

INTER-AMERICAN TROPICAL TUNA COMMISSION

SCIENTIFIC ADVISORY COMMITTEE

17TH MEETING

La Jolla, California (USA)

08-12 June 2026

SAC-17-06

A MANAGEMENT PROCEDURE FOR THE TROPICAL TUNAS IN THE EASTERN PACIFIC OCEAN

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SUMMARY

A Management Strategy Evaluation (MSE) has been completed for bigeye tuna in the eastern Pacific Ocean (EPO), in which eight candidate harvest control rules (HCRs) were evaluated ([SAC-17-04](#)). In addition, an interim multi-species, multi-stock MSE (MS-MSE) was conducted to assess the implications of adopting a Management Procedure for bigeye tuna on yellowfin tuna (under both the northeast and southwest stock structure hypotheses) and skipjack tuna ([SAC-17 INF-Q](#)).

The MSE identified three HCRs for bigeye tuna that meet the proposed management objectives. The multi-species MSE indicates that implementation of these HCRs would not adversely affect the safety and status of yellowfin or skipjack tuna stocks.

The MSE results indicate that the measures established under Resolution [C-25-01](#) for 2026 are effective in supporting the high-level management objective of the IATTC Antigua Convention: *maintaining or restoring fish stocks at levels capable of producing maximum sustainable yield (MSY)*. In practical terms, this implies maintaining spawning biomass at or above S_{MSY} . Accordingly, the staff concludes that the scientific pre-requisites specified in paragraph 1 of Resolution C-25-01 have been met and that the

conservation measures established for 2026 could remain in force during 2027 and 2028 if the Commission decides to do so.

An update assessment for bigeye tuna conducted in 2026 indicates that fishing mortality on juveniles has continued to decline following implementation of the Individual Vessel Threshold (IVT) ([SAC-17-03](#)). In response to paragraphs 12 and 13 of Resolution C-25-01, which provide for the possibility of modifying the management measures should the Commission so decide, the staff notes that the updated bigeye tuna assessment indicates that substantial reductions in the conservation measures, including the elimination of the purse-seine closure, would be possible under the interim harvest control rule established in Resolution [C-23-06](#). The staff does not recommend direct application of the HCR in Resolution C-25-01 under the circumstances observed in 2026. Instead, the staff recommends that, if desired by the Commission, any reductions in management measures continue to be implemented incrementally and within a Management Procedure framework.

Incremental reductions in management measures would allow additional data collection and scientific research to reduce uncertainty in the stock assessments and improve future management advice. An incremental reduction would also provide the time needed to gain clarity on the ecosystem objectives of the Antigua Convention and to work toward achieving them through the implementation of the various workplans set out in the IATTC's Science Strategic Plan (SSP) ([103-INF-03a](#)), in particular the workplan to operationalize the Ecosystem Approach to Fisheries Management (EAFM) through the development of ecosystem-advice products ([EB-02-02](#)).

In this document, the staff presents three alternative Management Procedure (MP) options for tropical tunas in the eastern Pacific Ocean (EPO). In response to paragraph 44 of Resolution C-25-01, and taking into account the discussions held during the fourth meeting of the *Ad Hoc Working Group to Strengthen the Dialogue among Scientists, Managers, and Other Stakeholders on MSE*, the staff proposes an *interim* multi-species Management Procedure for tropical tunas in the EPO (Option 2c; Section 6).

Rather than allowing for the complete elimination of the purse-seine closure period (currently at 64 days), the proposed MP would establish an initial minimum closure period of 40 days. This approach is intended to reduce the risk of future increases in the closure period while still providing a more rapid trajectory toward the target fishing mortality. The minimum closure period was determined using a risk-based approach.

The main elements of the proposed *interim* Management Procedure (MP) are as follows:

- **MP Schedule:**
 - **2027-2029:** A 50-day closure of the purse-seine fishery (a 14-day reduction from the 64-day closure established under Resolution C-25-01, to allow for a more rapid trajectory toward the target fishing mortality.
 - **2030-2032:** Closure period determined by the MP, subject to a minimum closure of 40 days (a precautionary minimum duration of the closure).
- Beginning in 2030 and every three years thereafter, the staff's proposed F30-S20 HCR would be applied independently to each tropical tuna stock (bigeye, yellowfin, and skipjack). The purse-seine closure period would then be determined by the stock requiring the most restrictive management measures, thereby ensuring that management remains responsive to the stock of greatest concern.
- The changes in the purse-seine closure period should be limited to a maximum of 10 days per management cycle. However, if the spawning biomass of the stock determining the management

action falls below 20% of the unfished spawning biomass level, the maximum increase in the closure period should be 20 days.

- Scientific research should be conducted to reduce the uncertainty in the stock assessments, and the Management Procedure should be re-evaluated through MSE before being used to determine management actions for 2033 and beyond.
- The proposed MP is termed *interim* to allow the Commission and its staff to complete ongoing work. Specifically, this six-year (two management cycle) timeframe would provide an opportunity for the Commission to develop and adopt multi-species management objectives, for the staff to complete MSEs for individual stocks, and ultimately to conduct a fully integrated multi-species MSE. In addition, this would allow the Commission to determine how best to operationalize a multi-species Management Procedure for tropical tunas in the EPO (e.g. separation of stocks and fisheries, if desired).

1. INTRODUCTION

In 2025, based on a new benchmark assessment and risk analysis for yellowfin, the first risk analysis for skipjack, and stock status indicators, the staff concluded that all three tropical tuna stocks remained in healthy condition and that the recent improvement in the status of bigeye tuna was largely associated with implementation of the Individual Vessel Threshold (IVT) measure to reduce bigeye catches on floating-object sets. The staff advised that reductions in the conservation measures were possible under the *interim* harvest control rule established in Resolution [C-23-06](#), but recommended that any reductions be implemented incrementally, with a maximum reduction of 10 days in the purse-seine closure period relative to the previous 72-day closure, in line with the staff's proposed harvest strategy ([SAC-16-06](#)).

As requested under Resolution [C-24-01](#), in 2025 the staff presented a proposed harvest strategy for bigeye tuna (Staff's HS; [SAC-16-06](#)), based on elements identified during a series of [IATTC MSE workshops](#) held from 2019 to 2025. Although the proposed harvest strategy was considered by the Commission, it had not yet been formally tested through Management Strategy Evaluation (MSE) or evaluated against alternative strategies. Consequently, it was not adopted, and interim management measures were established for 2026 through Resolution [C-25-01](#). The principal management change adopted for 2026 was an 8-day reduction in the purse-seine closure period, from 72 to 64 days, while maintaining the IVT measure and the *corralito* closure. The resolution also established the Integrated Port Sampling Program (IPSP, [SAC-16-05](#)) and funded a tropical tuna tagging program during 2026–2027. In addition, all other conservation and management measures adopted under previous tropical tuna resolutions remained in effect, providing continuity in the management of the fishery while further scientific evaluation and the development of harvest strategies continue.

Resolution [C-25-01](#) established two possible pathways for scientific advice after 2026: 1) continuation of the 2026 measures into 2027–2028 (paragraph 1); 2) modifying the measures based on best available science (paragraphs 12 and 13).

Paragraph 1 of Resolution [C-25-01](#) allows for the continuation of the 2026 management measures through 2027 and 2028, provided that the MSE process confirms the effectiveness of those measures in achieving the intended management objectives. Specifically, paragraph 1 states:

These measures are applicable from 00:00 hours on 1 January 2026 and will expire on to 24:00 hours on 31 December 2026, except for the second closure period referred to in paragraph 3, which extends until 24:00 hours on 11 January 2027, unless the scientific advice provided by the staff and the Scientific Advisory Committee (SAC) in 2026 through the Management Strategy Evaluation (MSE) process

confirms the effectiveness of the measures in place. In this case, the Resolution would remain in force until 24:00 hours on 31 December 2028, except for the second closure period referred to in paragraph 3, which would extend until 24:00 hours on 11 January 2029, and also except for the additional days of closure that would be added pursuant to paragraph 4 to that second closure period.

To provide the Commission with a pathway to revise management measures in 2027 and beyond, if appropriate, paragraph 12 of Resolution C-25-01 provides for adjustments to the conservation and management measures based on the results of updated stock assessments:

In the event that the status quo conditions, as represented by the average annual catches of bigeye tuna during the three-year period 2017-2019 (66,906 t – Best Scientific Estimate [BSE]), are not offset by this measure, or taking into consideration the results of any new stock assessments for bigeye, the IATTC scientific staff shall propose to the Commission an update of its recommendations for these conservation measures, including, among others, an increase of the numbers of closure days.

Likewise, paragraph 13 of Resolution C-25-01 provides for modifications to the management measures if scientific evidence demonstrates an improvement in the status of the bigeye tuna stock:

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

Context for the review of management measures

In 2026, a Management Strategy Evaluation (MSE) for bigeye tuna in the EPO was completed (SAC-17-05). The MSE evaluated the harvest control rule (HCR) included in the staff’s proposed harvest strategy (SAC-16-06), alongside a range of alternative HCRs, providing a basis to assess, and if appropriate confirm, the effectiveness of the management measures adopted under Resolution C-25-01. Based on the performance metrics evaluated in the MSE, three HCRs were identified as meeting the proposed management objectives related to safety, stock status, stability, yield, effort, and abundance: F30-S20 (staff’s proposal), F35-S20 and F35-S25 (Tables 1 and 2a).

An updated bigeye tuna stock assessment was conducted in 2026 ([SAC-17-03](#)). The assessment indicates that fishing mortality on juveniles has continued to decline since the implementation of the Individual Vessel Threshold (IVT) measure to reduce bigeye catches on floating-object sets. Furthermore, the updated assessment indicates that the spawning biomass has increased, reflecting an improvement in stock status since the benchmark assessment used to develop Resolution C-25-01 ([SAC-15-02](#)). The 2026 risk analysis results indicate that all three stocks are assessed to be in healthy condition, with very low (0-5%) to low (5-20%) probabilities (risks) of exceeding the target reference points ([SAC-17-10](#)). In addition, the estimated risks of exceeding the limit reference points for all three species are essentially zero (<1%).

Accordingly, the management measures adopted under Resolution C-25-01 may be re-evaluated and, if appropriate, adjusted in light of the improved stock status and low estimated risks.

In 2026, the staff identified the following **potential options for consideration by the Commission regarding tropical tuna conservation and management measures for 2027 and beyond**:

- 1. Extend the current measures in Resolution C-25-01 through 2027 and 2028 (paragraph 1):** This option would continue to support the high-level objective of the Antigua Convention to maintain stocks at or above levels capable of producing maximum sustainable yield (MSY). However, it would forgo potential fishing opportunities, particularly for skipjack, indicated by the current more optimistic stock status and results of the risk analysis.

2. Adopt a Management Procedure

- a. **Apply one of the three candidate HCRs identified in the bigeye tuna MSE:** This is like Option 1, but would be implemented within the context of an adopted Management Procedure. Application of any of the three candidate HCRs identified as meeting the proposed management objectives would provide a structured and tested pathway for management ([SAC-17-05](#)). However, progress toward the target fishing mortality would be gradual, being achieved over an extended period (more than 20 years).
 - b. **Apply one of the three candidate HCRs identified in the bigeye tuna MSE, adjusted to allow a more rapid trajectory toward the target fishing mortality:** Similar to Option 2a, this approach would maintain the proposed management objectives while providing increased fishing opportunities at a faster rate than option 2a, consistent with the current stock status and low estimated risks of exceeding the reference points for the all three species (bigeye, yellowfin and skipjack).
 - c. **For all three species:** Extend Option 2b by applying the same HCR developed for bigeye to yellowfin and skipjack tunas. Similar to the current interim HCR (C-23-06), the Management Procedure associated with the stock requiring the most restrictive management would determine the overall management action. This approach recognizes that bigeye may no longer be the stock requiring the strongest management measures, while leveraging the knowledge gained through the bigeye MSE process. It would also provide a structured and tested framework for management and could allow increased fishing opportunities to be realized more rapidly.
3. **Direct application of the interim harvest control rule (Resolution [C-23-06](#))** This option would increase fishing mortality toward the target reference point, F_{MSY} . The staff does not recommend this option because application of the interim HCR would result in an abrupt and complete elimination of the purse-seine closure, representing large changes and levels of fishing mortality not experienced in the fishery and a substantial departure from the gradual and precautionary approach evaluated in the MSE.

Objectives of this document

This document provides information relevant to the evaluation of paragraphs 1, 12, and 13 of Resolution C-25-01 and forms part of the basis for the staff's recommendations presented in [SAC-17-10](#). The ultimate goal is to harmonize the bigeye MSE and update assessment under the framework of Resolution [C-25-01](#), while using concepts from the current *interim* harvest strategy to address the multi-stock nature of the fishery.

This document is organized into the following sections:

- **Background:** Key considerations regarding the assessment and management of tropical tunas in the eastern Pacific Ocean (EPO).
- **Bigeye tuna Management Strategy Evaluation (MSE):** Summary of the bigeye MSE results and the candidate harvest control rules evaluated ([SAC-17-05](#)).
- **Evaluating the effectiveness of the current management measures based on MSE:** Evaluating Paragraph 1 of Resolution [C-25-01](#) that allows for the continuation of the 2026 management measures through 2027 and 2028 (**Option 1**).
- **Options for a Management Procedure for tropical tunas in the EPO (Options 2a-c):** Presentation and critical evaluation of three alternative approaches for implementing a Management

Procedure for tropical tunas in the EPO. These options build on each other to develop a complete MP in Option 2c. The first (Option 2a) would apply one of the harvest control rules (HCRs) identified by the bigeye MSE as meeting the proposed management objectives. The second (Option 2b) would apply a modified version of those HCRs designed to achieve the same objectives while allowing a more rapid transition toward them. The third (2c) applies a harvest control rule to each stock and bases management on the stock that requires the strictest management. These options are presented and evaluated while accounting for the technical challenges associated with implementing a Management Procedure for tropical tunas in the EPO in 2027, as identified above.

- **Management based on the current interim harvest strategy (Option 3):** Evaluating the implications of applying the current *interim* harvest strategy to the results of the 2026 bigeye update assessment ([SAC-17-03](#)).
- **Reducing uncertainty:** Identification of scientific research, monitoring, and data collection priorities to reduce uncertainty in stock assessments and management advice and to support the continued development and refinement of Management Procedures for tropical tunas in the EPO.

This document focuses primarily on options for implementing a Management Procedure for tropical tunas in the EPO (Options 2a-c). Options 1 and 3, extension of the current management measures under Resolution C-25-01 and management under the *interim* harvest control rule established in Resolution C-23-06, are discussed only briefly to provide context and span the range of possibilities. A more detailed evaluation of those options is provided in SAC-17-10.

As a side note, the staff has adopted the term Management Procedure (MP) in place of Harvest Strategy (HS). A harvest strategy generally refers to a broad management framework, whereas a management procedure refers to the specific set of decision rules evaluated through an MSE. Because the analyses presented here are tailored to the status and dynamics of the EPO tropical tuna fisheries, the term Management Procedure is considered more appropriate. However, during the transition to the new terminology, we may use HS and MP interchangeably.

Management procedure (MP): A pre-agreed framework for making fisheries management decisions, such as setting days of closure, that has been simulation-tested using MSE and designed to achieve specific management objectives. An MP typically includes a data collection program, stock status estimation method, and harvest control rule (HCR).

2. BACKGROUND: KEY CONSIDERATIONS FOR THE DEVELOPMENT OF A MANAGEMENT PROCEDURE FOR TROPICAL TUNAS IN THE EPO

A greatly improved stock status for bigeye tuna

The bigeye tuna harvest strategy proposed by the staff (Staff HS, [SAC-16-06](#)) was developed based on the results of the 2024 benchmark assessment ([SAC-15-02](#)). That assessment indicated that the implementation of the Individual Vessel Threshold (IVT) measure had likely reduced fishing mortality on juveniles, but that the resulting rebuilding of the spawning biomass had not yet been realized. In addition, the benchmark assessment did not evaluate stock status relative to the $F_{30\%}$ and $S_{30\%}$ reference points that form the basis of the staff's proposed HS. Stock status relative to these reference points would have been less optimistic than relative to the MSY-based reference points evaluated in the assessment, given that S_{MSY}/S_0 is generally between 15% and 25% across the models included in the risk analysis ensemble.

The updated bigeye tuna assessment conducted in 2026 ([SAC-17-03](#)) presents a far more optimistic view of stock status than the 2024 benchmark assessment ([SAC-15-02](#)). In particular, fishing mortality on

juveniles is estimated to have continued to decline (an approximate 50% reduction compared to just prior to the implementation of the IVT in 2022), while spawning biomass is estimated to be increasing. The associated risk assessment estimates that the median current spawning biomass is at $S_{30\%}$ ($S_{\text{current}}/S_{30\%}=0.98$) and that current fishing mortality (based on the 2023–2025 average, compared to 2021–2023 in the benchmark assessment) is approximately 70% of $F_{30\%}$ ($F_{\text{current}}/F_{30\%}=0.70$). Accordingly, the updated bigeye assessment results suggest that the fishing mortality can be increased substantially under both the current *interim* harvest control rule specified in Resolution C-23-06, which has a target fishing mortality of F_{MSY} , and the $F_{30\%}$ target fishing mortality of the staff’s proposed harvest strategy (SAC-16-06).

The Pace of Adjustment Toward the Target Fishing Mortality

When developing the Staff’s HS (SAC-16-06), the staff considered *stability* as an important management objective and therefore limited changes in the purse-seine closure period to a maximum of 10 days per three-year management cycle. This limit reflected several considerations. First, fishing mortality was estimated by the 2024 benchmark assessment to be approaching the proposed target level of $F_{30\%}$ (SAC-15-05), making large fluctuations in management measures unlikely to be necessary once fishing mortality was fluctuating around this proposed target level. Second, uncertainty remained regarding the effectiveness of the IVT measure, as increases in spawning biomass had not yet been observed in the longline CPUE index used as an indicator of spawning biomass. Consequently, a precautionary approach favored limiting the magnitude of any reductions in the management measures until stronger evidence of stock rebuilding became available. Third, historically, recommendations for closure increases greater than 10 days have often resulted in the Commission considering alternative management measures. If desired, large reductions in management measures should be implemented incrementally to allow for careful evaluation of their effects on the stocks and the ecosystem, as well as to minimize variability in catch and effort.

The 10-day limit was also considered consistent with stability objectives. A change of 10 days represented approximately 15% of the 72-day closure period in effect at the time, which is comparable to constraints on interannual management changes commonly incorporated into harvest strategies for other stocks. However, because fishing mortality is assumed to be proportional to the fishing season opening rather than to the closure period itself, a 10-day change represented only about 3% of the fishing season opening. Furthermore, because the management system is effort-based rather than catch-based, it is generally more robust to recruitment variability and therefore requires less frequent or less pronounced management adjustments.

The 2026 bigeye update assessment is much more optimistic than the 2024 benchmark assessment implying that obtaining the target fishing mortality will be substantially delayed under the Staff’s proposed HS (SAC-16-06). The MSE that evaluated the Staff’s HS and alternative harvest strategies for bigeye was based on operating models derived from an updated assessment conducted in 2025 (SAC-17-05), which are also more optimistic than the benchmark assessment. The more optimistic results are partly attributable to the additional years of data collected under implementation of the Individual Vessel Threshold (IVT) measure. Both the 2025 update assessment used in the MSE (which included data through 2024) and the 2026 update assessment (which included data through 2025) incorporated three years of IVT implementation (2022–2024), compared to only two years (2022–2023) in the benchmark assessment. The 2026 update assessment is even more optimistic, reflecting an additional year of data under the IVT measure and continued evidence of reduced fishing mortality on juvenile bigeye tuna.

A multi-species perspective

Because the purse-seine closure applies to all eligible vessels operating in the EPO, regardless of set type or species composition, limiting the magnitude of closure changes from one management cycle to the next will also constrain harvest opportunities for yellowfin and skipjack tuna. These species constitute the principal catches of the dolphin-associated and floating-object fisheries, respectively, and are therefore the primary “target species” of those fisheries, even though overall tuna production could potentially be considered the broader management objective of the tropical tuna fishery in the EPO, should the Commission choose to adopt such an objective.

Recent assessments indicate that both yellowfin ([SAC-16-03](#)) and skipjack tuna ([SAC-15-04](#); [SAC-16-04](#)) are being fished at levels substantially below F_{MSY} (see section 1.1.2.a in [SAC-17-10](#)). Consequently, increases in fishing mortality on these stocks could result in higher sustainable catches, particularly for skipjack tuna ([SAC-17 INF-Q](#)). Therefore, allowing a more rapid reduction in the closure period, and thus a faster increase in fishing mortality toward the $F_{30\%}$ target for bigeye tuna, may provide additional benefits by increasing harvest opportunities for yellowfin and skipjack tuna without compromising the ability to achieve the management objectives for bigeye tuna.

Fishing mortality on juvenile bigeye tuna has been reduced to such an extent that yellowfin tuna has now become the species requiring the most restrictive management measures ([SAC-17-10](#)). The 2025 benchmark assessment for yellowfin tuna evaluated a two-stock hypothesis in the EPO ([SAC-16-03](#); Figure 1), consisting of a northeast stock, which encompasses the primary purse-seine fishery on yellowfin associated with dolphins, and a southwest stock, where the principal floating-object fishery occurs. Therefore, both plausible yellowfin stocks should be considered when developing management advice.

Historically, management measures for tropical tunas in the EPO have been largely driven by the status of bigeye tuna, which was generally the stock of greatest management concern among the three tropical tuna species. However, the substantial improvement in the status of bigeye tuna estimated in the 2026 updated assessment introduces new considerations for management. Under alternative stock-structure hypotheses, yellowfin tuna now exhibits the highest estimated risk of exceeding F_{MSY} among the three species, although that risk remains relatively low and the stock continues to be considered in healthy condition ([SAC-17-10](#)). This shift highlights the need for a Management Procedure that explicitly considers the status and management objectives of all three tropical tuna species. In particular, it raises the question of whether management measures designed primarily to achieve bigeye tuna objectives remain appropriate when another species becomes the most constraining stock. Evaluating such trade-offs is an important consideration for the future development of a multi-species Management Procedure for tropical tunas in the EPO.

3. BIGEYE TUNA MANAGEMENT STRATEGY EVALUATION

A Management Strategy Evaluation (MSE) has been conducted for bigeye tuna in the EPO ([SAC-17-05](#)). In addition to the staff's proposed harvest strategy (HS), F30-S20 ([SAC-16-06](#)), which specifies a maximum fishing mortality rate corresponding to a depletion level of 30% and a control point at which fishing mortality is reduced when spawning biomass falls below 20% of the dynamic unexploited level, seven alternative HSs (Table 1; Figure 2a) have been developed. These HSs are based on the staff's interpretation of discussions held during the [IATTC MSE workshops](#) (2019–2025), meetings of the [Ad Hoc Working Group to Strengthen the Dialogue among Scientists, Managers, and other Stakeholders on MSE](#) (2025–2026), the Antigua Convention, relevant resolutions, the interim harvest control rule, and established reference points. The HSs were tested using MSE and evaluated against performance metrics associated with proposed management objectives related to safety, stock status, stability, yield, effort, and abundance.

Harvest control rules

The eight HCRs share a common, simple structure (Figure 2) and differ only in the maximum fishing

mortality, the biomass control point below which fishing mortality is reduced, or both (Table 1). All HCRs include a maximum change of 10 closure days per management cycle, except when biomass falls below the control point, in which case the closure period may increase by up to 20 days. Among the eight HCRs evaluated, the staff's proposed HCR (F30-S20) is the least conservative, resulting in higher fishing mortality and lower biomass levels relative to the alternatives tested.

MSE results

The spawning biomass is projected to increase rapidly during the first three-year management cycle in response to both the strong 2023 recruitment and the reduction in juvenile mortality following implementation of the Individual Vessel Threshold (IVT) measure in 2022. Changes in spawning biomass are substantially smaller in subsequent management cycles due to the three-year management cycle, limits on the magnitude of changes in the closure period, and assumptions about recruitment variation.

All HCRs perform well relative to the candidate limit reference points (Table 2a), with near-zero probabilities of breaching the IATTC interim limit reference point (7.7% B_0). Similarly, the probability of remaining in the green quadrant of the Kobe plot (MSY based) is high for all HCRs, ranging from approximately 90% to 95% from the least to the most conservative HCRs.

The bigeye MSE identified trade-offs among the HCRs with respect to fishing mortality, stock status, and stability. Less conservative HCRs provide higher purse-seine catches and shorter fishery closures but result in slightly lower probabilities of meeting stock status objectives. Several HCRs resulted in average closure periods exceeding 72 days, the level that triggered the bigeye IVT measure, and were therefore considered undesirable. In addition, several HCRs exhibited a moderate probability of requiring a 20-day increase in the closure period and were also considered undesirable.

Based on the performance metrics evaluated, three HCRs were identified as meeting the proposed management objectives related to safety, stock status, stability, yield, effort, and abundance: F30-S20, F35-S20, and F35-S25 (Table 2a).

4. EXTENSION OF MEASURES ADOPTED IN RESOLUTION C-25-01 THROUGH 2027 AND 2028 (OPTION 1)

Resolution [C-25-01](#) establishes conservation measures for tropical tunas in the EPO during 2026. This resolution shall remain in force for 2027 and 2028, provided that the scientific advice recommended by the staff and the Scientific Advisory Committee (SAC) in 2026, through the Management Strategy Evaluation (MSE) process, confirms the effectiveness of the measures in place, as set out in paragraph 1 concerning the possible extension of its period of validity:

These measures are applicable from 00:00 hours on 1 January 2026 and will expire on to 24:00 hours on 31 December 2026, except for the second closure period referred to in paragraph 3, which extends until 24:00 hours on 11 January 2027, unless the scientific advice provided by the staff and the Scientific Advisory Committee (SAC) in 2026 through the Management Strategy Evaluation (MSE) process confirms the effectiveness of the measures in place. In this case, the Resolution would remain in force until 24:00 hours on 31 December 2028...

In 2026, the staff completed an MSE for bigeye tuna ([SAC-17-05](#); see Section 4). The MSE can be used to evaluate whether the current measures adopted under Resolution C-25-01, particularly the reduction of the purse-seine closure period from 72 to 64 days (an 8-day reduction), can be maintained in 2027 and 2028. All harvest strategies evaluated in the MSE allowed reductions of up to 10 closure days per three-year management cycle. Although not all harvest strategies resulted in a reduction of the closure period during the first management cycle (Table 2a), the three harvest strategies identified as achieving the

proposed management objectives all included the maximum 10-day reduction in closure days. It should also be noted that the MSE was based on the 2025 updated assessment, which has subsequently been superseded by the more optimistic 2026 updated assessment.

The term “effectiveness” is not explicitly defined in Resolution C-25-01. Assuming that effectiveness refers to supporting the high-level objective of the Antigua Convention *to maintain or restore fish stocks at levels capable of producing maximum sustainable yield (MSY)*, the MSE results support the conclusion that the current measures are effective. The harvest strategies evaluated in the MSE encompass management scenarios that are less precautionary than the measures currently in place because they allow closure reductions of up to 10 days, compared to the 8-day reduction adopted under Resolution C-25-01. Consequently, if the proposed management objectives can be achieved under the less precautionary scenarios evaluated in the MSE, they would also be expected to be achieved under the more precautionary measures currently in place. Therefore, the MSE supports the continuation of the current measures under paragraph 1 of Resolution C-25-01.

This conclusion is not affected by the stock status of yellowfin and skipjack tuna. Although, in 2026, yellowfin became the species requiring the strongest management measures because of the substantial improvement in the stock status of bigeye tuna (see section 3 above), the yellowfin stock remains in healthy condition, and it does not require a closure longer than 64-days under the *interim* HCR ([C-23-06](#)). Recent trends in stock status indicators for yellowfin and skipjack show no concerns ([SAC-17-02](#)). In addition, this conclusion is supported by a multi-species MSE for tropical tuna in the EPO ([SAC-17 INF-Q](#)).

MAINTAIN CURRENT MEASURES, OPTION 1 (extending Resolution C-25-01 into 2027 and 2028):

- **HCR species:** None, simply extending measures currently in force.
- **Purse seine closure:**
 - **2027:** 64 days (and 2028).
 - **2030:** Undefined (and 2029).
- **Details:**
 - Supported by the results of the BET MSE ([SAC-17-05](#)).
 - Not a Management Procedure (an extension of C-25-01).
 - The multi-species MSE indicates that an extension of C-25-01 meets the safety and stock status objectives for YFT and SKJ tunas.
 - The trajectory toward the target fishing mortality is slow (more than 20 years).
 - Loss of potential fishing opportunities for SKJ tuna.

5. ADOPT A MANAGEMENT PROCEDURE (OPTION 2)

To provide the Commission with a basis for considering revisions to management measures in 2027 and beyond, if appropriate, paragraphs 12 and 13 of Resolution C-25-01 call for updated scientific evaluations and consideration of adjustments to the conservation and management measures based on the best available scientific information.

Based on an evaluation of the best available scientific information in 2026 (Section 2), the staff concluded that the implementation of Resolutions [C-21-04](#) and, subsequently, [C-24-01](#) has had a positive effect on the status of the bigeye tuna stock. Furthermore, all tropical tuna stocks in the EPO—specifically yellowfin,

bigeye, and skipjack tuna—are currently in healthy condition. Therefore, a reduction in the current management measures is possible under the *interim* HCR specified in Resolution C-23-06.

Accordingly, to achieve the fishing mortality corresponding to the MSY for the worse case stock status scenario for yellowfin, in particular the southwest stock structure hypothesis, eliminating the closure of the purse seine fishery would be possible¹. However, substantial changes in the duration of the purse-seine closure based solely on F_{MSY} , including eliminating the closure, are not recommended by the staff for various reasons (see Section 1.1.3.b in [SAC-17-10](#)).

Instead, if the Commission wishes to modify the current management measures, the staff recommends that such changes be implemented within a Management Procedure (Management Strategy) framework, consistent with the efforts outlined in paragraph 44 of Resolution C-25-01.

Paragraph 44 of Resolution C-25-01 directs the staff, in consultation with the SAC and the ad hoc Working Group on Management Strategy Evaluation, to develop and present a candidate harvest strategy for bigeye tuna for adoption by the Commission in 2026. Specifically, the resolution states:

The IATTC shall continue efforts to develop harvest strategies for tropical tunas. The IATTC scientific staff shall prioritize and continue to establish the scientific basis, through Management Strategy Evaluation testing, to advise the Commission on initial candidate harvest strategies, starting with bigeye tuna. The staff, consulting with the ad hoc Working Group on Management Strategy Evaluation and the SAC, shall then present for the Commission’s adoption in 2026 a candidate harvest strategy for bigeye tuna, including candidate management actions to be taken under various stock conditions.

The staff has completed a Management Strategy Evaluation (MSE) for bigeye tuna ([SAC-17-05](#)), together with an interim multispecies MSE for tropical tunas in the EPO ([SAC-17 INF-Q](#)). This best available scientific now provides a strong basis for the Commission to consider changes to management measures, if desired, through the implementation of a Management Procedure.

Should the Commission wish to modify the management measures for 2027 and beyond, the staff presents three options for the implementation of a Management Procedure for its consideration.

5.1. MSE TESTED MANAGEMENT PROCEDURE FOR BET (OPTION 2.a)

Eight alternative Harvest Control Rules (HCRs), including the staff’s propose HCR, were tested in the MSE for bigeye tuna ([SAC-17-05](#); see Section 4). The staff identified three HCRs that are considered to meet the proposed management objectives of safety, stock status, stability, yield, effort, and abundance: F30-S20, F35-S20, and F35-S25 (Tables 1 and 2a).

Therefore, should the Commission wish to modify the management measures, a logical first option would be to adopt one of these three candidate harvest control rules as the HCR within a Management Procedure. All three HCRs imply a 10-day closure in the first management cycle. Since an 8-day reduction has already taken place in 2026, an additional 2-day reduction could start in 2027.

BIGEYE MSE TESTED MANAGEMENT PROCEDURE (OPTION 2a):

- **HCR species:** Apply HCR to BET.

¹ Closure_{new} = 365-(365-Closure_{old})*F_{target}/F_{cur} = 365-(365-72)*1.32 = -21.76, which equates to eliminating the closure.

- **Purse seine closure:**
 - **2027:** 62 days (2-day reduction in 2027 since 8 days already reduced in 2026).
 - **2030:** 52 days minimum (maximum 10-day reduction as allowed by HCR).
- **Details:**
 - Three candidate HCRs identified in BET MSE as meeting proposed management objectives, including the staff's HCR (F30-S20; [SAC-17-05](#)).
 - The multi-species MSE indicates that these HCRs also meet the safety and stock status objectives for YFT and SKJ tunas.
 - The trajectory toward the target fishing mortality is slow (more than 20 years).
 - Loss of potential fishing opportunities for SKJ tuna.

5.2. MSE TESTED MANANAGENT PROCEDURE FOR BET WITH AJUSTMENT TO ALLOW FOR A MORE RAPID TRAJECTORY TOWARDS THE FISHING MORTALITY TARGET (OPTION 2b)

The 2026 updated bigeye tuna assessment is more optimistic than both the 2024 benchmark assessment and the 2025 updated assessment used to develop the operating models for the MSE. Consequently, it is appropriate to reconsider the harvest control rules (HCRs) evaluated in the MSE, particularly with respect to the rate at which fishing mortality is allowed to increase toward the staff-proposed target of F30%. The HCRs evaluated in the MSE limited increases in fishing mortality through a maximum 10-day reduction in the purse-seine closure period per three-year management cycle and the fishing mortality objectives were not achieved within the 21 years of the MSE simulation.

At the same time, uncertainty remains regarding stock status and population dynamics, as reflected in the risk analysis. Therefore, fishing mortality should not be increased to levels for which some plausible hypotheses represented in the risk-analysis ensemble indicate an unacceptable probability of failing to achieve the management objectives. Additional research and data collection are needed to reduce this uncertainty and potentially eliminate some of the alternative hypotheses represented in the ensemble.

Assuming a three-year management cycle, a timeframe of approximately two management cycles may provide a reasonable balance between progressing toward the target fishing mortality and reducing uncertainty. Major research initiatives capable of substantially reducing uncertainty, such as conventional tagging programs or close-kin mark-recapture (CKMR) studies, typically require multiple years for data collection, analysis, and incorporation into updated assessments and MSEs. Such a timeframe would also allow the Commission to adopt multi-species management objectives and evaluate practical approaches for implementing a multi-species Management Procedure for tropical tunas in the EPO.

The updated bigeye tuna risk analysis and MSE indicate that the probability of exceeding the limit reference point is essentially zero. Therefore, the safety objective is not currently a constraining factor in the development of management advice. Instead, the primary considerations become achieving the stock-status objective while maintaining management stability and providing opportunities for increased effort and catch.

Under this framework, the choice of closure level depends on the level of risk considered acceptable. In particular, there is a risk that the closure period could be reduced too rapidly relative to the target fishing mortality. If future research and data collection reduce uncertainty, revised estimates of stock status may indicate that the closure period should be increased again to achieve the target. Such reversals may be

undesirable, especially if they require substantial increases in management restrictions.

Assuming that an increase of 10 days or more in the closure period would be considered undesirable, a reasonable objective is to select a closure level that results in a low probability of such an outcome after two management cycles (six years). Accordingly, the proposed closure level after six years is defined as the closure corresponding to a specified probability (x%) that, if uncertainty were substantially reduced, the closure period required to achieve $F_{30\%}$ would be more than 10 days greater than the selected closure.

This probability can be calculated directly from the cumulative probability distribution of $F_{30\%}/F_{cur}$ derived from the risk analysis. Values of $F_{30\%}/F_{cur}$ are converted to corresponding closure days (DoC), and the probability that the required closure exceeds the selected closure by more than 10 days can then be estimated from the distribution.

$$DoC = 365 - (365 - 72) \frac{F_{30\%}}{F_{cur\ x\%}} - 10$$

Where $\frac{F_{30\%}}{F_{cur\ x\%}}$ is the value of $\frac{F_{30\%}}{F_{cur}}$ at the x% percentile of the cumulative probability distribution for $\frac{F_{30\%}}{F_{cur}}$.

The value of x% represents the level of risk that the selected closure period will ultimately prove to be at least 10 days shorter than required to achieve the target fishing mortality once uncertainty is reduced. In other words, it represents the risk tolerance for a future increase in the closure period of 10 days or more.

The interim harvest strategy includes an exceptional-circumstances provision that triggers the development of a rebuilding plan when the probability of exceeding the limit reference point reaches 10%. Because the implementation of a rebuilding plan represents a substantially more severe management response than an increase of 10 closure days, a 10% probability of requiring an additional 10 days of closure can be considered a conservative lower bound for risk tolerance in the present context. To illustrate the implications of alternative levels of risk tolerance, closure periods are calculated using risk levels of 10% and 20%.

The value of $\frac{F_{30\%}}{F_{cur\ x\%}}$ varies among stocks, reflecting differences in stock status, uncertainty, the models included in the risk-analysis ensemble. Consequently, the closure periods associated with a given level of risk tolerance also vary among stocks.

For the EPO yellowfin stock and skipjack tuna, the calculated closure is zero days under both the 10% and 20% risk-tolerance levels (Table 3). In contrast, the southwest yellowfin stock produces the most restrictive management advice. Although the median estimate of $F_{30\%}/F_{cur}$ is greater than one, the uncertainty associated with that estimate is sufficiently large that, under the 10% risk-tolerance criterion, the calculated closure is 96 days. This value exceeds the 72-day closure period under which the corresponding fishing mortality estimates were obtained. Intermediate closure periods are estimated for bigeye tuna and the northeastern yellowfin stock.

Under the 20% risk-tolerance level, the southwest yellowfin stock again produces the most restrictive management advice, with an estimated closure period of 40 days. This corresponds to a reduction of 24 days relative to the current 64-day closure adopted under Resolution C-25-01.

The risk-based approach described above could support implementing the full reduction in closure days immediately. However, given the remaining uncertainty in stock status and the benefits of continued monitoring, a more incremental approach may be a prudent precautionary strategy. For example, approximately half of the reduction could be implemented during the first three-year management cycle,

with the remainder implemented during the second cycle. Throughout this period, stock status indicators ([SAC-17-02](#)), particularly those related to juvenile fishing mortality and spawning biomass, should continue to be monitored.

A maximum reduction of 14 closure days during the first three-year management cycle, followed by up to 10 additional days during the second cycle, would remain broadly consistent with the harvest control rules evaluated in the MSE. The principal difference is that the Commission has already implemented an 8-day reduction in 2026. Consequently, a further 14-day reduction in 2027 would result in a cumulative reduction of up to 22 days relative to the original 72-day closure period, rather than the 10-day reduction evaluated in the first cycle of the MSE. During the second management cycle, the closure could then be determined using the assessment model and harvest control rule specified in the proposed bigeye Management Procedure (e.g., F30-S20), including the maximum 10-day adjustment.

The MSE analysis was extended in several ways to evaluate the appropriateness of this and other management procedures. An analysis was conducted where the closure was eliminated in the first management cycle and then the F30-S20 rule was applied with the maximum change in closure days set to 10 days except for a 20 day increase when the spawning biomass is below 20%. The performance metrics for this management procedure were like those for the F30-S20 rule (Table 2b) and therefore, a management procedure that reduces the closure anywhere from 62 days to complete elimination in the first management cycle can be considered MSE tested. Additionally, the multi-species MSE approach described in SAC-17 INF-Q was applied to evaluate the elimination of the closure and there is essentially no probability of exceeding the limit reference point and low probability of exceeding F30% for all stocks, including the southwest yellowfin stock (Table 3). Therefore, using the same logic as applied in SAC-17 INF-Q, these management procedures can also be considered to meet the safety and status objectives for all stocks.

ADJUSTED BIGEYE MSE TESTED MANAGEMENT PROCEDURE (OPTION 2b):

- **HCR species:** Apply HCR to BET
- **Purse seine closure:**
 - **2027:** 50 days (reduction of 14 days in 2027 + 8 days already reduced in 2026)
 - **2030:** 40 days minimum (maximum 10-day reduction as allowed by HCR).
- **Details:**
 - Directly addresses YFT requiring strictest measures (40 days minimum closure)
 - 40 days minimum closure based on considering uncertainty using the precautionary approach (risk analysis)
 - Three candidate HCRs identified in BET MSE as meeting proposed management objectives, including the staff's proposed HCR (F30-S20; SAC-17-05).
 - Initial reduction adjustment tested using BET MSE.
 - The multispecies MSE indicates that these HCRs also meet the safety and stock status objectives for YFT and SKJ tunas
 - More rapid trajectory towards the target fishing mortality.

5.3. AN INTERIM MANAGEMENT PROCEDURE FOR ALL TROPICAL TUNA STOCKS (OPTION 2.c)

Option 2b applies a harvest control rule (HCR) to bigeye tuna beginning in management cycle 2 to determine any further reductions or increases in the purse-seine closure period. However, bigeye tuna may not be the stock requiring the most restrictive management measures. An alternative approach is to apply HCRs to each of the tropical tuna stocks and base management actions on the stock requiring the most restrictive measures. This approach is like that used in the current interim harvest strategy (Resolution C-23-06).

Under this option, the MSY-based HCR currently used in the interim harvest strategy could be applied to yellowfin and skipjack tunas. The multispecies MSE indicates that this approach performs well when management actions are limited to reductions in the closure period (i.e., fishing mortality cannot be reduced more than simply eliminating the closure). However, consideration should also be given to applying the more precautionary F30-S20 HCR to all stocks. The F30-S20 HCR was developed using the best available scientific information and has been extensively tested through the bigeye MSE, including robustness tests under low recruitment scenarios. In addition, a similar F30-S20 HCR performed well in MSE testing for Pacific bluefin tuna.

Application of the F30-S20 HCR within the multispecies framework (SAC-17-06) indicates satisfactory performance across all tropical tuna stocks. For practical implementation, the HCR could be applied using the median stock status estimates from the risk analyses for each stock. Although the bigeye tuna MSE used a simplified estimation model, that model was tuned to reflect the median of the risk analysis. Therefore, applying the HCR to the median stock status estimates is expected to provide performance similar to that evaluated in the MSE.

Implementation of this option would require regular update assessments for all tropical tuna stocks. Any substantial changes to assessment assumptions, such as those typically introduced during benchmark assessments, would require a review of the Management Procedure and may necessitate additional MSE testing.

MULTI-SPECIES adjusted MANAGEMENT PROCEDURE (Option 2c):

- **HCR species:** Apply HCR to BET, YFT and SKJ
- **Purse seine closure:**
 - **2027:** 50 days (reduction of 14 days in 2027 + 8 days already reduced in 2026)
 - **2030:** 40 days minimum (maximum 10-day reduction as allowed by HCR).

Details:

- Applies BET HCR rule to SW YFT (and all stocks)
- More conservative than current interim HCR for YFT and SKJ
- Closure days based on species requiring strictest management
- Three candidate HCRs identified in BET MSE as meeting proposed management objectives, including the staff's proposed HCR (F30-S20; SAC-17-05)
- Initial reduction adjustment tested using BET MSE

- 40 days minimum closure based on considering uncertainty using the precautionary approach (risk analysis)
- The multispecies MSE indicates that these HCRs also meet the safety and stock status objectives for YFT and SKJ tunas
- More rapid trajectory towards the target fishing mortality
- More precautionary than option 2b

6. MANAGEMENT BASED ON THE INTERIM HARVEST CONTROL RULE (OPTION 3)

The reduction in fishing mortality has been sufficiently large that bigeye tuna is no longer the species requiring the most restrictive management measures. Consequently, management advice should consider the status of all tropical tuna species, including the alternative stock structure hypothesis of yellowfin tuna considered in the 2025 benchmark assessment. Recent benchmark assessments and associated risk analyses are available for both yellowfin tuna ([SAC-16-03](#)) and skipjack tuna ([SAC-16-04](#), [SAC-15-04](#)) and provide the basis for such an evaluation.

The *interim* harvest control rule ([C-23-06](#)) bases management on implementing measures that achieve the target fishing mortality (F_{MSY}) for the stock requiring the most restrictive management. The median results of the risk analyses for all three tropical tuna species indicate that no purse-seine closure would be required to achieve either F_{MSY} or $F_{30\%}$ (Table 3). Results for F_{MSY} are not presented because F_{MSY} exceeds $F_{30\%}$ in all cases and therefore requires less restrictive management measures. The bigeye MSE (Table 2b) and the multi-species MSE (Table 3) show that the interim harvest strategy meets the management objectives, when changes in fishing mortality are restricted to no closure.

Under the interim harvest control rule, fishing mortality is assumed to be proportional to the amount of time the fishery is open. Accordingly, the required number of closure days (DoC) is calculated by adjusting the current closure period according to the ratio of current fishing mortality (F_{cur}) to the target fishing mortality (F_{target}):

$$DoC_{new} = 365 - (365 - DoC_{old}) \frac{F_{target}}{F_{cur}}$$

The ratio $F_{30\%}/F_{cur}$ exceeds 1 for all yellowfin stocks, bigeye tuna, and skipjack tuna (Table 3). Applying the formula used to calculate closure days from F_{target}/F_{cur} , based on the 72-day closure period in effect at the time, indicates that no purse-seine closure would be required to achieve $F_{30\%}$ for any of the stocks.

However, the risk analyses are based on ensembles of models and therefore explicitly account for uncertainty in F_{target}/F_{cur} and the corresponding closure requirements. While the median estimates suggest that the closure could be eliminated, there remains a substantial probability for all stocks except skipjack that some level of closure is still required, with the southwest yellowfin stock exhibiting the highest probability (Figure 3). Consequently, eliminating the closure would carry a risk of fishing mortality exceeding the target level for one or more stocks.

Figure 3 further illustrates that, if the closure were eliminated, future reductions in uncertainty resulting

from additional data and scientific research could reveal the need to reintroduce a closure and potentially increase it substantially. For example, there is approximately a 40% probability that the southwest yellowfin stock requires a closure and about a 10% probability that the required closure exceeds 100 days. Therefore, the possibility of requiring substantial increases in management restrictions in the future may be an important consideration when adopting new management measures, particularly if management stability is considered an objective (see Options 2.b. and 2.c.).

The staff does not recommend the implementation of option 3. If desired, large reductions in management measures should be implemented incrementally to allow for careful evaluation of their effects on the stocks and the ecosystem, as well as to minimize variability in catch and effort (see Management Procedure Options 2).

APPLY INTERIM HARVEST CONTROL RULE, C-23-06 (Option 3):

- **HCR species:** Apply HCR to BET, YFT and SKJ.
- **Purse seine closure:**
 - **2027:** 0 days
 - **2030:** 0 days minimum
- **Details:**
 - F_{MSY} is target
 - Tested by BET MSE
 - The multispecies MSE confirms this option meets safety and status objectives for YFT and SKJ
 - Large increases in fishing mortality not observed historically
 - Impacts on ecosystem from such large and rapid increases in fishing mortality not evaluated
 - Moderate probability of large increases in closure days
 - Not recommended by staff for the reasons above

7. REDUCING UNCERTAINTY THROUGH IMPROVEMENTS IN THE BEST AVAILABLE SCIENCE

A direct consequence of incorporating uncertainty into management advice under a precautionary framework is that reductions in uncertainty can allow for more precise and potentially less restrictive management measures. For example, improved understanding of the status and dynamics of bigeye and yellowfin tuna, the two species that have most strongly influenced management decisions in the EPO purse-seine fishery, may allow management measures to be more closely aligned with stock status, potentially increasing harvest opportunities for skipjack tuna and other tropical tuna fisheries (SAC-17 INF-Q). This creates a direct incentive for continued investment in data collection, scientific research, and assessment improvements aimed at reducing uncertainty.

The assessments for tropical tunas in the EPO apply the best available science (e.g., following the recommendations of the CAPAM process; Maunder, 2024) using the data currently available. Nevertheless, substantial uncertainty remains due to the biological characteristics of the species, the nature of the fisheries, and limitations in the available data. Key sources of uncertainty include:

- **Indices of abundance.** Traditional fishery-independent surveys are not feasible for tropical tunas, and stock assessments therefore rely heavily on fishery-dependent CPUE indices. In particular, the spatial contraction of the longline fleet has reduced the reliability of longline CPUE as an index of abundance.
- **Absolute abundance and fishing mortality.** Tagging data remain limited, making it difficult to estimate absolute biomass and fishing mortality directly. As a result, these quantities are inferred primarily from catch-induced depletion in CPUE indices and from the size composition of the catch relative to model expectations.
- **Growth and age structure.** Direct aging of tropical tunas is currently limited, and age estimates for older individuals remain contentious. Consequently, uncertainty in growth and age structure contributes to uncertainty in stock status estimates.
- **Stock structure.** Alternative hypotheses regarding the stock structure of yellowfin tuna lead to different estimates of stock status and management advice. In particular, the stock-structure hypothesis that assumes two principal yellowfin stocks in the EPO indicates different stock status for the northeastern and southwestern stocks.
- **Species-specific information content.** The purse-seine fishery on yellowfin associated with dolphins has remained relatively stable, fishing mortality on skipjack is estimated to be low, and CPUE-based indices are generally considered unreliable for skipjack. Consequently, information on absolute abundance derived from catch-induced depletion may be more informative for bigeye tuna than for yellowfin or skipjack.

The risk analysis addresses these uncertainties through an ensemble of models representing alternative hypotheses regarding population dynamics, stock structure, growth, and fishery processes. Different assumptions can lead to different estimates of stock status and management advice. For example, alternative values of asymptotic length applied to length-composition data can imply different levels of stock depletion.

Reducing these uncertainties would improve the precision of management advice. In particular, data and research that improve understanding of absolute abundance, natural mortality, growth, and stock structure could eliminate some of the alternative hypotheses represented in the risk-analysis ensemble. This would reduce uncertainty in stock status estimates and could allow management measures to be more closely aligned with stock status, potentially resulting in less restrictive management and increased harvest opportunities, should the Commission wish to pursue such outcomes.

8. DISCUSSION

The analyses presented in this document evaluate the alternative management pathways contemplated under Resolution C-25-01. The results of the bigeye tuna MSE support the effectiveness of the management measures adopted for 2026 and therefore support their continuation through 2027–2028 under paragraph 1 of the resolution.

At the same time, the updated 2026 bigeye tuna assessment and associated risk analysis, together with the recent risk analyses for yellowfin and skipjack tuna, indicate that fishing mortality could be increased substantially relative to current levels while remaining consistent with the interim MSY-based harvest

control rule adopted by the Commission ([C-23-06](#)). In an effort to reconcile the MSE results with the more optimistic stock status estimated in the updated bigeye assessment, while also accounting for uncertainty and multi-species considerations (SAC-17 INF-Q), the staff evaluated alternative closure reductions using the risk-analysis framework. Under the assumption that additional information will be collected and incorporated into future assessments over the next six years (two 3-year management cycles), the analyses suggest that an additional reduction of up to 14 closure days could be considered while maintaining a low probability of requiring substantial increases in closure days in the future.

Approach	Option	DoC 2027	Minimum DoC 2030	HCR species	Initial closure
Resolution C-25-01	1	64	NA	NA	Resolution C-25-01
MP BET MSE	2a	62	52	BET	MP BET MSE
MP BET MSE Initial adjustment	2b	50	40	BET	SW YFT risk of DoC increase
Multi-species MP Initial adjustment	2c	50	40	BET, SKJ, YFT	SW YFT risk of DoC increase
Interim HCR C-23-06	3	0	0	BET, SKJ, YFT	Interim HCR C-23-06

The analyses also highlight the increasing importance of incorporating multi-species considerations into the management of tropical tunas in the EPO. Historically, management measures have largely been driven by the status of bigeye tuna, which was generally the stock of greatest management concern. However, the updated assessments and risk analyses indicate that the southwest yellowfin stock now represents the most restrictive stock among the tropical tuna species evaluated. Consequently, the proposed additional reduction in closure days was determined by the status and uncertainty associated with the southwest yellowfin stock rather than by bigeye tuna. This result underscores the need for future Management Procedures to explicitly account for the status, uncertainty, and management objectives of all tropical tuna species in the EPO.

Given that the southwest yellowfin stock now appears to be the most restrictive stock in the risk analyses, basing future management adjustments on that stock may be more appropriate than continuing to rely exclusively on a Management Procedure developed for bigeye tuna. For example, the management advice for the second management cycle could be informed by the status of the southwest yellowfin stock rather

than solely by the bigeye tuna assessment.

At present, a Management Procedure has not been developed and tested specifically for the southwest yellowfin stock. However, considerable experience has been gained through Management Strategy Evaluation of a range of tuna stocks and management strategies. In particular, the F30-S20 strategy has been shown to perform well for both bigeye tuna and Pacific bluefin tuna. Because these species are generally less productive and support lower fishing mortality rates than yellowfin tuna, their successful performance provides some confidence that an F30-S20 strategy would also be capable of achieving management objectives for the southwest yellowfin stock.

Accordingly, it may be reasonable to apply the F30-S20 framework developed for bigeye tuna to the southwest yellowfin risk analysis when evaluating management advice for the second management cycle. Furthermore, the risk analysis indicates a low probability that fishing mortality on the southwest yellowfin stock would exceed F30% even with a 40-day reduction in the closure period (Figure 4). Therefore, application of the bigeye F30-S20 harvest control rule, including the maximum 10-day reduction in closure days per management cycle, would likely result in an additional 10-day reduction during the second management cycle unless substantial changes are observed in the CPUE indices or composition data collected during 2026–2027, assuming the Management Procedure is evaluated in 2029 to provide management advice for implementation in 2030.

The generic harvest strategy approach could be further generalized and applied to all four stocks where the largest number of closure days is taken from any of the stocks as the management action. The risk analysis (e.g., median) could be used to evaluate the rule rather than a simplified estimation model that is tuned to the operating models, noting that the operating models are the risk analysis. Using an update risk analysis, rather than a benchmark, in addition to the 10 day maximum rule would provide stability.

Several technical challenges require careful evaluation if the Commission wishes to implement in 2027 a Management Procedure for tropical tunas in the EPO based on the results of the bigeye tuna MSE, which was developed primarily to evaluate management strategies for bigeye tuna ([SAC-17-05](#)).

- 1. Longline management measures were not included in the MSE framework.** The bigeye tuna MSE focused primarily on evaluating purse-seine management measures and did not explicitly evaluate alternative approaches for managing longline fisheries, including longline catch limits. Although excluding longline CPC catch limits from the MSE is not expected to change the conclusions of the MSE, additional work may be needed to determine how longline management measures should be incorporated within a Management Procedure framework.
- 2. The most recent updated stock assessment for bigeye differs from the assessment models used in the MSE.** The MSE was conditioned on an update assessment conducted in 2025 and associated operating models. The 2026 update assessment incorporates an additional year of data and several data updates, resulting in a more optimistic assessment of stock status. Consequently, consideration should be given to whether the MSE results remain fully representative of the current understanding of the stock or whether additional analyses are warranted and alternative management procedures considered.
- 3. Yellowfin tuna is now the species requiring the strictest management measures.** Historically, management of tropical tunas in the EPO has generally been driven by the species requiring the most restrictive conservation measures, which has typically been bigeye tuna. However, recent assessments indicate that yellowfin tuna, rather than bigeye tuna, is now the species requiring the strictest management measures. This raises the question of whether a Management Procedure developed and tested primarily for bigeye tuna should be used to guide management

of all tropical tunas in the EPO, or whether priority should instead be given to developing and evaluating a Management Procedure for yellowfin tuna. This is particularly relevant since maximizing yield is more appropriate for the target species yellowfin in the dolphin associated fishery and skipjack in the floating object fishery.

4. **Multi-species and multi-stock considerations still need to be fully incorporated.** Management of tropical tunas in the EPO ultimately requires consideration of interactions among multiple species and, in the case of yellowfin tuna, multiple stocks. While a fully integrated multi-species and multi-stock MSE would provide the most comprehensive basis for management, its development is likely to require several years of substantial additional work. Delaying management changes until such analyses are completed could result in the loss of fishing opportunities that may be available under the current healthy status of the tropical tuna stocks.

9. REFERENCES

Maunder, M.N., 2024. Towards a comprehensive framework for providing management advice from statistical inference using population dynamics models. *Ecol. Mod.* 498, 110836

Table 1. The eight candidate harvest control rules (HCRs) evaluated in the Management Strategy Evaluation (MSE) for bigeye tuna in the eastern Pacific Ocean (EPO) ([SAC-17-05](#)).

Number	1	2	3	4	5	6	7	8
Naming Code	F30-S20	F30-S30	F35-S20	F35-S25	F35-S30	F40-S20	F40-S30	F40-S40
F_{max}	$F_{30\%}$	$F_{35\%}$	$F_{40\%}$	$F_{30\%}$	$F_{35\%}$	$F_{35\%}$	$F_{40\%}$	$F_{40\%}$
$S_{control}$	$S_{20\%}$	$S_{30\%}$	$S_{20\%}$	$S_{30\%}$	$S_{20\%}$	$S_{25\%}$	$S_{30\%}$	$S_{40\%}$
Range for closure change (day): $S > S_{control}$	-10 to 10	-10 to 10	-10 to 10	-10 to 10	-10 to 10	-10 to 10	-10 to 10	-10 to 10
Range for closure change (day): $S < S_{control}$	-10 to 20	-10 to 20	-10 to 20	-10 to 20	-10 to 20	-10 to 20	-10 to 20	-10 to 20

Table 2a. The table of performance indicators summarized across iterations, simulation years, and operating models for the eight candidate harvest control rules. From left to right: HCR name, probability of dynamic spawning biomass ratio > 0.2 (%), probability of spawning biomass ratio > 0.077 (%), probability of spawning biomass > 50% spawning biomass at the maximum sustainable yield (%), probability of the stock in the green quadrant of the Kobe plot (%), average annual variability in annual total catch (%), probability of fishery closure increases by 20 days between two management cycles (%), average annual catch of bigeye by purse-seine (mt), average annual catch of bigeye by longline (mt), average fishery closure (day), and the average ratio of longline CPUE to the historical average for 2017-2019. The final column provides the days of closure (DoC) calculated using the estimation model for the different HSs using the data MSE conducted in 2025.

HCR	Prob dSBR > 0.2	Prob SBR > 0.077	Prob S > $0.5S_{MSY}$	Prob Kobe = green	AAV in catch	Prob change = 20	Annual PS catch	Annual LL catch	Fishery closure	CPUE ratio	DoC in first cycle
F30-S20	96.5	99.9	99.9	89.6	7.3	0.8	50,722	51,663	43	2.26	62
F30-S30	96.7	99.9	99.9	90.0	7.3	7.7	50,384	51,509	46	2.28	64
F35-S20	97.5	100.0	100.0	91.6	7.3	0.4	49,785	51,277	52	2.31	62
F35-S25	97.5	100.0	100.0	91.6	7.3	1.9	49,746	51,250	52	2.31	62
F35-S30	98.3	100.0	100.0	94.0	7.2	17.6	47,514	50,533	75	2.44	92
F40-S20	98.5	100.0	100.0	94.6	7.2	0.1	47,221	50,258	77	2.45	82
F40-S30	98.7	100.0	100.0	95.2	7.2	16.3	46,456	49,966	84	2.49	92
F40-S40	98.8	100.0	100.0	95.5	7.3	28.9	45,911	49,624	89	2.51	92

Table 2b. Performance metrics of the F30-S20 and interim (FMSY) harvest control rules implement with an elimination of the closure in the first management cycle. Note that the fishing mortality does not reach FMSY or F30% in the first or later management cycles as more than elimination of the closure is required.

HCR	Prob dSBR > 0.2	Prob SBR > 0.07 7	Prob S > 0.5 S_{MSY}	Prob Kobe = green	AAV in catch	Prob change = 20	Annua l PS catch	Annua l LL catch	Fisher y closur e	CPU E ratio	DoC in first cycl e
F30-S20	96.5	99.9	99.9	89.6	7.3	0.8	50,722	51,663	43	2.26	62
Interim	90.7	99.5	99.4	79.4	7.9		53651	51565	5	2.03	0
F30-S20+	91.4	99.5	99.6	80.9	7.6	3.6	53392	51533	9	2.05	0

Table 3. Calculations of the days of closure (DoC) corresponding to a target fishing mortality corresponding to a depletion level of 30% for each of the stocks: 1) Probability that the closure is needed [$P(\text{DoC} > 0)$] and 2) is greater than 10 days [$P(\text{DoC} > 10)$]; 3) the days of closure corresponding to the median value of $\frac{F_{30\%}}{F_{cur}}$, 4) the days of closure corresponding to a 10% chance that the days of closure would have to be increased by 10 days of more in the future if perfect information about the status of the stock was obtained [$P(\text{DoC} + > 10) = 10\%$] and 5) a 20% chance [$P(\text{DoC} + > 10) = 20\%$].

		YFT			SKJ	BET
		EPO	NE	SW		
F30%/F median		1.79	1.39	1.32	2.38	1.43
$P(\text{DoC} > 0)$		0.12	0.25	0.38	0.00	0.25
$P(\text{DoC} > 10)$		0.10	0.21	0.34	0.00	0.21
DoC	Median	0*	0*	0*	0*	0*
	$P(\text{DoC} + > 10) = 10\%$	0*	45	96	0*	30
	$P(\text{DoC} + > 10) = 20\%$	0*	4	40	0*	2
$P(F > F_{lim})$ w no closure		0	0	0	0	0
$P(F > F_{30\%})$ w no closure		0.12	0.25	0.38	0.00	0.25

*the calculated days of closure is negative

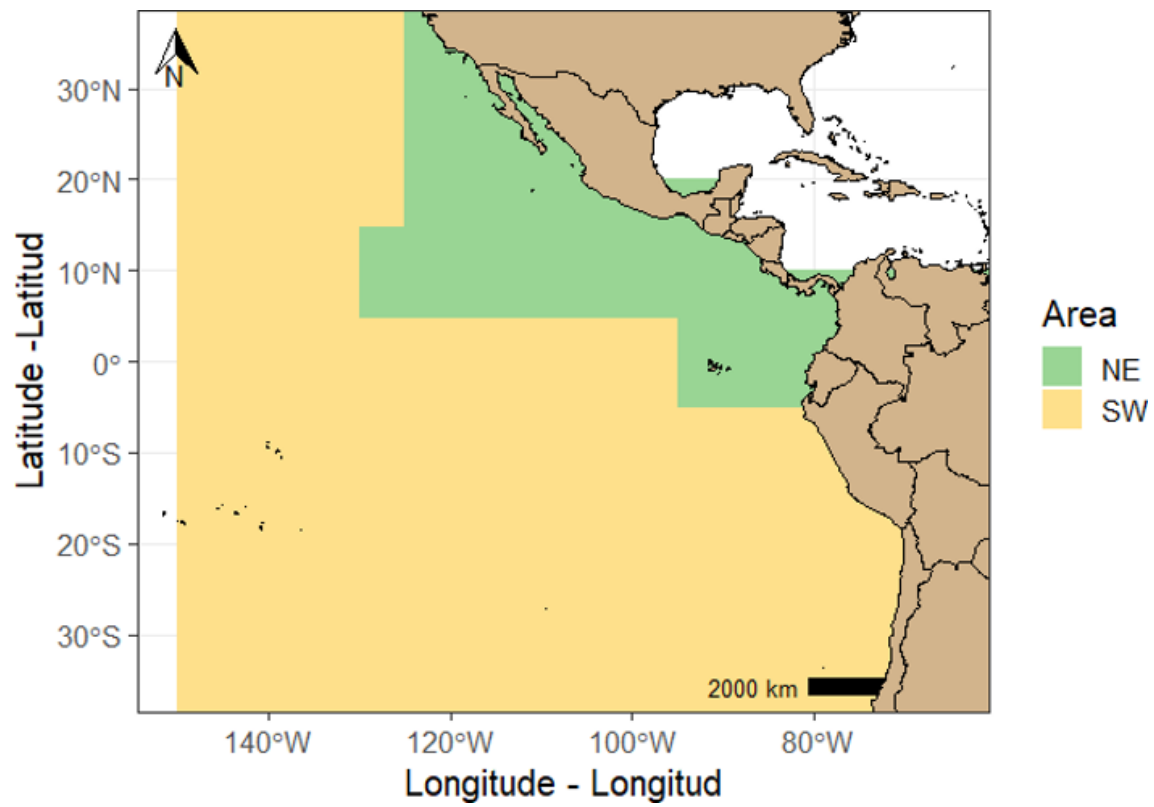


FIGURE 1. Spatial definitions of the two yellowfin stocks: 1) northeast (NE) and 2) southwest (SW).

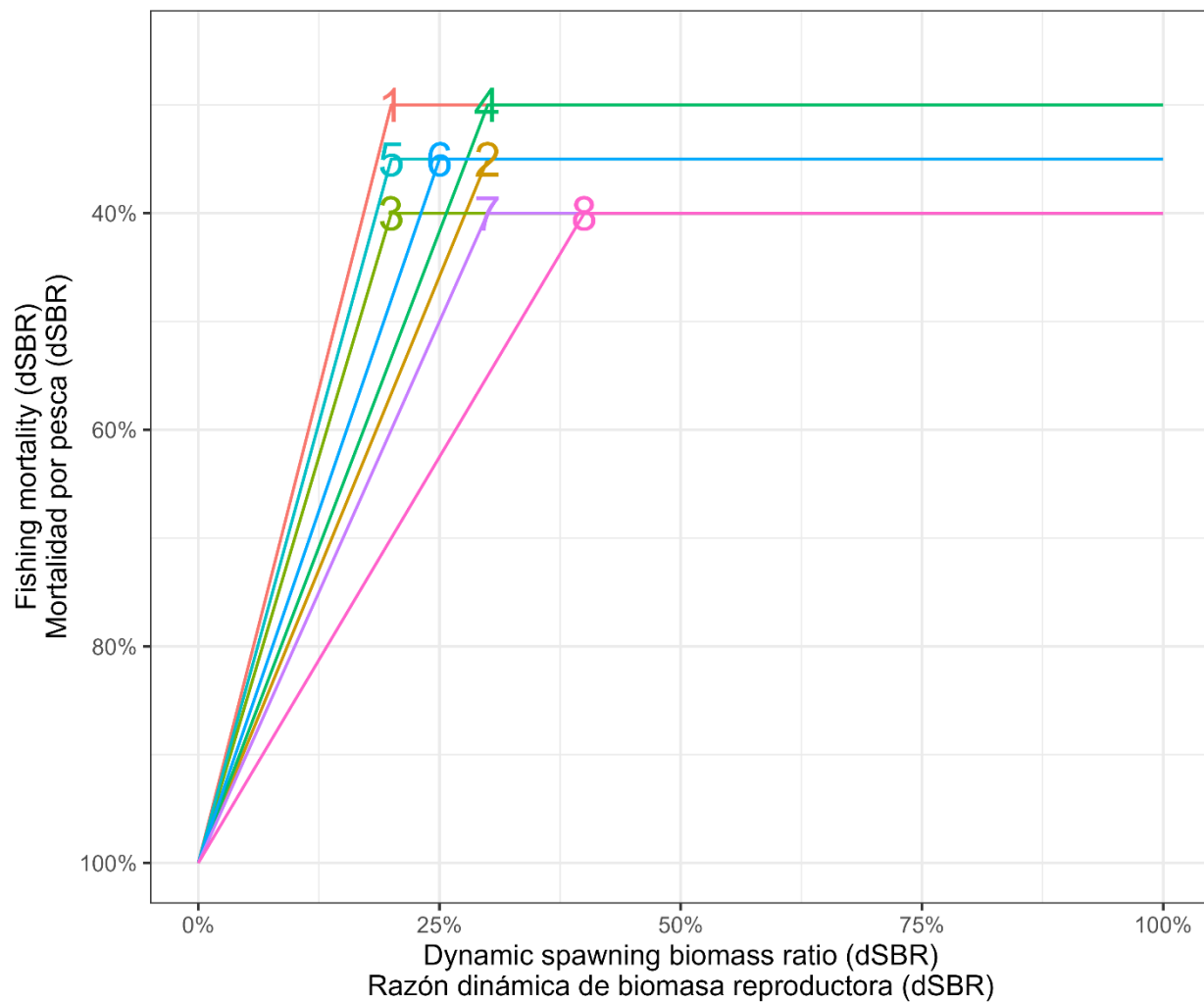


FIGURE 2. The eight candidate harvest control rules compared in the Management Strategy Evaluation (MSE) for bigeye tuna in the eastern Pacific Ocean (EPO) ([SAC-17-05](#)).

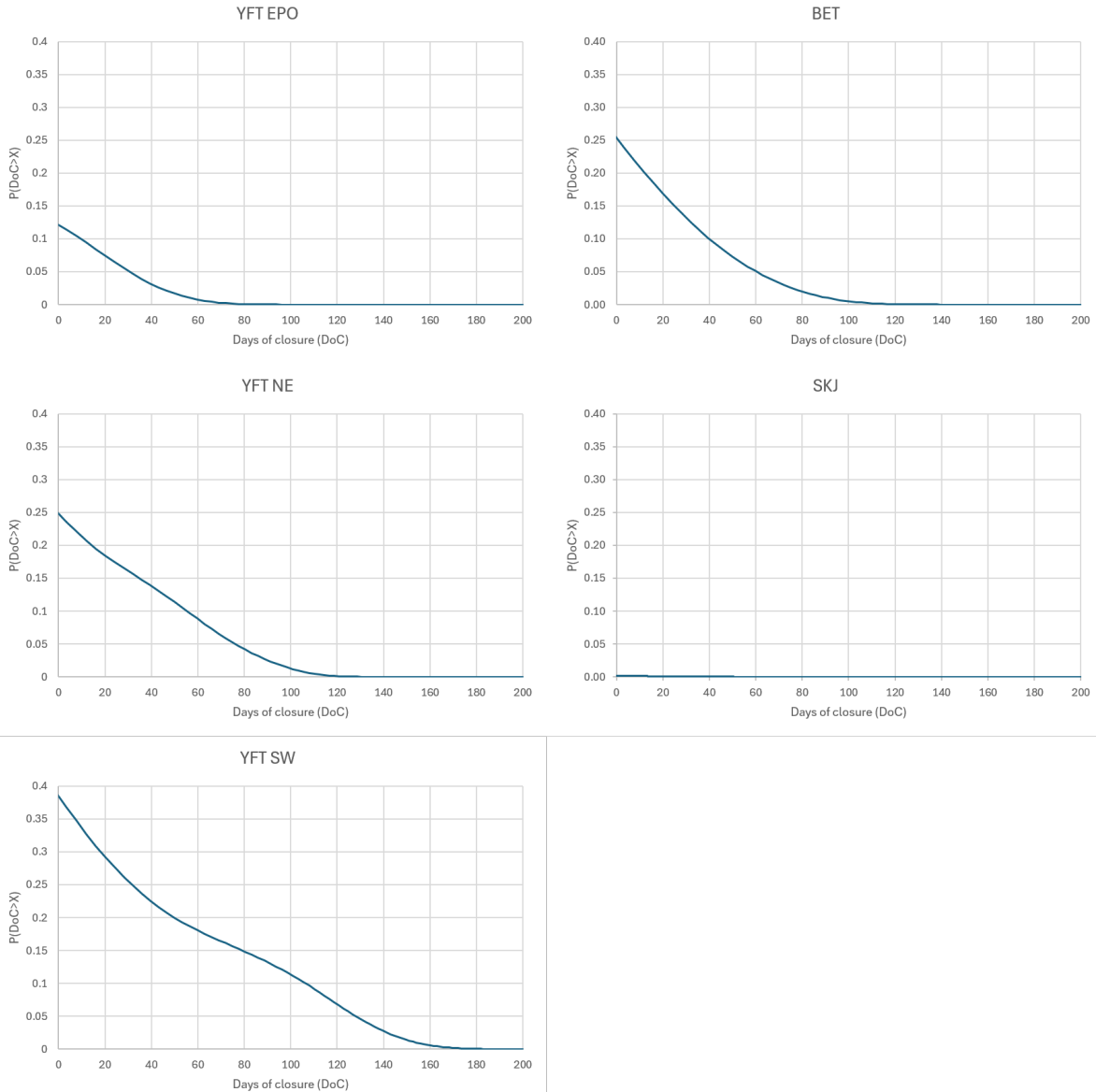


FIGURE 3. Probability that X days of closure or more is required to obtain the fishing mortality related to a 30% depletion.

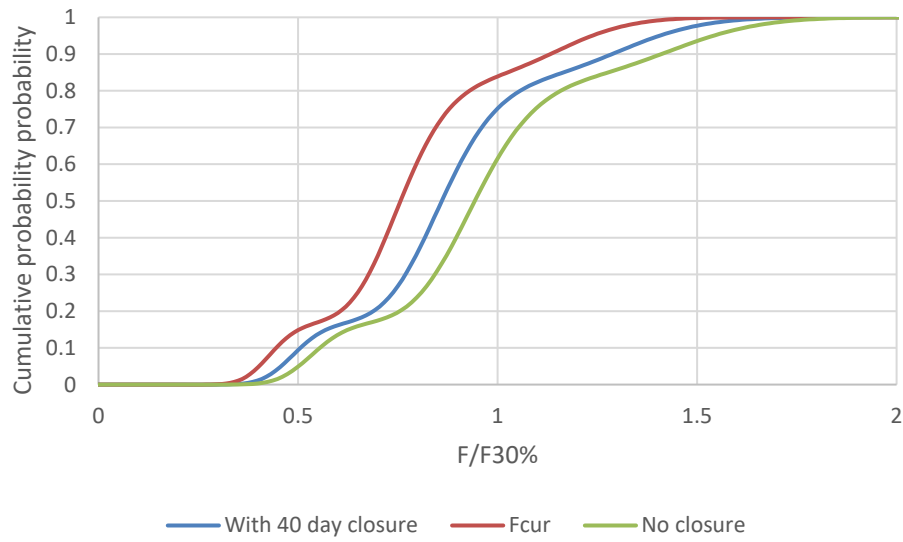


FIGURE 4. Cumulative probability of $F_{cur}/F_{30\%}$ for the southwest yellowfin stock from the risk analysis compared to when a 40-day reduction and complete reduction in the closure is applied.