

THE TUNA FISHERY IN THE EASTERN PACIFIC OCEAN IN 2024

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This report provides a summary of the catches and effort in 2024 of the fishery for tunas in the eastern Pacific Ocean (EPO), for whose management the Inter-American Tropical Tuna Commission (IATTC) is responsible. It is based on data available to the IATTC staff in March 2025; therefore, some of the data for 2023 and 2024 are incomplete, and all data for 2021, 2022, 2023 and 2024 should be considered preliminary. Any changes in the fishery statistics provided in this report for the years prior to 2020 are due to data updates reported by CPCs.

All weights of catches and discards are in metric tons (t). In the tables, 0 means no effort, or a catch of less than 0.5 t; - means no data collected; * means data missing or not available. The following acronyms are used:

| | | | |
|-----------------------------------|---|---------------------------------|-----------------------------------|
| <hr/> Species: <hr/> | | LL | Longline |
| ALB | Albacore tuna (<i>Thunnus alalunga</i>) | LP | Pole and line |
| BET | Bigeye tuna (<i>Thunnus obesus</i>) | LTL | Troll |
| BIL | Unidentified istiophorid billfishes | LX | Hook and line |
| BKJ | Black skipjack (<i>Euthynnus lineatus</i>) | MO | Multi-purpose |
| BLM | Black marlin (<i>Makaira indica</i>) | OTR | Other ¹ |
| BUM | Blue marlin (<i>Makaira nigricans</i>) | UNK | Unknown |
| BZX | Bonito (<i>Sarda</i> spp.) | PS | Purse seine |
| MLS | Striped marlin (<i>Kajikia audax</i>) | RG | Recreational |
| PBF | Pacific bluefin tuna (<i>Thunnus orientalis</i>) | TX | Trawl |
| SFA | Indo-Pacific sailfish (<i>Istiophorus platypterus</i>) | <hr/> Ocean areas: <hr/> | |
| SKJ | Skipjack tuna (<i>Katsuwonus pelamis</i>) | EPO | Eastern Pacific Ocean |
| SSP | Shortbill spearfish (<i>Tetrapturus angustirostris</i>) | WCPO | Western and Central Pacific Ocean |
| SWO | Swordfish (<i>Xiphias gladius</i>) | <hr/> Set types: <hr/> | |
| TUN | Unidentified tunas | DEL | Dolphin |
| YFT | Yellowfin tuna (<i>Thunnus albacares</i>) | NOA | Unassociated school |
| <hr/> Fishing gears: <hr/> | | OBJ | Floating object |
| FPN | Trap | LOG | Flotsam |
| GN | Gillnet | FAD | Fish-aggregating device |
| HAR | Harpoon | <hr/> Flags: <hr/> | |
| LHP | Handline | | |

¹ Used to group known gear types.

| IATTC Members & Cooperating Non-Members | |
|--|--------------------------|
| BLZ | Belize |
| BOL | Bolivia |
| CAN | Canada |
| CHL | Chile |
| CHN | China |
| COL | Colombia |
| CRI | Costa Rica |
| ECU | Ecuador |
| EUR | European Union |
| EU (CYP) | Cyprus |
| EU (ESP) | Spain |
| EU (PRT) | Portugal |
| FRA | France |
| FRA (PYF) | French Polynesia |
| GTM | Guatemala |
| HND | Honduras |
| IDN | Indonesia |
| JPN | Japan |
| KIR | Kiribati |
| KOR | Republic of Korea |
| LBR | Liberia |
| MEX | Mexico |
| NIC | Nicaragua |
| PAN | Panama |
| PER | Peru |
| SLV | El Salvador |
| TWN | Chinese Taipei |
| USA | United States of America |
| VEN | Venezuela |
| VUT | Vanuatu |
| Other flag codes | |
| COK | Cook Islands |
| MHL | Marshall Islands |
| NZL | New Zealand |
| PHL | Philippines |
| SLB | Solomon Islands |
| THA | Thailand |
| UNK | Unknown |

| | |
|------------|---------------------------|
| <i>S</i> | Index of spawning biomass |
| <i>SBR</i> | Spawning biomass ratio |
| <i>SSB</i> | Spawning stock biomass |

Stock assessment:

| | |
|-------------|---------------------------|
| <i>B</i> | Biomass |
| <i>C</i> | Catch |
| <i>CPUE</i> | Catch per unit of effort |
| <i>F</i> | Rate of fishing mortality |
| <i>MSY</i> | Maximum sustainable yield |

INTRODUCTION

This document summarizes the catches and effort of the fisheries for species covered by the IATTC's Antigua Convention (“*tunas and tuna-like species and other species of fish taken by vessels fishing for tunas and tuna-like species*”) in the eastern Pacific Ocean (EPO) in 2024. The most important of these species are the scombrids (family Scombridae), which include tunas, bonitos, seerfishes, and some mackerels. The principal species of tunas caught are the three tropical tuna species (yellowfin, skipjack, and bigeye), followed by the temperate tunas (albacore, and lesser catches of Pacific bluefin); other scombrids, such as bonitos and wahoo, are also caught. In addition to the tunas, this document covers the billfishes (swordfish, marlins, shortbill spearfish, and sailfish).

Complementary to this document, EB-03-01 (*Ecosystem Considerations*), provides information on other, non-target species (e.g., elasmobranchs (sharks, rays, and skates), sea turtles, and teleosts (e.g., dorado, wahoo, carangids), that belong to the same ecosystem and are affected by fishing for, or dependent on or associated with, the fish stocks covered by the Antigua Convention.

Access to the fisheries is regulated by Resolution [C-02-03](#), which allows only vessels on the IATTC [Regional Vessel Register](#) to fish for tunas in the EPO. Vessels are authorized to fish by their respective flag governments, and only duly authorized vessels are included in the Register. The Register lists, in addition to a vessel's name and flag, its fishing gear, dimensions, carrying capacity, date of construction, ownership, home port, and other characteristics. However, this requirement has not been applied to the thousands of small artisanal vessels, called *pangas*, that are known to catch tunas, among other species, in coastal waters of the EPO, but data on their numbers, effort, and catches are incomplete or unavailable. A pilot program, focused on sharks, to collect data on these fisheries in Central America has been completed ([SAC-11-14](#)). The results of the pilot study offer guidance in the development of a long-term sampling program in the region. With support from a second phase of the IATTC Common Oceans project to improve data collection for shark fisheries in the EPO, the sampling research conducted in Central America is expanding to other EPO coastal states, specifically Ecuador, Mexico and Peru ([SAC-15-10](#), SAC-16 INF-V, SAC-16 INF-W).

The IATTC staff has collected and compiled data on the longline fisheries since 1952, on catches of yellowfin and skipjack since 1954, bluefin since 1973, and bigeye since 1975. The data in this report, which are as accurate and complete as possible, are derived from various sources, including vessel logbooks, on-board observer data, unloading records provided by canners and other processors, export and import records, reports from governments and other entities, and the IATTC species and size composition port sampling program.

CATCHES AND LANDINGS OF TUNAS, BILLFISHES, AND ASSOCIATED SPECIES

Almost all the catches in the EPO are made by the purse-seine and longline fleets; pole-and-line vessels, and various artisanal and recreational fisheries, account for a small percentage of the total catches. The IATTC staff compiles catch data for all fishing gears, including trolls, harpoons, and gillnets.

Detailed catch data are available for the purse-seine fishery, which takes over 90% of the total reported catches; the data for the other fisheries are incomplete. Purse-seine data for 2023 and 2024, and 2021-2023 data for longlines and other gears, are preliminary.

Since 1993 all Class-6² purse-seine vessels carry observers, who collect detailed data on catches, including those discarded at sea. Estimates of the “retained” catch (the portion of the total catch that is landed) are based principally on data collected during vessel unloadings.

Longline vessels, particularly the larger ones, fish primarily for bigeye, yellowfin, albacore, and swordfish. Data on the retained catches of most of the larger longline vessels are obtained from the vessels' flag governments; data for smaller longliners, artisanal vessels, and other vessels that fish for species covered

² Class 6: carrying capacity greater than 363 metric tons (t).

by the Antigua Convention are incomplete or unavailable, but some are obtained from vessel logbooks, or from governments or governmental reports.

Data for the western and central Pacific Ocean (WCPO) are taken from the [Tuna Fishery Yearbook for 2024](#), published by the Western and Central Pacific Fisheries Commission (WCPFC).

This report summarizes data from all the above sources. The estimated total catches of tropical tunas (yellowfin, skipjack, and bigeye) in the entire Pacific Ocean are shown in [Table A-1](#) and are discussed further in the sections below.

Estimates of the annual retained and discarded catches of tunas and other species taken by tuna-fishing vessels in the EPO during 1995-2024 are shown in [Tables A-2a-b](#).

The catches of tropical tunas during 1995-2024, by flag, are shown in [Tables A-3a-e](#), and the purse-seine catches and landings of tunas during 2023-2024 are summarized by flag in [Tables A-4a-b](#).

CATCHES BY SPECIES

1.1. Yellowfin tuna

The total annual catches of yellowfin in the Pacific Ocean during 1995-2024 are shown in [Table A-1](#). The 2024 EPO catch of 294 thousand t is 14% higher than the average of 258 thousand t for the previous 10-year period (2014-2023). In the WCPO, the catches of yellowfin reached a record high of 747 thousand t in 2021.

The annual retained catches of yellowfin in the EPO, by gear, during 1995-2024 are shown in [Table A-2a](#). Over the most recent 10-year period (2014-2023), the annual retained purse-seine catches have fluctuated around an average of 246 thousand t (range: 211 to 298 thousand t). The preliminary estimate of the retained catch in 2024, 294 thousand t, is 1% lower than that of 2023, and 19% higher than the 2014-2023 average. Less than 1% of the total purse-seine catch of yellowfin was discarded at sea during the most recent 10-year period (average at 0.2% during the most recent 10-year period, 2014-2023) ([Table A-2a](#)).

During 1995-2006, annual longline catches in the EPO averaged about 19 thousand t (range: 10 to 30 thousand t), or about 6% of the total retained catches of yellowfin on average. They then declined sharply, to an annual average of 10 thousand t (range: 7 to 13 thousand t), or about 4% of the total retained catches, during 2007-2023. Catches by other fisheries (pole and line, recreational, gillnet, troll, artisanal, *etc.*), whether incidental or targeted, are shown in [Table A-2a](#), under “Other gears” (OTR); during 1995-2022 they averaged about 1.5 thousand t.

1.2. Skipjack tuna

The total annual catches of skipjack in the Pacific Ocean during 1995-2024 are shown in [Table A-1](#). Most of the catch is taken in the WCPO. WCPO total annual catches of skipjack averaged 1.8 million t over the most recent 10-year period (2014-2023), reaching an all-time catch high of 2 million t in 2019. In the EPO, total catches of skipjack reached its maximum historical level of 645 thousand t in 2024, higher than the previous 10-year (2014-2023) average of 323 thousand t by approximately 100%.

The annual retained catches of skipjack in the EPO, by gear, during 1995-2024 are shown in [Table A-2a](#). During 2014-2023 the annual retained purse-seine catch averaged 320 thousand t (range: 261 to 389 thousand t). The preliminary estimate of the retained catch in 2024, 641 thousand t, is the highest historic level. This value is 100% greater than the 10-year average (320 thousand t) for 2014-2023.

Discards of skipjack at sea were less than 1.2% of the total purse-seine catches of the species (average at 0.7% during the most recent 10-year period, 2014-2023) ([Table A-2a](#)).

Catches of skipjack in the EPO by longlines and other gears are negligible ([Table A-2a](#)).

1.3. Bigeye tuna

The total annual catches of bigeye in the Pacific Ocean during 1995-2024 are shown in [Table A-1](#). In the

WCPO starting in 1995 the bigeye has been fluctuating between 107 thousand t and a historic peak of 183 thousand t in 2004. In the EPO, the average catch during 1995-2024 was 101 thousand t, with a low of 52 thousand t in 2024 and a high of 149 thousand t in 2000.

The annual retained catches of bigeye in the EPO by purse-seine vessels during 1995-2024 are shown in [Table A-2a](#). The introduction of fish-aggregating devices (FADs) in 1993, deployed by fishers to attract tunas, led to a sudden and dramatic increase in the purse-seine catches. From 1995 to 1999, the average annual retained purse-seine catch of bigeye in the EPO was 53 thousand t, and then in 2000 was over 95 thousand t. From 2001-2023, it has fluctuated between 42 and 84 thousand t; the preliminary estimates for 2024 is 34 thousand t.

During 2000-2024 the percentage of the purse-seine catch of bigeye discarded at sea has steadily decreased, from 5% in 2000 to less than 1% in 2022, averaging about 1.4%.

Before the expansion of the FAD fishery, longliners caught almost all the bigeye in the EPO. Since 1995, coinciding with the expansion of the FAD fishery, the longline fishery has accounted for about 38% of the total bigeye catch, averaging 39 thousand t during 1995-2023. The preliminary estimate for 2024 is approximately 18 thousand t ([Table A-2a](#)).

Small amounts of bigeye are caught in the EPO by other gears ([Table A-2a](#)).

1.4. Pacific bluefin tuna

The catches of Pacific bluefin in the entire Pacific Ocean, by flag and gear, as reported by the vessels' flag governments to the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), are shown in [Table A-5a](#).

The catches of Pacific bluefin in the EPO during 1995-2024, by gear, are shown in [Table A-2a](#). EPO total annual catches of bluefin averaged 4.4 thousand t over the most recent 10-year period (2014-2023). During this same period, the purse-seine vessels accounted for 78% of the annual catch, on average. The 2014-2023 average EPO retained catch by purse seine vessels is 3.4 thousand t (range: 2.5 t to 5.3 thousand t); the preliminary estimate for 2024 is 3.5 thousand t ([Table A-2a](#)).

Catches of Pacific bluefin by recreational gear in the EPO during 1995-2024 are reported in numbers of individual fish caught ([Table A-5b](#)).

1.5. Albacore tuna

Data provided by the relevant CPCs on catches of albacore in the EPO, by gear, are shown in [Table A-2a](#). The same information, by area (north and south of the equator), is also shown in [Table A-6](#). On average over the most recent 10-year period (2014-2023), troll vessels (LTL, included under "Other gears" (OTR) in [Table A-2a](#)) have accounted for 80% of the annual retained catches of albacore north of the equator. The total annual retained catches of albacore north of the equator averaged 14 thousand tons over the most recent 10-year period (2014-2023), with a range of 6 to 23 thousand tons. In contrast, retained catches of albacore south of the equator are predominantly taken by longline (LL) gear (averaging 99% over the same period). Total annual retained catches of albacore south of the equator during 2014-2023 averaged 25 thousand t (range: 17 to 30 thousand t).

1.6. Other tunas and tuna-like species

While yellowfin, skipjack, and bigeye tunas comprise the great majority of the retained purse-seine catches in the EPO, other tunas and tuna-like species, such as albacore, black skipjack, Pacific bluefin, bonito, frigate and bullet tunas, contribute to the overall harvest. The estimated annual retained and discarded catches of these species during 1995-2024 are shown in [Table A-2a](#). The catches reported in the "unidentified tunas" (TUN) category in [Table A-2a](#) contain some catches reported by species (frigate and bullet tunas) along with the unidentified tunas. The total retained catch of these other species by the purse-seine fishery in 2024 was 13 thousand t, equal to the 10-year average (2014-2023) average of 12 thousand

t (range: 8 to 16 thousand t).

Black skipjack are also caught by other gears in the EPO, mostly by coastal artisanal fisheries. Bonitos are also caught by artisanal fisheries, and have been reported as catch by longline vessels in some years. Except for 2022, annual catch reports for bonitos have increased greatly from 2019 to 2023 (45-67 thousand t), largely due to new reports submitted by one CPC from its artisanal fisheries.

1.7. Billfishes

Catch data for billfishes (swordfish, blue marlin, black marlin, striped marlin, shortbill spearfish, and sailfish) are shown in [Table A-2b](#).

Swordfish are caught in the EPO with large-scale and artisanal longlines, gillnets, harpoons, and occasionally with recreational gear. During 1995-2014 the longline catch averaged 14 thousand t, but during 2015-2018 this increased by about 76%, to over 24 thousand t, possibly due to increased abundance of swordfish, increased effort directed toward the species along with improved fishing efficiency, increased reporting, or a combination of all of these.

Other billfishes are caught with large-scale and artisanal longlines and recreational gear. The average annual longline catches of blue marlin and striped marlin during the recent 10-year period (2014-2023) were about 3.0 thousand and 1.6 thousand t, respectively. Smaller amounts of other billfishes are taken by longline.

Little information is available on the recreational catches of billfishes, but, the retained catches are believed to be substantially less than the commercial catches for all species, due to catch-and-release practices.

Billfishes are caught incidentally in the purse-seine fisheries, which during 2014-2023 accounted for about 1% of the total catch of billfishes in the EPO. [Table A-2b](#)

CATCHES AND FISHING EFFORT

1.8. Purse seine

Estimates of the numbers of purse-seine sets of each type (associated with dolphins (DEL), associated with floating objects (OBJ), and unassociated (NOA)) in the EPO during 2009-2024, and the retained catches from those sets, are shown in [Table A-7](#) and [Figure 1](#). The estimates for Class 1-5³ vessels were calculated from logbook data in the IATTC statistical data base and some observer data from the voluntary TUNACONS program, and those for Class-6 vessels from the observer data bases of the IATTC, Colombia, Ecuador, the European Union, Mexico, Nicaragua, Panama, the United States, and Venezuela.

Since the introduction of artificial fish-aggregating devices (FADs) in the mid-1990s, they have become predominant in the floating-object fishery, and now account for an estimated 98% of all floating-object sets by Class-6 vessels ([Table A-8](#)).

1.9. Longline

The reported nominal fishing effort (in thousands of hooks) by longline vessels in the EPO, and their catches of

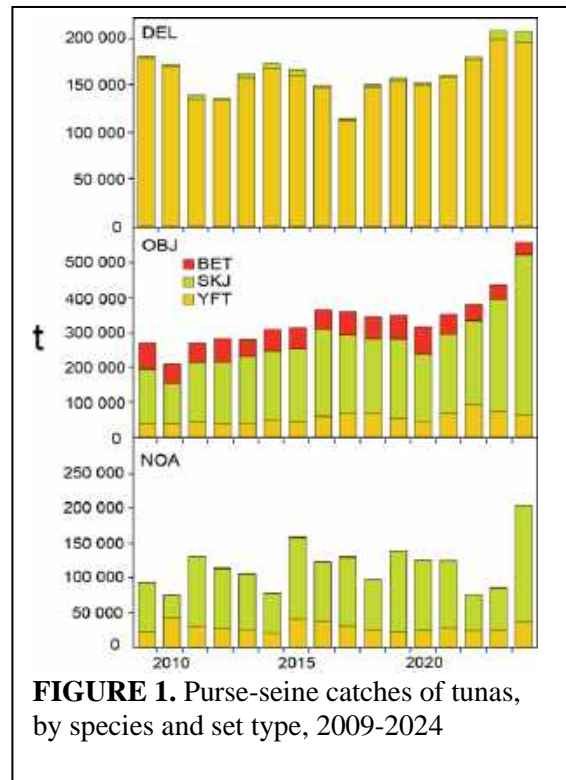


FIGURE 1. Purse-seine catches of tunas, by species and set type, 2009-2024

³ ≤363 t carrying capacity.

the predominant tuna species, are shown in [Table A-9](#).

DISTRIBUTIONS OF THE CATCHES OF TROPICAL TUNAS

1.10. Purse-seine catches

The average annual distributions of purse-seine catches, by set type, of tropical tunas (yellowfin, skipjack, and bigeye) in the EPO during 2014-2023 are shown in [Figures A-1a, A-2a, and A-3a](#), respectively, and preliminary estimates for 2024 are shown in [Figures A-1b, A-2b, and A-3b](#).

Yellowfin: The majority of catches in 2024 were taken in sets associated with dolphins in two principal areas: north of 10°N from 105°W to 130°W, and inshore north of 5°S from 95°W to the coast. Lesser amounts of yellowfin were taken in dolphin and floating-objects sets in the offshore area when compared to the previous 10 years ([Figure A-1b](#)).

Skipjack: In 2024, catches primarily occurred in two main fishing areas: predominantly on floating object sets between 10°N and 5°S and from 90°W to 120°W, and also on floating objects and unassociated sets inshore between 5°N and 20°S from 90°W to the coast. The proportion of skipjack catch from floating object sets in the area between 10°N and 5°S and from 90°W to 120°W has increased over the previous 10 years and in the area inshore between 5°N and 20°S from 90°W to the coast the unassociated sets have increased over the previous 10 years. Also, the amount of skipjack caught in 2024 in floating-object sets on the western edge of the EPO is less than the previous 10 years, and catches from unassociated sets in the same area have also decreased ([Figure A-2b](#)).

Bigeye are not often caught north of about 10°N in the EPO. Almost all of the 2024 catches were taken in sets on floating object sets between the 10°N and 15°S and west of 90°W ([Figure A-3b](#)). Lesser amounts of bigeye were taken in floating object sets between 90°W to 150°W than in the previous 10 years.

1.11. Longline catches

Since 2009, the IATTC has received tuna catch and effort data from Belize, China, France (French Polynesia), Japan, the Republic of Korea, Panama, Chinese Taipei, the United States, and Vanuatu. Albacore, bigeye and yellowfin tunas make up the majority of the catches by most of these vessels. The distributions of the catches of bigeye and yellowfin in the Pacific Ocean by Chinese, Japanese, Korean, and Chinese Taipei longline vessels during 2019-2023 are shown in [Figure A-4](#).

SIZE COMPOSITIONS OF THE CATCHES OF TUNAS

1.12. Purse-seine

Length-frequency samples are the basic source of data used for estimating the size and age compositions of the various species of fish in the landings. This information is necessary to obtain age-structured estimates of the populations for various purposes, primarily the integrated modeling that the staff uses to assess the status of the stocks (see [Stock Assessment Reports](#)). Length-frequency samples are obtained from the catches of purse-seine vessels in the EPO by IATTC personnel at ports of landing in Ecuador and Mexico. The methods for sampling the catches of tunas are described in the [IATTC Annual Report for 2000](#) and in IATTC [Stock Assessment Reports 2](#) and [4](#).

Historical long-term time series of size-composition data for yellowfin and bigeye are available in the [Stock Assessment Reports](#), and average length stock status indicators (SSIs) are available for yellowfin, bigeye and skipjack (SAC-16-02). In this report, data on the size composition of the catches during 2019-2024 are presented ([Figures A-6 to A-8](#)), with two sets of length-frequency histograms for each species: the first shows the data for 2024 by stratum (gear type, set type, and area), and the second the combined data for each year of the 2019-2024 period.

Yellowfin: nine purse-seine fisheries (four associated with floating objects (OBJ), three associated with dolphins (DEL), and two unassociated (NOA)) and one pole-and-line (LP) fishery, which includes all 13 sampling areas) are defined ([Figure A-5](#)). Of the 923 wells with fish caught during 2024, 741

contained yellowfin. The estimated size compositions of the fish caught are shown in [Figure A-6a](#). Most of the yellowfin catch was taken in the DEL fisheries throughout the year, with smaller amounts taken in the OBJ fisheries during the first three quarters of 2024. Large yellowfin (95-140 cm) were caught primarily in the DEL-I, DEL-S and DEL-N fishery in the all four quarters and in the NOA-N fishery in the first, third and fourth quarters. Smaller yellowfin (<80 cm) were taken in the OBJ fisheries in all four quarters.

The estimated size compositions of the yellowfin caught by all fisheries combined during 2019-2024 are shown in [Figure A-6b](#). The average weight of yellowfin in 2024, 9.8 kg, was higher than the previous years with the exception of 2020 that had an average weight of 10.5 kg. The size distribution shifted toward the middle of the range when compared to previous years, indicating fewer smaller and larger sized yellowfin in 2024.

Skipjack: seven purse-seine fisheries (four OBJ, two NOA, one DEL) and one LP fishery are defined ([Figure A-5](#)); the last two include all 13 sampling areas. Of the 923 wells with fish caught, 587 contained skipjack. The estimated size compositions of the fish caught during 2024 are shown in [Figure A-7a](#). Most of the skipjack catch was taken in the OBJ-N, OBJ-E, OBJ-I, OBJ-S and NOA-S fisheries in all four quarters. The largest skipjack (60-70 cm) were caught in the OBJ-E and OBJ-N fisheries in the third and fourth quarters. The smallest (<50 cm) were caught primarily in the OBJ-N, OBJ-I, OBJ-E, OBJ-S and NOA-S fisheries in the first two quarters.

The estimated size compositions of skipjack caught by all fisheries combined during 2019-2024 are shown in [Figure A-7b](#). The majority of the skipjack in 2024 was in the 40-60 cm range.

Bigeye: six purse-seine fisheries (four OBJ, one NOA, one DEL) and one LP fishery are defined ([Figure A-5](#)); all except the OBJ fisheries include all 13 sampling areas. Of the 923 wells with fish caught, 101 contained bigeye. The estimated size compositions of the fish caught during 2024 are shown in [Figure A-8a](#). Most of the smaller bigeye catch (<80 cm) was taken in the OBJ-N and OBJ-S fishery in the second and fourth quarters. The larger bigeye (>80 cm) was taken in the OBJ-N and OBJ-S fisheries in the second and fourth quarters.

The estimated size compositions of bigeye caught by all fisheries combined during 2019-2024 are shown in [Figure A-8b](#). The average weight of bigeye in 2024 (5.5 kg) was considerably higher than 2022 to 2023 (4.0 – 4.4 kg) and slightly higher than 2019 to 2021 (5.1 – 5.2 kg). The majority of bigeye caught in 2024 was in the 40-80 cm range, with less of the larger bigeye >80 cm than 2019-2023.

Pacific bluefin are caught by purse-seine and recreational gears off California and Baja California, historically from about 23°N to 35°N, but only between 28°N and 32°N in recent years. The 2024 purse-seine fishing season continued the trend of starting the first day in January: in 2024, bluefin were first caught in early January, and the fishery was closed in early March, when the annual catch limit was reached. Most of the catch is transported live to grow-out pens near the coast of Mexico. Mexico's National Observer Program (PNAAPD) submitted the length-composition data for purse-seine catches during 2018-2023 ([Figure A-9](#)). This data is provided every other year, so the figure will next be updated in 2026.

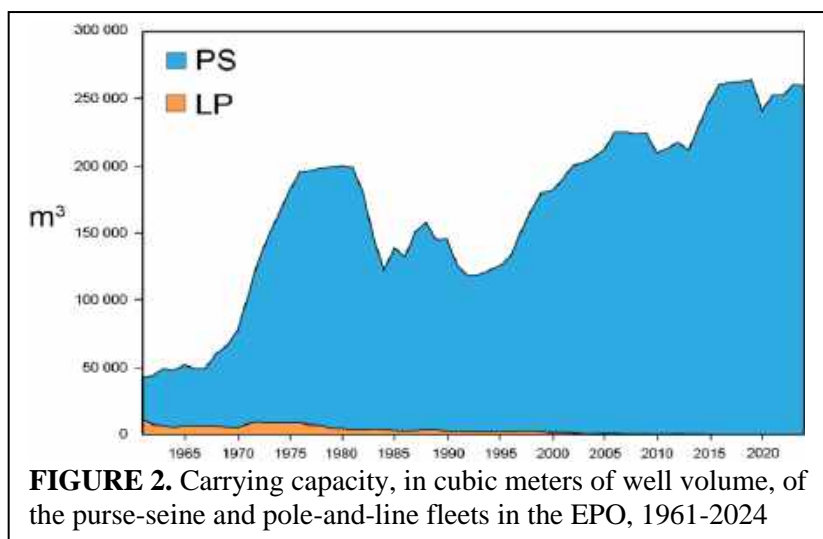


FIGURE 2. Carrying capacity, in cubic meters of well volume, of the purse-seine and pole-and-line fleets in the EPO, 1961-2024

1.13. Longline fishery

The size compositions of yellowfin and bigeye caught by the Japanese longline fleet (commercial and training vessels) in the EPO during 2019-2023 are shown in [Figures A-10](#) and [A-11](#). The average annual weight during that period ranged from 42.8 to 55.2 kg for yellowfin, and from 64.7 kg to 77.3 kg for bigeye. Size composition data for 2021 and 2022 was not available due to difficulties resulting from the COVID-19 pandemic, which impacted the collection and analysis of 2021 and 2022 YFT and BET size data.

1.14. Catches of tunas, by flag and gear

The annual retained catches of tunas in the EPO during 1995-2024, by flag and gear, are shown in [Tables A-3a-e](#). The purse-seine catches of tunas in 2023 and 2024, by flag and species, are summarized in [Table A-4a](#). Of the nearly 981 thousand t of tunas caught in 2024, 43% were caught by Ecuadorian vessels, and 19% by Mexican vessels. Other countries with significant catches included Panama (15%), United States (6%), Colombia (4%), Venezuela (4%) and Nicaragua (2%). The purse-seine landings of tunas in 2023 and 2024, by species and country of landing, are summarized in [Table A-4b](#). Of the more than 984 thousand t of tunas landed in the EPO in 2024, 63% were landed in Ecuadorian ports, and 19% in Mexican ports. Other countries with landings of tunas in the EPO included Colombia (4%), Peru (3%) and the United States (3%).

THE FLEETS

1.15. Purse seine

The IATTC [Regional Vessel Register](#) contains detailed records of all purse-seine vessels that are authorized to fish for tunas in the EPO. However, only vessels that fished for yellowfin, skipjack, bigeye, and/or Pacific bluefin tuna in the EPO in 2024 are included in the following description of the purse-seine fleet.

The IATTC uses well volume, in cubic meters (m^3), to measure the carrying capacity of purse-seine vessels ([Table A-10](#); [Figure 2](#)).

The 2023 and preliminary 2024 data for numbers and total well volumes of purse-seine vessels that fished for tunas in the EPO are shown in [Tables A-11a](#) and [A-11b](#). During 2024, the fleet was dominated by Ecuadorian and Mexican vessels, with about 35% and 23%, respectively, of the total well volume; they were followed by the Panama (12%), United States (9%), Venezuela (6%), Colombia (6%), European Union (Spain) (4%), Nicaragua (2%), El Salvador (2%) and Peru (1%).⁴

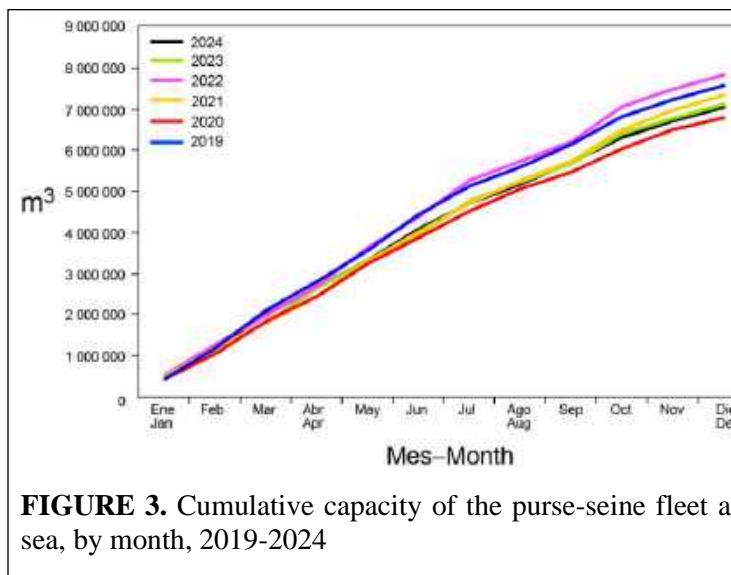


FIGURE 3. Cumulative capacity of the purse-seine fleet at sea, by month, 2019-2024

The cumulative capacity at sea during 2024 is compared to those of the previous five years in [Figure 3](#).

The monthly average, minimum, and maximum total well volumes at sea (VAS), in thousands of cubic meters, of purse-seine and pole-and-line vessels that fished for tunas in the EPO during 2014-2023, and the 2024 values, are shown in [Table A-12](#). The monthly values are averages of the VAS estimated at weekly intervals by the IATTC staff. The average VAS value for 2014-2023 was higher, at about 146 thousand m^3 (57% of total capacity), compared to 137 thousand m^3 (52% of total capacity) in 2024.

⁴ The sum of the percentages may not add up to 100% due to rounding.

1.16. Other fleets of the EPO

Information on other types of vessels that are authorized to fish in the EPO is available in the IATTC's [Regional Vessel Register](#). In some cases, particularly for large longline vessels, the Register contains information for vessels authorized to fish not only in the EPO, but also in other oceans, and which may not have fished in the EPO during 2024, or ever.

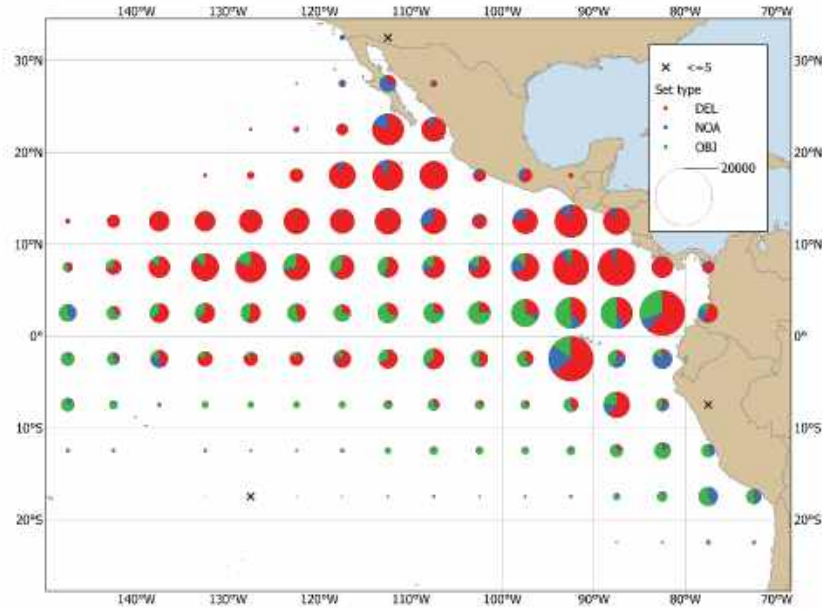


FIGURE A-1a. Average annual distributions of the purse-seine catches of yellowfin, by set type, 2014-2023. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA A-1a. Distribución media anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2014-2023. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

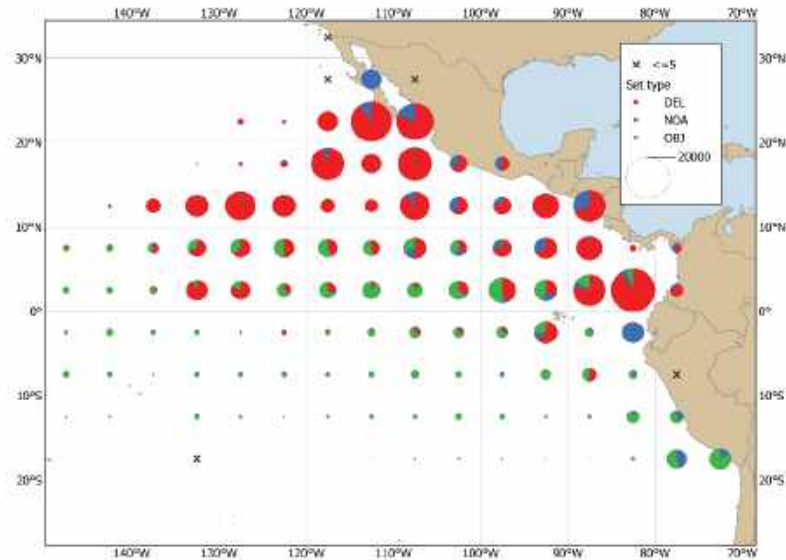


FIGURE A-1b. Annual distributions of the purse-seine catches of yellowfin, by set type, 2024. The sizes of the circles are proportional to the amounts of yellowfin caught in those 5° by 5° areas.
FIGURA A-1b. Distribución anual de las capturas cerqueras de aleta amarilla, por tipo de lance, 2024. El tamaño de cada círculo es proporcional a la cantidad de aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

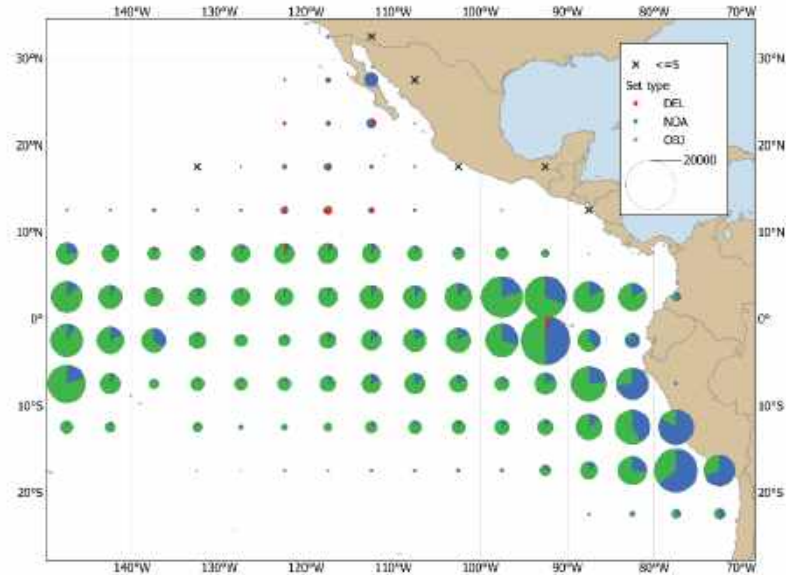


FIGURE A-2a. Average annual distributions of the purse-seine catches of skipjack, by set type, 2014-2023. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.
FIGURA A-2a. Distribución media anual de las capturas cerqueras de barrilete, por tipo de lance, 2014-2023. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

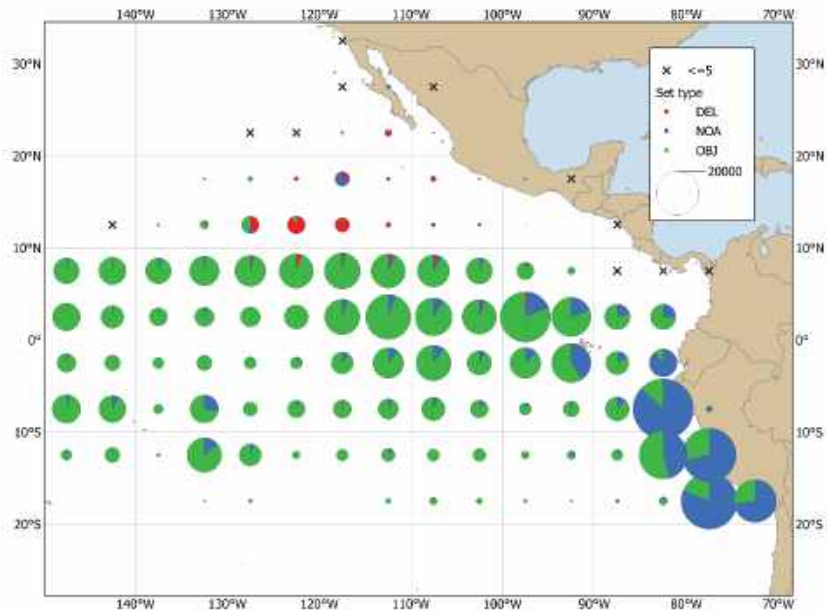


FIGURE A-2b. Annual distributions of the purse-seine catches of skipjack, by set type, 2024. The sizes of the circles are proportional to the amounts of skipjack caught in those 5° by 5° areas.
FIGURA A-2b. Distribución anual de las capturas cerqueras de barrilete, por tipo de lance, 2024. El tamaño de cada círculo es proporcional a la cantidad de barrilete capturado en la cuadrícula de 5° x 5° correspondiente.

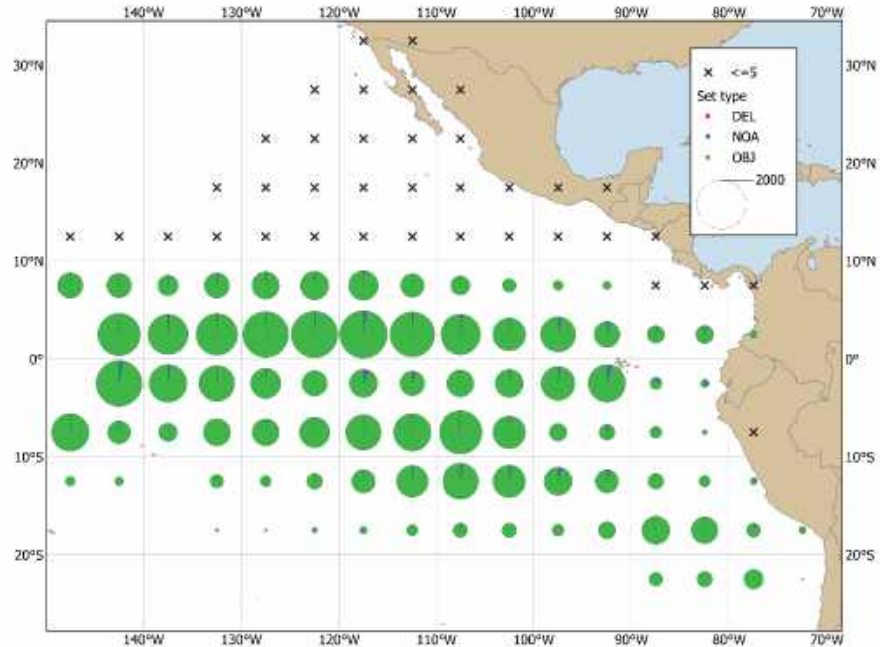


FIGURE A-3a. Average annual distributions of the purse-seine catches of bigeye, by set type, 2014-2023. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.

FIGURA A-3a. Distribución media anual de las capturas cerqueras de patudo, por tipo de lance, 2014-2023. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

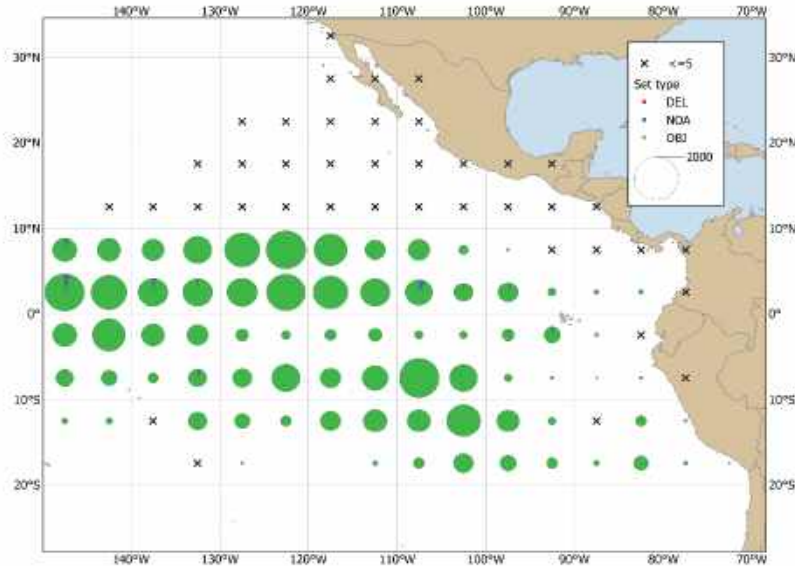


FIGURE A-3b. Annual distributions of the purse-seine catches of bigeye, by set type, 2024. The sizes of the circles are proportional to the amounts of bigeye caught in those 5° by 5° areas.

FIGURA A-3b. Distribución anual de las capturas cerqueras de patudo, por tipo de lance, 2024. El tamaño de cada círculo es proporcional a la cantidad de patudo capturado en la cuadrícula de 5° x 5° correspondiente.

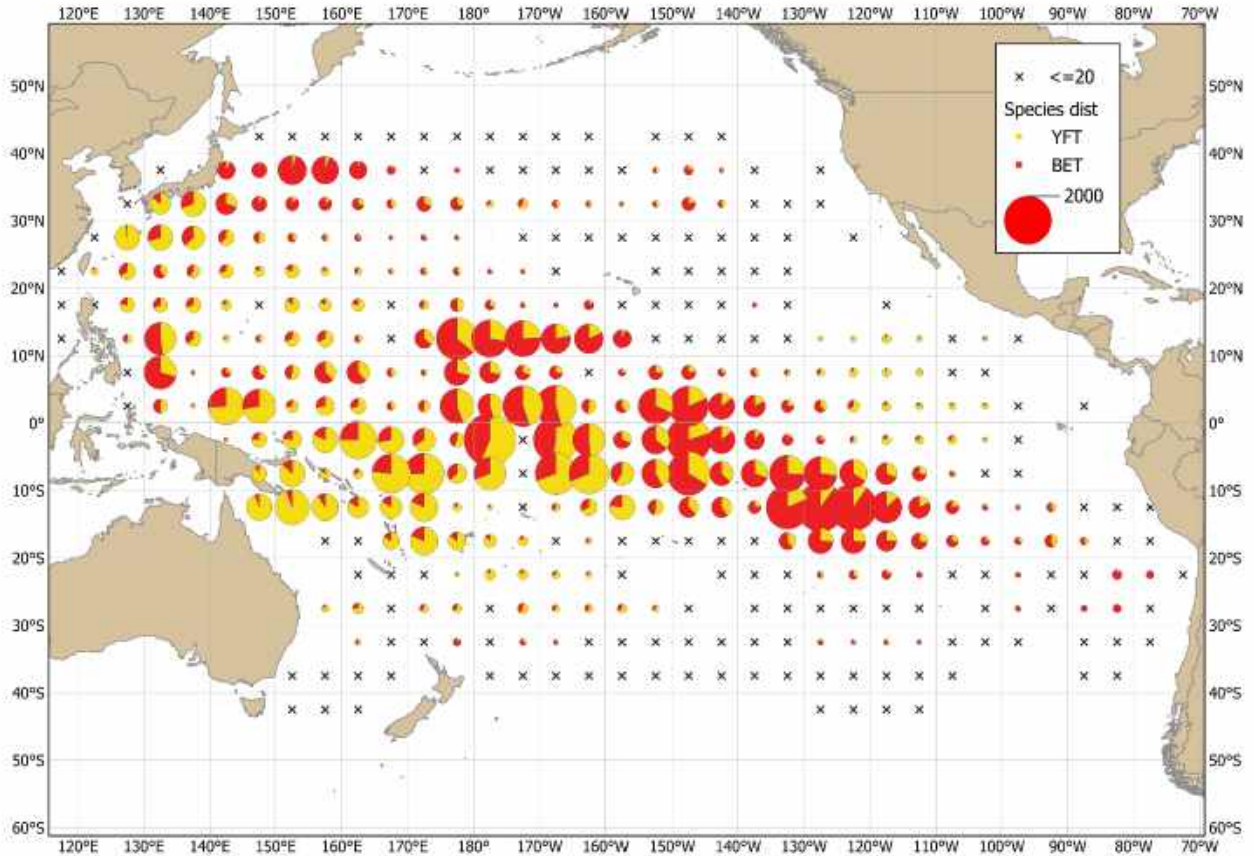


FIGURE A-4. Distributions of the average annual catches of bigeye and yellowfin tunas in the Pacific Ocean, in metric tons, by Chinese, Japanese, Korean, and Chinese Taipei longline vessels, 2019-2023. The sizes of the circles are proportional to the amounts of bigeye and yellowfin caught in those 5° by 5° areas.

FIGURA A-4. Distribución de las capturas anuales medias de atunes patudo y aleta amarilla en el Océano Pacífico, en toneladas métricas, por buques palangreros de China, Corea, Japón, y Taipei Chino, 2019-2023. El tamaño de cada círculo es proporcional a la cantidad de patudo y aleta amarilla capturado en la cuadrícula de 5° x 5° correspondiente.

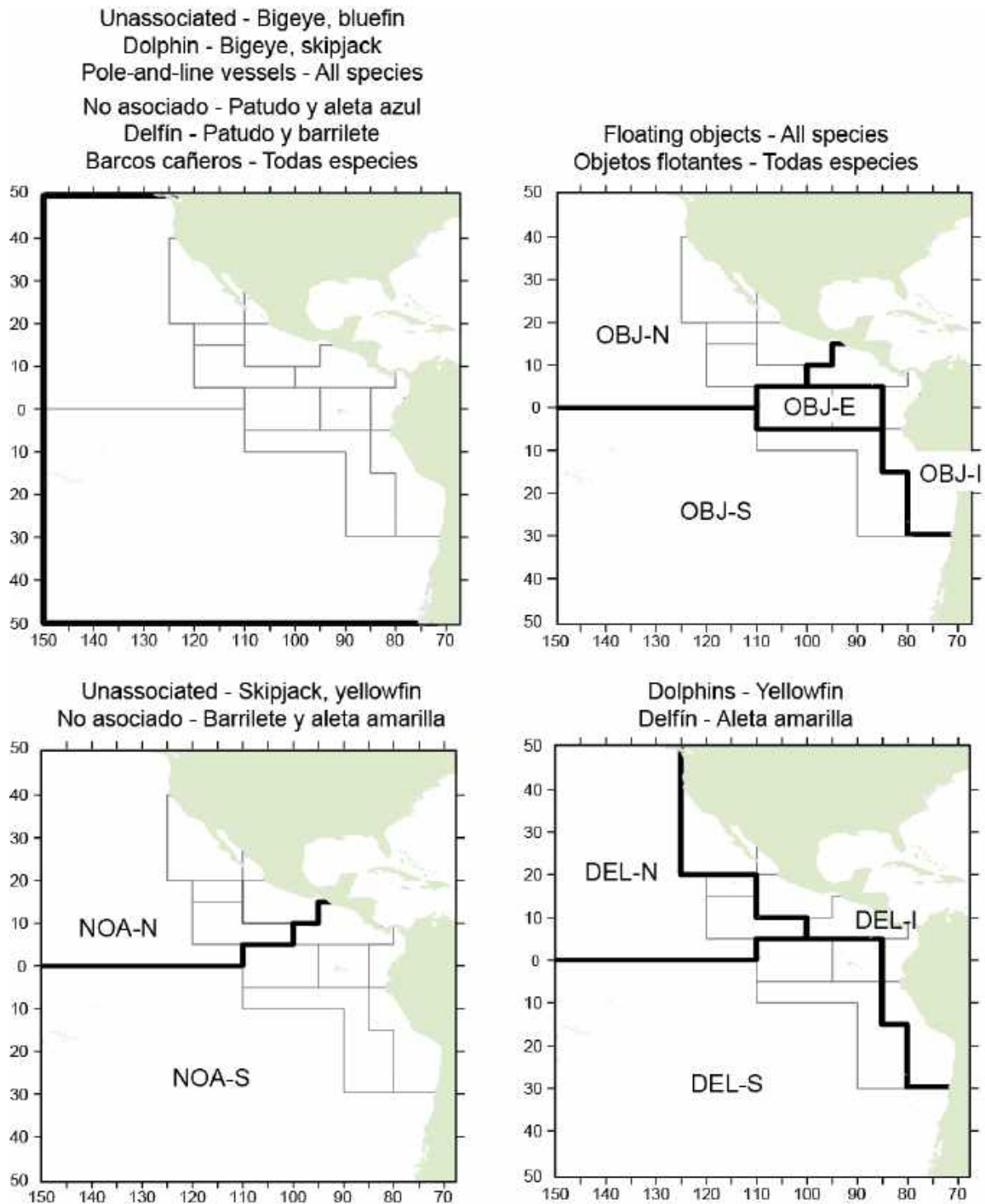


FIGURE A-5. The purse-seine fisheries defined by the IATTC staff for analyses of yellowfin, skipjack, and bigeye in the EPO. The thin lines indicate the boundaries of the 13 length-frequency sampling areas, and the bold lines the boundaries of the fisheries.

FIGURA A-5. Las pesquerías cerqueras definidas por el personal de la CIAT para los análisis de los atunes aleta amarilla, barrilete, y patudo en el OPO. Las líneas delgadas indican los límites de las 13 zonas de muestreo de frecuencia de tallas, y las líneas gruesas los límites de las pesquerías.

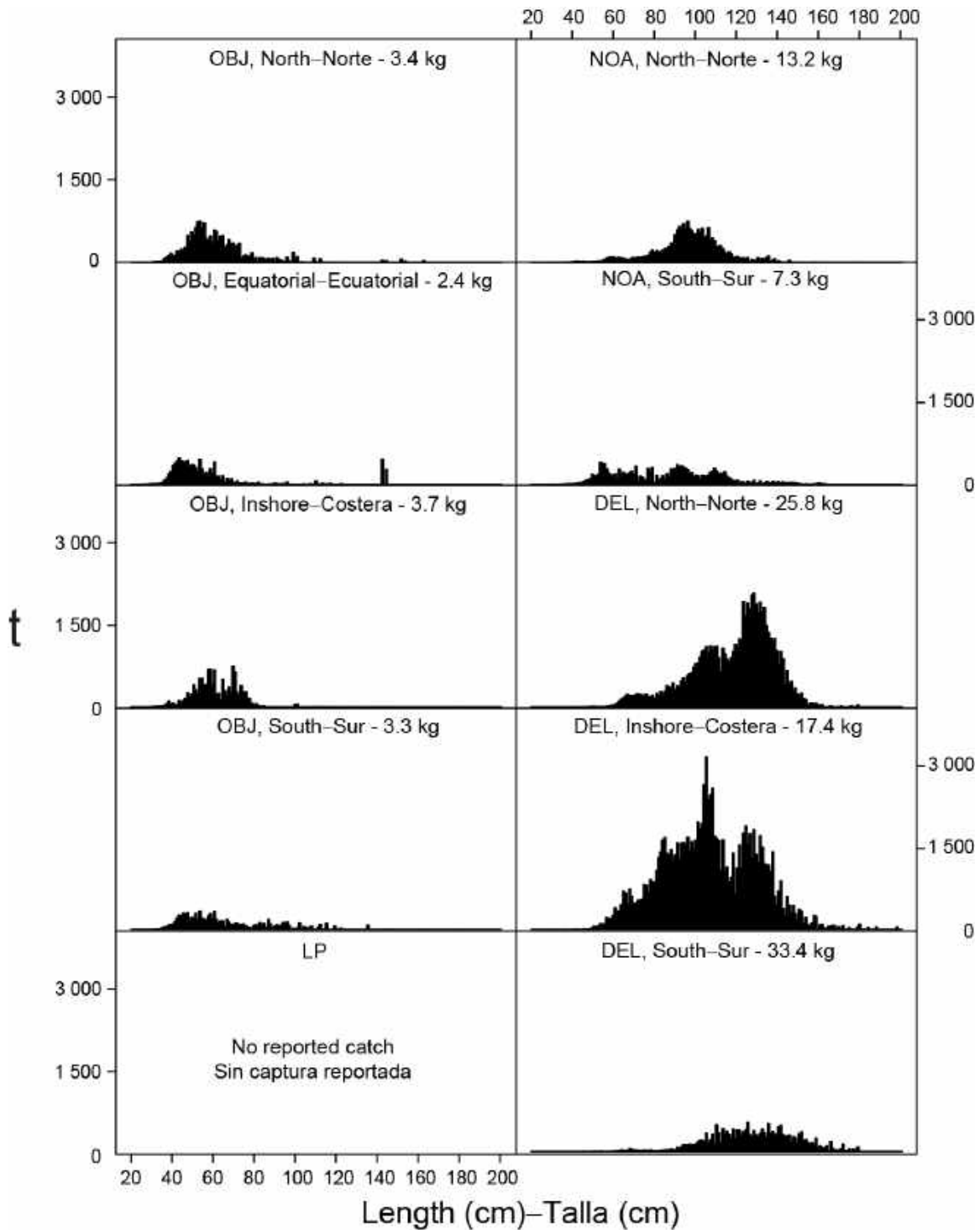


FIGURE A-6a. Estimated size compositions of the yellowfin caught in the EPO during 2024 for each fishery designated in Figure A-5. The value at the top of each panel is the average weight of the fish in the samples.

FIGURA A-6a. Composición por tallas estimada del aleta amarilla capturado en el OPO durante 2024 en cada pesquería ilustrada en la Figura A-5. El valor en cada recuadro representa el peso promedio del pescado en las muestras.

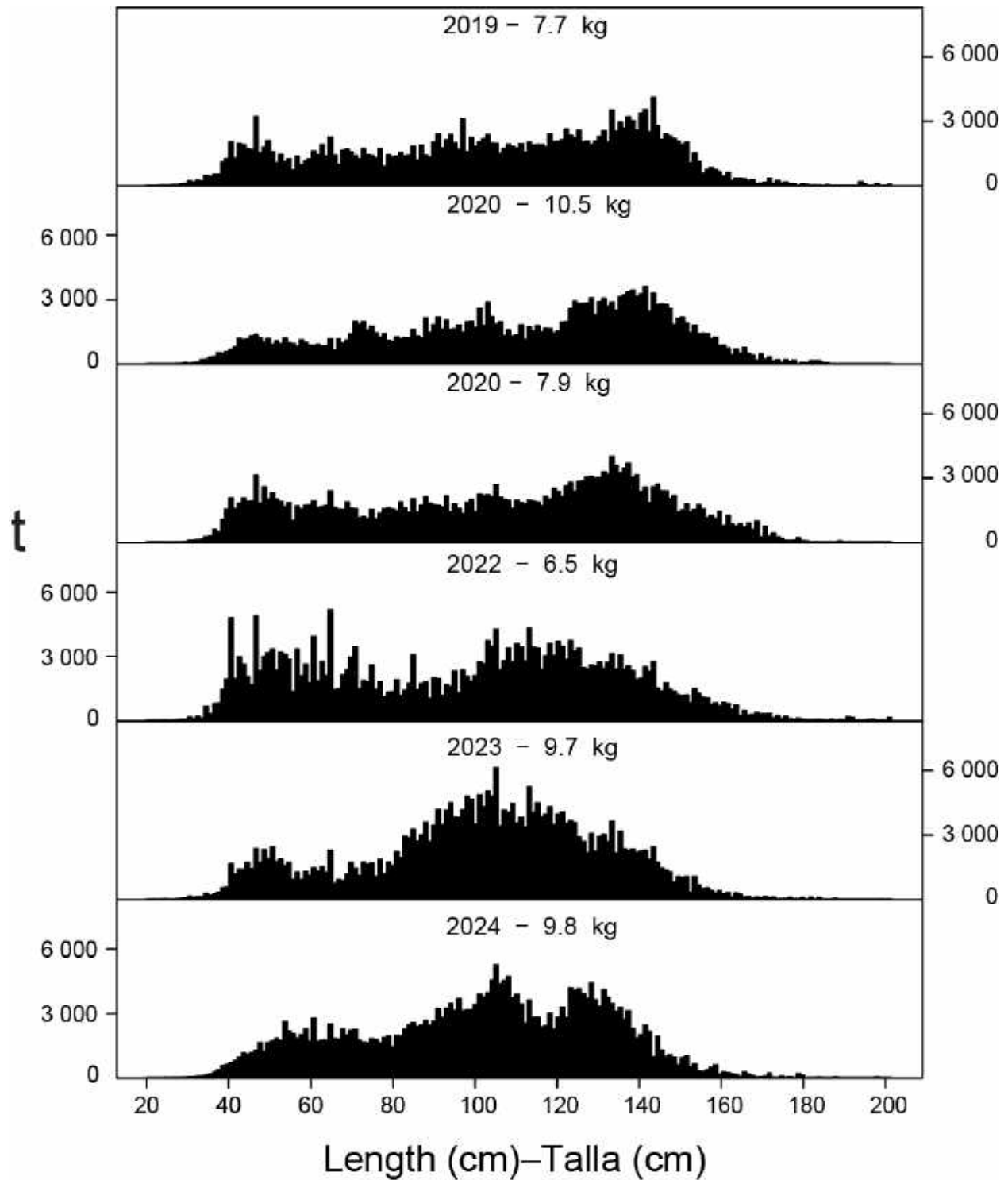


FIGURE A-6b. Estimated size compositions of the yellowfin caught by purse-seine and pole-and-line vessels in the EPO during 2019-2024. The value at the top of each panel is the average weight of the fish in the samples.

FIGURA A-6b. Composición por tallas estimada del aleta amarilla capturado por buques cerqueros y cañeros en el OPO durante 2019-2024. El valor en cada recuadro representa el peso promedio del pescado en las muestras.

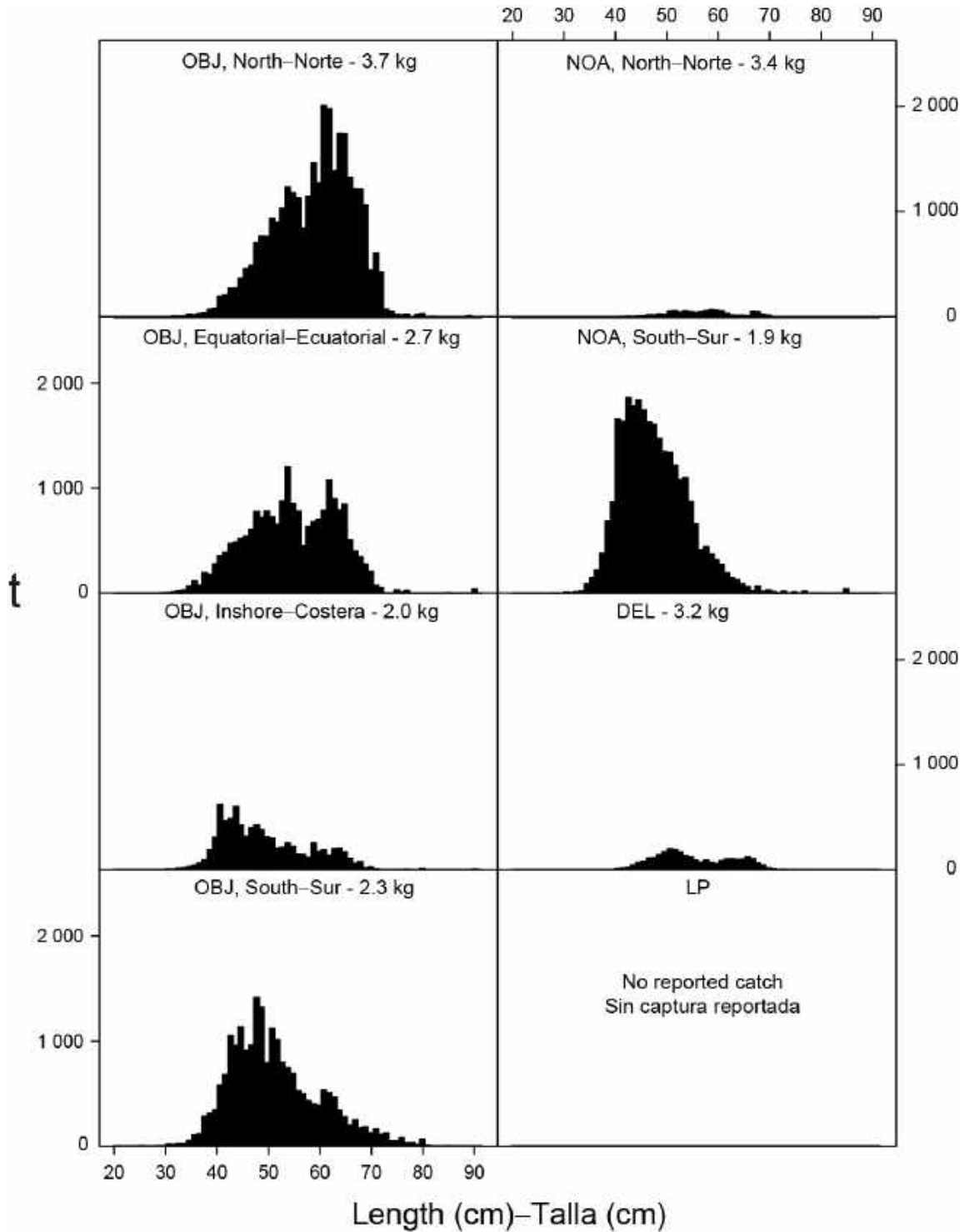


FIGURE A-7a. Estimated size compositions of the skipjack caught in the EPO during 2024 for each fishery designated in Figure A-5. The value at the top of each panel is the average weight of the fish in the samples. **FIGURA A-7a.** Composición por tallas estimada del barrilete capturado en el OPO durante 2024 en cada pesquería ilustrada en la Figura A-5. El valor en cada recuadro representa el peso promedio del pescado en las muestras.

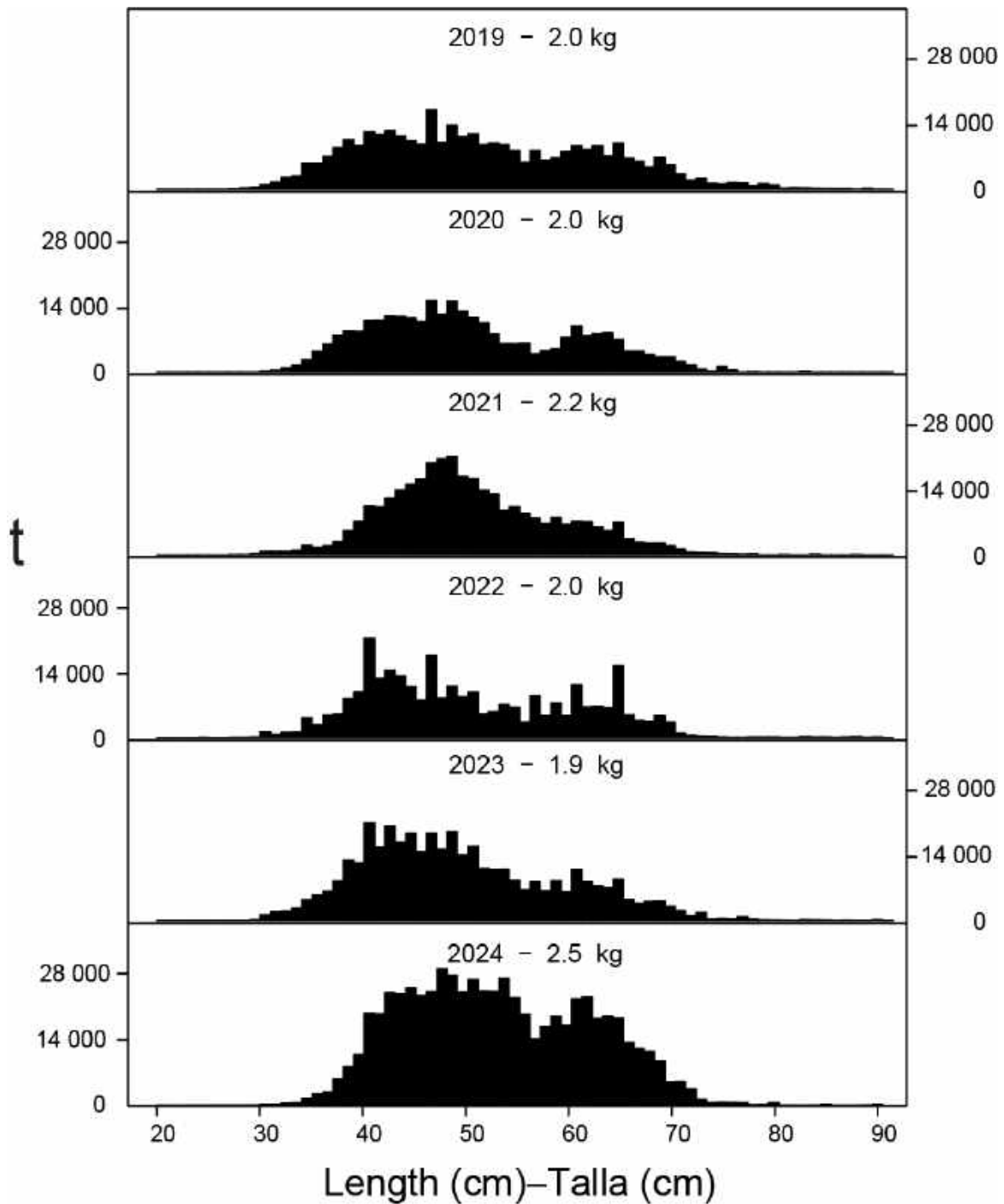


FIGURE A-7b. Estimated size compositions of the skipjack caught by purse-seine and pole-and-line vessels in the EPO during 2019-2024. The value at the top of each panel is the average weight of the fish in the samples.

FIGURA A-7b. Composición por tallas estimada del barrilete capturado por buques cerqueros y cañeros en el OPO durante 2019-2024. El valor en cada recuadro representa el peso promedio del pescado en las muestras.

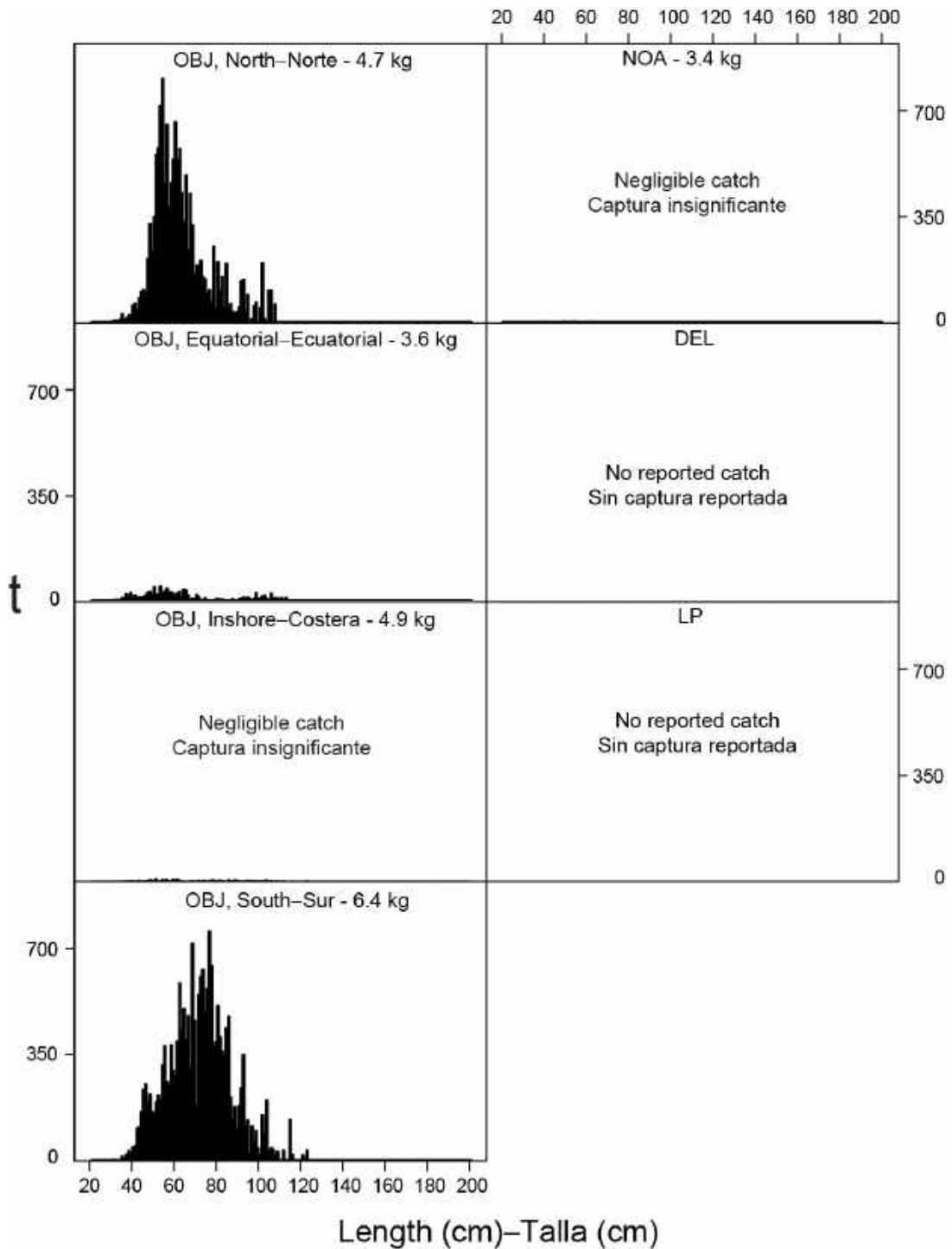


FIGURE A-8a. Estimated size compositions of the bigeye caught in the EPO during 2024 for each fishery designated in Figure A-5. The value at the top of each panel is the average weight.

FIGURA A-8a. Composición por tallas estimada del patudo capturado en el OPO durante 2024 en cada pesquería ilustrada en la Figura A-5. El valor en cada recuadro representa el peso promedio del pescado en las muestras.

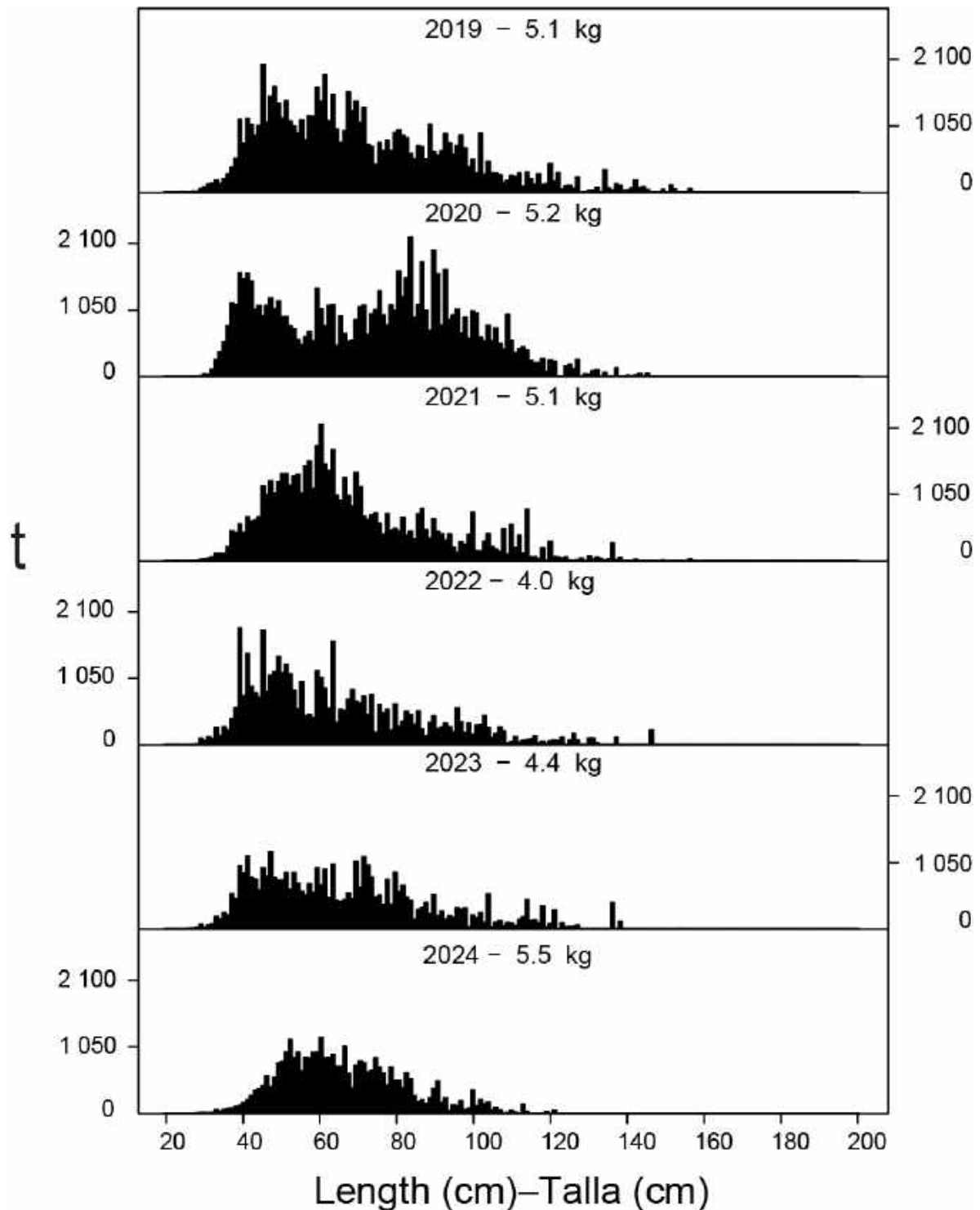


FIGURE A-8b. Estimated size compositions of the bigeye caught by purse-seine vessels in the EPO during 2019-2024. The value at the top of each panel is the average weight.

FIGURA A-8b. Composición por tallas estimada del patudo capturado por buques cerqueros en el OPO durante 2019-2024. El valor en cada recuadro representa el peso promedio del pescado en las muestras.

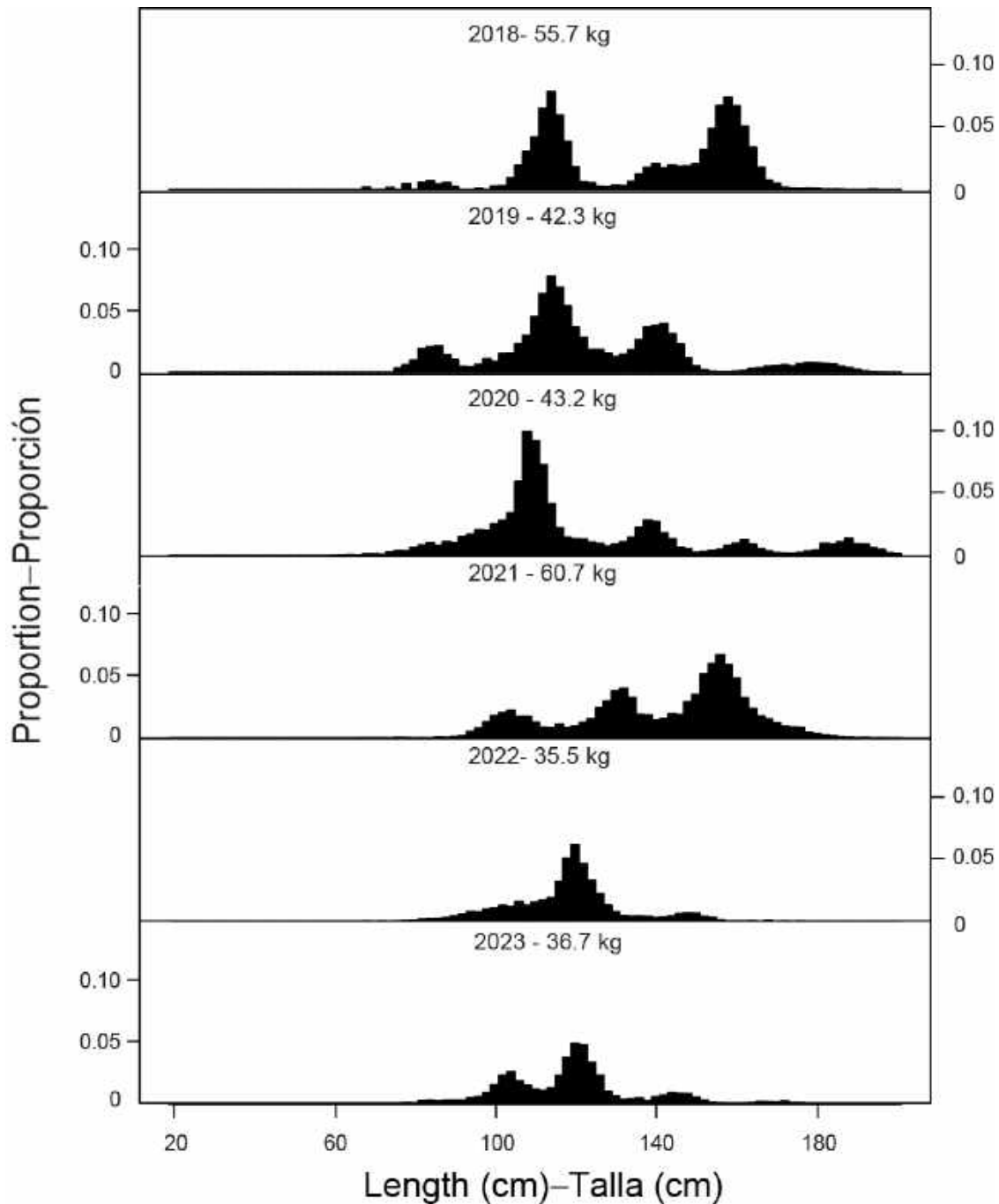


FIGURE A-9. Estimated length compositions of purse-seine catches of Pacific bluefin tuna, 2018-2023. The length distribution has been standardized as a proportion of the total number of measured tuna in each length interval. The value at the top of each panel is the average weight.

Source: Mexico's National Observer Program (PNAAPD).

FIGURA A-9. Composición por talla estimada de las capturas cerqueras de atún aleta azul del Pacífico, 2018-2023. La distribución de las tallas ha sido estandarizada como proporción del número total de atunes medidos en cada intervalo de talla. El valor en cada recuadro representa el peso promedio.

Fuente: Programa Nacional de Observadores de México (PNAAPD).

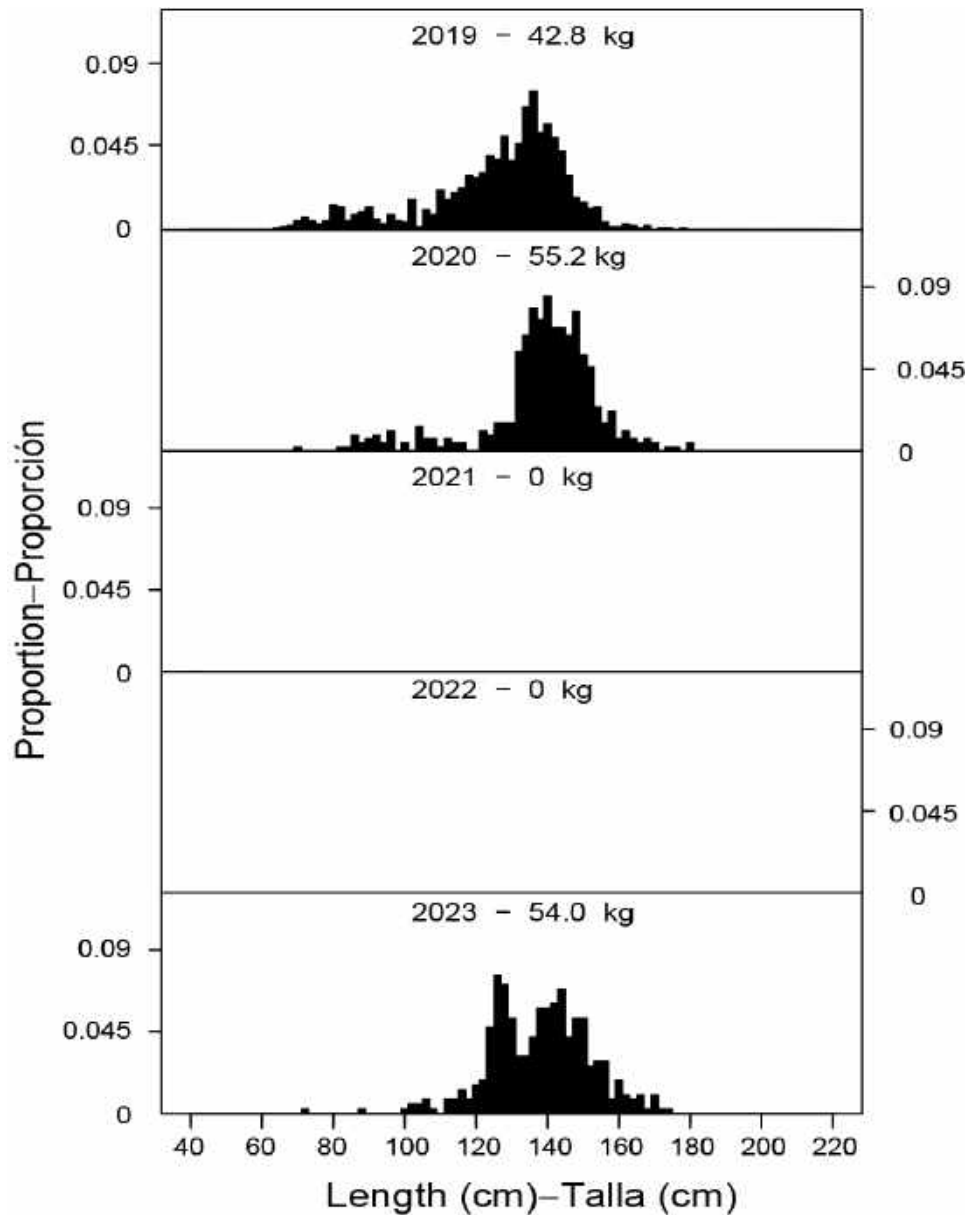


FIGURE A-10. Estimated size compositions of the catches of yellowfin by the Japanese longline fleet in the EPO, 2019-2023. The size distribution has been standardized as a proportion of the total number of measured tunas in each size range. The value at the top of each panel is the average weight. Source: Fisheries Agency of Japan. [Size composition data for 2021 and 2022 was not available due to difficulties resulting from the COVID-19 pandemic, which impacted the collection and analysis of 2021 and 2022 YFT size data.]

FIGURA A-10. Composición por tallas estimada de las capturas de aleta amarilla por la flota palangrera japonesa en el OPO, 2019-2023. La distribución de las tallas ha sido estandarizada como proporción del número total de atunes medidos en cada gama de tallas. El valor en cada recuadro representa el peso promedio. Fuente: Agencia Pesquera de Japón. [Los datos de composición por talla de 2021 y 2022 no estaban disponibles debido a las dificultades derivadas de la pandemia de COVID-19, que afectaron la recolección y el análisis de los datos de talla de YFT de 2021 y 2022.]

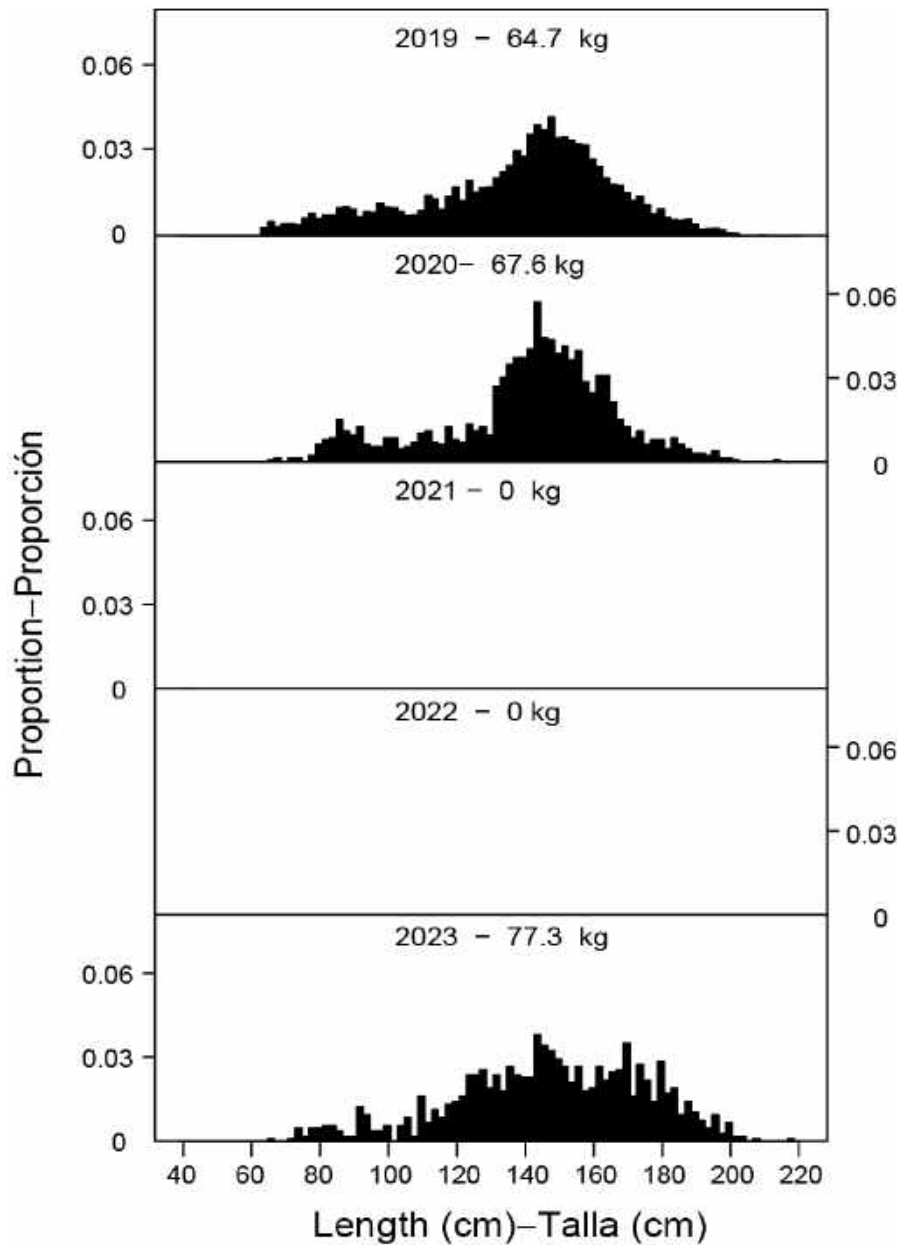


FIGURE A-11. Estimated size compositions of the catches of bigeye by the Japanese longline fleet in the EPO, 2019-2023. The size distribution has been standardized as a proportion of the total number of measured tunas in each size range. The value at the top of each panel is the average weight. Source: Fisheries Agency of Japan. [Size composition data for 2021 and 2022 was not available due to difficulties resulting from the COVID-19 pandemic, which impacted the collection and analysis of 2021 and 2022 BET size data.]

FIGURA A-11. Composición por tallas estimada de las capturas de patudo por la flota palangrera japonesa en el OPO, 2019-2023. La distribución de las tallas ha sido estandarizada como proporción del número total de atunes medidos en cada gama de tallas. El valor en cada recuadro representa el peso promedio. Fuente: Agencia Pesquera de Japón. [Los datos de composición por talla de 2021 y 2022 no estaban disponibles debido a las dificultades derivadas de la pandemia de COVID-19, que afectaron la recolección y el análisis de los datos de talla de BET de 2021 y 2022.]

TABLE A-1. Total annual catches (t) of yellowfin, skipjack, and bigeye tunas, by all types of gear combined, in the Pacific Ocean. The EPO totals for 1995-2024 include discards from purse-seine vessels with carrying capacities greater than 363 t.

TABLA A-1. Capturas totales anuales (t) de atunes aleta amarilla, barrilete, y patudo, por todas las artes combinadas, en el Océano Pacífico. Los totales del OPO de 1995-2024 incluyen los descartes de buques cerqueros de más de 363 t de capacidad de acarreo.

| | YFT | | | SKJ | | | BET | | | Total | | |
|------|---------|---------|-----------|---------|-----------|-----------|---------|---------|---------|---------|-----------|-----------|
| | EPO | WCPO | Total | EPO | WCPO | Total | EPO | WCPO | Total | EPO | WCPO | Total |
| 1995 | 244,639 | 442,805 | 687,444 | 150,661 | 977,478 | 1,128,139 | 108,210 | 110,385 | 218,595 | 503,510 | 1,530,668 | 2,034,178 |
| 1996 | 266,928 | 425,669 | 692,597 | 132,335 | 999,701 | 1,132,036 | 114,706 | 107,168 | 221,874 | 513,969 | 1,532,538 | 2,046,507 |
| 1997 | 277,575 | 481,019 | 758,594 | 188,285 | 939,497 | 1,127,782 | 122,274 | 133,495 | 255,769 | 588,134 | 1,554,011 | 2,142,145 |
| 1998 | 280,606 | 536,845 | 817,451 | 165,489 | 1,244,132 | 1,409,621 | 93,954 | 152,415 | 246,369 | 540,049 | 1,933,392 | 2,473,441 |
| 1999 | 304,638 | 474,648 | 779,286 | 291,249 | 1,070,280 | 1,361,529 | 93,078 | 162,524 | 255,602 | 688,965 | 1,707,452 | 2,396,417 |
| 2000 | 286,863 | 506,028 | 792,891 | 230,479 | 1,194,139 | 1,424,618 | 148,557 | 148,094 | 296,651 | 665,899 | 1,848,261 | 2,514,160 |
| 2001 | 425,008 | 504,501 | 929,509 | 157,676 | 1,100,714 | 1,258,390 | 130,546 | 134,459 | 265,005 | 713,230 | 1,739,674 | 2,452,904 |
| 2002 | 443,458 | 489,995 | 933,453 | 167,048 | 1,253,634 | 1,420,682 | 132,806 | 157,958 | 290,764 | 743,312 | 1,901,587 | 2,644,899 |
| 2003 | 415,933 | 563,926 | 979,859 | 300,470 | 1,245,155 | 1,545,625 | 115,175 | 143,471 | 258,646 | 831,578 | 1,952,552 | 2,784,130 |
| 2004 | 296,847 | 595,888 | 892,735 | 217,249 | 1,354,765 | 1,572,014 | 110,722 | 182,599 | 293,321 | 624,818 | 2,133,252 | 2,758,070 |
| 2005 | 286,492 | 551,822 | 838,314 | 283,453 | 1,418,105 | 1,701,558 | 110,514 | 154,748 | 265,262 | 680,459 | 2,124,675 | 2,805,134 |
| 2006 | 180,519 | 537,076 | 717,595 | 309,090 | 1,479,366 | 1,788,456 | 117,328 | 165,386 | 282,714 | 606,937 | 2,181,828 | 2,788,765 |
| 2007 | 182,141 | 565,930 | 748,071 | 216,324 | 1,663,353 | 1,879,677 | 94,260 | 165,365 | 259,625 | 492,725 | 2,394,648 | 2,887,373 |
| 2008 | 197,328 | 644,365 | 841,693 | 307,699 | 1,649,067 | 1,956,766 | 103,350 | 171,317 | 274,667 | 608,377 | 2,464,749 | 3,073,126 |
| 2009 | 250,413 | 558,914 | 809,327 | 239,408 | 1,761,272 | 2,000,680 | 109,255 | 169,294 | 278,549 | 599,076 | 2,489,480 | 3,088,556 |
| 2010 | 261,871 | 564,607 | 826,478 | 153,092 | 1,680,215 | 1,833,307 | 95,408 | 139,796 | 235,204 | 510,371 | 2,384,618 | 2,894,989 |
| 2011 | 216,720 | 530,946 | 747,666 | 283,509 | 1,536,806 | 1,820,315 | 89,460 | 168,119 | 257,579 | 589,689 | 2,235,871 | 2,825,560 |
| 2012 | 213,310 | 625,697 | 839,007 | 273,519 | 1,731,944 | 2,005,463 | 102,687 | 167,245 | 269,932 | 589,516 | 2,524,886 | 3,114,402 |
| 2013 | 231,170 | 578,467 | 809,637 | 284,043 | 1,831,413 | 2,115,456 | 86,029 | 154,783 | 240,812 | 601,242 | 2,564,663 | 3,165,905 |
| 2014 | 246,784 | 618,262 | 865,046 | 265,490 | 1,985,110 | 2,250,600 | 96,054 | 169,046 | 265,100 | 608,328 | 2,772,418 | 3,380,746 |
| 2015 | 260,265 | 589,128 | 849,393 | 334,049 | 1,788,545 | 2,122,594 | 104,820 | 145,709 | 250,529 | 699,134 | 2,523,382 | 3,222,516 |
| 2016 | 255,465 | 660,291 | 915,756 | 345,163 | 1,788,760 | 2,133,923 | 92,952 | 156,656 | 249,608 | 693,580 | 2,605,707 | 3,299,287 |
| 2017 | 224,800 | 710,202 | 935,002 | 327,629 | 1,609,970 | 1,937,599 | 102,860 | 130,595 | 233,455 | 655,289 | 2,450,767 | 3,106,056 |
| 2018 | 253,305 | 696,706 | 950,011 | 291,352 | 1,843,398 | 2,134,750 | 94,479 | 154,404 | 248,883 | 639,136 | 2,694,508 | 3,333,644 |
| 2019 | 242,248 | 682,704 | 924,952 | 350,992 | 2,044,477 | 2,395,469 | 97,145 | 131,808 | 228,953 | 690,385 | 2,858,989 | 3,549,374 |
| 2020 | 231,603 | 726,403 | 958,006 | 298,583 | 1,721,476 | 2,020,059 | 104,893 | 146,497 | 251,390 | 635,079 | 2,594,376 | 3,229,455 |
| 2021 | 263,755 | 747,354 | 1,011,109 | 328,616 | 1,684,029 | 2,012,645 | 79,953 | 132,915 | 212,868 | 672,324 | 2,564,298 | 3,236,622 |
| 2022 | 298,897 | 689,051 | 987,948 | 298,136 | 1,715,934 | 2,014,070 | 68,217 | 140,838 | 209,055 | 665,250 | 2,545,823 | 3,211,073 |
| 2023 | 306,170 | 739,277 | 1,045,447 | 390,549 | 1,631,322 | 2,021,871 | 67,233 | 140,673 | 207,906 | 763,952 | 2,511,272 | 3,275,224 |
| 2024 | 294,493 | * | 294,493 | 645,260 | * | 645,260 | 51,936 | * | 51,936 | 991,689 | * | 991,689 |

TABLE A-2a. Estimated catches, in metric tons, of tunas and bonitos in the EPO, by fishing gear, 1995-2024. For purse-seine (PS) vessels, retained (Ret.) catches include all vessels; discard (Dis.) data are for Class-6 vessels only. 'C' indicates that the catch has been combined with the total in the 'OTR' column. The purse-seine and pole-and-line (LP) data for yellowfin, skipjack, and bigeye tunas have been adjusted to the species composition estimate, and are preliminary. The data for 2021-2024 are preliminary.

TABLA A-2a. Capturas estimadas, en toneladas métricas, de atunes y bonitos en el OPO, por arte de pesca, 1995-2024. En el caso de los buques de cerco (PS), las capturas retenidas (Ret) incluyen todos los buques; los datos de descartes (Dis.) son de buques de Clase 6 únicamente. 'C' indica que la captura se ha combinado con el total en la columna 'OTR'. Los datos de los atunes aleta amarilla, barrilete, y patudo de las pesquerías de cerco y de caña (LP) fueron ajustados a la estimación de composición por especies, y son preliminares. Los datos de 2021-2024 son preliminares.

| | Yellowfin—Aleta amarilla | | | | | | Skipjack—Barrilete | | | | | | Bigeye—Patudo | | | | | |
|------|--------------------------|--------|-------|--------|-----------|---------|--------------------|--------|-------|-------|-----------|---------|---------------|--------|----|--------|-----------|---------|
| | PS | | LP | LL | OTR + UNK | Total | PS | | LP | LL | OTR + UNK | Total | PS | | LP | LL | OTR + UNK | Total |
| | Ret. | Dis. § | | | | | Ret. | Dis. § | | | | | Ret. | Dis. § | | | | |
| 1995 | 215,434 | 5,275 | 1,268 | 20,596 | 2,066 | 244,639 | 127,047 | 16,373 | 5,253 | 77 | 1,911 | 150,661 | 45,321 | 3,251 | - | 58,269 | 1,369 | 108,210 |
| 1996 | 238,607 | 6,312 | 3,762 | 16,608 | 1,639 | 266,928 | 103,973 | 24,494 | 2,555 | 52 | 1,261 | 132,335 | 61,311 | 5,689 | - | 46,958 | 748 | 114,706 |
| 1997 | 244,878 | 5,516 | 4,418 | 22,163 | 600 | 277,575 | 153,456 | 31,338 | 3,260 | 135 | 96 | 188,285 | 64,272 | 5,402 | - | 52,580 | 20 | 122,274 |
| 1998 | 253,959 | 4,697 | 5,085 | 15,336 | 1,529 | 280,606 | 140,631 | 22,643 | 1,684 | 294 | 237 | 165,489 | 44,129 | 2,822 | - | 46,375 | 628 | 93,954 |
| 1999 | 281,920 | 6,547 | 1,783 | 11,682 | 2,706 | 304,638 | 261,565 | 26,046 | 2,044 | 201 | 1,393 | 291,249 | 51,158 | 4,932 | - | 36,450 | 538 | 93,078 |
| 2000 | 253,263 | 6,205 | 2,431 | 23,855 | 1,109 | 286,863 | 205,647 | 24,467 | 231 | 68 | 66 | 230,479 | 95,282 | 5,417 | - | 47,605 | 253 | 148,557 |
| 2001 | 383,936 | 7,028 | 3,916 | 29,608 | 520 | 425,008 | 143,165 | 12,815 | 448 | 1,214 | 34 | 157,676 | 60,518 | 1,254 | - | 68,755 | 19 | 130,546 |
| 2002 | 412,286 | 4,140 | 950 | 25,531 | 551 | 443,458 | 153,546 | 12,506 | 616 | 261 | 119 | 167,048 | 57,421 | 949 | - | 74,424 | 12 | 132,806 |
| 2003 | 383,279 | 5,865 | 470 | 25,174 | 1,145 | 415,933 | 273,968 | 22,453 | 638 | 634 | 2,777 | 300,470 | 53,052 | 2,326 | - | 59,776 | 21 | 115,175 |
| 2004 | 272,557 | 3,000 | 1,884 | 18,779 | 627 | 296,847 | 197,824 | 17,078 | 528 | 713 | 1,106 | 217,249 | 65,471 | 1,574 | - | 43,483 | 194 | 110,722 |
| 2005 | 268,101 | 2,771 | 1,822 | 11,946 | 1,852 | 286,492 | 263,229 | 16,915 | 1,299 | 231 | 1,779 | 283,453 | 67,895 | 1,900 | - | 40,694 | 25 | 110,514 |
| 2006 | 166,631 | 1,534 | 686 | 10,210 | 1,458 | 180,519 | 296,268 | 11,177 | 435 | 224 | 986 | 309,090 | 83,838 | 1,680 | - | 31,770 | 40 | 117,328 |
| 2007 | 170,016 | 1,725 | 894 | 8,067 | 1,439 | 182,141 | 208,295 | 6,450 | 276 | 238 | 1,065 | 216,324 | 63,450 | 890 | - | 29,876 | 44 | 94,260 |
| 2008 | 185,057 | 696 | 814 | 9,820 | 941 | 197,328 | 296,603 | 8,249 | 499 | 1,185 | 1,163 | 307,699 | 75,028 | 2,086 | - | 26,208 | 28 | 103,350 |
| 2009 | 236,757 | 1,262 | 709 | 10,444 | 1,241 | 250,413 | 230,523 | 6,064 | 151 | 1,584 | 1,086 | 239,408 | 76,799 | 1,019 | - | 31,422 | 15 | 109,255 |
| 2010 | 251,009 | 1,031 | 460 | 8,339 | 1,032 | 261,871 | 147,192 | 2,769 | 47 | 1,815 | 1,269 | 153,092 | 57,752 | 564 | - | 37,090 | 2 | 95,408 |
| 2011 | 206,851 | 415 | 276 | 8,048 | 1,130 | 216,720 | 276,035 | 5,215 | 24 | 1,384 | 851 | 283,509 | 56,512 | 631 | - | 32,317 | - | 89,460 |
| 2012 | 198,017 | 451 | 400 | 12,954 | 1,488 | 213,310 | 266,215 | 3,511 | 303 | 2,381 | 1,109 | 273,519 | 66,020 | 473 | - | 36,167 | 27 | 102,687 |
| 2013 | 218,187 | 207 | 759 | 10,783 | 1,234 | 231,170 | 278,560 | 2,254 | 164 | 2,024 | 1,041 | 284,043 | 49,487 | 273 | - | 36,170 | 99 | 86,029 |
| 2014 | 234,066 | 517 | C | 8,649 | 3,552 | 246,784 | 261,469 | 2,596 | C | 194 | 1,231 | 265,490 | 60,445 | 83 | - | 35,356 | 170 | 96,054 |
| 2015 | 245,727 | 334 | C | 10,622 | 3,582 | 260,265 | 328,907 | 3,699 | C | 187 | 1,256 | 334,049 | 62,913 | 177 | - | 41,709 | 21 | 104,820 |
| 2016 | 242,118 | 404 | C | 9,801 | 3,142 | 255,465 | 337,561 | 4,086 | - | 214 | 3,302 | 345,163 | 56,731 | 541 | - | 35,656 | 24 | 92,952 |
| 2017 | 210,980 | 412 | C | 10,647 | 2,761 | 224,800 | 324,759 | 1,765 | C | 185 | 920 | 327,629 | 66,973 | 201 | - | 35,650 | 36 | 102,860 |
| 2018 | 238,981 | 231 | C | 12,576 | 1,517 | 253,305 | 288,821 | 865 | C | 1,221 | 445 | 291,352 | 64,523 | 145 | C | 29,787 | 24 | 94,479 |
| 2019 | 228,313 | 578 | C | 11,921 | 1,436 | 242,248 | 347,405 | 2,851 | C | 263 | 473 | 350,992 | 69,223 | 117 | - | 27,787 | 18 | 97,145 |
| 2020 | 218,747 | 148 | C | 11,584 | 1,124 | 231,603 | 295,961 | 1,787 | C | 269 | 566 | 298,583 | 78,784 | 106 | - | 25,959 | 44 | 104,893 |
| 2021 | 253,415 | 246 | C | 9,390 | 704 | 263,755 | 326,524 | 1,824 | C | 225 | 43 | 328,616 | 58,170 | 69 | C | 21,705 | 9 | 79,953 |
| 2022 | 291,661 | 332 | C | 6,757 | 147 | 298,897 | 296,791 | 1,058 | C | 201 | 86 | 298,136 | 46,974 | 50 | C | 21,106 | 87 | 68,217 |
| 2023 | 297,980 | 379 | C | 7,187 | 624 | 306,170 | 388,884 | 1,323 | C | 212 | 130 | 390,549 | 42,366 | 92 | C | 24,601 | 174 | 67,233 |
| 2024 | 293,770 | 723 | * | * | * | 294,493 | 640,670 | 4,590 | * | * | * | 645,260 | 34,058 | 238 | * | 17,640 | * | 51,936 |

§ Class-6 (carrying capacity >363 t) purse-seine vessels only—Buques cerqueros de Clase 6 (capacidad de acarreo >363 t) solamente

TABLE A-2a. (continued)
 TABLA A-2a. (continuación)

| | Pacific bluefin—Aleta azul del Pacífico | | | | | | Albacore—Albacora | | | | | | Black skipjack—Barrilete negro | | | | | |
|------|---|--------|----|-----|-----------|--------|-------------------|--------|-------|--------|-----------|--------|--------------------------------|--------|----|-----|-----------|-------|
| | PS | | LP | LL | OTR + UNK | Total | PS | | LP | LL | OTR + UNK | Total | PS | | LP | LL | OTR + UNK | Total |
| | Ret. | Dis. § | | | | | Ret. | Dis. § | | | | | Ret. | Dis. § | | | | |
| 1995 | 659 | - | - | 25 | 264 | 948 | - | - | 465 | 6,185 | 7,427 | 14,077 | 202 | 1,448 | - | - | - | 1,650 |
| 1996 | 8,333 | - | - | 19 | 83 | 8,435 | 11 | - | 72 | 7,631 | 8,398 | 16,112 | 704 | 2,304 | - | 12 | - | 3,020 |
| 1997 | 2,608 | 3 | 2 | 14 | 235 | 2,862 | 1 | - | 59 | 9,678 | 7,540 | 17,278 | 100 | 2,512 | - | 11 | - | 2,623 |
| 1998 | 1,772 | - | - | 95 | 516 | 2,383 | 42 | - | 81 | 12,635 | 13,158 | 25,916 | 489 | 1,876 | 39 | - | - | 2,404 |
| 1999 | 2,553 | 54 | 5 | 151 | 514 | 3,277 | 47 | - | 227 | 11,633 | 14,510 | 26,417 | 171 | 3,404 | - | - | - | 3,575 |
| 2000 | 3,712 | - | 61 | 46 | 349 | 4,168 | 71 | - | 86 | 9,663 | 13,453 | 23,273 | 294 | 1,995 | - | - | - | 2,289 |
| 2001 | 1,155 | 3 | 1 | 148 | 378 | 1,685 | 3 | - | 157 | 19,410 | 13,727 | 33,297 | 2,258 | 1,019 | - | - | - | 3,277 |
| 2002 | 1,758 | 1 | 3 | 71 | 620 | 2,453 | 31 | - | 381 | 15,289 | 14,433 | 30,134 | 1,459 | 2,283 | 8 | - | - | 3,750 |
| 2003 | 3,233 | - | 3 | 87 | 369 | 3,692 | 34 | - | 59 | 24,901 | 20,397 | 45,391 | 433 | 1,535 | 6 | 13 | 117 | 2,104 |
| 2004 | 8,880 | 19 | - | 15 | 59 | 8,973 | 105 | - | 126 | 18,444 | 22,011 | 40,686 | 884 | 387 | - | 27 | 862 | 2,160 |
| 2005 | 4,743 | 15 | - | - | 80 | 4,838 | 2 | - | 66 | 9,350 | 15,668 | 25,086 | 1,472 | 2,124 | - | - | 22 | 3,618 |
| 2006 | 9,928 | - | - | - | 93 | 10,021 | 109 | - | 1 | 13,831 | 18,980 | 32,921 | 1,999 | 1,972 | - | - | - | 3,971 |
| 2007 | 4,189 | - | - | - | 14 | 4,203 | 187 | - | 21 | 11,107 | 19,261 | 30,576 | 2,307 | 1,625 | - | 2 | 54 | 3,988 |
| 2008 | 4,392 | 14 | 15 | - | 63 | 4,484 | 49 | - | 1,050 | 9,218 | 16,505 | 26,822 | 3,624 | 2,251 | - | - | 8 | 5,883 |
| 2009 | 3,428 | 24 | - | - | 161 | 3,613 | 50 | 2 | - | 12,072 | 19,090 | 31,214 | 4,256 | 1,020 | - | 2 | - | 5,278 |
| 2010 | 7,746 | - | - | 3 | 89 | 7,838 | 25 | - | - | 14,256 | 19,363 | 33,644 | 3,425 | 1,079 | - | 8 | 184 | 4,696 |
| 2011 | 2,829 | 4 | - | 1 | 244 | 3,078 | 10 | - | - | 16,191 | 16,074 | 32,275 | 2,317 | 719 | - | 6 | - | 3,042 |
| 2012 | 6,705 | - | - | 1 | 405 | 7,111 | - | - | - | 24,198 | 18,100 | 42,298 | 4,504 | 440 | - | 5 | 7 | 4,956 |
| 2013 | 3,154 | - | - | 1 | 819 | 3,974 | - | - | - | 25,396 | 18,513 | 43,909 | 3,580 | 805 | - | 10 | 24 | 4,419 |
| 2014 | 5,263 | 66 | C | 1 | 427 | 5,757 | - | - | - | 29,231 | 19,463 | 48,694 | 4,153 | 486 | - | 11 | 81 | 4,731 |
| 2015 | 3,168 | - | C | 7 | 412 | 3,587 | - | - | - | 28,939 | 17,142 | 46,081 | 3,763 | 356 | - | 1 | 111 | 4,231 |
| 2016 | 3,025 | - | C | 0 | 728 | 3,753 | 2 | - | - | 26,777 | 14,567 | 41,346 | 6,606 | 792 | - | - | 178 | 7,576 |
| 2017 | 4,109 | - | C | 3 | 482 | 4,594 | - | - | - | 26,592 | 9,442 | 36,034 | 5,079 | 306 | C | - | 54 | 5,439 |
| 2018 | 2,852 | - | C | 0 | 588 | 3,440 | 8 | - | - | 25,759 | 11,138 | 36,905 | 3,002 | 732 | C | - | 120 | 3,854 |
| 2019 | 2,475 | - | C | 0 | 530 | 3,005 | - | - | - | 20,814 | 11,876 | 32,690 | 5,199 | 499 | C | - | 132 | 5,830 |
| 2020 | 3,383 | 19 | C | 1 | 857 | 4,260 | - | - | - | 19,983 | 10,338 | 30,321 | 4,573 | 684 | C | - | 363 | 5,620 |
| 2021 | 3,069 | 0 | C | 0 | 1,466 | 4,535 | - | - | - | 31,439 | 6,962 | 38,401 | 4,699 | 472 | C | 109 | 129 | 5,409 |
| 2022 | 3,392 | 7 | C | 2 | 1,749 | 5,150 | 76 | 0 | - | 31,809 | 12,758 | 44,643 | 6,453 | 591 | C | - | 9 | 7,053 |
| 2023 | 3,402 | 1 | C | 2 | 2,068 | 5,473 | 0 | 0 | - | 29,789 | 4,901 | 34,690 | 5,456 | 345 | C | 1 | 25 | 5,827 |
| 2024 | 3,531 | 18 | * | * | * | 3,549 | 1 | 0 | - | * | * | 1 | 6,647 | 811 | * | * | * | 7,458 |

§ Class-6 (carrying capacity >363 t) purse-seine vessels only-Buques cerqueros de Clase 6 (capacidad de acarreo >363 t) solamente

TABLE A-2a. (continued)
TABLA A-2a. (continuación)

| | Bonitos | | | | | | Unidentified tunas— Atunes no identificados | | | | | | Total | | | | | |
|------|---------|--------|-----|----|--------------|--------|--|--------|----|-------|-----------------|--------|---------|--------|-------|---------|--------------|-----------|
| | PS | | LP | LL | OTR + UNK | Total | PS | | LP | LL | OTR + UNK | Total | PS | | LP | LL | OTR + UNK | Total |
| | Ret. | Dis. § | | | | | Ret. | Dis. § | | | | | Ret. | Dis. § | | | | |
| 1995 | 7,929 | 55 | 81 | - | 54 | 8,119 | 11 | 626 | - | - | 1,004 | 1,641 | 396,603 | 27,028 | 7,066 | 85,152 | 14,096 | 529,945 |
| 1996 | 647 | 1 | 7 | - | 16 | 671 | 37 | 1,028 | - | - | 1,038 | 2,103 | 413,623 | 39,827 | 6,395 | 71,283 | 13,183 | 544,311 |
| 1997 | 1,097 | 4 | 8 | - | 34 | 1,143 | 71 | 3,383 | - | 7 | 1,437 | 4,898 | 466,483 | 48,157 | 7,747 | 84,588 | 9,962 | 616,936 |
| 1998 | 1,330 | 4 | 7 | - | 588 | 1,929 | 13 | 1,233 | - | 24 | 18,158 | 19,428 | 442,365 | 33,276 | 6,897 | 74,758 | 34,815 | 592,111 |
| 1999 | 1,719 | - | - | 24 | 369 | 2,112 | 27 | 3,092 | - | 2,113 | 4,279 | 9,511 | 599,160 | 44,076 | 4,059 | 62,254 | 24,310 | 733,859 |
| 2000 | 636 | - | - | 75 | 56 | 767 | 190 | 1,410 | - | 1,992 | 1,468 | 5,060 | 559,095 | 39,494 | 2,809 | 83,305 | 16,756 | 701,459 |
| 2001 | 17 | - | - | 34 | 19 | 70 | 191 | 679 | - | 2,448 | 55 | 3,373 | 591,243 | 22,799 | 4,523 | 121,616 | 14,755 | 754,935 |
| 2002 | - | - | - | - | 1 | 1 | 576 | 1,863 | - | 482 | 1,422 | 4,343 | 627,077 | 21,741 | 1,958 | 116,057 | 17,158 | 783,992 |
| 2003 | - | - | 1 | - | 25 | 26 | 80 | 1,238 | - | 215 | 750 | 2,283 | 714,079 | 33,416 | 1,177 | 110,799 | 25,600 | 885,071 |
| 2004 | 15 | 35 | 1 | 8 | 3 | 62 | 256 | 973 | - | 349 | 258 | 1,836 | 545,992 | 23,066 | 2,539 | 81,818 | 25,120 | 678,536 |
| 2005 | 313 | 18 | - | - | 11 | 342 | 190 | 1,922 | - | 363 | 427 | 2,902 | 605,945 | 25,664 | 3,187 | 62,585 | 19,865 | 717,246 |
| 2006 | 3,507 | 80 | 12 | - | 3 | 3,602 | 50 | 1,910 | - | 29 | 193 | 2,182 | 562,330 | 18,353 | 1,134 | 56,066 | 21,754 | 659,636 |
| 2007 | 15,906 | 628 | 107 | 2 | - | 16,643 | 598 | 1,221 | - | 2,197 | 301 | 4,317 | 464,948 | 12,540 | 1,298 | 51,488 | 22,179 | 552,452 |
| 2008 | 7,874 | 37 | 9 | 6 | 26 | 7,952 | 136 | 1,380 | 1 | 727 | 883 | 3,127 | 572,763 | 14,712 | 2,388 | 47,164 | 19,617 | 656,644 |
| 2009 | 9,720 | 15 | - | 8 | 77 | 9,820 | 162 | 469 | - | 1,933 | 74 | 2,638 | 561,695 | 9,875 | 860 | 57,466 | 21,743 | 651,640 |
| 2010 | 2,820 | 19 | 4 | 2 | 70 | 2,915 | 136 | 709 | - | 1,770 | 36 | 2,651 | 470,105 | 6,170 | 511 | 63,279 | 22,045 | 562,111 |
| 2011 | 7,969 | 45 | 18 | 10 | 11 | 8,053 | 108 | 784 | - | 3,178 | - | 4,070 | 552,631 | 7,813 | 318 | 61,136 | 18,311 | 640,208 |
| 2012 | 8,191 | 156 | - | 1 | 64 | 8,412 | 41 | 354 | - | 196 | 221 | 812 | 549,693 | 5,385 | 704 | 75,900 | 21,419 | 653,101 |
| 2013 | 2,067 | 9 | - | 13 | 27 | 2,116 | 53 | 461 | - | - | 529 | 1,043 | 555,088 | 4,009 | 923 | 74,397 | 22,286 | 656,703 |
| 2014 | 2,821 | 38 | - | - | 154 | 3,013 | 113 | 328 | - | 269 | 392 | 1,102 | 568,330 | 4,113 | C | 73,711 | 25,470 | 671,625 |
| 2015 | 789 | 28 | - | 1 | - | 818 | 90 | 242 | - | - | 1,232 | 1,564 | 645,357 | 4,836 | C | 81,466 | 23,756 | 755,415 |
| 2016 | 3,806 | 15 | - | - | 1 | 3,822 | 129 | 212 | - | - | 294 | 635 | 649,978 | 6,050 | C | 72,448 | 22,236 | 750,712 |
| 2017 | 3,438 | 54 | - | - | 130 | 3,622 | 234 | 303 | C | 1 | 366 | 904 | 615,572 | 3,041 | C | 73,078 | 14,191 | 705,882 |
| 2018 | 2,409 | 58 | - | - | 44 | 2,511 | 75 | 448 | - | 3 | 213 | 739 | 600,671 | 2,479 | C | 69,346 | 14,089 | 686,585 |
| 2019 | 7,255 | 27 | - | - | 37,775 | 45,057 | 83 | 276 | - | 4 | 66 | 429 | 659,953 | 4,348 | C | 60,789 | 52,306 | 777,396 |
| 2020 | 3,169 | 6 | - | - | 41,446 | 44,621 | 211 | 480 | - | 4 | 44 | 739 | 604,828 | 3,230 | C | 57,800 | 54,782 | 720,640 |
| 2021 | 6,899 | 75 | - | - | 46,153 | 53,127 | 1,253 | 441 | - | 1 | 172 | 1,867 | 654,029 | 3,127 | C | 62,869 | 55,638 | 775,663 |
| 2022 | 3,242 | 9 | - | - | * | 3,251 | 2,379 | 705 | - | 0 | 0 | 3,084 | 650,968 | 2,752 | C | 59,875 | 14,836 | 728,431 |
| 2023 | 855 | 0 | C | - | 64,831 | 65,686 | 1,943 | 589 | - | - | 424 | 2,956 | 740,886 | 2,729 | C | 61,792 | 73,177 | 878,584 |
| 2024 | 0 | 18 | * | - | * | 18 | 2,643 | 601 | - | - | * | 3,244 | 981,320 | 6,999 | * | 17,640 | * | 1,005,959 |

§ Class-6 (carrying capacity >363 t) purse-seine vessels only-Buques cerqueros de Clase 6 (capacidad de acarreo >363 t) solamente

TABLE A-2b. Estimated catches, in metric tons, of billfishes in the EPO, by fishing gear, 1995-2024. Purse-seine (PS) vessel data are for Class-6 vessels only. The data for 2021-2024 are preliminary.

TABLA A-2b. Capturas estimadas, en toneladas métricas, de peces picudos en el OPO, por arte de pesca, 1995-2024. En el caso de los buques de cerco (PS), los datos son de buques de Clase 6 únicamente. Los datos de 2021-2024 son preliminares.

| | Swordfish—Pez espada | | | | | Blue marlin—Marlín azul | | | | | Black marlin—Marlín negro | | | | | Striped marlin-Marlín rayado | | | | |
|------|----------------------|------|--------|-------|--------|-------------------------|------|-------|-----|-------|---------------------------|------|-----|-----|-------|------------------------------|------|-------|-------|-------|
| | PS § | | LL | OTR | Total | PS § | | LL | OTR | Total | PS § | | LL | OTR | Total | PS § | | LL | OTR | Total |
| | Ret. | Dis. | | | | Ret. | Dis. | | | | Ret. | Dis. | | | | Ret. | Dis. | | | |
| 1995 | 3 | - | 4,495 | 2,974 | 7,472 | 70 | 16 | 7,288 | - | 7,374 | 43 | 23 | 158 | - | 224 | 18 | 8 | 3,249 | 296 | 3,571 |
| 1996 | 1 | - | 7,071 | 2,486 | 9,558 | 62 | 15 | 3,596 | - | 3,673 | 46 | 24 | 100 | - | 170 | 20 | 9 | 3,218 | 430 | 3,677 |
| 1997 | 2 | 1 | 10,580 | 1,781 | 12,364 | 126 | 15 | 5,915 | - | 6,056 | 71 | 22 | 154 | - | 247 | 28 | 3 | 4,473 | 329 | 4,833 |
| 1998 | 3 | - | 9,800 | 3,246 | 13,049 | 130 | 20 | 4,856 | - | 5,006 | 72 | 28 | 168 | - | 268 | 20 | 3 | 3,558 | 509 | 4,090 |
| 1999 | 2 | - | 7,569 | 1,965 | 9,536 | 181 | 38 | 3,691 | - | 3,910 | 83 | 42 | 94 | - | 219 | 26 | 11 | 2,621 | 376 | 3,034 |
| 2000 | 3 | - | 8,930 | 2,383 | 11,316 | 120 | 23 | 3,634 | - | 3,777 | 67 | 21 | 105 | - | 193 | 17 | 3 | 1,889 | 404 | 2,313 |
| 2001 | 3 | 1 | 16,007 | 1,964 | 17,975 | 119 | 40 | 4,196 | - | 4,355 | 67 | 48 | 123 | - | 238 | 13 | 8 | 1,961 | 342 | 2,324 |
| 2002 | 1 | - | 17,598 | 2,119 | 19,718 | 188 | 33 | 3,480 | - | 3,701 | 86 | 30 | 78 | - | 194 | 69 | 5 | 2,158 | 412 | 2,644 |
| 2003 | 3 | 1 | 18,161 | 354 | 18,519 | 185 | 21 | 4,015 | - | 4,221 | 121 | 26 | 73 | - | 220 | 31 | 4 | 1,904 | 417 | 2,356 |
| 2004 | 2 | - | 15,372 | 309 | 15,683 | 140 | 21 | 3,783 | - | 3,944 | 62 | 5 | 41 | - | 108 | 23 | 1 | 1,547 | 390 | 1,961 |
| 2005 | 2 | - | 8,935 | 4,304 | 13,241 | 209 | 14 | 3,350 | - | 3,573 | 95 | 9 | 39 | - | 143 | 37 | 4 | 1,531 | 553 | 2,125 |
| 2006 | 7 | - | 9,890 | 3,800 | 13,697 | 164 | 21 | 2,934 | 105 | 3,224 | 124 | 21 | 77 | - | 222 | 54 | 3 | 1,735 | 490 | 2,282 |
| 2007 | 4 | - | 9,639 | 4,390 | 14,033 | 124 | 13 | 2,393 | 106 | 2,636 | 74 | 8 | 47 | - | 129 | 32 | 4 | 1,656 | 1,024 | 2,716 |
| 2008 | 6 | - | 12,248 | 3,071 | 15,325 | 125 | 8 | 1,705 | 114 | 1,952 | 76 | 9 | 100 | - | 185 | 33 | 2 | 1,291 | 1,045 | 2,371 |
| 2009 | 4 | - | 15,539 | 3,905 | 19,448 | 159 | 15 | 2,102 | 131 | 2,407 | 76 | 8 | 94 | - | 178 | 23 | 2 | 1,333 | 7 | 1,365 |
| 2010 | 4 | - | 18,396 | 4,480 | 22,880 | 176 | 12 | 2,920 | 126 | 3,234 | 62 | 9 | 160 | - | 231 | 21 | 2 | 2,129 | 9 | 2,161 |
| 2011 | 3 | - | 20,400 | 5,101 | 25,504 | 150 | 6 | 2,025 | 144 | 2,325 | 59 | 7 | 187 | - | 253 | 28 | 1 | 2,640 | 16 | 2,685 |
| 2012 | 5 | - | 23,587 | 7,148 | 30,740 | 178 | 15 | 3,723 | 177 | 4,093 | 71 | 4 | 444 | - | 519 | 28 | - | 2,703 | 20 | 2,751 |
| 2013 | 2 | - | 22,342 | 5,560 | 27,904 | 172 | 15 | 4,202 | 168 | 4,557 | 99 | 4 | 138 | - | 241 | 21 | 1 | 2,439 | 19 | 2,480 |
| 2014 | 4 | - | 21,331 | 6,332 | 27,667 | 209 | 12 | 4,069 | 186 | 4,476 | 70 | 4 | 151 | - | 225 | 22 | 1 | 1,929 | 3 | 1,955 |
| 2015 | 5 | 1 | 26,021 | 6,159 | 32,186 | 306 | 11 | 4,170 | 182 | 4,669 | 117 | 14 | 239 | - | 370 | 26 | - | 1,267 | 474 | 1,767 |
| 2016 | 4 | - | 24,370 | 7,513 | 31,887 | 247 | 6 | 3,776 | 175 | 4,204 | 62 | 3 | 80 | - | 145 | 19 | - | 1,562 | 4 | 1,585 |
| 2017 | 1 | 2 | 22,449 | 8,073 | 30,525 | 151 | 4 | 3,903 | 191 | 4,249 | 39 | 1 | 211 | - | 251 | 10 | - | 1,752 | 7 | 1,769 |
| 2018 | 2 | - | 24,571 | 7,040 | 31,613 | 167 | 1 | 4,094 | 174 | 4,436 | 23 | - | 298 | - | 321 | 10 | 1 | 1,819 | 5 | 1,835 |
| 2019 | 3 | - | 21,874 | 9,248 | 31,125 | 201 | 4 | 2,499 | 186 | 2,890 | 45 | - | 162 | - | 207 | 16 | - | 1,733 | 11 | 1,760 |
| 2020 | 2 | - | 22,489 | 5,768 | 28,259 | 131 | 1 | 2,787 | 194 | 3,113 | 45 | - | 611 | - | 656 | 10 | - | 1,843 | 9 | 1,862 |
| 2021 | 2 | - | 18,861 | 5,046 | 23,909 | 117 | 1 | 1,622 | - | 1,740 | 38 | - | 372 | - | 410 | 12 | - | 1,340 | 2 | 1,354 |
| 2022 | 3 | - | 20,687 | 5,038 | 25,728 | 168 | 3 | 1,250 | - | 1,421 | 39 | 1 | 213 | - | 253 | 16 | 1 | 1,062 | 2 | 1,081 |
| 2023 | 3 | 0 | 21,871 | 7,354 | 29,228 | 185 | 2 | 1,415 | - | 1,602 | 52 | 2 | 260 | - | 314 | 16 | 0 | 1,392 | 2 | 1,410 |
| 2024 | 3 | 0 | * | * | 3 | 205 | 6 | * | - | 211 | 50 | 1 | * | - | 51 | 22 | 0 | * | * | 22 |

§ Class-6 (carrying capacity >363 t) purse-seine vessels only-Buques cerqueros de Clase 6 (capacidad de acarreo >363 t) solamente

TABLE A-2b. (continued)
 TABLA A-2b. (continuación)

| | Shortbill spearfish— Marlín trompa corta | | | | | Sailfish— Pez vela | | | | | Unidentified istiophorid billfishes—Pículos isto- fóridos no identificados | | | | | Total billfishes— Total de peces picudos | | | | |
|------|---|------|-----|-----|-------|-----------------------|------|-------|-----|-------|--|------|-------|-----|-------|---|------|--------|-------|--------|
| | PS § | | LL | OTR | Total | PS § | | LL | OTR | Total | PS § | | LL | OTR | Total | PS § | | LL | OTR | Total |
| | Ret. | Dis. | | | | Ret. | Dis. | | | | Ret. | Dis. | | | | Ret. | Dis. | | | |
| 1995 | 1 | - | 155 | - | 156 | 12 | 15 | 1,351 | - | 1,378 | 4 | 9 | 232 | - | 245 | 151 | 71 | 16,928 | 3,270 | 20,420 |
| 1996 | 1 | - | 126 | - | 127 | 10 | 12 | 738 | - | 760 | 6 | 13 | 308 | - | 327 | 146 | 73 | 15,157 | 2,916 | 18,292 |
| 1997 | 1 | - | 141 | - | 142 | 12 | 11 | 1,891 | - | 1,914 | 3 | 5 | 1,324 | - | 1,332 | 243 | 57 | 24,478 | 2,110 | 26,888 |
| 1998 | - | - | 200 | - | 200 | 28 | 31 | 1,382 | - | 1,441 | 5 | 7 | 575 | 55 | 642 | 258 | 89 | 20,539 | 3,810 | 24,696 |
| 1999 | 1 | - | 278 | - | 279 | 33 | 8 | 1,216 | - | 1,257 | 6 | 12 | 1,136 | - | 1,154 | 332 | 111 | 16,605 | 2,341 | 19,389 |
| 2000 | 1 | - | 285 | - | 286 | 33 | 17 | 1,380 | - | 1,430 | 3 | 6 | 880 | 136 | 1,025 | 244 | 70 | 17,103 | 2,923 | 20,340 |
| 2001 | - | - | 304 | - | 304 | 18 | 45 | 1,539 | 325 | 1,927 | 2 | 5 | 1,741 | 204 | 1,952 | 222 | 147 | 25,871 | 2,835 | 29,075 |
| 2002 | 1 | - | 273 | - | 274 | 19 | 15 | 1,792 | 17 | 1,843 | 4 | 5 | 1,862 | 14 | 1,885 | 368 | 88 | 27,241 | 2,562 | 30,259 |
| 2003 | 1 | 4 | 290 | - | 295 | 38 | 49 | 1,174 | - | 1,261 | 6 | 5 | 1,389 | - | 1,400 | 385 | 110 | 27,006 | 771 | 28,272 |
| 2004 | 1 | - | 207 | - | 208 | 19 | 13 | 1,400 | 17 | 1,449 | 4 | 4 | 1,385 | - | 1,393 | 251 | 44 | 23,735 | 716 | 24,746 |
| 2005 | 1 | - | 229 | - | 230 | 32 | 11 | 805 | 15 | 863 | 5 | 3 | 901 | - | 909 | 381 | 41 | 15,790 | 4,872 | 21,084 |
| 2006 | 1 | - | 231 | - | 232 | 30 | 13 | 1,007 | 35 | 1,085 | 23 | 4 | 490 | 1 | 518 | 403 | 62 | 16,364 | 4,431 | 21,260 |
| 2007 | 1 | - | 239 | - | 240 | 41 | 8 | 1,032 | 64 | 1,145 | 13 | 4 | 1,171 | 15 | 1,203 | 289 | 37 | 16,177 | 5,599 | 22,102 |
| 2008 | 1 | - | 266 | - | 267 | 28 | 7 | 524 | 72 | 631 | 16 | 5 | 1,587 | 8 | 1,616 | 285 | 31 | 17,721 | 4,310 | 22,347 |
| 2009 | 1 | - | 446 | - | 447 | 17 | 6 | 327 | 8 | 358 | 11 | 1 | 1,799 | 12 | 1,823 | 291 | 32 | 21,640 | 4,063 | 26,026 |
| 2010 | 1 | - | 519 | - | 520 | 27 | 20 | 655 | 3 | 705 | 8 | 2 | 2,604 | - | 2,614 | 299 | 45 | 27,383 | 4,618 | 32,345 |
| 2011 | - | - | 462 | - | 462 | 18 | 5 | 658 | 28 | 709 | 15 | 1 | 2,377 | 3 | 2,396 | 273 | 20 | 28,749 | 5,292 | 34,334 |
| 2012 | 1 | - | 551 | - | 552 | 14 | 2 | 685 | 15 | 716 | 10 | 1 | 2,178 | - | 2,189 | 307 | 22 | 33,871 | 7,360 | 41,560 |
| 2013 | 1 | - | 913 | - | 914 | 16 | 2 | 614 | 9 | 641 | 15 | 3 | 2,743 | 1 | 2,762 | 326 | 25 | 33,391 | 5,757 | 39,499 |
| 2014 | - | - | 721 | - | 721 | 16 | 1 | 481 | 8 | 506 | 8 | 2 | 220 | 3 | 233 | 329 | 20 | 28,902 | 6,532 | 35,783 |
| 2015 | 1 | - | 498 | - | 499 | 18 | 8 | 1,403 | 22 | 1,451 | 19 | 1 | 654 | 4 | 678 | 492 | 35 | 34,252 | 6,841 | 41,620 |
| 2016 | 1 | - | 416 | - | 417 | 49 | 9 | 458 | 19 | 535 | 112 | 9 | 633 | 1 | 755 | 494 | 27 | 31,295 | 7,712 | 39,528 |
| 2017 | - | - | 245 | - | 245 | 22 | 2 | 526 | 15 | 565 | 164 | 12 | 259 | 16 | 451 | 387 | 21 | 29,345 | 8,302 | 38,055 |
| 2018 | - | - | 234 | - | 234 | 13 | 2 | 466 | 17 | 498 | 123 | 6 | 204 | 12 | 345 | 338 | 10 | 31,686 | 7,248 | 39,282 |
| 2019 | - | - | 751 | - | 751 | 17 | 1 | 857 | 5 | 880 | 121 | 5 | 416 | 51 | 593 | 403 | 11 | 28,292 | 9,501 | 38,207 |
| 2020 | 1 | - | 611 | - | 612 | 18 | 1 | 492 | 3 | 514 | 77 | 3 | 564 | 32 | 676 | 284 | 5 | 29,397 | 6,006 | 35,692 |
| 2021 | - | - | 115 | - | 115 | 10 | 1 | 602 | - | 613 | 70 | 6 | 78 | 23 | 177 | 249 | 8 | 22,990 | 5,071 | 28,318 |
| 2022 | 1 | - | 174 | - | 175 | 8 | 2 | 548 | - | 558 | 61 | 4 | 101 | 2 | 168 | 296 | 11 | 24,035 | 5,042 | 29,384 |
| 2023 | 1 | 0 | 107 | - | 108 | 9 | 1 | 458 | - | 468 | 63 | 3 | 51 | 16 | 133 | 328 | 8 | 25,554 | 7,372 | 33,263 |
| 2024 | 0 | 0 | * | - | - | 18 | 1 | * | - | 19 | 62 | 3 | * | * | 65 | 360 | 11 | * | * | 371 |

§ Class-6 (carrying capacity >363 t) purse-seine vessels only—Buques cerqueros de Clase 6 (capacidad de acarreo >363 t) solamente

TABLE A-3a. Retained catches (t) of yellowfin tuna by purse-seine vessels in the EPO, by vessel flag. ‘C’ indicates that the catch has been combined with the total in the ‘OTR’ column. The data have been adjusted to the species composition estimate and are preliminary.

TABLA A-3a. Capturas retenidas (t) de atún aleta amarilla por buques de cerco en el OPO, por bandera del buque. ‘C’ indica que la captura se ha combinado con el total en la columna ‘OTR’. Los datos están ajustados a la estimación de composición por especie, y son preliminares.

| | COL | CRI | ECU | EU (ESP) | MEX | NIC | PAN | PER | SLV | USA | VEN | VUT | C + OTR ¹ | Total |
|------|--------|-----|--------|----------|---------|--------|--------|-------|-------|-------|---------|--------|----------------------|---------|
| 1995 | 8,829 | C | 17,044 | C | 108,749 | - | 1,714 | - | - | 5,069 | 47,804 | 22,220 | 4,005 | 215,434 |
| 1996 | 9,855 | C | 17,125 | C | 119,878 | - | 3,084 | - | - | 6,948 | 62,846 | 10,549 | 8,322 | 238,607 |
| 1997 | 9,402 | - | 18,697 | C | 120,761 | - | 4,807 | - | - | 5,826 | 57,881 | 20,701 | 6,803 | 244,878 |
| 1998 | 15,592 | - | 36,201 | 5,449 | 106,840 | - | 3,330 | - | C | 2,776 | 61,425 | 17,342 | 5,004 | 253,959 |
| 1999 | 13,267 | - | 53,683 | 8,322 | 114,545 | C | 5,782 | - | C | 3,400 | 55,443 | 16,476 | 11,002 | 281,920 |
| 2000 | 6,138 | - | 35,492 | 10,318 | 101,662 | C | 5,796 | - | - | 4,374 | 67,672 | 8,247 | 13,563 | 253,262 |
| 2001 | 12,950 | - | 55,347 | 18,448 | 130,087 | C | 9,552 | - | C | 5,670 | 108,974 | 10,729 | 32,180 | 383,937 |
| 2002 | 17,574 | - | 32,512 | 16,990 | 152,864 | C | 15,719 | C | 7,412 | 7,382 | 123,264 | 7,502 | 31,068 | 412,287 |
| 2003 | 9,770 | - | 34,271 | 12,281 | 172,807 | - | 16,591 | C | C | 3,601 | 96,914 | 9,334 | 27,710 | 383,279 |
| 2004 | C | - | 40,886 | 13,622 | 91,442 | C | 33,563 | - | C | C | 39,094 | 7,371 | 46,577 | 272,555 |
| 2005 | C | - | 40,596 | 11,947 | 110,898 | 4,838 | 33,393 | - | 6,470 | C | 28,684 | C | 31,276 | 268,102 |
| 2006 | C | - | 26,049 | 8,409 | 69,449 | 4,236 | 22,521 | - | C | C | 13,286 | C | 22,679 | 166,629 |
| 2007 | C | - | 19,749 | 2,631 | 65,091 | 3,917 | 26,024 | - | C | C | 20,097 | C | 32,507 | 170,016 |
| 2008 | C | - | 18,463 | 3,023 | 84,462 | 4,374 | 26,993 | C | C | C | 17,692 | C | 30,050 | 185,057 |
| 2009 | C | - | 18,167 | 7,864 | 99,785 | 6,686 | 35,228 | C | C | C | 25,298 | C | 43,729 | 236,757 |
| 2010 | 20,493 | - | 34,764 | 2,820 | 104,969 | 9,422 | 34,538 | C | C | - | 21,244 | C | 22,758 | 251,008 |
| 2011 | 18,643 | - | 32,946 | 1,072 | 99,812 | 7,781 | 18,607 | - | C | C | 18,712 | C | 9,278 | 206,851 |
| 2012 | 20,924 | - | 29,485 | 1,065 | 93,323 | 7,541 | 15,932 | - | C | C | 23,408 | C | 6,339 | 198,017 |
| 2013 | 16,476 | - | 27,655 | 511 | 114,706 | 8,261 | 18,301 | C | C | - | 24,896 | C | 7,381 | 218,187 |
| 2014 | 17,185 | - | 37,546 | 760 | 120,980 | 8,100 | 19,349 | C | C | 1,105 | 23,025 | - | 6,016 | 234,066 |
| 2015 | 17,270 | - | 50,153 | C | 106,171 | 6,876 | 26,558 | 783 | C | 3,212 | 30,428 | - | 4,276 | 245,727 |
| 2016 | 19,280 | - | 59,280 | C | 93,928 | 11,047 | 23,249 | 1,647 | C | 4,578 | 23,812 | - | 5,298 | 242,118 |
| 2017 | 15,106 | - | 55,705 | C | 80,870 | 9,347 | 19,921 | 3,349 | C | 6,500 | 16,809 | - | 3,373 | 210,980 |
| 2018 | 21,855 | - | 57,164 | C | 101,651 | 7,552 | 22,625 | 1,458 | C | 3,808 | 19,527 | - | 3,341 | 238,981 |
| 2019 | 17,177 | - | 46,102 | C | 105,426 | 7,114 | 17,826 | 1,782 | C | 6,515 | 22,558 | - | 3,814 | 228,313 |
| 2020 | 16,641 | - | 39,897 | C | 102,137 | 5,423 | 22,585 | 561 | C | 3,728 | 24,475 | - | 3,300 | 218,747 |
| 2021 | 14,613 | - | 50,420 | C | 107,945 | 7,429 | 30,095 | C | C | 4,595 | 33,293 | - | 5,025 | 253,415 |
| 2022 | 15,710 | - | 59,897 | C | 119,381 | 8,918 | 39,151 | * | C | 4,399 | 37,995 | - | 6,210 | 291,661 |
| 2023 | 21,147 | - | 53,588 | C | 143,062 | 10,083 | 35,118 | C | C | 4,811 | 24,089 | - | 6,082 | 297,980 |
| 2024 | 8,034 | - | 45,369 | C | 157,601 | 6,683 | 35,884 | C | C | 3,335 | 33,186 | - | 3,678 | 293,770 |

¹ Includes—Incluye: BLZ, BOL, CHN, EU(CYP), GTM, HND, LBR, NZL, UNK

TABLE A-3b. Total annual catches (t) of yellowfin tuna by longline vessels, and totals for all gears, in the EPO, by vessel flag. ‘C’ indicates that the catch has been combined with the total in the ‘OTR’ column. The data for 2021-2024 are preliminary.

TABLA A-3b. Capturas totales anuales (t) de atún aleta amarilla por buques de palangre en el OPO, y totales de todas las artes, por bandera del buque. ‘C’ indica que la captura se ha combinado con el total en la columna ‘OTR’. Los datos de 2021-2024 son preliminares.

| | CHN | CRI | FRA (PYF) | JPN | KOR | MEX | PAN | TWN | USA | VUT | C + OTR ¹ | Total LL | Total PS+LL | OTR ² |
|------|-------|-------|--------------|--------|-------|-----|-------|-------|-----|-----|-------------------------|-------------|----------------|------------------|
| 1995 | - | 542 | 198 | 17,042 | 2,748 | 7 | - | 28 | 31 | - | * | 20,596 | 236,030 | 3,334 |
| 1996 | - | 183 | 253 | 12,631 | 3,491 | 0 | - | 37 | 13 | - | * | 16,608 | 255,215 | 5,401 |
| 1997 | - | 715 | 307 | 16,218 | 4,753 | - | - | 131 | 11 | - | 28 | 22,163 | 267,041 | 5,018 |
| 1998 | - | 1,124 | 388 | 10,048 | 3,624 | 16 | - | 113 | 15 | - | 8 | 15,336 | 269,295 | 6,614 |
| 1999 | - | 1,031 | 206 | 7,186 | 3,030 | 10 | - | 186 | 7 | - | 26 | 11,682 | 293,602 | 4,489 |
| 2000 | - | 1,084 | 1,052 | 15,265 | 5,134 | 153 | 359 | 742 | 10 | 5 | 51 | 23,855 | 277,118 | 3,540 |
| 2001 | 942 | 1,133 | 846 | 14,808 | 5,230 | 29 | 732 | 3,928 | 29 | 13 | 1,918 | 29,608 | 413,544 | 4,436 |
| 2002 | 1,457 | 1,563 | 278 | 8,513 | 3,626 | 4 | 907 | 7,360 | 5 | 290 | 1,528 | 25,531 | 437,817 | 1,501 |
| 2003 | 2,739 | 1,418 | 462 | 9,125 | 4,911 | 365 | C | 3,477 | 5 | 699 | 1,973 | 25,174 | 408,453 | 1,615 |
| 2004 | 798 | 1,701 | 767 | 7,338 | 2,997 | 32 | 2,802 | 1,824 | 6 | 171 | 343 | 18,779 | 291,336 | 2,511 |
| 2005 | 682 | 1,791 | 530 | 3,966 | 532 | 0 | 1,782 | 2,422 | 7 | 51 | 183 | 11,946 | 280,047 | 3,674 |
| 2006 | 246 | 1,402 | 537 | 2,968 | 928 | 0 | 2,164 | 1,671 | 21 | 164 | 109 | 10,210 | 176,841 | 2,144 |
| 2007 | 224 | 1,204 | 408 | 4,582 | 353 | 8 | - | 745 | 11 | 154 | 378 | 8,067 | 178,083 | 2,333 |
| 2008 | 469 | 1,248 | 335 | 5,383 | 83 | 5 | - | 247 | 33 | 175 | 1,842 | 9,820 | 194,877 | 1,755 |
| 2009 | 629 | 1,003 | 590 | 4,268 | 780 | 10 | - | 636 | 84 | 244 | 2,200 | 10,444 | 247,201 | 1,950 |
| 2010 | 459 | 3 | 301 | 3,639 | 737 | 6 | - | 872 | 54 | 269 | 1,999 | 8,339 | 259,348 | 1,492 |
| 2011 | 1,807 | - | 349 | 2,373 | 754 | 6 | - | 647 | 55 | 150 | 1,907 | 8,048 | 214,899 | 1,406 |
| 2012 | 2,591 | 1,482 | 538 | 3,600 | 631 | 7 | 519 | 749 | 39 | 155 | 2,643 | 12,954 | 210,971 | 1,888 |
| 2013 | 1,874 | 1,424 | 410 | 3,117 | 928 | 8 | 325 | 572 | 43 | 101 | 1,981 | 10,783 | 228,970 | 1,993 |
| 2014 | 2,120 | 1,072 | 567 | 2,633 | 704 | 4 | 249 | 896 | 61 | 323 | 20 | 8,649 | 242,715 | 3,552 |
| 2015 | 2,642 | 1,415 | 929 | 2,177 | 957 | 20 | 419 | 1,287 | 107 | 530 | 139 | 10,622 | 256,349 | 3,582 |
| 2016 | 2,398 | 1,010 | 825 | 1,839 | 1,124 | 29 | 688 | 1,222 | 247 | 166 | 253 | 9,801 | 251,919 | 3,142 |
| 2017 | 2,907 | 837 | 1,252 | 1,463 | 1,176 | 10 | 612 | 1,263 | 532 | 406 | 190 | 10,647 | 221,627 | 2,761 |
| 2018 | 5,386 | 1,190 | 1,101 | 1,412 | 1,189 | * | 231 | 1,212 | 423 | 293 | 139 | 12,576 | 251,557 | 1,517 |
| 2019 | 3,372 | 1,490 | 1,015 | 1,652 | 1,725 | * | 314 | 1,556 | 253 | 344 | 199 | 11,921 | 240,234 | 1,436 |
| 2020 | 3,392 | 1,719 | 853 | 1,338 | 2,110 | * | 94 | 1,185 | 373 | 242 | 278 | 11,584 | 230,331 | 1,124 |
| 2021 | 2,299 | - | 1,933 | 1,027 | 1,641 | * | 1,037 | 895 | 204 | 215 | 139 | 9,390 | 262,805 | 704 |
| 2022 | 1,388 | - | 1,096 | 904 | 1,597 | * | 44 | 1,202 | 271 | 80 | 175 | 6,757 | 298,418 | 147 |
| 2023 | 1,474 | - | 1,007 | 579 | 2,347 | * | 81 | 1,216 | 257 | 143 | 83 | 7,187 | 305,167 | 624 |
| 2024 | * | - | * | * | * | * | * | * | * | * | * | * | 293,770 | * |

¹ Includes—Incluye: BLZ, CHL, ECU, EU(ESP), EU(PRT), GTM, HND, NIC, SLV

² Includes gillnets, Handline, Harpoon, pole-and-line, recreational, Trawler, Troll and unknown gears—Incluye red agallera, línea de mano, arpon, caña, artes deportivas, red de arrastre, curricán y desconocidas

TABLE A-3c. Total annual catches (t) of skipjack tuna by purse-seine and longline vessels in the EPO, by vessel flag, adjusted to the species composition estimate. ‘C’ indicates that the catch has been combined with the total in the ‘OTR’ column. The 2021-2024 data are preliminary.

TABLA A-3c. Capturas totales anuales (t) de atún barrilete por buques de cerco y de palangre en el OPO, por bandera del buque, ajustadas a la estimación de composición por especie. ‘C’ indica que la captura se ha combinado con el total en la columna ‘OTR’. Los datos de 2021-2024 son preliminares.

| | PS | | | | | | | | | | | | | | LL+ |
|------|--------|-----|---------|---------|--------|--------|---------|-------|-------|--------|--------|--------|--------------------|---------|------------------|
| | COL | CRI | ECU | EU(ESP) | MEX | NIC | PAN | PER | SLV | USA | VEN | VUT | C+OTR ¹ | Total | OTR ² |
| 1995 | 13,081 | C | 31,934 | C | 29,406 | - | 4,084 | - | - | 14,032 | 5,508 | 13,910 | 15,092 | 127,047 | 7,241 |
| 1996 | 13,230 | C | 32,433 | C | 14,501 | - | 3,619 | - | - | 12,012 | 4,104 | 10,873 | 13,201 | 103,973 | 3,868 |
| 1997 | 12,332 | - | 51,826 | C | 23,416 | - | 4,277 | - | - | 13,687 | 8,617 | 14,246 | 25,055 | 153,456 | 3,491 |
| 1998 | 4,698 | - | 67,074 | 20,012 | 15,969 | - | 1,136 | - | C | 6,898 | 6,795 | 11,284 | 6,765 | 140,631 | 2,215 |
| 1999 | 11,210 | - | 124,393 | 34,923 | 16,767 | C | 5,286 | - | C | 13,491 | 16,344 | 21,287 | 17,864 | 261,565 | 3,638 |
| 2000 | 10,138 | - | 104,849 | 17,041 | 14,080 | C | 9,573 | - | - | 7,224 | 6,720 | 13,620 | 22,399 | 205,644 | 365 |
| 2001 | 9,445 | - | 66,144 | 13,454 | 8,169 | C | 6,967 | - | C | 4,135 | 3,215 | 7,824 | 23,813 | 143,166 | 1,696 |
| 2002 | 10,908 | - | 80,378 | 10,546 | 6,612 | C | 9,757 | C | 4,601 | 4,582 | 2,222 | 4,657 | 19,283 | 153,546 | 996 |
| 2003 | 14,771 | - | 139,804 | 18,567 | 8,147 | - | 25,084 | C | C | 5,445 | 6,143 | 14,112 | 41,895 | 273,968 | 4,049 |
| 2004 | C | - | 89,621 | 8,138 | 24,429 | C | 20,051 | - | C | C | 23,356 | 4,404 | 27,825 | 197,824 | 2,347 |
| 2005 | C | - | 140,927 | 9,224 | 32,271 | 3,735 | 25,782 | - | 4,995 | C | 22,146 | C | 24,149 | 263,229 | 3,309 |
| 2006 | C | - | 138,490 | 16,668 | 16,790 | 8,396 | 44,639 | - | C | C | 26,334 | C | 44,952 | 296,269 | 1,645 |
| 2007 | C | - | 93,553 | 2,879 | 21,542 | 4,286 | 28,475 | - | C | C | 21,990 | C | 35,571 | 208,296 | 1,579 |
| 2008 | C | - | 143,431 | 4,841 | 21,638 | 7,005 | 43,230 | C | C | C | 28,333 | C | 48,125 | 296,603 | 2,847 |
| 2009 | C | - | 132,712 | 6,021 | 6,847 | 5,119 | 26,973 | C | C | C | 19,370 | C | 33,481 | 230,523 | 2,821 |
| 2010 | 11,400 | - | 82,280 | 1,569 | 3,010 | 5,242 | 19,213 | C | C | - | 11,818 | C | 12,660 | 147,192 | 3,132 |
| 2011 | 23,269 | - | 149,637 | 5,238 | 11,899 | 3,889 | 29,837 | - | C | C | 27,026 | C | 25,240 | 276,035 | 2,259 |
| 2012 | 15,760 | - | 151,280 | 15,773 | 18,058 | 3,931 | 25,786 | - | C | C | 20,829 | C | 14,798 | 266,215 | 3,793 |
| 2013 | 22,168 | - | 172,002 | 2,900 | 17,350 | 4,345 | 31,022 | C | C | - | 17,522 | C | 11,251 | 278,560 | 3,229 |
| 2014 | 22,732 | - | 172,239 | 5,581 | 8,783 | 6,300 | 21,776 | C | C | 521 | 13,767 | - | 9,770 | 261,469 | 1,425 |
| 2015 | 16,431 | - | 208,765 | C | 23,515 | 1,261 | 31,427 | 5,225 | C | 16,826 | 4,792 | - | 20,665 | 328,907 | 1,443 |
| 2016 | 20,665 | - | 190,577 | C | 13,286 | 1,971 | 32,844 | 6,449 | C | 40,036 | 9,067 | - | 22,666 | 337,561 | 3,516 |
| 2017 | 19,284 | - | 190,139 | C | 21,238 | 6,959 | 37,419 | 6,257 | C | 24,989 | 7,288 | - | 11,186 | 324,759 | 1,105 |
| 2018 | 15,365 | - | 177,456 | C | 17,014 | 7,759 | 36,504 | 4,119 | C | 11,869 | 6,679 | - | 12,056 | 288,821 | 1,667 |
| 2019 | 23,395 | - | 211,827 | C | 19,656 | 8,089 | 33,662 | 8,944 | C | 19,706 | 5,719 | - | 16,407 | 347,405 | 735 |
| 2020 | 15,569 | - | 189,750 | C | 7,322 | 9,049 | 39,058 | 2,618 | C | 14,119 | 4,578 | - | 13,898 | 295,961 | 834 |
| 2021 | 26,107 | - | 193,168 | C | 7,944 | 7,574 | 44,375 | C | C | 24,116 | 7,306 | - | 15,934 | 326,524 | 268 |
| 2022 | 20,493 | - | 170,116 | C | 11,601 | 7,760 | 47,962 | * | C | 17,593 | 6,412 | - | 14,854 | 296,791 | 287 |
| 2023 | 21,830 | - | 231,535 | C | 12,034 | 8,934 | 53,570 | C | C | 29,843 | 2,767 | - | 28,371 | 388,884 | 342 |
| 2024 | 32,886 | - | 354,799 | C | 23,176 | 14,822 | 105,758 | C | C | 50,602 | 3,934 | - | 54,693 | 640,670 | * |

¹ Includes—Incluye: BLZ, BOL, CHN, EU(CYP), GTM, HND, LBR, NZL, UNK

² Includes gillnets, Handline, Harpoon, pole-and-line, recreational, Trawler, Troll and unknown gears—Incluye red agallera, línea de mano, arpon, caña, artes deportivas, red de arrastre, curricán y desconocidas

TABLE A-3d. Retained catches (t) of bigeye tuna by purse-seine vessels in the EPO, by vessel flag. ‘C’ indicates that the catch has been combined with the total in the ‘OTR’ column. The data have been adjusted to the species composition estimate and are preliminary for 2023 and 2024.

TABLA A-3d. Capturas retenidas (t) de atún patudo por buques de cerco en el OPO, por bandera del buque. ‘C’ indica que la captura se ha combinado con el total en la columna ‘OTR’. Los datos están ajustados a la estimación de composición por especie, y los de 2023 y 2024 son preliminares.

| | COL | CRI | ECU | EU(ESP) | MEX | NIC | PAN | PER | SLV | USA | VEN | VUT | C + OTR ¹ | Total |
|------|-------|-----|--------|---------|-------|-------|--------|-----|-------|--------|-------|--------|----------------------|--------|
| 1995 | 5,815 | C | 8,304 | C | 91 | - | 839 | * | - | 11,042 | 706 | 12,072 | 6,452 | 45,321 |
| 1996 | 7,692 | C | 20,279 | C | 82 | - | 1,445 | * | - | 8,380 | 619 | 12,374 | 10,440 | 61,311 |
| 1997 | 3,506 | - | 30,092 | C | 38 | - | 1,811 | * | - | 8,312 | 348 | 6,818 | 13,347 | 64,272 |
| 1998 | 596 | - | 25,113 | 5,747 | 12 | - | 12 | * | C | 5,309 | 348 | 4,746 | 2,246 | 44,129 |
| 1999 | 1,511 | - | 24,355 | 11,703 | 33 | C | 1,220 | * | C | 2,997 | 10 | 5,318 | 4,011 | 51,158 |
| 2000 | 7,443 | - | 36,094 | 12,511 | 0 | C | 7,028 | * | - | 5,304 | 457 | 10,000 | 16,446 | 95,283 |
| 2001 | 5,230 | - | 24,424 | 7,450 | 0 | C | 3,858 | * | C | 2,290 | 0 | 4,333 | 12,933 | 60,518 |
| 2002 | 5,283 | - | 26,262 | 5,108 | 0 | C | 4,726 | C | 2,228 | 2,219 | 0 | 2,256 | 9,340 | 57,422 |
| 2003 | 3,664 | - | 22,896 | 4,605 | 0 | - | 6,222 | C | C | 1,350 | 424 | 3,500 | 10,390 | 53,051 |
| 2004 | C | - | 30,817 | 3,366 | 0 | C | 8,294 | * | C | C | 9,661 | 1,822 | 11,511 | 65,471 |
| 2005 | C | - | 30,507 | 3,831 | 0 | 1,551 | 10,707 | * | 2,074 | C | 9,197 | C | 10,028 | 67,895 |
| 2006 | C | - | 39,302 | 5,264 | 6 | 2,652 | 14,099 | * | C | C | 8,317 | C | 14,197 | 83,837 |
| 2007 | C | - | 40,445 | 711 | 0 | 1,058 | 7,029 | * | C | C | 5,428 | C | 8,780 | 63,451 |
| 2008 | C | - | 41,177 | 1,234 | 327 | 1,785 | 11,018 | C | C | C | 7,221 | C | 12,266 | 75,028 |
| 2009 | C | - | 35,646 | 2,636 | 1,334 | 2,241 | 11,807 | C | C | C | 8,479 | C | 14,657 | 76,800 |
| 2010 | 4,206 | - | 34,902 | 579 | 11 | 1,934 | 7,089 | C | C | - | 4,360 | C | 4,672 | 57,753 |
| 2011 | 3,210 | - | 31,282 | 4,111 | 133 | 2,256 | 7,953 | * | C | C | 301 | C | 7,266 | 56,512 |
| 2012 | 1,873 | - | 45,633 | 3,866 | 225 | 1,250 | 7,238 | * | C | C | 848 | C | 5,087 | 66,020 |
| 2013 | 1,405 | - | 32,444 | 1,672 | 124 | 2,749 | 6,118 | - | C | - | 963 | C | 4,012 | 49,487 |
| 2014 | 2,479 | - | 39,094 | 2,812 | 40 | 3,068 | 8,168 | - | C | 129 | 1,183 | - | 3,472 | 60,445 |
| 2015 | 2,470 | - | 44,063 | C | 156 | 774 | 10,113 | - | C | 2,384 | 100 | - | 2,853 | 62,913 |
| 2016 | 2,743 | - | 33,139 | C | 255 | 667 | 8,440 | 312 | C | 2,801 | 345 | - | 8,029 | 56,731 |
| 2017 | 3,656 | - | 38,299 | C | 358 | 1,610 | 10,544 | 0 | C | 6,210 | 1,256 | - | 5,040 | 66,973 |
| 2018 | 1,449 | - | 40,427 | C | 766 | 1,519 | 11,753 | 104 | C | 3,354 | 1,157 | - | 3,994 | 64,523 |
| 2019 | 4,171 | - | 38,757 | C | 962 | 2,630 | 10,868 | - | C | 3,304 | 996 | - | 7,536 | 69,223 |
| 2020 | 4,548 | - | 47,957 | C | 726 | 1,885 | 10,519 | 65 | C | 4,066 | 688 | - | 8,330 | 78,784 |
| 2021 | 3,742 | - | 31,084 | C | 1,107 | 1,700 | 6,473 | - | C | 5,078 | 275 | - | 8,711 | 58,170 |
| 2022 | 2,137 | - | 24,252 | C | 580 | 2,056 | 7,374 | - | C | 3,866 | 838 | - | 5,871 | 46,974 |
| 2023 | 1,712 | - | 23,209 | C | 331 | 1,666 | 5,592 | C | C | 2,923 | 20 | - | 6,913 | 42,366 |
| 2024 | 1,775 | - | 18,746 | C | 774 | 710 | 2,898 | C | C | 3,215 | 130 | - | 5,810 | 34,058 |

¹ Includes—Incluye: BLZ, BOL, CHN, EU(CYP), GTM, HND, LBR, NZL, UNK

TABLE A-3e. Total annual catches (t) of bigeye tuna by longline vessels, and totals for all gears, in the EPO, by vessel flag. ‘C’ indicates that the catch has been combined with the total in the ‘OTR’ column. The data for 2021-2024 are preliminary.

TABLA A-3e. Capturas totales anuales (t) de atún patudo por buques de palangre en el OPO, y totales de todas las artes, por bandera del buque. ‘C’ indica que la captura se ha combinado con el total en la columna ‘OTR’. Los datos de 2021-2024 son preliminares.

| | CHN | CRI | FRA (PYF) | JPN | KOR | MEX | PAN | TWN | USA | VUT | C + OTR ¹ | Total LL | Total PS + LL | OTR ² |
|------|--------|-----|--------------|--------|--------|-----|-----|--------|-------|-------|-------------------------|-------------|------------------|------------------|
| 1995 | - | 13 | 97 | 49,016 | 8,992 | - | - | 77 | 74 | - | * | 58,269 | 103,590 | 1,369 |
| 1996 | - | 1 | 113 | 36,685 | 9,983 | - | - | 95 | 81 | - | * | 46,958 | 108,269 | 748 |
| 1997 | - | 9 | 250 | 40,571 | 11,376 | - | - | 256 | 118 | - | * | 52,580 | 116,852 | 20 |
| 1998 | - | 28 | 359 | 35,752 | 9,731 | - | - | 314 | 191 | - | * | 46,375 | 90,504 | 628 |
| 1999 | - | 25 | 3,652 | 22,224 | 9,431 | - | - | 890 | 228 | - | * | 36,450 | 87,608 | 538 |
| 2000 | - | 27 | 653 | 28,746 | 13,280 | 42 | 14 | 1,916 | 162 | 2,754 | 11 | 47,605 | 142,887 | 253 |
| 2001 | 2,639 | 28 | 684 | 38,048 | 12,576 | 1 | 80 | 9,285 | 147 | 3,277 | 1,990 | 68,755 | 129,273 | 19 |
| 2002 | 7,614 | 19 | 388 | 34,193 | 10,358 | - | 6 | 17,253 | 132 | 2,995 | 1,466 | 74,424 | 131,845 | 12 |
| 2003 | 10,066 | 18 | 346 | 24,888 | 10,272 | - | C | 12,016 | 232 | 1,258 | 680 | 59,776 | 112,828 | 21 |
| 2004 | 2,645 | 21 | 405 | 21,236 | 10,729 | - | 48 | 7,384 | 149 | 407 | 459 | 43,483 | 108,954 | 194 |
| 2005 | 2,104 | 23 | 398 | 19,113 | 11,580 | - | 30 | 6,441 | 536 | 318 | 151 | 40,694 | 108,589 | 25 |
| 2006 | 709 | 18 | 388 | 16,235 | 6,732 | - | 37 | 6,412 | 85 | 960 | 195 | 31,771 | 115,608 | 40 |
| 2007 | 2,324 | 15 | 361 | 13,977 | 5,611 | - | - | 6,057 | 417 | 1,013 | 101 | 29,876 | 93,326 | 44 |
| 2008 | 2,379 | 16 | 367 | 14,908 | 4,150 | - | - | 1,852 | 1,277 | 790 | 468 | 26,207 | 101,236 | 28 |
| 2009 | 2,481 | 13 | 484 | 15,490 | 6,758 | - | - | 3,396 | 730 | 1,032 | 1,038 | 31,422 | 108,221 | 15 |
| 2010 | 2,490 | 4 | 314 | 15,847 | 9,244 | - | - | 5,276 | 1,356 | 1,496 | 1,063 | 37,090 | 94,842 | 2 |
| 2011 | 5,450 | - | 445 | 13,399 | 6,617 | - | - | 3,957 | 1,050 | 694 | 706 | 32,318 | 88,829 | - |
| 2012 | 4,386 | 3 | 464 | 16,323 | 7,450 | - | - | 4,999 | 875 | 1,063 | 604 | 36,167 | 102,187 | 27 |
| 2013 | 5,199 | - | 527 | 14,258 | 8,822 | - | - | 4,162 | 2,054 | 604 | 544 | 36,170 | 85,657 | 99 |
| 2014 | 5,253 | 9 | 526 | 13,634 | 8,203 | - | 114 | 4,511 | 2,073 | 913 | 120 | 35,356 | 95,801 | 170 |
| 2015 | 8,401 | 8 | 692 | 13,079 | 8,635 | - | 364 | 5,181 | 2,948 | 2,073 | 328 | 41,709 | 104,622 | 21 |
| 2016 | 7,052 | 3 | 477 | 10,467 | 7,692 | - | 313 | 6,006 | 2,090 | 877 | 679 | 35,656 | 92,387 | 24 |
| 2017 | 7,093 | 16 | 700 | 8,055 | 8,749 | - | 357 | 6,186 | 2,700 | 1,463 | 331 | 35,650 | 102,623 | 36 |
| 2018 | 6,060 | 14 | 897 | 6,125 | 6,675 | - | 415 | 5,125 | 2,408 | 1,841 | 227 | 29,787 | 94,310 | 24 |
| 2019 | 5,372 | 23 | 800 | 5,656 | 6,137 | - | 325 | 5,868 | 1,720 | 1,571 | 315 | 27,787 | 97,010 | 18 |
| 2020 | 4,048 | 35 | 745 | 5,139 | 7,633 | - | 164 | 5,414 | 1,405 | 1,077 | 299 | 25,959 | 104,743 | 44 |
| 2021 | 3,481 | - | 906 | 4,224 | 7,029 | - | 41 | 3,526 | 1,388 | 947 | 163 | 21,705 | 79,875 | 9 |
| 2022 | 2,923 | - | 1,127 | 3,652 | 6,629 | - | 97 | 5,128 | 1,051 | 256 | 249 | 21,106 | 68,080 | 87 |
| 2023 | 2,382 | - | 929 | 2,648 | 11,428 | - | 57 | 5,056 | 1,274 | 700 | 127 | 24,601 | 66,967 | 174 |
| 2024 | 2,633 | - | * | 2,028 | 7,871 | - | * | 3,890 | * | 1,218 | * | 17,640 | 51,698 | * |

¹ Includes—Incluye: BLZ, CHL, ECU, EU(ESP), EU(PRT), HND, SLV

² Includes gillnets, Handline, Harpoon, pole-and-line, recreational, Trawler, Troll and unknown gears—Incluye red agallera, línea de mano, arpon, caña, artes deportivas, red de arrastre, curricán y desconocidas

TABLE A-4a. Preliminary estimates of the retained catches, in metric tons, of tunas and bonitos caught by purse-seine vessels in the EPO in 2023 and 2024, by species and vessel flag. The data for yellowfin, skipjack, and bigeye tunas have been adjusted to the species composition estimates and are preliminary.

TABLA A-4a. Estimaciones preliminares de las capturas retenidas, en toneladas métricas, de atunes y bonitos por buques cerqueros en el OPO en 2023 y 2024, por especie y bandera del buque. Los datos de los atunes aleta amarilla, barrilete, y patudo fueron ajustados a las estimaciones de composición por especie, y son preliminares.

| | YFT | SKJ | BET | PBF | ALB | BKJ | BZX | TUN | Total | % |
|------------------|--|----------------|---------------|--------------|----------|--------------|------------|--------------|----------------|------|
| 2023 | Retained catches–Capturas retenidas | | | | | | | | | |
| COL | 21,146 | 21,830 | 1,712 | - | - | 9 | - | 51 | 44,748 | 6.0 |
| ECU | 53,588 | 231,535 | 23,209 | - | - | 1,535 | 3 | 1,770 | 311,640 | 42.1 |
| MEX | 143,062 | 12,034 | 331 | 3,399 | - | 3,859 | 754 | 3 | 163,442 | 22.1 |
| NIC | 10,083 | 8,934 | 1,667 | - | - | 1 | - | 6 | 20,691 | 2.8 |
| PAN | 35,118 | 53,570 | 5,592 | - | - | 38 | - | 96 | 94,414 | 12.7 |
| USA | 4,811 | 29,843 | 2,923 | 3 | - | 5 | 97 | 6 | 37,688 | 5.1 |
| VEN | 24,089 | 2,767 | 20 | - | - | 8 | 1 | 2 | 26,887 | 3.6 |
| OTR ¹ | 6,083 | 28,371 | 6,912 | - | - | 1 | - | 9 | 41,376 | 5.6 |
| Total | 297,980 | 388,884 | 42,366 | 3,402 | - | 5,456 | 855 | 1,943 | 740,886 | |
| 2024 | Retained catches–Capturas retenidas | | | | | | | | | |
| COL | 8,034 | 32,886 | 1,775 | - | - | 69 | - | 15 | 42,779 | 4.4 |
| ECU | 45,369 | 354,799 | 18,746 | - | - | 2,414 | - | 2,012 | 423,340 | 43.1 |
| MEX | 157,601 | 23,176 | 774 | 3,531 | - | 3,568 | - | 22 | 188,672 | 19.2 |
| NIC | 6,683 | 14,822 | 710 | - | - | 74 | - | 52 | 22,341 | 2.3 |
| PAN | 35,884 | 105,758 | 2,898 | - | - | 441 | - | 447 | 145,428 | 14.8 |
| USA | 3,335 | 50,602 | 3,215 | - | 1 | 55 | - | 20 | 57,228 | 5.8 |
| VEN | 33,186 | 3,934 | 130 | - | - | 15 | - | - | 37,265 | 3.8 |
| OTR ² | 3,678 | 54,693 | 5,810 | - | - | 11 | - | 75 | 64,267 | 6.6 |
| Total | 293,770 | 640,670 | 34,058 | 3,531 | 1 | 6,647 | - | 2,643 | 981,320 | |

¹ Includes El Salvador, European Union (Spain) and Peru - This category is used to avoid revealing the operations of individual vessels or companies.

¹ Incluye El Salvador, Perú y Unión Europea (España) - Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

² Includes El Salvador, European Union (Spain) and Peru - This category is used to avoid revealing the operations of individual vessels or companies.

² Incluye El Salvador, Perú y Unión Europea (España) - Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

TABLE A-4b. Preliminary estimates of the landings, in metric tons, of tunas and bonitos caught by purse-seine vessels in the EPO in 2023 and 2024, by year, species and country of landing. The data for yellowfin, skipjack, and bigeye tunas have not been adjusted to the species composition estimates and are preliminary. Landings in a given year may include retained catches from the previous year.

TABLA A-4b. Estimaciones preliminares de las descargas, en toneladas métricas, de atunes y bonitos por buques cerqueros en el OPO en 2023 y 2024, por año, especie y país de descarga. Los datos de los atunes aleta amarilla, barrilete, y patudo no fueron ajustados a las estimaciones de composición por especie, y son preliminares. Las descargas de un año determinado pueden incluir capturas retenidas del año anterior.

| | YFT | SKJ | BET | PBF | ALB | BKJ | BZX | TUN | Total | % |
|------------------|---------------------------|----------------|---------------|--------------|----------|--------------|------------|--------------|----------------|------|
| 2023 | Landings-Descargas | | | | | | | | | |
| COL | 20,138 | 12,285 | 986 | - | - | - | - | - | 33,409 | 4.5 |
| ECU | 110,646 | 317,097 | 27,820 | - | - | 1,596 | 2 | 1,911 | 459,072 | 62.1 |
| MEX | 140,853 | 10,900 | 246 | 3,399 | - | 3,858 | 754 | 3 | 160,013 | 21.7 |
| PER | 1,605 | 14,227 | 630 | - | - | 8 | - | 63 | 16,533 | 2.2 |
| USA | 2,890 | 13,082 | 1,245 | 3 | - | - | 97 | - | 17,317 | 2.4 |
| OTR ¹ | 28,944 | 20,069 | 3,365 | - | - | - | - | 6 | 52,384 | 7.1 |
| Total | 305,076 | 387,660 | 34,292 | 3,402 | - | 5,462 | 853 | 1,983 | 738,728 | |
| 2024 | Landings-Descargas | | | | | | | | | |
| COL | 11,450 | 27,587 | 1,604 | - | - | 16 | - | 5 | 40,662 | 4.1 |
| ECU | 103,458 | 487,923 | 21,250 | - | - | 2,906 | 2 | 2,589 | 618,128 | 62.8 |
| MEX | 156,827 | 21,796 | 700 | 3,531 | - | 3,567 | - | 18 | 186,439 | 18.9 |
| PER | 1,784 | 23,132 | 741 | - | - | 8 | - | 15 | 25,680 | 2.6 |
| USA | 915 | 26,964 | 1,322 | - | 1 | - | - | - | 29,202 | 3.0 |
| OTR ² | 34,599 | 45,542 | 3,784 | - | - | 57 | - | 35 | 84,017 | 8.6 |
| Total | 309,033 | 632,944 | 29,401 | 3,531 | 1 | 6,554 | 2 | 2,662 | 984,128 | |

¹ Includes Costa Rica, El Salvador, France (French Polynesia), Guatemala, Kiribati, Marshall Islands, Panama, Philippines, Solomon Islands and Thailand - This category is used to avoid revealing the operations of individual vessels or companies.

¹ Incluye Costa Rica, El Salvador, Filipinas, Francia (Polinesias Francesas), Guatemala, Islas Marshall, Islas Salomón, Kiribati, Panamá y Tailandia - Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

² Includes Costa Rica, El Salvador, China, Guatemala, High Seas, Kiribati and Panama - This category is used to avoid revealing the operations of individual vessels or companies.

² Incluye Costa Rica, El Salvador, China, Guatemala, High Seas, Kiribati y Panamá - Se usa esta categoría para no revelar información sobre las actividades de buques o empresas individuales.

TABLE A-5a. Annual retained catches of Pacific bluefin tuna, by gear type and flag, in metric tons, 1995-2023. The data for 2021, 2022 and 2023 are preliminary; 2024 data are not available.

TABLA A-5a. Capturas retenidas anuales de atún aleta azul del Pacífico, por arte de pesca y bandera, en toneladas, 1995-2023. Los datos de 2021, 2022 y 2023 son preliminares; no se dispone de datos de 2024.

| PBF | Western Pacific flags—Banderas del Pacífico occidental ¹ | | | | | | | | | | EPO flags—Banderas del OPO | | | | | Total |
|------|---|-----|-------|-------|-------|-----|-----|-------|-----|-----------|----------------------------|-----|-------|-------|-----------|--------|
| | JPN | | | | KOR | | TWN | | | Sub-total | MEX | | USA | | Sub-total | |
| | PS | LP | LL | OTR | PS | OTR | PS | LL | OTR | | PS | OTR | PS | OTR | | |
| 1995 | 18,909 | 270 | 678 | 7,223 | 821 | - | - | 335 | 2 | 28,238 | 11 | - | 657 | 294 | 962 | 29,200 |
| 1996 | 7,644 | 94 | 901 | 5,359 | 102 | - | - | 956 | - | 15,056 | 3,700 | - | 4,639 | 110 | 8,449 | 23,505 |
| 1997 | 13,152 | 34 | 1,300 | 4,354 | 1,054 | - | - | 1,814 | - | 21,708 | 367 | - | 2,240 | 264 | 2,871 | 24,579 |
| 1998 | 5,391 | 85 | 1,255 | 4,450 | 188 | - | - | 1,910 | - | 13,279 | 1 | 0 | 1,771 | 703 | 2,475 | 15,754 |
| 1999 | 16,173 | 35 | 1,157 | 5,246 | 256 | - | - | 3,089 | - | 25,956 | 2,369 | 35 | 184 | 592 | 3,180 | 29,136 |
| 2000 | 16,486 | 102 | 953 | 7,031 | 2,401 | - | - | 2,780 | 2 | 29,755 | 3,019 | 99 | 693 | 380 | 4,191 | 33,946 |
| 2001 | 7,620 | 180 | 791 | 5,614 | 1,176 | 10 | - | 1,839 | 4 | 17,234 | 863 | - | 292 | 392 | 1,547 | 18,781 |
| 2002 | 8,903 | 99 | 841 | 4,338 | 932 | 1 | - | 1,523 | 4 | 16,641 | 1,708 | 2 | 50 | 625 | 2,385 | 19,026 |
| 2003 | 5,768 | 44 | 1,237 | 3,345 | 2,601 | - | - | 1,863 | 21 | 14,879 | 3,211 | 43 | 22 | 373 | 3,649 | 18,528 |
| 2004 | 8,257 | 132 | 1,847 | 3,855 | 773 | - | - | 1,714 | 3 | 16,581 | 8,880 | 14 | - | 61 | 8,955 | 25,536 |
| 2005 | 12,817 | 549 | 1,925 | 6,363 | 1,318 | 9 | - | 1,368 | 2 | 24,351 | 4,542 | - | 201 | 80 | 4,823 | 29,174 |
| 2006 | 8,880 | 108 | 1,121 | 4,058 | 1,012 | 3 | - | 1,149 | 1 | 16,332 | 9,806 | - | - | 96 | 9,902 | 26,234 |
| 2007 | 6,840 | 236 | 1,762 | 4,983 | 1,281 | 4 | - | 1,401 | 10 | 16,517 | 4,147 | - | 42 | 14 | 4,203 | 20,720 |
| 2008 | 10,221 | 64 | 1,390 | 5,505 | 1,866 | 10 | - | 979 | 2 | 20,037 | 4,407 | 15 | - | 64 | 4,486 | 24,523 |
| 2009 | 8,077 | 50 | 1,080 | 4,814 | 936 | 4 | - | 877 | 11 | 15,849 | 3,019 | - | 410 | 162 | 3,591 | 19,440 |
| 2010 | 3,742 | 83 | 890 | 3,681 | 1,196 | 16 | - | 373 | 36 | 10,017 | 7,746 | - | - | 89 | 7,835 | 17,852 |
| 2011 | 8,340 | 63 | 837 | 3,754 | 670 | 14 | - | 292 | 24 | 13,994 | 2,731 | 1 | - | 343 | 3,075 | 17,069 |
| 2012 | 2,462 | 113 | 673 | 2,846 | 1,421 | 2 | - | 210 | 4 | 7,731 | 6,668 | 1 | - | 442 | 7,111 | 14,842 |
| 2013 | 2,771 | 8 | 784 | 2,848 | 604 | 1 | - | 331 | 3 | 7,350 | 3,154 | - | - | 820 | 3,974 | 11,324 |
| 2014 | 5,456 | 5 | 683 | 3,429 | 1,305 | 6 | - | 483 | 42 | 11,409 | 4,862 | - | 401 | 427 | 5,690 | 17,099 |
| 2015 | 3,645 | 8 | 648 | 2,086 | 676 | 1 | - | 552 | 26 | 7,642 | 3,082 | - | 86 | 411 | 3,579 | 11,221 |
| 2016 | 5,095 | 54 | 691 | 2,514 | 1,024 | 5 | - | 454 | 0 | 9,837 | 2,709 | - | 316 | 413 | 3,438 | 13,275 |
| 2017 | 4,540 | 49 | 913 | 3,491 | 734 | 9 | - | 415 | 0 | 10,151 | 3,643 | - | 466 | 483 | 4,592 | 14,743 |
| 2018 | 4,049 | 9 | 700 | 1,447 | 523 | 12 | - | 381 | 3 | 7,124 | 2,840 | - | 12 | 589 | 3,441 | 10,565 |
| 2019 | 4,464 | 0 | 1,002 | 2,043 | 542 | 39 | - | 486 | 6 | 8,582 | 2,249 | - | 226 | 533 | 3,008 | 11,590 |
| 2020 | 3,960 | 1 | 1,416 | 2,634 | 567 | 38 | - | 1,149 | 1 | 9,766 | 3,285 | - | 116 | 860 | 4,261 | 14,027 |
| 2021 | 4,198 | 0 | 1,512 | 2,907 | 422 | 87 | - | 1,478 | - | 10,604 | 3,027 | - | 43 | 1,468 | 4,538 | 15,142 |
| 2022 | 4,702 | 13 | 1,599 | 3,798 | 654 | 227 | - | 1,496 | 1 | 12,490 | 3,194 | - | 198 | 1,751 | 5,143 | 17,633 |
| 2023 | 4,570 | 24 | 1,556 | 3,642 | 448 | 220 | - | 2,117 | 1 | 12,578 | 3,399 | - | 3 | 2,071 | 5,473 | 18,051 |

¹ Source: International Scientific Committee, 24th Plenary Meeting, PBFWG workshop report on Pacific Bluefin Tuna, June 2024—Fuente: Comité Científico Internacional, 24^a Reunión Plenaria, Taller PBFWG sobre Atún Aleta Azul del Pacífico, junio de 2024

TABLE A-5b. Reported catches of Pacific bluefin tuna in the EPO by recreational gear, in number of fish, 1995-2024. 2024 data are not available.

TABLA A-5b. Capturas reportadas de atún aleta azul del Pacífico en el OPO por artes deportivas, en número de peces, 1995-2024. No se dispone de datos de 2024.

| | | | |
|-------------|--------|-------------|--------|
| 1995 | 16,025 | 2010 | 8,453 |
| 1996 | 2,739 | 2011 | 31,494 |
| 1997 | 8,338 | 2012 | 40,012 |
| 1998 | 20,466 | 2013 | 63,158 |
| 1999 | 36,797 | 2014 | 27,889 |
| 2000 | 20,669 | 2015 | 28,661 |
| 2001 | 21,913 | 2016 | 12,312 |
| 2002 | 33,399 | 2017 | 16,493 |
| 2003 | 22,291 | 2018 | 14,072 |
| 2004 | 3,391 | 2019 | 18,702 |
| 2005 | 5,757 | 2020 | 37,469 |
| 2006 | 7,473 | 2021 | 58,823 |
| 2007 | 1,028 | 2022 | 59,595 |
| 2008 | 10,187 | 2023 | 80,196 |
| 2009 | 12,138 | 2024 | |

TABLE A-6. Annual retained catches of albacore in the EPO, by gear and area (north and south of the equator), in metric tons, 1995-2023. The data for 2021, 2022 and 2023 are preliminary; 2024 data are not available.

TABLA A-6. Capturas retenidas anuales de atún albacora en el OPO, por arte y zona (al norte y al sur de la línea ecuatorial), en toneladas, 1995-2023. Los datos de 2021, 2022 y 2023 son preliminares; no se dispone de datos de 2024.

| ALB | North—Norte | | | | South—Sur | | | | Total |
|------|-------------|------------------|-------|----------|-----------|-----|-----|----------|--------|
| | LL | LTL ¹ | OTR | Subtotal | LL | LTL | OTR | Subtotal | |
| 1995 | 1,380 | 7,773 | 102 | 9,255 | 4,805 | 2 | 15 | 4,822 | 14,077 |
| 1996 | 1,675 | 8,267 | 99 | 10,041 | 5,956 | 94 | 21 | 6,071 | 16,112 |
| 1997 | 1,365 | 6,115 | 1,019 | 8,499 | 8,313 | 466 | 0 | 8,779 | 17,278 |
| 1998 | 1,730 | 12,019 | 1,250 | 14,999 | 10,905 | 12 | 0 | 10,917 | 25,916 |
| 1999 | 2,701 | 11,028 | 3,668 | 17,397 | 8,932 | 81 | 7 | 9,020 | 26,417 |
| 2000 | 1,880 | 10,960 | 1,869 | 14,709 | 7,783 | 778 | 3 | 8,564 | 23,273 |
| 2001 | 1,822 | 11,727 | 1,638 | 15,187 | 17,588 | 516 | 6 | 18,110 | 33,297 |
| 2002 | 1,227 | 12,286 | 2,388 | 15,901 | 14,062 | 131 | 40 | 14,233 | 30,134 |
| 2003 | 1,129 | 17,808 | 2,260 | 21,197 | 23,772 | 419 | 3 | 24,194 | 45,391 |
| 2004 | 854 | 20,288 | 1,623 | 22,765 | 17,590 | 331 | 0 | 17,921 | 40,686 |
| 2005 | 405 | 13,807 | 1,741 | 15,953 | 8,945 | 181 | 7 | 9,133 | 25,086 |
| 2006 | 3,671 | 18,515 | 408 | 22,594 | 10,161 | 48 | 119 | 10,328 | 32,922 |
| 2007 | 2,708 | 17,948 | 1,415 | 22,071 | 8,399 | 19 | 87 | 8,505 | 30,576 |
| 2008 | 1,160 | 17,137 | 308 | 18,605 | 8,058 | 0 | 159 | 8,217 | 26,822 |
| 2009 | 91 | 17,933 | 996 | 19,020 | 11,981 | 0 | 213 | 12,194 | 31,214 |
| 2010 | 1,134 | 18,246 | 892 | 20,272 | 13,122 | 3 | 247 | 13,372 | 33,644 |
| 2011 | 1,833 | 15,437 | 426 | 17,696 | 14,357 | 0 | 222 | 14,579 | 32,275 |
| 2012 | 4,583 | 16,633 | 1,222 | 22,438 | 19,613 | 35 | 210 | 19,858 | 42,296 |
| 2013 | 6,193 | 17,398 | 844 | 24,435 | 19,204 | 0 | 271 | 19,475 | 43,910 |
| 2014 | 3,546 | 18,178 | 1,042 | 22,766 | 25,685 | 0 | 243 | 25,928 | 48,694 |
| 2015 | 2,067 | 15,986 | 935 | 18,988 | 26,872 | 0 | 221 | 27,093 | 46,081 |
| 2016 | 1,627 | 13,600 | 679 | 15,906 | 25,150 | 0 | 290 | 25,440 | 41,346 |
| 2017 | 2,580 | 8,851 | 402 | 11,833 | 24,012 | 3 | 186 | 24,201 | 36,034 |
| 2018 | 1,106 | 10,433 | 539 | 12,078 | 24,653 | 0 | 174 | 24,827 | 36,905 |
| 2019 | 1,425 | 10,146 | 1,517 | 13,088 | 19,389 | 1 | 212 | 19,602 | 32,690 |
| 2020 | 2,911 | 9,884 | 327 | 13,122 | 17,072 | 0 | 127 | 17,199 | 30,321 |
| 2021 | 1,368 | 6,629 | 312 | 8,309 | 30,071 | 2 | 19 | 30,092 | 38,401 |
| 2022 | 1,810 | 12,080 | 652 | 14,542 | 29,999 | 14 | 88 | 30,101 | 44,643 |
| 2023 | 1,376 | 4,305 | 578 | 6,259 | 28,413 | 3 | 15 | 28,431 | 34,690 |

¹ Includes pole-and-line—Incluye caña

TABLE A-7. Estimated numbers of sets, by set type and vessel capacity category, and estimated retained catches, in metric tons, of yellowfin, skipjack, and bigeye tuna by purse-seine vessels in the EPO. The data for 2023 and 2024 are preliminary. The data for yellowfin, skipjack, and bigeye tunas have been adjusted to the species composition estimate and are preliminary.

TABLA A-7. Números estimados de lances, por tipo de lance y categoría de capacidad de buque, y capturas retenidas estimadas, en toneladas métricas, de atunes aleta amarilla, barrilete, y patudo por buques cerqueros en el OPO. Los datos de 2023 y 2024 son preliminares. Los datos de los atunes aleta amarilla, barrilete, y patudo fueron ajustados a la estimación de composición por especie, y son preliminares.

| | Number of sets—Número de lances | | | Retained catch—Captura retenida | | |
|-------------|---|--------|--------|---------------------------------|---------|--------|
| | Vessel capacity— Capacidad del buque | | Total | YFT | SKJ | BET |
| | ≤363 t | >363 t | | | | |
| DEL | Sets associated with dolphins Lances asociados a delfines | | | | | |
| 2009 | 0 | 10,910 | 10,910 | 178,291 | 2,683 | 1 |
| 2010 | 0 | 11,646 | 11,646 | 170,028 | 1,365 | 0 |
| 2011 | 0 | 9,604 | 9,604 | 134,926 | 4,387 | 2 |
| 2012 | 0 | 9,220 | 9,220 | 133,825 | 2,122 | 0 |
| 2013 | 0 | 10,736 | 10,736 | 157,432 | 4,272 | 0 |
| 2014 | 0 | 11,382 | 11,382 | 167,780 | 4,413 | 3 |
| 2015 | 0 | 11,020 | 11,020 | 160,595 | 5,608 | 2 |
| 2016 | 0 | 11,219 | 11,219 | 146,526 | 3,179 | 4 |
| 2017 | 0 | 8,863 | 8,863 | 112,533 | 1,656 | 1 |
| 2018 | 0 | 9,774 | 9,774 | 147,859 | 2,456 | 1 |
| 2019 | 0 | 9,680 | 9,680 | 153,649 | 3,696 | 28 |
| 2020 | 0 | 9,773 | 9,773 | 150,263 | 1,705 | 63 |
| 2021 | 0 | 9,887 | 9,887 | 158,256 | 2,585 | 0 |
| 2022 | 0 | 10,614 | 10,614 | 177,458 | 2,874 | 0 |
| 2023 | 0 | 10,328 | 10,328 | 198,411 | 9,584 | 0 |
| 2024 | 0 | 10,554 | 10,554 | 195,076 | 12,035 | 0 |
| OBJ | Sets associated with floating objects Lances asociados a objetos flotantes | | | | | |
| 2009 | 2,142 | 7,077 | 9,219 | 36,147 | 157,023 | 75,889 |
| 2010 | 2,432 | 6,399 | 8,831 | 37,850 | 114,659 | 57,059 |
| 2011 | 2,538 | 6,921 | 9,459 | 42,176 | 171,193 | 55,587 |
| 2012 | 3,067 | 7,610 | 10,677 | 37,487 | 177,055 | 65,035 |
| 2013 | 3,081 | 8,038 | 11,119 | 35,112 | 194,372 | 48,337 |
| 2014 | 3,860 | 8,777 | 12,637 | 46,049 | 199,696 | 59,797 |
| 2015 | 3,457 | 9,385 | 12,842 | 43,603 | 206,515 | 60,975 |
| 2016 | 4,214 | 10,377 | 14,591 | 58,673 | 248,190 | 55,269 |
| 2017 | 4,544 | 11,148 | 15,692 | 67,167 | 224,422 | 65,443 |
| 2018 | 4,954 | 11,871 | 16,825 | 66,122 | 213,626 | 63,815 |
| 2019 | 4,885 | 10,591 | 15,476 | 52,862 | 226,375 | 68,553 |
| 2020 | 3,363 | 8,788 | 12,151 | 44,461 | 191,399 | 78,208 |
| 2021 | 4,002 | 11,167 | 15,169 | 66,542 | 227,028 | 57,391 |
| 2022 | 4,520 | 13,394 | 17,914 | 90,837 | 241,855 | 46,737 |
| 2023 | 4,634 | 12,630 | 17,264 | 74,129 | 319,153 | 42,167 |
| 2024 | 3,494 | 11,715 | 15,209 | 62,395 | 458,923 | 33,808 |

TABLE A-7. (continued)
 TABLA A-7. (continuación)

| | Number of sets—Número de lances | | | Retained catch—Captura retenida | | |
|-------------|--|--------|--------|---------------------------------|---------|--------|
| | Vessel capacity— Capacidad del buque | | Total | YFT | SKJ | BET |
| | ≤363 t | >363 t | | | | |
| NOA | Sets on unassociated schools Lances sobre cardúmenes no asociados | | | | | |
| 2009 | 3,822 | 4,109 | 7,931 | 22,319 | 70,817 | 909 |
| 2010 | 2,744 | 3,885 | 6,629 | 43,131 | 31,168 | 693 |
| 2011 | 2,840 | 5,182 | 8,022 | 29,749 | 100,455 | 923 |
| 2012 | 2,996 | 5,369 | 8,365 | 26,705 | 87,038 | 985 |
| 2013 | 3,064 | 4,156 | 7,220 | 25,643 | 79,916 | 1,150 |
| 2014 | 2,428 | 3,369 | 5,797 | 20,237 | 57,360 | 645 |
| 2015 | 3,116 | 6,201 | 9,317 | 41,529 | 116,784 | 1,936 |
| 2016 | 2,300 | 5,101 | 7,401 | 36,919 | 86,192 | 1,458 |
| 2017 | 2,016 | 4,960 | 6,976 | 31,280 | 98,681 | 1,529 |
| 2018 | 1,925 | 4,163 | 6,088 | 25,000 | 72,739 | 707 |
| 2019 | 2,064 | 5,948 | 8,012 | 21,802 | 117,334 | 642 |
| 2020 | 1,883 | 4,575 | 6,458 | 24,023 | 102,857 | 513 |
| 2021 | 1,678 | 4,803 | 6,481 | 28,617 | 96,911 | 779 |
| 2022 | 1,301 | 3,459 | 4,760 | 23,366 | 52,062 | 237 |
| 2023 | 850 | 3,435 | 4,285 | 25,440 | 60,147 | 199 |
| 2024 | 1,065 | 6,538 | 7,603 | 36,299 | 169,712 | 250 |
| ALL | Sets on all types of schools Lances sobre todos tipos de cardumen | | | | | |
| 2009 | 5,964 | 22,096 | 28,060 | 236,757 | 230,523 | 76,799 |
| 2010 | 5,176 | 21,930 | 27,106 | 251,009 | 147,192 | 57,752 |
| 2011 | 5,378 | 21,707 | 27,085 | 206,851 | 276,035 | 56,512 |
| 2012 | 6,063 | 22,199 | 28,262 | 198,017 | 266,215 | 66,020 |
| 2013 | 6,145 | 22,930 | 29,075 | 218,187 | 278,560 | 49,487 |
| 2014 | 6,288 | 23,528 | 29,816 | 234,066 | 261,469 | 60,445 |
| 2015 | 6,573 | 26,606 | 33,179 | 245,727 | 328,907 | 62,913 |
| 2016 | 6,514 | 26,697 | 33,211 | 242,118 | 337,561 | 56,731 |
| 2017 | 6,560 | 24,971 | 31,531 | 210,980 | 324,759 | 66,973 |
| 2018 | 6,879 | 25,808 | 32,687 | 238,981 | 288,821 | 64,523 |
| 2019 | 6,949 | 26,219 | 33,168 | 228,313 | 347,405 | 69,223 |
| 2020 | 5,246 | 23,136 | 28,382 | 218,747 | 295,961 | 78,784 |
| 2021 | 5,680 | 25,857 | 31,537 | 253,415 | 326,524 | 58,170 |
| 2022 | 5,821 | 27,467 | 33,288 | 291,661 | 296,791 | 46,974 |
| 2023 | 5,484 | 26,393 | 31,877 | 297,980 | 388,884 | 42,366 |
| 2024 | 4,559 | 28,807 | 33,366 | 293,770 | 640,670 | 34,058 |

TABLE A-8. Types of floating objects involved in sets by vessels of >363 t carrying capacity, 2009-2024. The 2023 and 2024 data are preliminary.

TABLA A-8. Tipos de objetos flotantes sobre los que realizaron lances buques de >363 t de capacidad de acarreo, 2009-2024. Los datos de 2023 and 2024 son preliminares.

| OBJ | Flotsam Naturales | | FADs Plantados | | Unknown Desconocido | | Total |
|------|----------------------|-----|-------------------|------|------------------------|-------|--------|
| | No. | % | No. | % | No. | % | |
| 2009 | 322 | 4.5 | 6,728 | 95.1 | 27 | 0.4 | 7,077 |
| 2010 | 337 | 5.3 | 6,038 | 94.3 | 24 | 0.4 | 6,399 |
| 2011 | 563 | 8.1 | 6,342 | 91.6 | 16 | 0.2 | 6,921 |
| 2012 | 286 | 3.8 | 7,321 | 96.2 | 3 | < 0.1 | 7,610 |
| 2013 | 274 | 3.4 | 7,759 | 96.5 | 5 | 0.1 | 8,038 |
| 2014 | 283 | 3.2 | 8,490 | 96.7 | 4 | < 0.1 | 8,777 |
| 2015 | 273 | 2.9 | 9,093 | 96.9 | 19 | 0.2 | 9,385 |
| 2016 | 278 | 2.7 | 10,070 | 97.0 | 29 | 0.3 | 10,377 |
| 2017 | 271 | 2.4 | 10,877 | 97.6 | 0 | 0 | 11,148 |
| 2018 | 322 | 2.7 | 11,549 | 97.3 | 0 | 0 | 11,871 |
| 2019 | 216 | 2.0 | 10,373 | 97.9 | 2 | < 0.1 | 10,591 |
| 2020 | 166 | 1.9 | 8,622 | 98.1 | 0 | 0 | 8,788 |
| 2021 | 260 | 2.3 | 10,907 | 97.7 | 0 | 0 | 11,167 |
| 2022 | 413 | 3.1 | 12,980 | 96.9 | 1 | < 0.1 | 13,394 |
| 2023 | 375 | 3.0 | 12,253 | 97.0 | 2 | < 0.1 | 12,630 |
| 2024 | 297 | 2.5 | 11,417 | 97.5 | 1 | < 0.1 | 11,715 |

TABLE A-9. Reported nominal longline fishing effort (E; 1000 hooks) and catch (C; metric tons) of yellowfin, skipjack, bigeye, Pacific bluefin, and albacore tunas only, by flag, in the EPO. 2024 data are not available.

TABLA A-9. Esfuerzo de pesca palangrero nominal reportado (E; 1000 anzuelos), y captura (C; toneladas métricas) de atunes aleta amarilla, barrilete, patudo, aleta azul del Pacífico, y albacora solamente, por bandera, en el OPO. No se dispone de datos de 2024.

| LL | CHN | | JPN | | KOR | | FRA(PYF) | | TWN | | USA | | OTR ¹ |
|------|--------|--------|---------|--------|--------|--------|----------|-------|--------|--------|--------|-------|------------------|
| | E | C | E | C | E | C | E | C | E | C | E | C | |
| 1995 | - | - | 129,598 | 69,435 | 54,979 | 12,778 | 1,776 | 559 | 2,910 | 1,639 | 828 | 180 | 562 |
| 1996 | - | - | 103,654 | 52,298 | 40,290 | 14,121 | 2,087 | 931 | 5,830 | 3,553 | 510 | 182 | 185 |
| 1997 | - | - | 96,383 | 59,325 | 30,493 | 16,663 | 3,464 | 1,941 | 8,720 | 5,673 | 464 | 215 | 752 |
| 1998 | - | - | 106,568 | 50,167 | 51,817 | 15,089 | 4,724 | 2,858 | 10,586 | 5,039 | 1,008 | 406 | 1,176 |
| 1999 | - | - | 80,958 | 32,886 | 54,269 | 13,294 | 5,512 | 4,446 | 23,247 | 7,865 | 1,756 | 469 | 1,157 |
| 2000 | - | - | 79,311 | 45,216 | 33,585 | 18,759 | 8,090 | 4,382 | 18,152 | 7,809 | 737 | 204 | 4,868 |
| 2001 | 13,056 | 5,162 | 102,219 | 54,775 | 72,261 | 18,201 | 7,445 | 5,086 | 41,920 | 20,060 | 1,438 | 238 | 15,612 |
| 2002 | 34,889 | 10,398 | 103,920 | 45,401 | 96,273 | 14,370 | 943 | 3,238 | 78,018 | 31,773 | 613 | 138 | 10,258 |
| 2003 | 43,289 | 14,548 | 101,227 | 36,187 | 71,006 | 15,551 | 11,098 | 4,101 | 74,460 | 28,328 | 1,314 | 262 | 11,595 |
| 2004 | 15,889 | 4,033 | 76,824 | 30,936 | 55,861 | 14,540 | 13,757 | 3,030 | 49,979 | 19,535 | 1,049 | 166 | 9,193 |
| 2005 | 16,896 | 3,681 | 65,081 | 25,712 | 15,798 | 12,284 | 13,356 | 2,515 | 38,536 | 12,229 | 2,397 | 557 | 5,244 |
| 2006 | 588 | 969 | 56,525 | 21,432 | 27,472 | 7,892 | 11,786 | 3,220 | 38,134 | 12,375 | 234 | 121 | 10,027 |
| 2007 | 12,226 | 2,624 | 45,972 | 20,514 | 10,548 | 6,037 | 9,672 | 3,753 | 22,244 | 9,498 | 2,689 | 436 | 6,424 |
| 2008 | 11,518 | 2,984 | 44,547 | 21,375 | 3,442 | 4,256 | 10,255 | 3,017 | 12,544 | 4,198 | 6,322 | 1,369 | 9,231 |
| 2009 | 10,536 | 3,435 | 41,517 | 21,492 | 18,364 | 7,615 | 10,686 | 4,032 | 13,904 | 6,366 | 5,141 | 852 | 11,731 |
| 2010 | 11,905 | 3,590 | 47,807 | 21,017 | 25,816 | 10,477 | 8,976 | 3,139 | 24,976 | 10,396 | 8,879 | 1,480 | 11,400 |
| 2011 | 37,384 | 9,983 | 52,194 | 18,682 | 25,323 | 7,814 | 9,514 | 3,192 | 21,065 | 9,422 | 7,359 | 1,233 | 7,616 |
| 2012 | 55,508 | 14,462 | 55,587 | 22,214 | 20,338 | 8,286 | 8,806 | 3,589 | 20,587 | 11,924 | 5,822 | 986 | 14,237 |
| 2013 | 70,411 | 18,128 | 48,825 | 19,097 | 31,702 | 10,248 | 9,847 | 3,303 | 19,198 | 11,722 | 10,765 | 2,127 | 9,754 |
| 2014 | 78,851 | 24,282 | 40,735 | 17,235 | 22,695 | 9,132 | 10,572 | 3,291 | 17,047 | 10,435 | 11,276 | 2,168 | 6,874 |
| 2015 | 99,131 | 25,559 | 35,290 | 16,046 | 22,394 | 9,879 | 13,661 | 4,509 | 15,334 | 11,274 | 13,868 | 3,089 | 10,924 |
| 2016 | 66,405 | 25,756 | 30,910 | 13,242 | 23,235 | 9,457 | 13,677 | 3,954 | 20,941 | 11,432 | 11,313 | 2,372 | 6,236 |
| 2017 | 82,461 | 27,341 | 27,961 | 10,617 | 27,540 | 10,525 | 11,641 | 3,425 | 24,164 | 11,811 | 15,266 | 3,266 | 6,093 |
| 2018 | 83,023 | 27,024 | 24,608 | 8,686 | 19,443 | 8,474 | 13,258 | 4,300 | 31,735 | 9,985 | 13,607 | 2,876 | 7,998 |
| 2019 | 65,298 | 18,652 | 18,472 | 8,342 | 17,655 | 8,556 | 12,620 | 4,209 | 34,930 | 12,170 | 11,117 | 2,012 | 6,843 |
| 2020 | 56,607 | 15,620 | 17,987 | 7,351 | 23,284 | 10,427 | 14,253 | 3,906 | 43,643 | 11,778 | 9,384 | 1,898 | 6,816 |
| 2021 | 84,812 | 27,299 | 15,266 | 6,176 | 19,704 | 9,699 | 15,748 | 5,092 | 28,693 | 8,032 | 8,123 | 1,692 | 4,770 |
| 2022 | 75,160 | 26,649 | 12,943 | 5,704 | 18,304 | 9,208 | 16,449 | 5,541 | 31,431 | 9,875 | 7,214 | 1,402 | 1,495 |
| 2023 | 30,837 | 24,528 | 7,900 | 3,547 | 5,131 | 14,416 | 14,638 | 5,431 | 28,786 | 10,659 | 8,425 | 1,777 | 1,434 |

¹ Includes the catches of—Incluye las capturas de: BLZ, CHL, COK, CRI, ECU, EU(ESP), GTM, HND, MEX, NIC, PAN, EU(PRT), SLV, VUT

TABLE A-10. Numbers and well volumes, in cubic meters, of purse-seine and pole-and line vessels of the EPO tuna fleet. The data for 2023 and 2024 are preliminary. (* The data provided for pole and line vessels for these years are reported combined under total catch (OTR; Table A-2a) because there is no information available by individual vessel; therefore, the total number of PL vessels and well volume is not available.)

TABLA A-10. Número y volumen de bodega, en metros cúbicos, de buques cerqueros y cañeros de la flota atunera del OPO. Los datos de 2023 y 2024 son preliminares. (* Los datos de buques cañeros de estos años se presentan combinados bajo captura total (OTR; Tabla A-2a) porque no se dispone de información por buque individual; por lo tanto, no se dispone del número total de buques cañeros ni del volumen de bodega).

| | PS | | LP | | Total | |
|------|-----|------------------------|-----|------------------------|-------|------------------------|
| | No. | Vol. (m ³) | No. | Vol. (m ³) | No. | Vol. (m ³) |
| 1995 | 175 | 123,798 | 20 | 1,784 | 195 | 125,582 |
| 1996 | 180 | 130,774 | 17 | 1,646 | 197 | 132,420 |
| 1997 | 194 | 147,926 | 23 | 2,127 | 217 | 150,053 |
| 1998 | 202 | 164,956 | 22 | 2,216 | 224 | 167,172 |
| 1999 | 208 | 178,724 | 14 | 1,642 | 222 | 180,366 |
| 2000 | 205 | 180,679 | 12 | 1,220 | 217 | 181,899 |
| 2001 | 204 | 189,088 | 10 | 1,259 | 214 | 190,347 |
| 2002 | 218 | 199,870 | 6 | 921 | 224 | 200,791 |
| 2003 | 214 | 202,381 | 3 | 338 | 217 | 202,719 |
| 2004 | 218 | 206,473 | 3 | 338 | 221 | 206,811 |
| 2005 | 220 | 212,419 | 4 | 498 | 224 | 212,917 |
| 2006 | 225 | 225,166 | 4 | 498 | 229 | 225,664 |
| 2007 | 227 | 225,359 | 4 | 380 | 231 | 225,739 |
| 2008 | 219 | 223,804 | 4 | 380 | 223 | 224,184 |
| 2009 | 221 | 224,632 | 4 | 380 | 225 | 225,012 |
| 2010 | 202 | 210,025 | 3 | 255 | 205 | 210,280 |
| 2011 | 208 | 213,237 | 3 | 339 | 211 | 213,576 |
| 2012 | 209 | 217,687 | 4 | 464 | 213 | 218,151 |
| 2013 | 203 | 212,087 | 3 | 268 | 206 | 212,355 |
| 2014 | 226 | 230,379 | 2 | 226 | 228 | 230,605 |
| 2015 | 244 | 248,428 | 1 | 125 | 245 | 248,553 |
| 2016 | 250 | 261,474 | * | * | 250 | 261,474 |
| 2017 | 254 | 263,018 | * | * | 254 | 263,018 |
| 2018 | 261 | 263,666 | * | * | 261 | 263,666 |
| 2019 | 261 | 265,085 | * | * | 261 | 265,085 |
| 2020 | 242 | 241,331 | * | * | 242 | 241,331 |
| 2021 | 236 | 253,323 | * | * | 236 | 253,323 |
| 2022 | 239 | 253,071 | * | * | 239 | 253,071 |
| 2023 | 246 | 261,296 | * | * | 246 | 261,296 |
| 2024 | 238 | 260,573 | * | * | 238 | 260,573 |

TABLE A-11a. Estimates of the numbers and well volume (cubic meters) of purse-seine (PS) and pole-and-line (LP) vessels that fished in the EPO in 2023, by flag and gear. Each vessel is included in the total for each flag under which it fished during the year but is included only once in the “Grand total”; therefore, the grand total may not equal the sums of the individual flags.

TABLA A-11a. Estimaciones del número y volumen de bodega (metros cúbicos) de buques cerqueros (PS) y cañeros (LP) que pescaron en el OPO en 2023 por bandera y arte de pesca. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el “Total general”; por consiguiente, los totales generales no equivalen necesariamente a las sumas de las banderas individuales.

| Flag Bandera | Gear Arte | Well volume —Volumen de bodega (m ³) | | | | | Total | |
|--|--------------|--|---------|----------|-----------|--------|-------|------------------------|
| | | <401 | 401-800 | 801-1300 | 1301-1800 | >1800 | No. | Vol. (m ³) |
| | | Number—Número | | | | | | |
| COL | PS | 1 | 2 | 7 | 3 | - | 13 | 14,590 |
| ECU | PS | 34 | 35 | 25 | 7 | 8 | 109 | 85,275 |
| EU(ESP) | PS | - | - | - | - | 4 | 4 | 9,330 |
| MEX | PS | 4 | 4 | 21 | 24 | - | 53 | 63,389 |
| NIC | PS | - | - | 2 | 1 | 1 | 4 | 6,099 |
| PAN | PS | - | 2 | 6 | 8 | 5 | 21 | 30,035 |
| PER | PS | - | 2 | - | - | - | 2 | 1,143 |
| SLV | PS | - | - | - | 1 | 2 | 3 | 6,202 |
| USA | PS | 9 | - | 1 | 8 | 5 | 23 | 25,386 |
| VEN | PS | - | - | 7 | 6 | 1 | 14 | 19,847 |
| Grand total— Total general | PS | 48 | 45 | 69 | 58 | 26 | 246 | |
| Well volume—Volumen de bodega (m³) | | | | | | | | |
| Grand total— Total general | PS | 12,359 | 26,196 | 78,474 | 88,806 | 55,461 | | 261,296 |

- : none—ninguno

TABLE A-11b. Estimates of the numbers and well volumes (cubic meters) of purse-seine (PS) vessels that fished in the EPO in 2024, by flag and gear. Each vessel is included in the total for each flag under which it fished during the year but is included only once in the “Grand total”; therefore, the grand total may not equal the sums of the individual flags.

TABLA A-11b. Estimaciones del número y volumen de bodega (metros cúbicos) de buques cerqueros (PS) que pescaron en el OPO en 2024, por bandera y arte de pesca. Se incluye cada buque en los totales de cada bandera bajo la cual pescó durante el año, pero solamente una vez en el “Total general”; por consiguiente, los totales generales no equivalen necesariamente a las sumas de las banderas individuales.

| Flag Bandera | Gear Arte | Well volume —Volumen de bodega (m ³) | | | | | Total | |
|--|--------------|--|---------|----------|-----------|--------|-------|------------------------|
| | | <401 | 401-800 | 801-1300 | 1301-1800 | >1800 | No. | Vol. (m ³) |
| | | Number—Número | | | | | | |
| COL | PS | 2 | 2 | 7 | 3 | - | 14 | 14,860 |
| ECU | PS | 33 | 36 | 27 | 9 | 8 | 113 | 91,171 |
| EU(ESP) | PS | - | - | - | - | 4 | 4 | 9,330 |
| MEX | PS | 3 | 4 | 20 | 23 | - | 50 | 61,043 |
| NIC | PS | - | - | 2 | 1 | 1 | 4 | 6,099 |
| PAN | PS | - | - | 6 | 8 | 6 | 20 | 31,002 |
| PER | PS | - | 5 | - | - | - | 5 | 2,686 |
| SLV | PS | - | - | - | 1 | 2 | 3 | 6,202 |
| USA | PS | 1 | - | 1 | 8 | 5 | 15 | 23,233 |
| VEN | PS | - | - | 3 | 6 | 1 | 10 | 14,947 |
| Grand total— Total general | PS | 39 | 47 | 66 | 59 | 27 | 238 | |
| Well volume—Volumen de bodega (m³) | | | | | | | | |
| Grand total— Total general | PS | 11,215 | 27,280 | 75,006 | 89,931 | 57,141 | | 260,573 |

- : none—ninguno

TABLE A-12. Minimum, maximum, and average capacity, in thousands of cubic meters, of purse-seine and pole-and-line vessels at sea in the EPO during 2014-2023 and in 2024, by month.

TABLA A-12. Capacidad mínima, máxima, y media, en miles de metros cúbicos, de los buques cerqueros y cañeros en el mar en el OPO durante 2014-2023 y en 2024, por mes.

| Month Mes | 2014-2023 | | | 2024 |
|----------------------|------------------|------------|-------------------|-------------|
| | Min | Max | Ave.-Prom. | |
| 1 | 86.9 | 130.4 | 109.3 | 116.4 |
| 2 | 154.2 | 192.3 | 179.6 | 180.8 |
| 3 | 147.9 | 189.7 | 171.7 | 164.1 |
| 4 | 151.2 | 200.8 | 172.5 | 160.2 |
| 5 | 150.6 | 196.9 | 174.1 | 165.7 |
| 6 | 156.3 | 198.6 | 176.7 | 152.1 |
| 7 | 161.4 | 200.4 | 174.0 | 155.8 |
| 8 | 107.6 | 148.7 | 121.6 | 116.7 |
| 9 | 102.2 | 142.2 | 119.1 | 105.4 |
| 10 | 141.7 | 188.9 | 169.4 | 153.9 |
| 11 | 93.5 | 135.9 | 115.4 | 99.8 |
| 12 | 56.3 | 90.4 | 66.7 | 67.1 |
| Ave.-Prom. | 125.8 | 167.9 | 145.8 | 136.5 |

B. YELLOWFIN TUNA

For the full version of the analyses herein, see documents [SAC-16-02](#), [SAC-16-03](#), [SAC-16 INF-T](#) and [SAC-16 INF-U](#).

Yellowfin are distributed across the Pacific Ocean, but the bulk of the catch is made in the eastern and western regions. Purse-seine catches in the vicinity of the western boundary of the eastern Pacific Ocean (EPO) at 150°W are relatively low, but have been increasing, mainly in sets on floating objects ([Figure A-1a](#) and [A-1b](#), Tables [A-1](#), [A-2](#)). Most of the catch in the eastern Pacific Ocean (EPO) is taken in purse-seine sets associated with dolphins and floating objects ([Figure B-1](#)). Tagging studies of yellowfin throughout the Pacific indicate that they tend to stay within 1,800 km of their release positions. This regional fidelity, along with the geographic variation in phenotypic and genotypic characteristics of yellowfin shown in some studies, suggests that there might be multiple stocks of yellowfin in the EPO and throughout the Pacific Ocean. This spatial heterogeneity makes the assessment of yellowfin tuna in the EPO challenging.

The purse-seine catches of yellowfin tuna were about 294,000 t in 2024, which is about 20% higher than the average for the previous 10 years ([Figure B-1](#)), and slightly lower than the 2023 catches. Catches from other gears (mainly longline) are about 5% of the total catches. The catch of yellowfin on floating-object sets peaked in 2022 at 91,000 t, which was the highest since 1975 (increase of ~50% from 2021 to 2022, in bias-adjusted weight), then decreased to 74,000 t in 2023 and 63,000 in 2024, returning to levels seen previous to the peak (average of about 60,000 from 2017-2021). The peak catches on 2022 were a concern due to the simultaneous peak in the number of floating objects sets, which decreased since then ([Figure B-2](#)). The increase in yellowfin catches in the floating-object fishery in 2022 may also be a consequence of the strong La Niña events in 2021 and 2022. The analysis of changes in yellowfin tuna catch of small fish in the purse-seine floating-object fishery relative to El Niño Southern Oscillation (ENSO) events suggested that there is positive impact of La Niña events on yellowfin recruitment into the fishery ([SAC-16-INF-T](#), [Figure B-3](#)). The increase of 26% in 2023 (to about 198,000) and 24% in 2024 (195,000) catches in purse-seine sets associated with dolphins from the average of the previous five years (2018-2022) are consistent with an increase in recruitment two years before, as this fishery catches larger and older yellowfin tuna than the floating object fishery. The meaning of those increases was also evaluated in the 2025 benchmark assessment.

The previous 2020 benchmark assessment ([SAC-11-07](#)) and external reviews ([YFT-02-Rep](#), [RVDTT-01](#), [RVMTT-01](#)) highlighted that uncertainty about the stock-structure of yellowfin in the EPO needs to be addressed in the assessment. The 2020 benchmark assessment considered a set of overarching hypotheses concerning stock structure, but due to the practical need for an assessment of the whole EPO, the assessment model was focused on the data for the core dolphin associated fishery area with catch included for the whole EPO. A review of all available information indicated that at least two stocks may be exploited by the EPO fisheries, roughly associated with epi- and meso-pelagic biogeochemical provinces ([SAC-14-06](#)), and that the boundaries between the stocks may vary dynamically. The external review concluded that there is evidence of spatial heterogeneity, but there was insufficient information to determine how to define areas for the assessment. Analysis of tagging data indicates that movement of yellowfin is limited (Schaefer and Fuller, 2022) and that isolation by distance may be occurring even within the area of distribution of dolphin associated fisheries, which was previously thought could be modelled as one group ([SAC-14-06](#)).

In 2024, exploratory stock assessments models were fit to an index of abundance derived from the data for the dolphin associated purse seine sets for the EPO. The models could not fit the length frequency data associated with the EPO-wide index because it was composed of fish from different areas that have different sizes. The catches from the core fishing area for purse-seine sets associated with dolphins (south of 20°N, north of 5°N and east of 125°W) show fish of intermediate size. To the north of that area, off Mexico, the fish sizes in the catches are smaller. To the west and south of the core area, the fish in the catches are larger. Further investigation indicated that those patterns are persistent over time and across gears ([SAC-15-03](#)). One of the main limitations of the exploratory models was that spatial definitions of fisheries were

constrained to be rectangles defined along latitude and longitude lines. In the 2025 benchmark assessment, irregular areas with homogeneous length composition were delineated using a newly developed flexible methodology based on cluster analysis. These areas were used to define fisheries and spatial domains for several models.

Given the uncertainty in stock structure, two hypotheses were used to develop models for the 2025 benchmark assessment:

- **Regional dynamics:** one stock with spatial dynamics among regions. The differences among regions may be due to spatial structure, movement, catchability/selectivity/availability and/or different exploitation rates. This hypothesis was implemented in the benchmark assessment with an EPO-wide areas-as-fleets model, where catches taken from the three regions and areas within were treated as separate fisheries and the differences in size composition were modeled with different selectivity curves. Note that a three-region spatial model was also implemented, but movement rates were estimated to be low so it was equivalent to independent stocks.
- **Independent stocks:** it is unlikely that the fish of different regions would be completely independent but given the estimation in the spatial model of movement rates to be very low, independent models for different regions are justified. In addition, modelling the regions independently will allow for understanding of the dynamics in different regions without influence from data outside the region. Two separate assessments were done. One for a northeast region (NE) that combines region 1 and region 2 in [Figure B-4](#), for simplicity, and is where most of the yellowfin catches are taken and another for region 3, which encompasses the south and west of the EPO (SW).

Four configurations representing the spatial-structure hypotheses in the 2025 benchmark assessment: 1) EPO, 2) SW, 3) NE, and 4) NE-short. The NE-short models were the same as the NE models, but started in 2006 instead of 1984, to address patterns in the data. One risk analysis was done for each spatial configuration, with eighteen models each, with a total of 72 models. A “base” scenario was built with new assumptions of growth, natural mortality and reproductive biology based on results of recent research. The uncertainty in biological parameters (growth, low and high, and natural mortality, low and high) and effort creep (increase in the catchability of the indices of abundance of 1% a year) was represented by alternative scenarios. Three values of steepness of the Beverton-Holt stock recruitment curve (1.0, 0.9, 0.8) are considered for the third level hypothesis. In the risk analyses, equal weight was used for level 2 hypotheses and expert judgement was used for level 3 (steepness). Indices of abundance and standardized length composition were obtained using spatiotemporal models fit to data from the purse-seine fishery associated with dolphins (to fit EPO, NE, NE-short) or longline fishery (SW). The models incorporated new information on growth, reproductive biology, and natural mortality, some derived from the IATTC Regional Tuna Tagging Program (RTTP). The indices were key to provide the relative trends in abundance but the information on absolute scale came from the length composition data.

Recruitment had two peaks in all models for all four spatial structure assumptions ([Figure B-5a](#)), but the timing differed. For the SW model the first peak occurred in 1998, while in the others it occurred in 1999. The second peak was in 2021. The EPO and NE models estimate a regime shift in recruitment to a lower level after the first peak, while the SW model does not. The SW models also estimated high recruitment in 2015-2017. Recruitment appears to be related to environmental conditions connected to the El Niño - La Niña system, but the relationship is more complex than what it can be represented by a simple index such as ONI ([Figure B-6](#)).

Spawning biomass generally follows the recruitment trends, with a 2-3 year delay, and since 2010 are diametric for the NE and SW regions ([Figure B-6](#)). The strong cohorts of 1998 and 1999 in the NE and SW regions appear as large spawning biomasses in 2001 and 2002 in the two regions, respectively. The NE (and NE_short) spawning biomass is estimated to be about twice the level of that estimated for the SW. EPO-

wide models have difficulty fitting data with incompatible trends and estimate larger and more uncertain biomass levels than the NE and SW combined.

Fishing mortality is higher for older fish ([Figure B-7](#)) and has been generally higher after 2000, but without any obvious trends except for a consistent increase in small fish in the SW region reflecting the increasing effort in the floating object fishery. The fishing mortality is lower for the EPO models, which is a consequence of its biomass being estimated to be higher than the sum of the biomasses for the NE and SW regions. The fishing mortality on the intermediate aged yellowfin (9-12 quarters of age) is low in the SW since the unassociated catches are lower and the purse-seine fishery associated with dolphins generally catches larger yellowfin. The fishing mortality on the youngest yellowfin (1-4 quarters of age) has steadily increased following the expansion of the floating object fishery in the mid 1990's. After 2015 the fishing mortality of this age group surpasses the 5-8 age class. The trends in fishing mortality are similar between the NE and the NE_short models, indicating that starting the model later does not change the perception of the effects of fishing in recent years. For those two hypotheses, there is a general increase in fishing mortality in all age classes after the year 2006, declining after 2015, with the lowest at the start of the covid19 pandemic, in 2020. After that, the fishing mortality increases, particularly for older yellowfin. The increase in fishing mortality noticed in the last five years in the NE area is not shared by the EPO model. This may be due to the influence of the SW area, which has stable fishing mortality followed by a sharp decline in 2023. This indicates that using an EPO-wide model may underestimate and mask regional trends in fishing mortality.

Impacts of the different types of fisheries in the EPO, NE and NE_short models are similar ([Figure B-8](#)). The longline fisheries have the smallest impact, while the purse-seine fisheries associated with dolphins have the greatest impact during most of the modelled period. The unassociated fisheries had the second largest impact in the early years, but in the 1990s the impact of the floating-object fisheries started to increase and surpassed that of the unassociated fisheries around 2008. For the SW models, the impact of the different purse seine set type has changed considerably over time. The longline fishery and the purse-seine associated with dolphins had the largest impact until mid-1990's, when there was an expansion of the floating object fishery, which steadily increased its impact and became the fishery with the largest impact in this region, larger than all other fisheries combined. The longline fishery has decreased both its effort and its impact on yellowfin in that area. The fishery associated with dolphins has slowly increased its absolute impact in this region, but in proportion it has stayed stable since the year 2000.

The spawning biomass ratio for all four spatial-structure hypotheses has been above the limit reference point ([Figure B-9](#)) for all the assessment periods. The spawning biomass is estimated to be above the staff's proposed MSY proxy target reference point of $30\%S_d$ ([SAC-15-05](#)) (and the biomass corresponding to MSY) for most of the assessment period, with the exceptions of some years for NE and NE_short ([Figure B-10](#)). The stock(s) is estimated to be currently well above the spawning biomass that corresponds to MSY (S_{MSY}) and the proxy $30\%S_d$ with low probability of being below these ([Table B-1](#), [Figure B-11](#)). The fishing mortality is estimated to be well below the level corresponding to MSY and the MSY proxy $F_{30\%}$ with low probability of being above these ([Table B-1](#), [Figure B-12](#)). The assessment estimates zero probability that the spawning biomass or fishing mortality limit reference points have been breached ([Table B-1](#), [Figure B-13](#)). The EPO models are the most optimistic. The most pessimistic models are those with low natural mortality ([Figures B-11](#) and [B-12](#)). Some of these models estimate that the spawning biomass is below the $S_{30\%}$ level and the fishing mortality is above the $F_{30\%}$ level. The high natural mortality levels are generally the most optimistic. The estimates of the SBR (the ratio of the spawning biomass to the virgin spawning biomass) corresponding to MSY are low (generally below 20%) even though the highest fishing mortality is on older yellowfin. The value is higher with lower steepness of the stock-recruitment relationship and lower natural mortality.

Future work to improve the assessment should focus on the key uncertainties: spatial structure, growth, natural mortality, and information about absolute abundance. This assessment showed that different areas in the EPO may have different depletion levels. The values used for natural mortality and the reliance on size composition data to inform absolute abundance remain key sources of uncertainty. Growth, especially at older ages, relied on a few high-quality tag returns. All four of these sources of uncertainty could be reduced by a comprehensive tagging program, which could allow for the application of newly developed spatiotemporal model approach to derive estimates of absolute abundance from tagging data, as done for skipjack tuna ([SAC-15-04](#)).

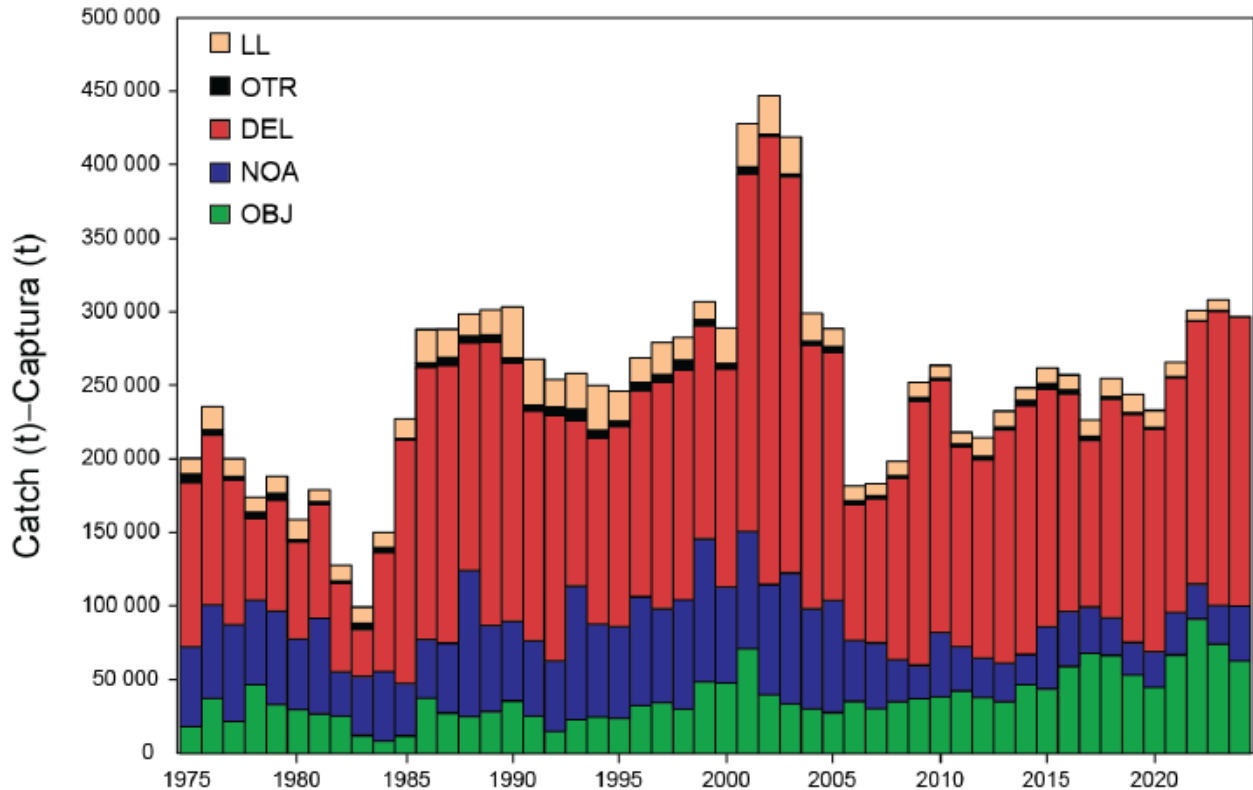


FIGURE B-1. Total catches (retained catches plus discards) for the purse-seine fisheries, by set type (DEL, NOA, OBJ), and retained catches for the longline (LL) and other (OTR) fisheries, of yellowfin tuna in the eastern Pacific Ocean, 1975-2024. The purse-seine catches are adjusted to the species composition estimate obtained from sampling the catches. The data for 2023 and 2024 are preliminary.

FIGURA B-1. Capturas totales (capturas retenidas más descartes) en las pesquerías de cerco, por tipo de lance (DEL, NOA, OBJ), y capturas retenidas de las pesquerías de palangre (LL) y otras (OTR), de atún aleta amarilla en el Océano Pacífico oriental, 1975-2024. Se ajustan las capturas de cerco a la estimación de la composición por especie obtenida del muestreo de las capturas. Los datos de 2023 y 2024 son preliminares.

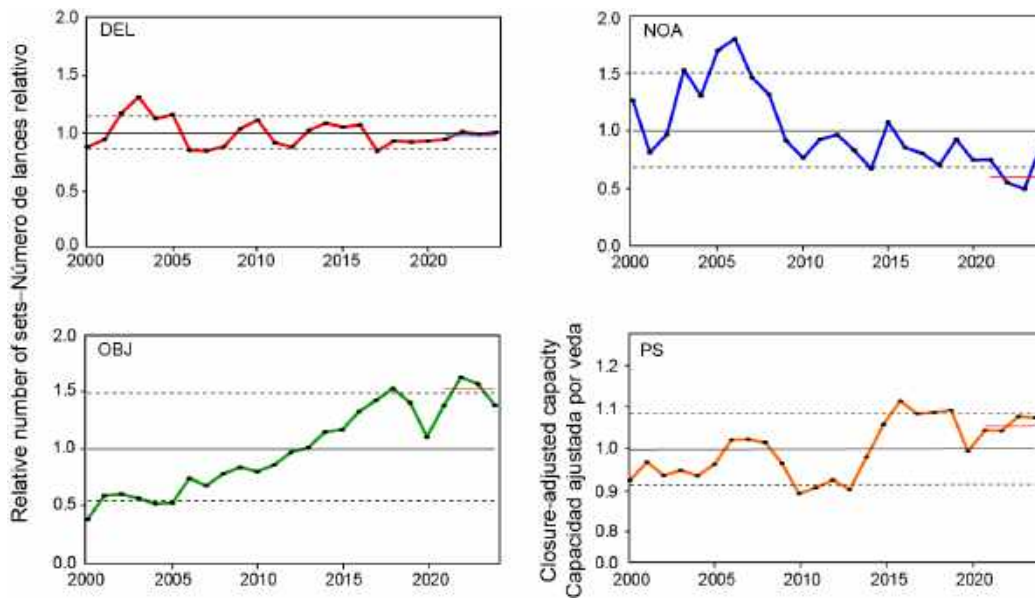


FIGURE B-2. Indicators of total effort in the EPO for 2000-2023, based on annual total number of sets, by type and purse-seine closure-adjusted capacity. The dashed horizontal lines are the 10th and 90th percentiles, the solid horizontal line is the mean. The red dashed lines mark the *status quo* levels (average conditions in 2017-2019).

FIGURA B-2. Indicadores del esfuerzo total en el OPO para 2000-2023, basados en número total anual de lances, por tipo, y capacidad ajustada por veda de cerco. Las líneas horizontales de trazos representan los percentiles de 10 y 90%, y la línea horizontal sólida el promedio. Las líneas discontinuas rojas marcan los niveles de *status quo* (condiciones promedio en 2017-2019).

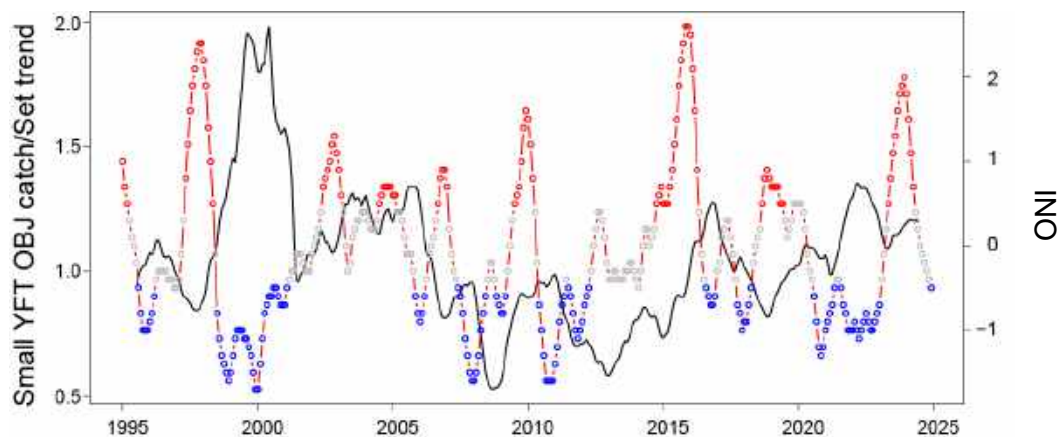


FIGURE B-3. Small yellowfin tuna monthly CPUE trend data overlaid with the Oceanic Niño Index (ONI). The colors of the points of ONI correspond to the El Niño (red), La Niña (blue), or Neutral (grey) phase ([SAC-16 INF-T](#)).

FIGURA B-3. Datos de tendencia de la CPUE mensual del atún aleta amarilla pequeño superpuestos con el índice Niño Oceánico (ONI). Los colores de los puntos del ONI corresponden a las fases de El Niño (rojo), La Niña (azul) o neutras (gris) ([SAC-16 INF-T](#)).

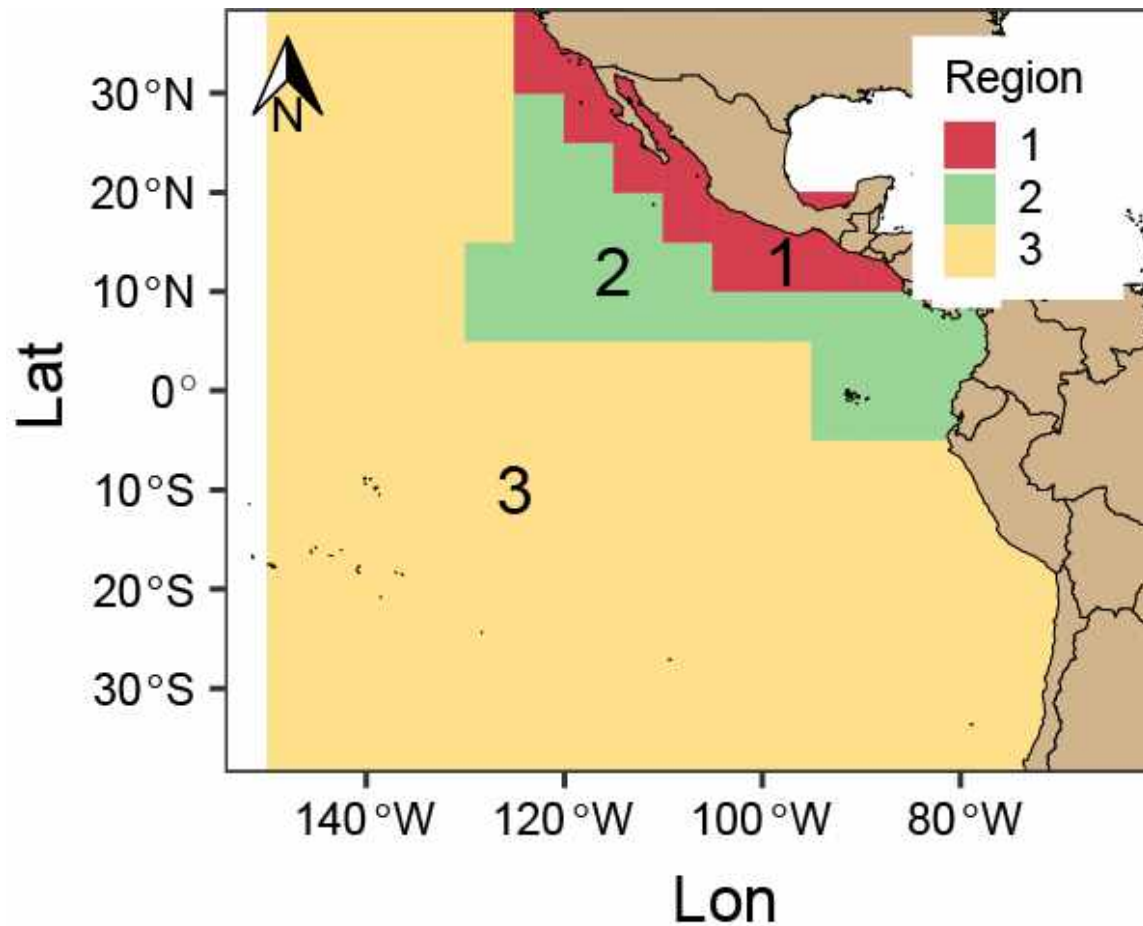


FIGURE B-4. Regional divisions obtained using cluster analysis of length composition data from the purse-seine fishery associated with dolphins. The EPO models consider all regions, the NE and NE_short models include regions 1 and 2, the SW model comprised only region 3. Further subdivisions in areas were made within each region based on the cluster analysis results, which were treated as different fisheries.

FIGURA B-4. Divisiones regionales obtenidas usando análisis de conglomerados de datos de composición por talla de la pesquería cerquera asociada a delfines. Los modelos del OPO consideran todas las regiones, los modelos NE y NE_short incluyen las regiones 1 y 2, el modelo SO comprende solo la región 3. Se hicieron subdivisiones adicionales en áreas dentro de cada región con base en los resultados del análisis de conglomerados, que fueron tratadas como pesquerías diferentes.

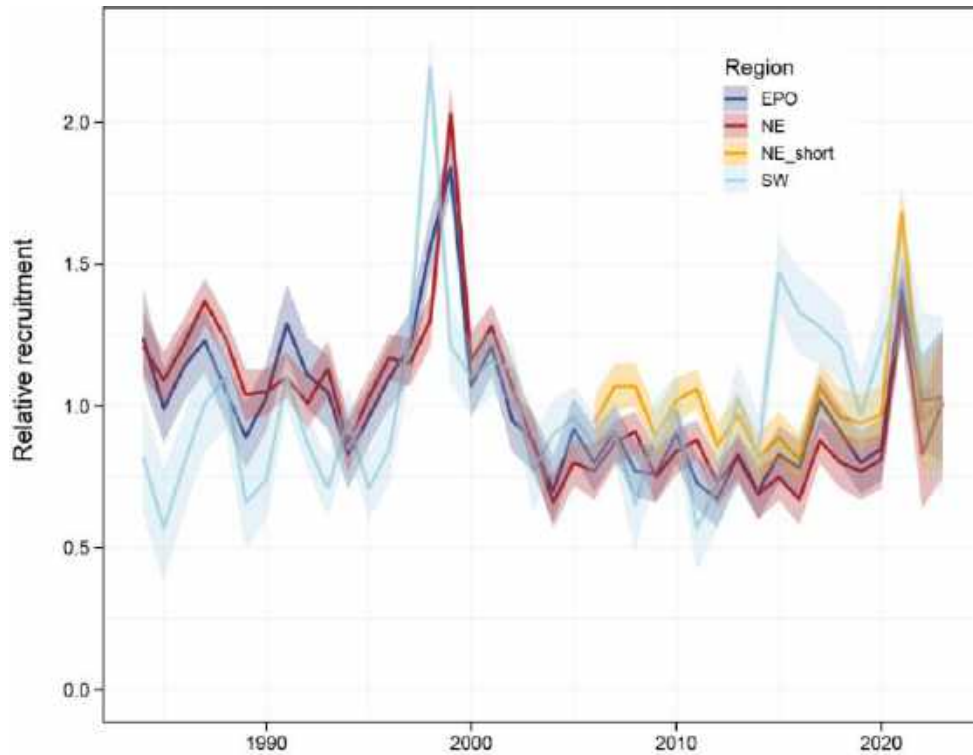


FIGURE B-5a. Relative recruitment. Comparison of multi-model estimates of median relative annual recruitment and 80% confidence interval of yellowfin tuna for each hypothesis of spatial structure. The multi-model estimates include all level 2 and level 3 uncertainty scenarios.

FIGURA B-5a. Reclutamiento relativo. Comparación de las estimaciones de múltiples modelos de la mediana del reclutamiento anual relativo y del intervalo de confianza del 80% del atún aleta amarilla para cada hipótesis de estructura espacial. Las estimaciones de múltiples modelos incluyen todos los escenarios de incertidumbre de nivel 2 y 3.

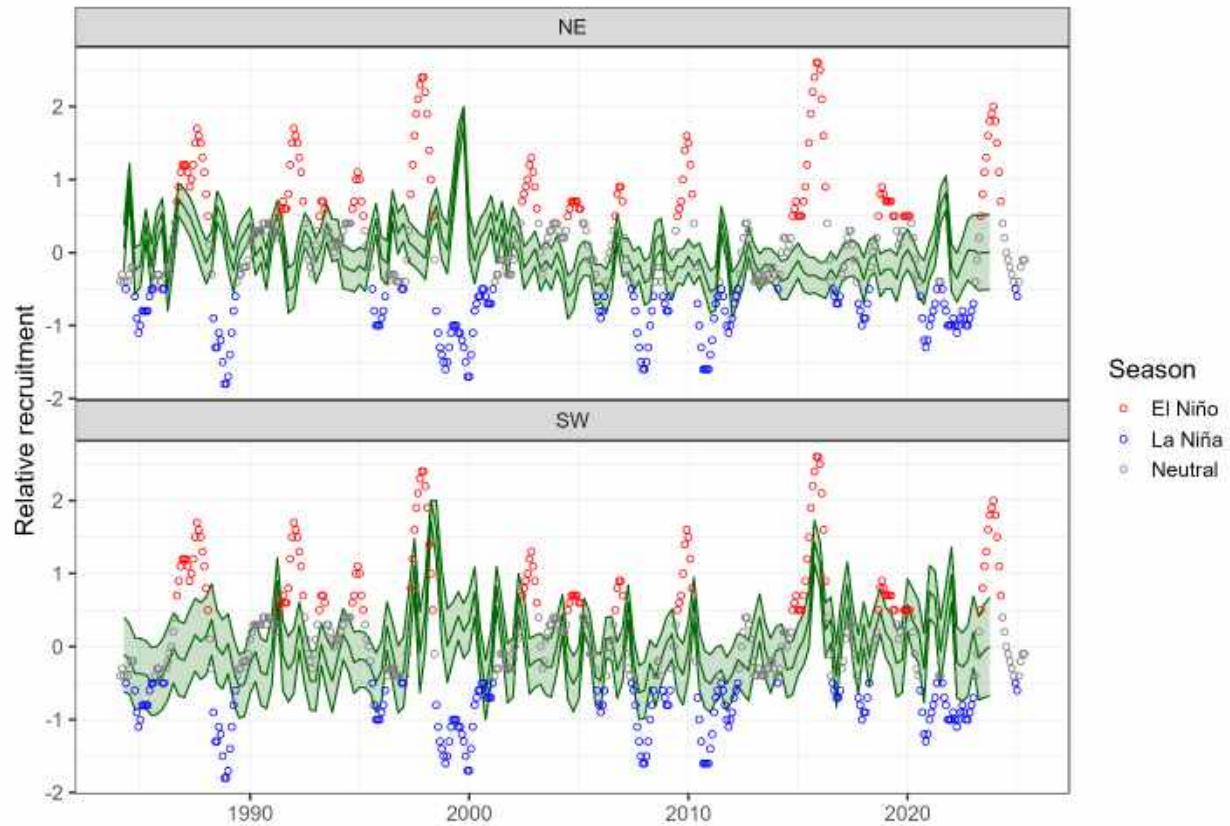


FIGURE B-5b. Relative recruitment. Quarterly estimates centered at 0 overlaid with the Oceanic Niño Index (ONI) for the NE (upper) and SW (lower) models. The colors of the points of ONI correspond to the El Niño (red), La Niña (blue), or Neutral (grey) phase.

FIGURA B-5b. Reclutamiento relativo. Reclutamientos trimestrales centrados en cero superpuestos con el índice Niño Oceánico (ONI). Los colores de los puntos del ONI corresponden a las fases de El Niño (rojo), La Niña (azul) o neutras (gris).

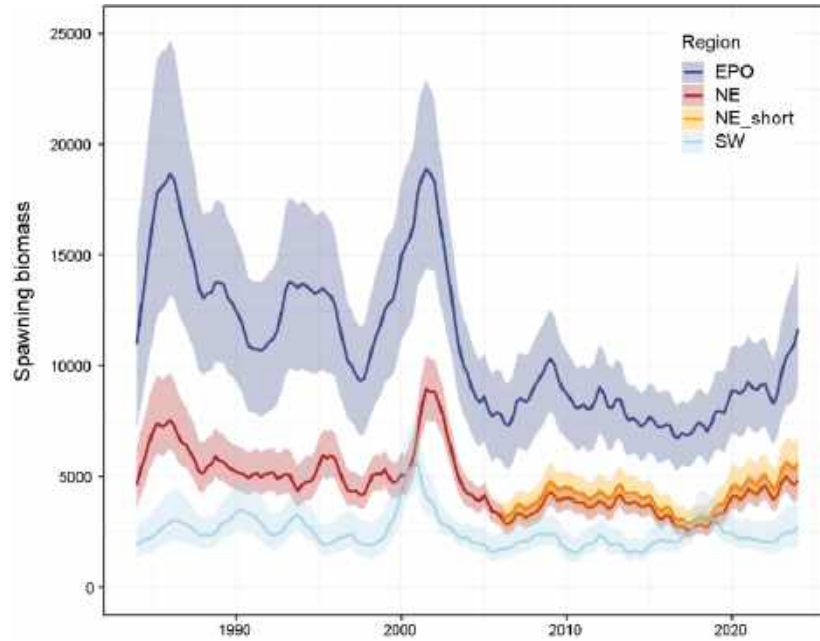


FIGURE B-6. Comparison of multi-model estimated spawning biomass of yellowfin tuna for each hypothesis of spatial structure with 80% confidence intervals.

FIGURA B-6. Comparación de la biomasa reproductora del atún aleta amarilla estimada en múltiples modelos para cada hipótesis de estructura espacial con intervalos de confianza del 80%.

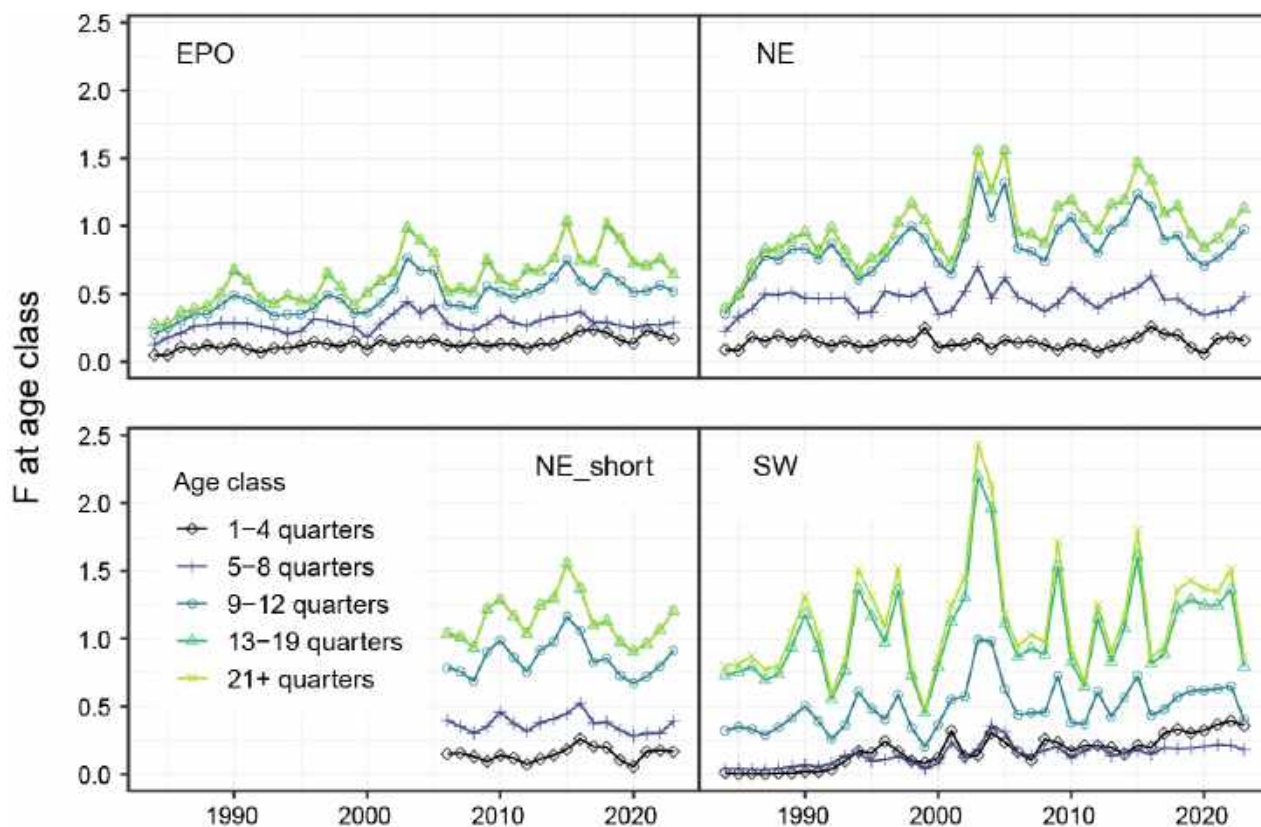


FIGURE B-7. Annual fishing mortality at age (sum of the four quarterly estimates within a year) of yellowfin by age group for each hypothesis of spatial structure (level 1). The values for each age group are weighted across level 2 and level 3 hypotheses.

FIGURA B-7. Mortalidad por pesca anual por edad (suma de las cuatro estimaciones trimestrales dentro de un año) de aleta amarilla por grupo de edad para cada hipótesis de estructura espacial (nivel 1). Los valores para cada grupo de edad están ponderados entre las hipótesis de nivel 2 y nivel 3

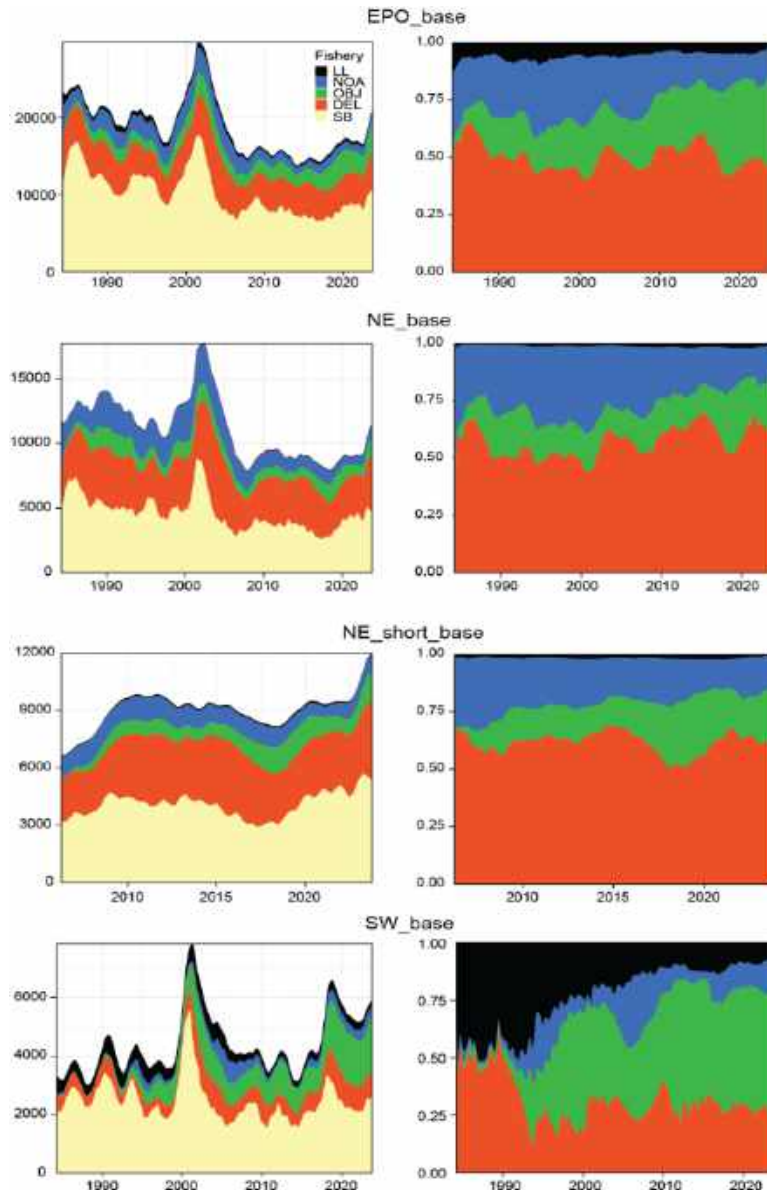


FIGURE B-8. Impact of the different fishing methods on the spawning biomass. Left panels: comparison of spawning biomass trajectory of a simulated population of yellowfin tuna that was never exploited (colored area) and that predicted by the stock assessment model (SB, yellow shaded area), and the impact of each fishing method (purse-seine on floating objects OBJ, also includes sorting discards and pole and line, purse-seine associated with dolphins DEL, purse-seine unassociated NOA and longline LL fisheries) for each stock structure hypothesis calculated from the base reference models with steepness of 1. Right panels: Proportional impacts.

FIGURA B-8. Impacto de los diferentes métodos de pesca en la biomasa reproductora. Paneles de la izquierda: comparación de la trayectoria de la biomasa reproductora de una población simulada de aleta amarilla que nunca fue explotada (área coloreada) y la predicha por el modelo de evaluación (SB, área sombreada en amarillo), y el impacto de cada método de pesca (cerco sobre objetos flotantes OBJ, también incluye descartes y caña, cerco asociado a delfines DEL, cerco no asociado NOA y pesquerías de palangre LL) para cada hipótesis de estructura de la población calculada a partir de los modelos de referencia base con inclinación de 1. Paneles de la derecha: impactos proporcionales.

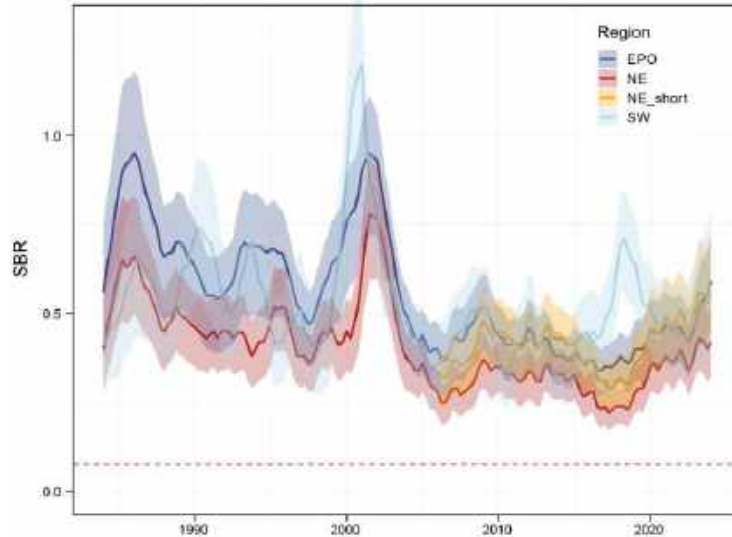


FIGURE B-9. Comparison of multi-model estimated spawning biomass ratio (spawning biomass over equilibrium virgin spawning biomass) of yellowfin tuna for each hypothesis of spatial structure with 80% confidence intervals. The red dashed line (at 0.077) indicates the SBR at the limit reference point S_{LIMIT} .

FIGURA B-9. Comparación del cociente de biomasa reproductora del atún aleta amarilla (biomasa reproductora sobre biomasa reproductora virgen de equilibrio) estimado en múltiples modelos para cada hipótesis de estructura espacial con intervalos de confianza del 80%. La línea roja discontinua (en 0.077) indica el SBR en el punto de referencia límite $S_{LÍMITE}$.

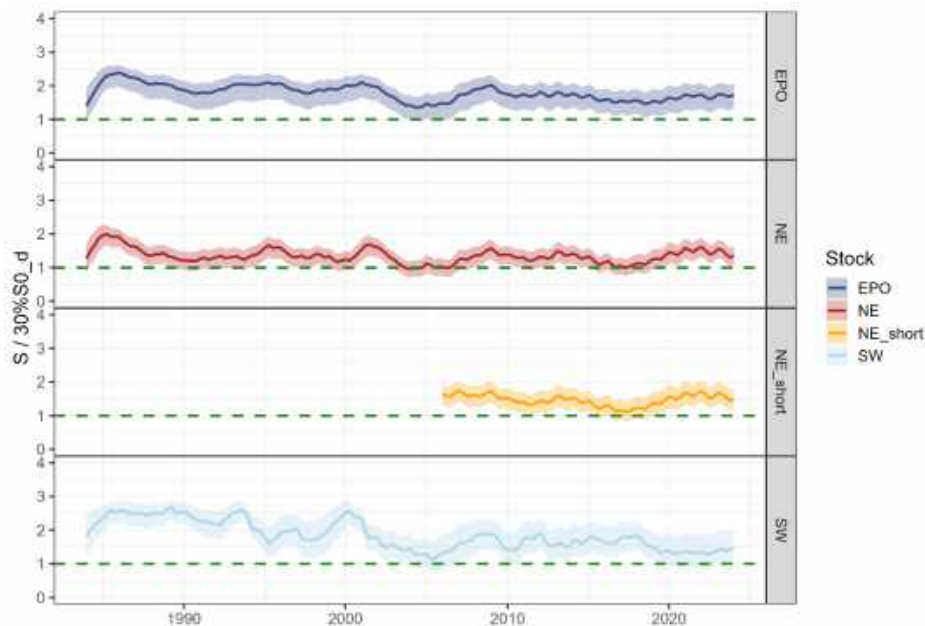


FIGURE B-10. Comparison of multi-model estimates of the ratio of S to $30\%S_d$ of yellowfin tuna for each hypothesis of stock structure.

FIGURA B-10. Comparación de estimaciones de múltiples modelos de la relación entre S y $30\%S_d$ del atún aleta amarilla para cada hipótesis de estructura de la población.

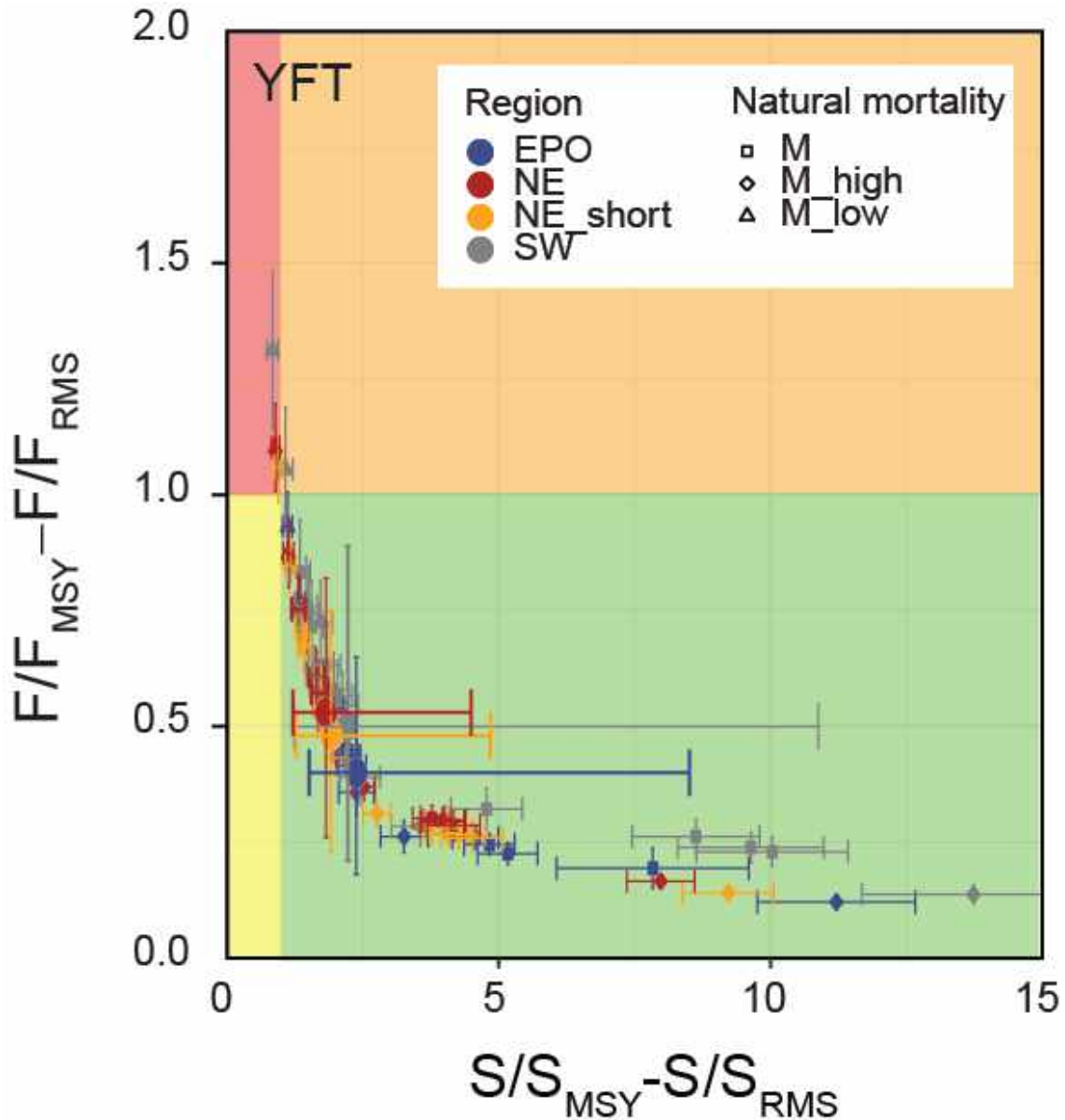


FIGURE B-11. Kobe plot of the most recent estimates of spawning biomass (S) and fishing mortality (F) relative to their target reference points ($S_{MSY,d}$ and F_{MSY}) for each hypothesis of spatial structure. Each dot is based on the average F over the most recent three years, 2021-2023, and the S for the first quarter of 2024 and the error bars represent the 80% confidence interval of model estimates. The larger dots represent the combined result for each spatial structure hypothesis.

FIGURA B-11. Gráfica de Kobe de las estimaciones más recientes de biomasa reproductora (S) y mortalidad por pesca (F) en relación con sus puntos de referencia objetivo ($S_{RMS,d}$ y F_{RMS}) para cada hipótesis de estructura espacial. Cada punto se basa en la F promedio de los tres años más recientes, 2021-2023, y la S del primer trimestre de 2024, y las barras de error representan el intervalo de confianza del 80% de las estimaciones del modelo. Los puntos más grandes representan el resultado combinado para cada hipótesis de estructura espacial.

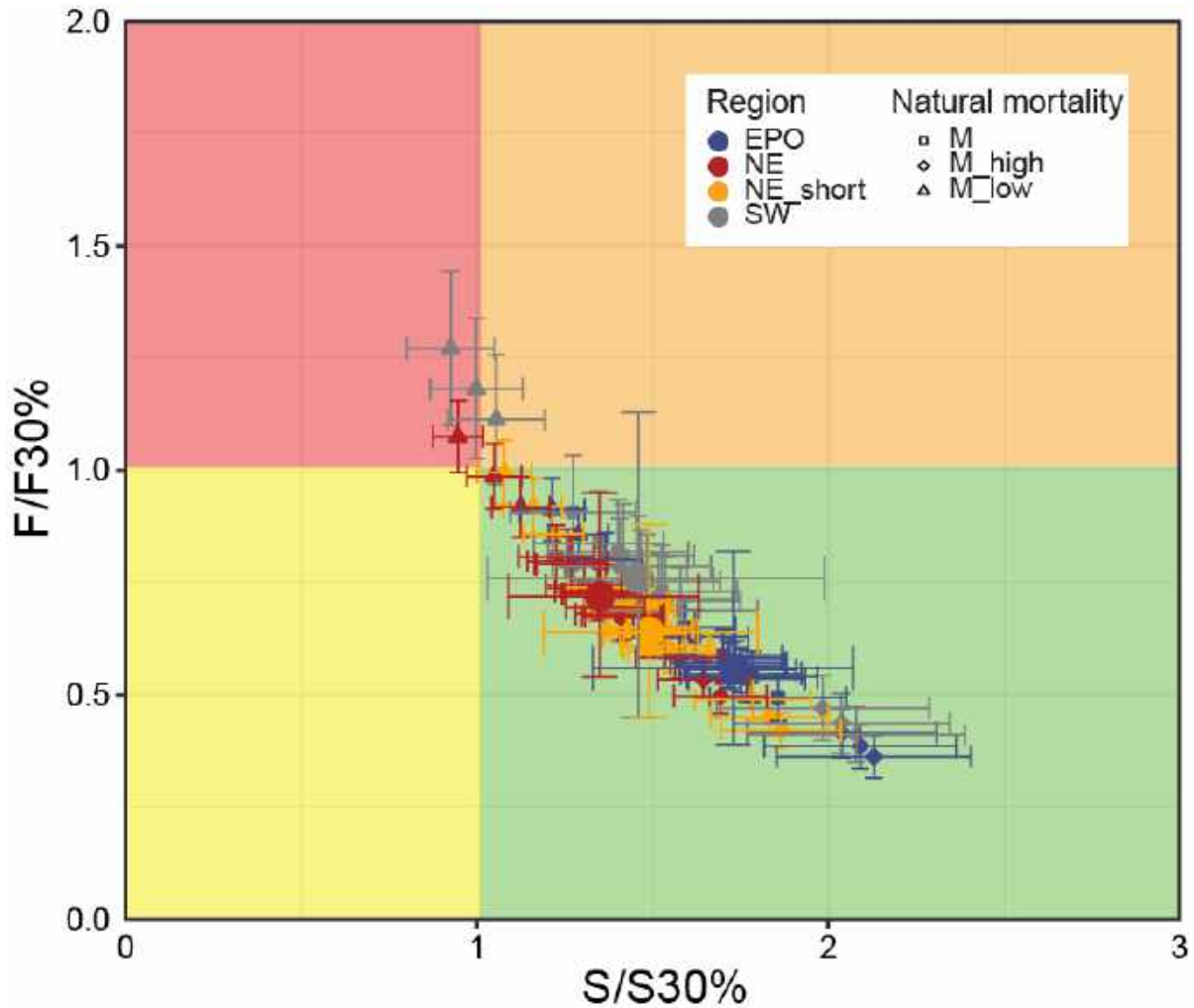


FIGURE B-12. Kobe plot of the most recent estimates of spawning biomass (S) and fishing mortality (F) relative to their proxy target reference points ($30\%S_d$ and $F_{30\%S_d}$) for each hypothesis of spatial structure. Each dot is based on the average F over the most recent three years, 2021-2023, and the S for the first quarter of 2024 and the error bars represent the 80% confidence interval of model estimates. The larger dots represent the combined result for each spatial structure hypothesis.

FIGURA B-12. Gráfica de Kobe de las estimaciones más recientes de biomasa reproductora (S) y mortalidad por pesca (F) relativas a sus puntos de referencia objetivo sustitutos ($30\%S_d$ y $F_{30\%S_d}$) para cada hipótesis de estructura espacial. Cada punto se basa en la F promedio de los tres años más recientes, 2021-2023, y la S del primer trimestre de 2024, y las barras de error representan el intervalo de confianza del 80% de las estimaciones del modelo. Los puntos más grandes representan el resultado combinado para cada hipótesis de estructura espacial.

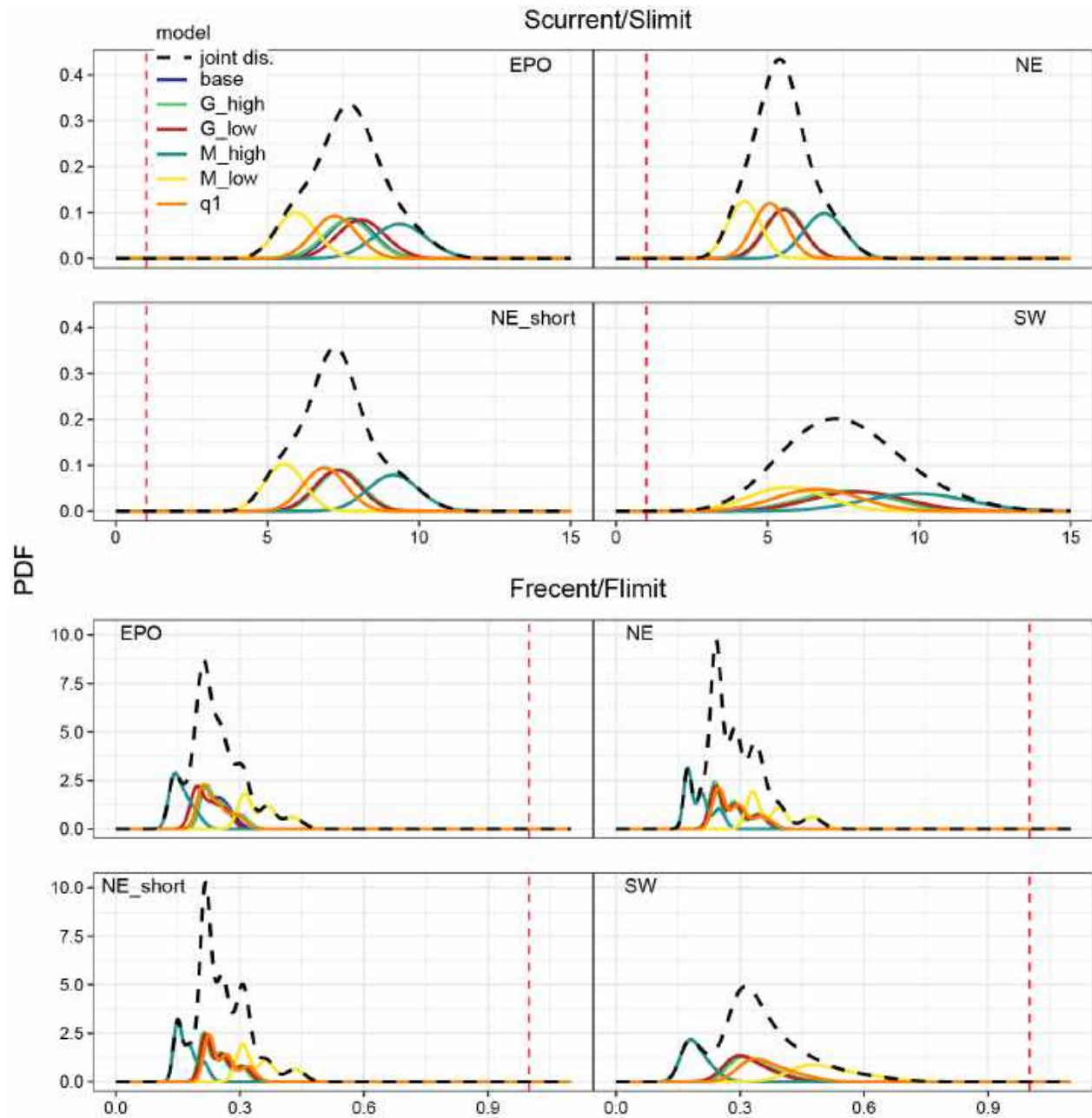


FIGURE B-13. The joint probability distributions for spawning biomass (S) in the first quarter of 2024 and average fishing mortality (F) in 2021-2023 relative to their limit reference points (S_{Limit} and F_{Limit}). The distributions are provided for each of the four spatial structure hypotheses separated into different components (level 2 hypotheses). The level 3 hypotheses (steepness values) were integrated out.

FIGURA B-13. Las distribuciones de probabilidad conjunta para la biomasa reproductora (S) en el primer trimestre de 2024 y la mortalidad por pesca (F) promedio en 2021-2023 en relación con sus puntos de referencia límite ($S_{Límite}$ y $F_{Límite}$). Las distribuciones se proporcionan para cada una de las cuatro hipótesis de estructura espacial separadas en distintos componentes (hipótesis de nivel 2). Las hipótesis de nivel 3 (valores de inclinación) se integraron fuera.

TABLE B-1. Management quantities for yellowfin tuna in the EPO for each spatial structure hypothesis. The medians (or expected values *) and probabilities were obtained from the joint probability distributions across models.

TABLA B-1. Cantidades de ordenación para el atún aleta amarilla en el OPO para cada hipótesis de estructura espacial. Las medianas (o valores esperados *) y probabilidades fueron obtenidas de las distribuciones de probabilidad conjunta en todos los modelos.

| | EPO | NE | NE_short | SW |
|---------------------------------|------------|-----------|-----------------|-----------|
| $SRMS/SO^*$ | 0.180 | 0.189 | 0.194 | 0.162 |
| $SRMS_d/SO_d^*$ | 0.190 | 0.192 | 0.201 | 0.170 |
| $F_{actual}/F_{30\%SO_d}$ | 0.559 | 0.718 | 0.643 | 0.757 |
| $p(F_{actual} > F_{30\%SO_d})$ | 0.002 | 0.059 | 0.020 | 0.161 |
| F_{actual}/F_{RMS} | 0.397 | 0.532 | 0.484 | 0.502 |
| $p(F_{actual} > F_{RMS})$ | 0.004 | 0.034 | 0.031 | 0.075 |
| $F_{actual}/F_{LÍMITE}$ | 0.232 | 0.272 | 0.243 | 0.330 |
| $p(F_{actual} > F_{LÍMITE})$ | 0.000 | 0.000 | 0.000 | 0.000 |
| $S_{actual}/30\%SO_d$ | 1.73 | 1.35 | 1.49 | 1.46 |
| $p(S_{actual} < 30\%SO_d)$ | 0.0000588 | 0.044 | 0.004 | 0.081 |
| $S_{(actual)} / S_{(RMS_d)}$ | 2.38 | 1.82 | 1.91 | 2.22 |
| $p(S_{actual} < S_{RMS_d})$ | 0.000 | 0.000 | 0.000 | 0.000 |
| $S_{actual}/S_{LÍMITE}$ | 7.67 | 5.43 | 7.23 | 7.48 |
| $p(S_{actual} < S_{LÍMITE})$ | 0.000 | 0.000 | 0.000 | 0.000 |

C. SKIPJACK TUNA

Skipjack tuna are distributed in tropical waters across the Pacific Ocean. In the eastern Pacific Ocean (EPO), the majority of catch is taken by the purse seine fishery. Since 1990 the purse-seine fishery associated with floating objects has become the dominant fishery type ([Figure C-1](#)).

A benchmark stock assessment for skipjack tuna in the EPO was conducted using an integrated statistical age-structured catch-at-length model in Stock Synthesis. This assessment represents a significant improvement from the initial interim assessment conducted in 2022. It reflects major advancements in the assessment methodologies and incorporates new data sets, including tagging data collected through the Regional Tuna Tagging Program in the EPO.

Several data sources are available to fit the model, including data from sixteen defined fisheries and five “surveys”. The fisheries are classified by gear type (purse-seine, longline) and purse-seine set type, which includes dolphin-associated (DEL), floating-object associated (OBJ), and unassociated (NOA) sets, as well as by geographical area of operation. The “surveys” data include: a) catch-per-set indices for purse-seine sets, by set type (OBJ, NOA), where the relationship between catch-per-set and abundance remains uncertain; b) an index based on recently developed echosounder buoy data; c) absolute biomass from a spatiotemporal Petersen-type model applied to tag-recapture data; and d) an index of relative biomass from a tagging biomass model that uses a flexible effort assumption. A reference model is developed based on the most plausible assumptions and sensitivity analyses are conducted by changing the assumptions of the reference model. There is substantial uncertainty about several model assumptions and sensitivity analyses are conducted to determine if the management advice is robust to the uncertainty, especially concerning model assumptions about growth and selectivity. There is also uncertainty about the reliability of different data sources, and there is conflict in the information they provide about absolute abundance. Sensitivity analyses are conducted to determine if the management advice is robust to the use of the different data sources. The diagnostics indicate that a data conflict exists. However, the management results were robust to the model assumptions about growth and selectivity, as well as to the inclusion or exclusion of the index of abundance and length-composition data sets.

MSY-based quantities cannot be estimated because the tradeoff between growth and natural mortality, in combination with the assumption that recruitment is independent of stock size, implies fish should be caught at the youngest ages to maximize yield, implying that the optimal fishing mortality should be infinite. Therefore, a conservative proxy for the target biomass of $SBR = 0.3$ based on values for bigeye and yellowfin, and the fishing mortality corresponding to that biomass, are proposed as the target reference points ([SAC-14-09](#); [SAC-14 INF-O](#)). The reference model estimated that the 2023 exploitation rate was below *status quo* (average level of 2017-2019; [Figure C-2](#)). Only one of the sensitivity analyses, which removed the ECHO index, estimated exploitation rates that exceeded the *status quo* in 2023 slightly ([Table C-1](#)). The reference model and most of the sensitivity analyses estimate that the current biomass is above the target reference point and the fishing mortality is below the target fishing mortality ([Figure C-3](#), [Table C-1](#)). Only the pessimistic model that excluded the echosounder buoy index estimates that the stock is below the proxy target and only when based on the static definition ([Table C-1](#)). None of these scenarios estimate that the stock is below the limit reference point ([Table C-1](#)).

A risk assessment conducted herein incorporates both the reference and seventeen sensitivity models to provide management advice, treating all models with equal weight. The risk analysis reveals unimodal probability distributions for key management metrics, indicating: a) a 4% probability that the spawning biomass at the start of 2024 was below 30% of the unexploited level, according to the dynamic SBR ($dSBR_{MSY\ proxy}$), b) zero probability that average fishing mortality during 2021-2023 exceeded the level associated with the target biomass ($F_{MSY\ proxy}$), and c) less than 1% probability that the spawning biomass at the start of 2024 was below the limit reference point (S_{limit}) ([Figure C-4](#)).

The improvement of the stock assessment for skipjack and future management advice will continue to strongly rely on the implementation of a comprehensive tagging program.

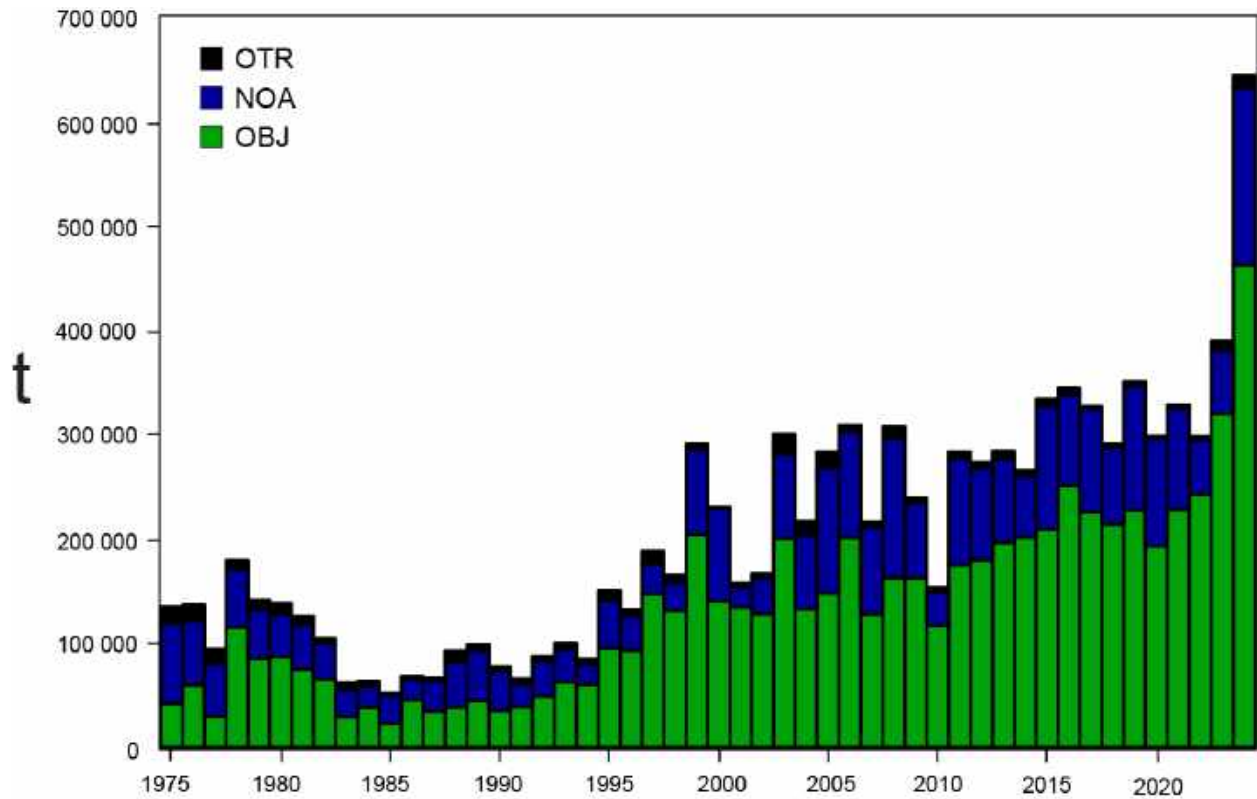


FIGURE C-1. Total catches (retained catches plus discards) for the purse-seine fisheries, by set type (NOA, OBJ) and retained catches for the other (OTR) fisheries, of skipjack tuna in the eastern Pacific Ocean, 1975-2023. The purse-seine catches are adjusted to the species composition estimate obtained from sampling the catches. The 2020 catch data are preliminary.

FIGURA C-1. Capturas totales (capturas retenidas más descartes) en las pesquerías de cerco, por tipo de lance (NOA, OBJ), y capturas retenidas de las otras pesquerías (OTR), de atún barrilete en el Océano Pacífico oriental, 1975-2023. Se ajustan las capturas de cerco a la estimación de la composición por especie obtenida del muestreo de las capturas. Los datos de captura de 2020 son preliminares.

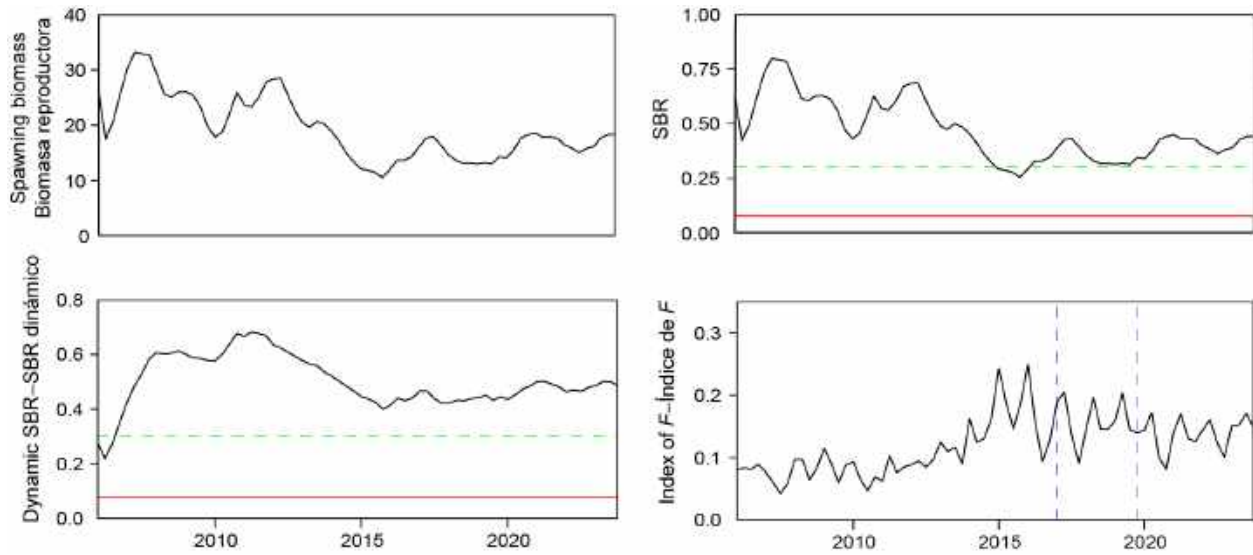


FIGURE C-2. Spawning biomass, spawning biomass ratio, dynamic spawning biomass ratio, and an index of quarterly exploitation rate for the reference model. The green dashed horizontal line is the target biomass reference point (SBR = 0.3) and the red horizontal dashed line is the limit biomass reference point (SBR = 0.077). The two vertical lines represent the *status quo* period (2017-2019).

FIGURA C-2. Biomasa reproductora, cociente de biomasa reproductora, cociente de biomasa reproductora dinámica y un índice de la tasa de explotación trimestral para el análisis de sensibilidad que supone que la edad de un pez de 37 cm es 3 trimestres. La línea horizontal verde discontinua es el punto de referencia objetivo de la biomasa (SBR = 0.3) y la línea horizontal roja discontinua es el punto de referencia límite de la biomasa (SBR = 0.077). Las dos líneas verticales representan el periodo de *statu quo* (2017-2019).

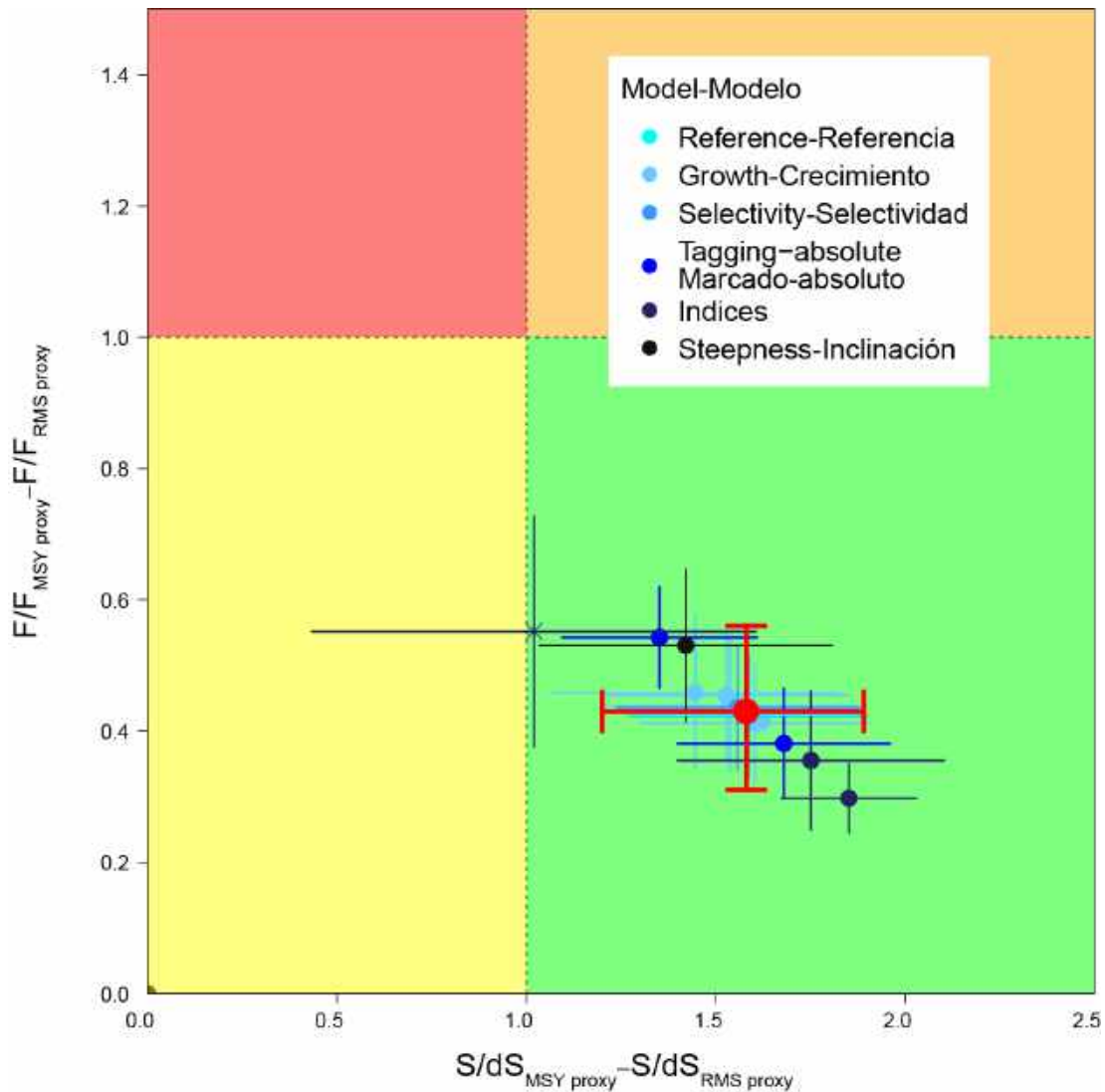


FIGURE C-3. Kobe plot showing the stock status estimates from all the models. The red dot and error bars represent weighted values across all eighteen models. The deep indigo cross and error bars represent the estimates from the model in which the ECHO index was removed.

FIGURA C-3. Gráfica de Kobe que muestra las estimaciones de la condición de la población de todos los modelos. El punto rojo y las barras de error representan los valores ponderados de los 18 modelos. La cruz azul oscuro y las barras de error representan las estimaciones del modelo en el que se eliminó el índice ECO.

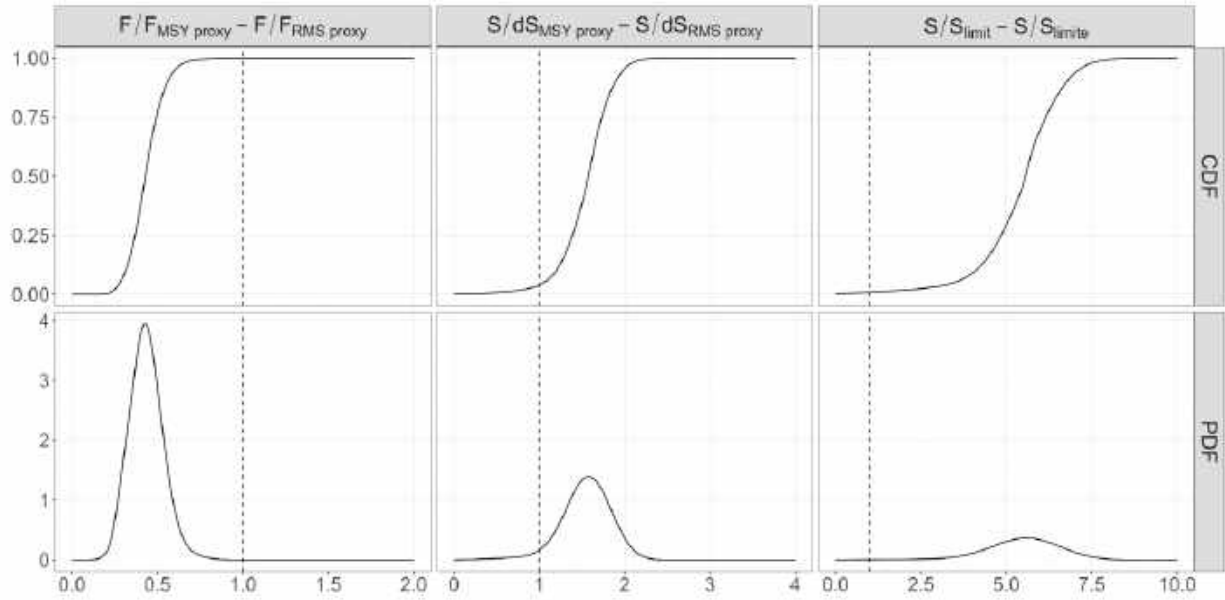


FIGURE C-4. The joint probability and cumulative distributions for spawning biomass (S) in the first quarter of 2024 and fishing mortality (F) in 2021-2023 relative to their reference points ($F_{MSY\ proxy}$, $dS_{MSY\ proxy}$, S_{limit}).

FIGURA C-4. Las distribuciones acumuladas y de probabilidad conjunta para la biomasa reproductora (S) en el primer trimestre de 2024 y la mortalidad por pesca (F) en 2021-2023 con respecto a sus puntos de referencia ($F_{RMS\ sust.}$, $dS_{RMS\ sust.}$, $S_{límite}$).

TABLE C-1. Estimates of spawning biomass (SB), spawning biomass ratio (SBR) and dynamic spawning biomass ratio (dSBR) at the beginning of 2024, average recruitment over the model time period (except the 4th quarter of 2023) as a ratio of the estimated virgin recruitment for all of the models, average exploitation rate in 2022 as a ratio of the *status quo*, average exploitation rate in 2023 as a ratio of the *status quo*, and current fishing mortality (the average F over the most recent three years, 2021-2023) as a ratio of the fishing mortality corresponding to $B_{MSY\ proxy} = 0.3B_0$. R_{ave}/R_0 is a check to make sure the SBR based on B_0 is not biased due to the bias correction for recruitment residuals (this will affect the plots of SBR that are plotted with confidence intervals). The dSBR is adjusted by the ratio R_{ave}/R_0 . The red highlighting and text indicate where SBR or dSBR are below the proxy target reference point (0.3) and when the *status quo* fishing mortality (average of 2017-2019) has been exceeded.

TABLA C-1. Estimaciones de biomasa reproductora (SB), cociente de biomasa reproductora (SBR), cociente de biomasa reproductora dinámica (dSBR), reclutamiento promedio a lo largo del periodo del modelo (excepto el cuarto trimestre de 2023) como razón del reclutamiento virgen estimado para todos los modelos, tasa promedio de explotación en 2022 como razón del *statu quo*, tasa promedio de explotación en 2023 como razón del *statu quo*, y mortalidad por pesca actual como razón de la mortalidad por pesca correspondiente a $B_{objetivo} = 0.3B_0$. R_{prom}/R_0 es una comprobación para asegurarse de que el SBR basado en B_0 no esté sesgado debido a la corrección del sesgo por los residuales de reclutamiento (esto afectará a las gráficas de SBR que se trazan con intervalos de confianza). El dSBR se ajusta por la razón R_{prom}/R_0 . Las celdas y el texto en rojo indican los casos en que el SBR o dSBR están por debajo del punto de referencia objetivo sustituto (0.3) y cuando se ha rebasado la mortalidad por pesca del *statu quo* (promedio de 2017-2019).

| ID | Model | SB _{cur} | SBR _{cur} | dSBR _{cur} | R_{av}/R_0 | F_{2022}/F_{sq} | F_{2023}/F_{sq} | $F_{cur}/F_{B_{MSY\ proxy}}$ |
|----|--|-------------------|--------------------|---------------------|--------------|-------------------|-------------------|------------------------------|
| | Reference model | 17809 | 0.43 | 0.47 | 0.95 | 0.85 | 0.85 | 0.42 |
| a1 | Estimating L_{inf} | 17873 | 0.43 | 0.48 | 0.95 | 0.85 | 0.85 | 0.42 |
| a2 | $L_{inf} = 78$ cm | 16769 | 0.42 | 0.46 | 0.95 | 0.85 | 0.85 | 0.45 |
| a3 | $L_{inf} = 88$ cm | 18181 | 0.43 | 0.48 | 0.96 | 0.85 | 0.84 | 0.41 |
| a4 | Estimating L_{cv} | 14055 | 0.41 | 0.43 | 1.01 | 0.82 | 0.82 | 0.46 |
| a5 | $L_{cv} = 0.03$ | 18926 | 0.43 | 0.49 | 0.94 | 0.86 | 0.85 | 0.41 |
| a6 | $L_{cv} = 0.09$ | 16612 | 0.42 | 0.46 | 0.97 | 0.84 | 0.84 | 0.44 |
| a7 | Estimating growth shape parameter | 17814 | 0.43 | 0.48 | 0.95 | 0.85 | 0.85 | 0.42 |
| b1 | Constant longline selectivity after 78 cm | 17873 | 0.43 | 0.48 | 0.95 | 0.85 | 0.85 | 0.42 |
| b2 | Constant longline selectivity after 83 cm | 17818 | 0.43 | 0.48 | 0.95 | 0.85 | 0.85 | 0.42 |
| b3 | Constant longline selectivity after 88 cm | 17826 | 0.43 | 0.48 | 0.95 | 0.85 | 0.85 | 0.42 |
| b4 | F9 asymptotic selectivity, fixed longline selectivity and no fit for longline size composition | 17263 | 0.42 | 0.47 | 0.96 | 0.85 | 0.85 | 0.44 |
| c1 | Using the most precise tagging-based absolute index and upweight by ten times | 13357 | 0.37 | 0.41 | 0.95 | 0.90 | 0.87 | 0.54 |
| c2 | Using four tagging-based absolute indices with low CVs and weight by one | 20018 | 0.46 | 0.50 | 0.96 | 0.83 | 0.83 | 0.38 |
| d1 | No tagging-based absolute index | 21849 | 0.47 | 0.53 | 0.96 | 0.83 | 0.83 | 0.36 |
| d2 | No echosounder buoy index | 8543 | 0.22 | 0.31 | 0.96 | 1.00 | 1.07 | 0.55 |
| d3 | Including longline survey index and size composition | 24444 | 0.50 | 0.56 | 0.95 | 0.80 | 0.85 | 0.30 |
| e1 | Steepness = 0.75 | 18420 | 0.39 | 0.43 | 0.92 | 0.85 | 0.84 | 0.53 |

D. BIGEYE TUNA

For the full version of this analysis, see document [SAC-15-02](#).

Bigeeye tuna are distributed in tropical and temperate waters across the Pacific Ocean. In the eastern Pacific Ocean (EPO), the majority of catch before 1993 was taken by longline fisheries that target large bigeye (Figure D-1). Due to the expansion of purse-seine fisheries associated with floating objects, purse-seine fisheries that catch small bigeye have replaced longline fisheries as the dominant fishery type for EPO bigeye since 1996. A workplan to improve the stock assessments for tropical tunas was executed and an [external review for data used in stock assessments](#) and an [external review of modelling aspects for stock assessments](#) were completed.

In the last benchmark assessment, the overarching hypothesis for bigeye tuna aimed to explain the apparent regime shift in recruitment estimates that coincided with the expansion of the floating-object fishery in the EPO. However, the degree of the regime shift in recruitment estimates from the new assessment models is reduced greatly, from 140% to 20% for the base reference model. As such, this overarching hypothesis is not included in this benchmark assessment. This significant decrease of the regime shift in recruitment results from the combination of changes made to the assessment model. Among these changes the most influential in reducing the regime shift are adding one more time block to the selectivity of longline fishery fleets in 2011, improving the CPUE standardization model, and using the Lorenzen natural mortality curve for juvenile bigeye. The reference models in this benchmark assessment address three major uncertainties within a hierarchical framework: (1) the misfit to the length-composition data for the longline fishery that is assumed to have asymptotic selectivity; (2) the degree of effort creep in the longline fishery; and (3) the steepness of the stock-recruitment relationship.

Level 1 hypothesis: Four models are included to address the misfit to the composition data for the longline fishery that is assumed to have asymptotic selectivity: (1) ignore the issue (Fix); (2) estimate the growth curve with a prior on L_{inf} (Gro); (3) estimate a dome-shape selectivity curve for the longline fishery that is assumed to have asymptotic selectivity (Sel); and (4) estimate the scaler of the natural mortality vector (Mrt). Additionally, a model where growth rather than natural mortality is sex-specific is explored to address the misfit, but it is not included for this hypothesis due to its worse misfit compared to the model where the issue is ignored (Fix). The four reference models are equally weighted. The decision to equally weight the four models is made based on the outcome of the two risk analysis workshops organized by the IATTC (WSRSK-01-RPT and WSRSK-02-RPT).

Level 2 hypothesis: Three levels of annual increasing rate of the longline catchability for bigeye are included to address the uncertainty in effort creep. Considering that bigeye is the main target species of the Japanese longline fishery in the EPO, its catchability in this fishery is expected to increase owing to advancements in fishing skill and technology. The review panel suggests considering a 1% annual increase in the catchability of bigeye in the longline fishery ([RVMTT-01-RPT](#)). Based on this recommendation, three annual increases in longline catchability (0%, 1%, and 2%) are considered to address this uncertainty, each equally weighted.

Level 3 hypothesis: Three steepness values (1.0, 0.9, and 0.8) are included to address the uncertainty in the shape of the stock-recruitment relationship. The three steepness values are weighted based on expert judgement from the risk analysis for the last benchmark assessment ([SAC-11 INF-F](#)).

The results from the thirty-three converged reference models show that (1) the recruitment shift is not apparent in this benchmark assessment (Figure D-2); (2) all models show a decreasing trend in spawning biomass while the scale of the spawning biomass varies dramatically among models (Figure D-3); (3) since 2021, the fishing mortality on both juvenile and adult bigeye has decreased significantly (Figure D-4).

Regarding management quantities, the thirty-three converged reference models estimate that (1) the spawning biomass of bigeye at the beginning of 2024 ranges from 45% to 292% of the spawning biomass at dynamic MSY; (2) the fishing mortality of bigeye in 2021-2023 ranges from 42% to 136% of the fishing mortality at MSY; (3) the spawning biomass of bigeye at the beginning of 2024 ranges from 134% to 346% of the spawning biomass at the limit level; and (4) the fishing mortality of bigeye in 2021-2023 ranges from 35% to 80% of the fishing mortality at the limit level.

The estimates from the thirty-three converged reference models are combined in a risk analysis framework to provide management advice. The overall results of the risk analysis show unimodal probability distributions for management quantities. The shift from a bimodal to unimodal pattern in the distributions likely results from resolving the regime shift in recruitment in this benchmark assessment. The risk analysis indicates that there is a (1) 46.6% probability

that the spawning biomass at the beginning of 2024 is below the target reference point (S_{MSY_d}) (Figure D-6); (2) 24.7% probability that the fishing mortality in 2021-2023 is above the target reference point (F_{MSY}) (Figure D-6); (3) 58.5% probability that the fishing mortality in 2017-2019 (the *status quo* period) was above the target reference point (F_{MSY}) (Figure D-7); (4) 0.2% probability that the spawning biomass at the beginning of 2024 is below the limit reference point (S_{Limit}) (Figure D-8); and (5) 0.1% probability that the fishing mortality in 2021-2023 is above the limit reference point (F_{Limit}) (Figure D-8). The weighted 10-year projection under the current fishing mortality suggests there is a 50% probability that the spawning biomass ratio at the beginning of 2034 will be above 0.27 (Figure D-9).

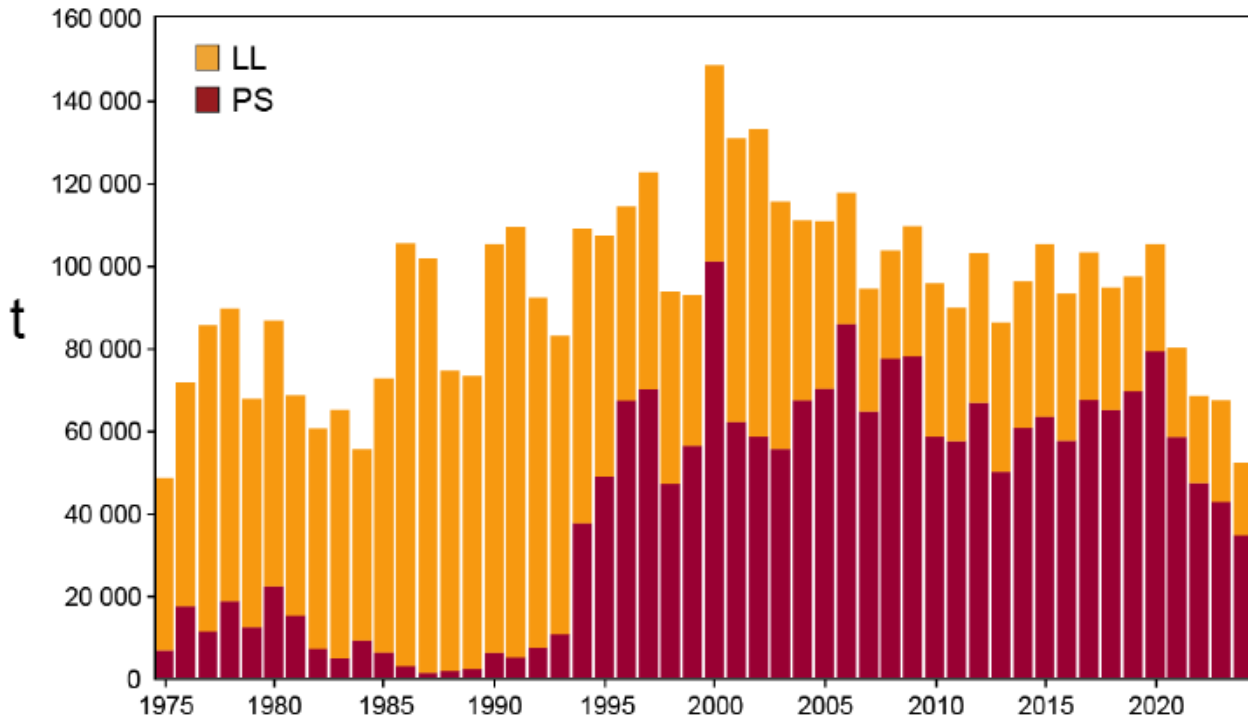


FIGURE D-1. Total catches (retained catches plus discards) by the purse-seine (PS) fisheries, and retained catches by the longline (LL) fisheries, of bigeye tuna in the eastern Pacific Ocean, 1975-2023. The purse-seine catches are adjusted to the species composition estimate obtained from sampling the catches. 2020 and 2021 data are preliminary.
FIGURA D-1. Capturas totales (capturas retenidas más descartes) de las pesquerías de cerco (PS), y capturas retenidas de las pesquerías de palangre (LL), de atún patudo en el Océano Pacífico oriental, 1975-2023. Se ajustan las capturas de cerco a la estimación de la composición por especie obtenida del muestreo de las capturas. Los datos de 2020 y 2021 son preliminares.

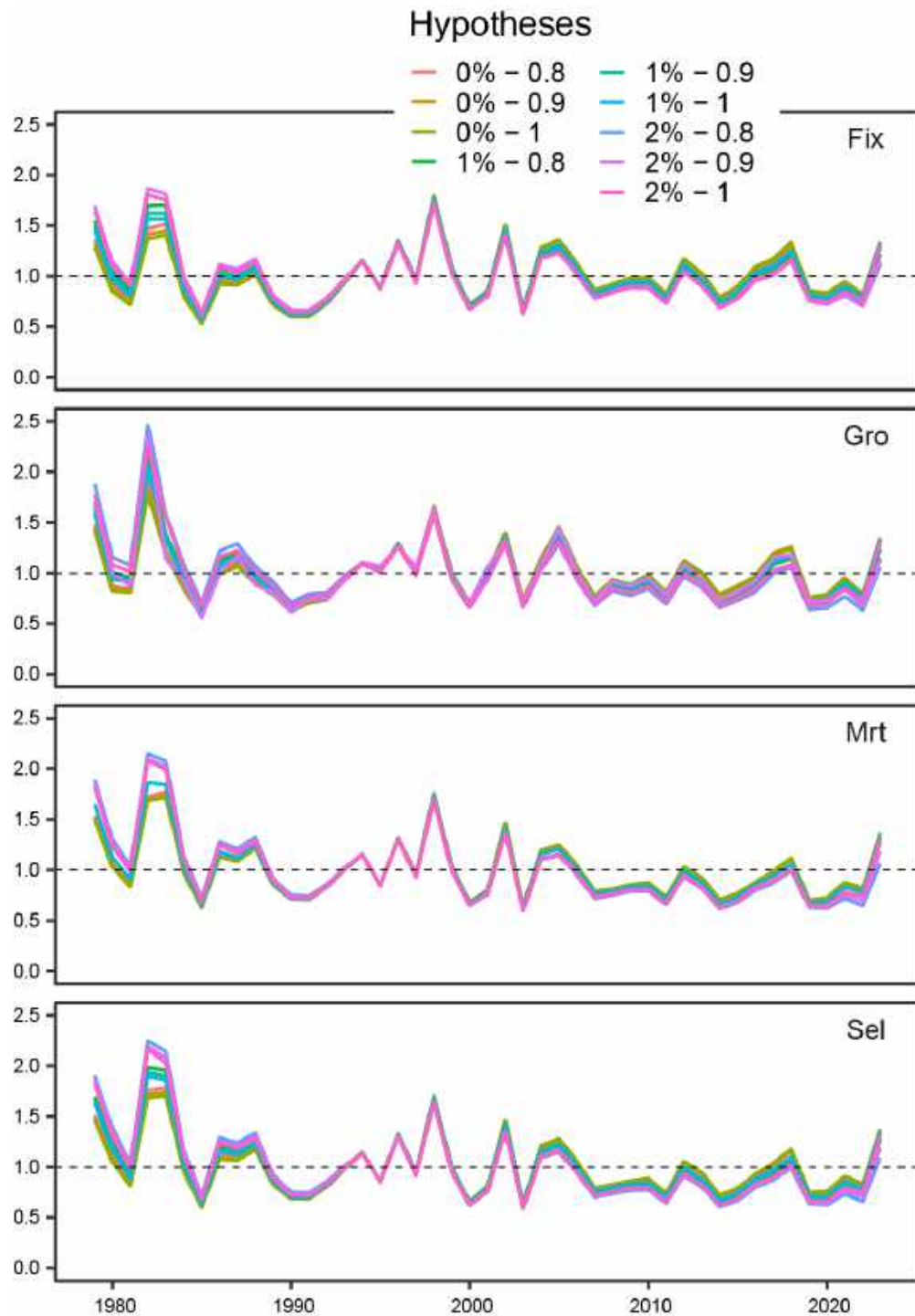


FIGURE D-2. Comparison of estimated relative annual recruitment of bigeye tuna between 1979 and 2023.
FIGURA D-2. Comparación del reclutamiento anual relativo estimado del atún patudo entre 1979 y 2023.

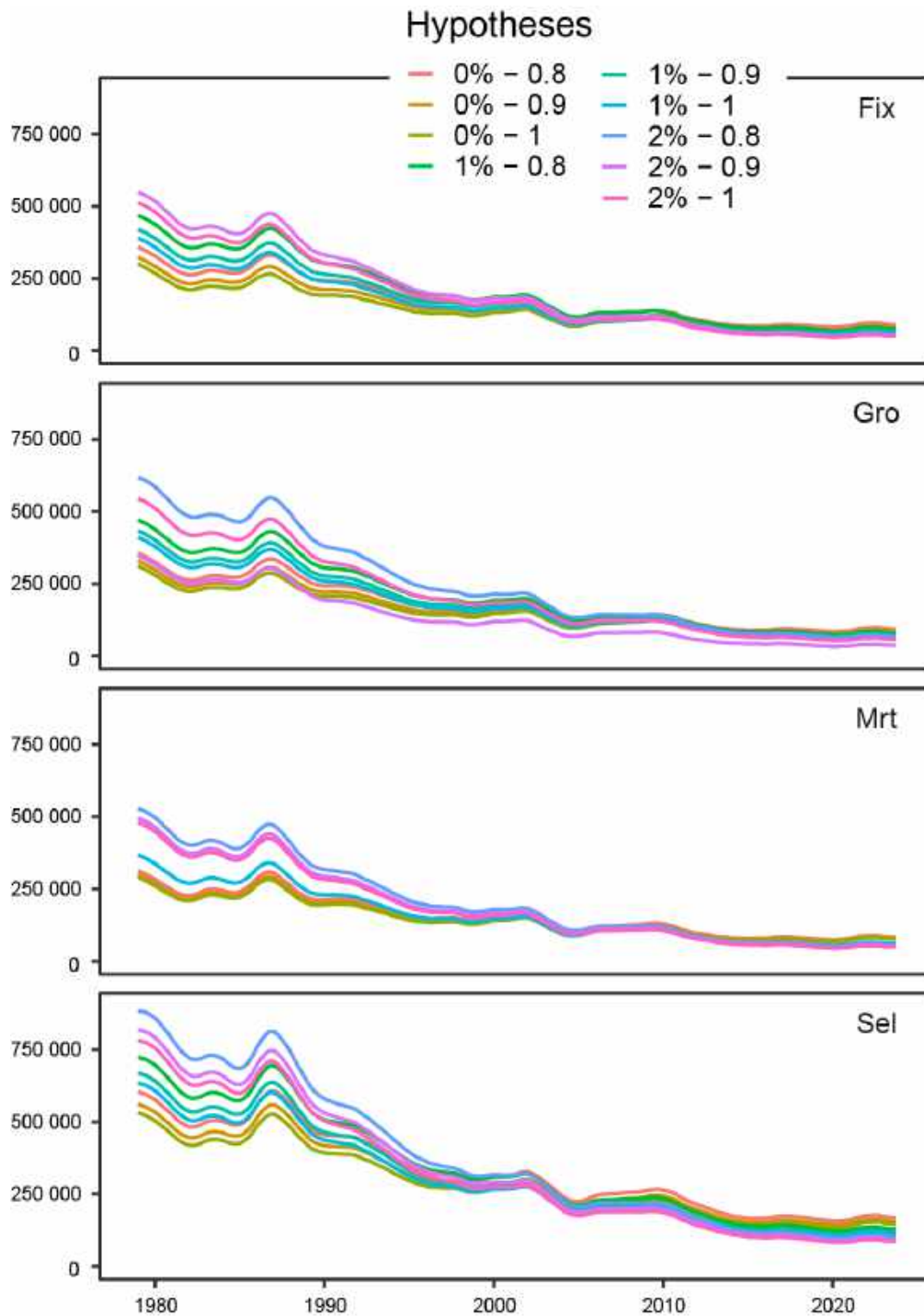


FIGURE D-3. Comparison of estimated spawning biomass of bigeye tuna between 1979 and 2023.
FIGURA D-3. Comparación de la biomasa reproductora estimada del atún patudo entre 1979 y 2023.

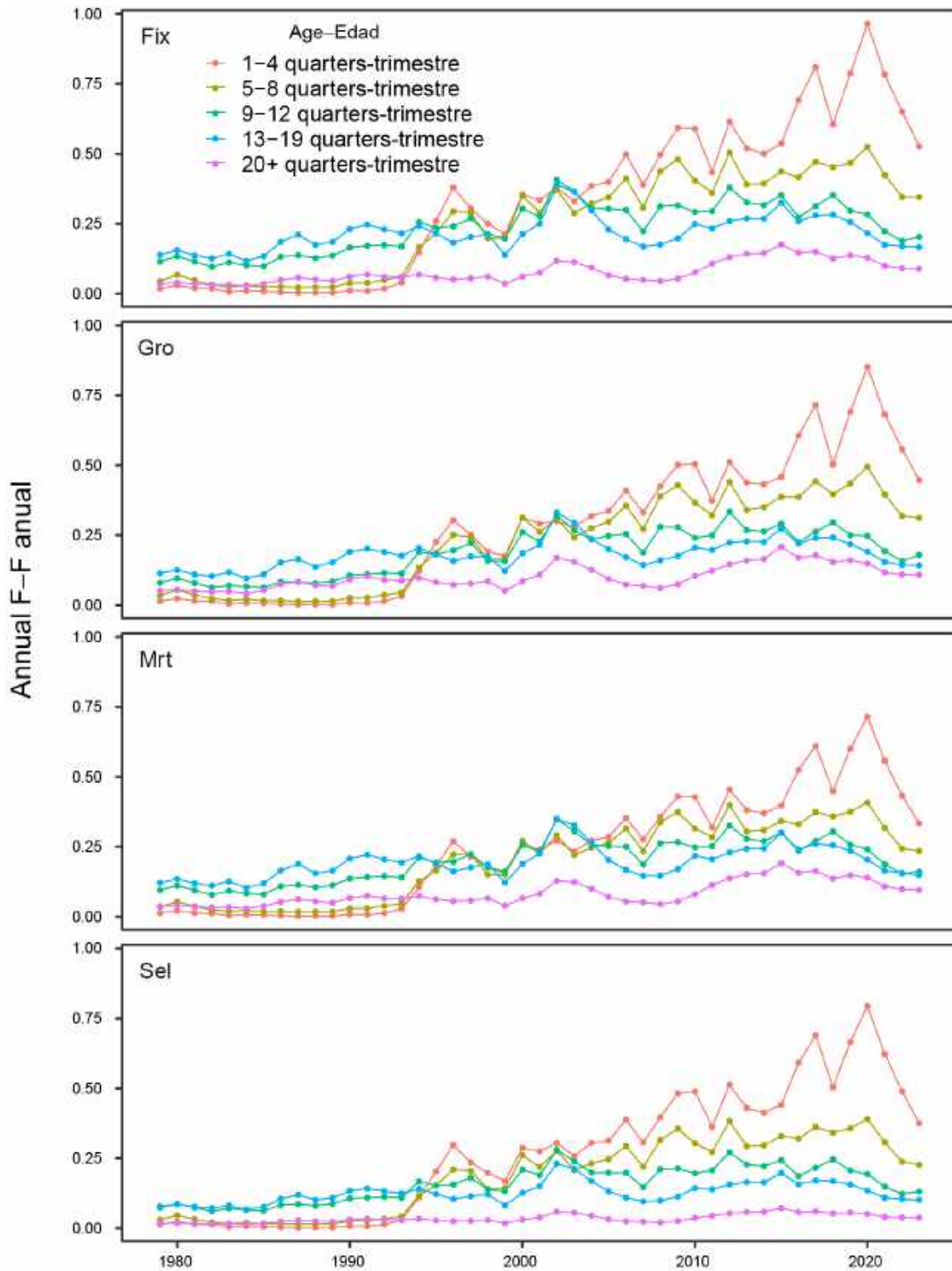


FIGURE D-4. Comparison of average annual fishing mortality, by age groups, of bigeye tuna between 1979 and 2023. The values for each model and age group are weighted across the second- and third-level hypotheses.

FIGURA D-4. Comparación de la mortalidad por pesca anual promedio, por grupos de edad, del atún patudo entre 1979 y 2023. Los valores para cada modelo y grupo de edad se ponderan en las hipótesis de segundo y tercer nivel.

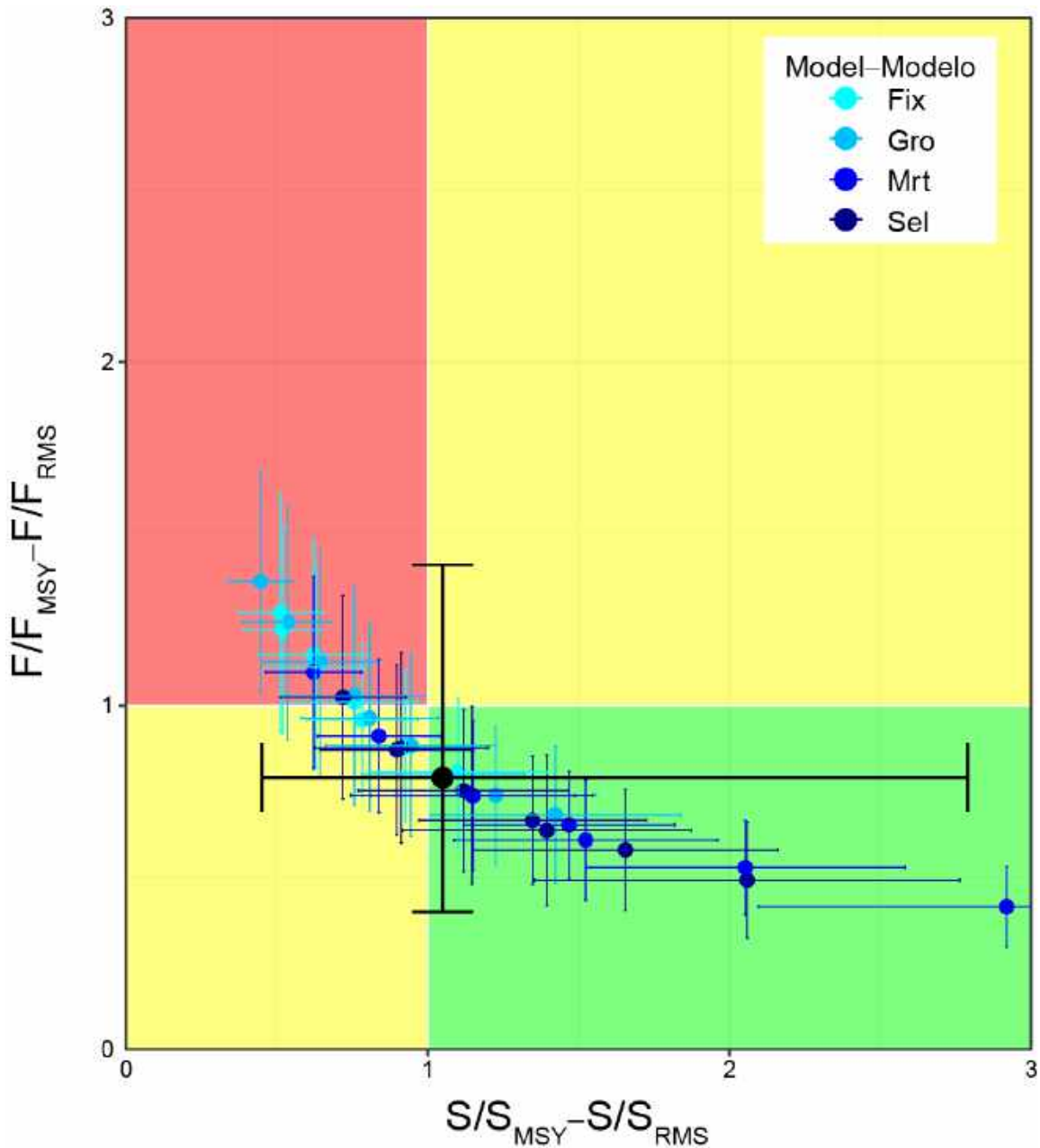


FIGURE D-5. Kobe plot of the most recent estimates of spawning biomass (S) and fishing mortality (F) relative to their MSY reference points (S_{MSY} and F_{MSY}) from the thirty-three reference models. Each dot is based on the average F over the most recent three years, 2021-2023, and the error bars represent the 95% confidence interval of model estimates. The black dot and error bars represent the median and 95% confidence interval of combined values, respectively.

FIGURA D-5. Gráfica de Kobe de las estimaciones más recientes de biomasa reproductora (S) y mortalidad por pesca (F) con respecto a sus puntos de referencia de RMS (S_{RMS} y F_{RMS}) de los 33 modelos de referencia. Cada punto se basa en la F promedio de los últimos tres años, 2021-2023, y las barras de error representan el intervalo de confianza del 95% de las estimaciones de los modelos. El punto negro y las barras de error representan el intervalo de confianza medio y del 95% de los valores combinados, respectivamente.

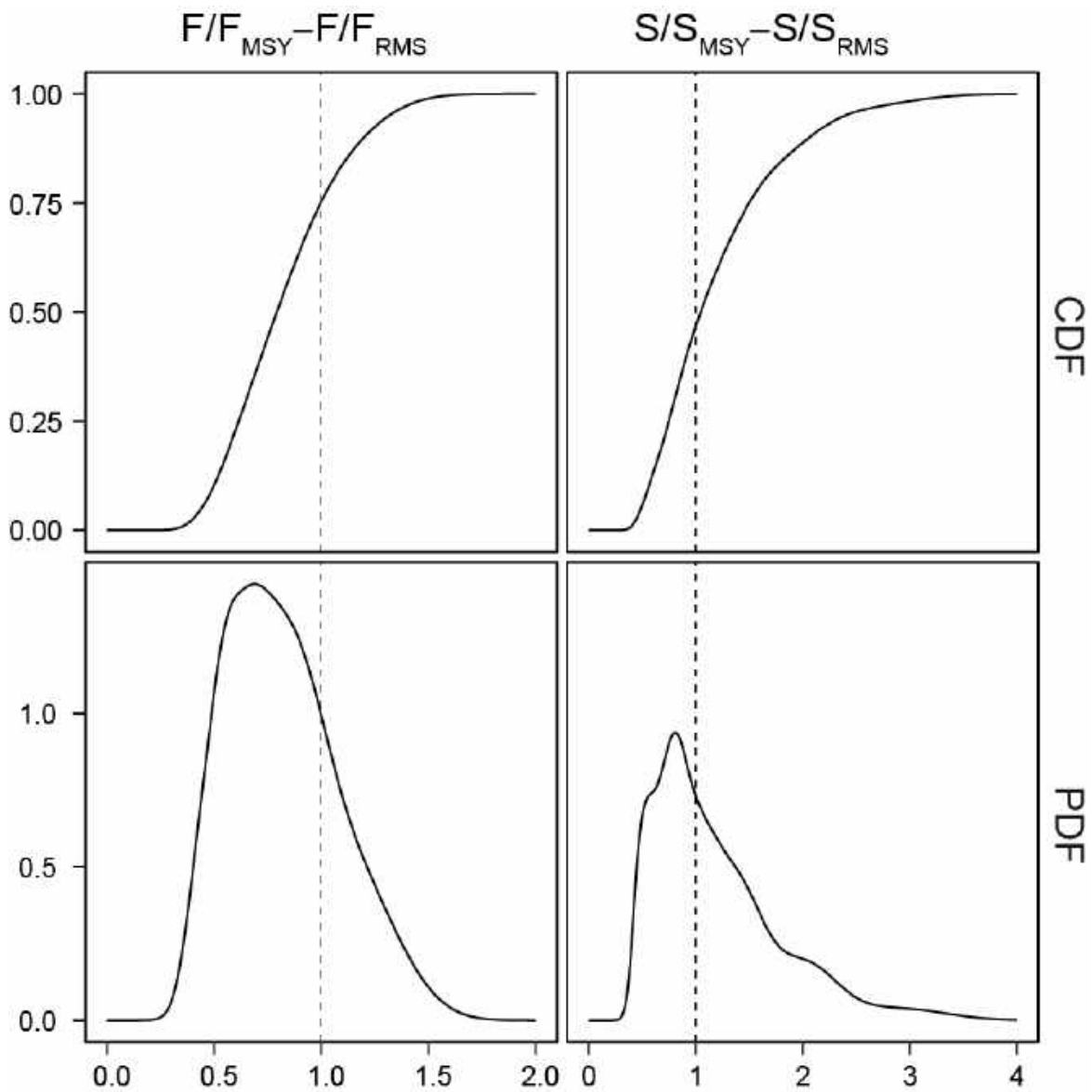


FIGURE D-6. The joint probability and cumulative distribution functions for spawning biomass (S) in the first quarter of 2024 and fishing mortality (F) in 2021-2023 relative to their MSY reference points (S_{MSY_d} and F_{MSY}).

FIGURA D-6. Funciones de distribución acumulada y de probabilidad conjunta para la biomasa reproductora (S) en el primer trimestre de 2024 y la mortalidad por pesca (F) en 2021-2023 en relación con sus puntos de referencia de RMS ($SRMS_d$ y $FRMS$).

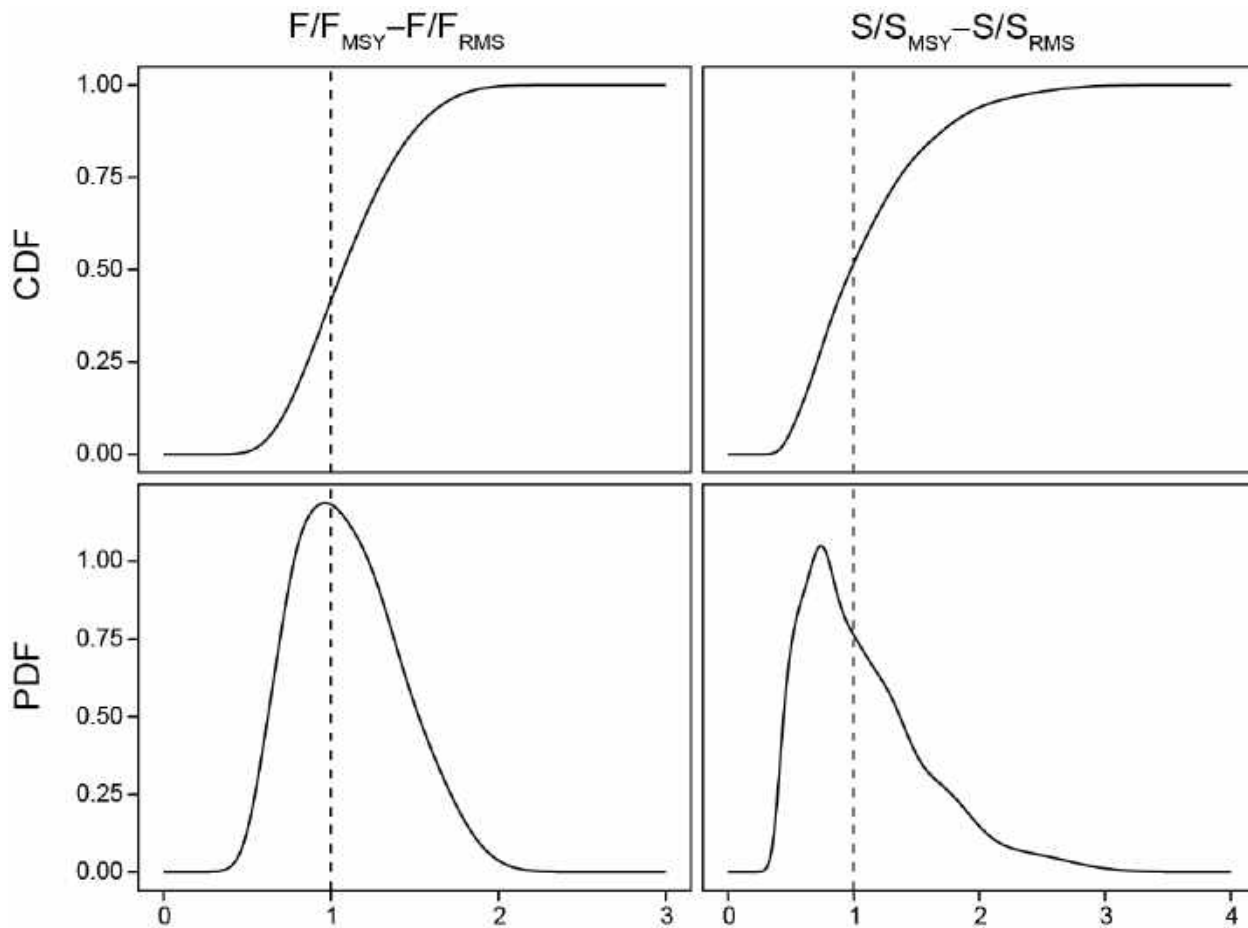


FIGURE D-7. The joint probability and cumulative distribution functions for spawning biomass (S) in the first quarter of 2020 and fishing mortality (F) in 2017-2019 relative to their MSY reference points (S_{MSY_d} and F_{MSY}).

FIGURA D-7. Funciones de distribución acumulada y de probabilidad conjunta para la biomasa reproductora (S) en el primer trimestre de 2020 y la mortalidad por pesca (F) en 2017-2019 en relación con sus puntos de referencia de RMS ($SRMS_d$ y $FRMS$).

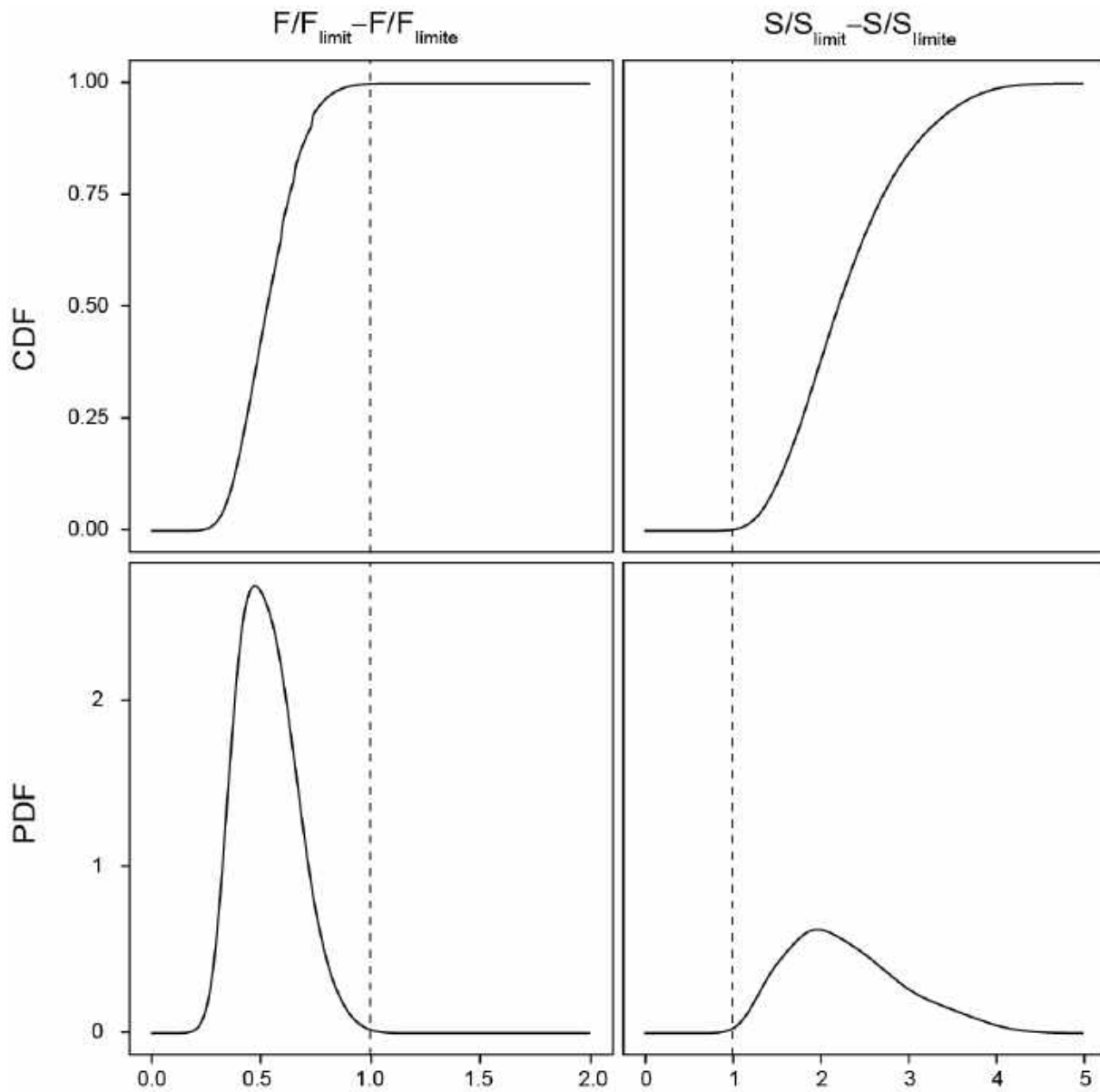


FIGURE D-8. The joint probability and cumulative distribution functions for spawning biomass (S) in the first quarter of 2024 and fishing mortality (F) in 2021-2023 relative to their limit reference points (S_{Limit} and F_{Limit}).
FIGURA D-8. Funciones de distribución acumulada y de probabilidad conjunta para la biomasa reproductora (S) en el primer trimestre de 2024 y la mortalidad por pesca (F) en 2021-2023 en relación con sus puntos de referencia límite ($S_{Límite}$ y $F_{Límite}$).

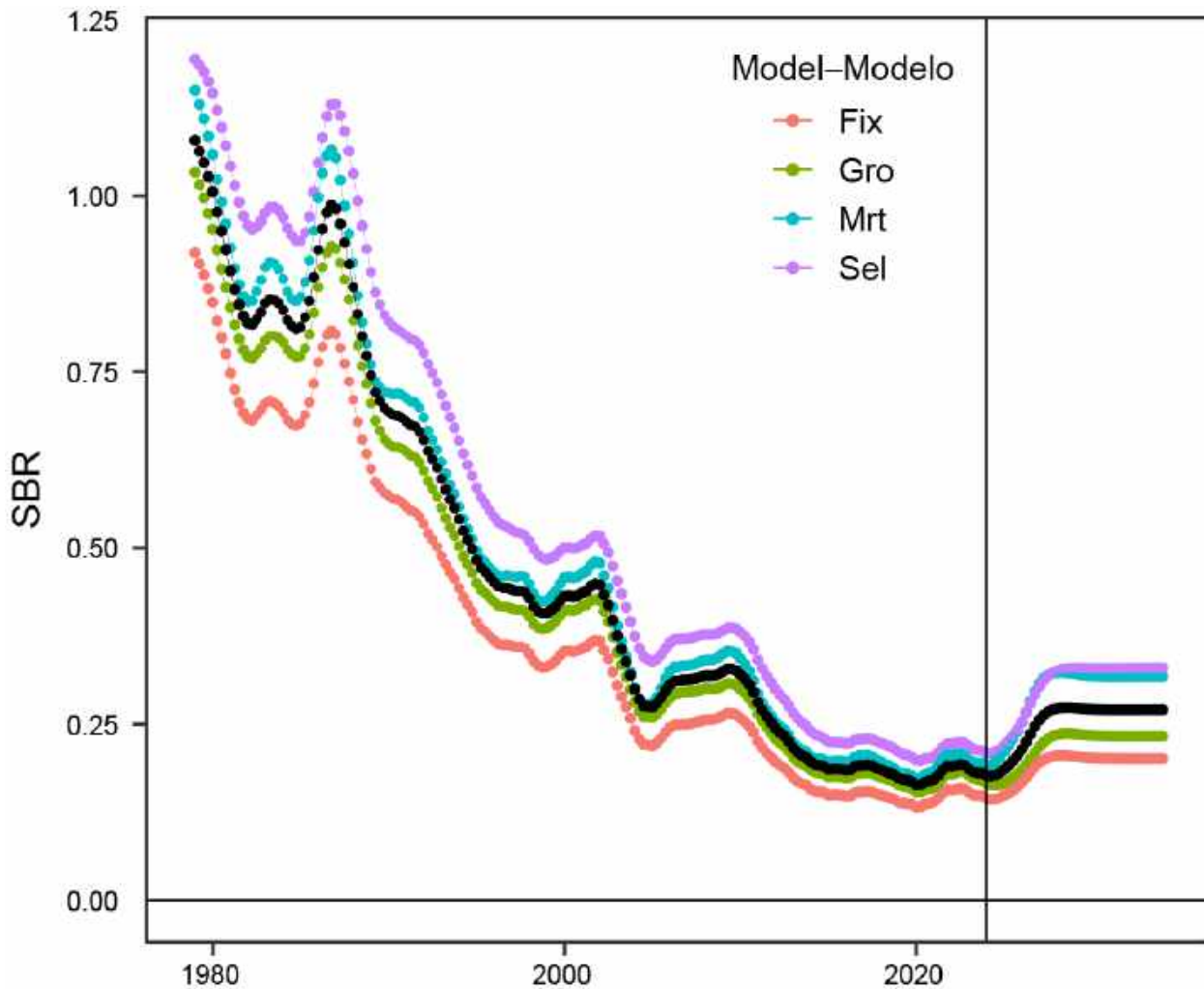


FIGURE D-9. The 10-year (2024-2033) projection of spawning biomass ratio under average recruitment and current fishing mortality. The color dots represent weighted values across the second- and third-level hypotheses and the black dots represent the weighted values across all thirty-three reference models.

FIGURA D-9. Proyección a 10 años (2024-2033) del cociente de biomasa reproductora bajo reclutamiento promedio y mortalidad por pesca actual. Los puntos de colores representan los valores ponderados en las hipótesis de segundo y tercer nivel y los puntos negros representan los valores ponderados en los 33 modelos de referencia.

E. PACIFIC BLUEFIN TUNA

Tagging studies have shown that there is exchange of Pacific bluefin between the eastern and western Pacific Ocean. Larval, post larval, and early juvenile bluefin have been caught in the western Pacific Ocean (WPO), but not in the eastern Pacific Ocean (EPO), so it is likely that there is a single stock of bluefin in the Pacific Ocean (or possibly two stocks in the Pacific Ocean, one spawning in the vicinity of Taiwan and the Philippines and the other spawning in the Sea of Japan).

Most of the commercial catches of bluefin in the EPO are taken by purse seiners. Nearly all of the purse-seine catches have been made west of Baja California and California, within about 100 nautical miles of the coast, between about 23°N and 35°N. Ninety percent of the catch is estimated to have been between about 60 and 100 cm in length, representing mostly fish 1 to 3 years of age. Aquaculture facilities for bluefin were established in Mexico in 1999, and some Mexican purse seiners began to direct their effort toward bluefin during that year. During recent years, most of the catches have been transported to holding pens, where the fish are held for fattening and later sale to sashimi markets. Lesser amounts of bluefin are caught by recreational, gillnet, and longline gear. Bluefin have been caught in the EPO during every month of the year, but most of the fish are taken from May through October.

Bluefin are exploited by various gears in the WPO from Taiwan to Hokkaido, Japan. Age-0 fish, about 15 to 30 cm in length, are caught by the Japanese troll fishery during July-October south of Shikoku Island and south of Shizuoka Prefecture. During November-April, age-0 fish about 35 to 60 cm in length are taken in troll fisheries south and west of Kyushu Island. Age-1 and older fish are caught by purse seining, mostly during May-September, between about 30°-42°N and 140°-152°E. Bluefin of various sizes are also caught by traps, gillnets, and other gear, especially in the Sea of Japan. Additionally, small amounts of bluefin are caught near the southeastern coast of Japan by longlining. The Chinese Taipei small-scale longline fishery, which has expanded since 1996, takes bluefin tuna more than 180 cm in length from late April to June, when they are aggregated for spawning in the waters east of the northern Philippines and Taiwan.

The high-seas longline fisheries are directed mainly at tropical tunas, albacore, and billfishes, but small amounts of Pacific bluefin are caught by these fisheries. Small amounts of bluefin are also caught by Japanese pole-and-line vessels on the high seas.

Tagging studies, conducted with conventional and archival tags, have revealed a great deal of information about the life history of bluefin. Some fish apparently remain their entire lives in the WPO, while others migrate to the EPO. These migrations begin mostly during the first and second years of life. The first- and second-year migrants are exposed to various fisheries before beginning their journey to the EPO. Then, after crossing the ocean, they are exposed to commercial and recreational fisheries off California and Baja California. Eventually, the survivors return to the WPO.

Bluefin more than about 50 cm in length are most often found in waters where the sea-surface temperatures (SSTs) are between 17° and 23°C. Fish 15 to 31 cm in length are found in the WPO in waters where the SSTs are between 24° and 29°C. The survival of larval and early juvenile bluefin is undoubtedly strongly influenced by the environment. Conditions in the WPO probably influence recruitment, and thus the portions of the juvenile fish there that migrate to the EPO, as well as the timing of these migrations. Likewise, conditions in the EPO probably influence the timing of the return of the juvenile fish to the WPO.

The total catches of bluefin have fluctuated considerably during the last 50 years ([Figure E-1](#)). The consecutive years of above-average catches (mid-1950s to mid-1960s) and below-average catches (early 1980s to early 1990s) could be partially due to consecutive years of above-average and below-average recruitments. The estimated impact of the fisheries on the bluefin population for the entire time period modeled (1952-2012) is substantial ([Figure E-2](#)). The WPO fisheries have had a greater impact than the EPO fisheries, and their impact increased starting in 1980s only leveling off in 2000s.

A benchmark stock assessment was carried out by the Pacific Bluefin Working Group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) in 2024. The assessment was conducted with Stock Synthesis, an integrated statistical age-structured

stock assessment model.

The base-case model results show that: (1) spawning stock biomass (SSB) fluctuated throughout the assessment period (fishing years 1983-2022); (2) the SSB steadily declined from 1996 to 2010; (3) the SSB has rapidly increased since 2011; (4) fishing mortality decreased from a level producing about 1% of spawner-per-recruit (SPR) in 2004-2009 to a level producing 23.6% of SPR in 2020-2022; and (5) SSB in 2022 increased to 23.2% of SSB₀, achieving the second rebuilding target by WCPFC and IATTC in 2021, and (6) the probability that it is above 20%SSB₀ is 75.9%, which is greater than the 60% defined in resolution [C-18-02](#). Based on the model diagnostics, the estimated biomass trend throughout the assessment period is considered robust. The SSB in 2022 was estimated to be 144,483 t, more than 10 times of its historical low in 2010. An increase in immature fish (0-3 years old) is observed in 2016-2019, likely resulting from reduced fishing mortality on this age group. This led to a substantial increase in SSB after 2019. No biomass-based or fishing mortality limit or target reference points have been adopted to evaluate whether Pacific bluefin is overfished.

Historical recruitment estimates have fluctuated since 1983 without an apparent trend. Currently, stock projections assume that future recruitment will fluctuate around the historical (1983-2020 FY) average recruitment level. Previously, no significant autocorrelation was found in recruitment estimates, supporting the use in the projections of recruitment sampled at random from the historical time series. In addition, now that SSB has recovered to 23.2%SSB₀, the PBFWG considers the assumption that the future recruitment will fluctuate within the historical range to be reasonable. The PBFWG also confirmed that the distributions of historical recruitment from the updated long-term model (1952-2022) and the present base-case model (1983-2022) are comparable.

Resolution [C-18-02](#) states that the Commission recognizes that the management objective of the IATTC is to maintain or restore fish stocks at levels capable of producing MSY, and shall implement a provisional rebuilding plan by adopting an 1) initial (first) rebuilding target of SSB_{med, 1952-2014} (the median point estimate for 1952-2014) to be achieved by 2024 with at least 60% probability and 2) a second rebuilding target of 20%SSB₀ to be achieved within 10 years of reaching the initial rebuilding target or by 2034, whichever is earlier, with at least 60% probability. The IATTC has adopted resolutions to restrict the catch of bluefin tuna in the EPO (e.g. [C-16-08](#), [C-18-01](#), [C-20-02](#), [C-21-05](#)). Resolution [C-18-02](#) also requires that no later than the IATTC meeting in 2020, taking into account the outcomes of the Joint IATTC-WCPFC NC Working Group, the Commission shall consider and develop candidate reference points and harvest control rules. These candidate reference points and harvest control rules will be forwarded to the Joint IATTC-WCPFC NC Working Group and ISC for consideration and potential inclusion in a management strategy evaluation to be completed by the ISC. This task has still not been accomplished.

SSB of PBF reached its initial rebuilding target (SSBMED = 6.3%SSB₀) in 2017, 7 years earlier than originally anticipated by the RFMOs, and its second rebuilding target (20%SSB₀) in 2021. [Resolution C-23-01](#) provided a harvest control rule to be applied based on the results of stock assessments and SSB projections from the year in which the stock has achieved the second rebuilding target to the year a long-term harvest strategy based on an MSE process is implemented.

- a. If the SSB projection indicates that SSB will be below 20%SSB₀ with a probability of 60%, management measures shall be modified to increase the SSB to at least 20%SSB₀ with 60% probability. For this purpose, the IATTC scientific staff is requested to collaborate with the ISC to provide information on possible management measures to achieve 60% that the stock is above 20%SSB₀ after 10 years of the latest stock assessment.
- b. If the SSB projection indicates that SSB will be greater than 20%SSB₀ with a probability of 60%, management measures should be adjusted so long as any changes maintain SSB greater than 20%SSB₀ with a probability of 60%. For this purpose, the IATTC scientific staff is requested to collaborate with the ISC to provide information on possible management under which the stock is maintained above 20%SSB₀ with a probability of 60%.

c. Any adjustments to management measures shall be considered in cooperation between the IATTC and WCPFC taking into account historical and future projected proportional fishery impacts on SSB between fisheries in the EPO and fisheries in the WCPO. For this purpose, the IATTC scientific staff is requested to collaborate with the ISC to provide relevant information, including projected proportional fishery impact of potential management measures changes.

d. This harvest control rule will be reviewed and modified, as necessary, if depletion estimates across the time-series have been adjusted due to changes in assumptions and/or settings of the stock assessment model.

Management Strategy Evaluation (MSE) has been completed for Pacific bluefin. The sixteen Harvest Control Rules (HCRs) tested in the MSE were put forward by the Pacific bluefin Joint Working Group (JWG). Each HCR used the same simplified version of the stock assessment model as the estimation model, but varied in the HCR's target fishing mortality and the location of the control points. The HCRs were tested using twenty different operating models based on the stock assessment model and were evaluated based on several performance metrics. The JWG has not agreed on their preferred HCR.

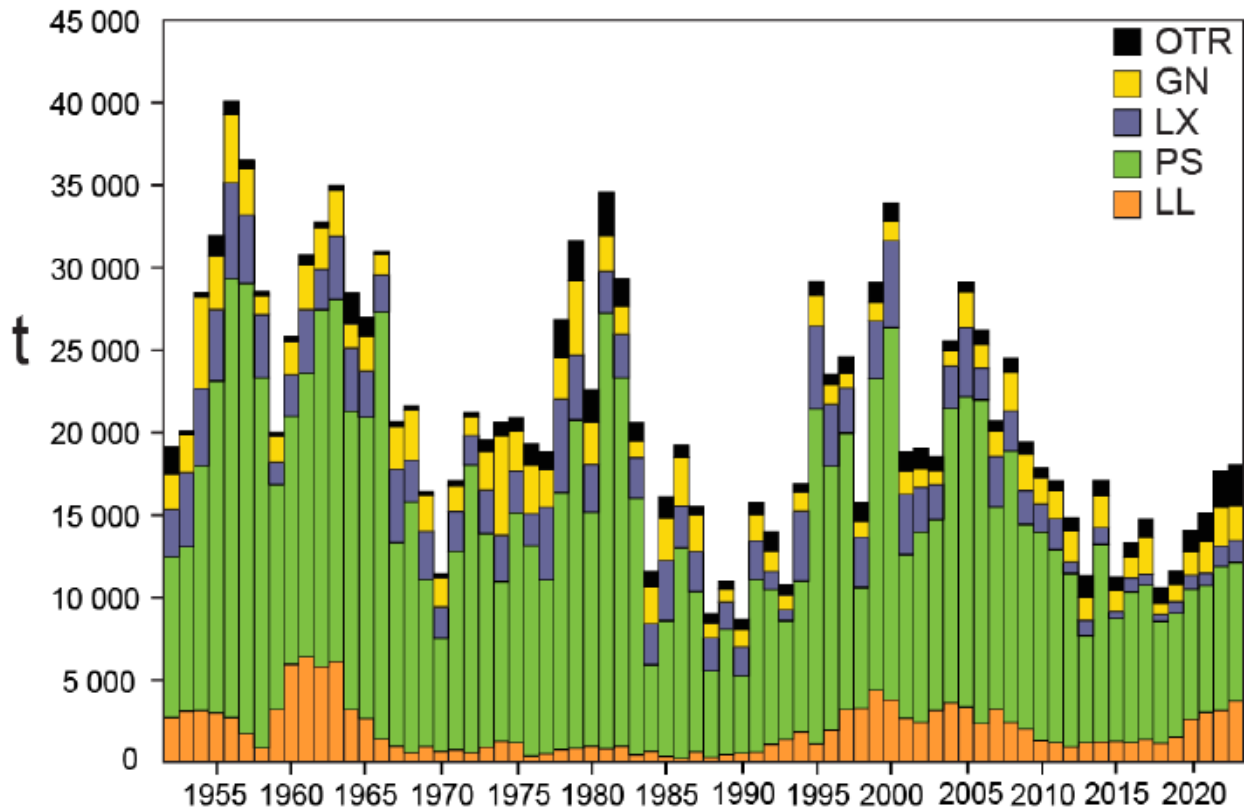


FIGURE E-1. Retained catches of Pacific bluefin tuna, by gear, 1952-2023. GN: gillnet; LL: longline; LX: hook and line; OTR: other; PS: purse seine.

FIGURA E-1. Capturas retenidas de atún aleta azul del Pacífico, por arte, 1952-2023. GN: red agallera; LL: palangre; LX: sedal y anzuelo; OTR: otras; PS: red de cerco.

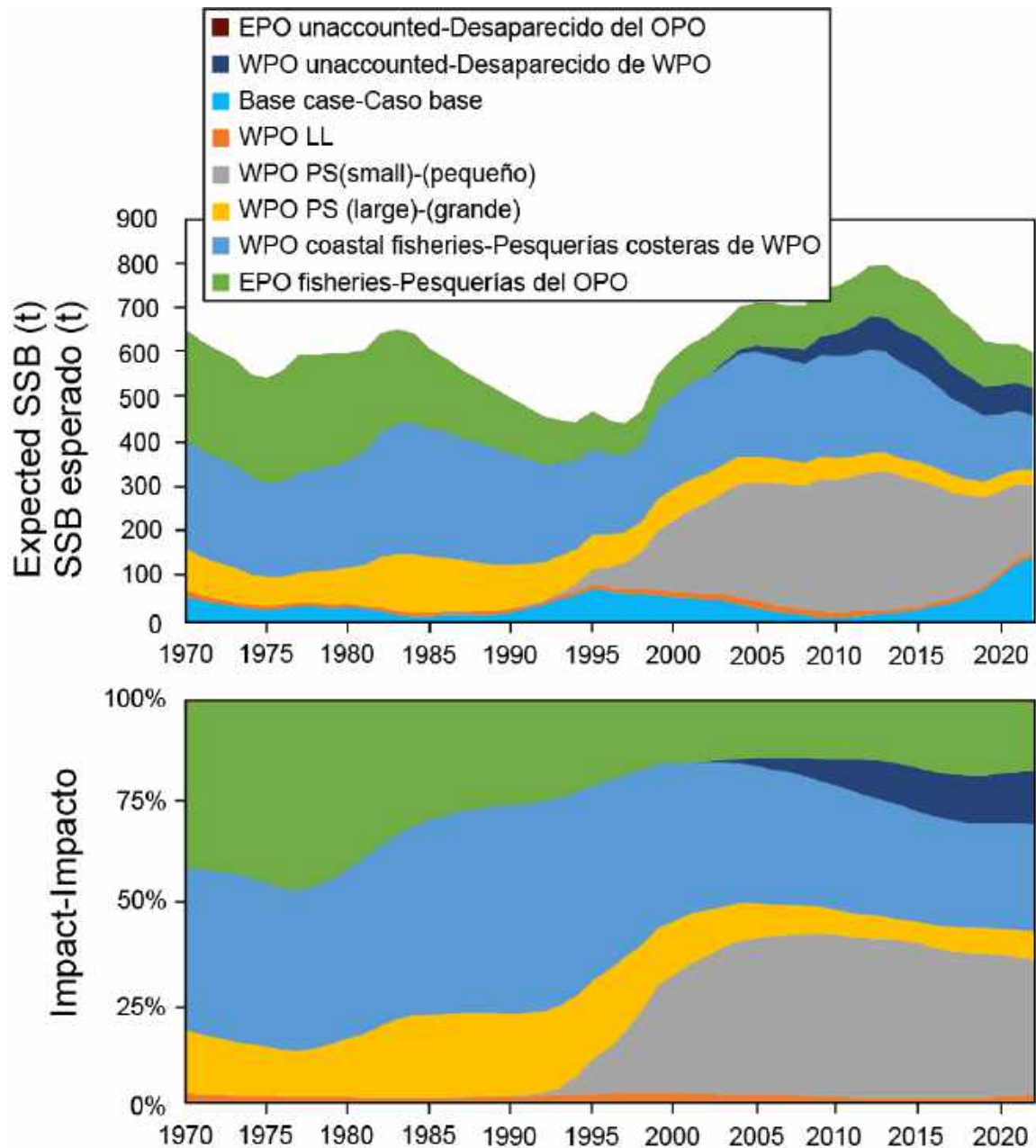


FIGURE E-2. Estimates of the impact on the Pacific bluefin tuna population of fisheries in the EPO and in the WPO (upper panel). The dashed line represents the estimated hypothetical unfished spawning biomass, and the solid line the estimated actual spawning biomass. The shaded areas indicate the impact attributed to each fishery. The lower panel presents the proportion of impact attributed to the EPO and WPO. (Figure from the draft Executive Summary of ISC 2022 stock assessment; subject to change and approval by the ISC Plenary.)

FIGURA E-2. Estimaciones del impacto sobre la población de atún aleta azul del Pacífico de las pesquerías en el OPO y en el WPO (panel superior). La línea de trazos representa la biomasa reproductora no pescada hipotética estimada, y la línea sólida la biomasa reproductora real estimada. Las áreas sombreadas indican el impacto atribuido a cada pesquería. El panel inferior ilustra la proporción del impacto atribuida al OPO y al WPO. (Figura del borrador de resumen ejecutivo de la evaluación de 2022 del ISC; sujeta a cambio y aprobación por la plenaria del ISC.)

F. ALBACORE TUNA

There are two stocks of albacore in the Pacific Ocean, one in the northern hemisphere and the other in the southern hemisphere. Albacore are caught by longline gear in most of the North and South Pacific, but not often between about 10°N and 5°S, by trolling gear in the eastern and central North and South Pacific, and by pole-and-line gear in the western North Pacific. In the North Pacific, about 40% of the catch is taken by pole-and-line and troll fisheries that catch smaller, younger albacore, and about 50% was taken by longline. In the South Pacific, almost all the albacore is taken by longline. The total annual catches of South Pacific albacore ranged from about 25,000 t to 50,000 t during the 1980s and 1990s but increased after that and peaked at about 94,500 t in 2017, declining slightly after that. During 2020-2022, the annual albacore catch in the south Pacific averaged about 80,000 t ([Figure F-1a](#)), of which about 32.6% was taken in the eastern Pacific Ocean (EPO). The total annual catches of North Pacific albacore increased from about 55,000 t in 1993 to about 126,000 t in 1999 ([Figure F-1b](#)). They then declined in the early 2000s then recovered in the early 2010s. Since 2012 catches have declined from about 92,000 t to about 50,000 t in 2022. The catches averaged about 56,000 t in 2020-2022, of which 21.4% was taken in the EPO. Those declines in catches coincide with decline in effort in the north EPO ([Figure F-2](#)).

Juvenile and adult albacore are caught mostly in the Kuroshio Current, the North Pacific Transition Zone, and the California Current in the North Pacific and in the Subtropical Convergence Zone in the South Pacific, but spawning occurs in tropical and subtropical waters, centering around 20°N and 20°S latitudes. North Pacific albacore are believed to spawn between March and July in the western and central Pacific.

The movements of North Pacific albacore are strongly influenced by oceanic conditions, and migrating albacore tend to concentrate along oceanic fronts in the North Pacific Transition Zone. Most of the catches are made in water temperatures between about 15° and 19.5°C. Details of the migration remain unclear, but juvenile fish (2- to 5-year-olds) are believed to move into the eastern Pacific Ocean (EPO) in the spring and early summer, and return to the western and central Pacific, perhaps annually, in the late fall and winter, where they tend to remain as they mature. This pattern may be complicated by sex-related movements of large adult fish (fork length (FL) >125 cm), which are predominately male, to areas south of 20°N. The significance of such movements for the demographic dynamics of this stock are uncertain at present.

Less is known about the movements of albacore in the South Pacific Ocean. The juveniles move southward from the tropics when they are about 35 cm long, and then eastward along the Subtropical Convergence Zone to about 130°W. When the fish approach maturity they return to tropical waters, where they spawn. Recoveries of tagged fish released in areas east of 155°W were usually made at locations to the east and north of the release site, whereas those of fish released west of 155°W were usually made at locations to the west and north of the release site.

The most recent published stock assessments for the South and North Pacific stocks of albacore are from 2024 and 2023, respectively. The assessments indicate that it is not likely that either stock is overfished or that overfishing is taking place.

South Pacific albacore

In collaboration with the IATTC, the Pacific Community (SPC) conducted a benchmark stock assessment for South Pacific albacore tuna in 2024. This assessment is based on a spatially-explicit stock assessment model in which the South EPO is included as a single area with multiple fishery fleets using an areas-as-fleets approach. Structural uncertainty in natural mortality and steepness were explored in this benchmark assessment using a Monte Carlo ensemble model approach with 100 models.

Based on the ensemble of models, the estimated reference points for albacore tuna in the South Pacific are:

1. The median depletion for the recent period ($SB_{2019-2022}/SB_{F=0}$) is 0.48 with a 10th to 90th percentile interval of 0.36 to 0.62.
2. All models in the uncertainty ensemble had $SB_{2019-2022}/SB_{F=0} > 0.2$, the limit reference point for WCPFC key tuna stocks.

3. The median recent spawning biomass is well above the MSY level (median $SB_{2019-2022}/SB_{MSY}$ is 3.02 with a 10th to 90th percentile interval 2.04 to 5.21).
4. The median recent fishing mortality as a ratio of that corresponding the MSY ($F_{2019-2022}/F_{MSY}$) is 0.18 with a 10th to 90th percentile interval of 0.06 to 0.44.

In summary, the benchmark assessment suggests that the South Pacific albacore stock is healthy and the recent fishing mortality is much lower than the fishing mortality at MSY. For albacore in the south EPO, the spawning biomass ratio in 2022 (spawning biomass divided by dynamic spawning biomass in an unfished condition) is estimated to be slightly below 0.5. The staff will continue collaborating with the Pacific Community to monitor the stock status of South Pacific albacore tuna by using stock status indicators and conducting another benchmark assessment with the SPC in 3-4 years.

Finally, it should be noted that a process has been initiated in coordination with WCPFC towards the establishment in the near future of a joint working group for South Pacific albacore, taking into consideration the very positive precedent of the work done in the IATTC-WCPFC Joint Working Group for Pacific bluefin tuna.

North Pacific albacore

A new stock assessment for north Pacific albacore was completed in 2023 by the Albacore Working Group (ALBWG) of the International Scientific Committee for Tuna and Tuna-like Species in the north Pacific Ocean (ISC) ([SAC-14 INF-R](#)). The north Pacific albacore tuna stock has been exploited for a long time, the catches were the highest in 1976 (about 127,000 t) and the lowest in 1991 (about 37,000 t). During the assessment period (1994-2018), the highest catches were in 1999 (about 119,000 t) and the lowest in 2019 and 2021 (about 43,000 t). About 2/3 of the catches come from surface fisheries (troll and pole-and-line) that harvest mainly juveniles, and the rest from longline fisheries that harvest mainly adults.

The assessment was done using the “best model” approach. The working group concluded that the stock was not experiencing overfishing and was probably not overfished ([Figure F-2](#), [Table F-1](#)). The SSB_{2021} was estimated to be approximately 54% (95% CI: 40 – 68%) of $SSB_{current, F=0}$ and 1.8 (95% CI: 1.3 – 2.3) times greater than the estimated threshold reference point (Table ES1). The estimated current fishing intensity ($F_{2018-2020}$) was estimated to be $F_{59\%SPR}$ (95% CI: $F_{72\%SPR}$ – $F_{46\%SPR}$) and was lower than both the $F_{45\%SPR}$ target reference point and the average fishing intensity during 2002 – 2004 (Table F1).

Based on the results of the new stock assessment for north Pacific albacore, the working group concludes that:

1. The stock is likely not overfished relative to the threshold (30% $SSB_{current, F=0}$) and limit (14% $SSB_{current, F=0}$) reference points adopted by the WCPFC and IATTC, and
2. The stock is likely not experiencing overfishing relative to the target reference point ($F_{45\%SPR}$).

The current IATTC conservation and management measures for north Pacific albacore (Resolutions [C-05-02](#), [C-13-03](#) and [C-18-03](#)) are based on maintaining the fishing effort below the 2002-2004 levels. The effort levels in eastern Pacific Ocean for 2019-2021 were 56% and 59% of those in 2002-2004, for vessel-days and number of vessels respectively, and are showing a declining trend in the last 10 years ([Figure F-2](#)).

In 2022, the Commission adopted the objectives, the target, threshold, and limit reference points, the acceptable level of risk of breaching the limit reference point and the monitoring method for the stock (IATTC Resolution C-22-04) following the completion of the Management Strategy Evaluation (MSE) for the stock by the ALBWG ([ISC/21/ANNEX/11](#)). Also, under that resolution, the Commission adopted a harvest control rule with those elements in 2023. The overarching objective is to ensure the sustainability of the North Pacific albacore tuna stock and current fisheries supported by the stock in the EPO. To reach the overarching objective, the following management objectives were established (C-22-04):

1. Maintain Spawning Stock Biomass (SSB) above the Limit Reference Point, with a probability of at least 80% over the next 10 years.
2. Maintain depletion of total biomass around historical (2006-2015) average depletion over the next 10 years.

3. Maintain fishing intensity (F) at or below the target reference point with a probability of at least 50% over the next 10 years.
4. To the extent practicable, management changes (e.g., catch and/or effort) should be relatively gradual between years.

The reference points adopted are:

1. Target reference point (TRP) of $F_{45\%SPR}$, which is the fishing intensity level that results in the stock producing 45% SPR.
2. Threshold reference point (ThRP, $SSB_{threshold}$) of $30\%SSB_{current, F=0}$, which is 30% of the dynamic unfished spawning stock biomass.
3. Limit reference point (LRP) of $14\%SSB_{current, F=0}$, which is 14% of the dynamic unfished spawning stock biomass.

The acceptable level of risk of breaching the LRP based on the most current estimate of SSB shall be no greater than 20%. The resolution further stated that if the LRP is breached, a rebuilding plan should be adopted.

In 2023, the Commission adopted the harvest control rules that apply to all fisheries harvesting albacore in the Convention Area north of the equator (IATTC resolution C-23-02). The harvest control rule parameters produce a relationship between stock status and fishing intensity with the minimum allowed fishing intensity equal to $F_{87\%}$ (Figure F-4), which is the fishing intensity level that results in the stock producing 87% of spawning potential ratio. The harvest control rules also state that if $SSB_{current}/SSB_{current, F=0}$ is above the LRP and below $SSB_{threshold}$, the maximum increase or decrease in catch or effort between the three-year management periods shall be 20%. In the year following the relevant ISC stock assessment, the IATTC will recommend adjustment to the existing Resolution for North Pacific Albacore to ensure fishing intensity is at or below the level set forth by this HCR using the latest ISC stock assessment. Changes to fishing intensity in accordance with the harvest control parameters shall apply between assessments starting the year after the stock assessment was completed, until the year following the next stock assessment that provides an estimate of unfished SSB.

In 2024, the ALBWG produced two documents for North Pacific Albacore. The first one develops the criteria to identify exceptional circumstances that would result in suspending or modifying the application of the adopted harvest strategy, and potentially may require updated MSE simulation work ([SAC-15 INF-S](#)). In 2025, one minor change was made from the previous version of the exceptional circumstances per ISC25 plenary's request. The second one provides scientific advice on interpreting the fishing intensity metric from the harvest strategies in terms of catch and effort management measures ([SAC-15 INF-T](#)). The ALBWG recommends that changes in fishing intensity required by the NPALB harvest strategy can potentially be translated into changes in catch for the management of all fleet groups, and changes in effort for the management of surface fleet groups and two Japanese longline fleets that likely target north Pacific albacore. Effort management is less precise than catch management in terms of changing the fishing intensity for surface fleet groups.

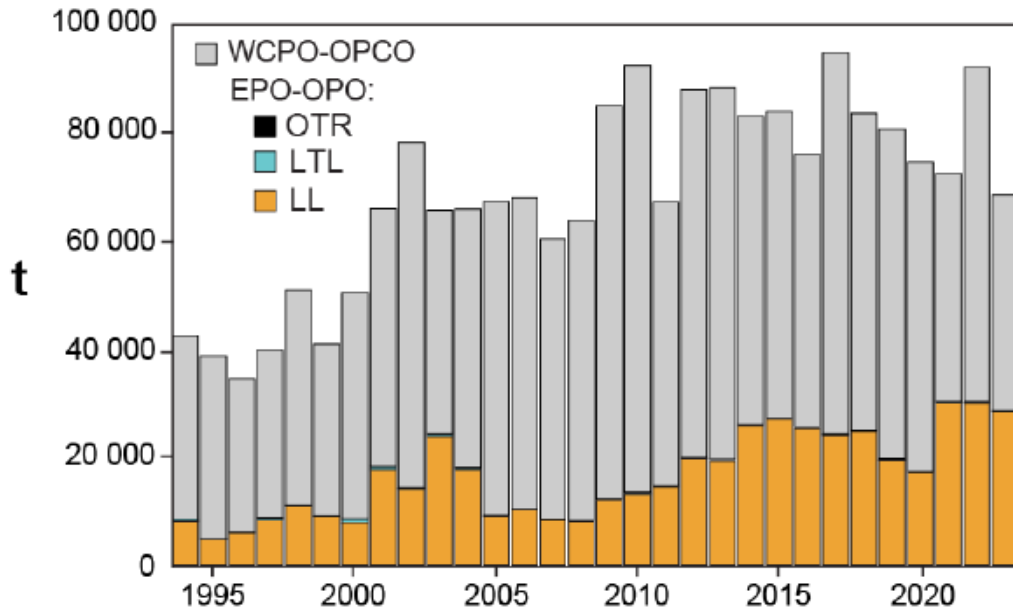


FIGURE F-1a. Retained catches of south Pacific albacore, by region. EPO catches broken down by gear: LL: longline; LTL: troll; OTR: other
FIGURA F-1a. Capturas retenidas de albacora del Pacífico sur, por región. Capturas del OPO desglosadas por arte: LL: palangre; LTL: curricán; OTR: otro.

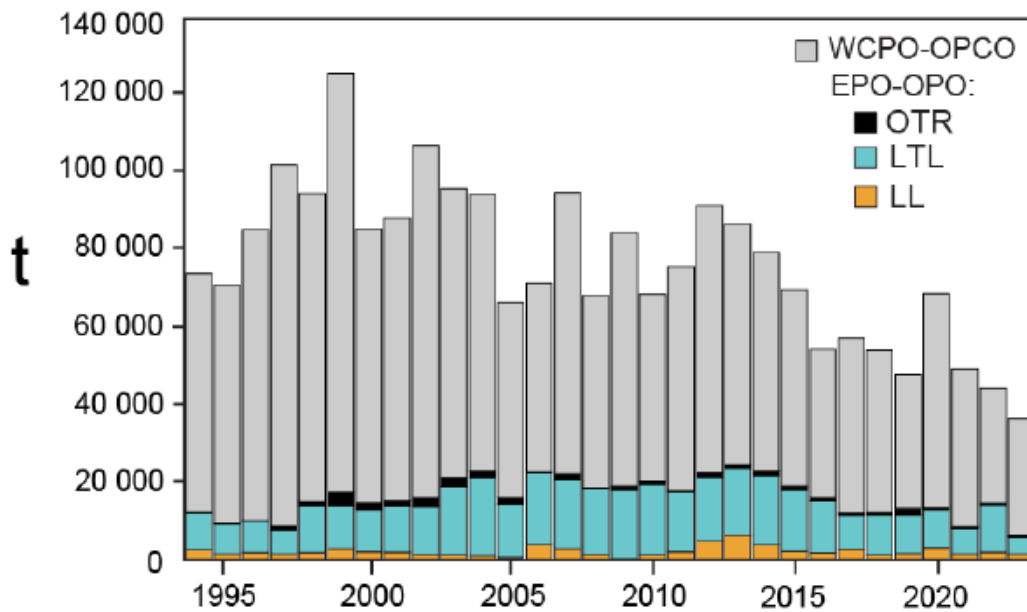


FIGURE F-1b. Retained catches of north Pacific albacore, by region. EPO catches broken down by gear: LL: longline; LTL: troll; OTR: other.
FIGURA F-1b. Capturas retenidas de albacora del Pacífico norte, por región. Capturas del OPO desglosadas por arte: LL: palangre; LTL: curricán; OTR: otro.

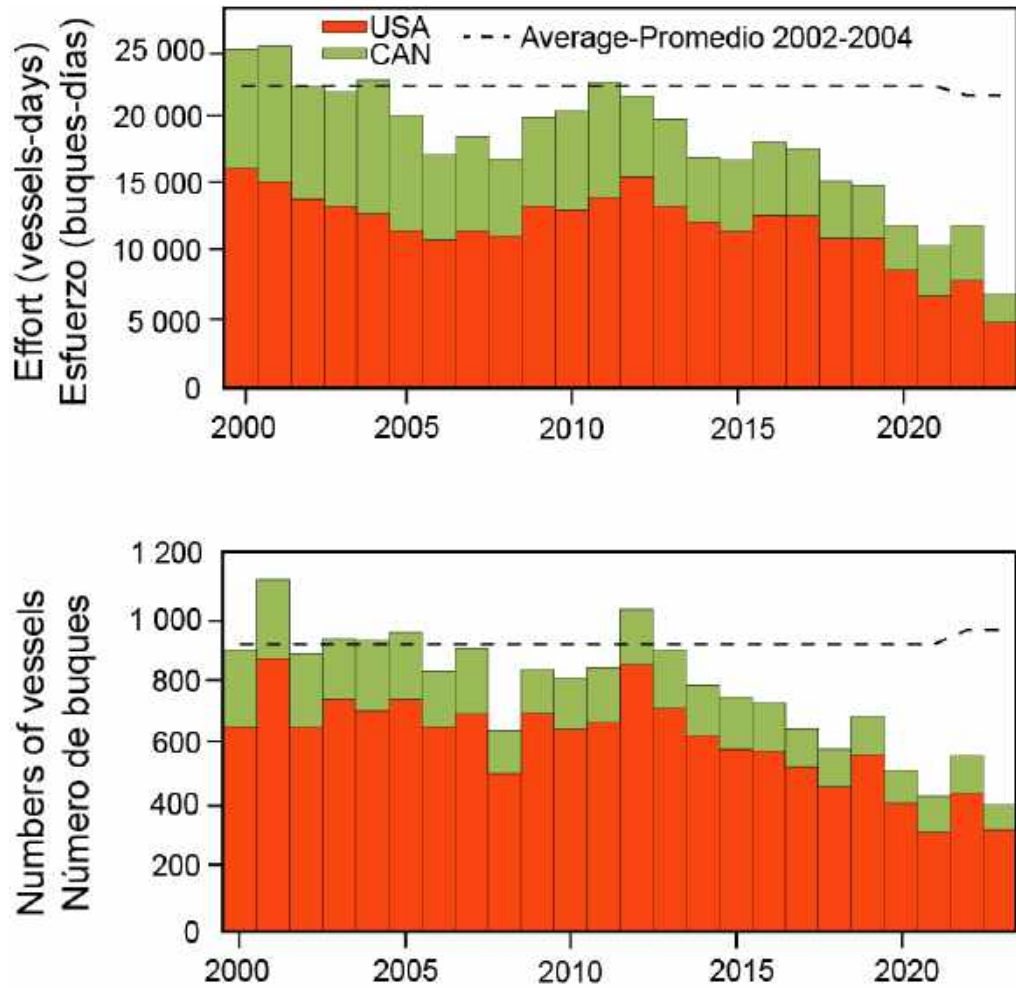


FIGURE F-2. Effort in vessel-days and number of vessels for the north Pacific albacore tuna in the eastern Pacific Ocean.
FIGURA F-2. Esfuerzo en días de buque y número de buques para el atún albacora del Pacífico norte en el Océano Pacífico oriental.

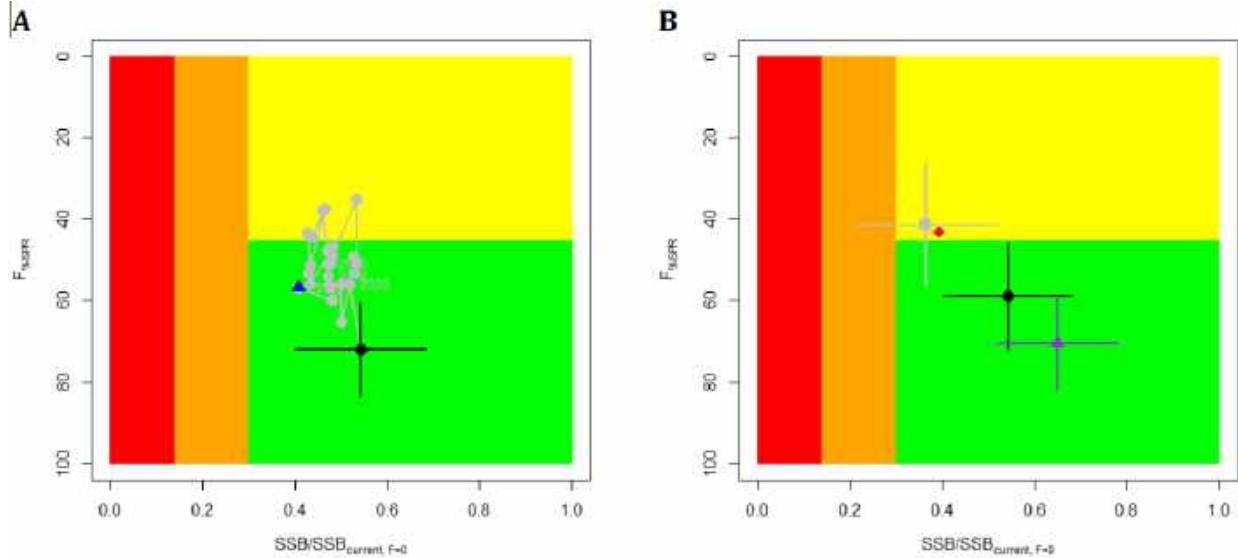


FIGURE F-3. Stock status phase plot showing the status of the north Pacific albacore stock relative to the biomass-based threshold ($30\%SSB_{current, F=0}$) and limit ($14\%SSB_{current, F=0}$) reference points, and fishing intensity-based target reference point ($F_{45\%SPR}$) over the modeling period (1994 – 2021). Blue triangle indicates the start year (1994) and black circle with 95% confidence intervals indicates the terminal year (2021). **(B)** Stock status plot showing current stock status and 95% confidence intervals of the base case model (black circle), an important sensitivity run of $CV = 0.06$ for L_{inf} in the growth model (gray square), an important sensitivity run with an estimated growth model (purple triangle), and a model representing an update of the 2020 base case model to 2023 data (red diamond). 95% confidence intervals are not shown for the update of the 2020 base case model (red diamond) because the model did not have a positive definite Hessian matrix and uncertainty estimates were unreliable. Red zones in both panels indicate female SSBs falling below the limit reference point while the orange zones indicate female SSBs between the threshold and limit reference points. Green zones indicate female SSBs above the threshold reference point and fishing intensity levels below the target reference point. Yellow areas indicate female SSBs above the threshold reference point and fishing intensity levels above the target reference point. The F_s in this figure are indicators of fishing intensity based on spawning potential ratio (SPR) and calculated as %SPR.

FIGURA F-3. Gráfica de fase de la condición de la población que muestra la condición de la población de atún albacora del Pacífico norte en relación con los puntos de referencia umbral ($30\%SSB_{actual, F=0}$) y límite ($14\%SSB_{actual, F=0}$) basados en la biomasa, y el punto de referencia objetivo basado en la intensidad de pesca ($F_{45\%SPR}$) durante el periodo del modelo (1994-2021). El triángulo azul indica el año inicial (1994) y el círculo negro con intervalos de confianza del 95% indica el año final (2021). **(B)** Gráfica de la condición de la población que muestra la condición actual de la población y los intervalos de confianza del 95% del modelo de caso base (círculo negro), un análisis de sensibilidad importante de $CV = 0.06$ para L_{inf} en el modelo de crecimiento (cuadrado gris), un análisis de sensibilidad importante con un modelo de crecimiento estimado (triángulo morado) y un modelo que representa una actualización del modelo de caso base de 2020 a los datos de 2023 (diamante rojo). No se muestran los intervalos de confianza del 95% para la actualización del modelo de caso base de 2020 (diamante rojo) porque el modelo no tenía una matriz hessiana positiva definida y las estimaciones de incertidumbre no eran fiables. Las zonas rojas de ambos paneles indican las SSB de las hembras por debajo del punto de referencia límite, mientras que las zonas anaranjadas indican las SSB de las hembras entre los puntos de referencia umbral y límite. Las zonas verdes indican las SSB de las hembras por encima del punto de referencia umbral y los niveles de intensidad de pesca por debajo del punto de referencia objetivo. Las áreas amarillas indican las SSB de las hembras por encima del punto de referencia umbral y los niveles de intensidad de pesca por encima del punto de referencia objetivo. Las F de esta figura son indicadores de la intensidad de pesca basados en la razón de potencial de desove (SPR) y calculados como %SPR.

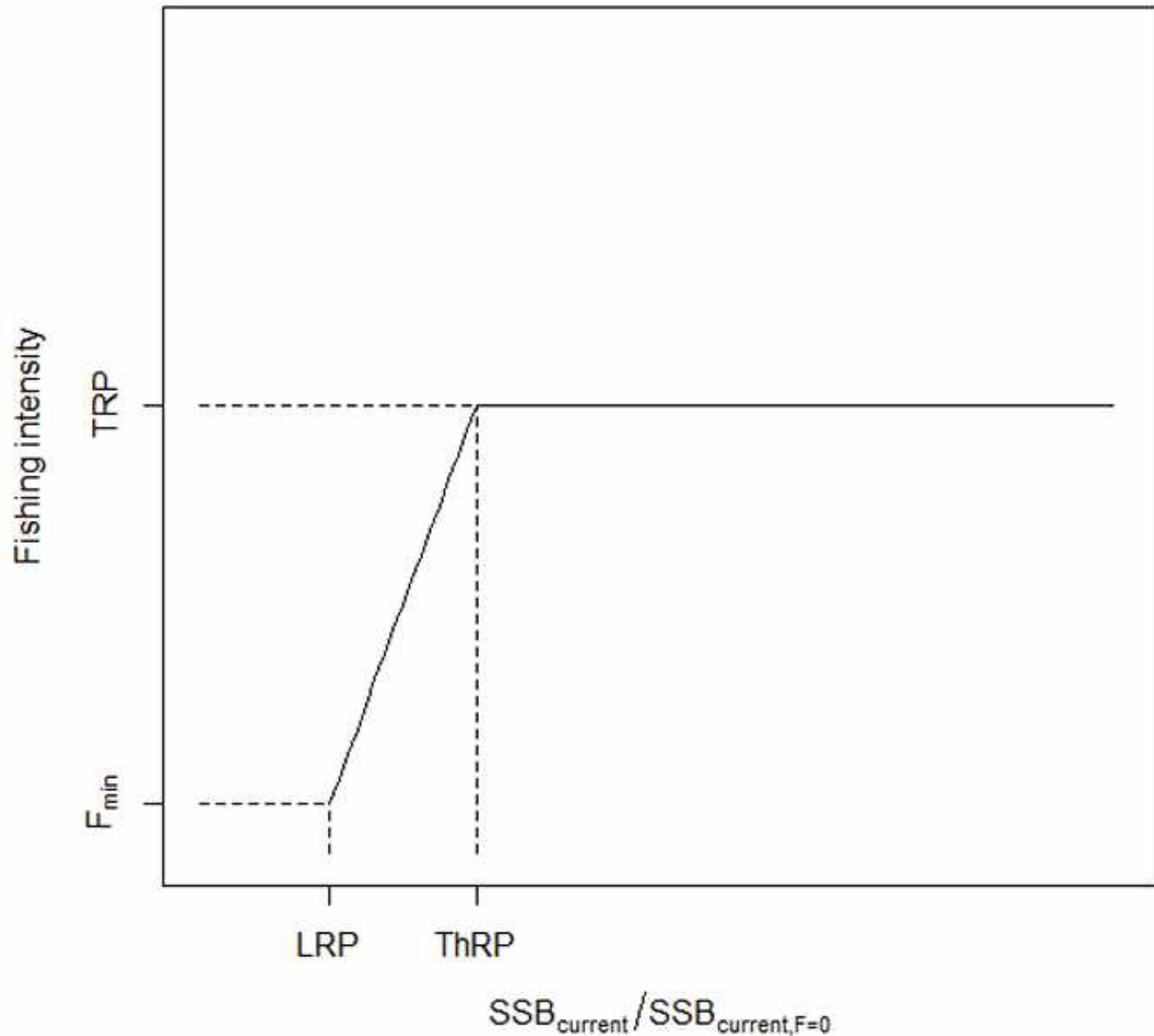


FIGURE F-4. Illustration of the harvest control rules with target reference point (TRP), threshold reference point (ThRP), limit reference point (LRP), and the minimum allowed fishing intensity (F_{min}). The harvest control rules include the triggering of a rebuilding measure if the $SSB_{current}/SSB_{current,F=0}$ falls below the LRP. **FIGURA F-4.** Ilustración de las reglas de control de extracción con el punto de referencia objetivo (PRO), el punto de referencia umbral (PRU), el punto de referencia límite (PRL) y la intensidad de pesca mínima permitida (F_{min}). Las reglas de control de extracción incluyen la activación de una medida de recuperación si $SSB_{actual}/SSB_{actual,F=0}$ cae por debajo del PRL.

TABLE F1. Bold values indicate corrected values from the 2023 stock assessment. Estimates of maximum sustainable yield (MSY), female spawning stock biomass (SSB), fishing intensity (F), and reference point ratios for north Pacific albacore tuna for: 1) the base case model; 2) two important sensitivity models due to uncertainty in growth parameters; and 3) a model representing an update of the 2020 base case model to 2023 data. SSB_0 , $SSB_{current, F=0}$ and SSB_{MSY} are the expected female SSB of a population in the equilibrium, unfished state; in the current, dynamic, unfished state; and at MSY, respectively. The Fs in this table are indicators of fishing intensity based on spawning potential ratio (SPR) and calculated as %SPR. SPR is the ratio of the equilibrium SSB per recruit that would result from the estimated F-at-age relative to that of an unfished population. Depletion is calculated as the proportion of the age-1+ biomass during the specified period relative to an unfished age-1+ equilibrium biomass. The model representing an update of the 2020 base case model is similar to but not identical to the 2020 base case model due to changes in data preparation and model structure. *Model may not have converged, and uncertainty estimates were unreliable because of the lack of a positive, definite Hessian matrix. †A value of >1 for the depletion ratio indicates higher age-1+ biomass in 2021 relative to the 2006 – 2015 period. §Higher %SPR values indicate lower fishing intensity levels. ¶Values of >1 for ratios of $F_{\%SPR}$ to $F_{\%SPR}$ -based reference points indicate fishing intensity levels lower than the reference points.

TABLA F1. Los valores en negrita indican los valores corregidos de la evaluación de la población de 2023. Estimaciones del rendimiento máximo sostenible (RMS), biomasa reproductora de las hembras (SSB), intensidad de pesca (F) y cocientes de puntos de referencia para el atún albacora del Pacífico norte para: 1) el modelo de caso base; 2) dos importantes modelos de sensibilidad debido a la incertidumbre en los parámetros de crecimiento; y 3) un modelo que representa una actualización del modelo de caso base de 2020 a los datos de 2023. SSB_0 , $SSB_{actual, F=0}$ y SSB_{RMS} son la SSB de las hembras esperada de una población en estado de equilibrio, sin pesca; en estado actual, dinámico, sin pesca; y en RMS, respectivamente. Las F de esta tabla son indicadores de la intensidad de pesca basados en la razón de potencial de desove (SPR) y calculados como %SPR. La SPR es la razón de la SSB en equilibrio por recluta que resultaría de la F por edad estimada en relación con la de una población en ausencia de pesca. La reducción se calcula como la proporción de la biomasa de edad 1+ durante el periodo especificado en relación con una biomasa de edad 1+ en equilibrio sin pesca. El modelo que representa una actualización del modelo de caso base de 2020 es similar pero no idéntico al modelo de caso base de 2020 debido a cambios en la preparación de los datos y en la estructura del modelo. *Es posible que el modelo no haya convergido y que las estimaciones de incertidumbre no sean fiables debido a la falta de una matriz hessiana positiva definida. †Un valor de >1 para la razón de reducción indica una mayor biomasa de edad 1+ en 2021 en relación con el periodo 2006-2015. §Valores de %SPR más altos indican niveles de intensidad de pesca más bajos. ¶Valores de >1 para los cocientes de $F_{\%SPR}$ con respecto a los puntos de referencia basados en $F_{\%SPR}$ indican niveles de intensidad de pesca inferiores a los puntos de referencia.

| Quantity | Base Case | Growth CV = 0.06 for L_{inf} | Growth All parameters estimated | Update of 2020 base case model to 2023 data* |
|---|-------------|--------------------------------------|---------------------------------------|--|
| MSY (t) | 121,880 | 93,167 | 144,792 | 97,777 |
| SSB_{MSY} (t) | 23,154 | 18,133 | 30,435 | 18,756 |
| SSB_0 (t) | 165,567 | 128,155 | 198,913 | 132,570 |
| SSB_{2021} (t) | 70,229 | 35,418 | 101,161 | 36,909 |
| $SSB_{current, F=0}$ (2021 estimate) | 129,581 | 97,368 | 155,542 | 93,808 |
| $SSB_{2021}/SSB_{current, F=0}$ | 0.54 | 0.36 | 0.65 | 0.39 |
| $SSB_{2021}/30\%SSB_{current, F=0}$ | 1.81 | 1.21 | 2.17 | 1.31 |
| $SSB_{2021}/14\%SSB_{current, F=0}$ | 3.87 | 2.60 | 4.65 | 2.81 |
| † Depletion ₂₀₂₁ /Depletion ₂₀₀₆₋₂₀₁₅ | 1.34 | 1.33 | 1.37 | 1.30 |
| § $F_{\%SPR, 2018-2020}$ (%SPR) | 59.0 | 41.4 | 70.4 | 43.2 |
| § $F_{\%SPR, 2011-2020}$ (%SPR) | 53.3 | 36.6 | 63.8 | 37.9 |
| ¶ $F_{\%SPR, 2018-2020}/F_{\%SPR, MSY}$ | 3.60 | 2.50 | 3.99 | 2.61 |
| ¶ $F_{\%SPR, 2011-2020}/F_{45\%SPR}$ | 1.19 | 0.81 | 1.42 | 0.84 |
| ¶ $F_{\%SPR, 2018-2020}/F_{45\%SPR}$ | 1.31 | 0.92 | 1.56 | 0.96 |
| ¶ $F_{\%SPR, 2018-2020}/F_{\%SPR, 2002-2004}$ | 1.48 | 1.63 | 1.40 | 1.25 |

G. SWORDFISH

Swordfish (*Xiphias gladius*) occur throughout the Pacific Ocean (PO) between about 50°N and 50°S. In the eastern Pacific Ocean (EPO), they are caught mostly by the longline fishery—about 80% of the catch in weight on average in recent years—by distant water fleets of Far East and Western Hemisphere nations. Lesser amounts are taken by drifting gillnets (~20%), mainly in South America, and minimal amounts by other gillnets and harpoon. They are seldom caught in the recreational fishery in the EPO.

Swordfish grow in length very rapidly, with both males and the faster-growing females reaching lower-jaw-fork lengths of more than a meter during their first year. Swordfish begin reaching maturity at about two years of age, when they are about 150 to 170 cm in length, and by age four all are mature. They probably spawn more than once per season. For fish greater than 170 cm in length, the proportion of females increases with increasing length.

Swordfish tend to inhabit waters further below the surface during the day than at night, and they tend to inhabit current frontal zones. Several of these fronts occur in the eastern Pacific Ocean (EPO), including areas off California and Baja California, off Ecuador, Peru, and Chile, and in the equatorial Pacific. Swordfish tolerate temperatures of about 5° to 27°C, but their preferred range is about 18° to 22°C, while larvae have been found only at temperatures exceeding 24°C.

There is strong evidence that swordfish in the Pacific comprise multiple stocks. Several specific spawning regions are known, and analyses of fisheries, tagging and genetic data suggest that there is only limited exchange of swordfish between geographical areas, including between the eastern and western, and the northern and southern, Pacific Ocean. As many as six stocks may exist in the Pacific Ocean, but the exact boundaries of these stocks, as well as their exchange rates—for the purposes of stock assessment—is currently uncertain. In the early 2000's, the IATTC produced [indicators for swordfish](#) in five areas of the EPO: two areas north of 10°N, separated at 125°W, a central area between 10°N and 5°S, and two areas south of 5°S, separated at 90°W.

Currently, two stocks are assumed to inhabit the EPO. One in the south and one in the north. The stock boundaries are uncertain, but it was assumed in the most recent assessments that the southern EPO stock could be distributed up to 10°N and that the north Pacific Ocean stock includes the EPO north of 10°N. The area north of 5°S and south of 10°N was added in the south EPO assessment in one of the stock structure hypotheses considered, as there was evidence of connectivity between that area and the area south of 5°S ([SAC-13 INF-N](#)), which defined the stock boundary in the previous assessment ([SAC-02-09](#)). The definition used in the previous assessment was also included as an alternative stock structure hypothesis. Tagging studies (presented during [SWO-01](#)) showed movement of swordfish across the previously assumed stock boundary between the north and central Pacific Ocean swordfish stock and the north EPO—a diagonal line from the tropics in the central Pacific to the northern coast of Mexico. This information motivated the revision of the stock boundary assumed for the north Pacific swordfish stock ([ISC/21/BILLWG-01](#)) to include the EPO north of 10°N. This new stock boundary assumption allowed for the inclusion of areas off Mexico and Central America in the 2023 north Pacific swordfish assessment ([ISC/23/ANNEX/11](#)), which were not included in the 2018 assessment ([ISC/18/ANNEX/16](#)).

In the northern EPO (north of 10°N), the annual longline fishing effort for the main longline fleets⁵ operating decreased from about 21 million hooks in 2017 to about 10 million hooks in 2023 ([Figure G-1](#)). The last three-year average (2021-2022) of about 11 million hooks remains within the historical range of 5 million to 23 million hooks ([Figure G-1](#)).

The catches in the EPO north of 10°N average about 2,000 tons in the last 40 years (ranged from 250 tons to 3,800 tons), decreased to an average of about 1,000 tons in the most recent 10 years and are currently in the lowest levels of about 380 tons in the last three years ([Figure G-2](#)), when effort is also low ([Figure G-1](#)).

In the southern hemisphere, the total annual longline fishing effort for the main longline fleets¹ in EPO was 210 million hooks in 1991 and declined steadily to about half that in 1999, increasing again to an average of 177

⁵ Japan, Korea, Chinese Taipei, China, United States and French Polynesia

million hooks in 2001–2004, decreasing to about 69 million hooks in 2008. Since 2012 the total effort was relatively stable, averaging 155 million hooks in the from 2020–2022 ([Figure G-3](#)). In 2023 there was a sharp decline in effort to 85 million hooks, about 55% of the 2020-2022 average.

[Figure G-4](#) shows the data on catches reported to the IATTC. For the assessment of south EPO swordfish, a compilation of catch data was conducted which resulted in higher values than those in [Figure G-4](#) due to some catches, mainly of artisanal fleets, still underreported to the IATTC. The catch data compiled for the EPO south of 10°N showed a dramatic increase since the mid-2000s ([Figure 3 in SAC-14-15](#)). The average catch per year from 2000 to 2009 was about 15,000 tons, while the average catch per year for 2010 to 2019 almost doubled to about 29,000 tons. In the last three years of the compilation available for the assessment (2017 - 2019), the average catch was about 34,000 t a year (of those about 30,000 t were reported to the IATTC, [Figure G-4](#)). The average reported catches in the most recent 3 years (2021-2023) are about 26,000 t, which is about 76% of the catches reported to the IATTC corresponding to the most recent 3 years included in the most recent stock assessment for south EPO ([SAC-14-15](#)). The fleets that currently take the most catch are the Spanish longline fleet, which catches about 30% of the total catches in weight, followed by the Chilean gillnet fleet with 22%, and the Ecuadorian longline fleet with 20%.

The last assessment of the north Pacific Ocean swordfish stock, which included the EPO north of 10°N, was conducted in 2023 by the Billfish Working Group (BILLWG) of the International Scientific Committee for Tuna and Tuna-like Species in the north Pacific Ocean. Results indicated that stock biomass (age 1 and older) for the stock fluctuated around an average of 83,000 t during 1975-2021 and was estimated to be 88,755 t in 2021. The recent 3-year (2019-2021) average spawning biomass was 34,900 t, 2.5 times greater than SSB_{MSY} . The fishing mortality (F) has been declining steadily since 2001 and was 49% of F_{MSY} during 2019-2021 (average F for ages 1 – 10). Reference points for the stock are yet to be adopted. Using MSY -based reference points as illustration, the base case model indicated that under current conditions the stock was very likely not overfished (>99% probability) and was very likely not subject to overfishing (>99% probability).

For the south EPO stock, the most recent benchmark assessment was done in 2023 with data up to 2019 ([SAC-14-15](#)). The main uncertainties accounted for were stock structure and the relationship of the indices of abundance with the stock biomass. Associated with the increase in catches, there was a clear increase in the indices of abundance, which was a continuation of the trends already apparent in the 2011 assessment. Four hypotheses were proposed to explain the simultaneous increase of catches and indices of abundance, which included both the possibilities that the increase is either real or not (increase in availability or catchability). Reference points, which are used only for illustrative purposes since reference points have yet to be adopted for swordfish by the Commission, indicated that the stock is approaching one of the hypothetical dynamic biomass TRP (of 40% unfished biomass) for one of the hypotheses and is larger for the other hypotheses ($SSB_{current}/SSBF = 0 > 0.4$). However, the stock is not approaching the hypothetical dynamic limit reference point of 20% unfished biomass ([Figure G-5](#)). All models estimate a strong increase in fishing mortality since the start of the fishery in the 1950's. The fishing intensity is slightly above the fishing intensity target reference point for one of the hypotheses and below for the other hypotheses ([Figure G-6](#)). There is not enough information in the current data to determine the relative plausibility of the different hypotheses that may explain the simultaneous increases in catch and indices of abundance. Anecdotal evidence is surfacing that the gear may have change causing increases in catchability.

In June 2025, a regional workshop was held in Chile with the participation of Chile, Ecuador, Costa Rica, the European Union and the IATTC stock assessment staff to improve the research and information for the future south EPO swordfish stock assessment.

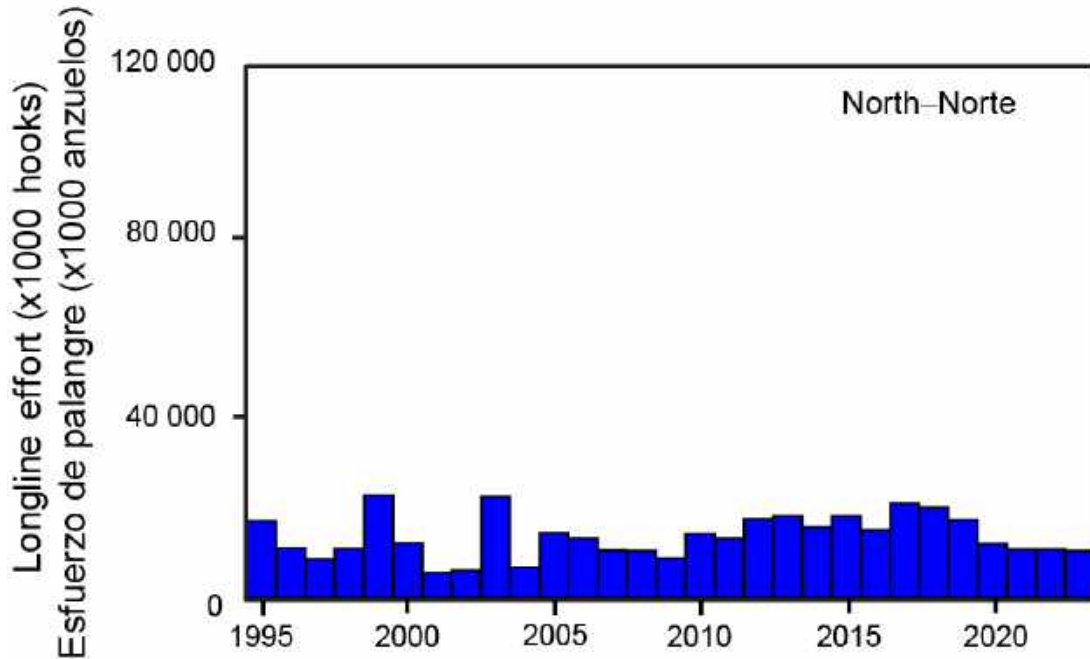


FIGURE G-1. Longline fishing effort (in millions of hooks) in the north EPO for the main longline fleets for 1995–2023 ([Table A-9](#)).

FIGURA G-1. Esfuerzo de pesca de palangre (en millones de anzuelos) en el OPO Norte para las principales flotas palangreras para 1995–2023 ([Tabla A-9](#)) (al norte 10°N).

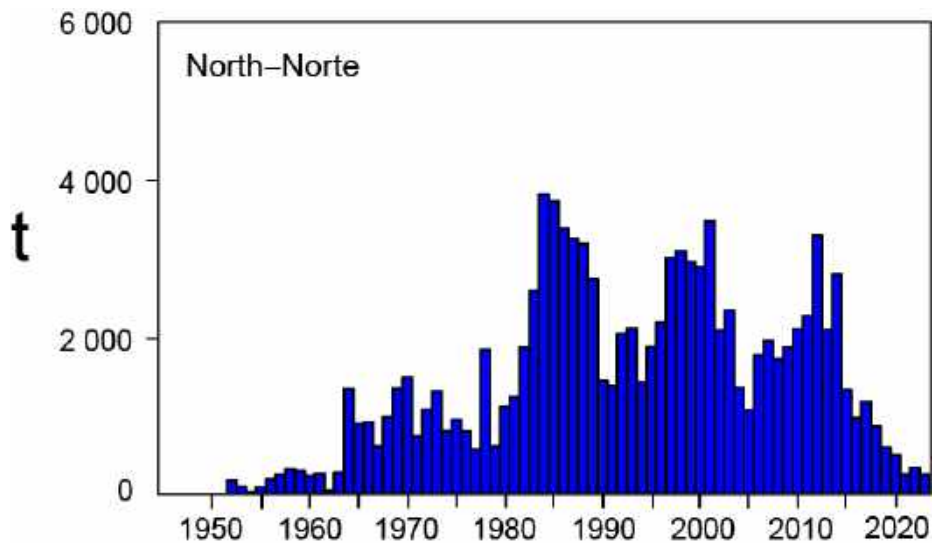


FIGURE G-2. Retained catches of swordfish in the north EPO stock for 1945–2023 (north of 10°N)

FIGURA G-2. Capturas retenidas de pez espada en la población del OPO Norte para 1945–2023 (al norte de 10°N).

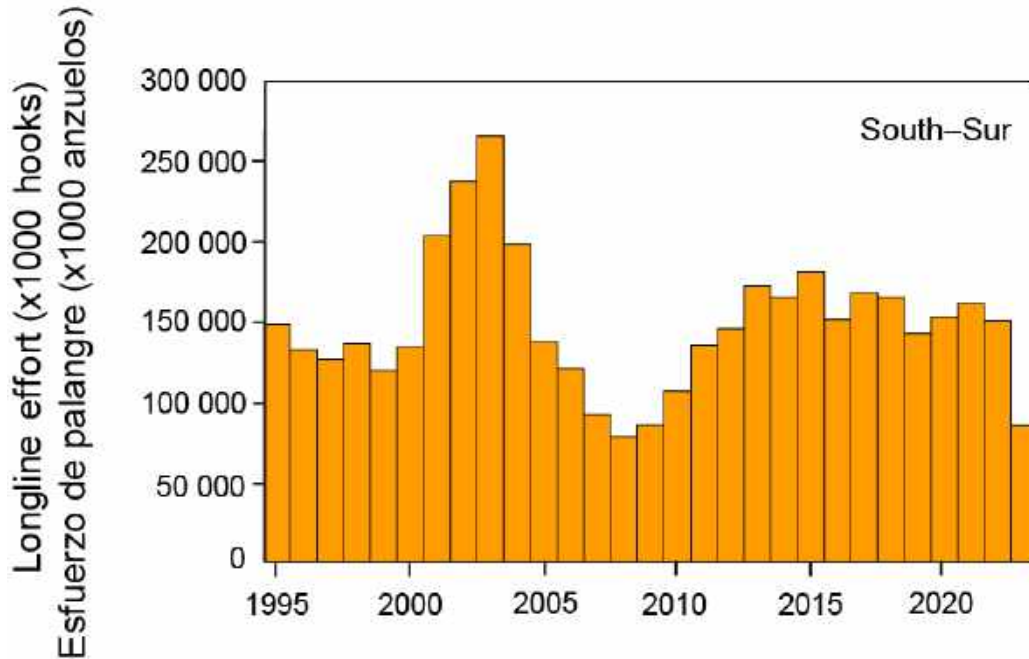


FIGURE G-3. Longline fishing effort (in millions of hooks) in the south EPO for the main longline fleets for 1995–2023 ([Table A-9](#)).

FIGURA G-3. Esfuerzo de pesca de palangre (en millones de anzuelos) en el OPO Sur para las principales flotas palangreras para 1995–2023 ([Tabla A-9](#))

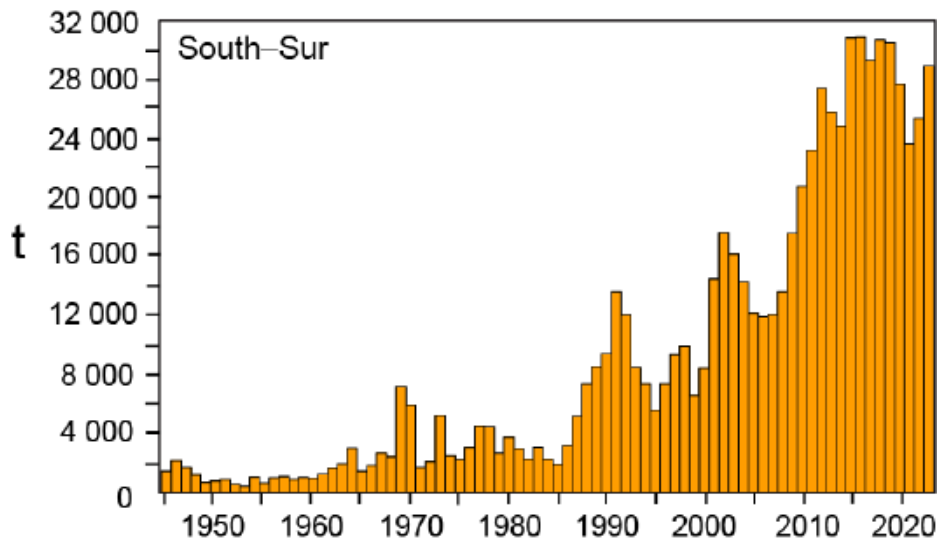


FIGURE G-4. Retained catches of swordfish in the south EPO stock for 1945–2023 (south of 10°N) reported to the IATTC.

FIGURA G-4. Capturas retenidas de pez espada en la población del OPO Sur para 1945–2023 (al sur de 10°N).

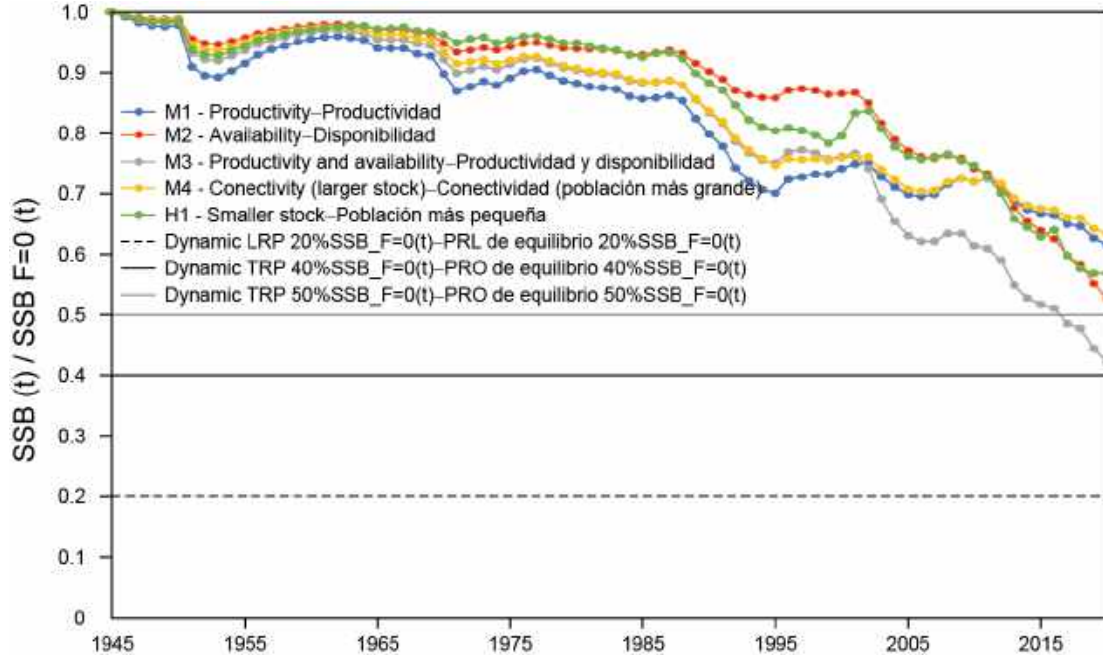


FIGURE G-5. Ratio of the estimated spawning stock biomass and spawning stock biomass with no fishing (dynamic) for the models corresponding to the four hypotheses that explain the simultaneous increase in indices of abundance and catches and the model corresponding to the stock structure hypothesis H1 (north boundary at 5°S). Note that M4 corresponds to the stock structure hypothesis H3 (western boundary at 170°W).

FIGURE G-5. Razón entre la biomasa de la población reproductora estimada y la biomasa de la población reproductora sin pesca (dinámica) para los modelos correspondientes a las cuatro hipótesis que explican el aumento simultáneo de los índices de abundancia y las capturas y el modelo correspondiente a la hipótesis de estructura de la población H1 (límite norte en 5°S). Nótese que el modelo M4 corresponde a la hipótesis de estructura de la población H3 (límite occidental en 170°O).

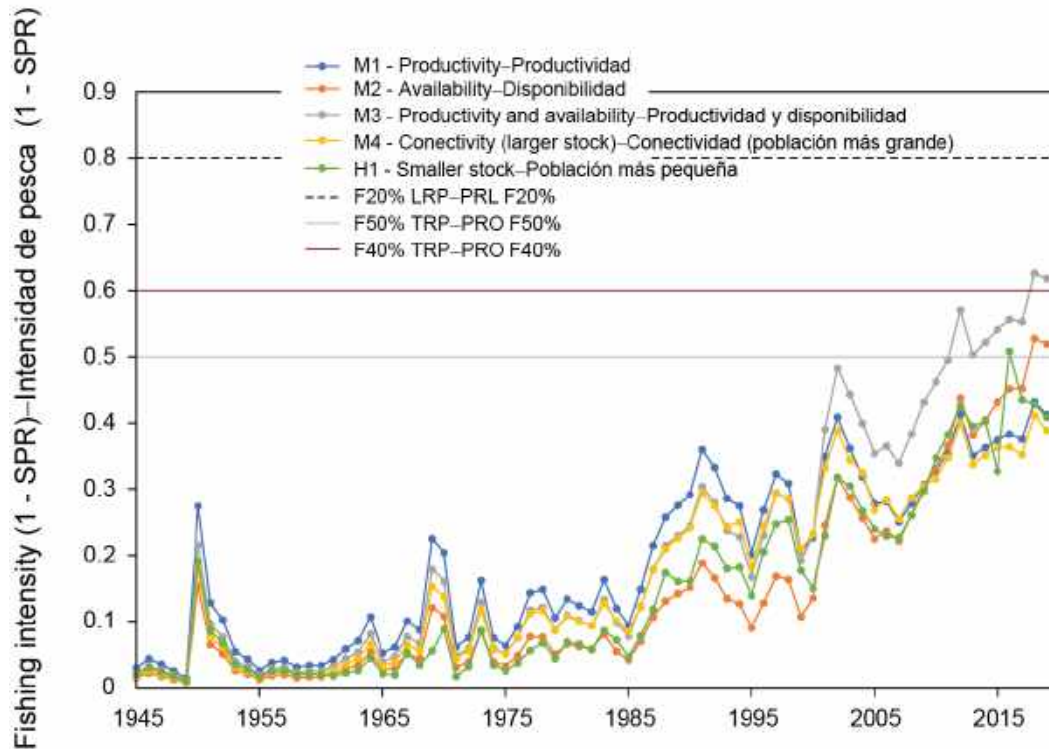


FIGURE G-6. Fishing intensity (1-SPR) for the models corresponding to the four hypotheses that explain the simultaneous increase in indices of abundance and catches and the model corresponding to the stock structure hypothesis H1 (north boundary at 5°S). Note that M4 corresponds to the stock structure hypothesis H3 (western boundary at 170°W). Fishing intensity is a proxy for fishing mortality, based on SPR (proportion of the spawning biomass produced by each recruit with fishing relative to biomass per recruit in the unfished condition, Goodyear 1993). Large SPR are indicative of low fishing mortality, thus a proxy for fishing mortality is 1-SPR.

FIGURE G-6. Intensidad de pesca (1-SPR) para los modelos correspondientes a las cuatro hipótesis que explican el aumento simultáneo de los índices de abundancia y las capturas y el modelo correspondiente a la hipótesis de estructura de la población H1 (límite norte en 5°S). Nótese que el modelo M4 corresponde a la hipótesis de estructura de la población H3 (límite occidental en 170°O). La intensidad de pesca es un sustituto de la mortalidad por pesca, con base en SPR (proporción de la biomasa reproductora producida por cada recluta con pesca en relación con la biomasa por recluta en ausencia de pesca, Goodyear 1993). Una SPR alta indica una mortalidad por pesca baja, por lo que 1-SPR es sustituto de la mortalidad por pesca.

H. BLUE MARLIN

The best information currently available indicates that blue marlin constitutes a single world-wide species (*Makaira nigricans*) and a single stock in the Pacific Ocean. For this reason, statistics on catches ([Figure H-1](#)) are compiled, and analyses of stock status are made, for the entire Pacific Ocean.

Blue marlin are taken mostly in longline fisheries for tunas and billfishes between about 30°N and 30°S. Lesser amounts are taken by recreational fisheries and by various other commercial fisheries, such as purse-seine.

Small numbers of blue marlin have been tagged with conventional dart tags, by researchers. In contrast, over 50,000 blue marlin have been tagged by recreational fishers among the world's five largest volunteer gamefish tagging programs, with over 600 fish being recaptured. While a small number of tagged fish have been recaptured long distances from their release locations (4,000–15,000 km), the majority of tagged fish have been recaptured less than 1000 km from their release location, despite some being at liberty for over 3 years. Blue marlin have been tagged in studies of post-release survival and movement, mostly in the Gulf of Mexico and the Atlantic Ocean, using electronic pop-up satellite tags (PSATs) that collected data over periods of about 30–180 days. A number of similar studies have been undertaken in the Pacific Ocean as part of the International Gamefish Association's "Great Marlin Race" tagging program.

Blue marlin usually inhabit regions where the sea-surface temperatures (SSTs) are greater than 24°C, and spend about 90% of their time at depths with temperatures within 1° to 2° of the SSTs. They inhabit the equatorial area (10°N to 10°S) but their latitudinal range may expand seasonally during the summer in each hemisphere to 35°N or 25°S in the EPO. They are epipelagic and spend most of their time within 10 m of depth but do occasional dives below 500 m.

The most recent full assessment of the status and trends of the species was conducted in 2021 ([SC/21/ANNEX/10](#)), which included data through 2019. No target or limit reference points have been adopted for blue marlin in the Pacific Ocean. As an illustration the MSY-based reference points were used to evaluate stock status. The assessment results indicated that the spawning stock biomass of blue marlin in the Pacific Ocean decreased steadily since the 1970's to levels below SSB_{MSY} in mid-2000's, increasing to above SSB_{MSY} in 2010. In 2019 the spawning biomass was 17% above SSB_{MSY} , while fishing mortality during 2017-2019 was 40% below F_{MSY} . Therefore, the assessment concluded that the stock was neither overfished nor subject to overfishing. The annual catches in the EPO average about 4,400 t from 2012 to 2018, declined to about 3,000 t in 2019-2020 and are currently about 1,600 t, which is about 40% of the average annual catches in 2017-2019, the last years in the assessment ([Figure H-1](#)). The catches in the EPO were about 30% before 2000 and are currently 13% of the total catches in the Pacific Ocean (average for 2021-2023) ([Figure H-1](#)).

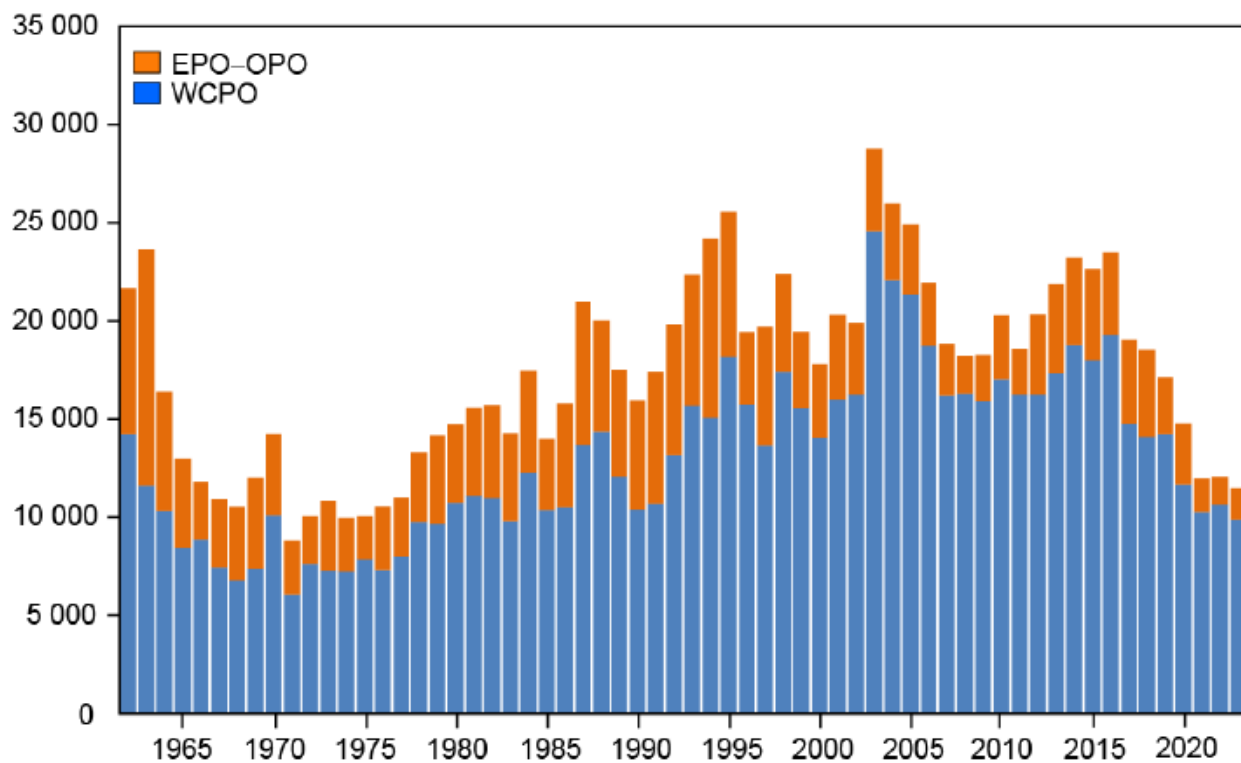


FIGURE H-1. Retained catches of blue marlin in the Pacific Ocean, by region.

FIGURA H-1. Capturas retenidas de marlín azul en el Océano Pacífico, por región.

I. STRIPED MARLIN

Striped marlin (*Kajikia audax*) occurs throughout the Pacific Ocean between about 45°N and 45°S. Significant effort has been devoted to understanding the stock structure of striped marlin in the Pacific Ocean, which is moderately well known. There most likely are a number of striped marlin stocks in the Pacific Ocean, but the boundaries are uncertain. Information on movement from research studies deploying conventional dart tags is limited, although over 40,000 striped marlin have been tagged by various volunteer recreational fisher tagging programs. Although reported recapture rates are below 1%, recapture data show that striped marlin are capable of moving long distances (5,000–6,000 km), however, most recaptures have occurred reasonably close to the release location. In the EPO specifically, fish tagged off the tip of Baja California were generally recaptured near where they were tagged, but some were recaptured around the Revillagigedo Islands, a few around Hawaii, and one near Norfolk Island, off Australia. Tagging studies in the Pacific, using pop-off satellite tags, indicated that there is essentially no mixing among tagging areas, and that striped marlin maintain site fidelity. Analyses of fisheries and genetic data indicate that the northern EPO supports a single stock, though there may be a seasonal low-level presence of juveniles from a more westerly Hawaii/Japan stock.

Historically, most of the catch in the EPO was taken by longline fisheries, which began expanding into the EPO in the mid-1950s and extended throughout the region by the late 1960s. Except for a few years in the late 1960s to early 1970s in the northern EPO, these fisheries did not target billfish. The fishing effort by large longline vessels in the North EPO has decreased by about 50% since 2017 ([Figure G-1](#)) and remains stable in the South EPO, except for the sharp decrease in 2023 ([Figure G-3](#)), but the catch of striped marlin has remained largely unchanged since then, and it is currently about 1,300 t (annual average for 2021–2023). Since the early 1990's, the catches by recreational fisheries have become important, although most fish caught are released ([Figure I-1](#)). However, the survival rate of released fish is little understood.

The recreational fishery has increased its contribution to the total annual reported catches of striped marlin in the EPO, particularly in the North EPO, from around 10% in 1990 to 64% and 84% in 2007 and 2008, respectively. However, a paucity of reported data since 2009 probably means that the catches of striped marlin in the EPO have been significantly underestimated since this time. Also, it appears that catches of billfishes, including striped marlin, by the artisanal longline fisheries from coastal CPCs may be incomplete. Therefore, the total catch of striped marlin in the EPO, and thus the total impact of fishing on the stock since about 2009, is not known.

Fishing by artisanal longline vessels targeting tuna and other species off Central America, for which data availability is limited, appears to have increased, over the past decade at least. The shifting patterns of areas fished and targeting practices increase the difficulties encountered when using fisheries data in analyses of stock status and trends. These difficulties are exacerbated when analyzing species which are not principal targets of the fishery, and further complicated when the total catch of the species by all fisheries is not known.

The last full assessment of striped marlin in the EPO was conducted in 2008, using Stock Synthesis, and later updated with data through October 2010 ([SAC-01-10](#)). The spatial domain of the assessment was north of 10°S, east of about 145°W north of the equator, and east of about 165°W south of the equator. Key results were that (1) the stock was not overfished; (2) overfishing was not occurring; and (3) the spawning stock biomass was above the level that would support MSY. More recently, average annual catches in the last ten years (2014–2023, 1,638 t) were at about half the estimated MSY level in 2010. If fishing effort and catches continue at or below the 2010 level (2,129 t), it is expected that the biomass of the stock will continue to increase over the near term.

In 2022–2023, the Billfish Working Group (BILLWG) of the International Scientific Committee for Tuna and Tuna-like Species in the north Pacific Ocean completed a full assessment of the western and central north Pacific Ocean (WCNPO) stock of striped marlin ([ISC/23/ANNEX/14](#)). A Stock Synthesis model was produced with the best-available life history parameters and catch, abundance index, and length composition data for the period 1977–2020. The results indicated that the fishing mortality (average for ages 3 – 12 during 2018–2020) was about three times the F_{MSY} and 9% above $F_{20\%SSB(F=0)}$. The spawning

biomass (average for 2018-2020) was of 1,360 t, which is 63% below 20%SSB_{F=0}. Relative to dynamic 20-year 20%SSB_{F=0}-based reference point, the WCNPO striped marlin stock was very likely overfished and was likely subject to overfishing.

Efforts continue to obtain reliable catch data from all fisheries. Until the data are available and updated, and a review of the status of striped marlin in the EPO is completed, it is recommended that, as a precautionary measure, fishing effort by fisheries that take most of the striped marlin catch in the EPO not be increased.

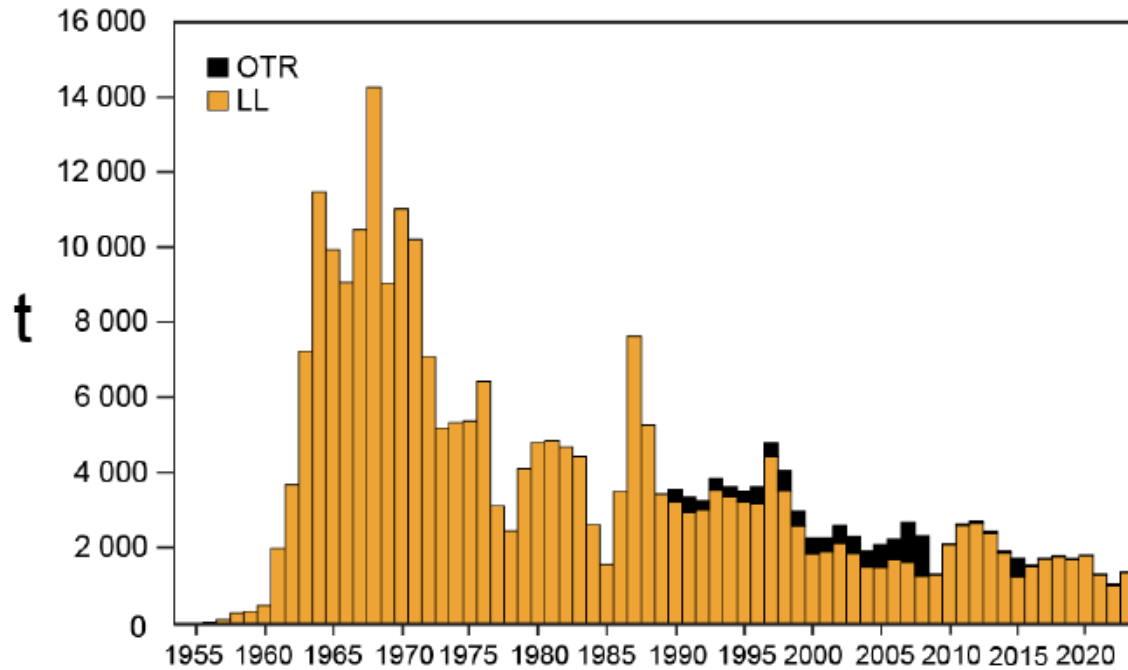


FIGURE I-1. Total reported retained catches of striped marlin in the North EPO by longline (LL) and other (OTR) fisheries (primarily recreational, 1954–2023). Due to unreported catches by recreational fisheries, estimates for 2009–2021 are minimums.

FIGURA I-1. Capturas retenidas totales reportadas de marlín rayado en el OPO Norte por las pesquerías palangreras (LL) y otras (OTR, principalmente recreativas), 1954–2023. Debido a capturas no reportadas por pesquerías recreativas, las estimaciones de 2009–2021 son mínimas.

J. SAILFISH

The stock structure of sailfish (*Istiophorus platypterus*) in the Pacific Ocean is well known. The species is most abundant in waters relatively near the continents and the Indo-Pacific land masses bordering the Pacific, and less frequently encountered in the high seas separating them. The populations in the EPO and in the western Pacific are genetically distinct.

The centers of sailfish distribution along the coast of the Americas shift in response to seasonal changes in surface and mixed-layer water temperature. Sailfish are found most often in waters warmer than about 28°C, and are present in tropical waters nearer the equator in all months of the year. Sailfish have among the largest number of conventional tag deployment of all billfishes, mainly attributed to their high importance to recreational fisheries worldwide. At least 126,000 sailfish have been tagged among the world's five largest volunteer gamefish tagging programs, although less than 2,000 fish (1.5%) have been recaptured. The data complement genetic information in that there appears to be high population substructure with fish often moving less than 500 km from their release locations. However, there are several instances where sailfish have moved reasonably long distances (2,000–3,500 km) over periods of less than a year, however, these distances can be considered small in comparison to movements of other billfish species in the EPO.

Spawning takes place off the coast of Mexico during the summer and fall, and off Costa Rica during winter, and perhaps year-round in areas with suitable conditions. The sex ratio is highly skewed towards males during spawning. The known shifts in sex ratios among spawning areas, and the spatial-temporal distributions of gonad indices and size-frequency distributions, which show smaller fish offshore, suggest that there may be maturity-dependent patterns in the distribution of the species in the EPO. Sailfish can reach an age of about 11 years in the EPO.

The principal fisheries that capture sailfish in the EPO include the large-scale tuna longline fishery primarily consisting of China, Chinese Taipei, Japan, and Korea; the smaller-vessel longline fisheries targeting tuna and other species, particularly those operating off Central America; and the artisanal and recreational fisheries of Central and South America. Sailfish are also taken occasionally in the purse-seine fisheries targeting tropical tunas, particularly in more coastal regions.

The first assessment of sailfish in the EPO was conducted in 2013 ([SAC-04-07c](#)). Initial analyses indicated that either this stock had uncharacteristically low productivity and high standing biomass, or—more likely—that a large amount of catch was missing in the data compiled for the assessment. A satisfactory estimate of the missing catch was unavailable, thus the estimates of stock status and trends using Stock Synthesis—the preferred model for assessments—were unreliable. As a result, the assessment was conducted using a surplus production model, which provided results consistent with those obtained with Stock Synthesis and simplified the illustration of the issues in the assessment.

Key results:

1. It is not possible to determine the status of the sailfish stock in the EPO with respect to specific management parameters, such as maximum sustained yield (MSY), because the parameter estimates used in making these determinations in this case cannot be derived from the model results.
2. Average annual reported catches during 2021–2023 were 545 t ([Figure J-1](#)), significantly less than the 1993–2007 average of 2,057 t.
3. Sailfish abundance trended downward during 1994–2009, since then it has been relatively constant or slightly increasing until 2011, the last year in the assessment model ([Figure J-2](#)).
4. Assessment model results suggest that there are significant levels of unreported catch, and the actual catch in earlier years was probably higher than those reported for 1993–2007. Assuming that this level of harvest has existed for many years, it is expected that the stock condition will not deteriorate if catch is not increased above current levels.
5. A precautionary approach that does not increase fishing effort directed at sailfish, and that closely

monitors catch until sufficient data are available to conduct another assessment, is recommended.

6. A reliable assessment of the sailfish resources in the EPO cannot be obtained without reliable estimates of catch. It is therefore recommended that:
 - a. historical data on catches of sailfish be obtained wherever possible
 - b. fisheries currently reporting sailfish catches commingled with other species be required to report catches by species.
 - c. existing data from small-scale fisheries, such as local longline fleets, artisanal and recreational fisheries, be compiled and that, where necessary, catch monitoring programs to identify catches by species be implemented.

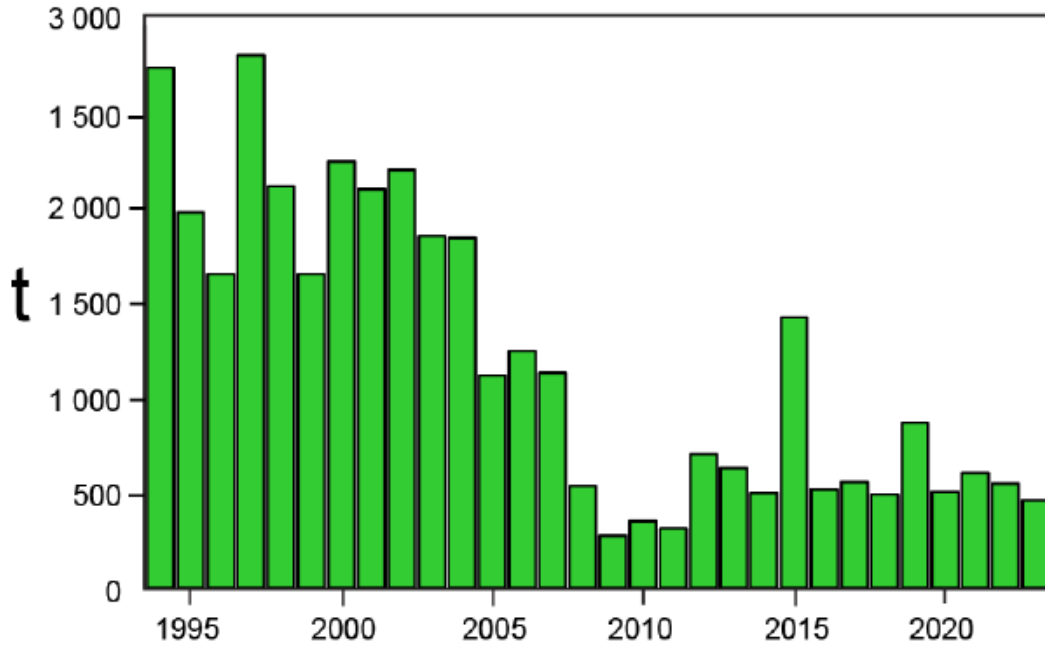


FIGURE J-1. Total reported catches of sailfish in the EPO, 1994–2023. (The actual catches were probably greater).

FIGURA J-1. Capturas totales reportadas de pez vela en el OPO, 1994–2023. (Las capturas reales fueron probablemente mayores).

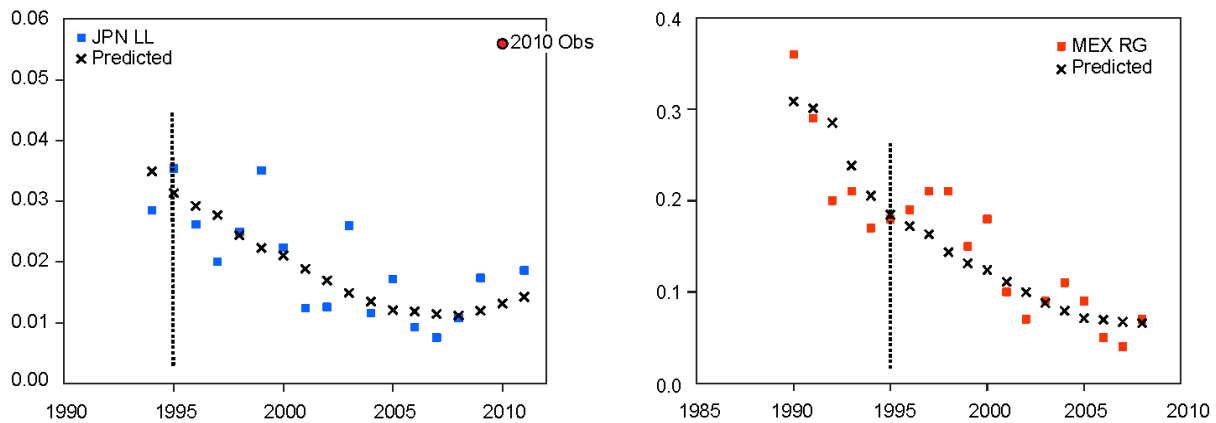


FIGURE J-2. Observed and predicted indices of relative abundance of sailfish in the EPO from Japanese longline (JPN LL) and Mexican recreational (MEX RG) fisheries. The 2010 observation in the JPN LL series was not included in the analyses.

FIGURA J-2. Índices observados y predichos de abundancia relativa del pez vela en el OPO, basados en las pesquerías palangrera japonesa (JPN LL) y recreacional mexicana (MEX RG). No se incluyó en los análisis la observación de 2010 en la serie JPN LL.

K. SHARKS

Over 300 species of sharks inhabit the Pacific Ocean, of which at least 49 species have been documented to be caught, either as a target or incidental bycatch, in the industrial and small-scale coastal (*i.e.*, ‘artisanal’) pelagic fisheries of the eastern Pacific Ocean (EPO). In general, sharks are long-lived (20+ years), slow growing, mature late in life and produce a small number of offspring (<10 pups), often every few years, resulting in conservation concerns for many species impacted by fishing. In recognition of the potential negative impacts of fishing on sharks globally, many species interacting with pelagic fisheries in EPO are listed by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species and/or by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Furthermore, the IATTC has implemented a range of conservation and management measures (CMMs) for sharks since at least 2005 to limit or prohibit their capture, or to promote handling practices to maximize their post-release survival. For example, retention prohibition measures have been in place for oceanic whitetip shark in all EPO industrial tuna fisheries since 2011 (Resolution [C-11-10](#)) and for silky shark in all purse-seine fisheries since 2016 (Resolution [C-16-06](#)). In 2024, the IATTC adopted Resolution [C-23-07](#) “*Conservation measures for the protection and sustainable management of sharks*” which consolidates existing measures that pertain to sharks in IATTC Resolutions, and strengthens shark conservation and management measures in the EPO. Furthermore, the resolution requires the IATTC staff to draft, in collaboration with the EBWG and the SAC, an interim list of shark species for the consideration by Members to be under the purview of the Commission. A list of 49 species documented to interact with pelagic fisheries in the EPO was used in combination with other available species lists, ecological characteristics and conservation classifications by international instruments to provide a recommendations from the staff for an interim list of shark species (see [SAC-15-09](#)). Based on the discussions with the EBWG and the IATTC staff, the SAC recommended 18 shark species be included in the draft list of species ([SAC-15-09 Recs](#)). These species were subsequently adopted by the Commission at its 102nd meeting in 2024 in Resolution [C-24-05](#) as priority species for research, with a particular emphasis on *Carcharhinus longimanus* and *C. falciformis*, *Sphyrna lewini*, *S. zygaena*, and *S. mokarran*, *Alopias pelagicus* and *A. superciliosus*, and *Prionace glauca*, with a goal to collaborate with the Western and Central Pacific Fisheries Commission (WCPFC) for Pacific-wide stocks.

Sharks are often incidentally caught as bycatch in EPO fisheries targeting tunas and billfish, and therefore insufficient or unreliable catch and biological data available for the majority of shark species has hindered the development of stock assessments, except for a small number of economically important species such as blue and shortfin mako sharks that were assessed by the ISC as contiguous north Pacific stocks in [2022](#) and [2024](#), respectively. Given data deficiencies, but at the same time acknowledging the need to demonstrate ecological sustainability mandates under the Antigua Convention, the IATTC has developed a strategic research plan (see [SAC-16-07](#)) to use ecological risk assessment to identify vulnerable species for monitoring, research and management, and where possible, undertake detailed assessments of stock indicators or stock status.

Vulnerability assessment of sharks caught in eastern Pacific Ocean pelagic fisheries

In 2018, the IATTC staff developed of a flexible spatially-explicit quantitative ecological risk assessment approach—Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish)—specifically designed to quantify the cumulative impacts of multiple fisheries for data-limited bycatch species to identify vulnerable species and prioritize them for data collection, research and management. In 2022, the IATTC undertook the first comprehensive vulnerability assessment for sharks in the EPO using EASI-Fish (SAC-13-11), which characterized their vulnerability status for 2019, the most recent complete fishing year to be representative of contemporary fishing effort regimes in the EPO before fishing effort, data collection and provision were significantly impacted by the COVID-19 pandemic.

Of the 49 shark species recorded to interact with industrial (purse-seine and longline) and artisanal (longline and gillnet) pelagic fisheries in the EPO, 32 species were formally assessed using EASI-Fish. In 2019, estimates of a proxy for fishing mortality (\tilde{F}_{2019}) and the spawning stock biomass per recruit (SBR_{2019}) exceeded biological reference points ($F_{40\%}$ and $SBR_{40\%}$) for 20 species, classifying them as

“most vulnerable” ([Figure K-1; SAC-13-11](#)). These included hammerhead sharks (5 species; *Sphyrna corona*, *S. media*, *S. mokarran*, *S. lewini*, and *S. zygaena*), requiem sharks (10 species; *Carcharhinus altimus*, *C. brachyurus*, *C. falciformis*, *C. leucas*, *C. limbatus*, *C. longimanus*, *C. plumbeus*, *C. porosus*, *Nasolamia velox*, and *Rhizoprionodon longurio*), threshers (2 species; *Alopias superciliosus* and *A. pelagicus*), mesopelagic sharks (3 species; *Dalatias licha*, *Pseudocarcharias kamoharai*, and *Zameus squamulosus*) and the commercially important blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*). The remaining 12 species were classified as “least vulnerable” (9 species) or “increasingly vulnerable” (3 species). Key knowledge gaps identified were the location of fishing effort and the shark catch in artisanal fisheries and basic biological information for several species. Overall, the most vulnerable species were *S. zygaena*, *C. falciformis* and *S. lewini*, which coincidentally, were identified by the IATTC as a priority for stock assessments (Resolution [C-16-05](#)), while stock indicators for silky shark have been produced annually since 2014 (see below). However, given the lack of species-specific catch data for these species, particularly in artisanal fisheries where catches are believed to be highest, EASI-Fish is planned to be used as an exploratory tool in the interim period until catch and post-release survival data are improved to simulate changes to existing, or additional, management measures, either in isolation or in concert, to determine their efficacy for reducing species-specific vulnerability. This exploratory approach was implemented in 2023, where the effects of 43 different conservation and management measures were simulated for silky shark (*Carcharhinus falciformis*) and three hammerhead species; scalloped hammerhead (*Sphyrna lewini*), great hammerhead (*Sphyrna mokarran*), and smooth hammerhead (*Sphyrna zygaena*) using EASI-Fish ([SAC-14-12](#)). This assessment showed that no single management measure was able to reduce the vulnerability status of any species from a “vulnerable” to a “least vulnerable” status. Although scenarios such as temporal EPO closures, banning wire traces, imposing a 100 cm total length minimum retention length for all sharks, and even prohibiting landing of all sharks predicted a significant reduction in at-vessel mortality, this positive effect on vulnerability was mostly negated by high post-release mortality of these species. These results highlighted that the most effective mitigation measure for these sharks is to avoid interaction with EPO fisheries. The assessment identified several major data gaps that need to be addressed through a collaborative participatory research approach between the IATTC and its CPCs, including basic biology and improved species-specific catch and size composition data in artisanal fisheries and the industrial longline fishery. Addressing these data needs will not only help to improve short-term rapid assessments such as EASI-Fish, but also develop longer-term time series data required to undertake new and conventional methods such as close-kin mark recapture or traditional stock assessments from the which population status of these vulnerable species can be determined.

Updated stock status indicators for silky sharks in the eastern Pacific Ocean (1994-2022)

The indices for large silky sharks (>150 cm total length (TL)), based on data from the purse-seine fishery on floating objects, have been updated through 2024 for the north and south EPO ([Figure 5; SAC-16-161](#)). Previous analyses ([SAC-08-08a\(i\)](#), [Lennert-Cody et al., 2019](#)) identified a correlation between north EPO indices, particularly those for small (<90 cm TL) and medium silky sharks (90–150 cm TL), and interannual variability in oceanographic conditions, and thus the indices for those size categories, and for all silky sharks, were not updated because of concerns about bias. Because of recent increases in the live release of silky sharks, two sets of indices for large silky sharks were computed, one including live release data and the other not. Taken together, the two sets of indices likely bracket the trend that would have resulted in both the north and south EPO if “finning”⁶, shark handling, and data recording practices had continued unchanged since 1994. The real trend is considered to be closer to the index based on dead + live releases because sharks recorded as released alive in recent years would probably have been recorded as dead previously, and thus the dead + live release is likely a more consistent indicator. The terminal point of these indices suggest a relatively stable abundance level for over a decade, with the 2024 values in both the south and north EPO being similar to the 2023 value, and thus no changes to management measures are recommended. However, the stock status is uncertain, and an assessment has not been possible due to the

⁶ Cutting the fins off sharks and discarding the carcass.

paucity of data, especially for the longline fleets of coastal nations, which are believed to have the greatest impact on the stock ([SAC-05-11a](#), [SAC-14 INF-L](#)). Thus, the IATTC staff reiterates its previous recommendations ([SAC-07-06b\(i\)](#), [SAC-07-06b\(iii\)](#), [SAC-08-11](#)) that improving shark fishery data collection in the EPO is critical. This will facilitate the development of other reliable stock status indicators and/or conventional stock assessments to better inform the management of the silky shark, and likely other, co-occurring shark species.

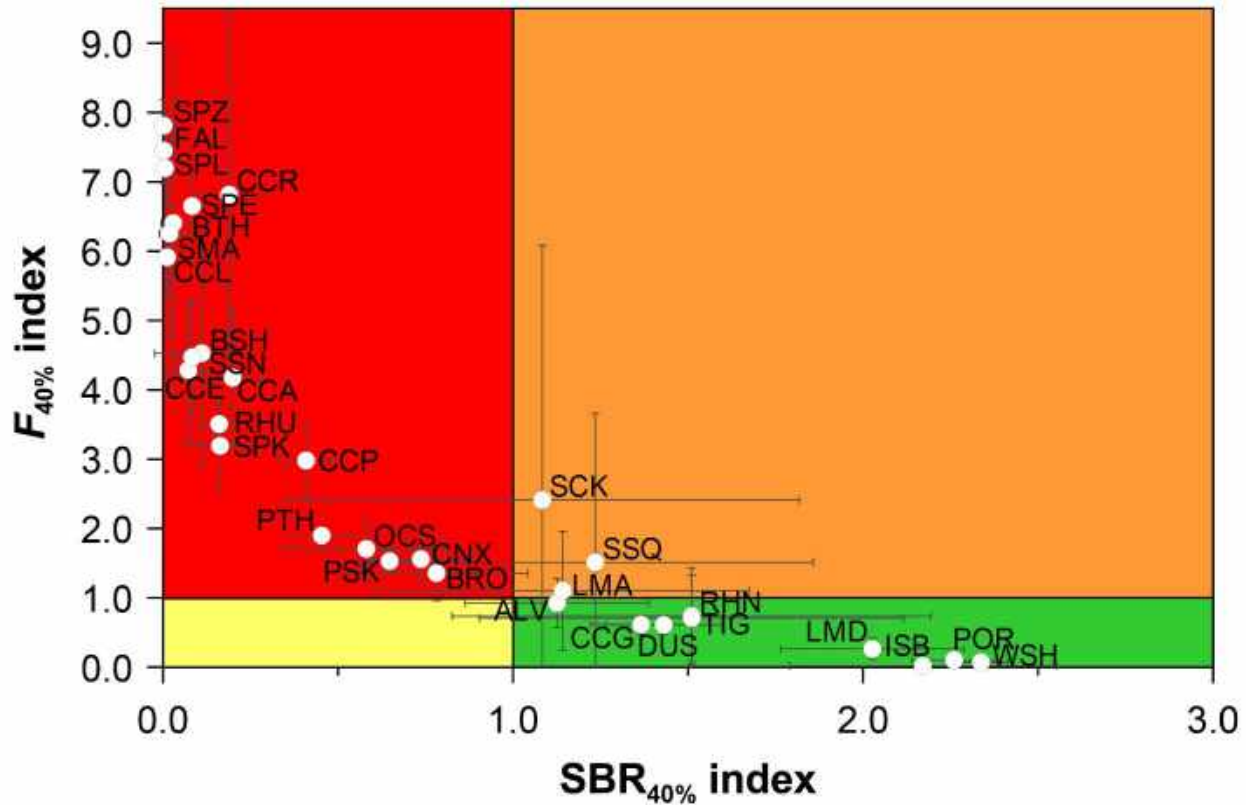


FIGURE K-1. Vulnerability phase plot showing the vulnerability status of 32 shark species caught in eastern Pacific Ocean pelagic fisheries assessed by EASI-Fish represented by mean (\pm standard deviation) estimates the biological reference points $\tilde{F}_{2019}/F_{40\%}$ and $SBR_{2019}/SBR_{40\%}$. Labels adjacent to symbols denote species codes shown Table 6. Vulnerability status values for each species are provided in Table 6.

FIGURA K-1. Gráfica de fase de vulnerabilidad que muestra el estado de vulnerabilidad de 32 especies de tiburones capturadas en las pesquerías pelágicas del Océano Pacífico oriental evaluadas por EASI-Fish, representadas por estimaciones promedio (\pm desviación estándar) de los puntos de referencia biológicos $\tilde{F}_{2019}/F_{40\%}$ y $SBR_{2019}/SBR_{40\%}$. Las etiquetas adyacentes a los símbolos indican los códigos de especie mostrados en la Tabla 6. Los valores del estado de vulnerabilidad de cada especie se presentan en la Tabla 6.

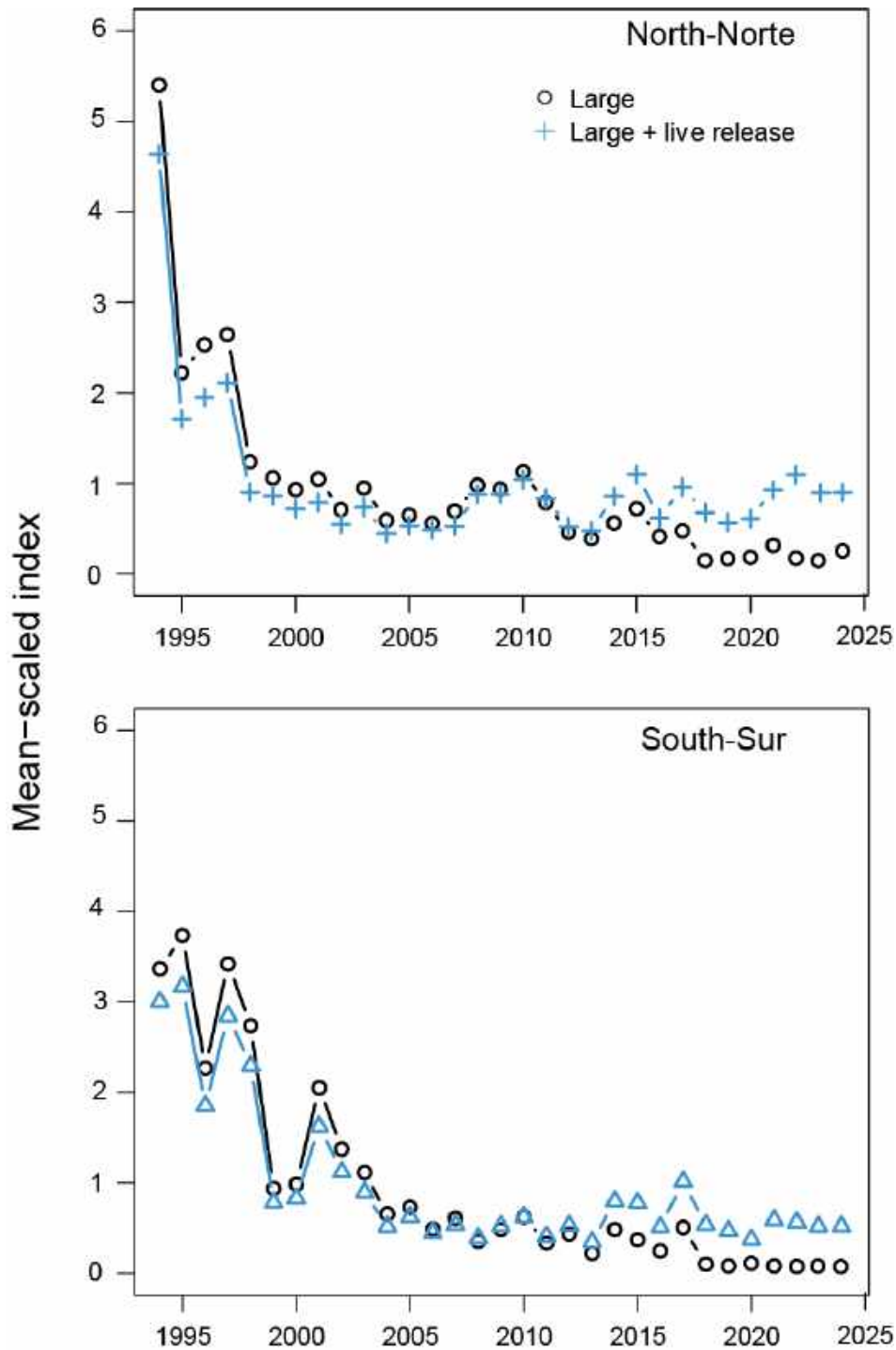


FIGURE K-2. Mean-scaled standardized bycatch-per-set (in numbers of sharks per set) of large silky sharks in sets on floating objects, with and without live release, in the north (top) and south (bottom) EPO. **FIGURA K-2.** Captura incidental por lance (en número de tiburones por lance) estandarizada de tiburones sedosos grandes en lances sobre objetos flotantes, con y sin liberación en vivo, en el OPO norte (arriba) y sur (abajo).

L. ECOSYSTEM CONSIDERATIONS

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SUMMARY

Over the past two decades, the scope of management of many fisheries worldwide has broadened to include the impacts of fishing on non-target species in particular, and the ecosystem more broadly. This ecosystem approach to fisheries management (EAFM) is important for maintaining the integrity and productivity of ecosystems while maximizing the utilization of commercially-important fisheries resources, but also ecosystem services that provide social, cultural and economic benefits to society. In response to the increasing interest in EAFM by the IATTC with the adoption of the Antigua Convention, the staff has presented an *Ecosystem Considerations* report since 2003 with information on non-target species and on the effect of the fishery on the ecosystem, and to describe how ecosystem research can contribute to management advice and the decision-making process. It also describes some important recent advances in research related to assessing ecological impacts of fishing and the environment on the eastern Pacific Ocean (EPO) ecosystem and its associated species. Specifically, information presented herein includes: (1) fisheries interactions (e.g., incidental catches of non-target species, generally termed “bycatch”, by broad taxonomic groups i.e., marine mammals, sea turtles, seabirds, elasmobranchs and teleosts), (2) a broad overview of the physical environment including short and medium- (e.g., El Niño Southern Oscillation conditions) and long-term (e.g., Pacific Decadal Oscillation) environmental indicators, (3) tools for identifying potentially vulnerable species⁷ (e.g., the Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish)), (4) ecosystem dynamics assessed through an eastern tropical Pacific Ocean (ETP)

⁷ Unless specified otherwise, including but not limited to citations to vulnerability assessments and any qualitative/quantitative scores (e.g. [BYC-10 INF-B](#); [SAC-13-11](#); [SAC-14-12](#)), the staff’s definition of “vulnerable species” refers to the species that, in the sensu lato, and due to their low-productive life-history traits (i.e. K species in r/K selection theory), are more vulnerable to the impacts of fisheries and other anthropogenic activities on these species or their habitat and ecosystem. This includes the marine mammals, seabirds, sea turtles and the elasmobranchs.

ecosystem model and corresponding ecological indicators, and (5) future developments for ecological research in the EPO to continue to guide science-based advice to the IATTC. It is important to note that data availability is poor for many bycatch taxa caught by fisheries other than the large vessel purse-seine fishery (class 6, >363 t), which has 100% observer coverage, such as the industrial longline fishery having a mandate of at least 5% observer coverage. Biological data is also lacking for many of these same species. This paucity in data has long been recognized by the staff (e.g., see [SAC-07-INF C\(d\)](#), [SAC-08-07b](#), [SAC-10 INF-B](#)). Consequently, recommendations by the staff for improvements in data collection and submission are underway. These include data improvement workshops (e.g., “industrial longline” (see [WSDAT-01](#), [WSDAT-01-RPT](#)); “small purse-seine vessels” i.e., ≤363 t (see [WSDAT-02](#), [WSDAT-02-RPT](#)) and a compilation of updated recommendations for both fisheries based on participant feedback ([SAC-16 INF-O](#))), a proposed biological sampling project ([SAC-14 INF-J](#)) and a list of ray species under the purview of the IATTC ([SAC-16-08](#)). The latter, similar to what was supported by the IATTC for sharks (see Resolution [C-24-05](#)), is expected to facilitate progress of science-based advice for guiding and implementing EAFM. Furthermore, updates to the proposal to restructure the *Ecosystem Considerations* report into two ecosystem-advice products (presented in [EB-02-02](#)): an indicator-based ecosystem report card (“*EcoCard*”) and a complementary *Ecosystem Status Assessment* are presented in [EB-03-04](#) to improve IATTC’s communication of ecosystem status.

INTRODUCTION

The ecosystem approach to fisheries management (EAFM) was first formalized in the 1995 FAO *Code of Conduct for Responsible Fisheries*, which stipulates that “*States and users of living aquatic resources should conserve aquatic ecosystems*” and that “*management measures should not only ensure the conservation of target species, but also of species belonging to the same ecosystem or associated with or dependent upon the target species*”. In 2001, the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem elaborated on these principles with a commitment to incorporate an ecosystem approach into fisheries management.

The IATTC’s Antigua Convention, which entered into force in 2010, is consistent with these instruments and principles. Article VII (f) establishes that one of the functions of the IATTC is to “*adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by this Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened*”. Prior to that, the 1999 Agreement on the International Dolphin Conservation Program (AIDCP) introduced ecosystem considerations into the management of the tuna fisheries in the EPO. Consequently, for over twenty years the IATTC has been aware of ecosystem issues pertaining to tuna fishing activities, and has moved towards EAFM in many of its management decisions (e.g., [SAC-10 INF-B](#); Juan-Jorda et al. 2018). Within the framework of the IATTC’s 5-year Strategic Science Plan (SSP), first implemented in 2019, the IATTC staff conducts novel and innovative ecological research aimed at obtaining the data and developing the tools required to implement EAFM in the tuna fisheries of the EPO. Current and planned ecosystem-related activities by the staff is summarized in the SSP ([IATTC-93-06a](#), [SAC-16-07](#)) and the Staff Activities and Research report (e.g., [SAC-16 INF-E](#)).

Assessing the ecological sustainability of EPO tuna fisheries is a significant challenge, given the wide range of species with differing life histories with which tuna fisheries interact. While relatively good information is available for catches of tunas and tuna-like species throughout the Convention area, this is not the case for most non-target (i.e., “bycatch”) species, especially those that are less frequently encountered, discarded at sea or have low economic value (see section 2 and [IATTC Special Report 25](#)). Furthermore, environmental processes that operate on a variety of temporal and spatial scales (e.g., El Niño-Southern Oscillation, Pacific Decadal Oscillation, ocean warming, anoxia and acidification) can influence the abundance and horizontal and vertical distributions of species to differing degrees, which in turn affects their potential to interact with tuna fisheries (e.g., [SAC-15 INF-L](#), [SAC-16 INF-T](#)). At its 101st meeting, the IATTC adopted its first Resolution on climate change ([C-23-10](#)). As a result, a proposed workplan towards climate resilient fisheries was presented at the 15th meeting of the Scientific Advisory Committee

(SAC) to facilitate a better understanding of climate change and to prepare for potential predicted impacts on fisheries, target species, non-target species, and the broader EPO ecosystem ([SAC-15-12](#)). In 2024, during the 102nd meeting of the IATTC, the climate change Resolution was amended ([C-24-10](#)), and the 1st Workshop on Climate Change ([WSCC-01](#)) was held virtually in February 2025. Updated background information and staff’s recommendations on the goal, scope and the framework of the proposed Climate Change workplan can be found in [SAC-16 INF-P](#).

Biological reference points, based on estimates of fishing mortality, spawning stock biomass, recruitment, and other biological parameters, have been used for conventional single-species management of target species, but the catch and/or biological data required for determining such reference points, or alternative performance measures, are unreliable or unavailable for most bycatch species. Similarly, given the complexity of marine ecosystems, there is no single indicator that can holistically represent their structure and internal dynamics and thus be used to monitor and detect the impacts of fishing and the environment.

Due to the broadening array of ecological, environmental and fishery issues that are required to support EAFM of the EPO ecosystem, the length and complexity of this all-encompassing document has increased significantly in recent years to the extent that it is not optimal for succinctly conveying key messages to IATTC’s Cooperating Members and Non-members (CPCs), stakeholders and the wider public. Therefore, the staff plan to restructure this report—considering ongoing work by the other tuna-Regional Fisheries Management Organizations (t-RFMOs)—into two complementary ecosystem-advice products: (1) an indicator-based Ecosystem Report Card or “EcoCard” highlighting a selected set of ‘key’ bycatch, ecosystem, and climate, indicators determined by the staff and through stakeholder consultation to best represent ecosystem status and (2) a complementary “Ecosystem Status Assessment” detailing the full suite of indicators considered to communicate the overall status of marine ecosystems and trends over time. A background paper ([EB-02-02](#)) details current efforts on EcoCards for the western and central Pacific Ocean by the Western and Central Pacific Fisheries Commission (WCPFC), the Atlantic Ocean by the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Indian Ocean by the Indian Ocean Tuna Commission (IOTC), along with a proposed workplan for IATTC to develop these ecosystem-advice products in support of EAFM. An update of this workplan is provided in [EB-03-04](#), focused on establishing the purpose (i.e., goal and objective) and a framework for the proposed *Eccocard* workplan. In the interim, the staff will continue to update the Ecosystem Considerations report.

DATA SOURCES

In this report, estimated total annual catches of bycatch species were obtained from observer data for the large-vessel purse-seine fishery⁸, nominal catches reported by the limited observer coverage onboard the small-vessel purse-seine fishery⁹, and gross annual removals by the longline fishery were obtained from annual summary reports (TASK I data, see [SAC-12-09](#), [WSDAT-01-01](#), [specifications for data provision](#)) submitted to the IATTC by CPCs. Minimum catches in 2023 reported by observers on longline vessels are also included as an interim measure until observer coverage increases from the mandated 5% to at least 20%—as recommended to the Commission by the scientific staff—that may allow total annual catches for some bycatch species to be reliably estimated. Observer coverage for CPCs has not been considered by staff to be representative of the activities of their longline fleets (see section 2.2. below and [BYC-10 INF-D](#)), although for some CPCs observer coverage has been above the 5% minimum coverage requirement (see e.g., [SAC-15 INF-B](#), [SAC-16 INF-B](#)). Longline data were available through 2023 as the deadline for data reporting for the previous year occurs after the annual SAC meeting (see Resolutions [C-03-05](#); [C-19-08](#)). However, these data are incomplete as operational data have not yet been received by all CPCs at the time of this report. Purse-seine data were available through 2024, with data from the last 2 years considered preliminary as of March 2025. Each data source and their associated data gaps are described in detail below. Additional information on bycatch data is available by fishery (see e.g., [SAC-07-INF-C\(d\)](#), [SAC-12-09](#), [WSDAT-01-01](#), [WSDAT-02-01](#), [IATTC Special Report 25](#)).

⁸ Size class 6 purse-seine vessels with a carrying capacity > 363 t

⁹ Vessels with a carrying capacity ≤363 t

1.1. Purse-seine

Data from the purse-seine fishery is compiled from 3 data sources: 1) IATTC and National Program observer programs, 2) vessel logbooks that are obtained by staff at the Commission’s field offices in Latin American tuna ports, and 3) canneries. The observer data from the large-vessel (Class 6) fishery are the most comprehensive in terms of bycatch species, since the 1992 Agreement on the Conservation of Dolphins (the [La Jolla Agreement](#)) has required an observer be onboard for all trips for Class- 6 vessels since 1993. An historical perspective of bycatch data collection from the observer programs is described in [IATTC Special Report 25](#). Observers working in the IATTC and the various National Programs provide detailed bycatch data by species, catch, disposition and effort for the exact fishing position (i.e., the latitude and longitude of the purse-seine set). Both the fisher-completed logbook and cannery datasets contain very limited data on bycatch species as reporting is primarily focused on commercially important tuna species. The logbook data, like the observer data, includes exact fishing positions. The cannery (or “unloading”) data do not have an exact fishing position but rather a broad geographic region where fish were caught (e.g., the eastern Pacific or western Pacific Ocean). These data contain bycatch species only if they were retained in a purse-seine well during the fishing operation and unloaded.

Smaller (Class 1–5) purse-seine vessels are not required to carry observers, except under specific circumstances (e.g., certification purposes, fishing during closure periods). The primary sources of unobserved data are logbook records and cannery unloading records. Some trips made by small purse-seine vessels are sampled for species composition and length frequencies (i.e., port sampling data). All of these data sources focus on tuna species. The FAD form, a logbook designed in late 2018 to be used by skippers of small vessels when fishing on FADs, is also a source of unobserved data for tunas and sensitive species groups, but bycatch data from this form is currently of little use for the purposes of the ecosystem considerations report as data are aggregated into broad taxonomic groups and data quality is uncertain. As such, there is limited information recorded on interactions with bycatch species by smaller purse-seine vessels. For additional information on data sources for the small purse-seine fishery see [WSDAT-02-01](#).

In recent years there has been an increase in the number of smaller vessels that have carried observers. This is due to AIDCP requirements for these vessels to fish during closure periods for Class 6 purse-seine vessels, a desire for dolphin-safe fishery certification, an IATTC pilot project trialing the efficacy of electronic monitoring methodologies ([SAC-11-11](#)), and a voluntary observer program for smaller vessels established by the Tuna Conservation Group ([TUNACONS](#))—a consortium of Ecuadorian tuna fishing companies that began in 2018. The minimum observer-derived catch reported by observers for bycatch species by small vessel trips are included in this report ([Table L-8](#)) to provide rudimentary information currently available for this fishery, with a view to expanding reporting on this fishery as data provision is hoped to improve in future (but see [WSDAT-02-02](#)). The 2nd Workshop on Data Improvement focused on the small purse-seine fishery and was held virtually in February 2025 ([WSDAT-02](#)) to discuss possible means for improving data collection and provision with the overarching goal of producing recommendations for updating the data provision Resolution C-03-05 (see [WSDAT-02-RPT](#)) and updated recommendations based on participant feedback ([SAC-16 INF-O](#)). In 2024, most trips (53%) made by smaller vessels were unobserved, 37% were observed by the voluntary TUNACONS observer program, 6% from the Ecuadorian National observer program, and 4% from the IATTC observer program.

Therefore, in this report we primarily focus on the comprehensive observer dataset from large purse-seine vessels to provide catch estimates for bycatch species. The bycatch data provided by the observers are used to estimate total catches, by set type (i.e., floating objects (OBJ), unassociated tunas (NOA), and dolphins (DEL)). The numbers of sets for each type made in the EPO during 2009–2024 are shown in [Table A-7](#) of Document [SAC-16-01](#).

Despite the observer requirement for all Class-6 trips, some sets are known to have taken place, based on logbooks and other sources, but were not observed. For example, at the start of bycatch data collection in 1993, about 46% of sets were observed, increasing to 70% in 1994. From 1994 to 2008, the average percent of sets observed was around 80%. From 2009 onwards, nearly 100% of sets were observed. Catch-per-day

data for both target and non-target, bycatch species are extrapolated¹⁰ to account for such instances.

1.2. Longline

The considerable variability in reporting formats, quality, completeness, and observer coverage levels of longline data has hindered the staff's ability to estimate EPO-wide catches for bycatch species ([SAC-08-07b](#), [SAC-08-07d](#), [SAC-08-07e](#), [BYC-10 INF-D](#)). Bycatch data for longline fisheries reported herein were obtained using data of gross annual removals estimated by each CPC and reported to the IATTC in summarized form (i.e., termed "[TASK I](#)" data). Because there is uncertainty in whether the IATTC is receiving all bycatch data from the longline fishery of each CPC and considerable variability has been observed in the reported data by taxa, these data are considered incomplete, or 'sample data', and are therefore regarded as minimum annual reported catch estimates for 1994–2023. A staff- and stakeholder-wide collaboration is underway to provide recommendations for updating the data provision Resolution [C-03-05](#) to improve the quality of data collection, reporting, and analysis to align with IATTC's responsibilities set forth in the Antigua Convention and the SSP ([SAC-12-09](#)). A preliminary objective of this work is to initiate a series of collaborative workshops between the staff and CPCs to assess the feasibility of collecting desirable data types and develop data collection templates for each gear type, with clear standards and procedures for data submission that will explicitly include interactions with bycatch species, especially those explicitly listed as priority species for research and management advice (e.g., see [SAC-15-09](#), Resolution [C-24-05](#)). The first [workshop](#) in the series—focused on the industrial longline fishery—was held by videoconference on 09–10 January 2023 and was attended by nearly 100 [participants](#). A background document detailing the need for improving longline data, along with case examples, and staff recommendations was prepared by the staff ([WSDAT-01-01](#)); a series of presentations on this document, as well as a presentation by an invited speaker, were discussed during the workshop. Staff recommendations for updating Resolution [C-03-05](#), pertaining to industrial longline data, were further revised based on input from workshop participants and consultations with individual CPCs (see [SAC-14-14](#)). The workshop report has also been posted to the IATTC website ([WSDAT-01-RPT](#)) and a series of staff recommendations were revised based on participant feedback (see [SAC-14 INF-Q](#); [SAC-16 INF-O](#)). In 2023, the SAC, in general terms, endorsed the recommendations on tunas presented by the staff in [SAC-14-14](#) (see [SAC-14-16](#), paragraph 1d, paragraph) as well as a recommendation that the Commission review and update Resolution C-03-05 on "Data Provision", taking into consideration document [SAC-14 INF-Q](#) ([SAC-14-16](#), paragraph 7.1 Resolution C-03-05). In 2024, the [SAC-15 Recommendations](#) included two similar recommendations, stating, "(c) *That the Commission notes the importance and need of having operational data from the longline fleet in order for stock assessments of tuna and other associated species covered by the Antigua Convention to be completed and (d) That CPCs that maintain tuna longline fleets operating in the EPO provide the scientific staff with historical operational data to enable the implementation of the Scientific Plan with respect to the construction of indices of abundance and useful information for stock assessments of tropical and temperate tunas.*" Therefore, the importance of updating this resolution is reiterated in [SAC-16-11](#) and encourages CPCs to update C-03-05 to better align data provision and submission requirements with the Antigua Convention's mandate to include non-target, dependent and associated species, and the effects of the fishery on the ecosystem.

As part of the data-review process for gathering information on data reported to the IATTC under

¹⁰ The observed data is aggregated by species, year, flag and set type. The number of known unobserved sets is taken from logbooks and other sources. Additionally, there are known EPO trips for which the staff do not know the number and type of sets made. Therefore, known bycatch-per-day from observer data is calculated by species, year, flag and set type, and applied to the number of days-at-sea for each trip to estimate the bycatch. In some instances, there may be unobserved sets or days-at-sea data by a flag that have no equivalent observer data for that year to facilitate a reliable estimation of catch. For these trips, yearly data from a proxy flag is used. The proxy flag is determined by subsequent 5 trips made by the vessel where an observer was onboard, and adopting the predominant flag used for those trips as the proxy flag. Then the bycatch-per-set or day of the known proxy flag for the year in question is applied to the data for the unrepresented flag.

Resolution [C-03-05](#), the staff were able to determine that the longline catches of sharks reported by CPCs were several times higher than previously reported. A review of the data revealed that a high proportion of shark catches were assigned to “other gears” in the annual [Fishery Status Reports](#) since 2006 but were in fact taken by longline by coastal CPCs. Therefore, attributing the catch from “other gears” to “longline” significantly increased the longline catches of sharks from 2006 onwards (see Table A2c in [SAC-11-03](#)).

Longline observer data reporting for longline vessels >20 m has been improving since Resolution [C-19-08](#) was adopted in 2019, updating the previous longline observer measure, C-11-08. The staff has received detailed set-by-set operational level observer data for several CPCs, but under coverage by observers was exacerbated by the challenges many CPCs had in placing observers during the COVID-19 pandemic. The program resumed in 2023 and the limited observer data (see section 2 Data Sources; [SAC-16 INF-B](#)), is included in this report. The IATTC staff, the Ecosystems and Bycatch Working Group (EBWG) and the Scientific Advisory Committee (SAC) have continued to recommend that the longline observer coverage requirement should be increased to at least 20%. IATTC staff discussed the inadequacy of 5% coverage for scientific purposes and the representativeness of the data to adequately describe the activities of longline fleets in the EPO ([BYC-10 INF-D](#)). Although CPCs have made a tremendous effort to improve their reporting of longline observer data, results from that analysis showed that 5% observer coverage is insufficient for estimating the total catch of the relatively data-rich yellowfin and bigeye tunas and so catch estimates for bycatch species are likely to be considerably less reliable given that less data are available for these species. The challenges to observer placement and reporting of observer data necessarily implies that the datasets presented in this report are provided for transparency and show only minimum interactions and mortalities submitted to the IATTC. IATTC staff will seek to provide fleet estimates of longline catches in the EPO based on observer data in the future, but the results of the aforementioned analyses highlight a clear need for data reporting of bycatch species to improve (see [SAC-12-09](#), [WSDAT-01-01](#), [SAC-14 INF-Q](#)) prior to data extrapolation attempts.

FISHERY INTERACTIONS WITH SPECIES GROUPS

1.3. Tunas and billfishes

Data on catches of the principal species of tunas and bonitos of the genera *Thunnus*, *Katsuwonis*, *Euthynnus*, and *Sarda*, and of billfishes in the Istiophoridae and Xiphiidae families, are reported in Document [SAC-16-01](#). The staff has developed [stock assessments](#)—including benchmark assessments for bigeye tuna ([SAC-15-02](#)), yellowfin tuna ([SAC-16-03](#)) and skipjack tuna ([SAC-15-04](#))—and/or stock status indicators (SSIs) for tropical tunas ([SAC-16-02](#)). A risk analysis ([SAC-16-04](#)) and spatiotemporal modeling ([SAC-16 INF-D](#)) on skipjack tuna and results for the management strategy evaluation (MSE) for bigeye tuna ([SAC-16-06](#)) were presented at the 16th meeting of the SAC. The staff has also collaborated on the assessments of [Pacific bluefin](#) (2024; [SAC-16 INF-Q](#)) and north Pacific [albacore](#) (2023)—along with a progress report on north Pacific albacore ([SAC-16 INF-X](#))—tunas led by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC), the assessment of [south Pacific albacore tuna](#) (2024) led by the Western and Central Pacific Fisheries Commission (WCPFC), and collaborated on the ISC assessments for north Pacific [swordfish](#) (2023), western and central North Pacific [striped marlin](#) (2023), and [blue marlin](#) (2021). A southern EPO swordfish benchmark assessment is provided in [SAC-14-15](#).

1.4. Marine mammals

Marine mammals, especially spotted dolphins (*Stenella attenuata*), spinner dolphins (*S. longirostris*), and common dolphins (*Delphinus delphis*), frequently co-occur with yellowfin tuna in the EPO. Purse-seine fishers commonly set their nets around herds of dolphins and the associated yellowfin tuna, and then release the dolphins while retaining the tunas. The incidental mortality of dolphins using this method was high during the early years of the fishery, but declined dramatically in the early 1990s, and has remained at low levels thereafter ([AIDCP-43-02](#); [Figure L-1](#)). The IATTC staff is collaborating on two research projects on dolphins focused on improving current understanding of the potential impacts of tuna fisheries on dolphin populations ([SAC-14 INF-K](#), [SAC-16 INF-K](#)), including a cow-calf separation study and a close kin mark recapture (CKMR) assessment pilot. Additionally, the staff co-organized a 2nd workshop on methods to

monitor the status of dolphins in the EPO in May 2024 (see details [here](#)).

Estimates of incidental mortality of dolphins in the purse-seine fishery of large vessels during 1994–2024 are shown in [Table L-1a](#). In 2024, the stock of dolphins with the highest incidental mortality was the eastern spinner (n=300), followed by the western-southern spotted (n=154), the northeastern spotted dolphins (n=151), and the whitebelly spinner (n=132). Common dolphins were least impacted by the fishery, with mortalities of 86 northern, 30 central, and 3 southern common dolphins.

In recent years, significant improvements have been made to the minimum data standards of longline observer data submitted to the IATTC, which now require submission of operational level data under Resolution [C-19-08](#). However, as discussed in section 2.2, the low level of observer coverage (at least 5%) currently mandated for these vessels is not representative of the different fleet components and hinders the extrapolation of observed data to generate fleet totals (see [BYC-10 INF-D](#)). For the time being, only the minimum number of observed interactions and mortalities reported for marine mammals is presented for 2023 ([Table L-1b](#)). Interactions and mortalities were defined by subjective classification of fate (injured, discarded, released, or not reported) and release condition (alive, alive and healthy, alive and injured, dead, or not reported) as recorded by observers. Dispositions not reported or reported as discarded were precautionarily assumed to represent mortalities. Under these assumptions, three of the four interactions with marine mammals reported by observers in 2023 for the EPO were considered to be mortalities. These included 1 interaction with a false killer whale (*Pseudorca crassidens*), 1 interaction with a Risso’s dolphin (*Grampus griseus*), and one with a Franciscana dolphin (*Pontoporia blainvillei*). The 1 interaction with a rough-toothed dolphin (*Steno bredanensis*) was recorded as released and was presumed to indicate survival. The staff reiterates that the level of observer coverage should be increased to at least the recommended 20% to help facilitate expansion of the number of interactions and mortalities to the total fleet activities for marine mammals and other vulnerable bycatch species.

1.5. Sea turtles

Sea turtles are occasionally caught in the purse-seine fishery in the EPO, usually when associated with floating objects that are encircled, although they are sometimes also caught by happenstance in sets on unassociated tunas or tunas associated with dolphins. They can also rarely become entangled in the webbing of fish-aggregating devices (FADs) or other floating objects ([FAD-07-04](#)) and drown or be injured or killed by fishing gear, although the impact of this is expected to be minimal due to improved FAD construction and design requirements ([C-23-04](#) and [C-23-05](#)).

The number of estimated sea turtle mortalities and interactions recorded by observers on large purse-seine vessels, by set type, from 1994–2024 is shown in [Figure L-2a](#) and [Figure L-2b](#), respectively. Interactions were defined from observer information recorded as fate on the dedicated turtle form as: entangled, released unharmed, light injuries, escaped from net, observed but not involved in the set and other/unknown, while mortalities were defined as those with fates recorded as: grave injuries, killed, or consumed. The Olive Ridley turtle (*Lepidochelys olivacea*) is, by far, the species of sea turtle most frequently caught, with a total of 21,469 interactions and 875 mortalities (~4%) during 1994–2024, but only 256 interactions and 1 mortality occurred in 2024 ([Table L-2a](#)). In 2024, there were 48 interactions recorded with eastern Pacific green, 35 loggerhead, 6 hawksbill, 3 leatherback, and 169 unidentified turtles and no mortalities.

In the longline fishery, sea turtles are caught when they swallow a baited hook, are foul hooked, or drown after becoming entangled in the mainline, floatlines or branchlines and cannot reach the surface to breathe. They are also caught in coastal pelagic and bottom-set gillnet fisheries, where they become enmeshed in the net or entangled in the floatlines or headrope. Although very few data are available on incidental mortality of turtles by longline and gillnet fishing, the mortality rates in the EPO industrial longline fishery are likely to be lowest in “deep” sets (around 200–300 m) targeting bigeye tuna and albacore, and highest in “shallow” sets (<150 m) targeting swordfish. There is also a sizeable fleet of artisanal longline and gillnet fleets from coastal nations that are known to catch sea turtles, but limited data are available (see [BYC-11-02](#)).

Data on sea turtle interactions and mortalities in the longline fishery have not been available ([SAC-08-07b](#)), but has been improving since 2019 with the submission of operational-level observer data pursuant to Resolution [C-19-08](#). Recalling the observer coverage for most longline vessels is 5% or less (see [BYC-10 INF-D](#)), compared to 100% of observed trips in the large-vessel purse-seine fishery, the observer data provided by CPCs for 2023 are considered minimum numbers of interactions and mortalities ([Table L-2b](#)) that have been reported to the IATTC (see section 2.2). Here interactions and mortalities were defined by fate (discarded, injured, grave injuries, released, released with hook, or not reported) and/or release condition (alive and healthy, alive and injured, dead, unknown, or not reported) as recorded by observers. Observers reported 88 interactions of sea turtles in the EPO (50 black/green turtles, 16 Olive Ridley turtles, 11 loggerhead, 10 leatherback and 1 hawksbill) for 2023. Thirteen of the 88 interactions resulted in mortalities (6 black/green turtles (12%), 4 loggerhead turtles (36%) and 3 leatherback turtles (30%). The staff hopes to use the new operational observer data submissions required under [C-19-08](#) to report the first total longline fleet catch estimate for sea turtle species in the future, although [BYC-10 INF-D](#) cautions that the current 5% observer coverage is insufficient for producing reliable estimates of total catch.

Various IATTC resolutions, most recently [C-19-04](#), have been intended to mitigate fishing impacts on sea turtles and establish safe handling and release procedures for sea turtles caught by purse-seine and longline gears. Additionally, a “circle hook” workshop was held prior to the 13th SAC meeting to discuss a) the effects of different sizes of circle hooks on mitigating bycatch of sea turtles and other vulnerable species in the longline fishery and b) the minimum hook size to satisfy the requirements outlined in Resolution [C-19-04](#). The workshop participants discussed the use of different circle hooks in longline fisheries to satisfy C-19-04, with minimum width of the hook defined on a fishery-specific basis and dependent upon the target species. However, no definitive conclusions or recommendations were made ([WSHKS-01](#)), although discussions on this topic resumed during the 11th Bycatch Working Group meeting in May 2022, the 1st EBWG meeting in May 2023, continued at the 2nd EBWG meeting in June 2024 and a 2nd circle hook workshop was held in April 2025 ([WSHKS-02](#)). The EBWG requested the workshop to address several topics including: 1) Define the size characteristics that qualify as a ‘large’ circle hook (Resolution [C-19-04](#), Paragraph 3(d)(i)); 2) Review of the impacts of fishing operations on the form and structure (i.e., longevity and integrity) of circle hooks of various sizes and from different manufacturers; 3) Develop a third mitigation measure as described in Paragraph 3(d)(iii) of Resolution C-19-04 for small coastal multi-species vessel fleets; and 4) Update best handling and release practice guidelines for shallow-set longline fisheries. A background document ([WSHKS-02-01](#)), with several reviews on the workshop topics, is available on the workshop website.

A preliminary vulnerability assessment was conducted in collaboration with the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) for the eastern Pacific stock of leatherback turtles for 2018, using the Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish) approach (see section 5) ([BYC-10 INF-B](#)). The vulnerability status of the stock was determined to be “most vulnerable” in 2018. The staff continued to collaborate with IAC in 2020–2023 to improve the species distribution model ([BYC-11-01](#), Lopez et al. 2024) and vulnerability assessment using updated fisheries data from coastal CPCs ([BYC-11-02](#), Griffiths, Wallace et al. 2024). The final assessment showed that the vulnerability status of the stock remained as “most vulnerable” in 2019. Modelling of 70 conservation and management scenarios showed that the implementation of improved handling and release practices by industrial and artisanal fleets, or use of circle hooks, or use of fish bait by longline fleets could reduce at-vessel and/or post-release mortality to an extent where the vulnerability status of the population could improve to “least vulnerable”, assuming the fishing effort dynamics of all EPO fisheries do not change. The use of these three measures in concert was predicted to reduce vulnerability even further. Detailed results from this work were presented in 2022, at the Bycatch Working Group meeting ([BYC-11-01](#), [BYC-11-02](#)) and at the Ecosystem and Bycatch Working Group of ICCAT in May 2023, as an example of a successful collaboration between two international organizations. Yet, Resolution C-19-04 has not been updated to reflect the potential benefits of such conservation and management measures on the leatherback turtle.

1.6. Seabirds

There are approximately 100 species of seabirds in the tropical EPO. Some of them associate with

epipelagic predators, such as fishes (especially tunas) and marine mammals, near the ocean surface; for some, feeding opportunities are dependent on the presence of tuna schools feeding near the surface. Some seabirds, especially albatrosses and petrels, are attracted to the lights and baits of pelagic longline vessels and are caught on baited hooks—often in the process of their deployment—used by this fishery. Sightings-only data are available for the purse-seine fishery ([IATTC Special Report 25](#)).

The IATTC has adopted one resolution on seabirds ([C-11-02](#)), and draft guidelines for best handling and release practices (BHRP) of seabirds were presented to the 1st EBWG meeting in 2023 ([EB-01-01](#), Annex 1) and the 2nd EBWG in 2024 ([EB-02-03](#), Annex 1). The BHRPs were further developed for seabirds captured in all fisheries under IATTC purview and were discussed again in 2025 during the 3rd EBWG ([EB-03-06](#)).

Participants in the circle hook workshop, held in March 2022 ([WSHKS-01](#)), discussed the influence of circle hooks on seabird capture and mortality. The available data seem to be inconclusive to comment on any conservation value of circle hooks over other hook shapes or sizes to seabirds, given a lack of empirical studies. In 2024 the EBWG adopted a seabird action plan (see [SAC-15-15](#), Annex 1), requesting the IATTC scientific staff to: 1) Conduct a comparison between IATTC seabird mitigation measures described in [C-11-02](#) and mitigation measures used in other tuna RFMOs; 2) Update [SAR-7-05b](#) which examined the spatial distribution of seabird species in the IATTC Convention Area relative to longline fishing effort; 3) Generate an overview of mitigation measures in use by CPCs in the IATTC Convention Area, including those CPCs that may have vessels fishing in areas where bycatch mitigation measures are not required; and 4) Summarize observed and estimated seabird bycatch rates in the IATTC Convention Area to inform CPC discussions regarding a potential update to Resolution C-11-02. In 2025, two documents addressing the four objectives laid out in the seabird action plan were presented at the 3rd EBWG. Document [EB-03-02](#) provides information on seabird distribution overlap with longline fishing effort and seabird bycatch rates in the IATTC Convention Area, and document [EB-03-03](#) provides a review of bycatch mitigation options, measures and use.

As with sea turtles, data on seabird interactions and mortalities in the longline fishery have been unavailable ([SAC-08-07b](#)), but with the submission of operational-level observer data for longline vessels >20 m beginning in 2019 some minimum values for 2023 are available ([Table L-3](#)) (but see section 2.2 for uncertainties and data gaps in reported data).

The observer data submitted by CPCs for 2023 contained 15 total interactions (14 mortalities) with two seabird taxa, the black-footed albatross, *Phoebastria nigripes*, (10 interactions; 10 mortalities) and unidentified albatross (5 interactions; 4 mortalities) in the EPO. Dispositions for 14 of the interactions were recorded as “discarded” and without additional information, these were precautionarily presumed to result in mortalities. One interaction with an unidentified albatross was recorded as “released” and this was presumed to indicate survival. The staff hopes to report the first total longline fleet catch estimate for seabird species in the future using the operational observer data as improvements in data collection continue—but see [BYC-10 INF-D](#) for a discussion on the current inadequacy of longline observer data for expanding data to the activities of the longline fleet to provide estimates of total catch.

1.7. Sharks

Sharks are caught as bycatch in EPO tuna purse-seine fisheries and as either bycatch or a target in longline and multi-species and multi-gear fisheries of the coastal nations. To mitigate the impacts of fishing on sharks, guidelines for best handling and release practices (BHRP) in IATTC fisheries were presented in [SAC-15-11](#), as requested under Resolution [C-23-07](#). An updated shark conservation Resolution [C-24-05](#) was adopted in 2024 and incorporated BHRP recommendations with a request for the staff to work with the CPCs and industry representatives on updating the BHRP guidelines in 2025. Document [SAC-16-10](#) addresses this request and provides the staff’s recommendations for updating the adopted BHRP guidelines. These recommendations are data driven and based upon practices that demonstrate measurable improvements to post release survival rates and include, among others, and to the extent possible, removing sharks from the purse-seine net prior to sacking up, releasing entangled sharks promptly and ensuring that

sharks are sorted on the main-work deck and do not go down the chutes to the wells, and minimizing handling stress and time onboard for purse-seine fisheries, and leaving sharks in the water, removing trailing gear, and minimizing handling stress to improve post-release survival for longline fisheries.

Stock assessments or stock status indicators (SSIs) are available for only 4 shark species in the EPO: silky (*Carcharhinus falciformis*) (Lennert-Cody *et al.* 2018; [BYC-10 INF-A](#), [BYC-11 INF-A](#)), blue (*Prionace glauca*) ([ISC Shark Working Group](#)), shortfin mako (*Isurus oxyrinchus*) ([ISC Shark Working Group](#)), and common thresher (*Alopias vulpinus*) (NMFS). As part of the [FAO Common Oceans Tuna Project](#), Pacific-wide assessments of the porbeagle shark (*Lamna nasus*) in the southern hemisphere (Clarke 2017) and the bigeye thresher shark (*Alopias superciliosus*) (Fu *et al.* 2018) were completed in 2017, and for the silky shark (Clarke 2018a), as well as a risk assessment for the Indo-Pacific whale shark population (Clarke 2018b), both in 2018. Whale shark interactions with the tuna purse-seine fishery in the EPO are summarized in document [BYC-08 INF-A](#). The staff is currently conducting a CKMR pilot for silky sharks, as well as improving data collection and the understanding of the catches of sharks by the small-scale coastal fisheries in Central America, Mexico, Peru and Ecuador, with an emphasis on silky sharks and hammerheads (e.g., [SAC-14 INF-L](#), [SAC-14 INF-M](#), [SAC-16 INF-V](#), [SAC-16 INF-W](#)).

The first quantitative vulnerability assessment of sharks for EPO industrial and artisanal fisheries—using the EASI-Fish methodology (section 5)—was completed in 2022 and was presented at SAC-13 ([SAC-13-11](#)). A total of 49 shark species were recorded to interact with EPO tuna fisheries, of which 32 species were formally assessed using EASI-Fish for 2019. Overall, 20 species were classified as “most vulnerable”, including hammerhead sharks (4 species), requiem sharks (10 species), threshers (*Alopias superciliosus* and *A. pelagicus*), mesopelagic sharks (3 species) and the commercially important blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*). The remaining 12 species were classified as “least vulnerable” (9 species) or “increasingly vulnerable” (3 species). The staff recommended further analysis to explore a range of potential hypothetical conservation and management measures (CMMs) that may be implemented—in isolation or in combination—within the EPO to reduce fishery impacts on particularly vulnerable shark species identified, including silky, thresher and hammerhead sharks. The EASI-Fish approach was applied to silky shark and hammerhead sharks during 2022–2023 to determine the relative benefits of alternative management scenarios on species’ vulnerability ([SAC-14-12](#)).

At its 101st meeting, the IATTC adopted Resolution [C-23-07](#), which includes a provision for IATTC staff to draft, in collaboration with the EBWG and the SAC, an interim list of shark species for the consideration by Members to be under the purview of the Commission. A list of 49 species documented to interact with pelagic fisheries in the EPO was used in combination with other available species lists, ecological characteristics and conservation classifications by international instruments (e.g., IUCN Red List of Threatened Species) to provide potential recommendations from the staff for an interim list of shark species ([SAC-15-09](#)). As a result of this work, a final list of 18 species was adopted in 2024 in Annex 4 of Resolution [C-24-05](#) to denote species of special research and management interest for the Commission.

Catches (t) of sharks in the large-vessel purse-seine fishery (1994–2024) and minimum reported catches¹¹ by longline fisheries (1994–2023) are provided in [Table L-4a](#), while catches of the most frequently caught species, discussed below, are shown in [Figure L-3a](#). Reporting of many shark species by longline gear began in 2006 (but see section 2 for data gaps, including high variability in this dataset). For purse seiners, the majority of the shark catch is from floating object sets, although this varies by species. Silky shark (family Carcharhinidae) is the most commonly caught shark species in the purse-seine fishery with annual catches averaging 551 t—primarily from sets on floating objects ([Figure L-3a](#))—and being 727 t in 2024. In contrast, minimum reported annual catch in the longline sample data for 2006–2023 averaged 9,501 t while only 55 t were reported in 2023. Annual catch of the oceanic whitetip shark (Carcharhinidae) in the purse-seine fishery averaged 53 t (also primarily from sets on floating objects) and was 22 t in 2024. The

¹¹ Sharks caught by longline vessels are recorded using different weight metrics (e.g., round, trunk or whole weight) and thus, total annual reported catch estimates may contain a mix of these weight metrics. The staff is working on harmonizing shark data collection to improve the reliability of total catch estimates (e.g., [SAC-11-13](#)).

minimum reported annual catch in the longline fishery from 2006–2018 averaged 165 t and none were reported in 2019–2023. Catches of oceanic whitetip have declined in the purse-seine fishery since the early 2000s, while minimum reported catches have been variable in the longline fishery ([Figure L-3](#)). Minimum annual reported catch of blue shark in the longline fishery from 1994–2023 averaged 6,715 t and was 10,268 t in 2023. By contrast, the annual catch in the purse-seine fishery from 1994–2024 averaged only 2 t, with 2 t caught in 2024. Some anomalies in the reporting of longline data are likely related to the COVID-19 pandemic or variability in reporting certain species or information, although it's important to note the reporting of bycatch data is not compulsory according to the data provision resolution ([C-03-05](#)) and the corresponding [specifications](#) (see [SAC-12-09](#), [WSDAT-01-01](#), [SAC-14 INF-Q](#), [SAC-16 INF-O](#)). Additionally, a list of priority shark species was only recently formally established (see Resolution [C-24-05](#)), which contributes to the variability in reporting for fisheries other than the large purse-seine fishery. The staff reiterate the importance of updating C-03-05 to adapt to mandates set forth in the Antigua Convention and encourage CPCs to draft a revised resolution based on input from the staff and workshop participants in [SAC-16 INF-O](#). These efforts are expected to reduce the variability in data reporting and quality.

Other important species of sharks caught in the purse-seine and longline fisheries include the smooth hammerhead (*Sphyrna zygaena*), the pelagic thresher (*Alopias pelagicus*), and mako sharks (*Isurus* spp.) ([Table L-4a](#), [Figure L-3a](#)). Catch estimates for the smooth hammerhead shark in the purse-seine fishery averaged 26 t (primarily caught in floating-object sets) and was 11 t in 2024, while in the longline fishery minimum annual reported catch averaged 802 t (2006–2023) and was 17 t in 2023. In contrast, the pelagic thresher was caught primarily in unassociated tuna school sets by the purse-seine fishery with the estimated annual catch averaging 4 t and was 2 t in 2024. Minimum annual reported catch of the pelagic thresher by the longline fishery averaged 1,703 t (2007–2023) and only 19 t was reported in 2023. Catch estimates for the mako sharks by the purse-seine fishery were lower than the aforementioned shark species averaging 3 t and was 1 t in 2024. However, in the longline fishery the minimum annual reported catch averaged 1,467 t (1994–2024) and was 1,220 t in 2023.

Complementary to the shark catches presented in [Figure L-3a](#) and similar to the purse-seine based SSIs reported by set type for the tropical tunas ([SAC-16-02](#)), catch by set type was scaled so that their average equals 1 during the 1994–2024 time period for 3 species of sharks with the highest annual nominal catches by large purse-seine vessels (i.e., silky shark, oceanic whitetip shark and smooth hammerhead shark). This relative catch in weight (t), which helps to better understand trends and anomalies in species catch, is presented in [Figure L-3b](#). In the earlier years (pre-2000), the silky shark relative catch was 3–3.5 times greater than the mean for those caught in dolphin sets, and about 3.5 times greater than the mean (1994) for those caught in unassociated sets, while relative catches were less variable in the floating-object set fishery. For the oceanic whitetip shark, a decreasing trend in relative catches is apparent for all set types with the highest relative catches occurring prior to 2000. The relative catches of smooth hammerhead sharks were variable, particularly in dolphin and unassociated sets; about 4 and 5 times greater than the mean in dolphin sets and in unassociated sets in 2004, respectively.

The spatial distribution (in 5°x5° grid cells) of the catch of the same 3 shark species by set type for the large-vessel purse-seine fishery is presented in [Figure L-3c](#) to provide an indication of current (i.e., 2024) and past (average of the last 5 years; 2019–2023) spatial catch dynamics. Catches of silky shark were widely distributed across the EPO, but primarily in the 10°N to 10°S latitudinal band and occurred mostly in floating-object sets. Silky shark catches were slightly lower in 2024 compared to the 5-year average throughout the EPO with the exception of higher catches in unassociated sets off the coast of southern Mexico in 2024. Catches of oceanic whitetip shark and smooth hammerhead shark were mostly negligible (i.e., primarily <1 t) in both time periods. Minimal catches of oceanic whitetip shark were observed in two locations from floating-object sets in 2024 (5°N–10°N, 140°W–150°W and 10°S–15°S, 125°W–135°W), with no catches >1 t in the 5-year average. For the smooth hammerhead shark, minimal catches (>1 t) were observed east of 85°W and south of 10°S off South America in 2024 while catches >1 t were observed east of 100°W along the equator and south of 5°S off South America during the 5-year average.

The limited observer data from small purse-seine vessels showed 29 t of silky shark and 3 t of scalloped hammerhead were caught in floating-object sets in 2024, while catches of other shark species or species groups (5 taxa) were minimal (≤ 1 t) ([Table L-8](#)).

The minimum catches derived only from the reported observer data for sharks caught by longline in 2023 are presented in [Table L-4b](#) (see section 2.2 and [BYC-10 INF-D](#) for uncertainties and data gaps in longline data). Blue shark was by far the most frequently caught shark species in this dataset with 4,508 interactions and 4,179 mortalities in 2023, followed by the crocodile shark with 545 interactions and 152 mortalities (~28%), the shortfin mako shark with 225 interactions, which all resulted in mortalities, bigeye thresher shark with 119 interactions and 111 mortalities (93%) and velvet dogfish with 115 interactions and 106 mortalities (92%). Less than 100 interactions were reported for all other shark taxa. Under the disposition criteria described in [Table L-4b](#), ~86% of interactions with all sharks reported by observers resulted in mortalities.

The artisanal longline fisheries of the coastal CPCs seasonally target sharks, tunas, billfishes and dorado (*Coryphaena hippurus*), and some of these vessels are similar to industrial longline fisheries in that they operate in areas beyond national jurisdictions (Martínez-Ortiz *et al.* 2015, [SAC-16-09](#)). However, essential shark data from these longline fisheries are often lacking, and therefore conventional stock assessments and/or stock status indicators cannot be produced (see data challenges outlined in [SAC-07-06b\(iii\)](#)). In 2025, a document describing proposed fleet characteristics to define three categories of longline fisheries was produced ([SAC-16-09](#)) to address a recommendation by the EBWG (see [SAC-15-15](#) “Fleet Characteristics”). These proposed classifications of longline fleets included (1) large-scale longline, (2) medium-scale longline and (3) small-scale fisheries of coastal States. Adoption of these proposed classifications is essential for the appropriate development of IATTC documents, research planning, management decisions and measures, and for providing clarity and guidance to CPCs, data handlers, scientists, policy makers and all relevant stakeholders.

Since 2014, the IATTC staff has carried out extensive collaborative research with Organización del Sector Pesquero y Acuícola del Istmo Centroamericano (OSPESCA) and IATTC’s Central American CPCs to develop a robust sampling methodology to improve data collection for shark fisheries in Central American EPO states. After approximately 7 years (2015–2021), this work—funded by the Food and Agriculture Organization of the United Nations (FAO) and the Global Environmental Facility (GEF) under the framework of the ABNJ Common Oceans program, the IATTC capacity building fund, and the European Union—was completed in December 2021. The project’s final results were presented at the 14th meeting of the SAC (e.g., [SAC-14 INF-L](#)), but there is a great need to maintain continuity of data collection to generate key fisheries data to assess and manage shark species in the EPO. Meanwhile, a second phase of the FAO-GEF ABNJ project is underway and the IATTC is receiving support to expand the previous work conducted in Central America to other EPO coastal States ([SAC-14 INF-M](#)). Two documents on the progress of this second phase were provided at the 16th meeting of the SAC (see [SAC-16 INF-V](#) and [SAC-16 INF-W](#)). Data obtained from these projects may be included in future iterations of this report to provide improved catch estimates, albeit minimum estimates, for sharks by the various longline, gillnet and mixed gear fleets.

1.8. Rays

To better represent estimated annual catches of manta rays (Mobulidae) and stingrays (Dasyatidae), these taxa are now reported in numbers of individuals by the large-vessel purse-seine fishery (1994–2024) in [Table L-5a](#), while catches of key species are shown in [Figure L-4a](#). Rays have rarely been reported in the annual summary reports for the longline fishery, although data have been available in the more recently obtained observer data (see [Table L-5b](#)). The largest average catches in the purse-seine fishery were observed for unidentified mobulid rays (Mobulidae spp., average 1994–2024: 1,008 individuals; number of individuals in 2024: 612, followed by the pelagic stingray (average: 834; 2024: 944), the smoothtail manta (average: 336; 2024: 249), the spinetail manta (average: 249; 2024: 434), unidentified stingrays (Dasyatidae spp., average: 175; 190) and the giant manta ray (average: 108; 2024: 13 individuals). Although catches of these rays can vary by set type, they have been highest in unassociated sets, followed by dolphin sets, and lowest in

floating-object sets ([Figure L-4a](#)).

Similar to sharks, relative catches of rays in numbers of individuals (i.e., scaled catch with the average equal to 1) by set type for large purse-seine vessels are provided in [Figure L-4b](#). As with the reported observed catch ([Figure L-4a](#)), ray relative catches were highly variable with no apparent trends, and peaks of relatively high catches were not consistent between species and set type.

The spatial distribution of catches (5°x5° grid cells) was greatest for pelagic stingray with variability in catches by set type. Most catches occurred primarily in floating-object sets south of 5°N and east of 120°W, in dolphin sets north of the equator, and in unassociated tuna school sets along the coast of South America for the 5-year average (2019–2023). In 2024, the highest catches occurred in unassociated sets along the coast of South America and in dolphin sets in the Sea of Cortez ([Figure L-4c](#)). Minimal catches (<5 individuals) of the giant manta were observed across space and time while catches of the spinetail (primarily <30 individuals) and smoothtail (primarily <50 individuals) manta occurred in coastal areas. Catches of the spinetail manta occurred in dolphin sets off the coast of central America and mostly in unassociated sets off the coast of South America during both time periods. Catches of the smoothtail manta occurred in unassociated sets in the Sea of Cortez in both time periods with greater catches in the 5-year average, primarily in dolphin sets along the coast of central America in both time periods, and in unassociated sets off the coast of South America in 2024.

For the small purse-seine vessel fishery, the limited observer data available for 2024 showed floating-object sets contained the largest numbers of individual ray species, including the pelagic stingray (n=31), followed by the spinetail manta (n=11), Chilean devil ray (n=9) and the smoothtail manta (n=6) while the number of other rays were ≤2 ([Table L-8](#)).

The minimal data available from the reported longline observer dataset for 2023 (see section 2.2. for data gaps and [BYC-10 INF-D](#)) showed that the most interactions were with the pelagic stingray (*Pteroplatytrygon violacea*) (3,832 individuals) with 3,634 (95%) of these interactions resulting in mortalities, followed by unidentified rays and skates (Rajiformes.) with 6 interactions (1 mortality, 17%), giant manta with 4 interactions (3 mortalities, 75%), and unidentified manta rays, Mobulidae (4 interactions, 4 mortalities) and *Mobula* spp. (1 interaction, 1 mortality) ([Table L-5b](#)).

The vulnerability status and efficacy of potential conservation and management measures (CMMs) for the spinetail manta (*Mobula mobular*) impacted by industrial purse-seine and longline fisheries in the EPO was determined using the EASI-Fish methodology (section 5). In the assessment year of 2018, the estimated fishing mortality exceeded the $F/F_{40\%}$ and $SBR/SBR_{40\%}$ biological reference points, leading to a vulnerability classification of “most vulnerable”. A retrospective analysis of vulnerability from 1979–2018 showed the species to be classified as “least vulnerable” between 1979 and 1993, but became “most vulnerable” from 1994, which coincided with the rapid spatial expansion of the industrial purse-seine fishery. Vulnerability increased significantly from 2011 following the rapid increase in the number of purse-seine sets made on floating objects to 2018. Simulating the CMMs in place in 2018 for EPO tuna fisheries (i.e., an EPO-wide closure) and for mobulids specifically (i.e., use of best handling and release practices under [C-15-04](#)) resulted in 31 of the 45 scenarios changing the classification of the species from “most vulnerable” to “least vulnerable”, which primarily involved a reduction of post-capture mortality by as little as 20%. Implementing appropriate best handling and release practices can be a reasonably simple, rapid and cost-effective conservation measure, but a recommendation from the work was to extend the EASI-Fish analysis to all species of mobulids impacted by EPO tuna fisheries, improve estimates of post-release mortality for these species through dedicated tagging studies (which are currently being conducted: Project M.2.c), and improve species-specific catch reporting, especially in small scale coastal ‘artisanal’ fisheries, to improve the reliability of outputs from EASI-Fish assessments. The development of BHRP guidelines for rays is planned for 2026 ([EB-02-03](#)).

The IATTC has recognized the conservation importance of mobulids since 2015 when it implemented conservation and management measures in Resolution [C-15-04](#). However, as was the case with shark species prior to 2024, there has been no prescriptive list of ray species that come under the purview of the IATTC. In 2024, the IATTC’s Scientific Advisory Committee made a recommendation to the Commission that “...the IATTC staff develop a draft list of ray and mobulid species under the purview of the IATTC for consideration by

the EBWG and the SAC”. In 2025, the staff analyzed catch data from IATTC data holdings for industrial and artisanal pelagic fisheries in the EPO and identified interactions with 17 ray species. Of these, 7 species—6 mobulids and the pelagic stingray (*Pteroplatytrygon violacea*)—had oceanic distributions and occupied epipelagic habitats where IATTC pelagic fisheries operate and were recommended to the EBWG and the SAC to come under the purview of the IATTC ([SAC-16-08](#)).

1.9. Other large fishes

Species composition of catches varies between purse-seine and longline fisheries. Large pelagic fishes caught by the large-vessel purse-seine fishery, primarily in floating-object sets, (1994–2024) and longline (1994–2023) fisheries are shown in [Table L-6a](#), with time series of catches of key species presented in [Figure L-5](#). The most commonly-caught pelagic fish in both fisheries is dorado (Coryphaenidae) with the estimated average annual catch for the purse-seine fishery being 1,364 t (871 t in 2024) and the minimum reported annual catch for the longline fishery averaging 5,657 t (421 t in 2023). Dorado is also one of the most important species caught in the artisanal fisheries of the coastal nations of the EPO ([SAC-07-06a\(i\)](#)). Recommendations for potential reference points and harvest control rules for dorado in the EPO were presented at the 10th meeting of the SAC ([SAC-10-11](#)). Additionally, a Resolution ([C-23-09](#)) on the research for the management of dolphinfish was adopted at IATTC’s 101st Commission meeting in 2023.

Other key species caught by the purse-seine fishery include wahoo (Scombridae) and rainbow runner (Carangidae). Wahoo had an estimated average annual catch of 361 t for the purse-seine fishery, although catches have declined from a peak of 1,025 t in 2001 to 233 t in 2024 ([Figure L-5](#)). Minimum reported annual catch of wahoo by the longline fishery have averaged 179 t and was 256 t in 2023. No catches of rainbow runner have been reported by the longline fishery. However, in the purse-seine fishery, estimated average annual catches of rainbow runner were 49 t, with the peak catch in 2007 at 158 t and declining thereafter to 87 t in 2024 ([Figure L-5](#)).

Pelagic fishes commonly reported by the longline fishery include opah (Lampridae), snake mackerels (Gempylidae) and pomfrets (Bramidae). Minimum reported annual catches for these species averaged 374 t (1994–2023), 357 t (2006–2023), and 55 t (1994–2023), respectively. Catches of all these taxa have increased after the mid-2000s ([Figure L-5](#)) but note the uncertainty and data gaps in this dataset (section 2.2). For the most recent reporting year (2023), there were 250 t, 288 t, and 64 t of opah, snake mackerels, and pomfrets reported, respectively ([Table L-5a](#)).

The limited observer data available for 2024 for the small purse-seine fishery included 126 t of dorado and 30 t of wahoo caught in floating-object sets, while the remaining species or species groups of large fishes (7 taxa) had ≤5 t reported ([Table L-8](#)).

For 2023, the limited available data from longline observers (see section 2.2. and [BYC-10 INF-D](#)) is provided in [Table L-6b](#). These data show the most frequently caught species in this dataset was the long snouted lancetfish (*Alepisaurus ferox*) with 8,501 interactions (all resulted in mortalities), followed by escolar (*Lepidocybium flavobrunneum*) with 3,165 interactions, one of which resulted in a mortality, snake mackerel (*Gempylus serpens*) with 2,581 interactions and 2,544 mortalities (99%), dorado (Coryphaenidae) with 2,468 interactions, all resulting in mortalities, wahoo (*Acanthocybium solandri*) with 1,707 interactions and 1,703 mortalities, opah (*Lampris guttatus*) with 1,171 interactions and 1,167 mortalities, and sickle pomfret (*Taractichthys steindachneri*) with 700 interactions and 697 mortalities. The remaining 7 taxa had approximately <500 interactions. Most interactions with large fishes resulted in mortalities (99%).

1.10. Forage species

A large number of taxa occupying the middle trophic levels in the EPO ecosystem—generically referred to as “forage” species—play a key role in providing a trophic link between primary producers at the base of the food web and the upper-trophic-level predators, such as tunas and billfishes. Some small forage fishes are incidentally caught in the EPO by purse-seine vessels on the high seas, mostly in sets on floating objects, and by coastal artisanal fisheries, but are generally discarded at sea. Catches of these species are presented in [Table L-7](#) with key species as identified by catch data presented in [Figure L-6](#) for the large-vessel purse-

seine fishery.

Bullet and frigate tunas (Scombridae) are by far the most commonly reported forage species with estimated annual catches averaging 963 t from 1994–2024. However, their catches have declined from 1,921 in 2005 to 601 t in 2024 ([Figure L-6](#)). Triggerfishes (Balistidae) and filefishes (Monacanthidae) are the second most commonly reported forage group with annual estimated catches averaging 279 t and totaling 513 t in 2024. Combined catches for these two groups peaked in 2004 at 922 t but have otherwise been variable. Annual catches of sea chubs (Kyphosidae) have averaged 16 t and have remained minimal with 7 t in 2024. Lastly, annual catches of the various species in the category ‘epipelagic forage fishes’ averaged 7 t with 11 t estimated to be caught in 2024.

A total of 95 t of bullet and frigate tunas and 133 t of triggerfishes and filefishes caught in floating-object sets were reported by observers on the limited number of trips on small purse-seine vessels that carried an observer in 2024. Catches of all other species or species groups (4 taxa) of small fishes were minimal (≤ 1 t) ([Table L-8](#)).

PHYSICAL ENVIRONMENT

Environmental conditions affect marine ecosystems and therefore impact species distributions and abundance, the dynamics and catchability of target and bycatch species, and the activities of fishers¹² (e.g., [SAC-10 INF-D](#), [SAC-16 INF-T](#)). At IATTC’s 101st meeting in 2023, a resolution on climate change was adopted ([C-23-10](#); amended in 2024 as [C-24-10](#)), and correspondingly, a proposed workplan towards climate resilient fisheries was presented at the 2nd EBWG meeting and the 15th meeting of the SAC ([SAC-15-12](#)). The following summary of the biophysical environment covers: 1) short-medium and long-term environmental indicators, and 2) environmental conditions and their potential effect on the fishery during the previous year, in this case, 2024.

1.11. Environmental indicators

The ocean environment changes on a variety of time scales, from seasonal to inter-annual, decadal, and longer “regimes”. Longer-term climate-induced changes are typically decadal at intervals of around 10–30 years and are characterized by relatively stable average conditions and patterns in physical and biological variables. The dominant source of variability in the upper layers of the EPO is the El Niño–Southern Oscillation (ENSO), an irregular fluctuation involving the entire tropical Pacific Ocean and the world’s atmosphere (Fiedler 2002). El Niño events occur at two- to seven-year intervals, and are characterized by weaker trade winds, deeper thermoclines, and higher sea-surface temperatures (SSTs) in the equatorial EPO. El Niño’s alternate phase is commonly called La Niña and is characterized by stronger trade winds, shallower thermoclines, and lower SSTs. The changes in the biogeochemical environment caused by ENSO have an impact on the biological productivity, feeding, and reproduction of fishes, seabirds, and marine mammals (Fiedler 2002).

ENSO is thought to cause considerable variability in the availability of commercially-important tunas and billfishes to capture by tuna fleets in the EPO (Bayliff 1989). For example, the shallow thermocline during a La Niña event can increase purse-seine catch rates for tunas by compressing the preferred thermal habitat of small tunas near the sea surface, while the deeper thermocline during an El Niño event likely could make tunas less susceptible to capture, and thus reduce catch rates. Furthermore, warmer- or cooler-than-average SSTs can also cause the fish to move to more favorable habitats, which may also affect catch rates as fishers expend more effort on locating the fish.

Recruitment of tropical tunas in the EPO may also be affected by ENSO events. For example, strong La Niña events in 2007–2008 may have been partly responsible for the subsequent lower recruitment of bigeye tuna, while the largest recruitments corresponded to the extreme El Niño events in 1982–1983 and 1998 ([SAC-09-05](#)). Yellowfin recruitment was also low in 2007, but high during 2015–2016, after the extreme

¹² See [SAC-04-08](#), *Physical Environment*, and [SAC-06 INF-C](#) for a comprehensive description of the effects of physical and biological oceanography on tunas, prey communities, and fisheries in the EPO.

El Niño event in 2014–2016 ([SAC-09-06](#)). Analyses on the potential effects of environment on tuna catches were presented at the 15th meeting of the SAC ([SAC-15 INF-L](#)) and updated for SAC-16 ([SAC-16 INF-T](#)).

The [Climate Diagnostics Bulletin](#) of the US National Weather Service reported that in 2024 anomalies—defined in the Bulletin as a departure from the monthly mean—in oceanic and atmospheric characteristics (e.g., surface and sub-surface temperatures, thermocline depth, wind, and convection) were consistent with weakening El Niño conditions from January through March, a transition to ENSO neutral conditions in April with these conditions lasting through November, and La Niña conditions in December.

Indices of variability in such conditions are commonly used to monitor the direction and magnitude of ENSO events in the Pacific Ocean. The Oceanic Niño Index (ONI) is used by the US National Oceanic and Atmospheric Administration (NOAA) as the primary indicator of warm El Niño and cool La Niña conditions within the Niño 3.4 region in the east-central tropical Pacific Ocean (Dahlman 2016) ([Figure L-7a](#)). Therefore, the ONI is used in this report to characterize inter-annual variability in SST anomalies. The ONI is a measure of El Niño defined by [NOAA](#) as “a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of SST anomalies in the Niño 3.4 region that is above (below) the threshold of +0.5°C (-0.5°C).” The ONI categorizes ENSO events from “extreme” to “weak” ([Figure L-7b](#)). For example, the “extreme” El Niño event in 1997–1998 was followed by a “very strong” La Niña event in 1998–2000. “Strong” La Niña events were also observed in 2007–2008 and 2010–2011. The highest ONI values (>2.5) were recorded during the 2015–2016 “extreme” El Niño event. “Very strong” El Niño conditions began to weaken at the beginning of 2024 and transitioned to a neutral phase while the year ended in La Niña conditions, with values ranging from 1.8 to -0.5 during this time period ([Figure L-7b](#)).

The Pacific Decadal Oscillation (PDO; [Figure L-8](#)) index is used to describe longer-term environmental fluctuations in the Pacific Ocean. In the EPO, it has been used to explain the influence of environmental drivers on the vulnerability of some species, such as the silky shark, to capture by tuna fleets (Lennert-Cody *et al.* 2018). The PDO—a long-lived El Niño-like pattern of Pacific climate variability, with events persisting 20–30 years—tracks large-scale interdecadal patterns of environmental and biotic changes, primarily in the North Pacific Ocean (Mantua 1997), with secondary patterns observed in the tropical Pacific, the opposite of ENSO (Hare and Mantua 2000). As with ENSO, PDO phases are classified as “warm” or “cool”. PDO values peaked at 2.79 in August 1997 and at 2.62 in April 2016, both of which coincided with the extreme El Niño events indicated by the ONI. The PDO has been in a “cool” phase since early 2020. During 2024, cool conditions persisted with the lowest value in October (-3.04) and the highest value in February (-1.07) (see [ERSST V5 PDO Time series data](#)).

1.12. Spatio-temporal exploration of environmental conditions

A time series of SST and chlorophyll-a concentration (CHL-a; an indicator of primary productivity biomass) ([Figure L-9](#)) in the eastern tropical Pacific (ETP) from 5°N to 5°S—the same latitudinal band used in the ONI—was developed to explore the variability in these variables across space and time using time-longitude Hovmöller diagrams. The SST time series show mean monthly values from 1993–2024, while monthly CHL-a concentrations covers data for 2003–2024 due to limitations with data availability. The SST plot ([Figure L-9, top panel](#)) clearly shows the extension of warmer waters during the extreme El Niño events of 1997–1998, 2015–2016, and for the latter half of 2023 into 2024 while cooler waters are observed during the strong La Niña events in 1999–2000, 2007–2008 and 2010–2011 across the ETP. The CHL-a plot ([Figure L-9, bottom panel](#)), although the pattern is less clear than the SST plot, shows an increase in CHL-a concentrations following the strong La Niña events particularly in 2010–2011, likely due to increases in nutrient availability.

1.13. Environmental conditions and distribution of catches

The availability of fish, and thus catches, are strongly related to environmental conditions and processes, particularly in pelagic waters (Fiedler and Lavín 2017; Chassot *et al.* 2011). ENSO conditions are influenced by many oceanic and atmospheric factors, but both SST and CHL-a levels are known to strongly influence the

habitat and distributions of oceanic animals (Hobday and Hartog 2014).

[Figures L-10 and L-11](#) show quarterly mean SSTs and CHL-a concentrations, respectively, to: 1) provide a general indication of seasonal environmental variability for 2024, and 2) overlay the distribution of tropical tuna catches, as a first step, to illustrate the potential influence of environmental conditions on catches across the EPO during 2024. In the future, the staff plans to incorporate catch distributions for key bycatch species and develop species distribution models (SDMs) to better describe potential relationships between environment and species. In 2021–2022, SDMs were developed for the leatherback sea turtle ([BYC-11-01](#)) and 32 species of sharks ([SAC-13-11](#)) and several high-resolution SDMs are underway for other vulnerable bycatch species, including oceanic whitetip, silky and hammerhead sharks.

Warm waters prevailed over much of the EPO during 2024, with the exception of the northern and southern extremities of the Convention Area where cooler waters occurred ([Figure L-10](#)). A warm pool off Central America was observed in quarter 1 that extended westwards during quarters 2 and 3 and retracted in quarter 4. A secondary, less intense, warm pool was observed in the southwestern EPO (below the equator–20°S, 130°–150°W) during quarters 1 and 2, which contracted in quarters 3 and 4.

[Figure L-11](#) shows CHL-a concentrations were highest along the equator and the coast of the Americas year-round. The oligotrophic¹³ South Pacific Gyre—located between 20°–40°S and extending from 150°–90°W—was present in quarter 1, retracted in quarters 2 and 3, and returned in quarter 4.

During quarters 1 and 2, skipjack predominated in the catches in waters ~20–25°C off the coast of South America ([Fig. L-10](#)), where CHL-a concentration was high ([Fig. L-11](#)). Yellowfin tuna was the predominant tuna species in the catch primarily north of the equator during these same quarters; yellowfin catches were present in the warmer waters (~29°C) off central America in quarters 2–4. Bigeye tuna catches mostly occurred south of 10°N with greater catches taken west of ~110°W, particularly in quarter 2. No tuna catches were recorded in the oligotrophic gyre located approximately south of 20°S and the western boundary of the EPO (150°W) to about 100°W.

IDENTIFICATION OF SPECIES AT RISK

The primary goal of EAFM is to ensure the long-term sustainability of all species impacted—directly or indirectly—by fishing. However, this is a significant challenge for fisheries that interact with many non-target species with diverse life histories, for which reliable catch and biological data required for single-species assessments are lacking. An alternative for such data-limited situations, reflected in [Goal L](#) of the SSP, are Ecological Risk Assessments (ERAs), assessments that are designed to identify and prioritize potentially vulnerable species for data collection, research and management.

‘Vulnerability’, in this risk assessment context, is defined as the potential for the productivity of a stock to be diminished by the direct and indirect impacts of fishing activities. The IATTC staff has applied qualitative assessments using Productivity-Susceptibility Analysis (PSA) to estimate the relative vulnerability of data-limited, non-target species caught in the EPO by large purse-seine vessels (Duffy *et al.* 2019) and by the longline fishery ([SAC-08-07d](#)).

Because PSA is unable to quantitatively estimate the cumulative effects of multiple fisheries on data-poor bycatch species, a new approach—Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish)—was developed by the IATTC staff in 2018 ([SAC-09-12](#)) to overcome this, and other, technical issues. This flexible, spatially-explicit method uses a smaller set of parameters than PSA to first produce a proxy for the instantaneous fishing mortality rate (\tilde{F}) of each species, based on the ‘volumetric overlap’ of each fishery on the geographic distribution of these species. The estimate of \tilde{F} is then used in length-structured yield- and spawning biomass per-recruit models to assess the vulnerability of each species using conventional biological reference points (e.g., F_{MSY} , $SPR_{40\%}$).

EASI-Fish was successfully applied to 24 species representing a range of life histories, including tunas,

¹³ An area of low productivity, nutrients, and surface chlorophyll, often referred to as an “oceanic desert”.

billfishes, tuna-like species, elasmobranchs, sea turtles and cetaceans caught in EPO tuna fisheries as a ‘proof of concept’ assessment in 2018 ([SAC-09-12](#)). It was subsequently used to assess the vulnerability status of the spinetail manta (*Mobula mobular*) caught by all industrial tuna fisheries in the EPO ([BYC-09-01](#)), and the East Pacific regional management unit (RMU) of the Critically Endangered leatherback turtle (*Dermochelys coriacea*) ([BYC-10 INF-B](#), [BYC-11-02](#)). Therefore, EASI-Fish is planned to be used by the staff in future to assess species-specific vulnerability within all species groups (e.g., elasmobranchs, sea turtles, teleosts) impacted by EPO tuna fisheries. In 2022, EASI-Fish was used to assess the vulnerability of the East Pacific stock of the leatherback turtle and shark bycatch species in EPO tuna fisheries and the results were presented at BYC-11 ([BYC-11-02](#)) and SAC-13, respectively ([SAC-13-11](#)). An EASI-Fish assessment for silky shark and hammerheads was presented at SAC-14, where the potential efficacy of 43 different conservation and management measures was simulated ([SAC-14-12](#)). The simulations showed that almost all CMMs were effective in reducing vulnerability, such as banning wire leaders, imposing a 100 cm total length minimum retention for all sharks, and prohibiting landing of all sharks. However, the positive effects of these measures were negated in most scenarios due to high post-release mortality of these species. These results highlighted that the most effective conservation measure for sharks is to avoid interaction with EPO fisheries.

ECOSYSTEM DYNAMICS

Although vulnerability assessments (e.g., EASI-Fish) are useful for assessing the ecological impacts of fishing by assessing the populations of individual species, ecosystem models are required to detect changes in the structure and internal dynamics of an ecosystem. These models are generally data- and labor-intensive to construct, and consequently, few fisheries worldwide have access to a reliable ecosystem model to guide conservation and management. These models require a good understanding of ecosystem components and the direction and magnitude of the trophic flows between them, which require detailed ecological studies involving stomach contents and/or stable isotope studies. Purposefully, IATTC staff have had a long history of undertaking such trophic studies, including the experimental determination of consumption estimates of yellowfin tuna at the NMFS Kewalo Basin facility on Oahu, HI in the 1980s, to more recent analyses of stomach content and stable isotope analysis of a range of top-level predators.

In 2003, the IATTC staff compiled the trophic data to complete the development of a model of the pelagic ecosystem in the tropical EPO (IATTC Bulletin, [Vol. 22, No. 3](#))—named “ETP7”—to explore how fishing and climate variation might affect target species (e.g., tunas), byproduct species (e.g., wahoo, dorado), elasmobranchs (e.g., sharks), forage groups (e.g., flyingfishes, squids) and species of conservation importance (e.g., sea turtles, cetaceans). A simplified food-web diagram, with approximate trophic levels (TLs), from the model is shown in [Figure L-12](#).

The model was calibrated to time series of biomass and catch data for yellowfin and bigeye tunas for 1961–1998. There have been significant improvements in data collection programs in the EPO since 1998, that has allowed the model to be updated with these new data up to 2018 (“ETP-8”). The model required a further update in 2021 due to a significant change in how the IATTC staff have reclassified the catch data submitted by the CPCs for “other gears” into longline and other gear types following an internal review of the data. This resulted in a dramatic increase in reported longline catches of high trophic level predators (sharks), which can have a strong influence on ecosystem dynamics. Therefore, annual catch estimates by species for 1993–2018 were assigned to the relevant functional groups in the ETP-21 model, which was then rebalanced and recalibrated to time series data to provide an updated ecosystem status for 2021 and to undertake simulations to assess potential impacts of the FAD fishery on the structure of the ecosystem ([SAC-12-13](#)).

1.14. Ecological indicators

Since 2017, the most recent Ecopath model has been used in the *Ecosystem Considerations* report to provide annual values for seven ecological indicators that, together, can identify changes in the structure and internal dynamics of the ETP ecosystem. These indicators are: mean trophic level of the catch (TL_c), the Marine

Trophic Index (MTI), the Fishing in Balance (FIB) index, Shannon's index, and the mean trophic level of the modelled community for trophic levels 2.0–3.25 (TL_{2.0}), ≥3.25–4.0 (TL_{3.5}), and >4.0 (TL_{4.0}). A full description of these indicators is provided in [SAC-10-14](#).

ETP-21 was updated in 2024 (named ETP-24) using annual catch estimates by species for 1993–2022 assigned to the relevant functional groups, which was then rebalanced to provide an updated ecosystem status for 2022.

Ecological indicators showed that values for TL_c and MTI decreased from their peak of 4.77 and 4.83 in 1991 to 4.66 and 4.69 in 2022, respectively, as the purse-seine fishing effort on floating objects significantly increased ([Figure L-13](#)), where there was increasing catches of high trophic level bycatch species that tend to aggregate around floating objects (e.g., sharks, billfish, wahoo and dorado). Since its peak in 1991, TL_c declined by 0.170 of a trophic level in the subsequent 30 years, or 0.057 trophic levels per decade. The increasing number of OBJ sets is also seen in the FIB index that exceeds zero after 1990, as well as the continual change in the evenness of biomass of the community indicated by Shannon's index.

The above indicators generally describe the change in the exploited components of the ecosystem, whereas community biomass indicators describe changes in the structure of the ecosystem once biomass has been removed due to fishing. The biomass of the TL_{MC4.0} community was at one of its highest values (4.493) in 1986 but has continued to decline to 4.467 in 2022 ([Figure L-13](#)). As a result of changes in predation pressure on lower trophic levels, between 1993 and 2022 the biomass of the TL_{MC3.25} community increased from 3.801 to 3.829, while interestingly, the biomass of the TL_{MC2.0} community also increased from 3.092 to 3.107.

Together, these indicators show that the ecosystem structure has likely changed over the 43-year analysis period. The consistent patterns of change in each ecological indicator, particularly in the mean trophic level of the communities since 1993, certainly warrant the continuation, and ideally an expansion, of monitoring programs for fisheries in the EPO. The COVID-19 pandemic in 2020 allowed staff to examine the direct effects of reduced fishing effort on the ecosystem through use of ecological indicators. The most notable change was a 23% decrease in the number of purse-seine floating-object sets from 14,987 sets in 2019 to 11,543 sets in 2020. This decrease in effort resulted in abrupt changes in most ecological indicators for 2020 and increasing beyond pre-pandemic levels in 2022 when the number of floating-object sets increased significantly to 17,699 ([Figure L-13](#)). These results suggest that the increase in floating-object sets may be primarily responsible for the continued change in ecosystem structure over the past two decades.

FUTURE DEVELOPMENTS

It is unlikely, in the near future at least, that there will be stock assessments for most of the bycatch species caught by IATTC tuna fisheries. Therefore, the IATTC must continue to undertake ecological research and assessments that can provide managers with reliable information to guide the development of science-based conservation and management measures, where required, to ensure the IATTC continues to fulfil its responsibilities under the Antigua Convention and the objectives of the [SSP](#). The priority research areas that have been identified by the scientific staff that require further development are detailed below:

- Following the development of the EASI-Fish approach, analysis of the full suite of over 100 impacted bycatch species will be conducted in stages, by taxonomic group (e.g., sharks, rays, teleosts, turtles and cetaceans). All pelagic shark species and the critically endangered eastern Pacific leatherback turtle stock were assessed in 2022.
- Given the high number of species classified as “most vulnerable” in the 2022 shark EASI-Fish assessment, a high priority is to develop a strategy for future conservation and management of these vulnerable species. As a first step EASI-Fish was used to explore the potential efficacy of hypothetical conservation and management measures for silky and hammerhead sharks in 2023 ([SAC-14-12](#)). This assessment is expected to be resumed in the near future with an external review of the EASI-Fish assessment planned for 2025 and the collaboration of the shark technical workshops of the IATTC.

- Significant knowledge gaps identified for sharks in the EASI-Fish assessment pertained to the fundamental parameter values required to characterize the population dynamics of several species in the EPO, even those that have been commonly recorded as bycatch for decades. Therefore, significant efforts are required by the IATTC and its Members to establish a strategy for undertaking cost-effective studies to collect data to develop morphometric relationships (e.g., length-weight and length-length), growth curves, and maturity ogives. In addition to the GEF-FAO ABNJ shark fishery data collection work recently completed in Central America and expanded to Mexico, Ecuador and Peru in 2023, which could be seen as an opportunity to achieve such a strategy ([SAC-13-12](#), [SAC-14 INF-L](#), [SAC-14 INF-M](#)), the IATTC staff has prepared a document identifying data gaps and potential opportunities for a phase-based approach to obtaining morphometric measurements and biological sampling of tunas, billfishes, and priority bycatch species on purse seiners and longliners ([SAC-14 INF-J](#)). In 2024, the staff proposed using the Enhanced Monitoring Program (EMP) as a means for collecting morphometric data for use in tuna stock assessments ([SAC-15 INF-H](#)). The Commission approved the initiation of morphometric sampling of tunas within the EMP framework, and during the last quarter of 2024 an experimental design was derived. Trials were conducted to guide the implementation of the sampling and sampling was initiated in January of 2025 in the ports of Mazatlán, Mexico and Manta, Ecuador. Opportunistic sampling of various retained bycatch species, including sharks, have been included in morphometric data collection.
- A shortcoming of the ETP-24 ecosystem model, from which the ecological indicators are derived, is that its structure is based on stomach content data from fish collected in 1992–1994. Given the significant environmental and fishery changes that have been observed in the EPO over the past decade, there is a critical need to collect updated trophic information. There have been proposals made by the staff in 2018–2024 to establish an ecological monitoring program to collect stomach content data to update the ecosystem model. Given the emerging requirements for biological data on sharks, such a monitoring program could incorporate all biological and ecological requirements of the IATTC. Again, the GEF-FAO ABNJ project which continues to expand among IATTC Members offers some opportunities for integrating such a sampling program, especially if the ABNJ pilot project continues in perpetuity as recommended by the staff. In addition, the proposed morphometric and biological sampling study ([SAC-14 INF-J](#)) aims to opportunistically collect biological samples, including stomachs, to obtain updated diet data for future use in a spatially-explicit ecosystem model.
- A second limitation of the ETP-24 model is that it describes only the tropical component of the EPO ecosystem, and results cannot be reliably extrapolated to other regions of the EPO. Therefore, after updated diet information is collected, future work will aim to develop a spatially-explicit model that covers the entire EPO and calibrate the model with available time series of catches, ideally for species representing different trophic levels, and effort data for key fisheries in the EPO.
- Environmental variables can have a profound influence on the catches of target and bycatch species, as has been shown previously by IATTC staff and now undertaken annually in this report, with a dedicated workplan on climate resilient fisheries resulting from Resolution [C-23-10](#), amended in [C-24-10](#), was proposed at SAC-15 ([SAC-15-12](#)). However, the staff's research to investigate the impact of environmental conditions on the fishery could be greatly improved with the availability of high-resolution operational level data for the longline fishery. Although IATTC Members and CPCs are now required to submit operational level observer data to the IATTC that covers at least 5% of their fleets, analyses conducted by the staff provide conclusive evidence that these data are not representative of the fleet ([BYC-10 INF-D](#)) and therefore brings into question the validity of using submitted longline data for future environmental analyses until the observer coverage reaches at least 20%.
- The task of disentangling the spatial and temporal overlap of multiple target and non-target species requires an in-depth exploration of risk and trade-offs across management scenarios and species groups. Although the scientific community has argued for the importance of exploring dynamic spatial management over the past 20 years, there are currently few examples of dynamic or adaptive

spatial management measures being implemented in tuna fisheries to reduce bycatch. In fact, no spatial management measures have been implemented to date to specifically reduce the catch of non-target species in tuna RFMOs. The identification of areas of potential interest for spatial management in the open ocean is directly dependent on the ever-changing species-environment relationship, which can be modeled to estimate and predict species' distributions and relative abundance across space and time and inform the design of adaptive management measures. Although the IATTC staff has started to investigate this issue in the EPO for both target and non-target species (e.g., [SAC-10 INF-D](#), Pons et al 2022, [BYC-11-04](#), Druon et al 2022, Ortuno-Crespo et al. 2024), the potential implementation and operationalization of adaptive management options for the IATTC should be explored in the coming years.

- The quality of ecological analyses and the annual reporting of EPO-wide catch estimates for bycatch species is currently hampered by IATTC's existing resolution on data provision ([C-03-05](#)), which no longer aligns with IATTC's evolving responsibilities under the Antigua Convention (see [SAC-12-09](#)). Such responsibilities include ensuring and monitoring the sustainable impacts of EPO fisheries on associated and dependent species, which is the primary reason for the creation, and annual updates of, this *Ecosystem Considerations* report. Presently, the only reliable source of bycatch data is from observers onboard large, size Class-6, purse-seine vessels. Limited data on bycatch exists for other pelagic fisheries in the EPO. Proposed capacity building opportunities and a series of workshops involving IATTC staff and CPCs to develop clear data reporting standards are expected to facilitate improved data submission, catch estimates and reporting, which in turn will improve ecological analyses to allow the IATTC to meet its obligations under the Antigua Convention. Discussions commenced during the first workshop on improving data collection for the industrial longline fisheries ([WSDAT-01](#), [WSDAT-01 RPT](#)) and during the second workshop focused on the small purse-seine fishery (i.e., vessels with a carrying capacity ≤ 363 t) ([WSDAT-02](#), [WSDAT-02-01](#), [WSDAT-02-02](#), [WSDAT-02 RPT](#)). A series of updated staff recommendations, which culminated from workshop participation and individual consultation with CPCs, is described in [SAC-16 INF-O](#) (compilation of updated recommendations for industrial longline and small purse-seine fisheries).
- During the 2nd meeting of the EBWG, a recommendation was adopted stating, “*the staff, in coordination with CPCs, develop and present to the Commission results of a process to characterize and classify the longline fleets and their fisheries in the Convention Area, distinguishing their dynamics and differentiated impacts, as well as the catchability of species, whether directed, associated or incidental.*” Consequently, the IATTC staff developed an approach to produce, in coordination with CPCs, a formal classification and definition of longline fisheries in the eastern Pacific Ocean (EPO) ([SAC-16-09](#)). The results of that discussion will be useful for improving data collection and other provisions for the longline fisheries in the IATTC.
- The IATTC staff is collaborating on two research projects on dolphins focused on improving current understanding of the potential impacts of tuna fisheries on dolphin populations ([SAC-14 INF-K](#)), including a cow-calf separation study and a CKMR assessment pilot.
- The staff aim to restructure this *Ecosystem Considerations* report into two ecosystem-advice products: 1) an indicator-based ecosystem report card (“*EcoCard*”) and corresponding *Ecosystem Status Assessment* to detail indicator selection, calculation, and validation, with a main goal of improving IATTC's communication of ecosystem status (see [EB-02-02](#)). The workplan in [EB-02-02](#) was presented to, and supported by, the EBWG (see [WGEB-02 Recommendations](#), [SAC-15 Recommendations](#)) and an update on the purpose (i.e., goal and objective) and framework of the proposed workplan is presented in [EB-03-04](#) for discussion with EBWG participants.

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presented at the 8th Meeting of the Working Group to Review Stock Assessments in 2007 ([SAR-8-17J](#)) and has been updated annually.

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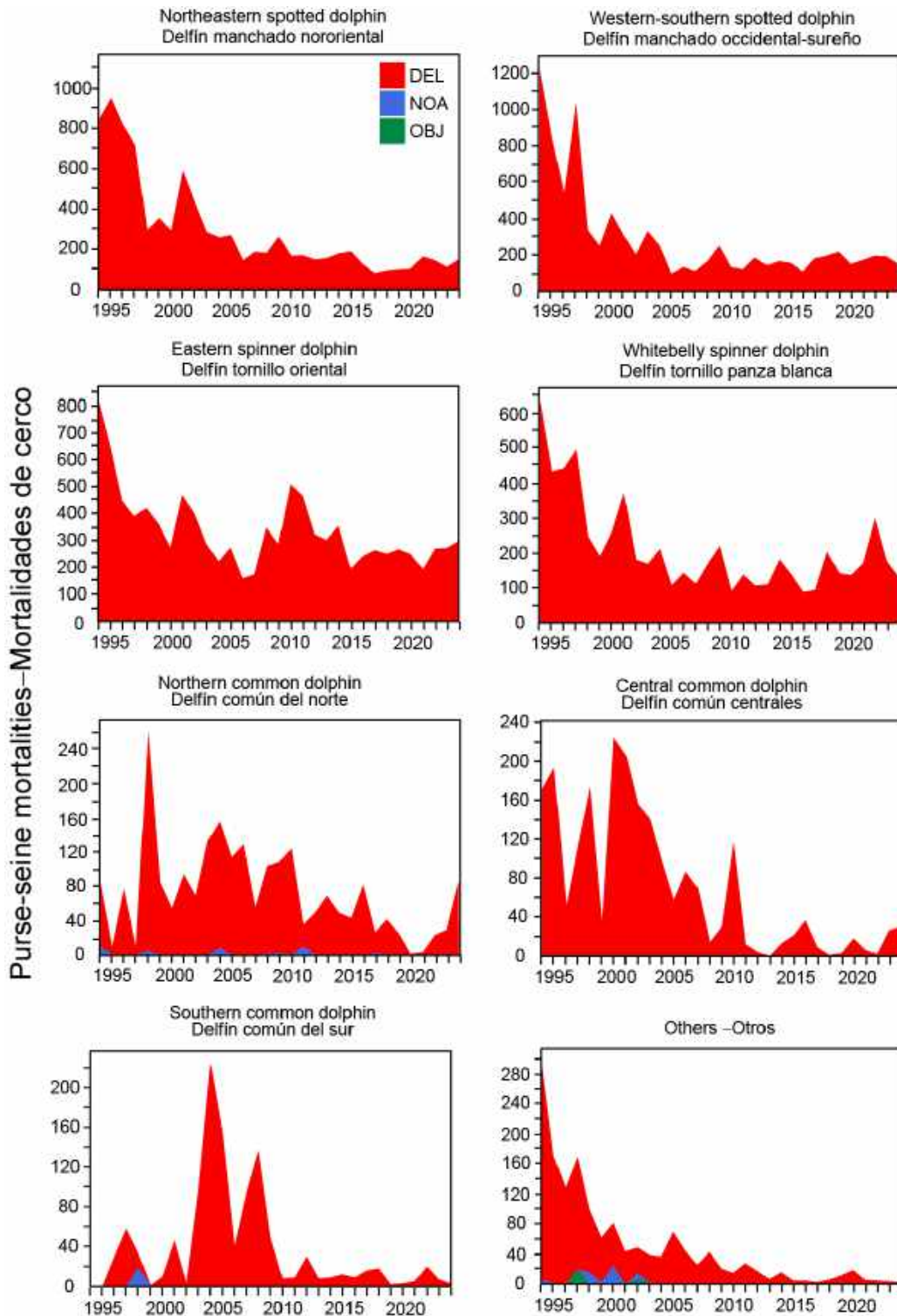
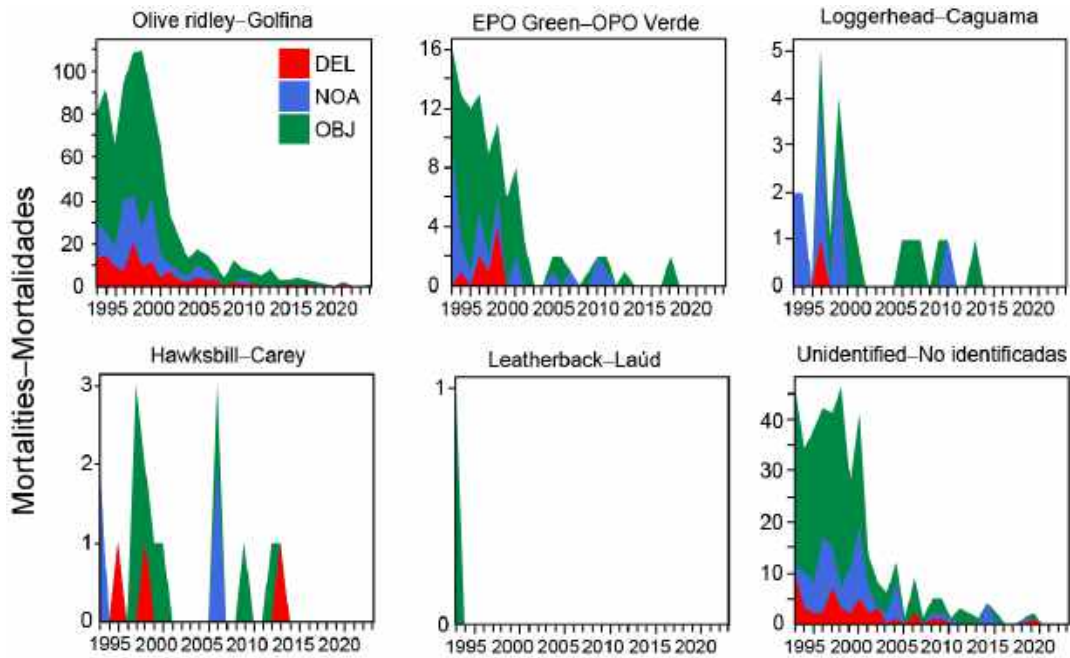


FIGURE L-1. Estimated number of incidental dolphin mortalities by observers onboard purse-seine vessels, 1994–2024.

FIGURA L-1. Número estimado de mortalidades incidentales de delfines por observadores a bordo de buques cerqueros grandes, 1994–2024.

a.



b.

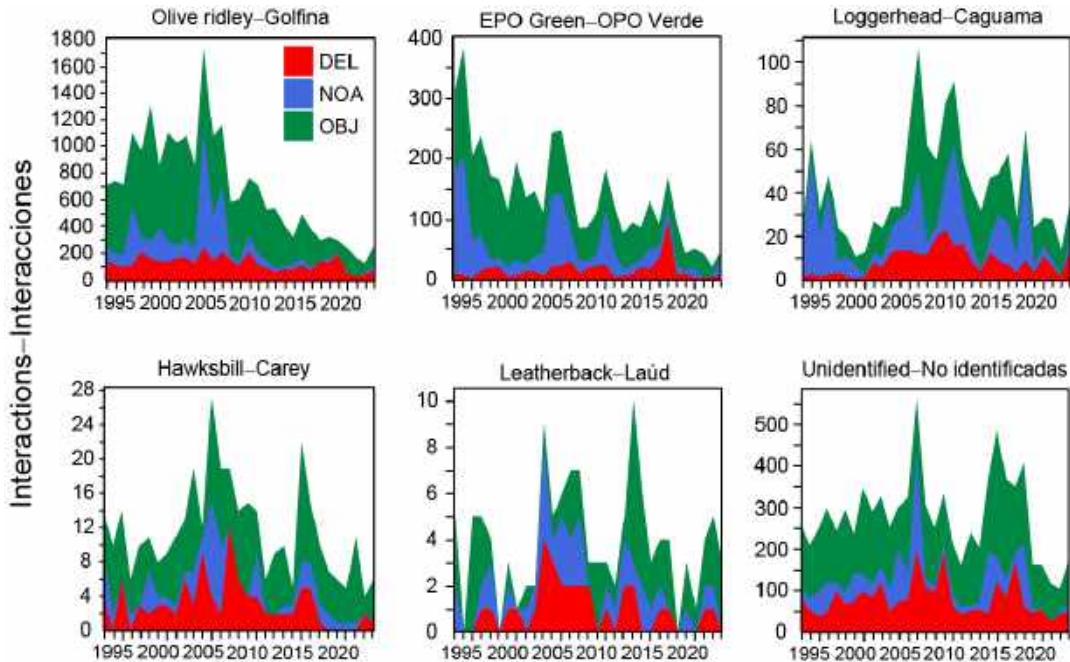


FIGURE L-2. Estimated number of sea turtle a) mortalities and b) interactions by observers onboard large purse-seine (Class 6, carrying capacity > 363 t) vessels, 1994–2024, by set type (dolphin (DEL), unassociated (NOA), floating object (OBJ)).

FIGURA L-2. Número estimado de a) mortalidades y b) interacciones de tortugas marinas por observadores a bordo de buques cerqueros grandes (clase 6, capacidad de acarreo > 363 t), 1994-2024, por tipo de lance (delfín (DEL), no asociado (NOA), objeto flotante (OBJ)).

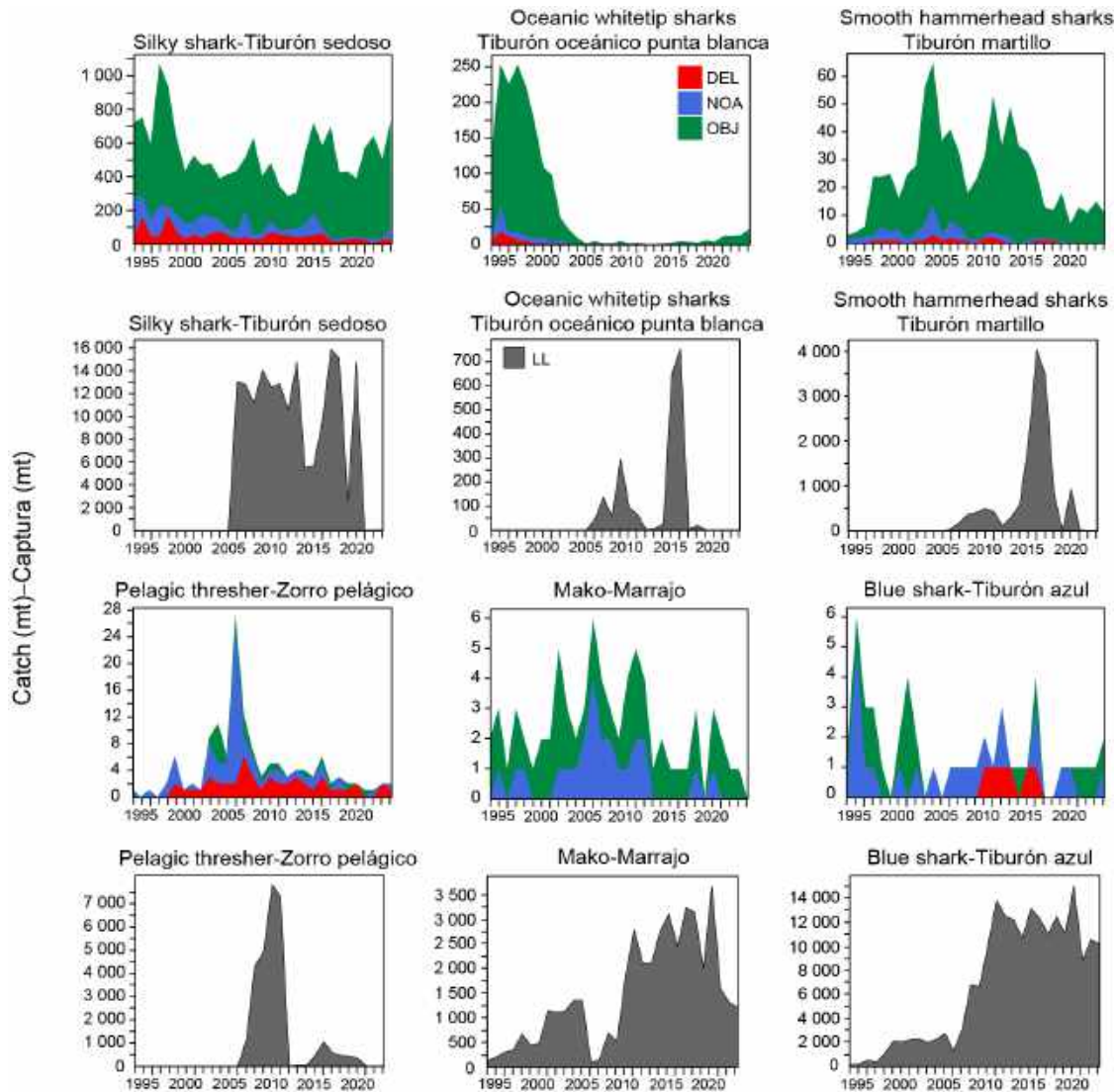


FIGURE L-3a. Estimated catches in metric tons (t) of key shark species in the eastern Pacific Ocean recorded by observers onboard large purse-seine (Class 6, carrying capacity > 363 t) vessels and minimum longline (LL) estimates of gross annual removals reported by CPCs (see section 2.2. for uncertainty and data gaps in reporting of bycatch species caught by longline). Purse-seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1994–2024) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Longline catches (1994–2023) are minimum reported gross-annual removals that may have been estimated using a mixture of different weight metrics (see footnote in section 3.5).

FIGURA L-3a. Capturas estimadas en toneladas (t) de especies clave de tiburones en el Océano Pacífico oriental registradas por observadores a bordo de buques cerqueros grandes (clase 6, capacidad de acarreo > 363 t) y estimaciones mínimas de palangre (LL) de extracciones anuales brutas reportadas por los CPC (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos en la notificación de especies capturadas incidentalmente con palangre). Se presentan las capturas cerqueras para buques de clase 6 con una capacidad de acarreo >363 t (1994-2024) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las capturas palangreras (1994–2023) son extracciones anuales brutas mínimas reportadas que pueden haber sido estimadas usando una mezcla de diferentes métricas de peso (ver nota al pie de página en la sección 3.5).

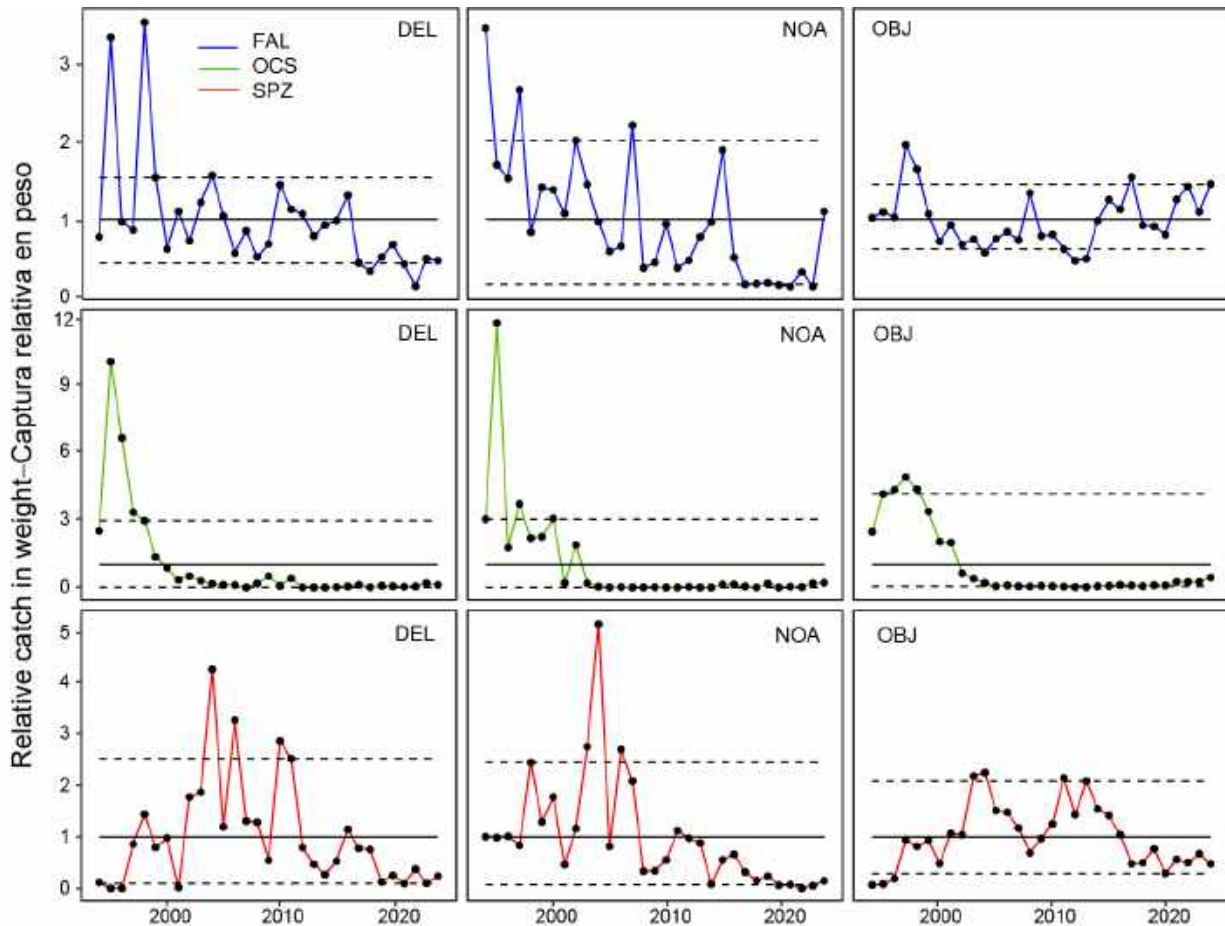


FIGURE L-3b. Indicators of relative catch of key shark species reported by observers onboard large purse-seine vessels (Class 6, carrying capacity > 363 t) by set type: dolphins (DEL), unassociated tuna schools (NOA) and floating object (OBJ). The solid line is the average total annual catch for the period 1994–2024 and scaled to 1 and the dashed lines represent the 10th and 90th percentiles. FAL: silky shark (*Carcharhinus falciformis*), OCS: oceanic whitetip shark (*Carcharhinus longimanus*), SPZ: smooth hammerhead shark (*Sphyrna zygaena*).

FIGURA L-3b. Indicadores de captura relativa de especies clave de tiburones notificada por observadores a bordo de buques cerqueros grandes (clase 6, capacidad de acarreo > 363 t) por tipo de lance: sobre delfines (DEL), no asociados (NOA) y sobre objetos flotantes (OBJ). La línea continua es el promedio de captura anual total para el periodo 1994-2024 y está escalada a 1 y las líneas punteadas representan los percentiles de 10 y 90%. FAL: tiburón sedoso (*Carcharhinus falciformis*), OCS: tiburón oceánico punta blanca (*Carcharhinus longimanus*), SPZ: cornuda cruz (*Sphyrna zygaena*).

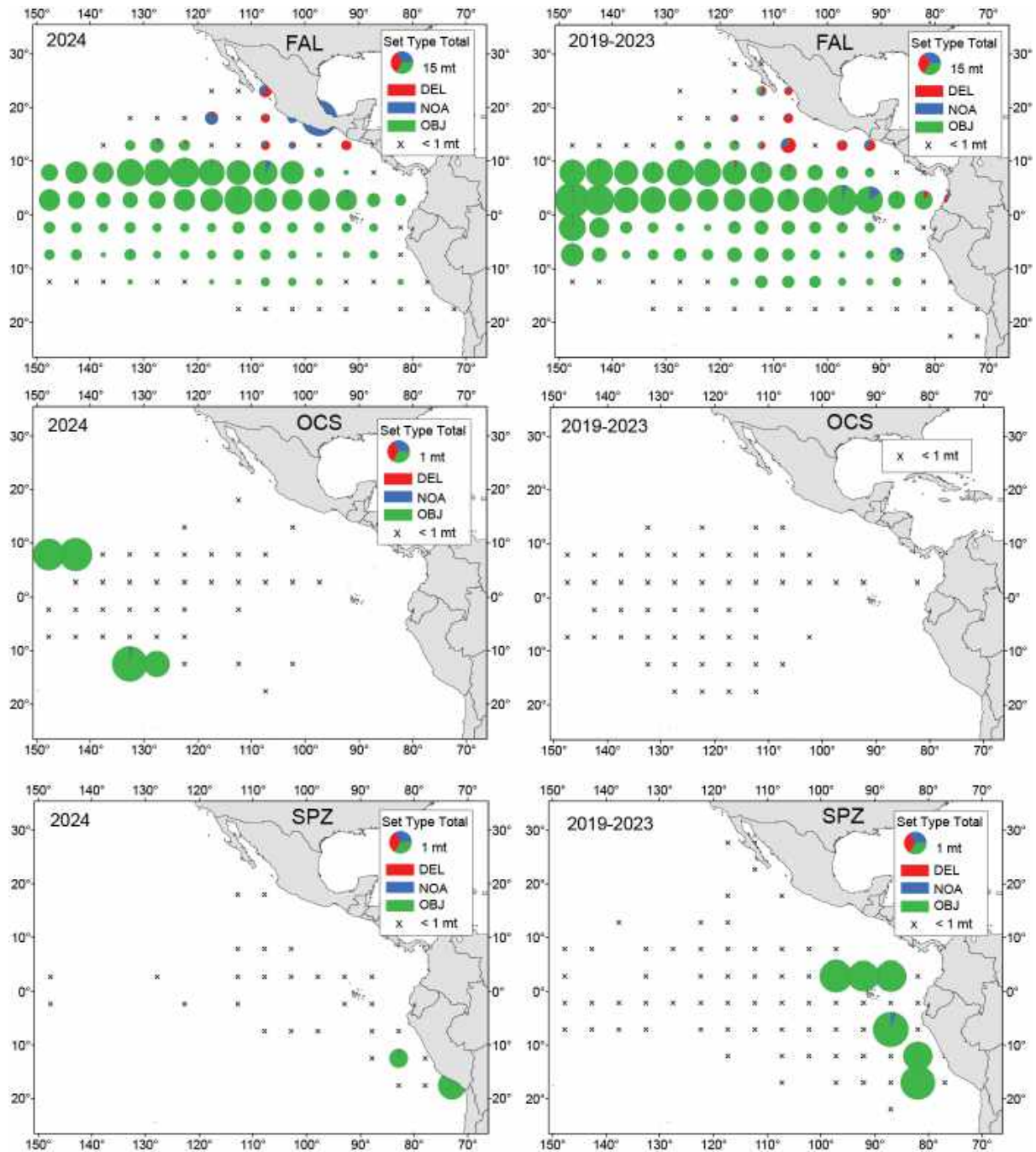


FIGURE L-3c. Purse-seine catches (Class 6, carrying capacity > 363 t) (at 5°x5° resolution) of key species of sharks by set type: floating object (OBJ) unassociated tuna schools (NOA) and dolphins (DEL), for 2024 (left panel) and the 2019–2023 averages (right panel). FAL: silky shark (*Carcharhinus falciformis*), OCS: oceanic whitetip shark (*Carcharhinus longimanus*), SPZ: smooth hammerhead shark (*Sphyrna zygaena*).
FIGURA L-3c. Capturas cerqueras (clase 6, capacidad de acarreo > 363 t) (resolución de 5°x5°) de especies clave de tiburones por tipo de lance: sobre objetos flotantes (OBJ), no asociados (NOA) y sobre delfines (DEL), para 2024 (panel izquierdo) y los promedios de 2019–2023 (panel derecho). FAL: tiburón sedoso (*Carcharhinus falciformis*), OCS: tiburón oceánico punta blanca (*Carcharhinus longimanus*), SPZ: cornuda cruz (*Sphyrna zygaena*).

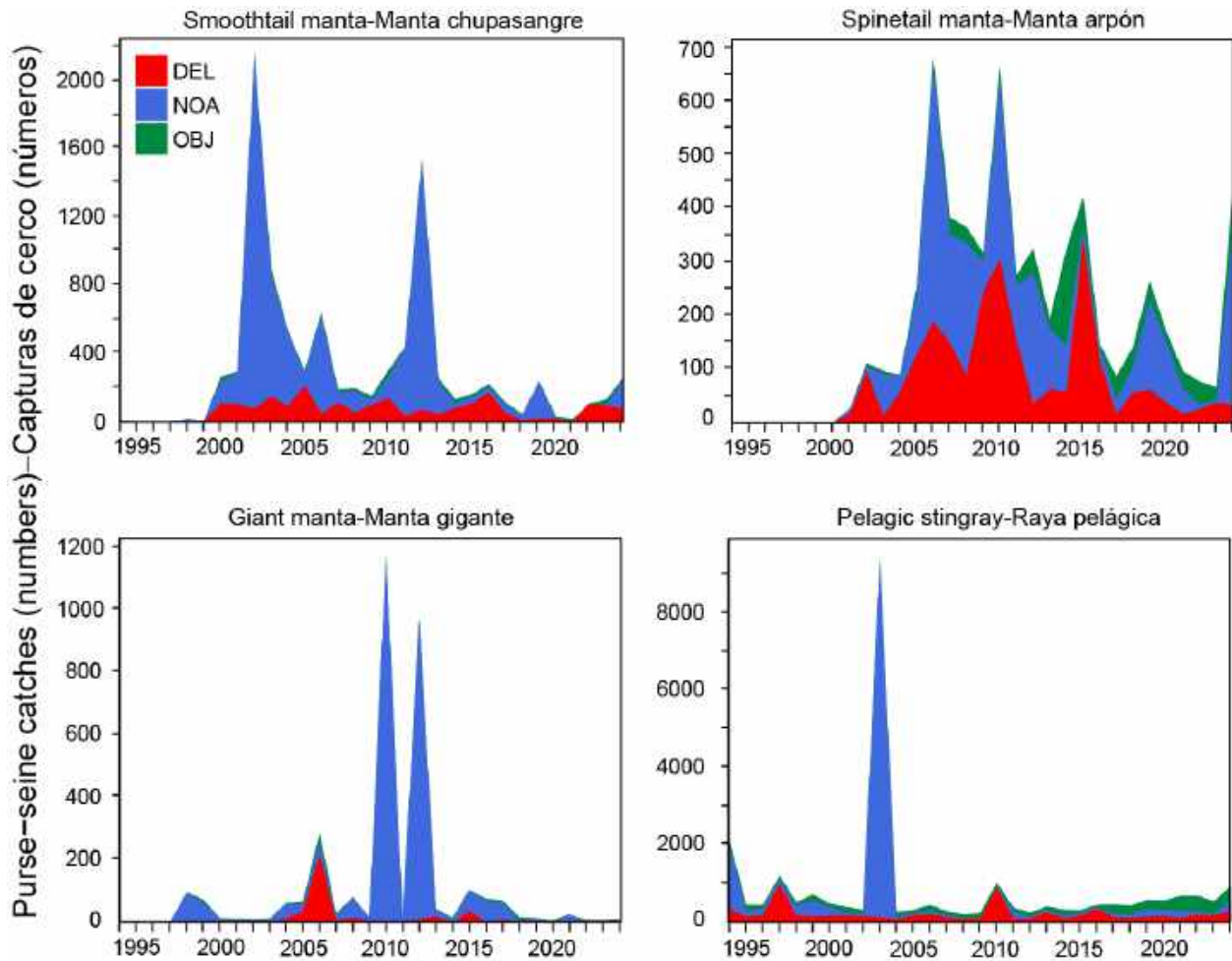


FIGURE L-4a. Estimated purse-seine catches in numbers of individuals of key species of rays in the eastern Pacific Ocean. Purse seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1994–2024) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL).

FIGURA L-4a. Capturas cerqueras estimadas en número de individuos de especies clave de rayas en el Océano Pacífico oriental. Se presentan las capturas cerqueras para buques de clase 6 con una capacidad de acarreo >363 t (1994-2024) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL).

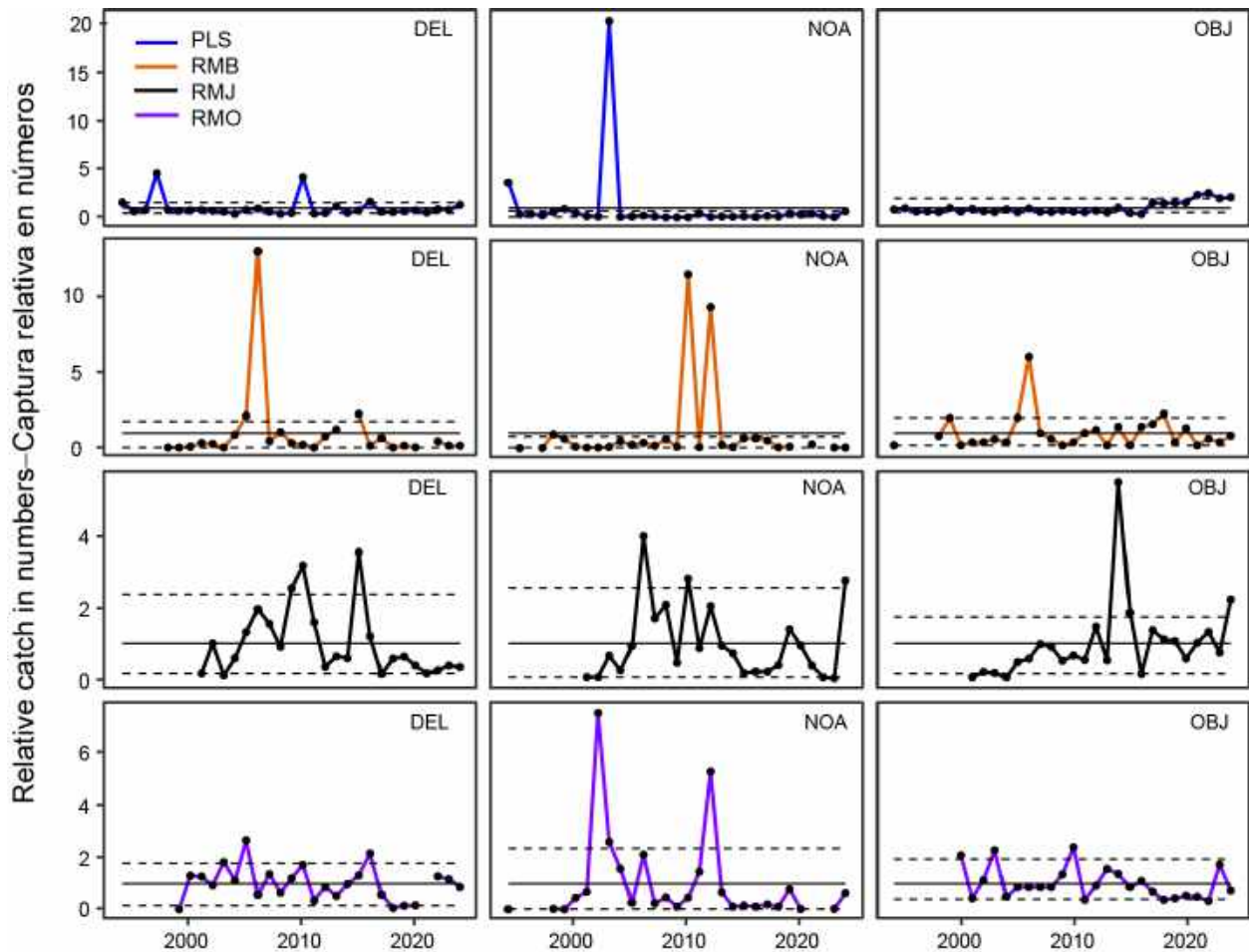


FIGURE L-4b. Indicators of relative number of individuals of rays reported by observers onboard large purse-seine vessels (Class 6, carrying capacity > 363 t) by set type: dolphins (DEL), unassociated tuna schools (NOA) and floating object (OBJ). The solid line is the average total annual catch for the period 1994–2024 and scaled to 1 and the dashed lines represent the 10th and 90th percentiles. PLS: pelagic stingray (*Pteroplatytrygon violacea*), RMB: giant manta (*Mobula birostris*), RMJ: spinetail manta (*Mobula mobular*), RMO: smoothtail manta (*Mobula thurstoni*).

FIGURA L-4b. Indicadores del número relativo de individuos de rayas notificado por observadores a bordo de buques cerqueros grandes (clase 6, capacidad de acarreo > 363 t) por tipo de lance: sobre delfines (DEL), no asociados (NOA) y sobre objetos flotantes (OBJ). La línea continua es el promedio de captura anual total para el periodo 1994–2024 y está escalada a 1 y las líneas punteadas representan los percentiles de 10 y 90%. PLS: raya pelágica (*Pteroplatytrygon violacea*), RMB: manta gigante (*Mobula birostris*), RMJ: manta mobula (*Mobula mobular*), RMO: manta diablo (*Mobula thurstoni*).

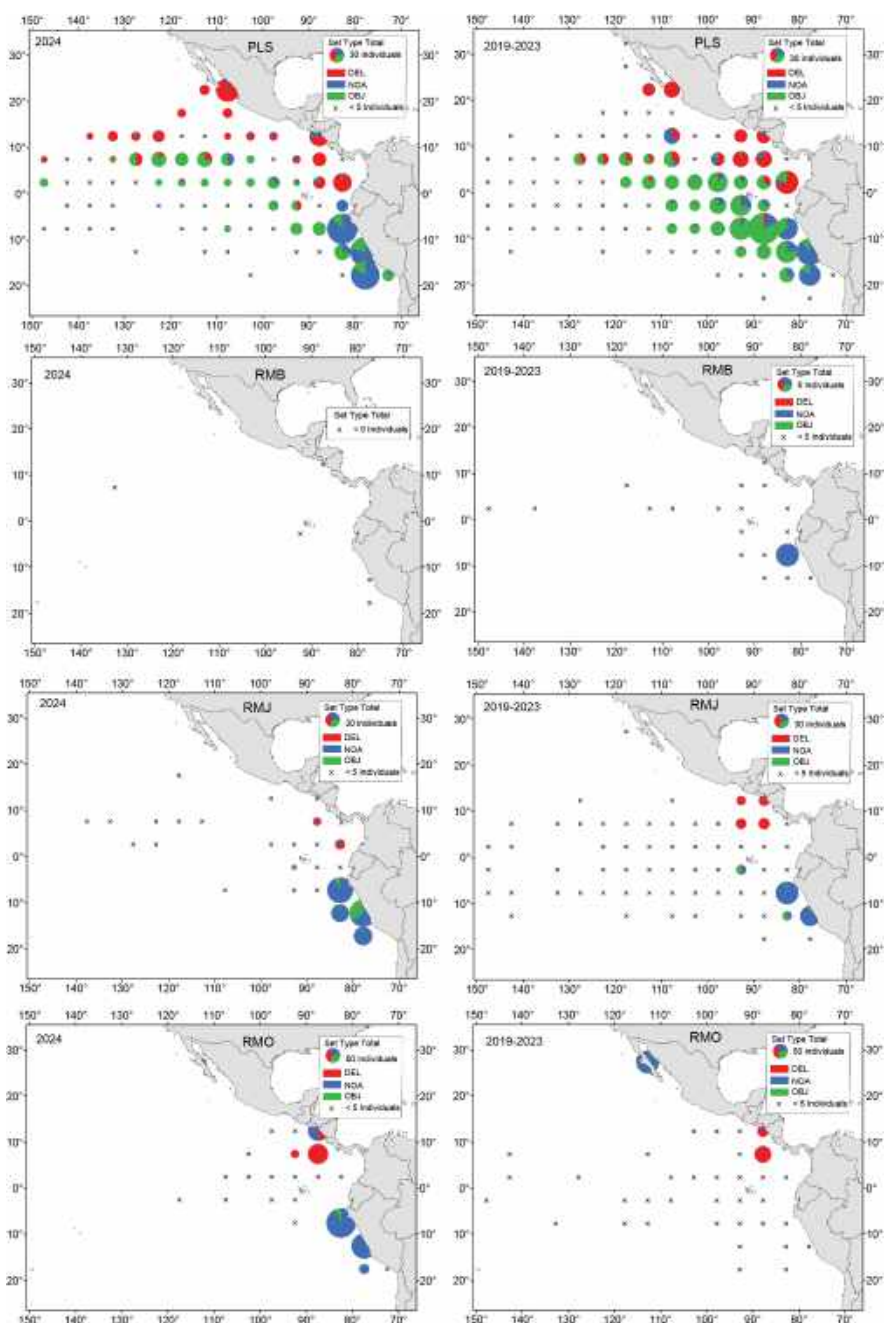


FIGURE L-4c. Purse-seine catches (Class 6, carrying capacity > 363 t) (at 5°x5° resolution) of key species of rays by set type: floating object (OBJ) unassociated tuna schools (NOA) and dolphins (DEL), for 2024 (left panel) and the 2019–2023 averages (right panel). PLS: pelagic stingray (*Pteroplatytrygon violacea*), RMB: giant manta (*Mobula birostris*), RMJ: spinetail manta (*Mobula mobular*), RMO: smoothtail manta (*Mobula thurstoni*).

FIGURA L-4c. Capturas cerqueras (clase 6, capacidad de acarreo > 363 t) (resolución de 5°x5°) de especies clave de rayas por tipo de lance: sobre objetos flotantes (OBJ), no asociados (NOA) y sobre delfines (DEL), para 2024 (panel izquierdo) y los promedios de 2019-2023 (panel derecho). PLS: raya pelágica (*Pteroplatytrygon violacea*), RMB: manta gigante (*Mobula birostris*), RMJ: manta mobula (*Mobula mobular*), RMO: manta diablo (*Mobula thurstoni*).

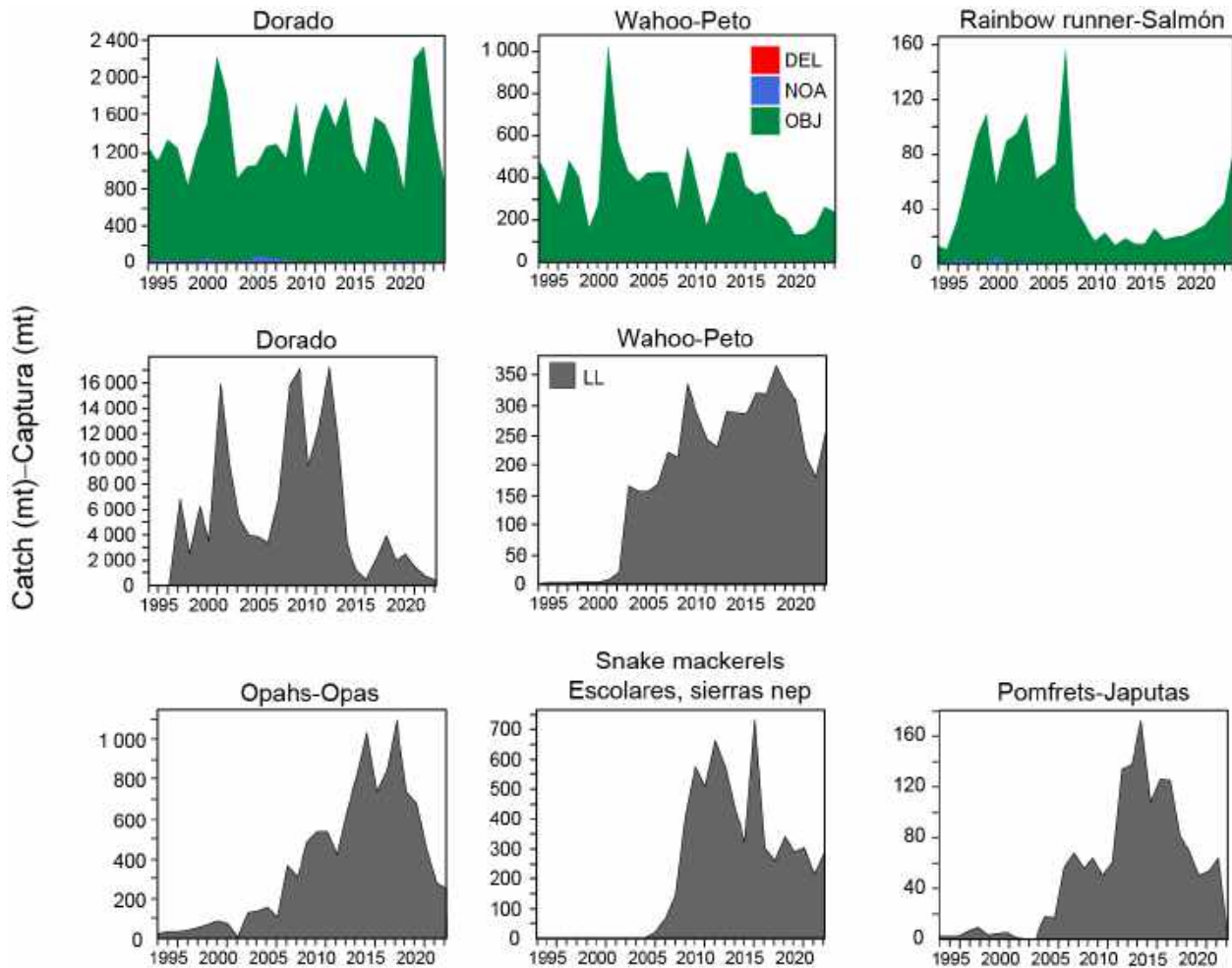


FIGURE L-5. Estimated purse-seine and longline catches in metric tons (t) of key species of large fishes in the eastern Pacific Ocean. Purse-seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1994–2024) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Longline (LL) catches (1994–2023) are minimum reported gross-annual removals (see section 2.2. for uncertainty and data gaps in reporting of bycatch species caught by longline).

FIGURA L-5. Capturas cerqueras y palangreras estimadas en toneladas (t) de especies clave de peces grandes en el Océano Pacífico oriental. Se presentan las capturas cerqueras para buques de clase 6 con una capacidad de acarreo >363 t (1994-2024) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las capturas palangreras (LL) (1994–2023) son extracciones anuales brutas mínimas reportadas (ver la Sección 2.2 para consultar información sobre la incertidumbre y las deficiencias de los datos en la notificación de especies capturadas incidentalmente con palangre).

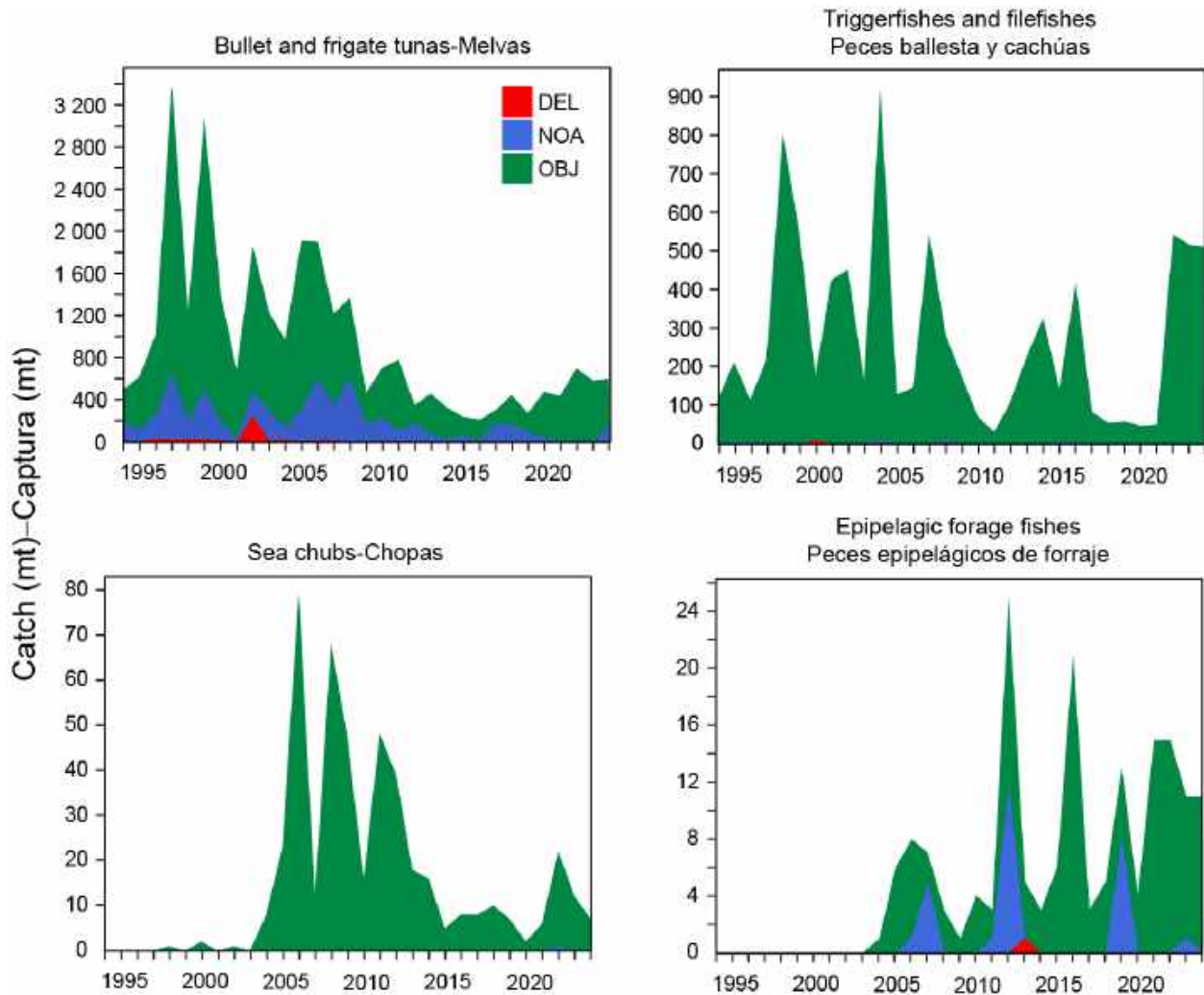


FIGURE L-6. Estimated purse-seine catches in metric tons (t) of key species of small fishes in the eastern Pacific Ocean. Purse seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1994–2024) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL).

FIGURA L-6. Capturas cerqueras estimadas en toneladas (t) de especies clave de peces pequeños en el Océano Pacífico oriental. Se presentan las capturas cerqueras para buques de clase 6 con una capacidad de acarreo >363 t (1994-2024) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL).

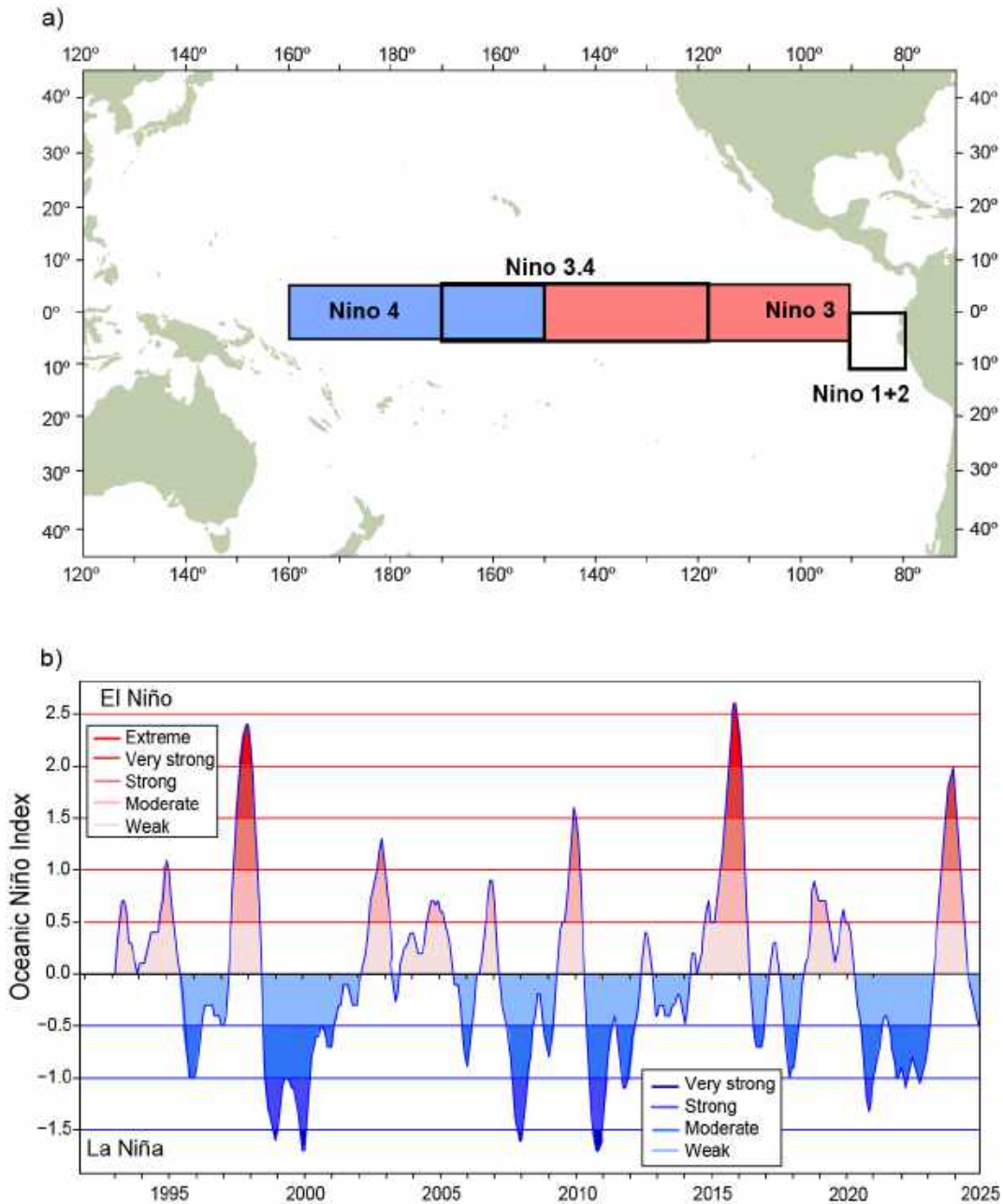


FIGURE L-7. El Niño regions used as indicators of El Niño Southern Oscillation (ENSO) events in the Pacific Ocean (top panel), and the Oceanic Niño Index (ONI) used to monitor ENSO conditions in Niño region 3.4 from 5°N to 5°S and 120°W to 170°W (bottom panel). Time series shows the running 3-month mean ONI values from the start of the IATTC observer program through December 2024. ONI data obtained from: http://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php

FIGURA L-7. Regiones de El Niño utilizadas como indicadores de los eventos de El Niño-Oscilación del Sur (ENOS) en el Océano Pacífico (panel superior), e Índice de El Niño Oceánico (ONI) usado para dar seguimiento a las condiciones de ENOS en la región Niño 3.4 de 5°N a 5°S y de 120°O a 170°O (panel inferior). Las series de tiempo muestran los valores del promedio móvil de 3 meses del ONI desde el inicio del programa de observadores de la CIAT hasta finales de diciembre de 2024. Datos del ONI obtenidos de: http://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php

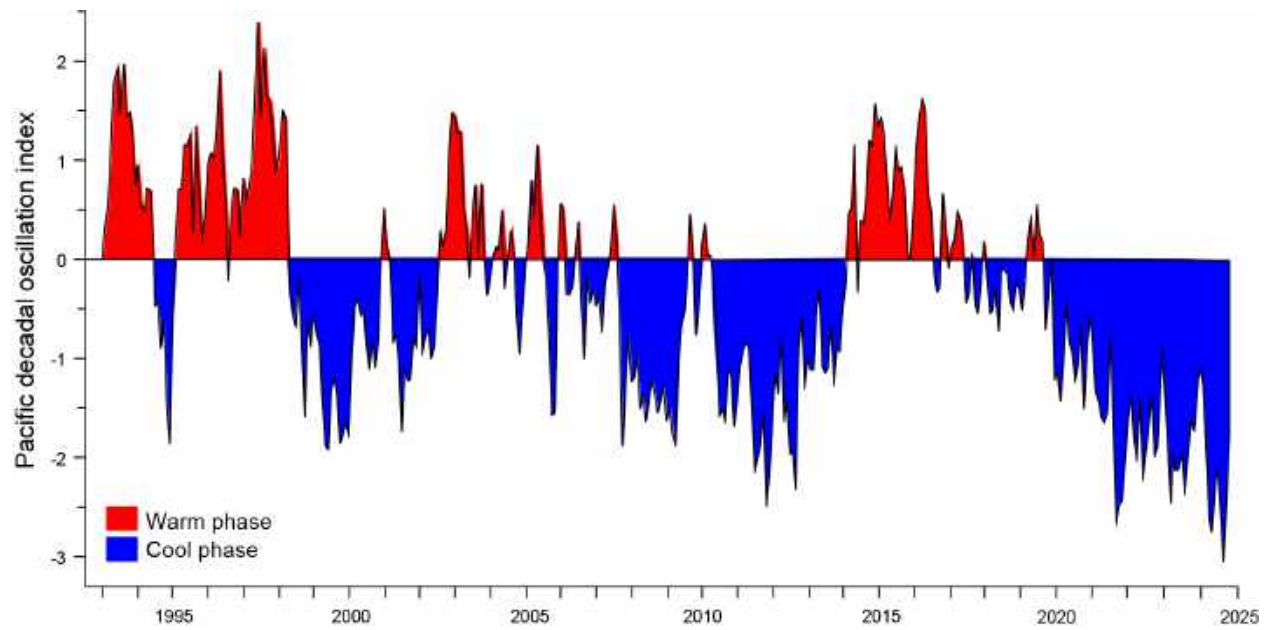


FIGURE L-8. Monthly values of the Pacific Decadal Oscillation (PDO) Index, January 1993–December 2024. ERSST V5 PDO Time Series data obtained from: <https://psl.noaa.gov/pdo/>
FIGURA L-8. Valores mensuales del índice de Oscilación Decadal del Pacífico (PDO), enero de 1993–diciembre de 2024. Datos de la serie de tiempo ERSST V5 PDO obtenidos de: <https://psl.noaa.gov/pdo/>

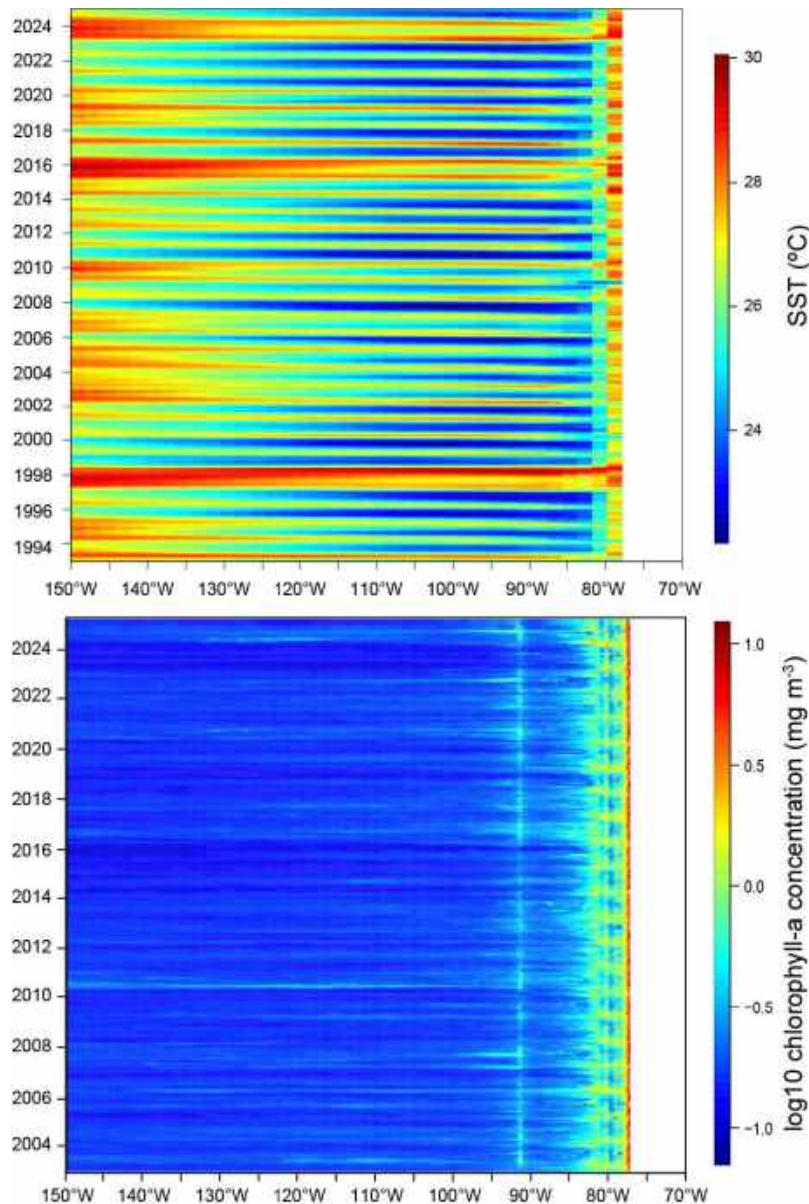


FIGURE L-9. Time-longitude Hovmöller diagram with data averaged across the tropical eastern Pacific Ocean from 5°N to 5°S for mean monthly SST for January 1993–December 2024 (top panel) (https://coastwatch.pfeg.noaa.gov/erddap/griddap/nceiErsstv5_LonPM180.html) and mean monthly chlorophyll-a concentration for January 2003–December 2024 (bottom panel) (https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html).

FIGURA L-9. Diagrama de Hovmöller tiempo-longitud con datos promediados en el Océano Pacífico tropical oriental de 5°N a 5°S para la TSM promedio mensual de enero de 1993 a diciembre de 2024 (panel superior) (https://coastwatch.pfeg.noaa.gov/erddap/griddap/nceiErsstv5_LonPM180.html) y concentración promedio mensual de clorofila-a de enero de 2003 a diciembre de 2024 (panel inferior) (https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html);

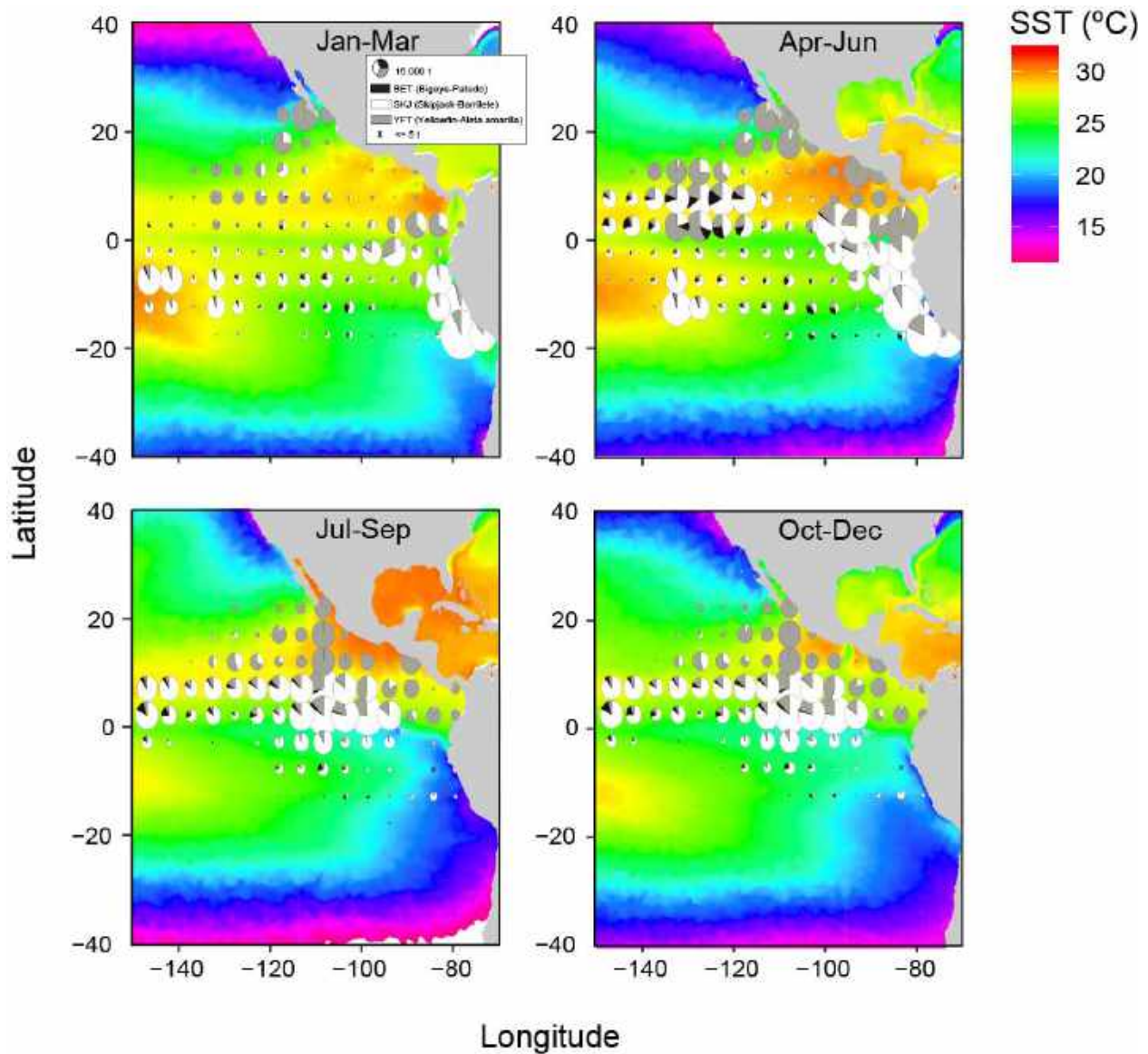


FIGURE L-10. Mean sea surface temperature (SST) for each quarter during 2024 with catches of tropical tunas overlaid. SST data obtained from NOAA NMFS SWFSC ERD on March 06, 2025, “Multi-scale Ultra-high Resolution (MUR) SST Analysis fv04.1, Global, 0.01°, 2002–present, Monthly”, <https://coastwatch.pfeg.noaa.gov/erddap/info/jplMURSST41mday/index.html>.

FIGURA L-10 Temperatura superficial del mar (TSM) promedio para cada trimestre de 2024 con las capturas de atunes tropicales superpuestas. Datos de TSM obtenidos de NOAA NMFS SWFSC ERD el 6 de marzo de 2025, “Multi-scale Ultra-high Resolution (MUR) SST Analysis fv04.1, Global, 0.01°, 2002–present, Monthly”, <https://coastwatch.pfeg.noaa.gov/erddap/info/jplMURSST41mday/index.html>.

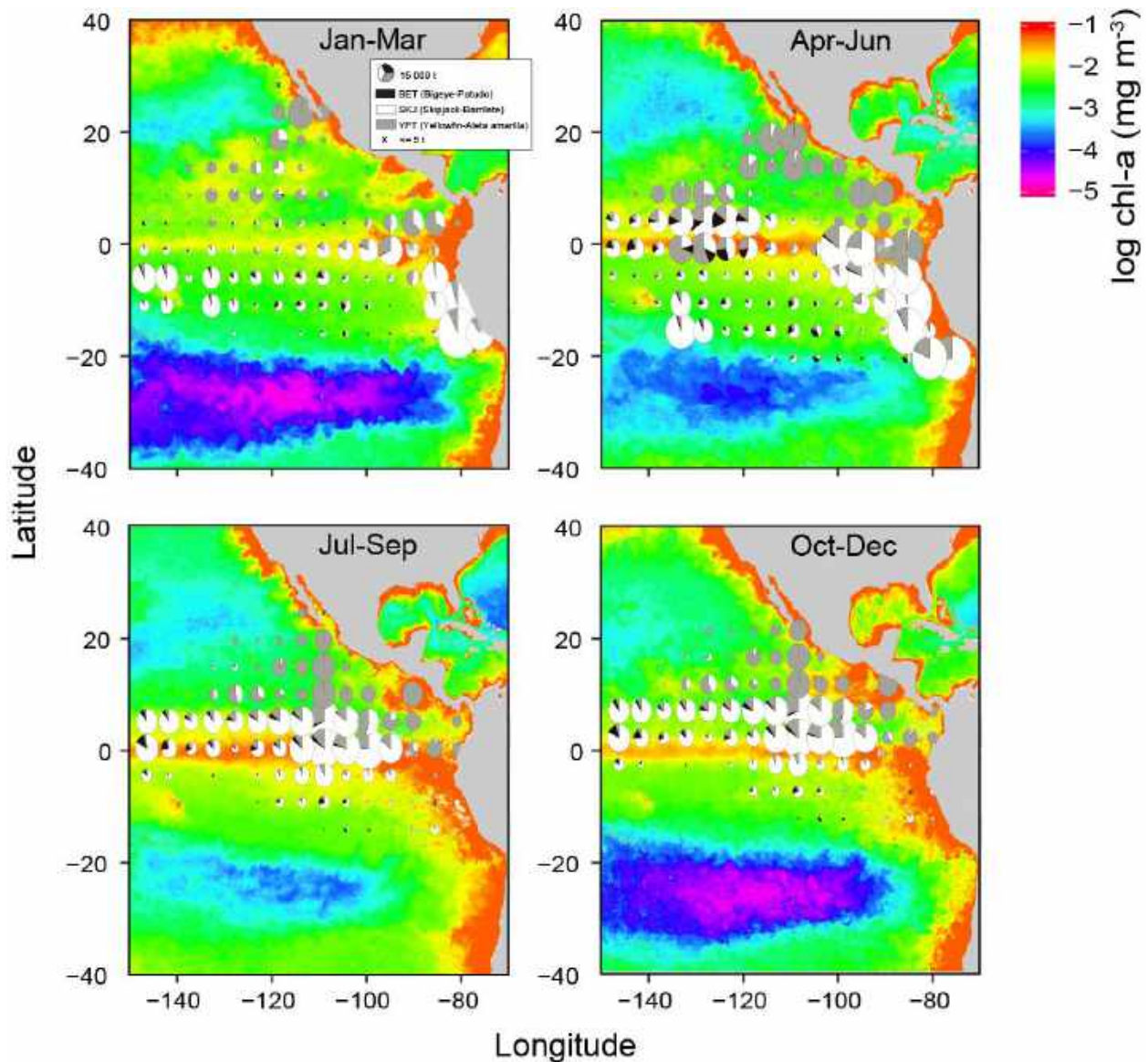


FIGURE L-11. Mean log chlorophyll-a concentration (in mg m^3) for each quarter during 2024 with catches of tropical tunas overlaid. Chlorophyll data obtained from NOAA CoastWatch on March 6, 2025, “Chlorophyll-a, Aqua MODIS, NPP, L3SMI, Global, 4km, R2022 SQ, 2003-present (Monthly Composite)”, NOAA NMFS SWFSC ERD, https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html.

FIGURA L-11. Concentración promedio de clorofila-a (en mg m^3) para cada trimestre de 2024 con las capturas de atunes tropicales superpuestas. Datos de clorofila obtenidos de NOAA CoastWatch el 6 de marzo de 2024, “Chlorophyll-a, Aqua MODIS, NPP, L3SMI, Global, 4km, R2022 SQ, 2003-present (Monthly Composite)”, NOAA NMFS SWFSC ERD, https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html.

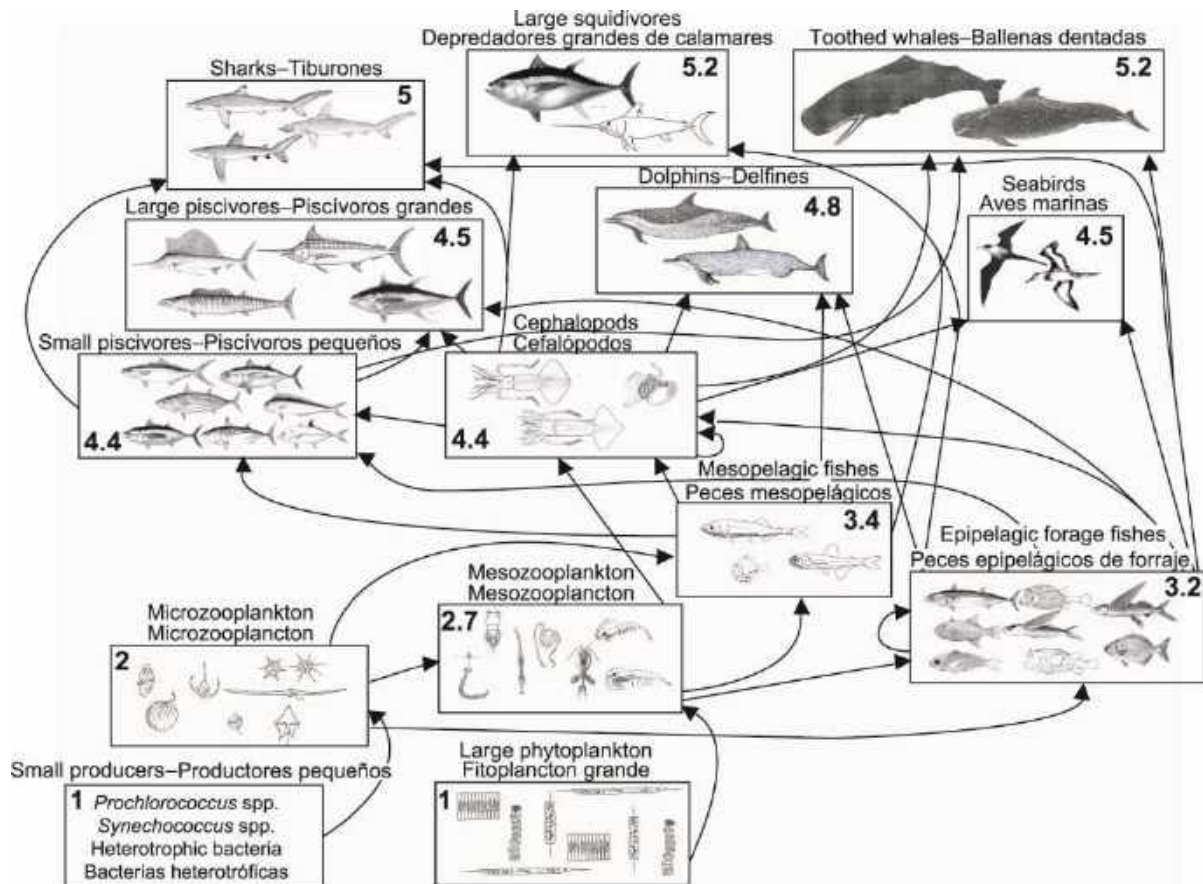


FIGURE L-12. Simplified food-web diagram of the pelagic ecosystem in the tropical EPO. The numbers inside the boxes indicate the approximate trophic level of each group.

FIGURA L-12. Diagrama simplificado de la red trófica del ecosistema pelágico en el OPO tropical. Los números en los recuadros indican el nivel trófico aproximado de cada grupo.

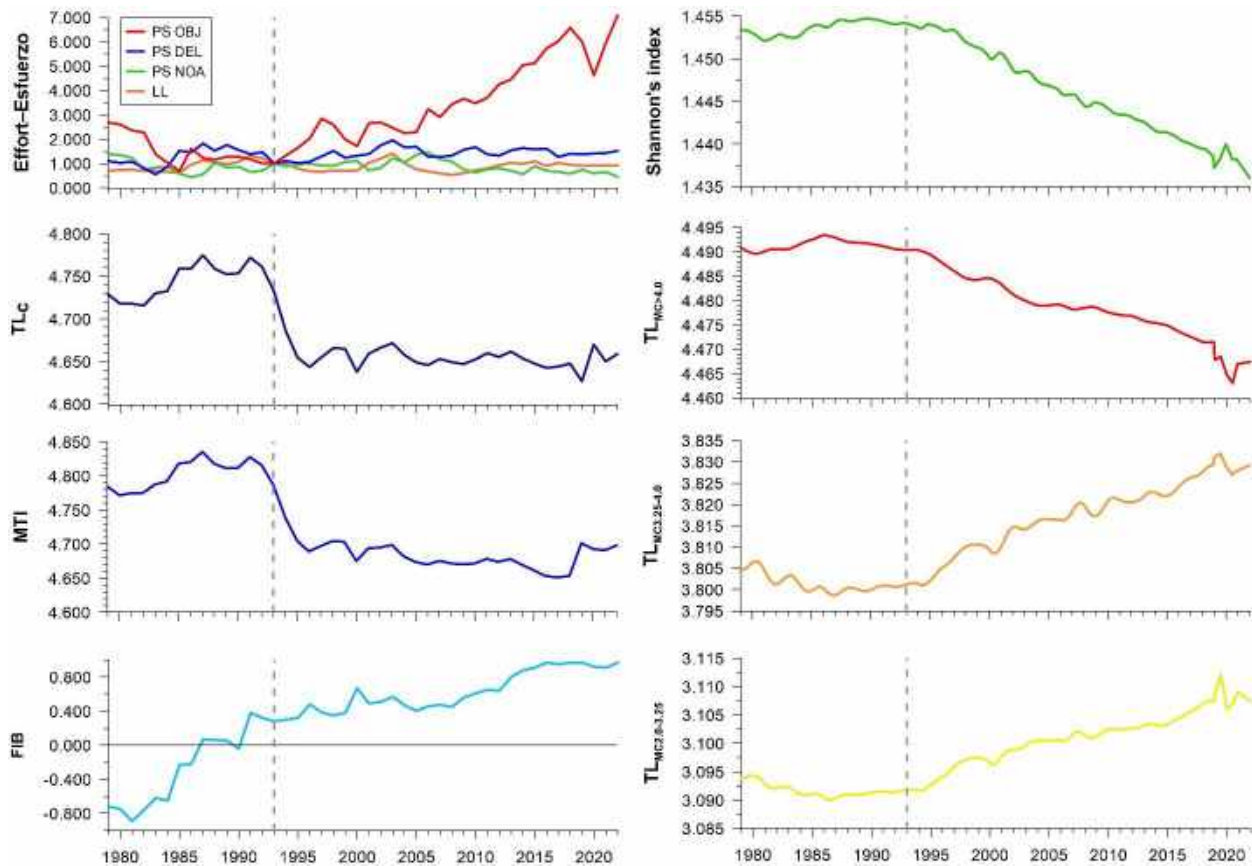


FIGURE L-13. Annual values for seven ecological indicators of changes in different components of the tropical EPO ecosystem, 1979–2022 (see Section 6 of text for details), and an index of longline (LL) and purse-seine (PS) fishing effort, by set type (dolphin (DEL), unassociated (NOA), floating object (OBJ)), relative to the model start year of 1993 (vertical dashed line), when the expansion of the purse-seine fishery on FADs began.

FIGURA L-13 Valores anuales de siete indicadores ecológicos de cambios en diferentes componentes del ecosistema del OPO tropical, 1979–2022 (ver detalles en la sección 6 del texto), y un índice de esfuerzo palangrero (LL) y cerquero (PS), por tipo de lance (delfín (DEL), no asociado (NOA), objeto flotante (OBJ)) relativo al año de inicio del modelo de 1993 (línea de trazos vertical), cuando comenzó la expansión de la pesquería cerquera sobre plantados.

Table L-1a. Estimated number of individuals of incidental dolphin mortalities by set type and stock in the eastern Pacific Ocean by the purse-seine fishery from 1994-2024. Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Data for 2023–2024 are considered preliminary.

Tabla L-1a. Número estimado de individuos de mortalidades incidentales de delfines por la pesquería de cerco durante 1994-2024, por tipo de lance y población en el Océano Pacífico oriental. Tipos de lances de cerco: sobre objetos flotantes (OBJ), no asociados (NOA) y sobre delfines (DEL). Los datos de 2023–2024 se consideran preliminares.

| Year | Northeastern spotted Purse seine | | | Western-southern spotted Purse seine | | | Eastern spinner Purse seine | | | Whitebelly spinner Purse seine | | |
|--------------|-------------------------------------|-----|-----|---|-----|-----|--------------------------------|-----|-----|-----------------------------------|-----|-----|
| | DEL | NOA | OBJ | DEL | NOA | OBJ | DEL | NOA | OBJ | DEL | NOA | OBJ |
| 1994 | 847 | - | - | 1,228 | - | - | 828 | - | - | 640 | - | - |
| 1995 | 952 | - | - | 859 | - | - | 654 | - | - | 431 | 5 | - |
| 1996 | 818 | - | - | 545 | - | - | 450 | - | - | 447 | - | - |
| 1997 | 718 | 3 | - | 1,044 | - | - | 391 | - | - | 498 | - | - |
| 1998 | 298 | - | - | 341 | - | - | 422 | - | - | 249 | - | - |
| 1999 | 358 | - | - | 253 | - | - | 363 | - | - | 192 | - | - |
| 2000 | 295 | - | - | 435 | - | - | 275 | - | - | 262 | - | - |
| 2001 | 592 | - | - | 315 | - | - | 470 | - | - | 374 | - | - |
| 2002 | 435 | - | - | 203 | - | - | 403 | - | - | 182 | - | - |
| 2003 | 288 | - | - | 335 | - | - | 290 | - | - | 170 | - | - |
| 2004 | 261 | - | - | 256 | - | - | 223 | - | - | 214 | - | - |
| 2005 | 273 | - | - | 100 | - | - | 275 | - | - | 108 | - | - |
| 2006 | 147 | - | - | 135 | - | - | 160 | - | - | 144 | - | - |
| 2007 | 189 | - | - | 116 | - | - | 175 | - | - | 113 | - | - |
| 2008 | 184 | - | - | 167 | - | - | 349 | - | - | 171 | - | - |
| 2009 | 266 | - | - | 254 | - | - | 288 | - | - | 222 | - | - |
| 2010 | 170 | - | - | 135 | - | - | 510 | - | - | 92 | - | - |
| 2011 | 172 | - | - | 124 | - | - | 467 | - | - | 139 | - | - |
| 2012 | 151 | - | - | 187 | - | - | 324 | - | - | 107 | - | - |
| 2013 | 158 | - | - | 145 | - | - | 303 | - | - | 111 | - | - |
| 2014 | 181 | - | - | 168 | - | - | 356 | - | - | 183 | - | - |
| 2015 | 191 | - | - | 158 | - | - | 196 | - | - | 139 | - | - |
| 2016 | 127 | - | - | 111 | - | - | 243 | - | - | 89 | - | - |
| 2017 | 85 | - | - | 183 | - | - | 266 | - | - | 95 | - | - |
| 2018 | 99 | - | - | 197 | - | - | 252 | - | - | 205 | - | - |
| 2019 | 104 | - | - | 220 | - | - | 269 | - | - | 143 | - | - |
| 2020 | 106 | - | - | 153 | - | - | 251 | - | - | 138 | - | - |
| 2021 | 166 | - | - | 173 | - | - | 194 | - | - | 172 | - | - |
| 2022 | 147 | - | - | 197 | - | - | 271 | - | - | 300 | - | - |
| 2023 | 115 | - | - | 195 | - | - | 274 | - | - | 178 | - | - |
| 2024 | 151 | - | - | 154 | - | - | 300 | - | - | 132 | - | - |
| Total | 9,044 | 3 | - | 9,086 | - | - | 10,492 | - | - | 6,640 | 5 | - |

Table L-1a continued

| Year | Northern common Purse seine | | | Central common Purse seine | | | Southern common Purse seine | | | Other dolphins Purse seine | | |
|--------------|--------------------------------|-----|-----|-------------------------------|-----|-----|--------------------------------|-----|-----|-------------------------------|-----|-----|
| | DEL | NOA | OBJ | DEL | NOA | OBJ | DEL | NOA | OBJ | DEL | NOA | OBJ |
| 1994 | 75 | 10 | - | 170 | - | - | - | - | - | 291 | 7 | - |
| 1995 | 9 | - | - | 192 | - | - | - | - | - | 171 | 1 | - |
| 1996 | 77 | - | - | 51 | - | - | 30 | - | - | 129 | - | - |
| 1997 | 9 | - | - | 114 | - | - | 58 | - | - | 150 | - | 20 |
| 1998 | 256 | 5 | - | 172 | - | - | 14 | 19 | - | 84 | 16 | - |
| 1999 | 85 | - | - | 34 | - | - | 1 | - | - | 59 | 3 | - |
| 2000 | 54 | - | - | 223 | - | - | 10 | - | - | 57 | 24 | 1 |
| 2001 | 94 | - | - | 205 | - | - | 46 | - | - | 44 | - | - |
| 2002 | 69 | - | - | 155 | - | - | 3 | - | - | 34 | 9 | 6 |
| 2003 | 133 | - | - | 140 | - | - | 97 | - | - | 37 | - | 2 |
| 2004 | 148 | 8 | - | 97 | - | - | 225 | - | - | 37 | - | - |
| 2005 | 114 | - | - | 57 | - | - | 154 | - | - | 70 | - | - |
| 2006 | 129 | - | - | 86 | - | - | 40 | - | - | 43 | 2 | - |
| 2007 | 55 | - | - | 69 | - | - | 95 | - | - | 25 | 1 | - |
| 2008 | 103 | 1 | - | 14 | - | - | 137 | - | - | 43 | - | - |
| 2009 | 107 | 2 | - | 30 | - | - | 49 | - | - | 21 | - | - |
| 2010 | 124 | - | - | 116 | - | - | 8 | - | - | 14 | - | 1 |
| 2011 | 25 | 10 | - | 12 | - | - | 9 | - | - | 28 | - | - |
| 2012 | 49 | - | - | 4 | - | - | 30 | - | - | 18 | - | - |
| 2013 | 69 | - | - | - | - | - | 8 | - | - | 6 | 1 | - |
| 2014 | 49 | - | - | 13 | - | - | 9 | - | - | 15 | - | 1 |
| 2015 | 43 | - | - | 21 | - | - | 12 | - | - | 5 | - | - |
| 2016 | 82 | - | - | 36 | - | - | 9 | - | - | 4 | - | 1 |
| 2017 | 24 | 2 | - | 9 | - | - | 16 | - | - | 3 | - | - |
| 2018 | 41 | - | - | 1 | - | - | 18 | - | - | 6 | - | - |
| 2019 | 25 | - | - | 3 | - | - | 2 | - | - | 10 | - | 2 |
| 2020 | 1 | - | - | 18 | - | - | 3 | - | - | 19 | - | - |
| 2021 | 3 | - | - | 6 | - | - | 5 | - | - | 6 | - | - |
| 2022 | 23 | - | - | 2 | - | - | 20 | - | - | 5 | - | - |
| 2023 | 29 | - | - | 26 | - | - | 7 | - | - | 4 | - | - |
| 2024 | 86 | - | - | 30 | - | - | 3 | - | - | 3 | - | - |
| Total | 2,190 | 38 | - | 2,106 | - | - | 1,118 | 19 | - | 1,441 | 64 | 34 |

Table L-1b. Minimum number of marine mammal interactions and mortalities in the eastern Pacific Ocean (EPO) in 2023 reported by observers onboard longline vessels under the current mandate of at least 5% coverage ([C-19-08](#)) of each CPC fleet operating in the EPO. Reported marine mammal interactions were precautionarily presumed to be mortalities (i.e., disposition was either not reported or a detailed disposition was not provided e.g., “discarded”, “injured”) unless release condition was reported as “alive”, “alive and healthy”, or “released”. These data are considered incomplete as data are insufficient for expanding to fleet totals ([BYC-10 INF-D](#)) (see section 2.2 for uncertainty and data gaps associated with longline data reporting).

Tabla L-1b. Número mínimo de interacciones con mamíferos marinos y mortalidades en el Océano Pacífico oriental (OPO) en 2023 reportadas por observadores a bordo de buques palangreros bajo el mandato actual de al menos 5% de cobertura ([C-19-08](#)) de cada flota de los CPC que opera en el OPO. Se supuso precautoriamente que las interacciones con mamíferos marinos reportadas resultaron en mortalidades (es decir, no se reportó la disposición o no se proporcionó una disposición detallada, por ejemplo, "descartado", "herido", a menos que la condición de liberación fuera reportada como "vivo", "vivo y sano" o "liberado"). Estos datos se consideran incompletos ya que son insuficientes para expandirlos a totales de la flota ([BYC-10 INF-D](#)) (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos asociadas a la notificación de datos de palangre)

| Common name | Scientific name | Interactions | Mortalities |
|----------------------|-------------------------------|--------------|-------------|
| Roughtoothed dolphin | <i>Steno bredanensis</i> | 1 | 1 |
| Risso's dolphin | <i>Grampus griseus</i> | 1 | 1 |
| False killer whale | <i>Pseudorca crassidens</i> | 1 | 1 |
| Franciscana | <i>Pontoporia blainvillei</i> | 1 | 1 |
| Total numbers | | 4 | 4 |

Table L-2a. Estimated number of turtle interactions and mortalities by observers onboard purse-seine size-class 6 vessels with a carrying capacity >363 t (1994–2024). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Data for 2023–2024 are considered preliminary.

Tabla L-2a. Número estimado de mortalidades e interacciones de tortugas por observadores a bordo de buques cerqueros de clase 6 con una capacidad de acarreo >363 t (1994–2024). Tipos de lances cerqueros: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Los datos de 2023–2024 se consideran preliminares.

| Year | <i>Lepidochelys olivacea</i> , Olive ridley (LKV) | | | | | | <i>Chelonia agassizii</i> , <i>Chelonia mydas</i> , eastern Pacific green (TUG) | | | | | | <i>Caretta caretta</i> , loggerhead (TTL) | | | | | |
|-------|--|-------|-------|-------------|-----|-----|--|-------|-----|-------------|-----|-----|--|-----|-----|-----------|-----|-----|
| | Purse seine | | | Purse seine | | | Purse seine | | | Purse seine | | | Purse seine | | | | | |
| | interactions | | | mortality | | | interactions | | | mortality | | | interactions | | | mortality | | |
| | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL |
| 1994 | 455 | 114 | 137 | 50 | 17 | 13 | 132 | 170 | 12 | 7 | 9 | - | 6 | 15 | 2 | - | 2 | - |
| 1995 | 537 | 89 | 117 | 66 | 11 | 14 | 181 | 196 | 8 | 10 | 2 | 1 | 9 | 52 | 3 | - | 2 | - |
| 1996 | 520 | 97 | 96 | 47 | 9 | 9 | 138 | 63 | 4 | 11 | 1 | - | 12 | 18 | 2 | - | - | - |
| 1997 | 544 | 439 | 112 | 54 | 33 | 7 | 164 | 59 | 16 | 8 | 3 | 2 | 7 | 38 | 3 | 1 | 3 | 1 |
| 1998 | 649 | 116 | 209 | 66 | 22 | 20 | 141 | 13 | 20 | 7 | 1 | 1 | 15 | 5 | 4 | 1 | - | - |
| 1999 | 1,005 | 140 | 160 | 82 | 18 | 9 | 130 | 16 | 21 | 5 | 2 | 4 | 9 | 9 | 2 | 1 | 3 | - |
| 2000 | 463 | 248 | 139 | 46 | 29 | 11 | 93 | 17 | 5 | 6 | - | - | 4 | 6 | 1 | 2 | - | - |
| 2001 | 802 | 162 | 136 | 51 | 11 | 4 | 164 | 24 | 8 | 6 | 2 | - | 10 | 1 | 2 | 1 | - | - |
| 2002 | 767 | 97 | 165 | 23 | 3 | 7 | 110 | 11 | 15 | 3 | - | - | 14 | 5 | 8 | - | - | - |
| 2003 | 762 | 147 | 168 | 16 | 4 | 3 | 107 | 25 | 15 | - | - | - | 14 | 4 | 6 | - | - | - |
| 2004 | 624 | 110 | 120 | 8 | 3 | 2 | 65 | 38 | 8 | - | - | - | 10 | 11 | 13 | - | - | - |
| 2005 | 606 | 872 | 249 | 7 | 6 | 4 | 101 | 122 | 21 | 1 | 1 | - | 5 | 15 | 14 | - | - | - |
| 2006 | 595 | 337 | 140 | 8 | 4 | 3 | 106 | 119 | 23 | 2 | - | - | 39 | 19 | 14 | 1 | - | - |
| 2007 | 450 | 494 | 210 | 6 | 1 | 3 | 83 | 56 | 31 | - | 1 | - | 56 | 38 | 12 | 1 | - | - |
| 2008 | 408 | 27 | 147 | 4 | - | - | 54 | 20 | 12 | - | - | - | 45 | 5 | 12 | 1 | - | - |
| 2009 | 464 | 30 | 110 | 10 | - | 2 | 56 | 12 | 19 | 1 | - | - | 30 | 5 | 20 | - | - | - |
| 2010 | 424 | 128 | 212 | 4 | 3 | 1 | 71 | 20 | 23 | - | 2 | - | 34 | 24 | 23 | 1 | - | - |
| 2011 | 502 | 96 | 115 | 6 | - | 1 | 70 | 89 | 25 | 1 | 1 | - | 29 | 46 | 16 | - | 1 | - |
| 2012 | 388 | 53 | 91 | 5 | - | - | 77 | 42 | 5 | - | - | - | 19 | 19 | 17 | - | - | - |
| 2013 | 454 | 20 | 66 | 7 | 1 | - | 61 | 10 | 7 | 1 | - | - | 24 | 9 | 8 | - | - | - |
| 2014 | 304 | 19 | 83 | 3 | - | - | 69 | 16 | 10 | - | - | - | 27 | 1 | 4 | 1 | - | - |
| 2015 | 195 | 49 | 78 | 2 | - | 1 | 54 | 12 | 21 | - | - | - | 28 | 6 | 13 | - | - | - |
| 2016 | 333 | 49 | 113 | 4 | - | - | 78 | 35 | 17 | - | - | - | 19 | 21 | 9 | - | - | - |
| 2017 | 285 | 24 | 72 | 2 | - | 1 | 39 | 21 | 34 | - | - | - | 31 | 20 | 7 | - | - | - |
| 2018 | 150 | 5 | 147 | 2 | - | - | 50 | 24 | 96 | 2 | - | - | 17 | 7 | 4 | - | - | - |
| 2019 | 170 | 28 | 129 | 1 | - | - | 72 | 13 | 10 | - | - | - | 14 | 46 | 9 | - | - | - |
| 2020 | 91 | 14 | 197 | - | - | - | 29 | 4 | 11 | - | - | - | 17 | 3 | 4 | - | - | - |
| 2021 | 191 | 2 | 54 | 1 | - | 1 | 32 | 17 | 3 | - | - | - | 13 | 5 | 11 | - | - | - |
| 2022 | 133 | 2 | 33 | - | - | - | 40 | - | 4 | - | - | - | 19 | 3 | 6 | - | - | - |
| 2023 | 65 | 14 | 47 | - | - | - | 13 | 2 | 6 | - | - | - | 12 | - | 2 | - | - | - |
| 2024 | 154 | 29 | 73 | 1 | - | - | 19 | 22 | 7 | - | - | - | 14 | 7 | 14 | - | - | - |
| Total | 13,491 | 4,052 | 3,926 | 583 | 174 | 117 | 2,597 | 1,288 | 517 | 71 | 25 | 8 | 602 | 463 | 265 | 11 | 10 | 1 |

Table L-2a continued

| Year | <i>Eretmochelys imbricata</i> , hawksbill (TTH) | | | | | | <i>Dermochelys coriacea</i> , leatherback (DKK) | | | | | | Unidentified turtles | | | | | |
|-------|--|-----|-----|-----------|-----|-----|--|-----|-----|-----------|-----|-----|----------------------|-------|-------|-----------|-----|-----|
| | Purse seine | | | | | | Purse seine | | | | | | Purse seine | | | | | |
| | interactions | | | mortality | | | interactions | | | mortality | | | interactions | | | mortality | | |
| | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL |
| 1994 | 5 | 5 | 4 | - | 2 | - | 3 | 2 | - | 1 | - | - | 151 | 27 | 83 | 34 | 2 | 9 |
| 1995 | 8 | 2 | - | - | - | - | - | - | - | - | - | - | 130 | 27 | 52 | 24 | 7 | 3 |
| 1996 | 8 | - | 6 | - | - | 1 | 5 | - | - | - | - | - | 151 | 58 | 37 | 30 | 6 | 2 |
| 1997 | 4 | 2 | - | - | - | - | 3 | 1 | 1 | - | - | - | 180 | 72 | 46 | 25 | 15 | 2 |
| 1998 | 7 | - | 3 | 3 | - | - | 1 | 2 | 1 | - | - | - | 121 | 24 | 97 | 26 | 8 | 7 |
| 1999 | 4 | 5 | 2 | 1 | - | 1 | - | - | - | - | - | - | 202 | 28 | 65 | 39 | 4 | 3 |
| 2000 | 4 | 1 | 3 | 1 | - | - | 1 | 1 | 1 | - | - | - | 92 | 68 | 74 | 17 | 9 | 2 |
| 2001 | 5 | 1 | 3 | 1 | - | - | - | - | 1 | - | - | - | 206 | 43 | 96 | 22 | 14 | 5 |
| 2002 | 8 | 1 | 2 | - | - | - | 1 | 1 | - | - | - | - | 175 | 33 | 82 | 6 | 5 | 2 |
| 2003 | 6 | 1 | 6 | - | - | - | - | 1 | 1 | - | - | - | 169 | 40 | 117 | 5 | - | 3 |
| 2004 | 12 | 4 | 3 | - | - | - | 1 | 4 | 4 | - | - | - | 151 | 53 | 48 | 4 | 2 | - |
| 2005 | 1 | 2 | 9 | - | - | - | 1 | 1 | 3 | - | - | - | 103 | 126 | 73 | 4 | 7 | 1 |
| 2006 | 12 | 11 | 4 | - | - | - | 1 | 3 | 2 | - | - | - | 184 | 64 | 77 | 1 | - | - |
| 2007 | 9 | 8 | 2 | 1 | 2 | - | 3 | 2 | 2 | - | - | - | 130 | 240 | 191 | 7 | - | 2 |
| 2008 | 7 | - | 12 | - | - | - | 2 | 3 | 2 | - | - | - | 182 | 18 | 107 | 1 | - | - |
| 2009 | 8 | - | 6 | - | - | - | 1 | - | 2 | - | - | - | 141 | 16 | 95 | 3 | 1 | 1 |
| 2010 | 11 | - | 4 | 1 | - | - | 3 | - | - | - | - | - | 122 | 24 | 187 | 3 | 1 | 1 |
| 2011 | 5 | 5 | 4 | - | - | - | 1 | 1 | 1 | - | - | - | 125 | 28 | 63 | - | 1 | - |
| 2012 | 4 | - | 2 | - | - | - | 1 | 1 | - | - | - | - | 99 | 19 | 40 | 3 | - | - |
| 2013 | 7 | - | 2 | 1 | - | - | 1 | 2 | 2 | - | - | - | 175 | 13 | 51 | 2 | - | - |
| 2014 | 7 | 1 | 2 | - | - | 1 | 7 | 1 | 2 | - | - | - | 132 | 18 | 53 | 1 | - | - |
| 2015 | 2 | 1 | 2 | - | - | - | 4 | 2 | - | - | - | - | 174 | 152 | 42 | - | 4 | - |
| 2016 | 14 | 3 | 5 | - | - | - | 2 | 1 | - | - | - | - | 307 | 59 | 120 | 2 | - | - |
| 2017 | 7 | 3 | 5 | - | - | - | 2 | 1 | 1 | - | - | - | 243 | 43 | 83 | - | - | - |
| 2018 | 7 | 2 | 1 | - | - | - | 3 | - | 1 | - | - | - | 160 | 22 | 169 | - | - | - |
| 2019 | 5 | 2 | - | - | - | - | - | - | - | - | - | - | 193 | 155 | 59 | - | 1 | - |
| 2020 | 5 | 1 | - | - | - | - | 2 | 1 | - | - | - | - | 108 | 8 | 45 | 1 | - | 1 |
| 2021 | 4 | 1 | - | - | - | - | 1 | - | - | - | - | - | 102 | 5 | 53 | - | - | - |
| 2022 | 10 | 1 | - | - | - | - | 2 | 1 | 1 | - | - | - | 92 | 1 | 23 | - | - | - |
| 2023 | 2 | - | 2 | - | - | - | 3 | 1 | 1 | - | - | - | 55 | 6 | 42 | - | - | - |
| 2024 | 5 | - | 1 | - | - | - | 3 | - | - | - | - | - | 102 | 21 | 46 | - | - | - |
| Total | 203 | 63 | 95 | 9 | 4 | 3 | 58 | 33 | 29 | 1 | - | - | 4,658 | 1,509 | 2,415 | 261 | 87 | 44 |

Table L-2b. Minimum number of sea turtle interactions and mortalities in the eastern Pacific Ocean (EPO) in 2023 reported by observers onboard longline vessels under the current mandate of at least 5% coverage (C-19-08) of each CPC fleet operating in the EPO. Dispositions considered to indicate a survival event are those reported by observers as “Alive and Healthy”, “Light injuries”, “Released” and “Released with a hook”, while those considered to indicate a mortality event are dispositions reported as “Dead”, “Discarded”, “Grave Injuries”, “Injured”, “Alive and injured”, or precautionarily where disposition was not reported. These data are considered incomplete as data are insufficient for expanding to fleet totals (BYC-10 INF-D) (see section 2.2 for uncertainty and data gaps associated with longline data reporting).

Tabla L-2b. Número mínimo de interacciones con tortugas marinas y mortalidades en el Océano Pacífico oriental (OPO) en 2023 reportadas por observadores a bordo de buques palangreros bajo el mandato actual de al menos 5% de cobertura (C-19-08) de cada flota de los CPC que opera en el OPO. Las disposiciones que se considera que indican un evento de supervivencia son las reportadas por los observadores como “Viva y sana”, “Heridas leves”, "Liberada" y "Liberada con un anzuelo", mientras que las que se considera que indican un evento de mortalidad son las disposiciones reportadas como "Muerta", "Descartada", "Heridas graves", "Herida", "Viva y herida" o, de manera precautoria, cuando la disposición no fue reportada. Estos datos se consideran incompletos ya que son insuficientes para expandirlos a totales de la flota (BYC-10 INF-D) (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos asociadas a la notificación de datos de palangre).

| Common name | Scientific name | Interactions | Mortalities |
|---------------------|-------------------------------|--------------|-------------|
| Black/Green turtle | <i>Chelonia mydas</i> | 50 | 6 |
| Olive ridley turtle | <i>Lepidochelys olivacea</i> | 16 | - |
| Loggerhead turtle | <i>Caretta caretta</i> | 11 | 4 |
| Leatherback turtle | <i>Dermochelys coriacea</i> | 10 | 3 |
| Hawksbill turtle | <i>Eretmochelys imbricata</i> | 1 | - |
| Total numbers | | 88 | 13 |

Table L-3. Minimum number of seabird interactions in the eastern Pacific Ocean (EPO) in 2023 reported by observers onboard longline vessels under the current mandate of at least 5% coverage (C-19-08) of each CPC fleet operating in the EPO. Seabird interactions with reported dispositions as “discarded” was precautionarily presumed to be mortalities; one interaction reported as “released” was presumed to indicate survival. These data are considered incomplete as data are insufficient for expanding to fleet totals (BYC-10 INF-D) (see section 2.2 for uncertainty and data gaps associated with longline data reporting).

Tabla L-3. Número mínimo de interacciones con aves marinas en el Océano Pacífico oriental (OPO) en 2022 reportadas por observadores a bordo de buques palangreros bajo el mandato actual de al menos 5% de cobertura (C-19-08) de cada flota de los CPC que opera en el OPO. Se supone precautoriamente que las interacciones con aves marinas con disposiciones reportadas como "descartada" son mortalidades; se supuso que una interacción reportada como “liberada” indicaba supervivencia. Estos datos se consideran incompletos ya que son insuficientes para expandirlos a totales de la flota (BYC-10 INF-D) (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos asociadas a la notificación de datos de palangre).

| Common name | Scientific name | Interactions | Mortalities |
|------------------------|-----------------------------|--------------|-------------|
| Black-footed albatross | <i>Phoebastria nigripes</i> | 10 | 10 |
| Albatross nei | <i>Diomedea</i> spp. | 5 | 4 |
| Total numbers | | 15 | 14 |

Table L-4a. Estimated purse-seine catches by set type in metric tons (t) of sharks by observers onboard size-class 6 vessels with a carrying capacity >363 t (1994–2024) and minimum reported longline (LL) catches of sharks (gross-annual removals in t) (1994–2023, *data not available; see section 2.2. for uncertainty and data gaps in reporting of bycatch caught by longline). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Species highlighted bold are discussed in main text. Data for 2019–2023 (longline) and 2023–2024 (purse-seine) are considered preliminary.

Tabla L-4a. Capturas cerqueras estimadas de tiburones, por tipo de lance, en toneladas (t), por observadores a bordo de buques de clase 6 con una capacidad de acarreo >363 t (1994–2024) y capturas palangreras (LL) mínimas reportadas de tiburones (extracciones anuales brutas en t) (1994–2023, *datos no disponibles; ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos en la notificación de especies capturadas incidentalmente con palangre). Tipos de lances cerqueros: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las especies en negritas se discuten en el texto principal. Los datos de 2019–2023 (palangre) y 2023–2024 (cerco) se consideran preliminares.

| Year | Carcharhinidae | | | | | | | | | | | | | | | |
|--------------|--|--------------|--------------|----------------|--|-----------|-----------|--------------|--|-----------|----------|----------------|---|------------|------------|---------------|
| | <i>Carcharhinus falciformis</i> , silky shark | | | | <i>Carcharhinus longimanus</i> , oceanic whitetip | | | | <i>Prionace glauca</i> , blue shark | | | | Other Carcharhinidae, requiem sharks | | | |
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | |
| | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL |
| 1994 | 439 | 244 | 38 | - | 119 | 9 | 4 | - | <1 | 1 | <1 | 209 | 24 | 14 | 5 | - |
| 1995 | 471 | 120 | 162 | - | 200 | 36 | 18 | - | <1 | 5 | <1 | 280 | 4 | 2 | 11 | - |
| 1996 | 442 | 107 | 47 | - | 209 | 5 | 12 | - | 2 | <1 | <1 | 606 | 12 | <1 | 7 | - |
| 1997 | 843 | 188 | 42 | - | 236 | 11 | 6 | - | 2 | <1 | <1 | 425 | 18 | 3 | 5 | - |
| 1998 | 710 | 59 | 171 | - | 211 | 7 | 5 | - | 1 | <1 | <1 | 1,164 | 4 | <1 | <1 | - |
| 1999 | 460 | 100 | 74 | - | 163 | 7 | 2 | - | <1 | <1 | <1 | 2,185 | 9 | <1 | <1 | - |
| 2000 | 308 | 97 | 30 | - | 98 | 9 | 2 | - | <1 | <1 | <1 | 2,112 | 5 | <1 | <1 | - |
| 2001 | 399 | 76 | 53 | - | 96 | <1 | <1 | - | 4 | <1 | <1 | 2,304 | 9 | <1 | - | - |
| 2002 | 291 | 142 | 35 | - | 31 | 6 | <1 | <1 | 1 | <1 | <1 | 2,356 | 4 | 17 | <1 | - |
| 2003 | 320 | 102 | 59 | - | 19 | <1 | <1 | - | <1 | <1 | <1 | 2,054 | 7 | 6 | <1 | - |
| 2004 | 247 | 68 | 76 | - | 9 | <1 | <1 | <1 | <1 | <1 | - | 2,325 | 5 | 3 | <1 | - |
| 2005 | 322 | 41 | 51 | - | 2 | - | <1 | - | <1 | <1 | - | 2,825 | 4 | 2 | 3 | - |
| 2006 | 361 | 46 | 27 | 13,053 | 5 | <1 | <1 | 46 | <1 | 1 | <1 | 1,341 | 13 | 3 | 8 | 280 |
| 2007 | 316 | 156 | 41 | 12,771 | 2 | - | <1 | 136 | <1 | 1 | - | 3,169 | 8 | 24 | 11 | 419 |
| 2008 | 577 | 27 | 25 | 11,205 | 2 | - | <1 | 55 | <1 | 1 | <1 | 6,838 | 11 | <1 | 1 | 741 |
| 2009 | 339 | 31 | 33 | 14,042 | 4 | <1 | <1 | 294 | <1 | <1 | <1 | 6,678 | 29 | 4 | 20 | 431 |
| 2010 | 347 | 66 | 70 | 12,510 | 2 | - | <1 | 94 | <1 | 1 | 1 | 10,130 | 17 | 10 | 21 | 4,259 |
| 2011 | 266 | 26 | 55 | 12,866 | 2 | - | <1 | 63 | <1 | <1 | 1 | 13,863 | 20 | 6 | 4 | 4,730 |
| 2012 | 200 | 33 | 52 | 10,585 | <1 | <1 | - | 1 | <1 | 2 | <1 | 12,565 | 8 | <1 | 1 | 4,082 |
| 2013 | 212 | 55 | 38 | 14,762 | <1 | <1 | - | 5 | <1 | <1 | 1 | 12,237 | 12 | 2 | 3 | 753 |
| 2014 | 422 | 68 | 45 | 5,511 | 2 | - | - | 25 | 1 | <1 | <1 | 10,728 | 13 | <1 | 5 | 1,515 |
| 2015 | 540 | 133 | 48 | 5,690 | 3 | <1 | <1 | 647 | <1 | <1 | <1 | 13,194 | 31 | 7 | 2 | 1,901 |
| 2016 | 488 | 36 | 63 | 9,610 | 5 | <1 | <1 | 755 | <1 | 2 | 1 | 12,381 | 35 | <1 | 3 | 2,755 |
| 2017 | 665 | 12 | 21 | 15,893 | 4 | <1 | <1 | 3 | <1 | <1 | - | 11,086 | 54 | <1 | 2 | 2,562 |
| 2018 | 397 | 12 | 16 | 15,072 | 3 | - | <1 | 19 | <1 | <1 | <1 | 12,499 | 28 | 3 | 1 | 1,360 |
| 2019 | 392 | 13 | 25 | 2,599 | 5 | <1 | <1 | - | <1 | <1 | <1 | 11,070 | 26 | 4 | 6 | 10 |
| 2020 | 345 | 11 | 33 | 14,752 | 4 | - | <1 | - | <1 | <1 | - | 15,080 | 87 | 5 | 4 | 2,896 |
| 2021 | 542 | 10 | 21 | 12 | 12 | <1 | <1 | - | <1 | <1 | <1 | 8,920 | 30 | <1 | <1 | - |
| 2022 | 614 | 23 | 7 | 37 | 12 | <1 | <1 | - | 1 | <1 | - | 10,563 | 30 | 2 | 2 | - |
| 2023 | 473 | 10 | 24 | 55 | 12 | <1 | <1 | - | <1 | <1 | - | 10,268 | 26 | <1 | 2 | - |
| 2024 | 626 | 78 | 23 | * | 21 | <1 | <1 | * | <1 | 1 | - | * | 25 | <1 | 1 | * |
| Total | 13,377 | 2,190 | 1,504 | 171,025 | 1,494 | 95 | 56 | 2,143 | 23 | 24 | 9 | 201,459 | 607 | 126 | 131 | 28,694 |

Table L-4a Continued

| Year | Sphyrnidae | | | | | | | | | | | | | | | |
|--------------|---|-----|-----|--------|---|-----|-----|-----|---|-----|-----|----|--|-----|-----|-------|
| | <i>Sphyrna zygaena</i> , smooth hammerhead | | | | <i>Sphyrna lewini</i> , scalloped hammerhead | | | | <i>Sphyrna mokarran</i> , great hammerhead | | | | <i>Sphyrna</i> spp., hammerheads, nei | | | |
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | |
| | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL |
| 1994 | 1 | 2 | <1 | - | <1 | 4 | <1 | - | - | - | - | - | 102 | 24 | 2 | - |
| 1995 | 2 | 2 | - | - | <1 | <1 | <1 | - | <1 | - | - | - | 71 | 15 | 4 | - |
| 1996 | 4 | 2 | - | - | 1 | <1 | - | - | <1 | - | - | - | 87 | 39 | 5 | - |
| 1997 | 21 | 2 | <1 | - | 10 | 3 | <1 | - | 1 | <1 | <1 | - | 63 | 10 | 3 | - |
| 1998 | 18 | 5 | 1 | - | 8 | 9 | <1 | - | 3 | <1 | 3 | - | 37 | 12 | 5 | - |
| 1999 | 21 | 3 | <1 | - | 16 | 3 | 1 | - | 1 | <1 | <1 | - | 18 | 5 | 3 | - |
| 2000 | 11 | 4 | <1 | - | 7 | 15 | 1 | - | 7 | <1 | <1 | - | 7 | 2 | 7 | - |
| 2001 | 24 | 1 | <1 | - | 12 | 1 | <1 | - | 5 | - | <1 | - | 23 | <1 | 1 | - |
| 2002 | 24 | 3 | 1 | - | 47 | <1 | 1 | - | 7 | - | <1 | - | 46 | 4 | 2 | - |
| 2003 | 49 | 6 | 1 | - | 38 | 3 | 3 | - | 13 | <1 | <1 | - | 52 | 3 | 2 | - |
| 2004 | 51 | 11 | 3 | - | 25 | 3 | 2 | - | 3 | <1 | <1 | - | 60 | 2 | <1 | - |
| 2005 | 34 | 2 | <1 | - | 25 | 10 | 3 | - | 2 | - | <1 | - | 19 | <1 | <1 | <1 |
| 2006 | 33 | 6 | 2 | 58 | 19 | 3 | 1 | - | 1 | <1 | <1 | - | 3 | <1 | <1 | 5 |
| 2007 | 27 | 5 | <1 | 200 | 12 | 3 | 1 | <1 | - | <1 | <1 | - | 1 | 1 | <1 | 43 |
| 2008 | 16 | <1 | <1 | 381 | 16 | 11 | <1 | 64 | <1 | - | <1 | - | 6 | <1 | 1 | 42 |
| 2009 | 22 | <1 | <1 | 423 | 13 | 2 | 1 | 50 | <1 | - | - | - | 5 | 1 | <1 | 22 |
| 2010 | 28 | 1 | 2 | 508 | 13 | 1 | 1 | 143 | <1 | - | <1 | - | 3 | <1 | <1 | 118 |
| 2011 | 49 | 2 | 2 | 443 | 13 | 6 | 2 | 191 | 3 | <1 | <1 | - | 12 | <1 | 1 | 131 |
| 2012 | 32 | 2 | <1 | 118 | 9 | 4 | <1 | 89 | <1 | <1 | <1 | - | 5 | 2 | 1 | 130 |
| 2013 | 47 | 2 | <1 | 311 | 22 | 2 | <1 | 87 | <1 | <1 | <1 | - | 9 | 1 | <1 | 296 |
| 2014 | 35 | <1 | <1 | 593 | 23 | 2 | <1 | 5 | 1 | <1 | <1 | - | 14 | <1 | <1 | 208 |
| 2015 | 32 | 1 | <1 | 1,961 | 9 | <1 | <1 | 11 | <1 | <1 | - | - | 9 | <1 | <1 | 392 |
| 2016 | 24 | 1 | <1 | 4,052 | 12 | 1 | <1 | 6 | 5 | <1 | - | - | 11 | 1 | <1 | 338 |
| 2017 | 11 | <1 | <1 | 3,495 | 8 | 3 | <1 | 83 | <1 | <1 | <1 | - | 6 | <1 | <1 | 197 |
| 2018 | 11 | <1 | <1 | 851 | 7 | <1 | <1 | <1 | <1 | - | - | - | 6 | <1 | <1 | 173 |
| 2019 | 17 | <1 | <1 | 33 | 11 | 2 | <1 | 43 | 1 | - | <1 | - | 5 | <1 | <1 | 5 |
| 2020 | 7 | <1 | <1 | 941 | 13 | <1 | <1 | 39 | <1 | - | <1 | - | 5 | <1 | <1 | 1,021 |
| 2021 | 13 | <1 | <1 | 37 | 31 | <1 | <1 | <1 | 2 | - | <1 | - | 7 | - | <1 | - |
| 2022 | 11 | - | <1 | 7 | 47 | <1 | <1 | <1 | <1 | - | - | - | 9 | <1 | <1 | - |
| 2023 | 15 | <1 | <1 | 17 | 19 | <1 | <1 | 40 | <1 | <1 | - | - | 8 | <1 | <1 | - |
| 2024 | 11 | <1 | <1 | * | 15 | <1 | <1 | * | 3 | 1 | <1 | * | 4 | <1 | <1 | * |
| Total | 702 | 68 | 22 | 14,430 | 503 | 97 | 27 | 854 | 65 | 5 | 5 | - | 712 | 130 | 45 | 3,122 |

Table L-4a Continued

| Year | Alopiidae | | | | | | | | | | | | | | | |
|--------------|--|-----|-----|--------|---|-----|-----|-------|---|-----|-----|-------|---|-----|-----|-------|
| | <i>Alopias pelagicus</i> , pelagic thresher | | | | <i>Alopias superciliosus</i> , bigeye thresher | | | | <i>Alopias vulpinus</i> , thresher shark | | | | <i>Alopias</i> spp., thresher shark, nei | | | |
| | Purse seine | | | LL | Purse seine | | | LL | Purse seine | | | LL | Purse seine | | | LL |
| | OBJ | NOA | DEL | | OBJ | NOA | DEL | | OBJ | NOA | DEL | | OBJ | NOA | DEL | |
| 1994 | - | <1 | <1 | - | - | 6 | <1 | - | - | 3 | <1 | - | <1 | 11 | 3 | 87 |
| 1995 | <1 | <1 | <1 | - | <1 | 2 | <1 | - | <1 | 1 | 1 | - | 1 | 6 | 3 | 200 |
| 1996 | - | 1 | - | - | <1 | 1 | <1 | - | <1 | <1 | <1 | - | <1 | 2 | 4 | 28 |
| 1997 | <1 | <1 | - | - | <1 | 1 | <1 | - | <1 | <1 | <1 | - | <1 | 4 | <1 | 5 |
| 1998 | <1 | 2 | <1 | - | <1 | 4 | 1 | - | <1 | 2 | <1 | - | <1 | 5 | 3 | 5 |
| 1999 | <1 | 4 | 2 | - | <1 | 1 | 6 | - | <1 | <1 | <1 | - | <1 | 3 | 2 | 5 |
| 2000 | <1 | <1 | <1 | - | <1 | 8 | 1 | - | <1 | <1 | <1 | - | <1 | <1 | 6 | 64 |
| 2001 | <1 | <1 | <1 | - | <1 | 4 | 2 | - | <1 | <1 | <1 | - | <1 | 4 | 1 | 172 |
| 2002 | <1 | <1 | <1 | - | 2 | 8 | 1 | - | <1 | 2 | <1 | - | <1 | 6 | 4 | 88 |
| 2003 | 1 | 5 | 3 | - | <1 | 8 | 6 | - | <1 | <1 | <1 | - | <1 | 4 | 3 | 134 |
| 2004 | 6 | 3 | 2 | - | <1 | 16 | 1 | - | <1 | 2 | <1 | - | <1 | 4 | 2 | 43 |
| 2005 | 1 | 3 | 2 | - | <1 | 6 | 3 | - | <1 | 1 | 2 | - | <1 | <1 | <1 | 12 |
| 2006 | 2 | 23 | 2 | - | <1 | 22 | 3 | 187 | <1 | 7 | <1 | 60 | <1 | 3 | <1 | 8 |
| 2007 | 3 | 3 | 6 | 1,133 | 2 | 3 | 3 | 115 | <1 | <1 | <1 | 35 | <1 | 1 | 1 | 15 |
| 2008 | 1 | 3 | 3 | 4,323 | <1 | 3 | 3 | 240 | <1 | 2 | <1 | 38 | <1 | 1 | 2 | 17 |
| 2009 | <1 | <1 | 1 | 4,909 | <1 | <1 | 2 | 343 | <1 | <1 | <1 | 76 | <1 | <1 | 1 | 4 |
| 2010 | <1 | <1 | 3 | 7,828 | <1 | <1 | 2 | 373 | 1 | <1 | <1 | 34 | <1 | <1 | 1 | 389 |
| 2011 | <1 | 2 | 2 | 7,302 | <1 | 2 | 2 | 458 | <1 | <1 | <1 | 61 | <1 | 1 | <1 | 430 |
| 2012 | <1 | 1 | 2 | 7 | <1 | 1 | 2 | 326 | <1 | <1 | <1 | 86 | <1 | 1 | <1 | 526 |
| 2013 | <1 | <1 | 3 | 46 | <1 | <1 | 2 | 543 | <1 | <1 | <1 | 49 | <1 | <1 | 1 | 109 |
| 2014 | <1 | 1 | 2 | 36 | <1 | 3 | 2 | 636 | <1 | <1 | <1 | 2 | <1 | <1 | <1 | 850 |
| 2015 | <1 | 2 | 1 | 463 | <1 | 1 | <1 | 859 | <1 | - | <1 | 13 | <1 | <1 | <1 | 283 |
| 2016 | <1 | 2 | 3 | 1,045 | <1 | <1 | 4 | 944 | <1 | 1 | <1 | 549 | <1 | <1 | 1 | 96 |
| 2017 | <1 | <1 | <1 | 582 | <1 | <1 | <1 | 1,148 | - | <1 | <1 | 1,682 | <1 | <1 | <1 | 153 |
| 2018 | <1 | 2 | <1 | 464 | <1 | <1 | <1 | 32 | <1 | <1 | <1 | 1,684 | <1 | <1 | <1 | 39 |
| 2019 | 1 | <1 | <1 | 444 | <1 | <1 | <1 | 17 | - | - | <1 | <1 | <1 | <1 | <1 | 31 |
| 2020 | <1 | <1 | 2 | 342 | <1 | <1 | 1 | 1,273 | - | - | <1 | 745 | <1 | <1 | <1 | 6 |
| 2021 | <1 | <1 | <1 | 1 | <1 | <1 | <1 | 3 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 1 |
| 2022 | <1 | <1 | <1 | 4 | <1 | <1 | <1 | 85 | <1 | <1 | <1 | - | <1 | <1 | <1 | 3 |
| 2023 | <1 | <1 | 2 | 19 | <1 | <1 | 6 | 90 | - | <1 | <1 | - | <1 | <1 | <1 | <1 |
| 2024 | <1 | <1 | <1 | * | <1 | <1 | <1 | * | - | <1 | - | * | <1 | <1 | <1 | * |
| Total | 23 | 65 | 47 | 28,947 | 17 | 106 | 59 | 7,671 | 5 | 29 | 13 | 5,114 | 13 | 63 | 47 | 3,803 |

Table L-4a Continued

| Year | Lamnidae | | | | | | | | Triakidae | | | | Other sharks | | | | All sharks | | | |
|--------------|---------------------------------|----|----|--------|--|----|----|-----|----------------------------------|----|----|--------|--------------|-----|-----|--------|-------------|-------|-------|---------|
| | <i>Isurus</i> spp., mako sharks | | | | Lamnidae spp., mackerel sharks, porbeagles nei | | | | Triakidae spp., houndsharks, nei | | | | Other sharks | | | | All sharks | | | |
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | |
| | OB | NO | DE | LL | OB | NO | DE | LL | OB | NO | DE | LL | OBJ | NO | DEL | LL | OBJ | NOA | DEL | LL |
| | J | A | L | | J | A | L | | J | A | L | | A | | | | | | | |
| 1994 | 2 | <1 | <1 | 156 | - | - | - | - | - | - | - | - | 69 | 47 | 7 | 782 | 759 | 367 | 62 | 1,234 |
| 1995 | 2 | <1 | <1 | 216 | - | - | - | - | - | - | - | - | 103 | 29 | 13 | 226 | 856 | 220 | 213 | 922 |
| 1996 | 1 | <1 | <1 | 318 | - | - | - | - | - | - | - | - | 69 | 41 | 34 | 168 | 830 | 202 | 110 | 1,120 |
| 1997 | 2 | 1 | - | 361 | - | - | - | - | - | - | - | - | 88 | 4 | 2 | 166 | 1,287 | 230 | 62 | 956 |
| 1998 | 1 | <1 | <1 | 693 | - | - | - | - | - | - | - | - | 90 | 10 | 6 | 237 | 1,085 | 116 | 198 | 2,099 |
| 1999 | <1 | <1 | <1 | 460 | - | - | - | - | - | - | - | - | 50 | 12 | 4 | 3,347 | 739 | 140 | 97 | 5,997 |
| 2000 | 2 | <1 | - | 502 | - | - | - | - | - | - | - | - | 21 | 67 | 178 | 5,740 | 466 | 207 | 227 | 8,418 |
| 2001 | 2 | <1 | <1 | 1,168 | - | - | - | - | - | - | - | - | 29 | 4 | 2 | 8,896 | 605 | 94 | 62 | 12,540 |
| 2002 | 4 | <1 | <1 | 1,131 | - | - | - | - | - | - | - | 1,484 | 40 | 11 | 3 | 7,339 | 497 | 201 | 51 | 12,398 |
| 2003 | 2 | <1 | <1 | 1,156 | - | - | - | - | - | - | - | 1,287 | 12 | 37 | 4 | 9,866 | 516 | 177 | 83 | 14,498 |
| 2004 | 1 | <1 | <1 | 1,374 | - | - | - | - | - | - | - | 846 | 36 | 10 | 5 | 6,684 | 446 | 125 | 95 | 11,273 |
| 2005 | 1 | 2 | <1 | 1,367 | - | - | - | - | - | - | - | 838 | 5 | 1 | 1 | 7,075 | 417 | 71 | 67 | 12,117 |
| 2006 | 2 | 4 | <1 | 95 | - | - | - | 2 | - | - | - | 674 | 8 | <1 | <1 | 4,770 | 449 | 118 | 46 | 20,579 |
| 2007 | 2 | 2 | - | 181 | - | - | - | 1 | - | - | - | 996 | 5 | 3 | 1 | 5,786 | 380 | 203 | 67 | 25,000 |
| 2008 | <1 | 2 | <1 | 707 | - | - | - | 1 | - | - | - | 1,398 | 12 | <1 | 2 | 4,091 | 644 | 52 | 40 | 30,141 |
| 2009 | 1 | <1 | <1 | 534 | - | - | - | 7 | - | - | - | 695 | 19 | 3 | 1 | 2,478 | 434 | 46 | 63 | 30,988 |
| 2010 | 3 | <1 | <1 | 1,901 | - | - | - | <1 | - | - | - | <1 | 17 | 4 | 2 | 2,246 | 433 | 87 | 104 | 40,533 |
| 2011 | 3 | 2 | <1 | 2,802 | - | - | - | 26 | - | - | - | 7 | 30 | <1 | <1 | 2,074 | 401 | 51 | 72 | 45,449 |
| 2012 | 2 | 2 | <1 | 2,120 | - | - | - | 12 | - | - | - | - | 10 | <1 | <1 | 1,242 | 272 | 50 | 62 | 31,889 |
| 2013 | 1 | <1 | <1 | 2,121 | - | - | - | 44 | - | - | - | 211 | 45 | 2 | <1 | 1,517 | 351 | 67 | 49 | 33,090 |
| 2014 | 2 | <1 | <1 | 2,778 | - | - | - | 51 | - | - | - | 4,067 | 24 | <1 | <1 | 2,075 | 540 | 78 | 56 | 29,081 |
| 2015 | <1 | <1 | <1 | 3,118 | - | - | - | 79 | - | - | - | 621 | 18 | 3 | 3 | 10,593 | 645 | 151 | 58 | 39,825 |
| 2016 | 1 | <1 | <1 | 2,476 | - | - | - | 91 | - | - | - | 538 | 19 | 3 | <1 | 2,245 | 602 | 50 | 78 | 37,880 |
| 2017 | <1 | <1 | - | 3,256 | - | - | - | 112 | - | - | - | 987 | 16 | 1 | <1 | 1,267 | 766 | 21 | 27 | 42,506 |
| 2018 | 2 | <1 | <1 | 3,161 | - | - | - | 111 | - | - | - | 730 | 5 | <1 | <1 | 1,161 | 460 | 21 | 20 | 37,357 |
| 2019 | <1 | <1 | <1 | 2,021 | - | - | - | 8 | - | - | - | <1 | 6 | <1 | <1 | 53 | 465 | 23 | 34 | 16,335 |
| 2020 | 2 | <1 | - | 3,693 | - | - | - | 95 | - | - | - | 1,032 | 3 | 2 | <1 | 2,381 | 467 | 21 | 42 | 44,297 |
| 2021 | 2 | <1 | - | 1,604 | - | - | - | 7 | - | - | - | 2 | 6 | <1 | <1 | 162 | 646 | 12 | 24 | 10,750 |
| 2022 | 1 | <1 | - | 1,324 | - | - | - | 5 | - | - | - | - | 2 | <1 | <1 | 121 | 729 | 27 | 11 | 12,150 |
| 2023 | 1 | - | <1 | 1,220 | - | - | - | 6 | - | - | - | - | 1 | <1 | <1 | 4 | 557 | 13 | 36 | 11,719 |
| 2024 | <1 | <1 | <1 | * | - | - | - | * | - | - | - | * | 2 | 1 | <1 | * | 709 | 86 | 26 | * |
| Total | 50 | 26 | 3 | 44,013 | - | - | - | 660 | - | - | - | 16,414 | 860 | 301 | 274 | 94,793 | 18,451 | 3,325 | 2,242 | 623,140 |

Table L-4b. Minimum number of shark interactions and mortalities in the eastern Pacific Ocean (EPO) in 2023 reported by observers onboard longline vessels under the current mandate of at least 5% coverage (C-19-08) of each CPC fleet operating in the EPO. Data are considered incomplete and are deemed by the staff to be insufficient for expanding to fleet totals (BYC-10 INF-D) (see section 2.2 for uncertainty and data gaps associated with longline data reporting). Dispositions considered to indicate a survival event are those reported by observers as “Alive and Healthy”, “Alive with light injuries” and “Alive”, while those considered to indicate a mortality event are dispositions reported as “Dead”, “Alive mortal”, “Alive injured”, “Discarded”, “Unknown”, or precautionarily where disposition was not reported.

Tabla L-4b. Número mínimo de interacciones con tiburones y mortalidades en el Océano Pacífico oriental en 2023 reportadas por observadores a bordo de buques palangreros bajo el mandato actual de al menos 5% de cobertura (C-19-08) de cada flota de los CPC que opera en el OPO. Los datos se consideran incompletos y el personal considera que son insuficientes para expandirlos a totales de la flota (BYC-10 INF-D) (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos asociadas a la notificación de datos de palangre). Las disposiciones que se considera que indican un evento de supervivencia son las reportadas por los observadores como "Vivo y sano", "Vivo con heridas leves" y "Vivo", mientras que las que se considera que indican un evento de mortalidad son las disposiciones reportadas como "Muerto", "Vivo, mortalidad probable", "Vivo herido", "Descartado", "Desconocida" o precautoriamente cuando la disposición no fue reportada.

| Common name | Scientific name | Interactions | Mortalities |
|------------------------|-----------------------------------|--------------|-------------|
| Blue shark | <i>Prionace glauca</i> | 4,508 | 4,179 |
| Crocodile shark | <i>Pseudocarcharias kamoharai</i> | 545 | 152 |
| Short fin mako shark | <i>Isurus oxyrinchus</i> | 225 | 225 |
| Bigeye thresher shark | <i>Alopias superciliosus</i> | 119 | 111 |
| Velvet dogfish | <i>Zameus squamulosus</i> | 115 | 106 |
| Various sharks nei | Euselachii | 98 | 98 |
| Pelagic thresher shark | <i>Alopias pelagicus</i> | 76 | 44 |
| Thresher shark, nei | <i>Alopias</i> spp. | 35 | 31 |
| Oceanic whitetip shark | <i>Carcharhinus longimanus</i> | 26 | 22 |
| Longfin mako shark | <i>Isurus paucus</i> | 21 | 20 |
| Shark - identified | Euselachii | 21 | 21 |
| Silky shark | <i>Carcharhinus falciformis</i> | 12 | 8 |
| Other sharks* | | 29 | 26 |
| Total numbers | | 5,830 | 5,043 |

*"Other sharks" include those with ≤ 10 interactions from 11 taxa in 2023

Table L-5a. Estimated purse-seine catches by set type in numbers of rays by observers onboard size-class 6 vessels with a carrying capacity >363 t (1994–2024). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Species highlighted bold are discussed in main text. Data for 2023–2024 are considered preliminary.

Tabla L-5a. Capturas cerqueras estimadas de rayas, por tipo de lance, en número de rayas, por observadores a bordo de buques de clase 6 con una capacidad de acarreo >363 t (1994–2024). Tipos de lances cerqueros: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las especies en negritas se discuten en el texto principal. Los datos de 2023–2024 se consideran preliminares.

| Year | Mobulidae | | | | | | | | | | | | | | |
|-------|--|-------|-------|---|-------|-------|--|-----|-----|---|-----|-----|---|-------|-----|
| | <i>Mobula thurstoni</i>, smoothtail manta | | | <i>Mobula mobular</i>, spinetail manta | | | <i>Mobula munkiana</i> , munk's devil ray | | | <i>Mobula tarapacana</i> , Chilean devil ray | | | <i>Mobula birostris</i>, giant manta | | |
| | Purse seine | | | Purse seine | | | Purse seine | | | Purse seine | | | Purse seine | | |
| | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL |
| 1994 | - | 3 | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| 1995 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - |
| 1996 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1997 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| 1998 | - | 8 | - | - | - | - | - | - | - | - | - | - | 4 | 94 | 1 |
| 1999 | - | 2 | 1 | - | - | - | - | - | - | - | - | - | 10 | 63 | 1 |
| 2000 | 34 | 121 | 101 | - | - | - | - | - | - | - | - | - | 1 | 12 | 2 |
| 2001 | 7 | 185 | 98 | 2 | 8 | 16 | - | - | 3 | 4 | - | - | 2 | 6 | 6 |
| 2002 | 18 | 2,048 | 72 | 7 | 8 | 96 | 1 | 3 | 10 | 7 | 15 | 7 | 2 | 6 | 5 |
| 2003 | 37 | 707 | 141 | 6 | 79 | 11 | 7 | 35 | 26 | - | - | 8 | 3 | 10 | 1 |
| 2004 | 8 | 429 | 86 | 2 | 30 | 57 | - | 15 | 17 | 1 | 28 | 4 | 2 | 47 | 15 |
| 2005 | 14 | 72 | 205 | 16 | 111 | 126 | - | 21 | 14 | 3 | 42 | 79 | 10 | 23 | 36 |
| 2006 | 14 | 572 | 43 | 19 | 473 | 187 | - | 65 | 31 | 5 | 52 | 45 | 30 | 37 | 219 |
| 2007 | 14 | 64 | 105 | 32 | 202 | 148 | 2 | 29 | 24 | 24 | 37 | 55 | 5 | 17 | 8 |
| 2008 | 14 | 126 | 50 | 30 | 247 | 87 | 8 | 127 | 36 | 10 | 276 | 30 | 3 | 61 | 18 |
| 2009 | 22 | 31 | 93 | 17 | 56 | 243 | 9 | 45 | 6 | 2 | 21 | 190 | 1 | 11 | 6 |
| 2010 | 39 | 123 | 132 | 22 | 334 | 303 | 1 | 48 | 33 | 7 | 12 | 148 | 2 | 1,163 | 4 |
| 2011 | 6 | 397 | 27 | 18 | 104 | 152 | 11 | 58 | 29 | 9 | 28 | 78 | 5 | 9 | 1 |
| 2012 | 15 | 1,435 | 67 | 48 | 243 | 34 | 3 | 63 | 6 | 7 | 94 | 21 | 6 | 949 | 13 |
| 2013 | 25 | 180 | 40 | 18 | 112 | 62 | 6 | 55 | 6 | 7 | 29 | 26 | 1 | 24 | 21 |
| 2014 | 22 | 29 | 75 | 179 | 87 | 57 | 6 | 4 | 15 | 5 | 10 | 18 | 7 | 9 | - |
| 2015 | 14 | 41 | 101 | 61 | 21 | 338 | 6 | 11 | 74 | 12 | 25 | 93 | 1 | 67 | 38 |
| 2016 | 18 | 31 | 166 | 5 | 26 | 115 | 2 | 236 | 86 | 13 | 17 | 26 | 7 | 68 | 3 |
| 2017 | 11 | 52 | 43 | 45 | 26 | 15 | 8 | 15 | 10 | 10 | - | 11 | 8 | 53 | 11 |
| 2018 | 6 | 29 | 5 | 37 | 48 | 56 | 22 | 4 | 12 | 8 | 2 | 2 | 11 | 7 | 1 |
| 2019 | 7 | 214 | 11 | 35 | 167 | 61 | 9 | - | 8 | 24 | 8 | 18 | 2 | 11 | 3 |
| 2020 | 9 | 4 | 12 | 19 | 113 | 37 | 1 | - | 47 | 5 | 2 | 7 | 7 | - | 1 |
| 2021 | 8 | - | - | 34 | 46 | 16 | 10 | 5 | - | 11 | 3 | 13 | 1 | 26 | - |
| 2022 | 5 | - | 98 | 43 | 8 | 25 | 12 | - | 4 | 23 | - | 12 | 3 | - | 8 |
| 2023 | 28 | 6 | 90 | 25 | 4 | 37 | 5 | 8 | 220 | 73 | 8 | 14 | 2 | 5 | 3 |
| 2024 | 12 | 171 | 67 | 73 | 328 | 33 | 2 | 32 | 69 | 39 | 23 | 12 | 4 | 6 | 3 |
| Total | 408 | 7,081 | 1,928 | 792 | 2,881 | 2,313 | 132 | 879 | 787 | 310 | 733 | 918 | 141 | 2,788 | 428 |

Table L-5a Continued

| Year | Mobulidae | | | Dasyatidae | | | | | | Other rays | | | All rays | | |
|-------|--------------------------------------|--------|-------|--|--------|-------|------------------------------------|-------|-----|-------------|-------|-----|-------------|--------|--------|
| | Mobulidae spp., mobulid rays, nei | | | <i>Pteroplatytrygon violacea</i> , pelagic stingray | | | Dasyatidae spp., stingrays, nei | | | Purse seine | | | Purse seine | | |
| | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL | OBJ | NOA | DEL |
| 1994 | 52 | 1,266 | 375 | 140 | 1,632 | 337 | - | - | - | - | - | - | 193 | 2,901 | 712 |
| 1995 | 69 | 2,248 | 500 | 159 | 151 | 144 | - | - | - | - | - | - | 228 | 2,400 | 643 |
| 1996 | 124 | 1,341 | 385 | 101 | 165 | 176 | - | - | - | - | - | - | 225 | 1,506 | 561 |
| 1997 | 126 | 707 | 396 | 106 | 106 | 993 | - | - | - | - | - | - | 232 | 816 | 1,390 |
| 1998 | 73 | 2,906 | 337 | 95 | 258 | 170 | - | 1,136 | - | 2 | 1 | - | 174 | 4,403 | 508 |
| 1999 | 140 | 1,498 | 474 | 164 | 403 | 151 | - | - | - | - | - | - | 314 | 1,966 | 627 |
| 2000 | 36 | 1,805 | 1,276 | 104 | 221 | 159 | - | - | - | - | - | - | 175 | 2,159 | 1,537 |
| 2001 | 50 | 289 | 447 | 150 | 64 | 174 | - | - | - | - | - | - | 215 | 553 | 744 |
| 2002 | 40 | 1,994 | 723 | 113 | 60 | 153 | 2 | - | - | - | - | - | 190 | 4,133 | 1,066 |
| 2003 | 130 | 1,005 | 904 | 94 | 9,188 | 135 | - | - | - | - | - | - | 277 | 11,025 | 1,226 |
| 2004 | 63 | 656 | 351 | 138 | 39 | 86 | 4 | 282 | 5 | - | - | - | 218 | 1,526 | 620 |
| 2005 | 36 | 259 | 177 | 91 | 52 | 173 | 9 | 13 | 20 | - | 1,724 | - | 179 | 2,317 | 831 |
| 2006 | 43 | 340 | 295 | 153 | 91 | 202 | 29 | 764 | 30 | - | - | 160 | 293 | 2,394 | 1,213 |
| 2007 | 40 | 205 | 237 | 98 | 54 | 132 | 9 | 931 | 21 | - | 19 | - | 225 | 1,557 | 730 |
| 2008 | 41 | 145 | 91 | 97 | 19 | 87 | 14 | 20 | 28 | - | - | - | 217 | 1,022 | 427 |
| 2009 | 37 | 107 | 270 | 116 | 17 | 105 | 5 | 4 | 68 | - | - | - | 209 | 292 | 981 |
| 2010 | 97 | 629 | 256 | 101 | 21 | 901 | 5 | - | 60 | - | 1,596 | - | 274 | 3,926 | 1,837 |
| 2011 | 27 | 227 | 81 | 92 | 193 | 90 | 13 | 114 | 18 | - | 24 | - | 181 | 1,154 | 476 |
| 2012 | 18 | 186 | 41 | 121 | 30 | 100 | 13 | 17 | 3 | 1 | 12 | 7 | 232 | 3,029 | 292 |
| 2013 | 15 | 121 | 323 | 90 | 59 | 255 | 27 | 2 | 6 | - | - | 403 | 189 | 582 | 1,142 |
| 2014 | 24 | 72 | 24 | 173 | 43 | 108 | 19 | 22 | 18 | - | - | - | 436 | 277 | 315 |
| 2015 | 20 | 54 | 141 | 82 | 65 | 163 | 11 | 5 | 32 | - | - | - | 207 | 289 | 980 |
| 2016 | 41 | 248 | 162 | 60 | 37 | 352 | 12 | - | 70 | - | - | - | 159 | 663 | 980 |
| 2017 | 141 | 290 | 100 | 258 | 76 | 130 | 31 | 68 | 144 | - | - | 137 | 512 | 580 | 601 |
| 2018 | 102 | 117 | 155 | 247 | 61 | 123 | 62 | 17 | 14 | - | - | - | 495 | 286 | 368 |
| 2019 | 87 | 484 | 165 | 255 | 185 | 143 | 40 | 38 | 27 | - | 8 | 1 | 460 | 1,114 | 437 |
| 2020 | 62 | 67 | 163 | 260 | 145 | 160 | 17 | 14 | 41 | - | - | - | 380 | 345 | 468 |
| 2021 | 85 | 73 | 154 | 388 | 178 | 117 | 46 | 3 | 14 | - | 25 | - | 584 | 360 | 314 |
| 2022 | 128 | 23 | 95 | 422 | 76 | 187 | 34 | 9 | 7 | - | - | - | 671 | 116 | 437 |
| 2023 | 112 | 20 | 81 | 333 | 37 | 173 | 40 | 12 | 5 | 1 | - | 20 | 618 | 100 | 643 |
| 2024 | 144 | 367 | 101 | 349 | 304 | 291 | 42 | 60 | 88 | - | 1 | - | 665 | 1,292 | 664 |
| Total | 2,203 | 19,750 | 9,280 | 5,150 | 14,029 | 6,669 | 485 | 3,531 | 719 | 4 | 3,410 | 729 | 9,626 | 55,082 | 23,771 |

Table L-5b. Minimum number of ray interactions and mortalities in the eastern Pacific Ocean (EPO) in 2023 reported by observers onboard longline vessels under the current mandate of at least 5% coverage (C-19-08) of each CPC fleet operating in the EPO. Data are considered incomplete as data are insufficient for expanding to fleet totals (BYC-10 INF-D) (see section 2.2 for uncertainty and data gaps associated with longline data reporting). Dispositions considered to indicate a survival event are those reported by observers as “Alive and Healthy”, “Alive with light injuries”, “Alive” and “Escaped”, while those considered to indicate a mortality event are dispositions reported as “Dead”, “Alive mortal”, “Alive injured”, “Discarded”, “Unknown”, or precautionarily where disposition was not reported.

Tabla L-5b. Número mínimo de interacciones con rayas y mortalidades en el Océano Pacífico oriental en 2023 reportadas por observadores a bordo de buques palangreros bajo el mandato actual de al menos 5% de cobertura (C-19-08) de cada flota de los CPC que opera en el OPO. Los datos se consideran incompletos ya que los datos son insuficientes para expandirlos a totales de la flota (BYC-10 INF-D) (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos asociadas a la notificación de datos de palangre). Las disposiciones que se considera que indican un evento de supervivencia son las reportadas por los observadores como "Viva y sana", "Viva con heridas leves", "Viva" y "Escapada", mientras que las que se considera que indican un evento de mortalidad son las disposiciones reportadas como "Muerta", "Viva, mortalidad probable", "Viva herida", "Descartada", "Desconocida" o precautoriamente cuando la disposición no fue reportada.

| Common name | Scientific name | Total interactions | Mortalities |
|-------------------|----------------------------------|--------------------|-------------|
| Pelagic stingray | <i>Pteroplatytrygon violacea</i> | 3,832 | 3,634 |
| Rays, skates, nei | Rajiformes | 6 | 1 |
| Giant manta | <i>Mobula birostris</i> | 4 | 3 |
| Manta rays | Mobulidae | 4 | 4 |
| Manta ray, nei | <i>Mobula</i> spp. | 1 | 1 |
| Total numbers | | 3,847 | 3,643 |

Table L-6a. Estimated purse-seine catches by set type in metric tons (t) of large fishes by observers onboard size-class 6 vessels with a carrying capacity >363 t (1994–2024) and minimum reported longline (LL) catches of large fishes (gross-annual removals in t) (1994–2023, *data not available, see section 2.2. for uncertainty and data gaps in reporting of bycatch caught by longline). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Species highlighted bold are discussed in main text. Data for 2019–2023 (longline) and 2023–2024 (purse-seine) are considered preliminary.

Tabla L-6a. Capturas cerqueras estimadas de peces grandes, por tipo de lance, en toneladas (t), por observadores a bordo de buques de clase 6 con una capacidad de acarreo >363 t (1994–2024) y capturas palangreras (LL) mínimas reportadas de peces grandes (extracciones anuales brutas en t) (1994–2023, *datos no disponibles; ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos en la notificación de especies capturadas incidentalmente con palangre). Tipos de lances cerqueros: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las especies en negritas se discuten en el texto principal. Los datos de 2019–2023 (palangre) y 2023–2024 (cerco) se consideran preliminares.

| Year | Coryphaenidae | | | | Scombridae | | | | Carangidae | | | | | | | | | | | |
|--------------|-----------------------------------|------------|-----------|----------------|--------------------------------------|-----------|-----------|--------------|---|-----------|--------------|----------|--------------------------------------|------------|--------------|----------|---|------------|----------|----------|
| | Coryphaenidae spp., dorado | | | | Acanthocybium solandri, wahoo | | | | Elagatis bipinnulata, rainbow runner | | | | Seriola spp., amberjacks, nei | | | | Caranx spp., jacks, crevalles, nei | | | |
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | |
| | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL |
| 1994 | 1,221 | 20 | <1 | 46 | 472 | 1 | 1 | <1 | 14 | <1 | <1 | - | <1 | - | - | - | - | - | - | - |
| 1995 | 1,071 | 22 | 3 | 39 | 379 | <1 | <1 | 1 | 11 | <1 | <1 | - | <1 | <1 | - | - | - | - | - | - |
| 1996 | 1,312 | 18 | <1 | 43 | 271 | <1 | <1 | 1 | 28 | 3 | <1 | - | 4 | - | - | - | - | - | - | - |
| 1997 | 1,225 | 12 | <1 | 6,866 | 475 | 3 | 1 | <1 | 60 | 2 | <1 | - | 1 | - | - | - | <1 | - | - | - |
| 1998 | 816 | 18 | <1 | 2,528 | 396 | <1 | 4 | 2 | 93 | <1 | <1 | - | 4 | - | - | - | <1 | - | - | - |
| 1999 | 1,238 | 4 | <1 | 6,283 | 161 | <1 | <1 | 2 | 110 | <1 | <1 | - | <1 | - | - | - | <1 | - | - | - |
| 2000 | 1,437 | 51 | 2 | 3,537 | 277 | 2 | <1 | 2 | 53 | 5 | <1 | - | <1 | - | - | - | <1 | - | - | - |
| 2001 | 2,202 | 17 | 3 | 15,942 | 1,023 | 2 | <1 | 6 | 90 | <1 | <1 | - | 1 | - | - | - | <1 | - | - | - |
| 2002 | 1,815 | 8 | <1 | 9,464 | 571 | <1 | <1 | 18 | 94 | 1 | <1 | - | <1 | <1 | - | - | <1 | - | - | - |
| 2003 | 894 | 11 | 1 | 5,301 | 428 | <1 | <1 | 164 | 108 | 2 | - | - | 1 | <1 | - | - | <1 | - | - | - |
| 2004 | 1,018 | 17 | 1 | 3,986 | 380 | <1 | <1 | 155 | 62 | <1 | - | - | 56 | 9 | <1 | 1 | 2 | <1 | - | - |
| 2005 | 972 | 75 | 1 | 3,854 | 420 | <1 | <1 | 155 | 66 | <1 | <1 | - | 26 | 2 | <1 | - | 2 | 1 | - | - |
| 2006 | 1,197 | 58 | <1 | 3,408 | 424 | 1 | <1 | 167 | 73 | <1 | <1 | - | 53 | 8 | <1 | - | 10 | 220 | <1 | - |
| 2007 | 1,235 | 47 | 1 | 6,907 | 421 | 2 | <1 | 221 | 157 | <1 | - | - | 18 | 80 | <1 | - | 1 | 11 | - | - |
| 2008 | 1,112 | 17 | 2 | 15,845 | 249 | 1 | <1 | 213 | 40 | <1 | <1 | - | 27 | <1 | - | - | 17 | 18 | - | - |
| 2009 | 1,722 | 7 | <1 | 17,136 | 547 | <1 | <1 | 336 | 28 | <1 | <1 | - | 13 | <1 | - | - | 11 | 8 | - | - |
| 2010 | 912 | 3 | <1 | 9,484 | 373 | 1 | <1 | 284 | 17 | <1 | <1 | - | 3 | 23 | - | - | 1 | 48 | - | - |
| 2011 | 1,410 | 7 | <1 | 12,438 | 169 | 2 | <1 | 242 | 22 | <1 | - | - | 7 | 33 | - | <1 | 4 | 14 | - | 1 |
| 2012 | 1,705 | 18 | <1 | 17,255 | 313 | <1 | <1 | 230 | 13 | 1 | - | - | 10 | 7 | - | - | 2 | 15 | <1 | - |
| 2013 | 1,455 | 7 | <1 | 11,249 | 518 | 1 | <1 | 291 | 19 | <1 | - | - | 6 | <1 | <1 | - | 4 | 2 | <1 | - |
| 2014 | 1,779 | 9 | <1 | 3,342 | 517 | 2 | <1 | 287 | 15 | <1 | <1 | - | 6 | 2 | - | - | 3 | <1 | <1 | - |
| 2015 | 1,167 | 8 | <1 | 1,206 | 357 | 1 | <1 | 285 | 15 | <1 | - | - | 6 | <1 | - | - | 9 | 8 | <1 | - |
| 2016 | 949 | 7 | <1 | 446 | 318 | 2 | <1 | 321 | 26 | <1 | <1 | - | 12 | <1 | <1 | - | 4 | <1 | 8 | - |
| 2017 | 1,557 | 11 | <1 | 2,118 | 335 | <1 | <1 | 319 | 18 | <1 | <1 | - | 12 | 5 | <1 | - | 4 | 12 | - | - |
| 2018 | 1,483 | 5 | 5 | 3,932 | 230 | <1 | <1 | 366 | 20 | <1 | - | - | 62 | <1 | - | - | 9 | <1 | - | - |
| 2019 | 1,208 | 29 | <1 | 1,971 | 201 | <1 | <1 | 331 | 21 | <1 | <1 | - | 12 | 4 | <1 | - | 5 | <1 | - | - |
| 2020 | 783 | 4 | <1 | 2,507 | 130 | <1 | <1 | 309 | 23 | - | <1 | - | 9 | 1 | - | <1 | 3 | <1 | <1 | - |
| 2021 | 2,183 | 13 | <1 | 1,431 | 132 | <1 | <1 | 214 | 28 | <1 | <1 | - | 81 | 3 | - | - | 3 | <1 | - | - |
| 2022 | 2,325 | 12 | 2 | 738 | 164 | <1 | <1 | 178 | 35 | <1 | - | - | 25 | 4 | - | - | 6 | <1 | - | - |
| 2023 | 1,457 | 4 | 2 | 421 | 264 | <1 | <1 | 256 | 45 | <1 | <1 | - | 9 | <1 | - | - | 3 | - | - | - |
| 2024 | 865 | 5 | <1 | * | 232 | <1 | <1 | * | 86 | <1 | <1 | * | 16 | - | - | * | 7 | <1 | <1 | * |
| Total | 41,727 | 545 | 36 | 169,724 | 11,150 | 32 | 10 | 5,358 | 1,491 | 20 | <1 | - | 484 | 183 | <1 | 2 | 111 | 360 | 9 | 1 |

Table L-6a Continued

| Year | Carangidae | | | | Molidae | | | | Lobotidae | | | | Sphyraenidae | | | | Lampridae | | | |
|-------|---|-----|-----|-----|------------------------------------|-----|-----|-----|---|-----|-----|----|---|-----|-----|----|-------------------------------|-----|-----|--------|
| | <i>Seriola, Caranx</i> spp., amberjacks, jacks, crevalles, nei | | | | <i>Molidae</i> spp., molas, nei | | | | <i>Lobotes surinamensis</i> , tripletail | | | | <i>Sphyraenidae</i> spp., barracudas | | | | <i>Lampris</i> spp., opahs | | | |
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | |
| | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL |
| 1994 | 19 | 6 | <1 | - | 1 | 3 | 2 | - | <1 | - | - | - | <1 | 34 | - | - | - | - | - | 23 |
| 1995 | 17 | 19 | - | - | 2 | 4 | <1 | - | <1 | <1 | - | - | <1 | 3 | - | - | - | - | - | 33 |
| 1996 | 29 | 153 | - | - | 5 | 6 | <1 | - | <1 | - | - | - | <1 | <1 | - | - | - | - | - | 33 |
| 1997 | 68 | 16 | 3 | - | 5 | 4 | 3 | - | 1 | <1 | <1 | - | <1 | <1 | - | - | - | - | - | 40 |
| 1998 | 72 | 7 | <1 | - | 2 | 2 | 1 | - | 16 | <1 | - | - | <1 | <1 | - | - | - | - | - | 54 |
| 1999 | 52 | 46 | - | - | 2 | 5 | 1 | - | 8 | <1 | - | - | - | - | - | - | - | - | - | 68 |
| 2000 | 29 | 19 | <1 | 4 | 2 | 4 | 1 | - | 4 | <1 | - | - | <1 | - | <1 | - | - | - | - | 88 |
| 2001 | 70 | <1 | <1 | 18 | 6 | 2 | 1 | - | <1 | - | - | - | <1 | <1 | - | - | - | - | - | 73 |
| 2002 | 26 | 9 | <1 | 15 | 6 | 2 | 1 | - | 3 | - | - | - | <1 | - | - | - | - | - | - | 6 |
| 2003 | 43 | <1 | <1 | 54 | <1 | 4 | <1 | - | 3 | <1 | - | - | <1 | - | - | - | - | - | - | 132 |
| 2004 | 8 | 7 | <1 | - | 6 | <1 | 1 | - | 1 | <1 | - | - | <1 | - | - | - | - | - | - | 139 |
| 2005 | 1 | <1 | - | - | 2 | 9 | 2 | - | 7 | <1 | <1 | - | <1 | - | <1 | - | - | - | - | 159 |
| 2006 | 29 | - | - | - | 26 | 14 | 2 | - | 9 | <1 | <1 | - | <1 | - | - | - | - | - | - | 109 |
| 2007 | 2 | 2 | - | 6 | 9 | 8 | 2 | - | 3 | <1 | <1 | - | <1 | 1 | - | - | - | - | - | 370 |
| 2008 | 4 | - | - | 5 | 9 | 6 | 4 | - | 2 | <1 | - | - | <1 | - | <1 | - | - | - | - | 308 |
| 2009 | 3 | <1 | <1 | 10 | 6 | 5 | 1 | - | 7 | <1 | <1 | - | 1 | <1 | - | - | - | - | - | 488 |
| 2010 | <1 | 4 | - | 8 | 9 | 44 | 1 | - | <1 | - | - | - | <1 | - | <1 | - | - | <1 | - | 539 |
| 2011 | <1 | 4 | - | 7 | 4 | 113 | <1 | - | 3 | <1 | - | - | <1 | 2 | <1 | 8 | - | - | - | 539 |
| 2012 | 7 | 1 | - | 1 | 9 | 12 | <1 | - | 3 | <1 | - | - | <1 | <1 | - | - | - | <1 | - | 425 |
| 2013 | 2 | <1 | - | <1 | 9 | 28 | 2 | - | 2 | - | <1 | - | <1 | - | <1 | - | - | <1 | - | 648 |
| 2014 | 2 | 2 | - | 11 | 3 | 9 | 1 | - | 2 | - | <1 | - | <1 | <1 | - | - | - | <1 | - | 818 |
| 2015 | 2 | - | <1 | 11 | 6 | 12 | 1 | 87 | 2 | <1 | - | - | <1 | - | - | - | - | - | - | 1,039 |
| 2016 | 7 | 5 | <1 | 11 | 10 | 7 | <1 | 275 | 2 | - | - | - | <1 | <1 | - | - | - | - | - | 741 |
| 2017 | 4 | 4 | - | - | 8 | 4 | <1 | <1 | 5 | - | <1 | - | <1 | - | - | - | - | - | - | 846 |
| 2018 | 2 | - | - | - | 5 | 2 | <1 | - | 3 | <1 | - | - | <1 | <1 | - | - | - | - | - | 1,102 |
| 2019 | 3 | <1 | - | - | 2 | 6 | <1 | - | 2 | - | <1 | - | <1 | - | - | - | - | - | <1 | 740 |
| 2020 | <1 | 1 | - | - | 1 | <1 | <1 | - | 2 | <1 | - | - | <1 | - | - | - | - | - | - | 684 |
| 2021 | 2 | <1 | - | - | <1 | 2 | <1 | - | 1 | <1 | - | - | 1 | <1 | - | - | - | - | - | 454 |
| 2022 | 4 | <1 | - | - | 2 | 2 | <1 | - | 4 | <1 | <1 | - | <1 | - | - | - | - | - | - | 279 |
| 2023 | 1 | - | - | - | 2 | <1 | <1 | 4 | 2 | - | <1 | - | 2 | - | <1 | <1 | - | - | - | 250 |
| 2024 | 9 | <1 | <1 | * | <1 | 6 | <1 | * | 3 | <1 | - | * | <1 | - | - | * | - | - | - | * |
| Total | 520 | 307 | 4 | 162 | 162 | 325 | 35 | 366 | 102 | <1 | <1 | - | 13 | 41 | <1 | 8 | - | <1 | <1 | 11,226 |

Table L-6a Continued

| Year | <i>Gempylidae</i> spp., snake mackerels, nei | | | | <i>Bramidae</i> spp., pomfrets, nei | | | | Other large fishes | | | | Unidentified fishes | | | | All fishes | | | |
|-------|---|-----|-----|-------|--|-----|-----|-------|--------------------|-----|-----|-----|---------------------|-----|-----|--------|-------------|-------|-----|---------|
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | |
| | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL |
| 1994 | - | - | - | - | - | - | - | 2 | 3 | 87 | <1 | - | <1 | <1 | 12 | 250 | 1,731 | 152 | 16 | 321 |
| 1995 | - | - | - | - | - | - | - | 2 | <1 | 3 | <1 | - | 3 | 1 | <1 | 209 | 1,485 | 53 | 4 | 285 |
| 1996 | - | - | - | - | - | - | - | 2 | 3 | 125 | <1 | - | 3 | <1 | <1 | 456 | 1,655 | 306 | 1 | 535 |
| 1997 | - | - | - | - | - | - | - | 6 | 7 | 5 | <1 | - | 7 | 2 | - | 847 | 1,850 | 44 | 7 | 7,760 |
| 1998 | - | - | - | - | - | - | - | 9 | 13 | 10 | <1 | - | 7 | <1 | <1 | 1,338 | 1,420 | 38 | 7 | 3,931 |
| 1999 | - | - | - | - | - | - | - | 3 | 4 | 54 | <1 | - | 22 | 4 | <1 | 974 | 1,599 | 114 | 2 | 7,330 |
| 2000 | - | - | - | - | - | - | - | 4 | 1 | 1 | - | - | 1 | <1 | <1 | 1,485 | 1,804 | 82 | 4 | 5,119 |
| 2001 | - | - | - | - | - | - | - | 5 | 2 | 9 | <1 | - | 3 | <1 | <1 | 1,720 | 3,398 | 30 | 4 | 17,763 |
| 2002 | - | - | - | - | - | - | - | <1 | 2 | <1 | <1 | - | 2 | 6 | <1 | 1,895 | 2,521 | 27 | 2 | 11,399 |
| 2003 | - | - | - | - | - | - | - | - | 4 | <1 | - | - | 2 | 2 | - | 4,386 | 1,484 | 19 | 2 | 10,037 |
| 2004 | - | - | - | - | - | - | - | - | 4 | <1 | <1 | - | 10 | <1 | <1 | 377 | 1,548 | 35 | 3 | 4,658 |
| 2005 | - | - | - | - | - | - | - | 18 | <1 | <1 | <1 | - | 3 | <1 | <1 | 303 | 1,501 | 89 | 3 | 4,489 |
| 2006 | - | - | - | 18 | - | <1 | - | 17 | <1 | <1 | <1 | 7 | 3 | <1 | <1 | 285 | 1,824 | 302 | 3 | 4,011 |
| 2007 | - | - | - | 65 | - | - | - | 57 | 1 | <1 | <1 | 5 | 1 | 5 | <1 | 1,763 | 1,848 | 158 | 4 | 9,394 |
| 2008 | - | - | - | 144 | - | - | - | 68 | 1 | <1 | <1 | - | <1 | <1 | <1 | 793 | 1,462 | 44 | 6 | 17,375 |
| 2009 | - | - | - | 412 | - | - | - | 56 | 1 | <1 | <1 | 67 | 2 | - | <1 | 1,077 | 2,343 | 21 | 2 | 19,581 |
| 2010 | - | - | - | 575 | - | - | - | 64 | <1 | - | <1 | - | <1 | <1 | - | 879 | 1,318 | 122 | 2 | 11,833 |
| 2011 | - | - | - | 506 | - | <1 | - | 50 | <1 | <1 | - | 15 | <1 | - | <1 | 612 | 1,621 | 175 | <1 | 14,418 |
| 2012 | - | - | - | 661 | - | - | - | 61 | <1 | 2 | <1 | 11 | 1 | <1 | - | 1,305 | 2,065 | 57 | 1 | 19,949 |
| 2013 | - | - | - | 574 | - | - | - | 134 | <1 | <1 | <1 | 36 | <1 | <1 | - | 1,112 | 2,016 | 40 | 3 | 14,045 |
| 2014 | - | - | - | 431 | - | - | - | 138 | <1 | <1 | - | 77 | <1 | - | - | 1,013 | 2,329 | 25 | 2 | 6,116 |
| 2015 | - | - | - | 321 | <1 | - | - | 172 | <1 | <1 | - | 7 | 2 | <1 | - | 1,367 | 1,568 | 30 | 2 | 4,495 |
| 2016 | <1 | - | - | 730 | - | - | - | 108 | <1 | <1 | <1 | 100 | <1 | 1 | - | 506 | 1,328 | 23 | 9 | 3,238 |
| 2017 | - | - | - | 301 | - | - | - | 126 | <1 | <1 | - | 62 | 1 | - | - | 1,532 | 1,946 | 36 | 1 | 5,304 |
| 2018 | - | - | - | 260 | - | - | - | 125 | <1 | - | - | 1 | - | - | - | 222 | 1,816 | 9 | 6 | 6,009 |
| 2019 | - | - | - | 338 | - | - | - | 81 | <1 | - | - | 26 | <1 | <1 | <1 | 272 | 1,455 | 41 | 1 | 3,759 |
| 2020 | - | - | - | 288 | - | - | - | 70 | <1 | - | - | 213 | <1 | <1 | <1 | 462 | 953 | 9 | <1 | 4,534 |
| 2021 | - | - | - | 302 | - | - | - | 50 | <1 | <1 | - | <1 | <1 | <1 | - | 1,153 | 2,432 | 19 | 1 | 3,607 |
| 2022 | - | - | - | 212 | <1 | - | - | 53 | <1 | <1 | - | <1 | <1 | - | - | 1,902 | 2,564 | 19 | 3 | 3,364 |
| 2023 | - | - | - | 288 | <1 | <1 | - | 64 | <1 | - | - | 7 | - | - | - | 2,326 | 1,785 | 5 | 3 | 3,616 |
| 2024 | - | - | - | * | - | - | - | * | <1 | <1 | <1 | * | <1 | - | - | * | 1,220 | 13 | 1 | * |
| Total | <1 | - | - | 6,427 | <1 | <1 | - | 1,544 | 54 | 298 | <1 | 636 | 75 | 24 | 12 | 32,822 | 55,888 | 2,136 | 108 | 228,276 |

Table L-6b. Minimum number of interactions and mortalities of large fishes in the eastern Pacific Ocean (EPO) in 2023 reported by observers onboard longline vessels under the current mandate of at least 5% coverage (C-19-08) of each CPC fleet operating in the EPO. Data are incomplete and considered insufficient for expanding to fleet totals (BYC-10 INF-D) (see section 2.2 for uncertainty and data gaps associated with longline data reporting). Dispositions considered to indicate a survival event are those reported by observers as “Alive and Healthy”, “Alive with light injuries” and “Alive”, while those considered to indicate a mortality event are dispositions reported as “Dead”, “Alive mortal”, “Alive injured”, “Discarded”, “Unknown”, or where disposition was not reported.

Tabla L-6b. Número mínimo de interacciones y mortalidades de peces grandes en el Océano Pacífico oriental en 2023 reportadas por observadores a bordo de buques palangreros bajo el mandato actual de al menos 5% de cobertura (C-19-08) de cada flota de los CPC que opera en el OPO. Los datos se consideran incompletos y se consideran insuficientes para expandirlos a totales de la flota (BYC-10 INF-D) (ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos asociadas a la notificación de datos de palangre). Las disposiciones que se considera que indican un evento de supervivencia son las reportadas por los observadores como "Vivo y sano", "Vivo con heridas leves" y "Vivo", mientras que las que se considera que indican un evento de mortalidad son las disposiciones reportadas como "Muerto", "Vivo, mortalidad probable", "Vivo herido", "Descartado", "Desconocida" o cuando la disposición no fue reportada.

| Common name | Scientific name | Interactions | Mortalities |
|--------------------------------------|------------------------------------|---------------|---------------|
| Long snouted lancetfish | <i>Alepisaurus ferox</i> | 8,501 | 8,501 |
| Escolar | <i>Lepidocybium flavobrunneum</i> | 3,165 | 3,164 |
| Snake mackerel | <i>Gempylus serpens</i> | 2,581 | 2,544 |
| Dorado, mahi mahi, dolphin fish, nei | Coryphaenidae | 2,468 | 2,468 |
| Wahoo | <i>Acanthocybium solandri</i> | 1,707 | 1,703 |
| Opah | <i>Lampris guttatus</i> | 1,171 | 1,167 |
| Sickle pomfret | <i>Taractichthys steindachneri</i> | 700 | 697 |
| Common dolphinfish | <i>Coryphaena hippurus</i> | 505 | 502 |
| Oilfish | <i>Ruvettus pretiosus</i> | 316 | 316 |
| Pomfrets, ocean breams nei | Bramidae | 275 | 267 |
| Lancetfishes nei | <i>Alepisaurus</i> spp. | 247 | 247 |
| Snake mackerels, escolars nei | Gempylidae | 73 | 73 |
| Pompano dolphinfish | <i>Coryphaena equiselis</i> | 52 | 52 |
| Atlantic pomfret | <i>Brama brama</i> | 27 | 27 |
| Other large fishes* | | 97 | 95 |
| Total numbers | | 21,885 | 21,823 |

*"Other large fishes" includes those with ≤ 15 interactions from 21 taxa in 2023.

Table L-7. Estimated purse-seine catches by set type in metric tons (t) of small forage fishes by observers onboard size-class 6 vessels with a carrying capacity >363 t (1994–2024) and minimum reported longline (LL) catches of small forage fishes (gross-annual removals in t) (1994–2023, *data not available, see section 2.2. for uncertainty and data gaps in reporting of bycatch caught by longline). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Species highlighted bold are discussed in main text. Data for 2019–2023 (longline) and 2023–2024 (purse seine) are considered preliminary. “Epipelagic forage fishes” include various mackerels and scad (*Decapterus* spp., *Trachurus* spp., *Selar crumenophthalmus*), Pacific saury (*Cololabis saira*), and tropical two-wing flyingfish (*Exocoetus volitans*).

Tabla L-7. Capturas cerqueras estimadas de peces forrajeros pequeños, por tipo de lance, en toneladas (t), por observadores a bordo de buques de clase 6 con una capacidad de acarreo >363 t (1994–2024) y capturas palangreras (LL) mínimas reportadas de peces forrajeros pequeños (extracciones anuales brutas en t) (1994–2023, *datos no disponibles; ver Sección 2.2. para consultar información sobre la incertidumbre y las deficiencias de los datos en la notificación de especies capturadas incidentalmente con palangre). Tipos de lances cerqueros: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las especies en negritas se discuten en el texto principal. Los datos de 2019–2023 (palangre) y 2023–2024 (cerco) se consideran preliminares. “Peces epipelágicos de forraje” incluyen varias caballas y jureles (*Decapterus* spp., *Trachurus* spp., *Selar crumenophthalmus*), paparda del Pacífico (*Cololabis saira*), y volador tropical (*Exocoetus volitans*).

| Year | Auxis spp., bullet and frigate tunas | | | | Balistidae, Monacanthidae spp., triggerfishes and filefishes | | | | Kyphosidae, sea chubs | | | | Epipelagic forage fishes | | | | Small Carangidae spp., carangids, nei | | | | Other small fishes | | | |
|-------|---|-------|-----|----|---|-----|-----|----|----------------------------------|-----|-----|----|---------------------------------|-----|-----|----|--|-----|-----|----|--------------------|-----|-----|----|
| | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | | Purse seine | | | | | | | |
| | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL | OBJ | NOA | DEL | LL |
| 1994 | 294 | 200 | 2 | - | 114 | <1 | <1 | - | <1 | - | - | - | - | - | - | - | <1 | - | - | - | 53 | 15 | 2 | - |
| 1995 | 501 | 119 | 6 | - | 208 | 4 | <1 | - | <1 | - | - | - | - | - | - | - | <1 | - | - | - | 319 | 4 | 4 | - |
| 1996 | 761 | 234 | 33 | - | 113 | 2 | <1 | - | - | - | - | - | - | - | - | - | - | <1 | - | - | 55 | 8 | 25 | - |
| 1997 | 2,734 | 623 | 25 | - | 219 | <1 | <1 | - | - | - | - | - | - | - | - | - | <1 | - | - | - | 151 | 12 | 2 | - |
| 1998 | 1,033 | 168 | 32 | - | 801 | 2 | 1 | - | <1 | - | - | - | <1 | - | - | - | <1 | - | - | - | 91 | 15 | 3 | - |
| 1999 | 2,589 | 473 | 29 | - | 551 | 3 | <1 | - | <1 | <1 | - | - | <1 | - | - | - | <1 | <1 | - | - | 85 | 3 | 2 | - |
| 2000 | 1,210 | 181 | 19 | - | 168 | <1 | 9 | - | 2 | - | - | - | - | - | - | - | <1 | - | - | - | 68 | 8 | 6 | - |
| 2001 | 641 | 38 | - | - | 426 | 1 | - | - | <1 | - | - | - | - | - | - | - | <1 | - | - | - | 27 | 2 | <1 | - |
| 2002 | 1,382 | 234 | 248 | - | 453 | <1 | - | - | <1 | - | - | - | - | - | - | - | <1 | - | - | - | 25 | 3 | <1 | - |
| 2003 | 944 | 278 | 16 | - | 157 | 4 | <1 | - | <1 | - | - | - | <1 | - | - | - | <1 | - | - | - | 75 | 1 | 1 | - |
| 2004 | 834 | 115 | 24 | - | 914 | 7 | 2 | - | 8 | <1 | <1 | - | <1 | <1 | - | - | <1 | <1 | - | - | 22 | 1 | <1 | - |
| 2005 | 1,606 | 309 | 6 | - | 129 | <1 | <1 | - | 23 | <1 | <1 | - | 6 | <1 | <1 | - | 2 | <1 | <1 | - | <1 | 9 | <1 | - |
| 2006 | 1,300 | 591 | 19 | - | 145 | <1 | <1 | - | 79 | <1 | <1 | - | 7 | 1 | - | - | 2 | <1 | <1 | - | 5 | 1 | <1 | - |
| 2007 | 868 | 336 | 18 | - | 544 | 1 | <1 | - | 12 | <1 | <1 | - | 2 | 5 | - | - | <1 | <1 | <1 | - | 4 | <1 | <1 | - |
| 2008 | 759 | 619 | 2 | - | 276 | 7 | 2 | - | 68 | <1 | <1 | - | 3 | <1 | - | - | 10 | <1 | - | - | 2 | <1 | <1 | - |
| 2009 | 303 | 165 | 1 | - | 174 | 1 | <1 | - | 47 | <1 | - | - | <1 | <1 | - | - | <1 | <1 | <1 | - | 1 | <1 | <1 | - |
| 2010 | 474 | 234 | <1 | - | 69 | <1 | <1 | - | 16 | - | <1 | - | 4 | <1 | <1 | - | 1 | <1 | - | - | <1 | - | <1 | - |
| 2011 | 677 | 97 | 11 | - | 31 | <1 | - | - | 48 | <1 | - | - | 2 | <1 | <1 | - | <1 | <1 | - | - | <1 | <1 | <1 | - |
| 2012 | 173 | 179 | 1 | - | 110 | <1 | - | - | 39 | - | - | - | 13 | 12 | - | - | <1 | <1 | - | - | 4 | 2 | - | - |
| 2013 | 385 | 77 | - | - | 228 | <1 | <1 | - | 18 | - | <1 | - | 4 | - | <1 | - | <1 | 4 | <1 | - | 2 | <1 | <1 | - |
| 2014 | 297 | 30 | <1 | - | 325 | <1 | <1 | - | 16 | - | - | - | 3 | <1 | <1 | - | <1 | <1 | - | - | 1 | <1 | <1 | - |
| 2015 | 177 | 64 | - | - | 140 | 4 | <1 | - | 5 | - | <1 | - | 6 | - | - | - | <1 | <1 | - | - | 1 | <1 | <1 | - |
| 2016 | 189 | 23 | <1 | - | 416 | 2 | <1 | - | 8 | - | - | - | 21 | - | <1 | <1 | <1 | <1 | - | - | 3 | <1 | <1 | 77 |
| 2017 | 131 | 172 | - | - | 83 | <1 | - | - | 8 | - | - | - | 3 | - | - | - | <1 | <1 | - | - | <1 | <1 | - | - |
| 2018 | 276 | 172 | - | - | 54 | <1 | <1 | - | 10 | - | - | - | 5 | <1 | - | - | <1 | - | - | - | <1 | <1 | <1 | - |
| 2019 | 182 | 94 | <1 | - | 57 | <1 | <1 | - | 7 | <1 | <1 | - | 5 | 8 | <1 | - | <1 | <1 | - | - | <1 | 5 | - | - |
| 2020 | 435 | 44 | <1 | - | 47 | <1 | <1 | - | 2 | - | <1 | - | 4 | <1 | - | <1 | <1 | <1 | - | <1 | <1 | <1 | <1 | <1 |
| 2021 | 423 | 18 | - | - | 50 | <1 | - | - | 6 | - | <1 | - | 15 | - | - | - | <1 | <1 | - | - | <1 | 1 | <1 | <1 |
| 2022 | 687 | 17 | <1 | - | 543 | 2 | <1 | - | 21 | 1 | - | - | 15 | - | <1 | - | <1 | <1 | - | - | 1 | 3 | <1 | - |
| 2023 | 588 | <1 | <1 | - | 518 | <1 | <1 | - | 12 | - | <1 | - | 10 | <1 | <1 | - | 3 | <1 | <1 | - | 1 | 12 | <1 | <1 |
| 2024 | 446 | 155 | - | * | 513 | <1 | - | * | 7 | - | - | * | 11 | <1 | - | * | 2 | <1 | - | * | <1 | <1 | <1 | * |
| Total | 23,300 | 6,060 | 494 | - | 8,573 | 48 | 16 | - | 463 | 2 | <1 | - | 139 | 29 | <1 | <1 | 27 | 6 | <1 | <1 | 1,003 | 108 | 47 | 79 |

Table L-8a. Minimum nominal purse-seine catches of a) sharks, large fishes and small fishes in metric tons (t) and b) rays in numbers of individuals in 2024 for size-class 1–5 vessels with a carrying capacity <363 t as reported by observers in 47% of all trips that carried an observer. Purse-seine set types: floating object (OBJ) and unassociated tuna schools (NOA).

Tabla L-8a. Capturas cerqueras nominales mínimas de a) tiburones, peces grandes y peces pequeños, en toneladas (t), y b) rayas en número de individuos en 2024 para buques de clases 1-5 con una capacidad de acarreo <363 t según lo reportado por los observadores en el 47% de todos los viajes que llevaban observador a bordo. Tipo de lances cerqueros: objeto flotante (OBJ) y atunes no asociados (NOA).

a.

| Broad group | Common name | Scientific name | Set type | |
|------------------|---------------------------------|---------------------------------|----------|-----|
| | | | OBJ | NOA |
| Sharks | Silky shark | <i>Carcharhinus falciformis</i> | 29 | <1 |
| | Scalloped hammerhead shark | <i>Sphyrna lewini</i> | 3 | |
| | Smooth hammerhead shark | <i>Sphyrna zygaena</i> | 1 | |
| | Oceanic whitetip shark | <i>Carcharhinus longimanus</i> | <1 | |
| | Blue shark | <i>Prionace glauca</i> | <1 | |
| | Thresher shark | <i>Alopias vulpinus</i> | <1 | |
| | Mako shark | <i>Isurus</i> spp. | <1 | |
| Large fishes | Dorado | Coryphaenidae spp. | 126 | <1 |
| | Wahoo | <i>Acanthocybium solandri</i> | 30 | |
| | Rainbow runner | <i>Elagatis bipinnulata</i> | 5 | |
| | Amberjack, nei | <i>Seriola</i> spp. | 2 | |
| | Jacks, crevalles, nei | <i>Caranx</i> spp. | <1 | |
| | Amberjack, jack, crevalles, nei | <i>Seriola, Caranx</i> spp. | <1 | |
| | Tripletail | <i>Lobotes surinamensis</i> | <1 | |
| | Mola, nei | Molidae spp. | <1 | 3 |
| Small fishes | Other large fish | | <1 | |
| | Triggerfishes, Filefishes | Balistidae, Monacanthidae spp. | 133 | |
| | Bullet and frigate tunas | <i>Auxis</i> spp. | 95 | |
| | Sea chubs | Kyphosidae spp. | 1 | |
| | Small carangid, nei | Carangidae spp. | <1 | <1 |
| | Epipelagic forage fishes | | <1 | |
| Other small fish | | <1 | | |

b.

| Broad group | Common name | Scientific name | OBJ | NOA |
|-------------|--------------------|----------------------------------|-----|-----|
| Rays | Pelagic stingray | <i>Pteroplatytrygon violacea</i> | 31 | 3 |
| | Spinetail manta | <i>Mobula mobular</i> | 11 | 2 |
| | Chilean devil ray | <i>Mobula tarapacana</i> | 9 | |
| | Smoothtail manta | <i>Mobula thurstoni</i> | 6 | |
| | Munk's devil ray | <i>Mobula munkiana</i> | 2 | |
| | Mobulidae ray, nei | Mobulidae spp. | 1 | |
| | Stingray nei | Dasyatidae spp. | 1 | |