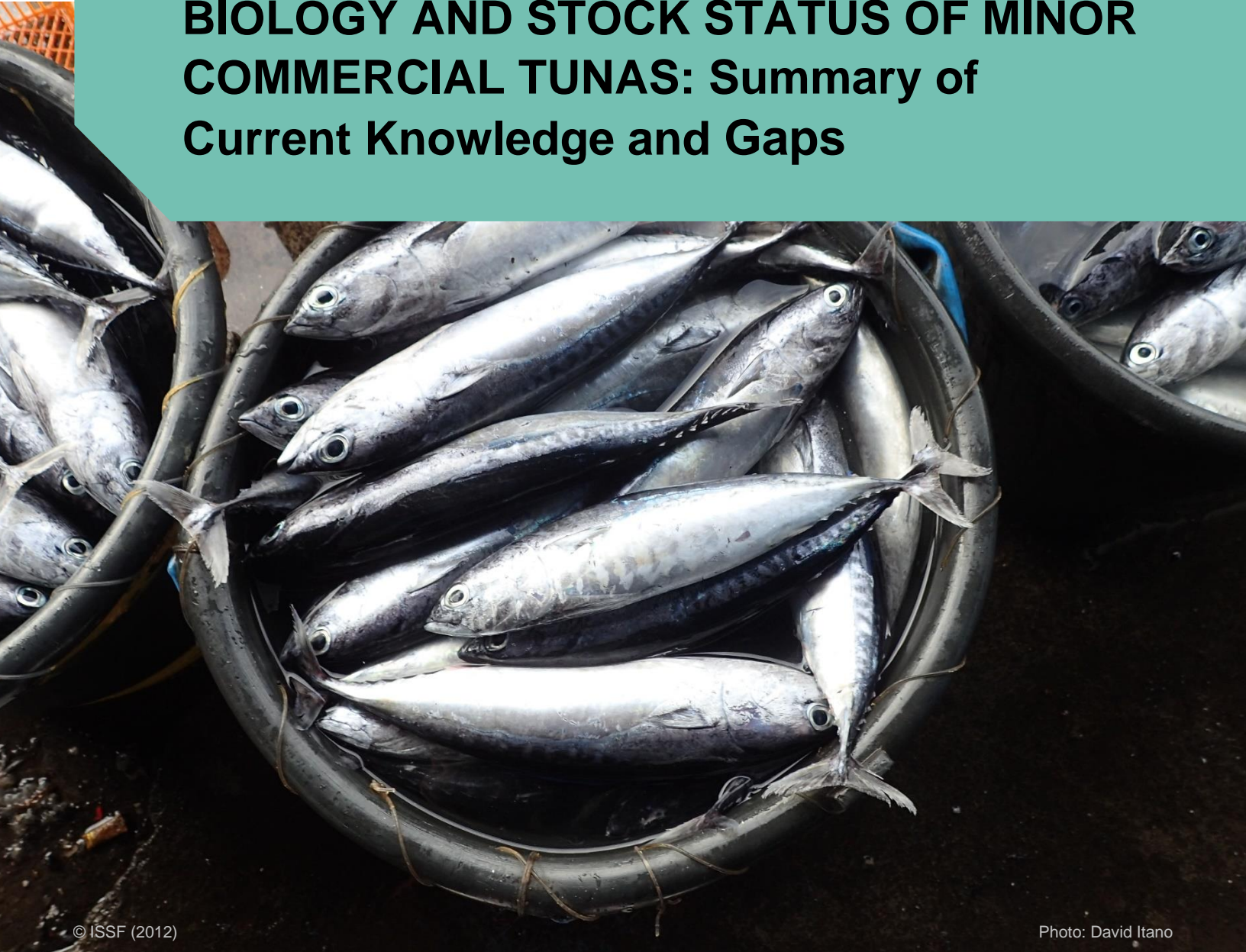


# BIOLOGY AND STOCK STATUS OF MINOR COMMERCIAL TUNAS: Summary of Current Knowledge and Gaps



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Lorena Recio, Hilario Murua and Víctor Restrepo / February 2022

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**Topic Categories:** Tuna stock status, neritic tunas

# Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	<b>7</b>
<b>INTRODUCTION</b> .....	<b>9</b>
<b>Background</b> .....	<b>9</b>
<b>Purpose</b> .....	<b>12</b>
<b>METHODOLOGY</b> .....	<b>13</b>
<b>Review of neritic tuna species information</b> .....	<b>13</b>
<b>Ratings methodology</b> .....	<b>13</b>
<b>SMALL TUNA SPECIES</b> .....	<b>15</b>
<b>Slender Tuna - <i>Allothunnus fallai</i></b> .....	<b>15</b>
BIOLOGY .....	15
STOCK STRUCTURE .....	16
RECENT CATCH.....	16
MAIN FISHING GEARS .....	17
STOCK ASSESSMENT .....	17
STOCK STATUS .....	17
MANAGEMENT MEASURES .....	17
<b>Frigate Tuna - <i>Auxis thazard</i></b> .....	<b>18</b>
BIOLOGY .....	18
STOCK STRUCTURE .....	18
<b>Atlantic Frigate Tuna</b> .....	<b>19</b>
MANAGEMENT UNIT .....	19
RECENT CATCH.....	19
MAIN FISHING GEARS .....	20
STOCK ASSESSMENT .....	20
STOCK STATUS .....	20
MANAGEMENT MEASURES .....	20
<b>Eastern Pacific Frigate Tuna</b> .....	<b>21</b>
MANAGEMENT UNIT .....	21
RECENT CATCH.....	21
MAIN FISHING GEARS .....	22

STOCK ASSESSMENT .....	22
STOCK STATUS .....	22
MANAGEMENT MEASURES .....	22
<b>Indian Ocean Frigate Tuna .....</b>	<b>22</b>
MANAGEMENT UNIT .....	22
RECENT CATCH.....	22
MAIN FISHING GEARS .....	23
STOCK ASSESSMENT .....	23
STOCK STATUS .....	23
MANAGEMENT MEASURES .....	24
<b>Western and Central Pacific Frigate Tuna .....</b>	<b>24</b>
MANAGEMENT UNIT .....	24
RECENT CATCH.....	24
MAIN FISHING GEARS .....	25
STOCK ASSESSMENT .....	25
STATUS .....	25
MANAGEMENT MEASURES .....	25
<b>Bullet tuna - <i>Auxis rochei</i>.....</b>	<b>26</b>
BIOLOGY.....	26
STOCK STRUCTURE .....	26
<b>Atlantic Bullet Tuna .....</b>	<b>27</b>
MANAGEMENT UNIT .....	27
RECENT CATCH.....	27
MAIN FISHING GEARS .....	28
STOCK ASSESSMENT .....	28
STOCK STATUS .....	28
MANAGEMENT MEASURES .....	28
<b>Eastern Pacific Bullet Tuna .....</b>	<b>28</b>
MANAGEMENT UNIT .....	28
RECENT CATCH.....	28
MAIN FISHING GEARS .....	29
STOCK ASSESSMENT .....	29
STOCK STATUS .....	29
MANAGEMENT MEASURES .....	29
<b>Indian Ocean Bullet Tuna.....</b>	<b>30</b>

MANAGEMENT UNIT .....	30
RECENT CATCH.....	30
MAIN FISHING GEARS .....	30
STOCK ASSESSMENT .....	30
STOCK STATUS .....	31
MANAGEMENT MEASURES .....	31
<b>Western and Central Pacific Bullet Tuna.....</b>	<b>31</b>
MANAGEMENT UNIT .....	31
RECENT CATCH.....	31
MAIN FISHING GEARS .....	32
STOCK ASSESSMENT .....	32
STOCK STATUS .....	32
MANAGEMENT MEASURES .....	33
<b>Kawakawa or Mackerel tuna - <i>Euthynnus affinis</i> .....</b>	<b>34</b>
BIOLOGY.....	34
STOCK STRUCTURE .....	35
<b>Indian Ocean Kawakawa .....</b>	<b>35</b>
MANAGEMENT UNIT .....	35
RECENT CATCH.....	35
MAIN FISHING GEARS .....	36
STOCK ASSESSMENT .....	36
STOCK STATUS .....	36
MANAGEMENT MEASURES .....	37
<b>Western and Central Pacific Kawakawa .....</b>	<b>37</b>
MANAGEMENT UNIT .....	37
RECENT CATCH.....	37
MAIN FISHING GEARS .....	38
STOCK ASSESSMENT .....	38
STOCK STATUS .....	38
MANAGEMENT MEASURES .....	39
<b>Little tunny - <i>Euthynnus alletteratus</i> .....</b>	<b>40</b>
BIOLOGY.....	40
STOCK STRUCTURE .....	41
<b>Atlantic Little Tunny.....</b>	<b>41</b>
MANAGEMENT UNIT .....	41

RECENT CATCH.....	41
MAIN FISHING GEARS .....	42
STOCK ASSESSMENT .....	42
STOCK STATUS .....	42
MANAGEMENT MEASURES .....	43
<b>Black skipjack - <i>Euthynnus lineatus</i> .....</b>	<b>44</b>
BIOLOGY .....	44
STOCK STRUCTURE .....	45
<b>Eastern Pacific Black Skipjack .....</b>	<b>45</b>
MANAGEMENT UNIT .....	45
RECENT CATCH.....	45
MAIN FISHING GEARS .....	46
STOCK ASSESSMENT .....	46
STOCK STATUS .....	46
MANAGEMENT MEASURES .....	46
<b>Longtail tuna - <i>Thunnus tonggol</i> .....</b>	<b>47</b>
BIOLOGY.....	47
STOCK STRUCTURE .....	48
<b>Indian Ocean Longtail Tuna .....</b>	<b>48</b>
MANAGEMENT UNIT .....	48
RECENT CATCH.....	48
MAIN FISHING GEARS .....	49
STOCK ASSESSMENT .....	50
STOCK STATUS .....	50
MANAGEMENT MEASURES .....	50
<b>Western and Central Pacific Longtail Tuna .....</b>	<b>51</b>
MANAGEMENT UNIT .....	51
RECENT CATCH.....	51
MAIN FISHING GEARS .....	51
STOCK ASSESSMENT .....	52
STOCK STATUS .....	52
MANAGEMENT MEASURES .....	52
<b>Blackfin tuna - <i>Thunnus atlanticus</i>.....</b>	<b>53</b>
BIOLOGY.....	53
STOCK STRUCTURE .....	54

<b>Atlantic Blackfin tuna .....</b>	<b>54</b>
MANAGEMENT UNIT .....	54
RECENT CATCH.....	54
MAIN FISHING GEARS .....	55
STOCK ASSESSMENT .....	55
STOCK STATUS .....	55
MANAGEMENT MEASURES .....	56
<b>BIBLIOGRAPHY .....</b>	<b>57</b>

# Executive Summary

Among the 15 species of tunas, eight are called “minor” or “neritic” tunas due to their currently lower commercial value. But minor tunas still are exploited commercially and/or caught recreationally. Those species are the slender (*Allothunnus fallai*), frigate (*Auxis thazard*), bullet (*Auxis rochei*), black skipjack (*Euthynnus lineatus*), longtail (*Thunnus tonggol*), kawakawa (*Euthynnus affinis*), little tunny (*Euthynnus alleteratus*) and blackfin (*Thunnus atlanticus*) tunas. They are very important for the food security of coastal communities, and some species — like longtail tuna — have become among the main market tuna species in some regions.

The annual reported catch of minor tunas totals about 1.1 million tonnes, compared to the 5.3 million tonnes of major commercial tunas. Nonetheless, the minor tunas complex are a very important source of both nutrition for coastal communities and income for coastal artisanal and subsistence fisheries and could increase in commercial importance into the future. The general lack of current importance relative to the major commercial tunas and common feature that many of these minor tuna species are taken as bycatch in industrial fleets or targeted by artisanal and subsistence ones, leads to greater uncertainty about catch levels and stock characteristics, thus limiting information for assessing fishery impact on stock status.

This document summarizes knowledge about the biology, stock structure, and recent catch of minor tunas; the main fisheries and fishing gears catching them; and their stock status in different oceans. The report reviews the information available in the literature about their life-history characteristics, fisheries and stock status provided by the different tuna RFMOs and identifies the knowledge gaps that can inform research priorities.

In summary, tuna RFMOs consider 16 stocks of eight species of neritic tunas. Only two of those stocks (12.5%) are assessed by tuna RFMOs (**Table 1**): One is assessed as overfished and subject to overfishing (Indian Ocean longtail tuna), and the other is assessed as neither overfished nor subject to overfishing (Indian Ocean kawakawa).

The report finds that there are substantial gaps in knowledge about these species. Filling the knowledge gaps would allow for improved monitoring and management of these important resources.

Table 1. Stock assessment availability, Spawning biomass (SSB), and Fishing Mortality (F) ratings for 16 neritic tuna stocks. The table is sorted by species. Catch, in thousands of tonnes, is for 2020 for Atlantic Ocean (AO) and Eastern Pacific Ocean (EPO) stocks and 2019 for Indian Ocean (IO) and Western and Central Pacific Ocean (WCPO) stocks. For an explanation of the methodology for assigning ratings, see **Table 3**.

STOCK	CATCH	STOCK ASSESSMENT	SSB	F
<b>Slender tuna</b>				
<a href="#">WW-SLT</a>	0.34	Not available		
<b>Frigate tuna</b>				
<a href="#">AO-FRI</a>	13	Not available		
<a href="#">EPO-FRI</a>	85*	Not available		
<a href="#">IO-FRI</a>	99	Not available		
<a href="#">WCPO-FRI</a>	235*	Not available		
<b>Bullet tuna</b>				
<a href="#">AO-BLT</a>	3.5	Not available		
<a href="#">EPO-BLT</a>	85*	Not available		
<a href="#">IO-BLT</a>	24	Not available		
<a href="#">WCPO-BLT</a>	235*	Not available		
<b>Kawakawa</b>				
<a href="#">IO-KAW</a>	149	Yes		
<a href="#">WCPO-KAW</a>	166	Not available		
<b>Little tunny</b>				
<a href="#">AO-LTA</a>	9.7	Not available		
<b>Black skipjack</b>				
<a href="#">EPO-BKJ</a>	4.3	Not available		
<b>Longtail tuna</b>				
<a href="#">IO-LOT</a>	113	Yes		
<a href="#">WCPO-LOT</a>	100	Not available		
<b>Blackfin Tuna</b>				
<a href="#">AO-BLF</a>	2.5	Not available		

\*Includes catch data of both frigate and bullet tuna.

# Introduction

## Background

Each year, ISSF makes several updates to its report Status of the World Fisheries for Tuna. The report covers the 23 stocks of seven so-called “major commercial” or principal market tuna species (albacore, bigeye, three species of bluefin, skipjack and yellowfin).

However, there are eight other tuna species from the tribe Thunnini of the Family Scombridae (**Table 2**), the so-called minor or neritic tunas: slender (*Allothunnus fallai*), frigate (*Auxis thazard*), bullet (*Auxis rochei*), black skipjack (*Euthynnus lineatus*), longtail (*Thunnus tonggol*), kawakawa (*Euthynnus affinis*), little tunny (*Euthynnus alleteratus*) and blackfin (*Thunnus atlanticus*) tunas, which are also exploited commercially and/or recreationally. The phylogeny tree of all species of the tribe Family Scombridae and the tribe Thunnini is shown in **Figure 1**.

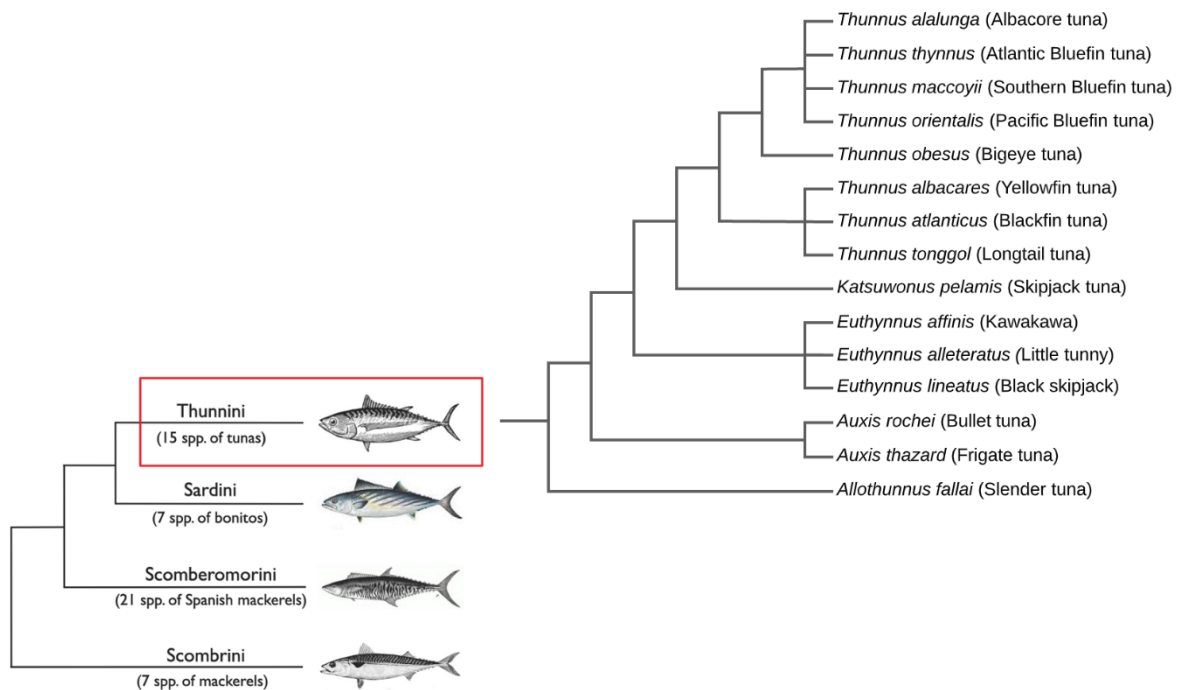


Figure 1. Morphological phylogeny of Scombridae (left) and the phylogenetic tree of Thunnini tribe (adapted from Juan-Jorda et al., 2013a and Bernal et al., 2001).

Table 2. List of tuna species of the Thunnini tribe of the Scombridae Family describing their habitats, environments and geographic distributions (adapted from Juan-Jorda *et al.*, 2013a).

Latin name	Common name	Commercial denomination	Climate	Environment	Distribution
<b><i>Thunnus alalunga</i></b>	Albacore tuna	Major	Subtropical	Oceanic	Atlantic, Pacific and Indian oceans, including the Mediterranean Sea
<b><i>Thunnus albacares</i></b>	Yellowfin tuna	Major	Tropical	Oceanic	Atlantic, Pacific and Indian oceans
<b><i>Thunnus atlanticus</i></b>	Blackfin tuna	Minor	Tropical	Neritic	Western Atlantic
<b><i>Thunnus maccoyii</i></b>	Southern bluefin tuna	Major	Temperate	Oceanic	Southern waters of the Atlantic, Pacific and Indian oceans
<b><i>Thunnus obesus</i></b>	Bigeye tuna	Major	Subtropical	Oceanic	Atlantic, Pacific and Indian oceans
<b><i>Thunnus thynnus</i></b>	Atlantic bluefin tuna	Major	Temperate	Oceanic	Atlantic ocean
<b><i>Thunnus orientalis</i></b>	Pacific bluefin tuna	Major	Temperate	Oceanic	Pacific Ocean
<b><i>Thunnus tonggol</i></b>	Longtail tuna	Minor	Tropical	Neritic	Northern Indian Ocean
<b><i>Katsuwonus pelamis</i></b>	Skipjack tuna	Major	Tropical	Oceanic	Atlantic, Pacific and Indian oceans
<b><i>Euthynnus affinis</i></b>	Kawakawa	Minor	Tropical	Neritic	Indian Ocean, Indo-Pacific region
<b><i>Euthynnus alleteratus</i></b>	Little tunny	Minor	Tropical	Neritic	Atlantic Ocean, including the Mediterranean and Black seas

Major tuna species are widely distributed throughout the tropical, subtropical and temperate waters of the world's oceans, and they are well adapted to the pelagic environment. They show wide life-history patterns (Juan-Jorda *et al.*, 2013a) and sustain some of the largest fisheries in the world, both large-scale industrial commercial and small-scale traditional and artisanal fisheries. Therefore, they are a very important natural resources for food security worldwide (Majkowski, 2007).

The minor or neritic tunas show in general a more coastal distribution and are mostly distributed along the continental shelves or oceanic islands. While the economic value of minor tunas is lower than that of the main tuna commercial species, minor tunas can reach high values for locally supporting artisanal fisheries. They also are an important protein source in coastal communities (Majkowski, 2007). These species are mainly caught in large and very diverse small-scale artisanal fisheries but also in semi-industrial and industrial fisheries, in both developed and developing countries.

Similar to the catch of major commercial tuna species, the global capture of some of the neritic tunas has increased in recent years, whether as target species of some fisheries or indirectly, as bycatch in some fisheries targeting major commercial tuna.

**Figure 2** shows an increasing trend of global neritic tuna catches since the late 1990s. After reaching an historic high in 2015, the catch has been maintained at around that level. The increasing trend is also observed in each ocean, especially in the Eastern Pacific and Indian Ocean (**Figure 3**).

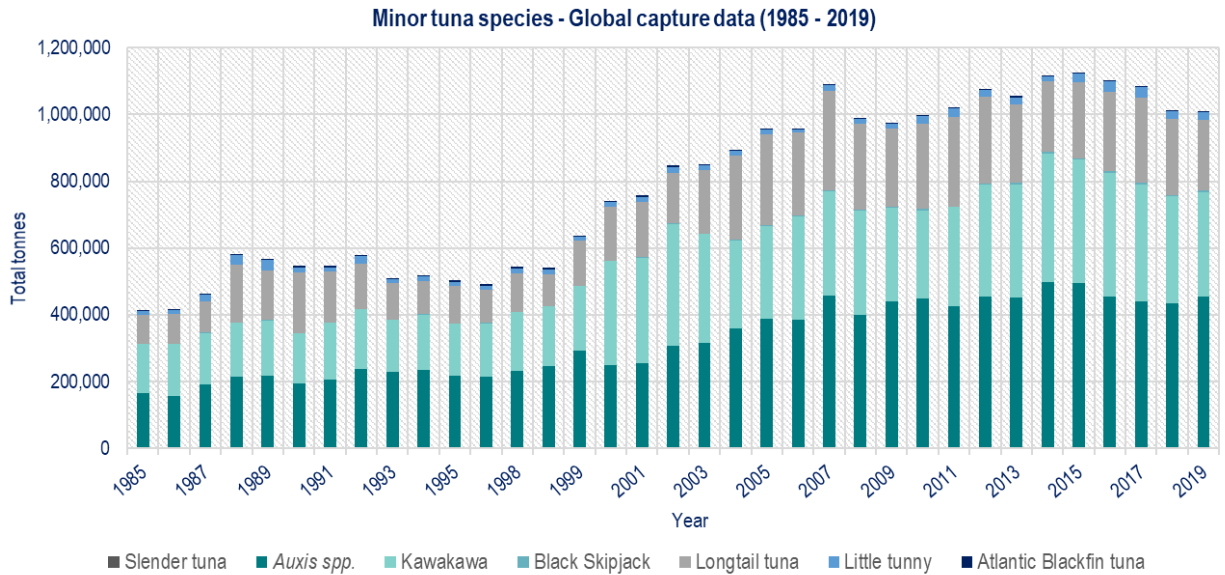


Figure 2. Global capture of the neritic tunas for the 1985-2019 period (FAO, 2021; ICCAT, 2021c; IOTC, 2021a). The data for *Auxis thazard* and *Auxis rochei* are not available separately for some oceans, so they appear combined here as *Auxis spp.*

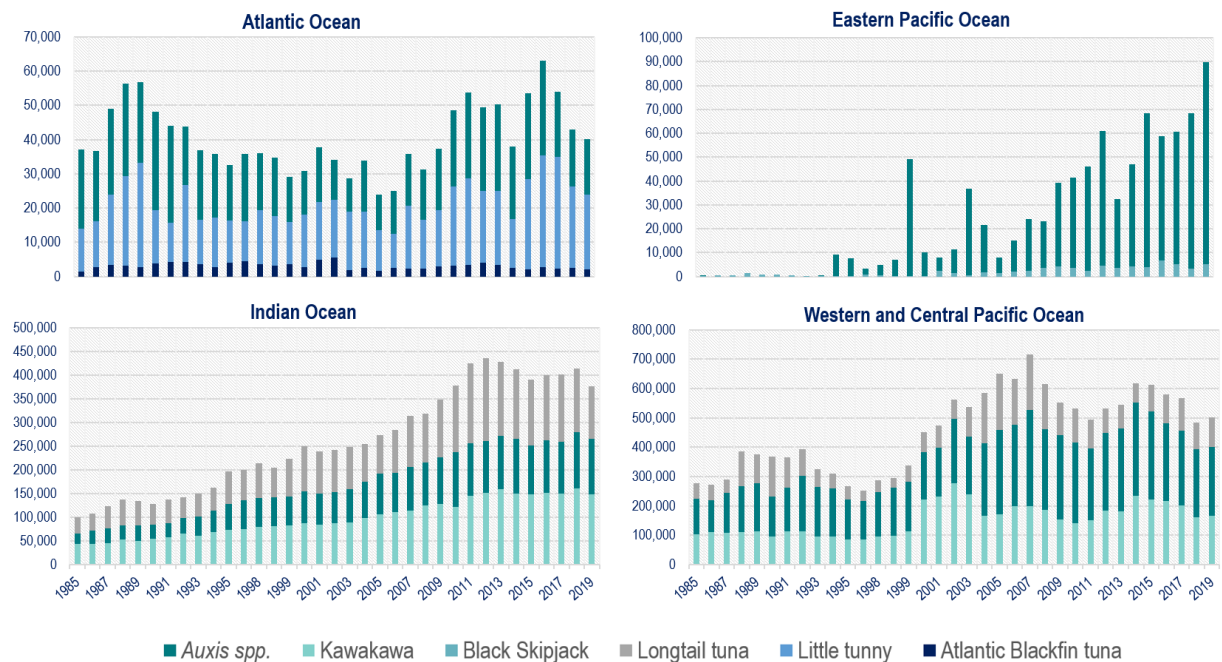


Figure 3. Capture data by ocean of the neritic tunas for the 1985-2019 period (FAO, 2021; ICCAT, 2021c; IOTC, 2021a). The data for *Auxis thazard* and *Auxis rochei* are not available separately for some oceans, so they appear combined here as *Auxis spp.*

Four tuna RFMOs are responsible for assessing and managing the 16 stocks of the eight minor tuna species:

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

## Purpose

Given the global scale and magnitude of minor tuna fisheries and their economic and social importance for many coastal countries, a global review of the biology, stock structure, catches, main fisheries and status of the eight minor tunas is necessary to inform their long-term conservation and sustainable use. Thus, the purpose of this report is to summarize the knowledge about the biology, stock structure, recent catch, main fishing gears, and stock status of the eight species of minor tunas in the different oceans. The report also aims to identify knowledge gaps about these species so as to focus tuna RFMO research efforts and allow for improved monitoring and management of these important resources.

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. 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.

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

## Review of neritic tuna species information

The review for each species using the information available in the scientific literature is structured in four sections. First, a review of each species' geographical distribution and biological characteristics is presented in the **Biology** section, followed by the information about the **Stock structure** of each species under the different tuna RFMOs.

Then, fishery statistics and information about main fishing gears are presented (**Recent catch** and **Main fishing gears** sections) using the information available from tuna RFMOs. When that information was not available, the FAO database (FishstatJ) was used, for example, for the global capture production data series from 1950 to 2019. Additional information about the fisheries and fishing gears involved in their capture from other data sources, such as recent scientific publications, was also included when considered relevant.

Finally, **Stock assessment** and **Stock status** sections offer a summary of the most up-to-date available information about the stocks of minor tunas in the different tuna RFMOs. When there are no stock assessments available for the species, the Stock status section shows "Unknown." In those cases, ancillary information from other studies, such as abundance indices, is presented.

The last section, **Management measures**, summarizes the actions put in place by the tuna RFMOs for the small tuna species in the area of competence or, even when no species-specific measure is in place, any recommendation or conservation measure that may affect the management and conservations of the small tuna species.




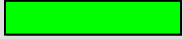


## Ratings methodology

For each stock, ISSF applies color ratings (Green, Yellow, and Orange) to stock abundance (SSB) and fishing mortality (F).

Each stock is rated separately in the Executive Summary section of the report on these two main criteria and color-coded to indicate the severity of the problem (**Table 3**).

- The green rating means that there are no sustainability concerns.
- An orange rating in any of these categories means that there are sustainability concerns (*i.e.*, that the tuna stocks are experiencing overfishing, or are currently overfished).
- The yellow rating is used in the absence of a stock assessment and when there are not even preliminary population indicators for the species.

Table 3. Color Ratings Decision Table.

STOCK ABUNDANCE		Spawning Biomass (SSB)* is at or above $SSB_{MSY}$ .
		Spawning Biomass is below $SSB_{MSY}$ and it has not been stable, increasing or fluctuating around $SSB_{MSY}$ **.
		Spawning Biomass is unknown because there is no stock assessment available.
FISHING MORTALITY		F is below $F_{MSY}$ .
		F is above $F_{MSY}$ and there are no adequate management measures to end overfishing, or the measures in place are insufficient.
		F is unknown because there is no stock assessment available.

\* 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.

# Small Tuna Species

## Slender Tuna - *Allothunnus fallai*

### BIOLOGY

Slender tuna (*Allothunnus fallai*) is a southern hemisphere species distributed between 20° and 50°S. It is a temperate species that often appears in Subantarctic waters of the Southern Ocean (Graham and Dickson, 2004). Juveniles are found between 20° and 35°S at surface temperatures ranging from 19 to 24°C, while adults tend to inhabit more southern and cooler waters. Spawning is thought to take place between October and December.

Slender tuna occasionally form schools, as reported in coastal areas in the Falkland Islands, where there is anecdotal evidence of large surface schools of slender tuna (Bradley and Arkhipkin, 2020).

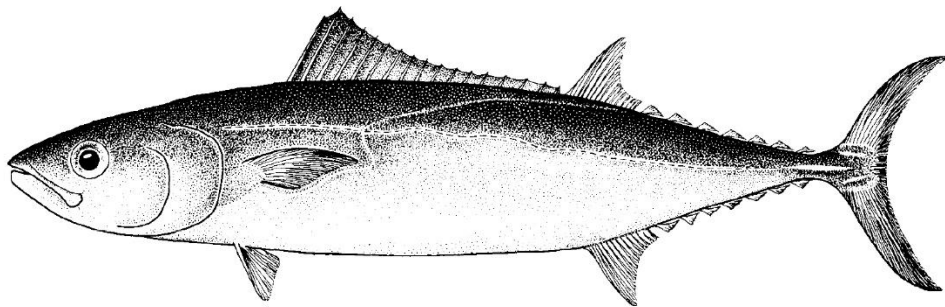


Figure 4. Slender tuna (*Allothunnus fallai*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

A recent study that analyzed the age and growth of fish collected in the South Atlantic Ocean (Bradley and Arkhipkin, 2020) reported common sizes in the range of 68–90 cm fork length, corresponding to ages between 9–42 years. These figures are different from previous ageing studies that estimated an age between 4 and 6 years based on a small sample size of 39 individuals with sizes ranging 65–95 cm (Wolfe and Webb, 1975).

Longevity was previously documented as less than 11 years, based on a correlation using maximum size (Juan-Jordá *et al.*, 2013b); however, Bradley and Arkhipkin (2020) have revealed that the slender tuna may live up to 42 years much longer than previously thought.

Size at first maturity is assumed to be about 70 cm, but there is not enough evidence to support this estimate. It is believed, however, that slender tuna females are significantly larger than males (Bradley and Arkhipkin, 2020), which reflects the sexual dimorphism of smaller scombrids, such as described for the Spanish mackerel (Juan-Jordá *et al.*, 2013b). The largest reported size for this species is 105 cm, and the all-tackle gamefish record is an 11.9 kg fish taken off New Zealand in 2001 (Collete and Graves, 2019).

Table 4. Slender tuna: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	65–95	-	9–42
MAXIMUM	105	11.9	42
MATURITY	70	-	-

## STOCK STRUCTURE

Not well known.

## RECENT CATCH

Even though slender tuna is similar in size to other commercial tuna species, such as the globally exploited skipjack tuna (*Katsuwonus pelamis*), it is an example of a rarely exploited species whose stocks remain practically virgin all through their distribution area. This may be due to the relatively low quality of its meat, which is grey (Collette and Nauen, 1983), and with a high lipid content (Bishop *et al.*, 1976). As a result, slender tuna has a low commercial value, and no fisheries target this species.

At present, slender tuna appears as bycatch in low quantities by bottom trawlers in the South Atlantic and sporadically in southern bluefin tuna (*Thunnus thynnus*) fisheries such as the Japanese tuna longline fishery (Majkowski, 2007). Anecdotally, in the western South Atlantic, 57% of the purse seine landings off Mar de Plata, Argentina, were slender tuna in January 2010, and small catches have been also reported from the Falkland Islands (Islas Malvinas) (Collette and Graves, 2019).

Reported catches worldwide (**Figure 5**) were around 1,000 t in 2014, and then remained under 500 t for the period of 2015 to 2017 before increasing again to 622 t in 2018. In 2019, landings were 339 t (FAO, 2021). These captures were mainly recorded in the South Pacific Ocean and are attributed to New Zealand. Other catches have been reported in Argentina, Australia and Falklands.

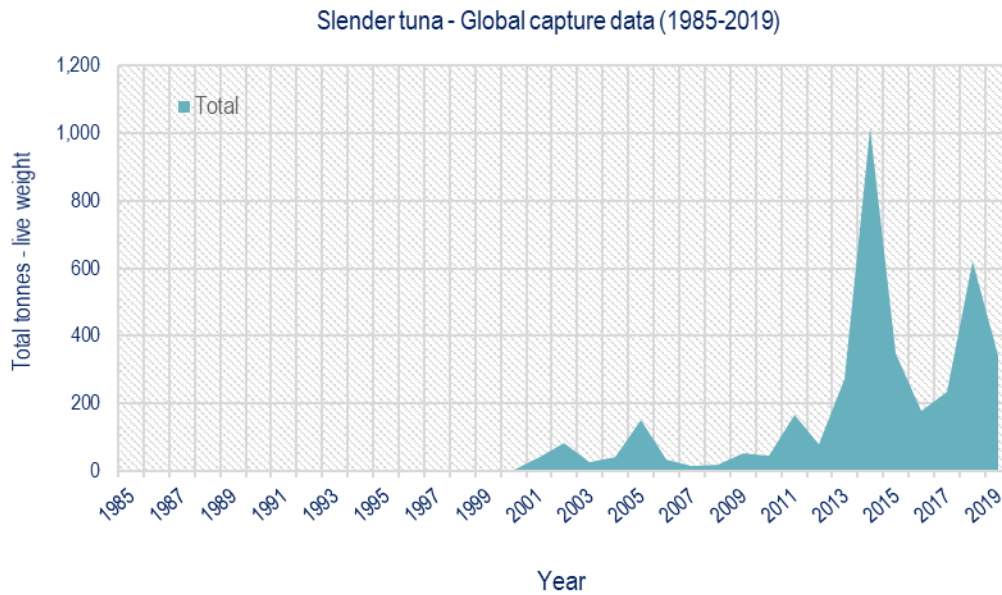


Figure 5. Reported global captures of slender tuna during the period 1985-2019 (FAO, 2021).

## MAIN FISHING GEARS

This species is caught incidentally in low quantities by bottom trawlers and in temperate longline and purse seine fisheries.

## STOCK ASSESSMENT

There is no stock assessment for this species.

## STOCK STATUS

Unknown.

## MANAGEMENT MEASURES

Although the impact of incidental bycatch on the slender tuna population is not known, bycatch is not considered a major threat due to the species' biological characteristics (Collette and Graves, 2019). It also is thought to be abundant in South Pacific subtropical and subantarctic waters.

It must be considered, however, that in recent years there has been an increasing interest in slender tuna by some fishing nations as a potential new resource (Reyes *et al.*, 2019). Its relatively unexploited condition is seen as an opportunity to sustain small to medium-scale artisanal fisheries, especially in developing countries. Therefore, monitoring the capture data for this species is necessary as a first step towards stock assessment.

## Frigate Tuna - *Auxis thazard*

### BIOLOGY

Frigate tuna (*Auxis thazard*) is widely distributed in temperate and tropical waters in the Indian, Pacific and Atlantic Oceans, and it is considered to be a vagrant in the Mediterranean Sea. Adults are mainly found in coastal or near-coastal waters, while juveniles inhabit more distant oceanic waters. Spawning occurs in both coastal and oceanic areas at water temperatures around 24°C, so the spawning season can differ between and among different oceans and may even extend throughout the year for some stocks (Collette and Graves, 2019).

Schooling of frigate tuna with bullet tuna has been reported in some parts of the Indo-Pacific, such as Hawaii and Ceylon.

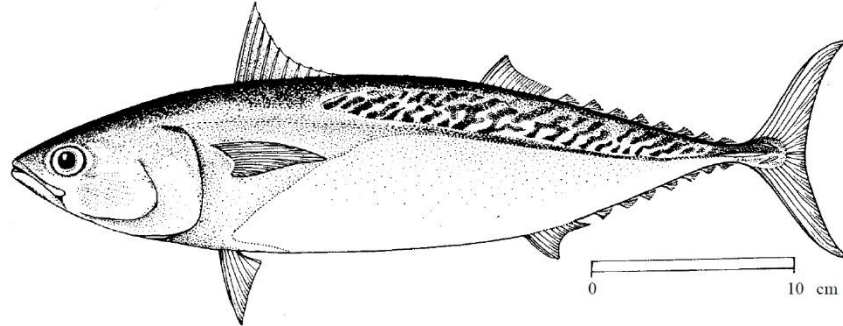


Figure 6. Frigate tuna (*Auxis thazard*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

Frigate tuna frequently reaches 25 to 40 cm in length, with the largest reported size of 65 cm and 1.6 kg. Size at maturity varies between 30 and 40 cm depending on the geographic zone, and age of maturity is estimated at two years. Maximum age is around four years (Collette and Graves, 2019; Petukhova., 2019; Juan-Jordá *et al.*, 2013b).

Table 5. Frigate tuna: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	25–40	-	-
MAXIMUM	65	1.6	4
MATURITY	30–40	-	2

### STOCK STRUCTURE

This species is widespread and present in the Atlantic, Indian, and Pacific Oceans (and is considered a vagrant in the Mediterranean). From a fishery management point of view, four different stocks are considered: Atlantic Ocean, Eastern Pacific, Western Pacific and Indian Ocean.

# Atlantic Frigate Tuna

## MANAGEMENT UNIT

In their last meeting, ICCAT's Small Tunas Species Group proposed splitting the population of frigate tuna into four stocks/management units (ICCAT, 2021a). Indeed, published scientific studies consider different sub-populations in the Atlantic. However, this is still an ongoing discussion that is hoped to be resolved in 2022. For now, ICCAT concluded there remains insufficient information to determine the stock structure of frigate tuna and, therefore, considers a single stock for the Atlantic Ocean.

## RECENT CATCH

In the Atlantic Ocean, ICCAT has reported landings of frigate tuna for the last 30 years, but these reports are suspected to include both *Auxis rochei* and *A. thazard* due to misidentification. Despite this, Atlantic frigate tuna is considered an important bycatch species in tuna fisheries, representing about 13% of the total catch of small or minor tuna species caught in the Atlantic Ocean (ICCAT, 2021a).

Moreover, this species has high commercial importance at a regional level and is targeted by some specialized fisheries in the Atlantic Ocean, where both *Auxis spp.* species are usually captured and commercialized together.

According to ICCAT records (**Figure 7**), landings of frigate tuna in the Atlantic Ocean started to decrease in the 1990s from values of almost 20,000 t in 1992 to approximately 5,700 t in 2003. Since then, catches oscillated around 7,000 t until 2009, when they gradually increased again to a peak of about 24,000 t in 2016. From 2016 onwards, reported catches steadily decreased, and they were estimated at 12,723 t in 2020 (ICCAT, 2021b).

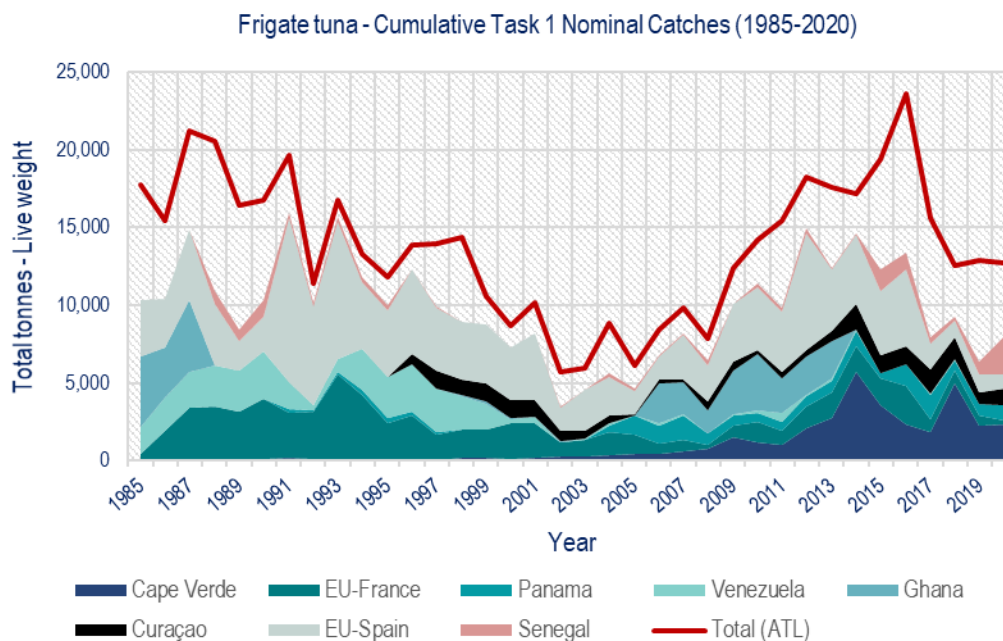


Figure 7. Reported captures of frigate tuna in the Atlantic Ocean for the eight fishing nations that contributed the most to the total catches during the period 1985-2020 (ICCAT, 2021c). The total catch is also shown in the graphic.

## MAIN FISHING GEARS

Most of the catch is incidentally taken by purse seiners, although this species is also caught by pole-and-line, gillnet, mid-water trawls, handline and longline vessels. Regionally, frigate tuna is also caught with beach seines, driftnets, hook-and-line, gillnets and trolling.

## STOCK ASSESSMENT

There is no stock assessment currently available for frigate tuna in the ICCAT area.

## STOCK STATUS

Unknown.

Although there are insufficient data to perform traditional stock assessments of frigate tuna in the Atlantic Ocean, some analyses of life-history parameters have been performed in recent years in the Southwest Atlantic (Frota *et al.*, 2004) and Northeast Atlantic populations (Petukhova, 2019; Zapadaeva, 2021). In 2019, Pons *et al.* used biological and length data from purse-seine fisheries for the period of 2010 to 2016 to estimate a quantitative proxy of current stock status for the Southeast and Northeast Atlantic Ocean areas. In 2021, Zapadaeva presented a preliminary stock assessment also based on life-history parameters of frigate tuna individuals collected between 2010 and 2019 as bycatch of research trawls operating in the Northeast Atlantic.

Pons *et al.* (2019) applied two different length-based models (LBSPR and LIME) to estimate instantaneous fishing mortality (F) and spawning potential ratio (SPR) for two sub-populations in the Atlantic (*i.e.*, northeast and southeast). As a result, in almost all scenarios, both sub-populations were estimated to be above 40% SPR, indicating that these components are above those reference points and therefore likely fished at healthy levels. However, the assessment for the northeast area always estimated lower SPR values than for the southeast area. These results were in line with a preliminary risk assessment for small scombrids performed in the Atlantic Ocean (Frédou *et al.*, 2017), where the population in the south is at lower risk than the one in the north.

The recent study carried out by Zapadaeva (2021) on the northeast sub-population presents new evidence of the higher risk to that stock. The author estimated the spawning potential ratio (SPR) by applying a length-based method (LBSPR). The calculated value of SPR obtained (0.26) is below 0.4 indicating an overfishing may be occurring for the northeast sub-population.

Although these outcomes must be taken with caution due to the limitations of the methodology applied, all authors highlight the need to continue collecting data for a better understanding of the population status of frigate tuna in the Atlantic Ocean.

## MANAGEMENT MEASURES

In general, frigate tuna is considered to be very abundant in many parts of its distribution. However, the lack of reported landings from artisanal fisheries and incomplete reporting of bycatch by other fisheries may bias the perception of productivity and status based on the noted studies. Moreover, for many years, most catches reported as frigate tuna probably also included *A. rochei*, and *vice versa*.

The ICCAT's Small Tuna Species Group also acknowledges the lack of accurate landing data, which precludes ICCAT's Standing Committee on Research and Statistics (SCRS) from carrying out traditional stock assessments for frigate tuna and providing management advice. Therefore, the small tuna WG, in the last meeting (ICCAT, 2021a), recommended these steps be undertaken by 2024: (i) To start new sampling studies for both *Auxis* species in the Atlantic and the Mediterranean Sea, (ii) to investigate genetic species differentiation between frigate and bullet tuna and (iii) to determine the stock structure of both species in the Atlantic Ocean. Particularly, for the frigate tuna, the group also underlined the

need for a geographical delimitation of the four regions currently discussed as possible different stocks for fishery management purposes.

## Eastern Pacific Frigate Tuna

### MANAGEMENT UNIT

The Eastern Pacific population is recognized as a subspecies, *Auxis thazard brachydorax* (Collette and Aadland, 1996), which occurs from California and the mouth of the Gulf of California to Peru, including waters of the Galapagos and all the oceanic islands in the region, except Clipperton.

### RECENT CATCH

In the Eastern Pacific Ocean, bullet and frigate tunas are commonly reported as bycatch species, especially by the large-scale purse seine tuna fleet, with most catches coming from floating object sets. IATTC reports the catches of frigate and bullet tunas without differentiating between the two species and includes them in the same category of unidentified tunas. Therefore, the available information is not reliable to estimate the catches of frigate tuna alone.

The only preliminary catch estimates available come from observers onboard large purse-seine vessels that recorded captures of frigate and bullet tunas, separately, as bycatch. The data seem to suggest a decline in the total catches in recent years from 1,922 t in 2005 to 481 t in 2020 (IATTC, 2021a).

FAO does not provide enough data to evaluate the trend of this species' captures. There are only data of reported catches by Ecuador, but they combine the two species of *Auxis spp.* (Figure 8).

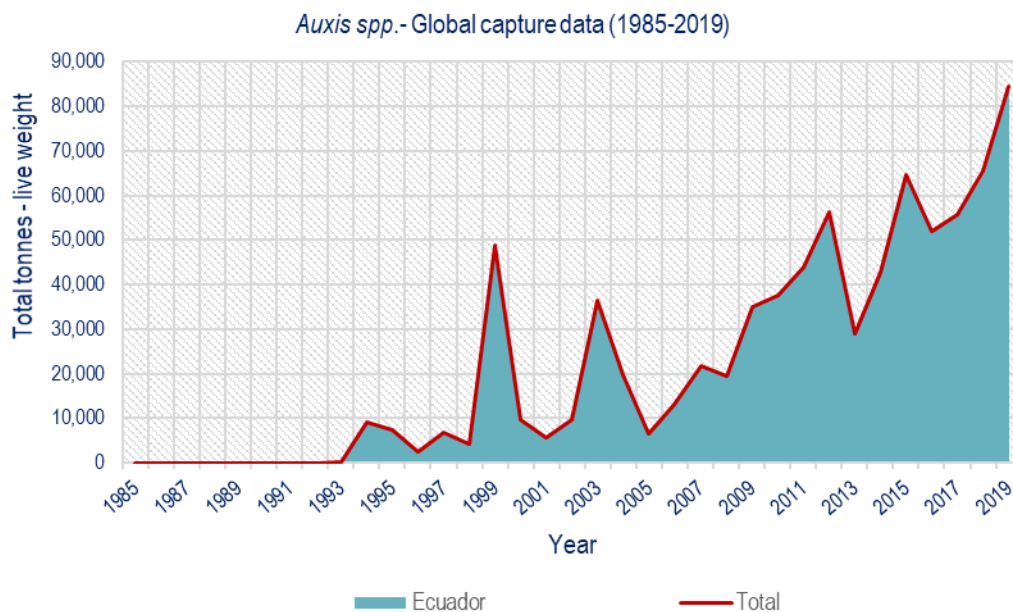


Figure 8. Reported captures of *Auxis spp.* in the Eastern Pacific Ocean for Ecuador, the only nation that reported data, during the period 1985-2019 (FAO, 2021).

## MAIN FISHING GEARS

Small quantities of frigate tuna are incidentally captured in the Eastern Pacific Ocean by purse-seine vessels, mostly in sets on floating objects, and by artisanal fisheries in some coastal regions of Central and South America. This species is considered bycatch and generally discarded at sea.

## STOCK ASSESSMENT

There are no stock assessments or preliminary population studies for this subspecies in the IATTC area.

## STOCK STATUS

Unknown.

## MANAGEMENT MEASURES

IATTC has not adopted any management measure related to this species.

## Indian Ocean Frigate Tuna

### MANAGEMENT UNIT

A single management unit or stock is considered for stock assessment and management purposes in the IOTC area.

### RECENT CATCH

In the Indian Ocean, total catches of this species (**Figure 9**) have been increasing continuously since 1985 to an historic peak of more than 100,000 t in 2014, after which they declined to less than 95,000 t. Reported catches in 2019 were 98,691 tonnes, higher than the average for the 2015–2019 period (96,644 t) (IOTC, 2021b).

The main fleets involved in the capture of frigate tuna are Indonesia (which accounts for 60% of reported catches), India, Sri Lanka and Iran. All these countries together approximately account for 90% of the total frigate tuna reported catches.

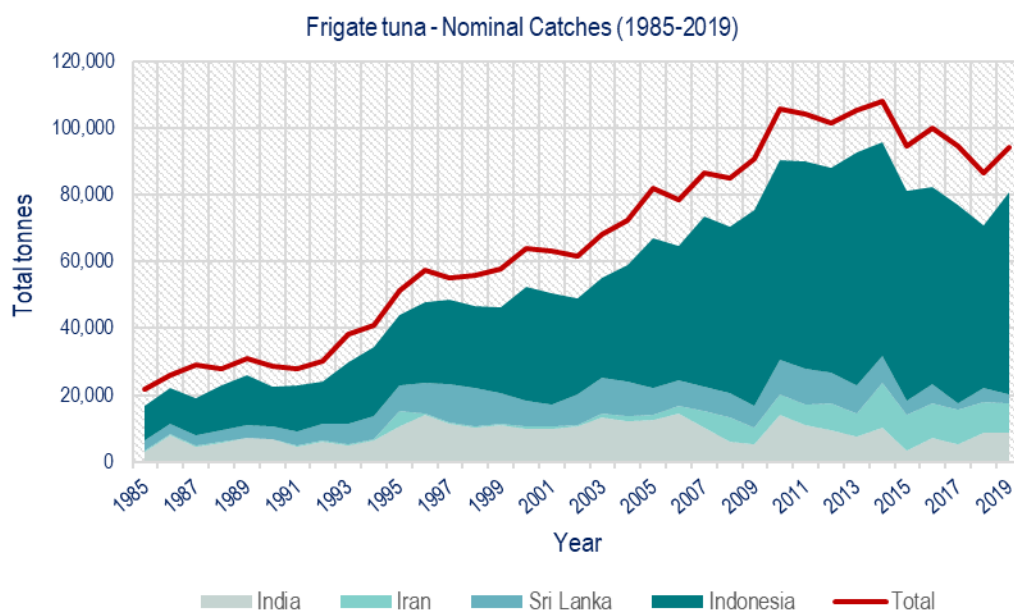


Figure 9. Reported captures of frigate tuna in the Indian Ocean for the four fishing nations that contributed the most to the total catches during the period 1985-2019 (IOTC, 2021a). Total catches of frigate tuna for the Indian Ocean are also shown.

## MAIN FISHING GEARS

Frigate tuna is taken from across the Indian Ocean area using gillnets (40%), coastal longline, handlines and trolling (33%) and to a lesser extent by coastal purse seine nets and pole-and-line vessels. This species is also an important bycatch for industrial purse seine vessels, especially in sets on floating objects, and is the target of some ring net fisheries (IOTC, 2021b).

## STOCK ASSESSMENT

There is no stock assessment for frigate tuna in the IOTC area.

## STOCK STATUS

Unknown.

No quantitative stock assessment is currently available for frigate tuna in the Indian Ocean, and due to the lack of fishery data for several gears, only preliminary stock status indicators are used by IOTC.

However, there are some local biological studies and preliminary assessments that evaluate the population status on a local basis. For example, Herath *et al.* (2019) studied the length-weight and length-length relationships of frigate tuna samples collected at port from 2015 to 2017 along the coastal waters of Sri Lanka and concluded that the species has an allometric growth, with fishes showing a good growth condition. Ghosh *et al.* (2012) and more recently Mudumala *et al.* (2018) also studied size composition and life-history parameters of frigate tuna to estimate the stock status and population characteristics of this species along the Indian coastline. The catch information was collected from landings between 2008 and 2012 and from 2006 to 2010, respectively, from a variety of gears (drift gillnets, shore seines, ring seines and hooks and lines). Although the catch trends of *Auxis spp.* showed an increasing pattern, the most recent

monitoring of catches recognized some signs of catch decrease, which could be related to overexploitation (Mudumala *et al.*, 2018) resulting from increasing pressure that frigate tuna population has been undergoing during last decade in Indian waters.

## MANAGEMENT MEASURES

The IOTC Scientific Committee (SC) recommended not to exceed the average catches estimated between 2009 and 2011 (94,921 t) and to maintain that level until an assessment for frigate tuna is available. Despite this, no direct measures have been adopted; there are only a series of resolutions agreed in recognition of under/misreporting and inadequate monitoring, requesting CPCs to submit their capture data ([Resolution 15/01](#) and [15/02](#)).

## Western and Central Pacific Frigate Tuna

### MANAGEMENT UNIT

There is little information available to determine the stock structure of Pacific frigate tuna in the Western and Central Pacific Ocean.

### RECENT CATCH

In the Western and Central Pacific Ocean, catch estimates are poorly documented, and bycatch estimates are not available from WCPFC.

FAO only has catch data that include both frigate tuna and *A. rochei* records (**Figure 10**). Although it is not possible to know the contribution of frigate tuna to the total *Auxis* species catch, an increasing trend in total catches for both species starting in the 1990s is observed, reaching a peak of catches at about 330,000 t in 2007. Catches decreased again to 240,000 t in 2011 and reached a new peak at 318,000 t in 2014. Since then, a continuous, steady decrease in captures has been observed, with reported landings of about 235,000 t in 2019 (FAO, 2021).

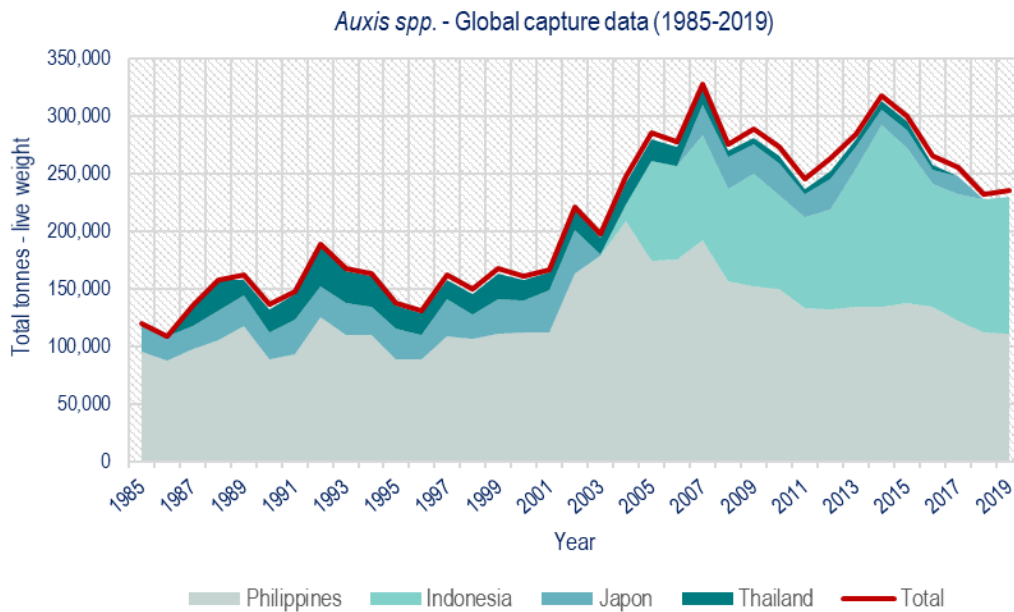


Figure 10. Reported captures of *Auxis spp.* in the Western and Central Pacific Ocean for the four fishing nations that contributed the most to the total catches during the period 1985-2019 (FAO, 2021). Frigate tuna total catches are also shown.

## MAIN FISHING GEARS

*Auxis spp.* are targeted by small scale purse seine and ring net vessels in the western Pacific region, and it is also caught as bycatch in industrial purse seine fisheries.

## STOCK ASSESSMENT

There are no stock assessments or preliminary population studies for frigate tuna in the WCPFC area.

## STATUS

Unknown.

## MANAGEMENT MEASURES

The WCPFC has not adopted any management measure related to this species.

## Bullet tuna - *Auxis rochei*

### BIOLOGY

Bullet tuna (*Auxis rochei*) is a species that inhabits temperate and tropical waters, and is widespread in the Indian, Pacific and Atlantic Ocean including the Mediterranean Sea. Adults are principally caught in coastal waters and around islands. The spawning season varies among the different oceans and occurs closer to shore than in other tuna species, at sea surface temperatures of 24°C or higher (Collette and Graves, 2019).

Bullet tuna is a schooling species, both in single species schools or with frigate tuna in some parts of the Indo-Pacific. When they form schools with frigate tuna, bullet tuna individuals are the smallest in the school.

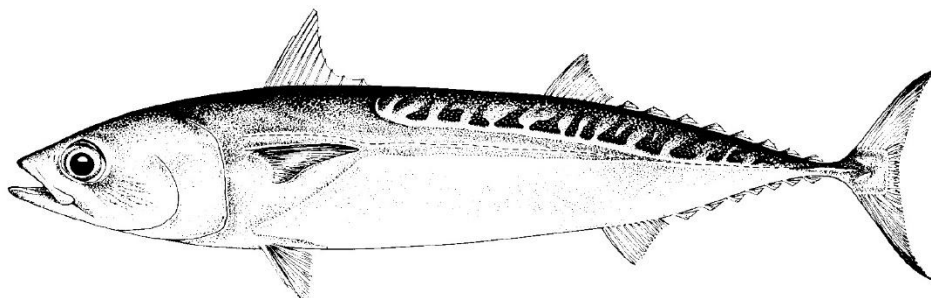


Figure 11. Bullet tuna (*Auxis rochei*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

Bullet tuna on average reach a length of 35 cm fork length, although this varies substantially from region to region, with the largest reported size of 50 cm FL and 1.84 kg weight (Collette and Graves, 2019). Their maximum age is around five years. Size at maturity, which is reached at approximately two years, also differs depending on the geographic zone, ranging between 18 and 33 cm (Collette and Graves, 2019; Juan-Jordá *et al.*, 2013b).

Table 6. Bullet tuna: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	35		2–5
MAXIMUM	50	1.84	5
MATURITY	18–33		2–3

### STOCK STRUCTURE

This species is widespread and present in the Atlantic, Indian, and Pacific oceans. From the fishery management point of view, four different stocks are considered: Atlantic Ocean, Eastern Pacific, Western Pacific and Indian Ocean.

# Atlantic Bullet Tuna

## MANAGEMENT UNIT

There is little information available to determine the stock structure of Atlantic bullet tuna; however, a single stock is considered by ICCAT.

## RECENT CATCH

In the Atlantic Ocean, ICCAT has reported landings of bullet tuna (*Auxis rochei*) for the last 30 years, but these reports are suspected to include both *Auxis rochei* and *A. thazard* due to the specimen misidentification. Despite this, Atlantic bullet tuna is considered an important bycatch species in tuna fisheries, representing about 5% of the total catch of small or minor tuna species caught in the Atlantic Ocean (ICCAT, 2021a).

Moreover, this species has high commercial importance at a regional level and is targeted by some specialized fisheries in the Atlantic Ocean and the Mediterranean Sea, where both *Auxis spp.* species are usually captured and commercialized together.

According to ICCAT records (**Figure 12**), landings of bullet tuna in the Atlantic Ocean show a peak of about 12,000 t in 1990. Catches decreased to approximately 2,000 t in 1998. In the 2000s, values oscillated around 4,000 to 6,000 t and then decreased to fluctuate between 2000 and 4000 tonnes. They increased again since 2007 to reach a new peak at about 9,500 t in 2011 but have been decreasing since then. Reported catches of bullet tuna in 2020 are estimated at 3,449 t (ICCAT, 2021b).

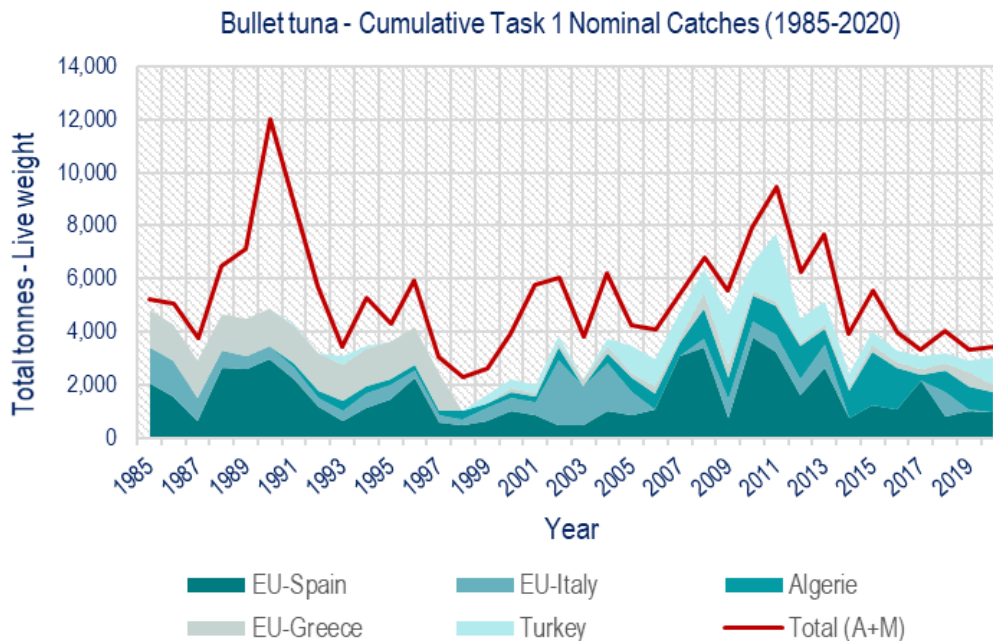


Figure 12. Reported captures of bullet tuna in the Atlantic Ocean and the Mediterranean Sea (A + M) for the four fishing nations that contributed the most to the total catches during the period 1985-2020 (ICCAT, 2021c). The total catches of bullet tuna are also shown.

## MAIN FISHING GEARS

This species is incidentally taken by purse seiners, pole-and-line, handline and longline vessels, gillnet and mid-water trawls. Regionally, bullet tuna is also caught with beach seines, driftnets, hook-and-line, gillnets and trolling.

## STOCK ASSESSMENT

There is no stock assessment currently available for bullet tuna in the ICCAT area.

## STOCK STATUS

Unknown.

The population of bullet tuna in the Atlantic Ocean has not been assessed because most of the data (particularly catches and abundance indices) required for stock assessment are not available. Some recent efforts have compiled data on the life-history traits of this species. For example, Frédou *et al.* (2017) carried out a preliminary risk assessment of bullet tuna that resulted in the first approach of PSA for a tuna longline fishery in the Atlantic Ocean. They concluded that among the 18 stocks of small tuna species studied, the bullet and frigate tuna stocks were the most productive. However, there is a lack of fishery data for other several gears, which limits the conclusions about the relative risk of this species.

## MANAGEMENT MEASURES

In general terms, bullet tuna is considered very productive, and a healthy status for this species is assumed. However, there is not enough information on its stock status due to both the lack of reporting from artisanal fisheries and incomplete reporting of bycatch from other fisheries. Moreover, for many years, most catches reported as bullet tuna probably also included *A. thazard*, and vice versa.

The ICCAT's Small Tuna Species Group also acknowledges this lack of accurate landing data, which precludes the ICCAT SCRS from carrying out stock assessments using traditional methods for bullet tuna and thus precluding provision of any management advice based upon these approaches, indicating a need to investigate data limited techniques for assessing status (like for frigate tuna, noted above). Therefore, the small tuna WG, in the last meeting (ICCAT, 2021a), recommended these steps be undertaken by 2024: (i) To start new sampling studies for both *Auxis* species in the Atlantic and the Mediterranean Sea, (ii) to investigate genetic species differentiation between frigate and bullet tuna and (iii) to determine the stock structure of both species in the Atlantic Ocean.

## Eastern Pacific Bullet Tuna

### MANAGEMENT UNIT

The Eastern Pacific population is recognized as a subspecies, *Auxis rochei eudorax* (Collette and Aadland, 1996), which occurs from California to the mouth of the Gulf of California to Peru, including the Galapagos, Cocos and Malpelos islands.

### RECENT CATCH

In the Eastern Pacific Ocean, bullet and frigate tunas are commonly reported as bycatch species, especially in the large-scale purse seine tuna fleet, with most catches coming from floating object sets. IATTC reports the catches of frigate and bullet tunas without differentiating between the two species and includes them in the same category of unidentified tunas. Therefore, the available information is not reliable to estimate the catches of frigate tuna.

The only preliminary catch estimates available come from observers onboard large purse-seine vessels that recorded captures of frigate and bullet tunas, separately, as bycatch. The data suggests a decline in the total catches in recent years from 1,922 t in 2005 to 481 t in 2020 (IATTC, 2021a).

FAO does not provide enough data for this species to evaluate the evolution of its captures. There are only data of reported catches by Ecuador, but they combine the two species of *Auxis spp.* (**Figure 13**).

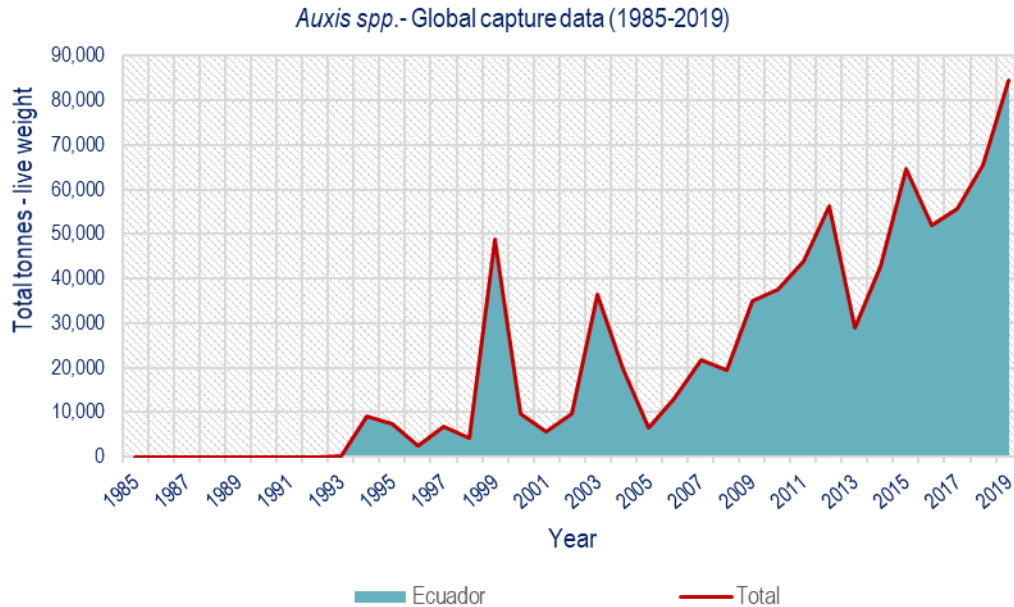


Figure 13. Reported captures of *Auxis spp.* in the Eastern Pacific Ocean for Ecuador, the only nation that reported data, during the period 1985-2019 (FAO, 2021).

## MAIN FISHING GEARS

Small quantities of bullet tuna are incidentally captured in the Eastern Pacific Ocean by purse-seine vessels, mostly in sets on floating objects, and by artisanal fisheries in some coastal regions of Central and South America. This species is considered bycatch and generally discarded at sea.

## STOCK ASSESSMENT

There are no stock assessments or preliminary population studies for this subspecies in the IATTC area.

## STOCK STATUS

Unknown.

## MANAGEMENT MEASURES

IATTC has not adopted any management measure related to this species.

# Indian Ocean Bullet Tuna

## MANAGEMENT UNIT

A single management unit or stock is considered for stock assessment and management purposes in the IOTC area.

## RECENT CATCH

In the Indian Ocean, IOTC reported an increasing trend of total annual catches of bullet tuna since 2014 (**Figure 14**), from 10,000 t to almost 16,000 t in 2017 and with the highest record in the history of more than 30,000 t in 2018. This increase is mostly attributed to an increase in reported catches by India (handline, gillnet and trolling fisheries) and Indonesia (purse seine fisheries). In 2019, the catches of bullet tuna decreased to less than 24,000 t (23,719 t) despite a major increase in the number of Indonesian industrial purse seiners in operation (IOTC, 2021b).

The main fleets involved in the capture of bullet tuna are highly concentrated; in recent years over 90% of catches in the Indian Ocean have been accounted for by fisheries in India, Sri Lanka, Indonesia and Thailand.

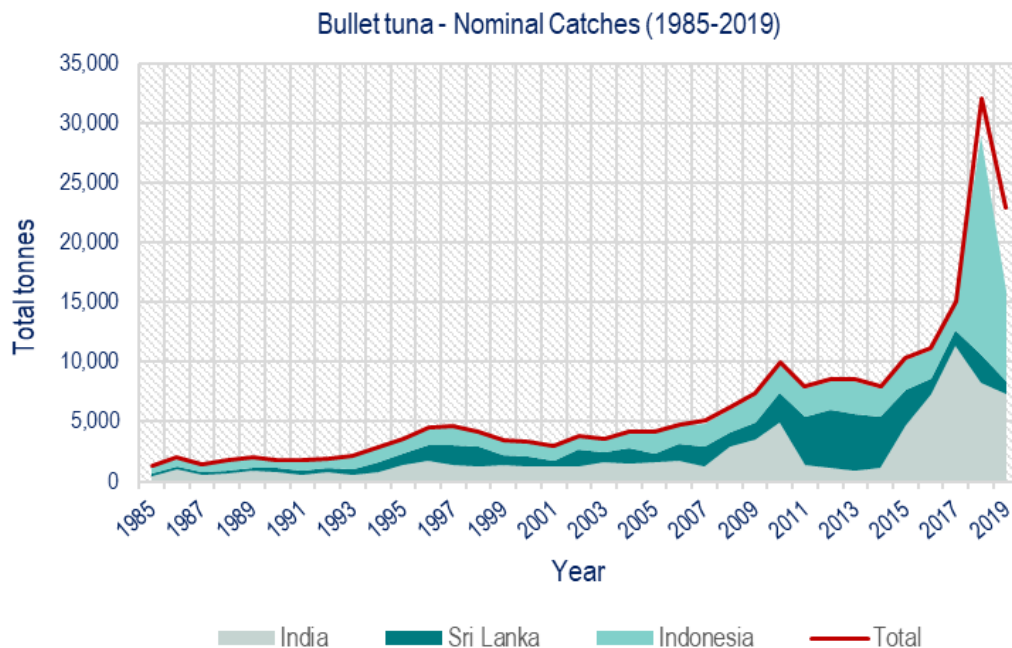


Figure 14. Reported captures of bullet tuna in the Indian Ocean for the three fishing nations that contributed the most to the total catches during the period 1985-2018 (IOTC, 2021a). The total catch of bullet tuna is also shown.

## MAIN FISHING GEARS

Bullet tuna is taken from across the Indian Ocean area by purse seine (49%), handline and trolling (26%), and gillnet (17%) fishing. (IOTC, 2021b).

## STOCK ASSESSMENT

There is no stock assessment for bullet tuna in the IOTC area.

## STOCK STATUS

Unknown.

The population of bullet tuna in the Indian Ocean has not been assessed, but there are some biological studies for this species in the region. For example, Herath *et al.* (2019) studied the length-weight and length-length relationships of bullet tuna samples collected at port from 2015 to 2017 along the coastal waters of Sri Lanka and concluded that it has an allometric growth.

Despite this local study, the incomplete reporting of bycatch data from tuna fisheries in conjunction with the lack of catch-and-effort information on several fishing gears makes it difficult to assess the actual status of bullet tuna in the Indian Ocean.

## MANAGEMENT MEASURES

The IOTC SC recommends not to exceed the average catches estimated between 2009 and 2011 (8,870 t) and to maintain that level until an assessment for bullet tuna is available. Despite this, no direct measures have been adopted; only a series of resolutions agreed in recognition of under/misreporting and inadequate monitoring, requesting CPCs to submit their capture data ([Resolution 15/01](#) and [15/02](#)).

## Western and Central Pacific Bullet Tuna

### MANAGEMENT UNIT

There is little information available to determine the stock structure of Pacific bullet tuna in the Western and Central Pacific Ocean.

### RECENT CATCH

In the Western and Central Pacific Ocean, catch estimates are poorly documented, and bycatch estimates are not available from the WCPFC.

FAO only has catch data that include both bullet tuna and *A. thazard* records (**Figure 15**). Although it is not possible to know the contribution of bullet tuna to the total *Auxis spp.* catch, an increasing trend in total catches for both species starting in the 1990s is observed, reaching a peak of catches in 2007 at about 330,000 t. Catches decreased again to 240,000 t in 2011 and reached a new peak at 318,000 t in 2014. Since then, a continuous, steady decrease in captures has been observed, with reported landings of about 235,000 t in 2019 (FAO, 2021).

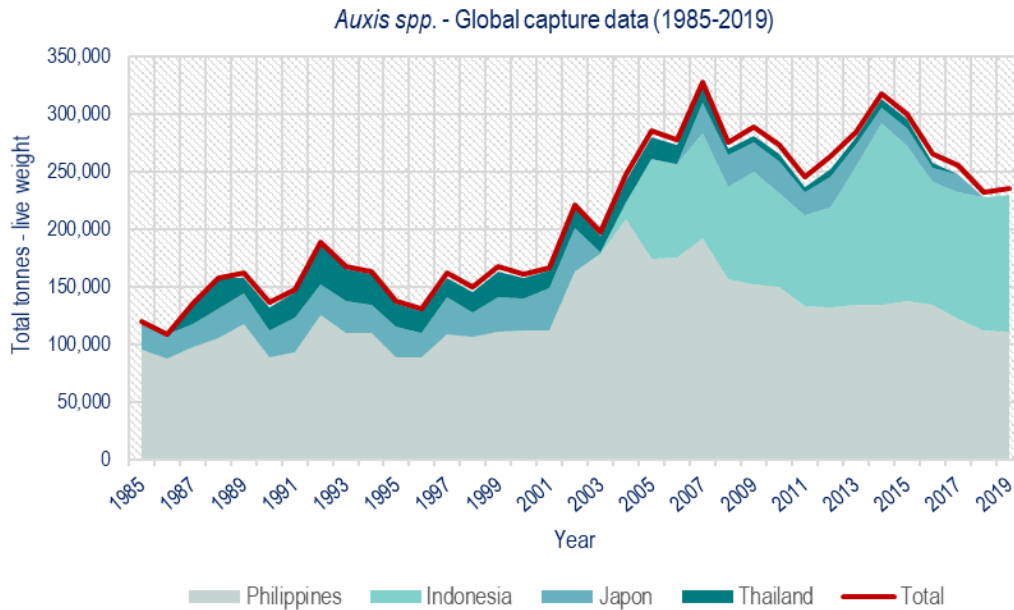


Figure 15. Reported captures of *Auxis spp.* in the Western and Central Pacific Ocean for the four fishing nations that contributed the most to the total catches during the period 1985-2019 (FAO, 2021). Frigate tuna total catches are also shown.

## MAIN FISHING GEARS

In the western and central Pacific Ocean region, bullet tuna is mainly captured by small-scale purse seines and, to a lesser extent, by handlines and trolling. According to local studies, most of the fishing activities are conducted surrounding anchored Fishing Aggregating Devices (aFADs). *Auxis spp.* also appear as bycatch in industrial purse seine fisheries that target other tuna species.

## STOCK ASSESSMENT

There is no stock assessment for bullet tuna in the WCPFC area.

## STOCK STATUS

Unknown.

The population of bullet tuna in the Western and Central Pacific Ocean has not been assessed, but there have been recent efforts to determine some biological indicators for this species on a local basis, mainly in the Indo-West Pacific region.

For example, Lelono and Bintoro (2019) presented some biological and length-weight data of bullet tuna captured in the south coast of East Java in 2016. Moreover, Khairul *et al.* (2019) carried out a catch-and-effort data collection from different ports of Sulawesi, Indonesia (2013-2016), along with some biological data from samples periodically taken on purse seine fisheries operating at the Banda Sea in 2016. According to this last study, catches of bullet tuna in the study area in 2016 increased substantially from the previous four years (from 2,100 t to 5,100 t), consistent with the general trend observed for the small tuna species in the Indo-Pacific region. They also analyzed some biological stock indicators and estimated the exploitation level, which they concluded was at maximum sustainable level. Although they concluded

that the bullet tuna stock in the Banda Sea and its adjacent waters is currently at an optimum level – with more than two-thirds of the population mature and spawning – they recommended reducing the fishing effort in the area as a precautionary approach, to maintain stock sustainability.

These studies only cover a small region of the Western Pacific Ocean and only provide preliminary stock status indicators based on biological parameters and catch-and-effort data. These limitations, in combination with the fact that catch and bycatch estimates are poorly documented, make their conclusions uncertain.

## MANAGEMENT MEASURES

WCPFC has not adopted any management measure related to this species.

## Kawakawa or Mackerel tuna - *Euthynnus affinis*

### BIOLOGY

Kawakawa or mackerel tuna (*Euthynnus affinis*) is a warm-water species of the Indo-West Pacific that lives in open waters ranging from 18° to 29°C but remains close to the shore in depths up to 200 m, including around oceanic islands and archipelagos (Kumar, 2019). A few stray specimens have been collected in the eastern tropical Pacific. Spawning mainly occurs in peripheral areas and around islands, and the spawning season is extensive, both geographically and temporally. There are seasonal spawning peaks that vary greatly by region (Ahmed *et al.*, 2015; Collette and Graves, 2019).

Kawakawa often form large schools of up to several thousand individuals with other similar-sized tunas (such as small albacore [*Thunnus alalunga*], skipjack and *Auxis spp.*) and other tuna and tuna-like mackerel species from the Scombridae family (Collette and Graves, 2019).

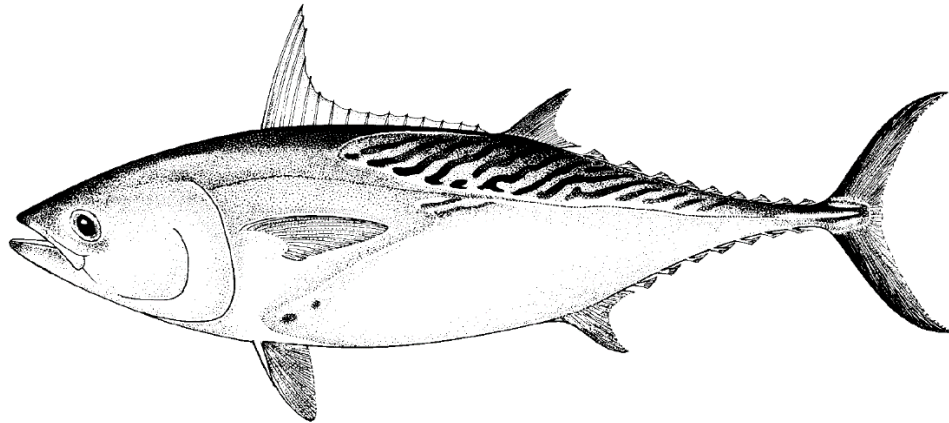


Figure 16. Kawakawa (*Euthynnus affinis*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

The size of kawakawa can vary regionally, with larger sizes in the Gulf of Persia and Oman Sea (Faizal *et al.*, 2019; Collette and Griffiths, 2019). In the Indian Ocean and the Indo-Pacific region, this species is considered to reach 50% maturity at between 37 and 50 cm length (Deepti and Sujatha, 2012), while in the Arabian Sea it is reached between 50 and 65 cm at age three (Ahmed *et al.*, 2015). In waters off Taiwan, age at first maturity is estimated at two years (Chiou and Lee, 2004). A study conducted in the Bay of Bengal, along the southeast coast of India, showed that the major catch is constituted by 34.5 to 54.5 cm size range (Kumar, 2019) although other studies established the common size for this species at about 60 cm (Ahmed *et al.*, 2015). Kawakawa can reach maximum lengths of about 100 cm (Griffiths *et al.*, 2009), with the largest reported weight at 15.1 kg (Collette and Graves, 2019). They grow fast and their longevity is between six and eight years (Collette and Graves, 2019).

Table 7. Kawakawa: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	60	-	-
MAXIMUM	100	15.1	6–8
MATURITY	37–50	4–5	2–3

## STOCK STRUCTURE

The stock structure of kawakawa throughout its range is poorly known. As this is an Indo-West Pacific species, two different stocks could be considered from the fishery management point of view: one in the Indian Ocean and other in the Western Pacific Ocean.

## Indian Ocean Kawakawa

### MANAGEMENT UNIT

A single management unit or stock is considered for stock assessment and management purposes in the IOTC area.

### RECENT CATCH

The reported catches for this species in the Indian Ocean (**Figure 17**) have gradually increased from the 1980s to the present, from values at about 40,000 t in 1985 to a peak of about 160,000 t in 2013. Since then, catches have been fluctuating around 150,000 t and reached 160,000 t again in 2018. In 2019, catches slightly decreased and are estimated at 148,828 t (IOTC, 2021b).

The countries with the largest landings are India, Indonesia and Iran, which concentrate almost three-quarters of the total reported landings. Thailand and Sri Lanka also contribute importantly to the total catches of kawakawa in the Indian Ocean.

Although there are many countries reporting landings for kawakawa, it is likely that there are still catches of this species that are not reported, especially those occurring as bycatch in fisheries targeting other tuna species.

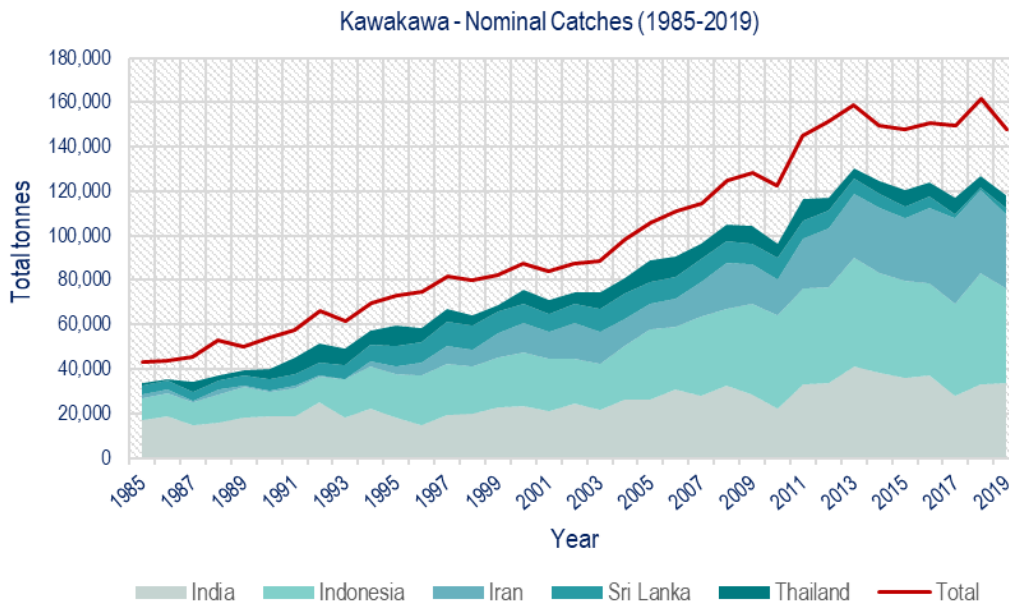


Figure 17. Reported captures of kawakawa in the Indian Ocean for the five fishing nations that contributed the most to the total catches during the period 1985-2019 (IOTC, 2021a). The total catch of kawakawa is also shown.

## MAIN FISHING GEARS

Kawakawa is caught across the Indian Ocean area mainly by multi-species fisheries using gillnets (49%), purse seiners (including coastal ones, 29%), and handlines and trolling (16%). This species is also an important bycatch of the industrial purse seine fishery (IOTC, 2021b).

## STOCK ASSESSMENT

A stock assessment was conducted for kawakawa in 2020 by applying data-limited assessment techniques, specifically an Optimised Catch Only Method (OCOM), and using catch data from 1950 to 2018 (IOTC, 2020). The results were very similar to those obtained from the 2015 assessment and indicate that the stock is exploited near optimal levels of  $F_{MSY}$  ( $F/F_{MSY} = 0.98$ ), with its biomass near the level that would produce MSY ( $B/B_{MSY} = 1.13$ ). The estimated probability of the stock currently being in green quadrant of the Kobe plot is about 50%. Thus, the kawakawa stock for the Indian Ocean is classified as not overfished and not subject to overfishing (IOTC, 2021b).

However, the fact that catch data were partially or fully estimated (e.g., 58% in 2017, 33% in 2018, 53% in 2019), owing to insufficient monitoring and reporting across the region and that the number of CPUE series available for fleets is only a small proportion of total catches, leads to high uncertainty about the stock status (IOTC, 2019; IOTC, 2020; IOTC, 2021b). Moreover, the IOTC Scientific Committee noted that kawakawa catches have surpassed estimated MSY levels since 2011 despite the decrease in catches from their peak in 2013 and thus recommended a reduction of the level of catches.

## STOCK STATUS

Not overfished and not subject to overfishing.

## MANAGEMENT MEASURES

IOTC recognizes that the stock is probably very close to being fished at MSY levels and that higher catches may not be sustained in the longer term. Thus, they recommended a precautionary approach where catch levels are reduced in the future to prevent the stock from becoming overfished. Moreover, IOTC emphasizes the need to expand data collection on catch data for the main fleets, size compositions and life trait history parameters of kawakawa in the Indian Ocean to improve stock assessments (IOTC, 2021b). In spite of scientific recommendations to limit catch, no management measures have been adopted for kawakawa in the Indian Ocean; only a series of resolutions adopted in recognition of inadequate fishery monitoring and reporting, requesting CPCs to collect and submit fishery statistics (Resolution 15/01 and 15/02) exist.

## Western and Central Pacific Kawakawa

### MANAGEMENT UNIT

There is little information available to determine the stock structure of kawakawa in the Western and Central Pacific Ocean.

### RECENT CATCH

In the Western and Central Pacific Ocean, catch estimates for kawakawa are poorly documented, and bycatch estimates are not available from the WCPFC.

The FAO database has landing records of kawakawa from around the world, including catches for several fishing nations operating in the Pacific Ocean. Reported catches in the WCPO (**Figure 18**) were oscillating around 100,000 t for the period of 1985 to 2000. A sharp increase, reaching a record-high 276,000 tonnes in 2002, was due to Indonesia starting to report their kawakawa catches in 2000. The total reported landings of kawakawa since 2002 ranged around 140,000 to 200,000 t, with the exception of another peak of approximately 235,000 t in 2014. Reported catches in 2019 are 165,689 t (FAO, 2021), and they are mainly recorded for the Southwest and Central Pacific and are attributed almost entirely to Indonesia, Philippines, Malaysia and Thailand.

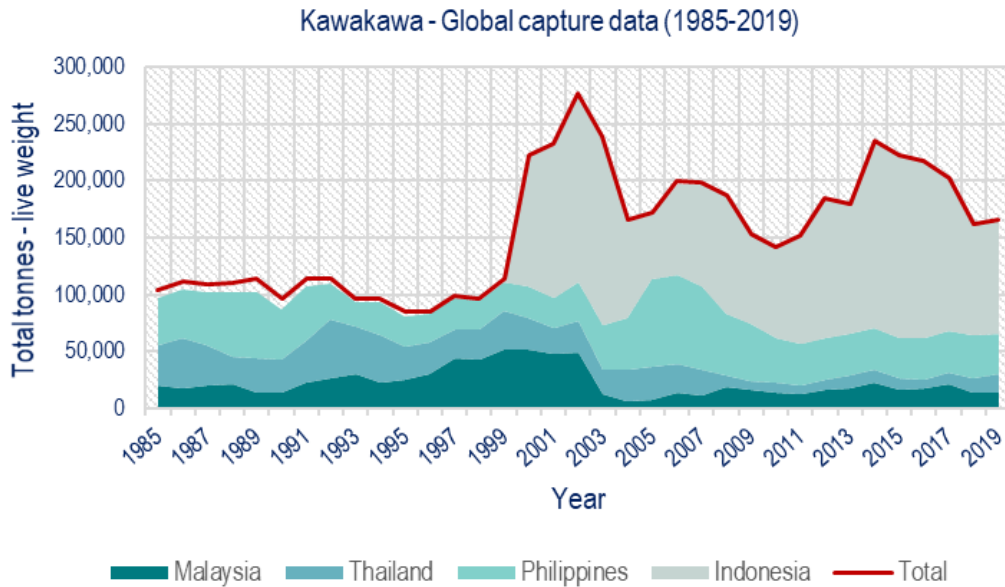


Figure 18. Reported captures of kawakawa in the Western and Central Pacific Ocean for the four fishing nations that contributed the most to the total catches during the period 1985-2018 (FAO, 2021). Note that Indonesia has only reported since 2000, although there were catches made prior to that time. The total catches of kawakawa are also shown.

## MAIN FISHING GEARS

Kawakawa is caught in multi-species fisheries such as surface trolling, gillnets and purse seines, where it has increased its commercial importance. It is also a common bycatch species in the industrial purse seine fishery (Collette and Graves, 2019).

Kawakawa is marketed canned or frozen but is also consumed dried, smoked and fresh at a local level. In the Philippines and Indonesia, the catch includes many small individuals. This species is also popular as bait for large game fish such as billfishes and tunas. Although the reported landings have increased in the last decades, it is considered that many catches are not being reported.

## STOCK ASSESSMENT

There is no stock assessment currently available for kawakawa in the WCPFC area.

## STOCK STATUS

Unknown.

There is no quantitative stock assessment currently available for kawakawa that covers the whole area of the Western and Central Pacific Ocean. The only recent stock assessment available was conducted in the South China Sea by Nishida *et al.* (2016) using catch and CPUE data using ASPIC stock assessment models to characterize the stock using data from 2000 to 2014. These authors concluded that the stock evaluated was not being subject to overfishing (estimated  $F/F_{MSY} = 0.74$ ) and was not overfished (estimated  $B/B_{MSY} = 1.29$ ). They also considered that it was possible to maintain the catch and fishing pressure levels for kawakawa in the region, provided that both catch and fishing pressure were maintained under their MSY levels.

Besides this regional assessment, there have been some other studies aimed to determine biological indicators for this species on a regional basis, mainly in the Indo-West Pacific region. Lelono and Bintoro (2019) presented some biological parameters such as the length and weight data of kawakawa captured in the south coast of East Java in 2016. Faizal *et al.* (2019) studied the growth parameters and length distribution of kawakawa individuals captured along the four seas surrounding the Peninsula of Malaysia, recording data from landings between 2003 to 2018, mainly attributable to the purse seine fleet (85%), hook-and-line, and trawling. These last authors observed an increase in landings of kawakawa at Malaysian ports, with important fluctuations since 2008, with a record-high 10,770 t in 2018.

Although these local studies shed some light on the biological aspects and trends in captures and population dynamics of kawakawa, they only cover small area of the western and central Pacific Ocean, mainly in the western part of the Pacific Ocean. Therefore, there is still high uncertainty about the stock status in the whole WCPFC area due to the lack of reliable data on captures and bycatch.

## MANAGEMENT MEASURES

WCPFC has not adopted any management measure related to this species.

## Little tunny - *Euthynnus alletteratus*

### BIOLOGY

Little tunny (*Euthynnus alletteratus*) is a sub-tropical species endemic to the Atlantic Ocean that inhabits tropical and subtropical latitudes, including the Mediterranean, Black Sea and Caribbean Sea, Gulf of Mexico and Gulf of Guinea. In the Western Atlantic, they are found from the Gulf of Maine, Bermuda, and the Caribbean islands to the border of Brazil and Argentina. Little tunny lives in surface waters close to shore, mainly on the continental and insular shelves, and are frequently associated with reefs (Collette and Graves, 2019; Cruz-Castán *et al.*, 2019).

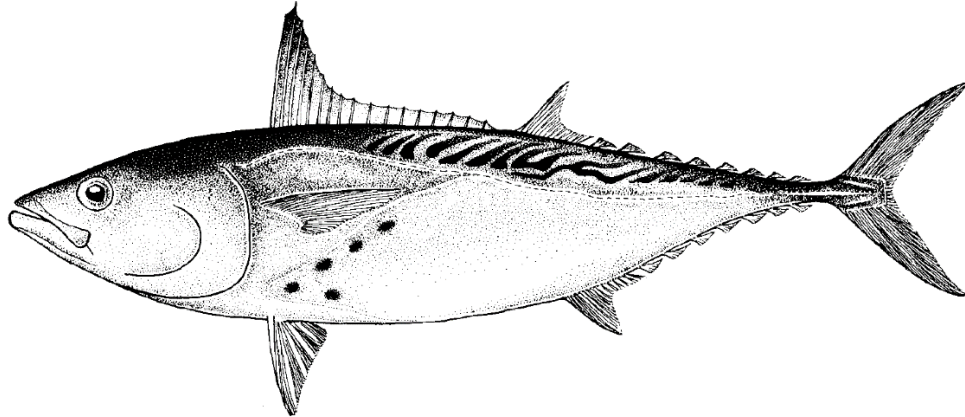


Figure 19. Little tunny (*Euthynnus alletteratus*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

Similar to other *Euthynnus* species, spawning mainly occurs near shore and around islands of the Atlantic Ocean, in waters between 30 and 40 m deep, and it extends over a long time, generally from April to September, with the most intensive spawning period between July and August, when the water is warmest (24–28°C).

The little tunny is typically a schooling species. The schools are primarily formed based on fish size rather than species, so other members of the family Scombridae, like the Atlantic bonito (*Sarda sarda*), may be present. Larger schools are more common offshore, where they swim in fast-moving compact schools, although they are less migratory than skipjack and other tunas. Smaller groups may be found in coastal areas with swift currents, near shoals and offshore islands (Collette and Graves, 2019).

The size of little tunny in commercial catches ranges roughly from 30 to 80 cm fork length (Collette and Nauen, 1983) with a weight of approximately 7 kg (FAO, 2014), although they can reach larger sizes in the Mediterranean and the Eastern Atlantic (Cruz-Castán *et al.*, 2019; Pons *et al.*, 2019b). The maximum recorded length is 122 cm (Claro, 1994) and the maximum recorded weight is 16.3 kg (Collette and Graves, 2019). Little tunny has an estimated longevity of between eight and 10 years. The generation length is estimated to be approximately four years (Collette and Graves, 2019). Their size at maturity ranges between 34 and 51 cm, which corresponds to two or three years, with a larger maturity size reported for males and varying greatly among the different regions of the Atlantic Ocean (Collette and Graves, 2019; Cruz-Castán *et al.*, 2019; Pons *et al.*, 2019b; Saber *et al.*, 2018).

Table 8. Little tunny: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	30–80	7	4
MAXIMUM	122	16.3	8–10
MATURITY	34–51	-	2–3

## STOCK STRUCTURE

This species is only present in the Atlantic Ocean, but there are no studies defining stock boundaries. There is little information available to determine the stock structure of little tunny in the Atlantic Ocean, but some authors have suggested that there may be four or five populations of little tunny: one or two populations in the western Atlantic, two populations in the eastern Atlantic, and a separate one in the Mediterranean (Collette and Graves, 2019; Pons *et al.*, 2019a). In this report, only one stock for the whole Atlantic Ocean is considered.

## Atlantic Little Tunny

### MANAGEMENT UNIT

In its last meeting, the Small Tunas Species Group proposed splitting the population of little tunny into five stocks/management units (the Mediterranean region shall be retained) (ICCAT, 2021a). Although this is still an ongoing discussion that is planned to conclude in 2022, ICCAT currently considers that there is not enough information to determine the stock structure of little tunny.

### RECENT CATCH

Little tunny is estimated to be the second most important species (in weight) among all small tunas in the Atlantic Ocean (ICCAT, 2021a), representing about 14% of total reported catch of small tuna species. Moreover, this species has high commercial importance at a regional level and is captured seasonally in western Africa, the Gulf of Cadiz, and the Mediterranean Sea, possibly contributing to its importance in reported small tunas catch, since catches of tunas with high commercial importance are likely better monitored than are catches of species with low commercial importance.

According to ICCAT records (**Figure 20**), reported landings of little tunny in the whole Atlantic Ocean (including the Mediterranean and the Black Sea) do not show an increasing trend but have been fluctuating around 15,000 t from 1985 to 2020, showing important peaks in years 1992 (20,000 t), 2011 (25,000 t) and 2016 (over 30,000 t). Reported landings for little tunny in 2020 were 9,686 t (ICCAT, 2021b). However, it is important to note that catches of little tunny (both for historical and for recent periods) are missing from the Gulf of Mexico, North America Atlantic Coast, and the Caribbean, so the total captures are known to be higher than reported by ICCAT (ICCAT, 2021a). Also, catch figures should be considered with caution, because those reported landings may include other species commonly confused with little tunny such as the Atlantic bonito (*Sarda sarda*).

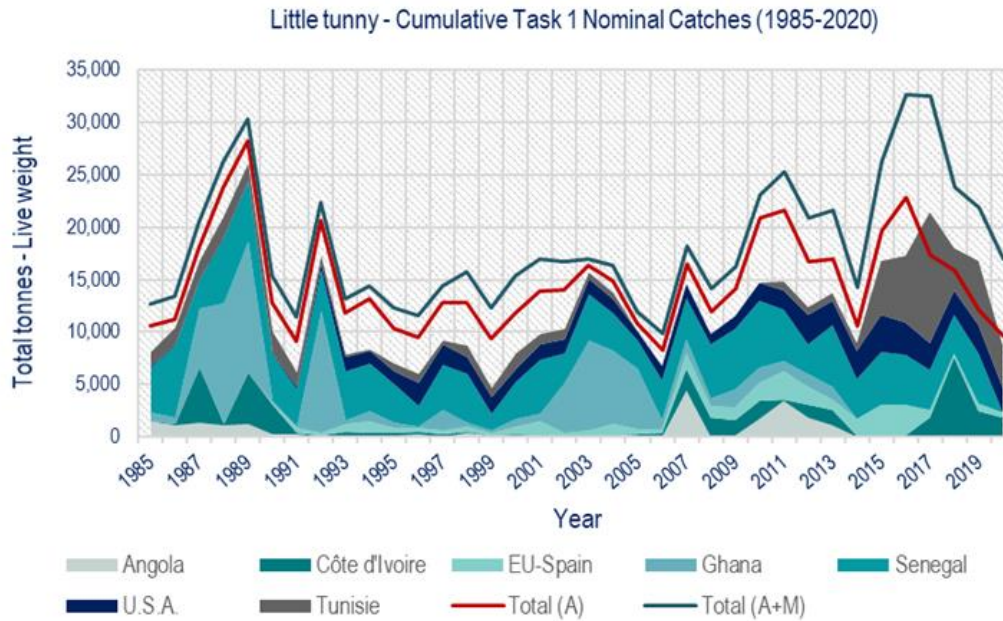


Figure 20. Reported captures of little tunny in the Atlantic Ocean for the six fishing nations that contributed the most to the total catches during the period 1990-2020 (ICCAT, 2021c). Total captures of Little tunny are also shown for both the Atlantic — Total (ATL) — and the Atlantic and the Mediterranean — Total (A+M).

## MAIN FISHING GEARS

Little tunny is captured throughout its whole range. As a target species, it is caught seasonally by coastal trawling fleets in western Africa, the Gulf of Cadiz, and the Mediterranean Sea. In Tunisia and Morocco, little tunny is captured with specialized traps in inshore areas. In the Caribbean and the Gulf of Mexico, this species is captured by several multi-specific artisanal fisheries using different fishing gears such as gillnets, driftnets, surface longlines, and handlines with bait or trolling, depending on regional practices. It also is a very valuable resource for local consumption and as bait for other fisheries.

Little tunny is also captured incidentally in significant amounts by industrial purse seine fishing, troll lines and trawling (Collette and Graves, 2019).

## STOCK ASSESSMENT

There is no stock assessment currently available for little tunny in the ICCAT area.

## STOCK STATUS

Unknown.

In 2017 the ICCAT's Small Tuna Species Group decided to prioritize the improvement of biological and catch data for Little tunny (*Euthynnus alletteratus*), and Atlantic Bonito (*Sarda sarda*) among others, based on their economic importance and the lack of knowledge on their biology and uncertain catch histories (ICCAT, 2017). Since then, many studies have been carried out to determine the biological and exploitation parameters of little tunny, from the coastal waters of Algeria (Labidi-Neghli *et al.*, 2019a, 2019b), Tunisia (Hajjej *et al.*, 2019), and Spain and Portugal (Saber *et al.*, 2018) in the East Atlantic to the Gulf of Mexico (Cruz-Castán *et al.*, 2019) in the West Atlantic.

Pons *et al.* (2019a) estimated a quantitative proxy of current stock status for the little tunny. They used biological and length data from multiple fleets for the period of 2010 to 2016. Two different length-based models (LBSPR and LIME) were applied to estimate instantaneous fishing mortality (F) and spawning potential ratio (SPR). For the Northwest Atlantic, Northeast Atlantic and Mediterranean regions or sub-population, results of LBSPR and LIME were similar, and the SPR was estimated to be above 40%. In contrast, SPR estimates for both LBSPR and LIME for the Southeast Atlantic area were below 0.40, and thus they considered little tunny in the Southeast Atlantic to be overfished. These results are in line with the findings of previous research using longline bycatch data (Frédou *et al.*, 2017) that concluded that the southern stock was at high risk while the northern population was at moderate risk considering longline fishery data.

## MANAGEMENT MEASURES

Despite these efforts to evaluate stock status for little tunny, there is still high uncertainty about its status in the Atlantic. Thus, ICCAT has developed a research program to address knowledge gaps regarding size data and biological parameters (from both biological sampling and tagging programs). Between August 2016 and April 2019, a total of nearly 8,000 little tunny were tagged off West Africa and in the Western Atlantic, with nearly 600 tags being recovered (ICCAT 2019b), which will be essential information for carrying out an assessment in the coming years. Also, during its last meeting (ICCAT, 2021a), the small tunas WG agreed that the next tasks of the project should focus on conducting additional sampling to fill information gaps about the growth and maturity parameters of little tunny. They also highlighted the need for further studies that allow geographical differentiation of the five regions that might be considered as potential different stocks/management units.

## Black skipjack - *Euthynnus lineatus*

### BIOLOGY

Black skipjack (*Euthynnus lineatus*) is a warm-water species endemic to the eastern tropical Pacific. It ranges from San Simeon (California) and the lower half of the Gulf of California to northern Peru, including all the offshore islands and the Galapagos. It is mostly found in surface waters but more offshore than other species of the same genus, within about 450 km off the mainland. Black skipjack inhabits warm waters where surface temperatures are at least 23°C, but the average water temperature where this species is mostly caught is 29.2°C (Collette and Graves, 2019).

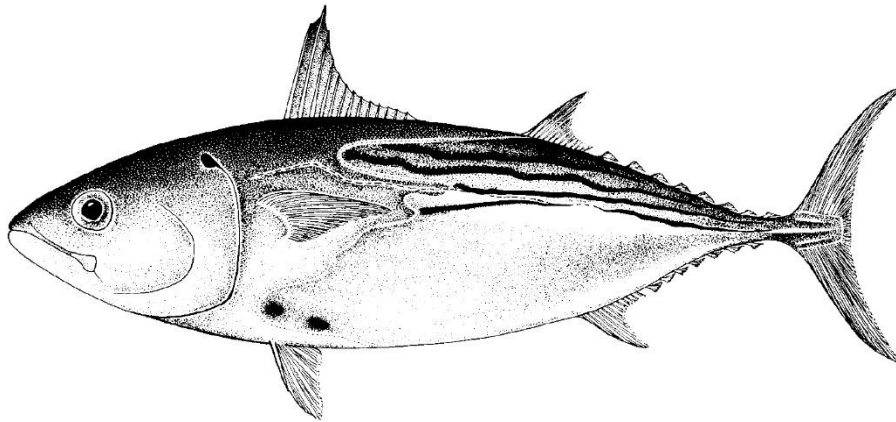


Figure 21. Black Skipjack (*Euthynnus lineatus*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

The spawning season extends over a long season and takes place throughout its whole geographical range. The batch fecundity, the number of eggs laid in each spawning event, has been described to increase with latitude (Schaefer, 1987). Like other *Euthynnus* species, spawning mainly occurs near shore and around islands; however, spawning for black skipjack extends more widely from coastal to oceanic areas in waters with temperatures frequently above 26°C (Collette and Nauen, 1983).

Black skipjack can form multi-species schools with other tunas, like yellowfin tuna (*Thunnus albacares*) and skipjack tuna (Collette *et al.*, 2011). It is an opportunistic predator that shares its feeding pattern with the other species in the school. But black skipjack also can be the prey of larger tunas and billfishes, for example, and has been found in the stomachs of yellowfin tunas (Collette and Graves, 2019).

This species commonly reaches 60 cm in length (ranges 30 to 65 cm) and about 5 kg weight. The maximum recorded size is 84 cm length and 11.8 kg weight. The length at 50% maturity for this species is estimated to be 47 cm. Its longevity has not been evaluated (Collette and Graves, 2019).

Table 9. Black skipjack: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	60	5	-
MAXIMUM	84	11.8	-
MATURITY	47	-	-

## STOCK STRUCTURE

This species is only present in the Eastern tropical Pacific Ocean and it is assumed that there is only one stock for the whole area.

## Eastern Pacific Black Skipjack

### MANAGEMENT UNIT

A single management unit or stock is considered in the IATTC area.

### RECENT CATCH

Black skipjack has little directed fishing effort at present, but it is incidentally captured by other tuna fisheries in the Eastern Pacific Ocean.

According to IATTC (IATTC, 2021b), which has recorded landings of black skipjack in the Eastern Pacific Ocean since the 1970s, catches fluctuated from 1970 to 2000. Yearly catches during this period (**Figure 22**) averaged 1,000 t, with marked peaks in 1974 and 1980 at about 4,000 t. In 2001, a new peak was reached at total reported landings of over 2,000 t. Since then, landings of black skipjack show an upward trend, with values of 4,000 t in 2009, 4,500 t in 2012, and a maximum peak of more than 6,700 t in 2016. These captures are almost completely attributed to Mexico, Ecuador, and the United States of America. Reported catches were 5,300 t and around 4,300 t in 2019 and 2020, respectively (IATTC, 2021a).

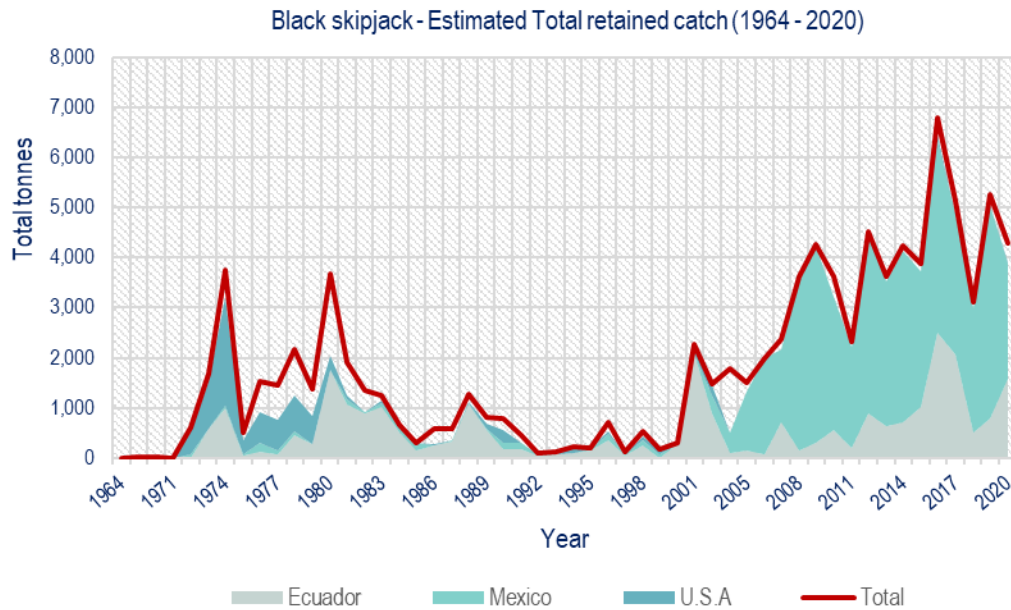


Figure 22. Reported captures of black skipjack in the Eastern Pacific Ocean for the three fishing nations that contributed the most to the total catches during the period 1964-2020 (IATTC, 2021b). Total catches of black skipjack are also shown.

## MAIN FISHING GEARS

The vast majority of black skipjack is caught as bycatch by purse seine vessels targeting other tuna species and, to a lesser extent, by live-bait pole-and-line gear, trolling, and sport fishing gear.

Black skipjack has certain commercial importance in some countries of Latin American such as Ecuador and Panama, where it is mainly captured using purse seines and pole-and-line and sold fresh for human consumption in local markets or as strip bait in sport fisheries targeting other billfishes (Collette and Graves, 2019).

## STOCK ASSESSMENT

There are no stock assessments or preliminary population studies for this species in the IATTC area.

## STOCK STATUS

Unknown.

Although the impact of incidental bycatch is not known, black skipjack is widely distributed in the Eastern Pacific Ocean and appears to be quite common.

## MANAGEMENT MEASURES

IATTC has not adopted any direct measures regarding black skipjack, but the species' geographical distribution range includes some marine protected areas of the Eastern Pacific Ocean (the Cocos, Galapagos and Malpelo protected areas). In addition, there are some area closures that affect purse seine vessels targeting other tuna species that bycatch black skipjack, and thus these closures also affect black skipjack (Resolution C-21-04).

## Longtail tuna - *Thunnus tonggol*

### BIOLOGY

Longtail tuna (*Thunnus tonggol*) is a tropical and subtropical species whose geographical range extends from the Western Pacific Ocean to the Western Indian Ocean. It occurs from the coasts of Japan through the Philippines and Indonesia to Papua New Guinea, and from the sub-tropical east and west coasts of Australia northwest through Malaysia and Thailand to India, Sri Lanka, and Pakistan, and finally to the Persian Gulf and the Red Sea. A distinctive characteristic of longtail tuna is that it is not considered to be a highly migratory species (Willette, 2019) and is instead a more neritic or coastal species.

Unlike other species of the genus, longtail tuna lives close to shore, in shallow waters less than 200 m depth and most commonly less than 50 m. Recent studies based on its diet have revealed that this species is more tolerant of high turbidity waters than other species of the *Thunnus* genus, allowing them to remain closer to shore even during the wet rainy seasons (Collette and Graves, 2019; Griffiths, 2020).

Longtail tuna is found in water temperatures ranging from 16° to 31°C. While juveniles and young adults are primarily found in water temperatures of 24-28°C at equatorial and tropical latitudes, larger adults prefer cooler subtropical waters (18-22°C) (Willette, 2019).

Spawning probably takes place in two seasons in the northern hemisphere (between March-May and July–December) and in a single period that extends from October to April in the southern hemisphere (Griffiths *et al.*, 2019a). It takes place in coastal regions at surface water temperatures of at least 28°C.

This species may form schools of a variety of sizes. Larger longtail tuna (>50cm FL) are known to form smaller schools and have also been described as solitary individuals (Griffiths *et al.*, 2019a).

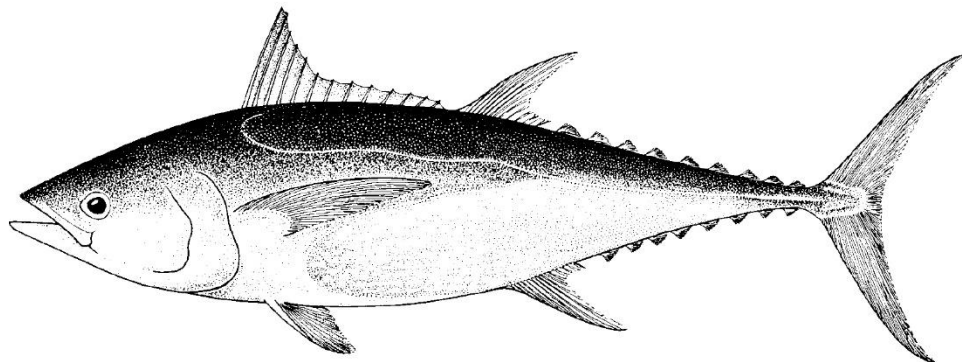


Figure 23. Longtail tuna (*Thunnus tonggol*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

Longtail tuna is the second smallest of eight *Thunnus* species that can reach sizes of about 130 cm length or more. The maximum recorded size for this species is 145.2 cm total length (Al-Mamari *et al.*, 2014) and 35.9 kg weight (Collette and Graves, 2019). Common fork lengths are around 40-70 cm length depending on the region. It is considered that longtail tuna grows faster in the northern hemisphere, reaching maturity at around 40-50 cm FL at the age of two years, than in the southern hemisphere, where maturity is reached at 50-60 cm and at an older age (Griffiths *et al.*, 2019a, 2019b). In Australia, longevity has been estimated to be around 10 years, but longtail tuna is considered to live as long as 18 years (Willette, 2019).

Table 10. Longtail tuna: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	40–70	-	10
MAXIMUM	130	36	18
MATURITY	40–60	-	2–3

## STOCK STRUCTURE

There is great uncertainty regarding the stock structure of longtail tuna throughout their geographic range. For many years, it was thought that separate stocks may exist in different regions due to morphological differences in specimens caught in different areas. The most recent genetic studies carried out by Kunal *et al.* (2014) in Indian waters and Willette *et al.* (2016) in the South China Sea concluded that longtail tuna exist as a single stock within their respective study regions; in comparing both studies (Willette *et al.*, 2016), however, they found that fish from the South China Sea and Indian waters comprise two distinct stocks.

On the other hand, some analyses mainly based on length-frequency data along Indian and Australian waters suggest that longtail tuna may exist as a single stock throughout Southeast Asia and Oceania, although the possibility of separate stocks being present in these regions cannot be dismissed (Griffiths *et al.*, 2019a). In another recent study, Griffiths *et al.* (2020) even suggested the possible existence of at least four main putative stocks: Oceania, Southeast Asia, western Indian Ocean, and eastern Indian Ocean. This knowledge gap on stock structures is one of the factors that have complicated accurate stock assessments.

For the purposes of this report and considering the fishery management point of view, two different stocks of longtail tuna have been considered: the Western Pacific and the Indian Ocean stock.

## Indian Ocean Longtail Tuna

### MANAGEMENT UNIT

A single management unit or stock is considered for stock assessment and management purposes in the IOTC area.

### RECENT CATCH

The reported catches for this species in the Indian Ocean (**Figure 24**) have increased greatly since the 1980s. In 1985 reported values were around 40,000 t and begun to increase rapidly, reaching a total of more than 100,000 t in 2007. A very large catch increase occurred between 2007 and 2012, when catches reached a maximum of about 175,000 t (IOTC, 2021a). Since then, catches in the Indian Ocean declined to about 137,000 t in 2015 and have been maintained at around this level until now. The estimated longtail tuna catches in 2019 were 112,867 t, lower than the average for the 2015–2019 period (135,070 t) (IOTC, 2021b).

Major fishing nations for this species are Iran (42%), Indonesia (19%), Oman (12%) and Pakistan (11%), which accounted for more than 80% of the total reported landings (IOTC, 2021b). Other countries that substantially contribute to landings of longtail tuna in the Indian Ocean are Malaysia and India (IOTC, 2021b).

This species is now the fifth most important for Indian Ocean tuna fisheries, exceeding catches of principal commercial tuna species like bigeye, *Thunnus obesus* (80,000 t) and albacore (40,000 t) and constituting about 9% of the total catch of tunas and scombrid fishes in the Indian Ocean (Griffiths *et al.*, 2019a).

The reported catch of longtail tuna is considered to be underestimated because some of it is landed as yellowfin or even as bluefin tuna (Collette and Graves, 2019) and since catches from artisanal and small scale fisheries are not fully monitored.

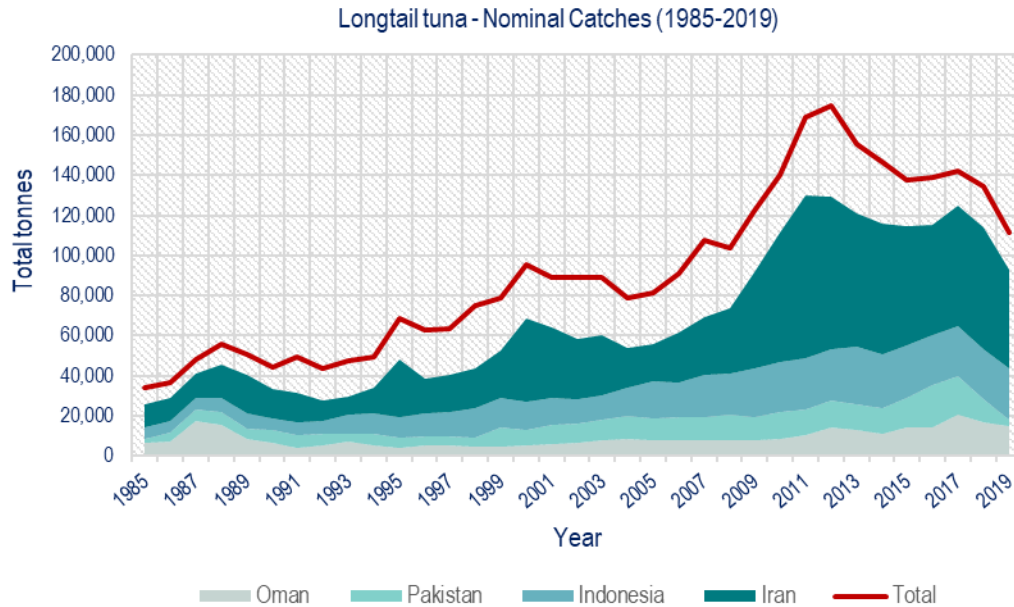


Figure 24. Reported captures of longtail tuna in the Indian Ocean for the four fishing nations that contributed the most to the total catches during the period 1985-2019 (IOTC, 2021a). Total catches of longtail are also shown.

## MAIN FISHING GEARS

As a result of their coastal distribution, longtail tuna are caught by small-scale commercial and artisanal fisheries throughout their geographical distribution area. In contrast to the WCPO fisheries that catch longtail tuna, the fisheries in the Indian Ocean generally catch larger fish (60–80 cm) (Griffiths *et al.*, 2019a).

Longtail tuna in the Indian Ocean are primarily caught using drift gillnets and to a lesser extent small purse seines — especially in the waters of Thailand and Malaysia — and hook-and-line (trolling), but also a variety of other minor methods including beach seine, stake traps, and set nets (Griffiths *et al.*, 2019a). These catches are usually made in coastal regions of the northwestern Indian Ocean from the west coast of India to Somalia. They are also important to sport fisheries in countries such as Kenya, Mozambique, Pakistan, Thailand, Malaysia and Indonesia (Wekesa and Ndegwa 2011; Griffiths *et al.*, 2013, Chacate and Mutombene 2014; Hornby *et al.*, 2014).

Although longtail tuna comprise the majority of catches in the coastal tuna fisheries of the Indian Ocean, they are not often targeted specifically; longtail tuna are mainly caught in other multi-species drift gillnet fisheries (73% of catches) that target larger oceanic tunas (e.g. yellowfin tuna) and sharks —particularly in Iran, Pakistan and India (IOTC, 2021b).

## STOCK ASSESSMENT

A stock assessment was conducted for longtail tuna in 2020 by applying the Optimised Catch-Only Method (OCOM) and using catch data from 1950 to 2018 (IOTC, 2020). The results indicated that the stock in recent years is being exploited at a rate that exceeds  $F_{MSY}$ , and stock biomass appears to be below  $B_{MSY}$  (76% of plausible models runs). The MSY estimate of around 140,000 t was exceeded between 2010 and 2014. In 2015 reported catches marginally decreased (136,849 t) and were below estimated MSY in 2019 (113,000 t). The estimate of the  $B_{2018}/B_{MSY}$  ratio (0.69) in this assessment is lower than in previous years, reflecting declining abundance. The  $F_{2018}/F_{MSY}$  ratio is slightly higher than previous estimates. Data-poor stock assessments have been conducted annually for longtail tuna since 2013 with the same results. Also, in 2020, an assessment using a biomass dynamic model incorporating gillnet CPUE indices was undertaken, and the results were consistent with OCOM in terms of population status. Therefore, the longtail tuna stock in the Indian Ocean is considered to be overfished and subject to overfishing.

## STOCK STATUS

Overfished and subject to overfishing.

The rise in reported annual catches to a peak in 2012 increased the pressure on the stock, even though the catch trend has reversed since then. As noted in 2015, the apparent fidelity of longtail tuna to particular areas/regions is a matter of concern, as overfishing in these areas can lead to localized depletion. This concern is also highlighted in some stock assessments conducted in localized regions of the Indian Ocean. In 2016, for example, Nishida *et al.* (2016) carried out an assessment using CPUE data in ASPIC models for the longtail tuna stock in the region of the Andaman Sea and Malacca Strait (Northeast Indian Ocean) and also concluded that the stock was overfished ( $B/B_{MSY} = 0.89$ ) and subject to overfishing ( $F/F_{MSY} = 1.11$ ). A more recent assessment, conducted for Iranian waters including the Persian Gulf and the Oman Sea (Darvishi *et al.*, 2018), determined that the population biomass was 17.2% of the unexploited biomass, concluding that the stock in that area was overfished and subject to overfishing.

## MANAGEMENT MEASURES

The IOTC Scientific Committee estimated that the stock is very close to being fished at MSY levels and that higher catches may not be sustained. It recommended a precautionary approach and emphasized the need to expand data collection on catch data, catch-and-effort data for the main fleets, and size composition. Despite IOTC has a series of resolutions, in view of inadequate monitoring and reporting of longtail catch, requesting CPCs to collect and submit fishery statistics (Resolution 15/01 and 15/02), there remains considerable uncertainty about the stock status of longtail tuna because total catches used in the stock assessment need to be partially estimated by the Secretariat (*e.g.*, 37% in 2017, 28% in 2018, 28% in 2019) (IOTC, 2019; IOTC, 2020; IOTC, 2021b). Therefore, the management advice of the Commission continues to emphasize the need for CPCs to comply with IOTC data requirements.

IOTC has a conservation measure in force prohibiting the use of large-scale drift gillnets (>2.5 km in length) in the high seas that will be extended to the whole IOTC area of competence by 2022 (Resolution 17/07), except for Pakistan, which objected to the resolution. In Pakistan, although there is no specific CMM in place for longtail tuna, there is a two-month closure (June-July), and longtail tuna are not being harvested by the Pakistan gillnet fleet in January-March (Griffiths *et al.*, 2020). Also, Resolution 12/12 that prohibits the use of large-scale drift gillnets in the high seas remains binding on Pakistan.

# Western and Central Pacific Longtail Tuna

## MANAGEMENT UNIT

A single management unit or stock is considered in the WCPFC area.

## RECENT CATCH

Longtail tuna is not covered by the Western and Central Pacific Fisheries Commission (WCPFC), as it is not considered a highly migratory species. Consequently, catch estimates for this species are poorly documented and bycatch estimates are not available in the WCPFC.

The FAO database has landing records of longtail tuna from around the world. Most of the global catch is taken in the Western Indian Ocean. However, there is also a major fishing ground off the South China Sea coast of Thailand and Malaysia, in the Western and Central Pacific Ocean. FAO catch records for this area show a gradual increase in the last decades (**Figure 25**) from 50,000 t in 1985 to more than 100,000 t in 2019, with two marked peaks along this period — one of more than 140,000 t in the 1990s and the other of almost 200,000 t in the 2000s (FAO, 2021). A large part of the peak in the 2000s relates to reporting from Indonesia and Malaysia, which started in the 2000s.

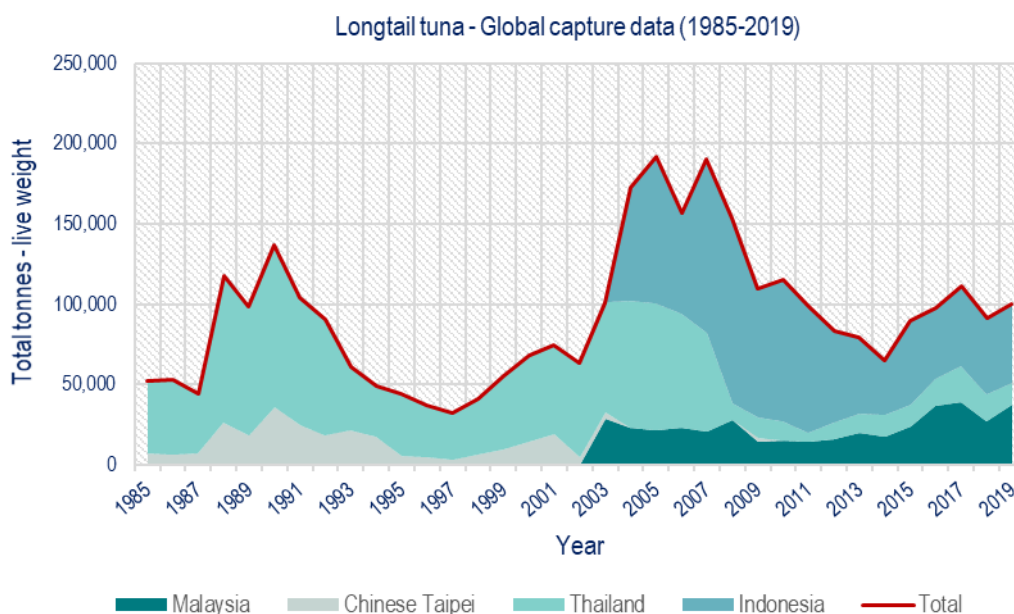


Figure 25. Reported captures of longtail tuna in the Western and Central Pacific Ocean for the four fishing nations that contributed the most to the total catches during the period 1985-2019 (FAO, 2021). Total catches of longtail tuna are also shown.

## MAIN FISHING GEARS

As a coastal species, longtail tuna are targeted mostly in small coastal fisheries, especially in areas with a wide continental shelf. The major fisheries for longtail tuna in the WCPO area operate in Southeast Asia, primarily the Gulf of Thailand and the South China Sea. In those regions, small fish (15–55 cm) are primarily caught by small purse seines and drift gillnets, and to a lesser extent by hook-and-line (primarily trolling, but also handline and small longlines),

particularly in Malaysia, Thailand, Vietnam, and Indonesia (Griffiths *et al.*, 2019a). Significant but inadequately quantified catches of longtail tuna are also taken in the set net fisheries in Taiwan and Japan and the recreational fisheries in Australia (Willette, 2019).

## STOCK ASSESSMENT

There is no stock assessment currently available for longtail tuna in the WCPFC area.

## STOCK STATUS

Unknown.

There is not a coordinated stock assessment of longtail tuna across its range in the western Pacific Ocean. However, several local assessments have been carried out.

In the South China Sea, Nishida *et al.* (2016) undertook a stock assessment for this species using catch and CPUE data in ASPIC models to characterize the stocks and determined that the stock was not subject to overfishing ( $F/F_{MSY} = 0.18$ ) and not overfished ( $B/B_{MSY} = 2.22$ ) in 2014. In a review of the model, Siriraksophon (2017), despite major uncertainties in the model resulting from the use of data only from Thai fisheries (mainly purse seine), suggested that the total catch of longtail tuna in the Pacific Ocean (Southeast Asian waters) could be increased to the MSY levels (*i.e.*, an increase of 123%, from 88,200 t to 196,700 t) with a probability of 50% to be at  $B_{MSY}$  and  $F_{MSY}$ .

Restiangsih and Hidayat (2018) used a YPR model based on monthly length-frequency samples from the Java Sea during 2014 and estimated a high fishing mortality ( $F = 1.01$  per year) for longtail tuna. They concluded that the stock in this area was subject to overfishing, primarily due to high catches by gillnets, which are the most commonly used fishing gear in the region.

In northern Australia, there was only one stock assessment conducted for longtail tuna, using an age-structured YPR model based on a combination of fish aged directly from otoliths and length-frequency data (Griffiths, 2010). The assessment characterized the period 2004–2006 and resulted in an estimated average annual fishing mortality of 0.24 per year. The authors concluded that the stock was not subject to overfishing in 2004–2006. However, when considering the spawning biomass, the fishing mortality was close to  $F_{40\%}$ , indicating that the stock was probably fully fished and that any increase in fishing effort would likely result in the stock being overfished (Griffiths *et al.*, 2020).

Therefore, there remains high uncertainty about the stock status of longtail tuna in the WCPO, with no consistent observed results in the different studied areas.

## MANAGEMENT MEASURES

Unlike other oceanic tuna fisheries where specific management measures have been adopted, longtail tuna has not received any management attention from WCPFC. In Australia alone, in response to the increasing fishing pressure on longtail tuna, this species was declared “recreational only,” with no commercial fishery allowed to target it. Moreover, an annual bycatch limit of 70 t has been imposed by Australia on the Commonwealth-managed fisheries.

Thailand and Indonesia both cover longtail tuna in their fisheries management plans. However, whether the Thai management plan will ensure longtail tuna sustainability in the area is yet to be demonstrated, and Indonesia’s tuna plan mostly focused on data gathering for neritic tunas. There is a need for coordination monitoring efforts across countries in the Western and Central Pacific Ocean to ensure total fishing mortality is within sustainable levels (Griffiths *et al.*, 2020).

## Blackfin tuna - *Thunnus atlanticus*

### BIOLOGY

Atlantic blackfin tuna (*Thunnus atlanticus*) is a tropical species whose geographical distribution is limited to the western central Atlantic Ocean, from Martha's Vineyard in Massachusetts to 26°S in Brazil and the island of Trinidad and Tobago, including Bermuda, the wider Caribbean and the Gulf of Mexico (Collette and Graves, 2019). Recent studies have described an expansion of the distribution and fishing grounds of blackfin tuna in the southwestern Atlantic that may be due to increasing water temperatures, suggesting that the species distribution may have been displaced southward until 34°S (Cardoso *et al.*, 2021).

Blackfin tuna inhabits waters with a temperature above 20°C. It is often found on the coastal shelf, over reefs, and bays, but it is also caught offshore on anchored FADs more than 18 km away from the coast (to depths of 2,500 m) and around natural drifting objects (Taquet, 2000). Blackfin tuna tagged with pop-up satellite archival tags in the Gulf of Mexico showed a preference for the surface mixed layer, spending 90% of their time in the upper 57 m of the water column (Fenton *et al.*, 2015).

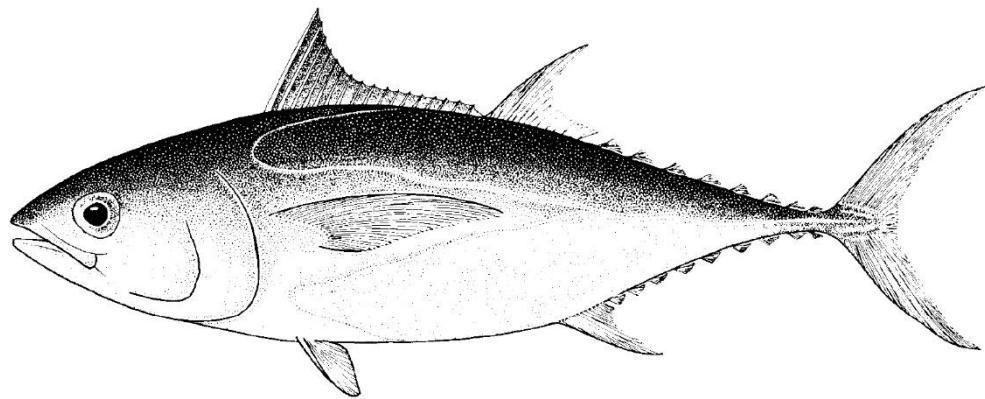


Figure 26. Atlantic blackfin tuna (*Thunnus atlanticus*). Courtesy of Fisheries and Aquaculture Department/Food and Agriculture Organization of the United Nations.

Blackfin tuna spawn in the open sea during the summer. Around Florida, spawning season extends from April to November, with a peak in May, while in the Gulf of Mexico spawning apparently occurs between June to September (Collette, 2010). In the southern hemisphere, this species is considered to spawn from October to January, with peaks in November and December off the coast of Brazil (Freire, 2009). This is a typically schooling species that forms large mixed schools with skipjack tuna (Collette and Graves, 2019).

The blackfin tuna is the smallest tuna species in the genus *Thunnus*, generally growing to an average size of 60 cm in length and 5 to 10 kg weight, considering the average sizes of the several specimens caught through its entire geographical range (Freire *et al.*, 2005; Vieira *et al.*, 2005; Juan-Jordá *et al.*, 2013b; Collette and Graves, 2019). The maximum recorded size is 110 cm fork length and 22.4 kg weight. The commonly reported age for this species is about five years, but their maximum age has been estimated as more than seven-and-a-half years (Neilson *et al.*, 1994). Their size at maturity varies slightly depending on the geographic zone and ranges between 48 and 55 cm, with larger sizes reported for males (Collette and Graves, 2019).

Table 11. Blackfin tuna: Biological characteristics.

	SIZE (CM)	WEIGHT (KG)	AGE (Y)
COMMON	60	5–10	5
MAXIMUM	110	22.4	8
MATURITY	48–55	-	-

## STOCK STRUCTURE

This species is only present in the western Atlantic Ocean, but there is no clear understanding of stock differentiation across its range. Some studies have found some genetic differentiation between fish from the Gulf of Mexico and the Northwest Atlantic (Saxton 2009). However, ICCAT considers there to be only one stock for the whole Atlantic Ocean (ICCAT, 2021a).

## Atlantic Blackfin tuna

### MANAGEMENT UNIT

A single management unit or stock is considered in the ICCAT area. In its last meeting (ICCAT, 2021a), the Small Tunas Species Group proposed referring to this stock with the Atlantic suffix (ATL) instead of the previously used suffix (A+M) referring to the Mediterranean Sea, since blackfin tuna catches are not currently reported for the Mediterranean Sea.

### RECENT CATCH

Atlantic blackfin tuna is a common tuna species in the western central Atlantic, although its commercial importance is limited to particular regions, such as the Caribbean region (Venezuela, Martinique, Guadeloupe, Cuba, and the Dominican Republic) or the Southern and Northeastern coast of Brazil, where blackfin tuna represents an important food for human consumption.

Atlantic blackfin tuna is a bycatch species that represents a small proportion of the total small tuna catches in comparison to other species of small tunas. Atlantic blackfin tuna and five other species are estimated to account for 8% of the bycatch of the total of small tuna species caught in the Atlantic Ocean (ICCAT, 2019a).

ICCAT-reported landings for Atlantic blackfin tuna in 2020 were 2,486 t (ICCAT, 2021b). However, it is known that landings are underestimated because there some countries stopped reporting catches in the late 1990s (Cuba, Martinique, and the Dominican Republic). These countries, however, continue reporting data to FAO. Therefore, in this case, both FAO landing records (FAO, 2021) and ICCAT landings data (ICCAT, 2021c) have been used to represent the trend in captures for Atlantic blackfin tuna (**Figure 27**). Catches of blackfin tuna fluctuated between 2,400-5,500 t from 1986-2004, and have been ranging around 2,000 t for the past 15 years, with a marked peak in 2013 at around 4,000 t. Apart from the non-reporting countries, a large portion of the captures in some areas represented by the artisanal and recreational fisheries are not fully reported — or reported at all — to ICCAT. Thus, there is still an important gap of information regarding the actual catches of this species.

On the other hand, the countries that are reporting landings do not show evidence of declining catches. For example, blackfin tuna was the species with the highest abundance in the pelagic longline fishery in northeast Brazil, representing 56.2% of all tunas caught (Collette and Graves, 2019).

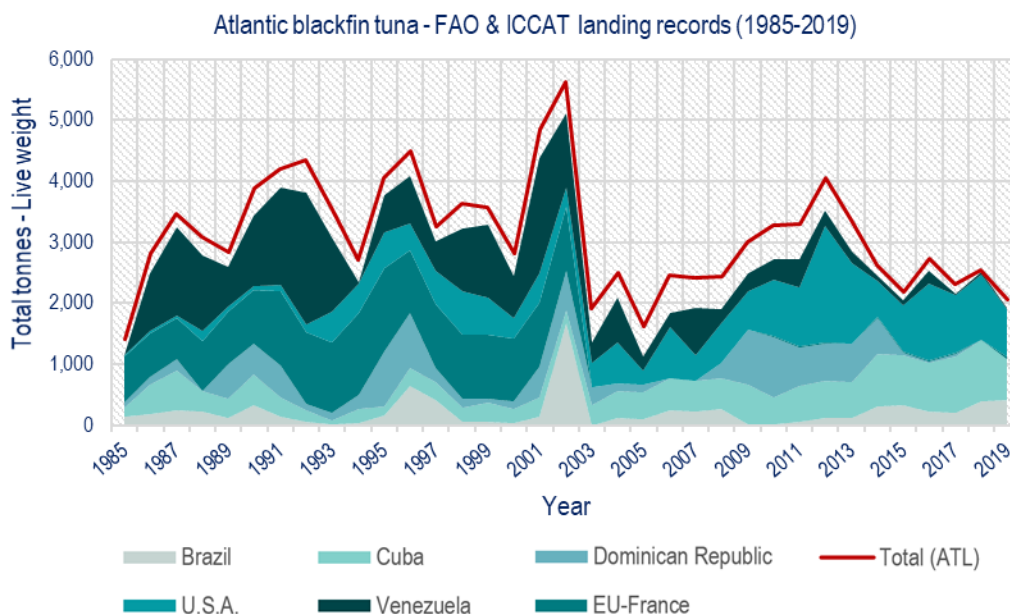


Figure 27. Reported captures of Atlantic blackfin tuna for the six fishing nations that contributed the most to the total catches during the period 1985-2020 (ICCAT, 2021c & FAO, 2021)<sup>1</sup>. Total catches of Atlantic blackfin tuna are also shown.

## MAIN FISHING GEARS

Blackfin tuna are often bycaught by some industrial surface fleets (baitboat, purse seine and longline) targeting other tuna species, but it is also the target species of some artisanal commercial and recreational coastal fisheries.

In the Caribbean region, this species supports important fisheries using different types of fishing gears — trolling, drifting longline, and pole-and-line with live bait — mainly in Venezuela, Martinique, Guadeloupe, Cuba, and the Dominican Republic. Along the southern and northeastern coast of Brazil, blackfin tuna is also targeted by artisanal trolling and handline fisheries (Taquet, 2000; Freire *et al.*, 2005; Narváez *et al.*, 2017). In the last decades, the use of anchored FADs has also been implemented to increase the capture of this species (Taquet, 2000; Collette and Graves, 2019; Doray *et al.*, 2004).

## STOCK ASSESSMENT

There is no stock assessment currently available for Atlantic blackfin tuna.

## STOCK STATUS

Unknown.

There have been some studies on the biological characteristics and exploitation parameters for this species (Headley, 2005; Vieira *et al.*, 2005; Freire, 2009). Freire *et al.* (2005) compiled some information on the fishery and population structure of blackfin tuna off northeastern Brazil. They noted some changes in catches and in the yield of blackfin tuna,

<sup>1</sup> Cuba and the Dominican Republic are not ICCAT members. Total annual catches from these two countries were taken from annual nominal catches reported to FAO. For the rest of the countries, catches were taken from ICCAT.

and they recognized signs of intense exploitation of the species in this area, although they were not alarming. More recently, Narváez *et al.* (2017) analyzed the catch-and-effort data from Venezuelan fisheries in comparison with other countries for the period 1986 to 2015 and highlighted the general declining trend in the catch rates during the last four years as a cause of concern.

Despite these local studies, there is high uncertainty about the stock status of this species.

## MANAGEMENT MEASURES

Since the early 1990s, blackfin tuna catches were required to be declared to ICCAT and reported in the logbooks from surface fleets, but no other species-specific management measures have been adopted by ICCAT.

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