

# Status of the World Fisheries for Tuna: March 2023



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ISSF / March 2023

Suggested citation:

ISSF. 2023. Status of the world fisheries for tuna. Mar. 2023. ISSF Technical Report 2023-01. International Seafood Sustainability Foundation, Pittsburgh, PA, USA.

**Topic Categories:** Tuna stock status

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# Executive Summary

Across the seven species of major commercial oceanic tuna, 23 stocks are recognized for stock assessment and management (6 albacore, 4 bigeye, 4 bluefin, 5 skipjack and 4 yellowfin stocks). This document summarizes the stock status resultant from the most recent scientific assessments of these stocks, as well as the current management measures adopted by the RFMOs. In addition, this report describes the status and management of the 23 stocks using a consistent methodology in terms of three factors: Abundance, Exploitation Rate (fishing mortality) and Environmental Impact (bycatch).

In 2021, the catch of major commercial tunas was 4.8 million tonnes. Fifty-six percent of it was skipjack tuna, followed by yellowfin (31%), bigeye (8%) and albacore (4%). Bluefin tunas accounted for 1% of the global catch.

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, 78% of the stocks are not experiencing overfishing and 13% are experiencing overfishing (Figure 1).

In relation to catch (Figure 2), 85% of the total catch comes from healthy stocks in terms of abundance. This is due to the fact that skipjack stocks contribute more than one half of the global catch of tunas, and most are in a healthy situation (Table 1). In contrast, one bluefin stock, one yellowfin stock, one bigeye stock and one albacore stock are overfished; resulting that 11% of the total catch comes from overfished stocks. Regarding exploitation, 87% of the total catches comes from stocks that are not experiencing overfishing (Figure 2).

Catch by rating (abundance and exploitation) and RFMO/region are shown in Figure 3.

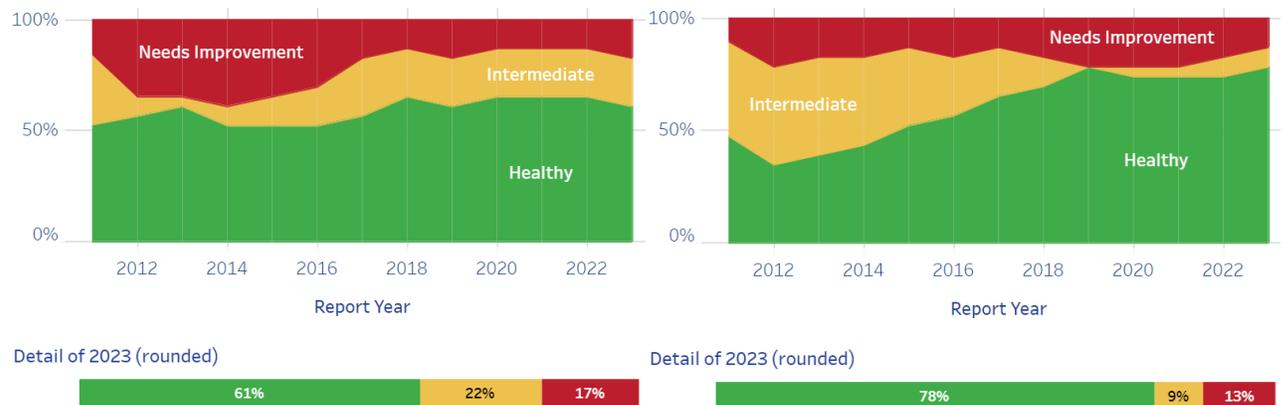


Figure 1. Trends in distribution of stocks of major commercial tunas according to abundance ratings (left) and fishing mortality ratings (right). The percentages correspond to the number of stocks with a given ranking.



Figure 2. Trends in distribution of catch of major commercial tunas according to abundance ratings (left) and fishing mortality ratings (right). The percentages correspond to the total catch of all stocks with a given ranking.

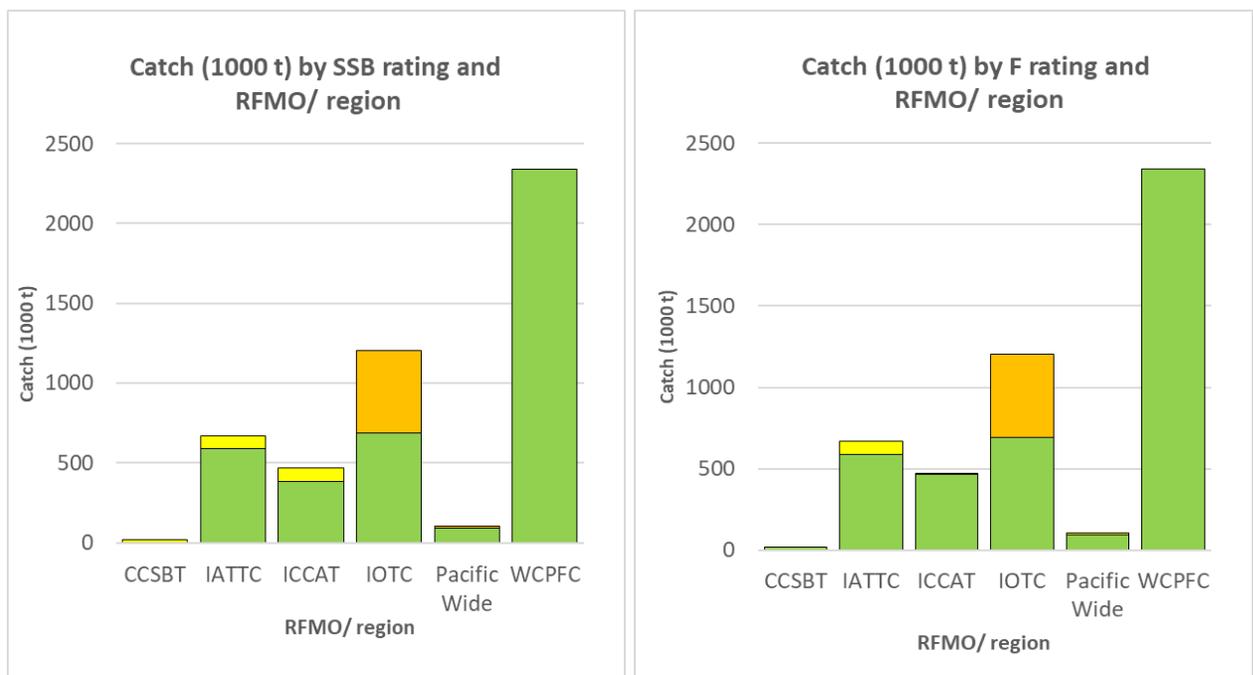


Figure 3. Catch (1000 t) by rating and RFMO or region in 2021. Left: SSB abundance ratings (Green = not overfished, Yellow = intermediate level of abundance, Orange = overfished). Right: F exploitation ratings (Green = not experiencing overfishing, Yellow = intermediate levels, Orange = experiencing overfishing).

Table 1. Spawning biomass (SSB), Fishing Mortality (F) and Environmental Impact ratings for 23 tuna stocks. The table is sorted by species. Catch, in thousands of tonnes, is for 2021). For an explanation of the methodology for assigning ratings see [page 13](#). Bycatch reflects the percentage of the catch that falls under each rating.

STOCK	CATCH	SSB	F	BYCATCH
<b>Albacore tuna</b>				
<a href="#">PO-ALB-N</a>	39			
<a href="#">PO-ALB-S</a>	52			
<a href="#">AO-ALB-N</a>	31			
<a href="#">AO-ALB-S</a>	25			
<a href="#">AO-ALB-M</a>	3			
<a href="#">IO-ALB</a>	35			
<b>Bigeye tuna</b>				
<a href="#">EPO-BET</a>	79			
<a href="#">WPO-BET</a>	158			
<a href="#">AO-BET</a>	46			
<a href="#">IO-BET</a>	95			
<b>Bluefin tuna</b>				
<a href="#">PO-PBF</a>	15			
<a href="#">AO-BFT-E</a>	35			
<a href="#">AO-BFT-W</a>	2			
<a href="#">SH-SBT</a>	17			
<b>Skipjack tuna</b>				
<a href="#">EPO-SKJ</a>	325			
<a href="#">WPO-SKJ</a>	1512			
<a href="#">AO-SKJ-E</a>	197			
<a href="#">AO-SKJ-W</a>	20			
<a href="#">IO-SKJ</a>	655			
<b>Yellowfin tuna</b>				
<a href="#">EPO-YFT</a>	263			
<a href="#">WPO-YFT</a>	672			
<a href="#">AO-YFT</a>	111			
<a href="#">IO-YFT</a>	421			

Table 2. Spawning biomass (SSB), Fishing Mortality (F) and Environmental Impact ratings for 23 tuna stocks. The table is sorted by ocean or ocean region. Catch, in thousands of tonnes, is for 2021. For an explanation of the methodology for assigning ratings see [page 13](#). Bycatch reflects the percentage of the catch that falls under each rating.

STOCK	CATCH	SSB	F	BYCATCH
<b>Eastern Pacific</b>				
<a href="#">EPO-BET</a>	79			
<a href="#">EPO-YFT</a>	263			
<a href="#">EPO-SKJ</a>	325			
<b>Western Pacific</b>				
<a href="#">WPO-BET</a>	158			
<a href="#">WPO-YFT</a>	672			
<a href="#">WPO-SKJ</a>	1512			
<b>Pacific Ocean</b>				
<a href="#">PO-ALB-N</a>	39			
<a href="#">PO-ALB-S</a>	52			
<a href="#">PO-PBF</a>	15			
<b>Atlantic Ocean</b>				
<a href="#">AO-BET</a>	46			
<a href="#">AO-YFT</a>	111			
<a href="#">AO-SKJ-E</a>	197			
<a href="#">AO-SKJ-W</a>	20			
<a href="#">AO-ALB-N</a>	31			
<a href="#">AO-ALB-S</a>	25			
<a href="#">AO-ALB-M</a>	3			
<a href="#">AO-BFT-E</a>	35			
<a href="#">AO-BFT-W</a>	2			
<b>Indian Ocean</b>				
<a href="#">IO-BET</a>	95			
<a href="#">IO-YFT</a>	421			
<a href="#">IO-SKJ</a>	655			
<a href="#">IO-ALB</a>	35			
<b>Southern Hemisphere</b>				
<a href="#">SH-SBT</a>	17			

# Introduction

## Purpose

The 23 stocks of the 7 major commercial oceanic tuna species are assessed and managed by five Tuna Regional Fishery Management Organizations (RFMOs). The purpose of this document is to summarize the status of the stocks according to the most recent scientific assessments, as well as the current management measures adopted by the RFMOs. The report is reviewed by the ISSF Scientific Advisory Committee, which provides advice on its content. The report does not advocate any particular seafood purchase decisions.

Note that stock status can change between consecutive assessments because the stocks and fisheries are dynamic. In addition, the scientific bodies of the RFMOs sometimes improve the assessment procedures in the light of new methods and more information, and these changes can also impact the interpretation of stock status, particularly in relation to MSY-based reference points.

When available, the stock summaries in this report include the probability statements about stock status that are provided by RFMO scientific committees.

While this report does not replace the more detailed information available directly from the RFMOs, it does serve as a single source in which uniform information is presented.

In terms of management, it is worth noting that the use of Management Procedures (MP) (also known as Harvest Strategies (HS)) differs between RFMOs. For instance, while some RFMOs adopted some elements of the MPs (e.g., the Harvest Control Rule), others adopted full MPs including the monitoring strategy and the stock assessment as elements of the MP/HS.

The report is organized by Ocean or by Ocean Region to match as closely as possible the mandates of the different RFMOs.

There are five tuna RFMOs, which are responsible of assessing and managing the 23 stocks of the 7 major commercial oceanic tuna species:

- IATTC: Inter-American Tropical Tuna Commission (La Jolla, USA – 1949)
- ICCAT: International Commission for the Conservation of Atlantic Tunas (Madrid, Spain – 1969)
- CCSBT: Commission for the Conservation of Southern Bluefin Tuna (Canberra, Australia – 1994)
- IOTC: Indian Ocean Tuna Commission (Mahé, Seychelles – 1996)
- WCPFC: Western and Central Pacific Fisheries Commission (Kolonias, Micronesia - 2004)

The stock assessments and the scientific management advice for those stocks are provided annually by the Scientific Committees of those RFMOs following this meeting calendar:

- IATTC Scientific Committee meets annually in May each year,
- ICCAT Scientific Committee meets annually in September each year,
- CCSBT Scientific Committee meets annually in September each year,
- IOTC Scientific Committee meets annually in December each year,
- WCPFC Scientific Committee meets annually in August each year.

**Table 3** shows the latest stock assessment conducted and the next planned stock assessment for each of the 23 stocks.

Catch data is presented by the following main gear type categories: Purse seine, Longline, Pole and Line, Gillnet and Other. Purse Seine catches are split by set type (FAD, free-school, dolphin) when possible throughout the report. The term “FAD” is used broadly as a synonym of “associated” sets, whether they are natural logs, anchored FADs, dFADs or other set types that RFMOs classify as associated. While FADs are not used exclusively by purse seine vessels, accurate data on FAD catches by other vessel types is not always available, therefore, this set type subdivision is only applied to Purse Seine catches in this report.

*Table 3. Calendar of planned stock assessments agreed by the RFMOs. Depending on RFMO priorities some assessment years could be changed.*

Stock	RFMO	Last assessment	Next assessment
EPO-BET	IATTC	2020	2024
EPO-YFT	IATTC	2020	2024
EPO-SKJ	IATTC	2022	2024
WCPO-BET	WCPFC	2020	2023
WCPO-YFT	WCPFC	2020	2023
WCPO-SKJ	WCPFC	2022	2025
PO-ALB-N	IATTC / WCPFC	2020	2023
PO-ALB-S	IATTC / WCPFC	2021	2024
PO-PBF	IATTC / WCPFC	2022	2024?
AO-BET	ICCAT	2021	2025 <sup>1</sup>
AO-YFT	ICCAT	2019	2024
AO-SKJ-E	ICCAT	2022	2026?
AO-SKJ-W	ICCAT	2022	2026?
AO-ALB-N	ICCAT	2020	2023
AO-ALB-S	ICCAT	2020	2026
AO-ALB-M	ICCAT	2021	2023
AO-BFT-E	ICCAT	2022	TBD
AO-BFT-W	ICCAT	2021	2025
IO-BET	IOTC	2022	2025
IO-YFT	IOTC	2021	2024
IO-SKJ	IOTC	2020	2023
IO-ALB	IOTC	2022	2025
SH-SBT	CCSBT	2020	2023

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<sup>1</sup> Tentatively

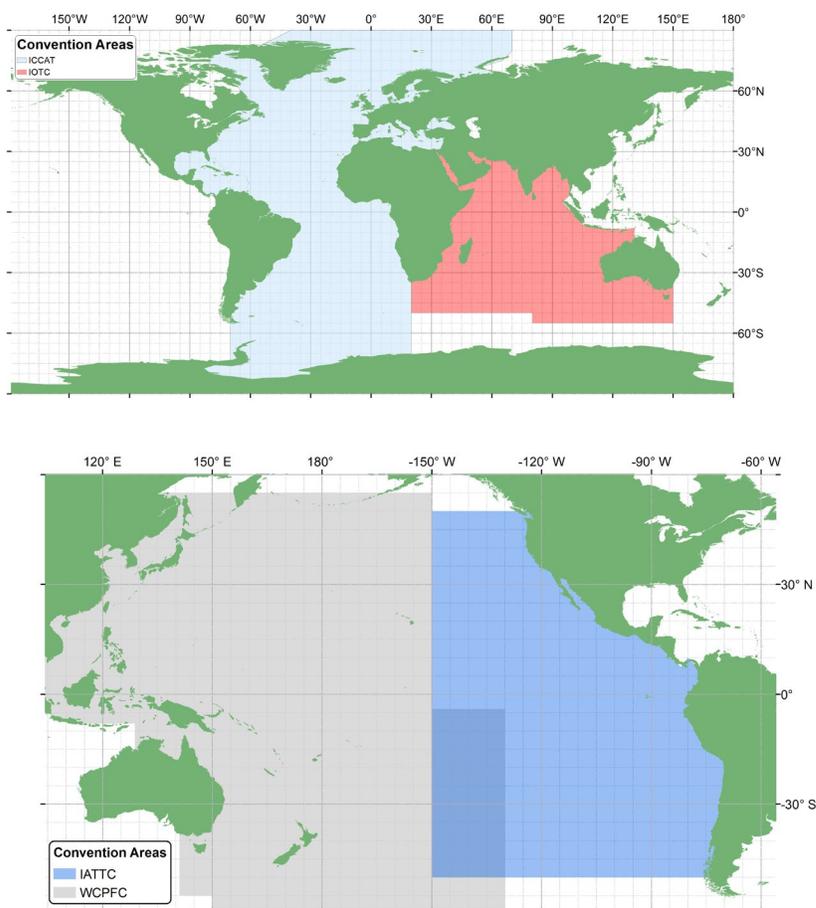


Figure 4. Tuna RMFO Convention Areas. Top: International Commission for the Conservation of Atlantic Tunas (ICCAT) and Indian Ocean Tuna Commission (IOTC). Bottom: Inter-American Tropical Tuna Commission (IATTC) and Western and Central Pacific Fisheries Commission (WCPFC).

In addition, this report describes the status and management of the 23 stocks using a consistent methodology (explained below) in terms of three factors: Abundance, Exploitation Rate and Environmental Impact (bycatch).

This report answers three key questions about each tuna stock:

**Is the stock overfished?** The report documents the abundance of fish that are able to reproduce each year, called the spawning stock biomass (SSB), and compares it to an estimate of the spawning biomass that would produce maximum sustainable yield ( $SSB_{MSY}$ ), which is the biomass that results in the highest average catches in the long-term (this is commonly considered a target of fisheries management). When SSB is below  $SSB_{MSY}$  the stock is considered in an “overfished” state.

An overfished stock doesn’t necessarily mean that the stock is in immediate danger of extinction or collapse but that currently the fish aren’t being allowed to grow and reproduce at their most productive level. If a stock is overfished, the report will note any corrective measures being taken by the relevant fisheries management organization.

In each stock summary table, the spawning stock biomass is also compared with the initial or spawning stock biomass without fishing ( $SSB_0$ ) to ascertain the stock depletion level from initial population biomass.

**Is it in danger of becoming overfished?** The report measures the fishing mortality rate ( $F$ ), a measure of fishing intensity, and compares it to the fishing mortality that produces maximum sustainable yield ( $F_{MSY}$ ). When  $F$  is above  $F_{MSY}$ , the stock is in danger of becoming overfished in the future. This is called **overfishing**. If overfishing is taking place, the report will note any corrective measures being taken by the relevant fisheries management organization.

**Are the methods used to catch the tuna also catching significant numbers of non-targeted species?** The report also measures the environmental impact of fishing in terms of “bycatch” rates. Bycatch is any species caught by the boat that is not targeted by the skipper. All fishing methods result in some bycatch of non-target species. The report identifies the relative bycatch rates by fishing gear and reports on mitigation measures adopted by the RFMOs for various species groups.

This report is updated several times each year, usually after an RFMO assesses the stocks it is responsible for or adopts management recommendations. [Appendix 2](#) provides a log of the updates.

Note that the IATTC and WCPFC Convention Areas have a region of overlap (**Figure 4**, bottom). In this report, catches of tropical tunas that occur in the overlap region are provided in the EPO summary. Similarly, the CCSBT Convention Area overlaps with those of ICCAT, IOTC and WCPFC. In this report, catches of southern bluefin tuna are provided in the Southern Hemisphere summary.

## Ratings methodology

For each stock, ISSF applies color ratings (Green, Yellow, Orange) to each of three factors: stock abundance, fishing mortality and environment.

Each stock is rated separately on these three main criteria and color-coded, to indicate not only the severity of the problem, but also the likelihood that the problem will continue in the future. An orange rating in any of these categories means that there are sustainability concerns (i.e. that the tuna stocks are experiencing overfishing, are currently overfished, the bycatch rate is causing adverse population effects, and/or there is insufficient data to understand the impacts of bycatch) and there are no adequate corrective measures in place. A yellow rating means that there are sustainability concerns, but adequate corrective measures are in place, or that a recent assessment is not available. Green rating means that there are no sustainability concerns.

The protocol used is as follows:

1. ISSF Scientific staff drafts the text based on reports from the RFMOs and assigns ratings according to the decision table below.
2. Members of the Scientific Advisory Committee review the draft and may revise the ratings based on their knowledge of the RFMO scientific committees.
3. The Scientific Advisory Committee approves the final report with changes as in step 2, above.

### COLOR RATINGS DECISION TABLE

STOCK ABUNDANCE		Spawning Biomass (SSB)* is at or above $SSB_{MSY}$ .
		Spawning Biomass is somewhat** below $SSB_{MSY}$ but it has been stable, increasing, or fluctuating around $SSB_{MSY}$ because the stock is being managed at $F_{MSY}$ ** . Yellow is also used in the absence of a recent*** stock assessment.
		Spawning Biomass is below $SSB_{MSY}$ and it has not been stable, increasing or fluctuating around $SSB_{MSY}$ **.

FISHING MORTALITY		F is below $F_{MSY}$ .
		F is above $F_{MSY}$ but there are management measures expected to end overfishing. Yellow is also used in the absence of a recent*** stock assessment.
		F is above $F_{MSY}$ and there are no management measures expected to end overfishing, or the measures in place are insufficient.
ENVIRONMENT		Adverse population effects on bycatch species are not expected for a given fishing gear/fishing method.
		Adverse population effects on bycatch species are expected for a given fishing gear/fishing method, but there are either management measures or research programs in place expected to mitigate these effects. In addition, there is adequate monitoring of bycatch.
		Adverse population effects on bycatch species are expected for a given fishing gear/fishing method, and there are no management measures or research programs in place expected to mitigate these effects. In addition, bycatch monitoring is inadequate.

\* In cases where spawning biomass (SSB) is not available from a stock assessment, total biomass (B) or another measure of abundance is used.

\*\* As determined by the ISSF Scientific Advisory Committee based on the results of the stock assessment. Generally, a stable or increasing trend has to be observed for more than two years.

\*\*\* "Recent" is measured by less than or equal to one generation length (GL), which varies for each species and sometimes between different stocks of the same species. GL is the average age of the parents of the current cohort (i.e., the newborn individuals in a population). GL values used in this report can be found in the [species descriptions on ISSF's website](#), which are taken from Juan-Jorda et al. (2022).

Environmental ratings are specific to different fishing methods. [Appendix 1](#) provides the default ratings for major gear types.

## MANAGEMENT STATUS

The management section for each stock in this report includes a table with scores for Harvest Strategies Performance Indicators (PI) from the Marine Stewardship Council (MSC) Fisheries Certification Standard, which provides a snapshot of the stock management framework for each stock. The scores presented in those tables are based on information in the independent report "[An evaluation of the sustainability of Global Tuna Stocks Relative to Marine Stewardship Council Criteria](#)".

Score	Evaluation
PI < 60	Fail
60 ≤ PI < 80	Condition Needed
PI ≥ 80	Passing Score

## Major commercial tunas

Seven species of oceanic tunas are of major commercial importance on a global scale: Three species of bluefin tuna, and one each of albacore, bigeye, yellowfin and skipjack tuna. Due to differences in their distributions and the different fisheries that exploit them, the species are classified as "temperate" or "tropical." The temperate tunas are the bluefins and albacore; they are found in waters as cold as 10°C, but can also be found in tropical waters. Skipjack and yellowfin are classified as tropical and are found in waters with temperatures greater than 18° C (although they can dive in colder waters). Bigeye could be classified as intermediate, but is often treated as a tropical species in fishery statistics. Ages/sizes at maturity relate to those at which 50% of females are expected to be mature.

For a more detailed description of each of the major tuna species, including some biological characteristics and distribution maps, please visit:

<https://www.issf-foundation.org/tuna-stocks-and-management/tuna-fishing/tuna-species/>

## Global summary of catches

The global catch of albacore, bigeye, bluefin, skipjack and yellowfin in 2021 was 4,8 million tonnes, a 4% decrease from 2020. Catches increased steadily until the early 2000s and although they appeared to have stabilized since then, annual catches have kept increasing in recent years (**Figure Global-1**). **Figure Global-2** shows trends in catches by species and gear. Ranked by species (using the 2017-2021 average = 5,079,200 tonnes), the majority of the catch corresponds to skipjack (57%), followed by yellowfin (30%), bigeye (8%), albacore (4%) and bluefin (1%). In terms of fishing gear, 66% of the catch is made by purse seining (approximately 37% associated + 26% unassociated + 3% dolphin sets), followed by longline (9%), pole-and-line (7%), gillnets (4%) and miscellaneous gears (14%).

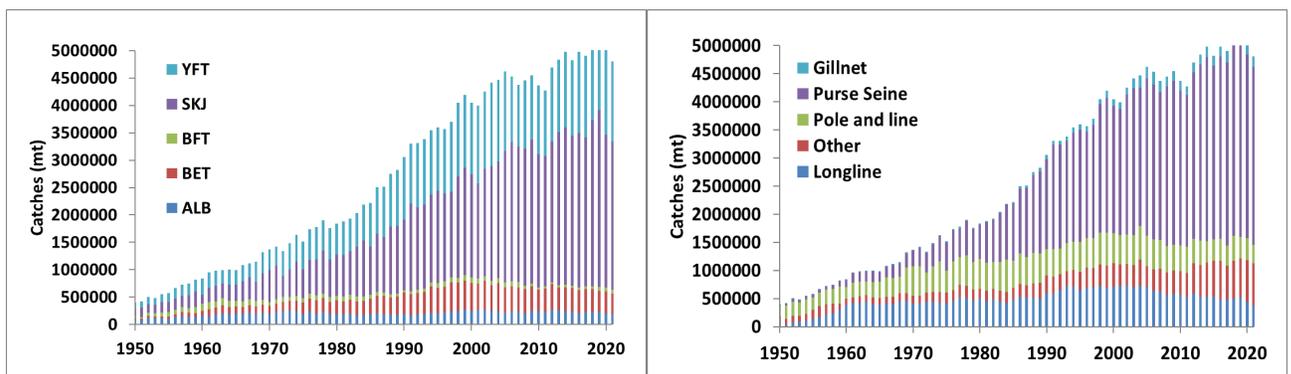


Figure Global-1. Global trends in catch (tonnes) of major commercial tunas, by species (top) and gear (bottom), 1950-2021.

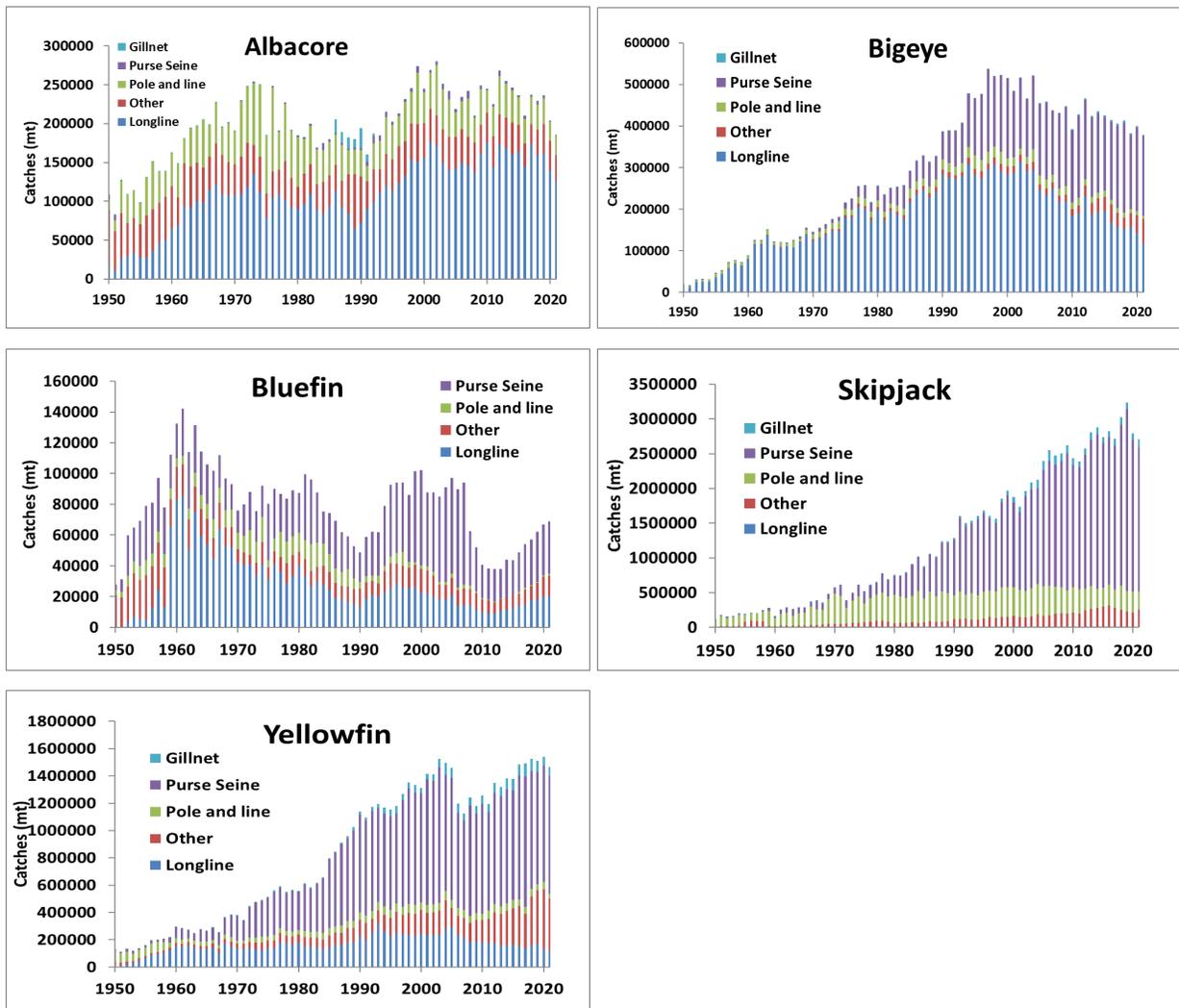


Figure Global-2. Global trends in catch (tonnes) of major commercial tunas, 1950-2021.

## Additional resources

ISSF produces other reports that are complementary to this one and are published as part of the [ISSF Technical Reports series](#). One such report can be particularly useful in providing additional information:

"[Stock Assessment 101: Current practice for tuna stocks](#)" gives a simple introduction to concepts and terms such as  $F$ ,  $F_{MSY}$ ,  $SSB_{MSY}$ , Recruitment, etc., which are encountered numerous times in this report. Many terms are also defined in the [ISSF Glossary](#).

- The [Regional Fisheries Management Organizations \(RFMOs\)](#) page in ISSF's website provides additional information about the RFMOs: How they are structured, who are their members, how they obtain their scientific advice, how are decisions made, and what ISSF's main advocacy asks are for each one.
- The [MSC tuna fisheries list](#) in ISSF's website shows tuna fisheries worldwide that either have been certified by the Marine Stewardship Council (MSC) or are currently undergoing a full assessment to become certified. The list is updated quarterly.
- The [tuna FIPs list](#) shows publicly listed tuna fishery improvement projects (FIPs) that are third-party verified. The list is updated quarterly.

# STOCKS IN THE EASTERN PACIFIC OCEAN

**RFMO:** Inter-American Tropical Tuna Commission (IATTC). EPO stocks are assessed by the IATTC staff, who makes recommendations to the IATTC. The SAC can also make recommendations to the IATTC.

**Last Scientific Committee (IATTC SAC) meeting:** May, 2022.

**Last Commission meeting:** August, 2022.

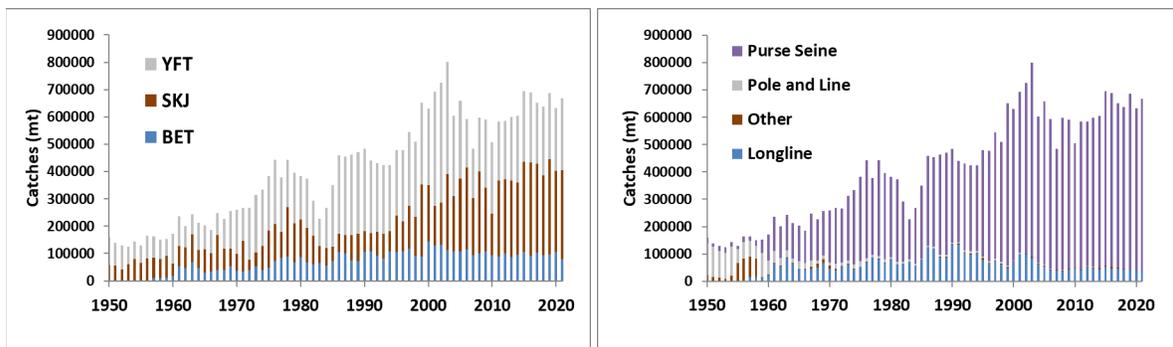
**Tuna stocks managed by IATTC:** EPO Yellowfin, EPO Bigeye, EPO Skipjack. Also, North Pacific Albacore, South Pacific Albacore and Pacific Bluefin (also managed by WCPFC; see [Stocks in the Pacific Ocean](#))

**Data sources:** The main source of information for this section is [IATTC \(2022\)](#), [IATTC \(2021a\)](#), [IATTC \(2021b\)](#), [Xu et al. \(2020\)](#), [Minte-Vera et al. \(2020\)](#), [Aires-da-Silva et al. \(2020\)](#) and [Maunder et al. \(2022\)](#)

**Last update:** November, 2022.

About 13 percent of the world production of tuna is from the eastern Pacific Ocean (EPO). Catches of skipjack, yellowfin and bigeye in 2021 were about 667,600 tonnes, a 5% increase from 2020. There was a general decline in the total catch since 2003, which recorded the peak catch of 800,000 tonnes of these three species. However, from 2007 onwards catches are steadily increasing (**Figure EPO-1**).

Catches of albacore and Pacific bluefin also occur in the EPO. These stocks are also distributed in the western Pacific and are covered in a different section of this report, under [Pacific Ocean](#).



*Figure EPO-1. Trends in catch (mt) of bigeye, skipjack and yellowfin in the EPO region, by species (left) and gear (right), 1950-2021.*

Average tropical tuna catches for the five-year period 2017-2021 (655,500 tonnes) provide an indication of the recent performance of the fisheries (**Figure EPO-2**): Skipjack accounts for 48% of the catches in weight, followed by yellowfin (37%) and bigeye (15%). Purse-seine vessels take 94% of the total catch, followed by longline (6%).

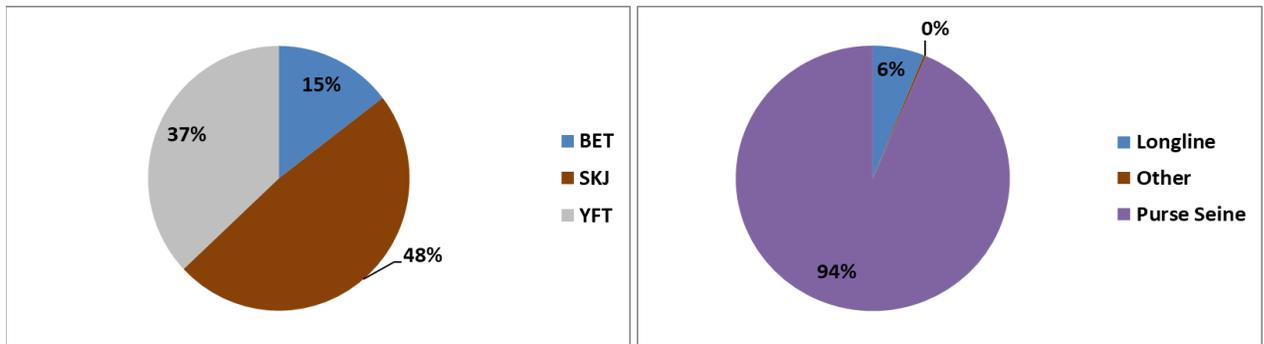


Figure EPO-2. Average 2017-2021 catches of skipjack, yellowfin and bigeye tuna in the EPO. The panel on the left shows the percentages by species, and the panel on the right shows the percentages by gear type.

## EPO Bigeye Tuna

Bigeye catches in 2021 were about 79,300 tonnes, a 25% decrease from 2020. Longline fishing dominated the catches in weight until the mid-1990s. However, in recent years purse seine fishing accounts for the majority of catches (70.5%), while longlining accounts for 29.5% (Figure EPO-3). Bigeye catches in the EPO by other gears are very minor. The bigeye stock in the EPO is expected to be fluctuating around the MSY level.

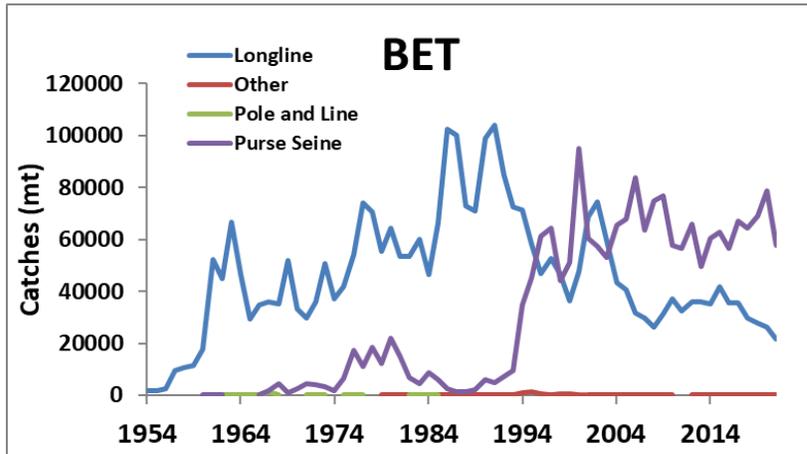


Figure EPO-3. Catches of bigeye tuna in the EPO from 1954 to 2021, by gear type.

## STOCK ASSESSMENT

In 2020, to evaluate stock status, the IATTC conducted a benchmark assessment that was the basis of a risk analysis. This approach differs fundamentally from the previous one of using a single model as the "best assessment." A total of 44 different models were used in the analyses, reflecting a wide range of plausible hypotheses about biology as well as different data sets and assumptions. The results of the assessment and risk analysis indicate the following (EPO-4):

1. While for the 44 models the ratio  $SSB_{current}/SSB_{MSY}$  varies considerably (95% CI: 0.25-2.52), the combined value of the ratio for all the models is 0.92. The overall probability that  $SSB_{current}$  is below  $SSB_{MSY}$  across all the models is 53%. This indicates that the stock is likely fluctuating around the target level of  $SSB_{MSY}$ .
2. The ratio of  $F_{current}/F_{MSY}$  for the 44 models also varies considerably (95% CI: 0.40-2.04). The combined value of the ratio across the 44 models is estimated at 1.00 and the combined probability that  $F_{current}$  exceeds  $F_{MSY}$  is 50%. This indicates that the stock is likely being exploited around the target level of  $F_{MSY}$ . However, the number of purse seine sets on floating objects have continuously increased in recent years, except for 2020, which is a concern.
3. The model-weighted average of MSY across all models is estimated to be 126,000 tonnes. MSY has been reduced to about half its level in 1993, when the expansion of the floating-object fishery began, as the overall selectivity from all fleets combined shifted towards smaller individuals. Since bigeye tuna can grow close to 200 cm, catching them when they are small results in a loss of potential yield, i.e. the catches that could be taken by other gears that target larger individuals, such as longlining. This is known as "growth overfishing".

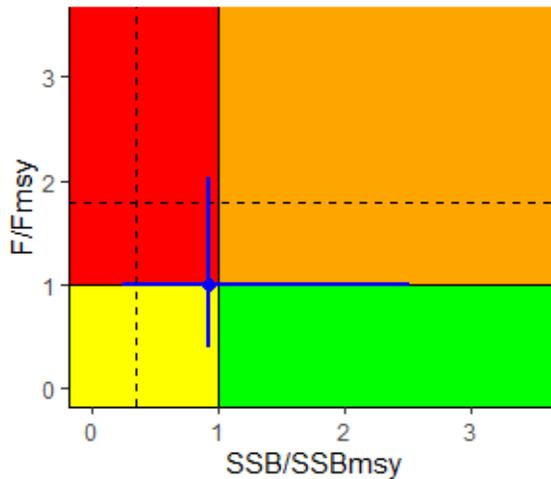


Figure EPO-4. Latest estimate of combined  $SSB/SSB_{MSY}$  and combined  $F/F_{MSY}$  (in blue, including range) across all models for EPO bigeye. Solid black lines represent interim target reference points and dashed black lines represent interim limit reference points.

In 2021, IATTC developed stock status indicators as supplemental information to monitor the stock. Most indicators based on the floating-object fishery are consistent with an increase in fishing mortality in that fishery and the average length for bigeye is at a historical low level in 2020. This is further supported by a positive relationship between number of sets and fishing mortality estimated in the bigeye tuna stock assessment.

## MANAGEMENT

**Harvest Strategy:** No, but the following components have been agreed:

**Limit reference point:** In 2014, on an interim basis, IATTC agreed to the staff's recommendation of the equilibrium spawning biomass/fishing mortality corresponding to that which produces a 50% reduction in recruitment from the unfished level. This corresponds to a spawning biomass that is about 8% of the un-fished level. This calculation is based on the assumption that the steepness of the stock-recruitment relationship is  $h=0.75$ , which is more conservative than the past IATTC assessment assumption that  $h=1.0$ . In the most recent assessment, there is a probability of 6% that the biomass limit reference point has been exceeded and a 5% probability that the F limit reference point was breached.

**Target reference point:** In 2014, on an interim basis, IATTC adopted  $F_{MSY}$  and  $SSB_{MSY}$  as target reference points. There is a 53% probability that  $SSB_{current} < SSB_{MSY}$ , and a 50% probability that  $F_{current} > F_{MSY}$ .

**Harvest control rule:** In 2016, IATTC adopted HCR for the tropical tuna purse-seine fishery based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02). The HCR aims to prevent fishing mortality from exceeding the MSY level for the tropical tuna stock (bigeye, yellowfin or skipjack) that requires the strictest management. If fishing mortality or spawning biomass are approaching or exceeding the corresponding limit reference point as measured by an estimated probability of 10% or greater of exceeding the limit, the HCR also triggers the establishment of additional management measures to reduce fishing mortality and rebuild the stock.

**Management objectives:** Not agreed.

**Management Strategy Evaluation:** There is an ongoing MSE process for tropical tunas at the IATTC adopted by Resolution C-19-07, which has included introductory workshops for the fishing industry, managers and other stakeholders as well as technical development of the MSE technical framework and improvement of models for the simulation work.

### Management measures:

The main conservation measure established by the IATTC for bigeye is Resolution C-21-04 that establishes a multi-annual management measure for tropical tunas in the eastern Pacific Ocean during 2022-2024. This measure calls for:

1. A 72-day closure for purse seiners greater than 182 tons capacity through 2024;
2. Additional days of closure for vessels exceeding a particular annual bigeye catch limit (i.e. 8 additional days in 2022 if a vessel has exceeded 1200 tons in 2017-2019, and 10-13-16-19-22 additional days in 2023-2024 if a vessel has exceeded 1200-1500-1800-2100-2400 tons, respectively, in previous year.
3. Strengthen the monitoring and control system for tropical tuna species (particularly bigeye) catches through on-board observers, logbooks, port sampling and information from tuna processing facilities to control individual vessel bigeye catches.
4. A seasonal closure of the purse seine fishery in an area known as "El Corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
5. A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
6. Bigeye catch limits for the main longline fishing nations.
7. Limits on the number of active FADs that each purse seiner can have at any time, ranging from 66 FADs/vessel for the smallest ones to 400 FADs/vessel for Class 6 vessels (1,200 m<sup>3</sup> capacity). These ranges will decrease to 64 to 340 in 2023 and 50 to 340 in 2024.
8. All purse seines are also required to not deploy FADs 15 days before the selected closure period and Class 6 vessels to recover within 15 days prior to the start of the closure period a number of FADs equal to the number of FADs set upon during that same period.
9. And in order to support the scientific analysis of FAD fisheries, the measure requires that CPCs or vessels report daily information on all active FADs (position and echosounder biomass data) as well as Vessel Monitoring System (VMS) data to the Secretariat.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	75	Condition Needed
1.2.2	Harvest control rules and tools	80	Passing Score
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

EPO BET	ESTIMATE	YEARS	NOTES
RECENT CATCH	79	2021	
5-YEAR CATCH	96	2017-21	
MSY	126		Model-weighted average
F/F <sub>MSY</sub>	1.00	2017-19	range: 0.40-2.04
SSB/SSB <sub>MSY</sub>	0.92	Start of 2020	range: 0.25-2.52
SSB/SSB <sub>0</sub>	0.21	Start of 2020	range: 0.04-0.41
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB ~ SSB <sub>MSY</sub> . Spawning biomass has been likely fluctuating around the MSY level.
FISHING MORTALITY		F ~ F <sub>MSY</sub> . F has probably fluctuated around F <sub>MSY</sub> . The increasing number of purse seine sets on floating objects is a major concern for increases in F (and subsequent decreases in SSB), if unaddressed and if catch limits fail to maintain the status quo.
ENVIRONMENT		69.5% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks, non-target species in general). There is 100% observer coverage on large purse seiners.
		29.5% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). There is a requirement for 5% observer coverage on large longliners.

*Last date of a change in Color Ratings: November, 2020.*

*Changes from the previous (October 2018) Color Ratings: Abundance rating changed from Green to Yellow and F rating changed from Orange to Yellow.*

## EPO Yellowfin Tuna

Yellowfin catches in the EPO in 2021 were about 263,000 tonnes, 14% higher than 2020 catch levels. The main fishing gear is purse seine (95% of the catch), and recent catches by this gear are about 60% of the record high caught in 2002 (Figure EPO-5). Catches from longline vessels, although smaller in magnitude, have also declined substantially in recent years. The yellowfin stock in the EPO is not currently overfished and overfishing is not taking place.

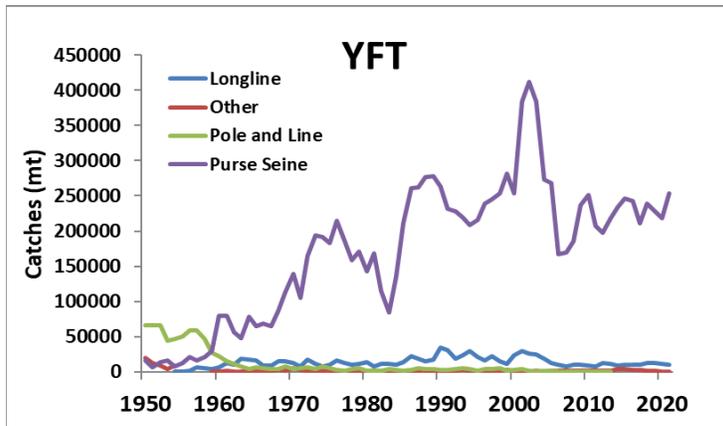


Figure EPO-5. Catches of yellowfin tuna in the EPO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

In 2020, to evaluate stock status, the IATTC conducted a benchmark assessment that was the basis of a risk analysis. This approach differs fundamentally from the previous one of using a single model as the "best assessment." A total of 48 different models were used in the analyses, reflecting a wide range of plausible hypotheses about biology as well as different data sets and assumptions. The results of the assessment and risk analysis differ considerably from the previous assessment due to the different modeling approach, use of different CPUE abundance indices input data (i.e. only using purse seine CPUE index), and use of a broader set of plausible hypotheses, and indicate the following (Figure EPO-6):

1. While for the 48 models the ratio  $SSB_{current}/SSB_{MSY}$  varies considerably (95% CI: 0.76-2.80), the model-weighted average of the ratio for all the models is 1.57. The overall probability that  $SSB_{current}$  is below  $SSB_{MSY}$  across all the models is 12%. This indicates that the stock is likely not overfished.
2. The ratio of  $F_{current}/F_{MSY}$  for the 48 models also varies considerably (95% CI: 0.28-1.20). The model-weighted average of the ratio across the 48 models is estimated at 0.67 and the combined probability that  $F_{current}$  exceeds  $F_{MSY}$  is 9%. This indicates that the stock is likely not suffering from overfishing.
3. The model-weighted average of MSY across all models is estimated to be 288,000 tonnes. Increasing the average weight of the yellowfin caught could increase the MSY.

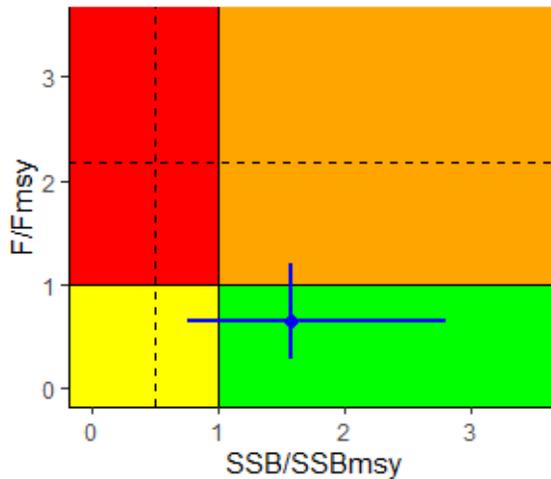


Figure EPO-6. Latest estimate of weighted average  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) across all models for EPO yellowfin. Solid black lines represent interim target reference points and dashed black lines represent interim limit reference points.

In 2021, IATTC developed stock status indicators as supplemental information to monitor the stock. Although the IATTC staff found some inconsistencies among stock status indicators for yellowfin, most indicators based on the floating-object fishery are suggesting an increase in fishing mortality in that fishery.

## MANAGEMENT

**Harvest Strategy:** No, but the following components have been agreed:

**Limit reference point:** In 2014, on an interim basis, IATTC agreed to the staff's recommendation of the equilibrium spawning biomass and fishing mortality corresponding to that which produces a 50% reduction in recruitment from the unfished level. This corresponds to a spawning biomass that is about 8% of the unfished level. This calculation is based on the assumption that the steepness of the stock-recruitment relationship is  $h=0.75$ , which is more conservative than the past IATTC assessment assumption that  $h=1.0$ . In the most recent assessment, the probability that the limit reference point was breached was estimated to be zero.

**Target reference point:** In 2014, on an interim basis, IATTC adopted  $F_{MSY}$  and  $SSB_{MSY}$  as target reference points. According to the risk analysis, there is a 12% probability that the stock is overfished ( $SSB < SSB_{MSY}$ ), and a 9% probability that overfishing ( $F > F_{MSY}$ ) is taking place.

**Harvest control rule:** In 2016, IATTC adopted HCR for tropical tuna purse-seine fisheries based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02). The HCR aims to prevent fishing mortality from exceeding the MSY level for the tropical tuna stock (bigeye, yellowfin or skipjack) that requires the strictest management. If fishing mortality or spawning biomass are approaching or exceeding the corresponding limit reference point as measured by an estimated probability of 10% or greater of exceeding the limit, the HCR also triggers the establishment of additional management measures to reduce fishing mortality and rebuild the stock.

**Management Objectives:** Not agreed.

**Management Strategy Evaluation:** There is an ongoing MSE process for tropical tunas at the IATTC adopted by Resolution C-19-07, which has included introductory workshops for the fishing industry, managers and other stakeholders as well as technical development of the MSE technical framework and improvement of models for the simulation work.

### Management measures:

The main conservation measure established by the IATTC for yellowfin is Resolution C-21-04 that establishes a multi-annual management measure for tropical tunas in the eastern Pacific Ocean during 2022-2024. This measure calls for:

1. A 72-day closure for purse seiners greater than 182 tons capacity through 2024;
2. Additional days of closure for vessels exceeding a particular bigeye annual catch limit (i.e. 8 days more in 2022 if a vessel has exceeded 1200 tons in 2017-2019, and 10-13-16-19-22 days more in 2023-2024 if a vessel has exceeded 1200-1500-1800-2100-2400 tons, respectively, in previous year.
3. Strengthen the monitoring and control system for tropical tuna species (particularly bigeye) catches through on-board observers, logbooks, port sampling and information from tuna processing facilities to control individual vessel bigeye catches.
4. A seasonal closure of the purse seine fishery in an area known as "El Corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
5. A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
6. Limits on the number of active FADs that each purse seiner can have at any time, ranging from 66 FADs/vessel for the smallest ones to 400 FADs/vessel for Class 6 vessels (1,200 m<sup>3</sup> capacity). These numbers will decrease to 64 to 340 in 2023 and 50 to 340 in 2024.
7. All purse seines are also required to not deploy FADs 15 days before the selected closure period and Class 6 vessels to recover within 15 days prior to the start of the closure period a number of FADs equal to the number of FADs set upon during that same period.
8. And in order to support the scientific analysis of FAD fisheries, the measure requires that CPCs or vessels report daily information on all active FADs (position and echosounder biomass data) as well as Vessel Monitoring System (VMS) data to the Secretariat

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	80	Passing Score
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

EPO YFT	ESTIMATE	YEARS	NOTES
RECENT CATCH	263	2021	
5-YEAR CATCH	243	2017-21	
MSY	288		weighted average range: 236-357
F/F <sub>MSY</sub>	0.67	2017-19	range: 0.28-1.20
SSB/SSB <sub>MSY</sub>	1.57	Start of 2020	range: 0.76-2.80
SSB/SSB <sub>0</sub>	0.20	Start of 2020	range: 0.11-0.30
TAC	N/A		

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> with 88% probability.
FISHING MORTALITY		F < F <sub>MSY</sub> with 91% probability.
ENVIRONMENT		60% of the catch is made by purse seining on tuna-dolphin associations. Dolphin mortality is managed and closely monitored by AIDCP, with 100% observer coverage. However, the last dolphin surveys took place in 2006, and therefore the status of these populations is uncertain.
		24% of the catch is made by purse seining on FADs. Several bycatch mitigation measures are in place (turtles, sharks, non-target species in general). There is 100% observer coverage on large purse seiners.
		11% of the catch is made by purse seining on free schools of yellowfin.
		5% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). There is a requirement for 5% observer coverage on large longliners.

Last date of a change in Color Ratings: November, 2020.

Changes from the previous (August 2019) Color Ratings: Abundance rating changed from Orange to Green and Fishing mortality rating changed from Orange to Green.

## EPO Skipjack Tuna

In 2021, skipjack catches were about 325,300 tonnes, a 10% increase from 2020. Skipjack catches in the EPO are notoriously variable (**Figure EPO-7**). Purse seine fishing dominates the catches (about 100% of the total). The skipjack EPO stock is not overfished, and overfishing is not occurring.

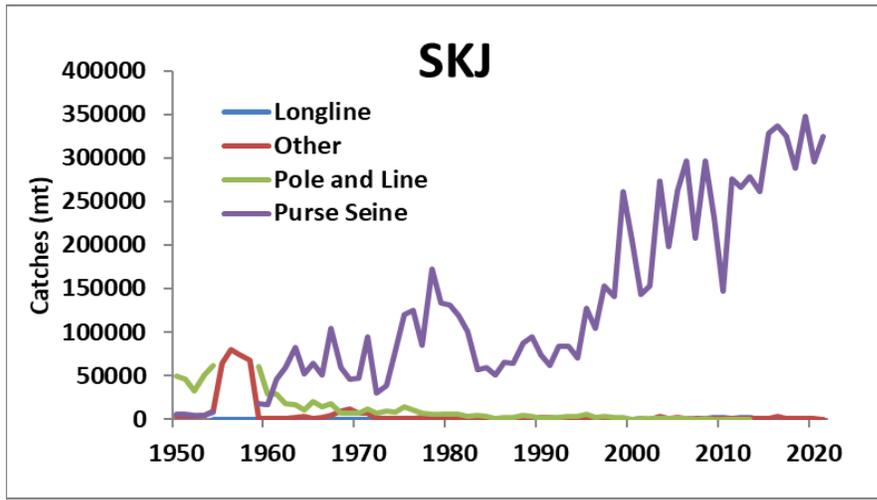


Figure EPO-7. Catches of skipjack tuna in the EPO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

In 2022, the IATTC staff conducted an interim assessment, the first conventional one since 2012. The new assessment is an integrated age-structured catch-at-length analysis, fitted to length composition data and indices of relative abundance, similar to the models used for bigeye and yellowfin. A benchmark assessment is planned for 2024 to include tagging data among other model improvements. Nevertheless, the staff and SAC considered that the 2022 interim assessment was reliable for the provision of management advice. 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  $SSB_{current}/SSB_0$ ) target reference of 0.3 was used, based on values for bigeye and yellowfin. The results indicate that (**Figure EPO-8**):

1. The reference model estimated that current depletion is above the target reference point ( $SBR_{2021}/SBR_{target}=1.77$ ; range: 0.4 to 3.5), indicating that the stock is not overfished. Most of the sensitivity runs support this conclusion. Current SBR is slightly above the status quo level (average level of 2017-2019) as did over half of the sensitivity runs.
2. The reference model estimated that current fishing mortality is below the value that would result in the target reference depletion level of 0.3 ( $F_{2021}/F_{SBR=0.3}=0.25$ ; range: 0.04 to 1.16), indicating that overfishing is not occurring. All but one of the sensitivity runs support this conclusion.

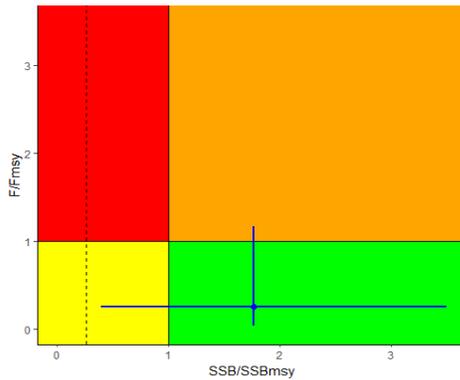


Figure EPO-8. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  proxies (in blue, including range) for skipjack tuna in the eastern Pacific Ocean, based on the reference model results.  $SBR_{target} = 0.3$  and  $F_{SBR=0.3}$  are used as a proxy for  $SSB_{MSY}$  and  $F_{MSY}$ , respectively. Range corresponds to Min-Max values across all models. Solid black lines represent interim target reference points and dashed black vertical line represents the SSB interim limit reference point.

In March 2022, the color ratings for the status of the stock had been changed from Green to Yellow due to the lack of a recent stock assessment. Given the new assessment and the results summarized above, these color ratings are being restored to Green.

## MANAGEMENT

**Harvest Strategy:** No, but the following components have been agreed:

**Limit reference point:** In 2014, on an interim basis, IATTC agreed to the staff's recommendation of the equilibrium spawning biomass and fishing mortality corresponding to that which produces a 50% reduction in recruitment from the unfished level. This corresponds to a spawning biomass that is about 8% of the unfished level. This calculation is based on the assumption that the steepness of the stock-recruitment relationship is  $h=0.75$ , which is more conservative than the past IATTC assessment assumption that  $h=1.0$ . The 2022 assessment indicates that the stock is above this limit.

**Target reference point:** In 2014, on an interim basis, IATTC adopted  $F_{MSY}$  and  $SSB_{MSY}$  as target reference points. No MSY-based reference points are available for EPO skipjack, and the staff used a depletion of 0.3 as a proxy target reference point. The 2022 assessment indicates that it is very likely that the stock is above this target depletion level and  $F$  is below the corresponding target reference equilibrium level.

**Harvest control rule:** In 2016, IATTC adopted HCR for tropical tuna purse-seine fisheries based on the interim target and limit reference points adopted in 2014 (Resolution C-16-02). The HCR aims to prevent fishing mortality from exceeding the MSY level for the tropical tuna stock (bigeye, yellowfin or skipjack) that requires the strictest management. If fishing mortality or spawning biomass are approaching or exceeding the corresponding limit reference point as measured by an estimated probability of 10% or greater of exceeding the limit, the HCR also triggers the establishment of additional management measures to reduce fishing mortality and rebuild the stock. The 2022 assessment indicates that these additional management measures are not triggered for skipjack.

**Management Objectives:** Not agreed.

**Management Strategy Evaluation:** There is an ongoing MSE process for tropical tunas at the IATTC adopted by Resolution C-19-07, which has included introductory workshops for the fishing industry, managers and other

stakeholders as well as technical development of the MSE technical framework and improvement of models for the simulation work.

**Management measures:**

The main conservation measure established by the IATTC for skipjack is Resolution C-21-04 that establishes a multi-annual management measure for tropical tunas in the eastern Pacific Ocean during 2022-2024. This measure calls for:

1. A 72-day closure for purse seiners greater than 182 tons capacity through 2024;
2. Additional days of closure for vessels exceeding a particular bigeye annual catch limit (i.e. 8 days more in 2022 if a vessel has exceeded 1200 tons in 2017-2019, and 10-13-16-19-22 days more in 2023-2024 if a vessel has exceeded 1200-1500-1800-2100-2400 tons, respectively, in previous year.
3. Strengthen the monitoring and control system for tropical tuna species (particularly bigeye) catches through on-board observers, logbooks, port sampling and information from tuna processing facilities to control individual vessel bigeye catches.
4. A seasonal closure of the purse seine fishery in an area known as "El Corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
5. A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
6. Limits on the number of active FADs that each purse seiner can have at any time, ranging from 66 FADs/vessel for the smallest ones to 400 FADs/vessel for Class 6 vessels (1,200 m<sup>3</sup> capacity). These numbers will decrease to 64 to 340 in 2023 and 50 to 340 in 2024.
7. All purse seines are also required to not deploy FADs 15 days before the selected closure period and Class 6 vessels to recover within 15 days prior to the start of the closure period a number of FADs equal to the number of FADs set upon during that same period.
8. And in order to support the scientific analysis of FAD fisheries, the measure requires that CPCs or vessels report daily information on all active FADs (position and echosounder biomass data) as well as Vessel Monitoring System (VMS) data to the Secretariat.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>2</sup>	Evaluation
1.2.1	Harvest Strategy	75	Condition Needed
1.2.2	Harvest control rules and tools	75	Condition Needed
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	80	Passing Score

<sup>2</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

EPO SKJ	ESTIMATE	YEARS	NOTES
RECENT CATCH	325	2021	
5-YEAR CATCH	317	2017-21	
MSY	N/A		
F/F <sub>MSY</sub>	0.25	2021	Uses a proxy for MSY
SSB/SSB <sub>MSY</sub>	1.77	2021	Uses a proxy for MSY
SSB/SSB <sub>0</sub>	0.53	2021	
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB>SSB <sub>MSY</sub> , based on a proxy value.
FISHING MORTALITY		F<F <sub>MSY</sub> , based on a proxy value.
ENVIRONMENT		68% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks, non-target species in general). There is 100% observer coverage on large purse seiners.
		31% of the catch is made by purse seining on free schools of skipjack.

*Last date of a change in Color Ratings: July, 2022.*

*Changes from the previous (March, 2022) Color Ratings: Abundance rating changed from Yellow to Green and Fishing mortality rating changed from Yellow to Green.*

# STOCKS IN THE WESTERN & CENTRAL PACIFIC OCEAN

**RFMO:** Western and Central Pacific Fisheries Commission (WCPFC). WCPO stocks are assessed by the Pacific Community (SPC) and the results are reviewed by the WCPFC scientific committee (SC) which makes recommendations to the WCPFC.

**Last Scientific Committee (SC) meeting:** August, 2022.

**Last Commission meeting:** December, 2022.

**Tuna stocks managed by WCPFC:** WCPO Yellowfin, WCPO Bigeye, WCPO Skipjack. Also, North Pacific Albacore, South Pacific Albacore and Pacific Bluefin (also managed by IATTC; see [Stocks in the Pacific Ocean](#)). Note also that WCPFC and IATTC have an area of overlap; WCPO catch figures reported here do not include those catches made in the WCPFC-IATTC overlap area.

**Data sources:** The main sources of information for this section are [Ducharme-Barth et al. \(2020\)](#), [Vincent et al. \(2020\)](#), [Castillo Jordan et al. \(2022\)](#), [WCPFC \(2022a\)](#) and [WCPFC \(2022b\)](#).

**Last update:** March, 2023.

About 51 percent of the world production of tuna is from the western and central Pacific Ocean (WCPO). Provisional catches of skipjack, yellowfin, and bigeye in 2021 were 2,342,000 tonnes, a 9% decrease from 2020. There has been a general increase in the total catch since 1980, with a small recess in 2010-2011 (**Figure WCPO-1**). This increase has been particularly pronounced for skipjack tuna.

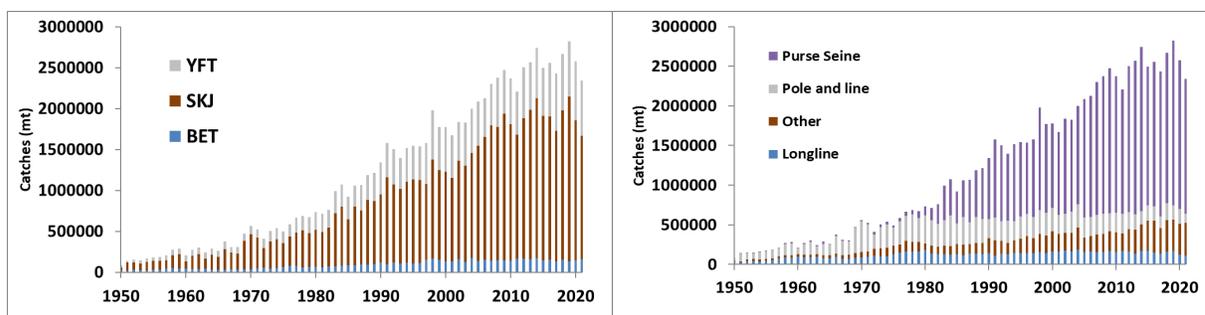


Figure WCPO-1. Trends in catch (mt) of bigeye, skipjack and yellowfin in the WCPO region, by species (left) and gear (right), 1950-2021.

Average catches for the five-year period 2017-2021 (2,569,000 tonnes) provide an indication of the recent performance of the fisheries (**Figure WCPO-2**): Skipjack accounts for 67% of the catches in weight, followed by yellowfin (27%) and bigeye (6%). Purse-seine vessels take 73% of the total catch, followed by pole-and-line (7%), longline (5%), and other gears.

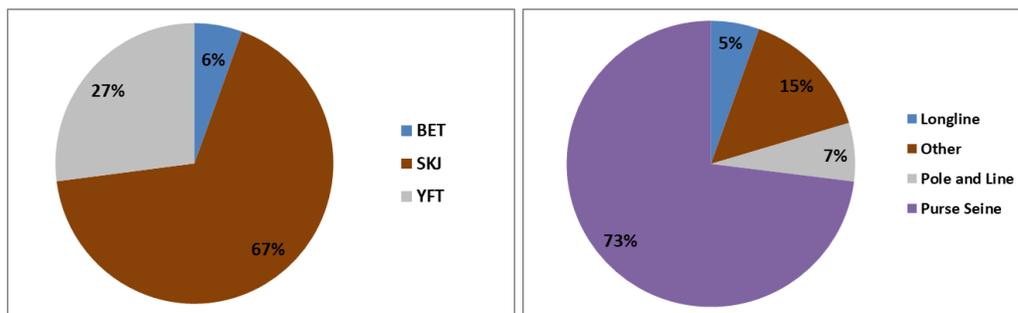


Figure WCPO-2. Average 2017-2021 catches of skipjack, yellowfin and bigeye tuna in the WCPO. The panel on the left shows the percentages by species, and the panel on the right shows the percentages by gear type.

## WCPO Bigeye Tuna

Provisional bigeye catches in 2021 were about 157,700 tonnes, a 9% increase from 2020. The main fishing gears are purse seine (5-year average 47%) and longline (38%) (**Figure WCPO-3**). Bigeye catches in the WCPO by other gears were relatively minor, but have increased in recent years. The latest assessment indicates that the WCPO bigeye tuna stock is not overfished, with biomass above the limit reference point established by WCPFC, and that overfishing is not occurring.

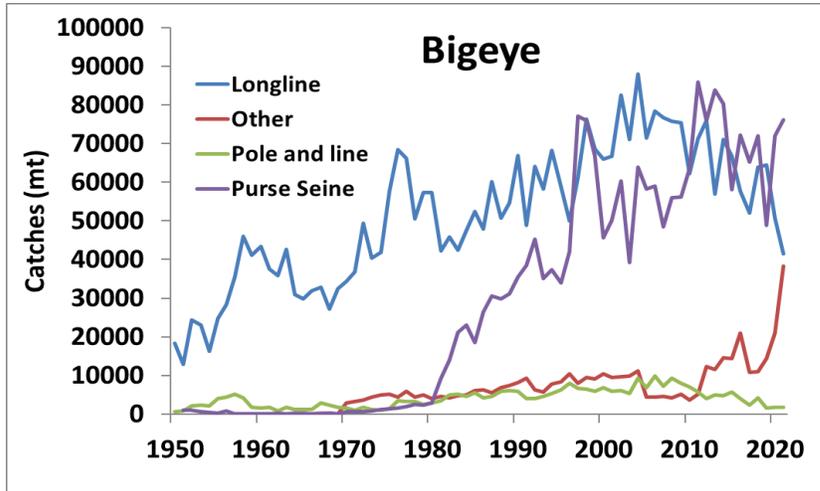


Figure WCPO-3. Catches of bigeye tuna in the WCPO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

In 2020, SPC conducted an assessment that included some new developments, such as an improved growth model as recommended by the 2017 Scientific Committee. All models in the uncertainty grid indicated the stock is above the biomass limit reference point as well as MSY-based reference points, though a substantial decline over time was estimated by all models. The new assessment indicated the following (**Figure WCPO-4**):

1. The median ratio of  $F_{\text{recent}}/F_{\text{MSY}}$  is estimated at 0.72 (80% C.I. range: 0.49 and 1.02), indicating that overfishing is likely not occurring (87.5% probability that  $F < F_{\text{MSY}}$ ).
2. The median ratio of spawning biomass  $SSB_{\text{recent}}/SSB_{\text{MSY}}$  in the model runs is estimated at 1.83 (80% C.I. range: 1.18 to 2.32), indicating that the stock is not overfished.
3. The median estimate of MSY is 140,700 tonnes. MSY has been reduced to less than half its levels prior to 1970 through harvest of small bigeye. Recent catches (2017-2021 average = 142,800 tonnes) are around MSY and catches in 2021 were above the estimated MSY.

The new assessment indicates that fishery impact is higher in the tropical regions and that the overall stock status is buffered with increased biomass levels due to low exploitation in the temperate regions.

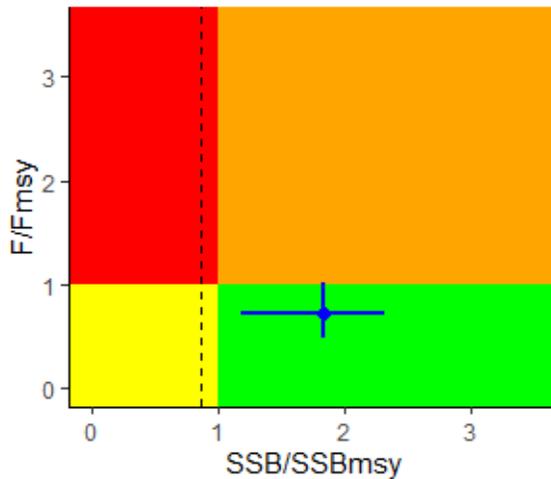


Figure WCPO-4. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for WCPO bigeye tuna. Dashed black line represents limit reference point.

## MANAGEMENT

**Harvest Strategy:** No, but CMM 2021-01 acts as a bridge to the adoption of a harvest strategy. So far, the following components have been agreed:

**Limit reference point:** 20% of the average spawning biomass that would be expected in the absence of fishing under current (most recent 10 years of the current assessment, excluding the last year) environmental conditions ( $20\%SSB_{current, F=0}$ ). The median value of  $SSB_{recent}/SSB_{F=0}$  is 0.41, which is above this limit.

**Target reference point:** Not defined for the long term. CMM 2021-01 establishes that, pending agreement on a TRP, the spawning biomass depletion ratio ( $SB/SB_{F=0}$ ) is to be maintained at or above the average  $SB/SB_{F=0}$  for 2012-2015.

**Harvest control rule:** Not defined. CMM-2014-06, superseded by CMM 2022-03, calls for WCPFC to develop and implement a harvest strategy approach that includes target reference points, harvest control rules and other elements. The workplan and its deadlines have been revised in subsequent meetings of the Commission.

**Management Objectives:** Not defined. Interim maximum acceptable risk level for breaching the LRP agreed in 2016.

**Management Strategy Evaluation:** Ongoing work under a mixed fishery framework that involves developing stock specific Management Procedures for skipjack, South Pacific albacore and bigeye, in line with the agreed WCPFC harvest strategy workplan. The interaction of these MPs, as well as their impact on yellowfin, would then be evaluated using a combined evaluation framework.

### Management measures:

The main binding conservation measure for bigeye established by the WCPFC is CMM 2021-01, that aims to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks for the period 2022-2024. It calls for:

1. A 3-month closure (July through September) of fishing on FADs (including the prohibition of deploying, servicing or setting on FADs) in EEZ waters and on the High Seas between 20°N and 20°S. VMS polling frequency is increased to 30 minutes during the closure;

2. In addition to (1), each member shall choose between extending the FAD closure for two additional sequential months of the year in the High Seas in either April-May, or in November-December, with some exemptions for Kiribati- and Philippines-flagged vessels;
3. To reduce the entanglement of sharks, marine turtles or any other species, since 1<sup>st</sup> January 2020, CCMs shall ensure that any FAD to be deployed in, or that drifts into, the WCPFC Convention Area shall have a lower-risk entanglement design. From 1<sup>st</sup> January 2024 CCMs shall ensure that all FADs deployed in, or that drift into, the WCPFC area are fully non-entangling without netting in their construction. To reduce the amount of synthetic marine debris, the use of non-plastic, natural or biodegradable materials for FADs construction is promoted and encouraged and the recovery of FADs is also encouraged;
4. A limit of no more than 350 drifting Fish Aggregating Devices (FADs) with activated instrumented buoys at sea at any one time per purse seine vessel. And the buoy shall be exclusively activated on board the vessel;
5. A limitation in the number of vessel days: For PNA members, the limit in their EEZs is the 2010 level. For other coastal states with effort in their EEZs exceeding 1,500 days annually over (2006-2010), the limit is either the 2001-2004 average or the 2010 level.
6. For non-SIDS members, purse seine effort on the high seas will be limited to levels specified in the CMM. Each member shall not allow the number of fishing days in the high seas to increase above limits specified in the CMM;
7. A full-retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas between 20°N and 20°S;
8. 100% Regional observer coverage for all purse seine vessels fishing on the high seas, on the high seas and in waters under the jurisdiction of one or more coastal States, or vessels fishing in waters under the jurisdiction of two or more coastal States during the same trip; all purse seiners fishing between 20°N and 20°S must have an observer onboard. Moreover, all purse seine vessels fishing solely in their EEZ between 20°N and 20°S should also carry a national observer and the CCMs are encouraged to submit the data to the Commission.
9. A limit between 20°N and 20°S in the number of purse seine and longline vessels with freezing capacity at the 2012 level for most countries (and specifically not including vessels of Small Island Developing States);
10. Flag-specific catch limits for non-SIDS fleets<sup>3</sup> for bigeye caught by longliners, with monthly reporting to monitor the utilization of the limits.

The first comprehensive management plan adopted for tropical tunas was CMM 2008-01 and has been amended annually since then. The CMM is complex with many “either/or” choices, exemptions or exclusions and decisions yet to be made with respect to some measures, which makes it difficult to predict the outcomes in terms of actual future catch and effort levels. SPC regularly performs a stochastic evaluation of the tropical tuna CMM where three possible scenarios of future purse seine effort and longline catch levels are defined, which attempt to capture much of the uncertainty in the implementation of the CMM. The latest evaluation assessed the potential of CMM 2021-01 to achieve its objectives for each of the three WCPO tropical tuna stocks (Hamer et al., 2022).

In addition, CMM 2009-02 provides more guidance on the FAD closure and full retention requirements in High Seas.

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<sup>3</sup> Catches of chartered vessels are attributed to the chartering State.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	75	Condition Needed
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

## SUMMARY

WCPO BET	ESTIMATE	YEARS	NOTES
RECENT CATCH	158	2021	
5-YEAR CATCH	143	2017-21	
MSY	141	2018	range: 126-179
F/F <sub>MSY</sub>	0.72	2014-17	range: 0.49-1.02
SSB/SSB <sub>MSY</sub>	1.83	2015-18	range: 1.18-2.32
SSB/SSB <sub>f=0</sub>	0.41	2015-18	range: 0.27-0.52
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> . The spawning biomass is above the MSY level.
FISHING MORTALITY		F < F <sub>MSY</sub> . F is below the MSY level.
ENVIRONMENT		38% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
		39% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (non-entangling FADs, turtles, sharks). There is 100% observer coverage on part of the purse seine fleet.
		8% of the catch is made with purse seining on free schools, with little impact on non-target species.
		2% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.

*Last date of a change in Color Ratings: October, 2018.*

*Changes from the previous (October 2017) Color Ratings: Abundance and F ratings changed from Yellow to Green.*

## WCPO Yellowfin Tuna

Provisional yellowfin catches in the WCPO in 2021 were about 672,200 tonnes, a 7% decrease from 2020. The main fishing gear is purse seine (58% of the catch). Twenty-seven percent of the catches are also taken by a number of mixed gears in the Philippines and Indonesia, and 12% by longliners (**Figure WCPO-5**). The Western and Central Pacific yellowfin tuna stock is not overfished, and overfishing is not occurring. Most of the catches are taken from the tropical region where the stock is considered fully exploited and there is little or no room for increased fishing pressure in this region.

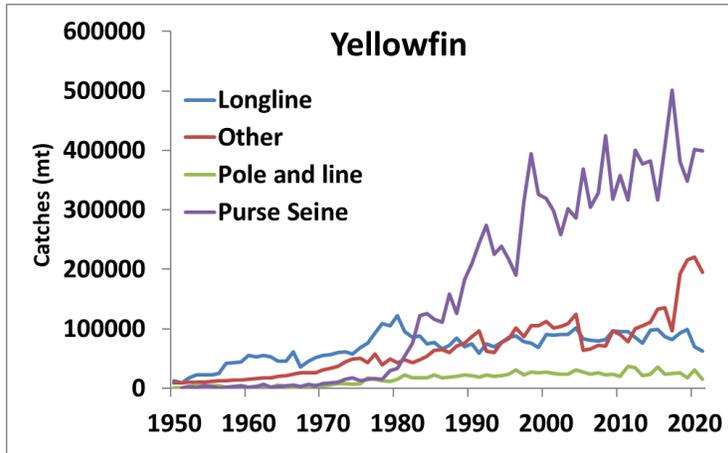


Figure WCPO-5. Catches of yellowfin tuna in the WCPO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The last yellowfin assessment was conducted in 2020. Developments to the stock assessment since the previous (2017) assessment included the incorporation of an index fishery for each region, changes to mixing periods and additional biological information. The results were in general more optimistic compared to previous assessments, but the causes are not fully understood. All models in the uncertainty grid indicate the stock is over the biomass limit reference point as well as MSY-based reference points. Assessment results indicated that (**Figure WCPO-6**):

1. The yellowfin stock is not in an overfished state as spawning biomass is above the  $SSB_{MSY}$  level ( $SSB_{recent}/SSB_{MSY} = 2.43$ , 80% C.I. range: 1.77-3.57).
2. The ratio  $F_{recent}/F_{MSY}$  (for the period 2014-2017) is estimated to be 0.36 (80% C.I. range: 0.27-0.47). None of the 72 models estimated that  $F_{recent} > F_{MSY}$ , indicating that overfishing is not occurring.
3. Median MSY is estimated to be 1,091,200 tonnes (80% C.I. range: 874,200-1,283,920). Current (2021) catch is below MSY.
4. The optimistic estimate of overall stock status should be tempered by the patterns estimated at a sub-regional level. The tropical Pacific, from which most of the catches are taken, is at least fully exploited with no potential for a substantial increase in catches to be sustainable.

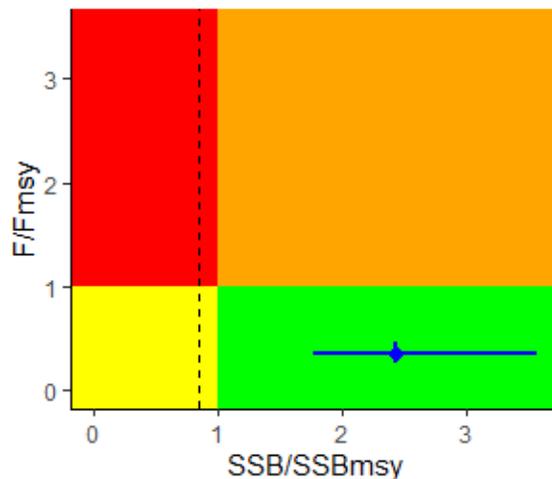


Figure WCPO-6. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for WCPO yellowfin tuna. Dashed black line represents limit reference point.

## MANAGEMENT

**Harvest Strategy:** No, but CMM 2021-01 acts as a bridge to the adoption of a harvest strategy. So far, the following components have been agreed:

**Limit reference point:** 20% of the equilibrium spawning biomass that would be expected in the absence of fishing under current (most recent 10 years of the current assessment, excluding the last year) environmental conditions ( $20\%SSB_{current, F=0}$ ). The yellowfin stock is estimated to be above this limit. The median value of  $SSB_{recent}/SSB_{F=0}$  across all models chosen by the Scientific Committee in 2020 to evaluate stock status is 0.58, which is above this 20% limit.

**Target reference point:** Not defined. CMM 2021-01 establishes that, pending agreement on a TRP, the spawning biomass depletion ratio ( $SB/SB_{F=0}$ ) is to be maintained at or above the average  $SB/SB_{F=0}$  for 2012-2015.

**Harvest control rule:** Not defined. CMM-2014-06, superseded by CMM 2022-03, calls for WCPFC to develop and implement a harvest strategy approach that includes target reference points, harvest control rules and other elements. The workplan and its deadlines have been revised in subsequent meetings of the Commission.

**Management Objectives:** Not defined.

**Management Strategy Evaluation:** Ongoing work under a mixed fishery framework that involves developing stock specific Management Procedures for skipjack, South Pacific albacore and bigeye, in line with the agreed WCPFC harvest strategy workplan. The interaction of these MPs, as well as their impact on yellowfin, would then be evaluated using a combined evaluation framework.

### Management measures:

The main binding conservation measure for yellowfin established by the WCPFC is CMM 2021-01, that aims to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks for the period 2022-2024. It calls for:

1. A 3-month closure (July through September) of fishing on FADs (including the prohibition of deploying, servicing or setting on FADs) in EEZ waters and on the High Seas between 20°N and 20°S. VMS polling frequency is increased to 30 minutes during the closure;

2. In addition to (1), each member shall choose between extending the FAD closure for two additional sequential months of the year in the High Seas in either April-May, or in November-December, with some exemptions for Kiribati- and Philippines-flagged vessels;
3. To reduce the entanglement of sharks, marine turtles or any other species, since 1<sup>st</sup> January 2020, CCMs shall ensure that any FAD to be deployed in, or that drifts into, the WCPFC Convention Area shall have a lower-risk entanglement design. From 1<sup>st</sup> January 2024 CCMs shall ensure that all FADs deployed in, or that drift into, the WCPFC area are fully non-entangling without netting in their construction. To reduce the amount of synthetic marine debris, the use of non-plastic, natural or biodegradable materials for FADs construction is promoted and encouraged and the recovery of FADs is also encouraged;
4. A limit of no more than 350 drifting Fish Aggregating Devices (FADs) with activated instrumented buoys at sea at any one time per purse seine vessel. And the buoy shall be exclusively activated on board the vessel;
5. A limitation in the number of vessel days: For PNA members, the limit in their EEZs is the 2010 level. For other coastal states with effort in their EEZs exceeding 1,500 days annually over (2006-2010), the limit is either the 2001-2004 average or the 2010 level.
6. For non-SIDS members, purse seine effort on the high seas will be limited to levels specified in the CMM. Each member shall not allow the number of fishing days in the high seas to increase above limits specified in the CMM;
7. A full-retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas between 20°N and 20°S;
8. 100% Regional observer coverage for all purse seine vessels fishing on the high seas, on the high seas and in waters under the jurisdiction of one or more coastal States, or vessels fishing in waters under the jurisdiction of two or more coastal States during the same trip; all purse seiners fishing between 20°N and 20°S must have an observer onboard. Moreover, all purse seine vessels fishing solely in their EEZ between 20°N and 20°S should also carry a national observer and the CCMs are encouraged to submit the data to the Commission.
9. A limit between 20°N and 20°S in the number of purse seine and longline vessels with freezing capacity at the 2012 level for most countries (and specifically not including vessels of Small Island Developing States).

SPC regularly performs a stochastic evaluation of the tropical tuna CMM where three possible scenarios of future purse seine effort and longline catch levels are defined, which attempt to capture much of the uncertainty in the implementation of the CMM. The latest evaluation assessed the potential of CMM 2021-01 to achieve its objectives for each of the three WCPO tropical tuna stocks (Hamer et al., 2022).

In addition, CMM 2009-02 provides more guidance on the FAD closure and full retention requirements on High Seas.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	75	Condition Needed
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

## SUMMARY

WCPO YFT	ESTIMATE	YEARS	NOTES
RECENT CATCH	672	2021	
5-YEAR CATCH	695	2017-21	
MSY	1,091	2014-17	range: 874-1284
F/F <sub>MSY</sub>	0.36	2014-17	range: 0.27-0.47
SSB/SSB <sub>MSY</sub>	2.43	2015-18	range: 1.77-3.57
SSB/SSB <sub>F=0</sub>	0.58	2015-2018	range: 0.51-0.64
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> .
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		21% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (non-entangling FADs, turtles, sharks). There is 100% observer coverage on part of the purse seine fleet.
		37% of the catch is made with purse seining on free schools, with little impact on non-target species.
		27% of the catch is made by other gears such as gillnets, with unknown impacts on non-target stocks.
		12% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.

*Last date of a change in Color Ratings: March, 2019.*

*Changes from the previous (original 2010 report) Color Ratings: F rating changed from yellow to green to harmonize with ratings methodology.*

## WCPO Skipjack Tuna

The WCPO Skipjack stock supports the largest tuna fishery in the world, accounting for 35% of worldwide tuna landings. Catches in 2021 were 1,512,600 tonnes, a 12% decrease from 2020. Purse seining, which accounts for 81% of the catches, increased steadily over the past three decades. In contrast, pole-and-line fishing (about 8%) has been declining since the mid-1980's (**Figure WCPO-7**). Overfishing is not occurring, and the stock is not overfished.

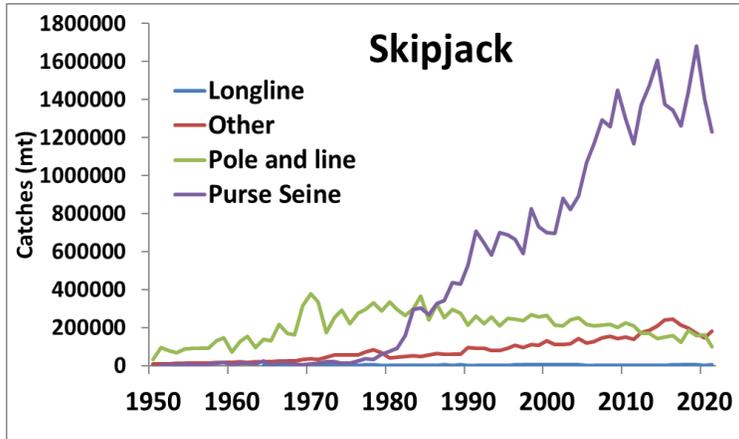


Figure WCPO-7. Catches of skipjack tuna in the WCPO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The last skipjack assessment was conducted in 2022. Stock status was determined over an uncertainty grid of 18 models. There were several new developments and improvements to the stock assessment compared to the 2019 assessment, including application of a new approach to estimate fishing mortality, use of a new approach to determine effective sample size, a different treatment of tagging periods, inclusion of an alternative growth model, and use of new free-school indices of abundance. Results of the assessment indicate that (**Figure WCPO-8**):

1. Fishing mortality rates have increased significantly since the beginning of industrial tuna fishing. The median ratio  $F_{\text{recent}}/F_{\text{MSY}}$  is estimated to be 0.32 (10<sup>th</sup> - 90<sup>th</sup> percentiles: 0.18-0.45), indicating that overfishing is not occurring.
2. The stock is not in an overfished state as spawning biomass is above the  $SSB_{\text{MSY}}$  level: median  $SSB_{\text{recent}}/SSB_{\text{MSY}} = 2.98$  (10<sup>th</sup> - 90<sup>th</sup> percentiles: 2.20-4.22).
3. Median  $MSY$  is estimated to be 2.65 million tonnes. Recent catches are lower than  $MSY$ .

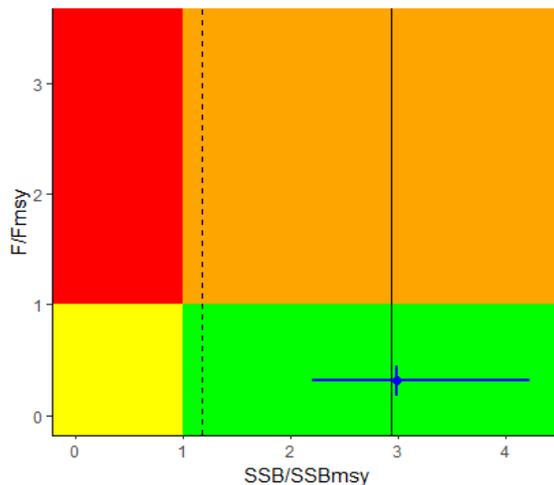


Figure WCPO-8. Latest estimate of  $SSB/SSB_{\text{MSY}}$  and  $F/F_{\text{MSY}}$  (in blue) for WCPO skipjack tuna. Solid black line represents interim target reference point and dashed black line represents limit reference point.

## MANAGEMENT

**Harvest Strategy:** Yes, defined in CMM 2022-01. The MP applies to the catch and effort of purse seine and pole and line fisheries, and other commercial fisheries referred to in paragraph 47 of CMM 2021-01 taking more than 2,000 tonnes of tropical tunas (bigeye, yellowfin and skipjack) in the Exclusive Economic Zones and high seas.

**Limit reference point:** 20% of the equilibrium spawning biomass that would be expected in the absence of fishing under current (most recent 10 years of the current assessment, excluding the last year) environmental conditions ( $20\%SSB_{\text{current}, F=0}$ ). The median value of  $SSB_{\text{recent}}/SSB_{F=0}$  is 0.51, which is above this limit.

**Target reference point:** CMM 2022-03 establishes that the TRP is calculated using two biomass depletion levels: (a) the equilibrium SSB of skipjack tuna average depletion level over the period 2018-2021 and (b) long-term equilibrium SSB that would be reached based on agreed baseline fishing effort (i.e., 2012 purse seine effort, 2001-04 pole and line effort, and 2016-2018 domestic fisheries effort in Region 5). The TRP is the average of both depletion levels, calculated as medians from the stock assessment grid.

**Harvest control rule:** Defined in CMM 2022-01. Features include:

- a. The input to the harvest control rule is the estimated spawning potential depletion ratio for the latest estimation year ( $SB_{\text{latest}}/SB_{F=0, t1-t2}$ ) of the most recent skipjack stock assessment, where  $SB_{\text{latest}}$  is the averaged estimated spawning potential in the absence of fishing for the last 10 years;
- b. The output from the harvest control rule is a scalar (multiplier) that adjusts future catch or effort relative to baseline fishing conditions (purse seine effort at 2012 levels, pole and line effort at average 2001-04 levels, and the domestic fisheries in assessment region 5 at average 2016-18 levels);
- c. Scalars apply to effort for purse seine fisheries, and to catch for all other fisheries; and
- d. For each 3-year management period, the harvest control rule uses the estimate of stock status ( $SB_{\text{latest}}/SB_{F=0, t1-t2}$ ), as determined by the most recent stock assessment, to calculate a scalar that adjusts catches or effort up or down relative to the baseline fishing conditions.

**Management Objectives:** To ensure that:

- a. the spawning potential depletion ratio of skipjack tuna is maintained on average at a level consistent with the target reference point; and
- b. the spawning potential depletion ratio of skipjack tuna is maintained above the limit reference point with a risk of the limit reference point being breached no greater than 20 percent;

in a manner that achieves the objective of relative stability in fishing levels between management periods and in the longer term.

**Management Strategy Evaluation:** Ongoing (finalized for current HS).

### Management measures:

The main binding conservation measure for skipjack established by the WCPFC is CMM 2021-01, that aims to provide for a robust transitional management regime that ensures the sustainability of bigeye, skipjack, and yellowfin tuna stocks for the period 2022-2024. It calls for:

1. A 3-month closure (July through September) of fishing on FADs (including the prohibition of deploying, servicing or setting on FADs) in EEZ waters and on the High Seas between 20°N and 20°S. VMS polling frequency is increased to 30 minutes during the closure;
2. In addition to (1), each member shall choose between extending the FAD closure for two additional sequential months of the year in the High Seas in either April-May, or in November-December, with some exemptions for Kiribati- and Philippines-flagged vessels;

3. To reduce the entanglement of sharks, marine turtles or any other species, since 1<sup>st</sup> January 2020, CCMs shall ensure that any FAD to be deployed in, or that drifts into, the WCPFC Convention Area shall have a lower-risk entanglement design. From 1<sup>st</sup> January 2024 CCMs shall ensure that all FADs deployed in, or that drift into, the WCPFC area are fully non-entangling without netting in their construction. To reduce the amount of synthetic marine debris, the use of non-plastic, natural or biodegradable materials for FADs construction is promoted and encouraged and the recovery of FADs are also encouraged;
4. A limit of no more than 350 drifting Fish Aggregating Devices (FADs) with activated instrumented buoys at sea at any one time per purse seine vessel. And the buoy shall be exclusively activated on board the vessel;
5. A limitation in the number of vessel days: For PNA members, the limit in their EEZs is the 2010 level. For other coastal states with effort in their EEZs exceeding 1,500 days annually over (2006-2010), the limit is either the 2001-2004 average or the 2010 level;
6. For non-SIDS members, purse seine effort on the high seas will be limited to levels specified in the CMM. Each member shall not allow the number of fishing days in the high seas to increase above limits specified in the CMM;
7. A full-retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas between 20°N and 20°S;
8. 100% Regional observer coverage for all purse seine vessels fishing on the high seas, on the high seas and in waters under the jurisdiction of one or more coastal States, or vessels fishing in waters under the jurisdiction of two or more coastal States during the same trip; all purse seiners fishing between 20°N and 20°S must have an observer onboard. Moreover, all purse seine vessels fishing solely in their EEZ between 20°N and 20°S should also carry a national observer and the CCMs are encouraged to submit the data to the Commission;
9. A limit between 20°N and 20°S in the number of purse seine and longline vessels with freezing capacity at the 2012 level for most countries (and specifically not including vessels of Small Island Developing States).

SPC regularly performs a stochastic evaluation of the tropical tuna CMM where three possible scenarios of future purse seine effort and longline catch levels are defined, which attempt to capture much of the uncertainty in the implementation of the CMM. The latest evaluation assessed the potential of CMM 2021-01 to achieve its objectives for each of the three WCPO tropical tuna stocks (Hamer et al., 2022).

In addition, CMM 2009-02 provides more guidance on the FAD closure and full retention requirements on High Seas.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>4</sup>	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	60	Condition Needed
1.2.3	Information / monitoring	90	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

<sup>4</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

WCPO SKJ	ESTIMATE	YEARS	NOTES
RECENT CATCH	1512	2021	
5-YEAR CATCH	1732	2017-21	
MSY	2648	2018-21	range: 2168-4777
F/F <sub>MSY</sub>	0.32	2018-21	range: 0.18-0.45
SSB/SSB <sub>MSY</sub>	2.98	2018-21	range: 2.20-4.22
SSB/SSB <sub>F=0</sub>	0.51	2018-21	range: 0.43-0.64
TAC	N/A		

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> .
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		38% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
		43% of the catch is made with purse seining on free schools, with little impact on non-target species.
		8% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.
		10% of the catch is made by other gears such as gillnets, with unknown impacts on non-target stocks.

Last date of a change in Color Ratings: None.

Changes from the previous (original) Color Ratings: None.

# PACIFIC-WIDE STOCKS

**RFMOs:** Western and Central Pacific Fisheries Commission (WCPFC) and Inter-American Tropical Tuna Commission (IATTC). The ISC evaluates North Pacific albacore and Pacific bluefin and the results are reviewed by the IATTC staff, the IATTC SAC and the WCPFC SC, who make recommendations to either IATTC or WCPFC. The SPC evaluates South Pacific albacore and the results are reviewed by the WCPFC SC providing management recommendations to the WCPFC.

**Last Scientific Committee meetings:**

- WCPFC: August, 2022
- IATTC: May, 2022
- ISC: July, 2022

**Last Commission meeting:**

- WCPFC: December, 2022
- IATTC: August, 2022

Three of the major commercial tunas with Pacific-wide distributions are warranted treatment as Pacific-wide stocks due to their scales of movement between the WCPO and the EPO: North Pacific albacore, South Pacific albacore and Pacific bluefin. The responsibility for their management is shared between IATTC and WCPFC.

**Data sources:** The main sources of information for this section are [WCPFC \(2022a\)](#), [WCPFC \(2022b\)](#), [Castillo Jordán et al. \(2021\)](#), [ISC \(2020\)](#), [ISC \(2022a\)](#), [ISC \(2022b\)](#).

**Last update:** March, 2023.

## PO North Pacific Albacore

North Pacific albacore provisional catches in 2021 were about 39,200 tonnes, a 1% increase from 2020. Approximately a 75% of the catch occurs in the WCPO and a 25% in the EPO. The main fishing gears are longline (45%) and pole-and-line (30%), followed by trolling (19%) (**Figure PO-1**). Catches by longlining have shown a decreasing trend since 1999. The North Pacific albacore stock is likely not overfished nor subject to overfishing. However, increasing fishing effort will not likely result in higher yield.

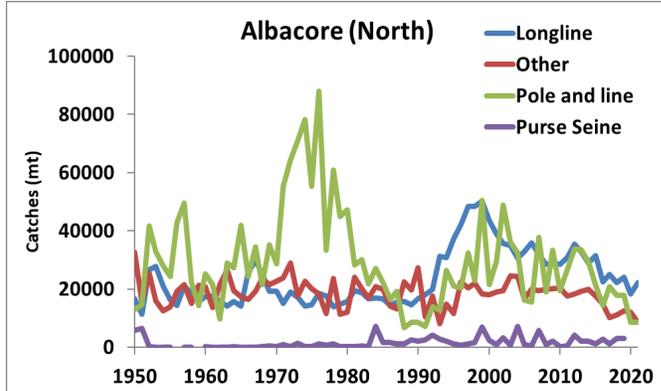


Figure PO-1. Catches of albacore tuna in the North PO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The latest north Pacific albacore stock assessment was done in 2020. A length-based, age-, and sex-structured stock assessment model over the 1994-2018 period was used following a base-case assessment approach. The assessment results indicated that (**Figure PO-2**):

1. The ratio  $SSB_{latest}/SSB_{MSY}$  is 3.01 (95% CI: 2.03-4.01), indicating that the stock is not in an overfished state.
2. The ratio  $F_{current}/F_{MSY}$  is 0.60 (95% CI: 0.45-0.79), indicating that overfishing is not occurring.
3. The estimate of MSY is 102,236 tonnes.

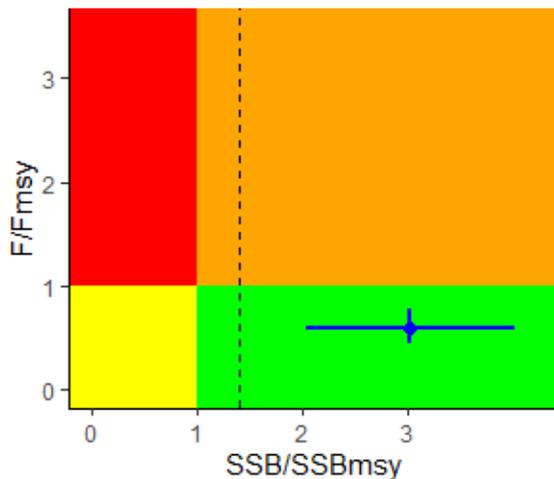


Figure PO-2. Latest estimate of SSB/SSB<sub>MSY</sub> and F/F<sub>MSY</sub> (in blue) for albacore tuna in the northern PO. Dashed black line represents limit reference point established by WCPFC (20%SSB<sub>current,F=0</sub>). Note that the X axis has been adjusted to the SSB/SSB<sub>MSY</sub> range.

## MANAGEMENT

**Harvest Strategy:** No, but the IATTC adopted the following components of a Harvest Strategy for all fisheries which harvest North Pacific albacore tuna in the IATTC Convention Area, pending the adoption of the full HS and Harvest Control Rule in 2023 (IATTC Res. C-22-04). WCPFC adopted the same partial HS as HS-2022-01 Harvest Strategy for North Pacific Albacore presented by the Northern Committee ([Attachment J](#)).

**Limit reference point:**

LRP = 14%SSB<sub>current,F=0</sub>, which is 14% of the dynamic unfished spawning stock biomass.

**Target reference point:**

TRP = F<sub>45%</sub>, which is the fishing intensity (F) level that results in the stock producing 45% of spawning potential ratio (SPR). They also adopted a biomass *threshold* reference point: SSB<sub>threshold</sub> = 30%SSB<sub>current,F=0</sub>, which is 30% of the dynamic unfished spawning stock biomass.

**Harvest control rule:**

Not defined. By 2023, the IATTC shall adopt harvest control rules that shall outline *inter alia* the actions the Commission will take to manage North Pacific albacore tuna. Those actions shall be determined by the position of the most recent fishing intensity and biomass estimates relative to the reference points.

**Management Objectives:**

- a. Maintain Spawning Stock Biomass (SSB) above the Limit Reference Point, with a probability of at least 80% over the next 10 years. The risk of breaching the Limit Reference Point based on the most current estimate of SSB shall be no greater than 20%.
- b. Maintain depletion of total biomass around historical (2006-2015) average depletion over the next 10 years.
- c. Maintain fishing intensity (F) at or below the target reference point with a probability of at least 50% over the next 10 years.
- d. To the extent practicable, management changes (e.g., catch and/or effort) should be relatively gradual between years.

**Management Strategy Evaluation:** Ongoing.

**Management measures:**

The main binding conservation measure for North Pacific albacore established by the WCPFC is CMM 2019-03 which called for members not to increase fishing effort for North Pacific albacore in the Convention Area north of the equator and not to increase fishing effort directed at North Albacore beyond 2002-2004 annual average levels. In the IATTC, Resolution C-05-02 called for members not to increase fishing effort directed at North Albacore beyond the "current level". IATTC Resolution C-13-03 supplements C-05-02 and requires the reporting of fishing vessel information for 2007-2012. IATTC Resolution C-18-03 amends Resolution C-13-03 and extends that period to 2017.

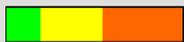
Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>5</sup>	Evaluation
1.2.1	Harvest Strategy	70	Condition Needed
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	90	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

## SUMMARY

PO ALB-N	ESTIMATE	YEARS	NOTES
RECENT CATCH	39	2021	
5-YEAR CATCH	49	2017-21	
MSY	102	2018	
F/F <sub>MSY</sub>	0.60	2015-17	Range: 0.45-0.79
SSB/SSB <sub>MSY</sub>	3.01	2018	Range: 2.03-4.01
SSB/SSB <sub>F=0</sub>	0.43	2018	
TAC	N/A		

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> .
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		45% of the catch is made by longlining. Several bycatch mitigation measures are in place (turtles, sharks, sea birds). Monitoring is deficient.
		30% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish species.
		19% of the catch is made by trolling, with little impact on non-target species.

Last date of a change in Color Ratings: October, 2017.

Changes from the previous (original) Color Ratings: Fishing mortality rating changed from Yellow to Green to reflect the more optimistic results of the 2017 assessment.

<sup>5</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## PO South Pacific Albacore

South Pacific albacore extends beyond the WCPFC Convention Area. However, the stock is assessed by WCPFC. South Pacific albacore provisional catches in 2021 were about 52,200 tonnes, an 27% decrease from 2020 catches.

Approximately 73% of the catch occurs in the WCPO and 27% in the EPO. The main fishing gear is longline, accounting for 95% of the catch. Relatively minor amounts are taken by other gears like trolling (**Figure PO-3**). The Southern Pacific albacore tuna stock is not overfished nor subject to overfishing.

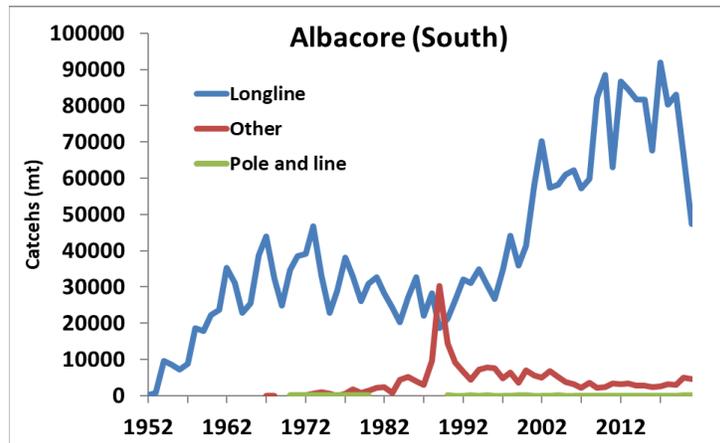


Figure PO-3. Catches of albacore tuna in the South PO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The last full assessment was conducted by SPC in collaboration with IATTC in 2021 and covers the whole South Pacific, including catches from the IATTC Convention Area. The 2021 analyses were done using 72 different models which examine different axes of uncertainty than the 2018 assessment (e.g. assumptions on movement and in recruitment distribution). The assessment results were similar to those in 2018 and indicated the following (**Figure PO-4**):

1. The estimated ratio  $F_{\text{recent}}/F_{\text{MSY}}$  in 2015-2018 is 0.24 (10<sup>th</sup> - 90<sup>th</sup> percentiles: 0.15-0.37), indicating that overfishing is not occurring. However, further increases in effort will yield little or no increase in long-term catches. WCPFC Scientific Committee in 2021 reiterated its previous recommendation that longline fishing mortality be reduced to avoid further decline in the vulnerable biomass so that economically viable catch rates can be maintained.
2. The estimated ratio of spawning biomass  $SSB_{\text{recent}}/SSB_{\text{MSY}}$  in 2016-2019 is 3.22 (10<sup>th</sup> - 90<sup>th</sup> percentiles: 2.24-5.18). This indicates that the stock is not in an overfished state. However, the stock's biomass may be approaching an unprofitably level for fisheries targeting South Pacific Albacore.
3. The estimate of MSY is 120,020 tonnes (the median across the uncertainty grid) with a range between 75,584 and 158,600 tonnes (10<sup>th</sup> - 90<sup>th</sup> percentiles).

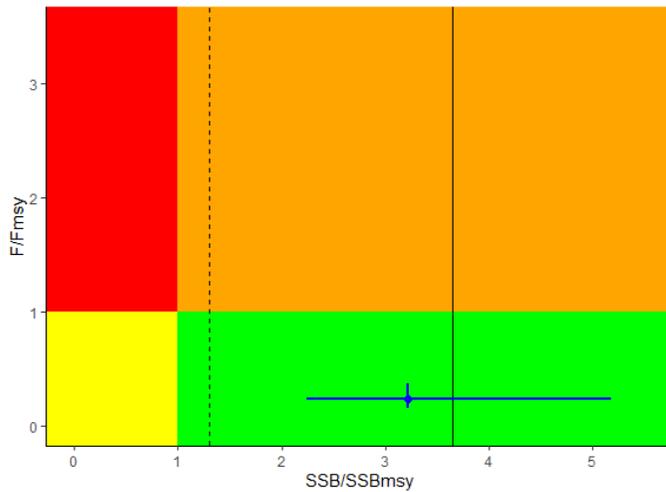


Figure PO-4. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue) for albacore tuna in the southern PO. Solid black line represents interim target reference point and dashed black line represents limit reference point. Note that the X axis has been adjusted to the  $SSB/SSB_{MSY}$  range.

## MANAGEMENT

**Harvest Strategy:** No, but the following components have been agreed:

**Limit reference point:** (WCPFC) 20% of the equilibrium spawning biomass that would be expected in the absence of fishing under current (most recent 10 years of the current assessment, excluding the last year) environmental conditions ( $20\%SSB_{current, F=0}$ ). The median value of  $SSB_{current}/SSB_{F=0}$  is 0.52, which is above this limit.

**Target reference point:** In 2018, WCPFC agreed on an interim target reference point (TRP) for south Pacific albacore at 56% of spawning stock biomass in the absence of fishing ( $0.56SSB_{F=0}$ ). The median value of  $SSB_{current}/SSB_{F=0}$  is 0.52, below the target.

**Harvest control rule:** Not defined. CMM-2022-03, that superseded CMM 2014-06, calls for WCPFC to develop and implement a harvest strategy approach that includes target reference points, harvest control rules and other elements. The workplan and its deadlines have been revised in subsequent meetings of the Commission.

**Management Objectives:** Not agreed.

**Management Strategy Evaluation:** Ongoing.

### Management measures:

The main binding conservation measure for south Pacific albacore established by the WCPFC is CMM 2015-02 which aims to limit fishing mortality by establishing a cap on the number of vessels fishing for South Pacific albacore by each Commission member, with some exemptions for small island developing states. This capacity limitation is for the number of vessels not to increase over the 2005 level, or the 2000-2004 average.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	70	Condition Needed
1.2.2	Harvest control rules and tools	60	Condition Needed
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

PO ALB-S	ESTIMATE	YEARS	NOTES
RECENT CATCH	52	2021	
5-YEAR CATCH	78	2017-2021	
MSY	120	2019	range: 76-159
$F/F_{MSY}$	0.24	2015-2018	range: 0.15-0.37
$SSB/SSB_{MSY}$	3.22	2016-2019	range: 2.24-5.18
$SSB/SSB_{f=0}$	0.52	2019	range: 0.41-0.57
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		$SSB > SSB_{MSY}$ .
FISHING MORTALITY		$F < F_{MSY}$ .
ENVIRONMENT		95% of the catch is made by longlining. Several bycatch mitigation measures are in place (turtles, sharks, sea birds). Monitoring is deficient.
		4% of the catch is made by trolling, with little impact on non-target species.

*Last date of a change in Color Ratings: None.*

*Changes from the previous (original) Color Ratings: None.*

## PO Pacific Bluefin Tuna

Reported Pacific bluefin provisional catches in 2021 were about 14,800 tonnes, a 7% increase from estimates available for 2020. Most of the catch (70%) occurs in the western Pacific. About 61% of the Pacific-wide catch is made by purse seine fisheries, followed by a variety of gears such as coastal set nets and troll (20%) and longline (14%). (Figure PO-5). Pacific Bluefin tuna is heavily overfished and is rebuilding slowly.

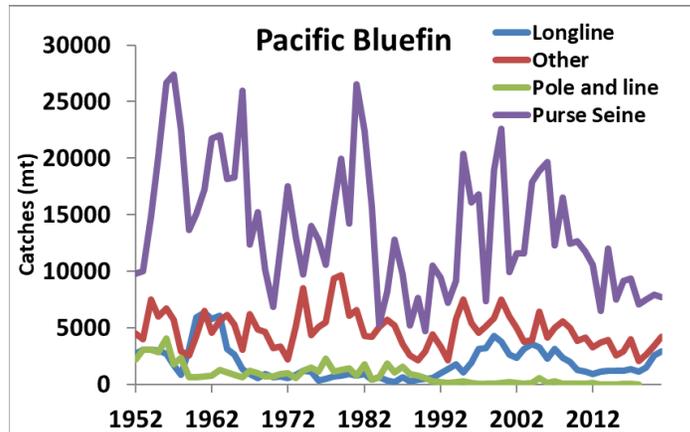


Figure PO-5. Catches of Pacific bluefin tuna from 1952 to 2021, by gear type.

## STOCK ASSESSMENT

The last assessment, conducted in 2022, consisted in an update of the 2020 assessment with the most recent two years fishery and CPUE data. The 2020 benchmark assessment used a fully integrated age-structured model fitted to catch, size-composition and catch-per-unit of effort- based abundance index data from 1952 to 2018 following a base-case assessment approach. Results indicate that (Figure PO-6):

1. The stock is heavily overfished, and the biomass continues to be near historically low levels. The spawning stock biomass steadily declined from 1996 to 2010, but the decline appears to have ceased since then and the stock is slowly rebuilding. However, the stock remains near the historic low and SSB was estimated to be 10.2% of the unfished level. This depletion level is considerably below the biomass depletion-based Limit Reference Point of 20% of the unfished stock biomass set by the Commission for all other WCPFC key tuna stocks ( $20\%SSB_{F=0}$ ).
2. The recent (2018-2020)  $F_{\%SPR}$  is estimated to produce a fishing intensity of 30.7%SPR and is below the level corresponding to overfishing for many F-based reference points proposed for tuna species, including  $SPR_{20\%}$ . However, this should be taken with precaution, as this estimate of F is a point estimate from a base case assessment and does not include an uncertainty range.

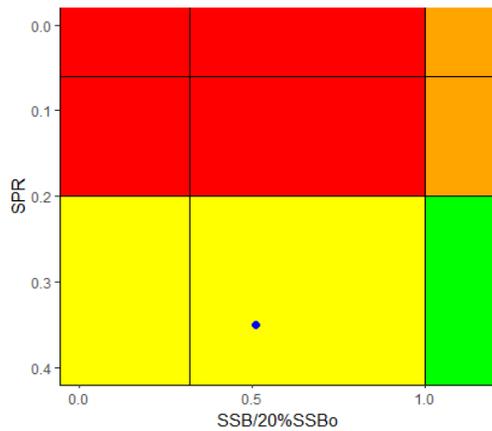


Figure PO-6. Latest estimate of SSB relative to 20%SSB<sub>0</sub> and Spawning Potential Ratio (SPR) as a measure of fishing mortality (in blue) for pacific bluefin tuna. Solid black lines represent the first and second biomass rebuilding target reference points and the corresponding fishing mortality that produces SPR. Note that 20%SSB<sub>0</sub> is normally taken as a limit reference point and is probably below SSB<sub>MSY</sub>.

## MANAGEMENT

**Harvest Strategy:** No, but the following components have been agreed:

**Limit reference point:** Not formally defined, but 20%SSB<sub>F=0</sub> is considered as both a rebuilding target (see below) and a potential limit in the longer term.

**Target reference point:** The initial rebuilding target for the PBF stock size is the median SSB estimated for the period 1952 through 2014 (which translates to 6.7% of SSB<sub>F=0</sub>), to be reached by 2024 with at least 60% probability. The second rebuilding target for the PBF stock size is 20%SSB<sub>F=0</sub>, to be reached by 2034, or 10 years after reaching the initial rebuilding target, whichever is earlier, with at least 60% probability. There is not yet a formally adopted target for the long term but maintaining the stock at levels capable of producing maximum sustainable yield is considered as a potential target. According to the latest assessment, the first target was reached in 2019.

**Harvest control rule:** During the initial rebuilding period, the stock will be evaluated frequently by ISC. If the SSB projection indicates that the probability of achieving the initial rebuilding target by 2024 is less than 60%, management measures will be modified to increase it to at least 60% (these measures include either reductions in the small fish catch limits or transferring part of the small fish catch limit to the large fish one). If the SSB projection indicates that the probability of achieving the initial rebuilding target by 2024 is at 75% or larger, the catch limits may increase if the probability is maintained at 70% or larger, and the probability of reaching the second rebuilding target by the agreed deadline remains at least 60%. The HCRs during the second rebuilding period will also rely on ISC stock assessments and projections. If the SSB projection indicates that the probability of achieving the second rebuilding target by 2034 (or ten years after the initial target) is less than 60%, management measures shall be modified to increase it to at least 60%. If the probability was 75% or larger, fishery controls may be changed, including adjustments to catch limits, if the probability to achieve the second rebuilding target is maintained at 70% or larger. The ISC projection results indicate that, under all investigated scenarios, there is 99% or 100% probability to achieve the initial biomass rebuilding target (6.7% of SSB<sub>F=0</sub>) by 2024 with at least 60% probability and that the estimated probability of achieving the second biomass rebuilding target (20% of SSB<sub>F=0</sub>) 10 years after the achievement of the initial rebuilding target or by 2034, whichever is earlier, is greater than 90%.

**Management Objectives:** Not agreed.

**Management Strategy Evaluation:** In development.

**Management measures:**

WCPFC adopted CMM 2021-02, which replaced CMM 2020-02, with the objective to establish management measures to rebuild the Pacific bluefin spawning biomass to its historical median level (the median point estimate for 1952-2014) by 2024 with at least 60% probability. This CMM limits total fishing effort north of 20°N to below the average 2002-2004 levels. Members are also required to reduce juvenile (less than 30 kg) catches 50% of the 2002-2004 average annual catch levels. Annual catch limits for Pacific bluefin tuna 30 kg or larger are limited to 115% of the 2002-2004 average annual level or 30 tons for a CCM who does not have an initial catch limit for Pacific bluefin tuna 30 kg or larger before 2022, but any member can use part of its juvenile catch limit to catch adults. Any overage or underage of the catch limit will be deducted or added from the following year TAC, with a maximum undercatch that can be carried over in any given not exceeding 5% of its annual initial catch limit.

An overall combined total commercial catch limit of 7295 tons during 2021-2022 and a combined total of 7990 tones during 2023-2024 were set by IATTC in Resolution C-21-02. IATTC Resolution C-21-01 describes the objectives of both rebuilding periods and establishes a HCRs for the second rebuilding period, sets over- and under-harvest limits and calls the Commission to collaborate with the WCPFC Northern Committee to develop candidate reference points and HCRs.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>6</sup>	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	65	Condition Needed
1.2.3	Information / monitoring	90	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

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<sup>6</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

PO-PBF	ESTIMATE	YEARS	NOTES
RECENT CATCH	15	2021	
5-YEAR CATCH	13	2017-21	
MSY	N/A		
$F/F_{MSY}$	N/A		
$SSB/SSB_{MSY}$	N/A		
$SSB/SSB_0$	0.102	2020	
TAC			

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB relative to $SSB_{MSY}$ was not estimated by ISC. However, SSB is 10.2% of the unfished level and near the historical lowest level.
FISHING MORTALITY		F relative to $F_{MSY}$ was not estimated by ISC. F estimated in the assessment is below some indicators used as proxies for $F_{MSY}$ . However, this should be taken with precaution, as this F is a point estimate with no uncertainty range.
ENVIRONMENT		61% of the catch is made by purse seining on free schools.
		14% of the catch is made by longlining.
		5% of the catch is made by trolling.
		10% of the catch is made by set nets

*Last date of a change in Color Ratings: November, 2022.*

*Changes from the previous (August, 2013) Color Ratings: Fishing mortality rating changed from Orange to Yellow.*

# STOCKS IN THE ATLANTIC OCEAN

**RFMO:** International Commission for the Conservation of Atlantic Tunas (ICCAT). The stocks are assessed by the SCRS who makes recommendations to ICCAT.

**Last Scientific Committee (SCRS) meeting:** September, 2022.

**Last Commission meeting:** November, 2022.

**Tuna stocks managed by ICCAT:** AO Yellowfin, AO Bigeye, Eastern AO Skipjack, Western AO skipjack, North AO Albacore, South AO Albacore, Mediterranean Albacore, Western AO bluefin, Eastern and Mediterranean AO bluefin.

**Data sources:** The main sources of information for this section are [ICCAT \(2019\)](#), [ICCAT \(2020\)](#), [ICCAT \(2021\)](#) and [ICCAT \(2022\)](#).

**Last update:** March, 2023.

About 11 percent of the world production of tuna is from Atlantic Ocean (AO) stocks. Catches of skipjack, yellowfin, bigeye, albacore and bluefin in 2021 were 470,159 tons, an 14% decrease from 2020 catch levels. There was a general tendency for the total catch to decline since the mid-1990s, followed by a new upward trend since 2009. In recent years catches have started to decrease again (**Figure AO-1**).

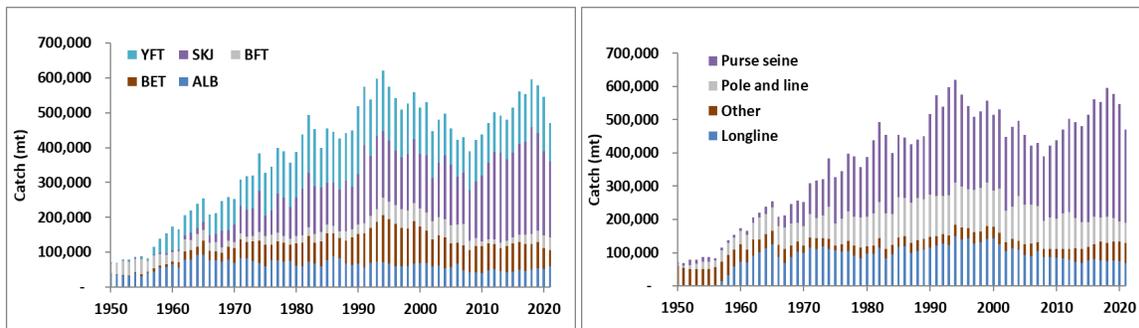


Figure AO-1. Trends in catch (mt) of bigeye, skipjack, yellowfin, albacore and bluefin in the AO region, by species (left) and gear (right), 1950-2021.

Average catches for the five-year period 2017-2021 (548,618 tonnes) provide an indication of the recent performance of the fisheries (**Figure AO-2**): Skipjack accounts for 48% of the catches in weight, followed by yellowfin (25%), bigeye (12%), albacore (9%), and bluefin (6%). Purse seine vessels take 63% of the total catch, followed by longline (14%), pole-and-line (some of which operate jointly with purse seiners, 13%) and other gears (10%).

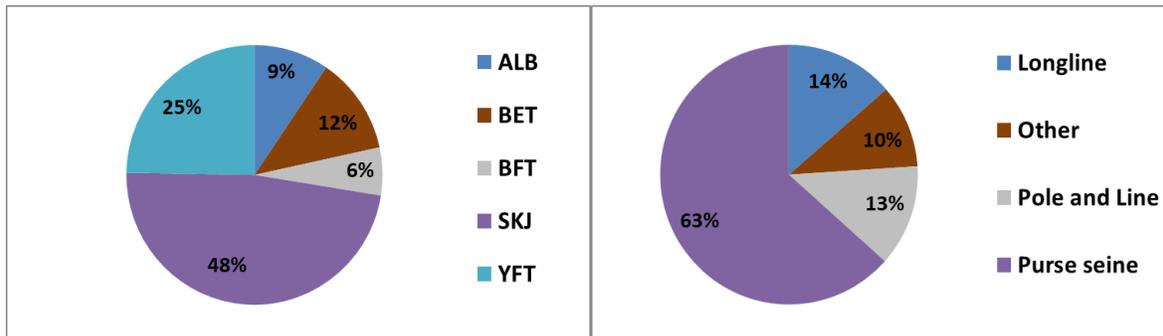


Figure AO-2. Average 2017-2021 catches of skipjack, yellowfin, bigeye, albacore and bluefin tuna in the AO. The panel on the left shows the percentages by species, and the panel on the right shows the percentages by gear type.

## AO Bigeye Tuna

Atlantic bigeye catches in 2021 were about 46,000 tonnes, a 22% decrease from 2020. Catches by longline, the main fishing gear (45% of the catch), declined sharply between 1999 and 2006, but they have declined more slowly during the last few years. Purse seine and pole-and-line vessels account for about 35% and 11% of the catches, respectively (Figure AO-3). The stock is estimated to be overfished, but overfishing is not occurring.

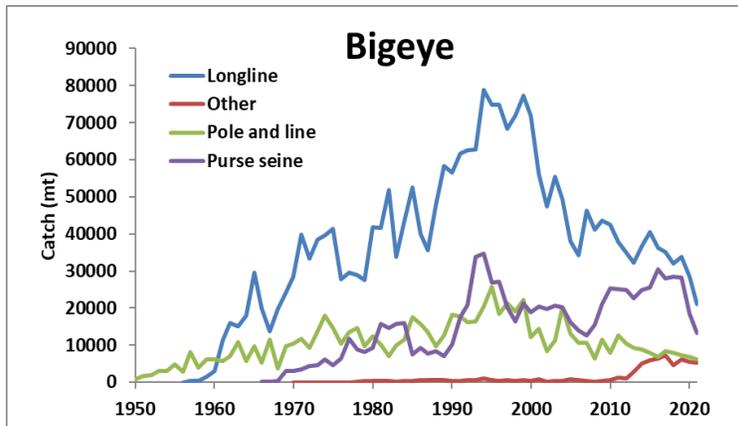


Figure AO-3. Catches of bigeye tuna in the AO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The last (2021) assessment conducted by SCRS (ICCAT Standing Committee on Research and Statistics) gave more optimistic results than the 2018 assessment. Changes to the data and models included updates to data and biological parameters, and changes to the abundance indices and fleet structure used. Sensitivity analyses demonstrated that such changes in stock status partially result from replacing the 2018 “late period” joint longline index with the updated “late period” joint longline index developed with slightly different methodology, and incorporating new mortality at age vectors based. The SCRS indicated that while uncertainty on natural mortality was included in the grid, the uncertainty related to the longline index was not incorporated in the advice, which provided a more pessimistic stock status. Based on combining several model-data scenarios, the SCRS determined that: (Figure AO-4):

1. The ratio of  $F_{\text{current}}/F_{\text{MSY}}$  in 2019 was estimated at 1.00 (range: 0.63-1.35), indicating that overfishing is not occurring.
2. The ratio of spawning biomass  $SSB_{\text{current}}/SSB_{\text{MSY}}$  in 2019 was estimated at 0.94 (range: 0.71-1.37). This indicates that the stock is in an overfished state.
3. The estimate of MSY was 86,800 tonnes (range: 72,200 to 106,400 tonnes). MSY has been reduced considerably through harvest of small bigeye. Current catches (46,000 tonnes) are below the MSY and the adopted catch limit (62,000 tonnes).

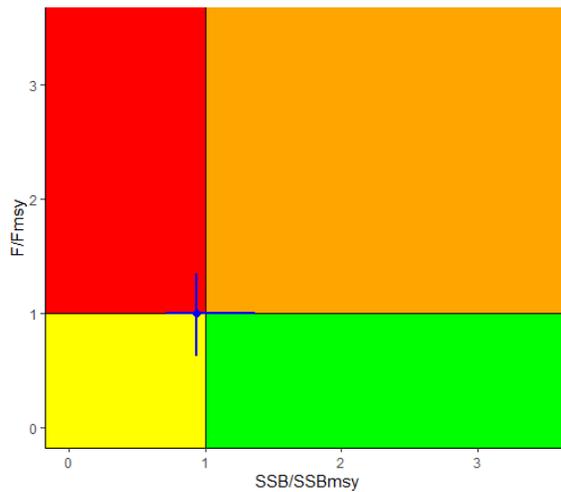


Figure AO-4. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for bigeye tuna in the AO.

## MANAGEMENT

**Harvest Strategy:** No.

**Limit reference point:** Not defined.

**Target reference point:** Not defined. "Green" quadrant in Kobe plot implied as target (Rec. 11-13).

**Harvest control rule:** Not defined, but Recs. 11-13 and 15-07 provide a framework.

**Management Objectives:** Not defined.

**Management Strategy Evaluation:** Early stages.

### Management measures:

The main binding conservation measure established by ICCAT for bigeye is Recommendation 22-01, which superseded several previous Recommendations. This management plan for tropical tunas calls for:

1. A Total Allowable Catch of 62,000 t in 2023, with catch limits given to ICCAT members based on reductions from their previous catch limits or recent average catch. The SCRS estimated that a future constant catch of 62,000 t will have a 97% probability of maintaining the stock in the green quadrant of the Kobe plot by 2034. The measure includes detailed provisions for countries to be penalized with lower quotas if their limits are exceeded;
2. Quarterly reporting to the Secretariat of the amount of tropical tuna by species caught (monthly reporting in the case of purse seiners and large longline vessels);
3. A capacity limitation consisting in each member producing an annual capacity/fishing plan that outlines how its overall longline and purse seine fleet capacity will be managed to ensure that the member can meet its obligation to limit the catch of bigeye, and its yellowfin and skipjack catches. Additionally, members shall report information on their support vessels;
4. The establishment of a record of vessels actively fishing for bigeye, or supporting fishing activities;
5. A 72-day closure (1<sup>st</sup> January to 13 March) prohibition in 2023 of purse seine and baitboat vessels fishing on floating objects, including their support vessels' activities, in the high seas or EEZs. In addition, a prohibition to deploy drifting FADs during the 15 days prior to the closure;

6. Observer coverage (human or electronic) of 100% for purse seine vessels and 10% for large longline vessels;
7. Annual submission of FAD management plans by countries with purse seine and baitboat (pole-and-line) fisheries;
8. A limit of 300 FADs with operational buoys at any one time per vessel in 2022. Each CPC with purse seine fishing vessels is encouraged not to increase its total fishing effort on FADs from its 2018 level.
9. To reduce the entanglement of sharks, marine turtles or any other species and reduce the amount of synthetic marine debris, CPCs shall ensure that all FADs deployed are non-entangling FADs and the use of non-plastic, natural or biodegradable materials for FADs construction is encouraged.

While a TAC of 62,000 tonnes is specified for 2023, consistent with SCRS advice, the permissible catch under Recommendation 22-01 may exceed 62,000 tonnes due to various exemptions in the catch limits provisions. There is concern that fishing capacity remains high, and is growing due to longline, pole and line and purse seine vessels moving from the IO and PO into the AO.

Additionally, Recommendation 17-01 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse seine vessels.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>7</sup>	Evaluation
1.2.1	Harvest Strategy	65	Condition Needed
1.2.2	Harvest control rules and tools	65	Condition Needed
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	100	Passing Score

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<sup>7</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

AO BET	ESTIMATE	YEARS	NOTES
RECENT CATCH	46	2021	
5-YEAR CATCH	66	2017-21	
MSY	87	2019	Range: 72-106
F/F <sub>MSY</sub>	1.00	2019	Range: 0.63-1.35
SSB/SSB <sub>MSY</sub>	0.94	2019	Range: 0.71-1.37
SSB/SSB <sub>0</sub>	0.28	2017	Range: 0.18-0.19
TAC	62	2023	

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB ≤ SSB <sub>MSY</sub> .
FISHING MORTALITY		F ≈ F <sub>MSY</sub> .
ENVIRONMENT		45% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
		26% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (non-entangling FADs, turtles, sharks).
		11% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. Some of the baitboats in the Gulf of Guinea fish together with the purse seiners, thus becoming like a single fleet.
		9% of the catch is made with purse seining on free schools, with little impact on non-target species.

Last date of a change in Color Ratings: March, 2022.

Changes from the previous (November, 2015) Color Ratings: The Abundance rating changed from Orange to Yellow. The Fishing mortality rating changed from Orange to Green.

## AO Yellowfin Tuna

Yellowfin catches in 2021 were about 110,600 tonnes, a 29% decrease from 2020. The main fishing gear is purse seining (about 68% of the catch) (**Figure AO-5**). Purse seine catches have shown a general decrease since the early 1990s, but started growing again after 2007. About 12% of the catch is made by longlining and 6% by pole-and-line vessels. The yellowfin tuna stock in the Atlantic Ocean is not overfished and overfishing is not taking place.

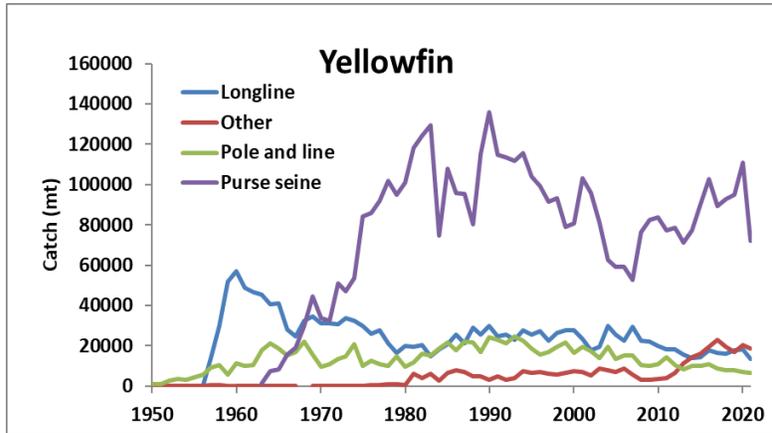


Figure AO-5. Catches of yellowfin tuna in the AO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The most recent full assessment of yellowfin tuna was carried out by SCRS in 2019. The SCRS advice is based on combined results from three different models. These results are more optimistic than those of the previous (2016) assessment due to changes in the models and data used. These results indicate that (**Figure AO-6**):

1. The ratio of  $F_{2018}/F_{MSY}$  is estimated at 0.96 (range 0.56-1.50), indicating that overfishing is not occurring.
2. The ratio of spawning biomass  $SSB_{2018}/SSB_{MSY}$  is estimated at 1.17 (range 0.75-1.62). This indicates that the stock in 2018 was not overfished. The SCRS cautioned that the differences between the 2016 and 2019 assessment results were not due to stock recovery as the 2019 models indicate that the stock biomass declined between 2014 and 2018. The perceived improvement is more likely due to changes in key data inputs and the assessment models applied.
3. The estimate of MSY is 121,300 tonnes (range 90,400-267,400). MSY is lower than in previous decades because the overall fishery selectivity has shifted towards smaller yellowfin, mainly through fishing on FADs. Current catch (110.600 t) is below MSY and around the adopted catch limit (110,000 tonnes).

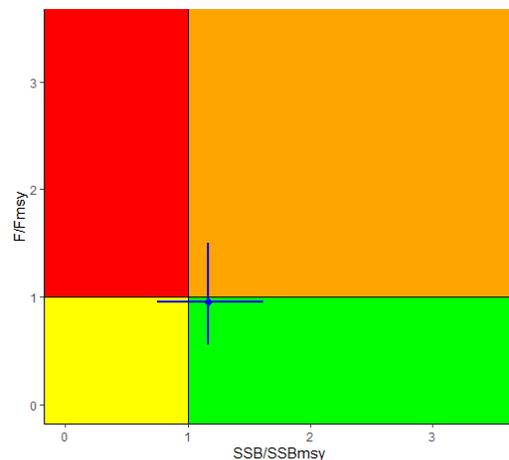


Figure AO-6. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for yellowfin tuna in the AO.

## MANAGEMENT

**Harvest Strategy:** No.

**Limit reference point:** Not defined.

**Target reference point:** Not defined. "Green" quadrant in Kobe plot implied as target (Rec. 11-13)

**Harvest control rule:** Not defined, but Recommendations 11-13 and 15-07 provide a framework.

**Management Objectives:** Not defined.

**Management Strategy Evaluation:** Early stages.

### **Management measures:**

The main binding conservation measure established by ICCAT for yellowfin is Recommendation 22-01, which superseded several previous Recommendations. This multi-annual management plan for tropical tunas calls for:

1. An overall TAC of 110,000 tonnes (unallocated by country);
2. Quarterly reporting to the Secretariat of the amount of tropical tuna by species caught (monthly reporting in the case of purse seiners and large longline vessels);
3. A capacity limitation consisting in each member producing an annual capacity/fishing plan that outlines how its overall longline and purse seine fleet capacity will be managed to ensure that the member can meet its obligation to limit the catch of bigeye, and its yellowfin and skipjack catches. Additionally, members shall report information on their support vessels;
4. The establishment of a record of vessels actively fishing for yellowfin, or supporting fishing activities
5. A 72-day closure (1<sup>st</sup> January to 13 March) prohibition in 2023 of purse seine and baitboat vessels fishing on floating objects, including their support vessels' activities, in the high seas or EEZs. In addition, a prohibition to deploy drifting FADs during the 15 days prior to the closure;
6. Observer coverage (human or electronic) of 100% for purse seine vessels and 10% for large longline vessels;
7. Annual submission of FAD management plans by countries with purse seine and baitboat (pole-and-line) fisheries.
8. A limit of 300 FADs with operational buoys at any one time per vessel in 2023. Each CPC with purse seine fishing vessels is encouraged not to increase its total fishing effort on FADs from its 2018 level.
9. To reduce the entanglement of sharks, marine turtles or any other species and reduce the amount of synthetic marine debris, CPCs shall ensure that all FADs deployed are non-entangling FADs and the use of non-plastic, natural or biodegradable materials for FADs construction is encouraged.

The TAC adopted by ICCAT in 2016 (and maintained in Rec. 22-01) was consistent with the advice provided by SCRS in recent years. However, recent catches have been above the TAC and MSY since 2015 and the SCRS has warned that catches above MSY levels are expected to further degrade the condition of the yellowfin stock in the future. The TAC is not allocated between CPCs, which makes it difficult to enforce.

Additionally, Recommendation 17-01 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse seine vessels.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>8</sup>	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

AO YFT	ESTIMATE	YEARS	NOTES
RECENT CATCH	111	2021	
5-YEAR CATCH	136	2017-21	
MSY	121	2018	Range: 90-267
F/F <sub>MSY</sub>	0.96	2018	Range: 0.56-1.50
SSB/SSB <sub>MSY</sub>	1.17	2018	Range: 0.75-1.62
SSB/SSB <sub>0</sub>	N/A		
TAC	110	2023	

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> in 2018.
FISHING MORTALITY		F < F <sub>MSY</sub> . However, the TAC and MSY levels have been exceeded in recent years.
ENVIRONMENT		51% of the catch is made with purse seining on free schools, with little impact on non-target species
		12% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
		6% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. Some of the baitboats in the Gulf of Guinea fish together with the purse seiners, thus becoming like a single fleet.
		17% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (non-entangling FADs, turtles, sharks).

<sup>8</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

*Last date of a change in Color Ratings: March, 2020.*

*Changes from the previous (November, 2016) Color Ratings: The Abundance rating changed from Yellow to Green.*

## AO Eastern Skipjack Tuna

There are two (eastern and western) skipjack stocks in the Atlantic. Skipjack catches in the eastern Atlantic Ocean in 2021 were about 197,000 tonnes, an 11% decrease from 2020. Purse seine (88%) and pole-and-line (10%) dominate the catches (**Figure AO-7**). The purse seine catches had been decreasing from the early 1990s to 2009, but increased substantially since then, reaching a high peak in 2018 and decreased again since. Catches by other gears have remained stable. It is estimated that the Eastern Atlantic skipjack stock is not overfished and overfishing is not occurring.

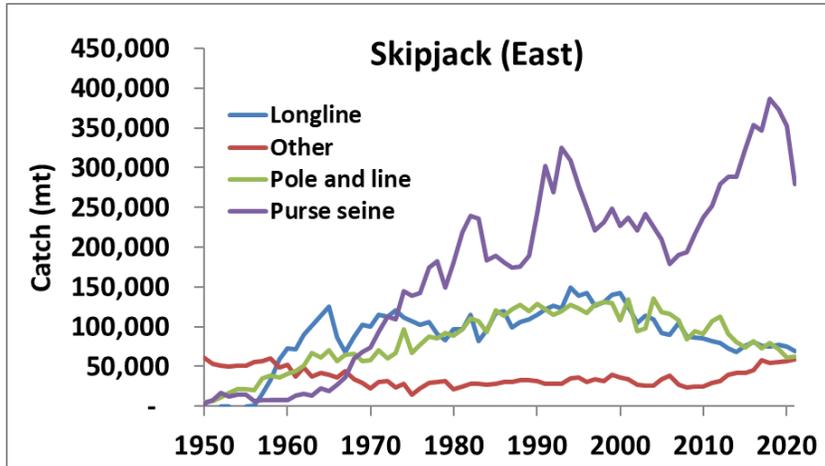


Figure AO-7. Catches of skipjack tuna in the Eastern AO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The stock was last assessed in 2022, using data up to 2020 and 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, show that (**Figure AO-8**):

1. The ratio of  $F_{current}/F_{MSY}$  is estimated to be 0.63 (95% C.I.: 0.18-2.35), indicating that overfishing is not occurring.
2. The ratio of spawning biomass  $SSB_{current}/SSB_{MSY}$  is estimated to be 1.60 (95% C.I.: 0.50-5.79), indicating that the stock is not in an overfished state.
3. The estimate of MSY is 216,617 t (95% C.I.: 172,735-284,658 t), which is above current catch levels (197,000 t in 2021).

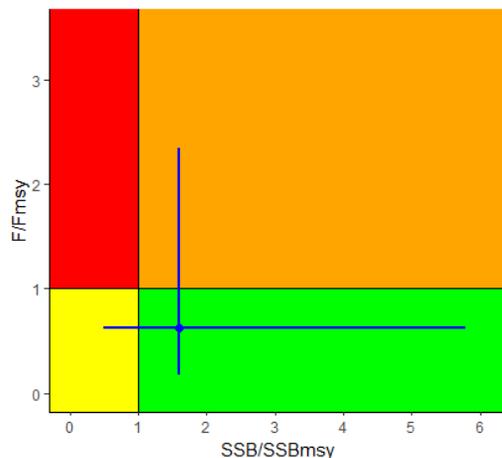


Figure AO-8. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for skipjack tuna in the eastern AO. Note that the X axis has been adjusted to the  $SSB/SSB_{MSY}$  range.

## MANAGEMENT

**Harvest Strategy:** No.

**Limit reference point:** Not defined.

**Target reference point:** Not defined. "Green" quadrant in Kobe plot implied as target (Rec. 11-13)

**Harvest control rule:** Not defined, but Recs. 11-13 and 15-07 provide a framework.

**Management Objectives:** Not defined.

**Management Strategy Evaluation:** Early stages.

### Management measures:

The main binding conservation measure established by ICCAT for skipjack is Recommendation 22-01, which superseded several previous Recommendations. This multi-annual management plan for tropical tunas calls for:

1. Quarterly reporting to the Secretariat of the amount of tropical tuna by species caught (monthly reporting in the case of purse seiners and large longline vessels);
2. A capacity limitation consisting in each member producing an annual capacity/fishing plan that outlines how its overall longline and purse seine fleet capacity will be managed to ensure that the member can meet its obligation to limit the catch of bigeye, and its yellowfin and skipjack catches. Additionally, members shall report information on their support vessels;
3. The establishment of a record of vessels actively fishing for skipjack, or supporting fishing activities;
4. A 72-day closure (1<sup>st</sup> January to 13 March) prohibition in 2023 of purse seine and baitboat vessels fishing on floating objects, including their support vessels' activities, in the high seas or EEZs. In addition, a prohibition to deploy drifting FADs during the 15 days prior to the closure;
5. Observer coverage (human or electronic) of 100% for purse seine vessels and 10% for large longline vessels;
6. Annual submission of FAD management plans by countries with purse seine and baitboat (pole-and-line) fisheries;
7. A limit of 300 FADs with operational buoys at any one time per vessel in 2023. Each CPC with purse seine fishing vessels is encouraged not to increase its total fishing effort on FADs from its 2018 level.
8. To reduce the entanglement of sharks, marine turtles or any other species and reduce the amount of synthetic marine debris, CPCs shall ensure that all FADs deployed are non-entangling FADs and the use of non-plastic, natural or biodegradable materials for FADs construction is encouraged.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>9</sup>	Evaluation
1.2.1	Harvest Strategy	65	Condition Needed
1.2.2	Harvest control rules and tools	60	Condition Needed
1.2.3	Information / monitoring	65	Condition Needed
1.2.4	Assessment of stock status	75	Condition Needed

<sup>9</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

AO SKJ-E	ESTIMATE	YEARS	NOTES
RECENT CATCH	197	2021	
5-YEAR CATCH	241	2017-21	
MSY	217	2020	Range: 173-285
F/F <sub>MSY</sub>	0.63	2020	Range: 0.18-2.35
SSB/SSB <sub>MSY</sub>	1.60	2020	Range: 0.50-5.79
SSB/SSB <sub>0</sub>	N/A		
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> .
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		79% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (non-entangling FADs, turtles, sharks).
		10% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. Some of the baitboats in the Gulf of Guinea fish together with the purse seiners, thus becoming like a single fleet.
		9% of the catch is made with purse seining on free schools, with little impact on non-target species.

*Last date of a change in Color Ratings: None.*

*Changes from the previous (original) Color Ratings: None.*

## AO Western Skipjack Tuna

There are two (eastern and western) skipjack stocks in the Atlantic. Skipjack catches in the western Atlantic Ocean in 2021 were about 20,000 tonnes, a 6% increase from 2020. Pole-and-line fishing dominates the catches (~71%), followed by purse seining (11%) (**Figure AO-9**). Pole and line catches have remained relatively stable (although highly variable) during the last two decades and declined recently. It is estimated that the Western Atlantic skipjack stock is not overfished and overfishing is not occurring.

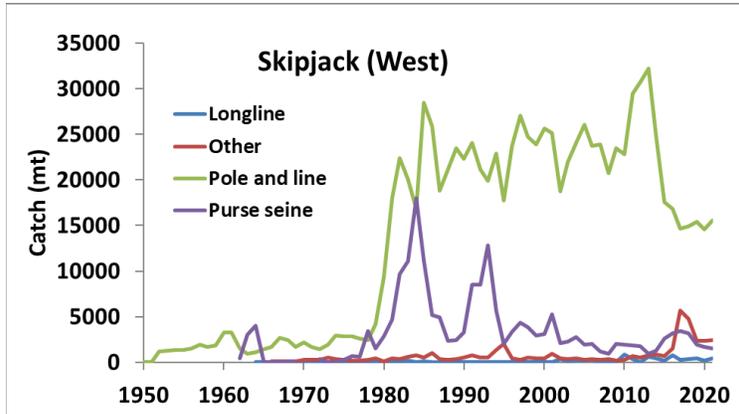


Figure AO-9. Catches of skipjack tuna in the Western AO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The stock was assessed by SCRS in 2022, using data up to 2020. Stock status was estimated by combining the results of the 9 scenarios in the uncertainty grid. The SCRS concluded that (**Figure AO-10**):

1. The ratio of  $F_{current}/F_{MSY}$  is around 0.41 (95% C.I.: 0.19-0.89), indicating that overfishing is not occurring.
2. The ratio of spawning biomass  $SSB_{current}/SSB_{MSY}$  is 1.60 (95% C.I.: 0.90-2.87), indicating that the stock is not overfished.
3. The value of MSY is estimated as 35,277 tonnes (95% C.I.: 28,444-46,340 t), higher than current catch levels (20,000 t in 2021).

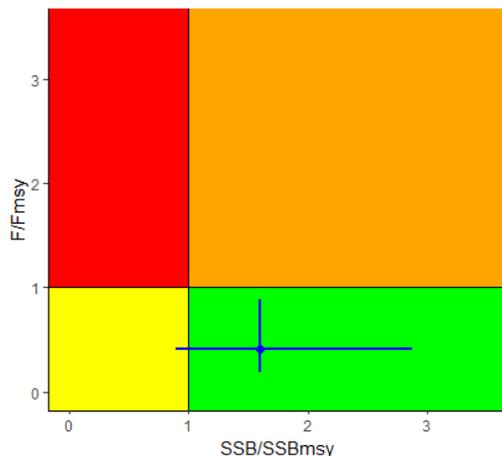


Figure AO-10. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue) for skipjack tuna in the western AO.

## MANAGEMENT

**Harvest Strategy:** No.

**Limit reference point:** Not defined.

**Target reference point:** Not defined. "Green" quadrant in Kobe plot implied as target (Rec. 11-13)

**Harvest control rule:** Not defined, but Recs. 11-13 and 15-07 provide a framework.

**Management Objectives:** Not defined, but preliminary performance indicators have been identified. Resolution 2022-02 presents 'conceptual' objectives to be used in 2023 in the development of initial operational management objectives.

**Management Strategy Evaluation:** Ongoing.

### **Management measures:**

The main binding conservation measure established by ICCAT for skipjack is Recommendation 22-01, which superseded several previous Recommendations. This multi-annual management plan for tropical tunas calls for:

1. Quarterly reporting to the Secretariat of the amount of tropical tuna by species caught (monthly reporting in the case of purse seiners and large longline vessels);
2. A capacity limitation consisting in each member producing an annual capacity/fishing plan that outlines how its overall longline and purse seine fleet capacity will be managed to ensure that the member can meet its obligation to limit the catch of bigeye, and its yellowfin and skipjack catches. Additionally, members shall report information on their support vessels;
3. The establishment of a record of vessels actively fishing for skipjack, or supporting fishing activities;
4. A 72-day closure (1<sup>st</sup> January to 13 March) prohibition in 2023 of purse seine and baitboat vessels fishing on floating objects, including their support vessels' activities, in the high seas or EEZs. In addition, a prohibition to deploy drifting FADs during the 15 days prior to the closure;
5. Observer coverage (human or electronic) of 100% for purse seine vessels and 10% for large longline vessels;
6. Annual submission of FAD management plans by countries with purse seine and baitboat (pole-and-line) fisheries;
7. A limit of 300 FADs with operational buoys at any one time per vessel in 2023. Each CPC with purse seine fishing vessels is encouraged not to increase its total fishing effort on FADs from its 2018 level.
8. To reduce the entanglement of sharks, marine turtles or any other species and reduce the amount of synthetic marine debris, CPCs shall ensure that all FADs deployed are non-entangling FADs and the use of non-plastic, natural or biodegradable materials for FADs construction is encouraged.

Recommendation 17-01 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse seine vessels.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>10</sup>	Evaluation
1.2.1	Harvest Strategy	75	Condition Needed
1.2.2	Harvest control rules and tools	60	Condition Needed
1.2.3	Information / monitoring	65	Condition Needed
1.2.4	Assessment of stock status	85	Passing Score

## SUMMARY

AO SKJ-W	ESTIMATE	YEARS	NOTES
RECENT CATCH	20	2021	
5-YEAR CATCH	21	2017-21	
MSY	35	2020	Range: 28-46
F/F <sub>MSY</sub>	0.41	2020	Range: 0.19-0.89
SSB/SSB <sub>MSY</sub>	1.60	2020	Range: 0.90-2.87
SSB/SSB <sub>0</sub>	N/A		
TAC	N/A		

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> .
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		71% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.
		16% of the catch is made by handline which typically results in small bycatch rates.
		10% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (non-entangling FADs, turtles, sharks).

Last date of a change in Color Ratings: None.

Changes from the previous (original) Color Ratings: None.

<sup>10</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## AO Northern Albacore Tuna

There are three stocks of albacore tuna in the ICCAT Area: North Atlantic, South Atlantic and Mediterranean. Albacore catches in the North Atlantic in 2021 were about 31,400 tonnes, similar to 2020 catch levels. Catches are made by a variety of fishing gears including pole-and-line (38%), trawl (27%), troll (18%) and longline (16%) (**Figure AO-11**). Based on the last stock assessment, the North Atlantic albacore stock is not overfished and overfishing is not occurring.

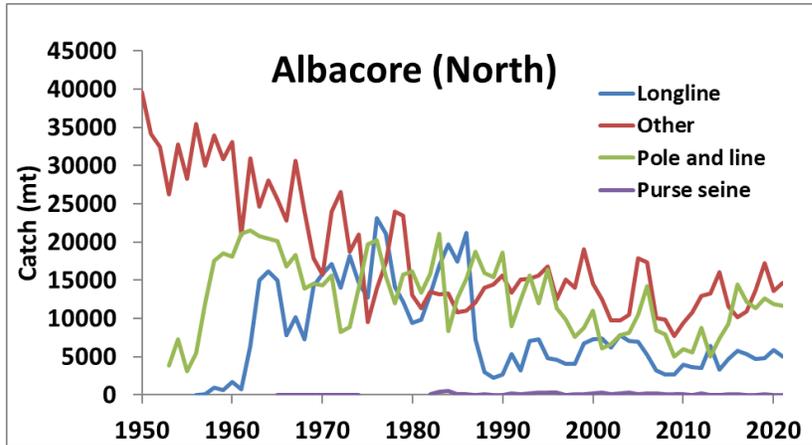


Figure AO-11. Catches of albacore tuna in the North AO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The most recent assessment for the northern albacore stock was conducted by SCRS in 2020 using data up to 2018. The results indicate that (**Figure AO-12**):

1. The ratio of  $F_{\text{current}}/F_{\text{MSY}}$  is estimated at 0.62 (80% CI: 0.52-0.74), indicating that overfishing is not occurring.
2. The ratio of spawning biomass  $SSB_{\text{current}}/SSB_{\text{MSY}}$  is estimated at 1.32 (80% CI: 1.13-1.51). This indicates that the stock is not in an overfished state.
3. MSY is estimated at 36,800 tonnes. Current (2021) catch is 31,400 t. Catches have been below MSY level since 2007.

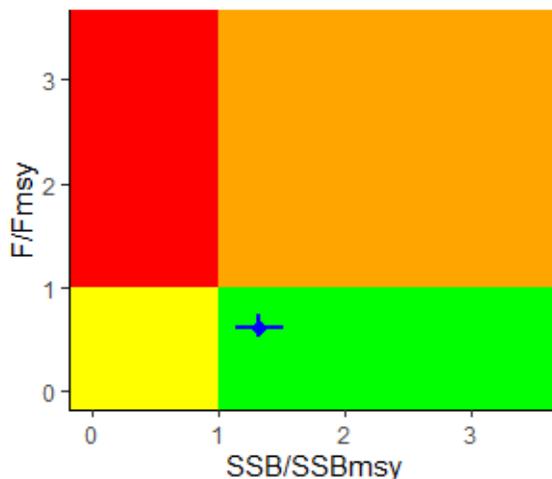


Figure AO-12. Latest estimate of  $SSB/SSB_{\text{MSY}}$  and  $F/F_{\text{MSY}}$  (in blue, including range) for albacore tuna in the northern AO.

## MANAGEMENT

**Harvest Strategy:** Yes. Rec. 21-04 provides a Management Procedure (MP) (including a HCR) to support the management objectives set by Rec. 21-04 for North Atlantic Albacore. The North Atlantic albacore stock assessment shall be conducted every three years, with the next stock assessment to occur in 2023. The MP sets a 3-year constant annual TAC using the following three values estimated from each stock assessment:

- a. The estimate of current biomass with respect to  $B_{MSY}$ .
- b. The estimate of the stock biomass at Maximum Sustainable Yield ( $B_{MSY}$ ).
- c. The estimate of the fishing mortality at MSY ( $F_{MSY}$ ).

**Limit reference points:** Rec. 21-04 establishes an abundance limit reference point of  $0.4 * B_{MSY}$ .

**Target reference points:** Rec. 21-04 sets  $F_{TAR}$  as  $0.8 * F_{MSY}$ . While Rec. 21-04 does not establish an abundance target reference point, it does set an abundance threshold equal to  $B_{MSY}$ , that is, the abundance level that triggers pre-agreed management actions to reduce the risk of breaching the limits.

**Harvest Control Rule:** The HCR within the MP has the following control parameters:

- a. The biomass threshold level is equal to the biomass corresponding to the maximum sustainable yield ( $B_{THRESH} = B_{MSY}$ ).
- b. A fishing mortality target corresponding to 80% of  $F_{MSY}$  ( $F_{TAR} = 0.8 * F_{MSY}$ ) will be applied when the stock status is at, or above, the threshold level ( $B_{THRESH}$ ).
- c. If the current biomass ( $B_{CURR}$ ) is estimated to be below the threshold level ( $B_{THRESH}$ ) and higher than  $B_{LIM}$ , then fishing mortality will be reduced linearly for the next multiannual management period following the equations included in the Recommendation.
- d. If the current biomass ( $B_{CURR}$ ) is estimated to be at, or below,  $B_{LIM}$ , then the fishing mortality shall be set at  $F_{MIN}$ , with a view to ensure a level of catch for scientific monitoring.
- e. The Maximum catch limit ( $C_{max}$ ) recommended is 50,000 t to avoid adverse effects of potentially inaccurate stock assessments.
- f. The maximum change in the catch limit ( $D_{max}$ ) shall not exceed 25% in case of increase and 20% in case of decrease of the previous recommended catch limit when  $B_{CURR} \geq B_{THRESH}$ .
- g. Data and stock assessment specification are included in the MP including which CPUE indices and stock assessment models should be used.
- h. Exceptional circumstances are included requesting the SCRS to determine, examining various indicators, whether a change in advice resulting from the MP is required.

**Management Objectives:** The management objective established for Northern albacore stock in Rec. 21-04 is to maintain the stock in the green quadrant of the Kobe plot ( $SSB > SSB_{MSY}$  and  $F < F_{MSY}$ ) with at least 60% of probability.

**Management Strategy Evaluation:** Ongoing (finalized for current HS).

### Management measures:

In 2021, as a result of applying the MP, an annual TAC of 37,801 t was established for 2022-2023. The recommended TAC for 2021-2023 represents a 12.5% increase with respect to the previous TAC in 2018-2020 and is above the MSY estimate for this stock (36,800 t) because the current biomass is well above  $B_{MSY}$ .

Additionally, the multi-annual management program established by ICCAT for north Atlantic albacore (Rec. 21-04) calls for a limit in the number of vessels by each member targeting northern Atlantic albacore to its average level of 1993-1995.

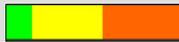
Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	85	Passing Score
1.2.2	Harvest control rules and tools	80	Passing Score
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

AO ALB-N	ESTIMATE	YEARS	NOTES
RECENT CATCH	31	2021	
5-YEAR CATCH	31	2017-21	
MSY	37	2018	
F/F <sub>MSY</sub>	0.62	2018	Range: 0.52-0.74
SSB/SSB <sub>MSY</sub>	1.32	2019	Range: 1.13-1.51
SSB/SSB <sub>0</sub>	0.48	2019	Range: 0.45-0.55
TAC	37.8	2021-2023	

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub>
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		38% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.
		18% of the catch is made with trolling, with little impact on non-target species.
		27% of the catch is made with pelagic trawling, with some impact on non-target species. Monitoring of bycatch is poor.
		16% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles). Monitoring is deficient.

*Last date of a change in Color Ratings: November, 2016.*

*Changes from the previous (December, 2013) Color Ratings: The Abundance rating changed from Yellow to Green.*

## AO Southern Albacore Tuna

There are three stocks of albacore tuna in the ICCAT Area: North Atlantic, South Atlantic and Mediterranean. Albacore catches in the South Atlantic in 2021 were about 25,000 tonnes (**Figure AO-13**), a 38% increase from 2020. Catches are made primarily by longline (81%) and pole-and-line (19%). The Southern Atlantic Albacore tuna stock is not overfished, and overfishing is not occurring.

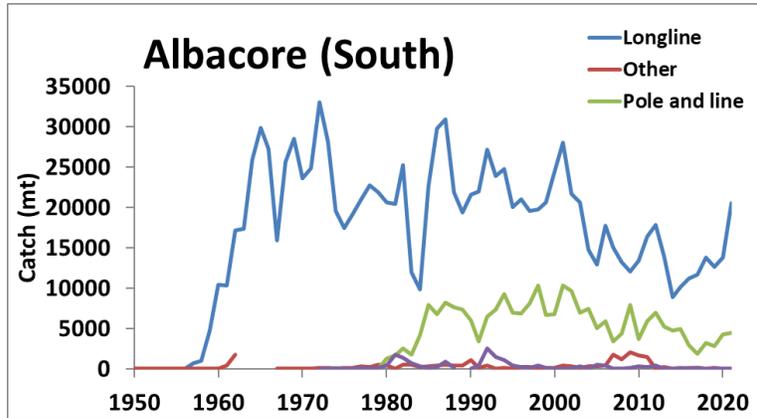


Figure AO-13. Catches of albacore tuna in the South AO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The most recent assessment for the southern stock of albacore was conducted by SCRS in 2020, including data until 2018. The assessment used similar models to the previous ICCAT stock assessment (2016), but the results were more optimistic than those in the previous one. The new analyses indicated that (**Figure AO-14**):

1. The median ratio of  $F_{current}/F_{MSY}$  in 2018 was estimated at 0.40 (95% CI: 0.28-0.59), indicating that overfishing is not occurring.
2. The ratio of biomass  $SSB_{current}/SSB_{MSY}$  in 2018 was estimated at 1.58 (95% CI: 1.14-2.05). This indicates that the stock is not overfished.
3. MSY is estimated at 27,300 tonnes (95% CI: 23,734-31,567 t.). Current (2021) catch is 25,000 t.

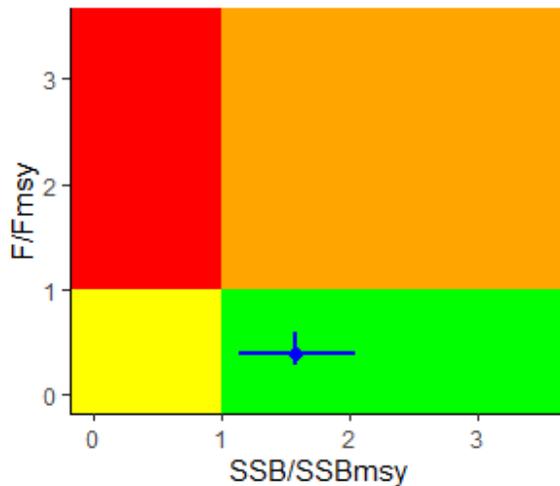


Figure AO-14. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for albacore tuna in the southern AO.

## MANAGEMENT

**Harvest Strategy:** No.

**Limit reference point:** Not defined.

**Target reference point:** Not defined. "Green" quadrant in Kobe plot implied as target (Rec. 11-13)

**Harvest control rule:** Not defined, but Rec. 11-13 provides a framework.

**Management Objectives:** Not defined.

**Management Strategy Evaluation:** No.

### Management measures:

Since 2011, following SCRS advice, the TAC was lowered to 24,000 tonnes. ICCAT Recommendation 22-06 increased the TAC to 28,000 t for the period 2023-2026. Permissible catch under Rec. 22-06 may exceed 28,000 tonnes due to individual allocations. The Recommendation requires major fishing countries to improve their monitoring and reporting of catch.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>11</sup>	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	60	Condition Needed
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	85	Passing Score

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<sup>11</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

AO ALB-S	ESTIMATE	YEARS	NOTES
RECENT CATCH	25	2021	
5-YEAR CATCH	18	2017-21	
MSY	27	2018	Range: 24-32
F/F <sub>MSY</sub>	0.40	2018	Range: 0.28-0.59
SSB/SSB <sub>MSY</sub>	1.58	2018	Range: 1.14-2.05
SSB/SSB <sub>0</sub>	0.59	2018	Range: 0.42-0.76
TAC	28	2023-2026	

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> .
FISHING MORTALITY		F < F <sub>MSY</sub> . The overall TAC has been lowered to 24,000 t following scientific advice to allow the stock to rebuild. Catches since 2013 have been below this level.
ENVIRONMENT		81% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
		19% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.

Last date of a change in Color Ratings: November, 2016.

Changes from the previous (December, 2011) Color Ratings: The Abundance rating changed from Orange to Green. The Fishing mortality rating changed from Yellow to Green.

## AO Mediterranean Albacore Tuna

There are three stocks of albacore tuna in the ICCAT Area: North Atlantic, South Atlantic and Mediterranean. Albacore catches in the Mediterranean in 2021 were about 2,900 tonnes, an 8% increase from 2020. Catches are highly variable and are made primarily by longline (94%) and the remainder by other surface gears (**Figure AO-15**). The Mediterranean Albacore tuna stock is estimated to be overfished and subject to overfishing, but there is high uncertainty on the stock status due to poor monitoring and basic fishery statistics.

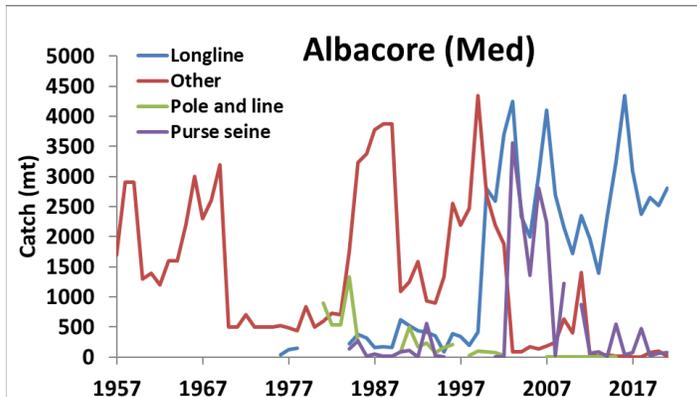


Figure AO-15. Catches of albacore tuna in the Mediterranean Sea from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The Mediterranean albacore stock was last assessed in 2021. The data sets used are extremely sparse and the available indices of abundance show a limited ability to monitor stock trends. In addition, there is considerable uncertainty with reported catches. The SCRS concluded that (**Figure AO-16**):

1. The ratio of  $F_{current}/F_{MSY}$  in 2019 was 1.21 (95% CI: 0.62 - 2.18). Therefore, overfishing is probably occurring.
2. The ratio of  $SSB_{current}/SSB_{MSY}$  in 2019 was estimated to be 0.57 (95% CI: 0.32 - 1.00). Therefore, the stock is probably overfished.
3.  $MSY$  is estimated to be 3,654 t (95% CI: 2,45-5,09 t).

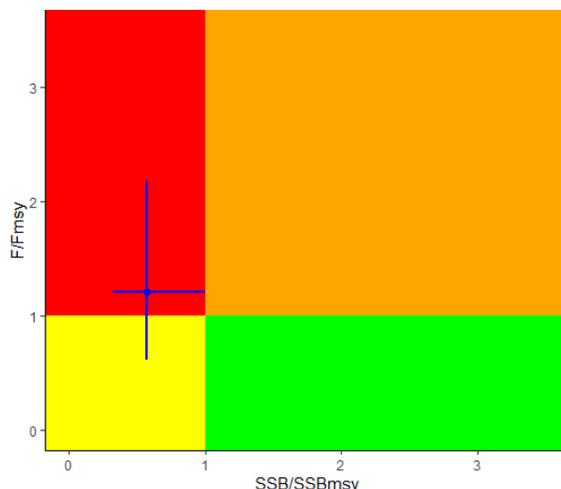


Figure AO-16. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for albacore tuna in the Mediterranean.

## MANAGEMENT

**Harvest Strategy:** No, but Recommendation 2021-06 *Rebuilding Plan for Mediterranean Albacore* (amended by Rec. 2022-05) establishes a 15-year rebuilding plan for Mediterranean albacore for the period 2022-2036.

**Limit reference point:** Not defined.

**Target reference point:** Not defined. "Green" quadrant in Kobe plot implied as target (Rec. 11-13)

**Harvest control rule:** Not defined, but Rec. 11-13 provides a framework.

**Management Objectives:** The management objective of the rebuilding plan is to achieve  $SSB_{MSY}$  with at least 60% of probability.

**Management Strategy Evaluation:** No.

### Management measures:

A TAC of 2,500 t is set for 2022-2024. Each CPC shall limit the number of their fishing vessels authorized to fish for Mediterranean albacore to the number of vessels that were authorized in 2017 (or to 2018 if licenses were first issued then), with a 10% tolerance margin. CPCs shall report a list of all sport and recreational vessels authorized to catch Mediterranean albacore, and these vessels will have a limit of three specimens retained/transshipped/landed per day. The Recommendation also establishes a prohibition to fish, retain on board, transship or land Mediterranean albacore between during either i) 1 October and 30 November and during an additional period of one month between 15 February and 31 March, or, alternatively, ii) during the period from 1 January to 31 March each year.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>12</sup>	Evaluation
1.2.1	Harvest Strategy	60	Condition Needed
1.2.2	Harvest control rules and tools	60	Condition Needed
1.2.3	Information / monitoring	65	Condition Needed
1.2.4	Assessment of stock status	85	Passing Score

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<sup>12</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

AO ALB-M	ESTIMATE	YEARS	NOTES
RECENT CATCH	2.9	2021	
5-YEAR CATCH	2.9	2017-21	
MSY	3.7		
F/F <sub>MSY</sub>	1.21	2019	Range: 0.62-2.18
SSB/SSB <sub>MSY</sub>	0.57	2019	Range: 0.32-1.00
SSB/SSB <sub>0</sub>			
TAC	2.5	2022-2024	

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB < SSB <sub>MSY</sub> .
FISHING MORTALITY		F > F <sub>MSY</sub> .
ENVIRONMENT		94% of the catch is officially reported as made by longlining. Several mitigation measures are in place (sharks, turtles). Monitoring is very deficient.
		6% of the catch is made by other surface gears, including gillnets. Monitoring is very deficient.

*Last date of a change in Color Ratings: March, 2022.*

*Changes from the previous (March, 2019) Color Ratings: The SSB rating changed from Yellow to Orange. The F rating changed from Green to Orange.*

## AO Eastern Atlantic and Mediterranean Bluefin Tuna

Atlantic bluefin tuna (*Thunnus thynnus*) are found in the entire North Atlantic and its adjacent seas, primarily the Mediterranean Sea. ICCAT recognizes two stocks: Western Atlantic, and eastern Atlantic and Mediterranean bluefin. There is considerable mixing between the two.

Eastern Atlantic bluefin catches have been subject to a high degree of misreporting between the mid-1990s and the recent past, although for the most recent few years, such misreported catch levels are thought to have diminished considerably. In 2021, reported catches were about 35,100 tonnes (**Figure AO-17**), similar to 2020 reported catches. Purse seiners take 62% of the catch, followed by traps (16%), longline (15%), and a variety of surface gears, including pole-and-line, handline and trolling. There is considerable uncertainty on its level of abundance. The TAC in place and strict controls have ended overfishing.

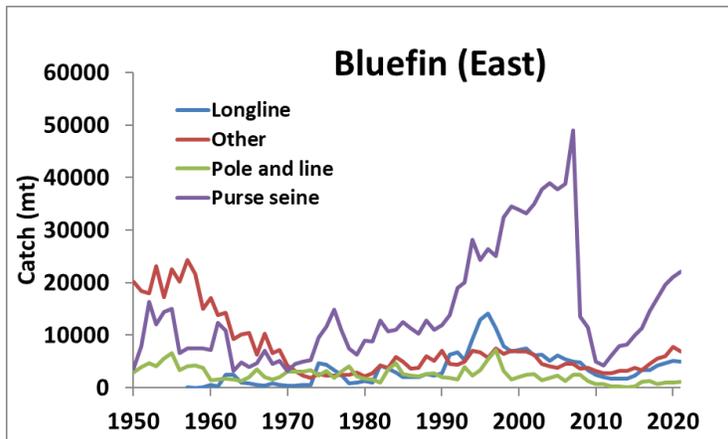


Figure AO-17. Catches of Eastern Atlantic and Mediterranean bluefin from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

ICCAT's SCRS last assessed the eastern Atlantic bluefin stock in 2022. The stock assessment is subject to considerable uncertainties due to scarcity of CPUE data and to high levels of misreporting that took place primarily in the 2000s. The SCRS concluded the following (**Figure AO-18**):

1. The current ratio of spawning biomass  $SSB_{current}/SSB_{MSY}$  is unknown, as biomass-based reference points were not estimated.
2. The ratio of  $F_{recent}/F_{MSY}$  (using the  $F_{0.1}$  proxy) was estimated at 0.81 (95% CI:0.48-1.62) Thus, overfishing is not taking place. Catches were reduced by over 70% since 2007 due to strict limits and controls but have been progressively increasing in recent years as the stock recovered and catches are now ~50% less than 2007 levels.
3. The estimate of MSY is unknown.

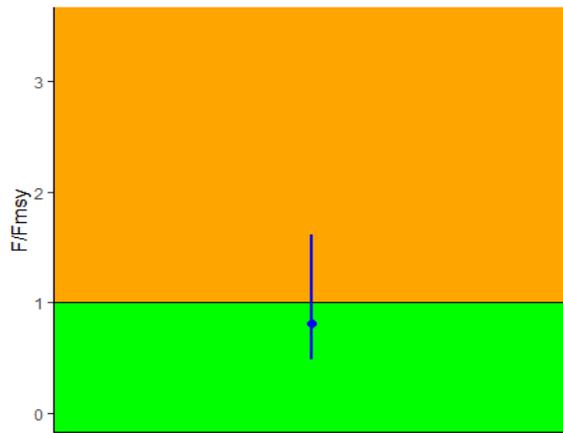


Figure AO-18. Latest estimate of  $F/F_{MSY}$  (using proxy; in blue, including range) for bluefin tuna in the Eastern Atlantic and Mediterranean. Solid black line represents Fishing mortality MSY-based interim target reference point, using  $F_{0.1}$  as a proxy for  $F_{MSY}$ .

## MANAGEMENT

**Harvest Strategy:** Yes, Rec. 2022-09 establishes a Management Procedure for both Atlantic bluefin tuna stocks.

**Limit reference point:** For the purposes of this MP, defined as 40% of the dynamic  $SSB_{MSY}$ .

**Target reference point:** Not defined for the long term. "Green" quadrant in Kobe plot implied as target (Rec. 11-13 and 22-09). Interim target is to maintain the biomass around  $B_{0.1}$ , achieved by fishing at or less than  $F_{0.1}$ , which the SCRS considers to be reasonable proxy for  $F_{MSY}$ .

**Harvest control rule:** Description and formulae for calculating TACs are included in Rec. 2022-09.

### Management Objectives:

- Stock Status: Both the western and eastern stocks should have a 60% or greater probability of occurring in the green quadrant of the Kobe plot (no overfishing occurring and not overfished);
- Safety: There should be a 15% or less probability of either stock falling below  $B_{LIM}$ ;
- Yield: Maximize overall catch levels in both the western and eastern management areas; and,
- Stability: Any change in TAC between consecutive management periods in both the western and eastern management areas should be no more than a 20% increase or a 35% decrease.

**Management Strategy Evaluation:** Ongoing (finalized for current HS).

### Management measures:

The eastern Atlantic and Mediterranean bluefin stock has been the subject of a rebuilding program since 2006 (ICCAT Rec. 06-05), which has been amended every year in 2007-2010 and again in 2012 (Rec. 12-03). By adopting Rec. 22-08 (replacing Rec. 21-08, 18-02, 19-04, and 20-0708), ICCAT moved from that rebuilding plan to a management plan starting in 2019 with the objective of maintaining the biomass around  $B_{0.1}$ .

The management plan set up in Rec. 22-08 is very comprehensive and combines multiple conservation elements with enforcement ones. Using the results of the MP, the annual TAC for 2023-2025 is set at 40,570 tonnes. In addition to the TACs, the plan includes the following measures, among others:

1. Manages fishing capacity (including mandated capacity adjustments to make fishing capacity more commensurate with quotas) and farming capacity;

2. Establishes closed fishing seasons for large-scale longlines (seven months), purse seiners (11 months), and requires CPCs to provide information on closed fishing seasons for other vessel types in their annual fishing plans;
3. Sets minimum sizes of 8 and 30 kg (75 and 115 cm-s respectively), depending on the fishery;
4. Bycatch limits on bluefin, requiring CPCs to describe the authorized bycatches as well as the methodology to calculate those in their annual fishing plans;
5. Establishes records of authorized fishing vessels, authorized traps and authorized farming facilities;
6. Establishes provision for recreational and sport fisheries, requiring CPCs to regulate those fisheries and prohibiting the catch and retention on board, transshipment or landing of more than one bluefin tuna per vessel per day for recreational fisheries.
7. Requires bi-weekly catch reports to ICCAT;
8. Establishes an observer program with 100% coverage for purse seiners, for transfers to cages and operations in tuna farms, for operations from traps, and of towing vessels;
9. Establishes an observer program with 20% coverage for active pelagic trawlers, longline vessels, and baitboats (all over 15 meters)
10. Requires VMS on every vessel over 15 m in length, and transmissions of the VMS data to ICCAT;
11. Prohibits trade of bluefin not accompanied by valid catch documents (Recs. 21-19, 2022-16);
12. Establishes procedures for at-sea boarding and inspection;
13. Allows SCRS to access all MCS data from the management plan.

The multiple amendments made to the management plan since 2006 have resulted in increasingly tighter controls of the actual catches. Combined with lower quotas, fishing mortality rates have been reduced substantially (current F is below  $F_{MSY}$ ).

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>13</sup>	Evaluation
1.2.1	Harvest Strategy	95	Passing Score
1.2.2	Harvest control rules and tools	65	Condition Needed
1.2.3	Information / monitoring	75	Condition Needed
1.2.4	Assessment of stock status	90	Passing Score

<sup>13</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

## SUMMARY

AO BFT-E	ESTIMATE	YEARS	NOTES
RECENT CATCH	35	2021	
5-YEAR CATCH	31	2017-21	
MSY	N/A		
F/F <sub>MSY</sub>	0.81	2017-2020	F/F <sub>0.1</sub> as F/F <sub>MSY</sub> proxy Range: 0.48-1.62
SSB/SSB <sub>MSY</sub>	N/A		
SSB/SSB <sub>0</sub>	N/A		
TAC	41	2023-25	

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		Unknown but increasing in recent years.
FISHING MORTALITY		F < F <sub>MSY</sub> . Fishing mortality has clearly been reduced through a TAC and strict controls.
ENVIRONMENT		62% of the catch is made by purse seiners that set on free schools.
		15% of the catch is made by longlining. Several mitigation measures are in place. Monitoring is deficient.
		16% of the catch is made by fixed traps that have minor impact on sensitive species.
		3% of the catch is made by pole-and-line fisheries that have some impact on baitfish stocks.

*Last date of a change in Color Ratings: February, 2015.*

*Changes from the previous (original) Color Ratings: The Abundance rating changed from Orange to Yellow.*

## AO Western Atlantic Bluefin Tuna

Atlantic bluefin tuna are found in the entire North Atlantic and its adjacent seas, primarily the Mediterranean Sea. ICCAT recognizes two stocks: Western Atlantic, and eastern Atlantic and Mediterranean bluefin. There is considerable mixing between the two.

Western Atlantic bluefin catches in 2021 were about 2,300 tonnes, a 1% increase from 2020. Sport gears (hand line, rod-and-reel) take 64% of the catch, followed by longline (30%) and other surface gears. Purse seine catches in recent years have been very minor (**Figure AO-19**). There is uncertainty about stock status but overfishing is not occurring.

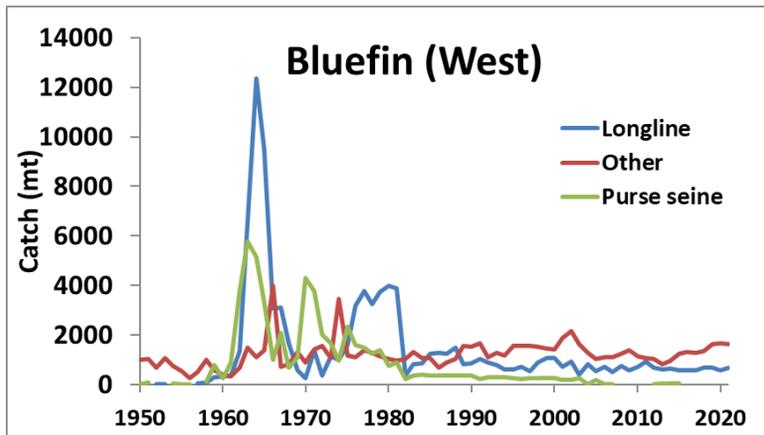


Figure AO-19. Catches of Western Atlantic bluefin tuna from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

ICCAT's SCRS assessed the western Atlantic bluefin stock in 2021. The models used underwent substantial changes compared to the 2020 "update" assessment, such as revised abundance indices, alternative assumptions about fleet selectivity and the addition of two years of data (2019 and 2020). The SCRS cautioned that conclusions from the 2021 assessment do not capture the full degree of uncertainty in the assessments and projections. Using the assessment results, the SCRS concluded the following (**Figure AO-20**):

1. The current ratio of spawning biomass  $SSB_{current}/SSB_{MSY}$  is unknown, as biomass-based reference points were not estimated.
2. The ratio of  $F_{current}/F_{MSY}$  (using  $F_{0.1}$  as a proxy for  $F_{MSY}$ ) was estimated at 0.53 (80% CI: 0.49-0.58). Thus, overfishing is not taking place.
3. The estimate of MSY is unknown.

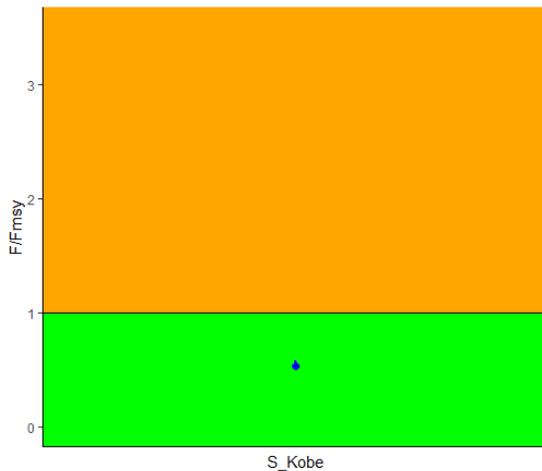


Figure AO-20. Latest estimate of  $F/F_{MSY}$  (using proxy; in blue, including range) for bluefin tuna in the Western Atlantic Ocean. Solid black line represents Fishing mortality MSY-based target reference point using  $F_{0.1}$  as a proxy for  $F_{MSY}$ .

## MANAGEMENT

**Harvest Strategy:** Yes, Rec. 2022-09 establishes a Management Procedure for both Atlantic bluefin tuna stocks.

**Limit reference point:** For the purposes of this MP, defined as 40% of the dynamic  $SSB_{MSY}$ .

**Target reference point:** Not defined for the long term. “Green” quadrant in Kobe plot implied as target (Rec. 11-13 and 22-09). Interim target is to maintain the biomass around  $B_{0.1}$ , achieved by fishing at or less than  $F_{0.1}$ , which the SCRS considers to be reasonable proxy for  $F_{MSY}$ .

**Harvest control rule:** Description and formulae for calculating TACs are included in Rec. 2022-09.

### Management Objectives:

- Stock Status: Both the western and eastern stocks should have a 60% or greater probability of occurring in the green quadrant of the Kobe plot (no overfishing occurring and not overfished);
- Safety: There should be a 15% or less probability of either stock falling below  $B_{LIM}$ ;
- Yield: Maximize overall catch levels in both the western and eastern management areas; and,
- Stability: Any change in TAC between consecutive management periods in both the western and eastern management areas should be no more than a 20% increase or a 35% decrease.

**Management Strategy Evaluation:** Ongoing (finalized for current HS).

### Management measures:

Western Atlantic bluefin has been the subject of a rebuilding program since 1998 (ICCAT Rec. 98-07), which has been amended in every other year since 2002. Then, an interim conservation and management plan was in place for the 2018-2022 period (Rec. 17-06, Rec. 21-07). Recommendation 2022-10 sets up a Conservation and Management Plan starting in 2023, that includes the establishing of TACs based on the application of the bluefin tuna management procedure (MP) (Rec. 2022-09). The annual TAC set for 2023-2025 is 2,726 t, allocated by country in Rec. 2022-10. This Conservation and Management Plan also includes a 30-kg minimum size and the prohibition of directed fisheries in the Gulf of Mexico (the only known spawning area for the stock).

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>14</sup>	Evaluation
1.2.1	Harvest Strategy	85	Passing Score
1.2.2	Harvest control rules and tools	65	Condition Needed
1.2.3	Information / monitoring	75	Condition Needed
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

AO BFT-W	ESTIMATE	YEARS	NOTES
RECENT CATCH	2.3	2021	
5-YEAR CATCH	2.2	2017-21	
MSY	N/A		
F/F <sub>MSY</sub>	0.53	2018-20	F/F <sub>0.1</sub> as F/F <sub>MSY</sub> proxy Range: 0.49-0.58
SSB/SSB <sub>MSY</sub>	N/A		
SSB/SSB <sub>0</sub>	N/A		
TAC	2.73	2023-25	

Catches, MSY and TAC in 1000 tonnes.

STOCK ABUNDANCE		Unknown.
FISHING MORTALITY		$F < F_{MSY}$ .
ENVIRONMENT		64% of the catch is made by sport fishing gears (rod-and-reel, handline) with minor amounts of bycatch.
		30% of the catch is made by longlining. Several mitigation measures are in place. Monitoring is deficient.

Last date of a change in Color Ratings: October, 2017.

Changes from the previous (February, 2015) Color Ratings: The Abundance rating changed from Orange to Yellow.

<sup>14</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

# STOCKS IN THE INDIAN OCEAN

**RFMO:** Indian Ocean Tuna Commission (IOTC). The stocks are assessed by the IOTC SC, which makes recommendations to the IOTC.

**Last Scientific Committee (SC) meeting:** December, 2022.

**Last Commission meeting:** June, 2022.

**Tuna stocks managed by IOTC:** IO Yellowfin, IO Bigeye, IO Skipjack, IO Albacore.

**Data sources:** The main sources of information for this section IOTC (2022).

**Last update:** March, 2023.

Over 22 percent of the world production of tuna is from the Indian Ocean (IO), making this the second largest region for tuna fishing after the western and Central Pacific Ocean. Catches of skipjack, yellowfin, bigeye and albacore in 2021 were 1,206,139 tonnes, a 9% increase from 2020. There was a general tendency for the total catch to decline since 2005, when a record 1.2 million tonnes were caught, followed by an increase in recent years (**Figure IO-1**). Catches of southern bluefin tuna occur substantially in the IO Convention Area. This stock is covered in a different section of this report, under Southern Hemisphere.

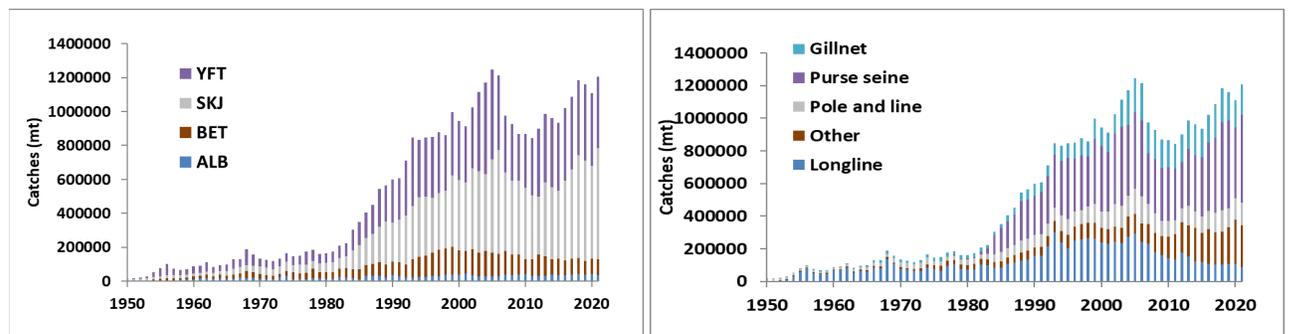


Figure IO-1. Trends in catch (mt) of bigeye, skipjack, yellowfin and albacore in the IO region, by species (left) and gear (right), 1950-2021.

Average catches for the five-year period 2017-2021 (1,149,600 tonnes) provide an indication of the recent performance of the fisheries (**Figure IO-2**): Skipjack accounts for 51% of the catches in weight, followed by yellowfin (38%), bigeye (8%), and albacore (3%). Purse-seine vessels take about 44% of the total catch, followed by gillnets (16%), longline (9%), and pole-and-line (11%). Gillnet fisheries are generally poorly monitored.

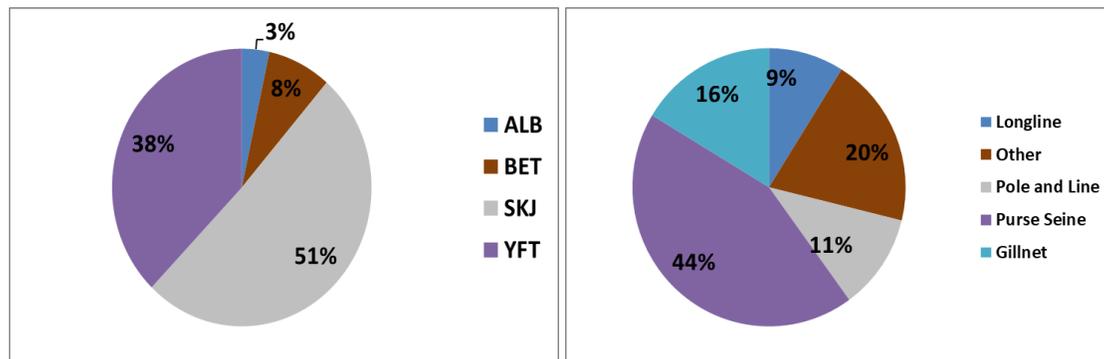


Figure IO-2. Average 2017-2021 catches of skipjack, yellowfin, bigeye and albacore in the IO. The graph on the left shows the percentages by species, and the graph on the right shows the percentages by gear type.

## IO Bigeye Tuna

Bigeye catches in 2021<sup>15</sup> were about 95,400 tonnes, a 5% increase from 2020. For the period 2017-2021, the main fishing gear is longline (35%). Catches by this gear have declined dramatically from a high in 2004 (**Figure IO-3**), due to vessels moving away from the main fishing grounds to avoid piracy, but increased sharply in 2012 to decrease again since then. In contrast, catches from purse seine vessels (43% on average for 2017-2021) have been relatively stable since 2000. The stock is determined to be overfished and subject to overfishing.

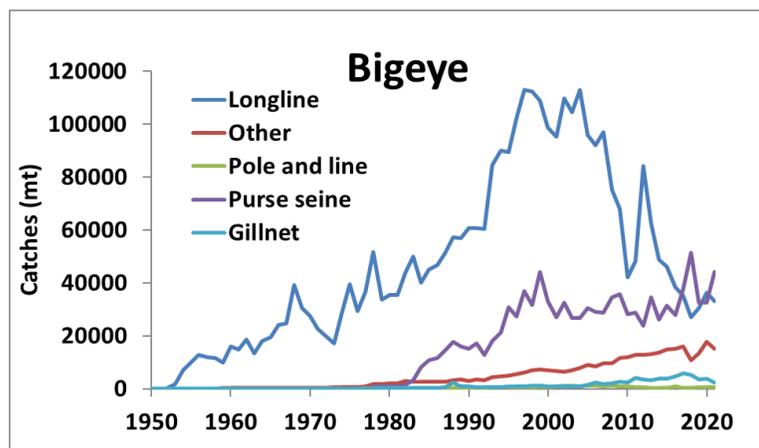


Figure IO-3. Catches of bigeye tuna in the IO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The latest assessment was conducted by the Scientific Committee in 2022. The reported stock status is based on a grid of 24 model configurations designed to capture the uncertainty on stock recruitment relationship, longline selectivity, growth and natural mortality. The results of the 2022 assessment indicated the following (**Figure IO-4**):

1. The ratio of  $F_{\text{current}}/F_{\text{MSY}}$  is estimated to be 1.43 (80% C.I.: 1.10 – 1.77), indicating that overfishing is occurring.
2. The ratio of spawning biomass  $SSB_{\text{current}}/SSB_{\text{MSY}}$  is 0.90 (80% C.I.: 0.75 to 1.05), indicating that the stock is in an overfished state.
3. The estimate of MSY is 96,000 tonnes. The 2021 estimate catch (95,400 t) was just below this level.

<sup>15</sup> Best scientific estimates of nominal catch data for IOTC species as of 23-Jan-2023

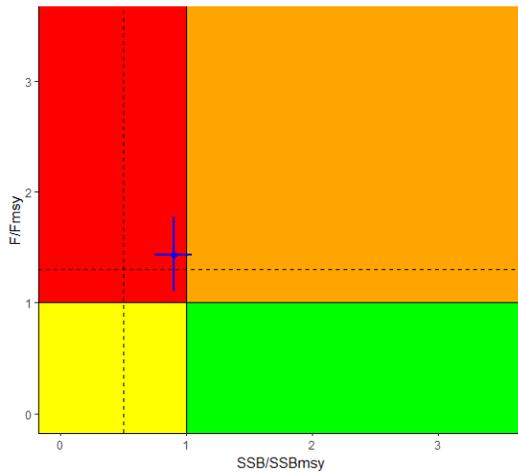


Figure IO-4. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for IO bigeye. Solid black lines represent interim target reference points and black dashed lines represent interim limit reference points.

## MANAGEMENT

**Harvest Strategy:** Yes, IOTC adopted a Management Procedure (MP) for bigeye in Resolution 22/03, known as MP1 Harvest, for setting the TAC for 2024-2025 with the objective of maintaining the stock in the green zone of the Kobe plot while maximizing the average catch from the fishery and reducing the variation in the TAC between management periods.

**Limit reference point:** Interim limits of  $0.5 \cdot SSB_{MSY}$  and  $1.3 \cdot F_{MSY}$  (Resolution 15/10).  $F_{current}/F_{MSY}$  equals 1.20, which is about 8% below the limit F;  $SSB_{current}/SSB_{MSY}$  equals 1.22, which is about 2.4 times above the limit SSB.

**Target reference point:** Interim targets of  $SSB_{MSY}$  and  $F_{MSY}$  (Resolution 15/10). Current SSB is above the target SSB and current F is above the target F.

**Harvest control rule:** The HCR used to calculate a TAC has two data inputs: total catch biomass and spatially aggregated longline CPUE. Then, a Pella-Tomlinson biomass dynamic model to the CPUE data given the catch biomass is applied to estimate a series of parameters and derive the two key variables used in the HCR: Ratio of fishing mortality to the value which produces MSY ( $F_{MSY}$  ratio) and relative biomass or depletion (B/K).

The HCR is a simple hockey stick type in which for biomass depletion above 0.4 the HCR multiplier ( $HCR_{mult}$ ) is 1 and it decreases to (almost) zero linearly by a biomass depletion of 0.1. The Scientific Committee will run the MP in 2022 and will advise the Commission of the outcome, including a recommended TAC for 2024 and 2025 and any advice on exceptional circumstances. Then, the Commission in 2023 will adopt the TAC based on the outcome of the MP for 2024 and 2025. The first TAC derived from the MP will be applied in 2024 and 2025. After 2025, the TAC will be applied in each of the subsequent three years following the year it is set by the Commission.

### Management Objectives:

- 60% probability that the bigeye tuna spawning stock biomass achieves the target reference point of  $SSB_{MSY}$  by 2034-2038;
- the bigeye tuna spawning stock biomass avoids breaching the interim limit reference point specified in Resolution 15/10 with a high probability;
- the maximum increase or decrease in the TAC shall be 15% relative to the previous TAC.

**Management Strategy Evaluation:** Ongoing (finalized for current HS).

### Management measures:

There are no conservation measures established by the IOTC specifically for bigeye. Resolution 21/01 on yellowfin request CPCs to gradually reduce supply vessels by 31 December 2022. Resolution 19/05 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse seine vessels. Resolution 19/02 established procedures on a FADs management plan, including a limit of 300 operational buoys at sea at any one time per vessel; and a limit of 500 instrumented buoys in stock at any time and 500 instrumented buoys to be acquired annually by each fishing vessel. Moreover, Resolution 19/02 requests CPC vessels to use non-entangling FADs constructed without netting material and encourage CPC vessels to use biodegradable FADs and remove from the water, retain onboard and only dispose of in port, all traditional FADs encountered (e.g. those made of entangling materials or designs) from 1 January 2022.

Anticipating the possible need for management measures, Resolution 16/10 was adopted to promote the implementation of IOTC Conservation and Management Measures and Resolution 17/02 established a Working Party on the Implementation of Conservation and Management Measures (WPICMM).

### Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>16</sup>	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

### SUMMARY

IO BET	ESTIMATE	YEARS	NOTES
RECENT CATCH	95	2021	
5-YEAR CATCH	91	2017-21	
MSY	96	2021	
F/F <sub>MSY</sub>	1.43	2021	Range: 1.10 to 1.77
SSB/SSB <sub>MSY</sub>	0.90	2021	Range: 0.75 to 1.05
SSB/SSB <sub>f0</sub>	0.25	2021	Range: 0.23-0.27
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

<sup>16</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

STOCK ABUNDANCE		SSB < SSB <sub>MSY</sub> .
FISHING MORTALITY		F > F <sub>MSY</sub> .
ENVIRONMENT		35% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
		34% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
		9% of the catch is made with purse seining on free schools, with little impact on non-target species.

*Last date of a change in Color Ratings: March, 2023.*

*Changes from the previous (March, 2020) Color Ratings: The Stock Abundance rating changed from Green to Orange.*

## IO Yellowfin Tuna

Yellowfin catches in 2021<sup>17</sup> were about 420,800 tonnes, a 2% decrease from 2020 catch levels. The main fishing gears for yellowfin for the 2017-2021 period are purse seine (33% of the catch), gillnets (18%), handlines (21%), other line fisheries such as troll and coastal longline (14%), longline (8%) and pole and line (4%) (**Figure IO-5**). Catches by gillnet (18%) and miscellaneous line gears (36% including handline, troll and coastal longline) have become increasingly important in recent years. Catches by these gears are poorly estimated. Catches from pole-and-line vessels (4%) have been relatively stable. Overall, catches have declined by 22% from a record high of 540,000 tonnes in 2004, but seem to be increasing again, especially in purse seine, gillnet and other gears fisheries like handline. The stock is estimated to be overfished and overfishing is occurring due to an increase in catch levels in recent years.

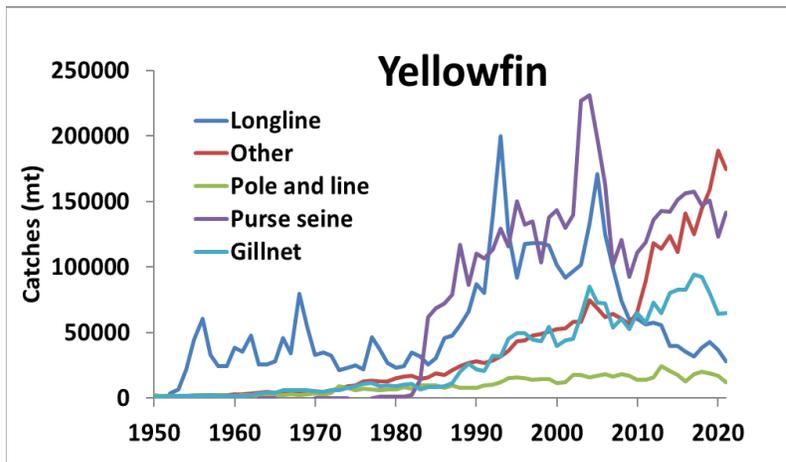


Figure IO-5. Catches of yellowfin tuna in the IO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

In 2021 a new stock assessment was carried out for yellowfin tuna in the IOTC area of competence. The model used in 2021 is based on the model developed in 2018 with a series of revisions. The new model grid represents a marked improvement over the previous results available in 2018 and incorporates a far wider range of uncertainty. Stock status estimates are more pessimistic, but do not differ substantially, from the previous assessment (**Figure IO-6**):

1. The ratio of  $F_{\text{current}}/F_{\text{MSY}}$  in 2020 is estimated at 1.32 (80% CI: 0.68-1.95), indicating that overfishing is occurring.
2. The stock is in an overfished state as spawning biomass in 2020 is estimated to be below the  $SSB_{\text{MSY}}$  level.  $SSB_{\text{current}}/SSB_{\text{MSY}} = 0.87$  (80% CI: 0.63-1.10).
3. The value of MSY is estimated to be 349,000 (80% CI: 286,000-412,000 tonnes). Catches since 2012 (~421,000 t in 2021) are above the estimated MSY.

<sup>17</sup> Best scientific estimates of nominal catch data for IOTC species as of 23-Jan-2023

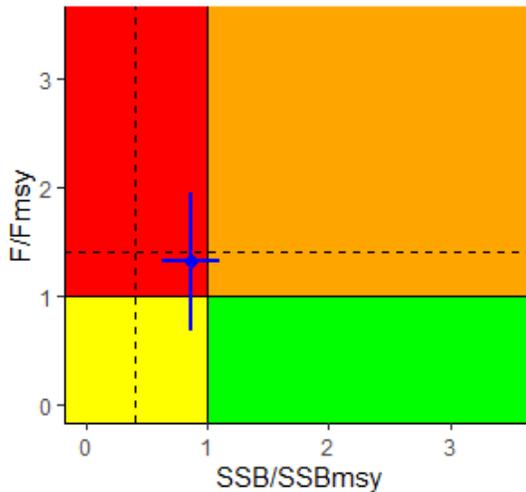


Figure IO-6. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for IO yellowfin. Solid black lines represent interim target reference points and black dashed lines represent interim limit reference points.

## MANAGEMENT

**Harvest Strategy:** No, but Resolution 16/09 established a Technical Committee on Management Procedures to help guide the Commission on policy choices for establishing Management Procedures. The following components have been agreed:

**Limit reference point:** Interim limit reference point of  $0.4 \cdot SSB_{MSY}$  and  $1.4 \cdot F_{MSY}$  (Resolution 15/10).  $F_{current}/F_{MSY}$  equals 1.32, which is about 6% below the limit  $F$ ;  $SSB_{current}/SSB_{MSY}$  equals 0.87, which is over 2 times above the limit  $SSB$ .

**Target reference point:** Interim targets of  $SSB_{MSY}$  and  $F_{MSY}$  (Resolution 15/10). Current  $SSB$  and  $F$  are breaching these targets.

**Harvest control rule:** Not defined yet. Resolution 16/09 requests IOTC to guide the Commission to agree on Management Procedures including HCRs designed to maintain or restore stocks to the “Green” quadrant of the Kobe plot.

**Management Objectives:** Not defined, but candidate objectives are identified.

**Management Strategy Evaluation:** Early stages.

### Management measures:

Resolution 19/01, superseded by Resolution 21/01, establishes an interim plan for rebuilding the Indian ocean yellowfin tuna stock in the IOTC area of competence. This plan details yellowfin tuna catch limits and provisions by CPCs requiring that Contracting Parties whose fleets exceed their catch limits will have that over-catch deducted from their annual limits in future years. Moreover, Resolution 21/01 requests CPCs to gradually reduce supply vessels by 31 December 2022. Resolution 19/05 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse seine vessels. Resolution 19/02 established procedures on FADs management plan, including a limit of 300 operational buoys at sea at any one time per vessel; and a limit of 500 instrumented buoys in stock at any time and 500 instrumented buoys to be acquired annually by each fishing vessel. Moreover, Resolution 19/02 requests CPC vessels to use non-entangling FADs constructed without netting material and encourage CPC vessels to use biodegradable FADs and remove from the water,

retain onboard and only dispose of in port, all traditional FADs encountered (e.g. those made of entangling materials or designs) from 1 January 2022.

Anticipating the possible need for capacity building to implement the adopted management measures, Resolution 16/10 was adopted to promote the implementation of IOTC Conservation and Management Measures and Resolution 17/02 established a Working Party on the Implementation of Conservation and Management Measures (WPICMM).

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>18</sup>	Evaluation
1.2.1	Harvest Strategy	65	Condition Needed
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

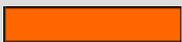
## SUMMARY

IO YFT	ESTIMATE	YEARS	NOTES
RECENT CATCH	421	2021	
5-YEAR CATCH	434	2017-21	
MSY	349	2020	Range: 286-412
F/F <sub>MSY</sub>	1.32	2020	Range: 0.68-1.95
SSB/SSB <sub>MSY</sub>	0.87	2020	Range: 0.63-1.10
SSB/SSB <sub>0</sub>	0.31	2020	Range: 0.24-0.38
TAC	N/A	Specified by CPC <sup>19</sup> in Res. 21/01	

*Catches, MSY and TAC in 1000 tonnes.*

<sup>18</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

<sup>19</sup> Catch limits for each CPC depend on different baseline year catches (2014 or 2015) and /or recent catches (2017-2019).

STOCK ABUNDANCE		SSB < SSB <sub>MSY</sub> . The low level of stock biomass is attributable to increased catch levels in recent years.
FISHING MORTALITY		F > F <sub>MSY</sub> .
ENVIRONMENT		18% of the catch is made by gillnets, which are poorly monitored. Gillnets are thought to have high bycatch rates. No mitigation measures are in place and monitoring is extremely deficient.
		8% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
		23% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
		10% of the catch is made with purse seining on free schools, with little impact on non-target species.
		21% of the catch is made by handlines, expected to have little impact on bycatch species.

*Last date of a change in Color Ratings: February, 2016.*

*Changes from the previous (December 2011) Color Ratings: The Abundance rating changed from Green to Orange. The Fishing mortality rating changed from Green to Orange.*

## IO Skipjack Tuna

Skipjack catches in the Indian Ocean in 2021<sup>20</sup> were about 655,100 tonnes, a 20% increase from 2020. Purse seine (54%), pole-and-line (19%) and gillnets (18%) dominate the catches (**Figure IO-7**). Pole-and-line, purse seine and gillnet catches have been decreasing since the mid-2000s, but their catches showed an increasing trend after 2012, notably so for purse seine. Overfishing is not occurring and the stock is not overfished.

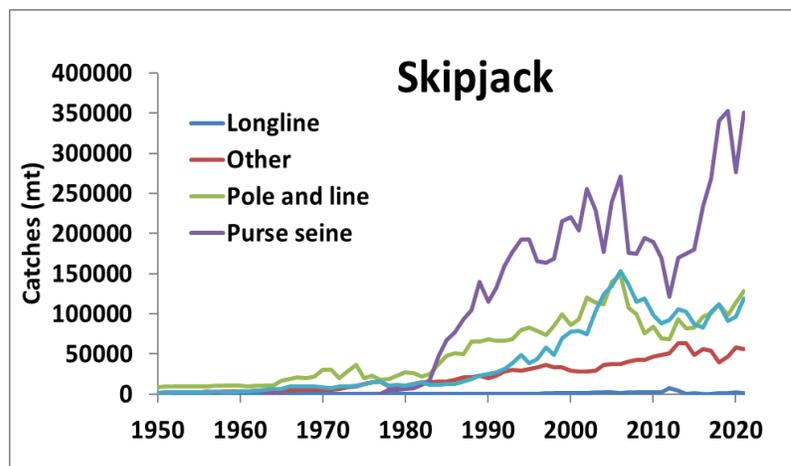


Figure IO-7. Catches of skipjack tuna in the IO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The most recent stock assessment of skipjack was conducted in 2020 with data up to 2019. Model results did not differ substantively from the previous 2017 assessment despite large catches in 2018 and 2019, which were higher than the annual catch limits in effect during that period. The new stock assessment estimated a higher productivity of the stock and a higher stock level relative to the target reference point due to the increasing trend of CPUE indices in most recent years despite the large catches. The estimated higher productivity was related to skipjack life history characteristics that respond quickly to ambient foraging conditions driven by ocean productivity, which seem to have been favorable in recent years.

The results of the assessment indicated that (**Figure IO-8**):

1. The ratio of  $F_{\text{current}}/F_{\text{MSY}}$  is estimated to be 0.48 (80% CI: 0.35-0.81). Therefore, overfishing is not occurring.
2. The stock is not in an overfished state as spawning biomass is above the  $SSB_{\text{MSY}}$  level ( $SSB_{\text{current}}/SSB_{\text{MSY}} = 1.99$ , 80% CI: 1.47-2.63).
3. The median estimate of MSY is estimated to be 601,000 tonnes (80% CI: 500,100 to 767,000 t). Catches in 2021 (~655,000 t) are above this level.

As for skipjack the stock assessment model was unable to accurately estimate MSY-based reference points, following Resolution 15-10 on target and limit reference points and a decision framework – which requests that reference points will be set at a rate of initial biomass ( $SSB_0$ ) when MSY-based reference points cannot be robustly estimated – and

<sup>20</sup> Best scientific estimates of nominal catch data for IOTC species as of 23-Jan-2023

Resolution 21-03 on Skipjack Harvest Control Rules; skipjack stock status and reference points are provided relative to  $SSB_0$  levels. These are given below.

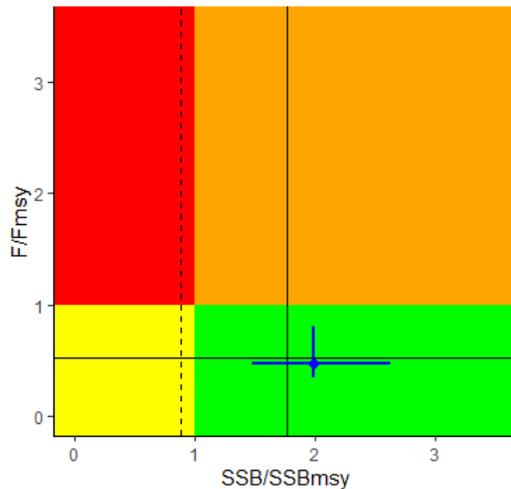


Figure IO-8. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for IO skipjack. Solid black lines represent interim target reference points and black dashed lines represent interim limit reference points.

## MANAGEMENT

**Harvest Strategy:** Not a full Harvest Strategy, but Resolution 16/09 established a Technical Committee on Management Procedures to help guide the Commission on policy choices for establishing Management Procedures and Resolution 21/03 on skipjack Harvest Control Rules requests to develop a full Harvest Strategy. The following components have been agreed:

**Limit reference point:** Interim limit reference points are  $0.2 \cdot SSB_0$  and  $F_{0.2SSB_0}$  (the fishing mortality value associated with sustaining the stock at  $0.2 \cdot SSB_0$ ) (Resolutions 21/03 and 15/10). The value of  $SSB_{current}/SSB_0$  is 0.45, which is above the SSB limit, and  $F_{current}/F_{40\%SSB_0}$  equals 0.92, which is below the F limit.

**Target reference point:** Interim target reference points are  $0.4 \cdot SSB_0$  and  $F_{0.4SSB_0}$  (the fishing mortality value associated with sustaining the stock at  $0.4 \cdot SSB_0$ ) (Resolutions 21/03 and 15/10).  $F_{current}/F_{40\%SSB_0}$  is 0.92, which is below the F target, and  $SSB_{current}/SSB_0$  is 0.45 which is above the SSB target.

**Harvest control rule:** Resolution 21/03 (which supersedes Res. 16/02) establishes a Harvest Control Rule for skipjack tuna in the IOTC area of competence. The HCR shall recommend a TAC using:

- a) The estimate of current spawning stock biomass ( $SSB_{current}$ )
- b) The estimate of the unfished spawning stock biomass ( $SSB_0$ )
- c) The estimate of the equilibrium exploitation rate ( $E_{target}$ ) associated with sustaining the stock at  $SSB_{target}$ .

**Management Objectives:** Not defined, but candidate objectives are identified.

**Management Strategy Evaluation:** Ongoing.

**Management measures:**

Based on the results of the stock assessment of skipjack tuna in 2020, IOTC adopted an annual catch limit of 513,572 tonnes for skipjack for the period 2021-2023 following the application of the Harvest Control Rule in Resolution 21/03. Large catches were recorded in the period 2018-2019, which exceeded the catch limits established in 2017 for this period by 30% and 16%, respectively. Hence, although the new catch limit is higher than for the previous period, IOTC needs to ensure that catches of skipjack do not exceed the agreed limit.

There are no other conservation measures established specifically for skipjack. Resolution 21/01 on yellowfin request CPCs to gradually reduce supply vessels by 31 December 2022. Resolution 19/05 establishes a ban on discards of bigeye, skipjack and yellowfin tuna by purse seine vessels. Resolution 19/02 established procedures on a FADs management plan, including a limit of 300 operational buoys at sea at any one time per vessel; and a limit of 500 instrumented buoys in stock at any time and 500 instrumented buoys to be acquired annually by each fishing vessel. Moreover, Resolution 19/02 requests CPC vessels to use non-entangling FADs constructed without netting material and encourage CPC vessels to use biodegradable FADs and remove from the water, retain onboard and only dispose of in port, all traditional FADs encountered (e.g. those made of entangling materials or designs) from 1 January 2022.

Anticipating the possible need for capacity building to implement the adopted management measures, Resolution 16/10 was adopted to promote the implementation of IOTC Conservation and Management Measures and Resolution 17/02 established a Working Party on the Implementation of Conservation and Management Measures (WPICMM).

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>21</sup>	Evaluation
1.2.1	Harvest Strategy	80	Passing Score
1.2.2	Harvest control rules and tools	75	Condition Needed
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	95	Passing Score

## SUMMARY

IO SKJ	ESTIMATE	YEARS	NOTES
RECENT CATCH	655	2021	
5-YEAR CATCH	585	2017-21	
MSY	601	2019	Range: 500-767
F/F <sub>MSY</sub>	0.48	2019	Range: 0.35-0.81
SSB/SSB <sub>MSY</sub>	1.99	2019	Range: 1.47-2.63
SSB/SSB <sub>0</sub>	0.44	2019	Range: 0.39-0.49
TAC	514	2021-2023	

*Catches, MSY and TAC in 1000 tonnes.*

<sup>21</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

STOCK ABUNDANCE		$SSB > SSB_{MSY}$ .
FISHING MORTALITY		$F < F_{MSY}$ .
ENVIRONMENT		18% of the catch is made by gillnets, a gear expected to have high bycatch rates. No mitigation measures are in place and monitoring is extremely deficient.
		51% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
		19% of the catch is made by pole-and-line fishing, with small bycatch of non-target species but unknown impacts on baitfish stocks.

*Last date of a change in Color Ratings: December, 2011.*

*Changes from the previous (original) Color Ratings: The Abundance rating changed from Yellow to Green.*

## IO Albacore Tuna

Albacore catches in the Indian Ocean in 2021<sup>22</sup> were about 34,800 tonnes, a 15% decrease from 2020. Almost all catches are made by pelagic longlines (**Figure IO-9**). The Indian Ocean albacore stock is not overfished and is not subject to overfishing. However, there is considerable uncertainty associated with latest stock assessment.

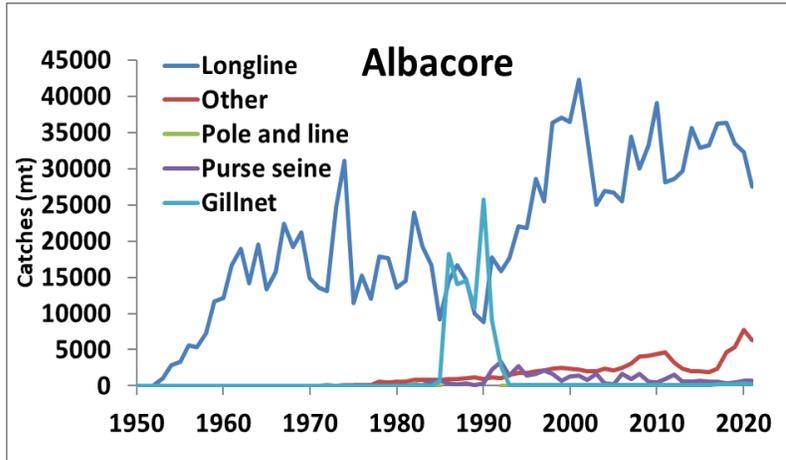


Figure IO-9. Catches of albacore tuna in the IO from 1950 to 2021, by gear type.

## STOCK ASSESSMENT

The latest assessment was performed by the Scientific Committee in 2022, using data through 2020. The model used in 2022 is based on the model developed in 2019 with a series of revisions. There are some noticeable changes compared to the previous assessment data set, mainly related to how the fisheries are structured, and how the CPUE indices and length composition data are treated within the assessment model. The conclusions from the assessment indicate that (**Figure IO-10**):

1. The ratio of  $F_{\text{current}}/F_{\text{MSY}}$  is estimated to be 0.68 (range: 0.42-0.94). Therefore, overfishing is not occurring.
2. The stock is not in an overfished state as spawning biomass is above the  $SSB_{\text{MSY}}$  level ( $SSB_{\text{current}}/SSB_{\text{MSY}} = 1.56$ ; range: 0.89-2.24).
3. The median estimate of MSY is estimated to be 45,000 tonnes. Current catch (~35,000 t in 2021) is below this level.

<sup>22</sup> Best scientific estimates of nominal catch data for IOTC species as of 23-Jan-2023

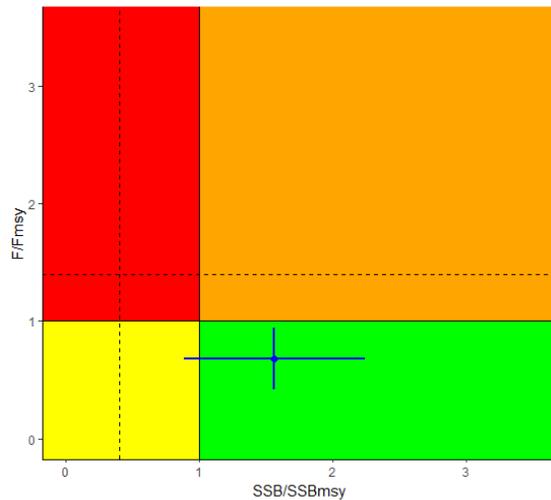


Figure IO-10. Latest estimate of  $SSB/SSB_{MSY}$  and  $F/F_{MSY}$  (in blue, including range) for IO albacore. Solid black lines represent interim target reference points and black dashed lines represent interim limit reference points.

## MANAGEMENT

**Harvest Strategy:** No, but Resolution 16/09 established a Technical Committee on Management Procedures to help guide the Commission on policy choices for establishing Management Procedures. The following components have been agreed:

**Limit reference point:** Interim limits of  $0.4 \cdot SSB_{MSY}$  and  $1.4 \cdot F_{MSY}$  (Resolution 15/10). The value of  $SSB_{current}/SSB_{MSY}$  is 1.28, about 3 times higher than the SSB limit.  $F/F_{MSY}$  is 1.35, which is around the limit  $F$ .

**Target reference point:** Interim targets of  $SSB_{MSY}$  and  $F_{MSY}$  (Resolution 15/10). Current  $F$  is well above the  $F$  target and current  $SSB$  is above the  $SSB$  target.

**Harvest control rule:** Not defined yet. Resolution 16/09 requests IOTC to guide the Commission to agree on Management Procedures including HCRs designed to maintain or restore stocks to the "Green" quadrant of the Kobe plot.

**Management Objectives:** Not defined, but candidate objectives are identified.

**Management Strategy Evaluation:** Ongoing.

### Management measures:

There are no conservation and management measures adopted by IOTC for albacore. Anticipating the possible need for capacity building to implement the adopted management measures, Resolution 16/10 was adopted to promote the implementation of IOTC Conservation and Management Measures and Resolution 17/02 established a Working Party on the Implementation of Conservation and Management Measures (WPICMM).

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score <sup>23</sup>	Evaluation
1.2.1	Harvest Strategy	60	Condition Needed
1.2.2	Harvest control rules and tools	<60	Fail
1.2.3	Information / monitoring	80	Passing Score
1.2.4	Assessment of stock status	90	Passing Score

## SUMMARY

IO ALB	ESTIMATE	YEARS	NOTES
RECENT CATCH	35	2021	
5-YEAR CATCH	39	2017-21	
MSY	45	2020	Range: 35-55
F/F <sub>MSY</sub>	0.68	2020	Range: 0.42-0.94
SSB/SSB <sub>MSY</sub>	1.56	2020	Range: 0.89-2.24
SSB/SSB <sub>0</sub>	0.36	2020	Range: 0.26-0.45
TAC	N/A		

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB > SSB <sub>MSY</sub> . However, there is considerable uncertainty in the assessment results.
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		Almost 100% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.

*Last date of a change in Color Ratings: March, 2023.*

*Changes from the previous (March, 2020) Color Ratings: Fishing mortality rating was changed from Orange to Green to reflect the results of the 2022 assessment.*

<sup>23</sup> These scores have not been updated to reflect latest (2022) changes in stock assessment or management.

# SOUTHERN HEMISPHERE STOCKS

**RFMO:** Commission for the Conservation of Southern Bluefin Tuna (CCSBT). The stock is assessed by the CCSBT SC who makes recommendations to the CCSBT.

**Last Scientific Committee meeting:** September, 2022.

**Last Commission meeting:** October, 2022.

**Tuna stocks managed by CCSBT:** Southern bluefin tuna.

**Data sources:** The main source of information for this section is [CCSBT \(2020\)](#), [CCSBT \(2022a\)](#), [CCSBT \(2022b\)](#).

**Last update:** March, 2023.

## SH Southern Bluefin Tuna

Southern bluefin tuna (*Thunnus maccoyii*) is found in the southern hemisphere, mainly in waters between 30° and 50° S. The stock is assessed and managed by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). While the IATTC, ICCAT, IOTC and WCPFC have in principle a mandate to manage all tunas in their respective Convention Areas, in practice they defer to CCSBT for management of southern bluefin. Practically all of the catches are made in the IOTC, ICCAT and WCPFC convention areas (~60% in the Indian Ocean, ~24% in the Pacific Ocean and ~15% in the Atlantic Ocean).

Southern bluefin catches in 2021 were about 16,800 tonnes, a 7% increase from 2020. Virtually all of the catches are made by longline (69%) and purse seine (29%). Current catches are about 20% of what they were at their peak, in 1961. (**Figure SH-1**). The stock of southern bluefin is heavily overfished. However, overfishing is not occurring due to measures taken in a rebuilding plan.

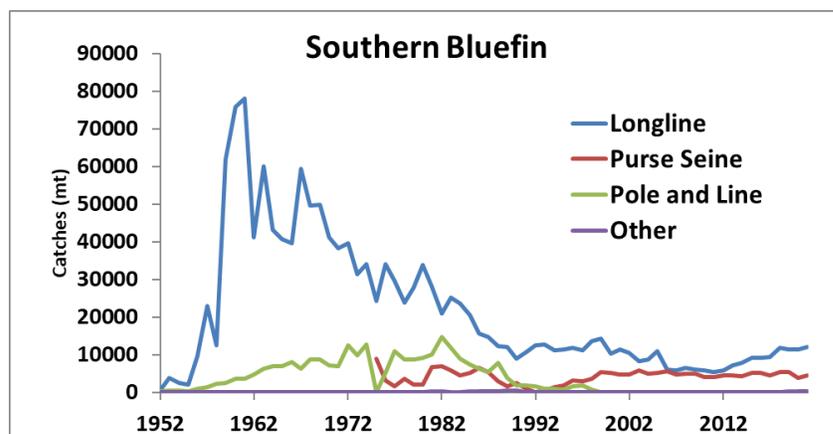


Figure SH-1. Catches of southern bluefin tuna from 1952 to 2021, by gear type.

## STOCK ASSESSMENT

Southern bluefin tuna is assessed by the Extended Scientific Committee (ESC) of the CCSBT. The latest full stock assessment was conducted in 2020. Since 2017, CCSBT has measured reproductive capacity as Total Reproductive Output (TRO) rather than SSB. The 2020 stock assessment suggested that the southern bluefin TRO is at 20% of its initial value as well as below the level that could produce maximum sustainable yield. However, there have been improvements since the 2011 stock assessment, which indicated the stock in 2011 was 5.5 % of the initial SSB proxy, and the 2017 stock assessment, which indicated the stock was at 13% of initial TRO in 2017. According to the 2020 assessment (**Figure SH-2**):

1. The current ratio of  $TRO_{current}/TRO_{MSY}$  is estimated at 0.69 (range: 0.49-1.03). This indicates that the stock is in an overfished state. TRO is estimated to be between 16% and 24% of the unfished level. Spawning biomass has been rebuilding since the implementation of CCSBT's management procedure.
2. The ratio of  $F_{current}/F_{MSY}$  is estimated at 0.52 (range: 0.37-0.73), indicating that overfishing is not occurring. While overfishing was taking place in recent years, current fishing mortality has been reduced below the MSY level following reductions in overall catch.
3. The estimate of MSY is 33,200 tonnes, well above current catch levels (16,800 t in 2021).

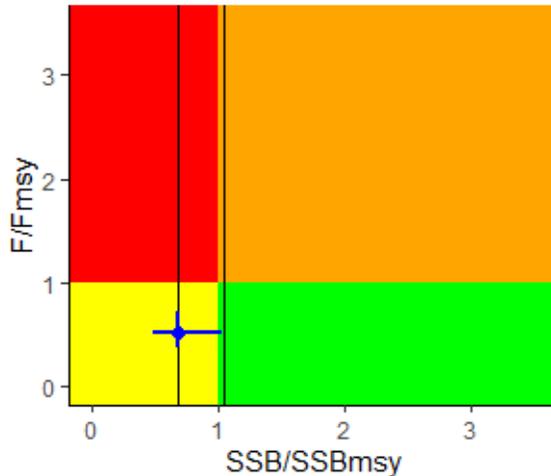


Figure SH-2. Latest estimate of  $SSB/SSB_{MSY}$  ( $TRO/TRO_{MSY}$  used as proxy) and  $F/F_{MSY}$  (in blue, including range) for southern bluefin tuna. Solid black lines represent rebuilding target reference points.

In 2022, while not through a full assessment, an interim estimate of stock status was provided based on an updated stock assessment, including future projections using the adopted management procedure. Stock status estimates produced were consistent with those from the 2020 stock assessment and suggest the stock is continuing to rebuild. However, in 2021, the TRO was at 22% of its initial biomass, still below the level that could produce maximum sustainable yield.

## MANAGEMENT

**Harvest Strategy:** Yes. In 2019, a new Management Procedure (MP) — the Cape Town Procedure (CTP) — was adopted to guide the setting of TACs for 2021-2023. The MP developed by the ESC specifies the data inputs, assessment framework, the HCR and actions to be taken based on any exceptional circumstances.

**Limit reference point:** Not defined.

**Target reference point:** 20% of the unfished biomass ( $20\%TRO_0$ ) was used previously as an interim rebuilding target to be achieved with 70% probability by 2035. A new interim TRP of  $30\%TRO_0$  to be achieved with 50% probability by 2035 is included as an objective in the new Management Procedure. The stock is currently estimated to be at the  $20\%TRO_0$  level.

**Harvest control rule:** Southern bluefin tuna is managed primarily through annual TACs. The MP HCR has three components, gene-tagging, CPUE and Close-Kin Mark Recapture indices; which are combined to estimate a TAC for a three-year period that would allow achieving both recovery targets.

**Management objectives:** The HCR incorporated as an objective, in addition to the previous interim recovery target as a performance metric, the new interim rebuilding target reference point of 30% of the original Total Reproductive Outcome by 2035 with 50% probability.

**Management Strategy Evaluation:** Ongoing (finalized for current HS).

**Management measures:**

TACs under the MP are set for three-year periods to maintain the stock on the planned rebuilding trajectory. The MP specifies the minimum and maximum permissible changes in TAC (either increase or decrease, depending on stock status relative to the rebuilding trajectory). The TAC for 2021 to 2023 remains at 17,647 tonnes.

Management status against MSC standard:

MSC PI no.	MSC Performance Indicator (PI)	Score	Evaluation
1.2.1	Harvest Strategy	95	Passing Score
1.2.2	Harvest control rules and tools	75	Condition Needed
1.2.3	Information / monitoring	90	Passing Score
1.2.4	Assessment of stock status	100	Passing Score

**SUMMARY**

SBT	ESTIMATE	YEARS	NOTES
RECENT CATCH	17	2021	
5-YEAR CATCH	16	2017-21	
MSY	33	2020	Range: 31-35
F/F <sub>MSY</sub>	0.52	2019	Range: 0.37-0.73
SSB/SSB <sub>MSY</sub>	0.69	2020	TRO used as proxy Range: 0.49-1.03
SSB/SSB <sub>0</sub>	0.20	2020	TRO used as proxy Range: 0.16-0.24
TAC	17.6	2021-2023	

*Catches, MSY and TAC in 1000 tonnes.*

STOCK ABUNDANCE		SSB < SSB <sub>MSY</sub> . Stock abundance is very low, between 16% and 24% of the unfished level. However, there is evidence that the stock is rebuilding as a result of the management procedure in place.
FISHING MORTALITY		F < F <sub>MSY</sub> .
ENVIRONMENT		69% of the catch is made by longlining. Several mitigation measures are in place (sea birds).
		29% of the catch is made by purse seining on free schools of southern bluefin.

*Last date of a change in Color Ratings: February, 2018.*

*Changes from the previous (February, 2015) Color Ratings: The SSB rating changed from Orange to Yellow, as there is evidence that the stock is rebuilding.*

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# Glossary and Acronyms

TERM	MEANING
<u>AIDCP</u>	The Agreement on the International Dolphin Conservation Program
<u>ALB</u>	Albacore tuna, <i>Thunnus alalunga</i> .
<u>AO</u>	Atlantic Ocean
<u>B</u>	Biomass. The total stock size, in weight.
<u>BET</u>	Bigeye tuna, <i>Thunnus obesus</i> .
<u>BFT</u>	Atlantic bluefin tuna, <i>Thunnus thynnus</i> .
<u>B<sub>MSY</sub></u>	(also "Biomass at MSY" or "MSY Biomass Level"). This is the stock size (biomass) that would result on average if FMSY was applied constantly year after year. BMSY is sometimes measured by the total biomass of the stock and sometimes by the biomass of the spawners ("spawning biomass", or SSB).
<u>CCSBT</u>	Commission for the Conservation of Southern Bluefin Tuna ( <a href="http://www.ccsbt.org">www.ccsbt.org</a> )
<u>EPO</u>	Eastern Pacific Ocean
<u>F</u>	Instantaneous fishing mortality rate, a measure of the intensity with which a stock is being exploited. The catch of a stock is roughly proportional to F multiplied by abundance.
<u>FAD</u>	Fish Aggregating Device. An inanimate object that attracts tunas and other marine life. In this report, "FAD" is used broadly for natural logs, as well as man-made objects, both anchored and drifting.
<u>FIP</u>	Fishery Improvement Project
Fishery Progress	<a href="http://FisheryProgress.org">FisheryProgress.org</a> is a web site that stores updated information on the progress of global fishery improvement projects (FIPs).
<u>F<sub>MSY</sub></u>	(also "Fishing Mortality at MSY" or "MSY Fishing Mortality Level"). This is the level of fishing intensity that, if applied constantly year after year, would result in MSY.
<u>Generation Length</u>	Generation length is the average age of parents of the current cohort (i.e. newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding individuals in a population.
<u>HCR</u>	Harvest Control Rules, one component of Harvest Strategies/Management Procedures
<u>IATTC</u>	Inter-American Tropical Tuna Commission ( <a href="http://www.iattc.org">www.iattc.org</a> )
<u>ICCAT</u>	International Commission for the Conservation of Atlantic Tunas ( <a href="http://www.iccat.int">www.iccat.int</a> )
<u>IO</u>	Indian Ocean
<u>IOTC</u>	Indian Ocean Tuna Commission ( <a href="http://www.iotc.org">www.iotc.org</a> )
<u>ISC</u>	International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean ( <a href="http://isc.ac.affrc.go.jp">isc.ac.affrc.go.jp</a> )
<u>LRP</u>	Limit Reference Point
<u>MSC</u>	<a href="http://www.msc.org">Marine Stewardship Council</a> .
<u>MSE</u>	Management Strategy Evaluation

<u>MSY</u>	The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. (For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others.)
<u>MP</u>	Management Procedure (also called Harvest Strategies)
<u>PBF</u>	Pacific bluefin tuna, <i>Thunnus orientalis</i>
<u>PNA</u>	<u>Parties to the Nauru Agreement</u>
<u>PO</u>	Pacific Ocean
<u>RFMO</u>	Regional Fishery Management Organization
<u>SBT</u>	Southern bluefin tuna, <i>Thunnus maccoyii</i>
<u>SH</u>	Southern hemisphere
<u>SIDS</u>	Small Island Developing States
<u>SKJ</u>	Skipjack tuna, <i>Katsuwonus pelamis</i>
<u>SPC / OFP</u>	Secretariat of the Pacific Community (Oceanic Fisheries Programme)
<u>SPR</u>	Spawning Potential Ratio. The amount of eggs produced by a fish stock over its lifespan under a specific fishing regime, relative to the spawn that would have been produced over the fish stock's lifespan if there were no fishing. It is a measure of the impact that fishing has on the ability of a fish stock to contribute to spawning.
<u>SSB</u>	Spawning stock biomass. The weight of spawners (usually females only) in the stock at any given time. SSB is a proxy for the reproductive output of a stock.
<u>SSB<sub>0</sub></u>	Spawning stock biomass at an unfished (F=0) level. Sometimes SSB <sub>F=0</sub> is used.
<u>SSB<sub>F=0</sub></u>	Spawning stock biomass that would be expected in the absence of fishing
<u>SSB<sub>MSY</sub></u>	(also "spawning biomass at MSY" or "MSY Biomass Level"). This is the stock size (biomass) of spawners that would result on average if F <sub>MSY</sub> was applied constantly year after year. SSB <sub>MSY</sub> is often measured by the biomass of female spawners.
<u>Stock</u>	In general, a stock is a biological unit of one species forming a group of similar ecological characteristics and, as a unit, is the subject of assessment and management. However, there are many uncertainties in defining spatial and temporal geographical boundaries for such biological units that are 100% compatible with established tuna RFMO Convention Areas. The stocks listed in this report correspond to the assessment/management units established by the tuna RFMOs, even if there is migration of the same species to and from adjacent areas.
<u>Stock Assessment</u>	The application of statistical and mathematical tools to relevant data in order to obtain a quantitative understanding of the status of the stock relative to management benchmarks (e.g. B <sub>MSY</sub> ) as needed to make quantitative predictions of the stock's reactions to alternative management measures.
<u>TAC</u>	Total Allowable Catch
<u>TRP</u>	Target reference point
<u>WCPFC</u>	Western and Central Pacific Fisheries Commission ( <a href="http://www.wcpfc.int">www.wcpfc.int</a> )
<u>WCPO</u>	Western and Central Pacific Ocean
<u>YFT</u>	Yellowfin tuna, <i>Thunnus albacares</i>

For extended definitions for these and other terms, please refer to the [ISSF Glossary](#).

# APPENDIX 1. Bycatch

## Impacts by gear type

All fishing gears have some level of environmental impact, and bycatch is one of the most noticeable ones. This summary presents the overall ratings given by default to various gear types. Deviations from these color ratings may occur for individual stocks, due to advice from the ISSF Scientific Advisory Committee; these are noted for each particular stock in which deviations may occur.

This summary is presented only for non-target (non-tuna) species. Note that in some ocean regions, fishing modes such as FAD-based purse seining and pole-and-line fishing can result in high catches of small individuals of bigeye and yellowfin, which are undesirable. In this stock status report, these impacts are measured directly under the status section for these stocks.

Sources of information used for these ratings include the following: Amandè et al. (2010), Clarke and Harley (2010), FAO (2009), Gillett (2011), Gilman (2011), Harley, et al. (2011), IATTC (2012), IOTC (2005), IOTC (2015), Matsumoto and Bayliff (2008), Morizura et al. (1999), Olson (2010), Pianet et al. (2010a), Pianet et al. (2010b), SPC/OFP (2008), SPC/OFP (2010) and Justel-Rubio and Restrepo (2015).

ORANGE

### GILLNET FISHING

Gillnet fisheries take substantial amounts of tunas in various ocean regions, especially in the Indian Ocean. For the most part, these are poorly monitored but it is known that they tend to catch many different species at the same time. Bycatch rates of many non-target species tends to be high. Large-scale driftnets are generally prohibited on the high seas but appear to continue to be used.

**Sharks.** Silky, oceanic whitetip and scalloped hammerhead sharks are common in gillnet fisheries. All of these species are of concern because of their low productivity and vulnerability to overfishing.

**Sea Turtles.** Sea turtle bycatch is thought to be highest in gillnet fisheries compared to other gears.

Sea birds. The incidental catch of sea birds in gillnet fisheries is largely unknown.

**Other finfish.** Gillnet operations catch a number of other finfishes. Some of these include very productive species such as dolphinfish ("mahi-mahi") that are not of immediate concern.

GREEN

### HANDLINES

This mode of fishing typically results in small bycatch rates.

ORANGE

### LONGLINING

**Sharks.** Longline fisheries tend to have very high catch rates of sharks (in some areas, 30% of the longline catches are sharks). In some cases the sharks can be a target of the fishing operations, at least for parts of a trip. Sharks caught include a wide range of species, some of which are thought to be resilient to fishing (blue shark), and others which are likely to be more vulnerable

because of their low reproductive rates (e.g., porbeagle and thresher sharks).

**Sea Turtles.** Some turtles are also caught in longline operations as bycatch, many of which are discarded (including live releases). All RFMOs have some type of mitigation measure in place. Roughly one half, or more, of the turtles caught are alive, so the main mitigation measures aim to dehook them and release them alive.

**Sea birds.** Some sea birds are also caught in longline operations as bycatch, especially in higher latitudes. Most (~90%) sea birds caught are dead when brought onboard, so the best practice for mitigation is to avoid their being hooked, which is the main type of mitigation measure used by the RFMOs. Of particular concern are albatrosses and petrels.

**Other finfish.** After tunas and sharks, longline operations catch a number of other finfishes. Some of these include very productive species such as dolphinfish ("mahi-mahi") that are not of immediate concern. Longlining also catches marlins, some of which are estimated to be overfished.

ORANGE

### MID-WATER TRAWLING

This mode of fishing has a small bycatch rate of cetaceans.

YELLOW

### POLE-AND-LINE FISHING

There are no major concerns with the catch of vulnerable non-target species by this gear. However, the method requires the use of live baitfish (small pelagics) that are used to keep the schools of tunas attracted to the fishing vessels while they are fished. The effects of fishing on these populations is largely unknown; however, they should be managed in order to support pole and line fisheries. Gillett (2011) notes that the amount of baitfish

available in the WCPO is a limiting factor to the amount of pole and line fishing that can occur. In addition, the bait species captured are generally more fragile than temperate baitfish species.

GREEN

### PURSE SEINING ON FREE SCHOOLS

This mode of fishing typically results in small bycatch rates of non-target species.

YELLOW

### PURSE SEINING ON FADS

Purse seining on FADs (anchored FADs, drifting FADs and natural logs) generally has bycatch rates of non-target species that are higher than those of free school sets.

**Sea Turtles.** The number of turtles that die in purse seine fishing operations is very small. Nevertheless, it is relatively easy to release turtles when caught alive and this is the main mitigation measures used by RFMOs.

**Sharks.** FAD purse seine fishing operations catch several species of sharks, some of which, based on catch trends, may have been declining in abundance in recent years, such as oceanic white tip and silky sharks. Entanglement can be a significant problem, especially if FAD designs use underwater netting materials with large mesh sizes. ISSF is advocating for RFMOs to require non-entangling designs.

**Sea birds.** Mortality of other sensitive species like seabirds in FAD operations is almost nonexistent.

**Other finfish.** FAD fishing does result in large catches of other finfish such as dolphinfish ("mahi-mahi"). Currently, it appears that these catches do not adversely impact the abundance of these species which are very productive and resilient to fishing. Rather, the main problem with these bycatches is one of utilization (waste), since the majority of these are discarded at sea so that the fish holding tanks can be reserved for the more valuable tunas.

YELLOW

### PURSE SEINING ON TUNA-DOLPHIN ASSOCIATIONS

**Marine mammals.** In the EPO, purse-seine fishermen have learned to take advantage of the association between yellowfin schools and herds of dolphins that is prevalent in the region. Fishermen maximize their catches of yellowfin by setting their nets around these associations. Mortality of dolphins was very high early on, but the IATTC estimates that it has since the late 1980s declined by 98% after fishermen and scientists developed techniques for releasing the dolphins alive after a set, and retaining the tunas. Some scientists believe that there is an un-quantified level of mortality after the sets, caused by stress, and this remains a controversial issue. Based on fishery-independent surveys, the abundance of most dolphin populations in the region was estimated to be either stable or increasing, while a few may have been declining. The last such survey was in 2006 and as a result there is uncertainty in the current status of those populations. Thus, the rating for this fishing method has changed from Green to Yellow (November, 2015). The Agreement on the International Dolphin Conservation Program (AIDCP) establishes allowable dolphin mortality limits; current (2011) levels are one-fourth of that level. There is a 100%-coverage observer program in place for these operations. Catches of non-target species in these operations are very small.

GREEN

### TROLLING

This mode of fishing typically results in very small bycatch rates of non-target species.

GREEN

### TUNA TRAPS

Migrating schools of bluefin tuna have been caught by traps that are fixed near the shoreline, especially in the eastern Atlantic and Mediterranean. Most of the catch in these traps consists of scombrids, including bluefin, and up to 99% of it is utilized. There are no major bycatch issues known with this passive gear, although it occasionally catches sharks.

## RFMO bycatch mitigation and monitoring

The following is a summary of the major mitigation and monitoring measures adopted by the various tuna RFMOs.

### CCSBT

**Sea birds, sharks and turtles.** With only one exception, all CCSBT Members and Cooperating Non-Members are also Parties or Cooperating Parties to IOTC, WCPFC and/or ICCAT. As a consequence, any binding bycatch mitigation measure of these RFMOs is in practice binding on the CCSBT Member/Cooperating Non-Member when fishing within that Convention Area. Additionally, the non-binding Recommendation to Mitigate the Impact on Ecologically Related Species - ERS - of Fishing for Southern Bluefin Tuna (updated 2011) strongly encourages CCSBT members to comply with mitigation measures on sea birds, sharks and sea turtles adopted by ICCAT, IOTC and WCPFC. The Resolution to align CCSBT's ERS measures with those of other tuna RFMOs (adopted in 2018 and revised in 2019) lists all ERS Measures in place.

**Sea birds.** Mandatory use of Tori poles is required by all members in all southern bluefin longline fisheries South of 30°S.

**Monitoring and mitigation research.** CCSBT members are required to exchange information concerning new or refined techniques to reduce incidental catch of seabirds and cooperate in developing and assessing the effectiveness of such techniques. Most CCSBT Members and Cooperating Non-Members have achieved 10% scientific observer coverage (in catch and effort) for their fisheries; the 10% level is a non-binding target.

### IATTC

**General.** Resolution 04-05 requires the release of non-target species caught in purse seine fisheries.

**Sea Turtles.** Resolution C-19-04 requires fishermen to release sea turtles sighted in purse seine nets or accidentally caught in longlines following the handling and release guidelines detailed in the resolution. CPC are also required to report annually information on sea turtle interactions. Resolution C-19-01 requires the use of non-entangling FADs in purse seine fisheries.

**Sharks.** Resolution C-16-04 discourages shark retention and establishes a limit in the amount of shark fins that can be landed, relative to the total weight of shark bodies that must be retained. This ratio of fin-to-body-weight acts as a disincentive to target sharks because the shark carcasses occupy hold space on the vessel and have little market value. The Resolution also mandates reporting of shark catches to IATTC. Resolution C-11-10 prohibits the retention of oceanic whitetip sharks and requires the release of specimens that are alive when caught. Resolution C-19-01 requires the use of non-entangling FADs in purse seine fisheries. Resolution C-19-06 prohibits deliberate setting on whale sharks. C-16-05 calls for a workplan for completing full stock assessments of silky and hammerhead sharks, and requires catch data collection for those species. C-19-05 defines other shark conservation measures with an emphasis on silky shark.

**Rays.** Resolution C-15-04 requires CPCs to prohibit retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of Mobulid rays and to release all Mobulid rays alive wherever

possible.

**Sea birds.** The IATTC Resolution C-11-02 requires longline vessels operating in high latitudes (North of 23°N, South of 30°S and around the Galapagos Islands) to employ at least two sea bird mitigation techniques such as night setting or weighted branch lines.

**Dolphins.** The AIDCP establishes total per-stock and per-year limits on incidental dolphin mortality (DMLs), with a structured protocol for allocating and keeping track of DMLs (using observers). A vessel must stop setting on dolphin associations for the rest of the year once its DML has been reached.

**Monitoring and mitigation research.** Through the Agreement on the International Dolphin Conservation Program (AIDCP), there is 100% observer coverage on all large purse seiners (> 363 tons in carrying capacity) and lower coverage on smaller vessels. This level of observer coverage, coupled with the information from fishing logbooks, allows the IATTC to maintain a very complete accounting of the bycatch taken in purse seine fisheries in the EPO. Several IATTC Recommendations and Resolutions encourage research that could make FAD-based purse seining and longlining more species-selective. These are non-binding, however, and depend on the IATTC member nations making the necessary resources available. ISSF has a research program for bycatch mitigation in purse seine fisheries, and IATTC scientists are taking part in this program (IATTC, 2010). Resolution C-11-08 now requires 5% scientific observer coverage for large longliners.

NOTE: Major fleets such as Japan that use longlining in the EPO reported catches of non-target species to IATTC (particularly sharks and billfishes; Matsumoto and Bayliff, 2008), and in this sense they were relatively better than longline fleets elsewhere. However, it is apparent that this level of monitoring and reporting has not been maintained.

### ICCAT

**General.** Recommendation 19-02 requires that all FADs deployed are non-entangling and, as of January 2021, constructed from biodegradable materials with the exception of FAD tracking buoys.

**Sharks.** Recommendation 04-10 established a limit on the ratio of fin weight to total shark weight that can be retained onboard a fishing vessel, and encouraged the release of live sharks in fisheries that do not target sharks. Recommendation 07-06 limits mortality on porbeagle and North Atlantic shortfin mako (SMA). Recommendation 14-06 aims to improve data collection and reporting for SMA. Recommendation 16-12 (amended by Rec. 19-07 and Rec.21-10) and Rec. 19-08 (amended by Rec. 21-11) establish limits on catches, aims to improve data collection and encourages scientific research on North Atlantic and South Atlantic blue sharks, respectively. Recommendation 15-06 prompts CPCs to promptly release unharmed and to ensure the collection of Task I and Task II data for porbeagle

sharks. Recommendations 09-07, 10-07, 10-08 and 11-08 prohibit the retention on board of bigeye thresher, oceanic white tip, several species of hammerhead sharks, and silky sharks. All of these measures have a reporting requirement associated with them (Recommendation 12-05 requires all parties in 2013 to report on their compliance with Recs. 04-10, 07-06, 09-07, 10-08, 10-07, 11-08, and 11-15). Recommendation 10-06 prohibits the retention of shortfin mako onboard vessels flagged to countries that do not report catches for this species. Rec. 21-09 lays a rebuilding programme for SMA including a prohibition on retaining on board, transshipping and landing, whole or in part in 2022-2023. Rec. 2022-11 sets a management plan for southern SMA. Recommendation 18-06 prompts CPCs to submit a check sheet with details of their implementation of and compliance with shark conservation and management measures.

**Sea Turtles.** Recommendations 10-09 and 13-11 (combined and amended in Rec. 2022-12) set up reporting requirements for sea turtle interactions and mandates its scientific committee to assess, by 2014, the impact of tuna fisheries on sea turtle populations. The measure has specific requirements for longline operators to be trained on appropriate handling and release of live turtles so as to maximize their survival.

**Sea birds.** Recommendation 07-07 required longliners operating south of 20°S to use at least two of several mitigation measures such as weighted branch lines or tori (bird-scaring) lines. The measure also required ICCAT members to collect and report data on interactions between fisheries and sea birds. Recommendation 11-09 strengthened the mitigation measures in 07-07, especially for longliners fishing south of 25°S, and in the Mediterranean.

**Other finfish.** Longliners and other fisheries also take Atlantic blue and white marlin as bycatch, both of which are thought to be overfished. ICCAT adopted Recommendation 06-09 (now Rec. 19-05), which includes a rebuilding plan with catch limits by country for blue and white marlins and minimum standards for safe handling and live release procedures. Rec. 18-05 requires that all CPCs submit a check sheet with details of their implementation of and compliance with billfish conservation and management measures.

**Monitoring and mitigation research.** ICCAT has specific requirements for reporting data on sharks, sea turtles and sea birds. For the most part these are not complied with fully, but the situation is improving over time. Recommendation 10-10 requires members to have at least 5% observer coverage (for vessels over 15 m) in their national observer programs for longline, purse seine and pole-and-line fisheries. Recommendation 11-10 requires CPCs to collect and report data on bycatch and discards either through observer programs and logbooks (for vessels to which Rec. 10-10 applies) or via alternative means (for artisanal and semi-industrial fisheries). Recommendation 11-15 establishes penalties for CPCs that do not report annual catch data (including zero catches) by prohibiting them from retaining such species in the following year.

## IOTC

**Sharks.** The IOTC has adopted measures that address shark conservation concerns. Resolution 17/05 established that CPCs shall take the necessary

measures to require that their fishermen fully utilize their entire catches of sharks, with the exception of species prohibited by the IOTC. Resolution 18/02 asks CPCs to ensure that effective management measures are in place to support the sustainable exploitation of blue shark by improving data reporting and scientific research.

Resolution 12/09 prohibits the retention on board of all species of thresher sharks, a group that is thought to be particularly vulnerable due to its low productivity. In addition, Resolution 12/09 requires data reporting to IOTC, especially for fisheries targeting sharks.

Resolution 13/05 prohibits intentional purse seine setting on tunas associated with whale sharks. Resolution 13/06 prohibits the retention of oceanic whitetip sharks. Resolution 19/02 calls for the use of non-entangling FADs in purse seine fisheries and a transition to biodegradable FADs by 2022.

**Rays.** Resolution 19/03 prohibits intentional setting on mobulid rays as well as retaining onboard, transshipping, landing or storing any part or whole carcass. Live release handling procedures are detailed in the resolution.

**Sea Turtles.** Resolution 12/04 (which supersedes various prior measures) requires IOTC members to mitigate sea turtle mortality and to provide data on turtle bycatch to the SC. The measure has specific requirements for longline and purse seine operators to facilitate the appropriate handling and release of live turtles. Resolution 19/02 calls for the use of non-entangling FADs in purse seine fisheries and a transition to biodegradable FADs by 2022.

**Sea birds.** Resolution 12/06 (which supersedes various prior measures) requires longliners operating south of 25°S to use at least two of several mitigation measures such as weighted branch lines or tori (bird-scaring) lines. The measure also requires IOTC members to provide data on interactions between fisheries and sea birds to the SC.

**Cetaceans.** Resolution 13/02 prohibits deliberate purse seine sets around cetaceans and requires reporting of interactions.

**Other finfish.** Resolution 18/05 requires IOTC members to ensure that the level of catches of striped marlin, black marlin, blue marlin and indo-pacific sailfish do not exceed their MSY level (or proxy). It also requires the release of specimens of those species if brought alive on board.

**Monitoring and mitigation research.** Resolution 10/04 established a regional observer program that requires at least 5% coverage for vessels over 24 m, and for smaller vessels operating in the high seas. Resolution 08/04 requires longliners greater than 24 m overall, as well as smaller longliners operating in the high seas, to have electronic logbooks and record and report data on target and non-target species to the SC. Monitoring of bycatches in the gillnet fisheries is extremely poor.

## WCPFC

**Sea Turtles.** CMM 2018-04 instructs WCPFC members to implement the FAO guidelines for reducing sea turtle mortality and ensure the safe handling of all captured sea turtles. It requires longline operators to use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled. The measure also requires purse seine operators to avoid setting on turtles if possible and to disentangle/release them when caught alive.

**Sharks.** CMM 2022-04 on conservation and management measures for sharks replaces all previous shark related CMMs (2019-04, 2010-07, 2011-04, 2012-04, 2013-08 and 2014-05). This CMM covers measures such as full utilization of sharks and prohibition of finning, data reporting of shark retentions and releases by gear type and species, minimizing bycatch and practicing safe release (following the adopted Best Handling Practices for the Safe Release of Sharks), prohibition of deliberate purse seine sets around whale sharks, requirement to report interactions and safe release following the WCPFC Guidelines for the Safe Release of Encircled Whale Sharks. CMM 2019-05 prohibits targeted fishing or intentional setting on mobulid rays, or the retention, transshipping or landing of any part of whole carcass. It includes best handling practices for the safe release of mantas and mobulids.

**Sea birds.** CMM 2018-03 sets specific requirements for longliners operating north of 23°N, between 25-30°S or south of 30°S on the use of seabird bycatch mitigation measures such as weighted branch lines, tori (bird-scaring) lines or hook-shielding devices. The measure also encourages mitigation research to be conducted by WCPFC members.

**Cetaceans.** CMM-2011-03 prohibits deliberate purse seine sets around cetaceans and requires reporting of interactions.

**Other finfish.** Striped marlin are also caught as bycatch in longline fisheries; this species is of more concern because it has been declining in abundance. The WCPFC adopted CMM 2010-01 which sets a cap on the catch of striped marlin for each member relative to historical levels.

**Monitoring and mitigation research.** With the exception of sharks under CMM 2009-04, reporting of bycatch species is not mandatory at WCPFC, so much of the information available comes from observer programs. The WCPFC has a Regional Observer Program that, since 2010, is intended to have 100% coverage on purse seine vessels that fish on the high seas or between two or more EEZs. As these data become available and are analyzed by the Scientific Committee, monitoring should improve. National observer programs are also run by WCPFC members, but it is not clear that all of the bycatch information collected in those programs is made available to the SC for integrated analyses. For longline fisheries, observer coverage is poor overall. Much of the information available is from bilateral EEZ access agreements in Pacific Island countries. Observer coverage for distant-water fleets is extremely low.

## APPENDIX 2. Version Log

DATE	TECH REP. <sup>24</sup>	CHANGES
03/2023	2023-01	<ul style="list-style-type: none"> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide management</li> <li>- Updated ICCAT management</li> <li>- Updated IOTC catch data and stock status</li> <li>- Some changes in report structure and contents</li> </ul>
11/2022	2022-15	<ul style="list-style-type: none"> <li>- Updated IATTC catch data</li> <li>- Updated WCPFC catch data and stock status</li> <li>- Updated Pacific-Wide catch data, stock status and management</li> <li>- Updated ICCAT catch data and stock status</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
07/2022	2022-13	<ul style="list-style-type: none"> <li>- Updated IATTC catch data and stock status</li> <li>- Updated IOTC management</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
03/2022	2022-04	<ul style="list-style-type: none"> <li>- Updated IATTC catch data and management</li> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide management</li> <li>- Updated ICCAT catch data, stock status and management</li> <li>- Updated IOTC catch data and stock status</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
09/2021	2021-13	<ul style="list-style-type: none"> <li>- Updated IATTC catch data and stock status</li> <li>- Updated WCPFC catch data</li> <li>- Updated Pacific-Wide catch data, stock status and management</li> <li>- Updated IOTC management</li> <li>- Updated MSC-certified fisheries by stock</li> <li>- Added SSB/SSB<sub>f=0</sub> values to stock summary tables</li> </ul>
03/2021	2021-10	<ul style="list-style-type: none"> <li>- Updated IATTC management</li> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide management</li> <li>- Updated ICCAT management</li> <li>- Updated IOTC catch data, stock status and management</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
11/2020	2020-16	<ul style="list-style-type: none"> <li>- Updated IATTC catch data and stock status</li> <li>- Updated WCPFC catch data and stock status</li> <li>- Updated Pacific-Wide catch data and stock status</li> <li>- Updated ICCAT catch data and stock status</li> <li>- Updated CCSBT catch data, stock status and management</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>

<sup>24</sup> Earlier versions of the report can be requested by e-mail ([info@iss-foundation.org](mailto:info@iss-foundation.org))

03/2020	2020-12	<ul style="list-style-type: none"> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide management</li> <li>- Updated ICCAT catch data, stock status and management</li> <li>- Updated IOTC catch data and stock status</li> <li>- Updated CCSBT catch data, stock status and management</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
10/2019	2019-12	<ul style="list-style-type: none"> <li>- Updated IATTC catch data, stock status and management</li> <li>- Updated IOTC management</li> <li>- Updated WCPFC catch data and stock status</li> <li>- Updated Pacific-Wide catch data</li> <li>- Added Management status against MSC standard for each stock</li> </ul>
03/2019	2019-07	<ul style="list-style-type: none"> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide management</li> <li>- Updated ICCAT management</li> <li>- Updated IOTC catch data and stock status</li> <li>- Updated CCSBT catch data and stock status</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
10/2018	2018-21	<ul style="list-style-type: none"> <li>- Updated IATTC catch data, stock status and management</li> <li>- Updated WCPFC catch data and stock status</li> <li>- Updated Pacific-Wide catch data, stock status and management</li> <li>- Updated ICCAT catch data and stock status</li> <li>- Updated IOTC management</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
02/2018	2018-02	<ul style="list-style-type: none"> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide management</li> <li>- Updated ICCAT management</li> <li>- Updated IOTC catch data and stock status</li> <li>- Updated CCSBT catch data, stock status and management.</li> <li>- Updated MSC-certified fisheries by stock</li> </ul>
10/2017	2017-02A	<ul style="list-style-type: none"> <li>- Updated IATTC catch data, stock status and management</li> <li>- Updated WCPFC catch data and stock status</li> <li>- Updated Pacific-Wide catch data and stock status</li> <li>- Updated ICCAT catch data and stock status</li> <li>- Updated IOTC management</li> <li>- Harmonized stock status plots ("Kobe plots")</li> <li>- Added MSC-certified fisheries by stock</li> </ul>
02/2017	2017-02	<ul style="list-style-type: none"> <li>- Updated IATTC catch data and management</li> <li>- Updated WCPFC management</li> <li>- Updated Pacific-Wide catch data and management</li> <li>- Updated ICCAT management</li> <li>- Updated IOTC catch data and stock status</li> </ul>
11/2016	2016-05B	<ul style="list-style-type: none"> <li>- Updated ICCAT catch data and stock status</li> <li>- Updated IATTC management of PBF.</li> <li>- Updated CCSBT catch data and management of southern bluefin.</li> </ul>
09/2016	2016-05A	<ul style="list-style-type: none"> <li>- Updated IATTC catch data, stock status and management</li> <li>- Updated WCPFC catch data and stock status</li> <li>- Updated Pacific-Wide catch data, stock status and management</li> <li>- Updated IOTC catch data and management</li> </ul>

02/2016	2016-05	<ul style="list-style-type: none"> <li>- Updated IATTC catch data</li> <li>- Updated WCPFC catch data and management</li> <li>- Updated Pacific-Wide catch data and management</li> <li>- Updated ICCAT catch data and management</li> <li>- Updated IOTC catch data and stock status</li> <li>- Updated CCSBT catch data</li> </ul>
11/2015	2015-03A	<ul style="list-style-type: none"> <li>- Updated IATTC catch data, stock status and management</li> <li>- Updated WCPFC catch data</li> <li>- Updated Pacific-Wide catch data, stock status</li> <li>- Updated ICCAT catch data, stock status</li> <li>- Updated IOTC management</li> <li>- Changed Purse Seine - Dolphin-tuna assoc. fishing method rating from Green to Yellow</li> </ul>
02/2015	2015-03	<ul style="list-style-type: none"> <li>- Updated WCPFC catch data and management</li> <li>- Updated ICCAT stock status and management</li> <li>- Updated IOTC stock status</li> <li>- Updated CCSBT stock status and management</li> <li>- Updated PBF management</li> </ul>
08/2014	2014-09	<ul style="list-style-type: none"> <li>- Updated IATTC stock status and management</li> <li>- Updated WCPFC stock status</li> <li>- Updated IOTC management</li> <li>- Updated Pacific-wide stock status</li> </ul>
12/2013	2013-04B	<ul style="list-style-type: none"> <li>- Updated ICCAT stock status and management</li> <li>- Updated IOTC stock status</li> <li>- Updated WCPFC stock status and management</li> <li>- Updated CCSBT management</li> </ul>
08/2013	2013-04A	<ul style="list-style-type: none"> <li>- Updated IATTC stock status</li> <li>- Updated Pacific bluefin</li> <li>- Updated IATTC management measures</li> <li>- Updated IOTC management measures</li> </ul>
04/2013	2013-04	<ul style="list-style-type: none"> <li>- Updated WCPFC catch data</li> <li>- Separated gillnet catches from "other" gears in the IO</li> <li>- Disaggregated Pacific-wide stocks</li> <li>- Added section on HCRs and Reference points for each stock</li> </ul>
12/2012	2012-04B	<ul style="list-style-type: none"> <li>- Updated ICCAT stock status and management</li> <li>- Updated WCPFC stock status and management for tropical tunas</li> <li>- Updated Pacific-wide stock status</li> <li>- Updated CCSBT status and management</li> <li>- Updated general introduction</li> <li>- Modified life-history tables (K. Schaefer review)</li> </ul>
07/2012	2012-04A	<ul style="list-style-type: none"> <li>- Updated EPO stock status</li> <li>- Updated WCPFC, IOTC and IATTC conservation measures adopted in 2012</li> <li>- Corrected F status for North Pacific albacore</li> <li>- Updated Pacific bluefin catches</li> </ul>
04/2012	2012-04	<ul style="list-style-type: none"> <li>- Added 4 bluefin stocks</li> <li>- Reformatted entire report</li> <li>- Added Exec. Summary, Glossary and Introductory sections</li> <li>- Reorganized presentation of stocks to match regions</li> </ul>
12/2011	2011-04C	<ul style="list-style-type: none"> <li>- Updated IO stock status to reflect 12/2011 IOTC SC meeting</li> <li>- Updated AO management to reflect 11/2011 ICCAT Comm. meeting</li> </ul>
11/2011	2011-04B	<ul style="list-style-type: none"> <li>- Updated AO stock status to reflect 10/2011 ICCAT SCRS meeting</li> <li>- Updated WCPO stock status to reflect 08/2011 WCPFC SC meeting</li> </ul>

08/2011	2011-04A	- Updated EPO management to reflect 06/2011 IATTC Comm. Meeting Note: Doc header erroneously labeled "May" instead of "August"
05/2011	2011-04	- Updated EPO stock status to reflect 05/2011 IATTC SAC meeting - Added new rating factor Environment (bycatch) - Added more exhaustive information on RFMO resolutions
02/2011	--	- IOTC stock status update
10/2010	--	- ICCAT stock status update
09/2010	--	- WCPFC stock status update
09/2010	--	- IATTC stock status update
05/2010	--	- Updated entire report - Added color ratings for F and Biomass
05/2009	--	- First stock status report for 19 stocks



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