A review of fisheries closures in tropical tuna RFMOs

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ABSTRACT

There are different management approaches in the tuna RFMOs that manage tropical tunas, ranging from input or effort control in the Pacific Ocean tuna RFMOs to output or catch control in the Atlantic and Indian Oceans. In some cases, input controls are used for some fisheries and catch controls for others. Among the various management options and tools, full purse seiners closures and FAD closures are also utilized, each serving distinct overarching management objectives. For instance, full closures are the primary management tool employed by the IATTC for purse seiners, whereas FAD closures serve as supplementary management options to attain various objectives within ICCAT and WCPFC.

In this article, we describe and review tropical tuna fisheries, the stock status of tropical species in different regions, the management approaches as well as the management objectives. We also examine the science and data collection that underpins and supports the identification of closure areas, if applicable, within the four tropical tuna RFMOs. This review aims to provide insights into the diverse objectives, characteristics, and designs of these closures, taking into account the unique attributes and characteristics of each region and fishery as closures should be tailored to achieve specific management objectives, whether they aim to reduce overall fishing effort on the three species, aid in the recovery of a particular stock, curtail the catch of a particular life stage (e.g., juvenile catches) or reduce impacts on non-target species.

KEYWORDS

Fishing Closures, FAD closures, Tropical tuna, sustainability, tunaRFMOs.

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1. Introduction

The world's oceans are home to a vast and diverse array of marine life, including some of the most iconic and economically important species, such as tuna. There are seven species of major oceanic commercial tunas: three species of bluefin, albacore, yellowfin, bigeye and skipjack. These species hold a special place in the global seafood industry. In 2021, the catch of major commercial tunas was 4.8 million tons. Skipjack accounted for 56% of the total catch,

followed by yellowfin at 31%, bigeye at 8%, albacore at 4%, and bluefin tunas, which represented 1% of the global catch (ISSF, 2023).

ISSF's Status of the World Fisheries for Tuna, based on the analysis of the Scientific Committees of tuna Regional Fishery Management Organizations (tunaRFMOs), estimates that globally, 61% of the stocks are at a healthy level of abundance, 17% are overfished and 22% are at an intermediate level. In terms of exploitation, the same report estimates that 78% of the stocks are not experiencing overfishing while 13% are currently subject to overfishing.

In terms of catch, 85% of the total catch comes from stocks in healthy abundance levels. This is primarily because skipjack stocks contribute to more than half of the global tuna catch, and all skipjack stocks are in a healthy state. In contrast, one bluefin stock, one yellowfin stock, one bigeye stock, and one albacore stock are overfished, resulting in 11% of the total catch coming from overfished stocks.

Overall, the global status of tuna species is generally healthy due mainly to the management measures implemented by tunaRFMOs. However, it is worth noting that, most of the tuna stocks are currently being exploited at their target reference levels, with some even being overfished. Therefore, fishery management measures must continue to ensure the sustainability of these healthy stocks, and in some cases measures should be strengthened to contribute to the recovery of overfished stocks.

Tuna RFMOs employ a diverse management toolbox, incorporating various management actions to ensure that fish stocks are exploited sustainably. These management measures can be categorized as either "input controls", which limit the amount of fishing effort exerted, or "output controls", which restrict the amount of catch taken from the system. Among the input management measures, RFMOs have also implemented various types of fishing closures. These closures serve several purposes, including protecting the tuna stock's health, preserving spawning grounds and juvenile populations, and promoting sustainable fishing practices in terms of bycatch or other ecosystem impacts.

Management approaches in the four tropical tuna RFMOs, range from input or effort control in the Pacific Ocean tuna RFMOs (IATTC and WCPFC) to output or catch control in the Atlantic (ICCAT) and Indian Oceans (IOTC). Among the various management options and tools, full purse seine closures and FAD closures are also utilized, each serving distinct overarching management objectives. For instance, full purse seine closures are the primary management tool employed by the IATTC, whereas FAD closures serve as supplementary management options to attain varying objectives within ICCAT and WCPFC.

In this article, we describe and review tropical tuna fisheries, the stock status of tropical species in different regions, the management frameworks as well as the management objectives. We also examine the science and data collection that underpins and supports the identification of closure areas, if applicable, within the four tropical tuna RFMOs. This review aims to provide insights into the diverse objectives, characteristics, and designs of these closures, taking into account the unique attributes and characteristics of each region and fishery as closures should be tailored to achieve specific management objectives, whether

they aim to reduce overall fishing effort on the three species, aid in the recovery of a particular stock, or curtail the catch of a particular life stage (e.g., juvenile catches).

2. Review of fishing closures in tuna RFMO

2.1. IATTC

2.1.1. Tropical Tuna Fisheries

In the Eastern Pacific Ocean, most of the catches are taken by purse seine fisheries, which include associated schools, unassociated schools, and dolphin-associated schools, with a lesser contribution from longline fisheries (IATTC, 2023). In the most recent five years, the purse seine fishery accounted for approximately 95% of the total reported catch, while the longline fishery contributed around 5%, with other fisheries contributing less than 1% (IATTC, 2023) (Figure 1).

This pattern is consistent across the various tropical species. For example, the purse seine fishery catches approximately 99% of skipjack, around 96% of yellowfin and, in the case of bigeye, around 70 % is taken by purse seines while 30% by longlining.

In 2022, within the purse seine fishery, 30% of tropical tunas were caught on sets associated with dolphins, around 60% in sets associated with floating objects, and 8% in unassociated sets. However, the percentages vary by species: (i) 81% of the skipjack were caught in sets associated with floating objects, 18% in unassociated sets, and 1% in dolphin-associated sets; (ii) 61% of yellowfin were caught in dolphin-associated sets, 31% in floating object sets, and 8% in unassociated sets; and (iii) nearly 100% of bigeye were caught in sets associated with floating objects.

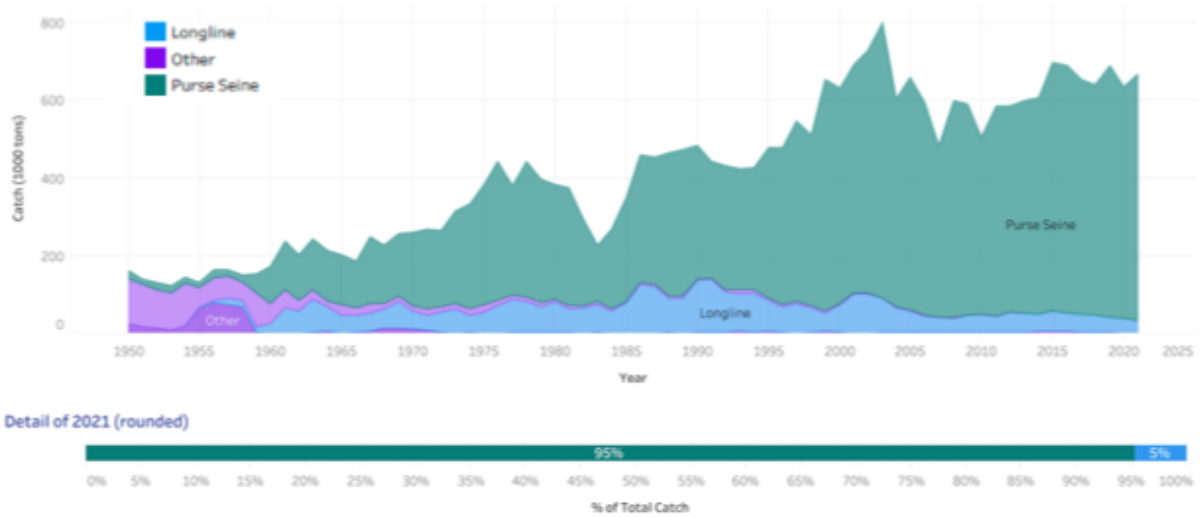

Figure 1.- Trend in tropical tuna catches by major fishing gear in IATTC from 1950 to 2021.

2.1.2. Stock Status

Skipjack: The stock is not overfished and overfishing is not occurring

In 2022, the IATTC staff conducted an interim assessment for skipjack, the first assessment based on an integrated age-structured model undertaken since 2005. The assessment consisted of a reference model based on the most plausible assumptions, plus 21 sensitivity analyses to test for robustness. MSY-based reference points were not calculated. Instead, a proxy depletion level (spawning biomass ratio, SBR, defined as $SSBc_{current}/SSB_0$), with a target reference of 0.3, was used based on values for bigeye and yellowfin. The results indicate that current depletion is above the target reference point and current fishing mortality is below the value that would result in the target reference depletion level of 0.3.

Yellowfin: The stock is not overfished and overfishing is not occurring.

The last assessment to evaluate stock status was conducted in 2020, forming the basis for a risk analysis. A total of 48 different models were used in the analyses, reflecting a wide range of plausible hypotheses about biology, different data sets, and assumptions. The results of the assessment and risk analysis indicate that, the ratio $SSB_{current}/SSB_{MSY}$ varies considerably among the 48 models, the model-weighted average of the ratio for all the models was 1.57. The overall probability that $SSB_{current}$ was below SSB_{MSY} across all the models was 12%. The model-weighted average of the ratio across the 48 models was estimated at 0.67 and the combined probability that $F_{current}$ exceeds F_{MSY} was 9%.

Bigeye: The stock is fluctuating around the target, both for biomass and fishing mortality.

In 2020, to evaluate stock status, the IATTC conducted a benchmark assessment, which formed the basis for a risk analysis. A total of 44 different models were used in the analyses, reflecting a wide range of plausible hypotheses about biology, different data sets, and assumptions. The results of the assessment and risk analysis indicate that, while the ratio

$SSB_{current}/SSB_{MSY}$ varies considerably among the 44 models, the combined value of the ratio for all the models was 0.92. The overall probability that $SSB_{current}$ was below SSB_{MSY} across all the models was 53%. This indicates that the stock is likely fluctuating around the target level of SSB_{MSY}. The ratio of $F_{current}/F_{MSY}$ for the 44 models also varies considerably, but the combined value of the ratio across the 44 models was estimated at 1.00. The combined probability that $F_{current}$ exceeds F_{MSY} was 50%. This indicates that the stock is likely being exploited around the target level of FMSY.

2.1.3. Management Approach

IATTC Resolution 21-04 establishes management measures for tropical tunas in the area on a 3-year cycle. This measure applies to all CPCs' purse-seine vessels with capacity classes 4 to 6 (more than 182 metric tons carrying capacity) and to all their longline vessels over 24 meters in length overall that fish for yellowfin, bigeye, and skipjack tunas in the IATTC Convention Area.

The primary management measure for the purse seine fleet (including three different fishing modes) is a total closure aimed at controlling fishing effort. All purse seine vessels covered by this measure must cease fishing in the Convention Area for a period of 72 days each year. Vessels can choose to cease operations during one of two periods: from 00:00 hours on July 29 to 24:00 hours on October 8 or from 00:00 hours on November 9 to 24:00 hours on January 19 of the following year.

Furthermore, the "corralito" area, located between 96° and 110°W and between 4°N and 3°S, is closed for purse seining from October 9 to November 8 with the objective of reducing the catch of juvenile bigeye.

The IATTC purse seine fishery is managed through a full closure that applies to all purse seine fishing types without distinguishing between floating objects and other types of sets.

Additionally, Resolution 21-04 mandates additional fishing closure days depending on the individual vessel's bigeye catch in previous years. For example, in 2023 and 2024, if a vessel exceeds 1200 metric tons of bigeye catch in the previous year, its closure period should increase by 10 additional days. This extends to 13 days if their annual catch limit exceeds 1500 metric tons, 16 days if it exceeds 1800 tons, 19 days if it catches more than 2100 tons, and 22 additional days if it exceeds 2400 tons.

Furthermore, purse seiners operating with floating objects have limits on the number of active FADs they can use at any time, must use fully non-entangling FADs without nets starting in 2025, follow a schedule of implementation of biodegradable FADs (Resolution 23-04), follow rules for deactivation and reactivation, provide daily position information and echosounder acoustic biomass data to the IATTC, as well as vessel VMS data. They are also prohibited from deploying FADs during the 15 days prior to the start of the selected closure period. For class-6 purse-seine vessels, they must recover the same number of FADs as set during that same period within 15 days prior to the start of the closure period.

No catch limits apply to purse seine vessels.

For longliners, Resolution 21-04 establishes annual catch limits by CPC.

2.1.4. Objectives of the full closure

IATTC has adopted target reference points as a management objective based on a level of spawning biomass (SSB_{target}) or a fishing mortality rate (F_{target}) at the level of SSB_{MSY} and F_{MSY}, which should be achieved and maintained in the long term. When SSB_{MSY} and F_{MSY} cannot be reliably estimated from parameters within the stock assessment model, proxies of SSB_{MSY} and F_{MSY} should be used. The IATTC has also adopted limit reference points to inform their harvest control rule.

IATTC has established a Harvest Control Rule (Resolution C-23-06) to provide management recommendations on conservation measures for the stocks of tropical tunas (yellowfin, bigeye, and skipjack), considering the limit and target reference points (TRPs) adopted by IATTC. The objective is to maintain the three stocks above their TRPs, while avoiding with a high probability breaching the TRP. The management recommendation for a full closure for the purse seine fishery is established to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY} or $F_{proxy-MSY}$) for the species that requires the strictest management, i.e., bigeye.

The harvest control rule then utilizes the outputs of the bigeye/yellowfin stock assessment to calculate the duration of the full closure based on the so-called F multiplier, the ratio of F_{MSY} divided by the average fishing mortality for the three most recent years (IATTC, 2020; Aires-da-Silva, 2020). The lower of the F multipliers estimated in the yellowfin and bigeye assessments are used as a basis to determine the duration of the seasonal closure of the purse-seine fishery, adjusted for recent changes in fishing capacity.

IATTC has also agreed that for fisheries using gears other than purse-seine nets, the recommendations by the IATTC scientific staff on additional management measures should be as consistent as possible with those adopted for the purse-seine fishery, while considering the impact of those fisheries on the target tuna species compared to that of the purse-seine fishery.

2.1.5. The science underpinning the closure advice

At the core of the conservation measures for tropical tunas in the EPO is the temporal closure of the purse-seine fishery, which currently for lasts 72 days per year, either during July-October or November-January (Resolution C-21-04).

Paragraph 3a of Resolution C-16-02 specifies that “the scientific recommendations for establishing management measures in the fisheries for tropical tunas, such as closures, which can be established for multiple years, shall aim to prevent the fishing mortality rate (F) from exceeding the best estimate of the rate corresponding to the maximum sustainable yield (F_{MSY}) for the species that requires the strictest management.”

The IATTC staff determined the duration of the closure based on the overall results of the stock assessment and risk analysis for bigeye, which requires the strictest management among the three species. For example, in the last assessment, assuming that the *status quo* conditions will remain in the next management cycle, the IATTC staff did not recommend changes in the number of closure days, because:

- *The overall results of the 2020 risk analysis for bigeye tuna indicate a 50% probability that F_{MSY} has been exceeded, and a 53% probability that SSBcurrent is below S_{MSY}. Although Resolution C-16-02 does not specify the acceptable level of probability of exceeding the target reference points, these probabilities are approximately a reasonable arbitrary reference level of 50%, considering that, at F_{MSY}, SSB will fluctuate around the target reference point (SSB_{MSY}) due to interannual recruitment fluctuations. F will also fluctuate around the target reference point (F_{MSY}) under the days of closure management due to interannual fluctuations in catchability and the distribution of purse-seine effort among set types.*
- *The overall results of the risk analysis for bigeye indicate that, although the probabilities that the F and SSB limit reference points have been exceeded are not negligible ($P(F_{current}>F_{LIMIT}) = 5\%$; $P(SSB_{current}<SSB_{LIMIT}) = 6\%$), they are below the 10% threshold for triggering an action specified in Resolution C-16-02.*

To ensure that the *status quo* conditions, or the current relative contribution of different purse seine fishing modes to the catches, are maintained in the next management cycle, IATTC has adopted additional fishing closure days for those purse seine vessels catching more than a certain among of bigeye in the previous year (Resolution C-21-04).

2.2. WCPFC

2.2.1. Tropical Tuna Fisheries

In the Western and Central Pacific Ocean, the majority of catches are taken by purse seine fisheries, including associated schools and unassociated schools, with longline, pole and line, and other gears like trolling and a variety of artisanal gears playing a smaller role (Williams and Ruaia, 2023). In 2022, the purse seine fishery accounted for 70% of the total reported catch, while longline contributed around 9%, pole-and-line around 6%, and the remaining 15% were caught using handline, troll gear and various artisanal gears, primarily in Indonesia and the Philippines (Figure 2).

This pattern remains consistent across the different tropical species. For example, the purse seine fishery catches approximately 84% of skipjack (with pole-and-line and trolling each contributing around 8%), around 53% of yellowfin (12% by longline, 3% by pole-and-line, and the remaining 32% by a variety of gears), and in the case of bigeye, around 45% is taken by purse seines while 40% is caught by longlining (with the remaining 15% by other gears).

In 2022, within the purse seine fishery, 48% of tropical tunas were caught on sets associated with floating objects or FADs, 47% on unassociated sets, and the remaining 5% on anchored FADs and sets on natural objects. However, the number of sets shows a different trend. While

sets on unassociated free-swimming schools of tuna represented 61% of all sets for the purse seine fishery in 2022, the proportion of sets on drifting FADs was 33% in 2022.

By species, in the last 5 to 10 years, these percentages have remained similar except for bigeye: (i) around 40% of the skipjack was caught by sets associated with floating objects, while most of the skipjack was caught in unassociated schools (around 55%), (ii) around 25% of yellowfin was caught in floating object or FAD-associated sets, while around 65% was caught on unassociated sets, and (iii) around 75% of bigeye was caught by floating associated sets, while the bigeye catch in unassociated free schools decreased to around 17%.

The purse seine tropical tuna catch in the WCPO differs from other regions in the sense that the catches of the three species (particularly yellowfin and skipjack) are dependent on unassociated free schools. It appears that there are more free schools available for the fishery in this region compared to the other three areas, perhaps due to the depth of the thermocline.

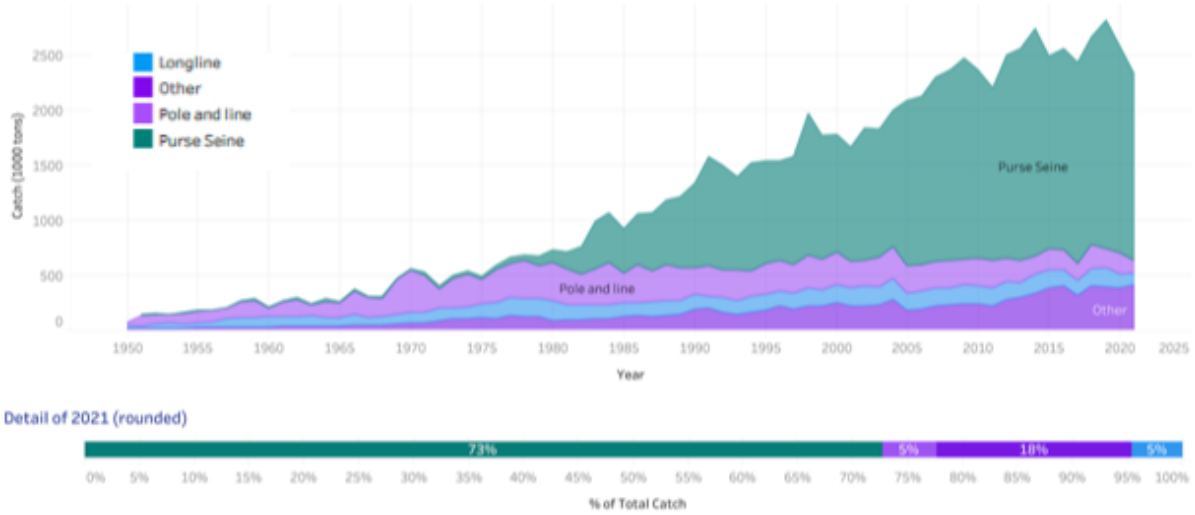

Figure 2.- Trend in tropical tuna catches by major fishing gear in WCPFC from 1950 to 2021.

2.2.2. Stock Status

Skipjack: the stock is not overfished and overfishing is not occurring.

The last skipjack assessment was conducted in 2022, and the stock status was determined using an uncertainty grid of 18 models. The results of the assessment indicated that the median ratio of fishing mortality to F_{MSY} was estimated at 0.32, and the spawning biomass was above the SSB_{MSY} level.

Yellowfin: the stock is not overfished and overfishing is not occurring.

The last assessment to evaluate stock status was conducted in 2023. A total of 54 different models were used in the analyses, representing a wide range of plausible hypotheses about

biology as well as different data sets and assumptions. The results of the assessment indicate that the median depletion from the model grid for the recent period (2018–2021; $SB_{recent}/SB_{F=0}$) was estimated at 0.47. For all models in the grid $SB_{recent}/SB_{F=0}$ was above the biomass limit reference point and exceeded the SSB_{MSY}. The recent median fishing mortality (2017–2020; F_{recent}/F_{MSY}) was 0.50, and for all models in the grid F_{recent}/F_{MSY} was less than one.

Bigeye: the stock is not overfished and overfishing is not occurring.

The last assessment was conducted in 2023, and all 54 models in the uncertainty grid indicated that the stock is above the biomass limit reference point as well as the MSY-based reference points. The new assessment indicated that the median depletion from the model grid for the recent period (2018–2021; $SSB_{recent}/SSB_{F=0}$) was 0.35. For all models in the grid $SSB_{recent}/SSB_{F=0}$ was above the biomass limit reference point and exceeded the SSB_{MSY}. The recent median fishing mortality (2017–2020; F_{recent}/F_{MSY}) was 0.59 and for all models in the grid, F_{recent}/F_{MSY} was less than one.

2.2.3. Management Approach

WCPFC Conservation and Management Measure 21-01 for bigeye, yellowfin and skipjack in the WCPO establishes the management framework for tropical tunas for a 3-year cycle (2022 to 2024). The objective of this measure is to maintain, at a minimum, levels capable of producing maximum sustainable yield. This measure applies to all areas of high seas and all Exclusive Economic Zones (EEZs) in the Convention Area. Coastal states are directed to adopt measures consistent with CMM 21-01 in archipelagic waters and territorial seas.

The primary management measure for the purse seine fleet, including both unassociated and floating object-associated fishing modes, is an effort control that restricts fishing days for CCMs in coastal EEZs and on the high seas within the area between 20°N and 20°S, in accordance with the limits established in CMM 21-01.

Fishing capacity is also limited, as CCMs (except Small Island Developing States and Indonesia) cannot increase the number of purse seine vessels larger than 24m with freezing capacity operating between 20°N and 20°S above the 2013 level (CMM 2013-01 and CMM 2021-01). Any new LSPSV constructed or purchased by a CCM shall replace a previous vessel or vessels and have a carrying capacity or well volume no larger than the vessel(s) being replaced, or shall not increase the catch or effort in the Convention Area beyond the level of the vessels being replaced.

In addition to the effort control, and with the objective of reducing the juvenile catch of bigeye and yellowfin, CMM 21-01 establishes a three (3) month FAD closure, prohibiting the deployment, servicing, or setting on FADs from 1 July to 30 September for all purse seine and tender vessels operating in EEZs and on the high seas within the area between 20°N and 20°S. For purse seine vessels operating on the high seas, the three-month FAD closure is extended for two additional sequential months of the year, either April – May or November – December, except for some SIDS.

Moreover, purse seiners operating with floating objects have limits on the number of active FADs they can use at any time and will be required to use fully non-entangling FADs without nets from 2024 onwards.

Catch limits do not apply to purse seiner vessels, except for Australia, New Zealand, and New Caledonia in their EEZs as per CMM 21-01.

For longliners, CMM 21-01 establishes annual catch limits by CPC.

Similar to purse seiners, CCMs (except Small Island Developing States and Indonesia) cannot increase the number of longline vessels with freezing capacity and ice-chilled longline vessels targeting bigeye tuna above the 2013 level (CMM 2013-01 and 2021-01)

2.2.4. Objectives of the FAD closure

Due to the status of bigeye and yellowfin in 2006, when the Scientific Committee determined that there was a high probability that the bigeye stock was subject to overfishing, and that the yellowfin stock was being fished at maximum capacity, the Scientific Committee recommended reductions in fishing mortality to reduce the risks of these stocks becoming overfished.

At that time, the goals of the WCPFC were to achieve, through the implementation of a package of measures, a minimum of a 30% reduction in bigeye tuna fishing mortality from the annual average during the period 2001-2004 or 2004 over a three-year period commencing in 2009 and to ensure that there was no increase in yellowfin fishing mortality beyond the annual average during 2001-2004 or 2004.

In 2006, the SC recommended that to maintain the bigeye and yellowfin stocks at a level capable of producing MSY, a 25% and 10% reduction, respectively, in fishing mortality from the average levels of 2001-2004 was required. The SC determined that effort reductions of 10% across all fisheries would be necessary to reduce fishing mortality to a level that would sustain stocks at BMSY for yellowfin tuna, whereas a 25% reduction across all fisheries would be required to achieve the same for bigeye tuna. If the purse seine fishery alone were to be targeted to achieve the recommended levels of fishing mortality, a significant reduction in effort (by 75%) would be required to achieve FMSY for bigeye tuna. However, because almost all of the purse seine bigeye catch occurs in sets on floating objects (referred to generally as “FAD sets”), such a reduction would need to be applied only to FAD fishing to achieve the necessary reduction in bigeye fishing mortality.

In summary, the FAD closure that applies to the purse seine fishery is in EEZs and High Seas, but purse seine vessels can continue fishing for yellowfin and skipjack in free schools, as the fishery is managed by input control. Additionally, the effort control is the primary management regulation to achieve and maintain the stocks at sustainable levels. In this case, it is worth noting that because yellowfin can be fished in unassociated and associated schools, while effort reduction due to the FAD closure affects associated sets, there is also the potential to increase the mortality of yellowfin if purse seine effort is simply transferred from

associated sets to unassociated sets, and this will have an impact on the yellowfin population as well.

2.2.5. The science underpinning the closure advice

To achieve these objectives, in 2006, the WCPFC, in conjunction with the science services provider -SPC-, prepared various options for reducing mortality of bigeye and yellowfin tuna in the WCPO, including: (i) a closure of the most significant purse seine fishing grounds in the Convention Area to purse seine fishing (similar to what applies in the EPO), which could include limited spatial closures (such as the high seas and/or areas under national jurisdiction) or temporal closures (quarterly), (ii) a closure of specific purse seine set types, such as FAD and floating object sets (WCPFC 2006). Effort and catch reductions in other fisheries responsible for significant bigeye and yellowfin mortality. The SPC, using purse seine data from 1996-2005, empirically determined whether closures in certain months would be more effective than others in achieving two main objectives: (1) maximizing the percentage reduction in yellowfin and bigeye catch and (2) minimizing the reduction in skipjack catch. These two objectives were considered because the SC recognized the importance of assessing the potential impacts on skipjack catches of measures aimed at bigeye and yellowfin tuna.

The SPC provided various scenarios involving total closures, FAD closures, and closures combined with catch limits to achieve the management objectives. They found that only a large-scale purse seine closure, in isolation, could meet the recommended level of effort reduction required to achieve the target fishing mortality for bigeye tuna as recommended by the Scientific Committee. While many of the scenarios met the FMSY management objective for yellowfin tuna, the only scenario that met the same objective for bigeye required an additional measure to reduce bigeye longline catch. The range of potential management options expanded significantly if reductions in bigeye longline effort and catch were also considered.

Based on these scenarios and recognizing the urgent need indicated by the SC to reduce fishing mortality of juvenile bigeye and yellowfin tuna from fishing on FADs, the Commission adopted the measure on FAD closures in 2008. This measure aimed to reduce juvenile bigeye and yellowfin mortalities resulting from fishing effort on FADs, while taking into account any existing measures.

However, the WCPFC also included various considerations when examining the different scenarios provided by SPC for a temporary purse seine closures. Some of the key considerations associated with a purse seine closure for the Commission include:

- Obligations in the Convention;
- Fairness and burden sharing;
- Uncertainty associated with the absence of a clear description of management objectives for the WCPO tuna fisheries;
- The influence of a reduction in effort and catch in the longline fishery on the scope of a purse seine closure;
- The relative importance of sets on FAD/floating object sets to some CCM purse seine fleets;

- The benefits of a measure to reduce the catch of juvenile bigeye will mostly accrue to fisheries targeting the adult bigeye stock;
- The value of the bigeye resource to the longline fishery relative to its value taken as juveniles in the purse seine fishery;
- Relocation of effort from FAD/floating object sets to freely associated schools may be strongly positive for bigeye but less so for yellowfin;
- Challenges in achieving an effort and catch reduction in surface fisheries responsible for a relatively high proportion of the juvenile catch of yellowfin and bigeye tuna (Indonesia and Philippines);
- Limited understanding of the individual and collective costs and benefits associated with a closure for fleets and/or zones;
- Impacts of a closure on the financial viability of purse seine and longline vessels;
- Limited evaluation of long term benefits that would accrue as a result of a reduction in the current effort and catch;
- Issues associated with relocation or transfer of effort out of a closed area to elsewhere in the Convention Area and subsequent implications for an effort reduction objective;
- Potential re-aggregation of fishing effort into the closed area after the fishery closure.

2.3. ICCAT

2.3.1. Tropical Tuna Fisheries

In the Atlantic Ocean, most of the tropical tuna catches are taken by purse seine fisheries (associated schools and unassociated schools), with a lesser contribution from longline, pole and line, and other gears including troll and a variety of artisanal gears (ICCAT, 2023). The purse seine fishery accounted for approximately 70% of the total reported catch in 2022, while longline contributed around 10%, pole-and-line around 9%, and the remaining 9% were caught using troll gear and a variety of artisanal gears (Figure 3).

This pattern holds true for each tropical species as well. The purse seine fishery catches approximately 84% of skipjack (with pole-and-line and troll each contributing around 10% and 6%, respectively), about 67% of yellowfin (with 11% by longline, 6% by pole-and-line, and the remaining 17% by various gears), and, in the case of bigeye, between 30% and 40% is taken by purse seines while 50% is caught by longlining (with the remaining 10-20% from bait boats and other gears).

In 2021 and the past three years on average, within the purse seine fishery, approximately 80% of tropical tunas were caught on sets associated with floating objects or FADs, while around 20% were caught on unassociated sets or free schools.

The relative contribution of FAD catches by species has increased for skipjack and bigeye while decreasing for yellowfin. Around 95% of skipjack and 90% of bigeye were caught by sets associated with floating objects or FADs, whereas approximately 40% of yellowfin was caught in floating object or FAD-associated sets, with 60% of yellowfin caught in unassociated free school sets.

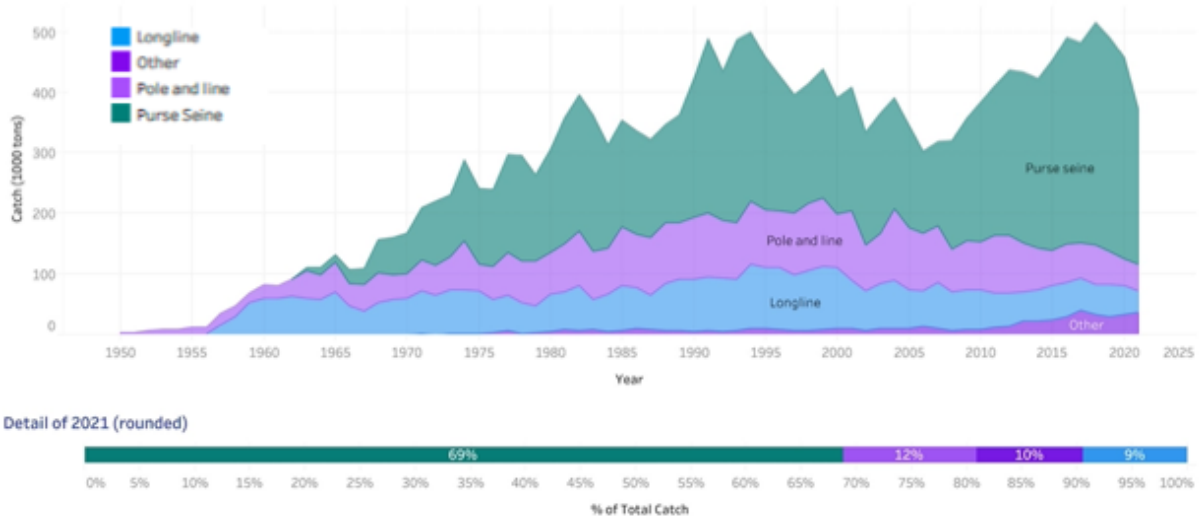

Figure 3.- Trend in tropical tuna catches by major fishing gear in ICCAT from 1950 to 2021

2.3.2. *Stock Status*

Eastern Atlantic Ocean Skipjack: the stock is not overfished and overfishing is not occurring.

The stock was last assessed in 2022 using two different model platforms. The combined results of both assessment models, based on the median of an uncertainty grid with 18 scenarios in each model, showed that the ratio of fishing mortality to FMSY ($F_{current}/F_{MSY}$) was estimated to be 0.63, and that the ratio of spawning stock biomass to SSB_{MSY} ($SSB_{current}/SSB_{MSY}$) was estimated to be 1.60.

Yellowfin: the stock is not overfished and overfishing is not occurring.

The most recent full assessment of yellowfin tuna was carried out by ICCAT in 2019 based on combined results from three different models. The results indicated that the fishing mortality ratio to F_{MSY} (F_{2018}/F_{MSY}) was estimated at 0.96, and that the ratio of spawning biomass to SSB_{MSY} (SSB_{2018}/SSB_{MSY}) was estimated at 1.17.

Bigeye: the stock is overfished but not subject to overfishing.

The last bigeye assessment was conducted in 2021. Based on combining several model-data scenarios, ICCAT determined that the fishing mortality ratio to F_{MSY} ($F_{current}/F_{MSY}$) was estimated at 1.00, and that the ratio of spawning biomass to SSB MSY ($SSB_{current}/SSB_{MSY}$) was estimated at 0.94.

2.3.3. *Management Approach*

ICCAT Recommendation 22-01 on a multi-annual conservation and management programme for tropical tunas establishes the main management framework for tropical tunas. The objective of this measure is to rebuild the bigeye stock through 2024 with the goal of

achieving MSY levels with more than a 50% probability and to maintain skipjack and yellowfin at sustainable levels. Interim management measures are established to reduce current levels of fishing mortality of tropical tunas, particularly small bigeye and yellowfin.

The main management measure for all CPC fisheries is a Total Allowable Catch (TAC) for bigeye that is apportioned among CPCs, with different rates of reduction depending on the amount of the previous year's catch. Similarly, ICCAT has established a total global TAC for yellowfin at 110,000 tons, however, this TAC is not allocated among CPCs.

Moreover, in order to reduce the fishing mortality of juvenile bigeye and yellowfin tunas, additional measures were agreed upon for purse seine fishing on FADs. A total FAD fishing closure for purse seine and baitboat vessels engaged in fishing for, or vessels supporting activities to fish for, bigeye, yellowfin, and skipjack tunas in ICCAT convention area (the high seas or Exclusive Economic Zones (EEZs)) was established during a seventy-two-day period from January 1 to March 13 in 2023.

Additionally, purse seines operating with floating objects have limits on the number of active FADs that can be used at any time, cannot deploy drifting FADs during a period of 15 days prior to the start of the closure, and are required to use fully non-entangling FADs without nets.

2.3.4. Objectives of the FAD closure

The Atlantic bigeye tuna stock in 2019 was estimated to be overfished but not undergoing overfishing and based on projections the ICCAT SCRS provided a series of future scenarios with different constant catch that would allow the recovery of the stock by 2034. The ICCAT SCRS also noted, for both bigeye and yellowfin, that increased harvests on small bigeye/yellowfin tuna have had negative consequences to both long-term sustainable yield and stock status, and that continued increases in the harvest of small yellowfin tuna will reduce the long-term sustainable yield the stock can produce. And the ICCAT SCRS noted that if the Commission wishes to increase long-term sustainable yield of bigeye and yellowfin, the SCRS recommends that effective measures be found to reduce fishing mortality on small bigeye/yellowfin tuna (e.g. FAD related and other fishing mortality of small yellowfin tuna).

ICCAT Recommendation 21-01 endorsed the SCRS recommendation and adopted additional measures (i.e., a full FAD closure) with the aim to reduce the fishing mortality of juvenile bigeye/yellowfin, particularly of juveniles.

2.3.5. The science underpinning the closure advice

The full FAD closure was adopted at the Commission meeting in 2019 for the years 2020 and 2021 and was later expanded in subsequent Recommendations for 2022 and 2023. The full FAD closure in the ICCAT convention area was first adopted for 2 months in 2020 (January 1 to February 28), 3 months in 2021 (January 1 to March 31), and 72 days in 2022/2023 (1 January 1 to March 13). This was more of a political decision as the ICCAT SCRS did not provide

an analysis of different possible scenarios of FAD closures or any other alternative management option to reduce the fishing mortality on juvenile bigeye and yellowfin.

Historically, ICCAT has adopted different FAD closures in specific time/area strata. In 1997, French and Spanish frozen tuna producers agreed to a voluntary 3-month spatial fishing closure (November 1997 to January 1998) in the Atlantic for purse seine fishing on floating objects or FADs (Moron, 2001). The objective of this Voluntary Protection Plan was the protection of the main spawning ground for tropical tunas, and the reduction of juvenile bigeye catch, in the Gulf of Guinea. This agreement was renewed for 1998/99. And based on this voluntary FAD closure, following ICCAT SCRS recommendations, ICCAT adopted Recommendation 98-01 to extend the measure to all purse seiners operating in the Atlantic to comply with the Gulf of Guinea FAD closure during a 3-month period from November 1999 to January 2000.

At its 2004 session, ICCAT adopted Recommendation 04-01 that closes fishing on FADs by purse seiners and bait boats in the “Piccolo” area – an area within the original moratorium area – but approximately 21% of the size of the original closure area and the closure period was reduced to one month (November).

In 2011, ICCAT adopted Recommendation 11-01 that enlarged the FAD closure from the Piccolo area but still was smaller than the original Gulf of Guinea closure and also increase the time of the closure from 1 month to 2 months from January 1 to February 28.

Finally, before the current total FAD closure, ICCAT adopted in 2015 Recommendation 15-01 that established the original FAD closure in the Gulf of Guinea (Rec 98-01) for 2 months, from January 1 to February 28.

Previous FAD closures were established based on empirical information provided by the SCRS on potential areas that maximize the percentage reduction in juvenile yellowfin and bigeye catch and minimize the reduction in skipjack catch of the FAD fishery using ICCAT fishing statistics. In general, the ICCAT SCRS noted that the FAD area closures were generally inefficient due to effort relocation to other areas in the Atlantic. It also noted that this was more pronounced in the smaller FAD closures (e.g., Piccolo) rather than when a larger area was closed for the FAD fishery both in space and time (e.g., Gulf of Guinea original closure), which the impact of reducing juvenile yellowfin and bigeye has a larger effect.

2.4. IOTC

2.4.1. Tropical Tuna Fisheries

Although in the Indian Ocean, the main fishery is the purse seine fishery, which includes industrial large-scale purse seiners and smaller purse seines from Indonesia, its contribution to total catches is approximately 45%. This contribution is even less if we only consider large industrial purse seine vessels, and it is far from the 70%-95% contribution seen in other oceans. The purse seine is the main fishery in the IOTC (45% of the total tropical tuna cathes), including those associated with drifting and anchored FADs (Fish Aggregating Devices) and unassociated schools, however, the rest of the gears (gillnets, hand lines, pole and line,

longlines, and other fishing gears) accounted from more than purse seine tropical tuna catches (55%) (IOTC, 2022). In 2022, the purse seine fishery accounted for around 45% of the total reported catch, with line fishing contributing around 19%, gillnets 15%, pole-and-line approximately 12%, longlines 6%, and the remaining 1% caught using a variety of artisanal gears (Figure 4).

This pattern varies for each of the tropical species. For skipjack, the purse seine fishery catches 52% (with pole-and-line accounting for around 21%, gillnets 18%, and line fishing 7%). Approximately 33% of yellowfin tuna is caught by purse seines, with 40% caught by line fishing, 15% by gillnets, 10% by longlines, and the remaining 3% by pole and line and other gears. In the case of bigeye tuna, around 50% is taken by purse seines, 30% by longlining, and 10% by line fisheries, with the remaining 5% caught by bait boats and other gears.

When considering only large-scale purse seiners (LSPS) operating with drifting FADs and on free schools (excluding small purse seiners fishing on anchored FADs), the contribution of LSPS to the total catch of the three tropical species in the Indian Ocean is smaller, around 40%. Similarly, the contribution to the total catch of LSPS for skipjack, yellowfin, and bigeye decreases to around 45%, 29%, and 45%, respectively.

Over the past five years, on average, within the purse seine fishery, approximately 85-90% of tropical tunas were caught on sets associated with floating objects or FADs, while around 15-10% were caught on unassociated sets or free schools.

The relative contribution of FAD catches to the total catch of each species was approximately 95% for skipjack, 82% for bigeye, and around 75% for yellowfin over the last five years on average.

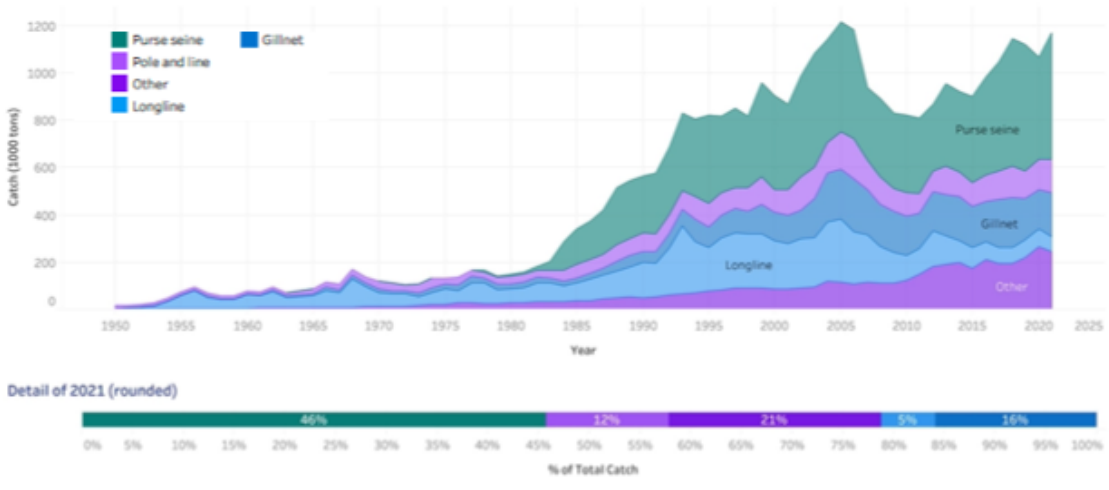

Figure 4.- Trend in tropical tuna catches by major fishing gear in IOTC from 1950 to 2021

2.4.2. Stock Status

Skipjack: the stock is not overfished and overfishing is not occurring.

The stock was last assessed in 2020 with data up to 2019. The combined results of different scenarios, based on the median of an uncertainty grid, indicated that the ratio of fishing mortality to FMSY ($F_{current}/F_{MSY}$) was estimated to be 0.48. and that the ratio of spawning stock biomass to SSBMSY ($SSB_{current}/SSB_{MSY}$) was estimated to be 1.99.

Yellowfin: the stock is overfished and overfishing is occurring.

The most recent full assessment of yellowfin tuna was carried out by IOTC in 2021. The results indicated that the fishing mortality ratio to F_{MSY} (F_{2020}/F_{MSY}) was estimated at 1.32, and that the ratio of spawning biomass to SSB_{MSY} (SSB_{2020}/SSB_{MSY}) was estimated at 0.87.

Bigeye: the stock is overfished and overfishing is occurring.

The latest assessment was conducted by IOTC in 2022. The results of the 2022 assessment indicated that the ratio of $F_{current}$ to F_{MSY} was estimated to be 1.43, and the ratio of spawning biomass to SSB_{MSY} ($SSB_{current}/SSB_{MSY}$) was 0.90.

2.4.3. Management Approach

IOTC Resolution 21-01 on an interim plan for rebuilding the Indian Ocean yellowfin tuna stock in the IOTC area of competence, IOTC Resolution 22-03 on a Management Procedure for bigeye tuna in the IOTC area of competence, and IOTC Resolution 23-04 on establishing catch limits for bigeye tuna in the IOTC area of competence establish the main management framework for yellowfin and bigeye tunas, respectively.

For yellowfin, the 2022 IOTC Scientific Committee provided various future projection scenarios of catch reduction, using the current relative catch share among main gears, to reduce fishing mortality from the 2020 level in order to end overfishing and recover the population by 2030. Following that advice, the IOTC adopted Resolution 21-01, which applies to all IOTC CPCs (Contracting Parties and Cooperating non-Contracting Parties) and establishes catch limits by CPC, depending on each CPC's previous catch. The catch reduction is dependent on the amount of the previous year's catch and the nature of the CPCs, whether they are long-distance nations, coastal developed states, coastal developing states, or small island development countries. This measure also reduces the number of supply vessels to be used by the purse seine CPCs and encourages the conversion of gillnets to other more selective gears.

For bigeye, the IOTC adopted a Management Procedure (Resolution 22-03) with the objective of maintaining the stock biomass in the green zone of the Kobe plot (not overfished and not subject to overfishing) while maximizing the average catch from the fishery and reducing the variation in the total allowable catch (TAC) between management periods. The adopted MP is designed to achieve, with the current catch share among gears, a 60% probability that the bigeye tuna spawning stock biomass will be above SSBMSY by 2034-2038, a high probability of avoiding breaching the bigeye limit reference points, and with a maximum 15% change in TAC among management periods.

Following the application of the Management Procedure, the 25th Session of the IOTC Scientific Committee recommended a total allowable catch (TAC) of 80,583 t of bigeye tuna per year for 2024 and 2025, which requires a 15% reduction from the 2021 catch level. Thus, the IOTC adopted Resolution 23-04, which sets a Total Allowable Catch (TAC) for bigeye tuna at 80,583 t in 2024 and 2025 and also establishes catch limits by CPCs to realize that overall TAC.

Moreover, purse seines operating with floating objects have limits on the number of active FADs that can be used at any time, the number of buoys that can be annually purchased or kept in stock, cannot deactivate and reactivate buoys unless they are brought back to the port, are required to use fully non-entangling FADs without nets, and have to submit operational FAD data for compliance purposes.

2.4.4. Objectives of the closure

There are currently no fishing closures in the IOTC.

Historically, in 1998, French and Spanish frozen tuna producers agreed to a voluntary 3-month spatial fishing closure (from November 1998 to January 1999) in the Indian Ocean purse seine fishing on floating objects or FADs off the coast of Somalia (Moron, 2001). The objective of this Voluntary Protection Plan was to reduce the catch of juvenile bigeye tuna off the coast of Somalia. This agreement was renewed for the 1998/99 period.

Later, in 2010, the IOTC adopted Resolution 10-01 for the conservation and management of tropical tunas in the IOTC's area of competence. This resolution established a seasonal and spatial fishing closure to reduce the overall pressure on the main targeted species, particularly yellowfin and bigeye. For longliners, the closure was set from 1 February to 1 March, and for purse seiners, it was from 1 November to 1 December for the 2011-2014 period. The IOTC Scientific Committee advised that this moratorium was not effective due to effort reallocation.

Resolution 23-02, which did not become binding for any member of the Commission due to objections from more than one-third of the IOTC members, proposed a full FAD closure lasting 72 days.

3. A comparison of the different closures

The closures established in the tuna RFMOs (Regional Fisheries Management Organizations) vary among RFMOs. For example, since the purse seine fishery accounts for the majority of the catch (around 95%, as shown in Table 1), the IATTC (Inter-American Tropical Tuna Commission) has implemented a full closure of 72 days for the purse seine fishery. This closure aims to maintain fishing effort levels as recommended by the IATTC staff based on the results of stock assessments.

In this case, only a large-scale purse seine closure is capable of meeting the recommended level of effort reduction required to achieve the target fishing mortality recommended by the

Scientific Committee for the tuna stock that requires the strictest management regulation (i.e., bigeye or yellowfin) given the current relative contribution of different gears/sets to the catch (i.e., the juvenile vs. adult contribution to the catch). Vessel operators also have the option to stop fishing during two different periods, which from an economic standpoint allows fishing companies to maintain operations throughout the year, ensuring a consistent supply to canneries. There are no catch limitations that restrict their operations outside of the fishery closure.

Additional IATTC measures, such as the corralito, additional FAD closure days linked to bigeye individual vessel limitis (IVLs) and FAD-related measures, are specifically directed to reduce the impact of fisheries on juvenile mortality.

The WCPFC, as best practices, outlined certain considerations to be taken into account when designing full or FAD closures (as mentioned earlier), and the IATTC full closure incorporates some of them. The measure distributes the burden of responsibility among CPCs and fisheries, without assigning a disproportionate share of management responsibility to any specific member or fishing mode. It represents a shared responsibility, which helps ensure the health of the three stocks of tropical tuna.

In summary, for the IATTC, the full closure is a primary effort input control management measure applied to all types of purse seine fishery sets to maintain sustainable stock levels. Additionally, there are no additional "output" control measures that limit purse seine operations outside of the fishing closure.

The WCPFC case is similar to the IATTC case, where the majority of the catch comes from purse seiners (70%). However, in the WCPFC, the availability of free schools is the highest among the tuna RFMOs, and free school catches account for approximately 50% of the total purse seine catch (Table 1). In the WCPFC, the primary management measure to limit overall fishing effort is restricting the purse seining fishing days of different members. Additionally, a 3-month FAD closure (extended to 5 months on the high seas) is implemented to reduce the overall fishing pressure on juvenile bigeye and yellowfin. In this case, both the input control of fishing days and the FAD closure are effective in achieving the recommended level of fishing mortality as advised by the Scientific Committee for the tuna stock. During FAD closures, vessels can shift their activity to free school fishing. From an economic standpoint, this allows fishing companies to maintain their operations and ensures a continuous supply to canneries. Similar to the IATTC case, because the primary management framework is based on input control, there are no catch limitations that restrict operations outside the fishery closure.

Once again, due to the purse seine fishery's predominant role in the total tropical tuna catch, these measures distribute the burden among CPCs and fisheries. They do not assign a disproportionate share of management responsibility to any specific member or fishing mode but promote shared responsibility. This shared responsibility, along with the current management measures, ensures that the three stocks of tropical tuna remain in a healthy state.

In summary, for the WCPFC, the FAD closure applies to the purse seine fishery in EEZs and on the High Seas. Purse seine vessels can continue fishing for yellowfin in free schools because

the fishery is managed using input controls and there is a large availability of free school tunas in the WCPO. Effort control is the primary regulatory tool to achieve and maintain sustainable stock levels. It's worth noting that because yellowfin can be caught in both unassociated and associated schools, an effort reduction due to FAD closures on associated sets could potentially increase yellowfin mortality if purse seine effort is simply shifted from associated sets to unassociated sets. This could impact the yellowfin population as well.

In the case of ICCAT, similar to IATTC/WCPFC, the majority of the tropical tuna catch comes from the purse seine fishery (70%). The primary management measures consist of output controls for both yellowfin and bigeye, while the FAD closure is designed to reduce the fishing mortality of juvenile yellowfin and bigeye, as recommended by the SCRS. Considering that ICCAT's projections are based on the current catch distribution between gears and fishing operations, especially for FAD vs free school in purse seines, if both TACs are fully implemented effectively, both stocks are expected to achieve their management objectives. The FAD closure, which may reduce the catch and fishing mortality of juvenile bigeye and yellowfin, is anticipated to expedite the recovery of both species but may also impact the catch of skipjack.

However, the purse seine fishery can continue fishing on free schools during the FAD closure. Consequently, while effort reduction on FAD sets can yield positive outcomes in reducing the mortality of juvenile bigeye tuna (as they are not typically caught in free schools), there is also the potential for an increase in the mortality of adult yellowfin if purse seine effort shifts from FAD sets to free schools.

In the case of ICCAT, where output controls limit overall fishing mortality, the FAD closure is designed to limit juvenile fishing mortality, potentially leading to an increase in adult yellowfin fishing mortality since the yellowfin TAC is an overall limit not allocated to individual countries.

The WCPFC has outlined certain considerations for designing full or FAD closures (as mentioned earlier), ICCAT’s output measures distributes the burden among CPCs and fisheries. This approach ensures that no particular member/fishing mode assumes a disproportionate share of the management responsibility; it is a shared responsibility. However, in the case of the FAD closure, it appears that purse seiners bear a significant responsibility, reflecting their substantial share of the total catch of tropical tunas (70%).

In the case of IOTC, the large-scale purse seine fishery[3] accounts for “only” 40% of the total tropical tuna catch (29% of the yellowfin tuna catch, 45% of the skipjack and bigeye total catch), which is lower than the 70%-95% contribution seen in other oceans where purse seiners dominate the total catch.

The main management measures to achieve the management objectives (maintain the stock in the green Kobe quadrant) in IOTC are an output control for both yellowfin and bigeye, which are “allocated” to specific CPCs. Therefore, considering that the yellowfin projections

[3] Considering only Large Scale Purse Seines which operates with drifing FADs (excluding small scale PS operating with anchored FADs)

and the bigeye MP were done using the current catch share among fleets/gears/fishing sets, the full effective implementation of the TAC/catch limits will allow the recovery of both species.

The main management measures in IOTC aim to maintain the stock in the green Kobe quadrant and involve output controls for both yellowfin and bigeye, with allocations to specific CPCs. Since the yellowfin projections and the bigeye Management Procedure (MP) were developed using the current catch relative distribution among fleets, gears, and fishing sets (free vs. FADs), full and effective implementation of the TAC and catch limits will allow the recovery of both species.

Any measure intended to reduce FAD-associated fishing effort, such as FAD closures, would decrease the fishing mortality of juvenile fish if the effort is not shifted to free schools. In this case, the measure may expedite population recovery. However, considering that purse seiners catch 30% of yellowfin and 50% of bigeye, achieving the necessary reduction in fishing mortality for yellowfin and bigeye recovery solely through a reduction in FAD effort would be substantial and challenging to implement unless additional measures for other gears are agreed upon.

Additionally, it is unlikely that effort will shift to free schools under a FAD closure scenario because most purse seine CPCs have yellowfin limits. Completing their yellowfin catch limit with free schools would shorten their annual operations, reducing the catch of skipjack, which is primarily caught on FADs. Without transferring effort to free schools, the catch of juvenile bigeye and yellowfin might not decrease as expected, as purse seiners will try to extend the fishing season and catch the total bigeye and yellowfin quota on FAD-associated schools. This would maintain similar juvenile fishing mortality rates and increase opportunities to catch skipjack.

An effort reduction scheme aimed at decreasing overall fishing mortality to recover yellowfin/bigeye from FAD-associated sets, without additional measures for other gears, would place a significant responsibility on purse seine CPCs for reducing bigeye and yellowfin catch and achieving recovery, despite accounting for only a third of the total catch.

In line with the considerations for closures discussed by the WCPFC, IOTC's output measures distribute the burden among CPCs and fisheries, ensuring a shared responsibility. However, if FAD-oriented measures become the primary means to recover yellowfin and bigeye, it is unlikely that yellowfin recovery will be achieved due to the smaller contribution to total catches (30%) and their ability to catch their TAC of yellowfin and bigeye (with an overall similar catch on juveniles) on FAD-associated sets outside the FAD closure period. Furthermore, purse seine members would shoulder most of the recovery responsibility while representing a smaller portion of the catch. Thus, FAD-oriented measures to reduce juvenile mortality can be seen as a management tool, which in conjunction with other primary management actions, could contribute to, facilitate and accelerate the recovery of both populations while maintaining skipjack catches at agreed levels.

Considering the stock status of IOTC tropical tuna species and that the catch limit for skipjack has been exceeded since 2018, effective management measures and tools (including

protective closed areas) based on sound science are needed to achieve clear conservation objectives for tuna populations in IOTC. For instance, while a FAD closure might contribute to reduce the overall pressure on the three tropical tuna species (as skipjack catches have exceed the catch limit since 2018), it may not achieve the intended management goals of ensuring sustainability for tuna populations and fisheries without additional measures effectively implemented to purse seiner and other gears.

In summary, FAD closures can be an effective tool in a regional fisheries management organization's management toolbox for reducing overall fishing mortality and FAD-related juvenile mortality, but they should not be considered a singular solution to replace comprehensive and active fishery management. Their design should take into account the region's different fisheries, regional characteristics, the relative contributions of different gears to the total catch, and the specific management objectives that need to be achieved with any management option.

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Table 1.- Management measures including fishing closures in tropical tunaRFMOs.

Measure		IATTC	ICCAT	IOTC	WCPFC
% of PS of the total catch					
	Total	95%	70%	45% (40%[4])	70%
	YFT	96%	67%	33% (29%[1])	53%
	SKJ	99%	84%	52% (45%[1])	84%
	BET	70%	30-40%	50% (45%[1])	45%
% of different PS fishing modes					
	PS free	8%	20%	10-15%	47%
	PS FADs	60%	80%	85-90%	48%
	PS Dolphins	30%			
	Others	2%			5%
Status of the stock					
	YFT	Green	Green	Red	Green
	BET	Green	Yellow (overfished not overfishing)	Red	Green
	SKJ	Green	Green	Green	Green
Type of main management measure					
PS	SKJ/YFT/BET	Effort	Output[5]	Output[6]	Effort
		72 days of closure			Number of days
LL	BET/FYT	Output	Output	Output	Output
Additional management measures					
	Juvenile reduction	Corralito closure (1 month) Additional closure days depending on surpassing a specific bigeye catch level in previous year.	72 days fishing closure on FADs	None	3 month FAD closure in EEZs pluse 2 months in HS
Other measures					
	Capacity	PS/LL limits	-	-	PS/LL limits
	FADs	Limit active FADs NEFAD (2025) BioFAD (2029) Deactivation and reaction rules Retrieval 15days before the closure Provision of daily FAD position and biomass data for science	Limit active NEFAD Deactivation/reactivation prohibited	Limit active NEFAD Deactivation/reactvation prohibited Limit annual purchase of buoys and buoys in stock Provision of daily FAD position data for compliance purposes	Limit active FADs NEFAD (2024)

[4] Considering only Large Scale Purse Seines which operates with drifting FADs (excluding small scale PS operating with anchored FADs)
[5] TAC for each CPC for bigeye and a general TAC for yellowfin
[6] TAC for each CPC for bigeye and catch limits by CPC for yellowfin