INTER-AMERICAN TROPICAL TUNA COMMISSION

PERMANENT WORKING GROUP ON FLEET CAPACITY

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CAP-27-02

EVALUATION OF POTENTIAL FLEET CAPACITY INCREASES AT THE IATTC: TARGET CAPACITY, TRADE-OFFS WITH DAYS OF CLOSURE, AND KEY CONSIDERATIONS

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This document was developed in response to Recommendation 1.1. of SAC-17:

That the staff present to the Commission an analysis on the potential equivalence in cubic meters of carrying capacity in relation to the various options for reducing the number of days of closure, as well as possible alternatives for addressing pending capacity claims from CPCs in accordance with document SAC-06-INF-B and its Addendum, taking into account the current status of tropical tuna populations and the potential future impact of a possible activation of this pending capacity.

SUMMARY

The most recent stock assessments for tropical tunas in the eastern Pacific Ocean (EPO) indicate that all three species (yellowfin, bigeye, and skipjack) are in good health. In particular, the introduction of the Individual Vessel Threshold (IVT) management measure has substantially decreased the fishing mortality on juvenile bigeye. Therefore, bigeye is no longer the species requiring the most restrictive management. Consequently, the purse-seine closure, which is the main management measure applied to the tropical tuna purse-seine fishery in conjunction with fleet capacity restrictions, could be substantially reduced.

There are numerous longstanding requests for increases in fleet capacity at the IATTC. However, any increase in capacity involves a corresponding trade-off with the duration of the closure. Historically, the staff has relied on an approximate conversion factor of one additional day of closure for every 1,000 m^3 of added capacity. Although this remains a reasonable approximation, the actual relationship depends on the current fleet capacity, the current days of closure, and the amount of capacity increased. The equivalent additional closure days are therefore presented for a range of capacity-increase scenarios (see Table 2).

Historically, the target capacity of 158,000 m^3 was derived largely from analyses aimed at maximizing the catch of yellowfin tuna. However, this target has become outdated as the fishery has evolved, particularly with a large increase in purse-seine sets on floating objects, which primary target skipjack tuna. Optimal capacity, defined as the capacity that would produce the maximum sustainable yield (MSY) in the absence a closure, differs among species. It also varies according to the fishing mortality objective used, including MSY-based reference points and the $F_{30\%}$ target proposed by the staff for the tropical tuna Management Procedure. Under the $F_{30\%}$ target, current fleet capacity is approximately equal to the estimated optimal capacity for the stock requiring the most restrictive management, the southwest yellowfin stock.

Substantial uncertainty remains in the stock assessments due to the limited types of data available. There

is also potential uncertainty in the implementation of the capacity limits and days of closure due to the ability of vessels to change set type and target species. These uncertainties should be considered when adopting management actions. This is particularly important for changes in fleet capacity, which are generally more permanent and more difficult to reverse than adjustments to closure duration and therefore involve a higher level of risk. Further uncertainty arises in defining both current and additional capacity, including the proportion of the year that individual vessels operate in the EPO. These risks could be reduced by improving the data and stock assessments and by developing more species-specific management measures, including measures that limit the ability of vessels to shift among set types.

The set types used by a vessel, and the resulting species composition of its catch, are major considerations when evaluating changes in fishing capacity. More broadly, this issue extends beyond capacity management and should be considered regardless of the management framework adopted, as it directly influences species-specific fishing mortality and the effectiveness of management measures.

Providing future management advice about potential changes in fleet capacity will benefit from a clear set of multi-species management objectives. This is particularly important in a multi-gear, multi-species fishery such as the EPO tropical tuna fishery. Such objectives would provide a stronger basis for defining target capacity and evaluating trade-offs among fleet capacity, closure duration, and other management measures.

Management measures are currently controlled by the species requiring the most restrictive management. Adopting management measures that are more species focused would allow for increased fishing mortality on a specific species reducing risk, as mentioned above, potentially allowing for less restrictive management (e.g., increases in capacity).

1. INTRODUCTION

Regulating purse-seine fishing capacity in the eastern Pacific Ocean (EPO) is one of the principal management tools used by the Inter-American Tropical Tuna Commission (IATTC) to ensure the sustainable exploitation of tropical tunas. Other management measures, such as seasonal closures, are applied in combination with capacity limits to fine-tune management in response to stock assessment results. Requests for increases in purse-seine capacity are currently under discussion at the IATTC (see Section 7 in CAP-27-01). Any such increases would interact with other management measures, and the complex nature of the fishery must therefore be taken into account when evaluating trade-offs among management measures and objectives. Information intended to support these decisions is provided in this document.

This document is organized as follows:

- **Sections 1–4:** Provide a simplified description of the complex and diverse nature of the fisheries, together with selected historical context relevant to current decision-making.
- **Sections 5–6:** Discuss the concept of target capacity and the methods used to estimate it.
- **Section 7:** Presents possible capacity-increase scenarios based on the different requests, together with the associated trade-offs with the duration of the seasonal closure (staff's response to Recommendation 1.1. of SAC-17).
- **Section 8:** Identifies considerations relevant to decisions on potential increases in fleet capacity.
- **Section 9:** Presents considerations for refining capacity management.
- **Section 10:** Discusses Questions 1–3 from the list considered at the first intersessional meeting of

the Working Group on Fleet Capacity, presented in Annex 5 of CAP-27-01.

2. HISTORIC DEVELOPMENT OF FLEET CAPACITY MANAGEMENT IN THE EPO

The following provides a summary of the main trends in the evolution of purse-seine fleet capacity in the EPO tuna fishery. **Table A.1** in the appendix summarizes the principal capacity-related decisions adopted by the IATTC.

Early development of the purse-seine fleet and the overcapacity crisis of the 1970s

The EPO purse-seine fleet expanded rapidly during the 1960s and 1970s, driven by strong demand for canned tuna and technological improvements in vessel design and fish-finding. By the mid-1970s, fleet capacity had grown to a level that generated fishing mortality estimated to be substantially above target levels for yellowfin tuna, reaching an average of 196,000 m^3 in 1980-1981 (**Figure 1**). This resulted in the closure of the Commission Yellowfin Regulatory Area (CYRA) for three to four months annually.

The extended closures proved economically unsustainable for many operators, and a significant portion of the fleet relocated to the western and central Pacific Ocean (WCPO). As a result, capacity declined by 27%, to an average level of approximately 141,000 m^3 during the mid- to late 1980s.

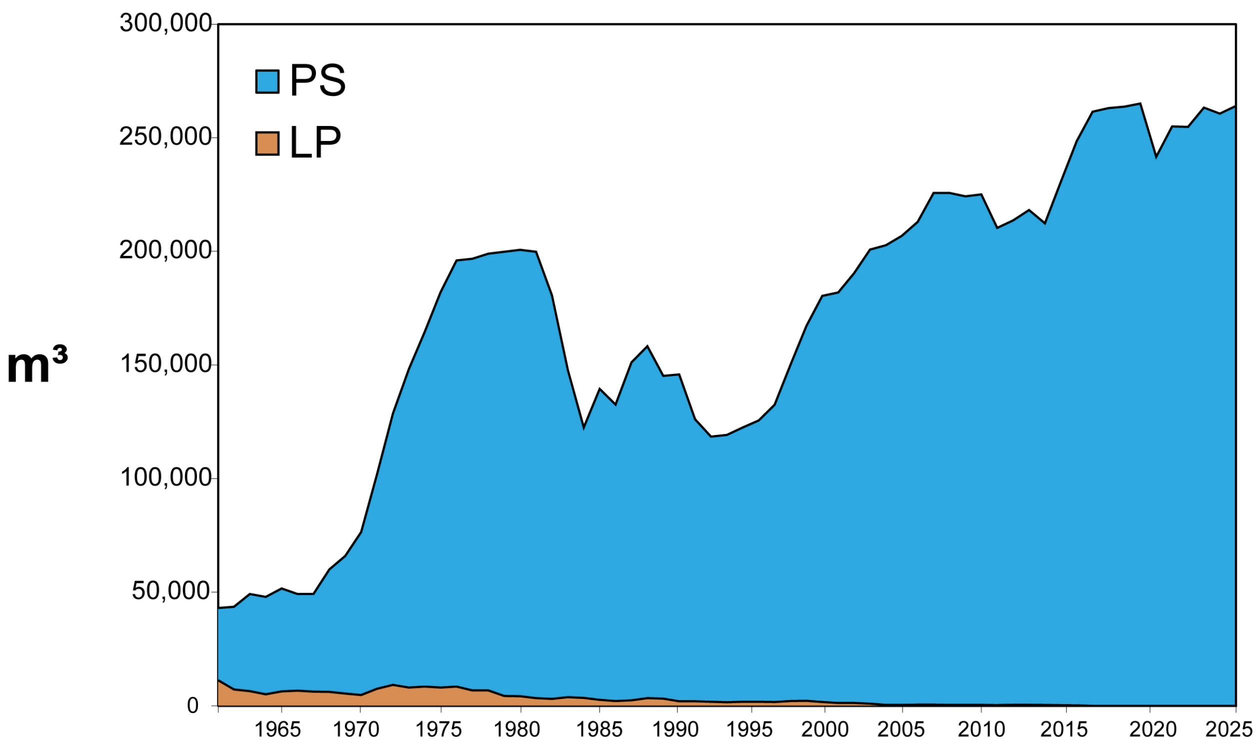

FIGURE 1. Carrying capacity, in cubic meters of well volume, of the purse-seine and pole-and-line fleets in the EPO, 1961-2025. Early years have been converted from metric tons to cubic meters.
FIGURA 1. Capacidad de acarreo, en metros cúbicos de volumen de bodega, de las flotas de cerco y de caña en el OPO, 1961-2025. Los datos de los primeros años se han convertido de toneladas métricas a metros cúbicos.

Increased capacity with the expansion of the floating-object fishery since the mid-1990s

Following a period of relatively low fishing pressure during the 1980s and early 1990s, when no seasonal closures were required, fleet capacity began to grow again. Much of this increase was driven by the expansion of the floating-object fishery in the EPO (**Figure 2**), and increasing catches of skipjack tuna.

In the early 1990s, total capacity averaged approximately 120,000 m³ (1991–1994). Since then, it has gradually trended upward over the following three decades, reaching a historical peak of 265,000 m³ in 2019. The COVID-19 pandemic resulted in a 9% decline in operational capacity in 2020, after which capacity gradually increased, reaching 264,000 m³ in 2025 close to its historical peak.

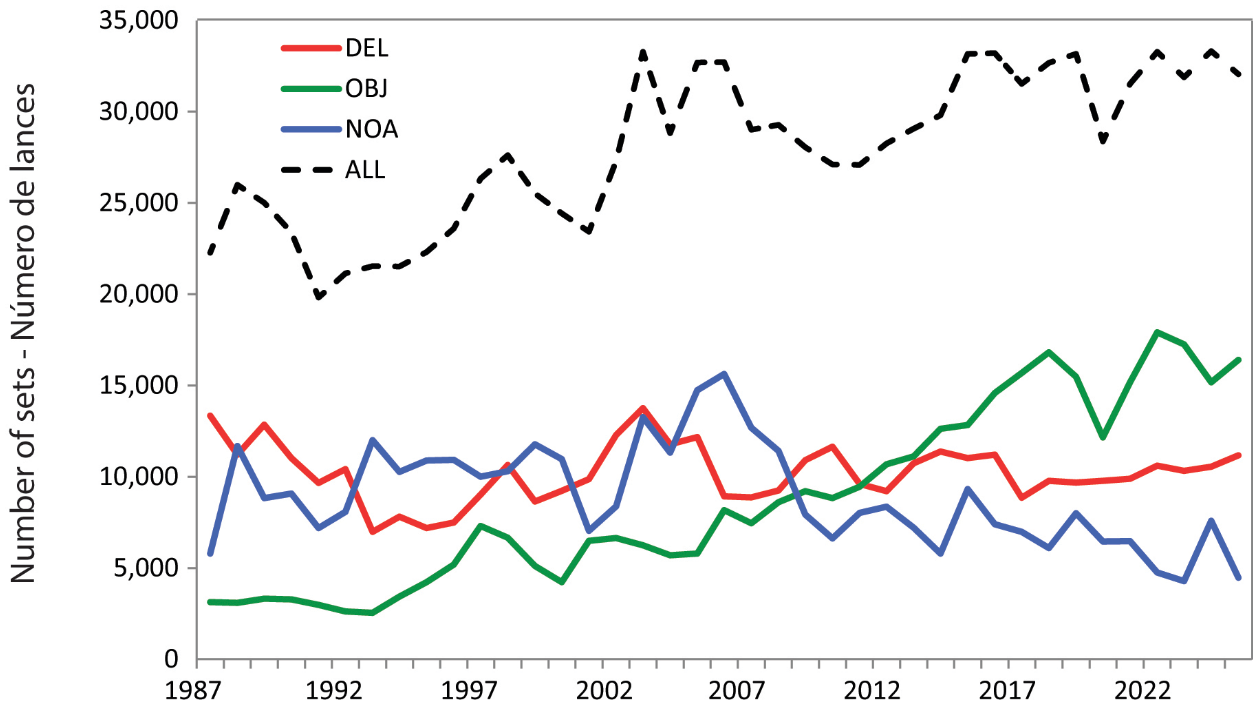

FIGURE 2. Number of purse-seine sets, in the EPO by set type.
FIGURA 2. Número de lances de red de cerco en el OPO, por tipo de lance.

3. INTERPRETING FLEET CAPACITY IN A MULTI-SPECIES, MULTI-FISHERY SYSTEM

Initial management of the purse seine fishery in the EPO focused on yellowfin tuna. However, the current tropical tuna purse seine fishery is a multi-species fishery using a combination of fishing methods that interacts with other fishing gears. The system can be simplified into three main interacting components:

1. The purse-seine fishery for yellowfin tuna associated with dolphins;
2. The purse-seine fishery for skipjack tuna associated with floating objects, which also catches substantial quantities of bigeye and yellowfin tuna; and
3. The longline fishery targeting primarily bigeye tuna.

In an idealized system, these components would operate independently and could be managed separately to maximize the sustainable yield of each target species. In practice, however, they are closely interconnected because each component catches multiple species. Consequently, changes in fishing effort or management measures in one component can affect the management requirements of the others. Additional fishing modes, particularly purse-seine sets on unassociated schools, must also be considered. Moreover, most large purse-seine vessels make more than one type of set (dolphin-associated, unassociated and floating-object sets), further limiting the extent to which fleet capacity can be associated with a single species or fishing mode.

Before the expansion of the floating-object fishery in the mid-1990s, most fishing effort was directed toward yellowfin tuna associated with dolphins. Under those conditions, management could focus primarily on yellowfin tuna, and measures such as limits on fleet capacity or the duration of the fishing season could, in principle, be designed to maximize its sustainable yield.

The subsequent expansion of purse-seine fishing on floating objects fundamentally changed this situation. Floating-object sets primarily target skipjack tuna but also catch juvenile bigeye and yellowfin tunas. Management therefore had to account increasingly for the conservation needs of bigeye tuna, which for many years required the most restrictive measures. The type of set made by a vessel thus became an important determinant of its impact on the different tuna stocks.

However, separately regulating vessels, trips, or individual sets according to fishing mode was generally not considered practically feasible to the Commission and its stakeholders. Management therefore continued to rely primarily on fleet-wide measures, particularly capacity limits and seasonal closures. As a result, over recent decades, the duration of the closure was largely determined by the stock requiring the strictest management, bigeye tuna, because of its vulnerability to the floating-object fishery.

Although this approach provided a practical and broadly acceptable management framework, it was not necessarily efficient in terms of maximizing the combined yield of the tropical tuna fisheries. Increasing effort in the floating-object fishery, particularly the continuing growth in the number of sets, contributed to the need for increasingly restrictive measures for bigeye tuna. This created incentives to develop more targeted management instruments, in particular the recent Individual Vessel Threshold (IVT) measure to reduce bigeye catches on floating-object sets.

The recent success of the IVT measure in reducing fishing mortality on juvenile bigeye has contributed substantially to the improved status of the bigeye stock (see Section 1.1.2.a in SAC-17-10). All three tropical tuna species are currently considered to be in a healthy state, and there is potential for substantial reductions in the days of closure. Because a trade-off exists between closure duration and fleet capacity, some scope for increases in capacity may also exist. These developments make a broader consideration of purse-seine capacity particularly timely, while recognizing the uncertainties and other factors that must inform any decisions regarding possible changes in capacity.

4. ADJUSTING DAYS OF CLOSURE FOR INCREASES IN CAPACITY

Under the IATTC's management framework, changes in fleet capacity have been explicitly linked to adjustments in the days of closure. Under the operational harvest control rule applied by IATTC staff and the interim harvest control rule adopted under Resolution C-23-06, management advice is derived from estimates of current fishing mortality (F_{cur}, averaged over the most recent three years in the stock assessment) relative to a target fishing mortality (F_{target}, corresponding to F_{MSY} or to a proxy reference point such as the staff's proposed $F_{30\%}$ in SAC-15-05). The required proportional change in fishing mortality is translated into a change in fishing days and ultimately into a recommendation for the number of closure days (**Eq. 1**; also see Appendix). As a result, increases in fleet capacity require longer closures to maintain a given level of fishing mortality.

$$DoC_{new} = 365 - (365 - DoC_{old})\frac{F_{target}}{F_{cur}}\frac{Capacity_{old}}{Capacity_{new}} \qquad \text{E.q. 1}$$

5. TARGET CAPACITY

Target capacity is a central concept in IATTC capacity management. As used by the IATTC, it is a broad term covering multiple management objectives and has neither been calculated to precisely achieve a single objective nor fine-tuned over time. The historically used figure of 158,000 m³ is best understood as the Commission's target or objective capacity for the EPO purse-seine fleet, rather than as the result of a single definitive analysis. It emerged from the specific historical context of the late 1990s, including the fleet size and closure regime prevailing at the time, as well as assumptions about what might constitute an optimal fleet size, particularly yellowfin tuna (**Table A.2**).

The simplest approach to determining target capacity in the EPO is to identify the fleet capacity that maximizes total yield while minimizing the need for a seasonal closure. This concept of "optimal capacity" has historically been evaluated for the EPO tropical tuna fishery primarily by focusing on maximizing yellowfin tuna catch. **Table A.3** summarizes the results of these analyses, which generally produced estimates ranging from 155,000 to 177,000 m³. Despite differences in methodology and time frame, these estimates were broadly consistent with the original target-capacity figure of 158,000 m³.

However, "optimal capacity" depends on management objectives, stock productivity, fleet composition (e.g., the relative composition of set types), fishing efficiency, and other factors. Because the EPO tuna fishery is multispecies and multigear, the optimum capacity for yellowfin tuna may differ from that for skipjack, and the optimum capacity for the purse-seine fleet may also depend on the capacity and fishing activity of the longline fleet. Consequently, there is effectively a family of "optimal" capacities, depending on which species management is optimizing for, and interactions among gear types.

5.1. Optimal fleet size based on current stock status

Estimates of optimal capacity for each stock were calculated using the results of the most recent stock assessments and risk analyses (Equation A.5). For yellowfin, optimal capacity estimates were calculated both under the assumption of a single stock for the entire EPO and separately for the northeast (NE) and southwest (SW) stocks, which imply stricter management requirements (**Table 1**).

Based on F_{MSY}, the northeast (NE) yellowfin stock requires the strictest management and corresponds to an optimal capacity estimate of 390,256 m³. Under the staff's proposed target of $F_{30\%}$ (SAC-15-05), the southwest (SW) yellowfin stock requires the strictest management and corresponds to an optimal capacity of 272,152 m³. Both estimates are substantially higher than the historical target capacity of 158,000 m³. The F_{MSY}-based estimate for NE yellowfin stock is also substantially higher than the current capacity of the purse-seine fleet operating in the EPO (272,786 m³; Weekly Report No. 2026-19, January 1–May 10, 2026), whereas the $F_{30\%}$-based estimate indicates that the current capacity operating in the EPO is already close to the level consistent with the $F_{30\%}$ target for the SW yellowfin stock.

Table 1. Estimates of optimal capacity based on the most recent stock assessments for the tropical tuna stocks in the EPO (SAC-16-03 for yellowfin, SAC-16-04 for skipjack, SAC-17-03 for bigeye). For yellowfin tuna, estimates are provided for both the EPO-wide assessment and the alternative stock structure assumption of separate northeast (NE) and southwest (SW) stocks. The F_{cur}/F_{target} ratios derived from the stock assessments, along with the operative capacity corresponding to the terminal period of each assessment, are also presented (2021–2023 for yellowfin and skipjack; 2023–2025 for bigeye). For the optimal capacity calculations using Equation 3 (Appendix), the F_{cur}/F_{target} ratios were derived from the median of the risk analysis ensemble of stock assessment models, using the median values across operating models and averaging F_{cur} over the most recent three years available for each assessment. Closure days at current capacity is calculated using Eq. A.3 and the current operative capacity (272,786 m³; Weekly Report No. 2026-19, January 1–May 10, 2026).

Tabla 1. Estimaciones de la capacidad óptima basadas en las evaluaciones más recientes de las poblaciones de atunesn tropicales en el OPO (SAC-16-03 para el atún aleta amarilla, SAC-16-04 para el atún listado y SAC-17-03 para el patudo). En el caso del atún aleta amarilla, se proporcionan estimaciones tanto para la evaluación de todo el OPO como para la hipótesis alternativa de estructura de la población, que distingue entre poblaciones separadas del noreste (NE) y del suroeste (SO). También se presentan las relaciones Factual/Fobjetivo t derivadas de las evaluaciones de las poblaciones, junto con la capacidad operativa correspondiente al período final de cada evaluación (2021-2023 para el atún aleta amarilla y el barrilete; 2023-2025 para el patudo). Para los cálculos de la capacidad óptima mediante la ecuación 3 (apéndice), las relaciones Factual/Fobjetivo se obtuvieron a partir de la mediana del conjunto de modelos de evaluación de poblaciones del análisis de riesgo, utilizando los valores de la mediana de todos los modelos operativos y calculando el promedio de Factual de los tres últimos años disponibles para cada evaluación. Los días de veda con la capacidad actual se calculan utilizando la ecuación A.3 y la capacidad operativa actual (272.786 m³; Informe semanal n.º 2026-19, del 1 de enero al 10 de mayo de 2026).

Stock	Target	Years	F_{cur}/F_{target}	Closure days	Closure days at current capacity	Period operating capacity (m^3)	Optimal capacity (m^3)
BET	MSY	2023-2025	0.52	72	-177	262,608	405,396
	B30%	2023-2025	0.70	72	-38	262,608	301,151
YFT EPO	MSY	2021-2023	0.40	72	-327	257,662	517,089
	B30%	2021-2023	0.56	72	-129	257,662	369,349
YFT NE	MSY	2021-2023	**0.53**	72	-157	257,662	**390,256**
	B30%	2021-2023	0.72	72	-19	257,662	287,272
YFT SW	MSY	2021-2023	0.50	72	-189	257,662	413,671
	B30%	2021-2023	**0.76**	72	1	257,662	**272,152**
SKJ	B30%	2021-2023	0.42	72	-294	257,662	492,466

These fleet capacity estimates are based on the median values of F_{cur}/F_{target} from the stock assessments and associated risk analysis. However, the risk analysis was specifically designed to represent uncertainty in the system through an ensemble of models reflecting alternative plausible assumptions about population and fishery dynamics. To evaluate uncertainty in optimal fleet capacity for the stock requiring the strictest measures, SW yellowfin, the distribution of optimal fleet capacity estimates was calculated based on the distribution of $F_{30\%}$ values across the ensemble of operating models. The resulting cumulative probability distribution (**Figure 3**) allows estimation of the probability that the optimal capacity lies above or below any specified capacity level. For example, under the SW yellowfin stock hypothesis at $F_{30\%}$, there is approximately a 97% probability that the optimal capacity exceeds the historical target capacity of 158,000 m³, but only about a 50% probability that it exceeds the current operating capacity of 272,786 m³.

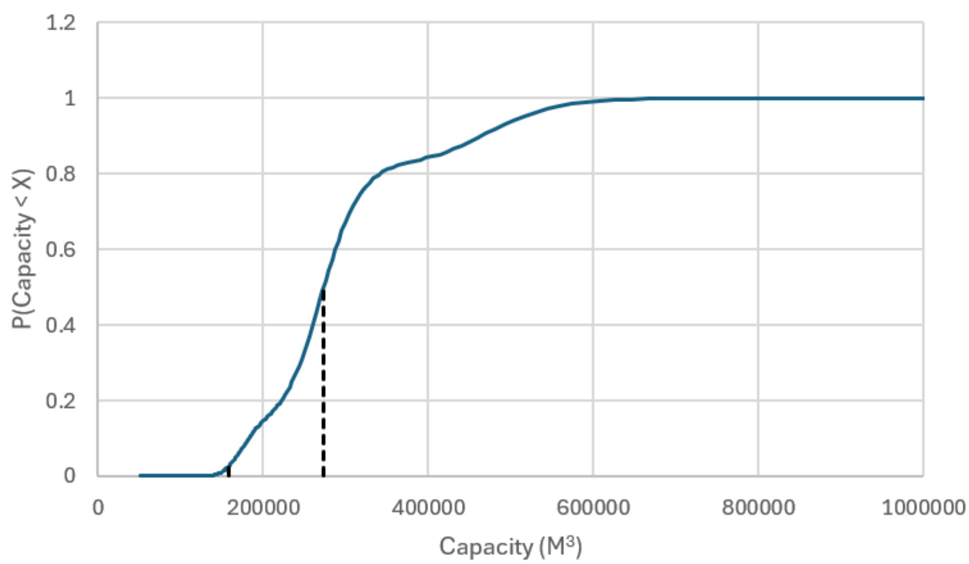

FIGURE 3. Cumulative probability (probability that optimal capacity is below a given fleet size) distributions of the optimal capacity estimate for the southwest (SW) yellowfin stock. The vertical lines are at the historical target capacity (158,000 m³) and the current operating capacity (272,786 m³).
FIGURA 3. Distribuciones de probabilidad acumulada (probabilidad de que la capacidad óptima sea inferior a un tamaño determinado de la flota) de la estimación de la capacidad óptima para la población de atún aleta amarilla del suroeste (SO). Las líneas verticales se sitúan en la capacidad objetivo histórica (158 000 m³) y en la capacidad operativa actual (272 786 m³).

6. POTENTIAL FOR INCREASED YIELD

Current stock assessments indicate that all three species are in a healthy state and that fishing mortality could be increased to obtain higher yields, whether managed relative to F_{MSY} or $F_{30\%}$. Such an increase could be achieved through a reduction in closure days, an increase in fishing capacity, a combination of both, or the use of other management measures. There are tradeoffs among increasing fishing mortality and other management objectives. Therefore, it is useful to evaluate the potential increases in yield resulting from increases in fishing mortality.

SAC-17 INF-Q evaluated the potential increases in yield for yellowfin and skipjack under F_{MSY} and $F_{30\%}$. Bigeye tuna was not evaluated as the introduction of the IVT implies that maximizing yield for bigeye in the purse-seine fishery is not considered a current management objective. The results for yellowfin were highly variable depending on the assumptions in the models included in the risk analysis. Nevertheless, the potential increases were low (< 20%) except under a small number of models. In contrast, the estimated increases in skipjack yield were substantially higher, averaging about 50% (e.g., **Figure 4**).

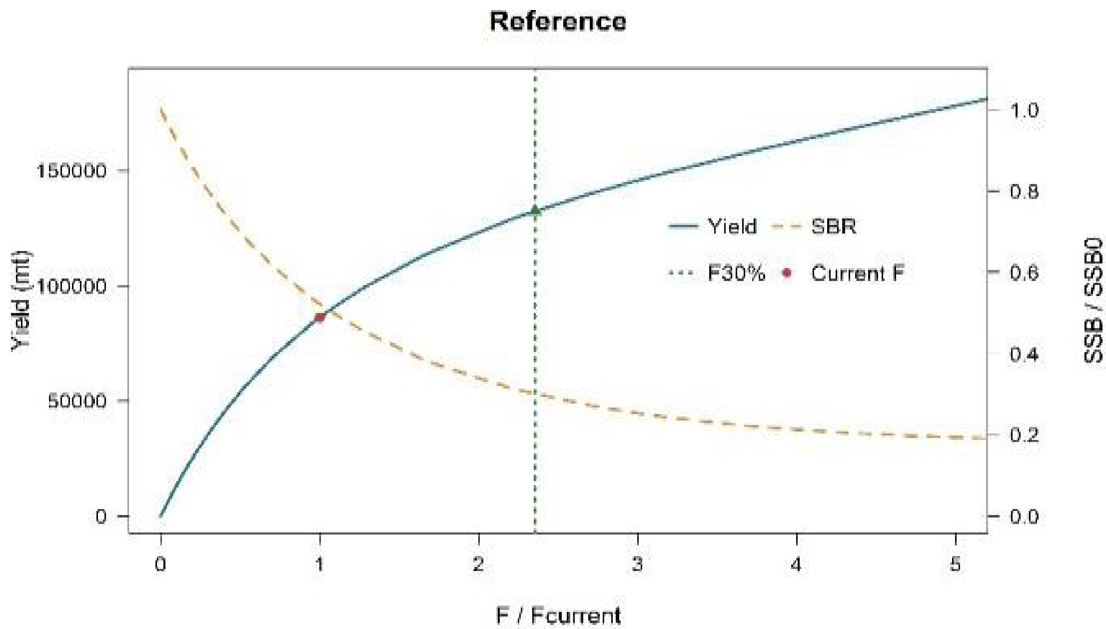

FIGURE 4. Example equilibrium yield (quarterly; i.e., multiply by for the annual value) curve for skipjack tuna (reference model) showing the increase in yield when fishing mortality is increased from the current level to that corresponding to $F_{30\%}$ (vertical dashed line).
FIGURA 4. Ejemplo de curva de rendimiento en equilibrio para el atún barrilete (modelo de referencia) que muestra el aumento del rendimiento cuando la mortalidad por pesca se incrementa desde el nivel actual hasta el correspondiente a $F_{30\%}$ (línea discontinua vertical).

7. IMPACT OF FLEET CAPACITY INCREASES ON CLOSURE DAYS

There are currently numerous pending capacity requests, claims and contested administrative decisions under consideration by the IATTC (see Section 7 in CAP-27-01). These cases arise from a variety of circumstances and rationales. Evaluating the validity of these requests is beyond the scope and authority of this report. Therefore, an evaluation is made for each pending case of potential increase in capacity. All calculations assume that additional capacity is added to the current operating level of 272,786 m³ (Weekly Report No. 2026-19, January 1–May 10, 2026). It should be noted that this current capacity is higher than the levels during the time frame used to calculate F_{cur}/F_{target} in the assessment.

Historically, in calculating the trade-off between days of closure and fleet capacity, the IATTC staff has used the approximate conversion factor of 1,000 m³ of capacity being equivalent to one day of closure. However, the actual relationship is a function of both the current closure duration and the current fleet capacity (see **Figure 5** and equation A.6 in Appendix). Under the current days of closure (64 days) and fleet capacity (272,786 m³), one additional day of closure is equivalent to approximately 909 m³ of capacity

(Equation A.6). Moreover, the conversion factor varies with the magnitude of the requested capacity change. For example, an increase of 20,000 m³ in fleet capacity corresponds to approximately 973 m³ per additional day of closure.

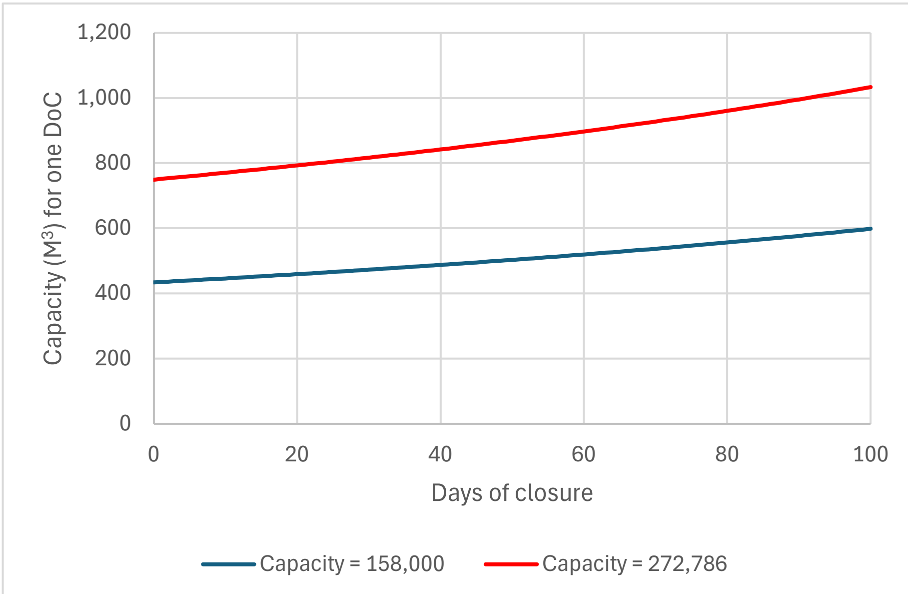

FIGURE 5. Equivalent fleet capacity per day of closure under different closure levels for the historic target capacity (158,000 m³) and current capacity (272,786 m³).
FIGURA 5. Capacidad equivalente de la flota por día de veda en función de los distintos niveles de veda, tanto para la capacidad objetivo histórica (158.000 m³) como para la capacidad actual (272.786 m³).

Table 2 provides the equivalent days of closure days associated with each capacity request, as well as with subtotals of those requests. Values are provided under the current 64-day closure (Resolution C-25-01) and under the 50-day closure corresponding to the first management cycle (2027-2029) of the staff's proposed management procedure (IATTC-104 INF-A). Under the 50-day closure, the equivalent number of closure days associated with a given capacity increase is approximately 5% higher than under the current 64-day closure.

Table 2. Equivalent days of closure days associated with each capacity request, as well as with subtotals of those requests. Values are provided under the current 64-day closure (Resolution C-25-01) and under the 50-day closure corresponding to the first management cycle (2027-2029) of the staff's proposed management procedure (IATTC-104 INF-A). The calculations are made using Equation A7 in appendix (*Capacity*$_{old}$ is assumed to be the current operative capacity of 272,786 m³).

Request	Capacity (m^3)		Days (64)	Days (50)
Historical				
a. Footnote in Resolution C-02-03				
Peru	5,851		6	7
Costa Rica	7,058		8	8
Colombia	4,772		5	5
Subtotal		**17,681**	**18**	**19**
b. Contested				
Bolivia	5,830		6	7
Vanuatu	1,358		1	2
Venezuela	3,805		4	4
Subtotal		**10,993**	**12**	**12**
c. New Requests				
El Salvador	2,105		2	2
Nicaragua	4,200		5	5
Honduras	3,000		3	3
Guatemala	9,000		10	10
Mexico	2,000		2	2
Subtotal		**20,305**	**21**	**22**
d. Other cases				
Ecuador		3,688	4	4
Subtotal		**52,667**	**49**	**51**
New				
a. New requests				
Belize	2,638		3	3
Bolivia	5,000		5	6
Panama	3,000		3	3
Vanuatu	12,500		13	14
Subtotal		**23,138**	**24**	**25**
b. Other cases				
Ecuador		178	0	0
Subtotal		**23,316**	**24**	**25**
Total		**75,983**	**66**	**69**

Under the current fleet capacity, the estimated days of closure required to achieve the $F_{30\%}$ target for the SW yellowfin stock is one day. However, as noted above, this estimate is subject to uncertainty, as reflected in the stock assessment and risk analysis. The results of the risk analysis can therefore be used to evaluate risks associated with increases in fleet capacity.

Two outcomes related to closure duration have been identified as undesirable in IATTC discussions and MSE workshops: (1) a closure exceeding 72 days; and (2) an increase of more than 10 closure days. **Figure 6** shows the probability of each outcome under different levels of additional fleet capacity and the current closure duration for the SW yellowfin stock requiring the strictest management. These probabilities reflect the uncertainty that remains in the stock assessments, as represented by the risk analysis.

For example, at current fishing capacity there is approximately 20% probability that the required closure would exceed 72 days. However, if current capacity is increased by 30,000 m^3, the risk increases to approximately 30%. There is approximately a 20% probability that the correct days of closure is 10 days or more greater than 50 days of closure (the value for the first management cycle of the proposed management procedure) at the current capacity. This probability increases to approximately 30% when capacity is increased by 20,000 m^3.

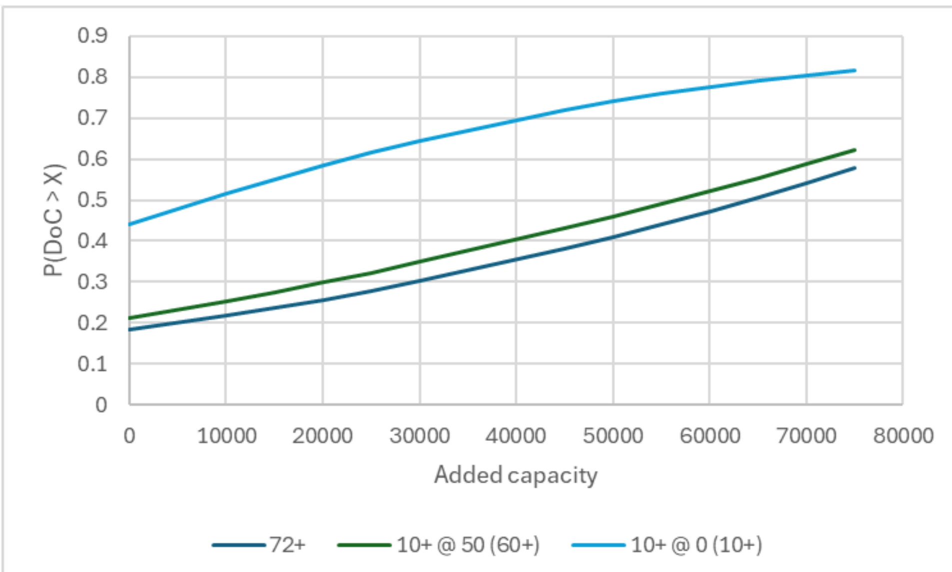

FIGURE 6. Probability that the closure required to achieve the $F_{30\%}$ target for the SW yellowfin stock will: (1) exceed 72 days; (2) require an increase of at least 10 closure days if the current closure is 50 days (i.e., a closure of 60 days or more); and (3) require a closure of at least 10 days if no seasonal closure is implemented (i.e., 10 days or more), under different levels of additional fleet capacity.
FIGURA 6. Probabilidad de que la veda e necesaria para alcanzar el objetivo del 30 % para la población de aleta amarilla del suroeste: (1) supere los 72 días; (2) requiera un aumento de al menos 10 días de veda si la veda actual es de 50 días (es decir, una veda de 60 días o más); y (3) requiera una veda de al menos 10 días si no se aplica ninguna veda estacional (es decir, 10 días o más), en función de diferentes niveles de capacidad adicional de la flota.

8. CONSIDERATIONS FOR DECISION-MAKING

The complex nature of the tropical tuna fishery, including the different fisheries and gear types, the species they catch, and the range of possible management objectives, raises several important considerations when evaluating potential increases in fishing capacity. These factors, which may influence both the appropriate level and the composition of fishing capacity, are discussed below.

8.1. Catch by species and set type

As mentioned previously, the different purse seine set types catch different proportions of the three tropical tuna species. Currently, the principal regulatory constraint on the type of set a vessel may make is the requirement to hold a dolphin mortality limit (DML) when setting on tuna associated with dolphins. Vessels with a DML can therefore switch relatively freely among set types, and many vessels make both floating-object and dolphin-associated sets. Consequently, even at the current level of fishing capacity, fishing mortality on a particular species may vary from year to year as vessels change their fishing strategies. For example, vessels that typically target yellowfin associated with dolphins could shift toward targeting skipjack associated with floating objects. Such a shift could increase fishing mortality on skipjack and bigeye, within the constraints set by the IVT measure, and potentially on juvenile yellowfin, while reducing fishing mortality on large yellowfin. The extent of those shifts between set types would, however, also be influenced by other constraints, including processing capacity and market demand.

The type of additional capacity will determine which species, and in the case of yellowfin, which potential stock (or management unit), will be most impacted. For example, adding only vessels without DMLs would be expected to have a greater effect on skipjack, bigeye, and juvenile yellowfin than adding vessels in proportions consistent with the set types composition of the current fleet. The evaluation of increased capacity provided above assumes that the additional capacity reflects the current fleet's proportions of the different set types. Departures from this assumption will bias the results of the analysis presented. A more comprehensive evaluation would require estimating both current and additional capacity by set type (e.g., using days of capacity fished by set type) and the additional capacity by set type.

The potential existence of different stocks for yellowfin tuna, as considered in the stock assessment, also implies that the areas fished by the additional capacity will also influence fishing mortality on each stock. At present, fishing capacity can freely switch among areas.

Constraining the set types, or the areas fished, of the additional capacity would allow the resulting increase in fishing mortality to be targeted among species more precisely.

8.2. Increased capacity and catch per unit of capacity

One consequence of increased capacity, and the associated increase in fishing mortality, is a reduction in population size leading to a reduction in catch-per-capacity (equivalently catch-per-vessel) (**Figure 7**). By contrast, increasing fishing mortality by reducing the number of closure days does not necessarily reduce catch per vessel, because each vessel is allowed to fish for a greater number of days, offsetting the effect of smaller population size. In fact, moving towards the target fishing mortality by reducing the days of closure is expected to increase catch-per-vessel.

The history of the EPO purse seine fishery illustrates the potential economic consequences of increased capacity. As fleet capacity expanded in the Yellowfin Regulatory Area (CYRA), the fishing season became progressively shorter, profitability declined, and part of the fleet ultimately left the EPO in the early 1980s (**Figure 1**).

A combination of reduced closure days and increased capacity could be identified that would maintain, or potentially increase, catch per vessel. However, estimating this combination with greater precision would require a reduction in the uncertainty associated with the stock assessments.

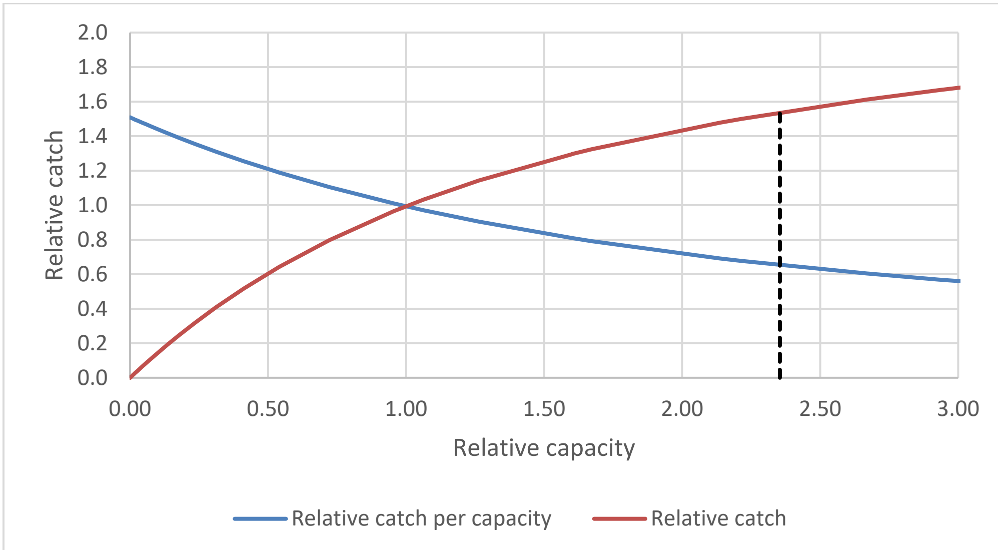

FIGURE 7. Illustration of the decline in equilibrium catch per unit of capacity (i.e., catch per vessel) as fishing capacity increases, based on the reference model from the skipjack stock assessment. Values are scaled relative to the current conditions (i.e., current = 1). The horizontal line indicates the capacity corresponding to $F_{30\%}$.

FIGURA 7. Ilustración de la disminución de la captura de equilibrio por unidad de capacidad (es decir, la captura por buque) a medida que aumenta la capacidad de pesca, con base en el modelo de referencia de la evaluación de la población de barrilete. Los valores están escalados con respecto a las condiciones actuales (es decir, valor actual = 1). La línea horizontal indica la capacidad correspondiente a $F_{30\%}$.

8.3. Defining capacity in terms of time fished

The amount of fishing capacity actually fishing (operative capacity) in the EPO is lower than the total authorized capacity. Some vessels may not be fishing in the EPO during a given year, while others may operate there for only part of the year, and this changes year to year. The operative capacity, its definition and calculation, is important when determining fishing mortality and how fishing mortality is impacted by addition capacity. The increase in fishing mortality depends on the current operative fishing capacity and how much of the additional capacity turns into operative capacity.

The definition of operative capacity used at IATC is complex. For a completed year, it is calculated as the sum of the well volume, in cubic meters, of all purse-seine vessels that made at least one set with catch in the EPO during that year, among other criteria (see Annex 1 in CAP-27-01). Thus, a vessel's full well volume is generally counted even if it operates in the EPO for only part of the year. A more accurate calculation of operative capacity may be needed to better evaluate the impact of increased capacity, including consideration of the proportion of a year that each vessel fishes in the EPO.

8.4. Capacity changes are less readily reversible than adjustments to closure days

Traditionally, the IATTC has limited fishing capacity and adjusted the number of closure days to fine-tune management in response to stock assessment results. This approach partially reflects the fact that seasonal closures are easier to modify than fishing capacity. For example, removal of capacity may require vessel buyback programs or other long-term measures.

Potential increases in capacity should therefore be evaluated considering the possibility that capacity may need to be reduced in the future. This is particularly relevant when uncertainty remains in the stock assessments. Future data or research may determine that stock status differs substantially from current estimates and the fishing mortality needs to be reduced substantially. In the IATTC context, this could require closures of impractical duration (**Figure 6**), reduction in capacity, or other management measures. Changes in management objectives and other considerations (e.g. ecosystem impacts and bycatch), could also affect the appropriate level of capacity. These considerations highlight the importance of retaining sufficient flexibility to respond to changing scientific information and management priorities.

8.5. Ecosystem considerations

The Antigua Convention provides a mandate for ecosystem-based management, and many sustainability labels carry ecosystem criteria. Ecosystem factors should therefore be considered when developing management advice, including capacity limits. Article VII(f) of the Convention provides the foundation for an Ecosystem Approach to Fisheries Management (EAFM); however, the Commission has not yet defined operational ecosystem objectives, and the staff has not evaluated the ecosystem impacts of large perturbations such as rapid, substantial increases in fishing capacity. The IATTC Strategic Science Plan (2026–2030; 103-INF-03a) sets out workplans to support both the definition of those objectives and the operationalization of EAFM through proper ecosystem-advice products (see EB-02-02).

Reference states for the ecosystem have not yet been defined at the IATTC, but they could be established under the implementation of the EB-02-02 workplan, alongside operational ecosystem objectives set as part of the definition of the objectives for the fishery. Until such objectives and reference states exist, the ecosystem consequences of significant capacity increases cannot be assessed against agreed benchmarks. For these reasons, and taking a precautionary approach, increases in fleet capacity should be regarded with caution, allowing the EAFM workplan to advance, including the clarification of ecosystem objectives and the establishment of reference states, and allowing its outputs to be used to track and monitor the potential ecosystem impacts of any capacity increase.

8.6. Socio-economic considerations

Socio-economic factors are relevant when defining management objectives and evaluating potential changes in fishing capacity. However, the staff currently lacks the data and specialized expertise needed to conduct a comprehensive socio-economic analysis. Such an analysis is therefore beyond the scope of this paper.

One socio-economic consideration that can be inferred from the biological analyses presented above is the effect of increased capacity on catch per vessel. Because the available resource is finite, increasing the number or capacity of vessels participating in the fishery may distribute the catch among more participants, reduce catch per vessel, and affect the economic returns of both existing and additional vessels.

This concern has long been recognized by the Commission. As noted in document IATTC-69-09b:

> *"The idea in limiting the size of the fleet is that otherwise the catches per vessel will decline, and the economic pressures on individual vessels will be so great that it would be very difficult to sustain an efficient conservation program."*

These factors have been discussed in the fisheries economics literature (e.g., Joseph, Squires). A Plan of Action of the Management of Fleet Capacity in the IATTC has recently been considered taking into account some of these factors (CAP-23 INF-A, INF-B and INF-C). Existing and future work integrating biological and socio-economic objectives could therefore improve advice on fleet capacity management.

9. REFINING CAPACITY MANAGEMENT

The management of tropical tuna in the EPO has historically relied on broadly applicable measures. These measures initially focused on yellowfin tuna and were later based on the species requiring the most restrictive management, which in recent years was typically bigeye. They included limits on vessel capacity and seasonal closures applying throughout the EPO. Although some species-specific measures were attempted, they were not maintained over the longer term. More recently, the introduction of the Individual Vessel Threshold (IVT) measure has been very successful in reducing the fishing mortality on juvenile bigeye. As a result, the southwest (SW) yellowfin stock has become the stock requiring the most restrictive management.

More species or stock-specific management is likely to allow fuller utilization of the skipjack resource while maintaining low fishing mortality on bigeye and preventing excessive fishing mortality on yellowfin. Achieving this combination would require increasing fishing effort on skipjack without proportionally increasing fishing mortality on the other species. Simply reducing closure days or increasing fishing capacity without additional restrictions is unlikely to achieve this objective.

Because skipjack is mainly caught in the floating object fishery, allowing further reductions in days closure and increasing capacity in the floating object fishery beyond the level consistent with required management of the SW yellowfin stock would require additional measures restricting the catch of bigeye and yellowfin. This would include ensuring that the bigeye IVT continues to maintain low fishing mortality on juvenile bigeye and adopting additional measures to restrict the fishing mortality on juvenile yellowfin in the floating object fishery. One potential measure is an IVT for yellowfin tuna in the floating object fishery. However, as was initially the case for bigeye, it is not clear yet what modifications in fishing strategy would allow vessels to avoid yellowfin effectively. The introduction of a yellowfin IVT would therefore likely require a trial period before substantial additional capacity was introduced. Other management measures could also be considered, including restrictions on the areas fished by the additional capacity.

10. DISCUSSION

Determining the appropriate level of purse-seine fishing capacity in the EPO, and evaluating the potential effects of additional capacity, is inherently complex. This paper addresses three questions currently under discussion by the Commission (questions 1–3 from the list considered at the first intersessional meeting of the Working Group on Fleet Capacity, presented in Annex 5 of CAP-27-01).

10.1. Do the current conditions of the resources and fishing activities in the EPO, nearly three decades later, still justify a diagnosis of excessive fishing capacity (question1)?

Whether fishing capacity is considered excessive depends on the management objectives. The process of defining objectives for the multispecies tropical tuna fishery is underway, but these objectives have not yet been adopted. Under the high-level objective established in the Antigua Convention of maintaining stocks at levels capable of producing maximum sustainable yield, current capacity does not exceed the level associated with F_{MSY} for the stock requiring the most restrictive management, the northeast yellowfin stock. However, fishing at F_{MSY} may not be the preferred management objective, and alternative levels, such as $F_{30\%}$, included in the proposed management procedure and adopted as a proxy for skipjack, may be more appropriate.

Current capacity is approximately equal to the estimated optimal capacity, defined as the capacity corresponding to zero closure days, for the stock requiring the most restrictive management under $F_{30\%}$, the southwest yellowfin stock. However, uncertainty in the stock assessment translates directly into uncertainty in the estimate of optimal capacity. The risk analysis indicates an approximately 50% probability that current capacity exceeds the estimated optimal level under $F_{30\%}$.

10.2. If such a diagnosis were still considered justified, is the historically defined target level of capacity still appropriate in practice, or should it be reviewed and possibly revised in accordance with paragraph 4 of Resolution C-02-03,[1] (question2)?

The historical definition of target capacity was based on management of yellowfin tuna corresponding to the purse seine fishery associated with dolphins. The current purse seine fishery is a multi-species fishery that includes a high proportion of sets on tuna associated with floating objects that mainly catches skipjack. Therefore, the old definition of capacity should be reviewed and revised taking into consideration management objectives.

The historical definition of target capacity was based primarily on management objectives for yellowfin tuna and on a purse-seine fishery dominated by dolphin-associated sets. The current purse-seine fishery, however, is a diversified, multi-species fishery in which a substantial proportion of fishing effort consists of sets on tuna associated with floating objects, which primarily catch skipjack but also affect bigeye and juvenile yellowfin. The historical definition of target capacity should therefore be reviewed and, as appropriate, revised to reflect management objectives taking into consideration fleet composition, set-type composition, and species-specific considerations.

10.3. Should the target level refer to the “operative” capacity rather than taking into account the total amount of “active” or “potential” capacity (see glossary) (question3)?

The scientific advice is based on the capacity of vessels that operate during the fishing year, and estimates of target or optimal capacity have therefore generally relied on the same concept. However, authorized vessels may or may not fish each year and, when active, may operate in the EPO for only part of the year. In addition, vessels may use different set types, with differing effects on the species caught and on species-specific fishing mortality. These factors complicate the relationship between authorized, operative, and effective capacity. The definition and estimation of operative capacity should therefore be re-evaluated to better account for vessel activity, time spent fishing in the EPO, and set-type composition.

10.4. Strategic considerations for future decisions on fleet capacity

Future decisions on fleet capacity will depend in part on the management approach selected by the Commission. Should the Commission decide to pursue a more explicit multi-species framework, the

[1] “*To review on a regular basis, and modify, if necessary, the methods for estimating fishing capacity and the target level of 158,000 m3, established in the resolution on fleet capacity of 19 August 2000, for the total capacity of the purse-seine fleet, taking into account the level of the stocks of tuna and other relevant factors*.”

following considerations could help inform its deliberations:

- **Clarifying multi-species management objectives.** A more explicit set of objectives for the different tropical tuna stocks could provide a stronger basis for defining target capacity and evaluating trade-offs among fleet capacity, closure duration, and other management measures.
- **Recognizing the different risks associated with capacity and closure adjustments.** Increases in fleet capacity are generally more permanent than changes in closure duration and therefore involve a different level of risk. These risks could be reduced through lower uncertainty in the stock assessments and the development of more species-specific management measures, including measures that reduce the ability of vessels to shift freely among set types.
- **Considering more species-focused management measures.** Under the current framework, management measures are generally determined by the species requiring the most restrictive management. More species-focused measures could allow fishing mortality to increase for stocks capable of supporting higher levels of exploitation while reducing risks to more vulnerable stocks. This approach could also allow for less restrictive management overall, including, where appropriate, increases in fleet capacity.

APPENDIX: CALCULATION OF CAPACITY AND DAYS OF CLOSURE

Fishing mortality is assumed to be proportional to the portion of the year the fishery is open and to the fleet capacity

$$F = q \times (365 - DoC) \times Capacity \qquad \text{E.q. A1}$$

where q is the proportionality coefficient and DoC is days of closure.

Note that to simplify the calculations these equations do not include the Corralito, which was included in the original calculations. The Corralito has been assumed to be equal to 3 days of closure. This equivalence for the Corralito is only a rough approximation and its effect on the calculation of capacity DoC equivalence is very minor.

This equation can be used to determine changes in capacity or DoC associated with changes in fishing mortality.

$$\frac{F_{new}}{F_{old}} = \frac{q \times (365 - DoC_{new}) \times Capacity_{new}}{q \times (365 - DoC_{old}) \times Capacity_{old}} \qquad \text{E.q. A2}$$

Where q cancels out.

This equation can be used to derive equations for the DoC and capacity given the target fishing mortality (where F_{target} is the new fishing mortality and F_{cur} is the old fishing mortality) and values for the other quantities.

$$DoC_{new} = 365 - (365 - DoC_{old}) \frac{F_{target}}{F_{cur}} \frac{Capacity_{old}}{Capacity_{new}} \qquad \text{E.q. A3}$$

$$Capacity_{new} = \frac{365 - DoC_{old}}{365 - DoC_{new}} \frac{F_{target}}{F_{cur}} Capacity_{old} \qquad \text{E.q. A4}$$

The optimal capacity can be calculated by setting the DoC_{new} to zero (no closure). In this case the old capacity and days of closure must be set at the levels corresponding to the reference years used in the stock assessment to calculate F_{target} and F_{cur}.

$$Capacity_{\mathrm{optimal}} = Capacity_{ref} \frac{365 - \mathrm{DoC}_{ref}}{365} \frac{Ftarget}{Fcur} \qquad \text{E.q. A5}$$

The equation can also be used to evaluate the trade-off between DoC and fleet capacity (**Figure 2**).

Capacity is not directly related to DoC, but rather to the number of days the fishery is open (365 − DoC). The relationship between capacity and DoC is non-linear (**Figure 3**). As a result, there is no single conversion factor between capacity and closure days' the capacity equivalent of a one-day change in DoC depends on the current level of closure and the current level of the capacity.

$$Capacity_{\text{one DoC}} = Capacity_{ref}\frac{365-\text{DoC}_{ref}}{365-(\text{DoC}_{ref}+1)} - Capacity_{ref} \qquad \text{E.q. A6}$$

The equivalent days of closure corresponding to a given increase in capacity can be calculated from equation A3. The target fishing mortality is assumed to be equal to the current fishing mortality therefore the term Ftraget/Fcur is equal to 1.

$$DoC_{new} = 365 - (365 - DoC_{old})\frac{Capacity_{old}}{Capacity_{old}+Capacity_{additional}} - DoC_{old} \qquad \text{E.q. A7}$$

TABLE A.1. Capacity management in the EPO purse-seine tuna fishery: historical decisions, analyses, and lessons learned.

Document	Title	Conclusions

CAP-report 1998	Chairman's report of the working group on limiting the growth in capacity of the purse-seine fleet in the eastern Pacific Ocean	• The fleet capacity grew rapidly during the 1970's causing yellowfin to be overfished and much of the fleet moved to the western Pacific Ocean
		• The current capacity is adequate to exploit the resource fully and effort needs to be kept between 22,000-24,000 days
		• Capacity could growth further because
		  ○ Coastal states without capacity could join the fishery
		  ○ Coastal states with capacity want to increase their capacity
		  ○ Vessels that moved to the western Pacific Ocean might return to the EPO
		• A draft agreement was prepared that
		  ○ Allocated 147,999 mt of capacity by country
		  ○ Allowed 32 US vessels to fish a single trip of maximum 90 days in the EPO

IATTC-69-09b (2002)	Review of the target size for the purse-seine fleet for the tuna fisheries in the eastern Pacific Ocean	• The current fleet size is well above the level that would support a year-long fishing season and economic benefits
		• 158,000 M3 is a reasonable upper limit for the fishing capacity
		• Optimal fleet size depends on the management objectives
		• Species specific fishing methods and management objectives would be required to provide simultaneous maximum harvest and sustainability for the three tropical tunas
		• Management should be based on yellowfin tuna while taking into consideration fishery-related connections with skipjack and bigeye tuna.
		• The capacity of the fleet has had drastic changes historically
		  ○ The fishery was open for only 3-4 months in the CYRA during the 1970s due to over capacity
		  ○ Many vessels moved to the western Pacific Ocean

		- There were no seasonal closures during the 1980s and early-mid 1990s. - The length of the seasonal closures and capacity during 1999-2001 suggest an optimal capacity of 159,011 M3. - The yield curve for yellowfin tuna is flat and therefore increases in capacity (i.e., fishing mortality related to the fishery on schools associated with dolphins) would not increase yield by much, but would decrease catch rates - Yields of bigeye and yellowfin in the longline fishery would increase moderately and appreciably, respectively, if the effort in the purse seine fishery is reduced.
IATTC-72-06 (2004)	Target capacity for the tuna fleet in the eastern Pacific Ocean	- A large component of the fleet is not targeting yellowfin tuna and catches of skipjack have increased considerably since 1995 - The length of the seasonal closures and capacity during 1999-2002 suggest an optimal capacity of 160,236 M3. - The number of sets could be used as a proxy for purse-seine capacity - The number of floating object sets needs to be reduced to conserve bigeye tuna. - The 16% reduction in total capacity optimal for yellowfin is insufficient to conserve bigeye and a precautionary reduction would be 50% reduction in capacity of vessels that fish primarily on floating objects, which corresponds to a 23% reduction in total capacity - Total effort (purse seine and longline) would have to reduce to about 62% of the current levels to achieve MSY for bigeye tuna - Determining the appropriate capacity for the longline fleet is difficult due to the lack of data for some components of the fleet - Reductions in the purse-sein fleet would increase the catch of bigeye and yellowfin in the longline fleet, but would reduce the catch of skipjack - If fishing mortality rates continue at the 2002-2003 levels, longline catch and spawning biomass would reduce to extremely low levels

		• If bigeye were only caught in the longline fishery, total MSY would double, but longline effort would have to increase back to the late 1980s-early 1990s levels • The purse-seine fishery on floating objects catches mainly skipjack, and it may be possible to reduce effective effort on bigeye by changing fishing practices. Simply reducing the fleet size is probably not the best way of reducing effective fishing effort. • The current capacity of the purse-seine fleet (202,000 M3 in 2003) is well above the level that would result in longer fishing seasons and economic benefits.

CAP-11-05 (2011)	Target capacity for the tuna fleet in the eastern Pacific Ocean	• Adjusting the fleet capacity for 2010 (209,600 M3) by the recommended average closure during the conservation period
		  ○ 2008-2010 (IATTC-78-06b) is 155,798
		  ○ 2011-2013 (IATTC-81-06b) is 172,141
		• The target capacity of 158,000 M3 still seems appropriate with respect to yellowfin tuna
		• The conclusions would be different if the purse-seine fleet was optimized for skipjack tuna

CAP-12-04 (2011)	Scenarios of the impact on the tuna resources in the EPO of various increases in fleet capacity	• The additional days of closure required to achieve MSY are calculated for different scenarios of added fishing capacity
		• The 2010 capacity levels are used as the base line
		• Values are calculated for conservation measures recommended in two periods
		  ○ 2008-2010 (IATTC-78-06b)
		  ○ 2011-2013 (IATTC-81-06b)
		• Additional days of closures ranged from 13 to 79 days

SAC-04-INF B (2012)	Fishing capacity and efficient fleet configuration for the tuna purse-seine fishery in the eastern Pacific Ocean: an economic approach	• Determines optimal capacity in two steps:
		  ○ Fishing capacity for each vessel based on efficiency frontier
		  ○ Calculates the optimal fleet capacity based on step 1 to obtain MSY for yellowfin and bigeye and historical levels of skipjack catch
		• The results correspond to optimal fleet capacity under individual transferable quotas

		• Capacity utilization results:
		  ○ Entire fishery 86%
		  ○ Non-DML 83%
		  ○ DML 89%
		• Capacity would be reduced to 76% to obtain MSY

SAC-05-12/CAP-WS-04A (2014)	Evaluation of the relationship between active purse-seine fishing capacity and fishing mortality in the eastern Pacific Ocean	• Yellowfin fishing mortality follows fishing capacity before the expansion of the floating object fishery but breaks down afterwards. • Restricting the yellowfin relationship to DML vessels does not improve the relationship • There is a vague relationship between bigeye tuna fishing mortality and fishing capacity after the start of the floating object fishery expansion • Restricting the bigeye relationship to non-DML vessels improves the relationship

TABLE A.2. Chronological summary of the key events that led to the development and formal establishment of the IATTC target capacity for the purse-seine fleet in the EPO.

1.	**September 1998:** The Working Group on Limiting the Growth in Capacity of the Purse-Seine Fleet in the Eastern Pacific Ocean, which later became the Permanent Working Group on Fleet Capacity, formally examined fleet capacity for the first time at its inaugural meeting on 3–4 September 1998. The working group concluded that the fleet capacity at that time, approximately 135,000 metric tons (mt) [equivalent to roughly **158,000 m^3** using a standard conversion factor of 1.17 mt/m3] **was sufficient to generate the fishing effort required to take the maximum sustainable yield (MSY) of yellowfin and the recommended catch of bigeye**.
2.	**February/March 2000, Resolution C-00-01**: the Commission was already referring to a "proposed target of 135,000 metric tons of carrying capacity" and requested analyses of alternatives to that target under different management regimes. It also anticipated the need for a register.
3.	**June 2000, Resolution C-00-06**: the Commission established the **Regional Vessel Register (RVR)**, requiring the Director to maintain a record of authorized vessels and information including fish-hold capacity in cubic meters and carrying capacity in metric tons.
4.	**19 August 2000 / June 2002:** the **target level of 158,000 m^3 was formally embedded in the fleet-capacity framework**. In paragraph 4, Resolution C-02-03 refers to the "target level of 158,000 m^3, established in the resolution on fleet capacity of 19 August 2000." This rounded figure has been used since 1999 in various IATTC documents and resolutions as the maximum target carrying capacity for the purse-seine fleet.

TABLE A.3. Historical estimates of target fleet capacity for the tropical tuna fishery in the EPO.

Document	Year	Method	Target capacity (m^3)
CAP-report 1998	1998	Draft proposal allocating 147,999 mt (approximately 173,000 M3 using a 1.17 conversion factor) capacity by country.	173,000
Report to the Permanent Working Group on Fleet Capacity (see IATTC-69-09b)	1998	"the current carrying capacity of the fleet, 135,000 metric tons, is large enough to generate the amount of fishing effort or mortality required to catch the [maximum sustainable yield] of yellowfin and the recommended catch of bigeye from the EPO. It is also capable of generating the amount of fishing effort that produced the highest catch of all species combined in the history of the fishery."	158,000
IATTC-69-09b	2002	Adjusting the average fleet capacity during 1999-2002 (190,758 M3) by the average closure during the same period ((365-58)/365) gives a target capacity of 159,011 M3. Similarly, using the 2021 capacity of 189,430 M3 gives a target capacity of 160,663 M3	159,011
IATTC-72-06	2004	A) Adjusting the average fleet capacity during 1999-2001 (183,416 M3) by the average closure during the same period ((365-55.4)/365) gives a target capacity of 160,236 M3. B) Based on the number of floating object sets optimal for bigeye tuna	A) 160,236 B) 146,000
CAP-11-05	2011	Adjusting the fleet capacity for 2010 (209,600 M3) by the recommended average closure during the conservation period A) 2008-2010 (IATTC-78-06b) B) 2011-2013 (IATTC-81-06b)	A) 155,798 B) 172,141
SAC-04-INF B	2012	• Determines optimal capacity in two steps: o Fishing capacity for each vessel based on efficiency frontier o Calculates the optimal fleet capacity based on step 1 to obtain MSY for yellowfin and bigeye and historical levels of skipjack catch • The results correspond to optimal fleet capacity under individual transferable quotas	167,000
SAC-05-12/CAP-WS-04A	2014	Combined MSY (based on weighted yellowfin and bigeye FMSY) using the relationship between fishing mortality and fishing capacity	176,707

TABLE A.4. Days of closure and additional measures for the EPO purse-seine (PS) fishery recommended by the IATTC staff and closures implemented by the IATTC, 2002-2023, along with Resolutions and *F* multipliers (F_{MSY}/F_{cur}). YFT: yellowfin; BET: bigeye. From SAC-15-07.

Year	Resolution	*F* multiplier		Closure (days)	
		YFT	BET	Recommended	Implemented
2002	C-02-04	1.12	1.85	31	31
2003	C-03-12	1.2	0.79	61 + add. measures[1]	42
2004	C-04-09	1.12	0.62	61[2] + add. measures[3]	42
2005	C-04-09	0.83	0.57	61 + add. measures[3]	42
2006	C-04-09	1.02	0.68	61 + add. measures[4]	42
2007	C-06-02	0.88	0.77	74	42
2008	None	1.13	0.82	84	49
2009	C-09-01	1.09	0.81	84	59
2010	C-10-01	1.33	1.13	62	62
2011	C-11-01	1.13	0.93	62	62
2012	C-12-01	1.15	0.95	62-74[5]	62
2013	C-13-01	1.01	1.05	62	62
2014	C-13-01	1.21	1.04	62	62
2015	C-13-01	1.11	1.14	62	62
2016	C-17-01	1.02 (0.92) [6]	1.05 (0.94) [6]	87	62 + OBJ DEL catch limits [7], amended to 72 days OBJ, UNA and 62 DEL
2017	C-17-02	1.03 (0.97) [8]	1.15 (1.08)[8]	72	72
2018	C-17-02	0.99	0.87[9]	72+ add. measures [12]	72
2019	C-17-02	0.89[10]	No assessment	72+ add. measures [12]	72
2020	C-20-06	1.61	0.7 / 1 / 1.44[11]	72+ add. measures [12]	72
2021-23	C-21-04	No assessment	No assessment	72+ add. measures [12	72 + BET IVT
2025-26	C-24-01	No assessment	1.27[13]	72+ add. measures	72 + BET IVT
2026 and 2027-28[14]	C-25-01	EPO 2.50 NE 1.89 SW 2.00 SW F30% 1.32[13]	No assessment	Option 1: 62 + add. measures Option 1: adopt Management procedure	64 + BET IVT

[1] Additional 61 days between 90°W and 150°W from 5°N to 10°S

[2] 2-month closure, which is 61 days for most combinations
[3] One of three options: (1) 6-month PS closure W of 95°W between 8°N and 10°S; (2) 6-month closure of PS fishery on floating objects W of 95°W; (3) Limit BET annual catch by each PS vessel with an observer to 500 t
[4] Additional 95 days for PS fishery for bigeye on floating objects
[5] 74 days after adjusting for capacity
[6] Number between () corrected by increases in PS capacity, 11.2% larger than previous 3-year average
[7] Amended by resolution C-17-02
[8] Number between () corrected by increases in PS capacity, 6.7% larger than previous 3-year average
[9] [10] Assessments determined not reliable for providing advice
[11] Computed from pessimistic / overall / optimistic models from BET risk analysis
[12] Limits on the number of OBJ and/or unassociated sets and vessel limit
[13] Fmultiplier is calculated as the inverse of the median of F_{cur}/F_{MSY} from the risk analysis
[14] According to Resolution C-25-01, these measures will remain in place for 2027-2028 if the Management Strategy Evaluation (MSE) process confirms the effectiveness of the measure