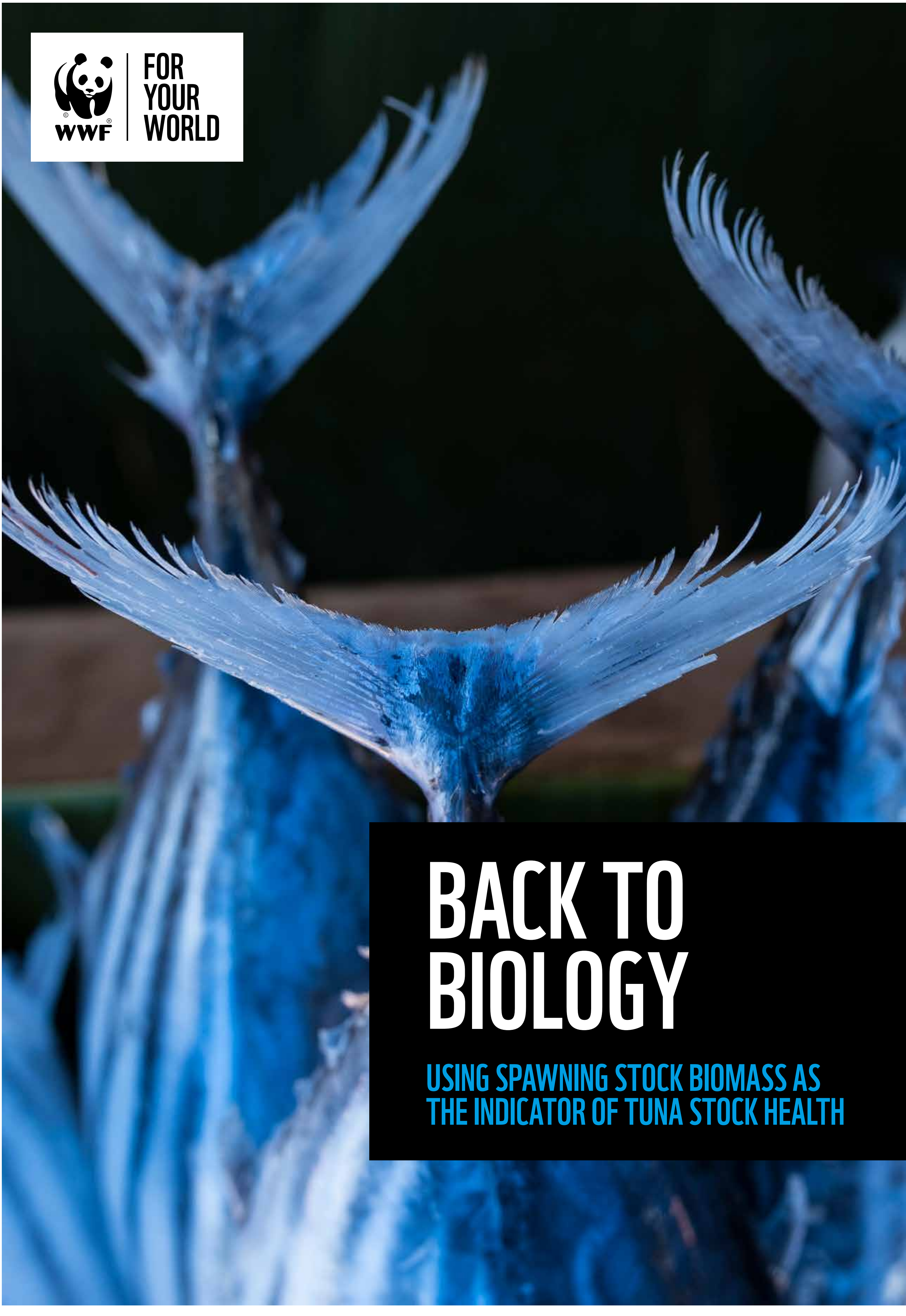

BACK TO BIOLOGY

USING SPAWNING STOCK BIOMASS AS THE INDICATOR OF TUNA STOCK HEALTH

Working together

TESCO WWF

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USING SPAWNING STOCK BIOMASS AS THE INDICATOR OF TUNA STOCK HEALTH

THE NEED FOR HEALTHY OCEANS

Healthy oceans play a key role in delivering a sustainable future. They are indispensable for human life. The plankton and bacteria in the ocean provide humanity with over half of the world's oxygen [1] and absorb almost a third of global carbon dioxide emissions, [2] making them a key climate regulator – an essential task in the face of global climate change. The oceans are also a key food source in the food system, providing vital food and income to over 800 million people. Seafood is an important animal protein source, which is often seen as a healthy, more climate friendly alternative to land-based protein sources. However, our oceans are under many threats.

The biggest threat to marine biodiversity is **overfishing.** [3] 94% of all fish stocks are either overfished (34%) or at a maximum sustainable level (60%). [4] Overfishing decimates productive fish stocks, making them yield fewer fish in the long-term, impacting fishers' income and global food security. As well as the drastic impacts on fish populations, the impact of overfishing on biodiversity can lead to a lack of resilience in ocean ecosystems when faced with the additional challenges of ocean acidification, habitat loss and increases in temperature.

Bycatch - catching species other than those targeted - is also problematic and adds to ecosystem stress as it leads to needless loss of fish through discarding, and the loss of iconic megafauna such as sharks, turtles, seabirds and cetaceans. It is crucial, therefore, to manage fish stocks in a way that reduces the risk of overfishing and bycatch.

WHERE SHOULD WE START?

Tuna are a keystone species in the ocean environment – they are top predators in the food chain that also move nutrients between the depths of the ocean and the surface. This nutrient movement fertilizes the surface waters helping plankton to thrive. Tuna contribute to a healthy ocean through this ecosystem service. Tuna can also act as a blue carbon sink, supporting oceans to absorb carbon dioxide in our fight against climate change.

Tuna are also among the world's most commercially valuable fish, critical for both artisanal, commercial and recreational fisheries. Due to its popularity, many tuna stocks are exploited to full capacity or overfished. This has a significant impact on ocean health as well as the sustainability of tuna supply to both coastal communities and global supermarkets. At least one third (33.4%) of the global tuna species were below biologically sustainable levels in 2017.[5] As they are such a key species, sustainable management of tuna could pave the way for sustainable management of other fish species in the world's oceans.

94%

OF ALL FISH STOCKS ARE EITHER OVERFISHED (34%) OR AT A MAXIMUM SUSTAINABLE LEVEL (60%)

The tuna Regional Fisheries Management Organisations (RFMOs) are the mandatory management authorities for tuna and other marine species in the areas under their jurisdiction. RFMOs are comprised of Contracting and Cooperating Non-contracting Parties (CPC) which are member countries and states. Their scientific committees use catch and effort data, as well as the species biological information to assess the status of the stocks. The management advice stemming from this is "refined" through a political process at the commission meetings, often loosening the arrangements allowing for higher levels of catch. As a result, the numbers of tuna within these populations may be too low to fulfil and maintain their ecosystems services, or provide a sustainable source of food to dependent coastal communities and other consumers.

CHANGING HOW WE MEASURE HEALTHY TUNA POPULATIONS

The conventional management strategy for tuna is to aim to achieve **Maximum Sustainable Yield** (MSY) – the theoretical highest catch a fish stock can support indefinitely. However, relying on MSY alone could be problematic as if a fishery changes, MSY can be recalculated and the stock can theoretically be fished at a much lower level of biomass, but still be classed as "sustainable". This makes estimates of the actual health of these tuna populations less reliable.

The scientific community have become vocal about the need to move away from MSY as a sustainability reference point.[6] **The Spawning Stock Biomass** (SSB) relative to some measure of the unfished state, indicates how many reproductively active fish we have left in the current population. Dropping stock levels below 20% SSB increases the risk of stock collapse. Whilst MSY calculates the maximum sustainable yield of the current population, the SSB ratio takes into consideration the original stock size and trends in recruitment and therefore is a more reliable indicator of the stock health.

Furthermore, to maintain a healthy population, there needs to be a low fishing mortality to avoid stock collapse. For a fishing mortality rate (F) to achieve MSY of 1.0, the amount of fishing effort (e.g. the number of boats) in the fishery should not deplete the spawning biomass below levels that are considered to be sustainable. In order for this to happen, the number of fish getting caught should not impair the ability of the stock to replenish itself.

Although WWF are aware differing opinions exist around target reference points, the presence of more productive mature tuna in the population is highly important for the fishery and ecosystem health.

> WWF's position is that in order for tuna stocks to be at a healthy level, they should be maintained at or above, or rebuilt to, at least 40% of their original spawning stock biomass[7] with a fishing mortality (F) relative to F_{MSY} (F/F_{MSY}) less than 1.0 (F<1).

HOW DO THE OCEANS MEASURE UP?

To measure the health of tuna populations in the world's oceans, WWF commissioned an investigation into the SSB estimates from tuna stock assessments in four tuna RFMOs. These include the Inter American Tropical Tuna Commission (IATTC); the International Commission for the Conservation of Atlantic Tunas (ICCAT); the Indian Ocean Tuna Commission (IOTC) and the Western and Central Pacific Fisheries Commission (WCPFC). Together these organisations cover the bulk of the world's ocean space (Figure 1) and manage the world's tropical and temperate tuna resources. These include albacore *(Thunnus alalunga),* bigeye *(Thunnus obesus),* skipjack *(Katsuwonus pelamis),* and yellowfin tuna *(Thunnus albacares).*

Together, these species represent nearly 4.5 million tonnes of catch, most of which comes from the Western and Central Pacific Ocean (Figure 2).

A critical part of managing these tuna stocks is determining the biological health of the tuna populations through assessments against biological reference points such as MSY and SSB. The measure of the current SSB can be compared to a predetermined level of unfished SSB to estimate the depletion of the fish stock. This is presented as an SSB ratio: SSB/SSB_0 or $SSB/SSB_{F=0}$. These stock depletion estimates are a key measure of stock health and effectiveness of tuna management. However, not every tuna RFMO presents these estimates for every tuna species.

Table 1 shows a summary of publicly available data from each RFMO on each tuna stock. There are some tuna stocks where the level of depletion is not known, for example skipjack and albacore tuna in both the eastern Pacific and the Atlantic, which have no direct assessments, only indirect estimates of their status. There is therefore no way of knowing the biological status based on the stock itself to determine whether these populations of tuna have been overfished or not, which should be a significant concern when sourcing from these oceans.

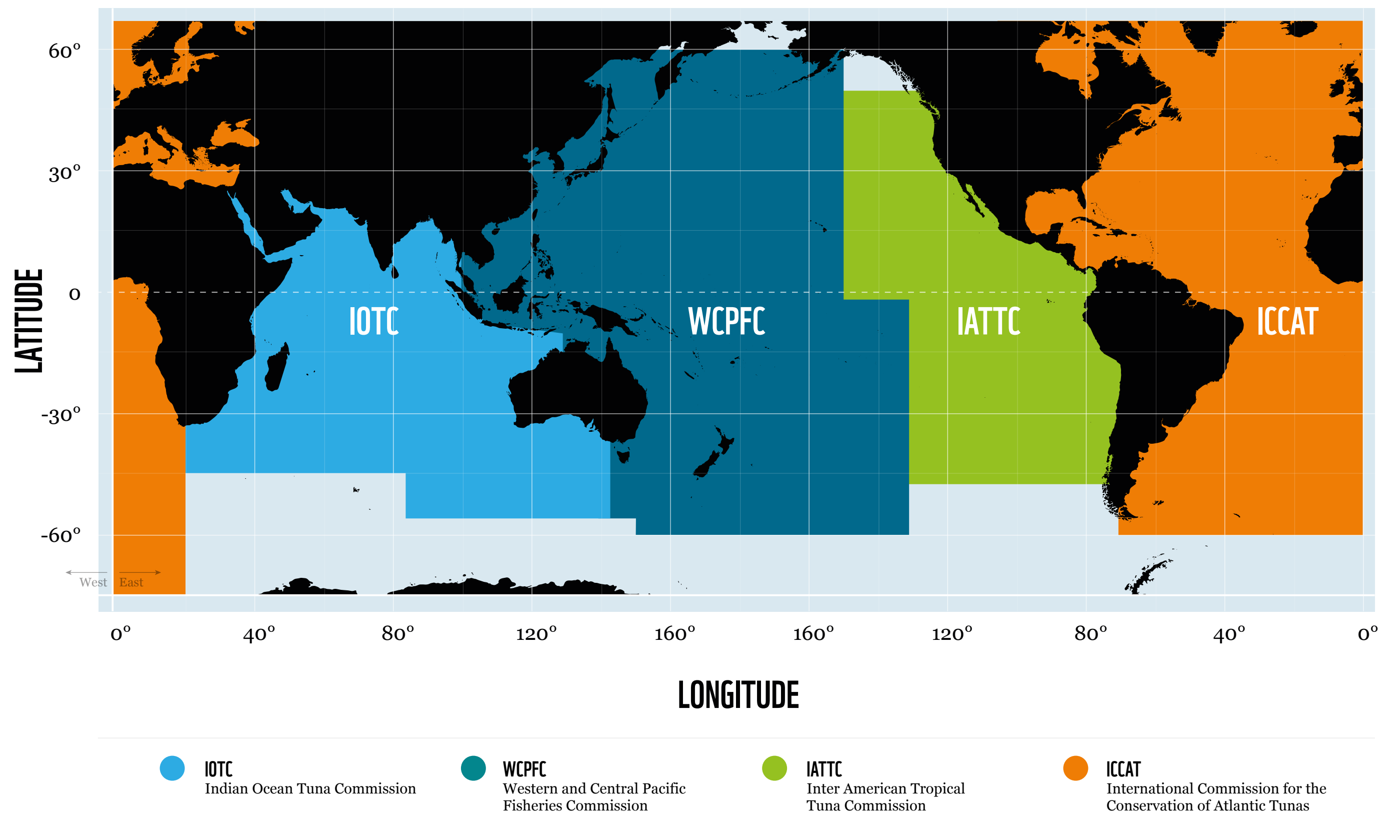


FIGURE 1:
World map showing the tropical/temperate tuna RFMO boundaries.

Figures 3, 4 and 5 show the different tuna species within each RFMO plotted according to where they stand in reference to the MSY target, SSB ratio and fishing mortality, where these metrics are available. Although the plot in Figure 3 shows that many tuna stocks are "sustainable" according to the MSY metric ($SB/SB_{MSY}>1$), when plotted against SSB depletion ratio (Figure 4), most fail to reach the SSB 40 ($SB/SB_0=0.4$) target that is broadly considered as the level for a minimum healthy tuna population. When considering fishing mortality (F) (Figure 5), it is noteworthy that many tuna stocks have excessive fishing effort (that is $F > F_{MSY}$) indicating that if effort is not reduced the population will become overfished in the future.

This is greatly concerning, in particular given that the MSY metric is what is used in certification schemes. This means that many retailers and tuna suppliers will be buying tuna caught from these stocks trusting that it is sustainable, when the stocks are depleted to less than 40% of the original SSB, and no longer support a healthy ocean ecosystem.

FIGURE 2:
Catch in the most recent assessment year of the tropical and temperate tuna in the tuna RFMOs. Colours designate the stock status as agreed by each RFMO.

CATCH AND STOCK STATUS BY RFMO

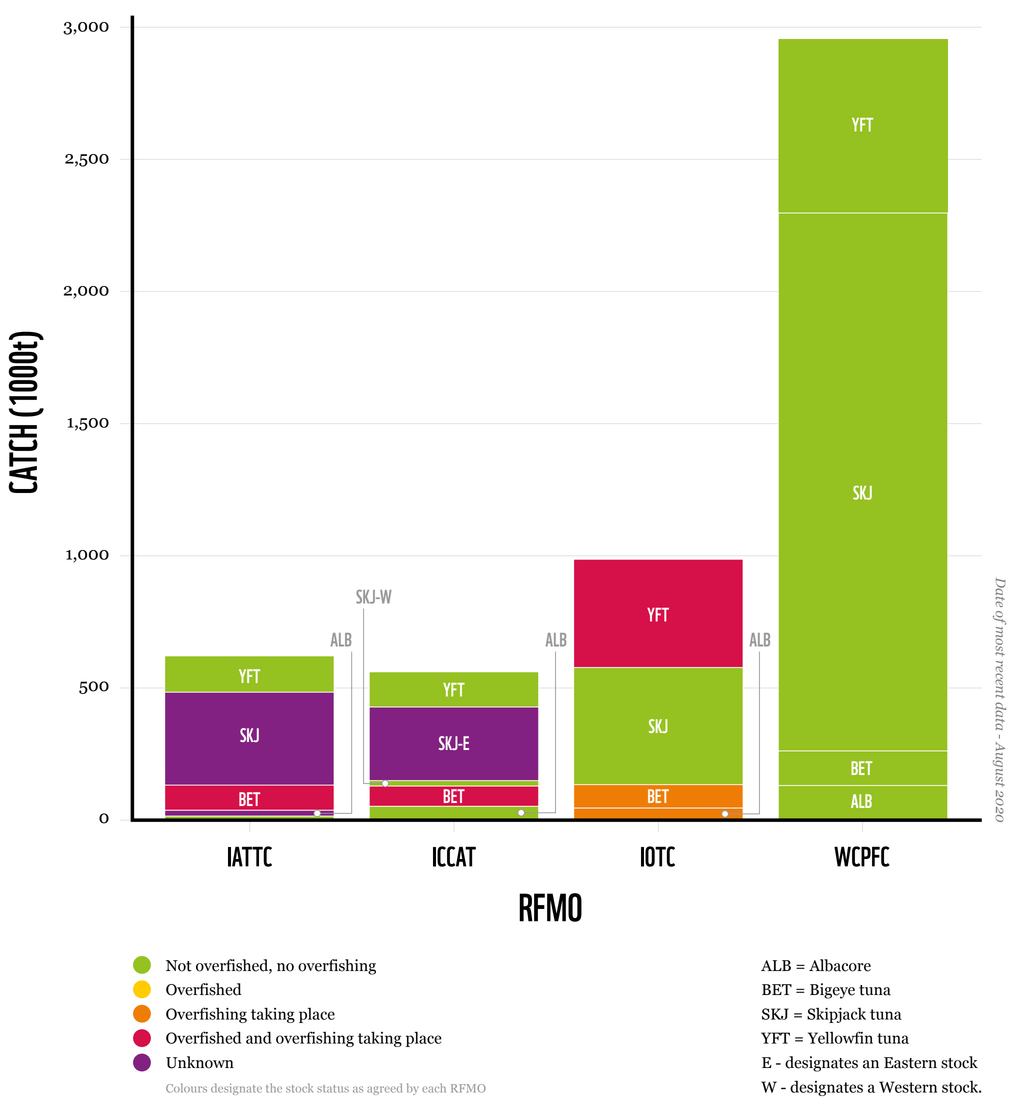


FIGURE 3:
Stock biomass showing the absolute stock size and depletion levels in relation to MSY for the main four tropical/temperate tuna species.

Note: IATTC Albacore and Skipjack stocks and ICCAT Skipjack stocks have no MSY estimates available to be plotted onto the graph

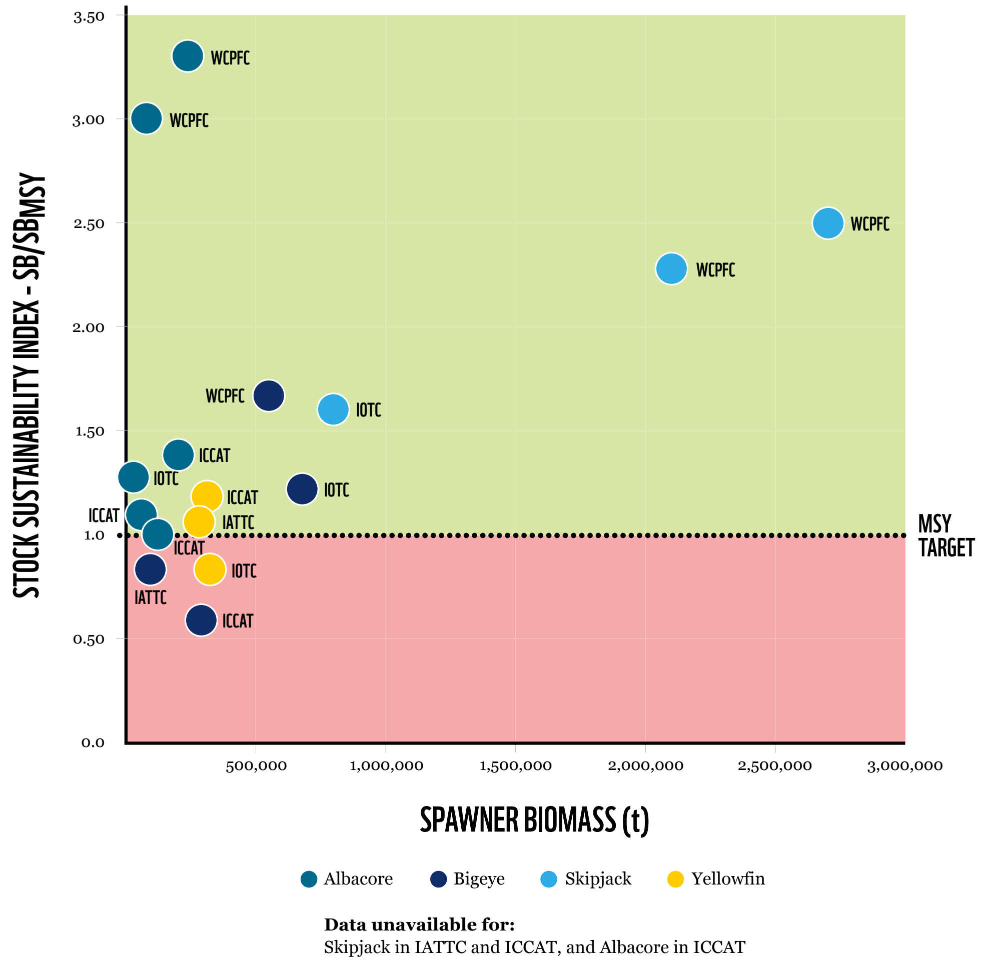
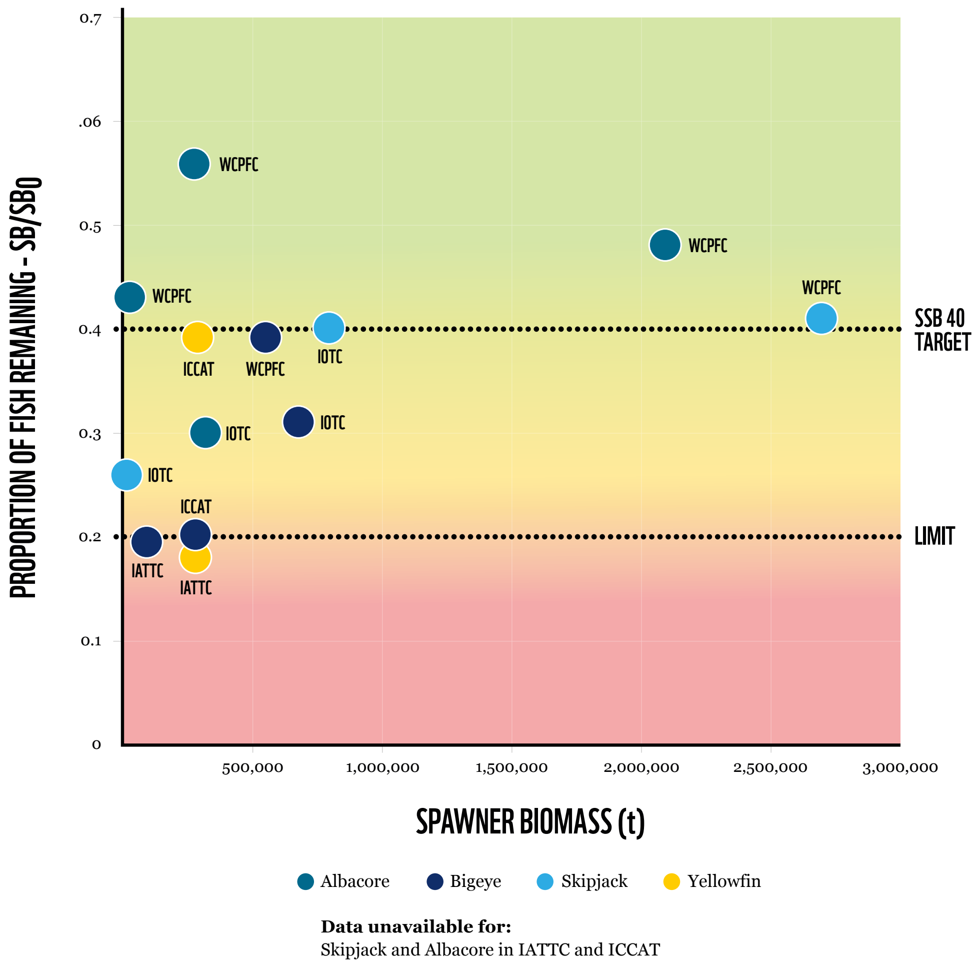


FIGURE 4:
Stock biomass showing the absolute stock size and depletion levels in relation to original SSB for the main four tropical/temperate tuna species.

Note: IATTC Albacore and Skipjack stocks and ICCAT Albacore and Skipjack stocks have no depletion level estimates available to be plotted onto the graph.

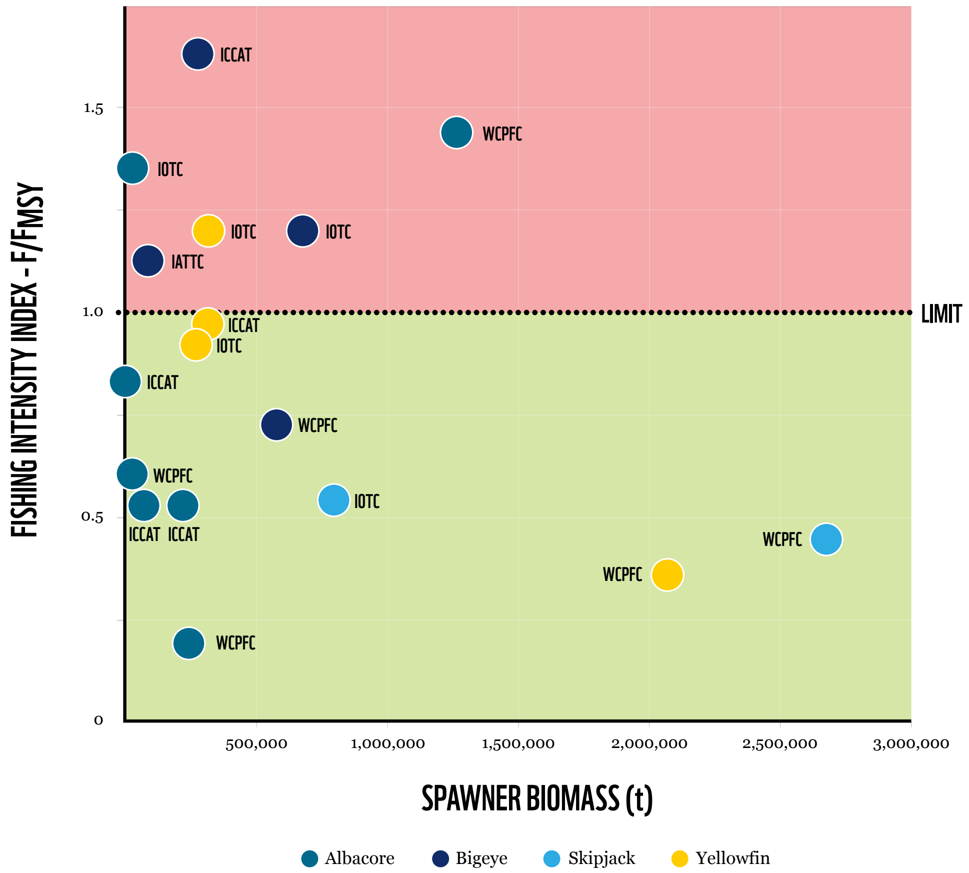


RFMO	STOCK	SSB ESTIMATE	SB/SB_0	CATCH
IATTC	Albacore (NH)	Unknown	Unknown	22,391
IATTC	Albacore (SH)	Unknown	Unknown	13,051
IATTC	Bigeye	92,905	0.2	95,192
IATTC	Skipjack	Unknown	Unknown	349,965
IATTC	Yellowfin	281,051	0.18	135,689
ICCAT	Albacore (Med)	24,209	Unknown	2,434
ICCAT	Albacore (NH)	220,086	Unknown	29,363
ICCAT	Albacore (SH)	65,051	Unknown	17,096
ICCAT	Bigeye	283,296	0.2	73,366
ICCAT	Skipjack (E)	Unknown	Unknown	282,427
ICCAT	Skipjack (W)	Unknown	Unknown	22,873
ICCAT	Yellowfin	294,551	0.39	131,042
IOTC	Albacore	23,200	0.26	38,347
IOTC	Bigeye	677,250	0.31	90,050
IOTC	Skipjack	796,660	0.4	446,723
IOTC	Yellowfin	320,700	0.3	409,567
WCPFC	Albacore (NH)	58,858	0.43	35,081
WCPFC	Albacore (SH)	240,569	0.56	86,706
WCPFC	Bigeye	554,880	0.39	135,680
WCPFC	Skipjack	2,701,459	0.41	2,034,230
WCPFC	Yellowfin	2,101,120	0.48	669,362

TABLE 1:
Estimated spawning stock biomass from each stock in the tuna RFMOs considered in this report.
NH = Northern Hemisphere; SH = Southern Hemisphere; Med = Mediterranean; E = East; W = West.
IATTC = Inter American Tropical Tuna Commission; ICCAT = International Commission for the Conservation of Atlantic Tunas; IOTC = Indian Ocean Tuna Commission; WCPFC = Western and Central Pacific Fisheries Commission.

FIGURE 5:
Stock biomass showing the absolute stock size and fishing mortality levels for the main four tropical/temperate tuna species.

Note: IATTC Albacore and Skipjack stocks and ICCAT Skipjack stocks have no fishing mortality level estimates available to be plotted onto the graph



Data unavailable for:
Skipjack in IATTC and ICCAT, and Albacore in ICCAT

WHAT NOW?

There are two issues identified from looking into the SSB estimates from the different tuna stocks:

1) Current SSB and the stock depletion (SSB ratio) is not presented within some of the RFMO reports (e.g. ICCAT and IATTC), making estimates of the actual health of these tuna populations less reliable.

2) The results from assessing fish stocks against the MSY metric differ greatly from using the SSB ratio and fishing intensity, and this could potentially give a misleading impression of sustainability, if not handled with caution.

In order to achieve a sustainable supply of tuna into the future, the aim of RFMOs should be to at least maintain or rebuild all tuna stocks to 40% of their original biomass. For this to happen, the SSB depletion levels need to be reported consistently across RFMO reports, and tuna management should aim for an SSB/SSB_0 or $SSB/SSB_{F=0}$ ratio of at least 0.4 as the ultimate target for rebuilding plans. According to RFMO reporting, only four tuna stocks with the available data are above the target of SSB 40 and three are almost on target, leaving at least six stocks below target and eight that have not been assessed against this metric (Table 1 and Figure 4). There is therefore urgent need for RFMOs to adopt more appropriate management metrics and more ambitious biological targets for all the tuna stocks under their mandates.

This will enable fishers, communities, the fishing industry, retailers and the public to have a much better understanding of the actual health of the stocks and will support efforts to achieve healthy ocean ecosystems.

These ambitions can be supported by a range of stakeholders with different roles in the tuna management system. WWF calls for:

- **Governments** who are members of RFMOs to propose or support proposals that are line with the SSB 40 targets.
- **Retailers and suppliers** who source from overfished tuna stocks to use their purchasing power to advocate RFMOs and their member governments to adopt SSB 40 targets and improved management measures, such as harvest strategies and harvest control rules, that would aim to achieve the targets for healthy stocks and oceans.

Rebuilding tuna stocks to 40% of their original spawning stock biomass will help us to achieve a healthy ocean. It is essential in tackling our triple challenge of meeting the demand for more seafood, the maintenance of biodiverse ecosystems under water and our fight against global climate change.

s1 https://oceanservice.noaa.gov/facts/ocean-oxygen.html#:~:text=At%20least%20half%20of%20Earth’s%20oxygen%20comes%20from%20the%20ocean.&text=Scientists%20estimate%20that%2050%2D80,some%20bacteria%20that%20can%20photosynthesize.
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7 https://www.wwf.org.uk/what-we-do/tuna-and-policy

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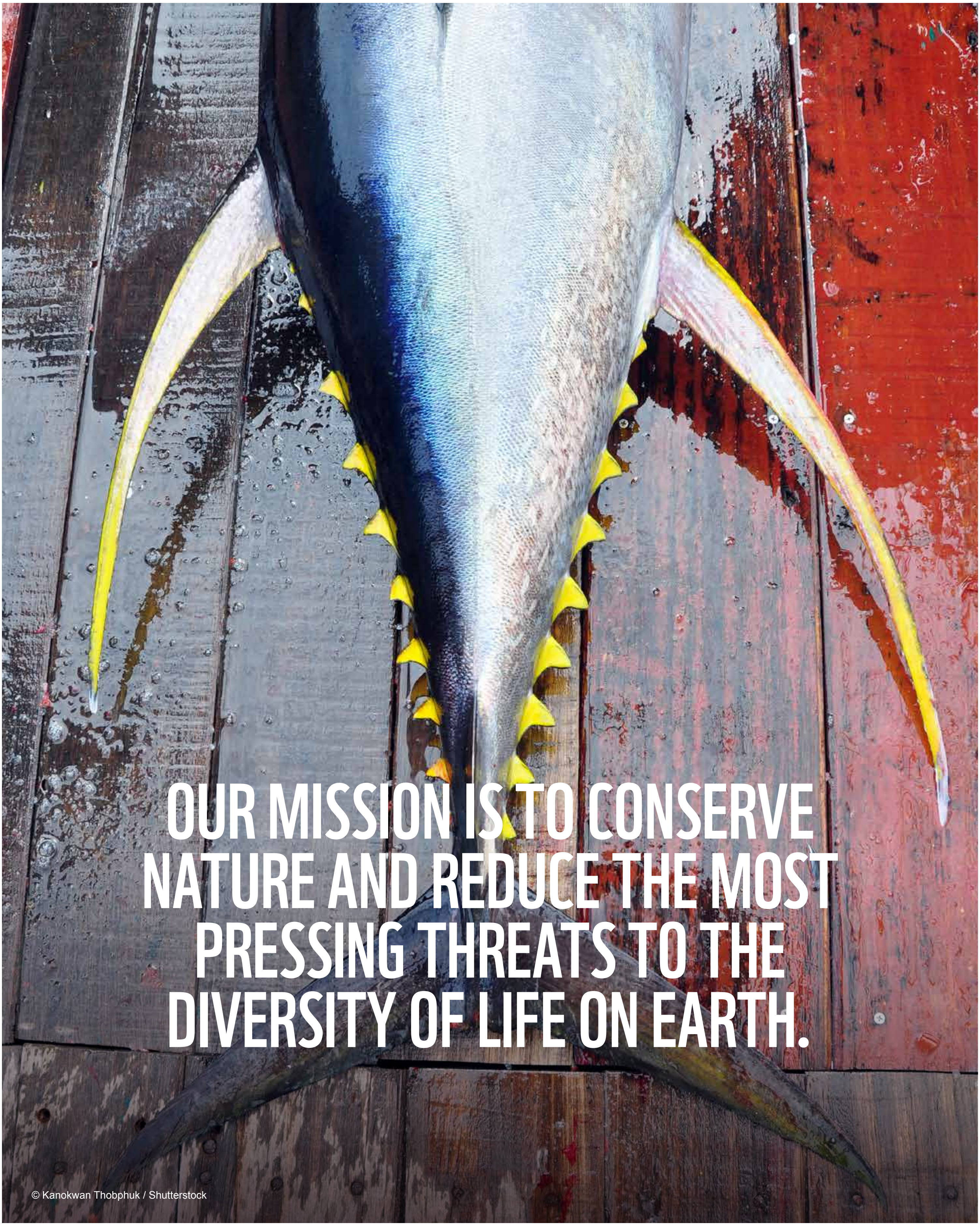
IN ORDER TO ACHIEVE A SUSTAINABLE SUPPLY OF TUNA FOR THE FUTURE, ALL TUNA STOCKS SHOULD BE REBUILT TO AT LEAST 40% OF THEIR ORIGINAL SPAWNING STOCK BIOMASS



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