine	vessels	228	-5%	7% lower than 5 yr avg
Purse-seine	days	53,313	+2%	0.3% higher than 5 yr avg
Purse-seine	sets	62,476	+21%	17% above 5 yr avg
Longline	vessels	2158	-3%	0.3% lower than 5 yr avg
Longline	hooks	666,000,000	+12%	0.5% higher than 5 yr avg
Pole-and-line	vessels	63	+2%	2nd lowest on record
Pole-and-line	days	8845	-12%	lowest on record

The recent longline catch estimates are often uncertain and subject to revision due to delays in reporting. Nevertheless, the bigeye catch of 54,139 t was down by just over 1,800 t from the 2023 catch and was the lowest since 1984, while the yellowfin catch (89,268 t) for 2024 was a 5% increase from the 2023 catch.

The pole-and-line fleet has been contracting in size continuously since 1974, when the number of vessels peaked at 798, to just 63 vessels in 2024, an increase of one vessel over 2023 (Table 3 and Figure 7). Pole-and-line effort, measured in fishing days, has shown a similar decline, from a high of 88,567 days in 1977 to 8845 days in 2024, noting, however, that 2024 numbers are subject to revision.

Skipjack accounts for the majority of the pole-and-line tuna catch (77%), with yellowfin tuna (11%) and North Pacific albacore (10%) making up the bulk of the remaining catch. The Japanese distant-water and offshore fleet and the Indonesian fleet account for most of the WCPFC-CA pole-and-line catch.

The 2024 troll catch in the WCPFC-CA was 7272 t, an increase of 5% from 2023, but 19% below the average of the previous five years. In recent years, albacore has comprised roughly half the troll catch, mainly by the New Zealand fleet (average 2205 t of catch per year over 2019–2023) but with a small catch by the United States (average 898 t per year). While skipjack and yellowfin tuna are usually taken in smaller quantities, there was greater catch of both species (2303 t and 2256 t respectively) than of albacore (1485 t) in 2024. Note also that much of the tropical small-scale troll fisheries catch is reported under “Other gear types”.

2 Status of tuna stocks

The sections below provide a summary of the recent developments in fisheries for each tuna species, and the results from the most recent stock assessments. A summary of the important biological reference points for the four stocks is provided in Table 10. The bigeye and yellowfin tuna stocks were assessed in 2023 (Day et al. 2023 and Magnusson et al. 2023, respectively); the South Pacific albacore stock was most recently assessed in 2024 (Teears et al. 2024). The skipjack tuna stock was assessed in 2025 (Teears et al. 2025) . Due to uncertainty in the fisheries data for the most recent year, data from the year immediately preceding the assessment year is not included in the bigeye, yellowfin and albacore assessments. Thus, the bigeye and yellowfin tuna assessments include data through 2021, while South Pacific albacore currently includes data through 2022. Skipjack has a much shorter lifespan and young fish are of great importance to the fishery. Therefore, the skipjack assessment includes the most recent year of data, almost of which come from purse-seine logsheet data which are available on a more timely basis than longline data. Thus the 2025 assessment included fisheries data through 2024. Information on the status of other oceanic fisheries resources (e.g. billfish and sharks) is provided in subsection 3.4 Catch and status of billfish and sharks.

2.1 Skipjack tuna

The 2024 WCPFC-CA skipjack catch of 2,045,720 t and represented a new record catch, surpassing the previous high of 2,044,549 t recorded in 2019 (Table 4 and Figure 8). As in recent years, the main contributor to the overall skipjack catch was the purse-seine fishery (1,716,190 t in 2024 – 84% of total skipjack catch). The next-highest proportion of the catch was by “other” fishery (214,065 t – 10%), which includes small-scale and miscellaneous gear types such as handlines, ringnets and coastal trolling. The longline fishery accounted for less than 1% of the total catch. The vast majority of skipjack are taken in equatorial areas, including Indonesia and the Philippines, and most of the remainder is taken by the seasonal domestic fishery off Japan (Figure 8).

The dominant size of the WCPFC-CA skipjack catch (by weight) typically ranges from 40 cm to 60 cm, corresponding to fish that are 1–2+ years old (Figure 8). Pole-and-line-caught skipjack typically range in size from 40 cm to 55 cm, while skipjack caught by the domestic fisheries of Indonesia and the Philippines are much smaller, ranging from 20 cm to 40 cm. In general, skipjack taken in “unassociated” (i.e. free-swimming) schools are larger than those taken in schools “associated” with fish aggregating devices (FADs).

Stock assessment

The most recent stock assessment of skipjack tuna in the WCPO was conducted in 2025, incorporating data from 1972 through to the end of 2024 (Teears et al. 2025). The assessment retained the 8-region model structure used since 2019 but featured several key analytical changes. These included: a new method for estimating natural mortality-at-age (Lorenzen); the inclusion of effort creep in the Japanese pole-and-line CPUE indices; the exclusion of early Skipjack Survey and Assessment Programme (SSAP) tagging data to moderate a likely bias in early recruitment estimates; and substantial modifications to the structure of tag reporting rate estimations. At its Twenty-First Regular Session (SC21), the Scientific Committee accepted the assessment as the best available science. Uncertainty was characterized using a multi-variate Monte Carlo approach to generate a 300-model ensemble. Key sources of uncertainty sampled in the ensemble included the stock-recruitment relationship steepness, the growth coefficient k, effort creep trajectories for the pole-and-line fishery, and three different tag mixing scenarios. The 2025 assessment results indicate that recent fishing mortality (F_{recent}) is approximately 0.35 times the level associated with maximum sustainable yield (F_{MSY}). Therefore, overfishing is not occurring. The median recent spawning biomass ($\text{SB}_{\text{recent}}$) is estimated to be at 51% of the level predicted in the absence of fishing ($\text{SB}_{F=0}$), which is well above the limit reference point (LRP) of $\text{SB}_{F=0}$. In a significant departure from the previous assessment, the 2025 model estimates that spawning potential, depletion, and fishing mortality have been relatively stable since approximately 2010. The previously estimated long-term increasing trend in recruitment is no longer a feature of the assessment, a change attributed to the exclusion of early tagging data and the inclusion of effort creep in key abundance indices. This new understanding of the stock's dynamics is more consistent with the total catch history, which has also been variable but stable since 2010. While the aggregate stock status is stable, trends in fishing mortality and spawning potential vary considerably among model regions, with the highest fishing pressure concentrated in the equatorial regions. The assessment concluded that the WCPO skipjack stock is not overfished and is not subject to overfishing. Under status quo fishing conditions, where catch and effort levels are maintained at the average 2021–2024 levels, the stock is projected to have zero probability of dropping below the LRP. A number of illustrative plots on exploitation history, present status and future projections are shown in Figure 9.

SC21 endorsed the 2025 assessment as a substantial improvement over the previous one, noting the improved model diagnostics and convergence. A summary of the key outcomes is provided below.

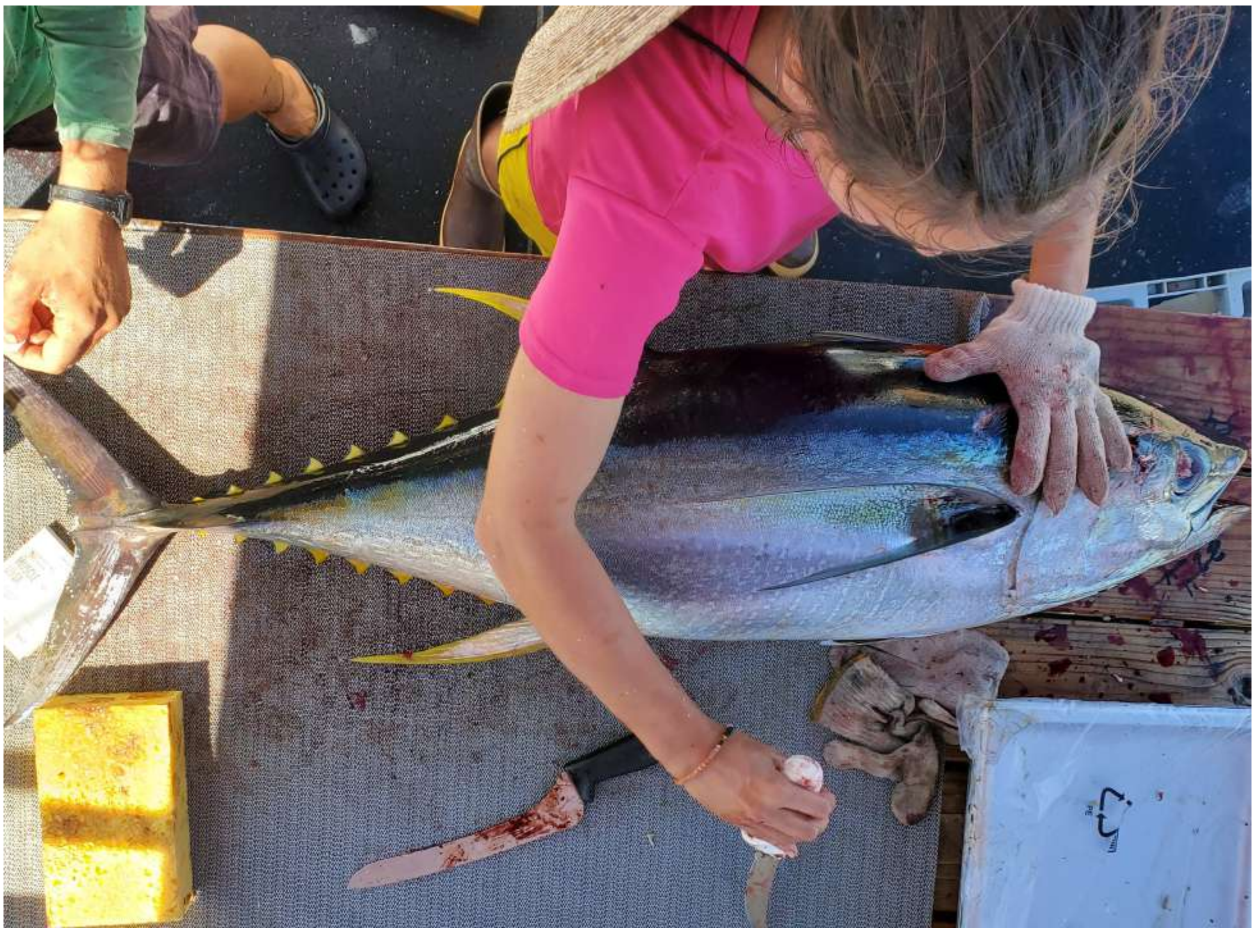
- The median spawning biomass depletion level from the model ensemble is $\text{SB}_{recent}/\text{SB}_{F=0}$=0.51, with a likely range of 0.45–0.63 (80% confidence interval). There is a zero probability that the stock is below the LRP.
- The year 2024 represents the first year of application of the skipjack interim management procedure (CMM 2022-01). The stock is on average at 98% of the recalibrated TRP (0.94 –1.01). This is within the range expected through the MSE testing of the adopted interim skipjack MP.
- The median $\text{F}_{recent}>\text{F}_{\text{MSY}}$ is 0.35, with a likely range of 0.24 to 0.45 (80% confidence interval). There is a zero probability that overfishing is occurring.
- The largest uncertainty in the stock status estimates was the choice of tag mixing scenario, with stricter criteria for mixed tags leading to more optimistic results. Steepness was also identified as an influential factor for MSY-based reference points.
- SC21 noted that the assessment results indicated a shift in the perceived stock dynamics, with spawning potential and fishing mortality estimated to be relatively stable since around 2010, contrasting with the continuous declining depletion trend seen in the 2022 assessment.
- SC21 acknowledged the persistence of some data conflict, where size composition data support a higher population scale, while the CPUE and tagging data support a lower scale.
- SC21 again highlighted that fishery impacts and depletion levels differ by region, with the highest fishing mortality occurring in the tropical regions (regions 5, 6, and 7) due to large-scale purse seine and "other" fisheries.

Several key research needs identified in 2022 were addressed in this assessment. SC21 provided updated recommendations for future work, which can be found in the SC21 Summary Report (WCPFC Secretariat

2025). The main priorities are to: 1) acquire better information on skipjack growth and age structure, potentially through epigenetic aging; 2) improve understanding of the stock's meta-population structure, particularly linkages between the western Pacific and east Asian waters; 3) reduce uncertainty related to tag mixing period assumptions, possibly by developing finer-spatial-scale models; and 4) conduct further work to understand and resolve the identified conflicts among the key data sources.

2.2 Yellowfin tuna

The total WCPFC-CA yellowfin catch in 2024 (741,473 t) was 3% less than the highest value (763,008 t) recorded in 2021 (Table 5 and Figure 10). The purse-seine catch (376,533 t) decreased by 12%, and the longline catch (89,268 t) increased by 5%, from 2023 levels. The remainder of the yellowfin tuna catch comes from pole-and-line and troll fisheries, and the domestic fisheries in Indonesia, Vietnam and the Philippines. The purse-seine catch of yellowfin tuna is typically around four times the size of the longline catch.



As with skipjack, most of the yellowfin catch is taken in equatorial areas by large purse-seine vessels, and with a variety of gear types in the Indonesian and Philippines fisheries. The domestic surface fisheries of the Philippines and Indonesia take large numbers of small yellowfin in the range of 20–50 cm (Figure 10). In the purse-seine fishery, greater numbers of smaller yellowfin are caught in log and FAD sets than in unassociated sets. A major proportion (by weight) of the purse-seine catch is adult (> 100 cm) yellowfin tuna.

Stock assessment

The most recent assessment of yellowfin tuna in the WCPO was conducted in 2023 (Magnusson et al. 2023) and included data from 1952 to 2021. The 2023 assessment had five regions and was less complex than the nine-region structure used in the previous assessment. The 2023 assessment uses an integrated assessment framework, fitting to CPUE data, tag data, length data and conditional age-at-length data, and estimates both natural mortality and growth, using Lorenzen and von Bertalanffy functional forms respectively. Additional size composition filtering was applied with changes to the size data weighting, and with revisions to assumptions on non-decreasing selectivity and tagger effect modelling. The analysis presented the results as a structural uncertainty grid comprising 54 model runs that were equally weighted by SC19 when developing management advice. The structural uncertainty grid addressed several key model uncertainties in addition to estimation uncertainty. The most influential factors contributing to uncertainty around estimated stock status were the assumed tag mixing period and steepness. Additional model uncertainties addressed in the grid included weighting of the age and size composition data.

Fishing mortality on both juvenile and adult fish has increased since the early years of the fishery, although adult mortality has shown signs of levelling off in recent years. In contrast, juvenile fishing mortality is estimated to have increased rapidly in the last few years, from 0.22 in 2015 to 0.46 in 2021. This increase matches the rapidly increasing catches in fishery 23, which consists of miscellaneous gear types used by the Indonesian domestic small-scale fishery that targets juvenile fish at ages 0.5 and 0.75 years (i.e. two and three quarters, respectively). The annual catches in fishery 23 have increased from 58,000 in 2015 to 169,000 t in 2021. Current fishing mortality rates for yellowfin tuna, however, are estimated to be below F_{MSY} in all models, which indicates that overfishing is not occurring. Spawning biomass showed a continuous decline from the 1950s to the 2000s but appears to have levelled off after around 2010. Absolute recruitment has been variable throughout the assessment period, with no apparent long-term trend. Recent spawning biomass levels are uniformly (in all models) estimated to be above the SB_{MSY} level and the LRP of 20% of the level predicted in the absence of fishing. Under status quo fishing conditions, where fishing levels are maintained at the average 2019–2021 levels, the stock is projected to have zero probability of dropping below the LRP. A number of illustrative plots on exploitation history, present status and future projections are shown in Figure 11.

The conclusions of SC19, which were presented as recommendations to the Twentieth Regular Meeting of the WCPFC (WCPFC20) in 2023, are outlined below.

- Based on the uncertainty grid adopted by SC19, the WCPO yellowfin tuna spawning biomass is above the biomass LRP and recent F is below F_{MSY}. The stock is not experiencing overfishing (0% probability $F_{recent} > F_{MSY}$) and is not in an overfished condition (0% probability $SB_{recent}/SB_{F=0} <$ LRP). Additionally, stochastic projections predict there is no risk of breaching the LRP (0% probability $SB_{2048}/SB_{F=0} < 0.2$) under average 2019–2021 fishing conditions.
- Levels of fishing mortality and depletion differ between regions, and fishery impact was highest in the tropical region (regions 2, 3, and 4 in the stock assessment model), mainly due to the purse-seine fisheries in the equatorial Pacific and "other" fisheries within the western Pacific.
- WCPFC could consider reducing fishing mortality on yellowfin, from fisheries that take juveniles, with the goal to increase maximum fishery yields and reduce any further impacts on the spawning biomass for this stock in the tropical regions.
- Although the structural uncertainty grid presents a positive indication of stock status, the high level of unresolved conflict among the data inputs used in the assessment suggests additional caution may be appropriate when interpreting assessment outcomes to guide management decisions.
- SC19 recommends as a precautionary approach that the fishing mortality on the yellowfin tuna stock should not be increased from the level that maintains spawning biomass at 2012–2015 levels until the WCPFC can agree on an appropriate TRP.

2.3 Bigeye tuna

The 2024 WCPFC-CA bigeye tuna catch was 151,611 t, which was well below the highest value (195,052 t) recorded in 2004. Of the total bigeye catch in 2024, 36% was caught by longline, 33% by purse-seine, and the remainder was distributed across troll, pole-and-line, and other gear types.

The majority of the WCPFC-CA catch is taken in equatorial areas, by both purse-seine and longline fisheries, but with some longline catch in sub-tropical areas (e.g. east of Japan) (Figure 12). In equatorial areas, much of the longline catch is taken in the central Pacific, contiguous with the important traditional bigeye longline area in the EPO.

As with skipjack and yellowfin tuna, the domestic surface fisheries of the Philippines and Indonesia take large numbers of small bigeye in the range of 20–50 cm. In addition, large numbers of small 25–75 cm bigeye are taken by purse-seine fishing on FADs (Figure 12) which, along with the fisheries of the Philippines and Indonesia, account for the bulk of the catch by number. The longline fishery, which lands bigeye larger than 100 cm, accounts for most of the catch by weight in the WCPFC-CA. Large bigeye are very rarely taken by the WCPO purse-seine fishery, and only a relatively small amount is taken by the handline fishery in the Philippines. Bigeye sampled in the longline fishery are predominantly adult fish, with a mean size of approximately 130 cm, with most between 80 cm and 160 cm.

Around 17% of recent bigeye catches have been taken in the domestic fisheries of Indonesia, Philippines and Vietnam, a large proportion of which is from archipelagic waters. Fisheries in these archipelagic waters have been subject to variable fishery dynamics in recent years and face challenges in catch reporting leading to increased uncertainty in future catch levels. Recent trends show a progressive reduction in longline catches as effort increasingly switches to smaller scale fishing operations (e.g. handline and troll). Changes in the pattern of fishing are apparent for 2024 that may be a consequence of recently introduced management measures for yellowfin and skipjack in the archipelagic waters of Indonesia. Catch and effort levels for this region are quite uncertain but show progressive increases in recent years. It remains unclear to what extent the data reflect changes in fishery dynamics or changes in data reporting and raising practices.

Stock assessment

The most recent assessment of bigeye tuna in the WCPO was conducted in 2023 (Day et al. 2023) and included data from 1952 to 2021. The assessment uses an integrated assessment framework, fitting to CPUE data, tag data, length data and conditional age-at-length data, and estimates both natural mortality and growth, using Lorenzen and von Bertalanffy functional forms respectively. Additional size composition filtering was applied with changes to the size data weighting and with revisions to assumptions on non-decreasing selectivity and tagger effect modelling. Management advice was formulated from the results of an uncertainty grid of 54 models that addressed several key model uncertainties in addition to estimation uncertainty. The most influential factors contributing to uncertainty around estimated stock status were the assumed tag mixing period and steepness. Additional model uncertainties addressed in the grid included weighting of the age and size composition data.

Fishing mortality is estimated to have increased over time since 1970, particularly on juveniles, although mortality shows signs of levelling off in the last 20 years. Current fishing mortality rates for bigeye tuna, however, are estimated to be below F_{MSY} in all models in the uncertainty grid, which indicates that overfishing is likely not occurring. Spawning biomass shows a long continuous decline from the 1950s to the 2000s but appears to have levelled off since around 2010. Absolute recruitment has been variable throughout the assessment period, with no long-term trend, although with a tendency for some higher recruitments in the recent decade. All models in the structural uncertainty grid estimated spawning biomass to be above both the SB_{MSY} level and the LRP of 20% of the level predicted in the absence of fishing. Under status quo fishing conditions, where effort and catch levels are maintained at the average 2019–2021 levels and the relatively positive recent (2010–2019) recruitment patterns are assumed to continue, the stock is projected to have zero probability of dropping below the LRP. A number of illustrative plots on exploitation history, present status and future projections are shown in Figure 13.

The conclusions of WCPFC SC19, which were based on placing equal weight on all 54 model runs, were presented as recommendations to the WCPFC20 and are outlined below.

- The preliminary estimate of the 2022 catch was 140,664 t, which is less than the median MSY (164,640 t).
- Based on the uncertainty grid, WCPO bigeye tuna spawning biomass is above the biomass LRP and F_{recent} is below F_{MSY} for all models in the uncertainty grid.
- It was concluded that the stock is not overfished and not experiencing overfishing.
- Levels of fishing mortality and depletion differ among regions, and the fishery impact was higher in the tropical regions (regions 3, 4, 7 and 8 in the stock assessment model), with particularly high fishing mortality on juvenile bigeye tuna in these regions. There is also evidence that the overall stock status is buffered with biomass estimated at a more elevated level overall due to low exploitation in the temperate regions (regions 1, 2, 5, 6 and 9).
- The interim objective of bigeye tuna stock under CMM 2021-01 is to maintain the depletion level of the stock at or above the average depletion level for 2012–2015. The recent depletion level of bigeye tuna is close to this interim objective.

2.4 South Pacific albacore tuna

The total WCPFC-CA South Pacific albacore catch in 2024 (74,591 t) was an increase of 8% from the 2023 catch, but well below the historical high of 94,499 t in 2017 (Table 7 and Figure 14). Longline fishing has accounted for most of the catch of this stock (79% in the 1990s, but 95% in the most recent 10 years). The troll catch, mostly taken from November to April, has generally been in the range of 3000–8000 t, although it has averaged less than 3500 t over the past five years. We note here that the 2024 albcore catches are incomplete for IATTC-CA and therefore these values will likely increase.

The longline catch is widely distributed across the South Pacific (Figure 14), with the largest catches taken from the western region. Much of the increase in catch in the early 2000s is attributed to that taken by vessels fishing north of latitude 20°S. The Pacific Island domestic longline fleet catch is restricted to latitudes 10°–25°S. Troll catches are distributed mostly in New Zealand's coastal waters, mainly off the South Island, and along the sub-tropical convergence zone. In the past, less than 20% of the overall South Pacific albacore catch was taken east of 150°W but, in the last five years, this has increased to over 25%, largely due to increased catches by the Chinese fleet in the high seas.

The longline fishery takes mainly larger adult albacore, mostly in the narrow size range of 90–105 cm, and the troll fishery takes juvenile fish in the range of 45–80 cm. Juvenile albacore also occasionally appear in the longline catch in more southern latitudes.

Stock assessment

The most recent stock assessment for South Pacific albacore tuna was undertaken in 2024 (Teears et al. 2024). Similar to the previous assessment (Castillo-Jordán et al. 2021), the assessment included the entire South Pacific region (south of the equator) incorporating both the WCPFC-CA and the IATTC-CA. The assessment was a collaborative effort by SPC and IATTC scientists, and data covered the period 1954–2022. Based on recommendations from SC17 and the 2024 pre-assessment workshop, there was a strong focus on simplifying the 2024 assessment compared to previous versions.

The assessment presented the results from an ensemble model approach in which 100 models incorporated uncertainty in average natural mortality, stock-recruitment steepness and estimation error. The 2021 assessment was the first to include both convention areas modelled jointly in a spatially structured South Pacific wide assessment. The 2024 assessment also includes both convention areas however, an areas-as fleets approach was implemented in each of the convention areas in lieu of the explicit regional spatial structure used in 2021. Other changes from the 2021 assessment included: 1) conversion from a catch-errors to a catch-conditioned modelling framework; 2) inclusion of a likelihood component for the CPUE from the index fisheries; 3) application of a time-varying coefficient of variation for index fisheries; 4) effective sample sizes for size composition data (calculated using the Francis weighting approach), and movement; and 5) recruitment distribution fixed to values derived from SEAPODYM. Management advice was provided for the entire South Pacific region, and separately for the WCPFC-CA and IATTC-CA. Here, we focus on South Pacific-wide outcomes.

Consistent with the findings of the previous south Pacific albacore assessment (Castillo Jordan et al., 2021), the spawning biomass shows a sharp decline from the start of the model period until the mid-1970s after which it stabilises. The stock status, as indicated by the spawning biomass depletion ($\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$), shows a more gradual long-term decline from the start of the model period. Based on the ensemble set of models accepted at the Twentieth Regular Session of the SC (SC20), the South Pacific albacore stock is not considered to be overfished, and there was zero estimated risk of the stock being below the LRP of 20% $\mathrm{SB}_{F=0}$. Stock depletion (years 2019–2022) including estimation uncertainty, across models had a median value of 0.48 (10^{th} to 90^{th} percentile interval 0.36–0.62). Fishing mortality has generally been increasing over time, most notably for the adult component of the stock. The median F_{recent} (2018–2021 average) was estimated to be 0.18 times the fishing mortality that would support MSY (10^{th} to 90^{th} percentile interval 0.06–0.44). Similarly, median $\mathrm{SB}_{recent}/\mathrm{SB}_{\mathrm{MSY}}$ was estimated at 3.02 (10^{th} to 90^{th} percentile interval 2.04–5.21). These estimates indicate that, according to WCPFC reference points, the stock is not overfished or currently undergoing overfishing. The addition of the IATTC region into the South Pacific albacore assessment did not notably alter the main assessment outcomes, and similar trajectories and terminal depletion levels were estimated in both the WCPFC-CA and IATTC-CA (Teears et al. 2024).

Stock projections (Teaars et al. 2024), with stochastic recruitment variation, suggest that under status quo fishing conditions, where catch levels are maintained at the average for 2020–2022, the stock is projected to increase in the short term but stabilise over the long term near a median depletion ($\mathrm{SB}/\mathrm{SB}_{F=0}$) of 0.50, with a small ($< 10\%$) risk of being below the LRP of 20% $\mathrm{SB}_{F=0}$. A number of illustrative plots on exploitation history, present status and future projections are shown in Figure 15.

The conclusions of the WCPFC SC20, based on the ensemble of 100 models were presented as recommendations to the WCPFC, and are outlined below.

- Spawning biomass shows a sharp decline from the beginning of the model period until the mid-1970s after which it stabilises. The stock status, as indicated by the spawning biomass depletion ($SB/SB_{F=0}$), shows a more gradual long-term decline from the beginning of the model period.
- The median value of relative recent (2019–2022) spawning biomass depletion for South Pacific albacore ($SB_{recent}/SB_{F=0}$) was 0.48 with a 10^{th}–90^{th} percentile interval of 0.36–0.62, which is close to, but just below, the 0.5 re-calibrated interim target reference point (iTRP) for South Pacific albacore based on the 2024 assessment.
- There was 0% probability (0 out of 100 ensemble models, including estimation uncertainty) that the recent (2019–2022) spawning biomass had breached the adopted LRP.
- Fishing mortality on adults continues to increase, while fishing mortality on juveniles remains low. Fishing mortality has increased sharply in the EPO since 2010 as longline catches have increased but has remained stable in the WCPFC-CA over a similar period.
- The median of relative recent fishing mortality for South Pacific albacore (F_{recent}/F_{MSY}) was 0.18 with a 10^{th}–90^{th} percentile interval of 0.06–0.44.
- There was 0% probability (0 out of 100 ensemble models) that the recent (2018–2021) fishing mortality was above F_{MSY}.
- Spawning biomass shows a sharp decline from the beginning of the model period until the mid-1970s after which it stabilizes. The stock status, as indicated by the spawning biomass depletion, shows a more gradual long-term decline from the beginning of the model period.

2.5 Summary across target tuna stocks

To summarise the most recent stock assessments for the four target tuna stocks, the stock status for all four species is plotted on a single Majuro plot, along with the associated uncertainty from their respective model grids with weightings applied where required by SC (Figure 16). All four stocks are considered to be in a healthy, sustainable status as none are considered to be overfished. All four target tuna stocks: skipjack, yellowfin, bigeye and South Pacific albacore are estimated to have a 0% probability of currently experiencing overfishing. To place these results in context, a summary of stock status for these same four species assessed in other ocean basins by the three other tuna regional fisheries management organizations is illustrated in Figure 16. As most of the other regional tuna fisheries management organizations report stock status relative to MSY-based reference points (i.e. SB/SB_{MSY} and F/F_{MSY}), we based the WCPFC status on the same criteria. The classification of stock status used in Figure 16 (bottom plot) is based on the medians of multiple models (weighted if required by SC) for each assessment. However, stock status estimates often carry a large uncertainty, which is not evident in plots showing only medians. The pie charts at the bottom of Figure 16 present a summary of the fraction of models for each assessment that estimated stock status in each of the four Kobe quadrants.

2.6 Progress in harvest strategy development

WCPFC CMM 2022-03 - *Conservation and Management Measure on Establishing a Harvest Strategy for key fisheries and stocks in the Western and Central Pacific Ocean* establishes the requirement that "...the Commission shall develop and implement a harvest strategy approach for each of the key fisheries or stocks under the purview of the Commission". Progress in developing and implementing the harvest strategy elements varies across the four key tuna stocks, as summarised in Box 4.

A major step was made at the Nineteenth Regular Session of the WCPFC (WCPFC19) meeting in Da Nang, Vietnam where WCPFC CMM 2022–01 - *"Conservation and Management Measure on a Management Procedure for WCPO Skipjack Tuna"* - was adopted. This CMM sets out the specifications of an interim management procedure (MP) for skipjack tuna, including the definition of a harvest control rule and a target reference point (TRP). The skipjack tuna MP was run for the first time in 2023. The output of the MP provides recommendations for the overall effort and catch levels for the WCPFC skipjack fisheries to apply for the next three years (i.e. 2024–2026), which was incorporated within CMM 2023–01 - *"Conservation*

Box 4 – Summary of progress in implementing harvest strategy elements for key WCPFC tuna stocks and fisheries.

Stock:	Skipjack	SP Albacore	Bigeye	Yellowfin
Key gear:	Tropical purse seine	Southern longline	Tropical longline	
Management objectives	TRP adopted*	Noted	Noted	Noted
Management procedure	MP adopted*	Developing	Developing	
Performance indicators	Identified	Identified	Identified	Identified
Mixed fishery	Developing			
Monitoring strategy	Proposed#	Developing		

* *WCPFC CMM 2022-01. Conservation and Management Measure on a Management Procedure for WCPO Skipjack Tuna*

\# *Scott, R et al. 2023. Monitoring the WCPO skipjack management procedure. WCPFC-SC19-MI-WP-02*

and Management Measure for Bigeye, Yellowfin and Skipjack Tuna in the Western and Central Pacific Ocean" - at WCPFC20 in the Cook Islands. WCPFC21 adopted the monitoring strategy for WCPO skipjack tuna, which supports the process for the Commission and its subsidiary bodies to routinely evaluate the performance of the MP to check that it is working as expected. The monitoring strategy was run for the first time in 2025 and considered the results of the 2025 skipjack stock assessment. SC21 considered that the results of the stock assessment, in general, support the continued application of the skipjack MP.

Further technical progress was made on South Pacific albacore at WCPFC20 after WCPFC21 failed to adopt an MP in 2024. Evaluations of a range of alternative MP designs were conducted and presented to SC21. WCPFC members also discussed the alternative MPs in two focussed online meetings; SPAM01 and SPAM02. Based on these discussions a set of candidate MPs will be provided to WCPFC22 to consider the adoption of a south Pacific albacore MP in 2025.

In 2024, WCPFC21 identified three candidate TRPs for WCPO bigeye tuna for evaluation within MPs for this stock. Work in 2025 developed the bigeye tuna MSE framework and evaluated several MPs to demonstrate the utility of the bigeye MSE framework to SC21. Further advice is required from WCPFC22 to progress the development of a set of candidate bigeye MPs for consideration by WCPFC23 in 2026. WCPFC21 also noted that the interim management objectives for yellowfin and bigeye in CMM 2023-01 are not compatible. As part of the mixed fishery approach, development of MPs for South Pacific albacore, WCPO bigeye and the adopted WCPO skipjack MP will allow the outcomes for WCPO yellowfin to be evaluated.

A selection of papers documenting the latest developments and timetables for future work are listed with other cited references in subsection 4.3 Harvest strategies.

2.7 Tuna tagging

Large-scale tagging experiments are important to enhance the level of information (fishery exploitation rates and population size) that is necessary to inform stock assessments of tropical tunas in the WCPO. Tagging data have the potential to provide significant information of relevance to stock assessment, either by way of stand-alone analyses or, preferably, through their integration with other data directly in the stock assessment model. Tuna tagging has been a core activity of the OFP over the last 30 years, with tagging campaigns occurring in the 1970s, 1990s and, most recently, since 2006. This most recent campaign has tagged and released 497,051 tunas in the equatorial WCPO, including over 1,800 archival tag releases, with 69,667 reported recaptures (Figure 17). A summary of tag releases and recoveries for all historical tuna tagging programs is provided in Table 11, and a breakdown by species and EEZ for the ongoing Pacific Tuna Tagging Programme is provided in Table 12.

3 Ecosystem considerations

3.1 Observer coverage

Observer-collected data are critical to characterising bycatch in the commercial fisheries, as well as observing and documenting operational fishing practices onboard vessels. The placement and protection of observers onboard vessels has been codified in a series of WCPFC conservation and management measures (CMMs). At present, coverage of purse-seine fishing activities is mandated at 100% (since 2010), while longline fishing activities are mandated at 5% (since 2012). In practice, neither of these coverage levels is being routinely met. However, coverage levels of both fleets have increased steadily since 2010 (Figure 18). Observer coverage of the purse-seine fleet, measured as fishing days effectively observed onboard, peaked in 2018 at just over 90%; longline coverage peaked in 2023 at just over 6%. The COVID-19 pandemic had a significant impact on observer coverage, with 2021 coverage rates declining to less than 10% and 4% for the purse-seine and longline fleets, respectively. Coverage rates improved sharply in the purse-seine fishery attaining nearly 65% coverage in 2023, but declined slightly in 2024 to below 60%. Longline coverage (7.1%) was second highest on record, trailing only the 2023 rate of roughly 7.5%. More detailed breakdowns of observer coverage by fleet and EEZ, as well as discussion on the barriers to achieving higher coverage rates, can be found in Panizza et al. (2025).

3.2 Purse-seine set characterisation

Two forms of purse-seine fishing occur: fishing on anchored and drifting FADs, which along with drifting logs are referred to as associated, and fishing on free schools, referred to as unassociated. Catch and size composition differ between the two fishing methods and the use of FADs is regulated by several WCPFC CMMs. Between 1990 and 2009, the number of associated and unassociated sets were roughly equal with total catch slightly higher for associated sets (Figure 19). Beginning in 2010, coinciding with implementation of the Parties to the Nauru Agreement (PNA) Vessel Day Scheme, there was a sharp increase in the number of unassociated sets, while the number of associated sets has remained roughly at a constant level over the past decade. Despite the difference in set numbers, total catch over the past decade has remained relatively equal between the two set types, indicating a much lower average catch for unassociated sets. However, free school purse-seine fishing results in a much higher proportion of "skunk" sets where very low catches (< 1 t) are made, typically due to the failure of a set to encircle a tuna school (Figure 19, top figure) – 42% compared with less than 5% for associated sets over the past five years.

The information concerning the non-target catch composition of the main tuna fisheries in the WCPO comes largely from the various observer programmes operating in the region. Overall, catch (in weight) from unassociated and associated purse-seine sets are dominated by tuna species (99.7% and 97.8%, respectively), with anchored FAD sets having a slightly higher bycatch rate (96% tuna) than drifting FADs (Figure 20). Historically, associated sets have accounted for the majority of bycatch of finfish and shark species, although there is some variation from year to year due to the relative proportions of unassociated and associated sets (Peatman et al. 2021).

3.3 Species of special interest

The tuna fisheries of the WCPO principally target four main tuna species: skipjack, yellowfin, bigeye, and albacore. However, the fisheries also catch a range of other species in association with these. Some of the associated species (bycatch) are of commercial value (byproducts), while many others are discarded. There are also incidents of the capture of species of ecological, conservation and/or social significance, including marine mammals, seabirds, marine turtles and some species of shark (e.g. whale sharks, *Rhincodon typus*).

A range of CMMs have been introduced by the WCPFC to reduce the impacts of fisheries on species of special interest, including marine turtles, whales and seabirds (sharks are discussed in subsection 3.4 Catch and status of billfish and sharks). Spatially and temporally disaggregated summaries of observer bycatch data are publicly available[5], including observed longline and purse-seine effort and interaction rates for species of special interest.

There are limited interactions between the purse-seine fishery and protected species, such as whale sharks and oceanic manta rays (*Mobula birostris*). Historically, some vessels deliberately set around whale sharks associated with tuna schools, but this practice has been prohibited since 2014 in the WCPO. In a very small percentage of cases of free school sets, a whale shark is encountered; in these instances, the whale shark was apparently not seen before the set was started. Observed interaction rates between the purse-seine fishery and marine turtles are low (< 1 interaction per 100 sets), and interactions with seabirds are very rare (Peatman et al. 2019).

Interactions with seabirds and marine mammals are low for the three major gear types (i.e. purse-seine, longline, pole-and-line), although the probability of detecting rare events with low observer coverage means that the estimates of interaction rates are uncertain. Catches of five species of marine turtles have been observed in the equatorial longline fishery, although the observed encounter rate was particularly low and mortality rates vary between turtle species.

3.4 Catch and status of billfish and sharks

In addition to the main tuna species, annual catch estimates for the WCPFC-CA in 2024 are available for the main species of billfish: swordfish (*Xiphias gladius*) at 13,495 t, blue marlin (*Makaira nigricans*) at 13,278

[5] See: https://www.wcpfc.int/public-domain-bycatch

t, striped marlin (*Kajikia audax*) at 4280 t and black marlin (*Istiompax indica*) at 10763 t. Note that these bycatch estimates are generally based on catch reported in logsheets and may represent an underestimate of actual bycatch, although most of the billfish catch is retained.

Estimates of total billfish and shark catches, for both the purse-seine (associated and unassociated sets) and longline fisheries, based on observer data, have been produced for the period 2003 onwards (Figure 21, Peatman et al. 2024, Peatman and Nicol 2025). These estimates show that shark and billfish catches in the longline fishery is at least one order of magnitude greater than in the purse-seine fishery. Over the past 20 years, total annual longline fishery billfish catches have remained relatively steady between 0.5 and 1.0 million individuals, and generally around 7000 individuals in the purse-seine fishery, with roughly equal numbers in associated and unassociated sets.

Five species of WCPFC-CA billfish have been formally assessed over the past decade: Southwest Pacific swordfish (Day et al. 2025) and Southwest Pacific striped marlin (Castillo-Jordán et al. 2025, Ducharme-Barth et al. 2025) by SPC, North Pacific striped marlin (ISC 2023) and blue marlin (ISC 2021) by ISC. Stock status for these species is based on the Kobe plot, where the overfished status is judged relative to spawning stock size at MSY.[6] There is considerable uncertainty in the estimates of F/F_{MSY} and SB/SB_{MSY} for all five species. Based on the assessment model grid medians, Southwest Pacific striped marlin and North Pacific striped marlin are likely in an overfished state, while overfishing is also occurring for North Pacific striped marlin.

Similar to billfish, the estimatyed annual bycatch of sharks (sharks, in this context, refers to sharks and rays) is much greater in the longline fishery (1–2 million individuals) than in the purse-seine fishery (50–125,000 individuals). Purse-seine associated set catch of sharks is generally higher than unassociated set shark catches, although in recent years the numbers have been similar. A detailed species composition of the longline shark catch, based on an analysis of observer data, was reported to WCPFC SC at its Twentyfirst Regular Session (SC21) (Peatman and Nicol 2025). Blue shark (*Prionace glauca*) and silky shark (*Carcharhinus falciformis*) are the most common shark species taken by the longline fisheries, with sizable numbers of shortfin mako (*Isurus oxyrinchus*), oceanic whitetip (*Carcharhinus longimanus*) and bigeye thresher (*Alopias superciliosus*) also being taken (Figure 22). The decline in the total longline shark catch noted earlier is primarily due to a decrease in blue shark catches from more than 1 million individuals in the early 2000s to around 0.7 million after 2015. The pelagic stingray (*Pteroplatytrygon violacea*) is the most common non-shark elasmobranch species taken by the longline fishery and is surpassed only by blue shark in total numbers caught.

The status of silky and oceanic whitetip sharks is of particular concern because assessments have shown that these stocks are subject to overfishing and, in the case of oceanic whitetip, is severely overfished. A WCPFC ban on the use of either shark lines or wire traces in longline sets is in place, and it is hoped this will reduce the catch of silky and oceanic whitetip sharks. Over the past several years, stock assessments have also been

[6] Because the WCPFC has not agreed on LRPs for billfish or sharks, the Kobe plot, rather than the depletion-based Majuro plot, is the default.

undertaken for five WCPFC-CA shark species (Figure 23, bottom plot): South Pacific blue shark (2022), oceanic whitetip (2025) and silky shark (2024) by SPC; North Pacific blue shark (2017) and North Pacific shortfin mako shark (2024) by ISC. Even more so than with the billfish assessments, there is considerable uncertainty in the estimates of the biological reference points, F/F_{MSY} and SB/SB_{MSY}, for all five species. Based on the assessment model grid medians, the oceanic whitetip is considered to be both overfished and experiencing overfishing while the silky shark is likely in an overfished state. Encouragingly, southwest Pacific blue shark has improved in status in recent years and is likely neither overfished nor experiencing overfishing. Similarly, the recent assessment of silky shark concludes that overfishing of the stock has likely ended, although the stock biomass likely remains below the biological reference point; this is more uncertain than the conclusion regarding overfishing.

Links to the stock assessments for the billfish and shark species listed above are given in subsection 4.2.

The SC recommendations on billfish and sharks to the WCPFC are broadly outlined below.

- Stabilise stock size or catch to ensure there is no increase in fishing pressure on:
  - southwest Pacific swordfish; and
  - Pacific blue marlin.
- Reduce catch and/or rebuild the stock and/or reduce effort and/or enhance data collection efforts for:
  - southwest Pacific striped marlin;
  - western and central North Pacific striped marlin;
  - southwest Pacific blue shark;
  - silky shark; and
  - oceanic whitetip shark.

3.5 Climate and ecosystem indices

WCPFC, primarily through the work of its SC, has been considering the application of ecosystem indicators to assist with advice on the impacts of fisheries targeting tuna and tuna-like species on the broader pelagic ecosystem since the Eleventh Regular Session of the SC (SC11) in 2015. At SC18, a set of candidate ecosystem and climate indicators was presented for consideration for adoption (SPC-OFP 2022). Several recommendations concerning the reporting of ecosystem and bycatch issues were made. In particular, SC18 recommended that available information and updates on the impacts of climate change be included or combined with status of stocks reporting. Further, SC18 recommended that "Ecosystem and Bycatch

Indicators" be presented annually to the SC as a standing agenda item, and the identification of their implications and subsequent triggers be developed.

Beginning in 2022, a new section has been added to the TFAR, to present a summary of a select number of the important climate and ecosystem indices. In 2025, an expanded set and description of climate indices was further included. A condensed summary of the indicators is presented here, the full report can be found at `https://www.spc.int/digitallibrary/get/e3vwh`.

For the TFAR, five climate indicators are presented for the Western and Central Pacific Ocean. These indicators were selected based on their ability to monitor ocean variability and trend, providing a summary of the state of oceanographic features of the WCPO. For a global climate summary, see these references: Johnson and Lumpkin 2025; SPC 2025; WMO 2025.

El Niño Southern Oscillation (ENSO)

ENSO is the main driver of inter-annual climate variability in the Pacific, influencing weather, ocean circulation, and ecosystems (Lehodey et al. 1997). From 2020-2023 the WCPO experienced near continuous La Niña conditions, an anomalously long-term ENSO event (Figure 24, top panel) (`NOAA,www.climate.gov/climatedashboard`). This was followed by a short, intense El Niño event that occurred between May 2023 and April 2024. Since this time, ENSO has shown neutral to slightly La Niña like conditions with above average temperatures in the western Pacific and average to below average SSTs in the central and eastern Pacific. At the time this report went to press, weak La Niña conditions were in effect, with several meteorological agencies forecasting an event of moderate strength lasting through early 2026. The United States NOAA Climate Prediction Center projects a relatively quick return to neutral conditions before mid-2026 (Figure 24, bottom panel).

Sea surface temperature (SST)

Sea surface temperature (SST) is a key index of the ocean climate that impacts a range of ecological processes, such as marine life and species distributions (WMO 2025). The WCPO was divided into eight distinct regions based on different oceanographic features, and the monthly SSTs are presented from 1982 to 2024 to capture the main trends (Figure 25). Overall, 2024 was an anomalously warm year in the WCPO relative to the climatological mean (1982 to 2024). Based on this subdivision, diverse SST trend patterns were observed in various regions since 1982, which shows the influence of different climate drivers. For instance, the northern and southern regions (Region 1 and 8, respectively) showed long-term warming trends overlain on seasonal cycles, with each decadal average warmer than the previous one (Figure 26). For both Regions 1 and 8, the top 10 hottest years have all occurred since 2010; 2024 was the third and fourth hottest year on record for the two regions, respectively. In contrast, SSTs in the central equatorial Pacific (Region 5) were near their long-term average, linked to the current neutral ENSO conditions.

Western Pacific Warm Pool (WPWP) area

The western Pacific warm pool (WPWP) is an important driver of climate and oceanographic conditions in the tropical Pacific Ocean. The area is an important feeding and spawning ground for key tuna species and is predicted to change in size, volume, and position with the changing climate (Bell et al. 2021). The area of the warm pool (waters >29°C) is characterised by ENSO-driven inter-annual variability with no clear long-term trend from 2004-2024, and the 2024 value only slightly above the average (Figure 27). This is caused by the strong influence of ENSO-driven inter-annual climate variability on the location and size of the warm pool (waters >29 °C). During El Niño, the westerlies extend the eastern edge of the warm pool eastwards, and retreat westwards during La Niña due to enhanced trade winds. Of concern is the long-term increase in size for waters > 30 °C from 2004 to 2024 in the warm pool area (Figure 27). Between 2015 and 2019, the waters > 30 °C were concentrated mainly to the east of 160°E due to El Niño events during this period. On the other hand, between 2020 and 2024, there was a westward (to 140°E) displacement of waters > 30 °C due to strong La Niña events ((Figure 24) and (Figure 27)). Additionally, from 2004 to 2014, waters >30°C varied from approximately 0 - 5 million km², representing on average 10% of the warm pool area. This has increased to 30% since 2014 and as high as 55% in August 2024. However, a longer timeseries is needed to monitor the impacts of decadal climate forcings such as the Pacific Decadal Oscillation (PDO, Mantua et al. 1997).

Ocean heat content

The world's oceans are central to the transport and absorption of heat, with the ocean storing more than 90% of the excess heat energy trapped in the Earth's climate system from the greenhouse effect. Ocean heat content for 0-300m depth of the WCPO has increased from 1993-2023 (Figure 28, lower panel). Ocean warming is highest in the western equatorial region around Papua New Guinea and the Solomon Islands (Figure 28, upper panel), which coincides with the position of the warm pool.

Marine heatwaves (MHWs)

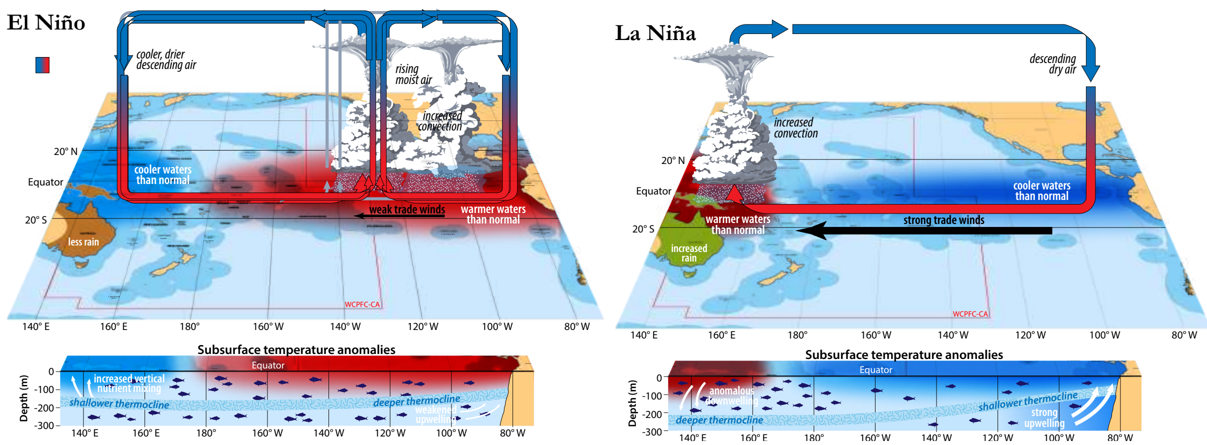
Marine heat waves (MHWs) are defined as daily SSTs above the 90th percentile of the 1993 -2019 climatological mean. MHWs have detrimental impacts on marine ecosystems. Due to. MHWs can have detrimental impacts on marine ecosystems and with the impacts of climate change MHWs are predicted to increase in frequency, duration, and intensity. Here, analysis undertaken in Lal et al. 2025 is presented for the south equatorial Pacific Ocean (`https://doi.org/10.5194/egusphere-2025-3281`). MHWs were defined as daily SSTs above the 90th percentile of the 1993-2019 climatological mean. The number of MHW days, mean duration of MHWs, and their depth have all increased from 1982-2022, while their intensity has decreased. Furthermore, the percentage of the south equatorial Pacific Ocean in a MHW state has increased 3.5% per decade over this same period (Figure 29). Over the past decade, there has not been a single day when at least part of the region was not exposed to a MHW.

Mean fish condition

Mean fish condition, abbreviated as K_{rel}, is a relative measure of the average "fatness" of a tuna. Values greater than 1.0 K_{rel} indicate fatter tuna than expected, given the fish length and may be indicative of good feeding conditions (Figure 30).

Equatorial purse seine fishery distribution

One of the major factors influencing the distribution of tuna species, perhaps most notably for skipjack, is the ENSO cycle. The two extremes of the oscillation, El Niño and La Niña, result in very different distributions of purse-seine fishing effort.



Typically, La Niña events result in a pooling of warm water in the western Pacific with a deepening of the warmer surface layer, a relative decrease in sea surface temperature in the eastern Pacific, and a greater concentration of skipjack in the western Pacific; El Niño events result in a broader swath of warm surface waters extending from the central American coast to as far west as 170°E. It is important to note that every ENSO event differs in its magnitude, range and impact. The response of the purse-seine fleet to fishing conditions influenced by the ENSO cycle is illustrated for the past decade in Figure 31. In 2015, a year with a very strong El Niño event, purse-seine fishing was widely distributed across the tropical Pacific, with the geographic centre of fishing activity located around 170°E. In neutral or La Niña conditions (as in 2020–2022), the geographic centre of fishing can be as much as much as 20° of longitude to the west, a distance of more than 2000 km. To illustrate the contraction of the fishing grounds, we computed the amount of oceanic area comprising 90% of the purse-seine sets (Figure 31, lower right figure). Between 2014 and 2019, the fleet occupied between 8 and 10 million km² of ocean; the area occupied dropped to just 6 million km² in 2022. There is one confounding factor that appears to counter the tendency of skipjack movement, and the purse-seine fishery, to the west in times of La Niña, and that is the use of drifting FADs. The centres of the unassociated and associated fleets are illustrated in Figure 31 by large blue and red dots, respectively. In most years, unassociated effort is highest to the west of the centre of the associated effort.

3.6 Climate change and projected impacts on tuna biomass distribution

The SEAPODYM (2022) modelling framework was used to investigate how climate change could affect the distribution and abundance of skipjack, yellowfin, bigeye and South Pacific albacore, on a Pacific–basin scale, and within the EEZs of Pacific Island countries and territories (Senina et al. 2018; Bell et al. 2021). The analysis formed two parts: 1) a model parameterisation phase over the historical period (1979–2010) using an analysis of historic ocean conditions, and then projections of an ensemble of simulations to explore key sources of uncertainty in climate models; and 2) four different atmospheric forcing datasets from earth system models (ESMs) projected under the ("business as usual") Intergovernmental Panel on Climate Change (IPCC) Regional Concentration Pathways 8.5 (RCP8.5) emissions scenario (((Figure 32) and Figure 33) were used to drive physical-biogeochemical models through the 21st century. To study the impact of moderate emission scenario RCP 4.5 on tuna population distributions, additional projections were generated by simulating the lower rate of warming from available ocean forcings (see details in Methods section of Bell et al., 2021). The impact of ocean acidification was also studied for yellowfin tuna based on results from laboratory experiments (Nicol et al. 2022).

The estimations of historical tuna abundance and spatial distributions (Figure 33 and Figure 34, left column) reflect key features of the ecology and behaviour of the four tuna species, and match the total historical catch in terms of both weight- and size-frequency distributions. Historical fishing pressure was estimated to have reduced the adult stocks of all four tuna species by 30–55% by the end of 2010, with the lowest estimate for skipjack tuna and the highest for bigeye, and yellowfin and South Pacific albacore adult stocks estimated to be depleted to 50% of their unfished populations. The effects of fishing on biomass strongly outweighed the decreases attributed to climate change in the short- to medium-term. Thus, fishing pressure is expected to be the dominant driver of tuna population status until the mid-century. In addition, tuna stocks were projected to shift towards the central and eastern Pacific Ocean. However, despite the gradual shift, western stocks will still reside within the WCPO convention area until the early 2040s, which is reflected by the stable biomass levels illustrated in Figure 33. Later on, the biomass trends become negative. A spatial depiction of the projected redistribution of biomass for all four target tunas is illustrated in Figure 34. Two sets of projections are shown, representing a medium greenhouse gas emissions scenario (RCP4.5) and the more extreme scenario (RCP8.5). Qualitatively, the impacts are similar, albeit more enhanced under the RCP8.5 scenario. The agreement between the projections under four ESMs forcings indicate that the distributional shifts are very likely to occur.

The projected changes in abundance and redistribution of these tuna associated with climate change could have significant implications for the economic development of Pacific Island countries and territories, and the management of tuna resources on an ocean–basin scale. In particular, larger proportions of the catch of each tuna species are increasingly expected to be made in international waters (Bell et al. 2021).

Quantitatively, current estimations of climate change impacts have considerable uncertainty due to coarse spatial resolution and model sensitivities to biases in environmental variables. Throughout 2023-2025, work was focusing on reducing these uncertainties using new ocean forcings and updating SEAPODYM reference models at finer spatial resolution. The main objectives were to 1) improve the parameter estimation in the SEAPODYM model (Bonnin and Senina, 2023), 2) improve fisheries data structure (Forestier et al., 2025) and 3) update the reference models using fisheries, tagging and early-life data (Senina et al., 2025).

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[7] All WCPFC documents can be obtained by visiting the WCPFC website (`www.wcpfc.int`); hyperlinks are provided for documents listed herein.

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Tables

Table 1. Catch (in metric tonnes) of the four target tuna species (skipjack, yellowfin, bigeye and South Pacific albacore) by gear for the WCPFC-CA, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	129,874	98,956	5,224	0	31,195	265,249
1961	123,330	150,709	14,540	0	34,536	323,115
1962	128,804	166,141	18,875	0	34,947	348,767
1963	122,703	125,048	11,934	0	36,795	296,480
1964	102,481	167,181	29,012	0	41,334	340,008
1965	103,955	176,112	8,621	0	41,727	330,415
1966	145,278	241,730	16,913	0	46,993	450,914
1967	128,047	205,255	14,508	5	52,006	399,821
1968	120,136	183,954	15,143	14	52,327	371,574
1969	122,806	208,748	9,482	0	57,703	398,739
1970	141,360	230,142	16,222	50	69,633	457,407
1971	143,625	241,506	24,511	0	68,925	478,567
1972	161,533	242,745	29,030	268	87,209	520,785
1973	166,399	330,841	36,269	484	103,281	637,274
1974	145,192	370,499	29,547	898	109,578	655,714
1975	164,049	279,663	27,685	646	111,669	583,712
1976	198,013	382,627	40,770	25	104,582	726,017
1977	218,413	345,257	53,492	621	136,322	754,105
1978	212,059	407,482	52,041	1,686	131,084	804,352
1979	211,221	344,799	90,103	814	124,684	771,621
1980	230,625	398,498	116,755	1,489	89,969	837,336
1981	191,732	348,917	158,559	2,118	107,884	809,210
1982	179,575	316,457	255,491	2,552	107,990	862,065
1983	175,498	342,287	442,152	946	109,381	1,070,264
1984	162,111	415,016	462,277	3,124	118,478	1,161,006
1985	177,722	287,892	409,536	3,465	136,815	1,015,430
1986	169,129	360,864	474,838	2,270	146,887	1,153,988
1987	179,966	294,879	543,980	2,323	131,876	1,153,024
1988	200,774	327,997	608,996	4,649	151,215	1,293,631
1989	170,876	311,981	664,660	8,646	165,205	1,321,368
1990	188,842	247,104	795,530	7,181	203,546	1,442,203
1991	160,889	290,006	1,006,764	7,969	203,164	1,668,792
1992	199,688	259,762	975,738	6,786	163,594	1,605,568
1993	195,377	293,014	846,114	4,438	145,436	1,484,379
1994	221,367	262,721	971,563	7,411	162,932	1,625,994
1995	217,417	298,301	927,491	23,490	168,157	1,634,856
1996	215,466	301,279	896,443	17,708	208,131	1,639,027
1997	226,375	298,666	959,218	18,637	178,294	1,681,190
1998	251,197	323,645	1,257,392	19,004	213,874	2,065,112
1999	219,024	338,480	1,068,956	13,381	211,995	1,851,836
2000	248,474	319,854	1,143,294	25,750	235,765	1,973,137
2001	264,340	272,483	1,118,917	17,234	212,029	1,885,003
2002	281,627	286,202	1,265,452	16,026	222,616	2,071,923
2003	261,636	303,905	1,265,758	19,777	251,042	2,102,118
2004	284,849	322,179	1,354,239	23,347	290,764	2,275,378
2005	250,698	266,735	1,484,881	13,173	228,682	2,244,169
2006	255,653	257,594	1,524,791	9,985	255,759	2,303,782

Continued on next page

Table 1. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2007	245,130	284,661	1,691,082	9,120	304,655	2,534,648
2008	247,755	269,551	1,737,348	11,707	312,938	2,579,299
2009	280,374	264,350	1,800,944	9,850	277,334	2,632,852
2010	278,577	270,123	1,707,563	11,284	260,046	2,527,593
2011	261,756	275,070	1,575,357	9,144	242,160	2,363,487
2012	275,053	242,960	1,851,274	10,659	302,350	2,682,296
2013	242,833	229,560	1,934,752	9,211	313,332	2,729,688
2014	264,682	206,939	2,079,879	6,355	348,106	2,905,961
2015	270,007	214,041	1,772,737	7,267	396,965	2,661,017
2016	240,729	198,398	1,862,822	6,684	412,211	2,720,844
2017	246,325	171,570	1,833,283	7,534	332,174	2,590,886
2018	257,247	232,216	1,908,953	7,027	412,178	2,817,621
2019	267,784	186,021	2,099,221	8,831	411,543	2,973,400
2020	210,924	228,506	1,881,924	9,454	400,808	2,731,616
2021	206,404	200,086	1,880,232	9,981	419,566	2,716,269
2022	229,879	154,241	1,887,723	9,544	387,353	2,668,740
2023	232,693	109,358	1,861,330	6,929	440,621	2,650,931
2024	247,350	139,405	2,146,139	7,272	518,840	3,059,005

Table 2. Catch (in metric tonnes) by species for the four main tuna species taken in the WCPFC-CA, 1960-2024. Note: Data for 2024 are preliminary.

Year	Albacore	Bigeye	Skipjack	Yellowfin	Total
1960	56,619	45,025	89,938	73,667	265,249
1961	51,561	39,380	156,736	75,438	323,115
1962	46,331	36,868	181,624	83,944	348,767
1963	53,675	44,346	122,703	75,756	296,480
1964	50,545	32,391	182,918	74,154	340,008
1965	70,226	31,333	155,221	73,635	330,415
1966	75,114	33,187	249,514	93,099	450,914
1967	89,303	36,750	204,829	68,939	399,821
1968	64,213	30,427	194,990	81,944	371,574
1969	72,106	36,032	203,329	87,272	398,739
1970	74,350	41,702	242,366	98,989	457,407
1971	100,737	44,142	228,722	104,966	478,567
1972	109,655	57,163	238,082	115,885	520,785
1973	131,149	48,889	329,050	128,186	637,274
1974	115,162	52,758	356,557	131,237	655,714
1975	84,651	69,314	288,468	141,279	583,712
1976	132,947	83,110	356,862	153,098	726,017
1977	83,171	84,055	401,708	185,171	754,105
1978	111,161	66,964	448,039	178,188	804,352
1979	86,007	74,557	408,847	202,210	771,621
1980	95,156	73,355	448,633	220,192	837,336
1981	88,095	66,352	426,215	228,548	809,210
1982	89,496	76,730	459,614	236,225	862,065
1983	65,988	82,856	629,453	291,967	1,070,264
1984	74,540	89,648	703,988	292,830	1,161,006
1985	77,060	90,508	547,717	300,145	1,015,430
1986	71,757	97,580	690,369	294,282	1,153,988
1987	63,645	113,979	638,743	336,657	1,153,024
1988	67,948	110,236	789,843	325,604	1,293,631
1989	73,533	110,967	749,978	386,890	1,321,368
1990	63,872	134,376	809,942	434,013	1,442,203
1991	58,322	119,886	1,025,148	465,436	1,668,792
1992	74,452	143,145	928,151	459,820	1,605,568
1993	77,496	121,643	864,459	420,781	1,484,379
1994	96,461	135,473	939,534	454,526	1,625,994
1995	91,750	119,681	977,514	445,911	1,634,856
1996	91,140	115,273	1,003,276	429,338	1,639,027
1997	112,900	141,099	943,070	484,121	1,681,190
1998	112,465	161,641	1,248,763	542,243	2,065,112
1999	131,066	170,450	1,072,197	478,123	1,851,836
2000	101,672	160,442	1,197,535	513,488	1,973,137
2001	121,561	147,535	1,104,396	511,511	1,885,003
2002	148,051	169,452	1,257,444	496,976	2,071,923
2003	123,239	157,258	1,250,353	571,268	2,102,118
2004	122,399	195,052	1,357,372	600,555	2,275,378
2005	105,371	163,189	1,418,111	557,498	2,244,169
2006	105,257	171,132	1,481,612	545,781	2,303,782
2007	126,857	170,448	1,665,759	571,584	2,534,648
2008	105,109	178,622	1,647,814	647,754	2,579,299

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Table 2. *(continued)*

Year	Albacore	Bigeye	Skipjack	Yellowfin	Total
2009	135,622	174,660	1,760,249	562,321	2,632,852
2010	129,223	148,261	1,679,879	570,230	2,527,593
2011	115,766	176,070	1,534,529	537,122	2,363,487
2012	143,792	177,326	1,733,338	627,840	2,682,296
2013	138,396	167,323	1,840,855	583,114	2,729,688
2014	121,719	176,901	1,985,679	621,662	2,905,961
2015	116,364	155,008	1,792,612	597,033	2,661,017
2016	101,268	162,474	1,792,869	664,233	2,720,844
2017	126,541	138,411	1,616,047	709,887	2,590,886
2018	110,893	160,484	1,844,529	701,715	2,817,621
2019	104,393	135,992	2,044,549	688,466	2,973,400
2020	127,300	147,165	1,714,955	742,195	2,731,616
2021	90,083	147,385	1,715,792	763,008	2,716,269
2022	92,587	152,859	1,753,614	669,681	2,668,740
2023	100,769	147,280	1,650,311	752,570	2,650,931
2024	120,201	151,611	2,045,720	741,473	3,059,005

Table 3. Several indices of fishing effort for the three main gears used in commercial fishing of tuna in the western and central Pacific region, 1960-2024. Note: For vessels, the abbreviations are: DPI: domestic (Pacific Island); DNPI: domestic (non-Pacific Island); DWFN: distant-water fishing nation. For longline effort, the abbreviation Mhks refers to millions of hooks. Effort totals exclude the following: Japan coastal, Indonesia, Philippines and Vietnam domestic purse-seine vessels; Vietnam and Indonesia domestic longline vessels; Japanese coastal and Indonesian domestic vessels for pole-and-line. Longline effort data prior to 1970 is deemed unreliable and, therefore, have been removed; the same is true of pole-and-line data prior to 1972.The table begins at 1960 solely to maintain consistency with the years present in the catch tables.

	Purse-seine				Longline				Pole-and-line			
	Vessels		Effort		Vessels			Effort	Vessels			Effort
Year	DPI	DWFN	Days	Sets	DPI	DNPI	DWFN	Mhks	Japan	DPI	DNPI	Days
1960	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	8	13	0	0	0	0	0	0	0	0
1968	0	0	51	77	0	0	0	0	0	0	0	0
1969	0	4	17	22	0	0	0	0	0	0	0	0
1970	0	6	99	120	0	1,743	1,658	342	0	0	0	0
1971	0	6	1,939	2,654	0	1,794	1,684	379	0	0	0	0
1972	0	7	2,465	3,433	0	1,862	1,609	342	554	56	0	54,754
1973	0	6	2,657	3,591	2	2,232	1,650	365	650	66	0	65,383
1974	0	10	1,942	2,337	0	1,986	1,786	407	716	82	0	66,810
1975	0	12	2,197	2,629	0	2,147	1,763	354	696	81	0	66,302
1976	0	18	2,534	3,159	2	2,174	1,847	368	653	89	9	74,787
1977	0	15	2,253	2,721	2	2,125	1,821	364	662	100	20	88,567
1978	0	19	2,491	2,994	2	2,358	1,871	360	645	100	14	83,754
1979	0	27	3,639	4,463	2	2,505	1,868	471	625	98	10	79,590
1980	1	33	3,798	4,961	2	2,743	1,913	498	572	160	9	79,189
1981	1	42	7,764	8,115	2	2,645	1,871	462	548	168	18	80,060
1982	1	73	11,770	11,560	3	2,641	1,592	409	475	108	23	68,126
1983	8	118	18,994	16,062	4	2,527	1,437	351	434	91	16	58,692
1984	6	120	25,085	21,471	5	2,563	1,445	376	396	98	8	59,279
1985	6	110	20,820	18,418	6	2,844	1,437	387	356	98	0	53,866
1986	5	110	20,806	18,160	3	2,732	1,445	332	330	97	5	51,413
1987	5	116	24,330	19,823	4	3,100	1,415	364	314	112	5	48,305
1988	8	132	24,259	19,441	5	2,774	1,393	442	277	102	18	42,862
1989	5	152	27,110	22,115	9	2,557	1,405	401	269	105	15	43,480
1990	13	176	30,062	23,081	16	2,132	1,410	392	255	48	20	42,075
1991	15	184	37,134	31,074	27	1,820	1,455	385	242	46	19	32,256
1992	17	193	40,824	30,618	59	3,032	1,396	506	216	48	13	32,447
1993	15	183	42,753	31,219	113	3,186	1,570	394	203	40	19	32,113
1994	22	176	38,073	29,233	158	3,285	1,687	445	185	41	23	31,233
1995	21	163	36,968	28,486	217	3,057	1,624	462	174	45	33	31,229
1996	20	158	37,725	29,951	259	2,726	1,428	386	165	43	33	29,449
1997	31	158	39,336	30,686	349	3,262	1,231	378	163	38	26	33,060
1998	32	164	36,518	31,736	415	3,077	1,223	453	163	30	16	33,995
1999	40	164	38,522	27,260	405	3,063	1,151	514	163	29	16	33,600
2000	52	174	37,728	30,707	422	3,113	1,089	516	160	20	15	28,622
2001	46	161	37,907	30,339	490	3,358	1,118	592	155	15	11	25,809
2002	55	158	41,598	33,256	463	3,380	1,149	675	151	15	11	27,327
2003	59	152	44,018	33,639	482	2,165	1,139	719	144	14	9	22,759
2004	78	147	47,192	35,280	476	2,062	910	712	127	12	9	22,122
2005	86	142	48,947	40,347	475	2,124	763	650	128	11	11	22,122
2006	76	148	44,978	36,188	433	2,182	639	641	113	13	6	18,424
2007	83	162	48,147	39,349	458	1,959	518	716	106	8	5	18,413
2008	80	175	52,248	44,750	432	1,773	604	734	98	3	3	16,887
2009	80	187	52,813	47,059	401	1,734	589	765	96	1	6	16,002
2010	87	196	55,047	54,311	509	1,751	632	771	95	2	2	16,150
2011	94	191	65,861	60,737	608	1,873	660	820	91	4	2	14,835
2012	100	191	61,518	64,763	540	1,806	645	888	87	4	1	15,286
2013	104	199	62,398	64,759	380	1,884	744	726	80	2	2	13,786
2014	109	204	60,245	64,872	540	1,849	656	742	80	6	0	11,361

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Table 3. *(continued)*

	Purse-seine				Longline				Pole-and-line			
	Vessels		Effort		Vessels			Effort	Vessels			Effort
Year	DPI	DWFN	Days	Sets	DPI	DNPI	DWFN	Mhks	Japan	DPI	DNPI	Days
2015	118	195	49,195	55,331	538	1,976	705	769	76	6	0	12,817
2016	138	160	50,193	53,374	373	1,936	701	692	76	5	0	14,464
2017	136	152	53,402	57,178	547	1,638	633	732	80	11	0	13,307
2018	132	145	50,328	57,189	609	1,402	631	741	70	4	0	13,980
2019	138	148	47,898	58,676	454	1,174	619	800	67	4	0	13,177
2020	137	131	57,797	53,085	367	1,147	608	678	60	4	1	11,802
2021	142	116	55,156	51,585	353	1,200	596	620	65	4	1	11,156
2022	142	109	52,330	53,039	346	1,118	627	620	62	4	1	10,209
2023	143	85	52,463	51,461	367	1,223	628	597	61	1	0	10,036
2024	145	83	53,313	62,476	359	1,233	566	666	61	0	2	8,845

Table 4. Skipjack tuna catch (in metric tonnes) by gear type for the WCPFC-CA, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	0	70,428	3,728	0	15,782	89,938
1961	0	127,011	11,693	0	18,032	156,736
1962	4	152,387	11,674	0	17,559	181,624
1963	0	94,757	9,592	0	18,354	122,703
1964	5	137,106	25,006	0	20,801	182,918
1965	11	129,933	4,657	0	20,620	155,221
1966	52	215,600	10,949	0	22,913	249,514
1967	124	168,846	10,929	0	24,930	204,829
1968	83	162,379	7,599	0	24,929	194,990
1969	130	168,084	5,045	0	30,070	203,329
1970	1,608	197,873	7,670	0	35,215	242,366
1971	1,475	180,945	13,873	0	32,429	228,722
1972	1,544	172,827	18,343	0	45,368	238,082
1973	1,861	253,217	19,537	0	54,435	329,050
1974	2,124	289,202	11,209	0	54,022	356,557
1975	1,919	218,271	13,259	0	55,019	288,468
1976	2,096	276,582	22,077	0	56,107	356,862
1977	3,127	294,641	32,700	0	71,240	401,708
1978	3,233	331,401	32,176	0	81,229	448,039
1979	2,179	285,859	54,667	0	66,142	408,847
1980	632	333,597	76,108	12	38,284	448,633
1981	756	296,065	85,153	17	44,224	426,215
1982	972	264,726	145,814	64	48,038	459,614
1983	2,144	298,928	278,721	154	49,506	629,453
1984	870	366,811	287,899	284	48,124	703,988
1985	1,108	238,932	253,771	146	53,760	547,717
1986	1,439	322,665	301,300	211	64,754	690,369
1987	2,329	252,142	325,570	154	58,548	638,743
1988	1,937	295,325	434,004	286	58,291	789,843
1989	2,507	275,088	413,702	229	58,452	749,978
1990	363	211,573	503,247	158	94,601	809,942
1991	885	259,778	672,760	126	91,599	1,025,148
1992	432	218,765	617,897	125	90,932	928,151
1993	573	255,152	530,677	105	77,952	864,459
1994	379	209,636	652,327	187	77,005	939,534
1995	598	247,744	638,531	12,244	78,397	977,514
1996	3,935	242,486	651,106	6,456	99,293	1,003,276
1997	4,070	236,999	606,523	9,164	86,314	943,070
1998	5,030	266,772	866,959	8,262	101,740	1,248,763
1999	4,208	255,330	706,421	5,606	100,632	1,072,197
2000	4,559	264,407	797,991	14,951	115,627	1,197,535
2001	5,059	212,668	774,718	7,482	104,469	1,104,396
2002	3,450	207,488	932,334	6,737	107,435	1,257,444
2003	3,824	238,179	882,074	9,665	116,611	1,250,353
2004	4,051	249,936	950,066	15,062	138,257	1,357,372
2005	1,084	216,715	1,054,924	6,235	139,153	1,418,111
2006	1,528	208,731	1,109,716	3,920	157,717	1,481,612
2007	1,175	213,010	1,257,359	3,521	190,694	1,665,759
2008	803	218,570	1,225,679	4,553	198,209	1,647,814

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Table 4. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2009	1,220	201,323	1,383,392	4,227	170,087	1,760,249
2010	1,192	223,409	1,291,770	4,685	158,823	1,679,879
2011	1,124	206,843	1,172,705	2,188	151,669	1,534,529
2012	2,004	170,538	1,372,607	3,885	184,304	1,733,338
2013	1,254	169,025	1,475,711	3,063	191,802	1,840,855
2014	1,879	148,684	1,616,536	1,343	217,237	1,985,679
2015	1,879	151,317	1,393,137	1,651	244,628	1,792,612
2016	5,642	156,603	1,378,985	1,649	249,990	1,792,869
2017	2,571	123,466	1,268,902	2,016	219,092	1,616,047
2018	4,162	183,935	1,450,201	1,719	204,512	1,844,529
2019	5,593	158,225	1,702,802	1,909	176,020	2,044,549
2020	2,325	159,440	1,399,946	1,322	151,922	1,714,955
2021	2,865	165,480	1,397,422	2,697	147,329	1,715,792
2022	2,554	130,233	1,476,281	2,534	142,012	1,753,614
2023	2,686	87,188	1,375,095	2,566	182,777	1,650,311
2024	5,726	107,453	1,716,190	2,303	214,048	2,045,720

Table 5. Yellowfin tuna catch (in metric tonnes) by gear type for the WCPFC-CA, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	55,020	1,872	1,438	0	15,337	73,667
1961	53,166	3,259	2,777	0	16,236	75,438
1962	55,547	4,225	6,975	0	17,197	83,944
1963	53,185	2,071	2,277	0	18,223	75,756
1964	45,247	5,074	3,647	0	20,186	74,154
1965	45,493	3,434	3,752	0	20,956	73,635
1966	61,654	2,192	5,844	0	23,409	93,099
1967	36,083	3,125	3,428	0	26,303	68,939
1968	46,070	2,706	7,083	0	26,085	81,944
1969	51,627	5,166	3,867	0	26,612	87,272
1970	55,806	4,606	7,644	0	30,933	98,989
1971	57,766	5,248	9,058	0	32,894	104,966
1972	61,175	7,465	9,739	0	37,506	115,885
1973	62,291	7,458	14,609	0	43,828	128,186
1974	58,116	6,582	17,098	0	49,441	131,237
1975	69,462	7,801	12,987	0	51,029	141,279
1976	77,570	17,186	15,576	0	42,766	153,098
1977	94,414	15,257	17,430	0	58,070	185,171
1978	110,202	12,767	15,818	0	39,401	178,188
1979	108,910	11,638	32,097	0	49,565	202,210
1980	125,113	15,142	36,502	9	43,426	220,192
1981	97,114	22,044	61,398	16	47,976	228,548
1982	86,149	17,123	90,099	54	42,800	236,225
1983	90,259	17,184	136,317	48	48,159	291,967
1984	76,988	17,633	143,930	67	54,212	292,830
1985	79,973	22,717	134,057	66	63,332	300,145
1986	68,999	17,970	141,884	56	65,373	294,282
1987	75,407	19,044	182,212	35	59,959	336,657
1988	88,855	20,566	144,529	67	71,587	325,604
1989	73,306	22,133	215,964	47	75,440	386,890
1990	79,300	20,769	247,028	48	86,868	434,013
1991	63,512	19,182	285,775	38	96,929	465,436
1992	77,739	23,043	296,814	83	62,141	459,820
1993	72,055	20,486	267,646	37	60,557	420,781
1994	82,184	21,378	273,986	60	76,918	454,526
1995	88,306	23,209	250,865	2,529	81,002	445,911
1996	91,887	30,551	205,833	2,595	98,472	429,338
1997	81,065	22,845	293,618	2,797	83,796	484,121
1998	81,077	27,506	328,241	2,765	102,654	542,243
1999	71,023	26,787	275,091	3,121	102,101	478,123
2000	96,908	26,957	276,615	3,302	109,706	513,488
2001	95,569	24,443	289,725	3,675	98,099	511,511
2002	95,644	24,133	268,839	3,129	105,231	496,976
2003	95,712	24,304	325,493	3,059	122,700	571,268
2004	104,066	30,640	323,660	2,664	139,525	600,555
2005	87,417	27,007	357,404	2,455	83,215	557,498
2006	85,016	23,653	343,373	2,561	91,178	545,781
2007	82,516	26,570	353,104	2,802	106,592	571,584
2008	84,200	22,705	431,280	2,889	106,680	647,754

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Table 5. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2009	99,373	23,918	334,629	3,005	101,396	562,321
2010	98,523	20,112	351,274	3,595	96,726	570,230
2011	97,778	36,838	315,175	2,999	84,332	537,122
2012	87,666	34,705	398,145	2,926	104,398	627,840
2013	77,346	21,924	372,649	2,352	108,843	583,114
2014	100,375	24,082	379,904	2,106	115,195	621,662
2015	104,375	35,719	317,558	2,574	136,807	597,033
2016	91,870	23,387	406,526	2,554	139,896	664,233
2017	86,227	24,935	494,977	2,446	101,302	709,887
2018	97,727	26,225	379,664	2,425	195,674	701,715
2019	104,426	17,706	343,875	2,723	219,736	688,466
2020	73,850	30,622	408,639	2,509	226,576	742,195
2021	75,839	20,997	412,864	2,693	250,615	763,008
2022	88,758	17,676	341,314	2,712	219,221	669,681
2023	85,051	15,629	426,682	2,659	222,548	752,570
2024	89,268	14,997	376,533	2,256	258,419	741,473

Table 6. Bigeye tuna catch (in metric tonnes) by gear type for the WCPFC-CA, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	43,467	1,500	58	0	0	45,025
1961	37,517	1,800	63	0	0	39,380
1962	35,895	800	173	0	0	36,868
1963	42,540	1,800	6	0	0	44,346
1964	30,989	1,143	231	0	28	32,391
1965	29,848	1,254	201	0	30	31,333
1966	31,984	1,108	9	0	86	33,187
1967	33,632	2,803	62	0	253	36,750
1968	27,757	2,272	194	0	204	30,427
1969	32,571	3,350	49	0	62	36,032
1970	34,965	3,178	591	0	2,968	41,702
1971	38,359	1,862	678	0	3,243	44,142
1972	51,040	1,762	671	0	3,690	57,163
1973	42,412	1,258	770	0	4,449	48,889
1974	45,653	1,039	1,079	0	4,987	52,758
1975	61,488	1,334	1,280	0	5,212	69,314
1976	73,325	3,423	2,008	0	4,354	83,110
1977	72,083	3,325	2,693	0	5,954	84,055
1978	56,364	3,337	2,932	0	4,331	66,964
1979	63,837	2,540	3,214	0	4,966	74,557
1980	62,537	2,916	3,816	0	4,086	73,355
1981	46,590	3,382	11,756	0	4,624	66,352
1982	48,578	4,993	19,017	0	4,142	76,730
1983	46,311	5,077	26,764	0	4,704	82,856
1984	52,976	4,557	27,068	0	5,047	89,648
1985	58,629	5,529	20,175	0	6,175	90,508
1986	56,989	4,133	30,112	0	6,346	97,580
1987	68,832	4,602	34,993	0	5,552	113,979
1988	68,288	5,890	29,255	0	6,803	110,236
1989	64,916	6,131	32,473	0	7,447	110,967
1990	77,009	5,985	43,260	0	8,122	134,376
1991	61,033	3,929	45,577	0	9,347	119,886
1992	75,966	4,055	56,923	0	6,201	143,145
1993	66,566	4,505	44,902	0	5,670	121,643
1994	79,175	5,251	43,224	0	7,823	135,473
1995	68,125	6,228	36,918	145	8,265	119,681
1996	58,054	7,940	38,923	432	9,924	115,273
1997	68,597	6,563	58,009	412	7,518	141,099
1998	85,048	6,405	60,638	507	9,043	161,641
1999	74,959	5,856	80,572	316	8,747	170,450
2000	76,924	6,838	66,280	397	10,003	160,442
2001	78,690	5,905	53,500	408	9,032	147,535
2002	92,381	6,109	60,976	712	9,274	169,452
2003	83,016	5,296	57,564	142	11,240	157,258
2004	99,709	9,238	73,313	232	12,560	195,052
2005	78,892	6,851	71,703	220	5,523	163,189
2006	83,592	9,781	71,338	157	6,264	171,132
2007	81,113	7,296	74,937	187	6,915	170,448
2008	83,428	9,204	79,564	212	6,214	178,622

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Table 6. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2009	80,507	7,916	80,846	174	5,217	174,660
2010	72,721	7,027	64,189	275	4,049	148,261
2011	77,567	5,655	86,997	251	5,600	176,070
2012	83,971	3,934	76,329	273	12,819	177,326
2013	65,637	5,009	84,404	266	12,007	167,323
2014	75,434	4,714	81,430	303	15,020	176,901
2015	73,397	5,687	60,970	199	14,755	155,008
2016	63,077	3,933	73,622	174	21,668	162,474
2017	58,126	2,264	66,748	157	11,116	138,411
2018	68,911	4,165	76,064	108	11,236	160,484
2019	68,237	1,514	51,397	146	14,698	135,992
2020	57,024	1,773	66,981	88	21,299	147,165
2021	55,221	2,123	69,385	94	20,562	147,385
2022	55,412	2,039	69,932	92	25,383	152,859
2023	55,944	2,340	56,265	84	32,647	147,280
2024	54,139	2,949	50,118	188	44,218	151,611

Table 7. Albacore tuna catch (in metric tonnes) by gear type for the WCPFC-CA (including the overlap region with the IATTC-CA), south of the equator, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	18,750	0	0	0	0	18,750
1961	19,979	0	0	0	0	19,979
1962	24,492	0	0	0	0	24,492
1963	16,827	0	0	0	0	16,827
1964	13,058	0	0	0	0	13,058
1965	18,057	0	0	0	0	18,057
1966	31,786	0	0	0	0	31,786
1967	35,292	0	0	5	0	35,297
1968	27,332	0	0	14	0	27,346
1969	24,024	0	0	0	0	24,024
1970	33,285	100	0	50	0	33,435
1971	34,116	100	0	0	0	34,216
1972	33,079	100	0	268	0	33,447
1973	44,730	100	0	484	0	45,314
1974	26,279	100	0	898	0	27,277
1975	18,498	100	0	646	0	19,244
1976	28,018	100	0	25	0	28,143
1977	32,970	100	0	621	0	33,691
1978	29,935	100	0	1,686	0	31,721
1979	24,159	100	0	814	0	25,073
1980	29,047	100	0	1,468	0	30,615
1981	30,263	0	0	2,085	5	32,353
1982	27,491	0	0	2,434	6	29,931
1983	23,540	0	0	744	39	24,323
1984	18,522	0	0	2,773	1,589	22,884
1985	23,401	0	0	3,253	1,937	28,591
1986	28,765	0	0	2,003	1,946	32,714
1987	19,750	0	0	2,134	930	22,814
1988	27,617	0	0	4,061	5,283	36,961
1989	17,887	0	0	8,135	21,968	47,990
1990	17,671	245	0	6,740	7,538	32,194
1991	20,303	14	0	7,570	1,489	29,376
1992	28,069	11	0	6,343	65	34,488
1993	27,229	62	0	4,061	70	31,422
1994	31,673	65	0	6,929	89	38,756
1995	26,012	139	0	7,481	104	33,736
1996	24,201	30	0	7,274	156	31,661
1997	31,340	9	0	4,530	133	36,012
1998	41,362	9	0	6,113	85	47,569
1999	28,652	38	0	3,194	74	31,958
2000	34,216	80	0	6,104	139	40,539
2001	53,964	19	0	5,047	199	59,229
2002	63,477	7	0	4,517	150	68,151
2003	52,003	5	0	5,984	130	58,122
2004	49,753	6	0	4,551	123	54,433
2005	53,917	12	0	3,431	137	57,497
2006	55,923	23	0	2,749	188	58,883
2007	52,847	17	0	1,987	60	54,911
2008	54,200	12	0	3,502	160	57,874

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Table 7. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2009	72,813	21	0	2,031	211	75,076
2010	70,902	14	0	2,139	190	73,245
2011	54,360	21	0	3,189	233	57,803
2012	71,814	26	0	2,962	248	75,050
2013	72,091	26	0	3,226	248	75,591
2014	47,216	26	0	2,403	248	49,893
2015	50,755	24	0	2,602	263	53,644
2016	56,804	33	10	2,158	333	59,338
2017	75,671	12	10	2,418	199	78,310
2018	63,465	16	17	2,685	380	66,563
2019	64,786	43	2	3,507	263	68,601
2020	57,956	27	20	4,732	331	63,066
2021	42,713	21	6	4,068	342	47,150
2022	64,814	17	1	3,777	270	68,879
2023	65,501	17	0	1,192	664	67,374
2024	72,038	0	1	1,485	735	74,259

Table 8. Albacore tuna catch (in metric tonnes) by gear type south of the equator, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	22,248	45	0	0	0	22,293
1961	23,742	0	0	0	0	23,742
1962	35,219	0	0	0	0	35,219
1963	31,095	16	0	0	0	31,111
1964	22,824	0	0	0	0	22,824
1965	25,455	0	0	0	0	25,455
1966	38,661	0	0	0	0	38,661
1967	43,952	0	0	5	0	43,957
1968	32,368	0	0	14	0	32,382
1969	24,805	0	0	0	0	24,805
1970	34,775	100	0	50	0	34,925
1971	38,530	100	0	0	0	38,630
1972	39,131	122	0	268	0	39,521
1973	46,701	141	0	484	0	47,326
1974	33,039	112	0	898	0	34,049
1975	22,849	105	0	646	0	23,600
1976	28,951	100	0	25	0	29,076
1977	38,010	100	0	621	0	38,731
1978	32,881	100	0	1,686	0	34,667
1979	26,141	100	0	814	0	27,055
1980	30,947	101	0	1,468	0	32,516
1981	32,692	0	0	2,085	5	34,782
1982	28,339	1	0	2,434	6	30,780
1983	24,290	0	0	744	39	25,073
1984	20,321	2	0	2,773	1,589	24,685
1985	27,126	0	0	3,253	1,937	32,316
1986	32,641	0	0	2,003	1,946	36,590
1987	21,979	9	0	2,134	930	25,052
1988	28,288	0	0	4,296	5,283	37,867
1989	18,738	0	0	8,370	21,968	49,076
1990	21,304	245	0	6,975	7,538	36,062
1991	26,292	14	0	7,805	1,489	35,600
1992	32,014	11	0	6,578	65	38,668
1993	30,998	74	0	4,296	70	35,438
1994	34,998	67	0	7,164	89	42,318
1995	30,484	139	0	7,716	104	38,443
1996	26,663	30	0	7,410	156	34,259
1997	34,693	21	0	4,679	133	39,526
1998	43,963	36	0	6,280	85	50,364
1999	36,988	138	0	3,447	74	40,647
2000	43,284	102	0	6,455	139	49,980
2001	60,147	37	0	5,253	199	65,636
2002	73,027	18	0	4,661	150	77,856
2003	59,269	12	0	5,984	130	65,395
2004	60,623	110	0	4,614	123	65,470
2005	63,347	29	0	3,503	137	67,016
2006	64,540	29	0	2,884	188	67,641
2007	58,108	17	0	2,014	60	60,199
2008	59,903	12	0	3,502	160	63,577

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Table 8. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2009	82,425	21	0	2,031	211	84,688
2010	82,072	14	0	2,139	190	84,415
2011	62,501	30	0	3,190	233	65,954
2012	84,486	41	0	2,962	248	87,737
2013	84,482	26	0	3,226	248	87,982
2014	65,866	26	0	2,403	248	68,543
2015	69,386	24	0	2,581	263	72,254
2016	71,529	40	0	2,137	333	74,039
2017	91,868	14	0	2,418	199	94,499
2018	78,350	16	0	2,684	380	81,430
2019	73,985	68	0	3,507	263	77,823
2020	67,508	32	0	4,733	331	72,604
2021	65,569	350	0	4,068	342	70,329
2022	86,907	65	0	3,777	270	91,019
2023	67,023	17	14	1,192	664	68,910
2024	72,371	0	0	1,485	735	74,591

Table 9. Albacore tuna catch (in metric tonnes) by gear type for the WCPFC-CA, north of the equator, 1960-2024. Note: Data for 2024 are preliminary.

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
1960	12,637	25,156	0	0	76	37,869
1961	12,668	18,639	7	0	268	31,582
1962	12,866	8,729	53	0	191	21,839
1963	10,151	26,420	59	0	218	36,848
1964	13,182	23,858	128	0	319	37,487
1965	10,546	41,491	11	0	121	52,169
1966	19,802	22,830	111	0	585	43,328
1967	22,916	30,481	89	0	520	54,006
1968	18,895	16,597	267	0	1,109	36,868
1969	14,454	32,148	521	0	959	48,082
1970	15,696	24,385	317	0	517	40,915
1971	11,909	53,351	902	0	359	66,521
1972	14,695	60,591	277	0	645	76,208
1973	15,101	68,808	1,353	0	569	85,831
1974	13,020	73,576	161	0	1,128	87,885
1975	12,682	52,157	159	0	409	65,407
1976	16,998	85,336	1,109	0	1,355	104,798
1977	15,810	31,934	669	0	1,058	49,471
1978	12,316	59,877	1,115	0	6,123	79,431
1979	12,115	44,662	125	0	4,011	60,913
1980	13,271	46,743	329	0	4,179	64,522
1981	17,007	27,426	252	0	11,071	55,756
1982	16,377	29,615	561	0	13,117	59,670
1983	13,225	21,098	350	0	7,206	41,879
1984	12,737	26,015	3,380	0	10,022	52,154
1985	14,599	20,714	1,533	0	12,187	49,033
1986	12,937	16,096	1,542	0	9,194	39,769
1987	13,649	19,091	1,205	0	10,218	44,163
1988	14,077	6,216	1,208	235	17,656	39,392
1989	12,260	8,629	2,521	235	17,276	40,921
1990	14,499	8,532	1,995	235	24,034	49,295
1991	15,156	7,103	2,652	235	8,050	33,196
1992	17,482	13,888	4,104	235	12,392	48,101
1993	28,954	12,809	2,889	235	1,187	46,074
1994	27,956	26,391	2,026	235	1,097	57,705
1995	34,352	20,981	1,177	1,091	389	57,990
1996	37,289	20,272	581	951	286	59,379
1997	41,194	32,250	1,068	1,734	534	76,780
1998	38,310	22,953	1,554	1,357	352	64,526
1999	40,046	50,469	6,872	1,144	441	98,972
2000	35,643	21,572	2,408	996	289	60,908
2001	31,004	29,448	974	622	230	62,278
2002	26,556	48,465	3,303	931	526	79,781
2003	26,986	36,121	627	927	360	65,021
2004	27,063	32,359	7,200	838	299	67,759
2005	29,388	16,150	850	743	654	47,785
2006	29,596	15,406	364	596	412	46,374
2007	27,480	37,768	5,682	549	394	71,873
2008	25,124	19,060	825	550	1,675	47,234

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Table 9. *(continued)*

Year	Longline	Pole-and-line	Purse-seine	Troll	Other	Total
2009	26,462	31,172	2,076	413	423	60,546
2010	27,498	19,561	330	590	258	48,237
2011	30,013	25,713	480	448	326	56,980
2012	29,598	33,757	4,193	613	581	68,742
2013	26,505	33,576	1,988	304	432	62,805
2014	25,500	29,433	2,009	200	406	57,548
2015	28,267	21,294	1,072	241	512	51,386
2016	21,627	14,442	3,679	149	324	40,221
2017	23,730	20,893	2,646	497	465	48,231
2018	21,062	17,875	3,001	90	341	42,369
2019	22,124	8,533	1,143	545	826	33,171
2020	18,039	36,644	6,335	803	680	62,501
2021	27,747	11,465	554	460	718	40,944
2022	17,907	4,276	195	429	467	23,274
2023	23,159	4,184	765	428	1,985	30,521
2024	26,125	14,006	3,295	1,040	1,420	45,886

Table 10. Biological reference points (BRPs) and stock status from the latest stock assessments (assessment year shown in parentheses) for South Pacific albacore, bigeye, skipjack and yellowfin tunas. Note: Biomass is in metric tonnes. SB_{recent} is the average spawning biomass over the last four years of the assessment; $SB_{F=0}$ is the average spawning biomass (over the recent 10-year period) predicted to occur in the absence of fishing; MSY is the maximum sustainable yield based on recent patterns of fishing; F_{recent}/F_{MSY} is the ratio of recent (using a window from one year prior to the last year of the assessment) fishing mortality to that which will support the MSY; No. of models in the grid indicates the number of models that were included in the assessment uncertainty grid that was approved by the Scientific Committee. Values represent the medians, or weighted medians, where relevant, across the model grids.

BRP	**Albacore (2024)**	**Bigeye (2023)**	**Skipjack (2025)**	**Yellowfin (2023)**
SB_{recent}	341,308	672,600	3,248,438	2,633,535
$SB_{F=0}$	711,059	1,921,715	6,466,725	5,603,267
MSY	101,100	164,640	2,374,800	700,400
F_{recent}/F_{MSY}	0.18	0.59	0.35	0.5
$SB_{recent}/SB_{F=0}$	0.48	0.35	0.51	0.47
No. models in grid	100	54	300	54

Table 11. Total numbers of albacore, bigeye, skipjack, and yellowfin tuna tagged during the three major tropical tuna tagging projects in the western and central Pacific region. Note: Separate EEZ results are provided for any region with more than 10,000 releases in any single programme. Also, as releases and recoveries occur independently and fish move from where they were tagged, it is possible for the number recovered of a species in a particular EEZ to exceed the number released in that EEZ. With respect to the abbreviations, SSAP: Skipjack Survey and Assessment Programme (1977-1981), RTTP: Regional Tuna Tagging Programme (1989-1992), PTTP: Pacific Tuna Tagging Programme (2006-2024).

	PTTP		**RTTP**		**SSAP**	
EEZ	**Releases**	**Recoveries**	**Releases**	**Recoveries**	**Releases**	**Recoveries**
FJ	0	6	5,197	528	28,980	2,659
FM	33,824	3,255	11,711	1,779	8,791	330
ID	40,418	5,053	13,740	2,653		37
IW	35,563	4,009				
KI	55,120	5,342	14,754	851	5,212	449
NZ	2,863	8		2	15,020	1,000
PF	0	1		1	29,693	128
PG	218,466	29,241	44,502	3,677	9,079	1,077
PW	14,369	214	7,495	142	8,663	114
SB	95,220	19,174	15,226	2,372	7,870	597
Other	5,654	3,347	39,042	6,925	48,976	1,077
TOTAL	501,497	69,650	151,667	18,930	162,284	7,468

Table 12. PTTP tagging totals for the four target tuna species.

	Releases				**Recoveries**			
EEZ	**Albacore**	**Bigeye**	**Skipjack**	**Yellowfin**	**Albacore**	**Bigeye**	**Skipjack**	**Yellowfin**
FJ	0	0	0	0	3	0	1	2
FM	0	1,552	25,367	6,905	0	253	2,519	483
ID	0	506	31,548	8,364	3	67	4,295	688
IW	0	27,542	2,080	5,941	3	2,117	1,468	421
KI	0	33,306	13,037	8,777	0	2,859	1,783	700
NZ	2,863	0	0	0	6	0	2	0
PF	0	0	0	0	1	0	0	0
PG	0	4,488	151,629	62,349	3	764	20,355	8,119
PW	0	45	11,509	2,815	0	1	185	28
SB	0	581	69,952	24,687	2	92	15,338	3,742
Other	14	1,364	3,308	968	3	1,873	1,041	430
TOTAL	2,877	69,384	308,430	120,806	24	8,026	46,987	14,613

EEZ abbreviations: FJ: Fiji, FM: Federated States of Micronesia, ID: Indonesia, IW: International Waters (high seas), KI: Kiribati, NZ: New Zealand, PF: French Polynesia, PG: Papua New Guinea, PW: Palau, SB: Solomon Islands, Other: Pacific Island countries and territories with low numbers of releases and/or recoveries.

Figures

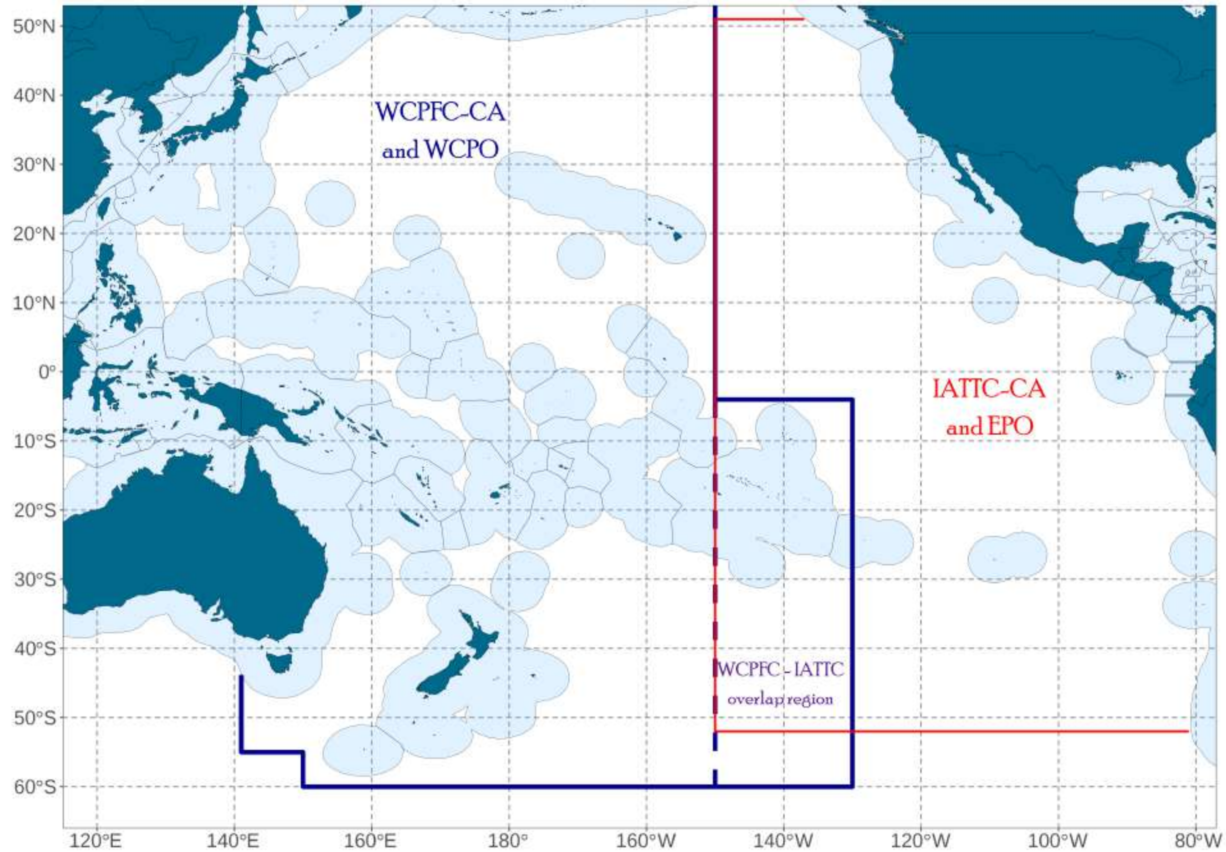


Figure 1. Important national and regional management zones in the Pacific. The WCPFC-CA is outlined in dark blue, the IATTC-CA area is outlined in red. The western and central Pacific Ocean (WCPO) includes all of the WCPFC-CA, minus the overlap with the IATTC-CA; the eastern Pacific Ocean (EPO) is coincident with the IATTC-CA. The EEZs of Pacific Island countries and territories are shaded light blue and high seas areas are white.

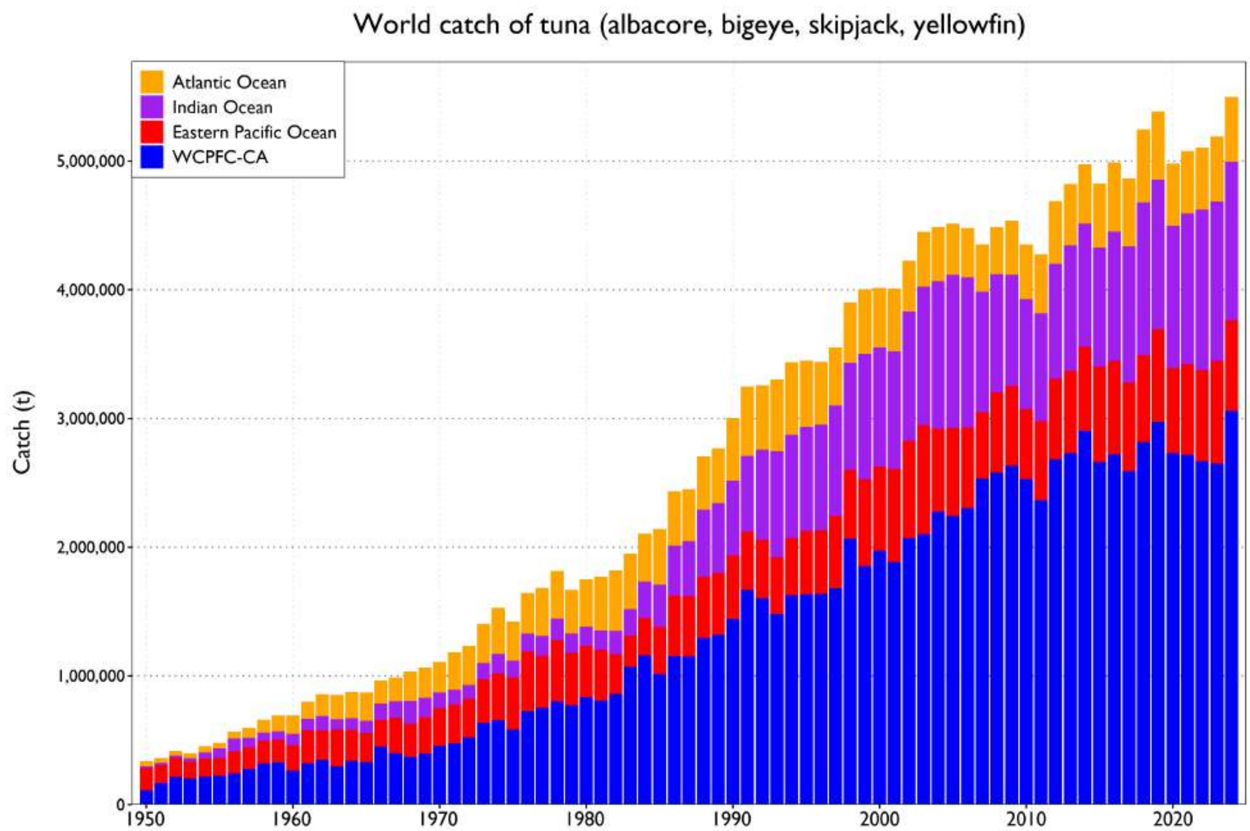
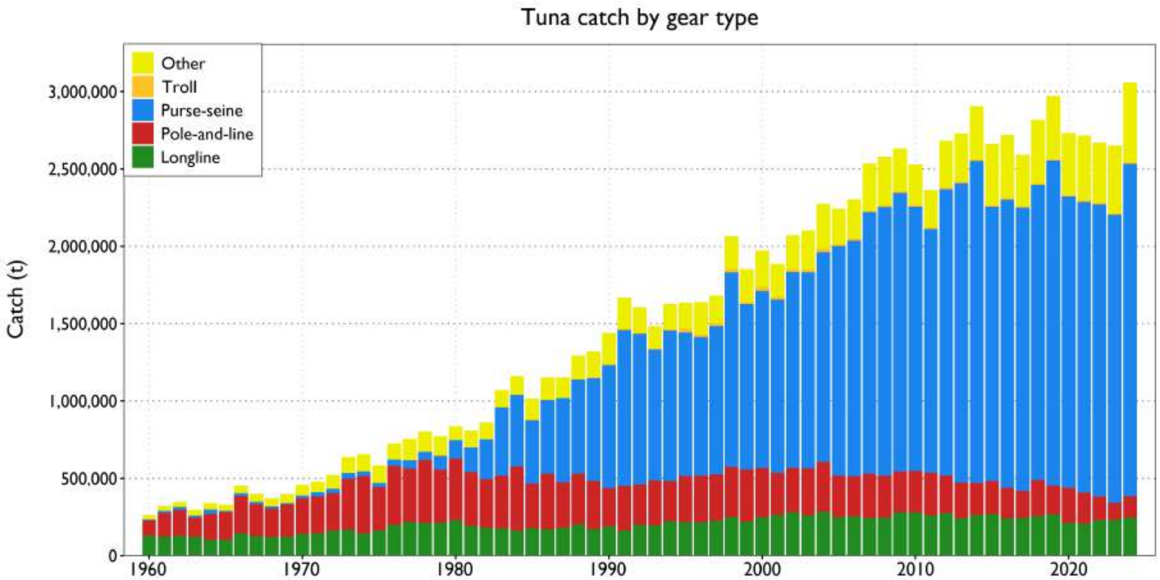


Figure 2. World catch of target tuna (albacore, bigeye, skipjack, yellowfin), 1950–2024. The WCPFC-CA total includes catch in the overlap region with the IATTC; therefore, the eastern Pacific Ocean total does not include that catch. Data for 2024 is provisional for all areas.

Total WCPFC-CA target tuna catch plots



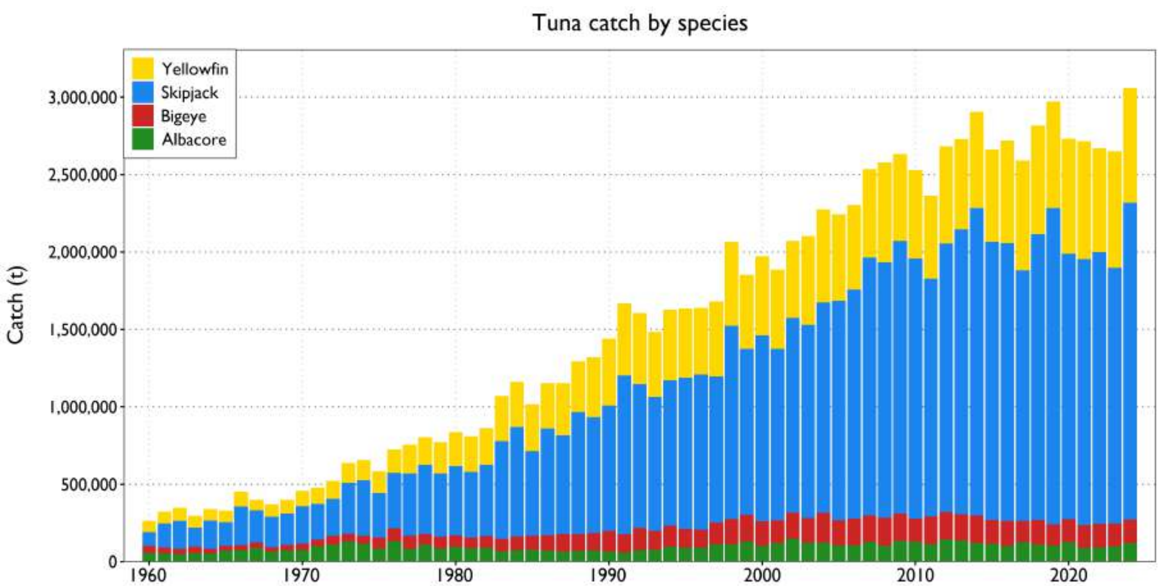
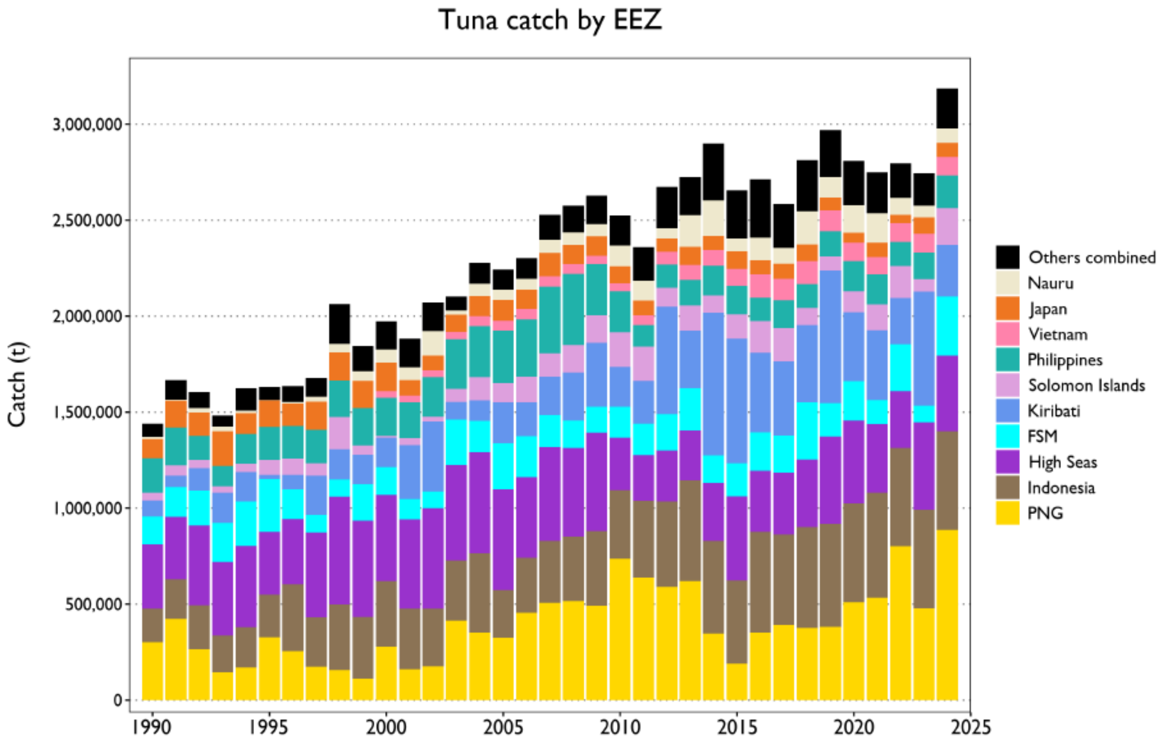


Figure 3. Catch (in metric tonnes) by gear type (top) and species (bottom) for the western and central Pacific region, 1960–2024. Note: data for 2024 are preliminary.

Total WCPFC-CA target tuna catch plots, cont.



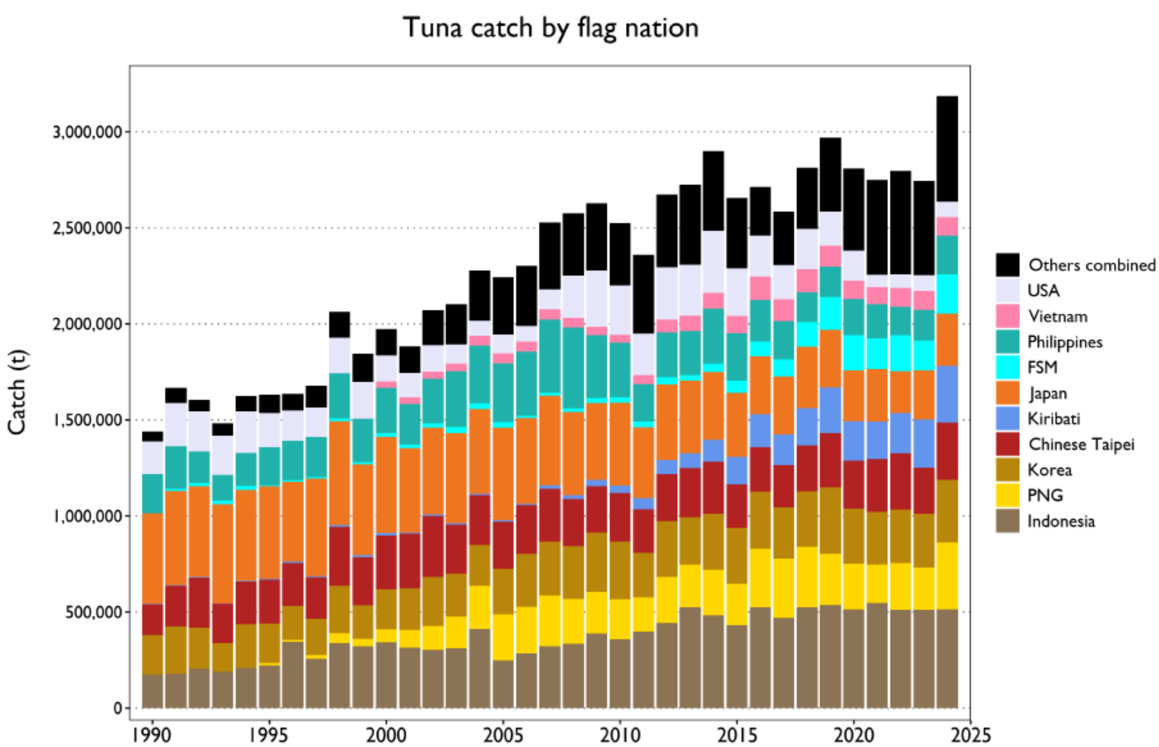


Figure 4. Catch (in metric tonnes) by EEZ (top) and flag (bottom) for the western and central Pacific region, 1990–2024. Note: The top 10 individual EEZs or flags are shown, as determined by total target tuna catch in 2024.

Purse-seine catch and effort plots

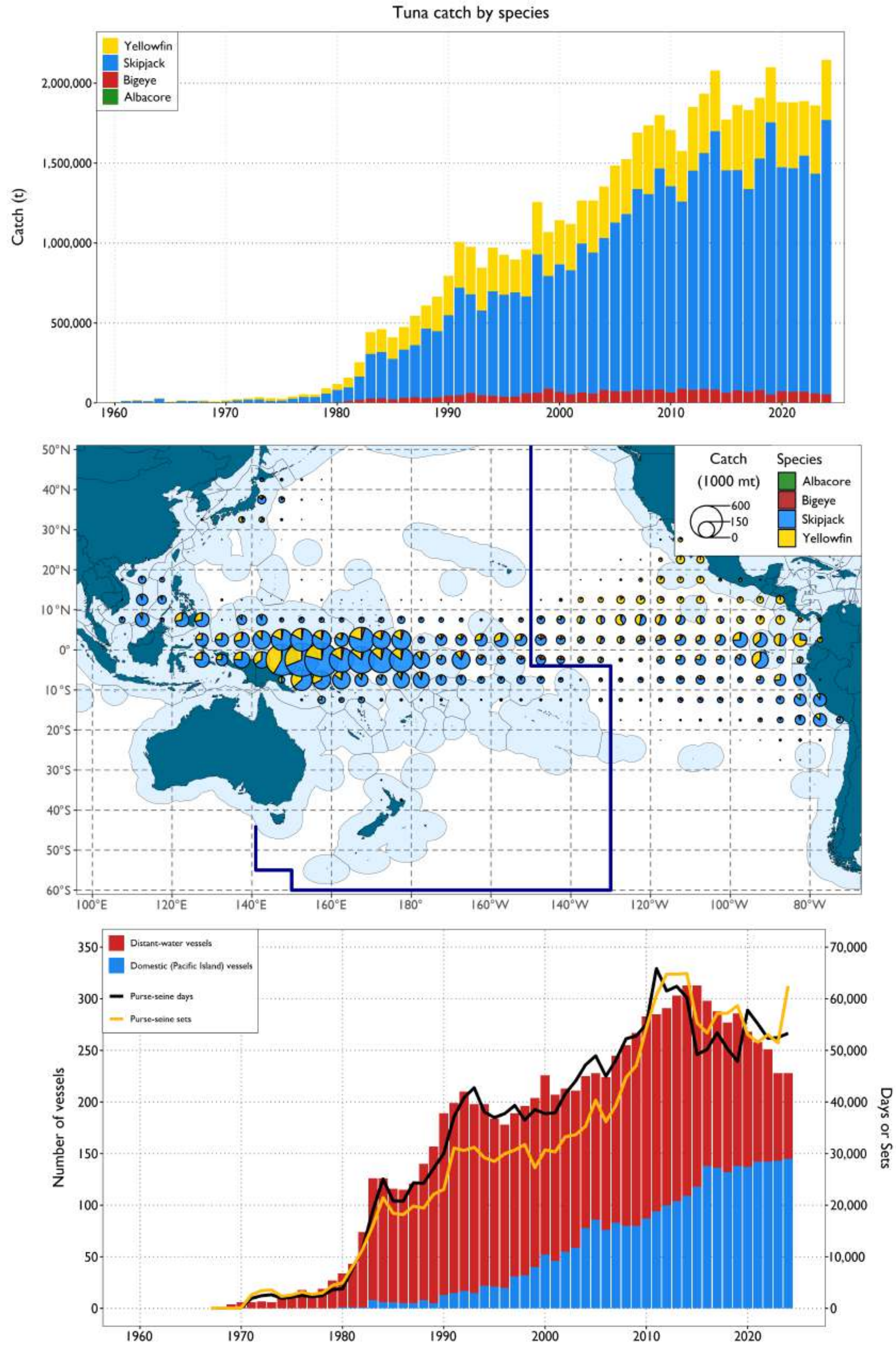
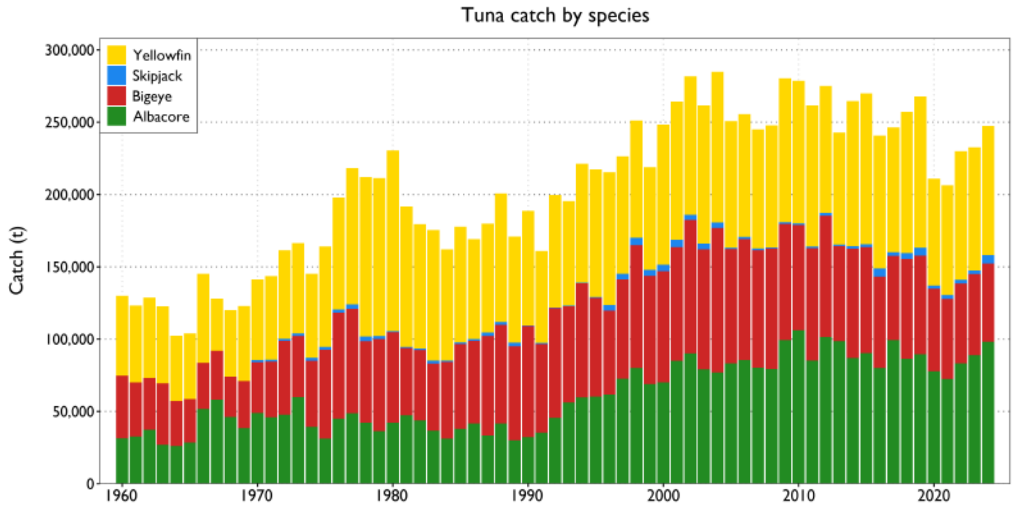
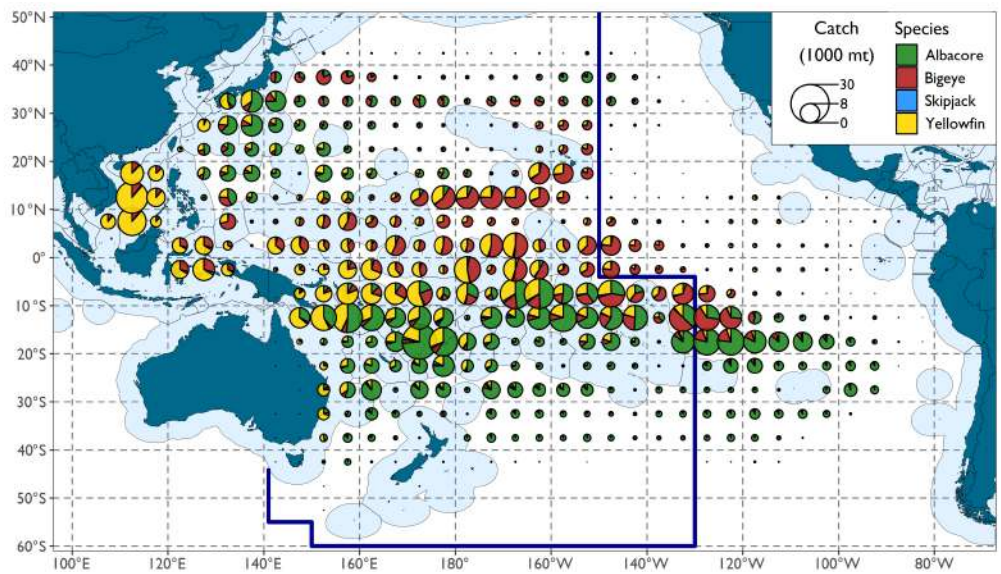


Figure 5. Time series of catch (top), recent (2020–2024) spatial distribution of catch (middle), and indices of fishing effort, in fleet sizes and number of sets and days (bottom), for the purse-seine fishery in the WCPO. Note: Effort totals exclude Japan coastal, Indonesia, the Philippines and Vietnam domestic purse-seine vessels.

Longline catch and effort plots





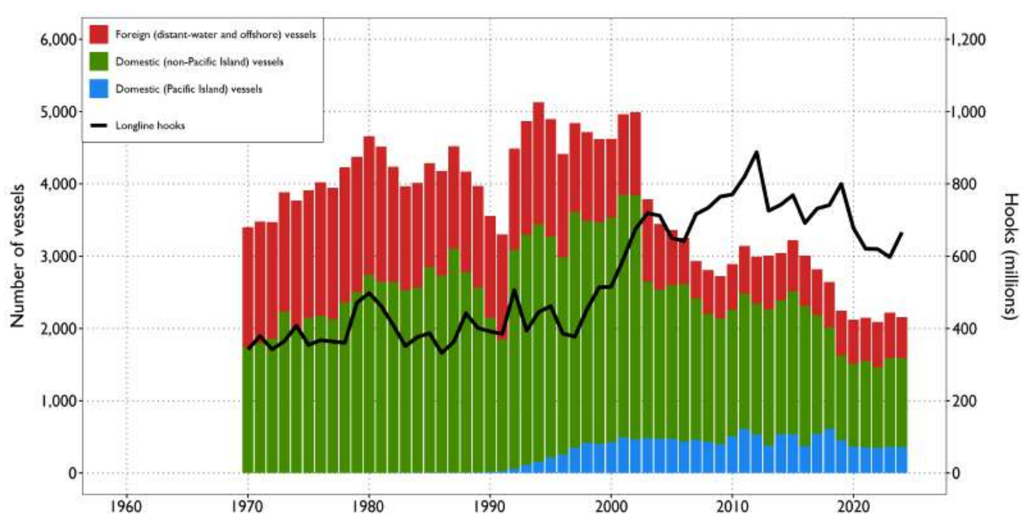


Figure 6. Time series of catch (top), recent (2020–2024) spatial distribution of catch (middle), and indices of fishing effort, in fleet sizes and number of hooks fished (bottom), for the longline fishery in the WCPFC-CA. Note: vessel numbers and hook estimates are considered unreliable prior to 1970.

Pole-and-line catch and effort plots

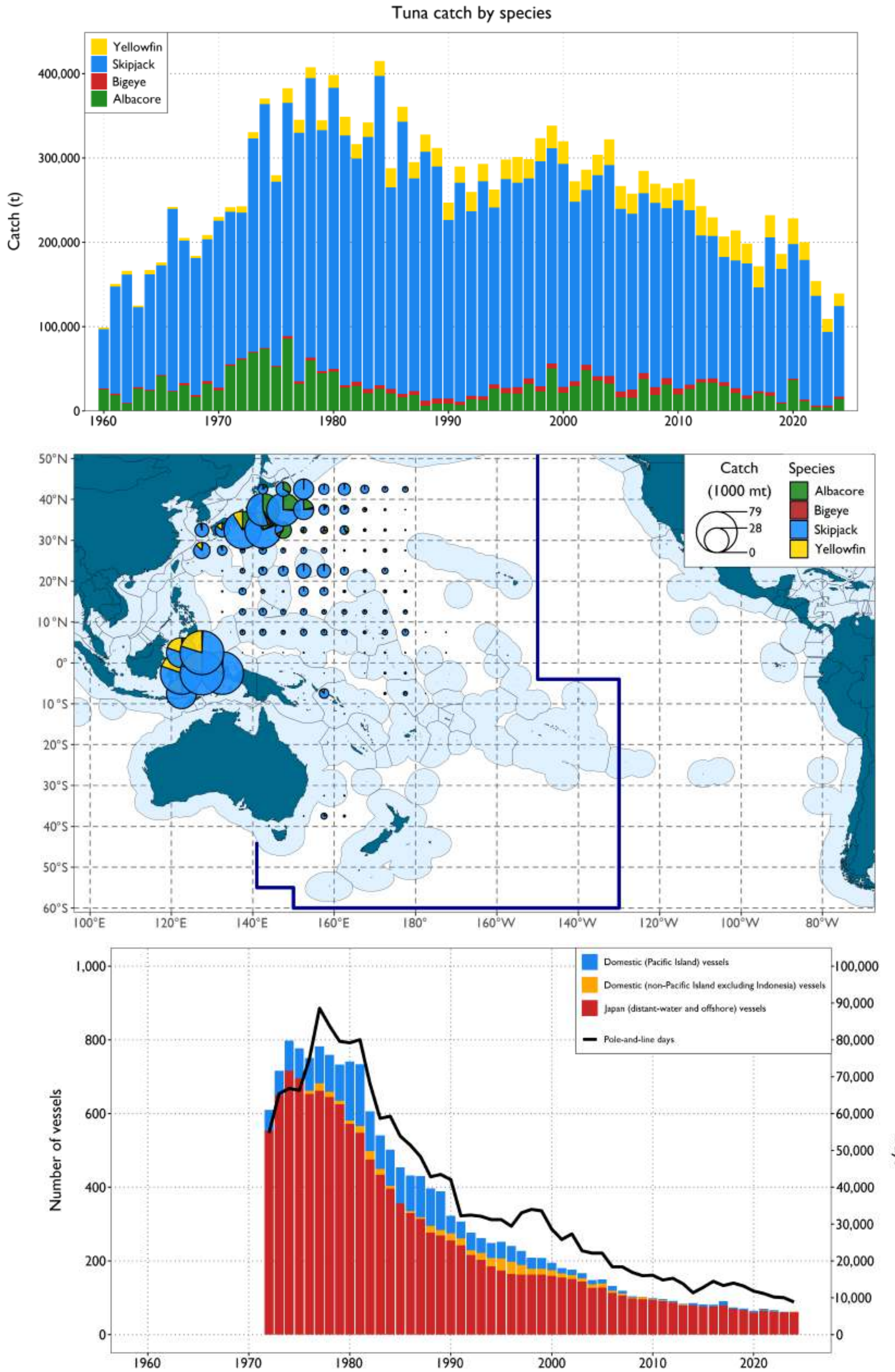


Figure 7. Time series of catch (top), recent (2020–2024) spatial distribution of catch (middle), and indices of fishing effort in fleet sizes and number of days (bottom), for the pole-and-line fishery in the WCPFC-CA. Note: vessel numbers and fishing days are not available prior to 1972.

Skipjack catch data

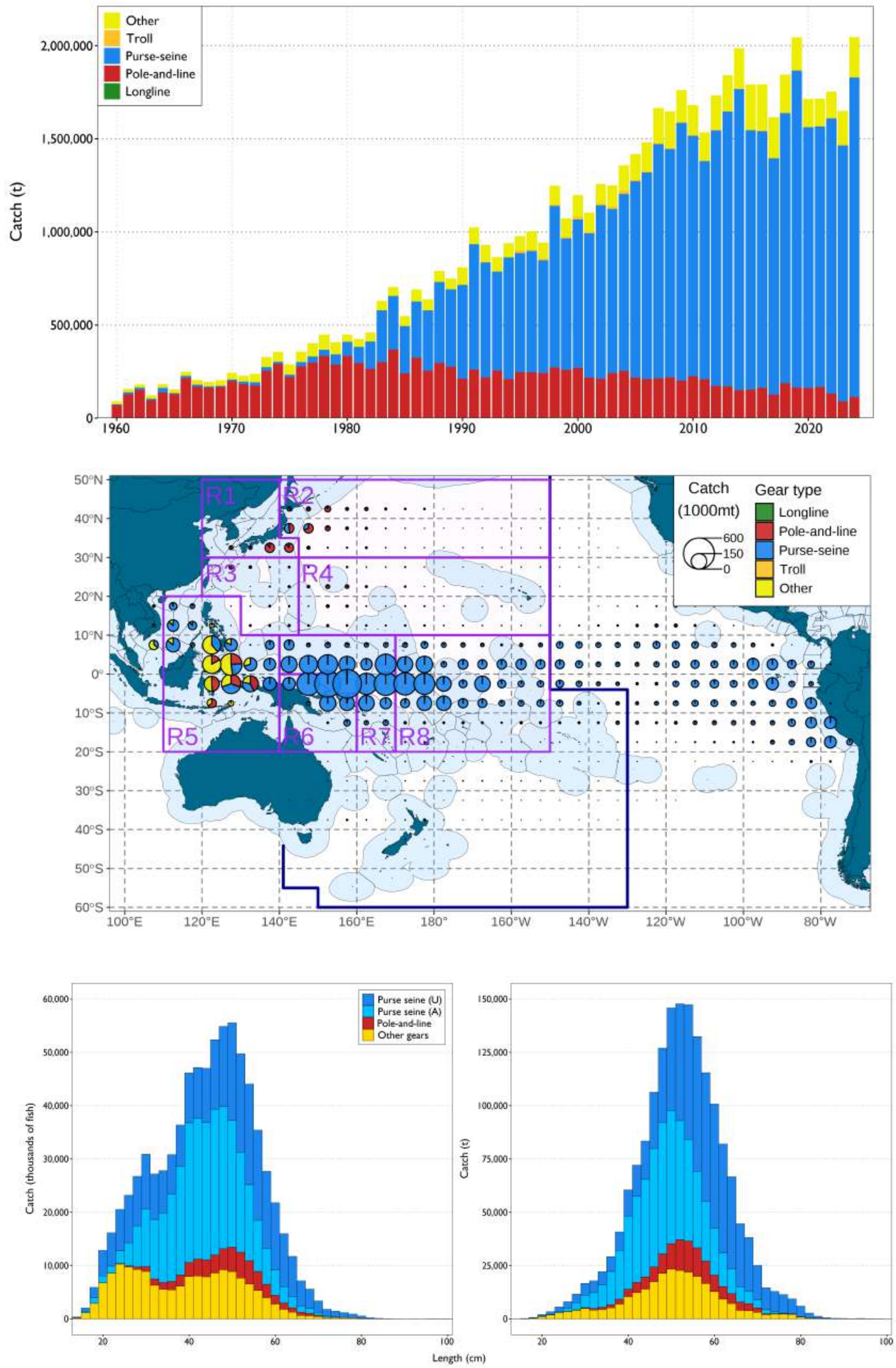


Figure 8. Time series (top), recent (2020–2024) spatial distribution and assessment regions outlined in purple (middle), and size composition (average for last five years, bottom) of skipjack tuna catch by gear type for the WCPFC-CA.

Skipjack stock status plots

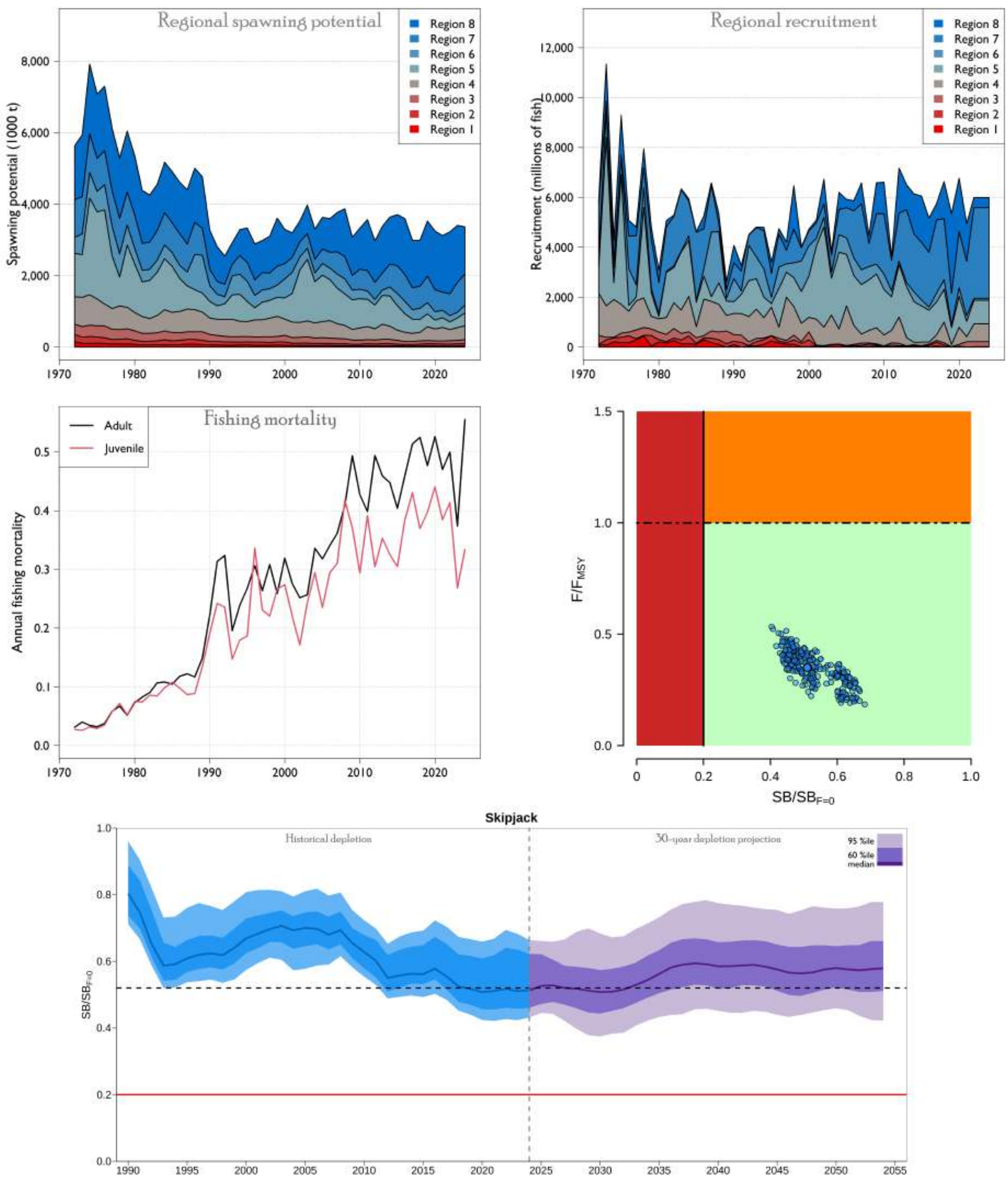


Figure 9. Estimated spawning biomass (SB) time series by model region (top left), recruitment by model region (top right), and fishing mortality for adults and juveniles (middle left) from the skipjack diagnostic case model; stock status displayed on a Majuro plot as the end points (recent values) from the uncertainty grid of 18 models (middle right) with the median value illustrated by the large blue point. Estimated historical depletion since 1990 (from the stock assessment) and projected 30-year depletion under status quo conditions (2024 catch/effort levels) are shown in the bottom plot. The vertical line represents the final year of data in the most recent assessment and, thus, marks the transition to projection estimates. All depletion estimates (historical and projected) are computed in the same manner as $SB_{recent}/SB_{F=0}$. Spawning biomass in the absence of fishing is computed as a 10-year average lagged by one year relative to each of the three years used in the "recent" SB calculation. The red horizontal line is the LRP (at 0.2 $SB_{recent}/SB_{F=0}$). The dashed horizontal line (at 0.5 $SB_{recent}/SB_{F=0}$) is the interim TRP objective described in the skipjack MP CMM 2022-01.

Yellowfin catch data

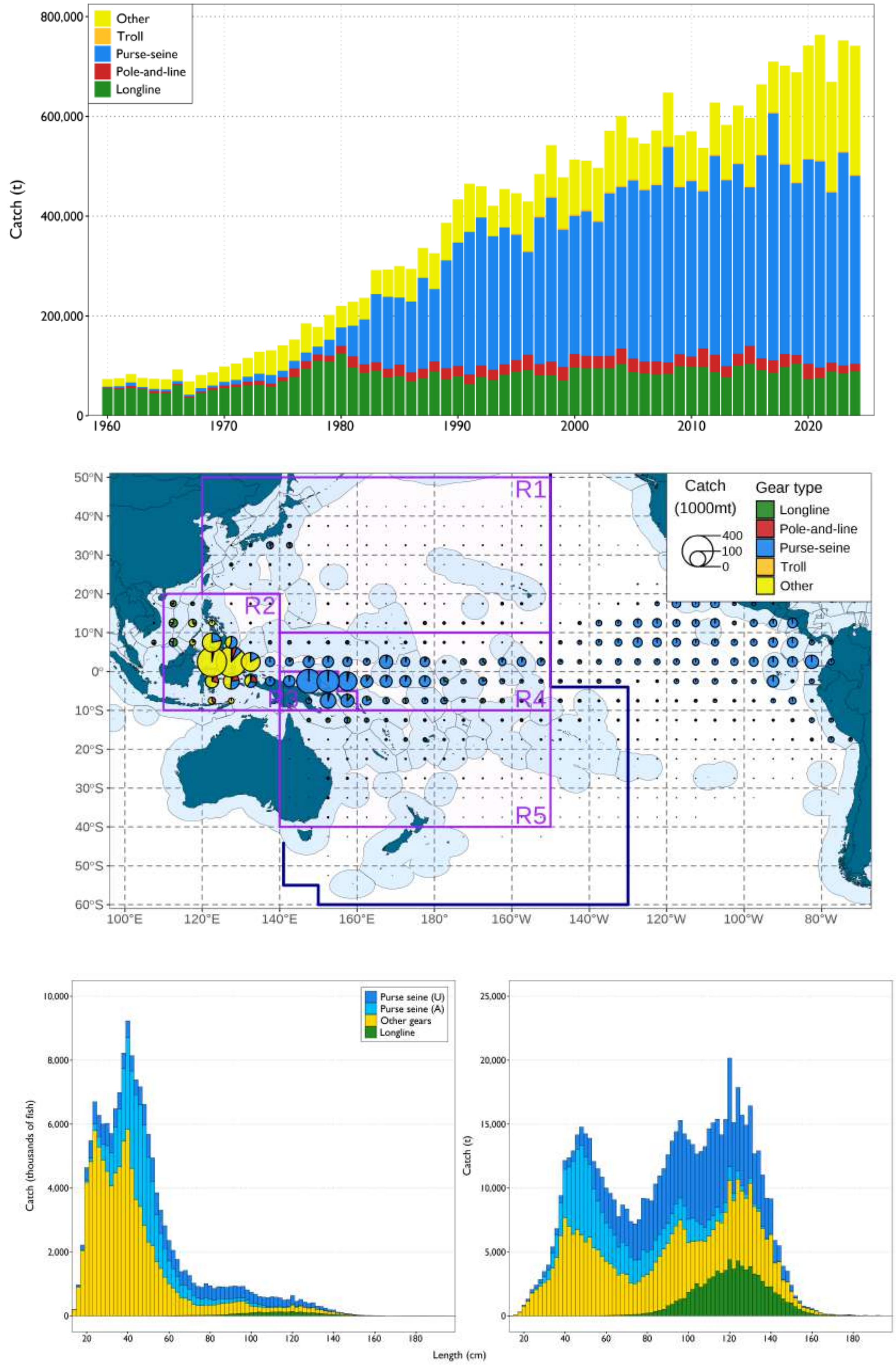


Figure 10. Time series (top), recent (2020–2024) spatial distribution and assessment regions (middle), and size composition (average for last five years, bottom) of yellowfin tuna catch by gear type for the WCPFC-CA.

Yellowfin stock status plots

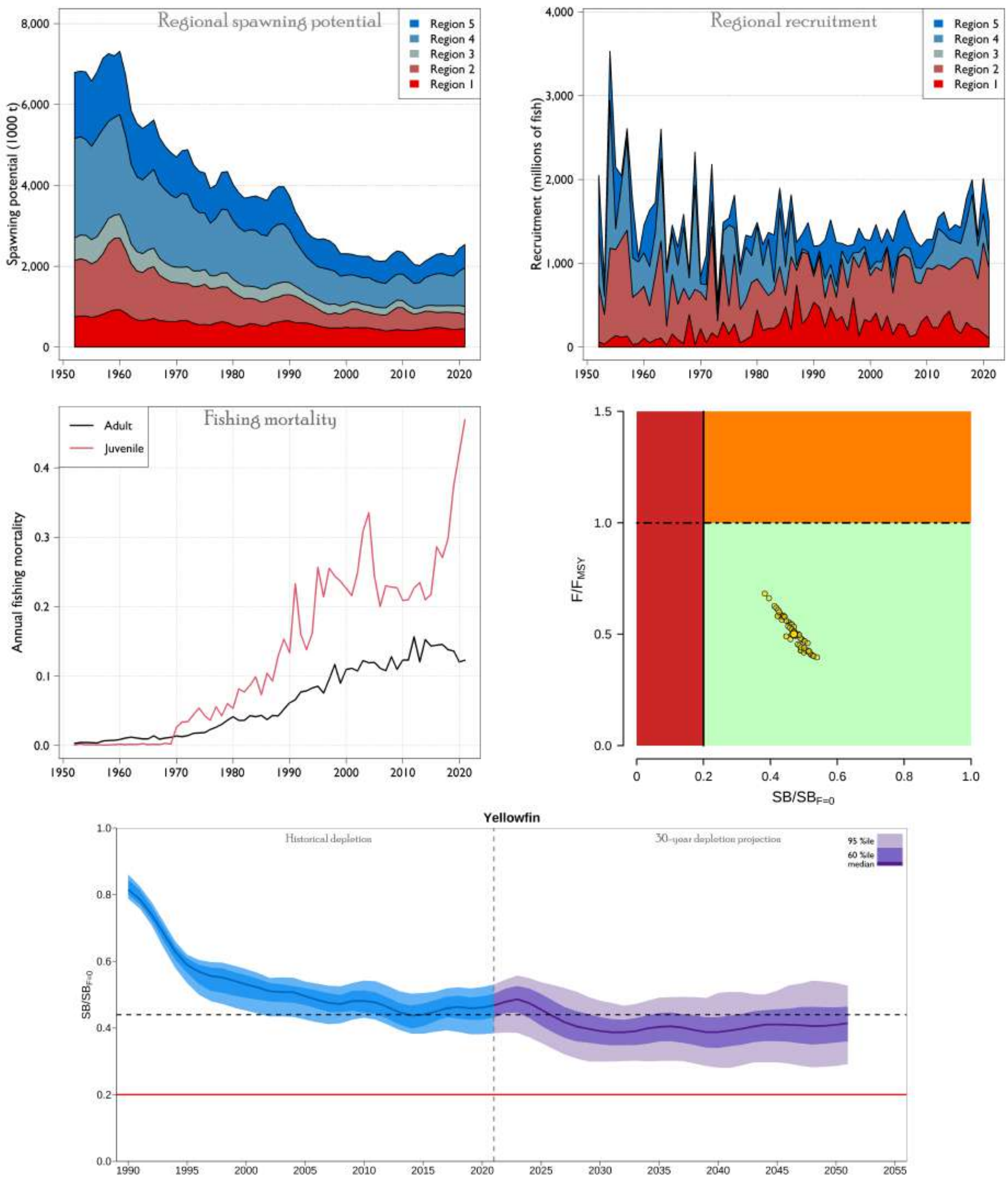


Figure 11. Estimated spawning biomass (SB) time series by model region (top left), recruitment by model region (top right), and fishing mortality for adults and juveniles (middle left) from the yellowfin diagnostic case model; stock status displayed on a Majuro Plot as the end points (recent values) from the uncertainty grid of 54 models (middle right) with the median value illustrated by the large yellow point. Estimated historical depletion since 1990 (from the stock assessment) and projected 30-year depletion under status quo conditions (2024 catch/effort levels) are shown in the bottom plot. The vertical line represents the final year of data in the most recent assessment and, thus, marks the transition to projection estimates. All depletion estimates (historical and projected) are computed in the same manner as $\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$. Spawning biomass in the absence of fishing is computed as a 10-year average lagged by one year relative to each of the three years used in the "recent" SB calculation. The red horizontal line is the LRP (at 0.2 $\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$). The dashed horizontal line represents the latest estimate of the average depletion ratio (at 0.44 $\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$) over the period 2012–2015, which is listed as the interim depletion objective in Tropical Tuna CMM 2023-01.

Bigeye catch data

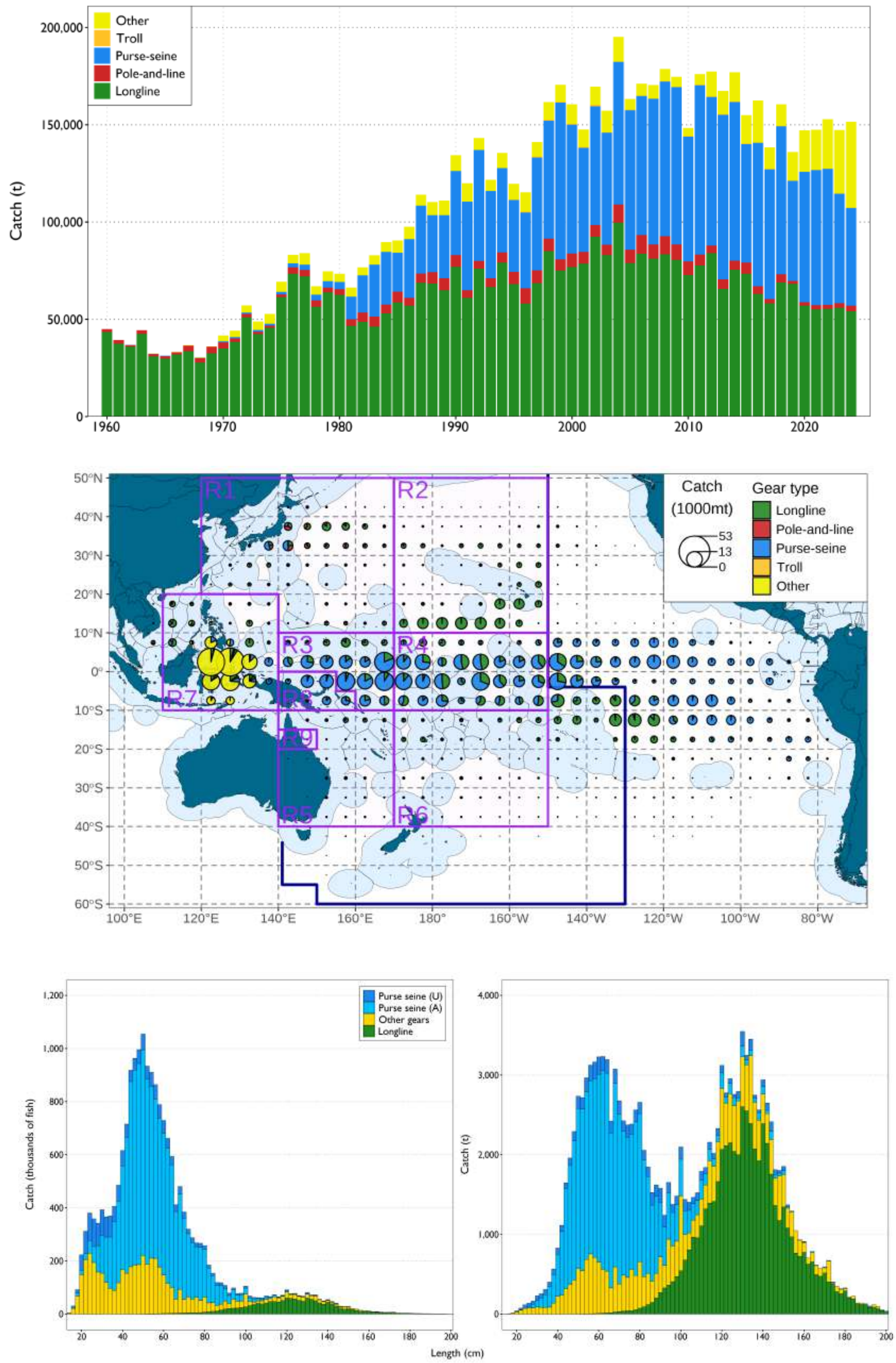


Figure 12. Time series (top), recent (2018–2022) spatial distribution and assessment regions (middle), and size composition (average for last five years, bottom) of bigeye tuna catch by gear for the WCPFC-CA.

Bigeye stock status plots

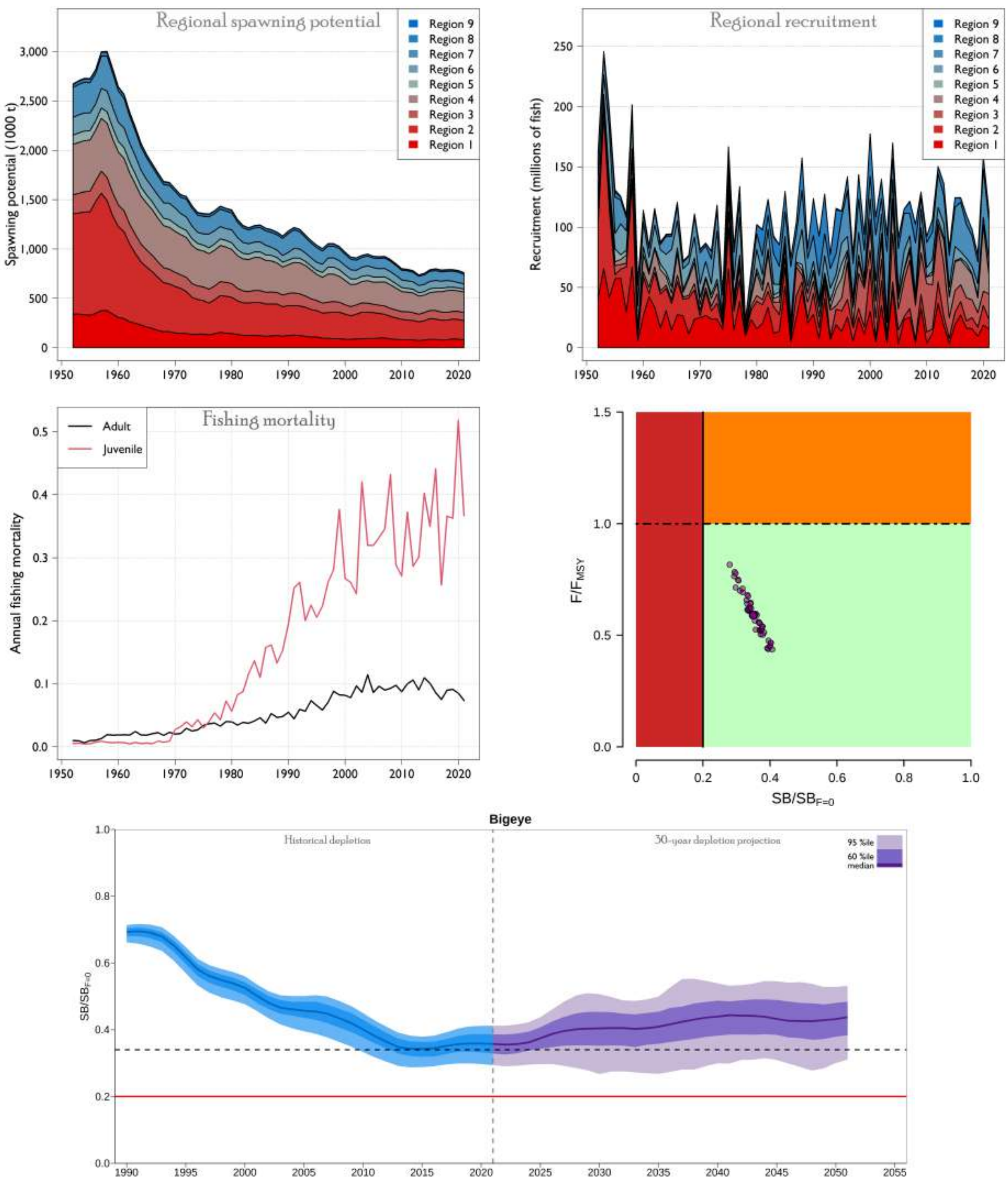


Figure 13. Estimated spawning biomass (SB) time series by model region (top left), recruitment by model region (top right), and fishing mortality for adults and juveniles (middle left) from the bigeye diagnostic case model; stock status displayed on a Majuro plot as the end points (recent values) from the uncertainty grid of 54 models (middle right) with the median value illustrated by the large purple point. Estimated historical depletion since 1990 (from the stock assessment) and projected 30-year depletion under status quo conditions (2024 catch/effort levels) are shown in the bottom plot. The vertical line represents the final year of data in the most recent assessment and, thus, marks the transition to projection estimates. All depletion estimates (historical and projected) are computed in the same manner as $\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$. Spawning biomass in the absence of fishing is computed as a 10-year average lagged by one year relative to each of the three years used in the "recent" SB calculation. The red horizontal line is the LRP (at 0.20 $\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$). The dashed horizontal line represents the latest estimate of the average depletion ratio (at 0.34 $\mathrm{SB}_{recent}/\mathrm{SB}_{F=0}$) over the period 2012–2015, which is listed as the interim depletion objective in Tropical Tuna CMM 2023D-01.

South Pacific albacore catch data

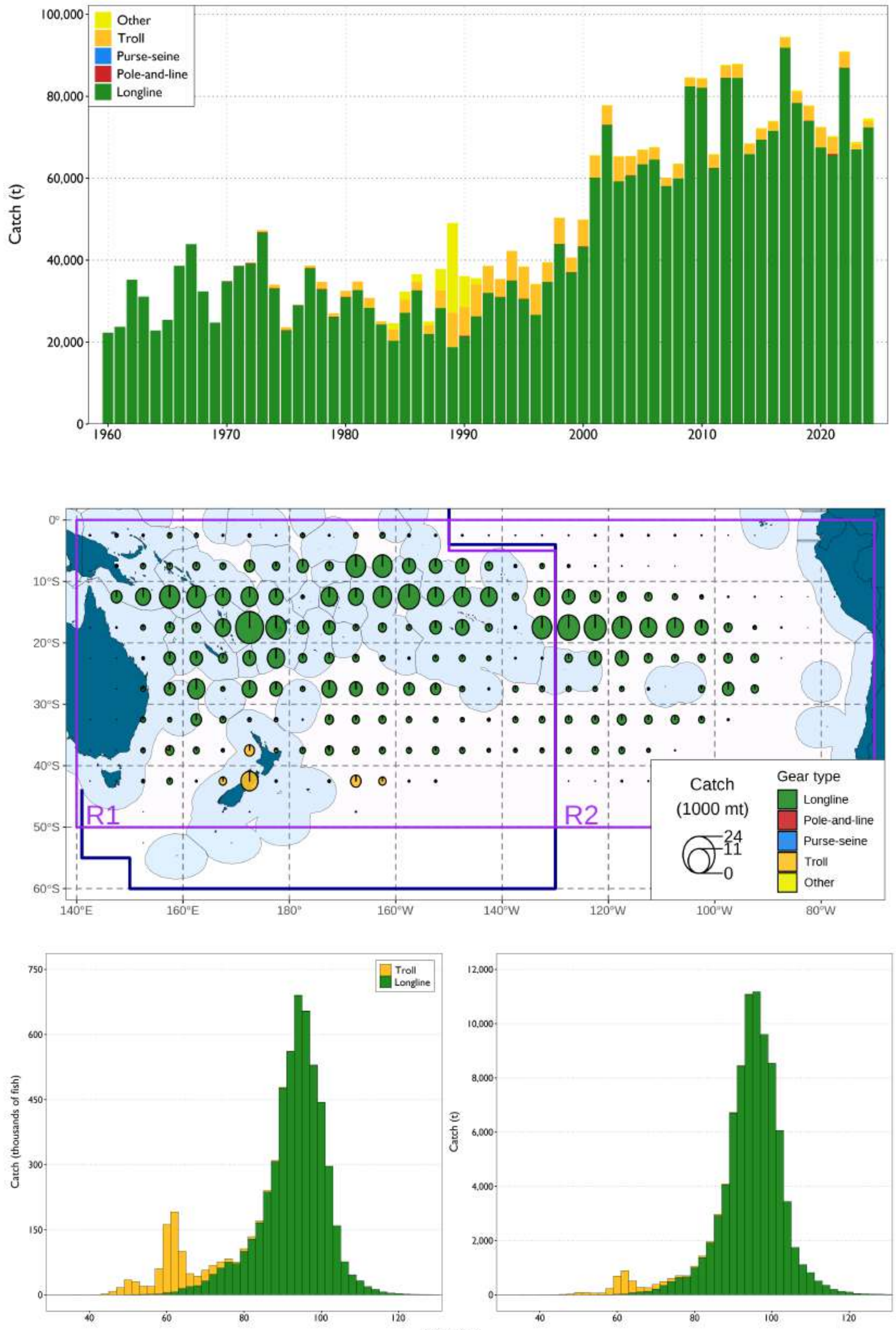


Figure 14. Time series (top), recent (2020–2024) spatial distribution and assessment regions (middle), and size composition (average for last five years, bottom) of South Pacific albacore tuna catch by gear type, Pacific-wide, south of the equator. Note: Size data represent only WCPFC-CA-caught albacore.

South Pacific albacore stock status plots

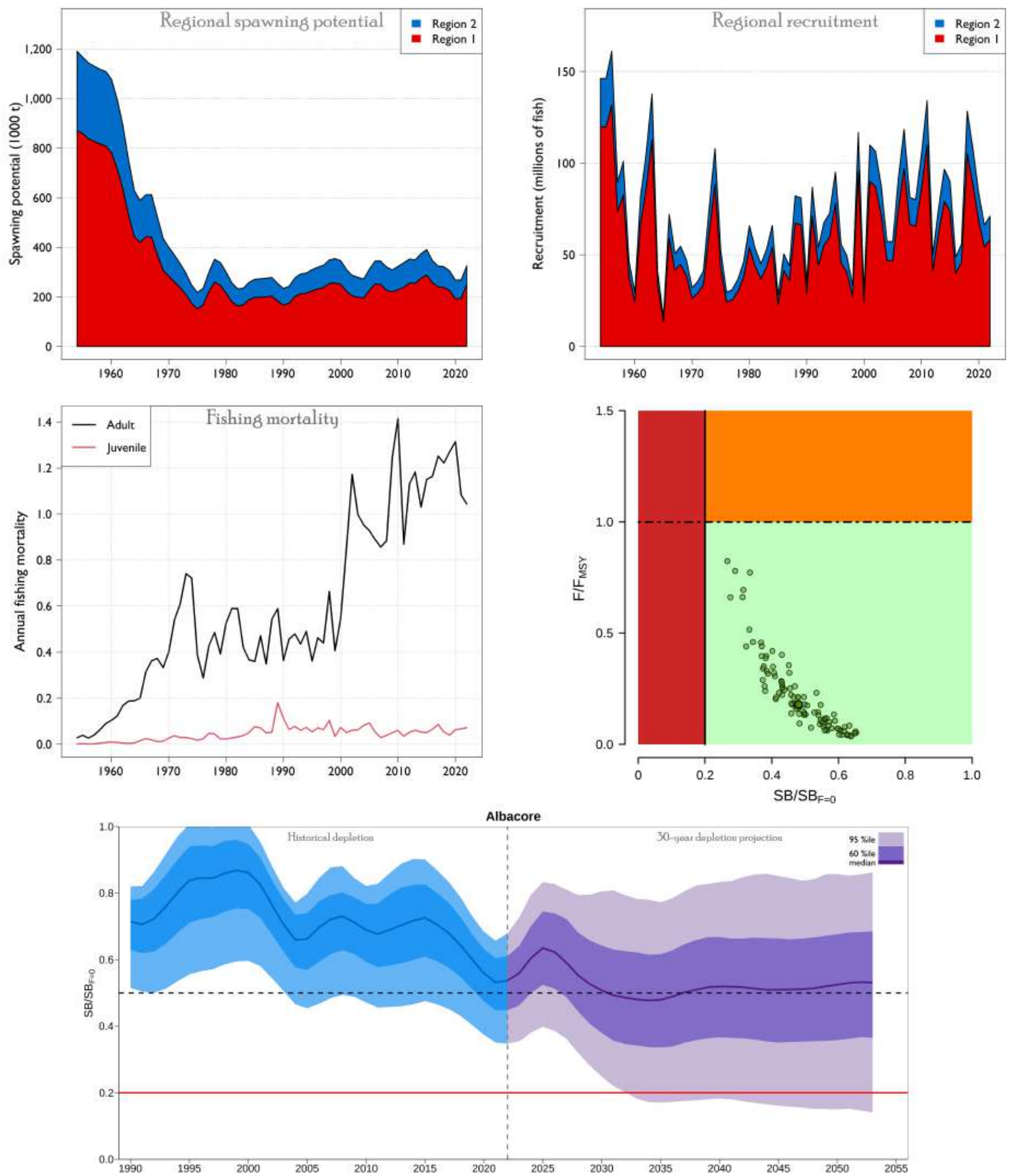


Figure 15. Estimated spawning biomass (SB) time series by model region (top left), recruitment by model region (top right), and fishing mortality for adults and juveniles (middle left) from the South Pacific albacore diagnostic case model; stock status displayed on a Majuro Plot as the end points (recent values) from the 100 ensemble model runs (middle right) with the median value illustrated by the large green point. Estimated historical depletion since 1990 (from the stock assessment) and projected 30-year depletion under status quo conditions (2024 catch/effort levels) are shown in the bottom plot. The vertical line represents the final year of data in the most recent assessment and, thus, marks the transition to projection estimates. All depletion estimates (historical and projected) are computed in the same manner as $SB_{recent}/SB_{F=0}$. Spawning biomass in the absence of fishing is computed as a 10-year average lagged by one year relative to each of the three years used in the "recent" SB calculation. The red horizontal line is the LRP (at 0.2 $SB_{recent}/SB_{F=0}$). The dashed horizontal line represents the 2024 recalibration to the interim TRP at an average depletion ratio of 0.5 $SB_{recent}/SB_{F=0}$) as agreed at the 20$^{\text{th}}$ Annual Meeting of the WCPFC.

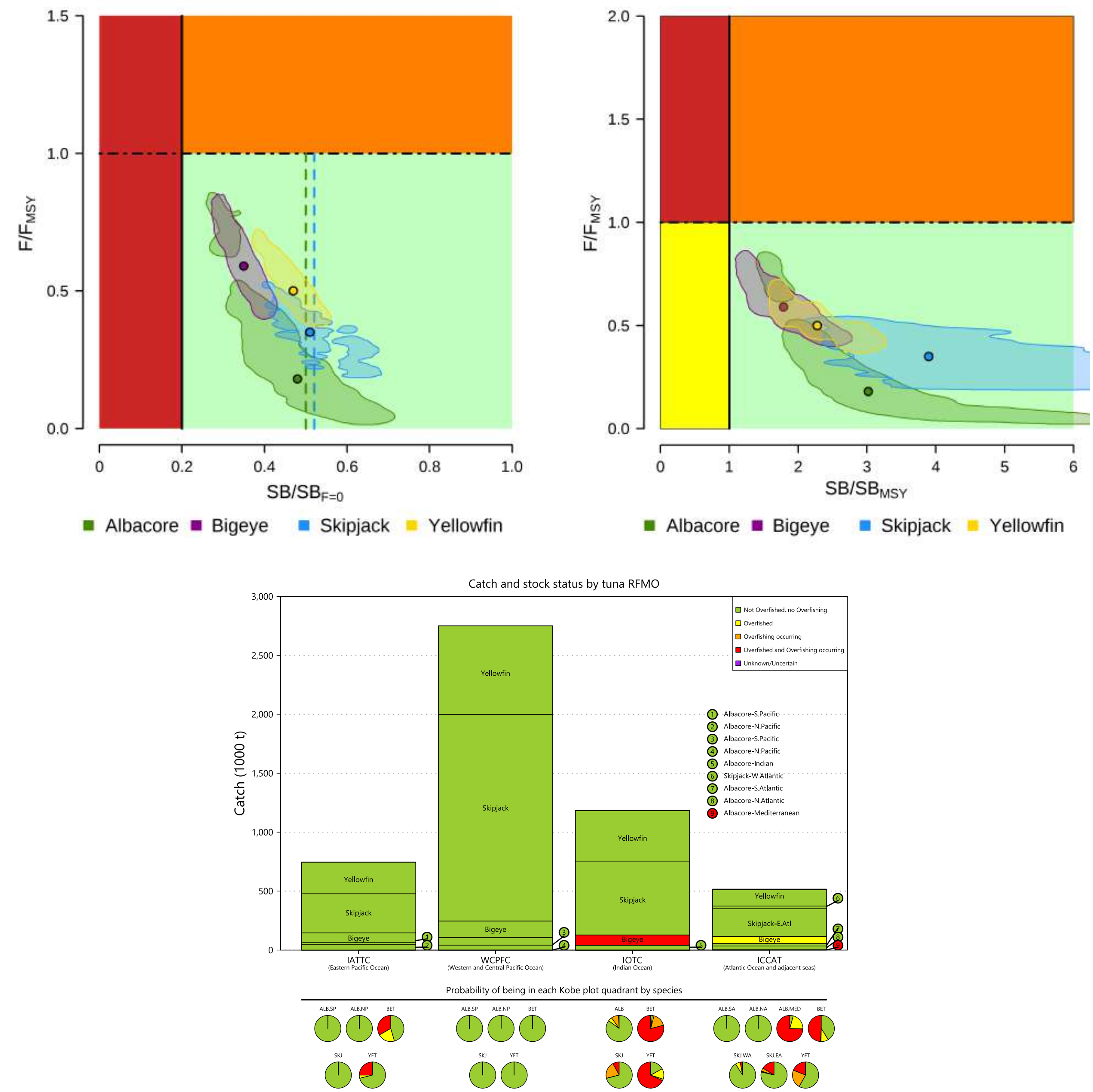
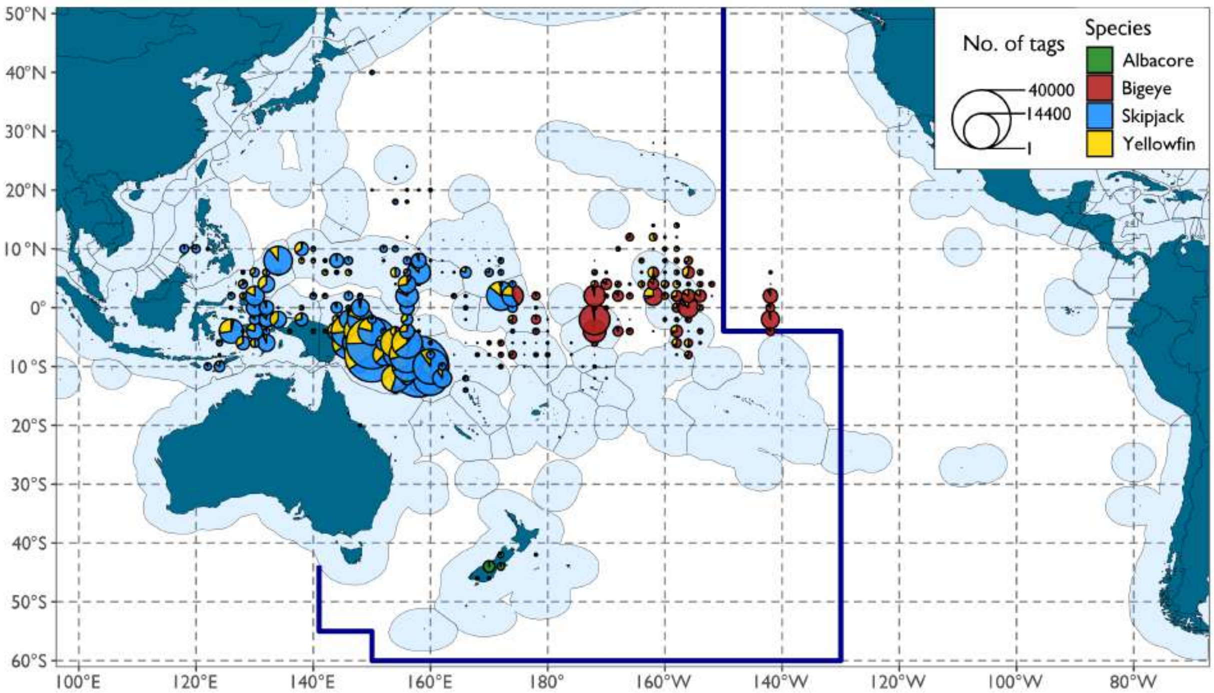


Figure 16. Majuro (top left) and Kobe (top right) plot stock status summary for the four WCPO target tuna stocks and a comparison of Kobe plot stock status for the same four tuna species in the other major ocean basins (bottom). In the Kobe and Majuro plots, the grid median value is shown as a large dot. For skipjack, uncertainty is illustrated by an ellipse closely approximating the distribution of point estimates from uncertainty grid models. For albacore, yellowfin, and bigeye, all assessed since 2023, the irregularly shaped regions represent the 95% confidence interval (kernel density estimate) of the grid model (for bigeye and yellowfin) and ensemble model (albacore) point estimates, incorporating estimation uncertainty (see text for additional detail). The vertical lines on the Majuro plot are interim TRPs (skipjack and South Pacific albacore) and management objectives (bigeye and yellowfin), and the colour corresponds to species. Both skipjack and albacore have interim TRPs of 0.5 and so their lines have been slightly jiggered. The stock status comparison across ocean basins is based on spawning biomass and fishing mortality relative to their MSY values. Data are current as of November 2024 and stock status assessments were obtained directly from documents produced by the responsible tuna regional fisheries management organization. See text for explanation of Kobe quadrant pie charts. Catch is average catch over the five most recent years available. Note that South and North Pacific albacore span both the WCPFC-CA and the IATTC-CA and, therefore, are included for both organisations, with the catch levels reflecting the split between the two convention areas.



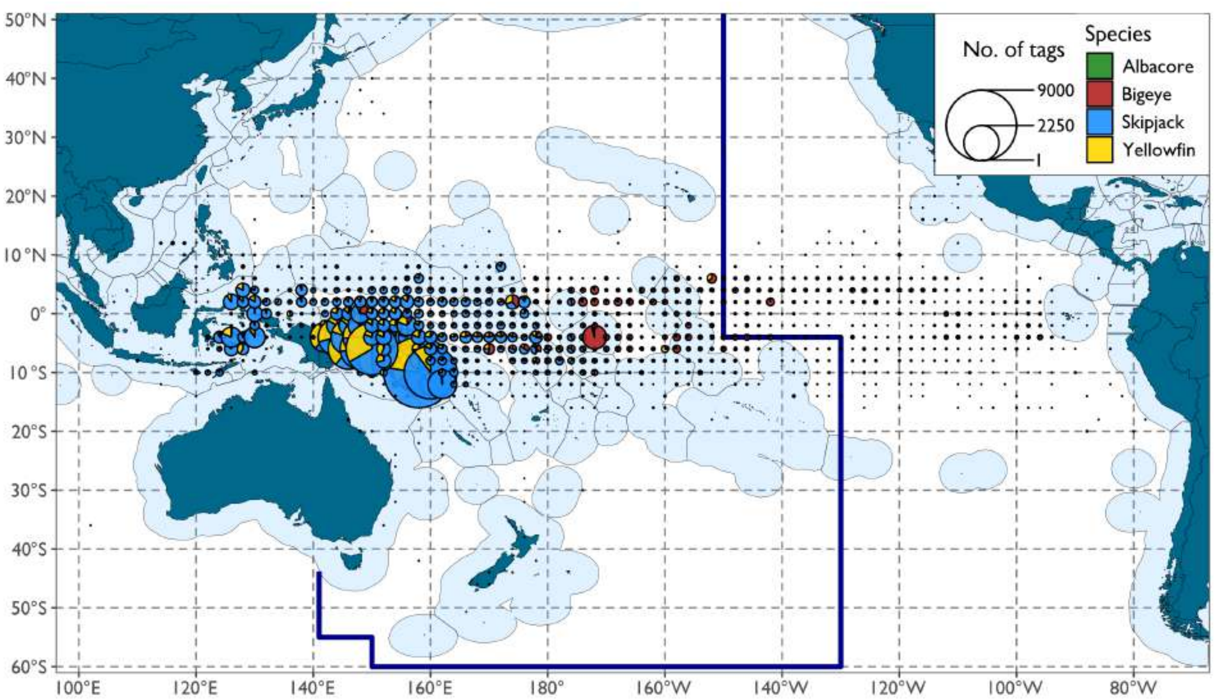


Figure 17. Tag releases (top) and recaptures (bottom) by species from the recent Pacific Tuna Tagging Programme. Note: Release and recovery locations have been aggregated to a 2°x2° grid resolution for visual clarity.

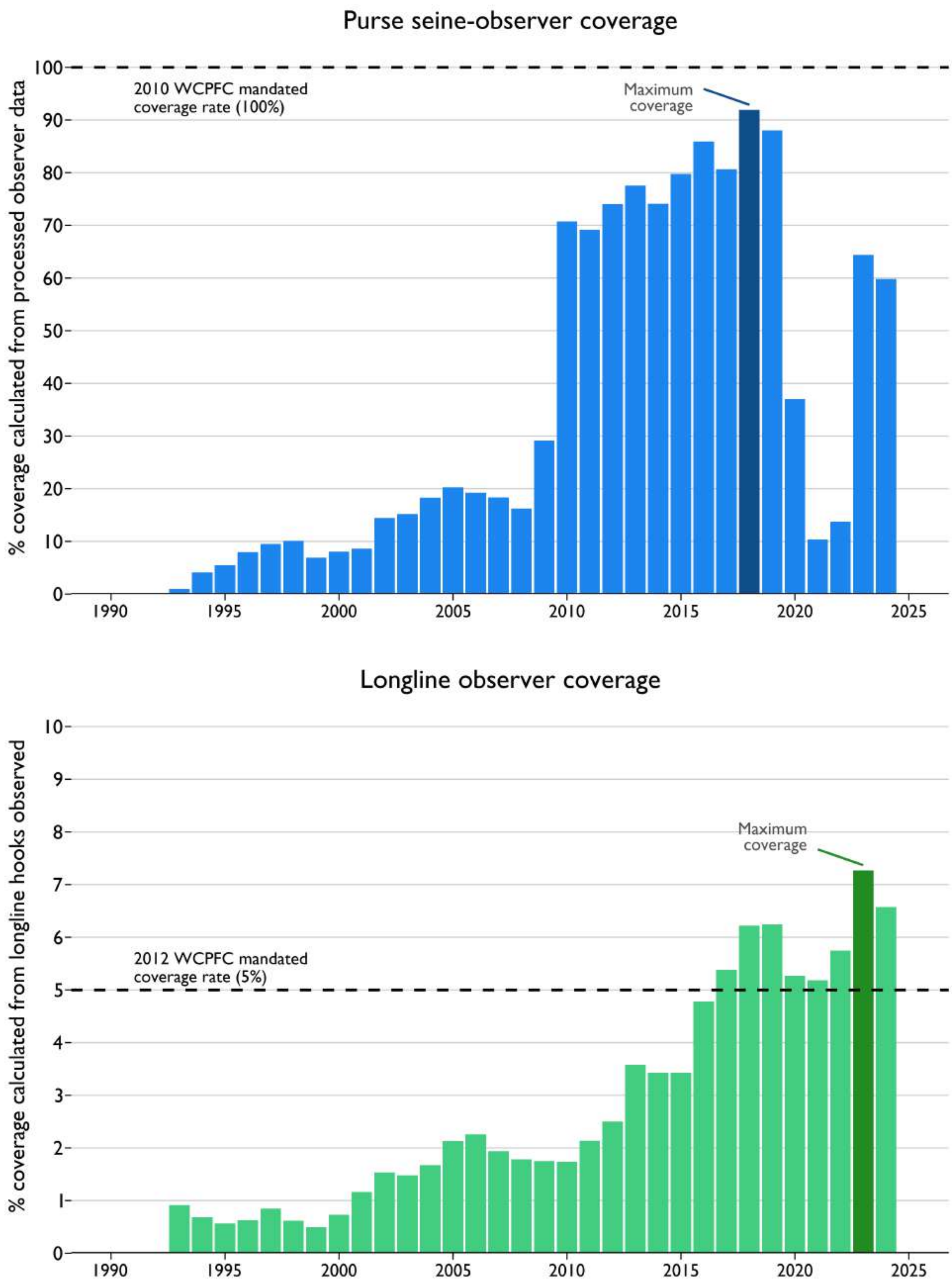
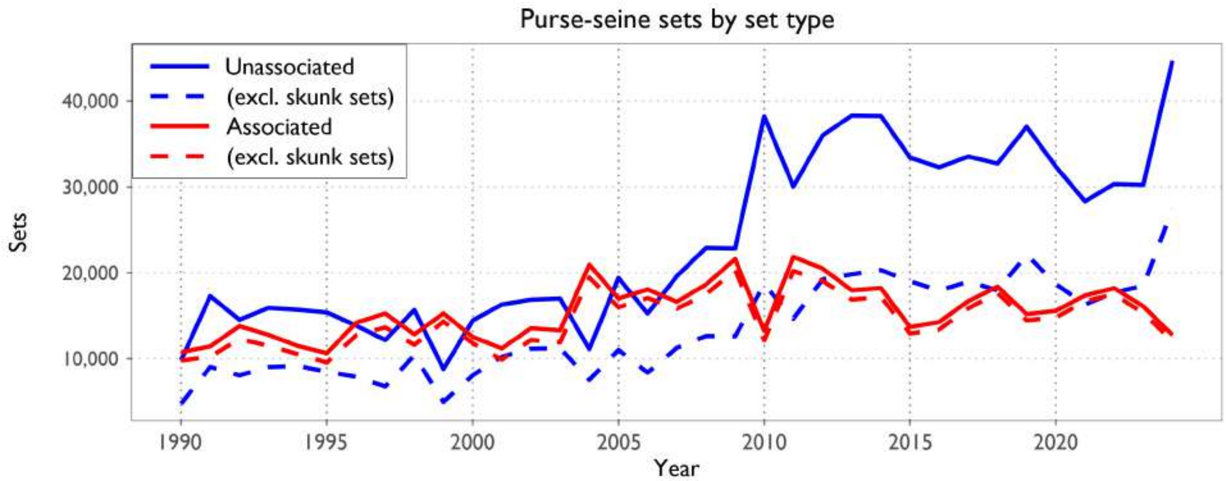


Figure 18. Observer coverage of the purse-seine (top) and longline fleets (bottom) operating within the EEZs of the WCPFC-CA, over the period 1993–2024. Note: Longline coverage is computed on the basis of hooks fished and includes fishing effort and observer coverage in both EEZs and the high seas. The Japan coastal longline fleet as well as the domestic longline fleets of Indonesia and Vietnam are excluded from effort summaries. Purse-seine coverage is based on processed observer data records and represents fishing days at sea. Purse-seine fishing days are computed from logsheets prior to 2010 and on VMS data for 2010–2024. Purse-seine data are between 10°N and 10°S, and exclude the domestic purse-seine fleets of Indonesia, the Philippines and Vietnam.



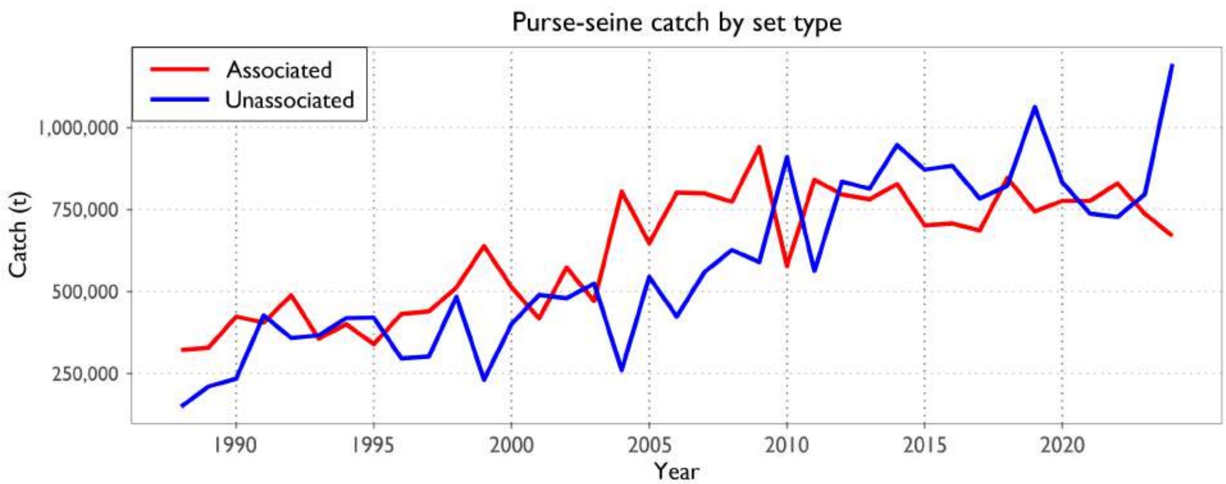


Figure 19. Illustration of the relative annual number of sets (top) and catch tonnage (bottom) by set association type (unassociated versus associated) over the period 1990–2024. The associated sets include all set association types, including FADs, logs, etc. Illustrated data are from raised logsheet data for the WCPFC tropical purse-seine fishery, excluding the domestic fleets of Indonesia, the Philippines and Vietnam.

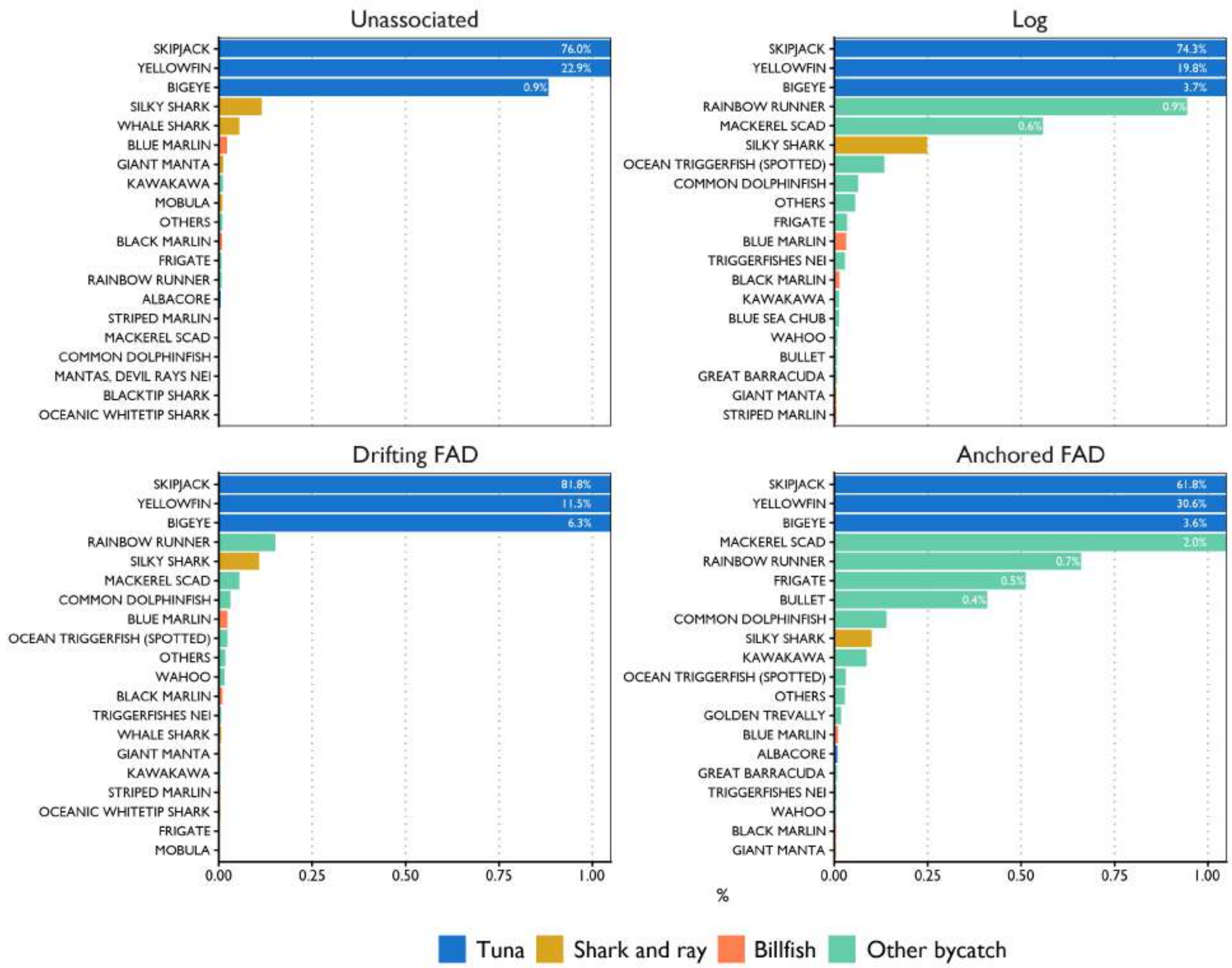


Figure 20. Catch composition of the various categories of purse-seine fisheries operating in the WCPFC-CA based on observer data from the last five years of data.

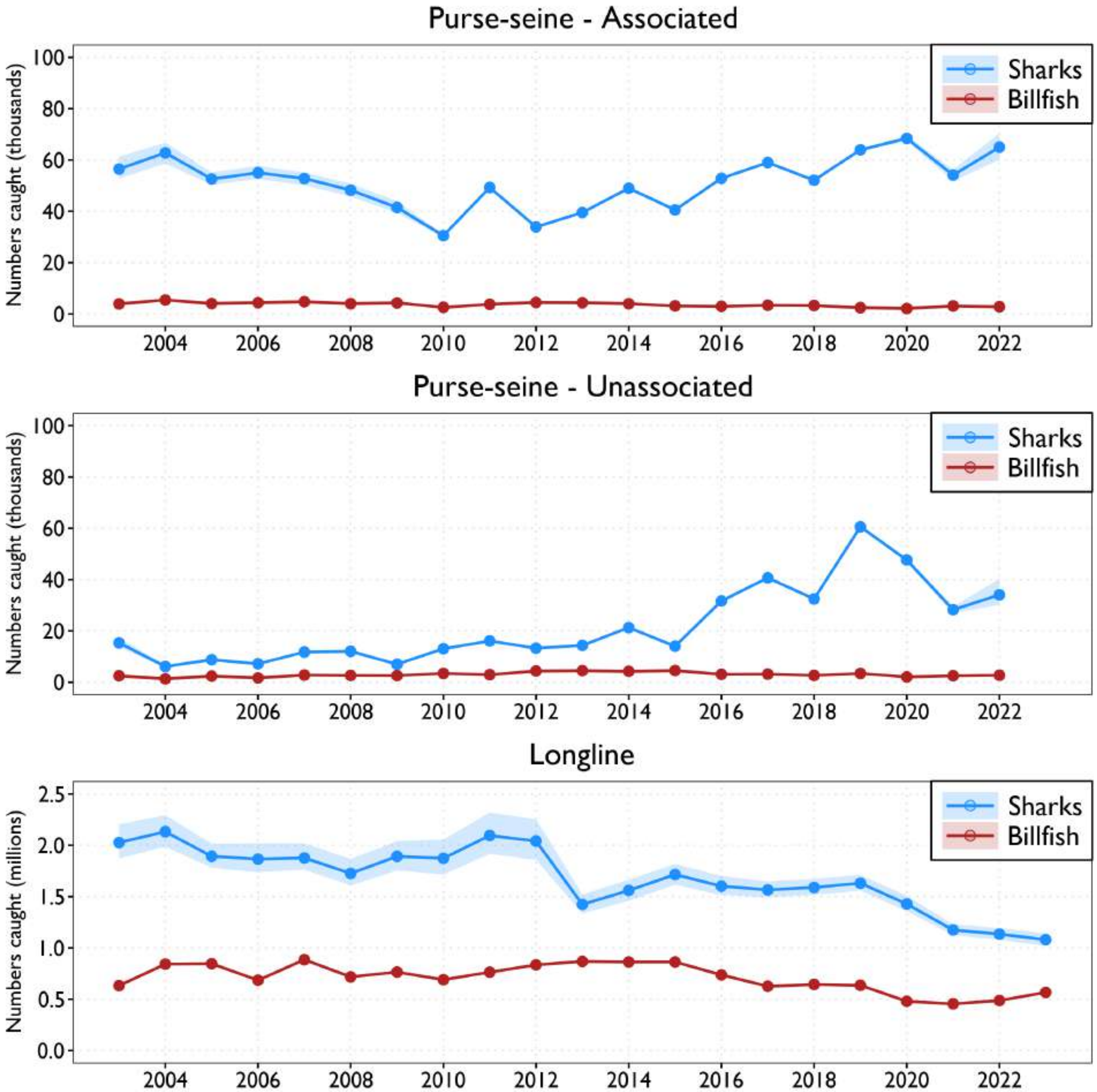


Figure 21. Estimated total catch (in numbers) of sharks and billfish in the purse-seine and longline fisheries operating in the WCPFC-CA. Note: Purse-seine estimates, for the period 2003–2020, are shown separately for associated sets (top figure) and unassociated sets (middle figure). Longline estimates cover the period 2003–2021 and are illustrated in the bottom figure. Note that the y-axis differs for the two gear types; numbers caught are in thousands for purse-seine gear and millions for longline gear.

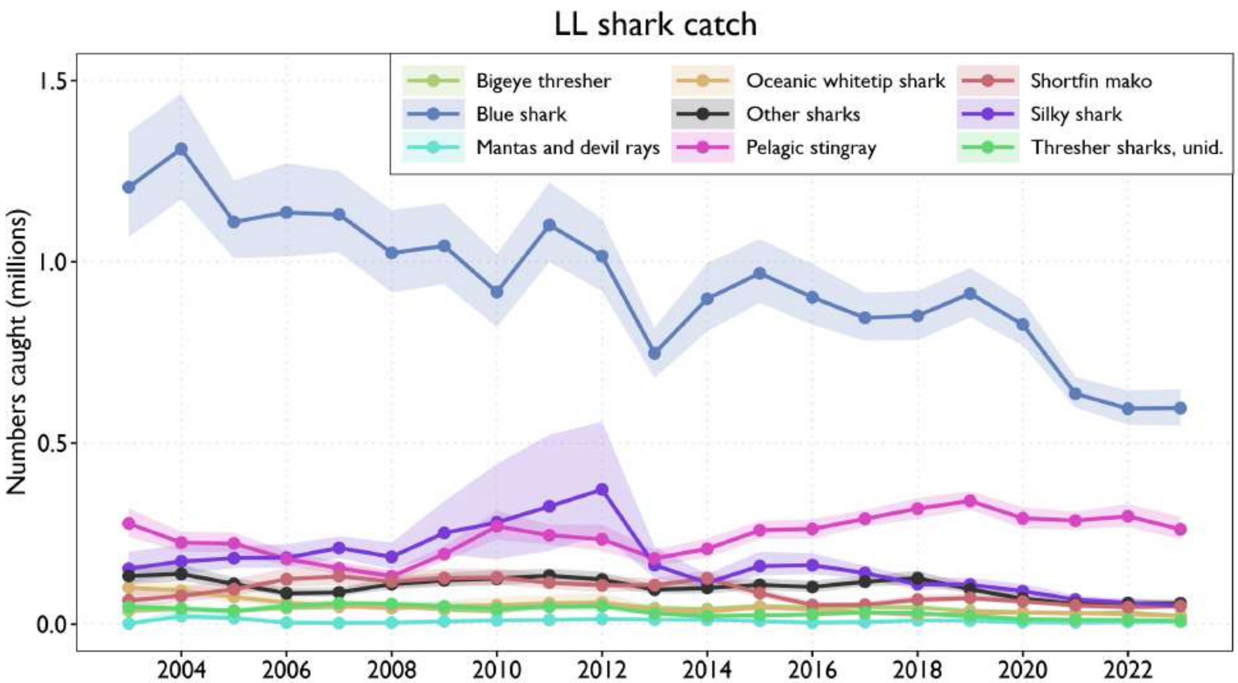
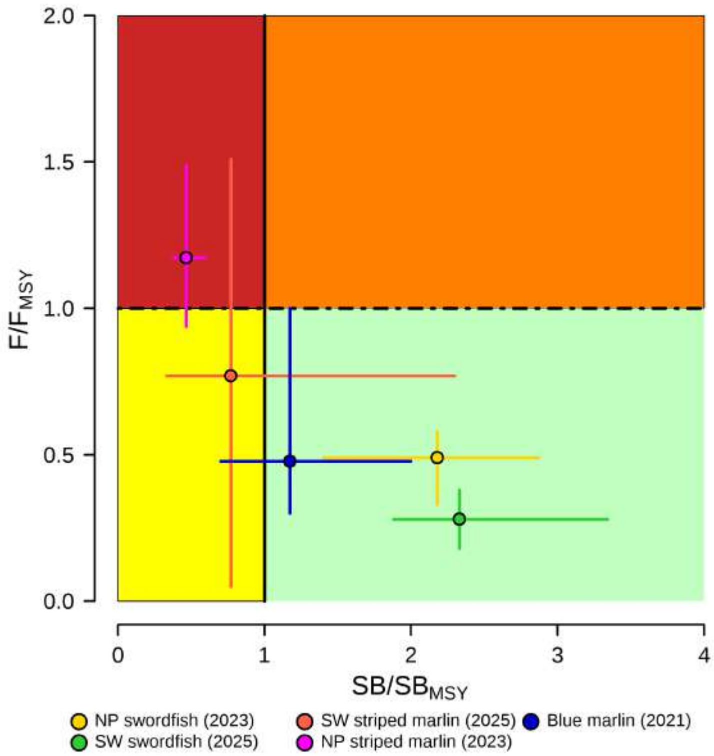


Figure 22. Estimated species composition of the longline shark catch in the WCPFC-CA, 2003–2021.



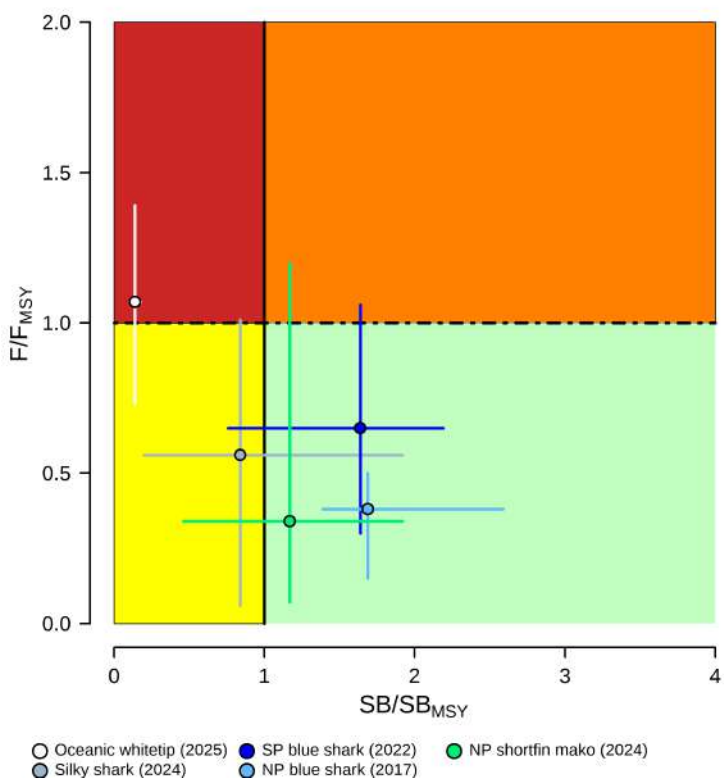
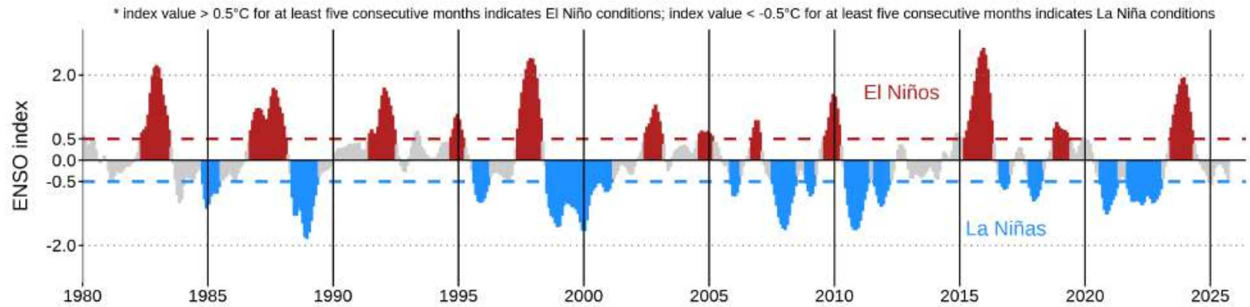


Figure 23. Kobe plot stock status summary for WCPFC-CA billfishes (top) and sharks (bottom) assessed over the past decade and for which stock status has been determined. Note: This plot differs from that presented for the target tuna (the Majuro plot), because the WCPFC has not yet decided on LRPs for these species and therefore MSY-based reference points are used as a default. The numbers in parentheses represent the year of the most recent stock assessment for that species.

Climate and ecosystem indices



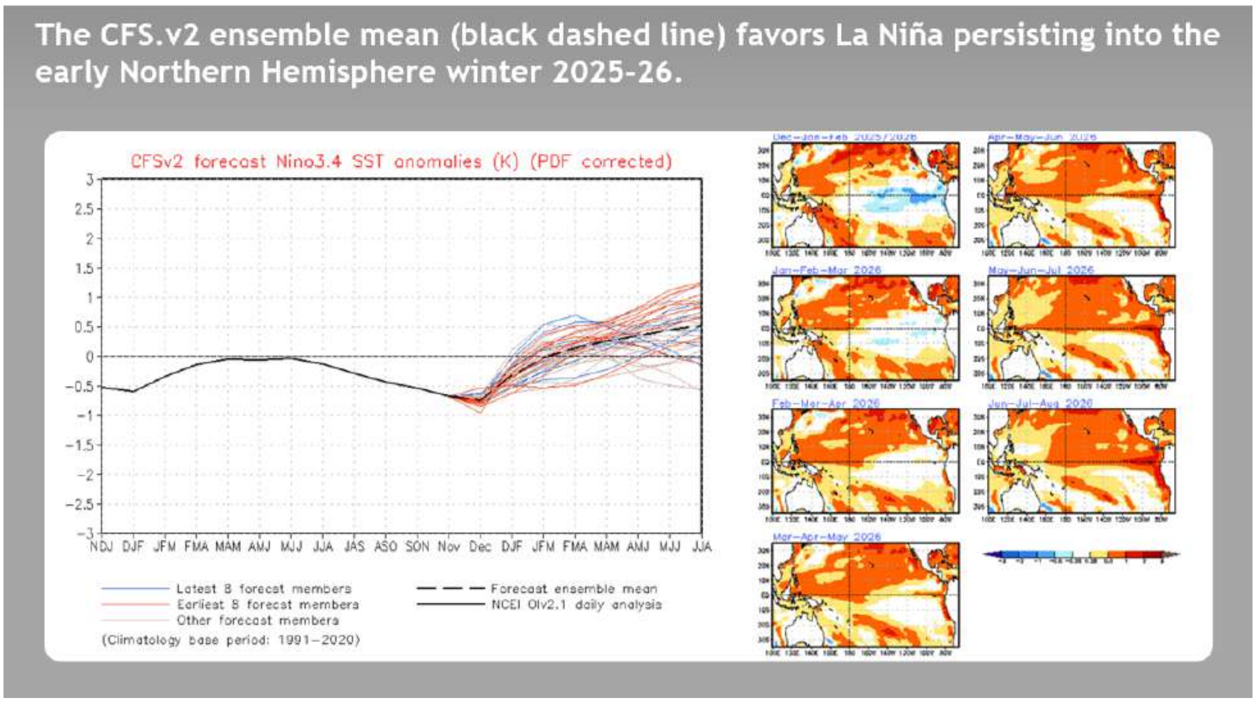


Figure 24. Top figure: The Oceanic Niño Index (ONI), over the period 1980–2025 (source: https://www.cpc.ncep.noaa.gov/data/indices/oni.ascii.txt). Note: The ONI provides a long-term perspective on the strength and duration of ENSO events; the ENSO gauges in Figure 30 were derived from this index. Bottom figure: The most recent ENSO forecast at the time this TFAR went to press (forecast date: 16 November 2025). Source: https://www.cpc.ncep.noaa.gov.

Climate and ecosystem indices, cont.

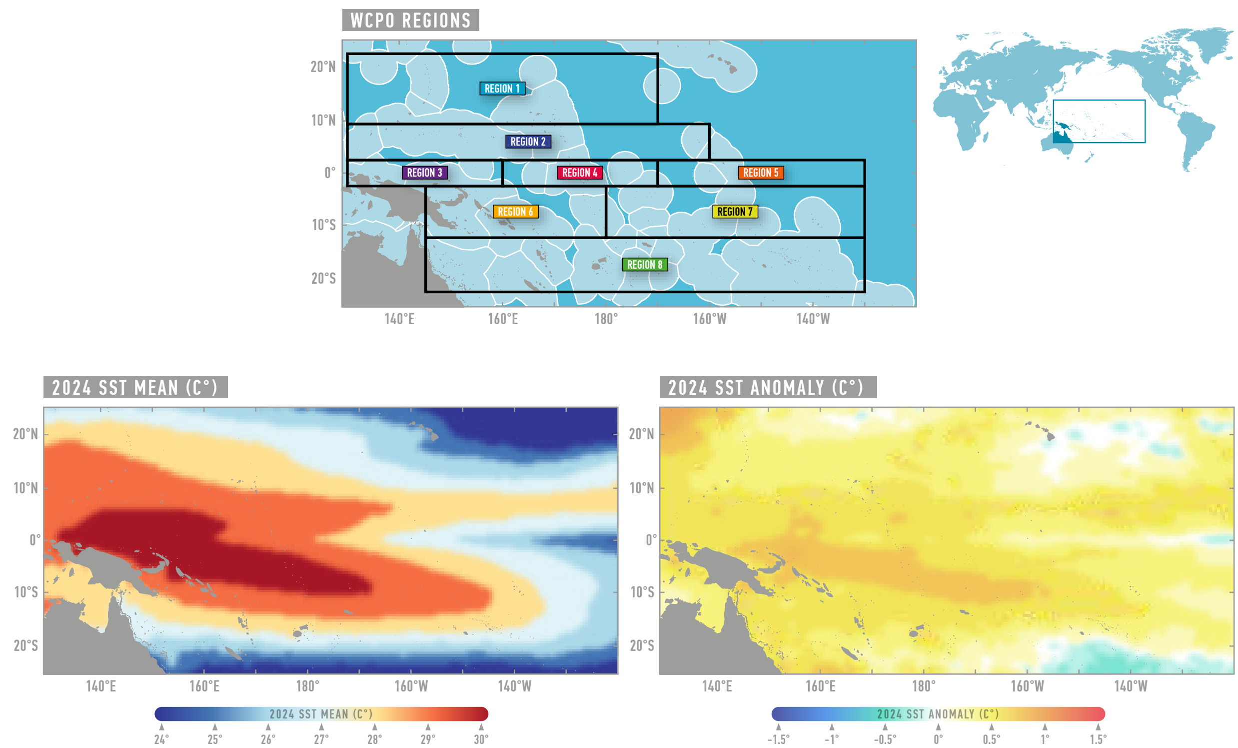


Figure 25. Oceanographic regional structure of the Western and Central Pacific Ocean (top), 2024 sea surface temperature (left), and 2024 sea surface temperature anomaly (right) relative to the climatological mean (1982-2024).

Climate and ecosystem indices, cont.

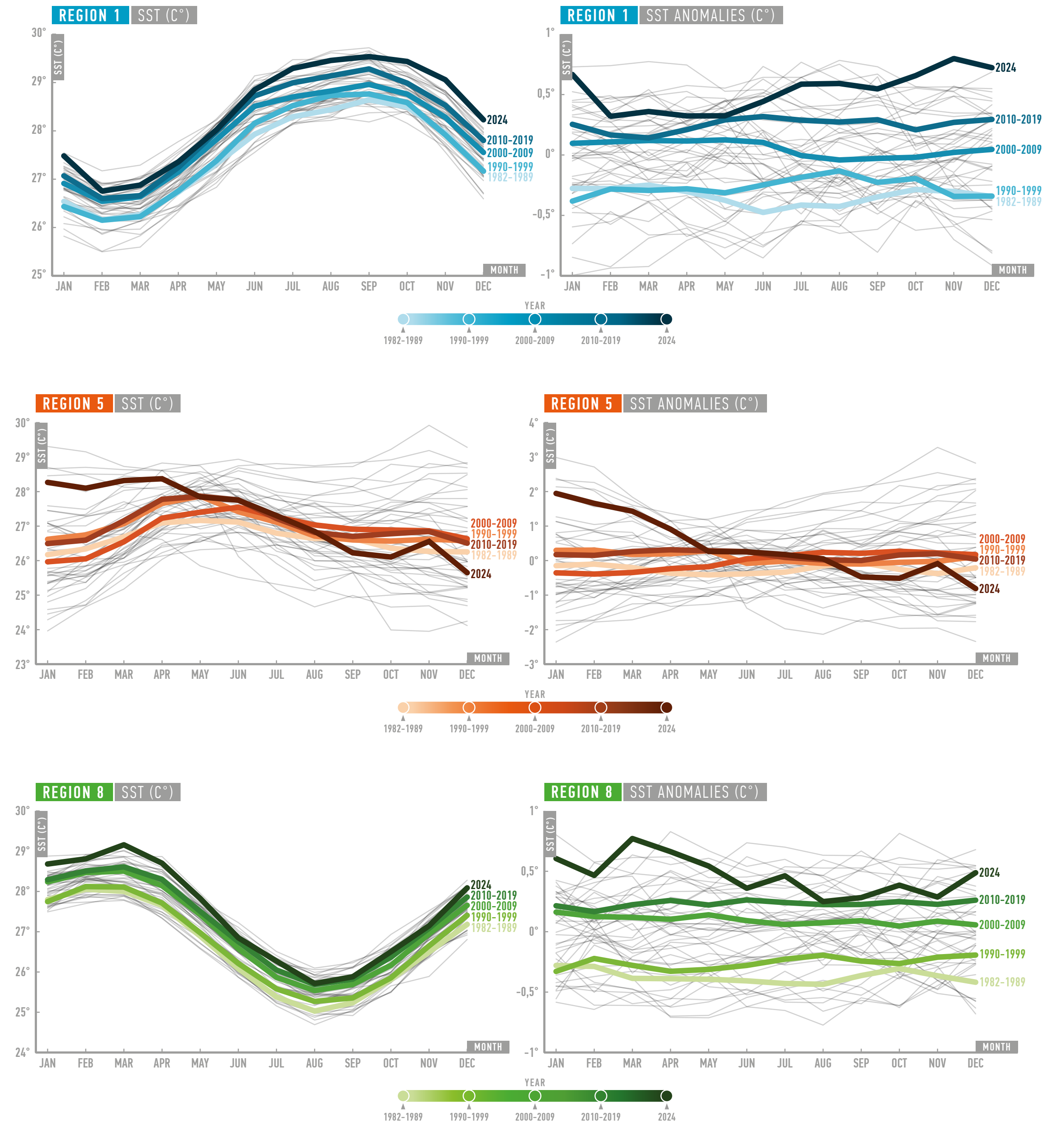


Figure 26. Monthly sea surface temperature (left) and anomalies (right) from 1982-2024 for Region 1 (top), Region 5 (middle), and Region 8 (bottom). Anomalies are relative to the mean of the timeseries (1982-2024) for each region. Coloured lines represent decadal averages, 2024 is the annual mean, and grey lines represent individual years.

Climate and ecosystem indices, cont.

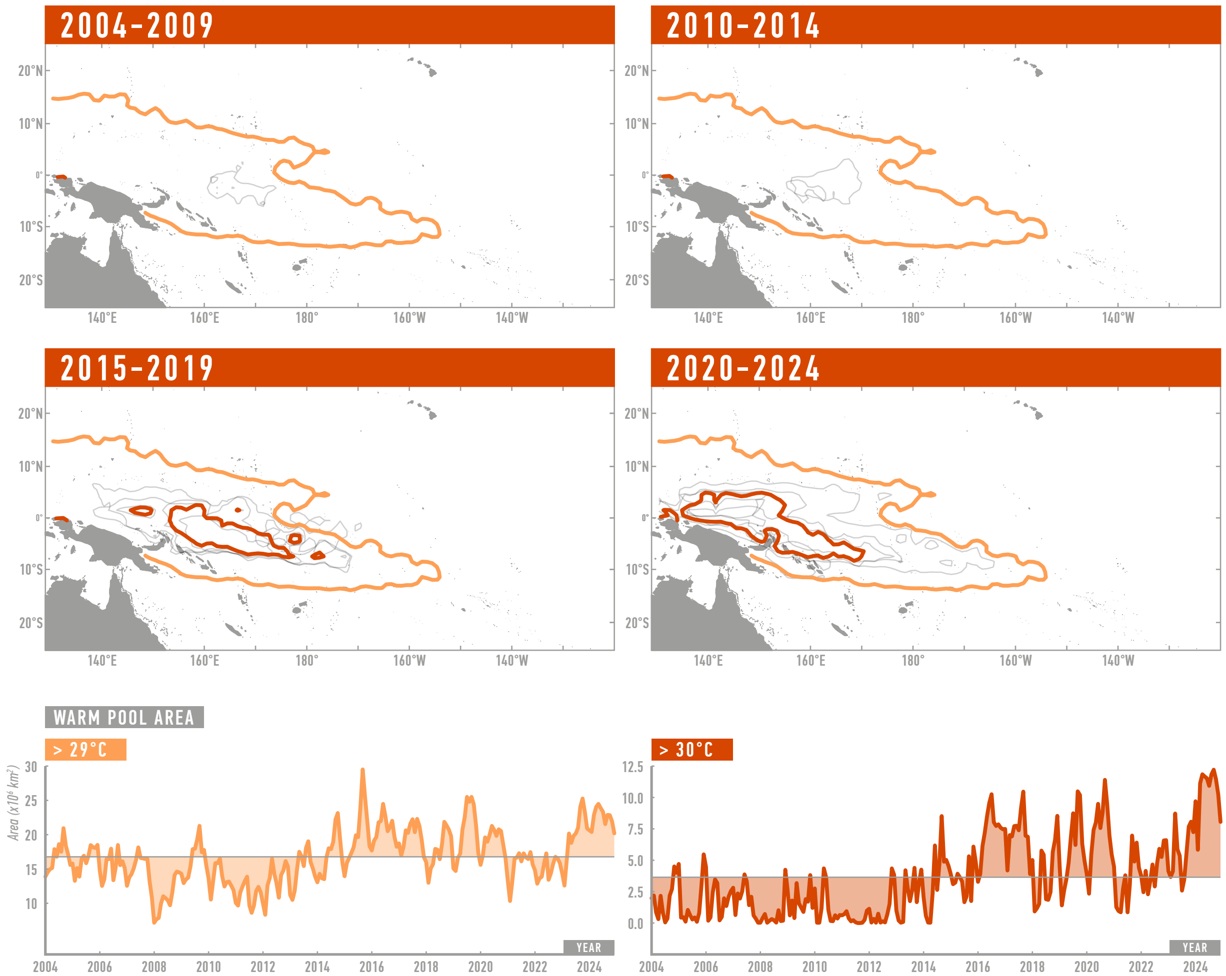
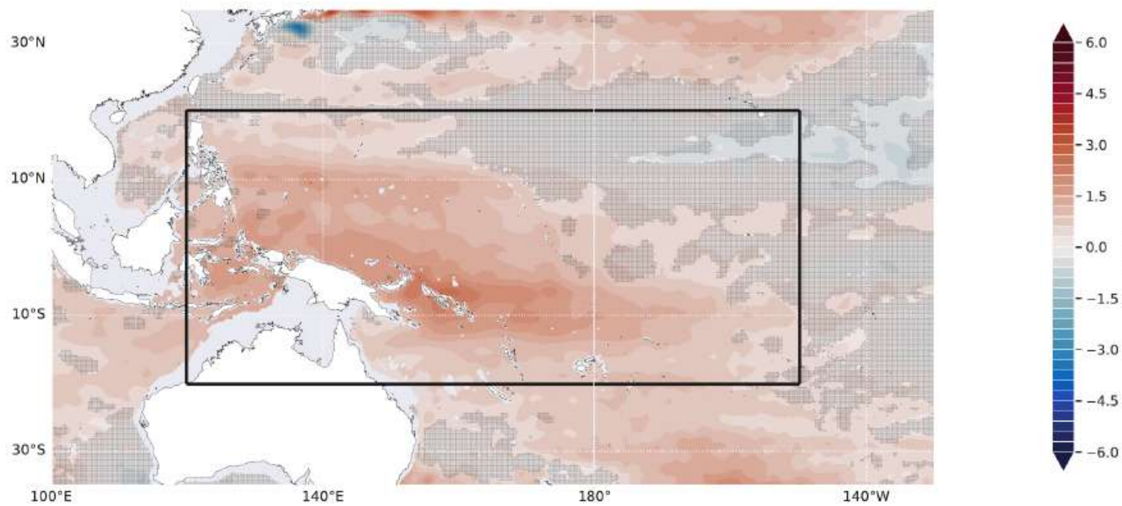


Figure 27. Trends in the 29°C warm pool area and 30°C waters within it from 2004-2024. Maps show the increase in 30°C waters within the warm pool over time. Yellow line = 2004-2024 29°C mean warm pool size, orange line = mean 30°C area for each time period, grey lines = individual years. Line plots show area of 29°C and 30°C waters from 2004-2024 relative to their overall mean (29°C mean = 16.8 million km², 30°C mean = 3.65 million km²).

Climate and ecosystem indices, cont.



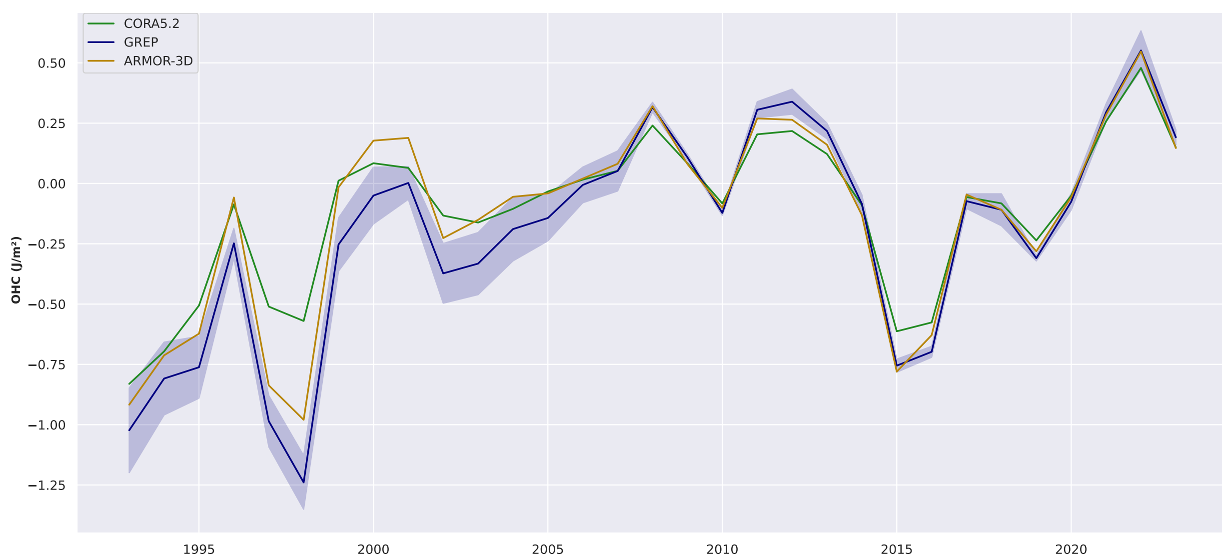


Figure 28. Top panel - Ocean heat content anomaly (Watts/metre²) for the upper 300m of the western and central Pacific Ocean (WCPO) comparing 2023 values to the 1993-2023 mean across three climate data products: CORA5.2, GREP, and ARMOR-3D. Grey areas represent uncertain cells where the standard deviation exceeded the ocean heat content trend value. Bottom panel - Ocean heat content anomaly (Joules/metre²) for the upper 300m of the WCPO (20°N-20°S, 120°E-150°W) from 1993-2023 relative to a mean climatology from 2005-2023.

Climate and ecosystem indices, cont.

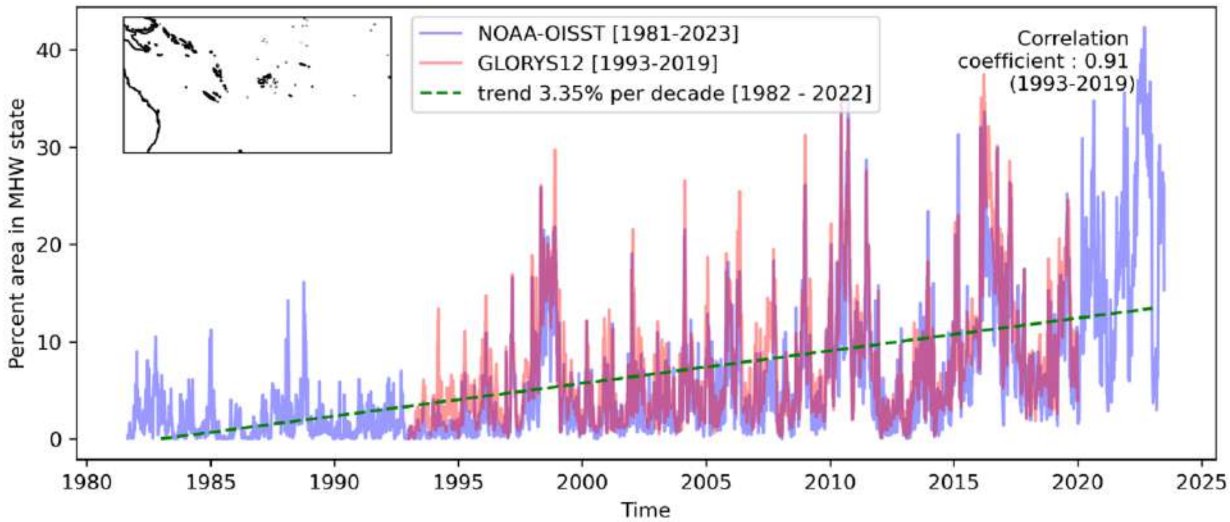


Figure 29. Timeseries showing percent of study region in a marine heatwave state, with a statistically significant trend line (p-value < 0.05) in green calculated between 1982 to 2022 for NOAA-OISST and Pearson correlation coefficient calculated between 1993 and 2019 for NOAA-OISST and GLORYS12 (p-value < 0.05) (Lal et al. 2025).

Climate and ecosystem indices, cont.

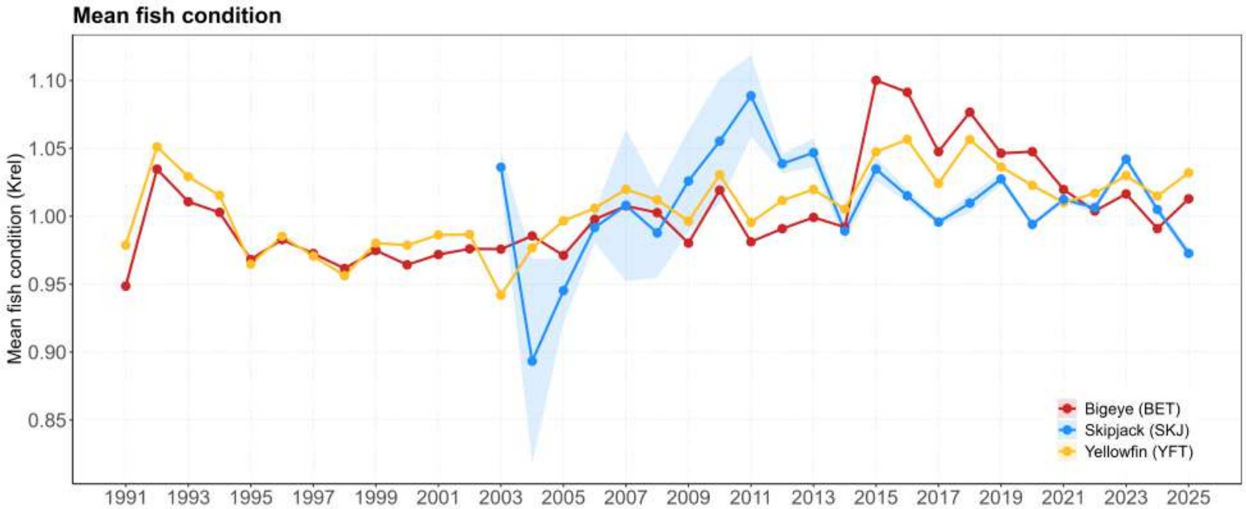


Figure 30. Mean fish condition of longline caught tuna. See text for details

Climate and ecosystem indices, cont.

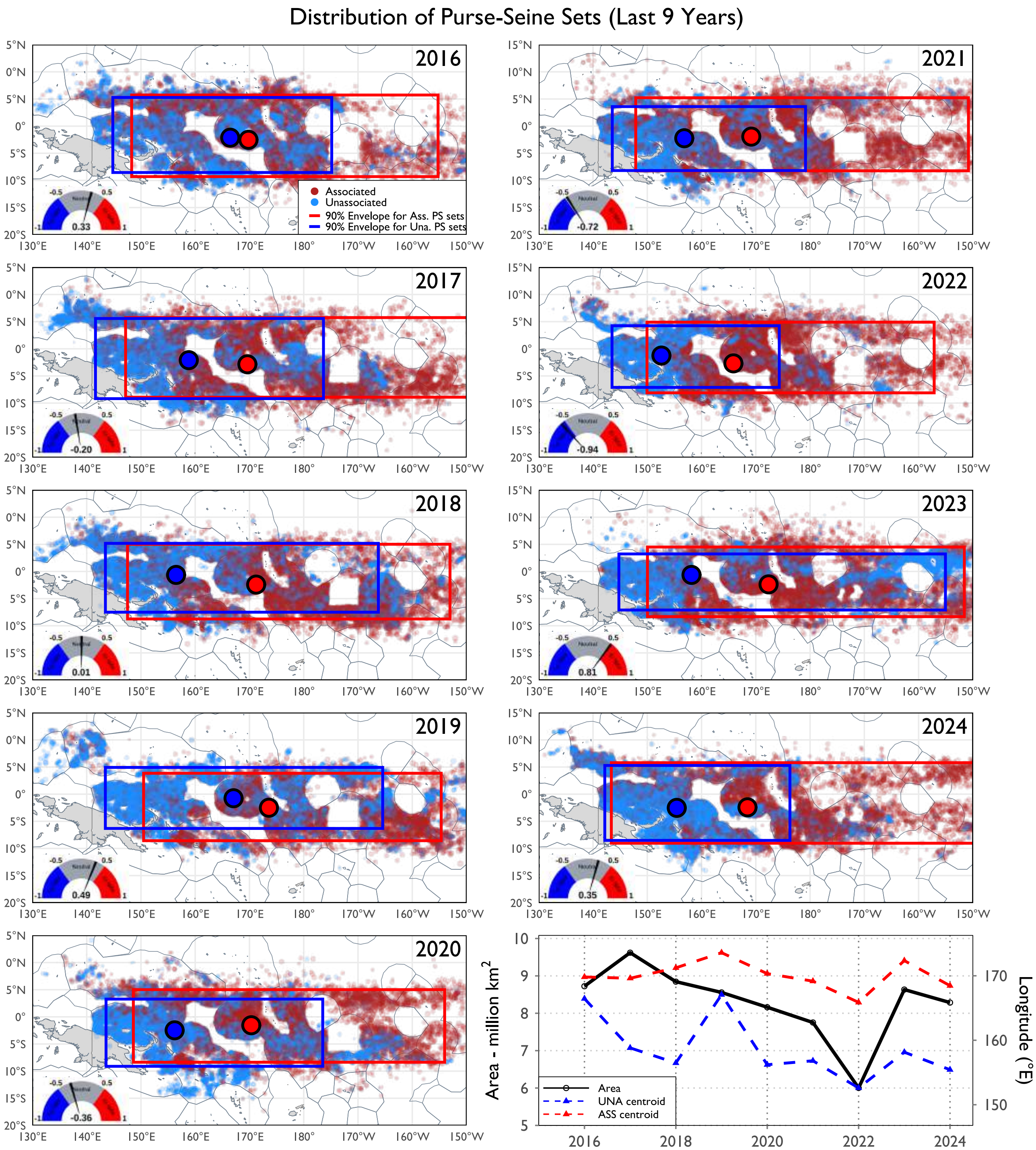


Figure 31. Illustration of the annual distribution of WCPO unassociated and associated sets over the period 2016–2024. Note: Each point is scaled relative to catch size and FAD-associated (ASS), and free school (UNA) sets are coloured differently. The large coloured dots show the centre of distribution for the two set types. The rectangular boxes bound 90% of all UNA segs (blue) and all ASS sets (red) sets both, north–south and east–west. The ENSO gauge in the lower left corner of each figure is the annual average of the Oceanic Niño Index (ONI), which is further described and illustrated in Figure 24. Illustrated data are from raised logsheet data for the WCPFC tropical purse-seine fishery, excluding the domestic fleets of Indonesia, the Philippines and Vietnam.

Climate change and tuna biomass projections

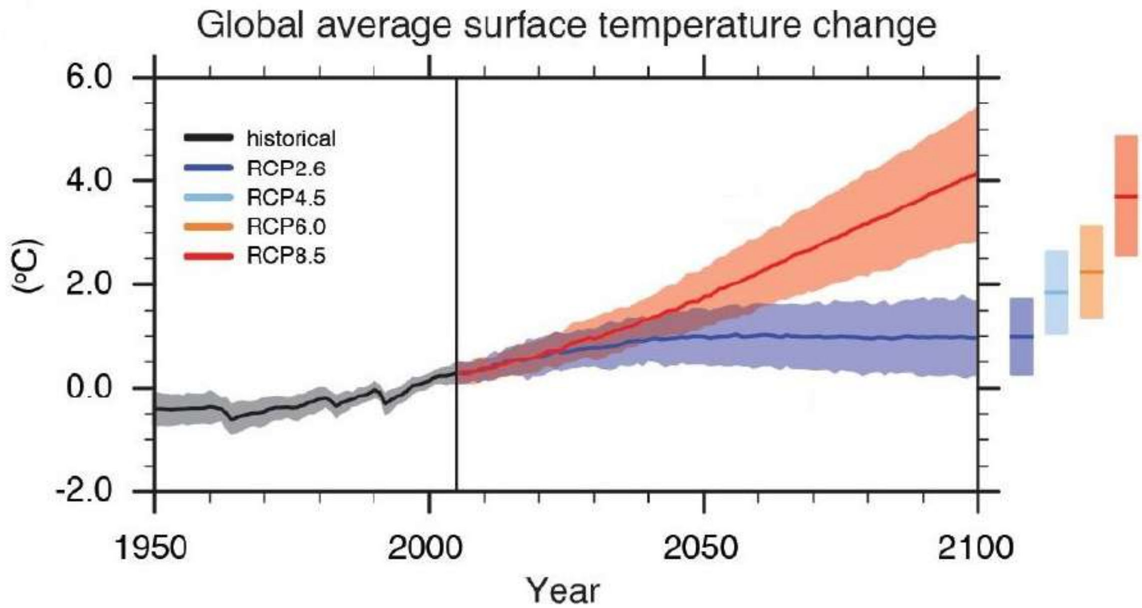


Figure 32. Two global temperature change projections developed for the Intergovernmental Panel on Climate Change 5th Assessment Report (AR5). Note: The illustrated trajectories represent two scenarios, termed Representative Concentration Pathways (RCP), reflecting different assumptions about human response to future greenhouse gas emissions. RCP2.6 and RCP8.5 reflect extremes between a strong coordinated effort to reduce emissions by 30% from baseline conditions by 2100 (RCP2.6) and a "no climate policy" response wherein emissions continue to increase at current levels (RCP8.5). The bars on the right show projected temperature increases in the year 2100, and include the two other scenarios (RCP4.5 and RCP6.0) listed in the legend, for which the full time series are not displayed. Source: IPCC 2014.

Climate change and tuna biomass projections, cont.

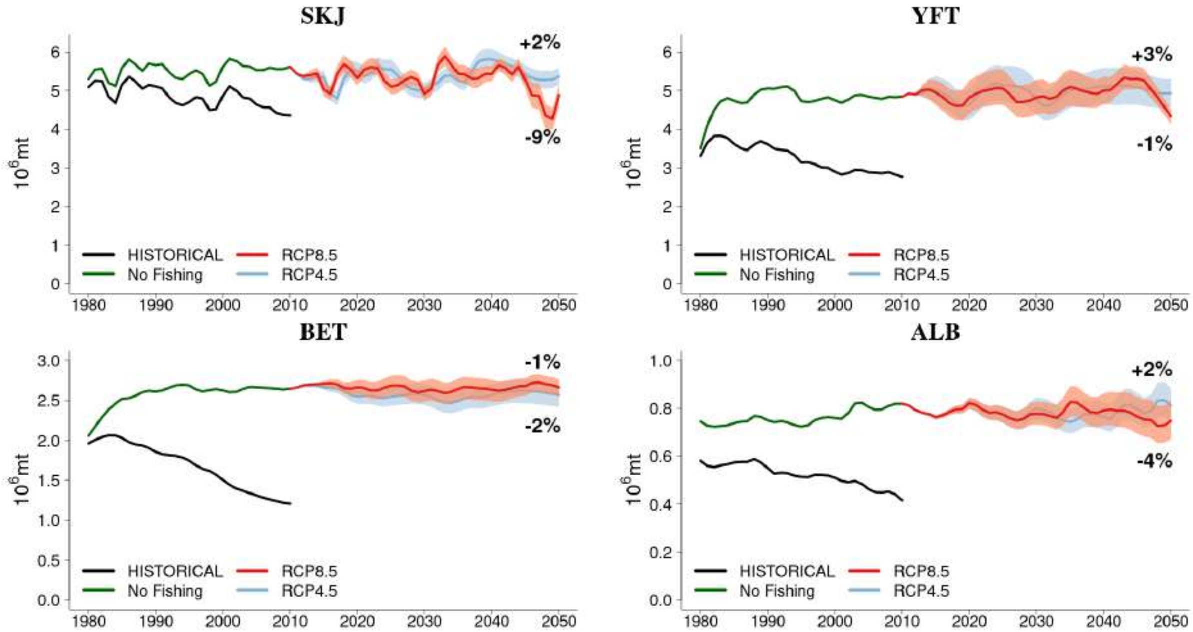


Figure 33. Envelope of predictions computed from four earth system models (IPSL, GFDL, MIROC and MPI) under IPCC RCP8.5 and RCP4.5 scenarios for the WCPO for skipjack (SKJ), yellowfin (YFT), bigeye (BET) and South Pacific albacore (ALB) tuna. Note: The change in total biomass is presented with the average and its envelope bounded by the 5% and 95% quantile values of the simulation ensembles. The percentage values represent the change in the mean biomass across runs in the 2011–2020 time window compared with 2044–2053. Modified and updated from Senina et al. 2018.

Climate change and tuna biomass projections, cont.

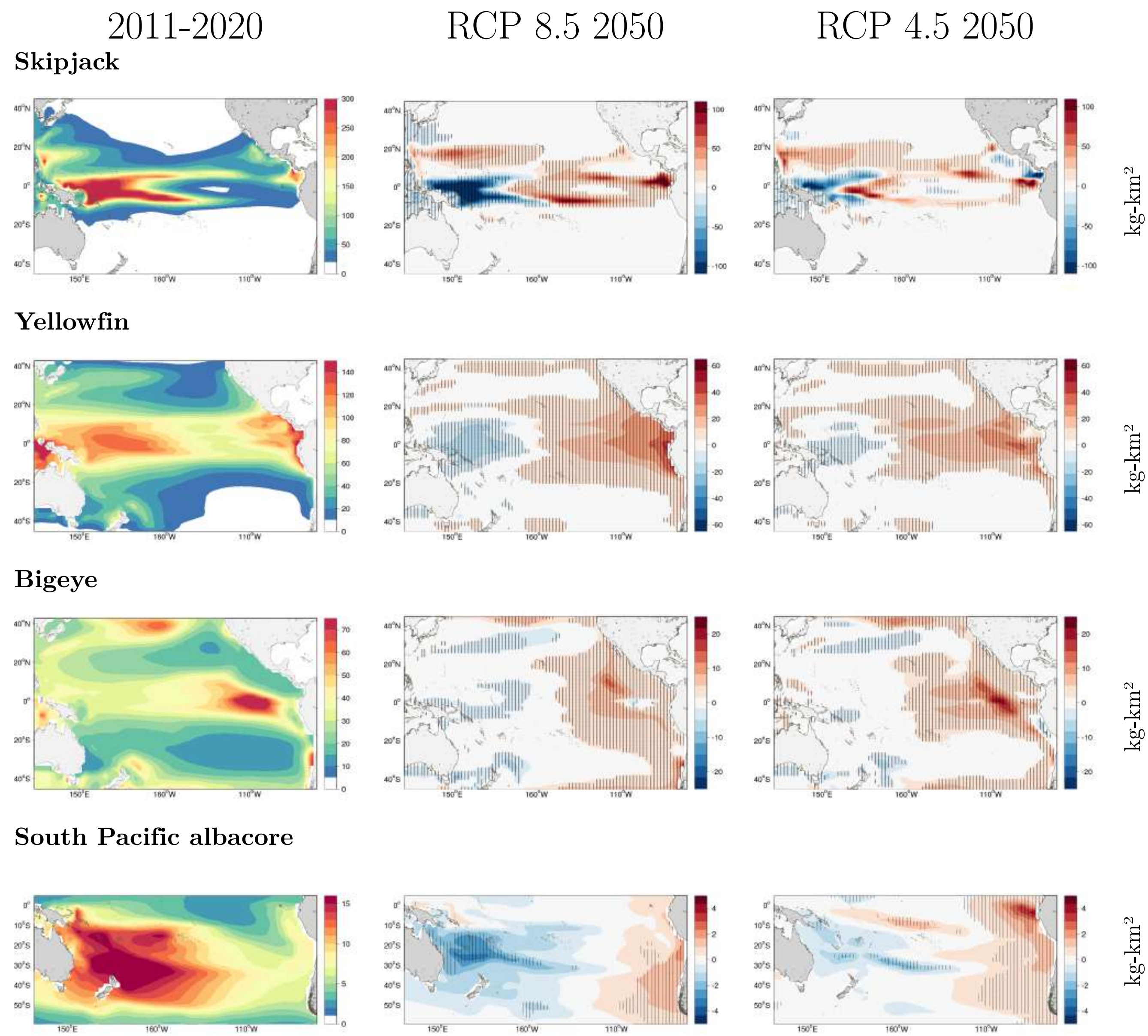


Figure 34. Average biomass distributions (kg-km²) of skipjack, yellowfin, bigeye and South Pacific albacore tuna in the Pacific Ocean basin for 2015 (averaged over 2011–2020) (left), and mean anomalies (kg-km²) from the average 2015 biomass distribution of each tuna species projected to occur by 2050 (averaged over 2044–2053) under the RCP 8.5 (middle) and RCP 4.5 (right) greenhouse gas emissions scenarios. Note: Shading indicates areas where projections from four Earth System Models agree in the sign of change. Source: Bell et al. (2021).