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STAFF RECOMMENDATIONS FOR MANAGEMENT AND DATA COLLECTION, 2025

CONTENTS

A. MANAGEMENT

1. TUNAS

1.1. Conservation of tropical tunas: bigeye, skipjack and yellowfin

Summary

Resolution C-24-01 establishes conservation measures for tropical tunas in the eastern Pacific Ocean (EPO) during the biennial period of 2025-2026. Therefore, the adoption of a new resolution is not necessary in 2025 to establish conservation measures for 2026, unless the Commission decides otherwise. However, according to paragraph 14 of the Resolution:

> *If the implementation of this measure has positive effects that demonstrate an improvement of the status of the bigeye tuna stock, the scientific staff shall analyze the conservation measures in force in order to submit to the Commission for consideration new measures that consider, among others, reducing the number of closure days or eliminating the "corralito".*

In 2025, the staff evaluated the status of the stocks using various sources of scientific information. In addition to reviewing recent trends in stock status indicators (SAC-16-02), the 2024 benchmark assessments were used to assess the status of bigeye and skipjack tuna (SAC-15-02, SAC-15-04). Most importantly, the staff successfully overcome the challenges encountered during the 2024 exploratory assessment of yellowfin tuna (SAC-15-03), and a new benchmark assessment and risk analysis is now available (SAC-16-03), one the staff considers reliable for providing management advice for yellowfin tuna in the EPO. Finally, a risk analysis assessing the probability of exceeding reference points was completed for skipjack tuna (SAC-16-04). With this, risk analysis results are now available to support management advice for all tropical tuna species in the EPO.

RISK ANALYSIS TABLE. Stock status of yellowfin, bigeye and skipjack tunas, expressed in terms of the probabilities of exceeding the reference points specified in the current interim HCR.

	Probability (%) of exceeding RP		
Target RP	**Yellowfin**	**Bigeye**	**Skipjack**
$F_{cur}>F_{MSY}$	<7	25	0
$S_{cur}<S_{MSY}$	<3	47	4
Limit RP			
$F_{cur}>F_{LIMIT}$	0	<1	0
$S_{cur}<S_{LIMIT}$	0	<1	<1

All three stocks are assessed to be in healthy condition, with low to moderate (for bigeye only) probabilities (risks) of exceeding the reference points. Bigeye tuna remains the species with the highest risk of exceeding the reference points; however, these risks are below 50% for the target reference points and less than 1% for the limit reference point.

In response to the request made to the staff in paragraph 14 of Resolution C-24-01, and based on an evaluation of the best available science in 2025, the staff concluded that the implementation of Resolutions C-21-04 and, subsequently, C-24-01 has had a positive effect on the status of the bigeye tuna stock. The main reason underlying this improvement was the implementation of the IVT program to promote an incentive for fleets to change their behavior and reduce their catches of juvenile bigeye tuna in floating object sets. Furthermore, all tropical tuna stocks in the EPO are currently in healthy condition. Therefore, a reduction in the current measures is possible under the harvest control rule (HCR) specified in Resolution C-23-06.

Under the current HCR, conservation measures for all tropical tuna stocks are determined by the species requiring the strictest measures among yellowfin, bigeye and skipjack tunas. If the Commission elects to pursue a fishing mortality rate that corresponds with the Maximum Sustainable Yield (MSY), this would correspond with a reduction in the closure of the purse seine fishery from 72 to 8 days[1]. The IATTC staff

[1] Calculation of the new closure ignoring any changes in fishing capacity:

does not recommend this course of action for three reasons: 1) for bigeye, the spawning biomass corresponding with S_{MSY} is relatively low, only slightly above the limit reference point (LRP) of 20% used at WCPFC, and the staff has previously recommended $S_{30\%}$ as an alternative proxy for the interim target reference point, SAC-15-05); 2) if the Commission decides to pursue such significant changes in a conservation and management regime (e.g. large reductions in number of closure days), the staff considers that it would be preferable for such changes to be implemented incrementally to allow for careful evaluation of their effects on the stocks and the ecosystem, and also to help minimize variability in catch and effort; and 3) such adjustments should be made within the framework of an adopted harvest strategy, and the Commission has not yet concluded this work. For these reasons, if the Commission wishes to consider reductions in the measures, the staff recommends that any reduction in the number of closure days be limited to a maximum of 10 days (corresponding to an approximately 15% reduction of the duration of the current closure).

The staff were also requested to provide candidate harvest strategies for managing bigeye tuna (paragraph 43 in Resolution C-24-01). A candidate harvest strategy is presented in SAC-16-06. This candidate harvest strategy could be adopted on an interim basis if a multi-year management cycle is desired.

Accordingly, the staff presents the following two options for consideration should the Commission decide to revise the conservation measures in 2025, and adopt new measures for 2026 and beyond:

- **Option 1:** If the Commission wishes to adopt revised management measures for **2026 only,** a maximum reduction of 10 days in the purse seine fishery closure is recommended (or alternatively a maximum reduction of 7 days if the *corralito* is eliminated).
- **Option 2:** If the Commission wishes to initiate a **new triennial cycle (2026-2028)** with revised management measures, the staff recommends the adoption of the proposed **candidate harvest strategy** (developed in response to paragraph 8 of Resolution C-24-01; see SAC-16-06).

If the Commission decides to pursue significant reductions in management measures, the staff strongly recommends that this should be accompanied by two related decisions. The first is that the Commission maintains the incentive provided by the Individual Vessel Threshold (IVT) program for fisheries to avoid large catches of bigeye, as evidence indicates that this is the primary driver behind the recent improvement in the stock status of bigeye. This would include continuation of the Enhanced Monitoring Program (EMP) or, preferably, adoption of the staff's proposed Integrated Port Sampling Program (IPSP) to merge the EMP with the traditional sampling program (see proposed IPSP in SAC-16-05 developed in response to the Commission's request on paragraph 8 of Resolution C-24-01). Second, the Commission should agree in 2025 to commit the necessary financial and other resources and action to enable the staff to conduct a benchmark assessment for skipjack in 2028-2029, including funding necessary to carry out a tropical tuna tagging program in the EPO during 2026-2027 (see unfunded project in SAC-16 INF-E.b).

1.1.1. Background

This background section reviews important science and management outcomes leading to the current stock status of the tropical tuna stocks in the EPO at the start of 2025.

a) Safeguarding the *status quo* through tropical tuna conservation Resolution C-21-04 (2022-2024)

At its 98th meeting in 2021, the IATTC adopted Resolution C-21-04, which established conservation measures for tropical tunas during the 2022–2024 triennial management cycle in the eastern Pacific Ocean

$$Closure = 365 - (365 - Closure_{old})\left(\frac{F_{MSY}}{F_{cur}}\right) = 365 - (365 - 72)\left(\frac{1}{0.82}\right) = 8$$

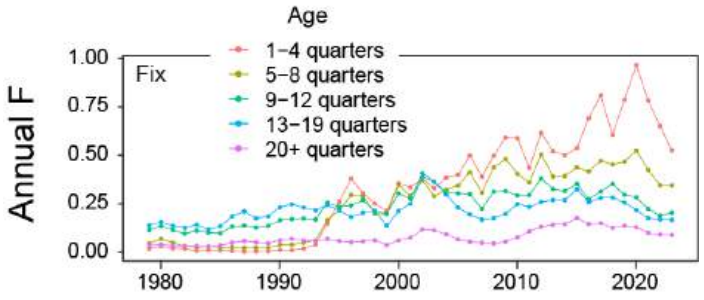
(EPO). This resolution introduced a package of management measures aimed at preventing fishing mortality from exceeding the *status quo*, defined as the average fishing mortality conditions during the 2017–2019 period.

An important piece of scientific work determining the measures adopted in Resolution C-21-04 was the 2020 risk analysis for tropical tuna management in the EPO (SAC-11-08). According to the 2020 risk analysis results, the stocks of yellowfin, bigeye, and skipjack were all assessed to be in a healthy condition at the start of 2020. For bigeye tuna in particular, the species requiring the strictest management, it was estimated that the fishing mortality (F) and spawning stock biomass (S) were fluctuating around the target reference points[2], specifically the fishing mortality and the spawning stock biomass corresponding to the maximum sustainable yield (F_{MSY} and S_{MSY}). However, the number of floating object sets continued to increase, raising concerns that this trend could lead to fishing mortality exceeding F_{MSY}. Resolution C-16-02, defined the harvest control rules for the tropical tunas, implied that new management measures should aim to prevent F from exceeding F_{MSY} for bigeye. Accordingly, to maintain the healthy status of these stocks and avoid breaching the *status quo*, Resolution C-21-04 extended most of the provisions of Resolution C-20-06 through 2022–2024, such as the 72-day closure for the purse-seine fishery and catch limits for the longline fishery, and also introduced a new measure to prevent increases in fishing mortality for bigeye. The new measure consisted of Individual Vessel Thresholds (IVT) on annual bigeye tuna catches by purse-seine vessels, which trigger additional closure days for vessels that exceed the thresholds.

b) Impact of the Individual Vessel Threshold (IVT) program on reducing bigeye catches in 2022-2024

In 2024, significant improvements were made to the stock assessment for bigeye tuna in the EPO, as reflected in a new benchmark assessment (SAC-15-02). Two major advancements were achieved: first, resolving the prominent regime shift in recruitment associated with the expansion of the floating-object fishery in the mid-1990s; and second, the elimination of the bimodal pattern in management quantities observed in the 2020 benchmark and risk analysis (SAC-11-08), which had resulted from two distinct sets of models, optimistic and pessimistic. Using the 2020 methodological framework, the 2024 assessment included a new risk analysis for bigeye, based on the probability of exceeding reference points defined under the harvest control rule (HCR) in Resolution C-23-06 (amending C-16-02). The results indicate an improved stock status, largely attributed to the implementation of the IVT program during the 2022–2024 management cycle. This improvement is primarily reflected in two key findings:

1 – A significant decrease in fishing mortality (F) for young bigeye (1-8 quarters of age) over recent years coinciding with the implementation of the IVT in 2022 (**Figure 1**);
2- A decrease in the probability of exceeding F_{MSY} from 58.5% in 2017-2019 (the *status quo* period) to 24.7% in 2021-2023 (**Figure 2**).



[2] The 2020 risk analysis estimated a 50% probability of fishing mortality (F) exceeding F_{MSY} and a 53% probability that spawning biomass (S) was below S_{MSY} for bigeye.

FIGURE 1. Comparison of average annual fishing mortality (F), by age groups, of bigeye tuna between 1979 and 2023 from the base reference model. The values for each age group are weighted across the second- and third-level hypotheses (see SAC-15-02).
FIGURA 1. Comparación de la mortalidad por pesca (F) anual promedio, por grupos de edad, del atún patudo entre 1979 y 2023. Los valores para grupo de edad se ponderan en las hipótesis de segundo y tercer nivel (ver SAC-15-02).

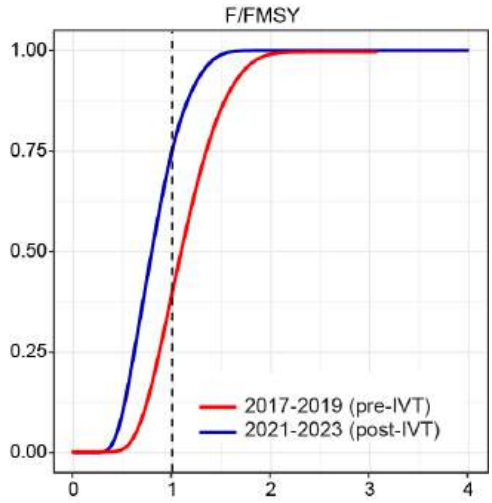


FIGURE 2. The joint cumulative probability distribution for fishing mortality (F) in 2017-2019 and 2021-2023 relative to their MSY reference points (F_{MSY}).
FIGURA 2. Funciones de distribución de probabilidad acumulada para la mortalidad por pesca (F) en 2017-2019 y 2021-2023 en relación con sus puntos de referencia de RMS (F_{RMS}).

The staff also conducted a comprehensive evaluation of the impacts of the IVT scheme on tropical tuna catches and fleet behavior in the EPO (SAC-15 INF-K, SAC-16 INF-S). In summary, the staff estimated that the IVT caused meaningful decreases in catches of bigeye in floating-object sets by class 6 purse seine vessels in 2022, 2023 and 2024. This change appears to have been driven largely by a decrease in catch-per-unit-effort of floating-object sets, as opposed to a decrease in the number of total sets or a shift from floating-object to unassociated sets. The estimated reduction in bigeye catches caused by the IVT takes into account the effects of underlying bigeye abundance. These results are further supported by results showing that highliner vessels[3] appeared to have decreased their probability of catching ≥ 10 t of bigeye in a floating-object set relative to other background trends in this rate. In a recent anonymous skipper survey conducted in 2024–2025, the responses provided some support for the mechanisms behind the estimated reduction in bigeye catches. A majority of respondents (60%) reported having taken steps to reduce bigeye captures since 2022. The most commonly cited measures included changes in fishing locations (~23%), modifications to FAD design (10%), and avoidance of FADs associated with bigeye presence (7%) (SAC-16 INF-S).

c) Tropical tuna conservation Resolution C-24-01 (2025-2026)

Since Resolution C-21-04 applied to the 2022–2024 triennial period, a new resolution needed to be adopted in 2024 to establish management measures for tropical tunas in the EPO for 2025 and beyond. Although new benchmark assessments were available for bigeye and skipjack, both indicating healthy stock status, a benchmark assessment for yellowfin was not available in 2024. Consequently, the Commission chose not to modify the primary management measures previously established under Resolution C-21-04 and extended them into a new biennial management cycle for 2025–2026 through the adoption of Resolution C-24-01. However, the Commission did request the staff to provide advice on updating the conservation

[3] Vessels that historically caught levels of bigeye that could put them at risk of exceeding the IVT (see SAC-15 INF-K for details).

measure (Paragraphs 13 and 14) and on a candidate harvest strategy (Paragraph 43).

1.1.2. Rationale for staff recommendations

The technical rationale underlying the staff's recommendations for the conservation of tropical tunas in 2025 is summarized below.

1.1.2.a Stock status

In 2025, the staff evaluated the status of the stocks using various sources of scientific information. In addition to reviewing recent trends in stock status indicators (SAC-16-02), the 2024 benchmark assessments were used to assess the status of bigeye and skipjack tuna (SAC-15-02, SAC-15-04). Most importantly, the staff successfully overcome the challenges encountered during the 2024 exploratory assessment of yellowfin tuna (SAC-15-03), and a new benchmark assessment and risk analysis is now available (SAC-16-03), one the staff considers reliable for providing management advice for yellowfin tuna in the EPO. Finally, a risk analysis assessing the probability of exceeding reference points was completed for skipjack tuna (SAC-16-04). With this, risk analysis results are now available to support management advice for all tropical tuna species in the EPO.

The results below summarize the stock status[4] for each of the tropical tunas (bigeye, skipjack and yellowfin) at the start of 2024. The reported status of the stocks is associated with the average fishing mortality (F) conditions estimated in the latest benchmark assessments for the tropical tuna in the EPO during 2021-2023. The results of the risk analysis, expressed in terms of the probabilities of exceeding the reference points specified in the current HCR, are presented in **Table 1**. All three stocks are assessed to be in healthy condition, with low to moderate (for bigeye only) probabilities (risks) of exceeding the reference points. Bigeye tuna remains the species with the highest risk of exceeding the reference points; however, these risks are below 50% for the target reference points and less than 1% for the limit reference point (**Table 1, Figure 3**).

TABLE 1. Stock status[5] of yellowfin, bigeye and skipjack tunas, expressed in terms of the probabilities of exceeding the reference points specified in the HCR.

	Probability (%) of exceeding RP		
Target RP	**Yellowfin**	**Bigeye**	**Skipjack**
$F_{cur}>F_{MSY}$	<7	25	0
$S_{cur}<S_{MSY}$	<3	47	4
Limit RP			
$F_{cur}>F_{LIMIT}$	0	<1	0
$S_{cur}<S_{LIMIT}$	0	<1	<1

[4] In this report, the terms "overfished" and "overfishing" are not used, because the Commission has not defined the threshold probabilities associated with those terms.

[5] Defined as the spawning biomass (S) at the start of 2024 or the average fishing mortality (F) during the most recent three years in the benchmark assessment (2021-2023).

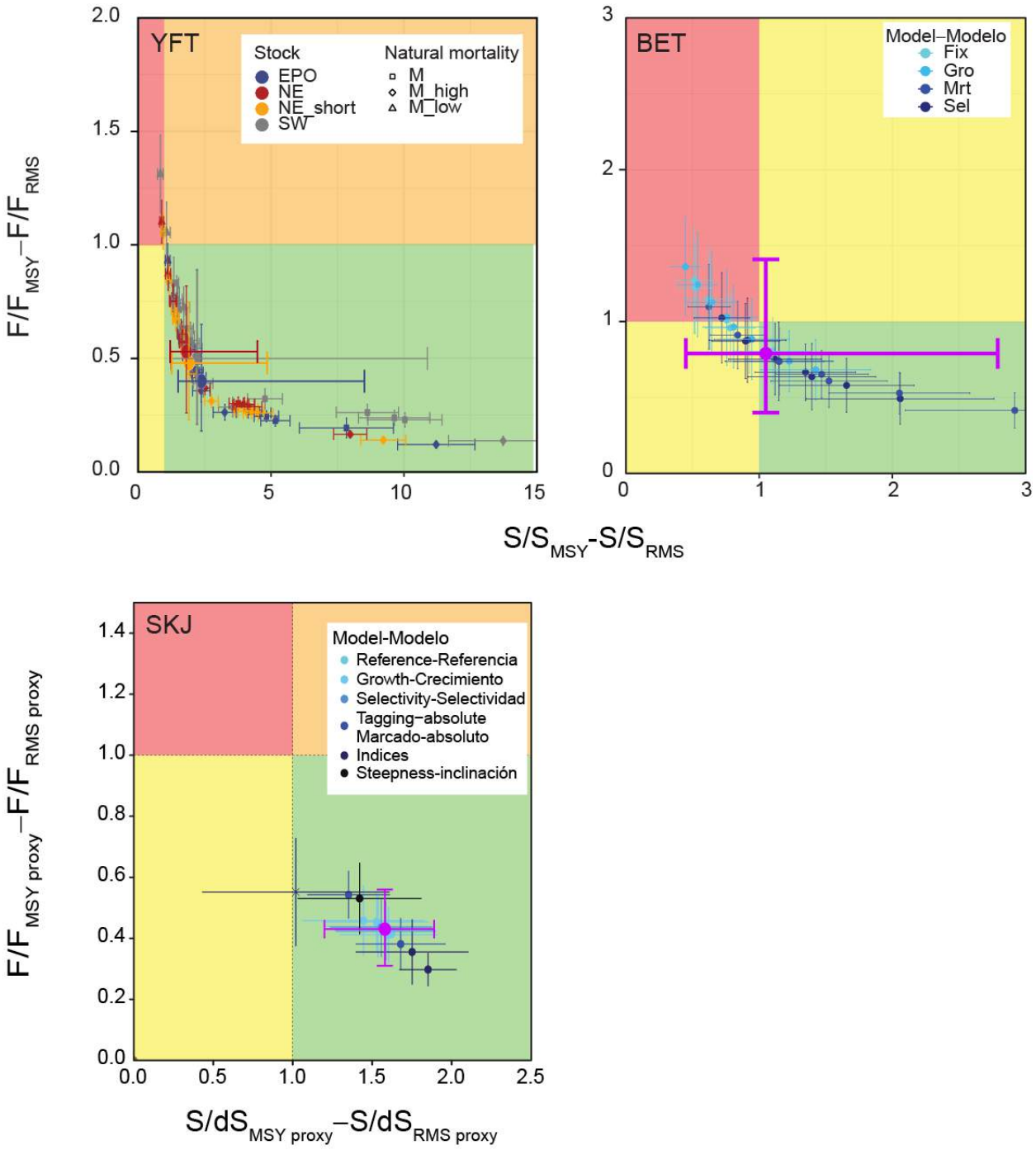


FIGURE 3. Kobe plots of the most recent estimates of spawning biomass (S) and fishing mortality (F) relative to their target reference points (S_{MSY_d} and F_{MSY} for yellowfin and bigeye, $S_{MSY\text{-}proxy}$ and $F_{MSY\text{-}proxy}$ for skipjack) from the reference models used in the benchmark assessments and risk analysis for a) yellowfin, b) bigeye, and c) skipjack tuna. Each dot is based on the average F over the most recent three years, 2021-2023, and the error bars represent the 80% confidence interval of that model's estimates. The large dot and error bars represent the medium and 80% confidence interval of values combined acrtoss models.

Yellowfin

The previous benchmark assessment for yellowfin in the EPO was carried out in 2020 (SAC-11-07), and the results were included in a risk analysis for management[6] (SAC-11-08). An attempt to conduct a new benchmark assessment for yellowfin tuna in 2024, as initially planned, was unsuccessful due to by major uncertainties in the stock assessment (SAC-15-03).

Since the 15th Meeting of the Scientific Advisory Committee (SAC) in May 2024, substantial research has been conducted to improve the yellowfin assessment. In 2025, a benchmark sock assessment and risk analysis were conducted for yellowfin tuna in the EPO which the staff considers reliable for management advice (SAC-16-03). The main uncertainty addressed in this benchmark assessment was spatial structure with advances made in determining the areas and spatial definitions of fisheries. A total of 72 models based on three levels of hypotheses were used in the risk analysis. The hypotheses addressed (1) the spatial structure; (2) effort creep, uncertainty in growth and natural mortality; and (3) the steepness of the stock-recruitment relationship. A model starting in 2006 was also conducted to account for the possibility of change in population or fishery dynamics before and after this period to explain differences in information content between the index of relative abundance and length composition data.

The overall results, expressed in terms of the probabilities of exceeding the reference points specified in the harvest control rule (HCR) under Resolution C-23-06, indicate the following (**Table 1, Figure 1**):

- With respect to the target reference points, less than 7% probability that F_{MSY} has been exceeded ($P(F_{cur}>F_{MSY}) < 7\%$) and less than a 3% probability that S_{cur} is below S_{MSY} ($P(S_{cur}<S_{MSY}) < 3\%$).
- Regarding the limit reference points, the risk analysis estimates that there is no probability that the F and S limit reference points have been exceeded ($P(F_{cur}>F_{LIMIT}) = 0\%$; $P(S_{cur}<S_{LIMIT}) = 0\%$), both below the 10% threshold for triggering an action specified in Resolution C-23-06.

Bigeye

Two great improvements were achieved in the 2024 benchmark assessment for bigeye (SAC-15-02). The first one is resolving the prominent regime shift in recruitment coinciding with the expansion of the floating-object fishery in the mid-1990s. The second one is resolving the bimodal pattern in estimated management quantities which resulted from two distinct groups of models, optimistic and pessimistic, in the previous 2020 benchmark and risk analysis (SAC-11-06, SAC-11-08). For bigeye, the risk analysis includes 33 reference models. The hypotheses addressed (1) misfit to the composition data for the longline fishery that is assumed to have asymptotic selectivity; (2) effort creep in the longline fishery; and, (3) the steepness of the stock-recruitment relationship.

The overall results, expressed in terms of the probabilities of exceeding the reference points specified in the harvest control rule (HCR) under Resolution C-23-06, indicate the following (**Table 1, Figure 2a**):

- With respect to the target reference points, a 25% probability that F_{MSY} has been exceeded ($P(F_{cur}>F_{MSY}) = 25\%$) and a 47% probability that S_{cur} is below S_{MSY} ($P(S_{cur}<S_{MSY}) = 47\%$).
- Regarding the limit reference points, the risk analysis estimates that there is very low probability that the F and S limit reference points have been exceeded ($P(F_{cur}>F_{LIMIT}) = 0.1\%$; $P(S_{cur}<S_{LIMIT}) = 0.2\%$), both below the 10% threshold for triggering an action specified in Resolution C-23-06.

[6] The overall results of the 2020 risk analysis, which included 48 reference models, indicated only a 9% probability that the fishing mortality corresponding to the maximum sustainable yield (F_{MSY}) had been exceeded, and there was a 12% probability that the spawning stock biomass corresponding to the maximum sustainable yield (S_{MSY}) had been breached. The probability that the F and S limit reference points had been exceeded was zero.

Skipjack

In 2024 the staff completed the first benchmark assessment for skipjack tuna in the EPO. This assessment represents a significant improvement from the *interim* assessment conducted in 2022. It reflects major advancements in the assessment methodologies and incorporates new data sets, including an updated index of relative abundance based on recently developed echosounder buoy data (FAD-08-02), and an absolute biomass estimate derived from the tagging data collected under the Regional Tuna Tagging Program in the EPO (SAC-15 INF-G). There is substantial uncertainty about several model assumptions and sensitivity analyses were conducted and determined that the management advice is robust to the uncertainty.

MSY-based quantities cannot be estimated for skipjack. The tradeoff between growth and natural mortality, in combination with the assumption that recruitment is independent of stock size, implies that fish should be caught at the youngest ages to maximize yield. Therefore, the optimal fishing mortality is infinite. Under these circumstances Resolution C-23-06 allows for the consideration of MSY *proxies* as interim target reference points. Therefore a conservative *proxy* for the target biomass of SBR[7] = 0.3 and the fishing mortality corresponding to that biomass are used as the interim target reference points (SAC-14-09).

In 2025, the results of the 2024 skipjack assessment were incorportated into a risk analysis to evaluate the probabilities of exceeding the interim *proxy* reference points (SAC-16-04). For skipjack, the risk analysis includes 18 reference models. The hypotheses addressed (1) misfit to the composition data for the longline fishery that is assumed to have asymptotic selectivity; (2) effort creep in the longline fishery; and (3) the steepness of the stock-recruitment relationship.

The risk analysis reveals unimodal probability distributions for key management metrics, indicating the following (**Table 1, Figure 2a**):

- With respect to the MSY-proxy target reference points, zero probability that $F_{\text{MSY-proxy}}$ has been exceeded ($P(F_{\text{cur}}>F_{\text{MSY-proxy}}) = 0\%$) and a 4% probability that S_{cur} is below $S_{\text{MSY-proxy}}$ ($P(S_{\text{cur}}< S_{\text{MSY-proxy}}) = 4\%$).
- Regarding the limit reference points, the risk analysis estimates that there is very low probability that the F and S limit reference points have been exceeded ($P(F_{\text{cur}}>F_{\text{LIMIT}}) = 0\%$; $P(S_{\text{cur}}<S_{\text{LIMIT}}) < 1\%$), both below the 10% threshold for triggering action specified in Resolution C-23-06.

1.1.3. Management advice

a. Staff response to paragraph 14 of Resolution C-24-01

Resolution C-24-01 establishes conservation measures for tropical tunas in the EPO for the 2025–2026 biennial period. Therefore, the adoption of a new resolution is not necessary in 2025 to establish conservation measures for 2026, unless the Commission decides otherwise. However, according to paragraph 14 of the resolution:

> *If the implementation of this measure has positive effects that demonstrate an improvement of the status of the bigeye tuna stock, the scientific staff shall analyze the conservation measures in force in order to submit to the Commission for consideration new measures that consider, among others, reducing the number of closure days or eliminating the "corralito".*

In response to paragraph 14, and based on an evaluation of the best available science in 2025 (Section 1.1.2), the staff concluded that the implementation of Resolutions C-21-04 and, subsequently, C-24-01 has had a positive effect on the status of the bigeye tuna stock. Furthermore, all tropical tuna stocks in the EPO are currently in healthy condition, specifically yellowfin, bigeye and skipjack. Therefore, a reduction in the current measures is possible under the harvest control rule (HCR) specified in Resolution C-23-06.

b. Reduction in the closure of the purse-seine fishery

[7] Spawning biomass ratio: SBR; spawning biomass divided by the spawning biomass in the unfished state.

Under the current HCR, conservations measures for all tropical tuna stocks are determined by the species requiring the strictest measures among yellowfin, bigeye and skipjack tunas. In 2025, this species is bigeye although the risk of exceeding the MSY-based reference points remains below 50% (**Table 1**). To achieve the fishing mortality corresponding to the MSY for bigeye, a reduction in the seasonal closure of the purse seine fishery from 72 to 8 days would be necessary[2]. Such a large reduction is not recommended for various reasons. First, for bigeye, the spawning biomass at S_{MSY}, based on current age-specific fishing mortality and stock assessment model assumptions, is relatively low (with a median estimate of 22.2%, SAC-15-02), only slightly above the limit reference point (LRP) of 20% used at WCPFC. Therefore, targeting this level would not align with the IATTC's intention to move toward compatibility with the measures adopted by WCPFC, as reflected in spirit of paragraph 40 in Resolution C-24-01. A biomass target above this level might be more appropriate and also aligned with target biomass levels adopted by other tuna RFMOs (MSE-04-01). The IATTC staff has previously recommended $S_{30\%}$ as an alternative proxy for the interim target reference point (SAC-15-05). Second, if desired, large reductions in management measures should be implemented incrementally to allow for careful evaluation of their effects on the stocks and the ecosystem, as well as to minimize variability in catch and effort. Such adjustments should be made within the framework of an adopted harvest strategy (see Section 1.1.4.a below). For these reasons, if the Commission wishes to consider reductions in the measures, the staff recommends that any reduction in the number of closure days be limited to a maximum of 10 days per year (corresponding to an approximately 15% reduction of the duration of the current closure).

c. The *corralito*

Paragraph 14 of Resolution C-24-01 specifically mentions reducing the number of closure days or eliminating the *corralito* as possible reductions of the conservation measures. The IATTC has utilized the spatiotemporal closure known as "the *corralito*" as part of its conservation and management measures package for many years. The *corralito* has been in the same location since 2009, but the exact dates of the closure have varied slightly (most recently from Oct 9 to Nov 8 within 2017 through 2024). In response to a request in Resolution C-21-04, the IATTC staff assessed evidence for the effects of the *corralito* on a range of outcomes of the purse-seine fishery in the EPO (SAC-15 INF-M). The new analysis did not find clear empirical effects of the *corralito* on the evaluated metrics (catch, effort, catch-per-unit effort, mean length of tropical tunas, and catches of sharks and other vulnerable non-target taxa). This is not surprising, given the limited expected effect sizes of the *corralito* previously predicted by the staff (IATTC-77-04 REV, Section 3.1). As such, while the staff cannot point to clear empirical evidence confirming the predicted impacts of the *corralito*, the estimates were consistent with the previous predicted levels of impact, on average 3 days of closure for bigeye but with substantial year-to-year variation, on which the original decision to implement the corralito was based. Therefore, this new study should not be considered to substantially change the staff's previous evaluation of the potential benefit of the *corralito* as a tropical tuna management measure (i.e. equivalent to, on average, to 3 days of EPO purse-seine closure for bigeye). Accordingly, if the Commission wishes to consider the elimination of the *corralito* as part of a reduction in management measures, its estimated average effect, equivalent of 3 days of closure for bigeye, should be deducted from the maximum allowable 10-day reduction in the closure (e.g. a reduction up to 7 days and the elimination of the *corralito*).

d. Request for a candidate harvest strategy for bigeye tuna

Paragraph 43 of Resolution C-24-01 tasks the staff, in consultation with the SAC, with presenting a candidate harvest strategy for bigeye tuna to the Commission in 2025. Although the Management Strategy Evaluation (MSE) for bigeye is still ongoing and expected to be completed in 2026, the staff is proposing a candidate harvest strategy for consideration by the SAC, the Commission, and the Ad Hoc Working Group on MSE (SAC-16-06). The proposed strategy is based on the best available scientific information, taking into account management objectives, stock and fishery dynamics, the performance of the stock assessment model, insights from IATTC MSE workshops, and lessons learned from MSEs conducted on other stocks, particularly Pacific bluefin tuna (SAC-16 INF-Q). The candidate harvest strategy could be considered in

the case that the Commission wishes to adopt measures for a new triennial management cycle (2026-2028) rather than only for 2026. See Section 1.1.4.a for additional information and recommendations on Development of Harvest Strategies for the Tropical Tunas in the EPO.

e. Additional actions that staff believes should accompany any significant reductions in management measures

The IVT and EMP programs are maintained: The main assumption underlying any reductions in the management measures is that the measure that greatly contributed to the recent reduction in the fishing mortality (*F*) of bigeye remains in place. Specifically, that the IVT program to reduce bigeye catches will continue to work effectively as in recent years (SAC-15 INF-K, SAC-16 INF-S, see section 1.1.1.b) maintaining the lower levels of fishing mortality. In addition, a continuing reduction in *F* on bigeye by the floating-object fishery due to improved effectiveness of the IVT could potentially allow for continuing reductions in the closure increasing fishing opportunities for skipjack and yellowfin. Eliminating the IVT and consequently the motivation for purse-seiners to avoid large catches of bigeye tuna could result in increased bigeye catches on floating-object sets similar those observed before the implementation of this measure (average of 68,000 during 2019-2021 versus 41,000 t during 2022-2024, a 40% decrease). As a result, this would require returning to the management regime associated with the *status quo* period (2019-2021) with a duration of the closure set back to at least 72-days.

An important data collection tool associated with the IVT that also needs to be maintained if any reductions in the measures are planned is the Enhanced Monitoring Program (EMP). The EMP is a provisional sampling program established in 2023 under Resolution C-21-04 in order to fulfill the Commission's request to the IATTC scientific staff for the Best Scientific Estimate (BSE) of bigeye catch per trip and per vessel, in support of the IVT management measure (SAC-14-10, SAC-14 INF-I). Paragraph 8 of Resolution C-24-01 tasks the staff to present to the SAC a proposal to maintain and merge the existing EMP with the Commission's traditional port sampling program. To this end, the staff is proposing the establishment of the IATTC Integrated Port Sampling Program (IPSP, SAC-16-05). The staff supports the merging of the EMP with the traditional port sampling program through the IPSP. In relation to the IVT, the IPSP would provide coverage of prioritized vessel trips similar to or greater than that expected by the EMP in 2025, and would generate data that can be used to estimate bigeye catch per trip from a model of the well-level relationship between port-sampling and observer data (SAC-16 INF-I). In addition, the data collected by the IPSP will be used to estimate fleet-level catch by species, and the variance on those estimates, and update the morphometric relationships necessary for stock assessment modelling. See Section 1.1.4.b. ahead for additional information about the EMP.

Securing a benchmark assessment for skipjack in 2028-2029: Finally, if reductions in management measures are being considered, the staff must be able to evaluate the impact of increased fishing mortality on all three tropical tuna stocks in order to provide sound management advice to the Commission. Although there are challenges associated with the stock assessments for all three species, the assessments for bigeye and yellowfin appear to be secured for at least the next management cycle. This is not the case for skipjack, which is short lived, highly variable, and whose stock assessment depends on the availability of estimates of absolute abundance derived from tagging data. Fortunately, in collaboration with external scientists at Technical University of Denmark (DTU), the staff has developed a spatiotemporal approach to derive estimates of absolute abundance from tagging data (SAC-13-08, SAC-14 INF-E, SAC-16 INF-D). The potential of this approach and its benefits for stock assessment are shown for the first time in the 2024 benchmark assessment for skipjack (SAC-15-04).

The staff's ability to conduct a benchmark assessment for skipjack in 2028–2029 will depend upon the successful implementation of a tropical tuna tagging cruise in late 2026 to early 2027. For skipjack, at least one year of time at liberty is required after tagging and release where fish are recaptured and reported during 2027 and 2028 to provide adequate information for estimating absolute abundance. Consequently, a stock assessment for skipjack could only be conducted in late 2028 or early 2029, after the tags are recovered,

reported, and the data are analyzed. To initiate a tagging cruise in 2026, funding must be secured in 2025 (see unfunded project in SAC-16 INF-E.b).

RECOMMENDATIONS:

Resolution C-24-01 establishes conservation measures for tropical tunas in the EPO for the 2025–2026 biennial period. Therefore, the adoption of a new resolution is not necessary in 2025 to establish conservation measures for 2026, unless the Commission decides otherwise.

If the Commission chooses to update the conservation measures in 2025, substantial reductions are possible under the harvest control rule specified in Resolution C-23-06. However, the staff recommends that any reductions in management measures be planned incrementally to allow for a careful evaluation of their effects on the stocks and the ecosystem, and also to help minimize variability in catch and effort.

Accordingly, the staff presents the following two options for consideration should the Commission decide to revise the conservation measures in 2025, and adopt new measures for 2026 and beyond:

- **Option 1:** If the Commission wishes to adopt revised management measures for **2026 only,** a maximum reduction of 10 days in the purse seine fishery closure is recommended (or alternatively a maximum reduction of 7 days if the *corralito* is eliminated).
- **Option 2:** If the Commission wishes to initiate a **new triennial cycle (2026-2028)** with revised management measures, the staff recommends the adoption of the proposed **candidate harvest strategy** (developed in response to paragraph 43 of Resolution C-24-01; see SAC-16-06).

Additional actions that the staff believes should accompany any significant reductions in management measures:

- **Maintain the incentive provided by the Individual Vessel Threshold (IVT) program for fisheries to continue reducing fishing mortality for bigeye** (see Section 1.1.1.b). This includes the continuation of the EMP program or, preferably, the staff's proposed Integrated Port Sampling Program (IPSP) to merge the EMP with the traditional sampling program (see proposed IPSP in SAC-16-05 developed in response to Commission request on paragraph 8 of Resolution C-24-01).
- **Secure the staff's ability to conduct a benchmark assessment for skipjack in 2028-2029**. This requires securing funding in 2025 to carry out a tropical tuna tagging program in the EPO during 2026-2027 (see unfunded project in SAC-16 INF-E.b).

1.1.4. Opportunities and challenges related to management advice

a. Opportunity: Development of harvest strategies for the tropical tunas in the EPO

The staff acknowledges that there may always be unresolved issues in knowledge, and inherent limits of modelling complex and changing natural systems and their fisheries, which may impact the scientific advice for taking appropriate management actions. These uncertainties need to be taken into consideration when providing management advice. The "gold standard" in dealing with uncertainty to manage fish stocks is through the development and testing of harvest strategies within a MSE framework. The IATTC is in the process of conducting MSE for tropical tunas with the goal of evaluating the robustness of the management advice and the likelihood of alternative strategies achieving desired management objectives. However, some, if not all, of the harvest strategy elements still need specification or refinement as well as full specification of alternative harvest control rules.

The evaluation of harvest strategies can be conducted using Management Strategy Evaluation (MSE), a process that uses computer simulations to test the robustness of alternative management strategies (designed using stakeholder's input) to different sources of uncertainty. An MSE process for tropical tunas (SAC 15-07, Report of 4th Workshop on MSE, WSMSE-05-01) is ongoing at IATTC, with an initial focus on bigeye

given that it has been historically the tropical tuna driving management measures.

Implementing reliable stock assessments to act as operating models is an essential part of the MSE process. The bigeye assessment has been evolving over time with several substantial improvements being made recently. The 2020 bigeye assessment still had substantial uncertainties, including a bimodal pattern in management quantities (one group of models with estimates of biomass above the level corresponding to maximum sustainable yield (B_{MSY}), another group below B_{MSY} with little probability in between) along with an apparent regime shift in recruitment coincidental with the increase of floating object purse seine catches in the 1990s that was suspected to be a modelling artifact. Although the 2020 assessment models covered the range of uncertainties, this led to operating models that may not result in the best strategy being selected had a better set of operating models been available. Recently, substantial changes in modeling of bigeye tuna (SAC-15-02) related to data, biology, and model specifications, with input from panel recommendations of the two recent stock assessments external reviews (RVDTT-01-RPT and RVMTT-01-RPT), removed the apparent regime shift in recruitment estimates and the bimodal pattern in management quantities. Since the 2024 assessment has resolved many of the structural issues of previous bigeye assessments, using that assessment for the operating models in the update of the MSE should result in a better strategy being selected.

Staff revisited target reference points for tropical tunas in 2024 (SAC-15-05) following concerns about the definition of the target reference point and estimated highly depleted stock levels at MSY ($S_{MSY}/S_0 = 0.17$) for some scenarios of the 2024 bigeye tuna assessment given recent changes in the assumptions about age-specific natural mortality. A more global approach to defining MSY, which is designed to support a range of proportioning of catch among the fleets, occurs at a less depleted biomass ($S_{MSY}/S_0 = 0.3$). The staff has proposed to consider $S_{MSY}/S_0 = 0.3$ as interim target reference point until discussions under a comprehensive Management Strategy Evaluation framework process determine target reference points based on a variety of objectives.

These changes prompted the staff to revise the workplan for the bigeye tuna MSE work by replacing the original set of operating models with a new set of operating models derived from the 2024 bigeye tuna benchmark assessment, as well as incorporating proposed alternative HCRs and reference points. The staff's organized MSE dialogue component has included a series of educational and stakeholder input workshops (see recent Workshops).

The revised timeline includes bigeye MSE work during 2025 and 2026, with plans to expand the MSE work to the other tropical tunas (likely skipjack next and then yellowfin).

Resolution C-24-08 created the Ad Hoc Working Group to Strengthen the Dialogue among Scientists, Managers and other Stakeholders on Management Strategy Evaluation (Working Group on MSE), expected to convene its first meeting on May 31, 2025. It is expected that this WG will enhance or replace the staff organized workshops in the near future, and help expedite the development and testing of harvest strategies at IATTC.

Request to provide a candidate harvest strategy

Paragraph 43 of Resolution C-24-01 tasks the staff, in consultation with the SAC, with presenting a candidate harvest strategy for bigeye tuna to the Commission in 2025:

> *The IATTC shall continue efforts to develop harvest strategies for tropical tunas. The IATTC scientific staff shall continue to establish the scientific basis, through Management Strategy Evaluation testing, to advise the Commission on initial candidate harvest strategies, starting with bigeye tuna. The staff, consulting with the SAC, shall then present for the Commission's consideration in 2025 a candidate harvest strategy for bigeye tuna, including candidate management actions to be taken under various stock conditions.*

A set of candidate harvest strategies tested through Management Strategy Evaluation (MSE) is not yet available due to the ongoing nature of the IATTC's MSE process. Therefore, the staff has proposed a candidate harvest strategy, based on best available science, for consideration by the SAC, the Commission, and

the Ad Hoc Working Group on MSE (SAC-16-06). This proposed strategy synthesizes management objectives, stock and fishery dynamics, the performance of the stock assessment model, insights from IATTC MSE workshops, and lessons learned from MSEs conducted on other stocks, particularly Pacific bluefin tuna (SAC-16 INF-Q). The candidate harvest strategy could be considered if the Commission wishes to adopt measures for a new triennial management cycle (2026-2028), rather than for 2026 alone (see Option 2 in recommendations under Section 1.1.3).

The staff's candidate harvest strategy could also facilitate the development of alternative candidate harvest strategies within the MSE process. It is fully specified and includes all the necessary components, making a suitable a starting point, while taking into consideration previous discussion during the IATTC staff's workshops, for the specification and discussion of alternative strategies. The staff's candidate harvest strategy will be presented at the 5th IATTC MSE workshop (May 30, 2025), allowing for discussion during the 1st meeting of the IATTC Ad Hoc WG on MSE (May 31, 2025) prior to SAC-16.

RECOMMENDATIONS:

1. The Commission adopt management objectives (WSMSE-05-01 , SAC-16-06) and revised reference points for tropical tunas (SAC-15-05).
2. If the Commission wishes to initiate a new triennial cycle (2026-2028) with revised management measures, the staff recommends the adoption of the proposed candidate harvest strategy (developed in response to paragraph 8 of Resolution C-24-01, SAC-16-06)
3. Continue development and testing of harvest strategies for tropical tuna in the EPO with support from the IATTC WG on MSE.

b. Opportunity: Integrated Port-Sampling Program for data collection for scientific research in support of fisheries management

The management measure for bigeye tuna catch thresholds per vessel (IVT) for the EPO Class 4 – 6 purse-seine vessels, established in Resolution C-21-04 and ratified by Resolution C-24-01, utilizes the Enhanced Monitoring Program (EMP) as a science-based support tool. The EMP started in 2022 with a pilot study for the development of a well-level sampling protocol through the intensive within-well sampling of 71 floating-object-set wells from 42 trips. Since March 2023, this program has been collecting port-sampling data that allows for the estimation of the bigeye tuna caught by a vessel during a fishing trip and a measure of precision on that catch estimate. As of the first quarter of 2025, the EMP has sampled 1,224 floating-object-set wells and provided Best Scientific Estimates (BSEs) of bigeye tuna catch per trip based exclusively on those sample data for 166 trips (SAC-16 INF-H).

Scientific analyses related to the development of the EMP trip-level sampling protocol, identified several potential areas for improvement to the sampling protocol for fleet-level species catch estimation that is implemented through the Traditional Port-Sampling (TPS) (SAC-16 INF-J). Key features of the improved protocol include random selection of trips, wells, and fish groups within the well. The purpose of these and other features is to: 1) minimize bias by eliminating opportunistic data collection practices; 2) allow greater flexibility in stock assessment modelling by removing temporal and spatial sampling restrictions; and, 3) reduce the estimated variance on species composition estimates for the floating-object fishery by obtaining greater within-well sampling coverage for floating-object-set wells. Additionally, EMP data for 2023-2024 were used to develop a model for the well-level relationship between the EMP estimates of the proportion of bigeye tuna in the well and those from the observer for the same wells (SAC-16 INF-I). This model, updated with recent data, could be used in the future to predict well-level bigeye tuna catch from observer data for unsampled wells and trips of vessels historically covered by the EMP, providing an alternate approach for obtaining trip-level BSEs when sufficient port-sampling data are not available for a sample-only estimate.

Based on this research, the recommendations of the first external review of the data used in stock assessments for tropical tunas in the eastern Pacific Ocean, held in October of 2023, and in response to the task given on paragraph 8 of Resolution C-24-01, that requires the scientific staff perform an analysis of components, actions, technical feasibility, implications for scientific output and budget needed to merge objectives and actions of the EMP and the TPS, including any suggested improvement to the latter, the scientific staff proposes the creation of the Integrated Port-Sampling Program (IPSP) (SAC-16-05). The IPSP would serve as the operational platform that implements the collection of port-sampling data under the improved sampling protocol for fleet-level species catch estimation, and would support other scientific needs, such as the collection of morphometric data to update the morphometric relationships necessary for stock assessment modeling. In support of the IVT, the IPSP would provide sampling coverage of prioritized vessel trips similar to or greater than that expected by the EMP in 2025, and would generate well-level data that can be used to obtain BSEs of bigeye tuna catch per trip using the model of the well-level relationship between port-sampling and observer data.

RECOMMENDATIONS:

Establish the Integrated Port Sampling Program (SAC-16-05) as a regular program at the IATTC, to merge the scope of the Enhance Monitoring Program (EMP) and the traditional Port Sampling Program. The IPSP will support data collection for scientific research in support of fisheries management and continuing development of harvest strategies for the tropical tuna in the eastern Pacific Ocean

1.2. Pacific bluefin tuna

The Pacific bluefin tuna working group of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) completed a benchmark assessment of the species in 2024 (SAC-15 INF-N). The stock achieved the second rebuilding target of 20%$SSB_{F=0}$ in 2021, 13 years earlier than originally scheduled. The working group has also conducted a Management Strategy Evaluation (MSE) (SAC-16 INF-Q).

IATTC Resolution C-24-02 establishes management of Pacific bluefin tuna in the EPO for the period 2025-2026 defining total commercial catches and biennial catch limits for each CPC.

The assessment evaluates several catch scenarios, with different increases in catch and different distributions of the catch between small and large fish and between the eastern and western Pacific Ocean. Catching larger fish increases the total catch in weight for a given level of rebuilding. While most catch increase scenarios maintain the probability of spawning biomass being above the second rebuilding target 20%$SSB_{F=0}$ by 60% or more, some of the scenarios have a 10% or higher probability of being below the interim limit reference point of 7.7%$SSB_{F=0}$, at least once by 2041, and high probability of breaching potential target reference points, including the 30% proxy proposed by the staff for tuna, billfish and other highly migratory fishes (SAC-14 INF-O). The Joint IATTC-WCPFC-NC Working Group requested additional scenarios that reduce these probabilities. However, without specific target and limit reference points defined for the IATTC, these scenarios cannot be evaluated appropriately by the staff. In addition, these projections have been superseded by the MSE process.

Target and limit reference points have not been defined for Pacific bluefin tuna. Preferably, permanent or interim reference points would be defined so that catch scenarios can be appropriately evaluated. For example, a target proxy reference point of 30%$SSB_{F=0}$ (dynamic), and associated F, as proposed by the staff for highly fecund pelagic spawning species managed by the IATTC, and the limit reference point 7.7%SSB_0 (equilibrium) currently used for tropical tunas in the EPO, should be considered (SAC-14 INF-O; SAC-15-05). This recommendation is related to Harvest Control Rules 11 and 12 requested for MSE evaluation by the JWG. However, the staff recognizes that adopting reference points is challenging and progress in the MSE process will identify reference points and evaluate harvest control rules in context of these reference points. The Harvest Control Rules (HCRs) requested for MSE evaluation by the JWG have been evaluated under a set of operating models based on performance metrics. The assessment working group has provided some clear patterns in the performance of the HCRs. For example, HCRs with a spawning biomass control point close to that associated with the F target have higher catch variability and there is a tradeoff between the level of catch and catch stability. In addition, robustness tests show that the HCRs, which are all based on spawning

biomass, do not perform well in scenarios of a low recruitment regime. The staff recommends that one of the HCRs should be selected taking these performance metrics into consideration. The staff also recommends that recruitment should be monitored, and an exceptional circumstance that activates additional analyses and/or management when several years of low recruitment is identified should be included in the harvest strategy. Future work should focus on improving the HCRs to ensure they are robust to possible low recruitment scenarios (e.g., use an estimation model that includes information on recruitment, base implemented values for F and consequent catch on estimates of biomass for young individuals. A more inclusive measure of biomass other than spawning biomass should be considered for the HCR).

RECOMMENDATIONS:

1. Reference points should be adopted (e.g. taking into consideration those proposed in SAC-14 INF-O).
2. Choose one of the harvest control rules requested by the Joint IATTC-WCPFC-NC Working Group and tested using MSE (SAC-16 INF-Q), considering performance relative to the possible future reference points for bluefin tuna (e.g. the reference points proposed in SAC-14 INF-O) and other performance metrics.
3. Recruitment should be monitored, and the harvest strategy should include provisions for an exceptional circumstance that triggers additional analyses and/or management actions if several consecutive years of low recruitment are observed.
4. Future work should focus on improving the harvest control rules (HCRs) to ensure they are robust to potential low recruitment scenarios and other factors (e.g. using an estimation model that incorporates recruitment data, basing implemented fishing mortality (*F*) values and resulting catch levels on estimates of biomass for young individuals). A more inclusive measure of biomass other than spawning biomass should be considered for the HCR.

1.3. North Pacific albacore tuna

The North Pacific albacore tuna is assessed routinely by the Albacore Working Group (ALBWG) of the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). The ALBWG completed a benchmark stock assessment in 2023. The assessment results indicate that:

1. The spawning biomass in 2021 (54% of $SSB_{current, F=0}$[8]) was higher than the threshold and limit reference points (30% $SSB_{current, F=0}$ and 14% $SSB_{current, F=0}$, respectively).
2. The average fishing mortality during 2018-2020 ($F_{59\%SPR}$; the fishing intensity that results in the stock producing a SPR[9] of 59%) was below the target reference point ($F_{45\%SPR}$; the fishing intensity that results in the stock producing a SPR of 45%).
3. The Working Group concluded that the north Pacific albacore stock is likely not overfished relative to the threshold and limit reference points adopted by the WCPFC and IATTC and is likely not experiencing overfishing relative to the target reference point.

In 2023, the Commission adopted a harvest control rule with elements specified in Resolution C-23-02. The harvest control rule parameters define the relationship between stock status and fishing intensity.

The staff has collaborated with the ISC to develop criteria for identifying exceptional circumstances for north Pacific albacore tuna that would result in suspending or modifying the application of the adopted harvest strategy, and potentially may require updated Management Strategy Evaluation simulation work

[8] Dynamic spawning biomass in 2021 under no fishing.
[9] Spawning potential ratio is the female spawning stock biomass per recruit (resulting from a fishing mortality pattern) relative to the female spawning biomass per recruit in the unfished population. The fishing intensity can be measured as 1-SPR.

(SAC-15 INF-S). Three general elements will be considered when evaluating possible exceptional circumstances for north Pacific albacore: stock and fleet dynamics, application, and implementation. In 2025, one minor change was made from the previous version of the exceptional circumstances per ISC25 plenary's request.

The staff has also collaborated with the ISC to provide scientific advice on interpreting the fishing intensity metric from the harvest strategies in terms of catch and effort management measures (SAC-15 INF-T). The ALBWG recommends that the change in fishing intensity required by the harvest strategy can potentially be translated into catch reductions for all fleet groups, and effort reductions for surface fleet groups and two Japanese longline fleets that likely target north Pacific albacore. Effort management is less precise than catch management in terms of changing the fishing intensity for surface fleet groups.

RECOMMENDATIONS:

1. Based on the adopted harvest control rule (C-23-02) and the 2023 assessment result that there is more than 50% probability that $SSB_{current}/SSB_{current,\ F=0}$ is above the threshold reference point, fishing intensity should be maintained at or below the target fishing mortality reference point.
2. The change in fishing intensity required by the harvest strategy is potentially translated into catch and effort measures according to the relationships described in SAC-15 INF-T.
3. CPCs should consider the criteria developed by the ALBWG for identifying exceptional circumstances for north Pacific albacore tuna (SAC-15 INF-S).

1.4. South Pacific albacore tuna

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

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

1. The median depletion for the recent period ($SB_{2019\text{-}2022}/SB_{F=0}$) is 0.48 with a 10th to 90th percentile interval of 0.36 to 0.62.
2. All models in the uncertainty ensemble had $SB_{2019\text{-}2022}/SB_{F=0} > 0.2$, the limit reference point for WCPFC key tuna stocks.
3. The median recent spawning biomass is well above the MSY level (median $SB_{2019\text{-}2022}/SB_{MSY}$ is 3.02 with a 10th to 90th percentile interval 2.04 to 5.21).
4. The median recent fishing mortality as a ratio of that corresponding the MSY ($F_{2019\text{-}20122}/F_{MSY}$) is 0.18 with a 10th to 90th percentile interval of 0.06 to 0.44.

In summary, the benchmark assessment suggests that the South Pacific albacore stock is healthy and the recent fishing mortality is much lower than the fishing mortality at MSY. For albacore in the south EPO, the spawning biomass ratio in 2022 (spawning biomass divided by dynamic spawning biomass in an unfished condition) is estimated to be slightly below 0.5 (Figure 5).

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

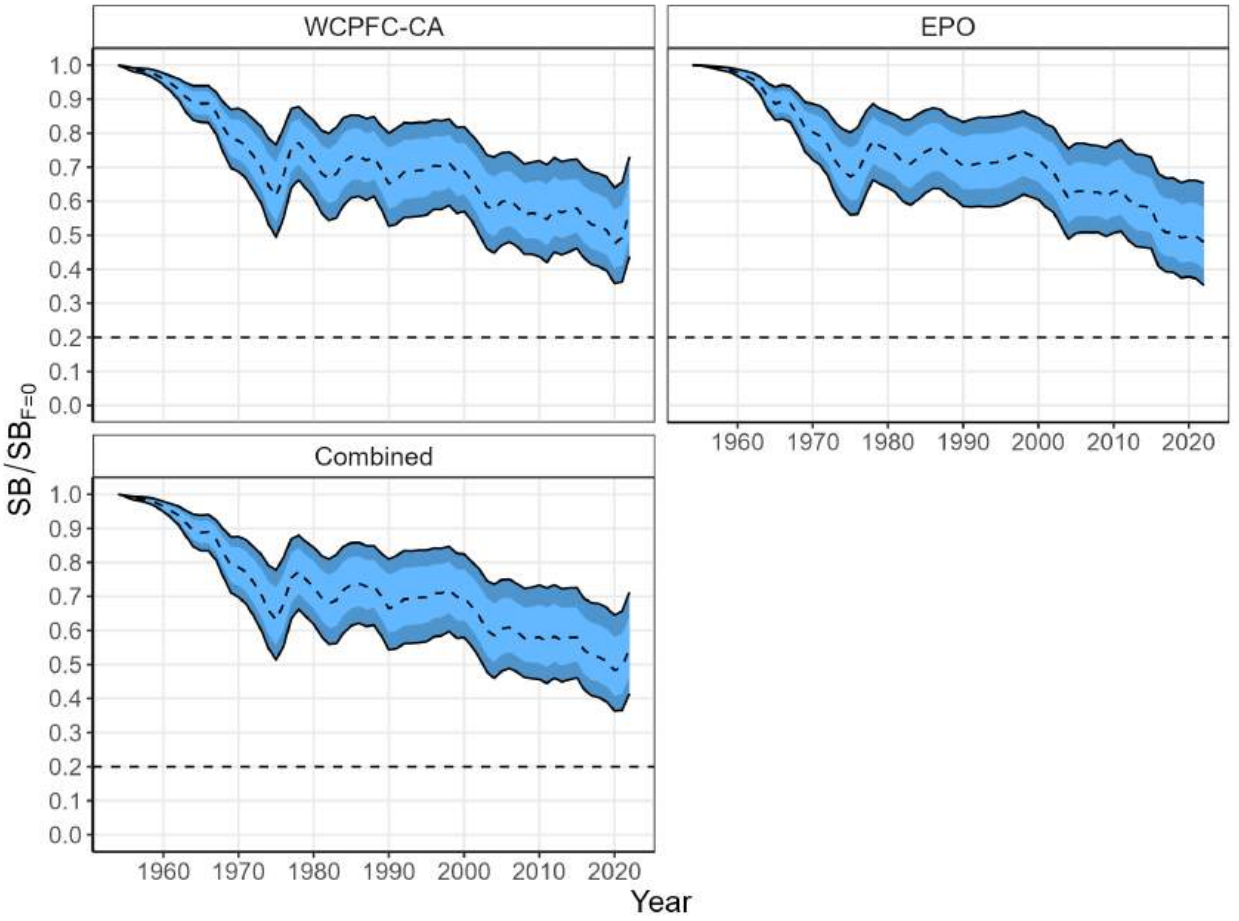


FIGURE 5. Estimated 90% (dark blue) and 75% (light blue) quantiles of dynamic depletion rate for south Pacific albacore by management region from the model ensemble. The dashed line within the interval indicates the median. This figure is modified from Figure 58 in SAC-13 INF-S.

RECOMMENDATION:

1. Continue collaborating with the Pacific Community (SPC) to monitor the stock status of South Pacific albacore tuna (*e.g.*, using sock status indicators and conducting another benchmark assessment in 3-4 years).
2. That the Commission consider favorably efforts to establish a joint working group with WCPFC in order to facilitate coordinated managment strategies for South Pacific albacore tuna.

1.5. South Pacific swordfish

The IATTC staff have finalized the benchmark assessment for south EPO swordfish (SAC-14-15), which was possible due to the collaboration with several CPCs, national scientists and other colleagues (SWO-01-REP). The data up to 2019 was included. There is uncertainty in the stock structure, and three hypotheses were proposed. The initial reference model considered the hypothesis that all catches in the EPO south of 10°N are part of the S EPO stock, as there is support for connectivity between equatorial area and the area south of 5°S, which was the 2011 assessment stock structure assumption, and one of the hypotheses considered. The third stock structure hypothesis was that the stock extends to 170°W and 10°N, including the area of high catches in the central Pacific Ocean. The catch data compiled for the EPO south of 10°N showed a dramatic increase since the mid-2000s. The average catch per year from 2000 to 2009 was about 15,000 tons, while the average catch per year for 2010 to 2019 almost doubled to about 29,000 tons. In the last three years of the compilation (2017 - 2019) the average catch was about 34,000 tons a year. The fleets that are currently the most important are the

Spanish longline fleet, which catches about 30% of the total catches in weight, followed by the Chilean gillnet fleet with 22%, and the Ecuadorian longline fleet with 20%.

Associated with the increase in catches, there was a clear increase in the indices of abundances, which was a continuation of the trends already apparent in the 2011 assessment. To inspect the possibility that the increasing trend was not real but an artifact of a particular index (for example because of changes in target), several indices were constructed using catch and effort data from different longline fleets and from gillnets. No index was considered ideal to represent the stock due to a range of limitations of each one, but all shared the increasing trend in the last 20 years. Four hypotheses were proposed to explain the simultaneous increase of catches and indices of abundance, which included both the possibilities that the increase is either real or not (increase in availability). Dynamic reference points used only for illustrative purposes, indicated that the stock is approaching the hypothetical biomass TRP (of 40% unfished biomass) for one of the hypotheses and is larger for the other hypotheses (SSBcurrent/SSBF=0> 0.5). In any case, the stock is not approaching the hypothetical limit reference point (20% unfished biomass), which is also only to illustrate the stock status (Figure S1). All models estimate a strong increase in fishing mortality since the start of the fishery in the 1950's. The fishing intensity is slightly above the fishing intensity target reference point for one of the hypotheses and below for the other models (Figure S2).

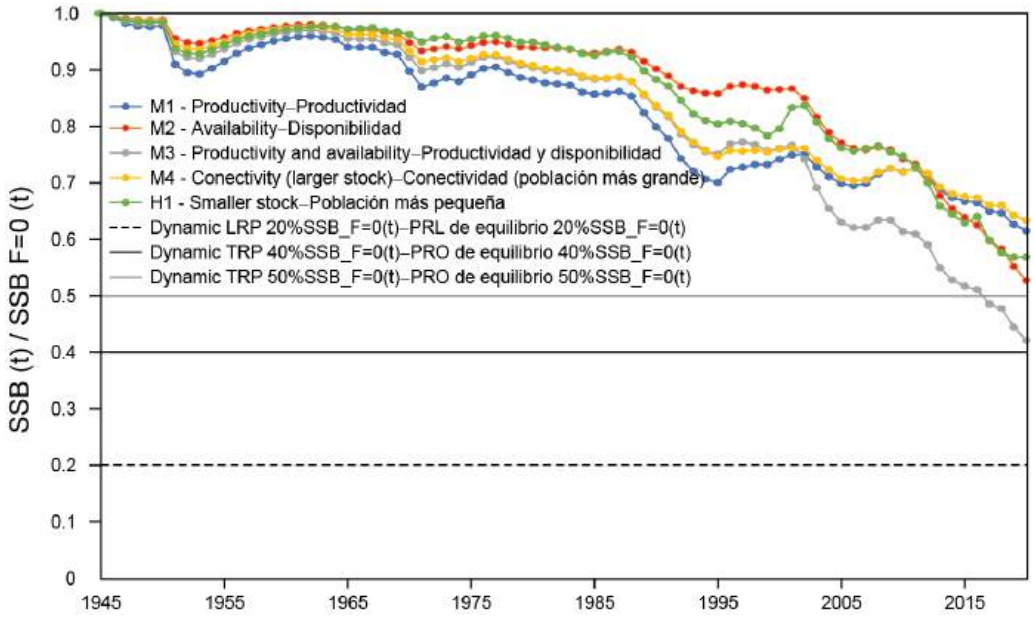


FIGURE S1. Ratio of the estimated spawning stock biomass and spawning stock biomass with no fishing (dynamic) for the models corresponding to the four hypotheses that explain the simultaneous increase in indices of abundance and catches and the model corresponding to the stock structure hypothesis H1 (north boundary at 5°S). Note that M4 corresponds to the stock structure hypothesis H3 (western boundary at 170°W).

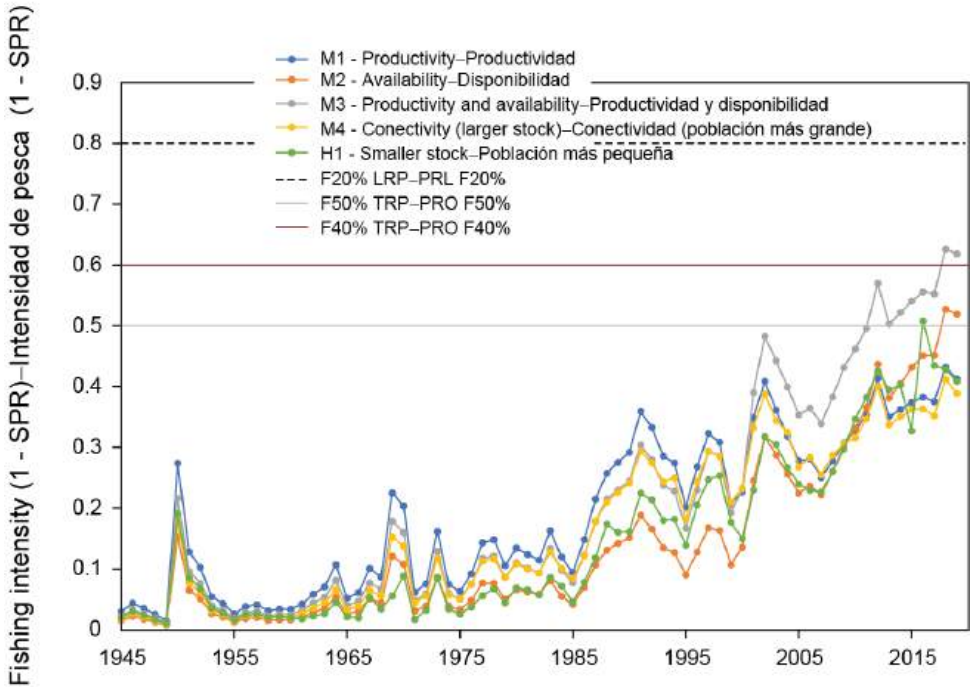


FIGURE S2. Fishing intensity (1-SPR) for the models corresponding to the four hypotheses that explain the simultaneous increase in indices of abundance and catches and the model corresponding to the stock structure hypothesis H1 (north boundary at 5°S). Note that M4 corresponds to the stock structure hypothesis H3 (western boundary at 170°W). Fishing intensity is a proxy for fishing mortality, based on SPR (proportion of the spawning biomass produced by each recruit with fishing relative to biomass per recruit in the unfished condition, Goodyear 1993). Large SPR are indicative of low fishing mortality, thus a proxy for fishing mortality is 1-SPR.

There is not enough information in the current data to determine the relative plausibility of the different hypotheses that may explain the simultaneous increases in catch and indices of abundance. There is external evidence that an increase in productivity of the stock may be plausible due to increase in the main prey of swordfish in the South EPO, the jumbo squid. If this is the case, management of the stock should account for potential decreases in productivity if the prey species decreases in abundance. Nevertheless, the other hypotheses are also plausible and should be considered.

Due to the large uncertainties in both stock structure and the effect of fishing on the stock, the staff recommends that the stock be closely monitored though indicators and assessment, and that CPCs should continue to report operational level (set-by-set) catch and effort data to IATTC, size and age composition, as well as other pertinent data towards this end. The staff also recommends that future research should focus on information that could help discriminate among these hypotheses such as genomics, close-kin mark-recapture studies, electronic tagging studies, habitat modelling and changes in habitat over time and investigating changes in fishing strategies. Finally, the staff recommends that reference points be adopted for the stock, for example those suggested in SAC-14-INF-O.

RECOMMENDATIONS:

1. Continue to monitor the stock (e.g., using stock status indicators and conducting benchmark assessments in 3-5 years).
2. Adopt interim reference points for the stock taking into consideration those proposed in SAC-14 INF-O.

2. NON-TARGET SPECIES

2.1. Sorting grids

Mitigating the ecological impacts of tuna purse-seine fisheries in the EPO using properly implemented advanced techniques and fishing gear configurations, such as sorting grids, could contribute to sustainable management. These grids may enable small individuals representing target and non-target species—frequently associated with FADs—to escape through the grid mesh, thereby potentially reducing fishing mortality and promoting long-term fishery sustainability. At its 15th meeting in 2024, the IATTC's Scientific Advisory Committee made a recommendation to the Commission that "… *"a) the scientific staff provide an evaluation of the conservation value of sorting grids and conduct a comparative analysis of the catch between sets with and without the use of sorting grids for fish in order to detect changes in the composition of the target and non-target catch, and b) That a workshop be held in Ecuador with IATTC scientific staff, industry, and fishing technicians in order to: i: learn about prototype sorting grids used during fishing maneuvers, use, experiences, benefits and problems, and ii: analyze the possibility of quantifying the amount of fish that are extracted by this method as well as their survival or condition, by means of the design of an experiment and/or sampling during sets in which the grids are used (e.g., through the use of underwater cameras)* ". In response, the IATTC staff collaborated with experts in the region to conduct analyses on sorting grid usage, tuna evasion proportions, and the composition of small tuna catches relative to total tuna catches based on different data sources (see SAC-16 INF-M). Based on the findings of these analyses, the IATTC staff recommends that, if a 2nd Sorting Grid Workshop is organized, it should consider all the relevant information presented in SAC-16 INF-M and the existing literature (e.g., report of the first IATTC sorting grids workshop [IATTC-94 M-1]), and invite the participation of all relevant stakeholders, including global experts, fishers, fleet owners and net engineers and manufacturers, to optimize the design and parameters of an eventual dedicated experiment.

RECOMMENDATION:

A potential second workshop on sorting grids, if organized, should consider all the relevant information presented in SAC-16 INF-M and existing literature (e.g., report of the first IATTC sorting grids workshop), and grant the participation of all relevant stakeholders, including global experts, fishers, fleet owners and net engineers and manufacturers, so that the design and parameters of an eventual dedicated experiment are established.

2.2. Silky sharks

The indices for large silky sharks, based on data from the purse-seine fishery on floating objects, were updated through 2024 for the north and south EPO (**Figure 5**). Previous analyses (SAC-08-08a(i), Lennert-Cody et al., 2019) identified a correlation between indices for small and medium silky sharks in the north EPO and interannual variability in oceanographic conditions. Consequently, the indices for small and medium size categories and for all size categories combined were not updated because of concerns about potential biases. Because of recent increases in the live release of silky sharks (of all sizes), two sets of indices for large silky sharks were computed, one including live release data (i.e., dead and alive) and the other not (i.e., dead only). Together, the two sets of indices likely bracket the trend that would have resulted in both the north and south EPO if "finning"[10], shark handling, and data recording practices had continued unchanged since 1994. The real trend is considered to be closer to the index based on dead and live releases because, in recent years, sharks recorded as being released alive would probably have been previously recorded as dead, and thus the dead and live release is likely a more consistent indicator. The terminal point of these indices suggests a relatively stable abundance level for over a decade, with the 2024 values slightly higher in both the south and north relative to the 2023 value, and thus no changes to active conservation and management measures are recommended (**Figure 5**). Despite the indices appearing stable, stock status

[10] Cutting the fins off sharks and discarding the carcass.

is uncertain, and a conventional stock assessment has not been possible due to a paucity of data, especially for the various longline fleets of the EPO coastal nations, which are believed to have a substantial impact on the stock (SAC-05 INF-F, SAC-14 INF-L). Insufficient data for conventional stock assessments is also a common problem for almost all shark species with which EPO fisheries interact. Therefore, in 2022 the staff used a quantitative ecological risk assessment method (EASI-Fish) to conduct the first comprehensive vulnerability assessment for 32 shark species caught in industrial and small-scale coastal fisheries in the EPO (SAC-13-11). The assessment showed silky shark to be classified as "most vulnerable", having the second highest vulnerability rank among the 32 shark species assessed. In 2023, a focused EASI-Fish assessment was undertaken on silky shark and three hammerhead shark species to explore the potential efficacy of hypothetical conservation and management measures (CMM) (SAC-14-12), such as EPO-wide closures, and prohibition of the use of wire leaders. The assessment showed that the majority of measures reduced the vulnerability of silky sharks but no single CMM, or up to four CMMs used in concert, resulted in silky shark being classified as "least vulnerable". As a result of handicapped stock assessment attempts and EASI-Fish outcomes, the staff recommends data collection for silky sharks as part of its broader workplan for addressing the needs for stock assessments of key shark species in the EPO (see Section 6.1).

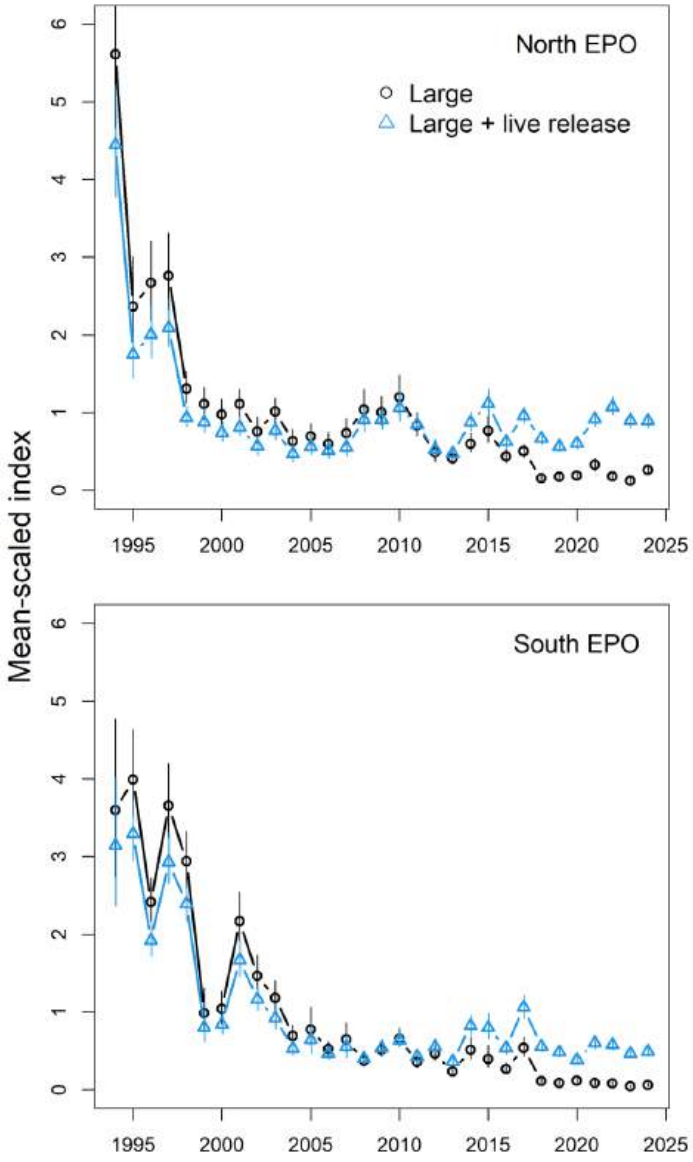


FIGURE 5. Mean-scaled standardized bycatch-per-set (BPS; in numbers of sharks per set) of large silky sharks recorded in sets on floating objects, with and without live release, in the north (top) and south (bottom) EPO.

Paragraph 7 of Resolution C-23-08, which extends Resolution C-19-05 for 2024–2025, requires CPCs to implement a three-month prohibition on the use of steel leaders (i.e., wire leaders) in certain longline fisheries. Further, paragraph 8 requires the IATTC staff to present, at the SAC meeting in 2025, an analysis of the available data pertaining to steel leader use—including from the shark fishery sampling program in Central America—and recommendations for improving the resolution, including adjustment of the prohibition period in paragraph 7. Resolution C-23-08 also directs the staff to consider the efficacy of current catch limits and if necessary, recommend revisions. Unfortunately, the improved species-level catch and composition data required for this analysis are not yet available, so it is currently not possible for the staff to reliably evaluate the efficacy of these limits.

Such persisting data limitations, among others, which apply to both target and non-target species, motivated the staff to review current Resolutions pertaining to data provision that underpin all of its research, in particular, the Resolution on data provision, C-03-05. To this end, the staff prepared Document SAC-12-

09 (see Section 3) with the overarching goal of creating a revised Resolution C-03-05 to broaden the scope and improve the quality of data provided for science, conservation and management, for both target and non-target species. An outcome from this work was a staff recommendation to the SAC to hold a series of workshops, by gear type, on data provision (SAC-12-16 see Section B.3. "General Data Provisions"). This recommendation was endorsed by the SAC and the first and second data improvement workshops were organized in January 2023 and 2025, addressing the industrial longline and the small purse-seine (Class 1-5) fisheries, respectively. A series of background documents (WSDAT-01-01, WSDAT-02-01, WSDAT-02-02) and workshop reports (WSDAT-01-RPT, WSDAT-02-RPT) were produced. Recommendations from these workshops are included in Section 3 of this document.

Existing data collection programs have enabled the tracking of silky shark indicators and EASI-Fish assessments. A formal stock assessment model for silky sharks would both improve our understanding of stock status and facilitate appropriate management responses. However, a conventional statistical stock assessment requires long time series of representative data, including, at a minimum, total catches and a reliable index of abundance, which has not been historically feasible and would require years of future work to achieve. Given this, the staff believes that the most promising tool to assess silky sharks, and if applicable, other shark species such as hammerheads or other priority shark species for the IATTC (paragraph 15, C-24-05) is to establish a Close-Kin Mark-Recapture (CKMR) program in the EPO to assess silky sharks, (SAC-12-14, SAC-14 INF-M). The advantage of CKMR is that it can produce management relevant results, particularly estimates of total adult shark abundance, based primarily on genetic data extracted from tissue samples, rather than the extensive fishery dependent data and assumptions required by conventional stock assessment methods.

The staff has taken a number of steps to lay the foundation for future CKMR assessments of shark species in the EPO. With funds provided by the Common Oceans ABNJ "Tuna 2" project and the European Union, the staff began a feasibility study and pilot program for tissue sample collection, a simulation study evaluating the potential for a CKMR silky shark assessment in the EPO, and a conceptual model for silky sharks (Talwar et al. 2025) (SAC-14 INF-M). Initial results suggest that representative collection of 5,000 to 10,000 silky shark tissue samples across the EPO over a five year period may be sufficient to provide initial CKMR-based assesment results for silky sharks. Required next steps for this work include collection of initial samples to develop genetic tools required for CKMR, expanded simulation testing to design a sampling strategy and set expectations for likely CKMR outcomes, and, finally, collection of sufficient samples to run CKMR models for silky sharks in the EPO.

Given the prior goal of collecting suitable fisheries data to conduct a conventional stock assessment model, the staff undertook a range of tasks to improve estimates of total catches of silky sharks, including removals by fleets other than the industrial tuna fleets. This research indicated that small scale coastal fisheries likely make a substantial contribution to the total fishing mortality of silky sharks in the EPO (see Section B.4.1, SAC-11-13, SAC-14 INF-L). While CKMR can be accomplished with tissue samples, the inclusion of other data, such as total catches, by fishery, can improve model performance and improve estimation of management-relevant quantiaties such as fishing mortality rates. As such, the staff recommends continuation of efforts to estimate and monitor total catches of silky sharks across all relevant fleets in the EPO.

The staff has made significant progress towards sampling catches of shark fisheries in Central America (see Section B.4.1, SAC-11-13, SAC-14 INF-L). Made possible through funds provided by the FAO-Common Oceans GEF ABNJ "Tuna 1" project, the European Union and the IATTC's capacity building fund, the sampling program in Central America was completed in December 2021. The results supported a subsequent proposal to establish a long-term sampling program in Central America (IATTC-98-02c), which was presented at the 98th Meeting (resumed) meeting of the Commission in 2021. The funds required to implement the proposed long-term sampling program were not available. Nevertheless, in 2023, the IATTC, through the FAO-GEF Common Oceans Program (ABNJ "Tuna 2" Project) (SAC-14 INF-M), began expanding the shark sampling work originally developed in Central America under the ABNJ "Tuna 1" Project. The ABNJ "Tuna 2" project aims to harmonize and

standardized data collection systems for the EPO, in order to provide the necessary information for stock assessments, incorporating ecological, genetic, and conventional approaches. This second phase of the ABNJ project includes the countries of Ecuador, Mexico, and Peru. To date, a metadata review of available data sources in these countries has been completed (SAC-16 INF-V), along with the identification and characterization of the main shark landing sites (SAC-16 INF-W). Together, these efforts are facilitating approximate estimates of total catches from coastal fleets across Central and South America for use in both indicators and CKMR asessments.

Succesful completion of these efforts will enable CKMR-based assessment and improved management of silky sharks in the EPO. Until data are available from this work, the staff plans to continue its use of data-limited assessment methods, such as EASI-Fish, to explore the potential efficacy of CMMs to guide managers in the intervening period (*e.g.,* CMMs specified under Resolution C-23-08) (SAC-14-12).

RECOMMENDATIONS:

Considering the recent improvements in shark fishery data collection in Central America (SAC-14 INF-L, SAC-15-10), the upcoming opportunity to expand these data collection improvement efforts into other coastal states (SAC-14 INF-M, SAC-15-10), as well as the potential benefits of Close-Kin Mark-Recapture for silky shark assessment:

1. Fund the collection and analysis of representative silky shark tissue samples throughout the EPO using CKMR methodologies (see unfunded proposal H.5.b in Document SAC-16 INF-E.b)
2. Fund sampling efforts from which to reliably estimate total EPO catches of silky sharks across industrial and small-scale coastal fleets considered to be under the purview of the IATTC, starting with Central America for which proposed sampling designs and a budget are already available (see SAC-14 INF-P and unfunded project in SAC-16 INF-E.b).
3. Fund the development a conceptual model for hammerhead sharks, similar to the one described in Talwar et al. (2025) for silky shark, which will serve as the foundation for a CKMR assessment for hammerhead sharks (see unfunded project F.2.b in SAC-16 INF-E.b).

2.3. List of ray species under the IATTC purview

At its 15th meeting in 2024, the IATTC's Scientific Advisory Committee made a recommendation to the Commission that "*…the IATTC staff develop a draft list of ray and mobulid species under the purview of the IATTC for consideration by the EBWG and the SAC*". In response to that request, the IATTC staff prepared document SAC-16-08, which drew upon the IATTC data holdings of logbook and observer data and the incorporation of ancillary ecological and existing conservation measures to present options for the SAC and the EBWG to consider in developing a proposed interim list of ray species for potential adoption by the IATTC in 2025. The IATTC scientific staff present for consideration for adoption by the IATTC, at a minimum, a list of 7 oceanodromous and epipelagic ray species caught in the major industrial and small-scale coastal pelagic fisheries in the EPO (List B in SAC-16-08).

RECOMMENDATIONS:

At a minimum, the 7 ray species in List B of SAC-16-08 be considered as the list of ray species to be under the purview of the IATTC.

2.4. Seabirds

In 2024, the EBWG tasked the IATTC staff to conduct the Seabird Action Plan (SAP) (see annex 1 of EBWG-2 recommendations) to assess the impacts of fishing activities on seabirds in the EPO by fisheries under the purview of the IATTC. At a time when WCPFC is also considering an update of its seabird resolution, the IATTC staff led a collaboration with seabird conservation bodies, specifically the Agreement on the Conservation of Albatrosses and Petrels (ACAP) and BirdLife International, leading seabird experts and other RFMOs, both regionally and globally, with a goal of improving seabird conservation in the

IATTC Convention Area and fisheries. Collaborators greatly contributed to the project by sharing an extensive amount of seabird knowledge, expertise and data not directly available to the IATTC scientific staff. A key outcome of the assessment was the identification of the need for increased seabird bycatch interaction information from improved observer reporting and coverage (see Section 7.2 below).

As requested in the seabird action plan the staff also reviewed mitigation measures adopted across tuna RFMOs and the reported measures in use by IATTC CPCs (reported in EB-03-03). The review revealed recent updates to seabird conservation measures in other oceans where new analyses on the efficacy of some measures resulted in updated conservation advice and adoption of (IOTC) and/or continued review of (ICCAT and WCPFC) revised mitigation options in other tuna RFMOs.

While reviewing the CPC seabird mitigation reports between 2011-2023, the staff noted inconsistencies in reporting frequency and content. Standardized reporting for seabird mitigation techniques and their specifications will improve the staff's ability to assess the efficacy of mitigation options, compliance of mitigation requirements and assist CPCs with meeting reporting mandates under Resolution C-11-02.

To assist CPCs, the EBWG, SAC, and proponents of the IATTC seabird action plan in the potential development of an updated Resolution proposal, document EB-03-03 reviewed the seabird mitigation measures adopted in the IATTC, across other tuna RFMOs, and those endorsed by ACAP—for evidence of their relative efficacy in pelagic tuna and tuna-like longline fisheries. The review identified several mitigation measures in Resolution C-11-02 that lack scientific support for their efficacy, including line shooters, management of offal discharge and the use of blue-dyed bait. The review also revealed that several of the measures, very effective at reducing interaction rates under optimal conditions, had specifications in Resolution C-11-02 that require updating (i.e. weighted branchlines, tori lines, night setting), not only to meet ACAP standards but to ensure the full effects and intent of the measures are actualized.

Therefore, Resolution C-11-02 should be revised to be consistent with the current state of knowledge regarding seabird mitigation techniques (see EB-03-03) to require the simultaneous use of at least two of three mitigation methods—weighted branchlines, night setting, and bird-scaring lines, in a way that will meet the minimum standards and specifications recommended by the ACAP. Other mitigation methods including hook shielding devices and underwater bait setting devices, can each be used as standalone options, while side setting with bird curtains and weighted branchlines are cautiously recommended for areas in Northern hemisphere pending additional details on setting position specifications.

The review conducted in EB-03-03 also demonstrated that no single mitigation measure is 100% effective in eliminating seabird bycatch in longline fisheries. Therefore, on those occasions when seabirds are captured it is important that crews are aware of, and correctly implement best handling and release practices (BHRP) guidelines to improve post release survival rates. Therefore, the IATTC staff developed BHRP guidelines for seabirds captured in all IATTC fisheries (EB-03-06). The BHRP guidelines, recommended by the staff in 2025 to be included in an eventual update of Resolution C-11-02, were based on guidance from ACAP, NOAA Fisheries, and New Zealand Fisheries and were reviewed by CPCs, industry personnel, subject matter experts and ACAP staff.

RECOMMENDATIONS:

1. Continue collaborating with leading seabird experts and organizations both regionally and globally (e.g., ACAP, BirdLife), including other tuna RFMOs (e.g., WCPFC), to better understand and mitigate the potential impacts of tuna and tuna-like fisheries on seabird conservation.

2. Revise Resolution C-11-02 to be consistent with the current state of knowledge regarding seabird bycatch mitigation techniques, as described in EB-03-03 and below.

While fishing in high-risk seabird bycatch areas (Annex I, C-11-02), all vessels must use at least one of the options below (A, B, C, or D) following the approved specifications for each measure outlined by ACAP and EB-03-03:

A. For large vessels (>20 m) use at least 2 of the following measures in combination, for medium and small vessels (<20 m), use at least 1 of these measures: i. Weighted branchlines; ii. Night setting; iii. Bird Scaring lines (Tori lines); or

B. Hook-shielding devices; or

C. An underwater bait setting device; or

D. Side setting with a bird curtain and weighted branch lines (can only be applied if fishing North of 23°N).

Outside the high-risk seabird bycatch areas, CPCs are strongly encouraged to employ one or more of the listed seabird mitigation options (A–D).

3. A standardized reporting format for the requirements outlined in Resolution C-11-02 should be developed and adopted to better assist CPCs with meeting their obligations of implementing seabird mitigation requirements and to provide clarity for the scientific and compliance aspects of the technical specifications and efficacy of utilized mitigation measures.

4. Review Resolution C-11-02, in particular its definition of the spatial and fisheries exclusions, as well as the scope of the covered species, and consider updating it with a view at improving its clarity and the intended seabird conservation outcomes in the IATTC Convention Area.

5. Consider updating Resolution C-11-02 with the inclusion of the BHRP guidelines outlined in EB-03-06 for all IATTC fisheries.

2.5. Sea turtles

A revised resolution on sea turtles (C-19-04) entered into force on 1 January 2021 requires EPO tuna and tuna-like fisheries to implement various measures designed to reduce the bycatch of sea turtles, in particular by the use of circle hooks and finfish baits in shallow longline sets. However, the low encounter rates of sea turtles by fishing vessels make these 'rare event' data difficult to analyze using conventional approaches for assessing the status of sea turtle populations. Therefore, a collaborative research project (BYC-11-01) between the IATTC, the Inter-American Convention on the Protection and Conservation of Sea Turtles (IAC), and international sea turtle experts employed the EASI-Fish approach as an alternative means by which to assess vulnerability status and to simulate conservation and management measures (CMMs) that may mitigate fishery-imposed risks to the critically endangered East Pacific population of leatherback sea turtle. This project was extended in 2021–2022 to implement several model improvements (*e.g.,* a new species distribution model and updated fishing effort data for small-scale coastal fisheries) (BYC-11-02, Lopez et al 2024, Griffiths, Wallace et al. 2024). Proxies for fishing mortality ($\tilde{F}_{2019}$) and the breeding stock biomass per recruit (BSR_{2019}) exceeded precautionary biological reference points ($F_{80\%}$ and $BSR_{80\%}$), classifying the EP leatherback turtle stock as "most vulnerable" in the reference year (2019). Of the 70 conservation and management measures (CMM) scenarios, use of circle hooks, finfish bait, and to a lesser extent best handling and release practices were each predicted to decrease vulnerability when examined individually, by far the most effective scenarios involved using these three measures in concert, followed by using circle hooks with either finfish bait or best handling

and release practices.

Following this assessment, the IATTC organized two workshops to discuss the minimum circle hook size that would reduce sea turtle mortality. The first workshop in 2022 also addressed the ecosystem-level concerns and potential trade-offs regarding the expanded use of circle hooks in longline fisheries and discussed the potential impacts of gear types on various taxa, including sea turtles. However, a final agreement on a minimum hook size was not reached preventing both a recommendation to the Commission and a revision pertaining to hook size in Resolution C-19-04 (WSHKS-01). In 2024, the EBWG recommended that the IATTC staff co-host a subsequent workshop with the goal of exploring topics of interest and knowledge gaps identified by the Working Group to mitigate bycatch of sea turtles and to complete the outstanding requirements of Resolution C-19-04. In April 2025, the second circle hook workshop aimed to: 1. Fulfill the mandate of paragraph 3(d)(i) of Res. C-19-04 (agreement upon the characteristics of a "large" circle hook), 2. Seek advice from workshop participants on the impacts of fishing operations on the form and structure (i.e., longevity and integrity) of circle hooks of various sizes and from different manufacturers, and 3. Adopt a third mitigation measure as described in Paragraph 3(d)(iii) of C-19-04 for small-scale coastal multi-species fleets as well as best handling and release practices (BHRP) for sea turtles. A background document was developed for the workshop participants that reviewed up-to-date information and research on circle hook effects, the validity and effectiveness of a series of mitigation measures, and BHRP for surface-set longline fisheries (HKS-02-01). Again, participants were unable to reach consensus on a single definition for large circle hook size.

However, significant progress has been made in recent years in several of the topics of interest to improve C-19-04 and its efficacy for sea turtle conservation. For example, the IATTC staff, in consultation with CPCs, subject matter experts and industry representatives, recently developed sea turtle BHRP guidelines for all IATTC fisheries (EB-03-05, part of the IATTC's BHRPs workplan), and conducted simulations of the efficacy of different CMMs on sea turtle vulnerability status (BYC-11-02, Griffiths and Wallace et al. 2024), in response to an eventual revision of Resolution C-19-04. Therefore, the IATTC staff recommends:

RECOMMENDATIONS:

1. Revise Resolution C-19-04 to require longline vessels fishing for tuna and tuna-like species in the EPO to simultaneously use circle hooks, finfish baits and best handling and release practices, consistent with the simulated efficacy of CMMs assessed in BYC-11-02 and Griffiths and Wallace et al. 2024.

2. Consider updating Resolution C-19-04 with the inclusion of the BHRP guidelines outlined in EB-03-05 for all IATTC fisheries.

2.6. Best handling and release practices (BHRP) of vulnerable[11] species

Concerns about the incidental capture (*i.e.*, bycatch) of vulnerable marine species, including marine mammals, seabirds, sea turtles, and elasmobranchs, have resulted in increased efforts to develop more effective conservation and management measures for these species groups. These measures often prohibit retention and require use of best handling and release practices (BHRP) to reduce the impacts of fishing on these populations. However, developing safe and effective BHRP guidelines is often a complex and iterative process that involves understanding fishery characteristics, handling and discard methods, and post-release survival rates. The IATTC staff are currently developing safe and practical BHRP guidelines that are effective for vulnerable species captured by the various fishing gears across the convention area. A workplan with phases, components, and activities (including a list of research priorities), as well as a framework, and a timeline towards BHRP adoption for each vulnerable taxa have been developed by the

[11] 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), 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 susceptible 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.

staff (EB-02-03), and was received with interest by the EBWG.

The IATTC staff, in collaboration with CPCs, subject matter experts and industry personnel nominated by CPCs, have developed, in 2025, updated BHRP guidelines for sharks (SAC-16-10), sea turtles (EB-03-05) and seabirds (EB-03-06). The efficacy of BHRPs is dependent upon fishers being aware of, trained in, and competent in the implementation of recommended BHRPs and informed of which practices must be avoided or employed. Further, fishers require training in the proper use of BHRP tools, hook removal and resuscitation techniques, as needed. For this reason, the staff recommends that upon adoption, BHRP training activities, materials and curricula be developed and implemented, including infographics and videos, to facilitate education of the coordinators of training programs and fishers across the region. Therefore, regarding the implementation and training of BHRPs, the IATTC recommends that:

RECOMMENDATIONS:

Specifically on sharks (see the sea turtle and seabird sections for BHRPs recommendations for these groups):

1. Consider updating Resolution C-24-05 with the inclusion of the shark BHRP guidelines outlined in SAC-16-10 for all IATTC fisheries.

Regarding the implementation of BHRP:

2. The Commission ensures the necessary funding to support capacity building, the development of training materials and a range of education and outreach activities (unfunded project Q.3a in SAC-16 INF-E.b).

B. DATA COLLECTION

3. TUNA TAGGING

Conventional tagging experiments (mark-recapture) are a useful tool in fisheries science for obtaining important biological information on exploited fish populations. This can range from routine data, such as movements, stock structure, and growth, to more complex information, such as exploitation rates, natural mortality, and, in some cases, abundance estimates. By including electronic archival tags (ATs) in these experiments, researchers can gain insights into daily movements (horizontal and vertical), behavior, and habitat preferences. Combining information from both conventional and electronic tagging in stock assessments can reduce uncertainty, thus providing policymakers with more robust data for making management decisions.

Through financial support provided by the European Union and the IATTC, the multi-year Regional Tuna Tagging Project in the EPO was conducted by the IATTC during 2019–2023 (RTTP-EPO 2019–2020, Project E.4.a, SAC-14-07). The program consisted of a series of three tuna tagging cruises and aimed at advancing the biological information available for stock assessments and to help inform management decisions for the tropical tuna fishery in the EPO. The tagging data collected under the RTTP-EPO allowed for the development of a novel spatiotemporal Petersen-type model for skipjack tuna in the EPO. The model estimates absolute biomass utilizing available tag recapture and catch data as well as movement patterns estimated by a tagging movement model (SAC-13-08, SAC-14 INF-E, SAC-15 INF-G). These estimates were incorporated into the 2024 skipjack benchmark assessment (SAC-15-04). Maintaning the tagging cruises is essential to obtain absolute abundance estimates that are needed to secure the skipjack assessment.

Continuing improvements of the spatiotemporal modeling approach are ongoing (SAC-16 INF-D). Although the spatiotemporal tagging model is currently only available for skipjack (SAC-15 INF-G), the staff plans to apply the approach to the other tropical tuna species. This is particularly important at a time when the bigeye and yellowfin tuna assessments are facing serious challenges. In the bigeye tuna assessment, a pronounced decrease in the spatial coverage of the Japanese longline fleet in the EPO since 2020 has decreased the precision of the assessment's primary index of abundance derived, which is derived from this fishery (SAC-15-02). Consequently, the precision of the information provided by this index on temporal changes in abundance over recent years has been recuced. If this spatial contraction in effort

persists, the reliability of the bigeye stock assessment may become compromised. Although the staff intends to continue its collaboration with Asian CPCs to improve the longline index of abundance for bigeye tuna, there are other challenges with the data available. With respect to yellowfin tuna, there is evidence of strong spatial structure of yellowfin in the EPO and some form of a spatially structured assessment, or separate assessments for different sub-stocks, is needed. Although there is a reliable index of abundance for yellowfin in the northern EPO derived from dolphin-associated purse-seine sets (the "core" region; SAC-15-03), the equivalent indices available for the southern region of the EPO are not considered reliable and alternative indices are needed. Estimates of absolute abundance, such as those developed from the spatiotemporal model for skipjack, will help overcome the key challenges with the bigeye and yellowfin assessments.

RECOMMENDATIONS:

1. To secure the next benchmark assessment for skipjack in 2028-2029, and to improve the stock assessment of yellowfin and bigeye tunas, support the development and implementation of a tagging cruise for tropical tunas in the EPO to take place in 2026-2027.

a. Contribute funding to support the tagging program in 2026-2027 (see unfunded project in SAC-16 INF-E.b)

b. Assist the staff in developing a framework to strengthen collaboration and participation of CPCs and the tuna fishing industry in successfully implementing the tagging project.

4. DATA FOR LARGE LONGLINERS

Recent challenges with the stock assessments of the primary tropical tuna species in the EPO demanded the use of sophisticated analyses that required fine-scale spatial and temporal resolution catch, effort and size data (SAC-11-06; SAC-11-07; IATTC-95-05) from the longline fleets operating far from the coasts and particularly in the high-seas, which in some cases, are not routinely available to the staff. Challenges are also encountered by the staff when producing assessments for tuna-like species, such as swordfish (SWO-01), due to a lack of data. CPUE and length composition data from Japan forms the basis for the index of abundance and the associated length frequency data used in the current assessment of bigeye (SAC-15-02), and it is key to address hypotheses of spatial structure in the stock assessment of yellowfin tuna in the EPO (SAC-16-03). However, over the past two decades the magnitude and spatial extent of effort by the Japanese fleet has decreased markedly in the EPO (SAC-15-02), thereby deteriorating the quality of the index of abundance and the associated length frequency. Recent collaborative work with Japan, Korea, Chinese Taipei and China has improved the understanding of their logbook data for developing joint indices of abundance. Data for this work were only made available to the staff via multiple MoUs between the IATTC and each CPC, which are renewed annually. The data regularly submitted by the CPCs related to the Resolution C-03-05 on data provision are aggregated spatially (1° x 1° or 5° x 5°) and contain little or no gear configuration information, and no vessel identifiers, which are important factors for better understanding changes in catchability and species targeting (OTM-30), both of which are needed to provide abundance indices. Operational-level data (high resolution 'level 1' catch and effort data as defined in C-03-05) with corresponding size information are necessary to improve the indices of abundance routinely used in the stock assessments for bigeye and yellowfin tuna and will become increasingly important for other commercially important species such as swordfish, other billfish and sharks. These data already exist for most, if not all, large longline fleets (and for some small-scale coastal longline fleets), are currently submitted to other t-RFMOs by IATTC CPCs (WCPFC13), and are similar to the data available to the staff for the purse-seine fishery. Therefore, these equivalent longline data should be expected to be made available to staff on an annual basis for the purposes of improving the quality of data reporting and research to facilitate fulfillment of mandates by the Antigua Convention.

The staff has prepared an extensive workplan to address several uncertainties in the stock assessment of yellowfin tuna, bigeye tuna and other species that will require high-resolution CPUE data with corresponding size information. The staff has routine access to high-resolution data for most of the purse-seine fleet,

but not for most longline fleets from which indices of abundance are mostly derived. The quality of stock assessments of tuna and tuna-like species undertaken by the staff will therefore continue to be severely compromised without access to these high-quality existing data.

Additionally, the Antigua Convention entered into force over a decade ago and expanded the mandate of the Commission to include non-target, dependent and associated species, and the effects of the fishery on the ecosystem. The data provision has lagged both in pace and types of data reported to the IATTC. This in turn has affected the staff's ability to adequately fulfill its obligations under the Convention and objectives under IATTC's Strategic Science Plan (2019–2023, IATTC-93-06a). Therefore, the staff—under the direction of a SAC- and Commission-endorsed staff recommendation (see SAC-12-16, General Data Provisions)—planned and facilitated the 1st workshop on improvements in data collection and provision with a focus on the industrial longline fishery (WSDAT-01) taking into consideration elements from SAC-12-09 on data gaps pertaining to all gear types. Preliminary staff recommendations to improve data collection and provision for the industrial longline fishery were presented at the workshop (WSDAT-01-01) to stimulate discussions on recommendations to revise resolution C-03-05. Input from workshop participants (WSDAT-01-RPT) was used to revise the staff's recommendations provided in SAC-14 INF-Q and SAC-16 INF-O.

The SAC, in general terms, endorsed the recommendations on tunas presented by the staff in SAC-14-14 (SAC-14-16, paragraph 1d) as well as a recommendation that the Commission review and update Resolution C-03-05 on "Data Provision", taking into consideration document SAC-14 INF-Q (SAC-14-16, paragraph 7.1). In 2024, the SAC also recommended in paragraph 5 (SAC recommendations), "(c) *That the Commission notes the importance and need of having operational data from the longline fleet in order for stock assessments of tuna and other associated species covered by the Antigua Convention to be completed* and (d) *That CPCs that maintain tuna longline fleets operating in the EPO provide the scientific staff with historical operational data to enable the implementation of the Scientific Plan with respect to the construction of indices of abundance and useful information for stock assessments of tropical and temperate tunas.*" Therefore, the importance of updating Resolution C-03-05 with submission of operational longline data is reiterated by the IATTC staff.

RECOMMENDATIONS:
Following the SAC-endorsed staff recommendation to review and update Resolution C-03-05:

1. Encourage CPCs to support the updating of the data provision resolution (C-03-05) to improve the reliability of scientific advice, based on indices of abundance derived from longline data, for management of stocks of tuna and tuna-like species and to better align data provision and submission requirements with the Antigua Convention's principle of the Ecosystem Approach to Fisheries Management (EAFM) and its mandate to include non-target, dependent and associated species, and the effects of the fishery on the ecosystem.

Consider the following recommendations summarized from SAC-14 INF-Q and SAC-16 INF-O (see documents for detailed recommendations) and revised based on discussions at SAC-15:

2. The Commission establishes a resolution (e.g., either a new resolution or through amendments to Resolution C-03-05) to mandate the submission of set-by-set and vessel-specific, catch and effort longline data, both current and historical, and update annually thereafter, by March 31st every year, to the scientific staff for their use pursuant to the objective, rules, and relevant provisions of the Antigua Convention and measures adopted by the IATTC.
3. Until the coverage of the operational-level logbook data provided to the Commission is 100%, catch and effort data aggregated at a 1° x 1° spatial resolution by vessel, month, hooks-per-basket and species should be provided. Priority should be given to tuna and tuna-like species and species of special interest (see Tables 1a and 1b, SAC-16 INF-O).
4. The resolution in recommendation 2 includes compulsory reporting of size composition data that are representative of the catches by the fisheries at the finest possible spatial and temporal resolution in the originally measured type and unit.

On a case-by-case basis, where necessary according to domestic laws and regulations, a CPC may work with the Director to develop a Memorandum of Understanding or other equivalent instruments, subject to periodic renewal, in order to provide IATTC with continuous or near continuous access to these data for scientific use.

5. SHARKS AND RAYS

5.1. Improving data collection programs and stock assessments for sharks

As noted in SAC-05 INF-F, SAC-05-11a, and SAC-07-06b(iii), improving shark fishery data collection in the EPO is an essential prerequisite for the IATTC staff to be able to conduct stock assessments for sharks in the EPO. Similarly, paragraph 14 and 15 of Resolution C-24-05 require the IATTC staff, in consultation with the SAC and the EBWG, to develop and strengthen a data collection program, with special emphasis on the small-scale coastal fishery, and a research plan for key shark species associated with fisheries managed by the Commission.

As a first step toward developing sampling designs for catch and size composition in small-scale coastal fisheries, and for size composition in industrial longline fisheries, a wealth of information has been collected in five Central American countries under Project C.4.a, funded by the FAO-GEF Common Oceans project through March 2019, and through March 2020 by the IATTC capacity-building fund (SAC-11-13). Made possible through recent funds provided by the European Union, the sampling program in Central America has reached its completion in December 2021. The results supported a proposal that was presented at the 98th Meeting (resumed) meeting of the Commission held in 2021 to establish a long-term sampling program in Central America (IATTC-98-02c). Unfortunately, the necessary funds to implement such long-term program are not available to date. If these funds to initiate the long-term sampling program in Central America become available and are secured to expand these efforts to other regions in the EPO (*e.g.,* South America, Mexico), both data collection and stock assessments for sharks in the EPO could improve. Resources to expand the Central American shark data collection improvements into other EPO coastal nations have recently been made available under part 2 of the FAO-GEF Common Oceans ABNJ project (SAC-13-12,

SAC-14 INF-M, SAC-15-10) and have translated into significant progress in 2024 and 2025 with the completion of the metadata phase (SAC-16 INF-V) and the identification, mapping and classification of locations of interest in Mexico, Ecuador, and Peru (SAC-16 INF-W).

RECOMMENDATIONS:

1. Establish, or strengthen, data collection programs for small-scale coastal fisheries in EPO coastal States to obtain reliable catch and size composition data and biological information for assessments of stock status and vulnerability.

2. Adopt, on an interim basis, the data collection forms and sampling systems developed under the Common Oceans ABNJ-1 (Central America) and ABNJ-2 (Mexico, Ecuador, Peru) shark data collection projects developed by the IATTC staff for small-scale coastal fisheries. These forms, along with the associated sampling designs, may be revised in 2026 and 2027 following the ABNJ-2 project and related feasibility studies (e.g. CKMR, biological sampling).

Recommendations by the staff on data collection by observers on longline vessels and Class 1–5 purse-seine vessels are described in Section 7.

6. ECOSYSTEM CONSIDERATIONS

6.1. Operationalization of EAFM

International instruments such as the 1982 United Nations Convention on the Law of the Sea (UNCLOS), the 1995 FAO's Code of Conduct for Responsible Fisheries (CCRF), the 2001 Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and IATTC's 2003 Antigua Convention prompted IATTC's production of an *Ecosystem Considerations* report, updated annually since 2003 (see e.g., EB-03-01). The purpose of this report is to broadly describe fisheries impacts on the EPO ecosystems and therefore to promote and strengthen awareness of this topic among its members and other relevant stakeholders. Due to the increasing length and complexity of this report over the past 20 years, IATTC's staff undertook an evaluation of the ways and means of better communicating the status of the ecosystems as well as advancing and supporting operationalization of the Ecosystem Approach to Fisheries Management (EAFM). In 2023–2024, the staff collaborated with experts working with other tuna-Regional Fisheries Management Organizations (t-RFMOs) to review and summarize ecosystem research conducted globally, and how this research is delivered to the respective Commissions. This review was used to inform an *EcoCard* workplan (EB-02-02)—with continued work supported by the Ecosystem and Bycatch Working Group in 2024 (see SAC-15 Recommendations)—and progress on the workplan is described in EB-03-04. Progress towards Phase 1 – Planning (EB-02-02) included establishing the purpose of an *EcoCard* and designing a conceptual framework. The purpose (or function) of an indicator-based *EcoCard*—i.e., the main reason why the IATTC staff developed an *EcoCard* workplan—is to support IATTC's commitment to the principles of the EAFM in the Antigua Convention and advance operationalization of the EAFM by developing a user-friendly, visual tool for monitoring and communicating ecosystem status to the IATTC in a more efficient way. Following work undertaken by other t-RFMOs, Stage 1 of developing an *EcoCard* includes defining the goal and objective, while Stage 2 includes designing a conceptual operating framework. Defining the goal (i.e., a broad, long-term desired outcome) facilitates an understanding of the overall vision the IATTC staff proposes to achieve regarding improved ecosystem-science advice and management. Defining the objective (i.e., a shorter-term step towards achieving the main goal) helps to track progress towards the goal in a more specific and tangible way. IATTC staff also designed a conceptual operating framework to visualize the steps of an *EcoCard* plan, and created a proposed, preliminary, visual dashboard of elements to consider for monitoring in an *EcoCard*.

RECOMMENDATIONS:

1. Support the staff's definition of the **goal** of an *EcoCard*, "*To facilitate operationalization of the EAFM by improving ecosystem-science advice for management through the development and application of meaningful and effective tools and communication products*."
2. Support the staff's definition of the **objective** of an *EcoCard*, "*To transition to an indicator-based EcoCard to support decision making by enhancing awareness, communication and reporting on the status of various ecosystem components enabling the IATTC to prioritize research and potential management intervention*."
3. Consider adopting the proposed **conceptual framework** described in section 2.2.3 and shown in Figure 4 of EB-03-04 to support and guide the *EcoCard* workplan (EB-02-02).
4. Consider adopting the proposed, preliminary, **visual dashboard** of elements to consider for monitoring in an indicator-based *EcoCard* (Figure 7, EB-03-04).

6.2. Updating morphometric relationships and collecting biological samples from prioritized species in EPO tuna fisheries to improve stock and ecological assessments

Length-weight (L-W) relationships are the foundation to a variety of research projects including stock assessments, ecological risk assessments (*e.g.,* EASI-Fish) and for converting catch reported in numbers to weights, and vice versa. These relationships can vary markedly in space and time and can greatly influence stock and risk assessment model outcomes. Despite this, L-W relationships for tunas are outdated (*e.g.,* yellowfin: 1986, bigeye: 1966 and skipjack: 1959) or inadequate for many priority species (see SAC-13-11, SAC-09-12, IATTC Special Report 25). Catch estimations are also affected by imprecise and/or outdated L-W relationships. Furthermore, species and size composition of the catch and fishing strategies differ significantly between longline (LL) and purse-seine (PS) fisheries (*e.g.,* see IATTC-102-01). Additionally, basic life history data for assessment models are absent or inadequate for most bycatch species. A proposed feasibility study (Project F.3.a) addresses these issues and a background paper (SAC-14 INF-J) summarizes the staff's internal discussions, provides background information, describes data deficiencies in morphometric relationships and biological sampling, and identifies potential sampling opportunities in 3 gradual phases. In SAC-14 INF-J, the staff built upon Project F.3.a and developed a hierarchical phased-based approach to update morphometric relationships and biological sampling for tunas, billfishes, and prioritized bycatch species, through the collaboration of staff, CPCs, industry and other relevant stakeholders. This project is complementary to other data improvement projects (SAC-12-09, WSDAT-01-01, WSDAT-01 Report, WSDAT-02-01, WSDAT-02 Report) and also aims to align with work conducted in the Western and Central Pacific Ocean through SPC's Oceanic Fisheries Programme on the collection of morphometric data to build a comprehensive database on various length and weight types and to establish collection of biological samples (*e.g.,* see SC18-ST-IP-04). Concerns over the outdated morphometric relationships for tunas were discussed at the 1st external review of data used in stock assessments of tropical tunas in the eastern Pacific Ocean (RVDTT-01), and this inadequacy contributes to considerable uncertainty in catch estimates and the tuna stock assessments. Accordingly, the external review panel recommended the implementation of Project F.3.a (RVDTT-01). In 2024, the staff proposed using the Enhanced Monitoring Program (EMP) as a means for collecting morphometric data for use in tuna stock assessments (SAC-15 INF-H), including various retained bycatch species. The Commission approved the initiation of morphometric sampling of tunas within the EMP framework. During the last quarter of 2024 an experimental design was derived, and trials were conducted to guide the implementation of the sampling. Sampling was initiated in January of 2025 in the ports of Mazatlán, Mexico and Manta, Ecuador and a report will be presented at SAC-16 (see SAC-16 INF-H).

RECOMMENDATION:

1. Continue with the collection of morphometric measurements and biological samples on (i) tropical tunas and (ii) opportunistically on other prioritized species (see Tables 1a and 1b in SAC-16 INF-O), initiated by the EMP in 2025 (see SAC-16-05 for proposed Integrated Port Sampling Program).

2. In collaboration with CPCs and relevant stakeholders, expand the sampling currently being executed in relation to Reccomendation 1 above. Descriptions of possible strategies are outlined in Project F.3.a (unfunded proposals, SAC-16 INF-Eb)—which may be upscaled using a hierarchical phase-based approach (see SAC-14 INF-J)—for a fishery-dependent sampling program to collect morphometric measurements and biological samples from tunas and other prioritized species captured in a multitude of EPO fisheries (see Tables 1a and 1b in SAC-16 INF-O).

7. FISH-AGGREGATING DEVICES (FADs)

The recommendations in this section are based on documents FAD-08-01, FAD-08-02, FAD-08-03, FAD-09-01, and FAD-09-02; some of which were previously endorsed by the *Ad Hoc* Working Group on FADs, SAC-09, SAC-10, SAC-14 and IATTC-97-01, among others.

7.1. Provision of detailed historic buoy data

Under previous Resolutions C-17-02 and C-20-06 CPCs were required to provide "daily information" on their active FADs, which was interpreted to mean a single data point per FAD per day. However, the criteria for selecting a single point from a FAD's daily path was unclear (*e.g.* no acoustic biomass information was required by the Resolutions). The combination of low resolution and ambiguous selection criteria meant that these data were of limited scientific utility. Also, CPCs were allowed to report data in different formats, sometimes highly summarized (without any information on FAD identification or trajectory), which limited the scientific use of these data. In recent years, the IATTC staff, the FAD-WG and the SAC recommended the provision of raw buoy data as received by original users (*i.e.*, vessels, fishing companies), including both trajectories and acoustic biomass information. Therefore, starting in 2022, Resolution C-21-04 required CPCs to report these data following the format specified in Annex IV of C-21-04.

Despite Resolution C-21-04 reducing the number of active FAD limits in 2022 and 2023 relative to the 2018–2021 period, analysis of raw buoy data for 2022–2023 (e.g., FAD-09-01) has shown an increase in the number of active FADs used by the fleet. However, the data available to the staff before and after 2022 are inconsistent in both reporting rate and quality, and thus, the exact reasons for this increase remain unclear, but may range from improved data to actual increases in FAD usage.

In addition, a recent study conducted by the IATTC staff (FAD-09-02) found that only 22% of deployed FADs were observed to be recovered, meaning that up to 78% of deployed FADs observed over the study period (2019-2024) are potentially unrecovered. Raw buoy data would enable the staff to provide more reliable estimates of the fate of FADs not observed as recovered by IATTC observers, as well as facilitate improved science-based management efforts, such as spatial management options, FAD recovery programs or incentive systems, among other potential options. Moreover, as noted by voluntary pilot studies using raw buoy data, including both trajectories and acoustic biomass information, at regional (*e.g.*, FAD-05-INF-E, FAD-06-03, FAD-07-03, SAC-13-07, FAD-08-02) and global scale (*e.g.*, IOTC-2020-WPTT20-14, SCRS/2019/075, SCRS/2024/044), scientific studies, including improved stock assessments of tropical tuna, require high-resolution, standardized long-time series data. Therefore, the staff recommends that CPCs provide historic raw buoy data in order to conduct the appropriate scientific analyses, and in particular, to continue improving staff's understanding of FAD fishery dynamics and the assessment of skipjack (SAC-15-04) and other tropical tuna species.

RECOMMENDATION:

CPCs provide to the IATTC staff the historic raw buoy data received by original users (*i.e.,* vessels, fishing companies), including both trajectories and acoustic biomass information.

7.2. Regional data collection program on stranding FADs and reducing FAD loss

The best available estimates of FAD lifespans at sea in the EPO come from data collected by IATTC observers starting in 2019. These data reveal that only 22% of observed FADs were recorded to be recovered, meaning that up to 78% of deployed FADs tracked by IATTC observers are potentially unrecovered (FAD-09-02). The fates of these FADs without an observed recovery are not well known, nor are the potential effects of unrecovered FADs on the environment, stocks and ecosystems through impacts such as ghost fishing, school dynamics, stranding or collisions with sensitive habitats, and general marine pollution, although there is a generalized awareness and concern regarding the consequences of their stranding and the resulting damage to ecosystems.

In this context, the IATTC recognized the importance and urgency of the issue and adopted measures "*to prevent loss or drifting*" of FADs (Resolution C-23-03, paragraph 3) and establish a gradual transition to fully non-biodegradable FADs by 2031 (Resolution C-23-04), in addition to approving the recommendations of the *Ad Hoc* Working Group on FADs (FADWG) (FAD-07-05) that were also endorsed by the SAC (IATTC-101-03):

"3. *On stranding FADs*

3.1. Consider alternative mechanisms to continue monitoring buoys that are leaving the convention area or the fishing grounds and that are susceptible for deactivation, taking into account the implications with regard [to] the limits on active FADs per vessel.

3.2. To the extent possible, provide data to the Secretariat on the entire trajectory of FADs, even when transiting outside the convention area or the fishing grounds, monitored through new FAD marking systems, the FAD's buoy or other systems.

3.3. Consider putting in place a set of best practices for optimizing FAD retrieval.

3.4. Promote FAD recovery programs, both from the land and from the sea, and establish standards to ensure the effectiveness of these programs.

3.5. Create awareness of FAD strandings and encourage the expansion of the in-country data collection efforts on FAD strandings in the EPO to harmonize with SPC-WCPFC efforts in the WCPO.

3.6. Develop solutions to process/recycle FAD materials in ports."

To this end, CPCs were invited to participate in the development and implementation of an IATTC regional data collection program on FAD strandings (Memorandums Ref.: 0008410 and 0373-410) aimed at (i) facilitating a better understanding of the extent of environmental impacts of drifting or stranded FADs both in the EPO, and in the WCPO, when crossing over to that area and (ii) contributing to improved management advice on FADs. Development of this program will harmonize IATTC's efforts with those already established by the WCPFC's data collection program described in FAD-07 INF-A to foster Pacific-wide research as recommended by the SAC ("*Increase Pacific-wide collaboration on drifting FAD research…*" See document IATTC-101-03, recommendation 5.1). It will also facilitate collaboration on FAD stranding events as well as guidance of potential management options, particularly for events that span both regions.

To date, six CPCs and TUNACONS have responded to the memorandums and expressed interest in participating in a regional data collection program to harmonize with SPC-WCPFC's efforts. In December 2024, an informal meeting was held virtually for CPCs that expressed interest in establishing a voluntary regional data collection program on FAD strandings. SPC staff presented experiences with implementing a data collection program on stranding FADs in the WCPO and suggestions for the next steps and elements needed to initiate regional programs were presented by IATTC staff, based on SPC's experiences. These potential steps included:

a. creating awareness about FAD strandings and engaging with local communities,

b. networking with NGOs and/or local organizations with existing marine pollution projects or other projects that might allow for inclusion of data collection on FAD strandings,

c. training fisheries officers in coastal States on communication materials, the FAD form and database (harmonized with WCPFC's communication materials, FAD form and database and adapted for the EPO), and

d. regularly communicating with fisheries officers to ensure training is conducted accordingly.

Elements to consider for initiating local data collection programs included funding for dissemination material, program launch and other support (e.g., personnel). The initial interest by these CPCs, as well as the success of the eventual data collection program on stranding FADs, could significantly benefit from the participation of other CPCs in the region and from increasing awareness by local communities.

RECOMMENDATIONS:

1. CPCs participate in a regional data collection program on FAD strandings originating from EPO fisheries—following, to the extent possible, the system of data collection and dedicated data forms already established by, and harmonized with, SPC-WCPFC and described in Appendix A—to improve understanding of the extent of environmental impacts of drifting or stranded FADs and to guide potential management options.

2. CPCs create awareness of FAD strandings by engaging local communities to communicate and disseminate information (e.g., through posters, radio and television broadcasts, and public speaking) and improve reporting of lost and abandoned FADs data found by fishers and/or local communities.

Regarding FAD loss:

3. The IATTC take measures to secure the necessary data (e.g., see section 6.1 on historic high-resolution satellite buoy data reporting) and resources to better understand the ultimate fate of unrecovered FADs, and enacts management efforts as appropriate to mitigate the impacts of FAD strandings and promote FAD recovery programs, including through the use of incentive systems and spatial management options.

8. OBSERVER COVERAGE

8.1. Purse-seine fishery

8.1.1. Observer coverage of purse-seine vessels of less than 364 t carrying capacity

No formal, fleet-wide onboard observer program exists for Class 1–5 purse-seine vessels, and as a result, trips by many small[12] purse-seine vessels are not sampled by observer programs (SAC-08-06a, SAC-12-09, SAC-14-11, EB-02-01, WSDAT-02-01, WSDAT-02-02). However, data collection has been improving, mostly due to a voluntary observer program established in 2018. Initially, observer coverage from this voluntary program was low due to its voluntary nature. Therefore, vessel logbooks and cannery unloading records are the principal sources of data on the activities of these for Class 1–5 purse-seine vessels. However, these non-observer data sources generally do not contain information on tuna discards, and the data are less complete and detailed than those collected by observers. In addition, bycatch information is only rarely recorded in logbooks, which hampers efforts to track indicators or conduct assessments for such species. Electronic monitoring (EM) for this fleet component was explored (Project D.2.a; SAC-10-12), and some capabilities of EM systems in the pilot study are detailed in Appendix 2 of SAC-11-11. In 2024, voluntary interim minimum standards for the use of EM systems in EPO fisheries were adopted through Resolution C-24-09. Therefore, a formal, non-voluntary, fleet-wide observer program is recommended to routinely obtain the data necessary for estimating the quantity and species composition of bycatches (retained and discarded) by these vessels

[12] Carrying capacity ≤ 363 t.

and to understand the strategies and dynamics of their operations. In February 2025, the 2nd workshop on data improvement, focused on the small purse-seine fishery (see WSDAT-02), was held virtually. During the workshop, staff presented preliminary recommendations (see WSDAT-02-01), which drew upon an analysis that was conducted to assess observer coverage levels for total bycatch estimates for this fleet segment (see WSDAT-02-02). These preliminary recommendations were discussed with participants (see WSDAT-02-RPT) and the recommendation on observer coverage was revised to incorporate the feedback from workshop participants (see also SAC-16 INF-O).

RECOMMENDATION:

Establish a non-voluntary, observer program[1]—comprised of onboard observers or electronic monitoring systems (EMS)—for small purse-seine vessels ≤363 t carrying capacity that mimics the Class 6 observer program (i.e., vessels with a carrying capacity >363 t), to the extent possible, including but not limited to catch, disposition (e.g., retained, discarded) and fate (e.g., released alive, released injured, dead) in numbers of individuals or weights, and length composition data on priority species[2] and other species that interact with this fishery[3].

[1] Noting the observer program should be designed to collect representative data on the priority species (see [2]). The objectives of the program should be clarified by the Commission, with regard to both priority species (and corresponding acceptable error rates in total catch or other desired metrics) and the data to be collected on those species, since these will contribute to the definition of "representative" data and sampling designs. For example, the mix of vessel sizes and fishing strategies prioritized for the observer program may change depending on the list of priority species and the corresponding estimated error rates, as well as the relative impact of different vessels and fishing strategies on those species.

[2] Priority species include tunas, bonitos and billfishes (see Table 1a in SAC-16 INF-O), followed by species of interest (see Table 1b in SAC-16 INF-O) defined as those for which the Commission has adopted specific Resolutions (e.g., sharks: C-24-05, C-23-08, C-19-06, C-11-10; sea turtles: Resolutions C-19-04, C-04-07; mobulid rays: Resolution C-15-04; dorado: Resolution C-23-09; bycatch: Resolution C-04-05).

[3] Other non-target species caught incidentally as bycatch (e.g., Resolution C-04-05) – see Table 1c in SAC-16 INF-O.

8.2. Longline fishery

8.2.1. Characterizing and classifying longline fisheries in the IATTC Convention Area

During the 2nd meeting of the Ecosystem and Bycatch Working Group (EBWG), a recommendation was adopted stating, "*the staff, in coordination with CPCs, develop and present to the Commission results of a process to characterize and classify the longline fleets and their fisheries in the Convention Area, distinguishing their dynamics and differentiated impacts, as well as the catchability of species, whether directed, associated or incidental*." Consequently, the IATTC staff developed an approach to produce preliminary staff recommendations, in coordination with CPCs, for formally classifying and defining longline fisheries that operate in the Antigua Convention Area. Details of the process are included in document SAC-16-09.

A new, updated and improved classification of the longline fleet is essential for the appropriate development of IATTC documents, research planning, management decisions and measures, and for providing clarity to CPCs, data handlers, scientists, policy makers and all relevant stakeholders. Three broad categories were defined according to general characteristics of the fleets ("large-scale longline"; "medium-scale longline"; and "small-scale coastal fisheries") including vessel size and design, typical number of hooks deployed per set, target species, fishing areas and fishing technologies, and autonomy of the vessel (i.e., how long the vessel can remain at sea). Additional details on the process and the parameters and variables used to define and classify these fleets can be found in SAC-16-09.

RECOMMENDATION:

Consider adopting three broad categories to formally define longline fisheries in the IATTC Convention Area (i.e., "large-scale longline"; "medium-scale longline"; and "small-scale coastal fisheries") based on the information and classifications described in SAC-16-09.

8.2.2. Observer coverage

Resolution C-19-08 requires that at least 5% of the fishing effort by longline vessels greater than 20 m length overall (LOA) be monitored by a scientific observer. However, recent analyses undertaken by IATTC staff with the new operational-level data collected by observers onboard large longline vessels showed that, at such a low level of coverage, the data are not representative of the fishing activities of the entire fleet and cannot be used to produce sufficiently accurate estimates of total catch of target species such as bigeye tuna and yellowfin tuna (BYC-10 INF-D). Therefore, the staff concludes that 5% coverage is also too low for reliably estimating total catches of bycatch species caught by these vessels, particularly those species caught infrequently, such as sea turtles, seabirds and some sharks of conservation concern. Several studies of sampling coverage for other long-line fisheries have shown that 20% coverage is considered the minimum level required for estimating total catch of bycatch species. Both the staff and the SAC have recommended that this level of coverage be adopted for longline vessels over 20 m LOA (SAC-10 INF-H).

RECOMMENDATION:

Update paragraph 3 of Resolution C-19-08 to increase observer coverage[1]—comprised of onboard observers and/or electronic monitoring systems (EMS)—for longline vessels over 20 m length overall to at least 20% to improve data for stock assessments and ecological assessments, including but not limited to catch, disposition (e.g., retained, discarded) and fate (e.g., released alive, released injured, dead) in numbers of individuals, and length composition data on priority species[2] and other species[3] that interact with the fishery.

[1] Noting the observer program, and corresponding coverage level, should be designed to collect representative data (and corresponding acceptable estimated error rates) on the priority species (see [2]). The objectives of the program should be clarified by the Commission, with regard to both priority species (and corresponding estimated error rates) and the data to be collected on those species, since these will contribute to the definition of "representative" data.

[2] Priority species include tunas, bonitos and billfishes (see Table 1a in SAC-16 INF-O), followed by species of interest (see Table 1b in SAC-16 INF-O) defined as those for which the Commission has adopted specific Resolutions (e.g., sharks: C-24-05, C-23-08, C-19-06, C-11-10; sea turtles: Resolutions C-19-04, C-04-07; mobulid rays: Resolution C-15-04; dorado Resolution C-23-09; bycatch: Resolution C-04-05).

[3] Other non-target species caught incidentally as bycatch (e.g., Resolution C-04-05) – see Table 1c in SAC-16 INF-O.

9. CLIMATE CHANGE

9.1. Updated proposed climate change workplan

In 2023, the IATTC adopted Resolution C-23-10 on climate change. Since then, the IATTC staff proposed a Climate Change workplan (SAC-15-12) for consideration by the Commission that provided a general structure to promote climate-resilient tuna fisheries in the EPO, in the understanding that the details of the workplan and its implementation would be elaborated upon in consultation, as appropriate, with all relevant stakeholders, including the Commission. Additionally, draft Terms of Reference (ToRs) (IATTC-102 INF-B) were created for a guide to the series of climate change workshops aimed to facilitate staff and stakeholder engagement to develop the workplan. The 1st climate change workshop was held over three days in February 2025, where participants were educated about observed and potential climate impacts on highly migratory species and tuna fisheries and discussed three key elements of the proposed Climate Change workplan: main goal, scope, and framework. Each day focused on one of the key elements where an external speaker presented on their experiences in developing a climate change workplan for their organization. The IATTC staff then presented their preliminary recommendations for each key element, with the main goal and scope described in CC-01-01 and the framework outlined in CC-01-02. After presentations, the staff facilitated discussions with workshop participants about each element and the preliminary recommendations, which were summarized in a workshop report (WSCC-01-RPT). Subsequently, the staff developed SAC-16 INF-P to provide an overview of the importance of each of the above elements in climate-resilient fisheries workplans and detailed revised staff recommendations on the main goal, scope, and framework based on the feedback from workshop participants.

RECOMMENDATIONS:

1. Consider for adoption, the list of revised IATTC staff recommendations of the main goal, scope, and framework (SAC-16 INF-P) of the IATTC's proposed climate change workplan.

2. Consider adopting the Terms of References proposed by the IATTC staff (IATTC-102 INF-B) to guide the series of climate change workshops aimed to facilitate staff and stakeholder engagement during the development of the proposed climate change workplan (SAC-15-12).

Appendix A. Dedicated data collection form established by SPC-WCPFC and adapted to EPO fisheries to harmonize data collection across the Pacific, to the extent possible. This form corresponds to Recommendation 1, section 6.2 Regional data collection program on stranding FADs and reducing FAD loss.

FAD Sighting form v3

Form details **Date:** _____ Form nb: _____
Completed by: _____

Type of data
☐ community program
☐ survey* (☐ in-person, ☐ drone)
***Survey name:** _____

Observer/person who found the FAD/buoy
Name: _____
Phone number: _____
or Email: _____

Entered in the database ☐
Entry number: _____

Sighting information

Date found (yyyy/mm/dd): _____ **State/Province and/or Island:** _____

Location *(Describe where it was found, village/beach name)*: _____

Coordinates (*if possible, in decimal*)**: Latitude:** _____ **Longitude:** _____

Environment: ☐Beach ☐Coral reef ☐Drifting in the lagoon ☐Drifting in the ocean ☐Rocky shore ☐Mangrove ☐ Estuary/river/bay ☐Private property (found previously*) ☐Wharf or Port (found previously*) ☐Landfill (found previously*) ☐Unknown ☐Other: _____

*If found previously:
- Initial date (yyyy/mm/dd): _____
- Initial location: _____
- Initial environment: ☐Beach ☐Coral reef ☐Drifting in the lagoon ☐Drifting in the ocean ☐Rocky shore ☐Mangrove ☐ Estuary/river/bay ☐Unknown ☐Other: _____

Buoy information

Buoy present: ☐ Yes ☐ No

Buoy type: ☐ Satellite (used on dFADs) ☐ Radio (used on longlines) ☐ Oceanographic ☐ GPS ☐ Unknown ☐ Other: _____

Buoy ID Number *(n.b.: on Marine Instruments buoys, "PR0043" is not an ID number)*: _____

Buoy condition: ☐ Modified/reused by communities

☐ Whole buoy
- ☐ Intact
- ☐ Damaged:
  - ☐ Minor cracks on top case
  - ☐ Cracked top case
  - ☐ Cracked bottom case
  - ☐ Cracked plastic circle
  - ☐ Cracked echosounder
  - ☐ Water inside
  - ☐ Other: _____
- ☐ Unknown Damages

or

☐ Buoy part only
(Tick one or several)
- ☐ Electronics
- ☐ Plastic case (top)
- ☐ Plastic case (bottom)
- ☐ Other: _____
- ☐ Unknown

or ☐ Unknown

Inscriptions on the buoy: ☐ Yes (*specify*): _____ ☐ No ☐ Unreadable ☐ Unknown

Fate of the buoy? ☐Left in the environment ☐Removed from the environment (tick if *"found in a private property"*) ☐Unknown

Only if removed from environment, purpose: ☐ Left on private property ☐Storage (where?): _____

FAD Information

FAD present: ☐ Yes ☐ No

FAD type: ☐ anchored FAD (aFAD) ☐ drifting FAD (dFAD) ☐ Part of dFAD ☐ Log ☐ Unknown ☐ Other: _____

FAD condition: ☐Intact ☐Beginning to break ☐Mostly fallen apart ☐Unknown

Inscriptions on the FAD: ☐ Yes (*write it down*): _____ ☐ No ☐ Unreadable ☐ Unknown

Shape of the raft: ☐Square ☐Rectangular ☐ Buoys sausage ☐Cylindrical ☐Unknown ☐Other: _____

FAD Sighting form v3

Form details **Date:** _____ Form nb: _____
Completed by: _____

Raft materials *(Tick one or several)*

Raft materials structure and flotation: ☐Bamboo ☐Log ☐Wood ☐PVC ☐Floats ☐Plastic drum ☐ Fiberglass drum ☐Metal drum ☐Steel ☐Polystyrene ☐Unknown ☐Other: _____

Raft materials covering: ☐None ☐Ropes ☐Nets ☐Plastic sheeting ☐Canvas ☐Unknown ☐Other: _____

If net present in the raft, mesh size : ☐ Small (<7cm) ☐ Large(>7cm) ☐ Small & Large ☐Unknown

Estimated size of the raft (m) *(Length x Width)*: _____x_____ or ☐Unknown

Underwater component/tail *(Tick one or several)*

Submerged tail presence *(i.e., part of the FAD normally under water)*: ☐Yes ☐No ☐Unknown

Submerged tail materials: ☐Unknown ☐Net ☐Rope ☐Canvas ☐Plastic sheeting ☐ Bamboo ☐ Fishing lines ☐Other: _____

Design of the tail: ☐ Open panel, mesh size: ☐Small (<7cm) ☐Large(>7cm) ☐Other: _____
☐ Net rolled up in bundle, mesh size: ☐Small (<7cm) ☐Large(>7cm) ☐Other: _____
☐ Cube structure ☐ Other: _____
☐Unknown

Estimated depth of submerged tail (m): _____ or ☐Unknown

Fate of the FAD

Fate of the FAD? ☐Left in the environment ☐Sunk ☐Raft removed, tail section left ☐Unknown ☐Removed from the environment (*tick if "found in a private property"*) ☐Other: _____

Only if removed from environment, purpose: ☐Burned ☐ Left on private property ☐Landfill ☐ Recycled ☐Re-used (*specify*): _____ ☐Other: _____ ☐Unknown

Impact on / interaction with marine life *(Tick one or several)*

Environmental damages caused by the FAD :

Entangled animals: ☐ Yes ☐ No ☐Unknown	Entangled on corals: ☐ Yes ☐ No ☐Unknown Entangled on mangrove: ☐ Yes ☐ No ☐Unknown
Entangled animals? ☐ Turtle ☐Shark ☐Fish ☐Marine mammal ☐Unknown ☐Other: _____ **Status:** ☐Dead ☐Alive ☐ Unknown **Species** (*if known*): _____ **Number of individuals**: _____	**If FAD is entangled on coral reef or mangrove, please state the approximate size of the area impacted (m²):**_____ _____ _____

Fish caught around the FAD: ☐No ☐Yes ☐Unknown	**Fish or other animals aggregated around the FAD :**
If yes, **Species** (*if known*): _____ If yes, **Weight of the catch (in kg)** (*if known*): _____ **Number of individuals**: _____	☐No ☐Yes ☐Unknown If yes, **Species** (*if known*): _____ **Number of individuals**: _____

Comments: _____
_____

Number of pictures: _____