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DOCUMENT EB-04-01 CORR

ECOSYSTEM CONSIDERATIONS

This document was revised on 18 May 2026 to reflect a correction made to the longline observer data for sharks, where those labeled as "various identified sharks" were replaced with "various unidentified sharks", section 3.5.8.

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SUMMARY

Over the past two decades, fisheries management worldwide has expanded beyond target stocks to more explicitly consider the impacts of fishing on non-target species and the ecosystem as a whole. This broader ecosystem approach to fisheries management (EAFM) aims to maintain ecosystem integrity while sup-

porting the sustainable use of commercially-important fisheries and ecosystem services that provide social, cultural and economic benefits to society. In response to growing interest in EAFM within the IATTC—particularly following the adoption of the Antigua Convention—the staff has presented an *Ecosystem Considerations* report since 2003. This report provides information on non-target species and on the effect of tuna fisheries on the ecosystem and provides initial insights on how ecosystem research can inform management advice and decision-making. It also summarizes recent advances related to the ecological impacts of fishing and environmental variability in the eastern Pacific Ocean (EPO). Specifically, the report includes information on: (1) fisheries interactions, such as incidental catches of non-target species ("bycatch") across major taxonomic groups (marine mammals, sea turtles, seabirds, elasmobranchs and teleosts); (2) the physical environment, including short and medium-term (e.g., El Niño Southern Oscillation) and long-term (e.g., Pacific Decadal Oscillation) environmental indicators; (3) tools for identifying potentially vulnerable species[1] such as the Ecological Assessment of Sustainable Impacts of Fisheries (EASI-Fish); (4) ecosystem dynamics evaluated using an eastern tropical Pacific Ocean (ETP) ecosystem model and associated ecological indicators; and (5) future directions for ecological research in the EPO to support science-based advice to the IATTC.

Data limitations remain a significant challenge for many bycatch species taken in fisheries other than the large vessel purse-seine fishery (class 6, >363 t), which benefits from 100% observer coverage. For example, the industrial longline fishery is subject to a minimum observer coverage of 5% and biological data for many species are limited. This data gap has long been recognized by the staff (e.g., see SAC-07-INF C(d), SAC-08-07b, SAC-10 INF-B), and several recommendations have been made to improve data collection. These efforts include data improvement workshops for "industrial longline" fisheries (WSDAT-01, WSDAT-01-RPT) and "small purse-seine vessels" (≤363 t; WSDAT-02, WSDAT-02-RPT), with consolidated recommendations provided in 2025 (SAC-16 INF-O). A future workshop will address data improvement matters for the "small-scale" fisheries in the IATTC area.

Additionally, SAC-17-07 aims to develop a clear and standardized classification system for longline vessels operating in the EPO to improve consistency in terminology, data reporting, and compliance with IATTC measures. By doing so, it supports more effective management, research prioritization, and implementation and interpretation of obligations across CPCs.

Finally, updates to the proposed workplan to restructure the *Ecosystem Considerations* report into two ecosystem-advice products—an indicator-based ecosystem report card ("*EcoCard*") and a complementary *Ecosystem Status Assessment*—were presented in 2025 (EB-03-04). These updates focused on Phase 1 (*Planning*) to improve IATTC's communication of ecosystem status. A progress report on Phase 2 of this workplan, focused on "*Establishing criteria*" is provided in EB-04-03.

1. INTRODUCTION

The ecosystem approach to fisheries management (EAFM) was 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*". These principles were reinforced in 2001, through the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem committed to incorporating an ecosystem approach into

[1] 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 latu, 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.

fisheries management.

The IATTC's Antigua Convention, which entered into force in 2010, reflects these 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*". Earlier, the 1999 Agreement on the International Dolphin Conservation Program (AIDCP) had already introduced ecosystem considerations into the management of the tuna fisheries in the EPO. Consequently, the IATTC has, for over two decades, recognized ecosystem-related issues in tuna fisheries, and has progressively incorporated EAFM elements into its decision-making (e.g., SAC-10 INF-B; Juan-Jorda et al. 2018). This work has been further advanced under IATTC's 5-year Strategic Science Plan (SSP), first implemented in 2019 (IATTC-93-06a), through which staff conduct ecological research and generate the data and tools needed to implement EAFM. Current and planned ecosystem-related activities by the staff is summarized in the 2026–2030 SSP (IATTC-103-03A, SAC-16-07).

Assessing the ecological sustainability of EPO tuna fisheries remains challenging due to the wide range of species with differing life histories with which tuna fisheries interact. While relatively good information is available for catches of tuna and tuna-like species throughout the Convention Area, data on most non-target ("bycatch") species are limited, especially those that are less frequently encountered, discarded at sea or have low economic value (see section 2 and IATTC Special Report 25). In addition, environmental variability operating across multiple temporal and spatial scales—such as the El Niño-Southern Oscillation, Pacific Decadal Oscillation, ocean warming, anoxia and acidification—affect species distributions and their interactions with tuna fisheries (e.g., SAC-15 INF-L, SAC-16 INF-T). Recognizing these challenges, the IATTC adopted its first Resolution on climate change (C-23-10) in 2023, later amended in 2024 (C-24-10), and has initiated a workplan towards climate resilient fisheries (SAC-15-12; SAC-16 INF-P), including dedicated workshops (WSCC-01; WSCC-02) in February 2025 and April 2026, respectively. Additional workshops will be organized in the future under the mentioned workplan.

Traditional single-species management of target species relies on biological reference points, based on estimates of fishing mortality, spawning stock biomass, recruitment, and other biological parameters. However, the catch and/or biological data required for estimating those metrics are often unavailable or unreliable for most bycatch species. More broadly, the complexity of marine ecosystems precludes the use of any single indicator that can holistically represent the structure, function and responses to fishing and environmental change.

As the scope of ecological, environmental and fishery considerations relevant to EAFM in the EPO has expanded, the *Ecosystem Considerations* report has grown in length and complexity, limiting its effectiveness as a communication tool for IATTC's Cooperating Members and Non-members (CPCs), stakeholders and the public. To address this, the staff plan to re-envision the report—drawing on parallel efforts 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*" that highlights a selected set of key bycatch, ecosystem, and climate indicators, among others, identified by the staff and through stakeholder consultation to best represent ecosystem status and (2) a complementary, descriptive "*Ecosystem Status Assessment*" that documents the full suite of indicators used to communicate the overall status of marine ecosystems and trends over time.

This approach builds on similar initiatives undertaken by other t-FRMOs to advance EAFM. A phased workplan (EB-02-02) has been developed to guide implementation of EAFM, beginning with Phase 1 (*Planning*), which focused on defining the purpose, objectives and designing a conceptual framework (EB-03-04), followed by Phase 2 (*Establishing* criteria), including proposed screening criteria for defining ecoregions and developing candidate indicators (EB-04-03). Until this transition is completed, the *Ecosystem Considerations* report will continue to be updated.

2. DATA SOURCES

In this report, estimated total annual catches of bycatch species were obtained from observer data for the large-vessel purse-seine fishery[2], nominal catches reported by the limited observer coverage onboard the small-vessel purse-seine fishery[3], 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 2024 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-16 INF-B, SAC-17 INF-B). Longline data were available through 2024 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 2025, with data from the last 2 years considered preliminary as of March 2026.

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, DAT-01-01, DAT-02-01, IATTC Special Report 25).

2.1. 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

[2] Size class 6 purse-seine vessels with a carrying capacity > 363 t

[3] Size class <6 purse-seine vessels with a carrying capacity ≤363 t

sources focus on tuna species. The FAD form, a logbook designed in late 2018 to be used by skippers of small vessels without observers 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 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 second Workshop on Data Improvement focused on the small purse-seine fishery (WSDAT-02, February 2025) 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 2025, more than half of the trips (54%) made by smaller vessels were observed: 46% were observed by the voluntary TUNACONS observer program, 5% from the Ecuadorian National observer program, and 3% 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 2010–2025 are shown in Table A-7 of Document SAC-17-01.

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 extrapolated[4] to account for such instances.

2.2. Longline

Substantial variability in reporting formats, data quality, completeness, and observer coverage for longline fisheries has limited the staff's ability to estimate EPO-wide catches for bycatch species (SAC-08-07b, SAC-

[4] 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.

08-07d, SAC-08-07e, BYC-10 INF-D). The longline bycatch data presented herein are based on gross annual removals estimated by each CPC and reported to the IATTC in summarized ("TASK I") form. Given uncertainty regarding the completeness of submissions and marked variability among taxa and CPCs, these data are considered incomplete, or 'sample data', and are therefore treated as minimum annual reported catch estimates for the period 1995–2024.

To address these limitations, a staff–CPC collaborative process is underway to develop recommendations for updating Resolution C-03-05 on data provision, with the objective of improving data collection, reporting, and analysis in line with the Antigua Convention and the SSP (IATTC-103-03-A). An initial focus of this work has been the organization of collaborative workshops to assess the feasibility of collecting priority data types and to develop standardized data collection templates by gear type, explicitly including interactions with bycatch species listed as priority species for research and management advice (e.g., see SAC-15-09, Resolution C-24-05).

The first workshop (2023), focused on the industrial longline fishery, involved nearly 100 participants. A background document outlining key data deficiencies, illustrative case examples, and staff recommendations was prepared in advance (WSDAT-01-01) and discussed during the workshop, along with invited expert presentations. Staff recommendations for updating Resolution C-03-05 were subsequently revised based on workshop discussions and bilateral consultations with CPCs (SAC-14-14). The workshop report (WSDAT-01-RPT) and further refinements to the recommendations are documented in SAC-14 INF-Q and SAC-16 INF-O.

In 2023, the SAC broadly endorsed the staff's recommendations related to tunas (SAC-14-16, para.1(d)) and recommended that the Commission review and update Resolution C-03-05, taking into account SAC-14 INF-Q (SAC-14-16, para. 7.1). Similar recommendations were reiterated in 2024, emphasizing the need for operational longline data to support stock assessments of tuna and associated species, and urging CPCs to provide historical operational data to enable the development of abundance indices and other assessment inputs. These recommendations were reiterated in 2025 (SAC-16-11, SAC-16-16) and 2026 (SAC-17-10), which encourages updating Resolution C-03-05 to better reflect the Antigua Convention's mandate to address non-target, dependent and associated species, and the effects of the fishery on the ecosystem.

Observer data reporting for longline vessels >20 m has improved following the adoption of Resolution C-19-08 in 2019, which replaced the earlier measure (C-11-08). While detailed set-by-set operational level observer data has been received from several CPCs, observer deployment was significantly disrupted during the COVID-19 pandemic. Observer programs resumed in 2023, and the limited data available for 2024 are included in this report (see section 2 Data Sources; SAC-17 INF-B).

The IATTC staff, the Ecosystems and Bycatch Working Group (EBWG) and the SAC have consistently recommended increasing longline observer coverage to at least 20%, noting that the current 5% minimum is insufficient for scientific purposes (BYC-10 INF-D). Analyses indicate that even for relatively data-rich species such as yellowfin and bigeye tunas, 5% coverage is inadequate to reliably estimate total catches, implying that estimates for bycatch species are likely to be considerably less reliable. Consequently, the data presented in this report are provided for transparency and represent minimum documented interactions and mortalities. While IATTC staff aims to develop fleet-wide longline catch estimates based on observer data in the future, these efforts will require further improvements in data reporting before robust extrapolation can be undertaken (SAC-12-09, WSDAT-01-01, SAC-14 INF-Q).

3. FISHERY INTERACTIONS WITH SPECIES GROUPS

3.1. Tunas and billfishes

Data on catches of the principal species of tunas and bonitos (genera *Thunnus*, *Katsuwonis*, *Euthynnus*, and *Sarda*), as well as billfishes in the families Istiophoridae and Xiphiidae, are reported in SAC-17-01. The staff has conducted stock assessments, including benchmark assessments for bigeye tuna (SAC-17-03; updated assessment), yellowfin tuna (SAC-16-03) and skipjack tuna (SAC-15-04), as well as stock status indicators (SSIs) for tropical tunas (SAC-17-02). In addition, work on the bigeye tuna harvest strategy (SAC-17-06) and results of the management strategy evaluation (MSE) for bigeye tuna (SAC-17-05) will be presented at the 17th meeting of the SAC in 2026. Plans for the IATTC Tropical Tuna Tagging Program are also provided in SAC-17 INF-F.

The staff has further contributed to a range of collaborative assessments with other regional scientific bodies. These include assessments of Pacific bluefin (2024; SAC-16 INF-Q) and north Pacific albacore (2023 with an updated benchmark assessment scheduled for 2026. These efforts are led by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). Additional collaborations include the assessment of south Pacific albacore tuna (2024) led by the Western and Central Pacific Fisheries Commission (WCPFC), and ISC-led assessments for north Pacific swordfish (2023), western and central North Pacific striped marlin (2023), and blue marlin (2021). A new blue marlin stock assessment is expected to be finalized in 2026 by the ISC billfish working group. Finally, a benchmark assessment for swordfish in the southern EPO is presented in SAC-14-15.

3.2. 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 J-1).

3.2.1. Research projects

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 close kin mark recapture (CKMR) assessment pilot. As part of Phase I: Sampling Feasibility of the CKMR assessment, collaborators assessed DNA recovered from dolphin skin swabs and found high quantities of species-specific uncontaminated DNA that may allow for kinship parent-offspring identification. DNA quality was variable and further testing will be conducted during Phase II (SAC-17 INF-Q). In early 2026, the staff organized two cetacean expert meetings to discuss the most recent and accurate life history parameters of spotted and spinner dolphins. This information will guide the conceptual model, which will underpin future simulation modeling and population assessments.

3.2.2. Purse-seine data: large vessels

Estimates of incidental mortality of dolphins in the purse-seine fishery of large vessels during 1995–2025 are shown in Table J-1a. In 2025, the stock of dolphins with the highest incidental mortality was the eastern spinner (n=378), followed by the northeastern spotted dolphins (n=198), the western-southern spotted (n=183), and the whitebelly spinner (n=104). Common dolphins were least impacted by the fishery, with mortalities of 37 northern, 25 southern, and 13 central common dolphins.

3.2.3. Longline observer data

In recent years, substantial improvements have been made to the minimum data standards for 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 remains insufficient to adequately represent the diversity of fleet components and limits the ability to extrapolate observed data to estimate total interactions (see BYC-10 INF-D).

Given these limitations, only the minimum number of observed interactions and mortalities involving marine mammals is reported here for 2024 (Table J-1b). Interactions and mortalities are classified based on observer-reported fate (e.g., injured, discarded, released, or unknown) and release condition (alive, alive and healthy, alive and injured, dead, or unknown). In cases where disposition was either not reported or recorded as discarded, events were precautionarily treated as mortalities.

Under these assumptions, three of the nine marine mammal interactions recorded by observers in the EPO in 2024 were classified as mortalities. The observed interactions included five spinner dolphins (*Stenella longirostris*), two false killer whales (*Pseudorca crassidens*), one striped dolphin (*Stenella coeruleoalba*), and one bottlenose dolphin (*Tursiops truncatus*).

The staff reiterates that increasing observer coverage to at least the recommended 20% is essential to improve the reliability of estimates and enable expansion of observed interactions and mortalities to total fleet activities, for marine mammals and other vulnerable bycatch species.

3.3. 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).

3.3.1. Best Handling and Release Practices (BHRPs)

Various IATTC resolutions, most recently C-19-04, have aimed to mitigate fishing impacts on sea turtles and establish safe handling and release procedures for sea turtles caught by purse-seine and longline gears. In support of these efforts, a "circle hook" workshop was convened prior to the 13th SAC meeting in 2022 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.

During the workshop, participants discussed the use of various circle hook configurations, noting that the minimum width should be defined on a fishery-specific basis and depend on the target species. However, no definitive conclusions or recommendations were reached (WSHKS-01). Discussions continued at subsequent meetings, including the 11th Bycatch Working Group meeting in May 2022, and the EBWG-1 and EBWG-2 meetings (May 2023 and June 2024, respectively). A second circle hook workshop was later held in April 2025 (WSHKS-02).

At that workshop, several topics were addressed, based on the EBWG recommendations, including: (1) defining the size characteristics that qualify as a 'large' circle hook under Resolution C-19-04 (paragraph 3(d)(i)); (2) reviewing the impacts of fishing operations on the form, durability and structural integrity of circle hooks across sizes and manufacturers; (3) developing 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) updating best handling and release practice guidelines for shallow-set longline fisheries. A background document (WSHKS-02-01), which includes several reviews and discussions (WSHKS-02) of these topics, is available on the workshop website. BHRP guidelines for all fishing gears (document EB-03-05) were generated based on feedback from the workshop (for hook and line) and following a comment and review period by

CPCs and subject matter experts and were presented to the EBWG-3 in 2025. These guidelines were further refined following the 1st IATTC Workshop for Advancing BHRP Guidelines for Sharks, Sea Turtles and Seabirds and a comment review period, and will be discussed at the EBWG-4 meeting in 2026 (EB-04-04).

3.3.2. Ecological Assessment of the Sustainable Impacts of Fisheries (EASI-Fish)

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 (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 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. Therefore, the IATTC staff reiterates the recommendation to consider updating Resolution C-19-04 based on the scientific work conducted under BYC-11-02 and Griffiths et al. 2024 (SAC-17-10).

3.3.3. Purse-seine data: large vessels

The estimated number of sea turtle mortalities and interactions recorded by observers on large purse-seine vessels from 1995–2025 are presented in Figure J-2a and Figure J-2b, respectively, disaggregated by set type. Interactions are defined based on observer-recorded fate on the dedicated turtle form and include the following: entangled, released unharmed, light injuries, escaped from net, observed but not involved in the set and other/unknown. Mortalities include individuals recorded as: grave injuries, killed, or consumed.

The Olive Ridley turtle (*Lepidochelys olivacea*) is by far the most frequently encountered species, with 20,944 recorded interactions and 794 mortalities (~4%) over the 1995–2025 period. In 2025 alone, 181 interactions were recorded, with no associated mortalities (Table J-2a).

In 2025, observer data also documented 30 interactions with eastern Pacific green turtles, 13 with loggerhead turtles, and 3 each of hawksbill and leatherback turtles. An additional 121 interactions involved unidentified turtle species. No mortalities were reported for any species during 2025.

3.3.4. Longline and gillnet fisheries

In longline fisheries, 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. Similar risks occur in coastal pelagic and bottom-set gillnet fisheries, where turtles may become enmeshed in the net or entangled in the floatlines or headrope.

Data on incidental mortality in longline and gillnet fisheries remain limited. However, mortality rates in the EPO industrial longline fishery are likely to be lowest in "deep" sets (around 200–300 m), which primarily target bigeye tuna and albacore, and highest in "shallow" sets (<150 m) targeting swordfish. In addition, a substantial number of artisanal longline and gillnet fleets operating in coastal waters are known to interact with sea turtles, although data availability for these fleets is sparse (see BYC-11-02).

3.3.4.1. Longline observer data

Historically, data on sea turtle interactions and mortalities in longline fisheries have been limited (SAC-08-07b). However, reporting has improved since 2019 following the submission of operational-level observer data in accordance with Resolution C-19-08.

Observer coverage in longline fisheries remains low—5% or less (see BYC-10 INF-D)—compared to 100% observer coverage in the large-vessel purse-seine fishery. As a result, reported interactions and mortalities provided by CPCs for 2024 should be considered minimum estimates (Table J-2b; see also section 2.2).

In this dataset, interactions and mortalities are defined using observer-reported fate (e.g., discarded, injured, grave injuries, released, released with hook, or not reported) and/or release condition (e.g., alive and healthy, alive and injured, dead, unknown, or not reported). For 2024, observers reported 10 sea turtle interactions in the EPO, including 4 leatherback, 3 Olive Ridley, and 3 loggerhead turtles. Of these 10 interactions, five resulted in mortalities, including 2 leatherback (50% mortality rate), and all 3 loggerhead turtles (100%). Looking ahead, the staff aim 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. However, as noted in BYC-10 INF-D, current observer coverage levels are insufficient to generate robust total catch estimates.

3.4. 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).

3.4.1. Progress on seabird mitigation, data collections and BHRP guidelines

The IATTC has adopted a single resolution addressing seabird bycatch (C-11-02). In parallel, draft BHRP guidelines for seabirds were presented to the EBWG-01 and EBWG-02 meetings in 2023 (EB-01-01, Annex 1) and 2024 (EB-02-03, Annex 1), respectively. These guidelines were further refined in 2025 (EB-03-06) in response to the IATTC's Seabird Action Plan and updated again following the IATTC inter-sessional workshop for advancing BHRPs in 2026 (EB-04-05), to improve survival outcomes following seabird interactions across all fisheries under IATTC purview.

The potential role of circle hooks in reducing seabird bycatch was also considered during the 2022 circle hook workshop (WSHKS-01). However, participants concluded that available data remains inconclusive, largely due to a lack of empirical studies evaluating the effects of hook shape and size on seabird mortality. A second circle hook workshop was conducted in April 2025 (WSHKS-02-01) but was solely focused on objectives to fulfill the requirements of the sea turtle Resolution C-19-08 (see section 3.3.1).

Recognizing key knowledge gaps necessary to update the seabird Resolution (C-11-02), the EBWG adopted a seabird action plan in 2024 (see SAC-15-15, Annex 1), which tasked IATTC scientific staff with: (1) comparing seabird mitigation measures under C-11-02 with those implemented by other tuna RFMOs; (2) updating previous analyses of seabird spatial distributions in relation to longline fishing effort (SAR-7-05b); (3) compiling an overview of mitigation measures currently used by CPCs, including in areas where such measures are not required; and (4) summarizing observed and estimated seabird bycatch rates in the IATTC Convention Area to inform potential revisions to Resolution C-11-02.

Progress toward these objectives was reported at the EBWG-03 in 2025. Document EB-03-02 examined the overlap between seabird distributions and longline fishing effort, as well as associated seabird bycatch rates, while document EB-03-03 reviewed available mitigation options, measures and their implementation and compared these to those in the IATTC Resolution. In 2026, this work was further expanded through an updated analysis of seabird distribution overlap with longline fishing effort (EB-04-02). In addition, a standardized seabird mitigation reporting template (EB-04 INF-A) was developed to address the lack of a uniform template for CPCs to report seabird interactions to the IATTC, as recommended by EBWG-3.

3.4.2. Longline observer data

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 2024 are available (Table J-3) (but see section 2.2 for uncertainties and data gaps in reported data).

The longline observer data for the EPO submitted by CPCs for 2024 contained 13 total interactions, all of which were considered to result in mortalities. Dispositions for 12 of the interactions were not recorded and without additional information, these were precautionarily presumed to result in mortalities. One interaction with a Frigate bird (*Fregata* spp.) was recorded as “dead”. The data included 6 taxa: black-footed albatross (*Phoebastria nigripes*: 4 interactions), laysan albatross (*Phoebastria immutabilis*: 2 interactions), frigate bird (*Fregata* spp.: 3 interactions), boobies and gannets, nei (Sulidae: 2 interactions), Wilson’s storm petrel (*Oceanites oceanicus:* 1 interaction) and unidentified shearwater (*Puffinus* spp.: 1 interaction).

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.

3.5. Sharks

3.5.1. Best Handling and Release Practices (BHRPs)

Sharks are caught as bycatch in EPO tuna purse-seine fisheries and as both bycatch and target species in longline and multi-species and multi-gear fisheries of some CPCs. To improve post release survival rates following interactions where sharks are not retained and reduce the impacts of these interactions on shark populations, the scientific staff has developed guidelines for BHRPs. The use of BHRPs is an effective, low-cost conservation strategy with measurable improvements to survival rates post-release across fishing gears. Resolution C-23-07 (paragraph 12) requested the scientific staff, in collaboration with the SAC and EBWG, to develop a set of BHRP guidelines for inclusion in an updated measure. Document SAC-15-11 compiled the BHRPs based on an extensive data review for all IATTC fishing gears and provided a list of research recommendations for filling data gaps relevant to the development of BHRPs.

An updated shark conservation measure (Resolution C-24-05) was adopted in 2024, incorporating BHRP recommendations loosely based on the data driven BHRP recommendations compiled in SAC-15-11. Recognizing the need to improve the adopted BHRP recommendations in the Annex of the Resolution, the Resolution (paragraph 12) requested the staff to continue to collaborate with the SAC and EBWG to further refine these guidelines in 2025. Document SAC-16-10 was prepared in response to this request and provided updated recommendations following a comment and review period by CPC nominated subject-matter experts and industry representatives. An updated Resolution was adopted in 2025 (C-25-08) without an update to the BHRPs and requesting the staff to continue working on a set of updated BHRP guidelines.

In response, the staff held the 1st IATTC Workshop for Advancing Shark, Sea Turtle, and Seabird BHRP Guidelines virtually in December 2025, which continued in January 2026. Following the workshop, a third update to the shark BHRP guidelines was developed incorporating CPC, industry and subject-matter expert advice provided during the workshop and a subsequent comment period. The resulting document (SAC-17-08), contains guidance for purse-seine fisheries, which includes, among others, not rolling sharks through the power block, and to the extent possible, removing sharks from the net prior to sacking, promptly releasing entangled individuals, avoiding chute transfer to the wells, and minimizing handling time and stress onboard. For longline fisheries, recommended practices include leaving sharks in the water, removing trailing gear, and minimizing handling stress.

3.5.2. Stock assessments

Stock assessments or stock status indicators (SSIs) are available for only 4 shark species in the EPO: silky shark (*Carcharhinus falciformis*) (Lennert-Cody et al. 2018; BYC-10 INF-A, BYC-11 INF-A, EBWG-01 INF-A, SAC-17-11), blue shark (*Prionace glauca*) (ISC Shark Working Group), shortfin mako (*Isurus oxyrinchus*) (ISC Shark Working Group), and common thresher shark (*Alopias vulpinus*) (NMFS). Additional Pacific-wide assessments have been conducted under the FAO Common Oceans Tuna Project, including porbeagle shark (*Lamna nasus*) in the southern hemisphere (Clarke 2017), bigeye thresher shark (*Alopias superciliosus*) (Fu et al. 2018), and silky shark (Clarke 2018a), along with a risk assessment for the Indo-Pacific whale shark population (Clarke 2018b).

The staff are also currently conducting a close-kin mark recapture (CKMR) pilot for silky sharks and working to improve data collection and understanding of shark catches in small-scale coastal fisheries in Central America, Mexico, Peru, and Ecuador, with particular emphasis on silky and hammerhead (Sphyrnidae) sharks (e.g., SAC-14 INF-L, SAC-14 INF-M, SAC-16 INF-V, SAC-16 INF-W, SAC-17 INF-O, SAC-17 INF-P).

3.5.3. Ecological Assessment of the Sustainable Impacts of Fisheries (EASI-Fish)

The first quantitative vulnerability assessment of sharks interacting with EPO large-scale industrial and small-scale artisanal fisheries—using the EASI-Fish methodology—was completed in 2022 (SAC-13-11). Of the 49 shark species recorded in these EPO tuna fisheries, 32 were formally assessed 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) as well as blue shark (*Prionace glauca*) and shortfin mako shark (*Isurus oxyrinchus*). The remaining 12 species were classified as either “least vulnerable” (9 species) or “increasingly vulnerable” (3 species).

The staff recommended further analysis to evaluate potential hypothetical conservation and management measures (CMMs), applied individually or in combination, to reduce fishery impacts on highly vulnerable species identified such as silky, thresher and hammerhead sharks. This approach was subsequently applied to silky shark and hammerhead sharks during 2022–2023 to assess the relative benefits of alternative management scenarios on species’ vulnerability (SAC-14-12).

3.5.4. List of species of special research and management interest for the IATTC

At its 101st meeting in 2023, the IATTC adopted Resolution C-23-07, requesting staff to develop, in collaboration with the EBWG and SAC, an interim list of shark species for the consideration by Members to be under the purview of the Commission. Using a list of 49 species documented to interact with pelagic fisheries in the EPO, combined with other available species lists, ecological characteristics and conservation classifications by international instruments, the staff developed recommendations presented in SAC-15-

09. A final list of 18 species was adopted in 2024 under Resolution C-24-05 (Annex 4) and its replacement resolution in 2025 (C-25-08; Annex 4) as species of special research and management interest for the Commission. From those, a smaller list of 8 shark species was identified by the Resolution as key species that would need to be included in the IATTC's Shark Research Plan (SAC-17-09; IATTC-103-03-A).

3.5.5. Purse-seine data: large vessels

Catches (t) of sharks in the large-vessel purse-seine fishery (1995–2025) are presented in Table J-4a, with trends for the most frequently caught species shown in Figure J-3a. Most shark catch in this fishery occurs in floating object sets, although this varies by species.

Silky shark is the most commonly caught shark species, with annual catches averaging 551 t and reaching 737 t in 2025, primarily from floating-object sets. Oceanic whitetip shark (*Carcharhinus longimanus*) catches averaged 50 t annually and were 30 t in 2025, also mainly in floating-object sets. In contrast, blue shark catches in the purse-seine fishery are negligible, averaging 2 t annually.

Other notable species include smooth hammerhead (*Sphyrna zygaena*), pelagic thresher (*Alopias pelagicus*), and mako sharks (*Isurus* spp.) (Table J-4a, Figure J-3a). Smooth hammerhead catches averaged 26 t annually and were 11 t in 2025, largely from floating-object sets. Pelagic thresher sharks were primarily caught in unassociated tuna school sets, with catches averaging 5 t and reaching 14 t in 2025. Mako shark catches were comparatively low, averaging 3 t and totaling 1 t in 2025.

To better understand temporal trends and anomalies, catch by set type was standardized (mean = 1 over 1995–2025) for silky shark, oceanic whitetip shark and smooth hammerhead shark (Figure J-3b). This relative catch in weight (t) helps to better understand trends and anomalies in species catch. Silky shark relative catches were higher and more variable in dolphin and unassociated sets in the earlier years, while oceanic whitetip shark showed a consistent decline across all set types. Smooth hammerhead catches exhibited high interannual variability, particularly in dolphin and unassociated sets.

Spatial distributions (5°x5° grid cells) of these species (Figure J-3c) indicate that silky shark catches are widespread, primarily between 10°N to 10°S and mostly in floating-object sets. In 2025, catches were slightly reduced west of 130°W and south of the equator compared to the 2020–2024 average, with some new catches observed in the Sea of Cortez from unassociated sets. Catches of oceanic whitetip and smooth hammerhead were generally low in both recent and historical periods, with minimal catches of oceanic whitetip shark in the western region (west of 110°W) from the equator to 10°N during 2025.

3.5.6. Purse-seine data: small vessels

The limited observer data from small purse-seine vessels showed 34 t of silky shark and 2 t of scalloped hammerhead were caught in floating-object sets in 2025, while catches of other shark species or species groups (7 taxa) were minimal (≤ 1 t) (Table J-5).

3.5.7. Longline totals (TASK I data)

Minimum reported catches[5] of sharks by longline fisheries (1995–2024) are also provided in Table J-4a. Reporting of many shark species began in 2006 and remains variable due to data gaps and inconsistencies in reporting.

Silky shark catches in longline fisheries averaged 9,007 t annually (2006–2024), but only 104 t were reported in 2024. Oceanic whitetip shark catches averaged 165 t (2006–2018), with no reported catches from 2019 to 2024.

[5] 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).

Blue shark is the most frequently reported species in longline fisheries, with annual catches averaging 7,057 t and reaching 10,853 t in 2024. Other important species include smooth hammerhead (average 759 t; 3 t in 2024), pelagic thresher (average 1,703 t; none reported in 2024), and mako sharks (average 1,505 t; 1,319 t in 2024).

The staff reiterate the importance of updating Resolution C-03-05 and its corresponding specifications to align with the mandates of the Antigua Convention and encourage CPCs to develop a revised resolution based on recent technical input (see SAC-12-09, WSDAT-01-01, SAC-14 INF-Q, SAC-16 INF-O). These efforts are expected to improve the completeness and reliability of shark catch data.

3.5.8. Longline observer data

Minimum catches derived from the reported observer longline data for 2024 are presented in Table J-4b (see section 2.2 and BYC-10 INF-D for uncertainties and data gaps). This dataset includes operational information and provides insights into interaction outcomes. Dispositions categorized as survival include "Alive and healthy," "Alive with light injuries," and "Alive," while mortality includes "Dead," "Alive mortal," "Alive injured," "Discarded," "Unknown," or cases where disposition was not reported.

Blue shark was the most frequently observed species with 6,907 interactions (91% mortality) in 2024, followed by various unidentified sharks (Euselachii) with 1,172 interactions (87% mortality), the crocodile shark (*Pseudocarcharias kamoharai*) with 1,071 interactions (72% mortality), shortfin mako shark with 490 interactions (66% mortality), bigeye thresher shark with 212 interactions (50% mortality), velvet dogfish (*Zameus squamulosus*) with 121 interactions (84% mortality), and oceanic whitetip shark with 117 interactions (82% mortality). All other shark taxa had fewer than 100 interactions.

3.5.9. Small scale fisheries

The small scale longline fisheries in coastal CPCs seasonally target sharks, tunas, billfishes and dorado (*Coryphaena hippurus*), with some vessels operating in areas beyond national jurisdictions (Martínez-Ortiz et al*.* 2015, SAC-16-09, SAC-17-07). However, key shark data from these longline fisheries remain limited, constraining the ability to conduct conventional stock assessments or develop stock status indicators (see data challenges outlined in SAC-07-06b(iii)).

Recent work has focused on defining fleet characteristics to improve classification and data reporting. Proposed classifications have evolved from three categories (SAC-16-09) to five: large-scale, advanced medium-scale, medium-scale, small-scale commercial, and small-scale coastal longline fisheries (SAC-17-07), in response to EBWG and SAC recommendations (see SAC-15-15 "Fleet Characteristics" and SAC-16-Rpt; "7. Fleet Characterization"). These revised classifications aim to provide clearer guidance to CPCs, data handlers, scientists, policymakers, and other stakeholders, particularly regarding data reporting requirements with respect to small-scale longline fisheries and associated relevant Resolutions.

Long-term collaborative efforts between IATTC staff and regional partners (i.e., CPCs belonging to the Organización del Sector Pesquero y Acuícola del Istmo Centroamericano: OSPESCA), have improved sampling methodologies and data collection for shark fisheries in the EPO coastal States. This work, carried out over approximately 7 years (2015–2021), was supported 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, as well as the IATTC capacity building fund and the European Union, and was completed in December 2021.

The final results were presented in 2023 at SAC-14 (e.g., SAC-14 INF-L). However, the program was discontinued and maintaining continuity in data collection remains essential to generate key fisheries information needed to assess and manage shark species in the EPO. In parallel, a second phase of the FAO-GEF ABNJ project is underway, through which the IATTC has expanded this work to additional EPO coastal

States of Mexico, Ecuador and Peru (SAC-14 INF-M). Progress updates on this second phase were presented in 2025 at SAC-16 (see SAC-16 INF-V and SAC-16 INF-W). In 2026, two additional documents were prepared addressing the feasibility of biological sampling for sharks in EPO coastal fisheries (SAC-17 INF-O) and a sampling design for shark landings (SAC-17 INF-P). 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.

3.6. Rays

3.6.1. Best Handling and Release Practices (BHRPs)

The development of BHRP guidelines for rays is now planned for 2027 (EB-02-03) pending the outcome of the BHRP discussions during the 2026 EBWG-4 and SAC-17 for sharks, sea turtles and seabirds, as well some preliminary results for three different survival studies currently being conducted in both longline and purse-seine fisheries across the EPO.

3.6.2. Ecological Assessment of the Sustainable Impacts of Fisheries (EASI-Fish)

The vulnerability status and efficacy of potential 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 (Griffiths and Lezama-Ochoa 2021). 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 BHRPs 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 BHRPs 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; Stewart et al. 2024), and improve species-specific catch reporting and identification, especially in small scale coastal fisheries, to improve the reliability of outputs from EASI-Fish.

3.6.3. Ray species list

The IATTC has recognized the conservation importance of mobulids since 2015 when it adopted 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 SAC 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 large-scale industrial and small scale coastal 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 regularly operate and were recommended to come under the purview of the IATTC (SAC-16-08). This recommendation was ultimately endorsed by the EBWG and SAC (see SAC-16 Rpt). The IATTC staff is reiterating this recommendation in 2026 (SAC-17-10).

3.6.4. Purse-seine data: large vessels

To better represent estimated annual catches of manta rays (Mobulidae) and stingrays (Dasyatidae), these taxa are reported in numbers of individuals by the large-vessel purse-seine fishery (1995–2025) in Table J-6a, while catches of key species are shown in Figure J-4a. The largest average catches in the purse-seine fishery were observed for unidentified mobulid rays (Mobulidae spp., average 1995–2025: 961 individuals; number of individuals in 2025: 251), followed by the pelagic stingray (average: 790; 2025: 755), the smoothtail manta (average 1998–2025: 338; 2025: 46), the spinetail manta (average 2001–2025: 244; 2025: 125), unidentified stingrays (Dasyatidae spp., average 1998–2025: 170; 2025: 37) and the giant manta ray (average 1995–2025: 109; 2025: 35 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 J-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 J-4b. As with the reported observed catch (Figure J-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 highest for pelagic stingray, with notable variation by set type. For the 5-year average (2020–2024), most catches occurred in floating-object sets south of 10°N and east of 130°W, in dolphin sets north of the equator, and in unassociated tuna school sets along the South American coast. In 2025, the highest catches shifted to unassociated sets along the coast of Baja California, Mexico and near 5°N, 105°W, with lower catches off South America compared to the 5-year average (Figure J-4c). Catches of giant manta were minimal (<5 individuals) and confined to the region between 5°N and 5°S in both 2025 and the 2020–2024 average. In contrast, spinetail manta (primarily <30 individuals) and smoothtail manta (primarily <50 individuals) were more frequently observed in coastal areas. Spinetail manta catches in 2025 occurred mainly in dolphin sets off Central America, with some catches in the Sea of Cortez. During the 2020–2024 period, catches were primarily associated with unassociated sets, with higher concentrations off the South American coast—patterns not observed in 2025. Smoothtail manta catches were observed in unassociated sets off South America in the 5-year average dataset, while in both time periods they also occurred in dolphin sets off central America.

3.6.5. Purse-seine data: small vessels

For the small purse-seine vessel fishery, the limited observer data available for 2025 showed floating-object sets contained the largest numbers of individual ray species, including the spinetail manta (n=37), followed by the pelagic stingray (n=7), Chilean devil ray (n=6) and unidentified mobulid rays (n=6) while the number of other manta rays were ≤2 (Table J-5).

3.6.6. Longline observer data

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 J-6b). The limited data available from the reported longline observer dataset for 2024 (see section 2.2. for data gaps and BYC-10 INF-D) indicate that most interactions occurred with pelagic stingrays (5,901 individuals), of which 5,595 (95%) resulted in mortality. This was followed by manta rays with 9 interactions (1 mortality; 11%), unidentified rays and skates with 7 interactions (all resulting in mortality), spinetail manta rays with 7 interactions (6 mortalities; 86%), and giant manta rays with 2 interactions (both resulting in mortality) (Table J-6b).

3.7. Other large fishes

3.7.1. Dorado research and management in the EPO

Dorado (Coryphaenidae) is one of the most important large pelagic fishes in the EPO, supporting large-scale, small-scale and recreational fisheries throughout the region (SAC-07-06a(i)).

Research on dorado at the IATTC began in 2012, including a series of regional workshops (DOR-01, DOR-

02, DOR- 03) organized at the request of several coastal Member States. An exploratory stock assessment using integrated models was conducted for the southern EPO, where most catches occur (SAC-07-06a(i)). Recommendations for potential reference points and harvest control rules were presented in 2019 at SAC-10 (SAC-10-11).

More recently, Resolution C-23-09 on research for the management of dolphinfish was adopted at IATTC's 101st Commission meeting in 2023. In 2025, Resolution C-25-05 established the Working Group on Dorado, which become operational in 2026. In March 2026 the 4th Technical Meeting on Dorado (DOR-04) reviewed new information and initiated planning for an updated stock assessment.

3.7.2. Purse-seine data: large vessels

Species composition in the large-vessel purse-seine (primarily in floating-object sets; 1995–2025) is provided in Table J-7a, with time series of key species presented in Figure J-5.

Dorado is the most commonly caught large pelagic fish in this fishery, with an estimated average annual catch was 1,353 t (1995–2025) and 887 t recorded in 2025.

Other important species include wahoo (Scombridae) and rainbow runner (Carangidae). Wahoo catches averaged 353 t annually over the period 1995–2025, declining from a peak of 1,025 t in 2001 to 227 t in 2025 (Figure J-5).

Rainbow runner catches were comparatively low, with an estimated average of 52 t annually (1995–2025). Catches peaked at 158 t in 2007 and were 118 t in 2025 (Figure J-5).

3.7.3. Purse-seine data: small vessels

Observer coverage for the small purse-seine fishery remains limited. Available data for 2025 included catches of 169 t of dorado, 50 t of wahoo and 11 t of rainbow runner in floating-object sets. All other large-fish taxa (four groups) had reported catches of ≤6 t (Table J-5).

3.7.4. Longline data (TASK I)

Species composition in the longline fishery differs from that of the purse-seine fishery. Minimum reported annual catches for key species (Table J-7a, Figure J-5) include dorado, opah (Lampridae), snake mackerels (Gempylidae), pomfrets (Bramidae), and wahoo.

Like the purse-seine fishery, dorado is the most commonly reported pelagic fish in this dataset, with minimum reported annual catches averaging 5,660 t (1995–2024), although a much lower value (123 t) was reported in 2024.

For other taxa, minimum reported annual catches averaged 384 t for opah (1995–2024), 358 t for snake mackerels (2006–2024), 189 t for wahoo (1995–2024), and 57 t for pomfrets (1995–2024). In 2024, reported catches were 289 t of opah, 384 t of snake mackerels, 300 t of wahoo, and 54 t of pomfrets (Table J-7a).

Catches of these taxa have generally increased since the mid-2000s (Figure J-5). Although interpretation should consider the uncertainty and data gaps associated with this dataset (see section 2.2).

3.7.5. Longline observer data

Limited data from longline observers for 2024 (see section 2.2. and BYC-10 INF-D) are provided in Table J-7b. The most frequently recorded species was the long snouted lancetfish (*Alepisaurus ferox*) with 9,769 interactions (9,761 mortalities). This was followed by escolar (*Lepidocybium flavobrunneum*) with 5,926 interactions, (5,834 mortalities), wahoo with 5,109 interactions (5,104 mortalities), and opah with 4,422 interactions (4,382 mortalities).

Additional species included snake mackerel (*Gempylus serpens*), with 1,227 interactions (1,213 mortalities), sickle pomfret (*Taractichthys steindachneri*), with 820 interactions (684 mortalities; 84%) and butterfly kingfish (*Gasterochisma melampus*) with 509 interactions (all mortalities). The remaining 13 taxa each had fewer than 500 interactions.

Overall, interactions with large fishes in this dataset resulted in high mortality rates, averaging approximately 99%.

3.8. 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 linking primary producers at the base of the food web to upper-trophic-level predators, such as tunas and billfishes.

Some of these small forage fishes are incidentally caught by purse-seine vessels operating on the high seas, mostly in sets on floating objects, as well as by coastal small-scale fisheries. However, they are generally discarded at sea. Catches of these species are presented in Table J-8, with key taxa for the large-vessel purse-seine fishery highlighted in Figure J-6.

3.8.1. Purse-seine data: large vessels

Bullet and frigate tunas (Scombridae) are by far the most commonly reported forage species, with estimated annual catches averaging 964 t over the period 1995–2025. However, catches have declined substantially from a peak of 1,921 in 2005 to 534 t in 2025 (Figure J-6).

Triggerfishes (Balistidae) and filefishes (Monacanthidae) are the second most commonly reported forage group, with estimated annual catches averaging 302 t (1995–2025) and totaling 855 t in 2025. Combined catches of these groups peaked at 922 t in 2004 but have otherwise fluctuated over time.

Sea chubs (Kyphosidae) are caught in much smaller quantities, with average annual catches of 16 t (1995–2025) and only 4 t reported in 2025.

Finally, species grouped as 'epipelagic forage fishes' have consistently low catches, averaging 7 t annually (1995–2025), with 15 t reported in 2025.

3.8.2. Purse-seine data: small vessels

Observer coverage for small purse-seine vessels remains limited. In 2025, observer data reported 250 t of triggerfishes and filefishes and 159 t of bullet and frigate tunas caught in floating-object sets.

Catches of all other small-fish taxa (four groups) were minimal, totaling ≤2 t (Table J-5).

4. 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 fishers[6] (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 in 2024 at EBWG-02 and SAC-15 (SAC-15-12), and the staff has made recommendations on this matter in 2025 (SAC-16-INF P) and 2026 (SAC-17 INF-M)).

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

[6] 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.

previous year, in this case, 2025.

4.1. 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 El Niño event in 2014–2016 (SAC-09-06). Analyses on the potential effects of environment on tuna catches were presented at SAC-15 in 2024 (SAC-15 INF-L) and updated for SAC-16 in 2025 (SAC-16 INF-T).

The Climate Diagnostics Bulletin of the US National Weather Service reported that, in 2025, anomalies—defined as departures from monthly mean conditions—in oceanic and atmospheric variables (e.g., surface and sub-surface temperatures, thermocline depth, wind, and convection) were consistent with El Niño conditions in January. These conditions weakened in February and transitioned to ENSO-neutral conditions by April, which persisted through August, followed by the development of La Niña conditions from September through 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 J-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 can be categorized into ENSO events from "extreme" to "weak" (Figure J-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. Neutral to weak La Niña conditions persisted in 2025, with values ranging from 0 to -0.6 during this time period (Figure J-7b).

The Pacific Decadal Oscillation (PDO; Figure J-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 2025, cool conditions persisted with the lowest value in July (-3.59) and the highest value in March (-0.89) (see ERSST V5 PDO Time series data).

4.2. Spatio-temporal exploration of environmental conditions

A time series of SST and chlorophyll-a concentration (CHL-a; an indicator of primary productivity biomass) (Figure J-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 1993–2025, while monthly CHL-a concentrations cover data for 2003–2025 due to limitations with data availability. The SST plot (Figure J-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 J-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 associated to colder waters.

4.3. 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 J-10 and J-11 show quarterly mean SSTs and CHL-a concentrations, respectively, to: 1) provide a general indication of seasonal environmental variability for 2025, 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 2025. 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. Recent SDMs have been developed for the leatherback sea turtle (BYC-11-01; 2022), oceanic whitetip (2025), and silky sharks (2025), while in 2026 SDMs will be generated for dorado. The final goal is to develop an IATTC SDM library that could help develop scientific tools and advice to inform conservation and management in the region.

SST across the EPO exhibited clear seasonal structure, with relatively cooler conditions in the subtropical (i.e., the northern and southern extremities of the Convention Area) and equatorial regions in early 2025 (January–March; Figure J-10). As the year progressed into April–June, warmer waters expanded westward and intensified along the equator and coastal regions of Central and South America. Peak warming occurred during July–September, when warm waters (>28–30°C) became most extensive, especially in the eastern equatorial and coastal zones, while cool waters persisted at higher latitudes. By October–December, SSTs began to moderate slightly, though warm conditions remained prominent in the eastern equatorial Pacific and along the Central American coastline, maintaining a zonal gradient from warm east to cooler west. A secondary, warm pool was observed in the southwestern EPO (below the equator–20°S, 130°–150°W) during January–June, which contracted in July–September.

Figure J-11 shows CHL-a concentrations were highest along the coast of the Americas year-round and along the equatorial regions, particularly during the second half of 2025. The oligotrophic[7] South Pacific Gyre—located between 20°–40°S and extending from 150°–90°W—was largest in January–March, substantially retracted by July–September, and returned in October–December.

Skipjack was the most broadly distributed species and dominated the tropical tuna catches across the tropical Pacific in 2025 (Fig. J-10), where CHL-a concentration was high (Fig. J-11). Proportions of skipjack catches were greatest in the southeast during January–June. Yellowfin was the predominant tuna species in the catch primarily north of the equator year-round; the greatest yellowfin catches occurred off the Mexican coast during July–September in the warmer waters (~29°C). Bigeye tuna catches were concentrated south of 10°N with greater proportions in the equatorial region primarily west of ~110°W, particularly in April–June. No tuna catches were recorded in the oligotrophic gyre.

5. IDENTIFICATION OF SPECIES AT RISK: ERAS

The primary objective of EAFM is to ensure the long-term sustainability of the ecosystem and all species impacted—directly or indirectly—by fishing activities. Achieving this objective is particularly challenging in fisheries that interact with numerous non-target species with diverse life histories, for which reliable catch and biological data required for conventional single-species assessments are lacking.

In such data-limited contexts, Ecological Risk Assessments (ERAs) provide a practical alternative. Reflected in Goal ECO 1, of the updated SSP (2026–2030; SAC-16-07; IATTC 103-03a), ERAs are designed to identify and prioritize species that may be vulnerable to fishing impacts, thereby guiding data collection, research and management efforts.

This goal includes two key targets: (1) conducting ERAs for prioritized shark species, as requested in Resolution C-24-05, now replaced with C-25-08 (paragraph 16) and (2) undertaking similar assessments, as needed, for other potentially vulnerable taxa such as rays, seabirds, sea turtles and marine mammals. In this context, 'vulnerability' 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 developed the Ecological Assessment of the Sustainable Impacts of Fisheries (EASI-Fish) in 2018 (Griffiths et al. 2018, Griffiths et al. 2019), a sophisticated ERA that is spatially explicit and can accommodate the cumulative effects of fishing on the species of interest, while also serving as a simulation tool to evaluate the hypothetical impacts of CMMs on these species. As with other tools used by IATTC staff to develop scientific advice for management, future plans exist to externally review this tool.

6. 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, integrity 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

[7] An area of low productivity, nutrients, and surface chlorophyll, often referred to as an "oceanic desert".

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 J-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 ("ETP-21") 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).

The model has not been updated since 2024 due to data limitations and constrained internal resources. However, the staff has plans to update the model with new data during 2026–2027, with support from global experts and collaborators. This effort will enable existing staff to resume model development and more effectively support EAFM objectives, in line with the EcoCard workplan in EB-02-02, including the generation of indicators describing ecosystem structure and function. Planned work also includes the exploration of integrated ecosystem indicators (e.g., the Ecosystem Traits Index: ETI; Fulton and Sainsbury 2025).

6.1. 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 J-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 J-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 J-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.

The model was not updated in 2025, but plans are in place to resume ecosystem indicator development in the near future.

7. FUTURE DEVELOPMENTS

In the near term, stock assessments are unlikely to be available for most of the bycatch species interacting with IATTC tuna fisheries. As a result, continued ecological research on the impacts of the fishery and alternative assessment approaches remain essential to provide managers with reliable, science-based information to guide ecosystem-oriented conservation and management measures. This work is critical for ensuring that the IATTC continues to fulfil its responsibilities under the Antigua Convention, transition towards EAFM, as well as the objectives set out in both the original and updated SSPs (IATTC-93-06a: 2019-2023; IATTC-103-03a: 2026-2030).

In addition to updating the 2024 ecosystem model ETP-24, priority ecosystem-and bycatch-related research areas identified by the scientific staff—reflected in Theme 4 (Ecological Impacts of Fisheries: Assessment and Mitigation (ECO) of the current SSP—are outlined below:

- GOAL ECO 7: Advance and ultimately implement the EcoCard workplan (EB-02-02) to improve the communication of ecosystem advice and the status of ecosystems in the EPO.
- GOAL ECO 1: Conduct an external review of the EASI-Fish methodology and, following any recommended improvements, apply it to prioritized shark species (identified in Resolution C-25-08) and other vulnerable taxa (e.g., rays, seabirds, sea turtles, and marine mammals).
- GOAL ECO 2: Develop tools to reduce interactions between Commission-managed fisheries and prioritized bycatch species.
- GOAL ECO 4: Complete the development of science-based, standardized best handling and release practices (BHRPs) for all vulnerable taxa and Commission-managed fisheries, including associated crew training programs.
- GOAL ECO 6: Develop a toolbox to support the Commission's use of spatial management measures, including options aligned with the Biodiversity Beyond National Jurisdiction (BBNJ) agreement.

In addition, under Theme 5 (Interactions among the Environment, the Ecosystem, and Fisheries, ENV):

- GOAL ENV 1: Establish the foundation for climate-resilient fisheries through implementation of the ongoing workplan (see SAC-15-12).

Similarly, two priority goals for sharks are listed under theme 1 (Data collection for scientific support of management, DAT) and 3 (Sustainable fisheries, FISH):

- GOAL DAT 3: Complete the design and support the implementation of a standardized data collection program for shark species associated with fisheries managed by the Commission.
- GOAL FISH 5: Conduct a close-kin mark-recapture (CKMR) stock assessment for silky shark.

A key cross-cutting challenge related to bycatch and ecological analyses is the limitation of available data. The quality of ecological analyses and the annual reporting of EPO-wide bycatch estimates are currently constrained by the IATTC resolution on data provision (C-03-05), which no longer aligns with the Commission's evolving responsibilities under the Antigua Convention (see SAC-12-09). These responsibilities include assessing and monitoring the impacts of EPO tuna fisheries on associated and dependent species—one of the primary motivations for the development and annual update of the *Ecosystem Considerations* report.

At present, reliable bycatch data are largely limited to observer records from large (Class-6) purse-seine vessels, with substantial data gaps for other pelagic fisheries in the EPO. Addressing these gaps is therefore a priority. Proposed capacity building opportunities, along with a series of workshops involving IATTC staff and CPCs, aim to establish clearer data reporting standards and improve data submission, catch estimation and reporting practices.

Initial discussions have already taken place through workshops on industrial longline fisheries (WSDAT-01, WSDAT-01 RPT) and the small purse-seine fishery (≤363 t carrying capacity) (WSDAT-02, WSDAT-02-01, WSDAT-02-02, WSDAT-02 RPT). Similar efforts are expected in the near future for the small scale fisheries operating in the region. These efforts have informed a set of updated staff recommendations, developed in consultation with CPCs and compiled in 2025 (SAC-16 INF-O). Collectively, these initiatives are expected to strengthen the data foundation for ecological analyses and support the IATTC in meeting its obligations under the Antigua Convention.

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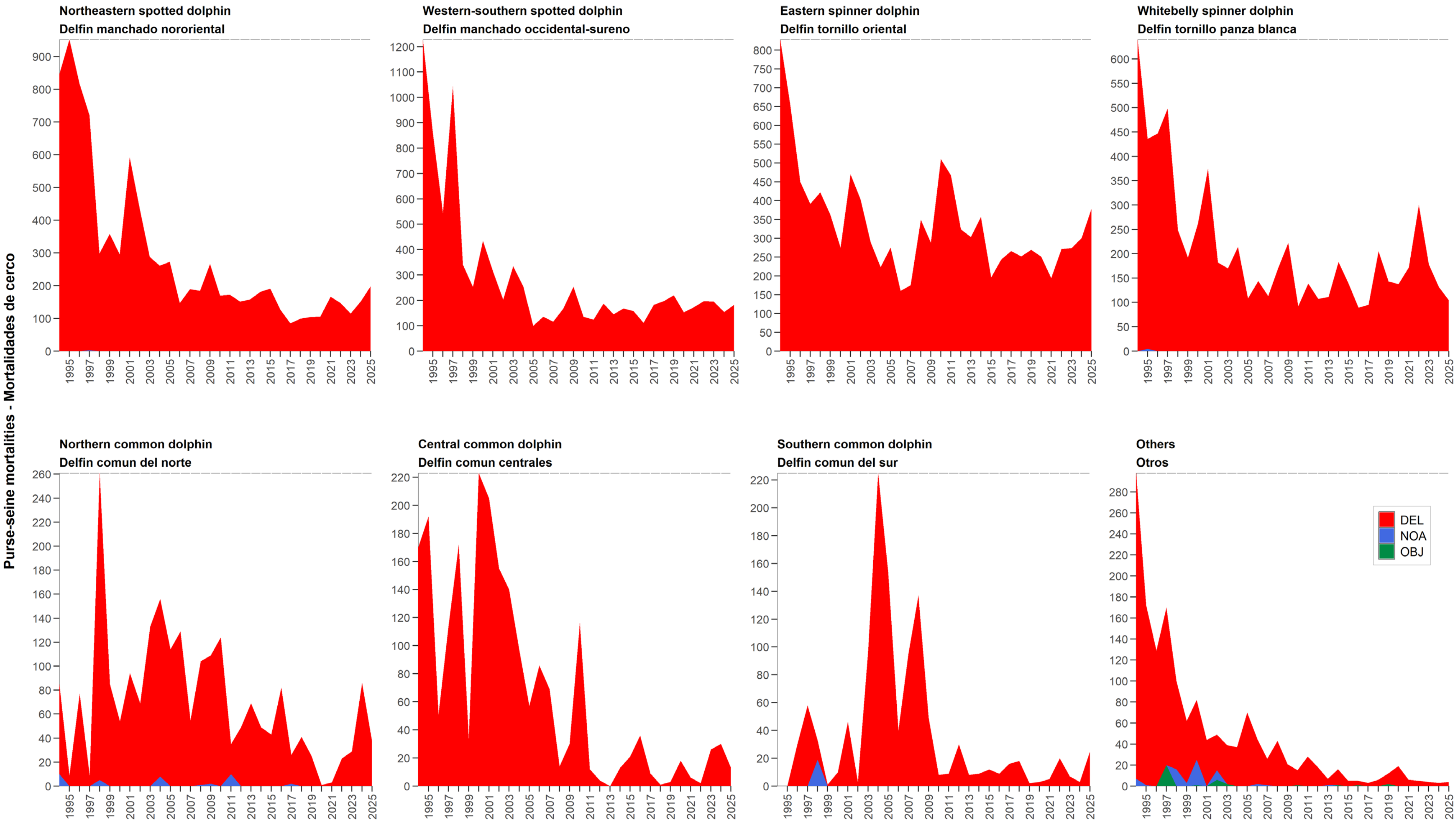

FIGURE J-1. Estimated number of incidental dolphin mortalities by observers onboard purse-seine vessels, 1995–2025.
FIGURA J-1. Número estimado de mortalidades incidentales de delfines por observadores a bordo de buques cerqueros grandes, 1995–2025.

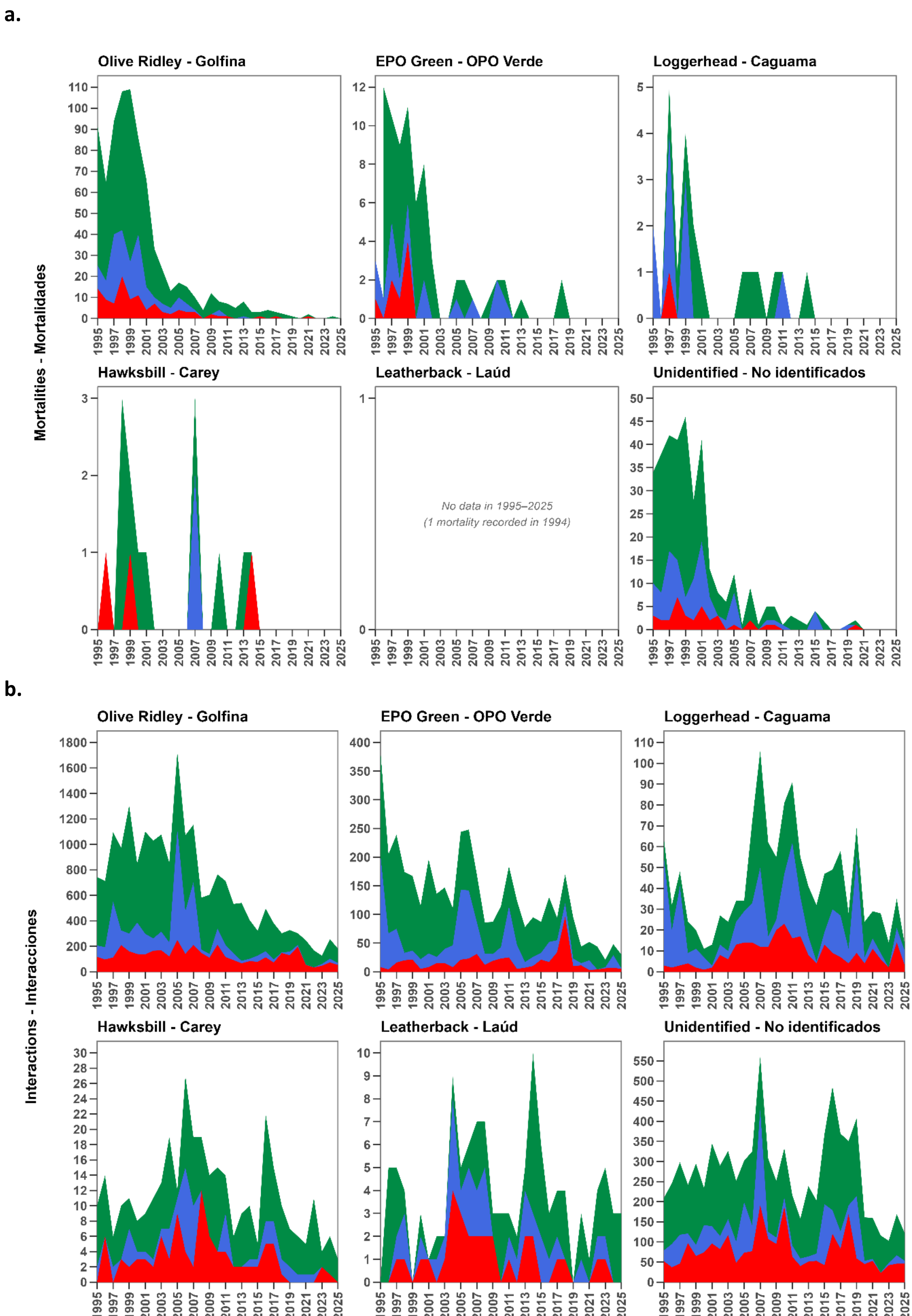

FIGURE J-2. Estimated number of sea turtle a) mortalities and b) interactions by observers onboard large purse-seine (Class 6, carrying capacity > 363 t) vessels, 1995–2025, by set type (dolphin (DEL), unassociated (NOA), floating object (OBJ)).

FIGURA J-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), 1995-2025, por tipo de lance (delfín (DEL), no asociado (NOA), objeto flotante (OBJ)).

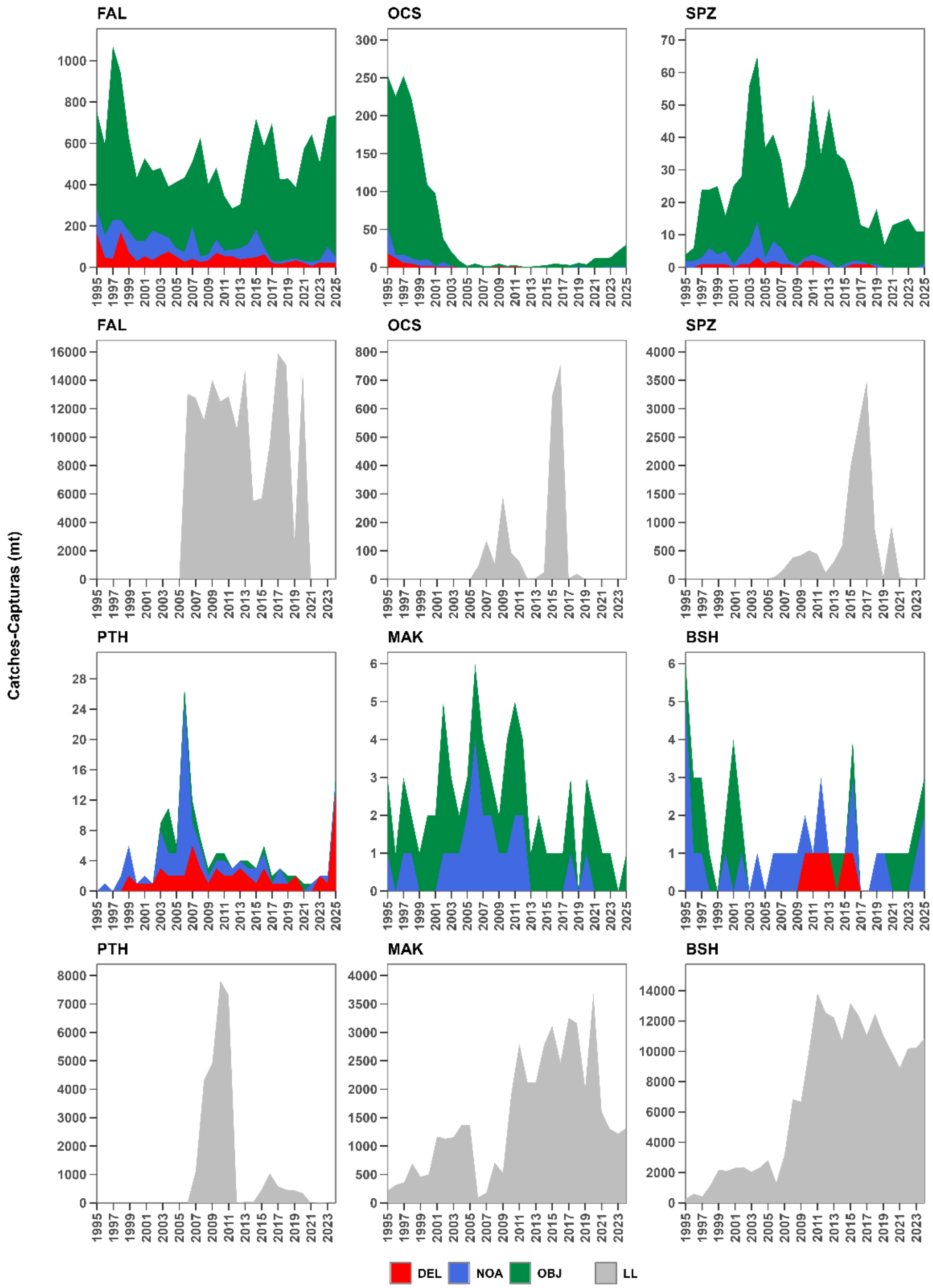

FIGURE J-3a. Estimated catches in metric tons (t) of key shark species in the eastern Pacific Ocean recorded by observers onboard large purse-seine (Class 6, carrying capacity > 363 t) vessels and minimum longline (LL) estimates of gross annual removals reported by CPCs (see section 2.2. for uncertainty 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 (1995–2025) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Longline catches (1995–2024) are minimum reported gross-annual removals that may have been estimated using a mixture of different weight metrics (see footnote in section 3.5). FAL: Silky shark, OCS: Oceanic whitetip shark, SPZ: Smooth hammerhead shark, PTH: Pelagic thresher shark, MAK: Mako shark, BSH: Blue shark.

FIGURA J-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 (1995-2025) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las capturas palangreras (1995–2024) 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). FAL: Tiburón sedoso, OCS: Tiburón oceánico punta blanca, SPZ: Tiburón martillo, PTH: Zorro pelágico, MAK: Marrajo, BSH: Tiburón azul.

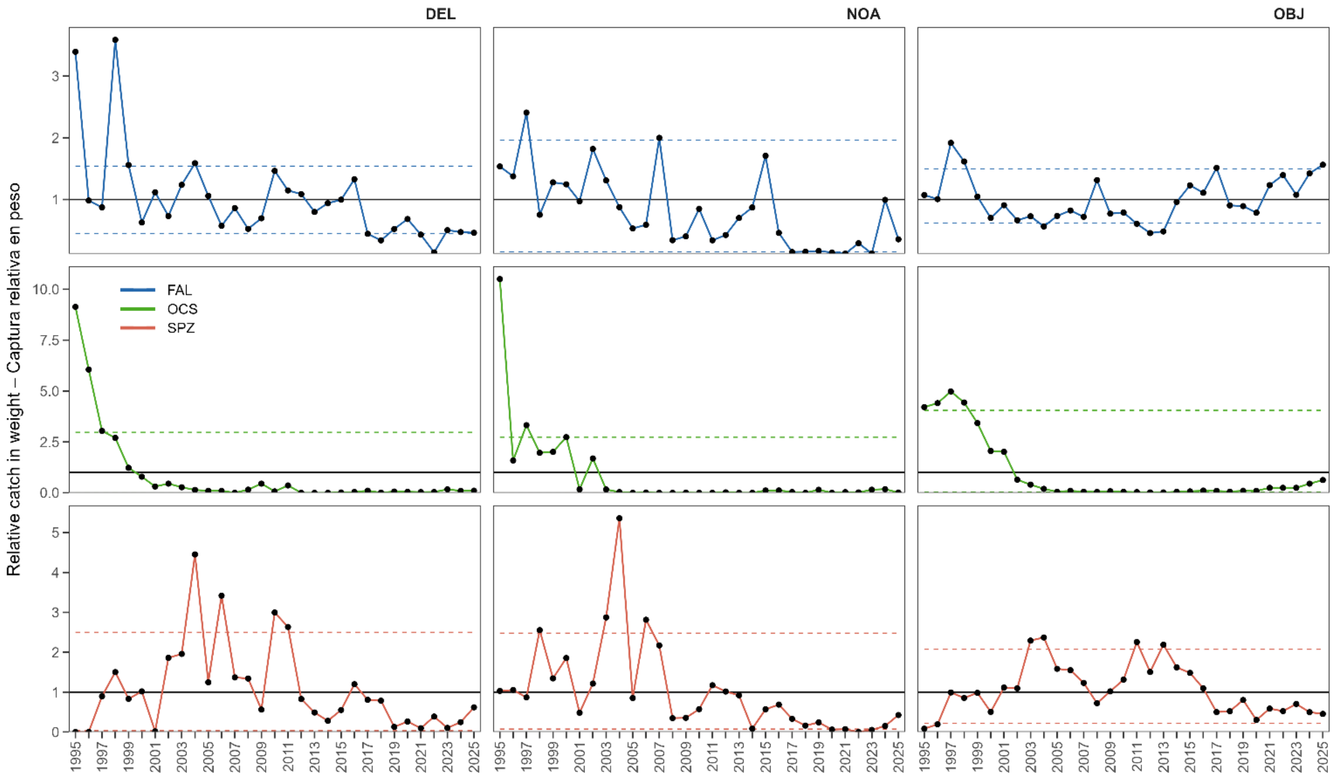

FIGURE J-3b. Indicators of relative catch of key shark species reported by observers onboard large purse-seine vessels (Class 6, carrying capacity > 363 t) by set type: dolphins (DEL), unassociated tuna schools (NOA) and floating object (OBJ). The solid line is the average total annual catch for the period 1995–2025 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 J-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 1995-2025 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*).

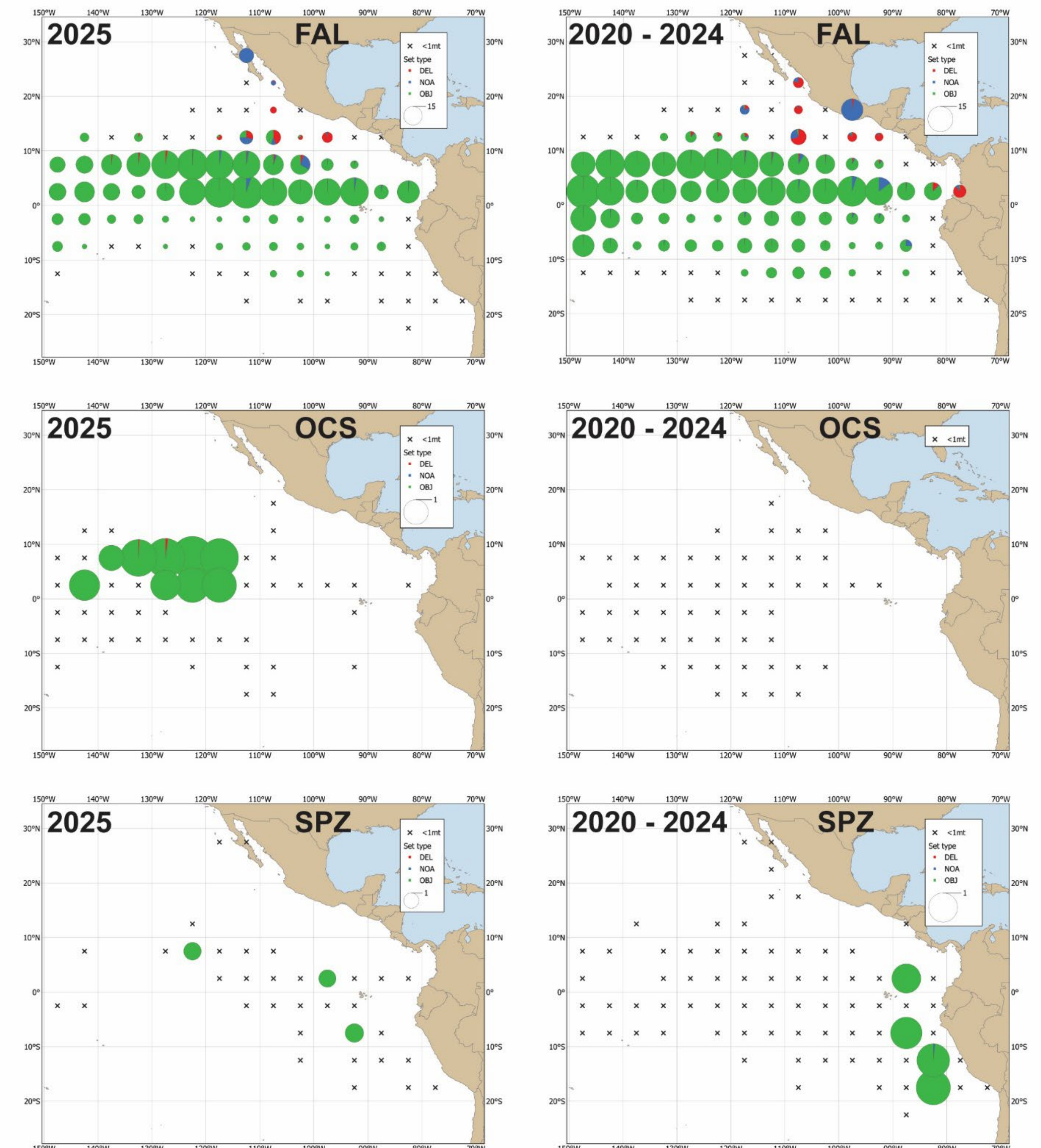

FIGURE J-3c. Purse-seine catches (Class 6, carrying capacity > 363 t) (at 5°x5° resolution) of key species of sharks by set type: floating object (OBJ) unassociated tuna schools (NOA) and dolphins (DEL), for 2025 (left panel) and the 2020–2024 averages (right panel). FAL: silky shark (*Carcharhinus falciformis*), OCS: oceanic whitetip shark (*Carcharhinus longimanus*), SPZ: smooth hammerhead shark (*Sphyrna zygaena*).

FIGURA J-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 2025 (panel izquierdo) y los promedios de 2020–2024 (panel derecho). FAL: tiburón sedoso (*Carcharhinus falciformis*), OCS: tiburón oceánico punta blanca (*Carcharhinus longimanus*), SPZ: cornuda cruz (*Sphyrna zygaena*).

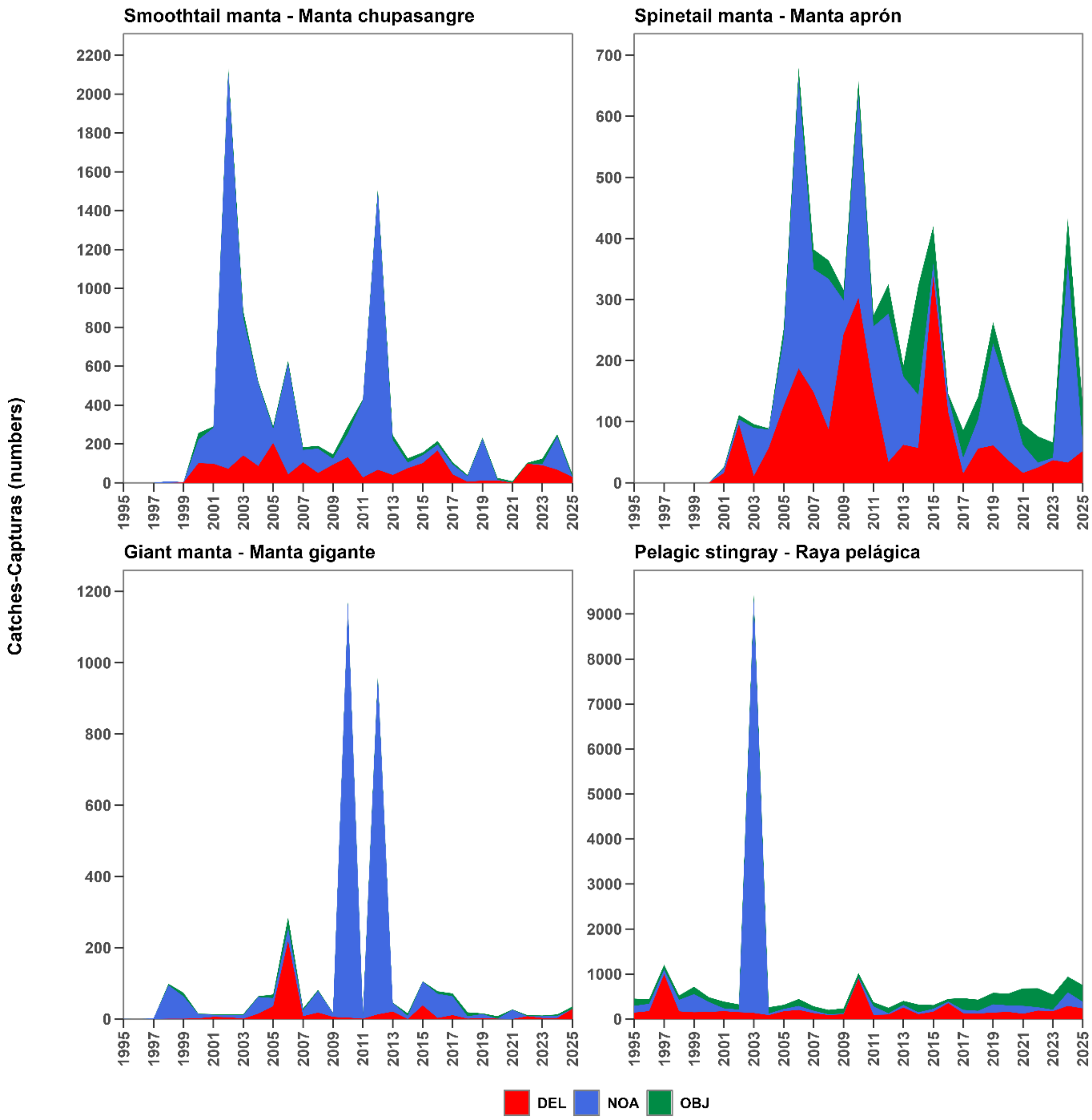

FIGURE J-4a. Estimated purse-seine catches in numbers of individuals of key species of rays in the eastern Pacific Ocean. Purse seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1995–2025) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL).

FIGURA J-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 (1995-2025) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL).

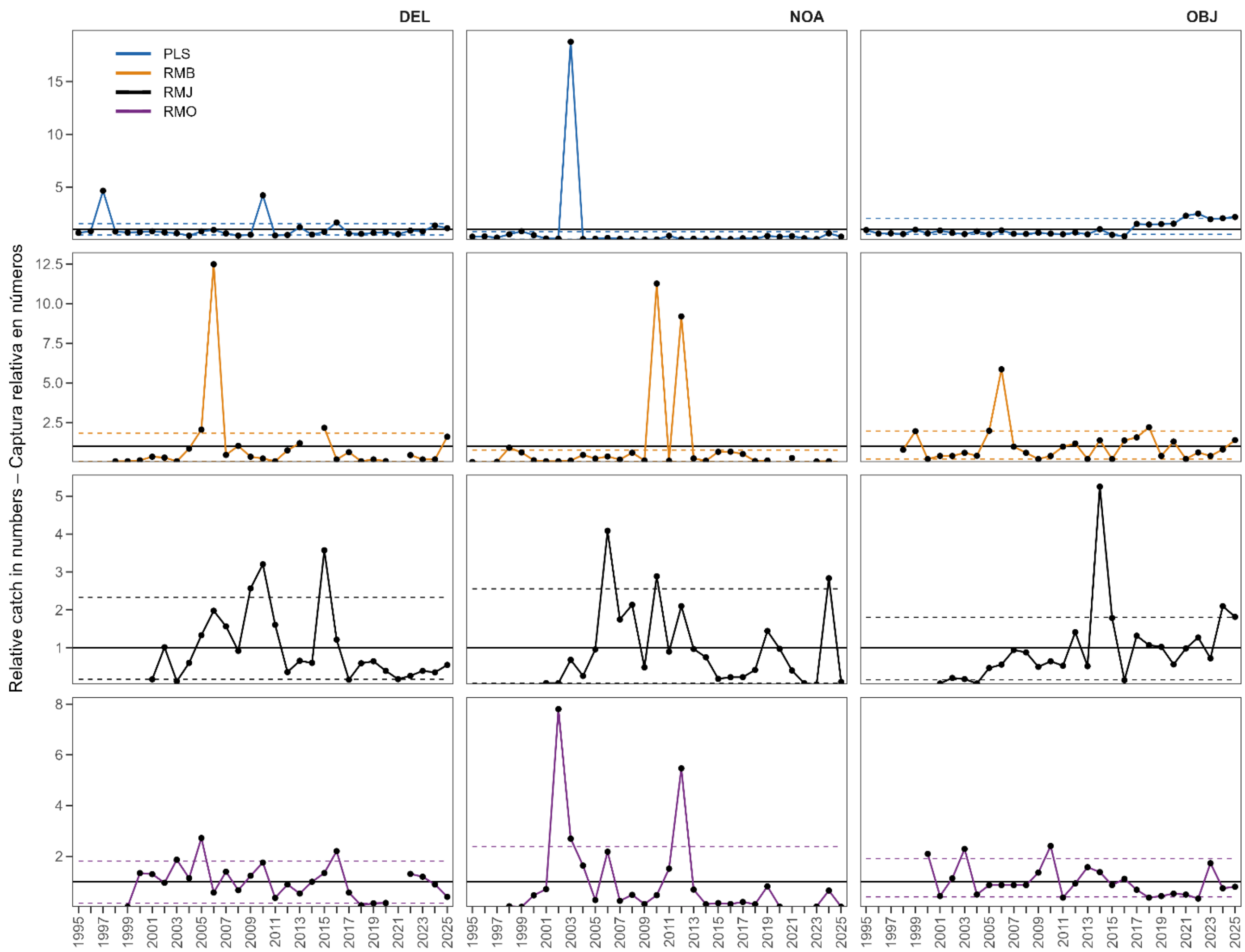

FIGURE J-4b. Indicators of relative number of individuals of rays reported by observers onboard large purse-seine vessels (Class 6, carrying capacity > 363 t) by set type: dolphins (DEL), unassociated tuna schools (NOA) and floating object (OBJ). The solid line is the average total annual catch for the period 1995–2025 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 J-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 1995-2025 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*).

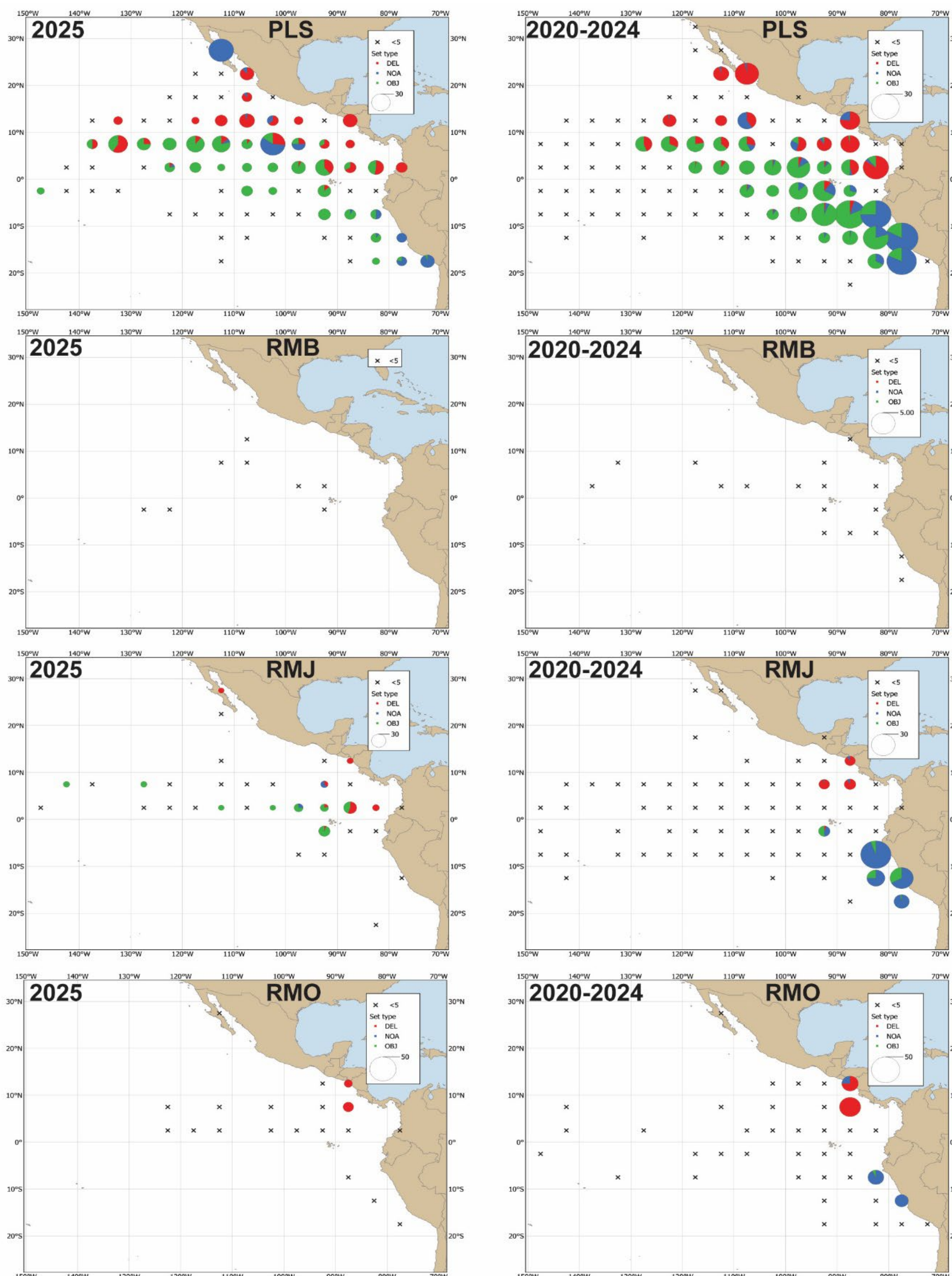

FIGURE J-4c. Purse-seine catches (Class 6, carrying capacity > 363 t) (at 5°x5° resolution) of key species of rays by set type: floating object (OBJ) unassociated tuna schools (NOA) and dolphins (DEL), for 2025 (left panel) and the 2020–2024 averages (right panel). PLS: pelagic stingray (*Pteroplatytrygon violacea*), RMB: giant manta (*Mobula birostris*), RMJ: spinetail manta (*Mobula mobular*), RMO: smoothtail manta (*Mobula thurstoni*).

FIGURA J-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 2025 (panel izquierdo) y los promedios de 2020–2024 (panel derecho). PLS: raya pelágica (*Pteroplatytrygon violacea*), RMB: manta gigante (*Mobula birostris*), RMJ: manta mobula (*Mobula mobular*), RMO: manta diablo (*Mobula thurstoni*).

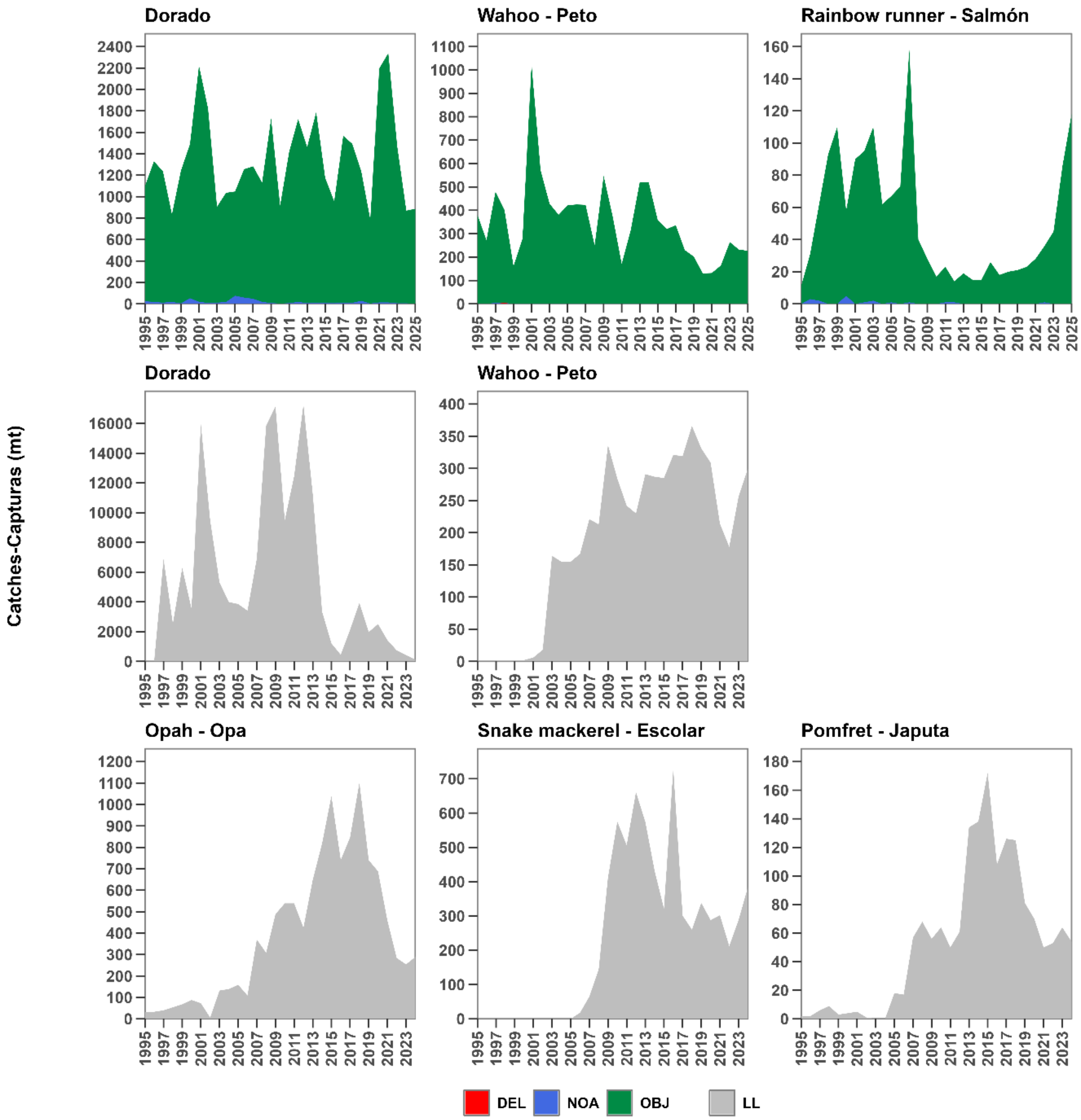

FIGURE J-5. Estimated purse-seine and longline catches in metric tons (t) of key species of large fishes in the eastern Pacific Ocean. Purse-seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1995–2025) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Longline (LL) catches (1995–2024) are minimum reported gross-annual removals (see section 2.2. for uncertainty and data gaps in reporting of bycatch species caught by longline).

FIGURA J-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 (1995-2025) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Las capturas palangreras (LL) (1995–2024) 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).

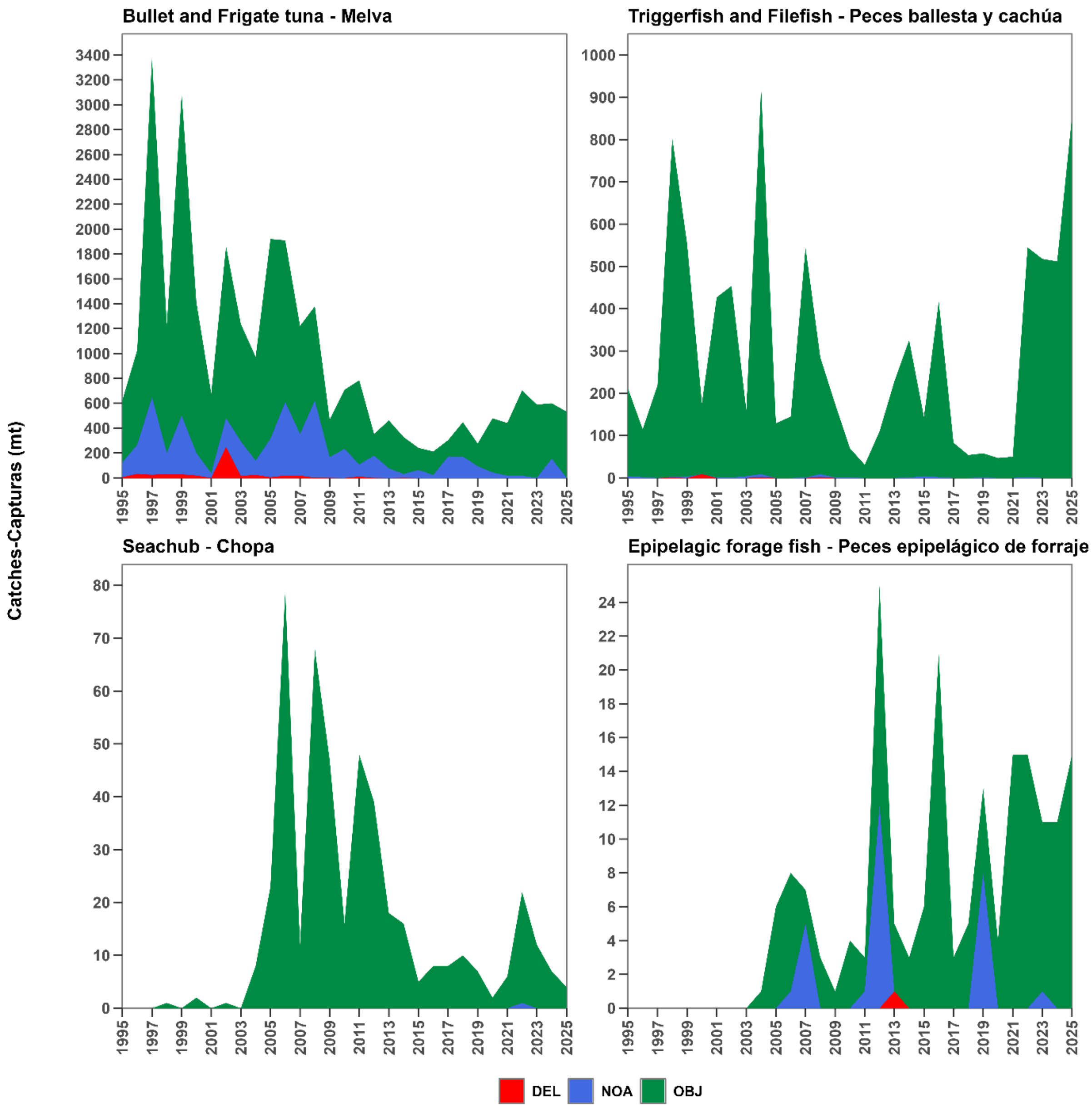

FIGURE J-6. Estimated purse-seine catches in metric tons (t) of key species of small fishes in the eastern Pacific Ocean. Purse seine catches are provided for size-class 6 vessels with a carrying capacity >363 t (1995–2025) by set type: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL).

FIGURA J-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 (1995-2025) por tipo de lance: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL).

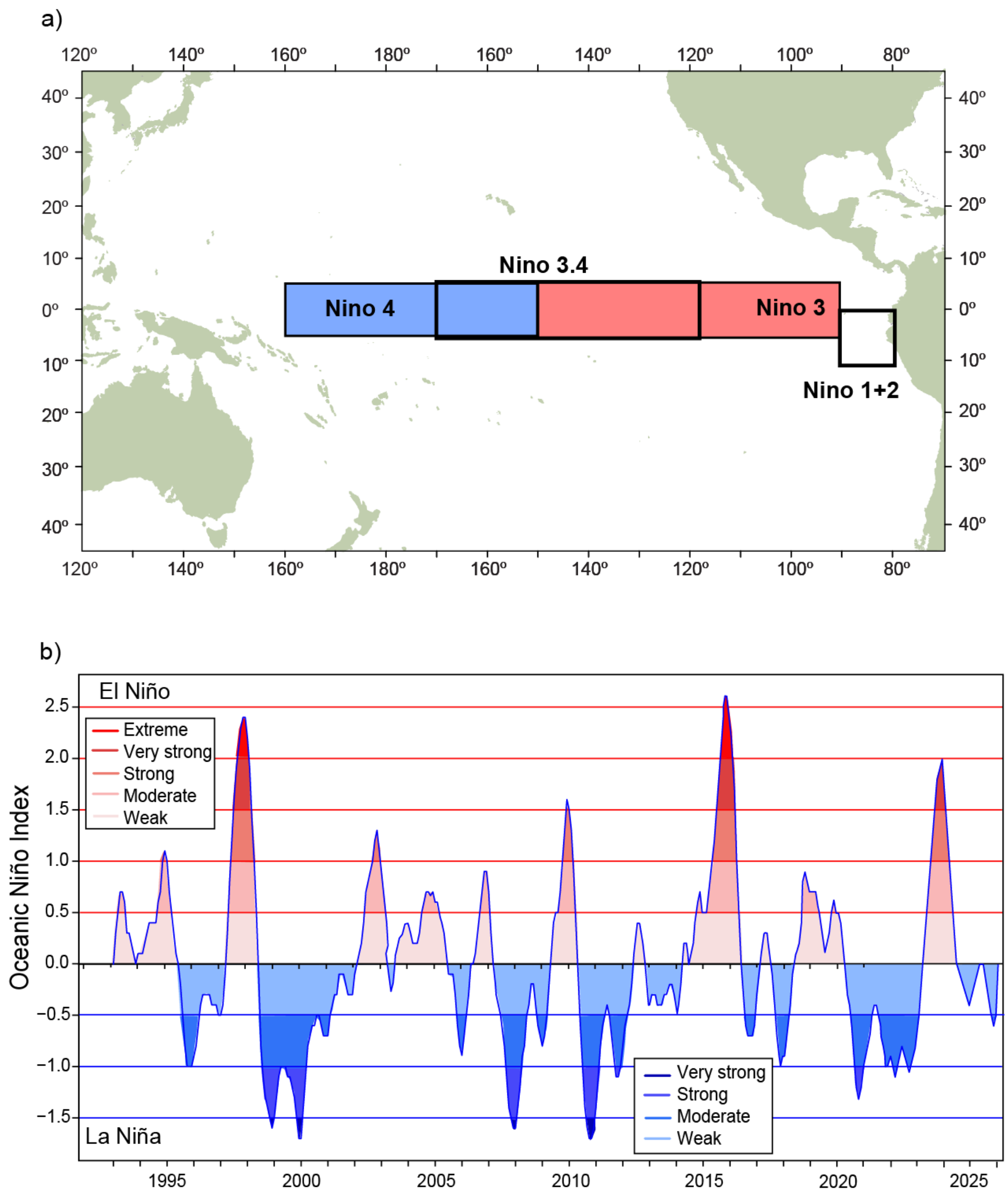

FIGURE J-7. El Niño regions used as indicators of El Niño Southern Oscillation (ENSO) events in the Pacific Ocean (top panel), and the Oceanic Niño Index (ONI) used to monitor ENSO conditions in Niño region 3.4 from 5°N to 5°S and 120°W to 170°W (bottom panel). Time series shows the running 3-month mean ONI values from the start of the IATTC observer program (1993) through December 2025. ONI data obtained from: http://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php

FIGURA J-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 (1993) hasta finales de diciembre de 2025. Datos del ONI obtenidos de: http://origin.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ONI_v5.php

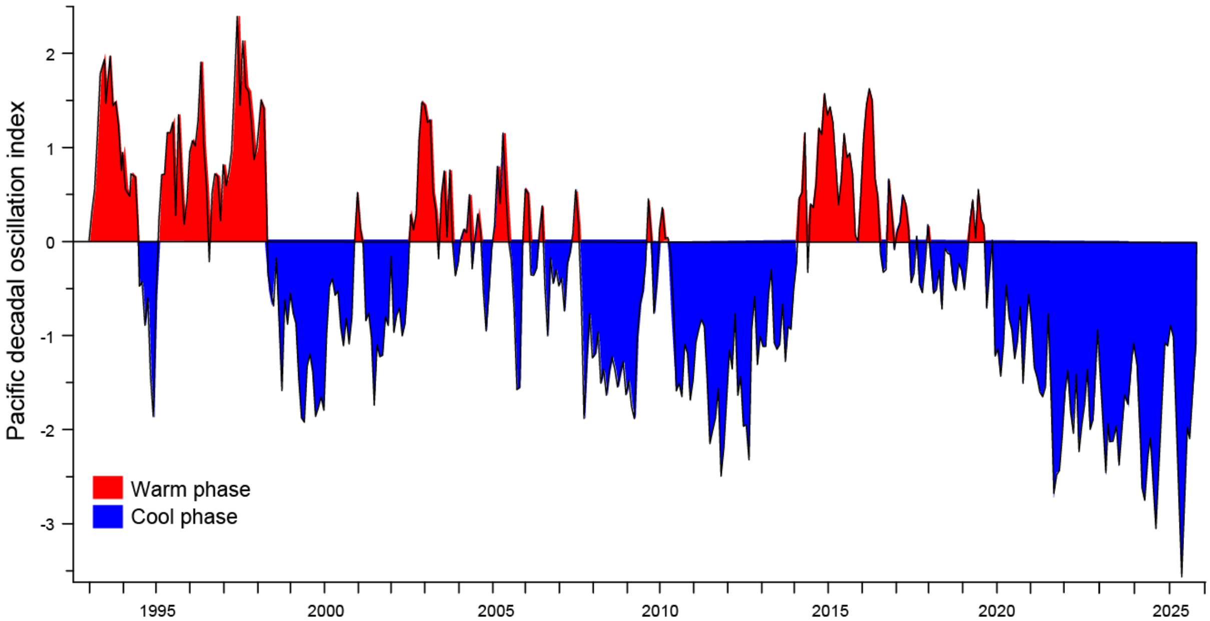

FIGURE J-8. Monthly values of the Pacific Decadal Oscillation (PDO) Index, January 1993–December 2025. ERSST V5 PDO Time Series data obtained from: https://psl.noaa.gov/pdo/

FIGURA J-8. Valores mensuales del índice de Oscilación Decadal del Pacífico (PDO), enero de 1993–diciembre de 2025. Datos de la serie de tiempo ERSST V5 PDO obtenidos de: https://psl.noaa.gov/pdo/

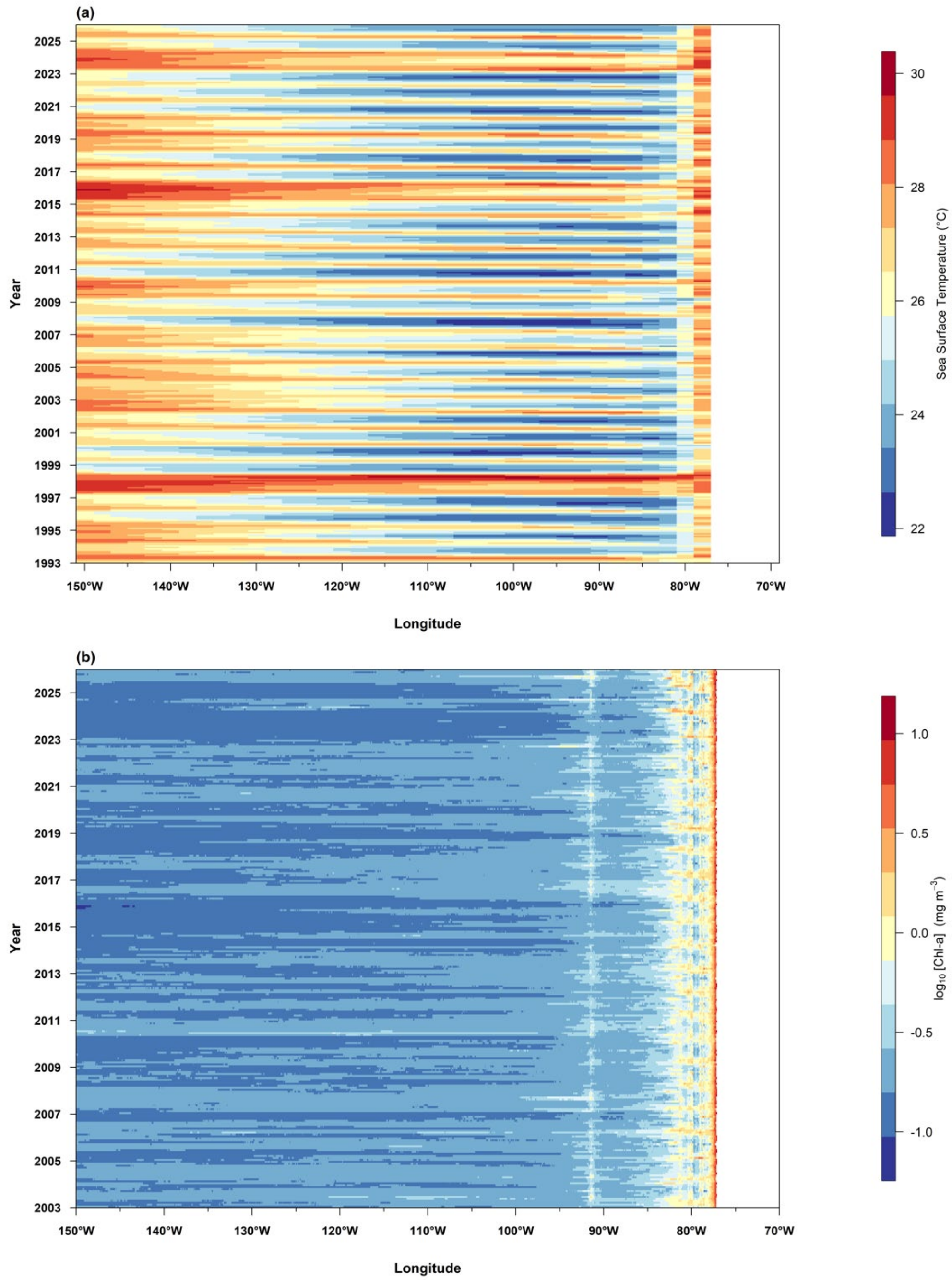

FIGURE J-9. Time-longitude Hovmöller diagram with data averaged across the tropical eastern Pacific Ocean from 5°N to 5°S for mean monthly SST for January 1993–December 2025 (top panel) (https://coastwatch.pfeg.noaa.gov/erddap/griddap/nceiErsstv5_LonPM180.html) and mean monthly chlorophyll-a concentration for January 2003–December 2025 (bottom panel); 2003–2024: https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html; January 2024–December 2025: https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1chlamday_R2022NRT.html.

FIGURA J-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 2025 (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 2025 (panel inferior); 2003–2024: https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html; enero de 2024–diciembre de 2025: https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1chlamday_R2022NRT.html.

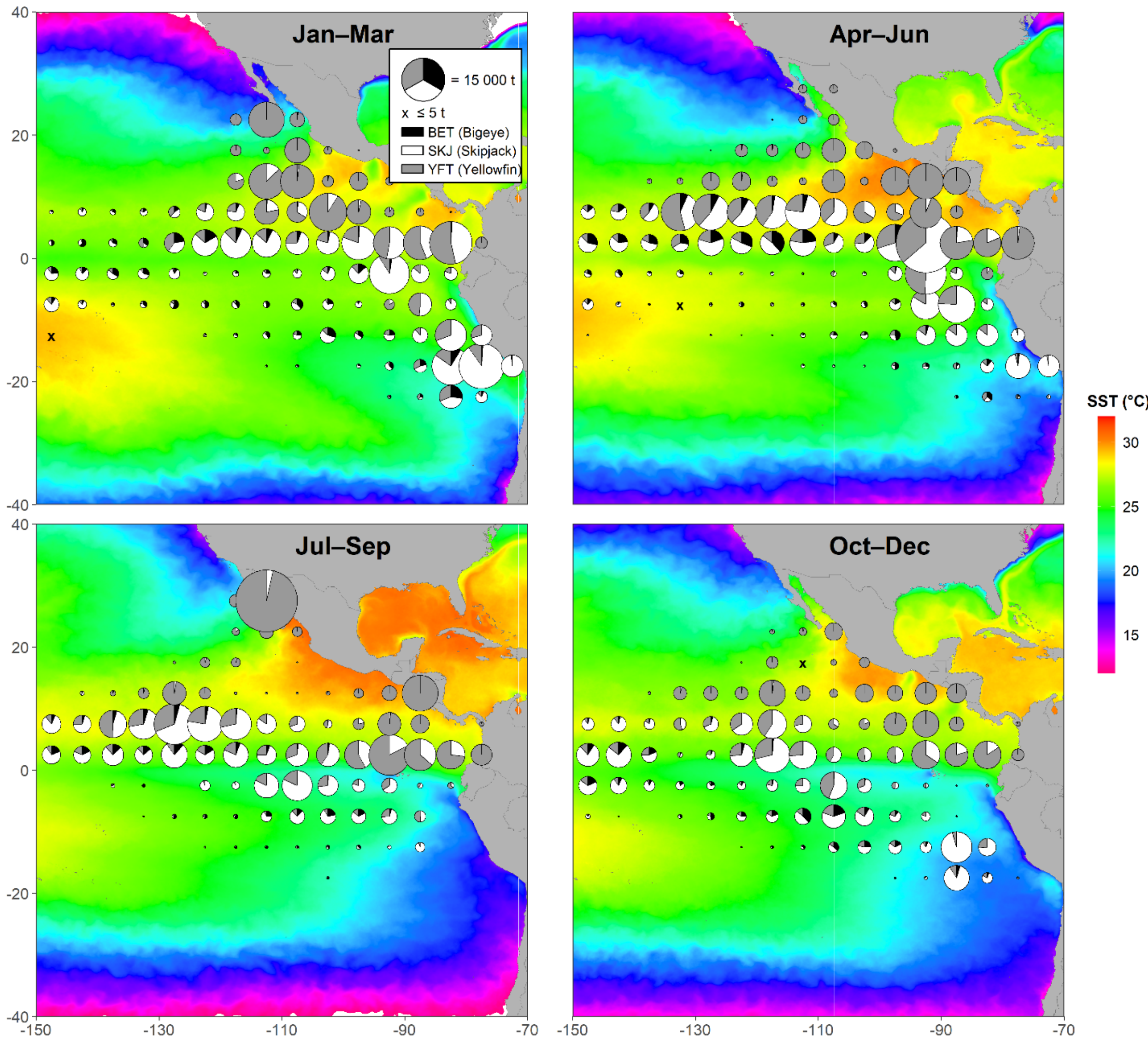

FIGURE J-10. Mean sea surface temperature (SST) for each quarter during 2025 with catches of tropical tunas overlaid. SST data obtained from NOAA NMFS SWFSC ERD on April 16, 2026, "Multi-scale Ultra-high Resolution (MUR) SST Analysis fv04.1, Global, 0.01°, 2002–present, Monthly", https://coastwatch.pfeg.noaa.gov/erddap/info/jplMURSST41mday/index.html.

FIGURA J-10 Temperatura superficial del mar (TSM) promedio para cada trimestre de 2025 con las capturas de atunes tropicales superpuestas. Datos de TSM obtenidos de NOAA NMFS SWFSC ERD el 16 de abril de 2026, "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.

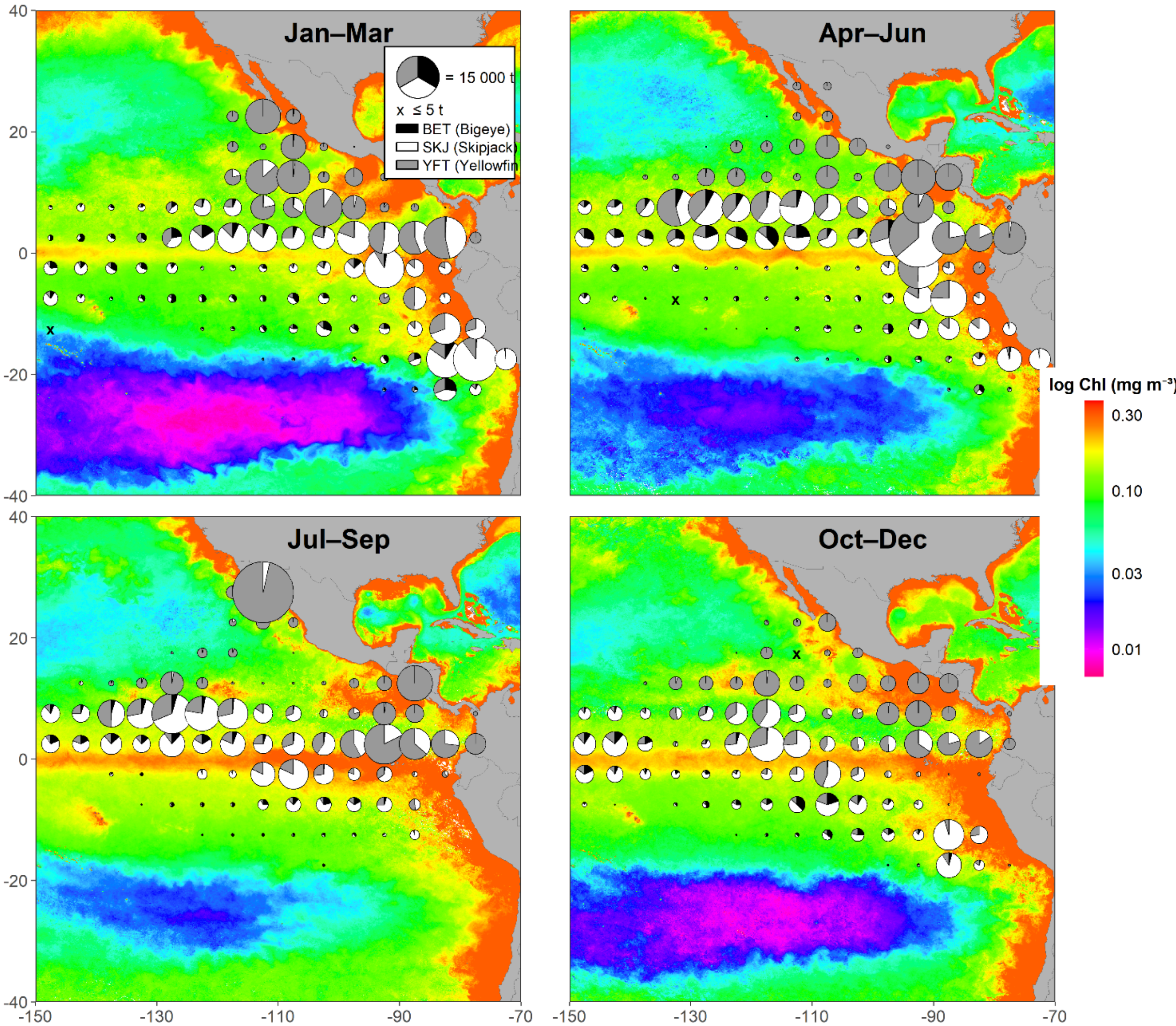

FIGURE J-11. Mean log chlorophyll-a concentration (in mg m[3]) for each quarter during 2025 with catches of tropical tunas overlaid. Chlorophyll data obtained from NOAA CoastWatch on April 17, 2026, quarters 1–3: "Chlorophyll-a, Aqua MODIS, NPP, L3SMI, Global, 4km, R2022 SQ, 2003-present (Monthly Composite)", https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html and quarter 4: "Chlorophyll-a, Aqua MODIS, NPP, L3SMI, Global, 4km, R2022 NRT, 2003-present (Monthly Composite)" https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1chlamday_R2022NRT.html.

FIGURA J-11. Concentración promedio de clorofila-a (en mg m[3]) para cada trimestre de 2025 con las capturas de atunes tropicales superpuestas. Datos de clorofila obtenidos de NOAA CoastWatch el 17 de abril de 2026, trimestres 1-3 "Chlorophyll-a, Aqua MODIS, NPP, L3SMI, Global, 4km, R2022 SQ, 2003-present (Monthly Composite)", https://coastwatch.pfeg.noaa.gov/erddap/info/erdMH1chlamday_R2022SQ/index.html y trimestre 4: "Chlorophyll-a, Aqua MODIS, NPP, L3SMI, Global, 4km, R2022 NRT, 2003-present (Monthly Composite)" https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdMH1chlamday_R2022NRT.html.

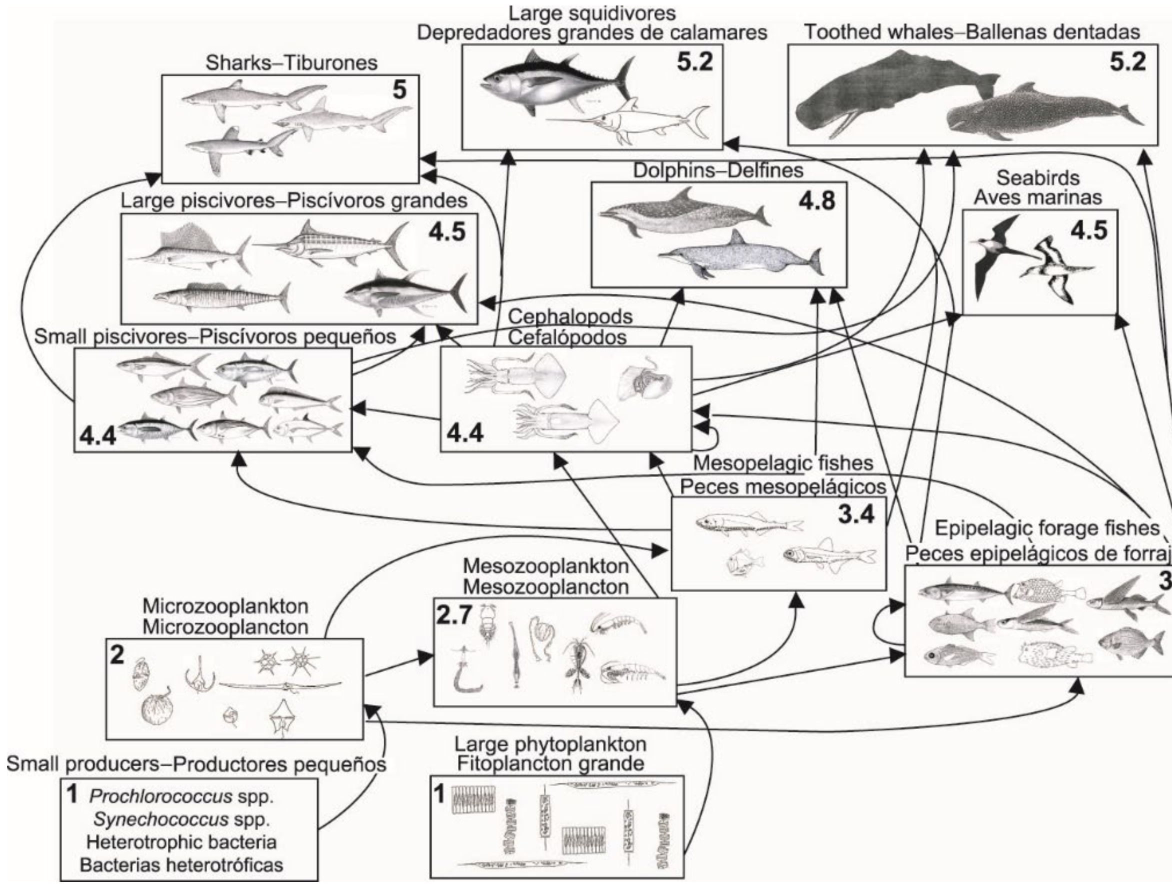

FIGURE J-12. Simplified food-web diagram of the pelagic ecosystem in the tropical EPO. The numbers inside the boxes indicate the approximate trophic level of each group.

FIGURA J-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.

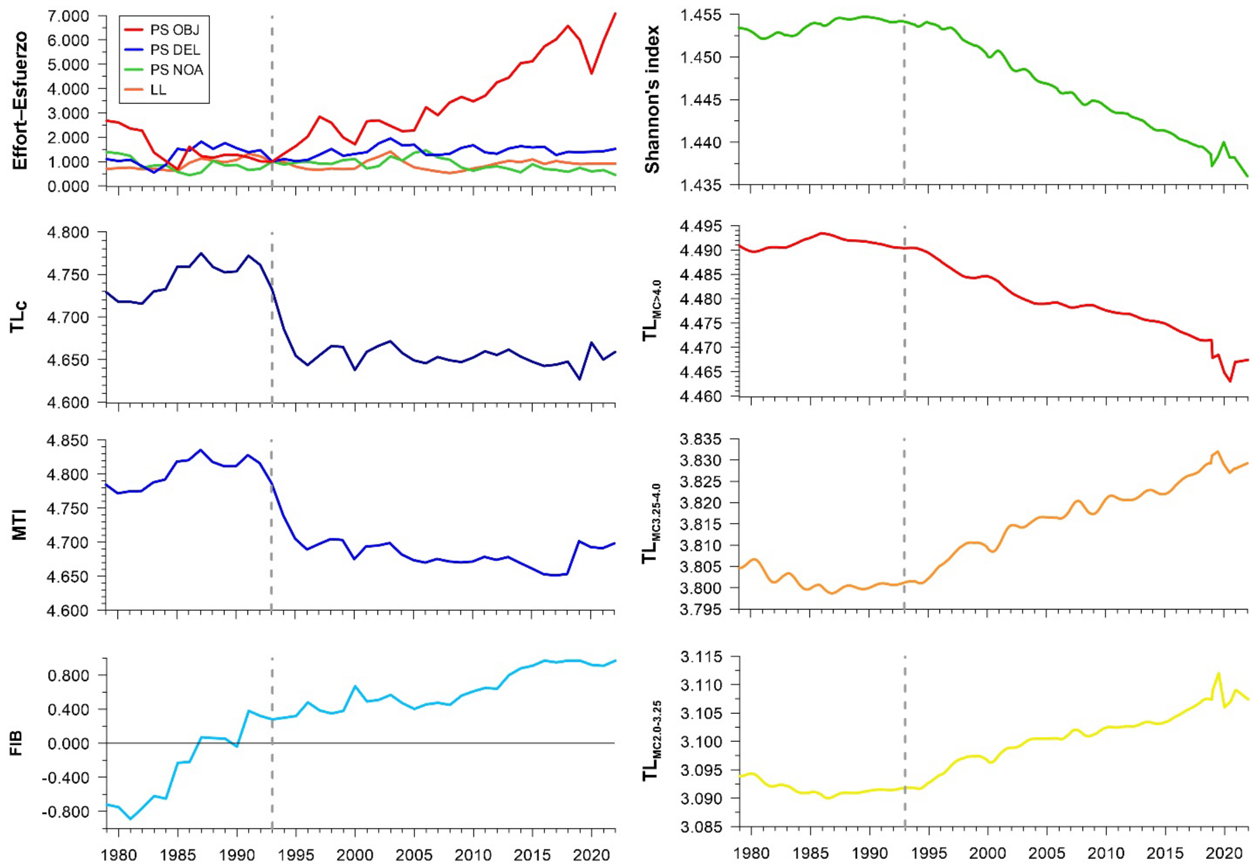

FIGURE J-13. Annual values for seven ecological indicators of changes in different components of the tropical EPO ecosystem, 1979–2022 (see Section 6 of text for details), and an index of longline (LL) and purse-seine (PS) fishing effort, by set type (dolphin (DEL), unassociated (NOA), floating object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

FIGURA J-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 J-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 1995-2025. Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Data for 2024–2025 are considered preliminary.

Tabla J-1a. Número estimado de individuos de mortalidades incidentales de delfines por la pesquería de cerco durante 1995–2025, 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 2024–2025 se consideran preliminares.

	Northeastern spotted Purse seine			Western-southern spotted Purse seine			Eastern spinner Purse seine			Whitebelly spinner Purse seine		
Year	DEL	NOA	OBJ	DEL	NOA	OBJ	DEL	NOA	OBJ	DEL	NOA	OBJ
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	-	-
2025	198	-	-	183	-	-	378			104	-	-
Total	8,395	3	-	8,041	-	-	10,042	-	-	6,104	5	-

Table J-1a continued

	Northern common Purse seine			Central common Purse seine			Southern common Purse seine			Other dolphins Purse seine		
Year	DEL	NOA	OBJ	DEL	NOA	OBJ	DEL	NOA	OBJ	DEL	NOA	OBJ
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	-	-
2025	37	-	-	13	-	-	25	-	-	4	-	-
Total	2,152	28	-	1,949	-	-	1,143	19	-	1,154	57	34

Table J-1b. Minimum number of marine mammal interactions and mortalities in the eastern Pacific Ocean (EPO) in 2024 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 J-1b. Número mínimo de interacciones con mamíferos marinos y mortalidades en el Océano Pacífico oriental (OPO) en 2024 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
Spinner dolphin	*Stenella longirostris*	5	-
False killer whale	*Pseudorca crassidens*	2	1
Striped dolphin	*Stenella coeruleoalba*	1	1
Bottlenose dolphin	*Tursiops truncatus*	1	1
Total numbers		9	3

Table J-2a. Estimated number of turtle interactions and mortalities by observers onboard purse-seine size-class 6 vessels with a carrying capacity >363 t (1995–2025). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Data for 2024–2025 are considered preliminary.

Tabla J-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 (1995–2025). Tipos de lances cerqueros: objeto flotante (OBJ), atunes no asociados (NOA) y delfines (DEL). Los datos de 2024–2025 se consideran preliminares.

	Lepidochelys olivacea, Olive ridley (LKV)						*Chelonia agassizii, Chelonia mydas,* eastern Pacific green (TUG)						*Caretta caretta,* loggerhead (TTL)					
	Purse seine						Purse seine						Purse seine					
	interactions			mortality			interactions			mortality			interactions			mortality		
Year	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**
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	-	-	-
2025	112	16	53	-	-	-	24	1	5	-	-	-	3	7	3	-	-	-
Total	13,149	3,953	3,842	533	158	104	2,490	1,119	510	64	16	8	599	455	266	11	9	1

Table J-2a continued

	Eretmochelys imbricata, hawksbill (TTH)						*Dermochelys coriacea*, leatherback (DKK)						Unidentified turtles					
	Purse seine						Purse seine						Purse seine					
	interactions			mortality			interactions			mortality			interactions			mortality		
Year	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**	**OBJ**	**NOA**	**DEL**
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	-	-	-
2025	3	-	-	-	-	-	3	-	-	-	-	-	68	7	46	-	-	-
Total	201	58	91	9	2	3	58	31	29	-	-	-	4,574	1,490	2,379	226	85	35

Table J-2b. Minimum number of sea turtle interactions and mortalities in the eastern Pacific Ocean (EPO) in 2024 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 J-2b. Número mínimo de interacciones con tortugas marinas y mortalidades en el Océano Pacífico oriental (OPO) en 2024 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
Leatherback turtle	*Dermochelys coriacea*	4	2
Olive Ridley turtle	*Lepidochelys olivacea*	3	-
Loggerhead turtle	*Caretta caretta*	3	3
Total numbers		10	5

Table J-3. Minimum number of seabird interactions in the eastern Pacific Ocean (EPO) in 2024 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" or blank were precautionarily presumed to be mortalities. 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 J-3. Número mínimo de interacciones con aves marinas en el Océano Pacífico oriental (OPO) en 2024 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" o en blanco son mortalidades. 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	*Phoebastria nigripes*	4	4
Laysan albatross	*Phoebastria immutabilis*	2	2
Frigate / man of war	*Fregata* spp.	3	3
Boobies and gannets nei	Sulidae Fam.	2	2
Wilson's storm petrel	*Oceanites oceanicus*	1	1
Unidentified shearwater	*Puffinus* spp.	1	1
Total numbers		13	13

Table J-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 (1995–2025) and minimum reported longline (LL) catches of sharks (gross-annual removals in t) (1995–2024, *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 2020–2024 (longline) and 2024–2025 (purse-seine) are considered preliminary.

Tabla J-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 (1995–2025) y capturas palangreras (LL) mínimas reportadas de tiburones (extracciones anuales brutas en t) (1995–2024, *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 2020–2024 (palangre) y 2024–2025 (cerco) se consideran preliminares.

	Carcharhinidae															
	***Carcharhinus falciformis*, silky shark**				***Carcharhinus longimanus*, oceanic whitetip**				***Prionace glauca*, blue shark**				Other Carcharhinidae, requiem sharks			
	Purse seine				Purse seine				Purse seine				Purse seine			
Year	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**
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	36	12	<1	<1	-	1	<1	-	10,191	30	2	2	-
2023	473	10	24	55	12	<1	<1	-	<1	<1	-	10,245	26	<1	2	-
2024	625	78	23	104	21	<1	<1	-	<1	1	-	10,853	25	<1	1	-
2025	687	28	22	*	30	<1	<1	*	<1	2	<1	*	31	5	1	*
Total	13,624	1,974	1,489	171,128	1,405	85	51	2,143	22	25	9	211,707	614	117	127	28,694

Table J-4a Continued

	Sphyrnidae															
	***Sphyrna zygaena*, smooth hammerhead**				*Sphyrna lewini*, scalloped hammerhead				*Sphyrna mokarran*, great hammerhead				*Sphyrna* spp., hammerheads, nei			
	Purse seine				Purse seine				Purse seine				Purse seine			
Year	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**
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	<1	47	<1	<1	3	<1	-	-	-	9	<1	<1	-
2023	15	<1	<1	18	19	<1	<1	42	<1	<1	-	-	8	<1	<1	-
2024	11	<1	<1	3	15	<1	<1	<1	3	1	<1	-	4	<1	<1	-
2025	10	<1	<1	*	27	<1	1	*	<1	<1	-	*	4	<1	-	*
Total	710	67	22	14,227	530	93	28	859	66	5	5	-	614	106	42	3,122

Table J-4a Continued

	Alopiidae															
	***Alopias pelagicus*, pelagic thresher**				*Alopias superciliosus*, bigeye thresher				*Alopias vulpinus*, thresher shark				*Alopias* spp., thresher shark, nei			
	Purse seine				Purse seine				Purse seine				Purse seine			
Year	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**
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	17	<1	<1	<1	48	<1	<1	<1	-	<1	<1	<1	3
2023	<1	<1	2	10	<1	<1	6	31	-	<1	<1	-	<1	<1	<1	<1
2024	<1	<1	<1	-	<1	<1	<1	11	-	<1	-	-	<1	<1	<1	<1
2025	<1	1	13	*	<1	2	2	*	-	<1	<1	*	<1	<1	<1	*
Total	24	65	60	28,952	18	103	60	7,585	5	27	13	5,114	13	52	44	3,716

Table J-4a Continued

	Lamnidae								Triakidae											
	***Isurus* 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			
Year	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**	**OBJ**	**NOA**	**DEL**	**LL**
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	2,020	-	-	-	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	-	1,303	-	-	-	5	-	-	-	-	2	<1	<1	167	729	27	11	11,773
2023	1	-	<1	1,219	-	-	-	6	-	-	-	-	1	<1	<1	72	557	13	36	11,698
2024	<1	<1	<1	1,319	-	-	-	11	-	-	-	2	2	1	<1	56	708	86	26	12,361
2025	1	<1	-	*	-	-	-	*	-	-	-	*	1	<1	<1	*	794	40	40	*
Total	49	26	3	45,154	-	-	-	670	-	-	-	16,417	792	254	267	94,181	18,485	2,998	2,220	633,870

Table J-4b. Minimum number of shark interactions and mortalities in the eastern Pacific Ocean (EPO) in 2024 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 J-4b. Número mínimo de interacciones con tiburones y mortalidades en el Océano Pacífico oriental en 2024 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	*Prionace glauca*	6,907	6,314
Various sharks nei	Euselachii	1,172	1,023
Crocodile shark	*Pseudocarcharias kamoharai*	1,071	769
Short fin mako shark	*Isurus oxyrinchus*	490	325
Bigeye thresher shark	*Alopias superciliosus*	212	107
Velvet dogfish	*Zameus squamulosus*	121	102
Oceanic whitetip shark	*Carcharhinus longimanus*	117	96
Silky shark	*Carcharhinus falciformis*	77	47
Requiem sharks, nei	Carcharhinidae	39	39
Pelagic thresher shark	*Alopias pelagicus*	33	3
Other sharks*		83	56
Total		10,322	8,881

*Other sharks" include those with ≤20 interactions from 13 taxa in 2024

Table J-5. 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 2025 for size-class 1–5 vessels with a carrying capacity <363 t as reported by observers in 54% of all trips that carried an observer. Purse-seine set types: floating object (OBJ) and unassociated tuna schools (NOA).

Tabla J-5. Capturas cerqueras nominales mínimas de **a)** tiburones, peces grandes y peces pequeños, en toneladas (t), y **b)** rayas en número de individuos en 2025 para buques de clases 1-5 con una capacidad de acarreo <363 t según lo reportado por los observadores en el 54% de todos los viajes que llevaban observador a bordo. Tipo de lances cerqueros: objeto flotante (OBJ) y atunes no asociados (NOA).

a.

			Set type	
Broad group	Common name	Scientific name	OBJ	NOA
Sharks	Silky shark	*Carcharhinus falciformis*	34	<1
	Oceanic whitetip shark	*Carcharhinus longimanus*	<1	
	Blue shark	*Prionace glauca*	<1	<1
	Other carcharhinid shark	Carcharhinidae spp.	<1	
	Smooth hammerhead shark	*Sphyrna zygaena*	1	
	Scalloped hammerhead shark	*Sphyrna lewini*	2	
	Pelagic thresher shark	*Alopias pelagicus*	<1	
	Thresher shark	*Alopias vulpinus*	<1	
	Mako shark	*Isurus* spp.	<1	
Large fishes	Dorado	Coryphaenidae spp.	169	
	Wahoo	*Acanthocybium solandri*	50	
	Rainbow runner	*Elagatis bipinnulata*	11	
	Amberjack, nei	*Seriola* spp.	6	
	Jacks, crevalles, nei	*Caranx* spp.	1	
	Tripletail	*Lobotes surinamensis*	<1	
	Mola, nei	Molidae spp.	<1	
Small fishes	Triggerfishes, Filefishes	Balistidae, Monacanthidae spp.	250	
	Bullet and frigate tunas	*Auxis spp.*	159	
	Epipelagic forage fishes		2	
	Sea chubs	Kyphosidae spp.	<1	
	Small carangid, nei	Carangidae spp.	<1	
	Other small fish		<1	

b.

			Set type	
Broad group	Common name	Scientific name	OBJ	NOA
Rays	Spinetail manta	*Mobula mobular*	37	
	Pelagic stingray	*Pteroplatytrygon violacea*	7	
	Chilean devil ray	*Mobula tarapacana*	6	
	Mobulidae ray, nei	Mobulidae spp.	6	<1
	Smoothtail manta	*Mobula thurstoni*	2	
	Manta ray	*Mobula birostris*	1	

Table J-6a. Estimated purse-seine catches by set type in numbers of rays by observers onboard size-class 6 vessels with a carrying capacity >363 t (1995–2025). Purse-seine set types: floating object (OBJ), unassociated tuna schools (NOA) and dolphins (DEL). Species highlighted bold are discussed in main text. Data for 2024–2025 are considered preliminary.

Tabla J-6a. 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 (1995–2025). 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 2024–2025 se consideran preliminares.

	Mobulidae														
	***Mobula thurstoni*, smoothtail manta**			***Mobula mobular*, spinetail manta**			*Mobula munkiana*, munk's devil ray			*Mobula tarapacana*, Chilean devil ray			***Mobula birostris*, giant manta**		
	Purse seine			Purse seine			Purse seine			Purse seine			Purse seine		
Year	OBJ	NOA	DEL	OBJ	NOA	DEL	OBJ	NOA	DEL	OBJ	NOA	DEL	OBJ	NOA	DEL
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	72	328	33	2	32	69	39	23	12	4	6	3
2025	13	3	30	62	12	52	2	-	30	21	-	14	7	-	28
Total	421	7,081	1,958	853	2,893	2,365	134	879	817	331	733	933	148	2,788	456

Table J-6a Continued

	Mobulidae			Dasyatidae											
	Mobulidae spp., mobulid rays, nei			***Pteroplatytrygon violacea*, pelagic stingray**			**Dasyatidae spp., stingrays, nei**			Other rays			All rays		
	Purse seine			Purse seine			Purse seine			Purse seine			Purse seine		
Year	OBJ	NOA	DEL	OBJ	NOA	DEL	OBJ	NOA	DEL	OBJ	NOA	DEL	OBJ	NOA	DEL
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	348	304	291	42	60	88	-	1	-	663	1,292	664
2025	94	62	95	369	149	236	25	4	8		267		592	497	495
Total	2,244	18,545	9,000	5,379	12,547	6,569	509	3,535	729	4	3,677	729	10,023	52,678	23,554

Table J-6b. Minimum number of ray interactions and mortalities in the eastern Pacific Ocean (EPO) in 2024 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 J-6b. Número mínimo de interacciones con rayas y mortalidades en el Océano Pacífico oriental en 2024 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	*Pteroplatytrygon violacea*	5,901	5,595
Manta rays	*Mobula spp.*	9	1
Rays, skates, nei	Rajiformes	7	7
Spinetail manta	*Mobula mobular*	7	6
Giant manta	*Mobula birostris*	2	2
Total numbers		5,926	5,611

Table J-7a. 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 (1995–2025) and minimum reported longline (LL) catches of large fishes (gross-annual removals in t) (1995–2024, *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 2020–2024 (longline) and 2024–2025 (purse-seine) are considered preliminary.

Tabla J-7a. 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 (1995–2025) y capturas palangreras (LL) mínimas reportadas de peces grandes (extracciones anuales brutas en t) (1995–2024, *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 2020–2024 (palangre) y 2024–2025 (cerco) se consideran preliminares.

	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			
Year	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL
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	864	5	<1	123	232	<1	<1	300	86	<1	<1	-	16	-	-	-	7	<1	<1	-
2025	884	3	<1	*	227	<1	<1	*	118	<1	-	*	33	<1	-	*	15	<1	-	*
Total	41,387	528	36	169,801	10,905	30	9	5,659	1,594	20	<1	-	516	183	<1	2	126	361	9	1

Table J-7a Continued

	Carangidae *Seriola, Caranx spp., amberjacks, jacks, crevalles, nei*				Molidae *Molidae spp., molas, nei*				Lobotidae *Lobotes surinamensis, tripletail*				Sphyraenidae *Sphyraenidae spp., barracudas*				Lampridae ***Lampris spp., opahs***			
	Purse seine				Purse seine				Purse seine				Purse seine				Purse seine			
Year	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL
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	-	-	-	-	-	459
2022	4	<1	-	-	2	2	<1	-	4	<1	<1	-	<1	-	-	-	-	-	-	284
2023	1	-	-	-	2	<1	<1	4	2	-	<1	-	2	-	<1	<1	-	-	-	254
2024	9	<1	<1	-	<1	6	<1	-	3	<1	-	-	<1	-	-	-	-	-	-	289
2025	3	-	-	*	4	<1	<1	*	2	-	-	*	<1	<1	-	*	-	-	-	*
Total	504	301	3	162	165	322	34	366	103	<1	<1	-	13	7	<1	8	-	<1	<1	11,509

Table J-7a continued

	***Gempylidae* spp., snake mackerels, nei**				***Bramidae* spp., pomfrets, nei**				Other large fishes				Unidentified fishes				All fishes			
	Purse seine				Purse seine				Purse seine				Purse seine				Purse seine			
Year	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL
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	1,915	953	9	<1	5,991
2021	-	-	-	302	-	-	-	50	<1	<1	-	<1	<1	<1	-	1,995	2,432	19	1	4,453
2022	-	-	-	212	<1	-	-	53	<1	<1	-	<1	<1	-	-	3,099	2,564	19	3	4,565
2023	-	-	-	288	<1	<1	-	64	<1	-	-	7	-	-	-	3,251	1,785	5	3	4,546
2024	-	-	-	384	-	-	-	54	<1	<1	<1	<1	<1	-	-	1,359	1,218	13	1	2,510
2025	-	-	-	*	-	-	-	*	<1	<1	-	*	<1	-	-	*	1,286	5	1	*
Total	<1	-	-	6,811	<1	<1	-	1,596	51	211	<1	570	75	24	<1	38,411	55,442	1,988	93	234,912

Table J-7b. Minimum number of interactions and mortalities of large fishes in the eastern Pacific Ocean (EPO) in 2024 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 J-7b. Número mínimo de interacciones y mortalidades de peces grandes en el Océano Pacífico oriental en 2024 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	*Alepisaurus ferox*	9,769	9,761
Escolar	*Lepidocybium flavobrunneum*	5,926	5,834
Wahoo	*Acanthocybium solandri*	5,109	5,104
Opah	*Lampris guttatus*	4,422	4,382
Snake mackerel	*Gempylus serpens*	1,227	1,213
Sickle pomfret	*Taractichthys steindachneri*	820	684
Butterfly kingfish	*Gasterochisma melampus*	509	509
Common dolphinfish	*Coryphaena hippurus*	467	457
Oilfish	*Ruvettus pretiosus*	453	452
Dorado, mahi mahi, dolphin fish, nei	Coryphaenidae	371	371
Lancetfishes nei	*Alepisaurus* spp	343	343
Pomfrets, ocean breams nei	Bramidae	294	289
Slender tuna	*Allothunnus fallai*	127	127
Short snouted lancetfish	*Alepisaurus brevirostris*	60	60
Ocean sunfish, Mola	*Mola mola*	57	51
Slender sunfish	*Ranzania laevis*	45	44
Snake mackerels, escolars nei	Gempylidae	44	44
Atlantic pomfret	*Brama brama*	26	26
Unicornfish	*Lophotus capellei*	20	20
Other fishes*		107	94
Total		30,196	29,865

*"Other large fishes" includes those with ≤15 interactions from 20 taxa in 2024.

Table J-8. 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 (1995–2025) and minimum reported longline (LL) catches of small forage fishes (gross-annual removals in t) (1995–2024, *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 2020–2024 (longline) and 2024–2025 (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 flyingish (*Exocoetus volitans*).

Tabla J-8. 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 (1995–2025) y capturas palangreras (LL) mínimas reportadas de peces forrajeros pequeños (extracciones anuales brutas en t) (1995-2024, *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 2020–2024 (palangre) y 2024–2025 (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*).

	***Auxis* spp., bullet and frigate tunas**				**Balistidae, Monacanthidae spp., triggerfishes and file-fishes**				**Kyphosidae, sea chubs**				**Epipelagic forage fishes**				Small Carangidae spp., carangids, nei				Other small fishes			
	Purse seine				Purse seine				Purse seine				Purse seine				Purse seine				Purse seine			
Year	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL	OBJ	NOA	DEL	LL
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	-	-	-	10	<1	<1	-	3	<1	<1	-	1	12	<1	<1
2024	445	155	-	-	512	<1	-	-	7	-	-	-	11	<1	-	-	2	<1	-	-	<1	<1	<1	-
2025	531	2	-	*	855	<1	<1	*	4	-	-	*	15	-	<1	*	<1	-	-	*	<1	<1	-	*
Total	23,536	5,862	492	-	9,314	48	16	-	468	2	<1	-	154	29	<1	<1	28	6	<1	<1	950	93	45	79