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FLOATING-OBJECT FISHERY INDICATORS: A 2025 REPORT

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SUMMARY

Scientists, managers, and other stakeholders have widely emphasized the importance of monitoring the FAD fishery as a whole. Based on the recommendations and guidelines of the joint technical Working Group on FADs (Lopez, 2019), as well as the repeated requests by some member countries on the production of specific data and analyses (e.g. IATTC-93 INF-A), this document compiles a comprehensive series of spatial and temporal indicators for the floating-object fishery in the EPO with the aim to better monitor and assess its potential impacts in the short, medium and long term. The indicators have been grouped into 8 categories: catch and effort, activities on FADs, satellite buoy-based indices, capacity, technology, ecosystem impacts, socio-economic, and biology, ecology, and behavior. It also informs FAD data collection and reporting needs and helps prioritize future actions for the conservation and

management of target species, non-target species, and the ecosystem.

In response to the FAD WG recommendation, a new appendix (Appendix 2) provides a complete guide to each indicator — its description, intended use, and the figure or table in which it is presented — and is included as a transparent record of how the multi-indicator framework for monitoring the floating-object fishery is being implemented in the EPO.

1. INTRODUCTION

The tropical tuna purse-seine fishery in the eastern Pacific Ocean (EPO) is one of the biggest in the world, with recent annual catches exceeding 950,000 tons (SAC-17-01). In recent years, about 65% of the catches have come from the floating-object (OBJ) fishery, which includes man-made fish aggregating devices (FADs) and natural objects (logs). The vast majority of purse-seine activities (e.g., sets, deployments) since the mid-1990s have been on FADs (SAC-17-01).

Although FADs are a highly efficient fishing tool, their continued increased use by the purse-seine fishery raises concerns about several potential negative impacts on ecosystems and tuna populations. Examples include (i) reduced yield per recruit for some tuna species; (ii) increased bycatch and disturbance of pelagic ecosystem balance; (iii) more marine debris and stranding events on sensitive habitats; and (iv) altered movement patterns of species associated with FADs (Dagorn et al. 2012; Escalle et al. 2019). Because the fishery's potential impacts are multi-dimensional, it must be monitored holistically through comprehensive metrics and indicators that capture its evolution and dynamics across spatial and temporal scales. A diverse suite of indicators improves both the overall assessment of the fishery's impacts and the utility and interpretation of the results; single indicators, by contrast, can be misleading and lead to conservation measures that fail to meet management objectives.

Scientists, managers, and other stakeholders have widely emphasized the importance of monitoring the FAD fishery as a whole. At the 1st joint t-RFMO Working Group (WG) on FADs meeting in Madrid in 2017, they agreed to establish a small technical working group (TWG) to advance key areas for future action. These largely technical and scientific topics range from harmonized definitions to coordination of regional and international research plans, and include the development of fishery indicators — a task led by IATTC staff within the TWG between 2018 and 2020. An extensive list of more than 40 indicators grouped into 8 categories (Table 1), spanning catch and effort to ecosystem indicators (Lopez, 2019), was presented and discussed at the 2nd joint t-RFMO Working Group on FADs meeting in San Diego in 2019. The process resulted in 4 of the categories considered as “major” priority indicators: catch and effort, activities on FADs, satellite buoy-based indices, and capacity (Table 1). Indicators related to the technology onboard and ecosystem impacts were classified as “moderate” priority level. Socio-economic and biology, ecology, and behavior indicators, although important, were assigned "minor" priority in this first assessment, largely because of the difficulty of regularly obtaining reliable, significant data on these topics.

Building on the TWG's recommendations and guidelines, and on repeated requests from some member countries for specific data and analyses (e.g. IATTC-93 INF-A), this document compiles a comprehensive series of spatial and temporal indicators for the floating-object fishery in the EPO to better monitor and assess its potential impacts in the short, medium, and long term. It also informs FAD data collection and reporting needs and helps prioritize future actions for the conservation and management of target species, non-target species, and the ecosystem. In response to the FAD WG recommendation, a new appendix (Appendix 2) provides a complete guide to each indicator — its description, intended use, and the figure or table in which it is presented — and is included as a transparent record of how the multi-indicator framework for monitoring the floating-object fishery is being implemented in the EPO.

TABLE 1. A list of the indicator types considered by Lopez *et al.* 2019 and discussed and prioritized during the 2nd joint t-RFMO working group on FADs.
TABLA 1. Lista de los tipos de indicadores considerados por Lopez *et al*. 2019 que fueron discutidos y priorizados durante la segunda reunión del Grupo de Trabajo conjunto de las OROP atuneras sobre plantados.

Indicator Type	Priority level (1 Major, 2 Moderate, 3 Minor)
Catch and effort	1
Activity	1
Buoy/FAD use	1
Capacity	1
Technology	2
Ecosystem Impacts	2
Socio-Economic	3
Biology, Ecology and Behavior	3

2. MATERIALS AND METHODS

2.1. Data

Five main datasets were used in the study:

a. 2020-2025 [1] AIDCP observer data for Class-6 vessels (>363 mt), which contain FAD-related information such as deployment, origin, and object characteristics, as well as on fishing activities on FADs. This dataset was used to estimate the indicators in the following categories: fleet behavior, activities, and technology.
b. Catch and effort data for all vessels (Classes 1-6), from observers and vessel logbooks. This dataset was exclusively used to estimate catch and effort indicators, including catch by set type, catch by species, and number of OBJ sets, among others.
c. Daily active buoy data for 171 vessels (Classes 1-6) reporting under Resolution C-17-02 and C-20-06 between 2018-2021, Resolution C-21-04 in 2022-2024, and Resolution C-24-01 in 2025. Daily vessel coverage and reporting rates vary by size class and month (e.g., min = 142, mean = 157, max = 165 for 2025), with not all vessels present in the active buoy dataset at any one time. See 2025 report of the Review Committee for further details on data reporting rates and categories. This dataset was used to estimate the indicators in the buoy-based indices category.
d. 2022-2025 monthly remote deactivation and reactivation data for all vessels (Classes 1-6), reported by the fleet under Resolution C-21-04 and C-24-01. This data was used to estimate remote deactivation and reactivation indicators in section 3.4.6.
e. 2020-2025 FAD form data for all vessels without observers (Class 1-5), reported by the fleet under Resolution C-19-01 and C-23-05. This data was used to complement table 2 and 3 in the activities category.

Indicators for categories biology, ecosystem impacts and capacity were not estimated in this study but extracted from the fishery status report (FSR) (SAC-17-01) and the Ecosystem Consideration report (EB-04-01). The indicators included in this document refer mainly to FADs, unless the contrary is specified.

[1] Except for the long-term deployment and retrieval indicator, where 2005-2024 data were used

2.2. Methods

Because the degree to which each vessel fishes on OBJ varies by vessel, all indicators were, where possible, broken down by OBJ-usage strategy and category (see section 3.1 below) to better capture the fishery's evolution and dynamics.

All the indicators were estimated for 2025 and averaged for the previous five years (i.e. 2020-2024) to allow comparison between periods and detect potential anomalies; the exceptions are catch and effort indicators, which are taken from the FSR and have longer time series, and the long-term deployment and retrieval trend, an indicator repeatedly requested by some Members. Where appropriate, and depending on data availability, quality, and resolution, indicators were also estimated at yearly, trip (e.g., activities within a trip), quarterly (e.g., activities), monthly (e.g., buoy densities), and daily (e.g., total active buoys) scales. A 1°x1° cell resolution was used to estimate spatial indicators. Summary statistics, convex hull areas (i.e., density areas containing 66% of fleet-segment activities), boxplots, and frequency and density histograms were also produced to describe general trends across indicators — particularly those based on observer data, to depict cluster-specific dynamics (see section 3.1 for clustering details).

When observer data were used to estimate indicators, Class 1–5 vessels and Class-6 vessels conducting fewer than 5 OBJ sets per year were excluded, for two reasons: (i) few Class-6 vessels conduct fewer than 5 OBJ sets per year, and their impact on the OBJ fishery is negligible compared with the FAD-oriented vessels that are the focus of this document; (ii) Class 1–5 vessel data are not collected systematically across the fleet, lack consistency (e.g., voluntary versus mandatory programs, year-to-year differences in coverage, quality, and time series), and have historically come from vessels carrying observers for specific reasons (e.g., certification, closure fishing). The representativeness of the FAD form 09-2018[2] — a logbook designed for skippers of small unobserved vessels (Res) — is of particular concern, since it is intended to capture the most important FAD-oriented data for vessels not carrying observers (e.g., activities, bycatch of sensitive species groups, and FAD characteristics for Class 1–5 vessels). Recent improvements in the reporting rate and data quality on the FAD form may make these data indicative for this component of the fleet, although the numbers should still be interpreted with caution at this stage. As a result, some indicators estimated using only Class-6 data (e.g., activities) or data that are not fully reported may be underestimates. Nonetheless, we believe these indicators accurately represent Class-6 vessel patterns and reasonably depict overall trends for the whole fleet.
Any exceptions, rules, and assumptions used to develop a given indicator are specified with that indicator below.

3. INDICATORS

3.1. Fleet behavior

To identify fleet segments among Class-6 vessels by fishing strategy, a cluster analysis was conducted using operational characteristics related to OBJ fishing (vessels per year included in the analysis: min = 127, max = 153, mean = 137). Only Class-6 vessels making at least five OBJ sets per year during 2020–2025 were considered; for convenience, detailed cluster results are shown only for the analysis year (2025). The methodology of Lennert-Cody et al. (2018) was applied, grouping vessels into fleet segments based on the following variables: (i) proportion of OBJ sets by object "origin" category (FADs deployed by the vessel on the current trip or a previous trip; FADs deployed by other vessels, either "given" by another vessel or encountered opportunistically, "taken"; unmonitored drifting objects – presumably natural objects such as logs); (ii) proportion of sets made by type (on tuna associated with dolphins, "DEL"; on unassociated schools of tuna, "NOA"; on OBJ); and (iii) proportion of OBJ sets made in the western EPO

[2] Download at https://www.iattc.org/Downloads.htm

(west of 100°W).

The cluster analysis identified several distinct vessel groupings with different fishing behaviors (Figs. 1–2). The dendrogram shows three main clusters, labeled A, B, and C. Cluster A comprises vessels for which about 30% or more of sets were DEL, with many making almost exclusively DEL sets. Most OBJ sets by Cluster A vessels were on "taken" FADs or unmonitored drifting objects (presumably logs), and the majority were made west of 100°W. The number of vessels in Cluster A ranged from 19 to 31 in the study period and the 2025 value was 23 (Figs 1-2). Cluster B comprises vessels that primarily made OBJ sets, with a few also making UNA sets and almost none making DEL sets. Their OBJ sets were mostly west of 100°W and were primarily on FADs deployed by the vessels themselves or on "given" FADs. The number of vessels in Cluster B ranged from 35 to 79 in the study period and the 2025 value was 55 (Figs 1-2). Cluster C comprises vessels that, compared with Cluster B, made a smaller proportion of OBJ sets and a larger proportion of UNA sets, with few making DEL sets. Cluster C vessels made more OBJ sets east of 100°W, and a greater proportion of those sets were on "taken" FADs or unmonitored drifting objects (presumably logs). The number of vessels in Cluster C ranged from 44 to 77 in the study period and the 2025 value was 50 (Figs 1-2). The number of vessels in Cluster B and C decreased and increased, respectively, in 2025 compared to 2024, agreeing with those found by Lopez et al. 2020 (FAD-05-INF-A), Lopez et al. 2021 (FAD-05-INF-C), Lopez et al. 2022 (FAD-06-01), Lopez et al. 2022 (FAD-07-01), and Lopez et al. 2023 (FAD-08-01) for 2018-2023 and by Lennert-Cody et al. (2018) for 2012-2015,. The three fleet segments appear to represent distinct OBJ-fishing strategies — for example, Cluster B is nearly pure OBJ-oriented, fishing FADs the vessels themselves monitor, so a clearer relationship between active FADs and number of sets is expected. The cluster results were therefore used to break down the indicators by cluster where possible, supporting a clearer interpretation of the relationships between the metrics and trends presented in this document.

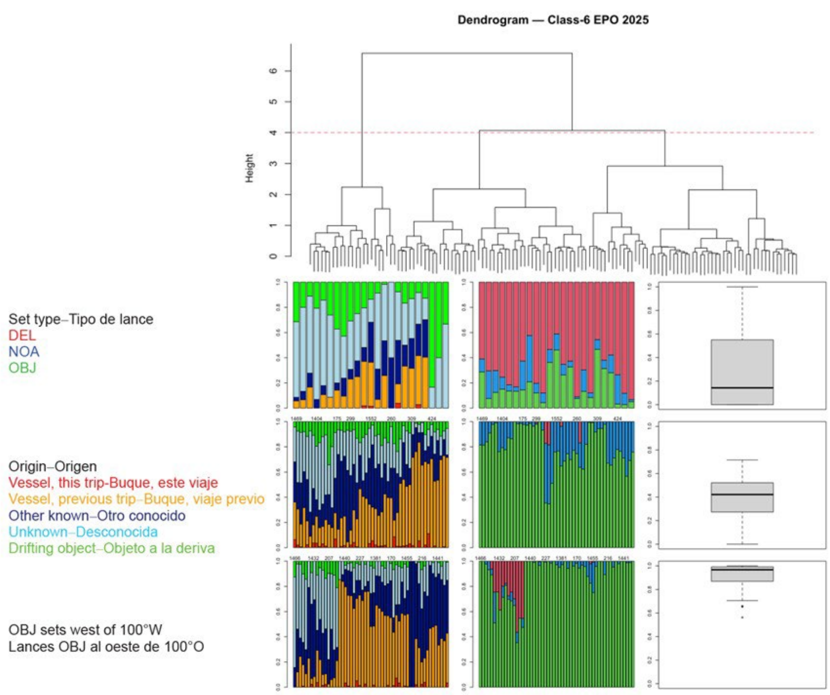

FIGURE 1. Fleet segments identified by the cluster analysis, 2025. Cluster A, B and C include 23, 55 and 50 vessels, respectively.
FIGURA 1. Segmentos de la flota identificados por el análisis de conglomerados, 2024. Los conglomerados A, B y C incluyen 23, 55 y 50 buques, respectivamente.

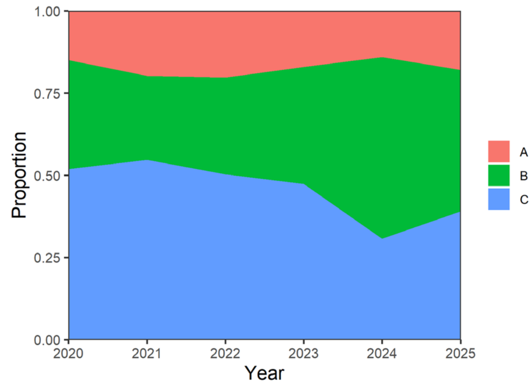

FIGURE 2. Evolution of the proportion of Clusters A, B, and C, 2020-2025.
FIGURA 2. Evolución de la proporción de los conglomerados A, B y C, 2020-2025.

3.2. Catch and effort

The purse-seine tropical tuna catch (section 3.2.1; catch by set type, Fig. 3; catch by species in mt and numbers, Fig. 4-5; spatial distribution of catches, Fig. 6) and effort (section 3.2.2; Number of set per set type, Fig. 7; OBJ sets by class, Fig. 8; Sets by OBJ type, Fig. 9; Cumulative number of OBJ sets, Fig. 10) indicators included in this section were taken, modified, or updated from documents SAC-15-01, SAC 15 INF-F and IATTC-93 INF-A, whereas the catch-per-set indicators (section 3.2.3; Fig. 11) were estimated using Class-6 observer data only, to show cluster-specific differences across OBJ-fishing strategies.

3.2.1. Catch

3.2.1.a Catch by set type

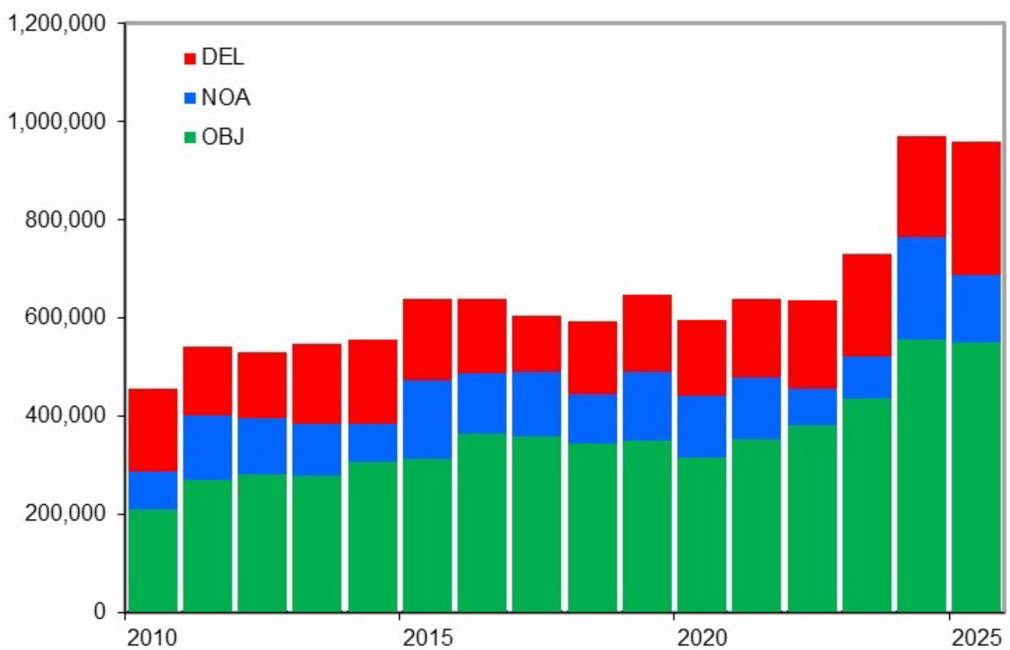

FIGURE 3. Evolution of purse-seine tropical tuna catches, by set type (OBJ: floating object; DEL: dolphin; NOA: unassociated), 2010-2025. Source: Document SAC-17-01, Table A-7.
FIGURA 3. Evolución de las capturas cerqueras de atunes tropicales, por tipo de lance (OBJ: objeto flotante; DEL: delfín; NOA: no asociado), 2010-2025. Fuente: Documento SAC-17-01, Table A-7.

Catch by species (in weight)

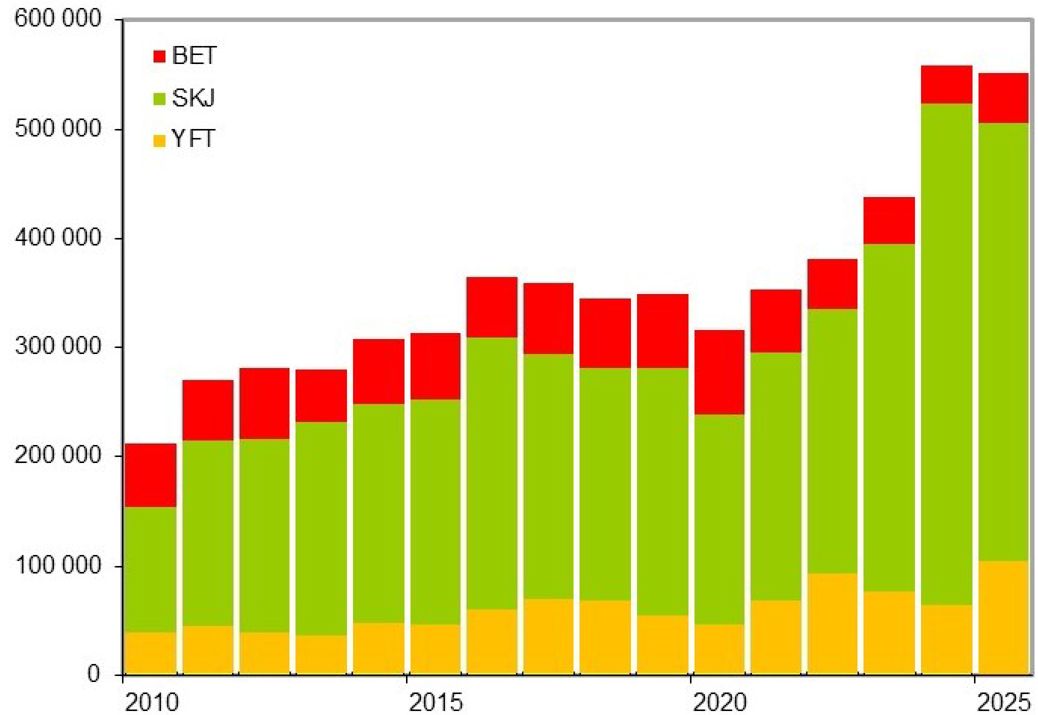

FIGURE 4. Evolution of purse-seine OBJ catches (mt), by species (BET: bigeye; SKJ: skipjack; YFT: yellowfin), 2010-2025. Source: Document SAC-17-01, Table A-7.
FIGURA 4. Evolución de las capturas OBJ de cerco (t), por especie (BET: patudo; SKJ: barrilete; YFT: aleta amarilla), 2010-2025. Fuente: Documento SAC-17-01, Tabla A-7.

3.2.1.b Catch by species (in numbers)

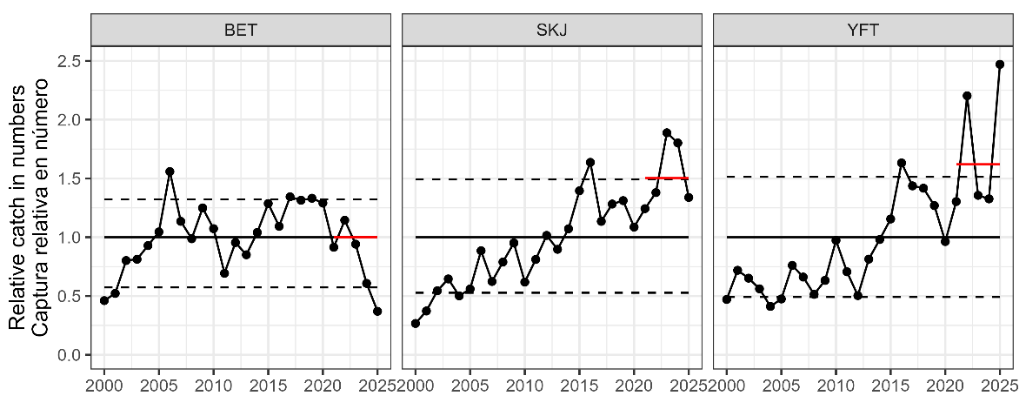

FIGURE 5. Indicators based on purse-seine catch in numbers, 2000-2025. Source: Document SAC-17-02**,** Fig 2b. The red horizontal lines mark the benchmark reference levels (average conditions in 2021-2025).
FIGURA 5. Indicadores basados en la captura de cerco, en número, 2000-2025. Fuente: Documento SAC-17-02, Fig. 2b. Las líneas horizontales rojas marcan los niveles de referencia (condiciones promedio en 2021-2025).

3.2.1.c Spatial distribution of OBJ catches

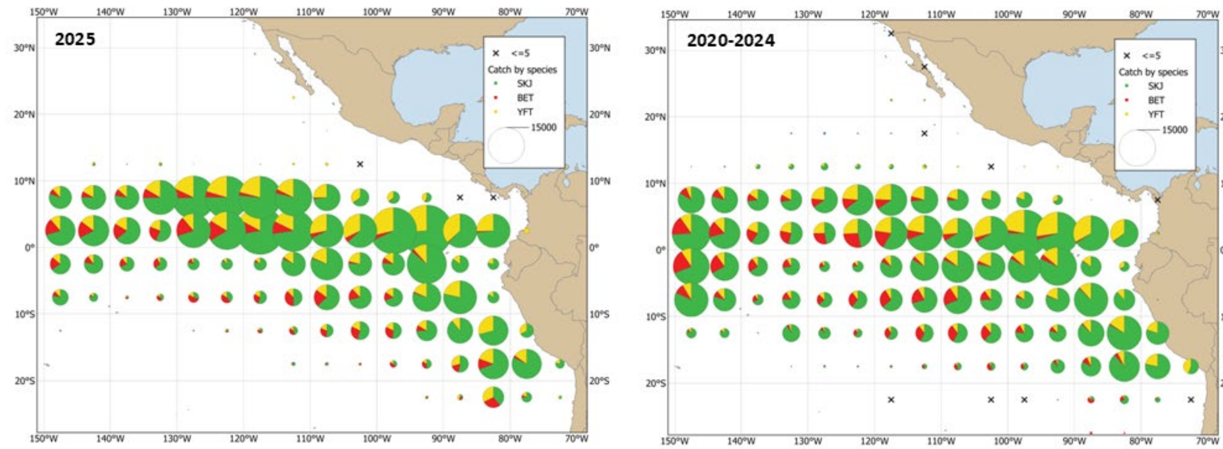

FIGURE 6. 5°x5° purse-seine catches on OBJ by species for 2025 (left panel) and the 2020-2024 averages (right panel).
FIGURA 6. Capturas OBJ de cerco 5°x5° por especie, en 2025 (panel izquierdo) y los promedios de 2020-2024 (panel derecho).

3.2.2. Effort

Number of set per set type

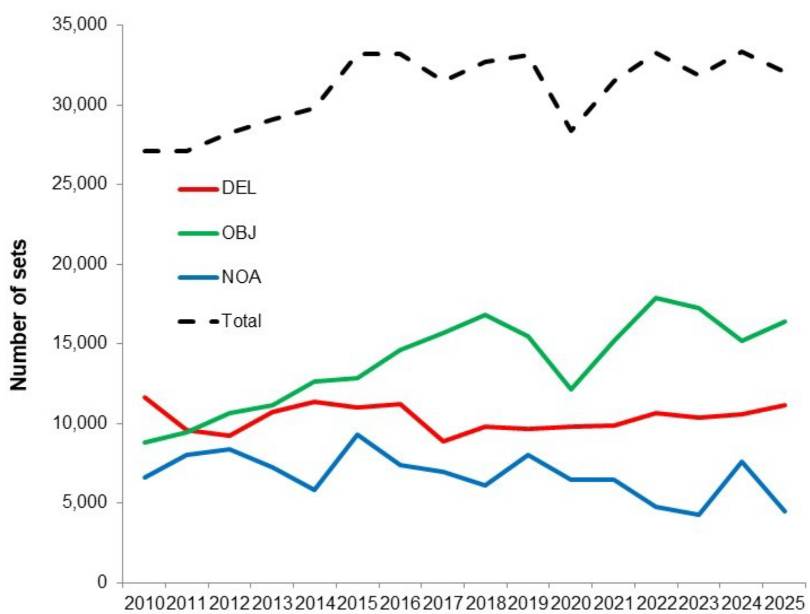

FIGURE 7. Evolution of the number of purse-seine sets, by set type (OBJ: floating object; DEL: dolphin; NOA: unassociated), 2010-2025. Source: Document SAC-17-01, Table A-7.
FIGURA 7. Evolución del número de lances cerqueros, por tipo de lance (OBJ: objeto flotante; DEL: delfín; NOA: no asociado), 2010-2025. Fuente: Documento SAC-17-01. Tabla A-7.

3.2.2.a OBJ sets by class

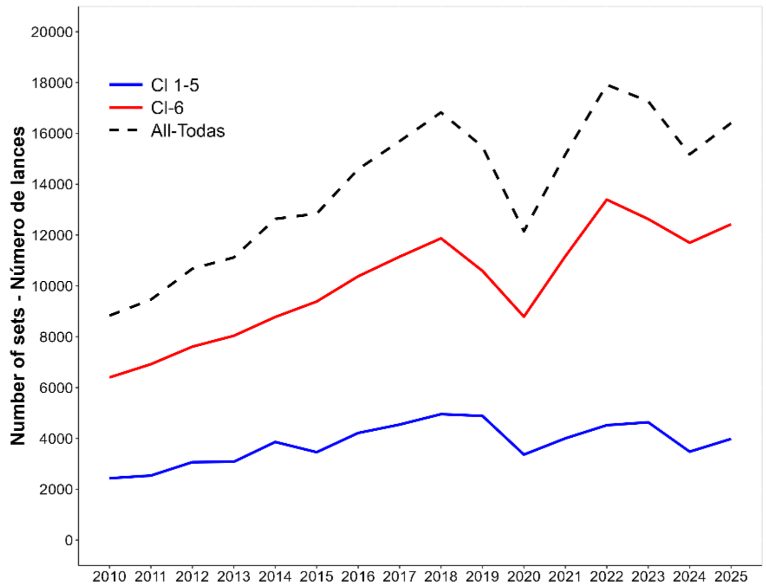

FIGURE 8. Evolution of the number of floating-object sets by Class 1-5 and Class 6 vessels, 2010-2025. Source: Document SAC-17-01, Table A-7.
FIGURA 8. Evolución del número de lances sobre objetos flotantes por buques de clases 1-5 y clase 6, 2010-2025. Fuente: Documento SAC-16-01, Tabla A-7.

3.2.2.b Sets by OBJ type

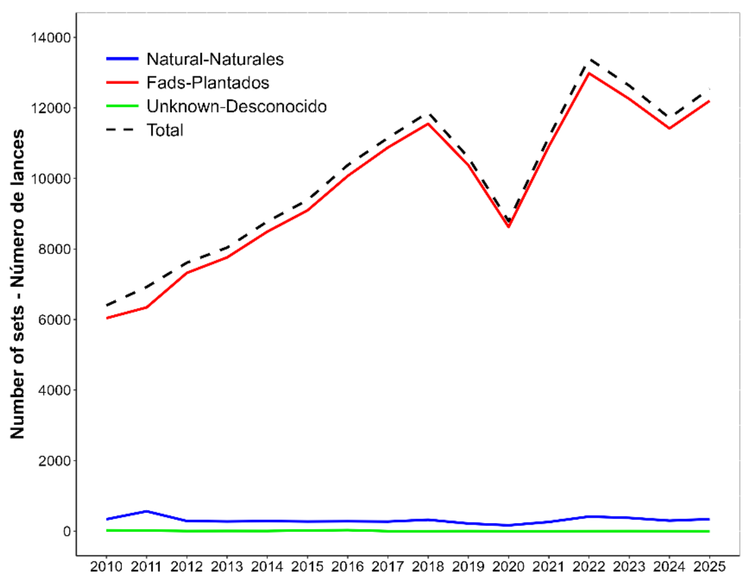

FIGURE 9. Evolution of the number of floating-object sets by Class-6 vessels, by type of floating object, 2010-2025. Source: Document SAC-16-01, Table A-8.
FIGURA 9. Evolución del número de lances sobre objetos flotantes por buques de clase 6, por tipo de objeto flotante, 2010-2025. Fuente: Documento SAC-16-01, Table A-8.

3.2.2.c Cumulative number of OBJ sets

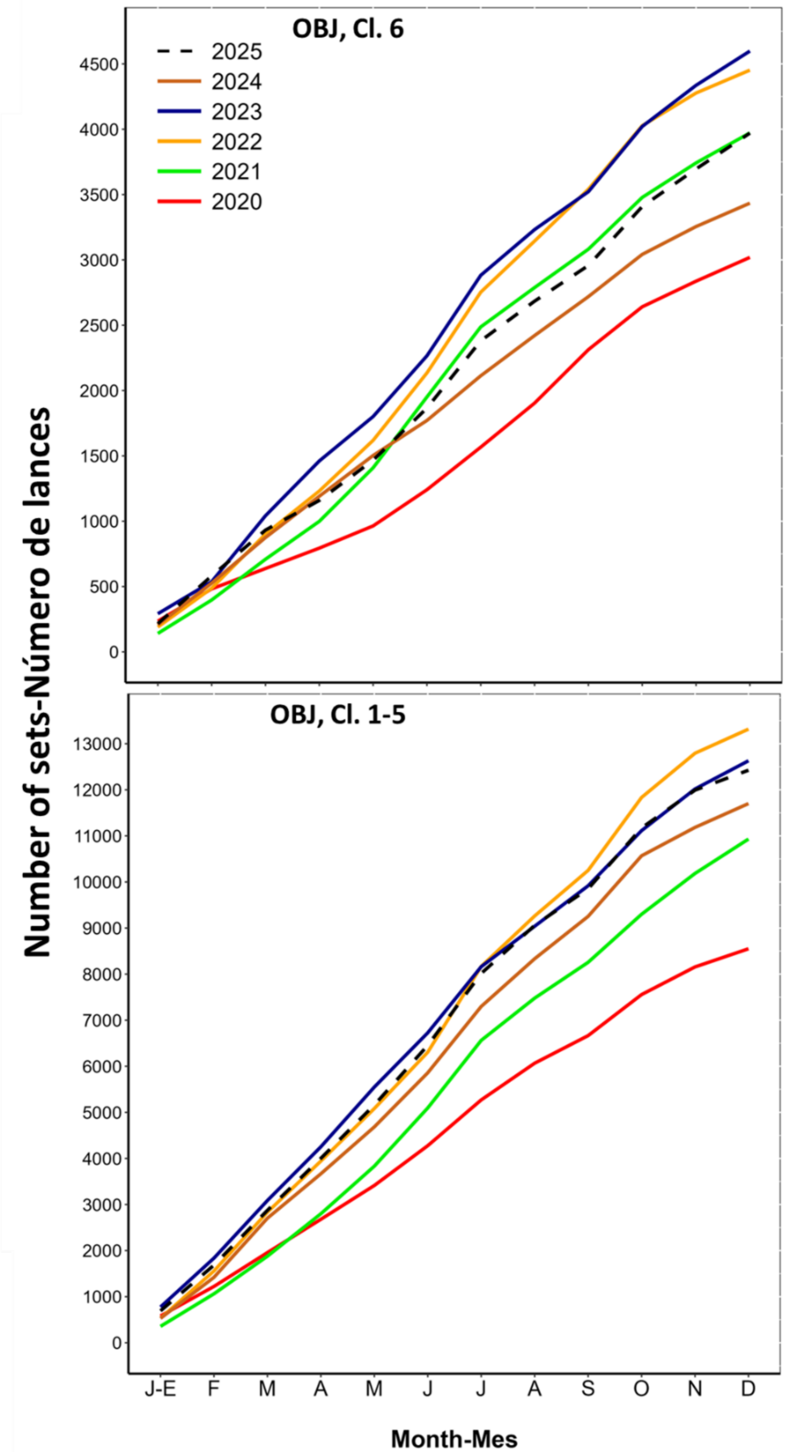

FIGURE 10. Cumulative number of floating-object (OBJ) sets, by month, 2020-2025: Class-6 vessels (top); Class 1-5 vessels (bottom). Updated from Document IATTC-93 INF-A.
FIGURA 10. Número acumulativo de lances sobre objetos flotantes (OBJ), por mes, 2020-2025: buques de clase 6 (arriba); buques de clases 1-5 (abajo). Actualizada del Documento IATTC-93 INF A.

3.2.3. Catch per set

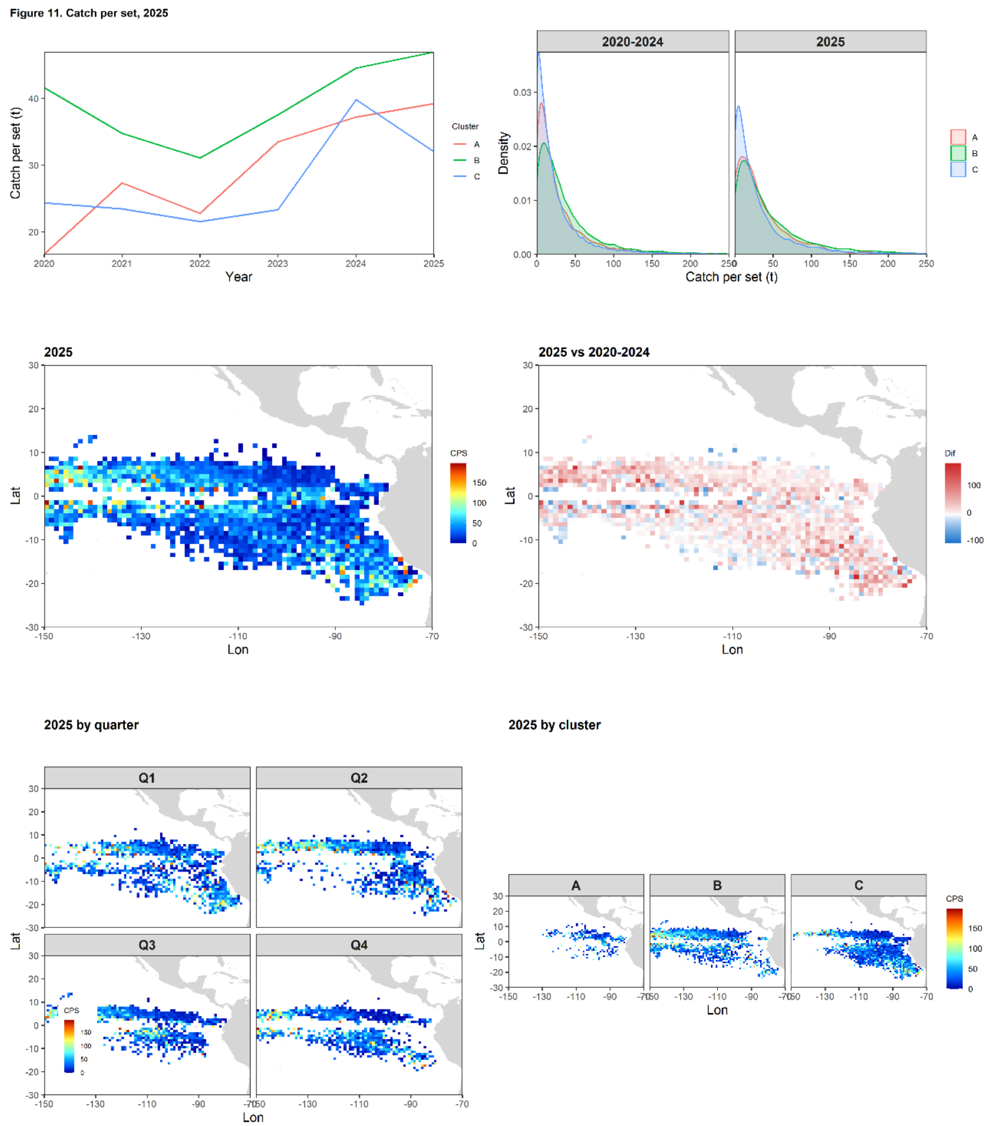

FIGURE 11. Top left: Evolution of catch per set, by cluster, 2020-2025 (see section 3.1 for details); Top right: Density plot of catch per set for 2020-2024 average and 2025, by cluster; Center left: average catch per set, by 1°-area, for 2025; Center right: differences of average catch per set, by 1°-area, 2025 vs 2020-2024; Bottom left: average catch per set, by 1°-area and quarter, for 2025; Bottom right: average catch per set, by 1°-area and cluster, for 2025**.**

FIGURA 11. Panel superior izquierdo: evolución de la captura por lance, por conglomerado, 2020-2025 (ver sección 3.1 para más detalles); panel superior derecho: gráfica de densidad de la captura por lance del promedio de 2020-2024 y de 2025, por conglomerado. Panel central izquierdo: captura promedio por lance, por área de 1°, 2025; panel central derecho: diferencias de la captura promedio por lance, por área de 1°, 2025 vs. 2020-2024. Panel inferior izquierdo: captura promedio por lance, por área de 1° y trimestre, 2025; panel inferior derecho: captura promedio por lance, por área de 1° y conglomerado, 2025.

3.3. Activity

The indicators in this section were estimated for all activities, using OBJ-origin information and fishing-activity records from observers. They cover the entire Class-6 fleet by trip and vessel (section 3.3.1, Table 2a) and by cluster (section 3.3.2, Table 4), and — for activities of special interest (sets, deployments, and encounters) — also by cluster, vessel, and trip (Tables 3, 5; section 3.3.3, Fig. 12). A first approximation of activities for vessels without observers was also estimated for recent years (2020–2025) using the FAD form (Tables 2b and 3b). Given their importance, sets, deployments, and encounters were also analyzed in detail for the whole Class-6 fleet — by cluster, spatially (sections 3.3.4–3.3.8, Figs. 13–17), and within the trip (section 3.3.9, Fig. 18). A long-term deployment-and-retrieval indicator — repeatedly requested by some Members — was also prepared for the Class-6 fleet (section 3.3.7, Fig. 16). For the encounter indicators (sections 3.3.8–3.3.9; Figs. 17–18), deployments and OBJ sets were excluded, since otherwise the results are dominated by those activities and underlying spatial and temporal patterns are obscured. In these cases, encounters reflect the evolution of, and the areas in which, FADs were visited but no OBJ sets or floating-object deployments/redeployments occurred. A spatial indicator of the differences between encounters and OBJ sets was also computed to highlight areas where the presence of objects was, or was not, followed by fishing. Similarly, the evolution of the methods used to locate floating objects was estimated for encounters and sets, by cluster (section 3.3.11, Fig. 20), to characterize OBJ-oriented location strategies.

3.3.1. General activity table

TABLE 2.A Class 6 vessels activities on floating-objects, 2025 and 2020–2024 averages. Included, for information, the number of vessels (Ves) and trips in the analysis. “Dep”: deployment, “Unk”: unknown, “Oth”: other, “Enc”: encounter.
TABLA 2.A Actividades de buques de clase 6 sobre objetos flotantes, 2025 y promedios de 2020–2024 Se incluye, con fines informativos, el número de buques y viajes en el análisis.

Year	Own Now	Own Prev	Dep	Given	Taken	Adrift	Unk	Oth	Enc	Sets	Ves	Trips
2020-2024	15	6390	26176	3884	7232	2748	3	8	49025	10964	139	685
2025	3	7274	31208	4087	8609	2453	11	11	55140	12035	128	749

TABLE 3.B Class 1-5 vessels activities on floating-objects, 2025 and 2020–2024 averages, reported by the vessels without observers using the FAD form under Resolution C-19-01 and C-23-05. Included, for information, the number of vessels (Ves) and trips in the analysis.
TABLA 2.B Actividades de buques de clases 1-5 sobre objetos flotantes, 2025 y promedios de 2020–2024, reportados por los buques sin observador usando el formulario de plantados bajo la resolución C-19-01 y C-23-05. Se incluye, con fines informativos, el número de buques y viajes en el análisis.

Year	Dep	Enc	Sets	Ves	Trips
2020–2024	867	3636	1858	29	164
2025	568	2478	1148	17	107

TABLE 4.A Class-6 vessel floating-object deployment, encounter and OBJ set average rates, by vessel and trip, for 2025 and 2020–2024.
TABLA 3.A Tasas promedio de siembras, encuentros y lances OBJ de buques de clase 6, por buque y viaje, en 2025 y 2020–2024.

Year	Deployments		Encounters		Sets	
	Vessel	Trip	Vessel	Trip	Vessel	Trip
2020–2024	188.3	38.2	352.7	71.6	78.9	16.0
2025	243.8	41.7	430.8	73.6	94.0	16.1

TABLE 5.B Class 1-5 vessel floating-object deployment, encounter and OBJ set average rates, by vessel and trip, for 2025 and 2020–2024. Events reported by the vessels without observers using the FAD form under Resolution C-19-01 and C-23-05.
TABLA 3.B Tasas promedio de siembras, encuentros y lances OBJ de buques de clases 1-5, por buque y viaje, en 2025 y 2020–2024. Eventos reportados por los buques sin observador usando el formulario de plantados bajo la resolución C-19-01 y C-23-05.

Year	Deployments		Encounters		Sets	
	Vessel	Trip	Vessel	Trip	Vessel	Trip
2020–2024	29.8	5.3	126.2	21.9	64.4	11.2
2025	145.8	5.3	145.8	23.2	67.5	16.4

3.3.2. Activity table by cluster

TABLE 6. Class 6 vessel activities on floating-objects, by cluster, for 2025 and 2020–2024 averages. Included, for information, is the number of vessels (Ves) and trips in the analysis. "Dep": deployment, "Unk": unknown, "Oth": other, "Enc": encounter.
TABLA 4. Actividades de buques de clase 6 sobre objetos flotantes, por conglomerado, 2025 y promedios de 2020–2024. Se incluye, con fines informativos, el número de buques y viajes en el análisis.

Year	Cluster	Own Now	Own Prev	Dep	Given	Taken	Adrift	Unk	Oth	Enc	Sets	Ves	Trips
2020-2024	A	0	37	72	34	309	158	1	1	624	385	24	86
	B	4	3,932	18,840	1,864	2,302	567	1	6	29,355	4,981	50	241
	C	10	2,421	7,263	1,985	4,621	2,023	2	1	19,047	5,599	65	358
2025	A	2	226	581	190	700	275	0	0	2,058	737	23	124
	B	1	3,340	19,689	1,903	3,549	544	11	10	29,978	5,564	55	257
	C	0	3,708	10,938	1,994	4,360	1,634	0	1	23,104	5,734	50	368

TABLE 7. Class-6 vessel floating-object deployment, encounter and OBJ set average rates, by cluster, vessel and trip, for 2025 and 2020–2024.
TABLA 5. Tasas promedio de siembras, encuentros y lances OBJ de buques de clase 6, por conglomerado, buque y viaje, en 2025 y 2020–2024.

Year	Cluster	Deployments		Encounters		Sets	
		Vessel	Trip	Vessel	Trip	Vessel	Trip
2020–2024	A	3.0	0.8	26.0	7.3	16.0	4.5
	B	378.3	78.2	589.5	121.8	100.0	20.7
	C	111.4	20.3	292.1	53.1	85.9	15.6
2025	A	25.3	4.7	89.5	16.6	32.0	5.9
	B	358.0	76.6	545.1	116.6	101.2	21.6
	C	218.8	29.7	462.1	62.8	114.7	15.6

3.3.3. Evolution of activities by cluster

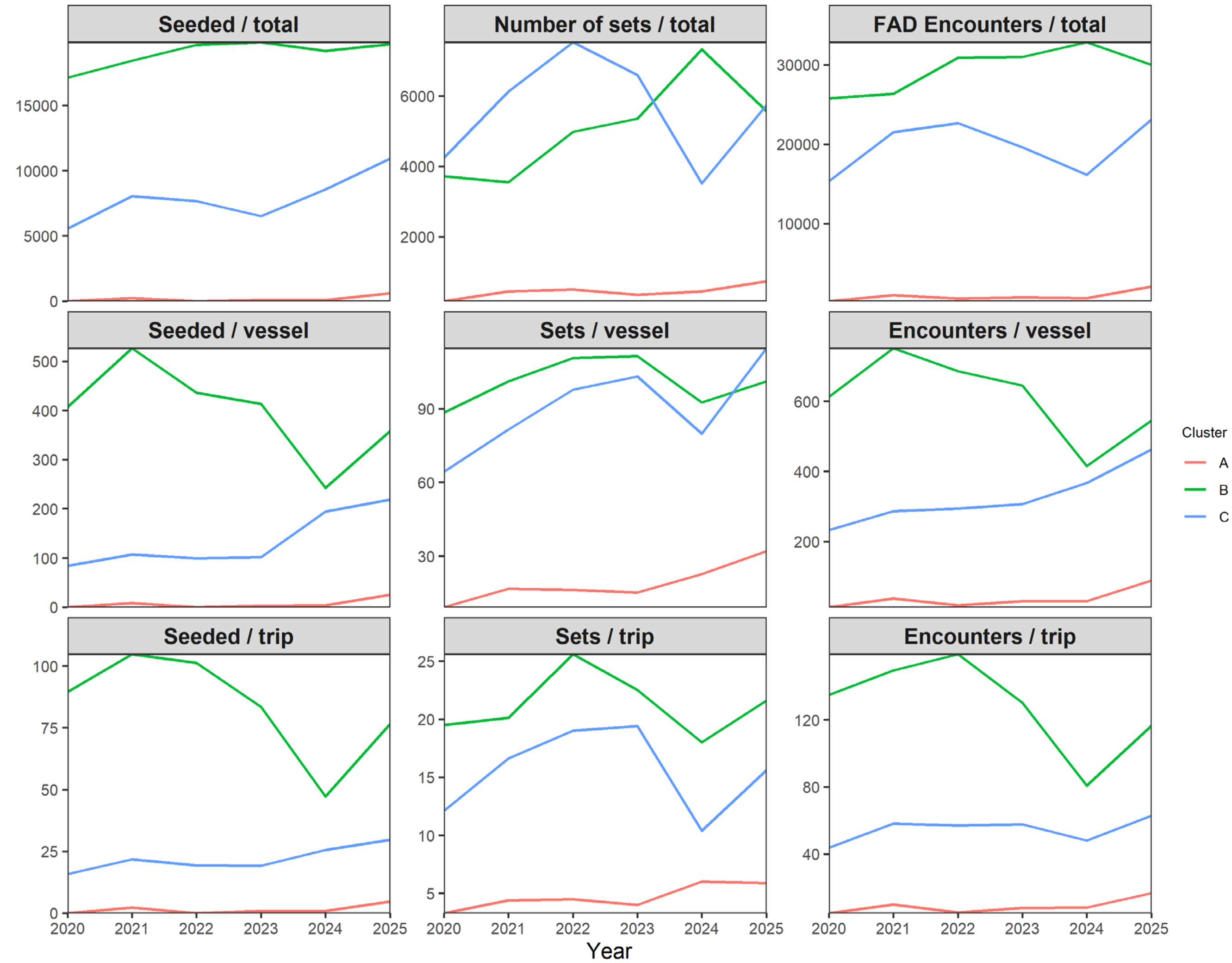

FIGURE 12. Top: Evolution of floating-object deployments, sets and encounters, by cluster, 2020-2025; Center: Evolution of floating-object deployments, sets and encounters, by cluster-vessel average, 2020-2025; Bottom: Evolution of floating-object deployments, sets and encounters, by cluster-trip average, 2020-2025.

FIGURA 12. Arriba: evolución de las siembras, lances y encuentros de objetos flotantes, por conglomerado, 2020-2025. Centro: evolución de las siembras, lances y encuentros de objetos flotantes, por promedio de conglomerado-buque, 2020-2025. Abajo: evolución de las siembras, lances y encuentros de objetos flotantes, por promedio de conglomerado-viaje, 2020-2025.

3.3.4. OBJ sets

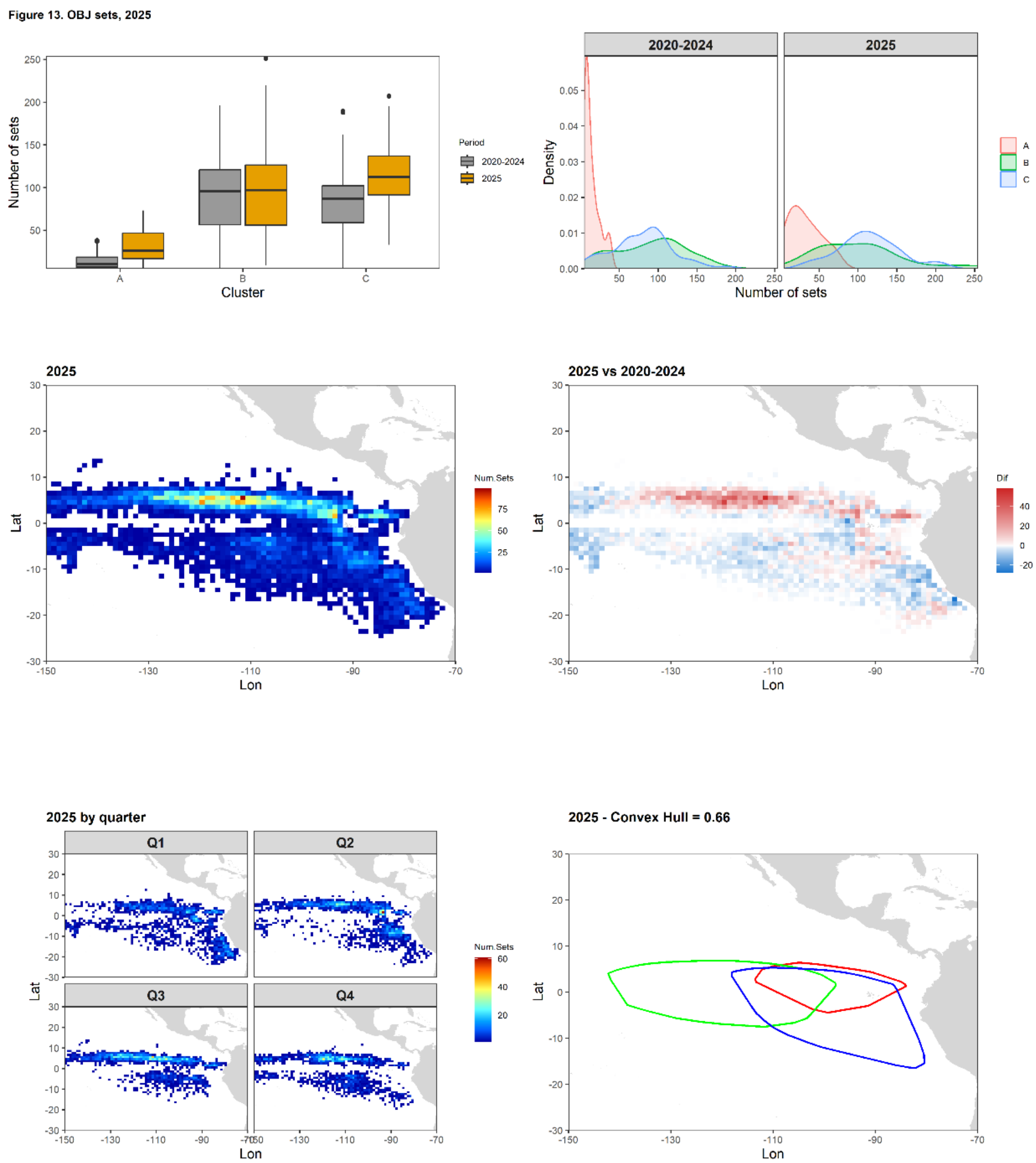

FIGURE 13. Top left: Boxplots of the number of OBJ sets per vessel, by cluster, 2020-2024 average and 2025; Top right: Density plot of OBJ sets per vessel for 2020-2024 average and 2025, by cluster; Center left: number of OBJ sets, by 1°-area, for 2025; Center right: differences of OBJ sets, by 1°-area, 2025 vs 2020-2024 average; Bottom left: number of OBJ sets, by 1°-area and quarter, for 2025; Bottom right: convex hull estimates of 66% of OBJ sets, by cluster (Red = A, Green = B, Blue = C), for 2025.

FIGURA 13. Panel superior izquierdo: diagramas de caja del número de lances OBJ por buque, por conglomerado, promedio de 2020-2024 y 2025; panel superior derecho: gráfica de densidad de lances OBJ por buque para el promedio de 2020-2024 y 2025, por conglomerado. Panel central izquierdo: número de lances OBJ, por área de 1°, para 2025; panel central derecho: diferencias de lances OBJ, por área de 1°, 2025 vs promedio de 2020-2024. Panel inferior izquierdo: número de lances OBJ, por área de 1° y trimestre, para 2025; panel inferior derecho: estimaciones de la envolvente convexa del 66% de los lances OBJ, por conglomerado (rojo = A, verde = B, azul = C), para 2025.

3.3.5. Set time

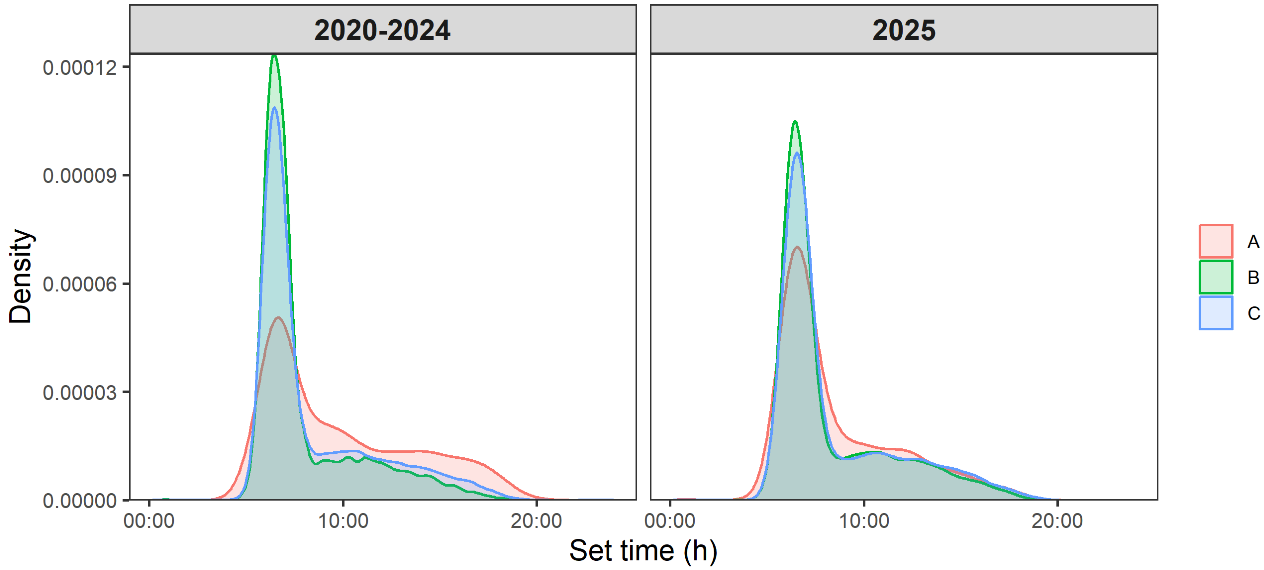

FIGURE 14. Density plot of OBJ set time, by cluster, 2020-2024 average and 2025.
FIGURA 14. Gráfica de densidad de la hora de los lances OBJ, por conglomerado, promedio de 2020-2024 y 2025.

3.3.6. Deployments

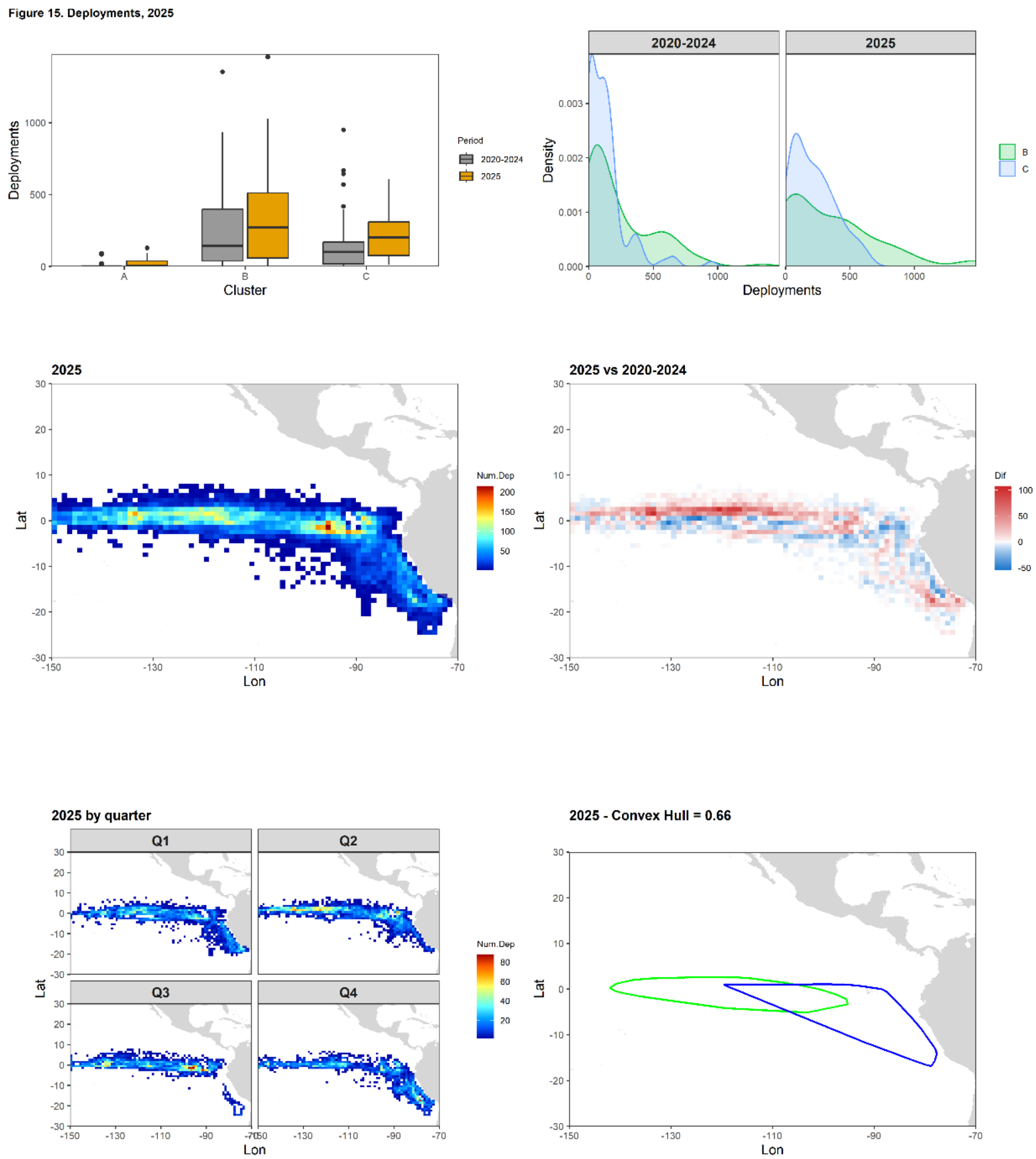

FIGURE 15. Top left: Boxplots of the number of deployments per vessel, by cluster, 2020-2024 average and 2025; Top right: Density plot of deployments per vessel for 2020-2024 average and 2025, by cluster; Center left: number of deployments, by 1°-area, for 2025; Center right: differences of deployments, by 1°-area, 2025 vs 2020-2024 average; Bottom left: number of deployments, by 1°-area and quarter, for 2025; Bottom right: convex hull estimates of 66% of deployments, by cluster (Green = B, Blue = C), for 2025.
FIGURA 15. Panel superior izquierdo: diagramas de caja del número de siembras por buque, por conglomerado, promedio de 2020-2024 y 2025; panel superior derecho: gráfica de densidad de siembras por buque para el promedio de 2020-2024 y 2025, por conglomerado. Panel central izquierdo: número de siembras, por área de 1°, para 2025; panel central derecho: diferencias de siembras, por área de 1°, 2025 vs promedio de 2020-2024. Panel inferior izquierdo: número de siembras, por área de 1° y trimestre, para 2025; panel inferior derecho: estimaciones de la envolvente convexa del 66% de las siembras, por conglomerado (rojo = A, verde = B, azul = C), para 2025.

3.3.7. Long-term deployment and retrieval trend

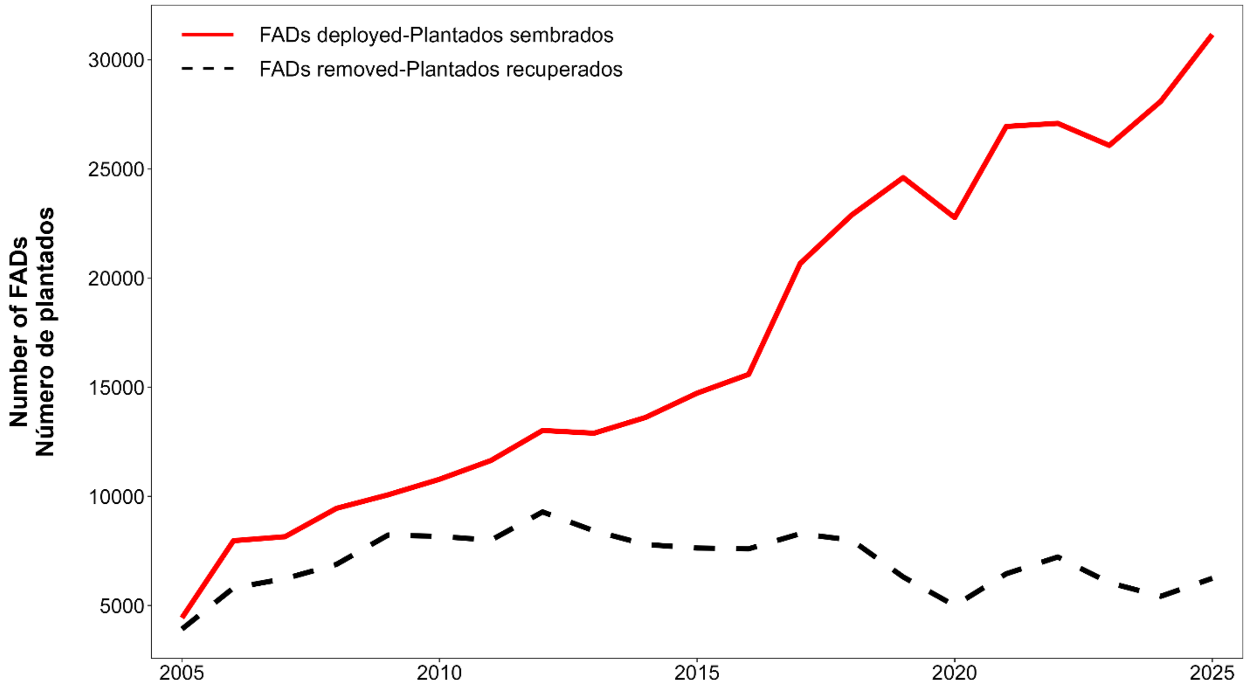

FIGURE 16. FAD deployments and retrievals by Class-6 vessels, 2005-2025. Adapted from document IATTC-93-INF-A.

FIGURA 16. Siembras y recuperaciones de plantados por buques de clase 6, 2005-2025. Adaptado del documento IATTC-93-INF-A.

3.3.8. Encounters

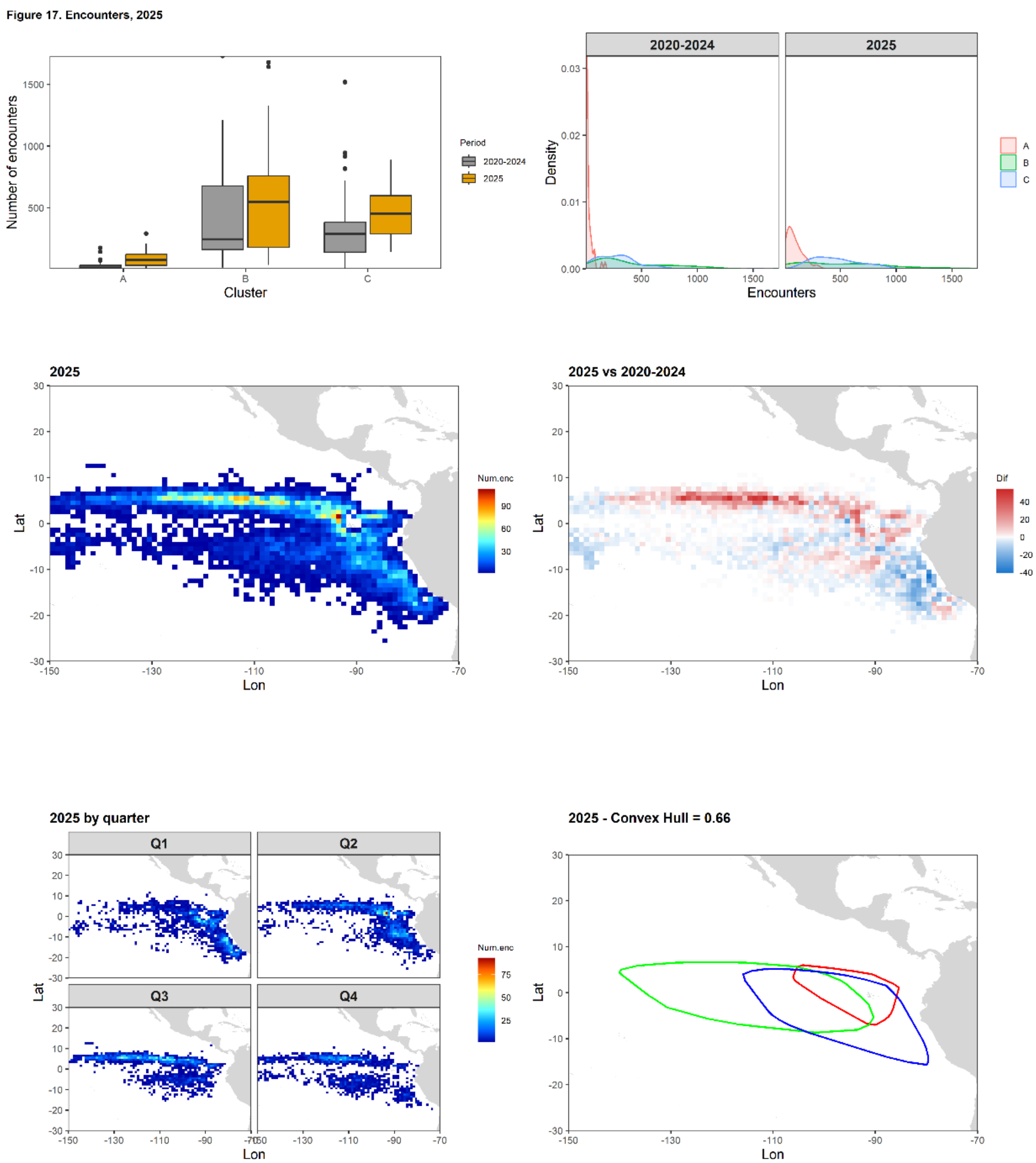

FIGURE 17. Top left: Boxplots of the number of OBJ encounters per vessel, by cluster, 2020-2024 average and 2025; Top right: Density plot of OBJ encounters per vessel for 2020-2024 average and 2025, by cluster; Center left: OBJ encounters, by 1°-area, for 2025; Center right: differences of OBJ encounters, by 1°-area, 2025 vs 2020-2024 average; Bottom left: OBJ encounters, by 1°-area and quarter, for 2025; Bottom right: convex hull estimates of 66% of OBJ encounters, by cluster (Red = A, Green = B, Blue = C), for 2025.
FIGURA 17. Panel superior izquierdo: diagramas de caja del número de encuentros OBJ por buque, por conglomerado, promedio de 2020-2024 y 2025; panel superior derecho: gráfica de densidad de encuentros OBJ por buque para el promedio de 2020-2024 y 2025, por conglomerado. Panel central izquierdo: encuentros OBJ, por área de 1°, para 2025; panel central derecho: diferencias de encuentros OBJ, por área de 1°, 2025 vs promedio de 2020-2024. Panel inferior izquierdo: encuentros OBJ, por área de 1° y trimestre, para 2025; panel inferior derecho: estimaciones de la envolvente convexa del 66% de los encuentros OBJ, por conglomerado (rojo = A, verde = B, azul = C), para 2025.

3.3.9. Encounters versus sets

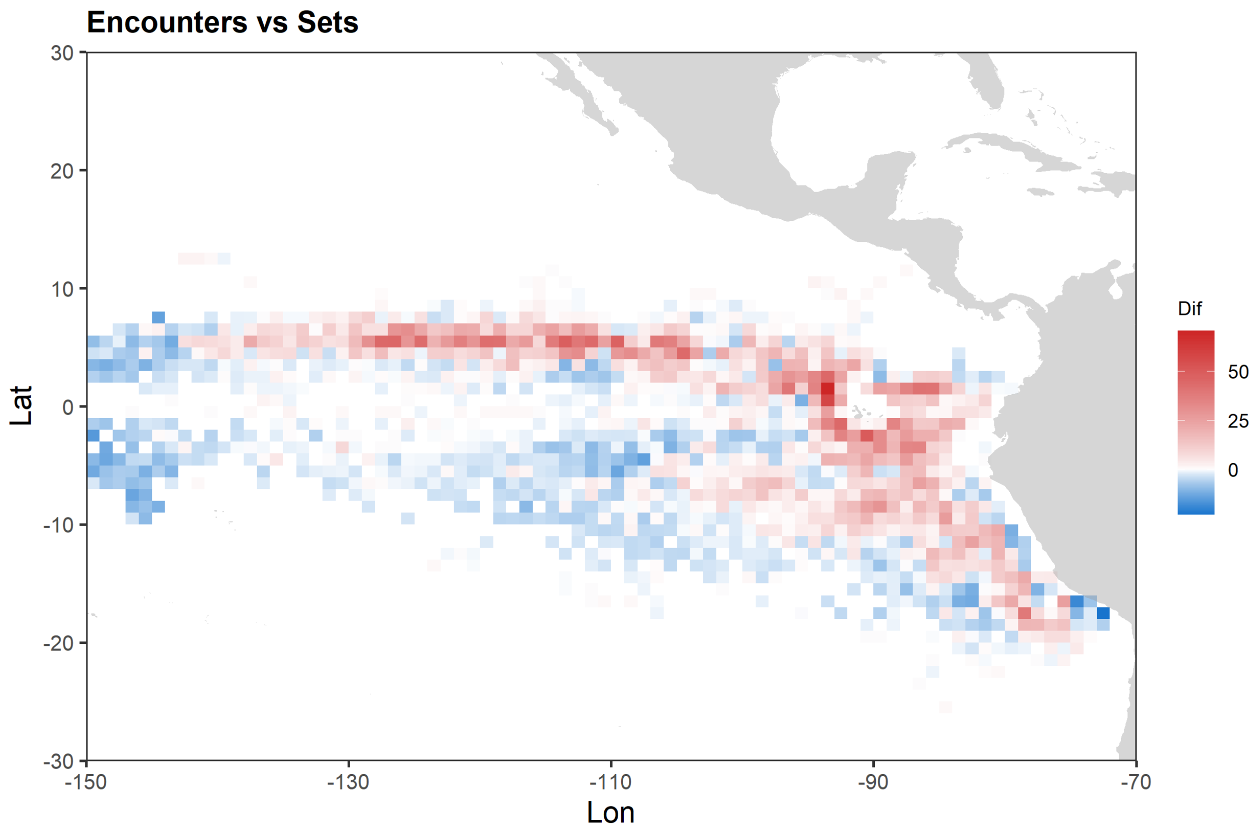

FIGURE 18. Differences between the number of OBJ encounters and the number of OBJ sets, by 1°-area, 2025. Red areas denote hotspots of visits on floating objects with no fishing activity associated. Blue cells, instead, denote areas where visits led to fishing sets.

FIGURA 18. Diferencias entre el número de encuentros OBJ y el número de lances OBJ, por área de 1°, 2025. Las áreas rojas indican sitios clave de visitas de objetos flotantes sin actividad de pesca asociada. Las celdas azules, en cambio, indican áreas donde las visitas resultaron en lances de pesca.

3.3.10. Activity dynamics within the trip

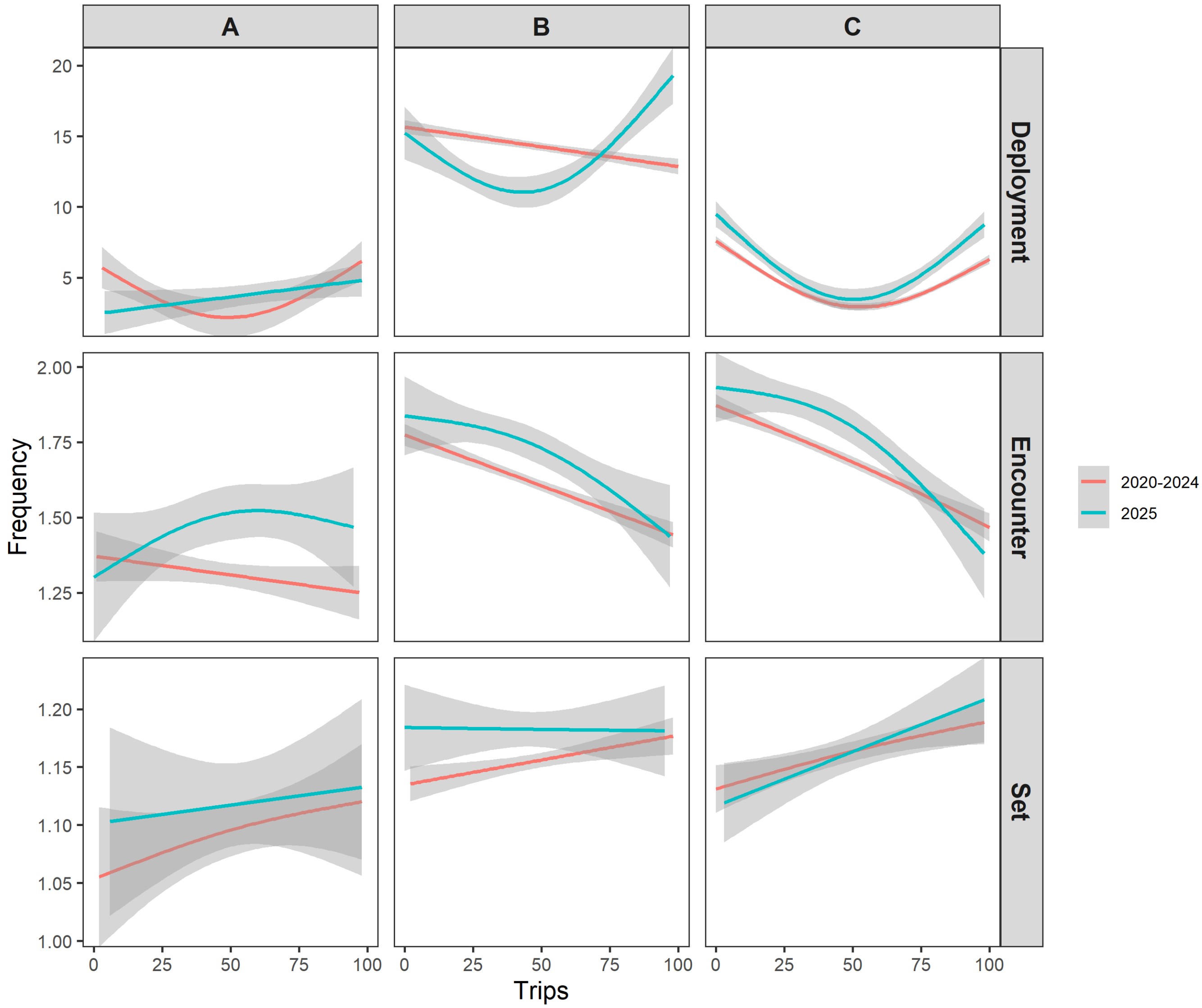

FIGURE 19. Evolution of floating-object deployment, encounter and set activities (number of each activity) within the trip, 2020-2024 averages and 2025. Only trips with a duration of 25-90 days were considered, quantiles 5 and 95, respectively. Trips were divided into 100 equal parts for standardization purposes.
FIGURA 19. Evolución de las actividades de siembras, encuentros y lances de objetos flotantes (número de cada actividad) en el viaje, promedio de 2020-2024 y 2025. Solo se consideraron viajes con una duración de 25 a 90 días, cuantiles 5 y 95, respectivamente. Los viajes se dividieron en 100 partes iguales con fines de estandarización.

3.3.11. Evolution of location method

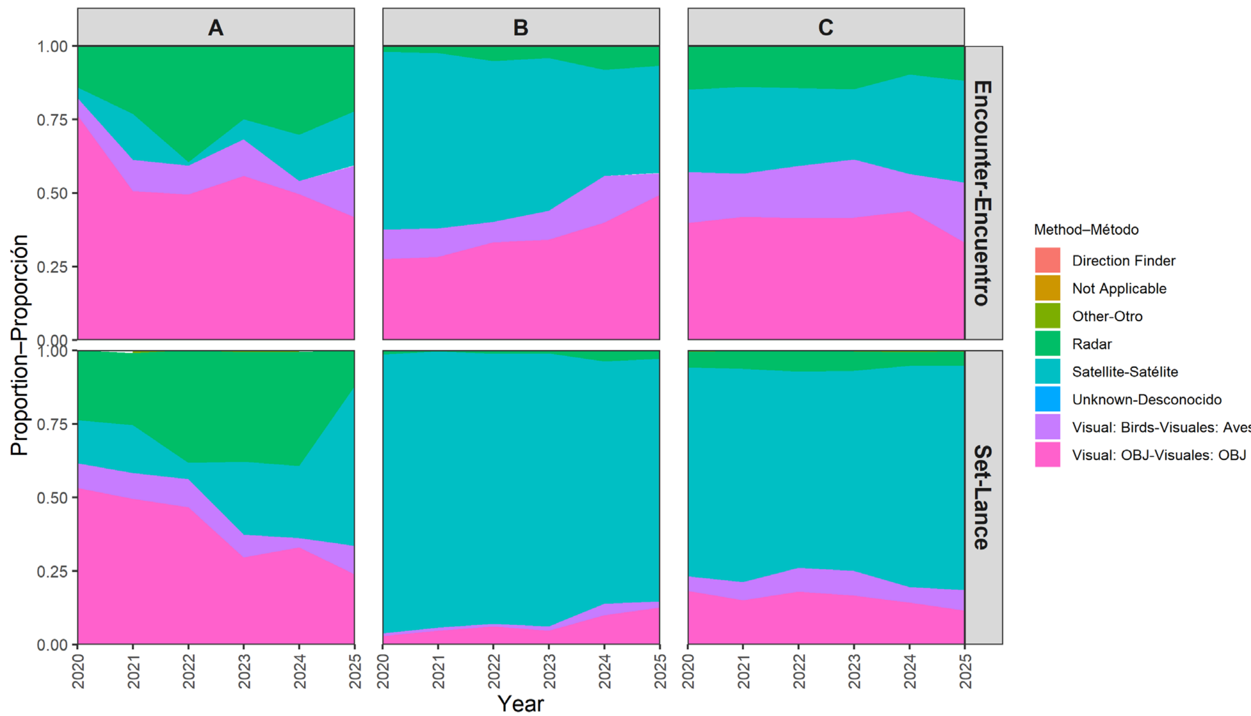

FIGURE 20. Evolution of locating methods for OBJ encounters and sets, by cluster, 2020-2025.
FIGURA 20. Evolución de los métodos de localización para encuentros y lances OBJ, por conglomerado, 2020-2025.

3.4. Buoy-based indices

The indicators in this section have been estimated using buoy data for 171 Class 1-6 vessels reporting in 2025 (37 and 134 vessels for Class 1-5 and Class 6, respectively). Because the limits on active FADs per vessel (i.e., active buoys) are class-specific, as established by Resolution C-24-01[3], the indicators in this category have been estimated for each class-limit where appropriate (sections 3.4.1–3.4.2, Table 6, Fig. 21). The indicators were estimated primarily for 2025 and for 2018–2025 to inform interpretation of the short-, medium-, and long-term evolution of the fishery.

Most vessels that deploy FADs comply with the Resolution C-24-01 requirement to report daily FAD data. Observer data indicate that reporting rates for Class 6 vessels deploying and fishing on their own FADs are high (>90%). Reporting rates for Class 1–5 vessels cannot be estimated, since that fleet segment does not routinely or systematically carry observers. The staff considers that extrapolating from these data to estimate the total number of FADs is not yet advisable, since fishing strategies vary by capacity, company, flag, season, or a combination of these and other factors, and the required assumptions may lead to misleading results and interpretations. Since 2022, the staff has had access to raw buoy data reported under Resolution C-21-04 (under C-24-01 in 2025–2026); analyzing those data will help clarify this

[3] Class 6 (⩾ 1,200 m^3) = 340; Class 6 (< 1,200 m^3) = 210; Class 4-5 = 85, Class 1-3 = 50 for 2024

relationship in the near future. Active FADs therefore do not represent the total FADs at sea, because (a) buoys can be deactivated remotely while the FAD remains at sea, and (b) not all vessels report continuously (e.g., buoys are deactivated during closure periods, and reporting gaps exist); these counts are therefore likely underestimates.

Section 3.4.7 shows the buoy-derived indices for the three tropical tuna species, using historical data (mostly voluntarily provided) for 2012–2023. The figure has been adapted from document FAD-08-02 (see that document for details on the methods and the specific data used). No buoy-derived index was prepared for the 2012–2025 period, as no benchmark tuna assessments were scheduled to use 2025 buoy data.

3.4.1. Daily active buoys per vessel

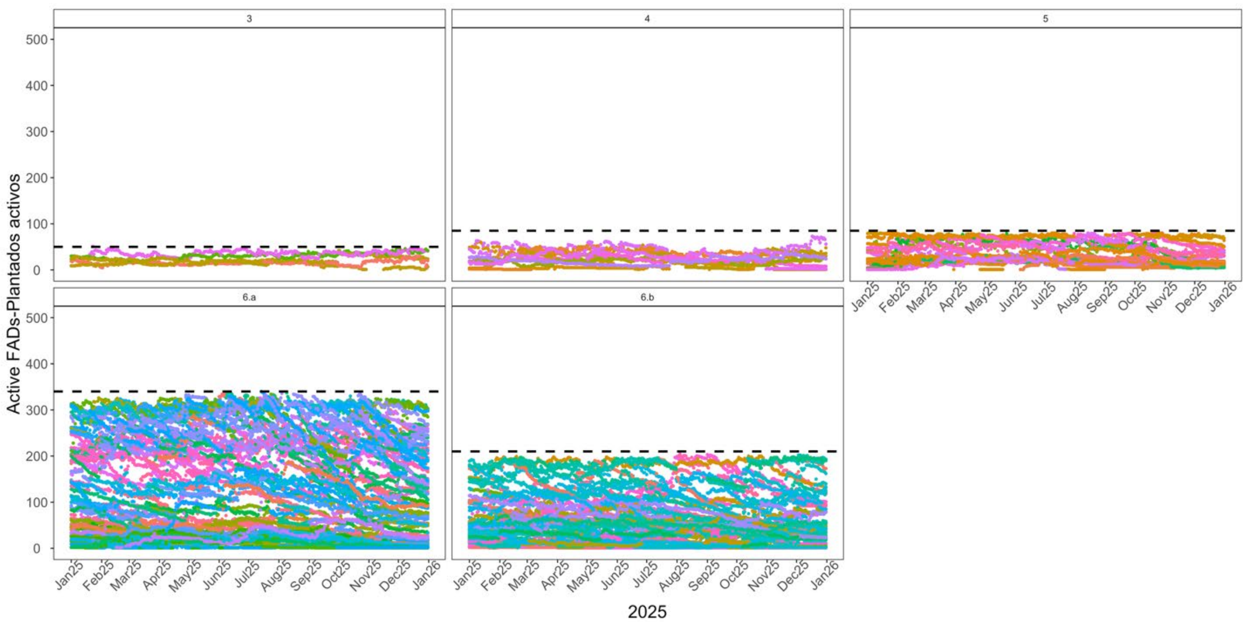

FIGURE 21. Evolution of daily active FADs per vessel and class, 2025. Each color represents a vessel (171 total). Points are used to show data reporting gaps per vessel. The following class and class-limits are considered: Class 6 ≥ 1,200 m^3 = 340 (6.a in the figure); Class 6 < 1,200 m^3 = 210 (6.b in the figure); Class 4-5 = 85, Class 1-3 = 50.

FIGURA 21. Evolución de plantados activos diarios por buque y clase, 2025. Cada color representa un buque (171 en total). Se usan puntos para mostrar las deficiencias en la notificación de datos por buque. Se consideran las siguientes clases y límites de clase: clase 6 ≥ 1,200 m^3 = 340 (6.a en la figura); clase 6 < 1,200 m^3 = 210 (6.b en la figura); clases 4-5 = 85; clases 1-3 = 50.

3.4.2. Annual and monthly statistics

TABLE 8. Monthly and annual minimum, mean, maximum, and standard deviations of active FADs (i.e. buoys), by class-limit, 2025. The analysis includes 57 Class-6 <1200 m^3, 77 Class-6 ≥ 1200 m^3, 32 Class-4-5, and 5 Class-1-3 vessels.

TABLA 6. Mínimo, promedio, máximo y desviación estándar mensuales y anuales de plantados activos (es decir, boyas), por límite de clase, 2025. El análisis incluye 57 buques de clase 6 <1200 m^3, 77 de clase 6 ≥ 1200 m^3, 32 de clases 4-5, y 5 de clases 1-3.

	Class 1-3				Class 4-5				Class 6 < 1200				Class 6 >1200			
Month	Min	Mean	Max	SD	Min	Mean	Max	SD	Min	Mean	Max	SD	Min	Mean	Max	SD
Jan	6	21.7	51	9	1	28.9	80	22.3	1	63.4	196	50.8	1	126.1	326	96.2
Feb	5	22	46	9.9	1	33.8	79	21.5	1	68.2	199	54.2	1	128.9	325	105.9
Mar	11	21.2	39	6.9	1	34.4	78	20.5	2	66.7	198	50.9	1	128.3	319	104.7
Apr	10	20.8	32	6.7	1	35.2	78	20.8	1	67	197	51.6	1	136.5	332	107.3
May	10	22.9	43	10	1	35.2	79	20.5	1	68.8	198	53.1	1	141.6	332	109.1
Jun	13	24.7	47	10.2	1	34.8	78	19.9	1	70.3	197	53.9	1	152.5	339	113
Jul	10	24	44	9.2	1	33	80	20.2	1	69.4	197	54.5	1	148.9	340	110
Aug	12	23.6	43	8.2	1	27	80	18	1	64.4	204	52.3	1	131.1	337	99.8
Sep	5	21.6	41	10.3	1	31.6	79	20.9	1	66.7	203	53.1	1	144.8	329	98.8
Oct	1	24.6	42	13.5	1	31.4	83	20.7	1	63.4	200	55.5	1	143.6	336	105.7
Nov	1	28.3	45	11.4	1	27.3	78	19.9	1	62.3	199	55	1	137.4	324	102.8
Dec	1	27.3	48	14.3	1	28.2	79	20	1	64.2	202	55.9	1	135	321	95.8
Annual	1	23.6	51	10	1	31.7	83	20.4	1	66.2	204	53.4	1	137.9	340	104.1

3.4.3. Daily total active buoys

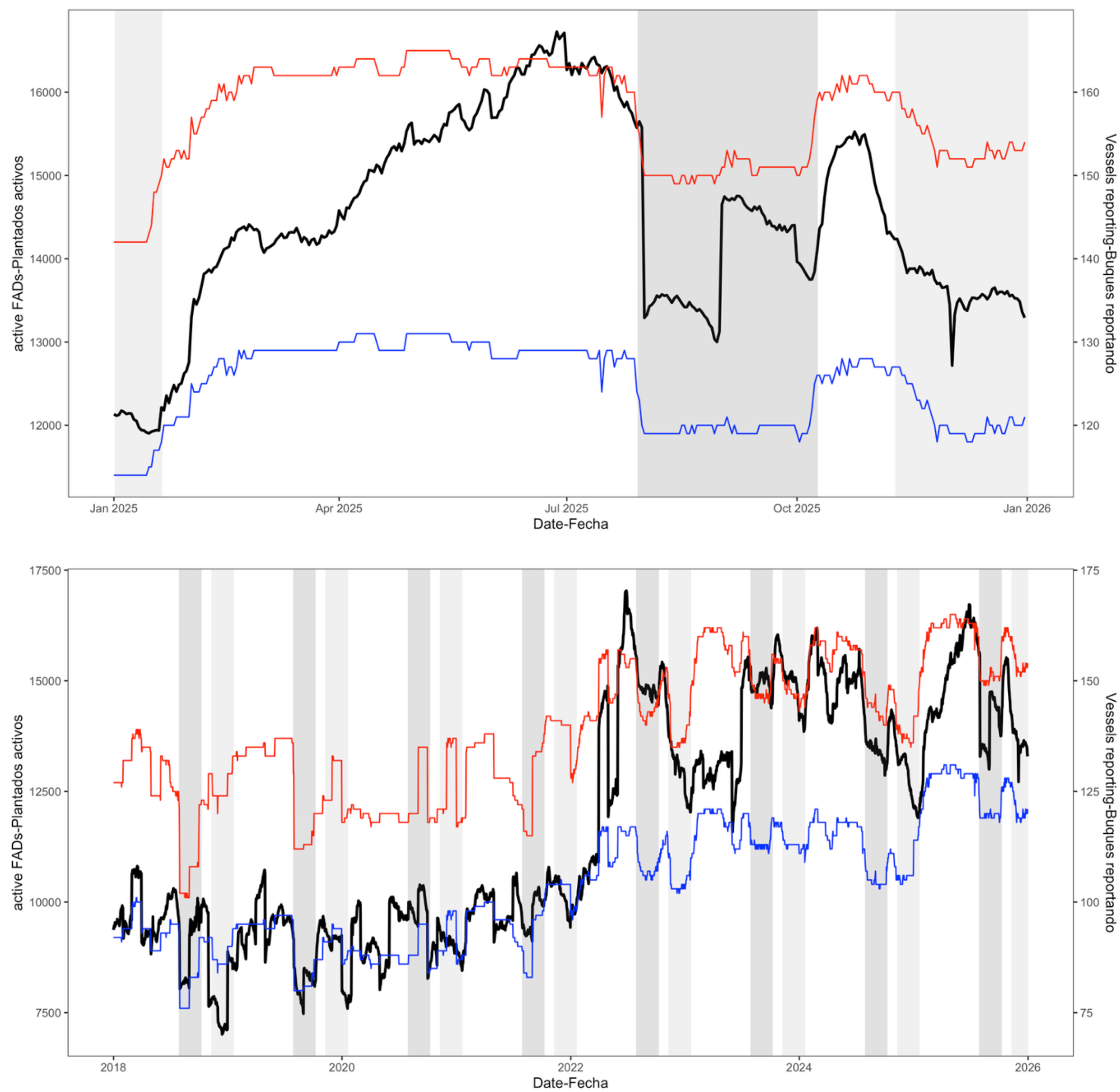

FIGURE 22. Number of active FADs (black line) reported by the purse-seine fleet in 2025 (a, top panel) and historically, 2018-2025 (b, bottom panel), and number of vessels reporting daily (red: total; blue: Class-6 vessels). Includes 134 Class-6 vessels, 20 Class-5, 12 Class-4, and 5 Class-2-3 in 2025. The number of total vessels reporting daily in 2025 ranged from 142 to 165 (median = 160, average = 158). The number of total daily active buoys reported in 2025 ranged from 11903 to 16726 (median = 14353, mean = 14486), and historically from 7013 to 17035 (median = 10582, mean = 11710).

FIGURA 22. Número de plantados activos (línea negra) reportados por la flota cerquera en 2025 (a, panel superior) e históricamente, 2018-2025 (b, panel inferior), y número de buques que reportan diariamente (rojo: total; azul: buques de clase 6). Incluye 134 buques de clase 6, 20 de clase 5, 12 de clase 4, y 5 de clase 2-3 en 2025. El número de buques totales que reportan diariamente en 2025 osciló entre 142 y 165 (mediana = 160, promedio = 158). El número de boyas activas diarias totales reportadas en 2025 osciló entre 11903 y 16726 (mediana = 14353, promedio = 14486), e históricamente entre 7013 y 17035 (mediana = 10582, promedio = 11710).

3.4.4. Monthly buoy densities

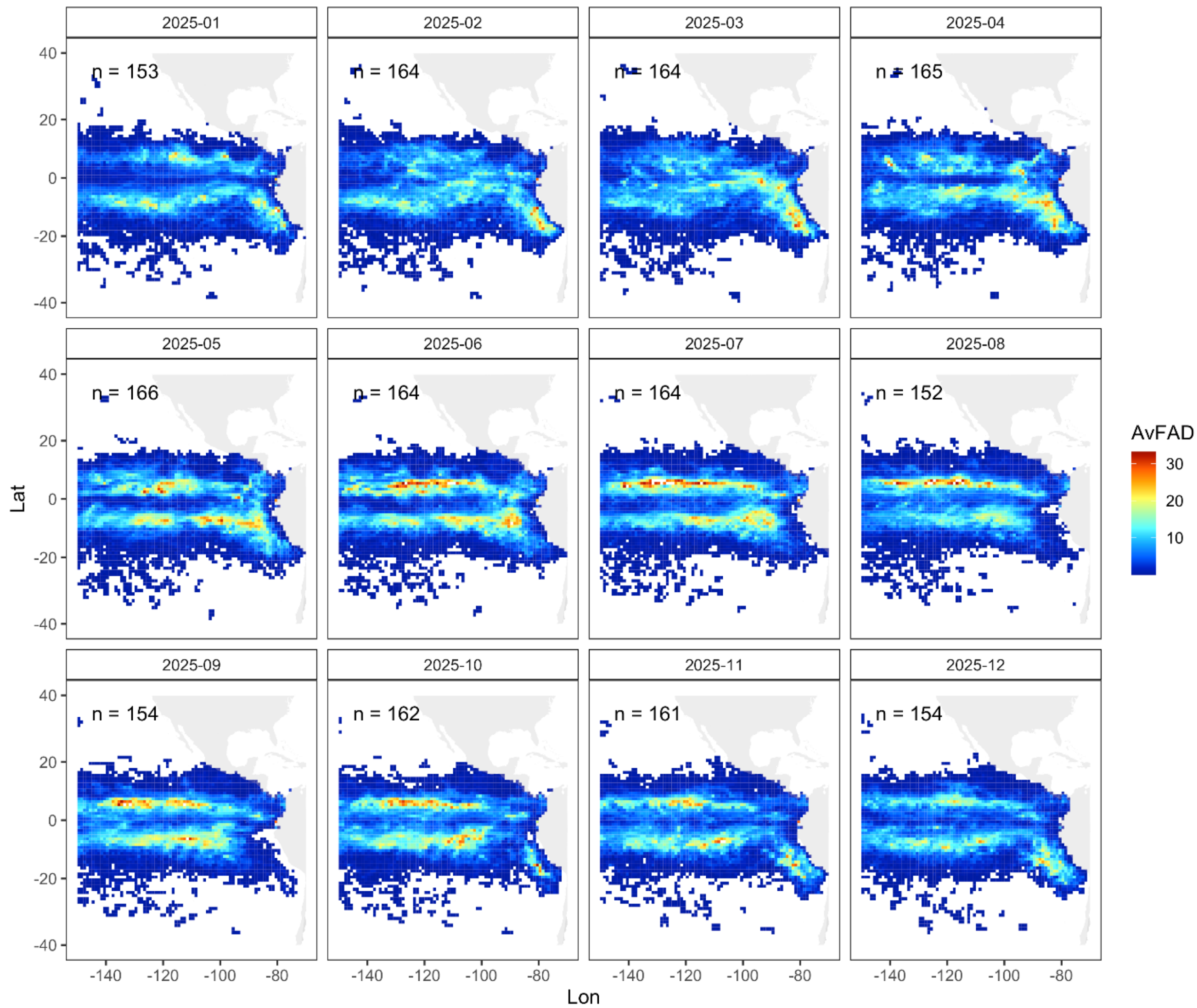

FIGURE 23. Average number of active FADs, by 1°-area, reported by between 152 and 166 vessels (mean = 160), by month, during the January-December 2025 period.
FIGURA 23. Número promedio de plantados activos, por área de 1°, reportado por entre 152 y 166 buques (promedio = 160), por mes, durante el periodo de enero-diciembre de 2025.

TABLE 9. Total number of active FADs in the EPO, reported by between 152 and 166 vessels (mean = 160), by month, and average, 2025. Number of active FADs ranged from 12192 to 16279 (average = 14486). Values correspond to those shown in Figure 23 above. Although very similar, these numbers do not match exactly the values provided in Figure 22 as the methods and resolution of data to estimate these figures vary.

TABLA 7. Número total de plantados activos en el OPO, reportado por entre 152 y 166 buques (promedio = 160), por mes y promedio, 2025. El número de plantados activos osciló entre 12192 y 16279 (promedio = 14486). Los valores corresponden a los que se muestran en la Figura 23 anterior. Aunque muy similares, estos números no coinciden exactamente con los valores provistos en la Figura 22, ya que los métodos y la resolucion de los datos para estimar estas figuras varían.

Month	Sum of average active FADs	Number of vessels
Jan	12192	153
Feb	14038	164
Mar	14245	164
Apr	15042	165
May	15633	166
Jun	16279	164
Jul	16099	164
Aug	13394	152
Sep	14548	154
Oct	14827	162
Nov	14055	161
Dec	13485	154
Average	14486	160

3.4.5. Annual buoy densities

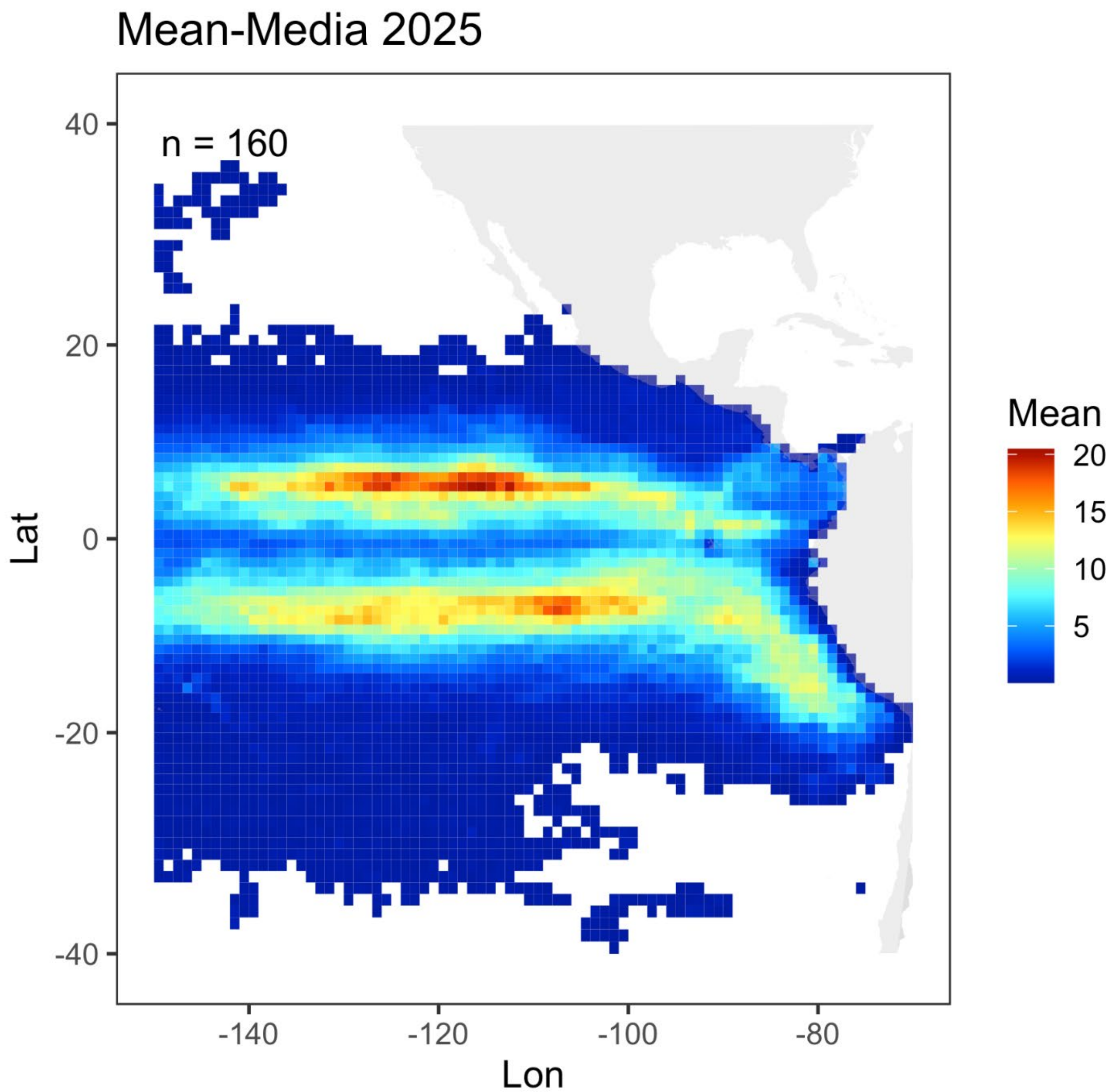

FIGURE 24. Average number of active FADs, by 1°-area, reported by between 152 and 166 vessels (mean = 160) during the January-December 2025 period.
FIGURA 24. Número promedio de plantados activos, por área de 1°, reportado por entre 152 y 166 buques (promedio = 160) durante el periodo de enero-diciembre de 2025.

3.4.6. Remote deactivations and reactivations

TABLE 8. Number of remote deactivation and reactivations reported, per reason, as specified in Resolution C-21-04 and C-24-01, reported by 179 vessels (40 Class 1-5; 139 Class 6) and 2589 monthly files, in 2025 (average reported number of monthly files per vessel in 2025 was 14.4). A total of 27883 and 4363 deactivation and reactivations were reported (12371 unknown deactivations), respectively, in 2025. Showed, for comparison purposes, averaged results for 2022-2024, where 134 and 178 vessels reported between 1439 and 2400 monthly files (a total of 3931 and 563 records for deactivations and reactivations, respectively, in 2022; a total of 25955 and 6845 deactivations and reactivations, respectively, in 2023; and a total of 26683 and 6543 deactivations and reactivations, respectively, in 2024; an average of 13796 unknown deactivations during 2022-2024). Average number of reported monthly files per vessel in 2022-2024 was12.7).

TABLA 8. Número de desactivaciones y reactivaciones remotas reportadas, por tipo de razón, tal y como se especifica en la resolución C-21-04 y la C-24-01, reportado por 179 buques (40 clases 1-5, 139 clase 6) y 2589 ficheros mensuales en 2025 (el número medio de ficheros mensuales reportados por buque en 2025 fue 14.4). Un total de 27883 y 4363 desactivaciones y reactivaciones remotas fueron reportadas (12371 desactivaciones desconocidas), respectivamente, en 2025. Se muestra, por razones comparativas, los resultados promedio para 2022-2025, para el cual 134 y 178 buques reportaron entre 1439 y 2400 ficheros mensuales (un total de 3931 y 563 registros fueron reportados para desactivaciones y reactivaciones, respectivamente, en 2022; un total de 25955 y 6845 desactivaciones fueron reportadas, respectivamente, en 2023; y un total de 26683 y 6543 desactivaciones y reactivaciones fueron reportadas, respectivamente, en 2024; un promedio de 13796 desactivaciones desconocidas). El número medio de ficheros mensuales reportados por buque en 2022-2024 fue 12.7).

		2025		2022-2024	
Type	**Reason**	**No. records**	**%**	**No. records**	**%**
Deactivation	Beaching	124	0.4%	89	0.5%
	FAD outside the areas (par. 20; c-21-04)	7724	27.7%	5690	29.9%
	Other	2531	9.1%	1709	10.0%
	Signal loss	8136	29.2%	6251	34.2%
	Stolen FAD	7456	26.7%	3258	16.3%
	Temporarily during closure periods	343	1.2%	250	1.1%
	Transferred ownership	1569	5.6%	1608	7.8%
	Total	27883	-	18856	-
	Unknown	*12371*	-	*13796*	-

Type	Reason	2025		2022-2024	
		No. records	%	No. records	%
Reactivation	After a temporary deactivation during the closure period	28	0.6%	120	2.2%
	Other	1423	32.6%	1223	22.5%
	Recovery of a signal loss	1984	45.5%	2395	43.9%
	Transfer of ownership	928	21.3%	1711	31.4%
	Total	4363	-	5448	-

3.4.7. Buoy derived abundance indices

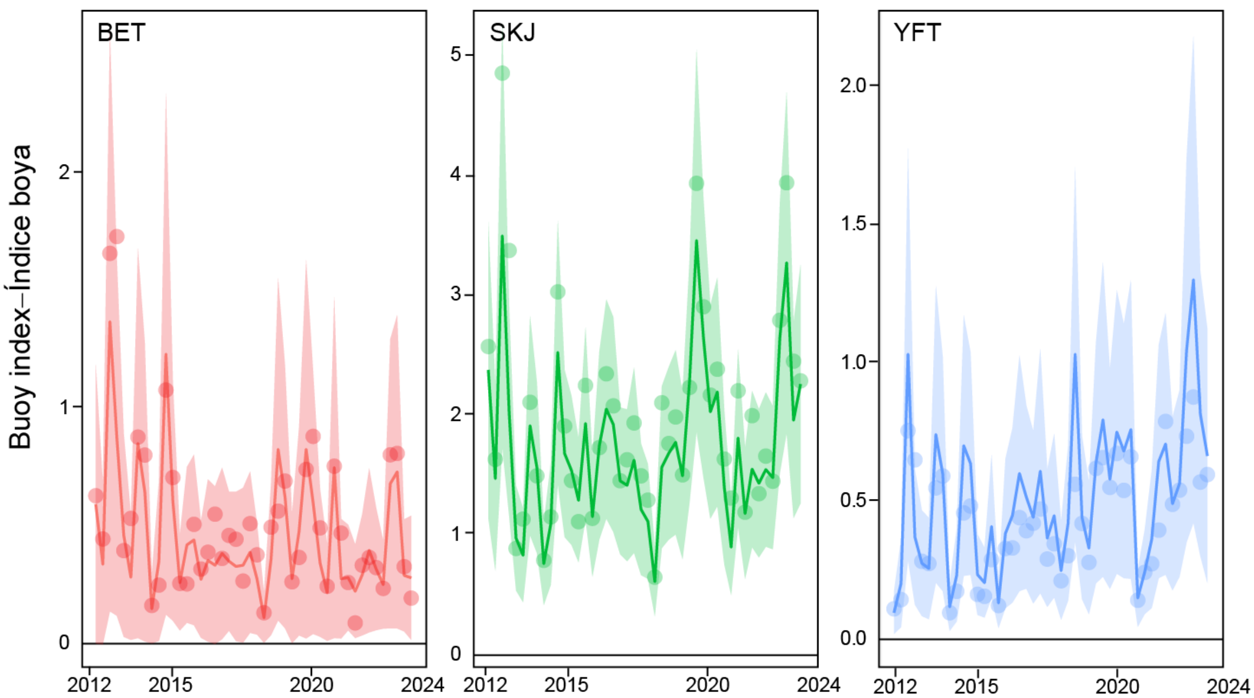

FIGURE 255. Buoy derived index for all three tropical tuna species, 2012-2023. Modified from FAD-08-02.
FIGURA 25. Índice derivado de las boyas para las tres especies de atunes tropical, 2012-2023. Modificado de FAD-08-02.

3.5. Capacity indicators

The IATTC uses well volume, in cubic meters (m^3), to measure the carrying capacity of purse-seine vessels. When reliable well-volume data are not available for a purse-seine vessel, well volume is calculated by applying a conversion factor to its capacity in tons. In 2025, the estimated carrying capacity was 263,955 m^3 across a total of 230 purse-seine vessels (Figure 26).

Cumulative capacity at sea during 2025 is compared with that of the previous five years in Figure 27.

The monthly average of the total well volume at sea (VAS), in thousands of cubic meters, is estimated by the IATTC staff at weekly intervals. The average monthly VAS was about 146,000 m³ (55.3% of total capacity) for 2015–2024 and about 136,500 m³ (51.7% of total capacity) for 2025.

The figures and indicators in this category were taken from section 6.1 of SAC-17-01 (Tables A-10, A-11a, A-11b, and A-12; Figs. 2–3).

3.5.1. Carrying capacity

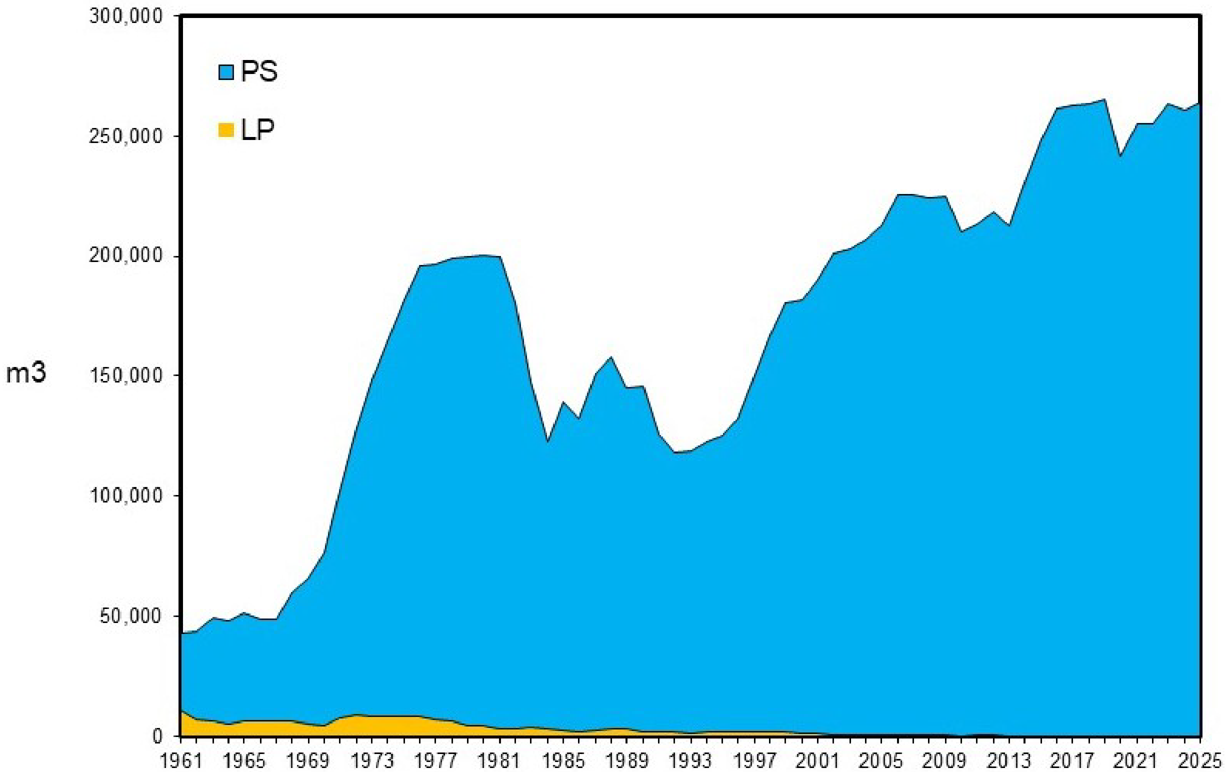

FIGURE 266. Carrying capacity, in cubic meters of well volume, of the purse-seine and pole and line fleets in the EPO, 1961-2025. Source: SAC-17-01 (Fig. 2).
FIGURA 26. Capacidad de acarreo, en metros cúbicos de volumen de bodega, de las flotas de cerco y de caña en el OPO, 1961-2025. Fuente: SAC-17-01 (Fig. 2).

3.5.2. Cumulative capacity

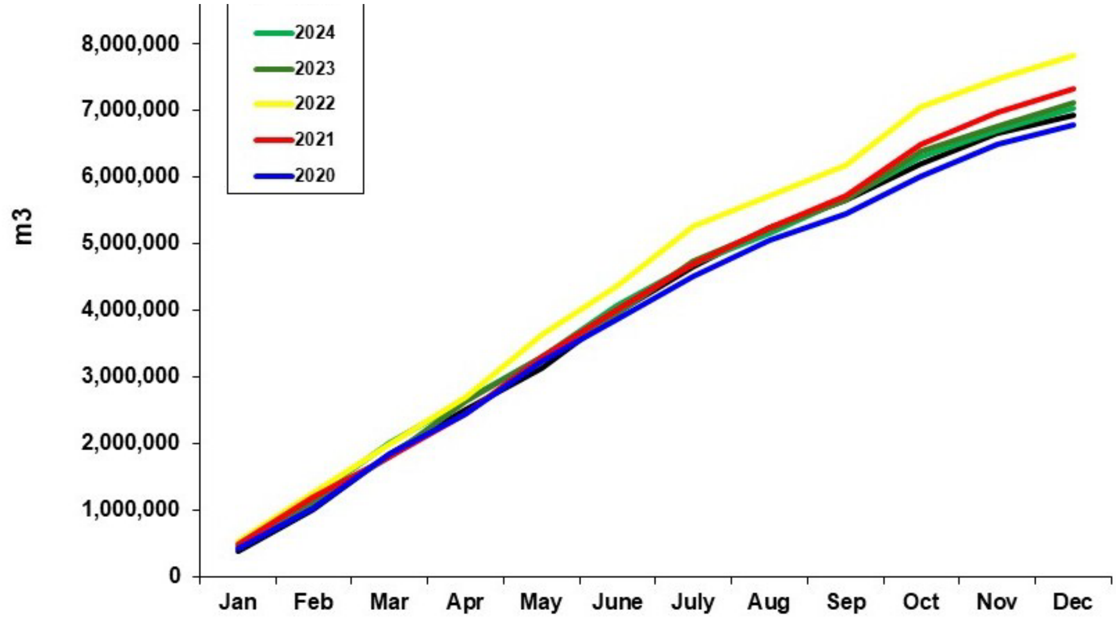

FIGURE 277. Cumulative capacity of the purse seine and pole and line fleet at sea, by month, 2020-2025. Source: SAC-17-01 (Fig. 3).
FIGURA 27. Capacidad acumulativa de la flota cerquera y cañera en el mar, por mes, 2020-2025. Fuente: SAC-17-01 (Fig. 3).

3.6. Technology

Fishing efficiency is known to be related to the gear and onboard technology used by vessels. Because of that, in this first approximation, a series of indicators showing the evolution of FAD designs (e.g. FAD depth), net size (i.e. depth), as well as their spatial distribution have been analyzed. FAD-depth indicators (Fig. 28) were estimated from deployment information, and net-size indicators (Fig. 29) from fishing-set information. In addition, the proportion of trips using specific technologies was analyzed by cluster (Fig. 30) to characterize the evolution of OBJ-oriented fishing strategies over the study period.

3.6.1. FAD depth

Figure 28. FAD depth, 2025

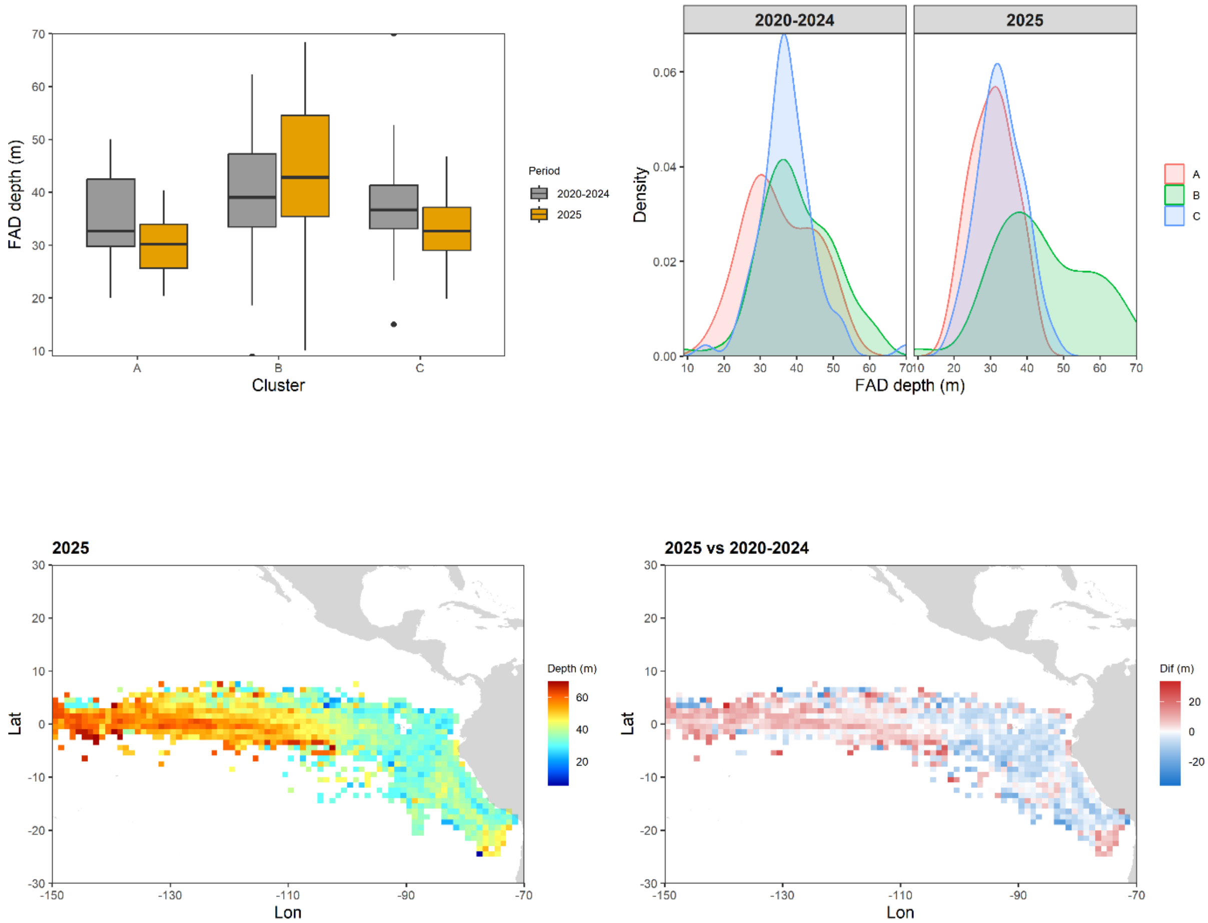

FIGURE 288. Top left: Boxplots of FAD depth for deployments, by cluster, 2020-2024 average and 2025; Top right: Density plot of FAD depth for deployments, 2020-2024 average and 2025, by cluster; Bottom left: average FAD depth, by 1°-area, for 2025; Bottom right: differences of FAD depth, by 1°-area, 2025 vs 2020-2024 average. All indicators are in meters. A clear tendency of deploying deeper FADs is observed in 2025, compared to the average of the previous five years (2020-2024).

FIGURA 28. Panel superior izquierdo: diagramas de caja de la profundidad de los plantados para las siembras, por conglomerado, promedio de 2020-2024 y 2025; panel superior derecho: gráfica de densidad de la profundidad de los plantados para las siembras, promedio de 2020-2024 y 2025, por conglomerado. Panel inferior izquierdo: profundidad promedio de los plantados, por área de 1°, en 2025; panel inferior derecho: diferencias de la profundidad de los plantados, por área de 1°, 2025 vs promedio de 2020-2024. Todos los indicadores están en metros. Se observa una clara tendencia a la siembra de plantados más profundos en 2024, en comparación con el promedio de los cinco años anteriores (2020-2024).

3.6.2. Net size

Figure 29. Net depth, 2025

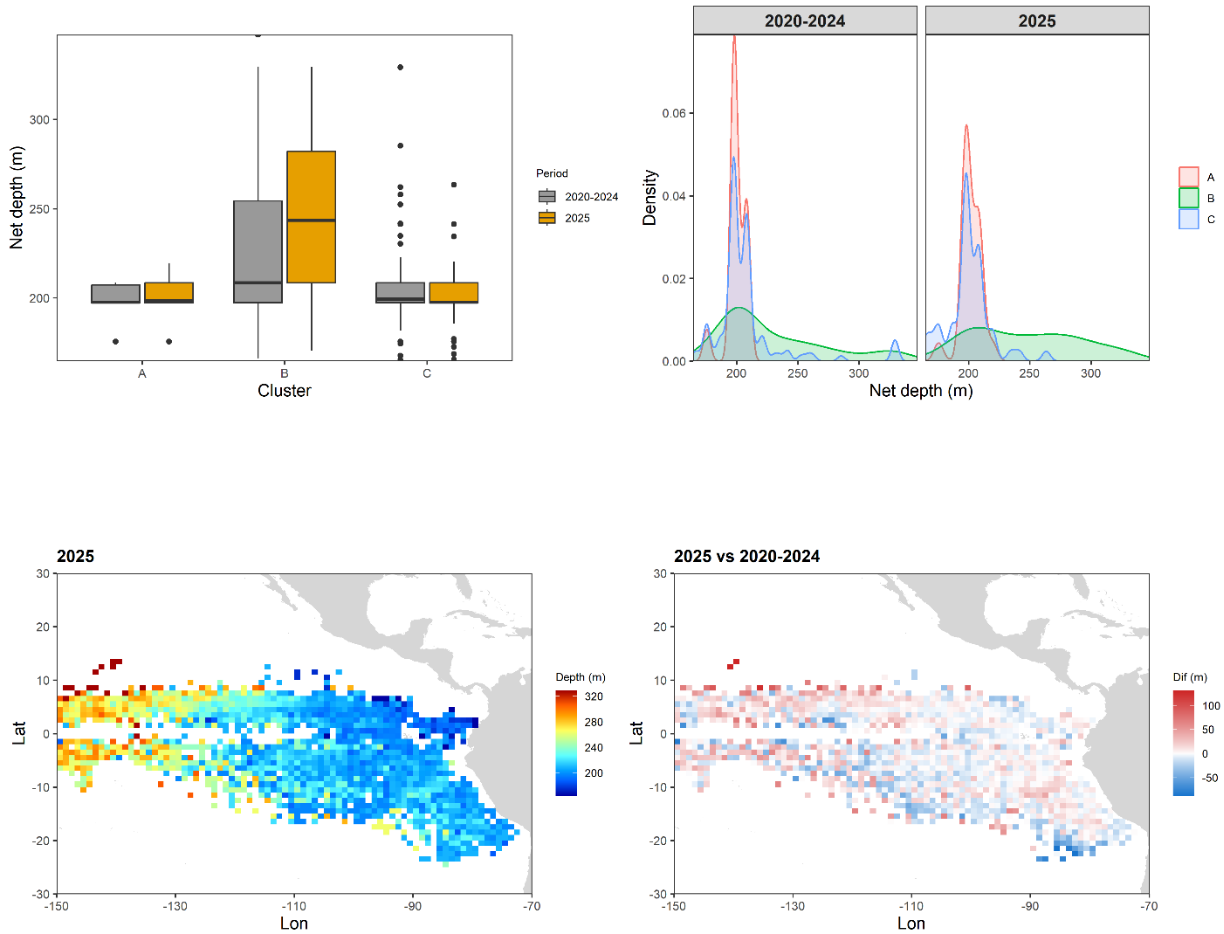

FIGURE 299. Top left: Boxplots of the net depth used in OBJ fishing sets, by cluster, 2020-2024 average and 2025; Top right: Density plot of the net depth used in OBJ fishing sets, 2020-2024 average and 2025, by cluster; Bottom left: average net depth used in OBJ fishing sets, by 1°-area, for 2025; Bottom right: differences of the net depth used in OBJ fishing sets, by 1°-area, 2025 vs 2020-2024 average. All indicators are in meters. A clear tendency of fishing with deeper nets is observed primarily in the western region of the EPO along the equator, as well as in the southern area, in 2025.

FIGURA 29. Panel superior izquierdo: Diagramas de caja de la profundidad de las redes usadas en los lances OBJ, por conglomerado, promedio de 2020-2024 y 2025; panel superior derecho: gráfica de densidad de la profundidad de las redes usadas en los lances OBJ, promedio de 2020-2024 y 2025, por conglomerado. Panel inferior izquierdo: profundidad promedio de las redes usadas en los lances OBJ, por área de 1°, en 2025; panel inferior derecho: diferencias de la profundidad de las redes usadas en los lances OBJ, por área de 1°, 2025 vs promedio de 2020-2024. Todos los indicadores están en metros. Se observa una clara tendencia a la pesca con redes más profundas para zonas al oeste del OPO a lo largo de la línea ecuatorial, así como al sur de la región, en 2025.

Onboard equipment

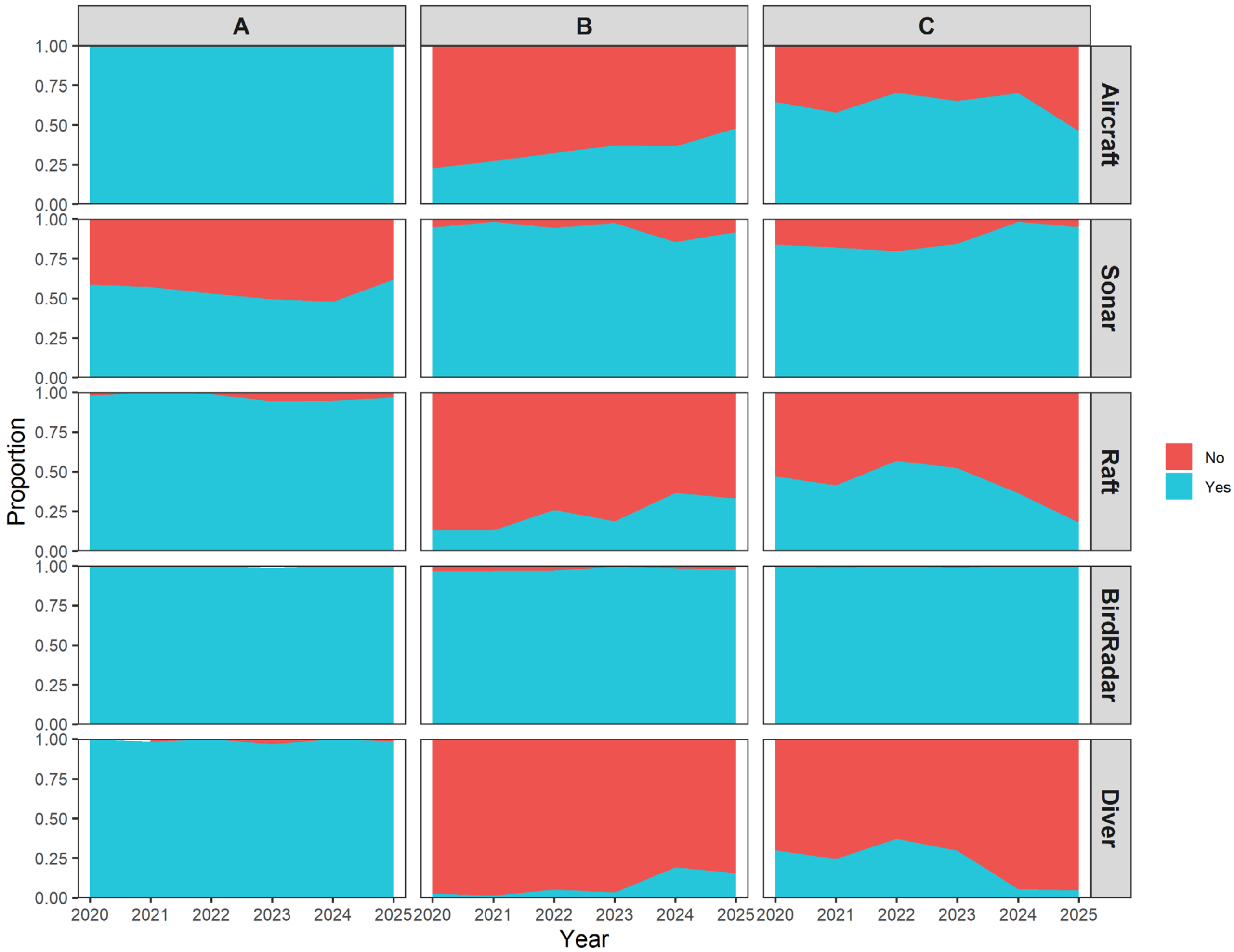

FIGURE 30. Evolution of the proportion of trips using different technologies, by cluster, including the use of aircrafts, sonar, rafts, bird radar and divers, for 2020-2025. Although some of these technologies have traditionally been used for dolphin fishing (e.g., rafts, divers, aircrafts), they have been included in the analysis, as they are an important component of the technology used by some clusters (see section 3.1 for details on clustering).

FIGURA 30. Evolución de la proporción de viajes en los que se usan diferentes tecnologías, por conglomerado, incluyendo el uso de aeronaves, sonares, balsas, radares de aves, y buzos, para 2020-2025. Aunque algunas de estas tecnologías se emplean tradicionalmente en la pesca sobre delfines (por ejemplo, balsas, buzos, aeronaves), se incluyeron en el análisis ya que son un componente importante de la tecnología empleada por algunos conglomerados (ver la sección 3.1 para más detalles sobre los conglomerados).

3.7. Ecosystem impacts

The Ecosystem Considerations document (EB-04-01) is an extensive review of the tuna fisheries in the EPO. Of particular importance are the bycatch estimates for the various components of the purse-seine fishery, including the OBJ fishery. Appendix 1 (Tables 9–13) presents OBJ-fishery bycatch estimates for 2020–2025 for taxa of special interest, including sea turtles and elasmobranchs.

3.8. Biology indicators

Length-frequency samples are needed to obtain age-structured population estimates, primarily for the integrated modeling the staff uses to assess stock status. IATTC personnel collect these samples from the catches of purse-seine vessels in the EPO at ports of landing in Ecuador, Mexico, Panama, and Venezuela. The methods for sampling the catches of tunas are described in the appendix of Suter (2010).

Long-term time series of size-composition data for yellowfin and bigeye are available in the Stock Assessment Reports, and average-length stock-status indicators for the three tropical tuna species are available in SAC-17-02. This document presents size-composition data for OBJ catches during 2020–2025 (Fig. 31). The indicators in this section were extracted from SAC-17-01, section 5.

3.8.1. Size composition of tuna catches

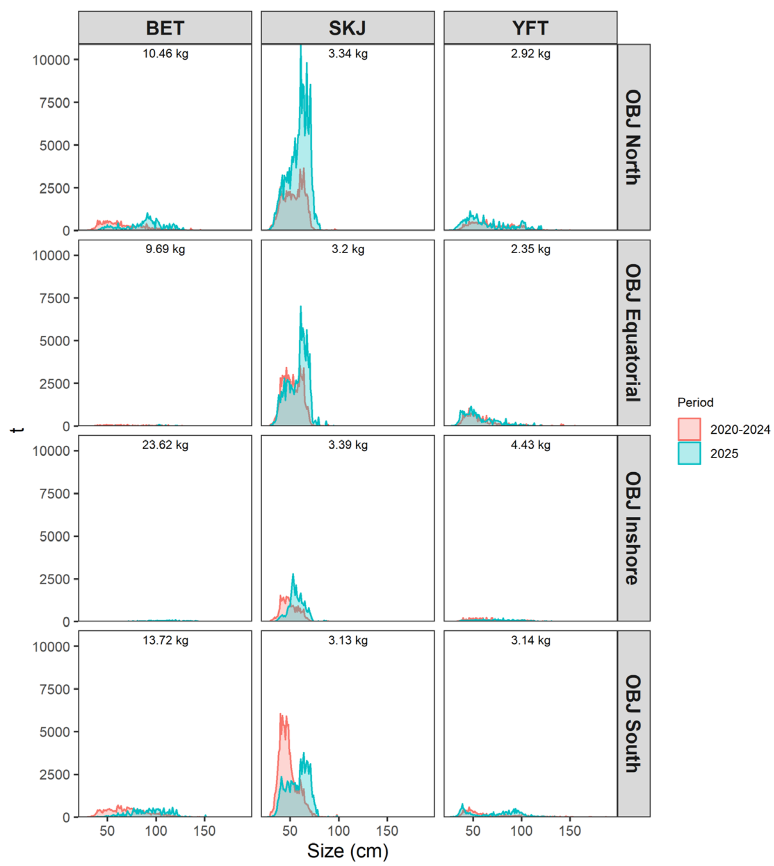

FIGURE 30. Estimated size compositions of bigeye, skipjack and yellowfin caught in the EPO, 2025 and 2020-2024 averages for each purse seine fishery defined by the IATTC staff for analyses of tropical tunas in the EPO (see Figure A-5 of SAC-17-01 for details on the designated areas). The value at the top of each panel is the average weight of the fish in the samples for 2025. Source of data: SAC-17-01.

FIGURA 31. Composiciones por talla estimadas del patudo, barrilete y aleta amarilla capturados en el OPO, 2025 y promedio de 2020-2024, para cada pesquería cerquera definida por el personal de la CIAT para los análisis de los atunes tropicales en el OPO (ver detalles sobre las áreas designadas en Figura A-5 de SAC-17-01). El valor en la parte superior de cada panel es el peso promedio de los peces en las muestras para 2025. Fuente de datos: SAC-17-01.

4. FUTURE PROSPECTS

Although this document presents a holistic assessment for the OBJ fishery in the EPO through a set of ~45 indicators, there is still room for improvement. Some categories — particularly socio-economic, ecosystem-impact, and biology-ecology and behavior indicators — are underrepresented because of the difficulty of systematically obtaining large amounts of reliable data. Future versions of this document will attempt to increase the number of indicators to comply with the joint tuna-RFMO Technical Working Group and the FAD WG recommendations. The staff is currently involved in projects that could produce additional indicators on a yearly basis: the buoy-derived abundance index (no buoy-derived index was prepared for the 2012–2024 period because no benchmark tuna assessments using the buoy index were scheduled) (e.g., FAD-08-02), quantifying the impact of strandings of lost or abandoned FADs in sensitive areas (Project M.5.b) (e.g., FAD-09-INF-A), and analyzing observer data voluntarily collected on Class 1–5 TUNACONS vessels (see DAT-02-01 and DAT-02-02). To that end, in 2026 the IATTC scientific staff prepared document FAD-10-02, which uses trajectory and buoy data to describe the dynamics, lifespan, spatial patterns, and fate of FADs, with the goal of better understanding their impacts once deployed by the fleet — work that could help inform recovery programs and the development of meaningful performance metrics in the near future. This work will also lead to recommendations on how to improve remote buoy deactivation and reactivation reporting.

Building on the FAD WG recommendations, this document also expands the indicator framework with a structured, plain-language guide (Appendix 2) that documents every indicator currently produced — its description, intended use, and the figure or table in which it is presented. This appendix is intended both as a transparent response to the FADWG's recommendation and as a foundation that can be extended in future versions as additional categories (e.g., socio-economic, biology-ecology, behavior) mature and as data quality and coverage improve.

The data collected through various methodologies and used to produce the indicators in this document have proven useful for monitoring the OBJ fishery and its evolution. However, many key aspects remain unknown. For instance, catch-per-set analyses are descriptive only and have not been standardized. The staff has emphasized the need to collect additional data — including historical high-resolution buoy data — to connect databases and advance scientific analysis and management advice. This information became available to the staff in 2022 (see Resolution C-21-04 and C-24-01 for details on raw buoy data reporting). However, improving our understanding of the relationship between fishing strategies and the number of FADs (available at sea or monitored by a given vessel), as well as the production of fishery-independent echo-sounder buoy indices, depends on the availability of long-term data. We hope that initiatives like the one presented in this document will be well received by the scientific community, managers, buoy manufacturers, and stakeholders in general, and will encourage historical data exchange between institutions to improve assessment of fishery impacts and management.

In addition, the staff plans to increase interaction with the fishing community — an invaluable source of first-hand information about the stock, the environment, and the fishery in general. Over the years, skippers' workshops have been conducted with staff participation for various reasons. The staff views these forums as an excellent opportunity to build capacity and to deepen its knowledge of changes in fleet behavior and strategy, the species, and environmental dynamics in a more tangible and immediate way. Since 2020, the workshops have been accompanied by brief anonymous questionnaires on the most urgent matters, along with basic questions about the fishery (e.g., biodegradable FADs, fishing strategy, best handling and release practices). The results of these consultations will be included in future versions of this document but have been made available in, for example, documents FAD-09-02, SAC-17-08 and SAC-16 INF-S.

5. RECOMMENDATIONS

Please refer to the staff recommendations document (SAC-17-11) for recommendations on the FAD fishery, including recommendations for data collection and any other relevant matter.

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Dagorn, L., K. N. Holland, V. Restrepo and G. Moreno (2012). "Is it good or bad to fish with FADs? What are the real impacts of the use of drifting FADs on pelagic marine ecosystems?" Fish and Fisheries: n/a-n/a.

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Suter, J. M. (2010). "An evaluation of the area stratification used for sampling tunas in the eastern Pacific Ocean and implications for estimating total annual catches." La Jolla, CA, Inter-American Tropical Tuna Commision, 114pp. (Special Report, 18).

APPENDIX 1. OBJ bycatch rates, 2020–2025.

Source: from EB-04-01, Tables J-2a; J-4a, J-6a, J-8.

TABLE 9. Purse-seine interactions and mortalities of sea turtles (numbers of individuals) associated with floating objects as reported by onboard observers for size-class 6 vessels with a carrying capacity >363 t (2020–2025). Data for 2024–2025 are considered preliminary. Adapted from EB-04-01, table J-2a.
TABLA 9. Interacciones y mortalidades cerqueras reportadas por observadores a bordo, en número de tortugas, para buques de clase 6 con una capacidad de acarreo >363 t (2020–2025). Los datos de 2024–2025 se consideran preliminares. Adaptada de EB-04-01, tabla J-2a.

	Lepidochelys olivacea, Olive ridley		*Chelonia agassizii, Chelonia mydas, eastern Pacific green*		*Caretta caretta, loggerhead*		*Eretmochelys imbricata, hawksbill*		*Dermochelys coriacea, leatherback*		Unidentified turtles	
Year	Interactions	Mortalities	Interactions	Mortalities	Interactions	Mortalities	Interactions	Mortalities	Interactions	Mortalities	Interactions	Mortalities
2020	91	-	29	-	17	-	5	-	2	-	108	1
2021	191	1	32	-	13	-	4	-	1	-	102	-
2022	133	-	40	-	19	-	10	-	2	-	92	-
2023	65	-	13	-	12	-	2	-	3	-	55	-
2024	154	1	19	-	14	-	5	-	3	-	102	-
2025	112	-	24	-	3	-	3	-	3	-	68	-
Average	124	1	26	-	13	-	5	-	2	-	88	-

TABLE 10. Estimated purse-seine OBJ catches in metric tons (t) of sharks for size-class 6 vessels with a carrying capacity >363 t (2020–2025). Data for 2024–2025 are considered preliminary. “Other sharks” include whale shark (*Rhincodon typus*) and unidentified sharks (Euselachii). Adapted from EB-04-01, table J-4a.

TABLA 10. Capturas OBJ cerqueras estimadas de tiburones, en toneladas (t), para buques de clase 6 con una capacidad de acarreo >363 t (2020–2025). Los datos de 2024–2025 se consideran preliminares. “Otros tiburones” incluyen el tiburón ballena (*Rhincodon typus*) y tiburones (Euselachii) no identificados. Adaptada de EB-04-01, tabla J-4a.

Year	*Carcharhinus falciformis*, silky shark	*Carcharhinus longimanus*, oceanic whitetip	*Prionace glauca*, blue shark	Other Carcharhinidae, requiem sharks
2020	345	4	<1	87
2021	542	12	<1	30
2022	614	12	1	30
2023	473	12	<1	26
2024	625	21	<1	25
2025	687	30	<1	31
Average	548	15	<1	38

Year	*Sphyrna zygaena*, smooth hammerhead	*Sphyrna lewini*, scalloped hammerhead	*Sphyrna mokarran*, great hammerhead	*Sphyrna* spp., hammerheads, nei
2020	7	13	<1	5
2021	13	31	2	7
2022	11	47	<1	9
2023	15	19	<1	8
2024	11	15	3	4
2025	10	27	<1	4
Average	11	25	1	6

Year	*Alopias pelagicus*, pelagic thresher	*Alopias superciliosus*, bigeye thresher	*Alopias vulpinus*, thresher shark	*Alopias* spp., thresher shark, nei
2020	<1	<1	-	<1
2021	<1	<1	<1	<1
2022	<1	<1	<1	<1
2023	<1	<1	-	<1
2024	<1	<1	-	<1
2025	<1	<1	-	<1
Average	<1	<1	<1	<1

Year	*Isurus* spp., mako sharks	Lamnidae spp., mackerel sharks, porbeagles nei	Triakidae spp., houndsharks, nei	Other sharks
2020	2	-	-	3
2021	2	-	-	6
2022	1	-	-	2
2023	1	-	-	1
2024	<1	-	-	2
2025	1	-	-	1
Average	1	-	-	3

TABLE 11. Estimated purse-seine OBJ catches in numbers of individual rays for size-class 6 vessels with a carrying capacity >363 t (2020–2025). Data for 2024–2025 are considered preliminary. Adapted from EB-04-01, table J-6a.

TABLA 11. Capturas OBJ cerqueras estimadas de rayas, en número de individuos, para buques de clase 6 con una capacidad de acarreo >363 t (2020–2025). Los datos de 2024–2025 se consideran preliminares. Adaptada de EB-04-01, tabla J-6a.

Year	*Mobula thurstoni*, smoothtail manta	*Mobula mobular*, spinetail manta	*Mobula munkiana*, munk's devil ray	*Mobula tarapacana*, Chilean devil ray	*Mobula birostris*, giant manta
2020	9	19	1	5	7
2021	8	34	10	11	1
2022	5	43	12	23	3
2023	28	25	5	73	2
2024	12	72	2	39	4
2025	13	62	2	21	7
Average	13	43	5	29	4

Year	Mobulidae spp., mobulid rays, nei	*Pteroplatytrygon violacea*, pelagic stingray	Dasyatidae spp., stingrays, nei	Other rays
2020	62	260	17	-
2021	85	388	46	-
2022	128	422	34	-
2023	112	333	40	1
2024	144	348	42	-
2025	94	369	25	-
Average	104	353	34	-

TABLE 102. Estimated purse-seine OBJ catches in metric tons (t) of large fishes for size-class 6 vessels with a carrying capacity >363 t (2020–2025). Data for 2024–2025 are considered preliminary. "Other large fishes" include unidentified mackerels (Scombridae), and large fishes nei (not elsewhere identified). Adapted from EB-04-01, table J-7a.

TABLA 12. Capturas OBJ cerqueras estimadas de peces grandes, en toneladas (t), para buques de clase 6 con una capacidad de acarreo >363 t (2020–2025). Los datos de 2024–2025 se consideran preliminares. "Otros peces grandes" incluyen caballas (Scombridae) no identificadas, y peces grandes nep (no identificados en otra parte). Adaptada de EB-04-01, tabla J-7a.

Year	Coryphaenidae spp., dorado	*Acanthocybium solandri*, wahoo	*Elagatis bipinnulata,* rainbow runner	*Seriola* spp., amberjacks, nei	*Caranx* spp., jacks, crevalles, nei
2020	783	130	23	9	3
2021	2,183	132	28	81	3
2022	2,325	164	35	25	6
2023	1,457	264	45	9	3
2024	864	232	86	16	7
2025	884	227	118	33	15
Average	1,416	192	56	29	6

Year	*Seriola, Caranx* spp., amberjacks, jacks, crevalles, nei	Molidae spp., molas, nei	*Lobotes surinamensis,* tripletail	*Sphyraenidae* spp., barracudas	*Lampris* spp., opahs
2020	<1	1	2	<1	-
2021	2	<1	1	1	-
2022	4	2	4	<1	-
2023	1	2	2	2	-
2024	9	<1	3	<1	-
2025	3	4	2	<1	-
Average	4	2	2	<1	-

Year	Gempylidae spp., snake mackerels, nei	Bramidae spp., pomfrets, nei	Other large fishes	Unidentified fishes
2020	-	-	<1	<1
2021	-	-	<1	<1
2022	-	<1	<1	<1
2023	-	<1	<1	-
2024	-	-	<1	-<1
2025	-	-	<1	<1
Average	-	<1	<1	<1

TABLE 113. Estimated purse-seine OBJ catches in metric tons (t) of small forage fishes for size-class 6 vessels with a carrying capacity >363 t (2020–2025). Data for 2024–2025 are considered preliminary. “Epipelagic forage fishes” include various mackerels and scad (*Decapterus* spp., *Trachurus* spp., *Selar crumenophthalmus*). “Other small fishes” include various Tetraodontiformes, driftfishes (Nomeidae), Pacific chub mackerel (*Scomber japonicus*), Pacific tripletail (*Lobotes pacificus*), remoras (Echeneidae), longfin batfish (*Platax teira*), and small fishes not elsewhere identified (nei). Adapted from EB-04-01, Table J-8.
TABLA 13. Capturas OBJ cerqueras estimadas de peces forrajeros pequeños, en toneladas (t), para buques de clase 6 con una capacidad de acarreo >363 t (2020–2025). Los datos de 2024–2025 se consideran preliminares. “Peces epipelágicos de forraje” incluyen varias caballas y jureles (*Decapterus* spp., *Trachurus* spp., *Selar crumenophthalmus*). “Otros peces pequeños” incluyen varios Tetraodontiformes, derivantes (Nomeidae), estornino del Pacífico (*Scomber japonicus*), dormilona del Pacífico (*Lobotes pacificus*), remoras (Echeneidae), pez murciélago teira (*Platax teira*), y peces pequeños (nep) no identificados en otra parte. Adaptada de EB-04-01, tabla J-8.

Year	*Auxis* spp., bullet and frigate tunas	Balistidae, Monacanthidae spp., triggerfishes and filefishes	Kyphosidae, sea chubs	Epipelagic forage fishes	Small Carangidae spp., carangids, nei	Other small fishes
2020	435	47	2	4	<1	<1
2021	423	50	6	15	<1	<1
2022	687	543	21	15	<1	1
2023	588	518	12	10	3	1
2024	445	512	7	11	2	<1
2025	531	855	4	15	<1	<1
Average	518	412	9	12	1	1

APPENDIX 2. GUIDE TO INDICATORS INCLUDED IN THIS DOCUMENT.

APÉNDICE 2. GUÍA DE INDICADORES INCLUIDOS EN ESTE DOCUMENTO.

This appendix provides a comprehensive guide to the indicators presented in this document, organized by category, with a brief description of each indicator, its main purpose and what it helps to monitor, and the corresponding figures and tables. It is intended as a quick reference for readers and as a transparent record of how the FAD WG recommendation to develop a holistic indicator framework for the floating-object fishery is being addressed in this document.
Este apéndice presenta una guía completa de los indicadores incluidos en este documento, organizados por categoría, con una breve descripción de cada indicador, su propósito principal y lo que ayuda a monitorear, así como las figuras y tablas correspondientes. Pretende servir como referencia rápida para los lectores y como registro transparente de cómo se está atendiendo la recomendación del Grupo de Trabajo sobre plantados de desarrollar un marco integral de indicadores para la pesquería sobre objetos flotantes.

Category	*Indicator*	*Description*	*Why it matters*	*Figure / Table*
Fleet Behavior				
Fleet behavior	*Cluster analysis of OBJ fleet segments*	*Hierarchical cluster analysis of Class-6 vessels by OBJ-fishing characteristics, yielding three fleet segments (Clusters A - opportunistic, B – fishing mostly on their own OBJ, C – mixed NOA-OBJ fishery).*	*Identifies distinct OBJ-fishing strategies so that other indicators can be reported by cluster, sharpening interpretation of behavior- and effort-driven trends.*	*Figs. 1–2*
Catch and effort				
Catch and effort	*Catch by set type*	*Total purse-seine catch in the EPO partitioned among DEL, NOA, and OBJ set types over time.*	*Establishes the relative contribution of OBJ to overall tuna production and tracks shifts in fishing-mode reliance.*	*Fig. 3*
Catch and effort	*Catch of OBJ-associated species (metric tons)*	*Annual OBJ-fishery catch in tonnes for the principal tuna species (bigeye, skipjack, yellowfin).*	*Tracks species-specific extraction levels under OBJ fishing — a primary input to species availability.*	*Fig. 4*
Catch and effort	*Catch of OBJ-associated*	*Annual OBJ-fishery catch for the principal tuna species*	*Complements tonnage with size-independent catch*	*Fig. 5*

	species (numbers of fish)	*expressed as numbers of individual fish.*	*volume; particularly informative for juvenile-dominated catches typical of OBJ sets.*	
Catch and effort	*Spatial distribution of OBJ catches*	*Mapped OBJ catch per species by 5°-area for the analysis year and historical comparison.*	*Reveals shifting fishing grounds and concentration of OBJ effort and catches, supporting spatial interpretation and discussions.*	*Fig. 6*
Catch and effort	*Sets by set type*	*Annual number of sets, partitioned by DEL, NOA, and OBJ.*	*Quantifies fishing effort by mode and contextualizes OBJ catch volumes against the set count behind them.*	*Fig. 7*
Catch and effort	*OBJ sets by vessel size class*	*OBJ sets disaggregated by vessel size class.*	*Shows the relative contribution to effort by different classes and dominance of Class-6 vessels in the OBJ fishery. Frames the scope of subsequent indicators.*	*Fig. 8*
Catch and effort	*OBJ sets by object origin*	*Proportion of OBJ sets on natural, man-made and unknown floating objects.*	*Distinguishes active FAD strategies from opportunistic encounters — a behavioral signal for FAD management.*	*Fig. 9*
Catch and effort	*Cumulative OBJ sets*	*Within-year cumulative number of OBJ sets across the fleet.*	*Shows the seasonal pace of OBJ activity and supports comparison of effort accumulation across years.*	*Fig. 10*
Catch and effort	*Catch-per-set*	*Average tuna catch per OBJ set (descriptive, non-standardized).*	*Provides a first-order measure of OBJ fishing efficiency; flagged as descriptive only and*	*Fig. 11*

			pending standardization.	
Activity				
Activity	*Activities by trip and vessel (observers, Class 6)*	*OBJ activity counts (sets, deployments, encounters) per trip and per vessel from observer data.*	*Baseline measure of fleet activity and the unit on which most other indicators are constructed.*	*Table 2a*
Activity	*Activities by trip and vessel (FAD form, unobserved vessels)*	*Approximation of activities for vessels without observers, derived from the FAD form.*	*Extends activity coverage to the unobserved fleet component; a first approximation pending data-quality and reporting improvements.*	*Table 2b*
Activity	*Activities by cluster, vessel, and trip for Class 6 (sets, deployments, encounters)*	*Sets, deployments, and encounters cross-tabulated by cluster, vessel, and trip from observer data.*	*Allows cluster-level comparison of intensity across the three activities of special management interest.*	*Table 3*
Activity	*Activities by vessel and trip (FAD form) for Class 1-5 unobserved vessels*	*FAD-form approximation of sets, deployments, and encounters by vessel, and trip.*	*Extends the vessel and trip-level activity view to vessels without observers.*	*Table 3b*
Activity	*Activities by cluster*	*Cluster-level summary of activity counts for the entire Class-6 fleet.*	*Shows how each fleet segment contributes to overall OBJ activity volume.*	*Table 4*
Activity	*Activities of special interest by cluster, vessel, trip*	*Detailed breakdown of sets, deployments, and encounters by cluster, vessel, and trip.*	*Supports vessel and trip-level inference within clusters and identification of activity outliers.*	*Table 5*
Activity	*Evolution of activities by trip and vessel*	*Visual summary of activity distributions and evolution across trips and vessels.*	*Provides a quick visual check on the spread and evolution of activity rates and within-fleet heterogeneity.*	*Fig. 12*

Activity	*Miscellaneous of OBJ sets*	*Boxplots, densities and mapped distribution of OBJ sets by 1°-area and cluster, including kernell densities.*	*Identifies where OBJ sets are concentrated, by fleet segment as well as their densities and differences at segment-level*	*Fig. 13*
Activity	*Miscellaneous of FAD deployments*	*Boxplots, densities and mapped distribution of FAD deployments by 1°-area and cluster, including kernell densities.*	*Identifies where new FADs enter the fishery, by fleet segment — a proxy for future OBJ set effort and fleet distribution.*	*Fig. 14*
Activity	*Miscellaneous of FAD encounters*	*Boxplots, densities and mapped distribution of FAD encounters by 1°-area and cluster, including kernell densities.*	*Highlights areas of FAD presence visited but not necessarily fished — informs fish availability and fleet and FAD movement patterns.*	*Fig. 15*
Activity	*Long-term FAD deployment-and-retrieval indicator*	*Long-term time series of deployments and retrievals at the Class-6 fleet level.*	*Tracks net FAD input to the system over time — repeatedly requested by Members in the FAD-management context.*	*Fig. 16*
Activity	*Encounter spatial indicator (excluding sets/deployments)*	*Spatial encounter indicator with sets and deployments excluded so that pure encounter patterns are visible.*	*Isolates passive FAD-presence signal from active fishing, exposing spatial/temporal patterns of successful/ unsuccessful visits.*	*Fig. 17*
Activity	*Within-trip activity patterns*	*Distribution of sets, deployments, and encounters within trips.*	*Reveals trip-level sequencing and timing of activities — informs how vessels operate during fishing trips.*	*Fig. 18*
Activity	*Encounter–OBJ set spatial differences*	*Spatial indicator of differences between encounters and OBJ sets.*	*Highlights areas where FAD presence was, or was not, followed by fishing — useful*	*Fig. 19*

			for fish availability, FAD-density and effort interpretation.	
Activity	*Floating-object locating methods, by cluster*	*Evolution of methods used to locate floating objects, separated for encounters and sets, by cluster.*	*Characterizes how OBJ-oriented location strategies are changing across fleet segments.*	*Fig. 20*
Buoy-based indices				
Buoy-based indices	*Daily active buoys per vessel*	*Number of active satellite buoys per vessel on a daily basis.*	*Direct measure of per-vessel FAD-monitoring footprint and a key input for individual-vessel FAD limits used in management.*	*Fig. 21*
Buoy-based indices	*Monthly and annual active-buoy statistics*	*Monthly and annual summaries (means, ranges) of active buoys.*	*Tracks fleet and class-level FAD-monitoring effort and supports capacity-based management discussions.*	*Tables 6–7*
Buoy-based indices	*Daily total active buoys in the EPO*	*Total number of active buoys (FADs) across the EPO on a daily basis.*	*Region-wide measure of active buoy (FAD) presence and monitoring levels — a primary indicator of pressure of OBJ on the system.*	*Fig. 22*
Buoy-based indices	*Monthly and annual buoy densities*	*Spatial densities of active buoys, summarized monthly and annually.*	*Identifies hotspots of FAD-monitoring effort, densities and informs spatial-management considerations.*	*Fig. 23-24*
Buoy-based indices	*Remote buoy deactivations and reactivations*	*Counts and patterns of buoys deactivated and reactivated remotely.*	*Indicates how vessels manage their FAD inventories under buoy limits — useful for informing compliance and effort-allocation signal and*	*Table 8*

			discussions.	
Buoy-based indices	*Buoy-derived relative-abundance index*	*Echo-sounder-buoy-based fishery-independent index.*	*Provides a fisheries-independent abundance index complementing CPUE-based indices in stock assessment.*	*Fig. 25*
Capacity				
Capacity	*Carrying capacity of the active fleet*	*Total well-volume capacity of purse-seine vessels actively fishing in the EPO.*	*Tracks the structural fishing pressure capacity of the fleet — helps with context for catch and effort indicators.*	*Fig. 26*
Capacity	*Cumulative carrying capacity at sea*	*Cumulative well-volume capacity of vessels actively at sea over the year, per month.*	*Captures the temporal cumulative profile of effective fishing capacity and pressure, accounting for closure and trip patterns.*	*Fig. 27*
Technology				
Technology	*FAD depth*	*Distribution of submerged FAD-structure depth at deployment, by cluster and area.*	*Tracks design evolution of FADs — deeper structures may target different areas, tuna components and aggregation dynamics.*	*Fig. 28*
Technology	*Net depth*	*Distribution of net depth used in OBJ sets, by cluster and area.*	*Tracks gear evolution — deeper nets may affect catchability and selectivity profiles.*	*Fig. 29*
Technology	*Onboard technologies, by cluster*	*Proportion of trips using specific technologies (aircraft, sonar, rafts, bird radar, divers), by cluster.*	*Documents the technology mix of different clusters, underpinning fishing strategies. Informs the technological evolution of OBJ-*	*Fig. 30*

			oriented practices.	
Ecosystem impacts				
Ecosystem impacts	*Sea-turtle bycatch in OBJ sets*	*Estimated interactions and mortalities of sea turtles in OBJ purse-seine sets, by species.*	*Tracks impacts on sensitive taxa; could support mitigation measure evaluation.*	*Table 9*
Ecosystem impacts	*Shark bycatch in OBJ sets*	*Estimated OBJ-fishery shark catches (silky, oceanic whitetip, hammerheads, threshers, makos, others), in tonnes.*	*Quantifies elasmobranch impacts central to IATTC conservation and management measures.*	*Table 10*
Ecosystem impacts	*Ray bycatch in OBJ sets*	*Estimated OBJ-fishery ray catches (mobulids, pelagic stingrays, others), in numbers of individuals.*	*Tracks bycatch of vulnerable batoid species subject to IATTC Resolutions.*	*Table 11*
Ecosystem impacts	*Large-fish bycatch in OBJ sets*	*Estimated OBJ-fishery catches of large finfish (dorado, wahoo, rainbow runner, jacks, etc.), in tonnes.*	*Documents the broader finfish bycatch component of the OBJ fishery, including species of certain commercial interest.*	*Table 12*
Ecosystem impacts	*Small forage-fish bycatch in OBJ sets*	*Estimated OBJ-fishery catches of small forage fishes (Auxis spp., epipelagics, triggerfishes, others), in tonnes.*	*Captures impacts on forage species relevant to ecosystem-level management of the EPO pelagic community.*	*Table 13*
Biology indicators				
Biology indicators	*Size composition of OBJ tuna catches*	*Estimated size compositions of bigeye, skipjack, and yellowfin in OBJ catches by purse-seine fishery/area, with average weights.*	*Provides the age-/size-structure information, by area, that underpins integrated stock assessments and average-length status indicators.*	*Fig. 31*