INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION

STATUS OF THE WORLD FISHERIES FOR TUNA
STOCK STATUS RATINGS - 2011

This section describes the status of the 19 stocks of the four main species of tunas – yellowfin (YFT), bigeye (BET), skipjack (SKJ), and albacore (ALB) – in each of the ocean areas covered by the four regional fisheries management organizations (RFMOs) responsible for the conservation and management of these species, and presents a brief summary of the conservation and management measures taken for each of these species.

This status report differs from that prepared by ISSF in previous years primarily by the incorporation of a new rating factor related the environmental impact, in terms of bycatch, of the principal gear(s) used to fish each stock (see Appendix 1). The ratings are thus prepared for three factors: Abundance, Fishing Mortality and Environment (bycatch).

This version (Tech. Report 2011-04A) has been updated to take into account conservation and management measures adopted by IATTC in June, 2010.

TABLE OF CONTENTS

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COLORS AND SYMBOLS USED IN THIS REPORT

$B_{current}$ (B_c)	Current **spawning biomass** (B represents spawning biomass throughout this report, unless otherwise noted)
$F_{current}$ (F_c)	Current fishing mortality rate
F_{MSY}	Fishing mortality rate (F) corresponding to maximum sustainable yield (MSY)
B_{MSY}	Spawning Biomass corresponding to MSY
Red	This color is reserved for ISSF to use as an overall rating for stocks that are overfished, are still being subjected to overfishing, are not being adequately managed to end overfishing and rebuild, and whose main fishing gears have considerable bycatch problems or insufficient bycatch monitoring.
Orange	**Biomass Factor**: Spawning Biomass is below B_{MSY} and it has not been stable or increasing*. **Fishing mortality Factor**: F is above F_{MSY} and there are no adequate management measures to end overfishing, or the measures in place are insufficient. **Environment (Bycatch) Factor**: Adverse population effects on bycatch species are expected for a given fishing gear/fishing method, and there are no management measures or research programs in place expected to mitigate these effects. In addition, bycatch monitoring is inadequate.
Yellow	**Biomass Factor**: Spawning Biomass is below B_{MSY} but it has been stable or increasing*. Yellow is also used in the absence of a stock assessment. **Fishing mortality Factor**: F is above F_{MSY} but there are adequate management measures expected to end overfishing. **Environment (Bycatch) Factor**: Adverse population effects on bycatch species are expected for a given fishing gear/fishing method, but there are either management measures or research programs in place expected to mitigate these effects. In addition, there is adequate monitoring of bycatch.
Green	**Biomass Factor**: Spawning Biomass is at or above B_{MSY}. **Fishing mortality Factor**: F is below F_{MSY}. **Environment (Bycatch) Factor**: Adverse population effects on bycatch species are not expected for a given fishing gear/fishing method.

* 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.

SUMMARY STOCK RATINGS

Stock	Catch	MSY	Biomass	F	Bycatch
Eastern Pacific Ocean					
BET	81	81			
YFT	255	263			
SKJ	147	N/A			
Western and central Pacific Ocean					
BET	119	74			
YFT	433	494-767			
SKJ	1,784	1,376			
Pacific Ocean					
ALB-S	67	98			
ALB-N	77	66-100			
Indian Ocean					
BET	102	114			
YFT	288	320			
SKJ	441	N/A			
ALB	41	N/A			
Atlantic Ocean					
BET	86	92			
YFT	119	131-147			
SKJ-E	122	143-170			
SKJ-W	26	30-36			
ALB-N	15	29			
ALB-S	23	33			
ALB-Med	4	N/A			

Notes:

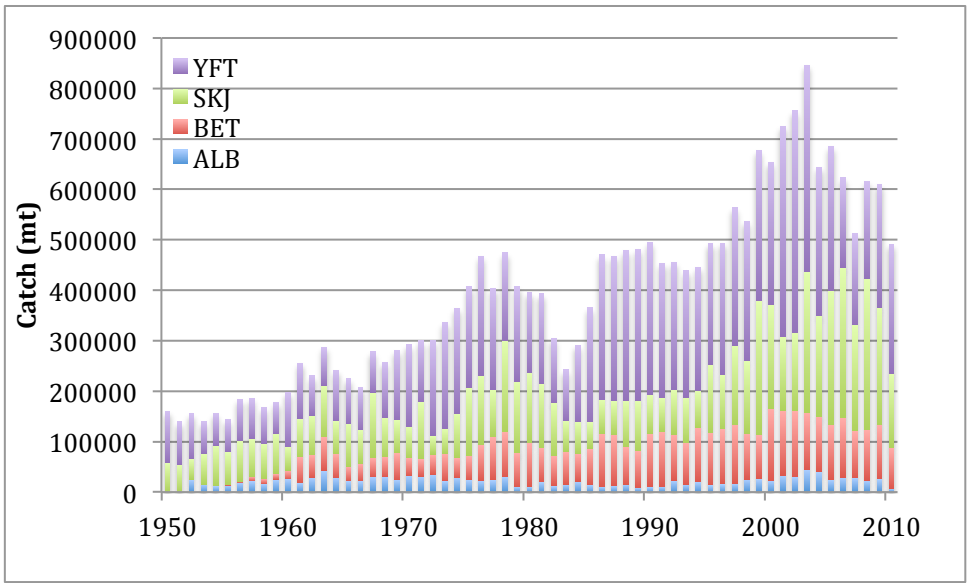
- Catch is for 2009 unless otherwise noted. Catch and MSY are in thousand tonnes;
- Catch for EPO stocks is for 2010
- See tables in the report for details on each stock

I. EASTERN PACIFIC OCEAN (EPO)

RFMO: Inter-American Tropical Tuna Commission (IATTC)
Last Scientific Committee (SAC) meeting: May, 2011
Last Commission meeting: September, 2010.
Tuna stocks managed: EPO Yellowfin, EPO Bigeye, EPO Skipjack, North Pacific Albacore (also managed by WCPFC), Pacific Bluefin (also managed by WCPFC). NOTE: Stock ratings for North Pacific Albacore are given in the Western Pacific Ocean report (Section II).
Data sources: The main sources of information for this section are Aires da Silva and Maunder (2011a and 2011b), and Maunder (2011).
Last update: May 25, 2011.

I.1. CATCHES

About 14 percent of the world production of tuna is from the eastern Pacific Ocean (EPO). Catches of skipjack, yellowfin, bigeye and albacore in 2010 were 491,000 tonnes (including dead discards), a 20% decline from 2009. This decline was particularly marked for skipjack. There has been a general tendency for the total catch to decline since 2003, when a record 877,000 tonnes were caught (**Figure I.1.1**).



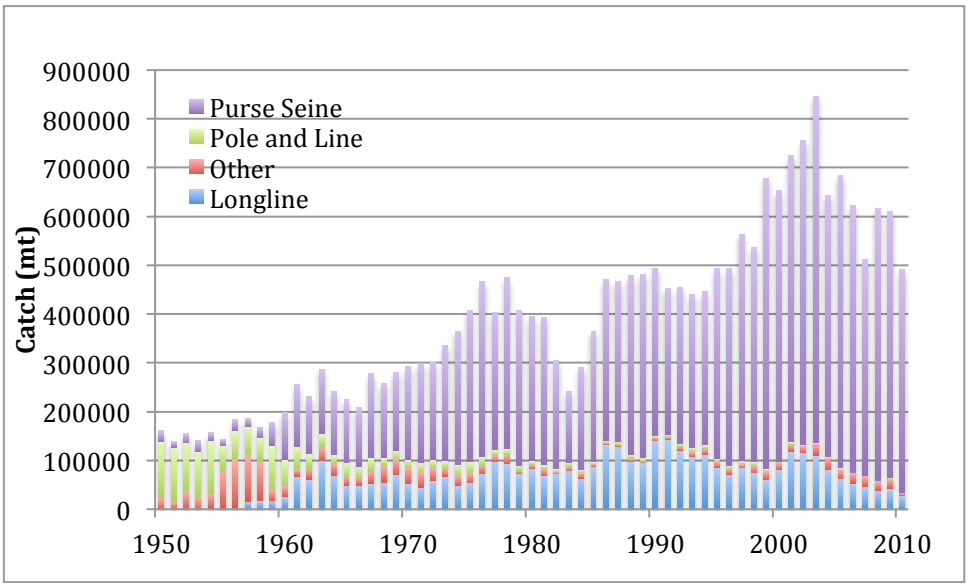


Figure I.1.1. Trends in catch (mt) of albacore, bigeye, skipjack and yellowfin in the EPO region, by species (top) and gear (bottom), 1950-2010.

Average catches for the five-year period 2005-2009 provide an indication of the recent performance of the fisheries (**Figure I.1.2**): Skipjack accounts for 42% of the catches in weight, followed by yellowfin (37%), bigeye (18%), and albacore (4%). Purse-seine vessels take the majority (89%) of the total catch, followed by longline (7%) and a variety of other gears.

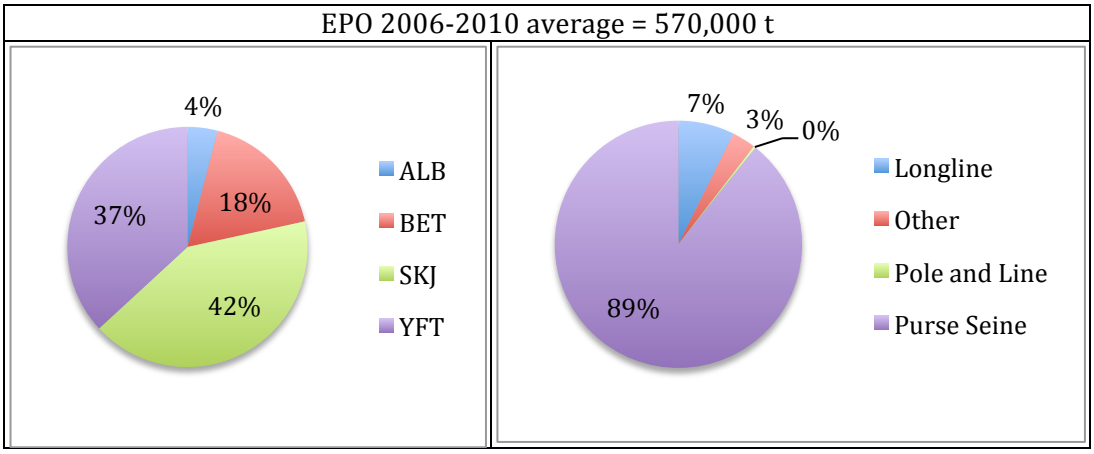


Figure I.1.2. Average 2006-2010 catches of skipjack, yellowfin, bigeye and albacore tuna in the EPO. The graph on the left shows the percentages by species, and the graph on the right shows the percentages by gear type.

I.2 EPO STOCK STATUS

I.2.1 Bigeye in the EPO

Bigeye catches in 2010 were about 81,000 tonnes, a 24% decrease from 2009. Longline fishing dominated the catches in weight until the mid-1990s. Purse seine fishing accounts for the majority of catches in recent years, 2.5 times higher than longlining (**Figure I.2.1.1**). Bigeye catches in the EPO by other gears are very minor.

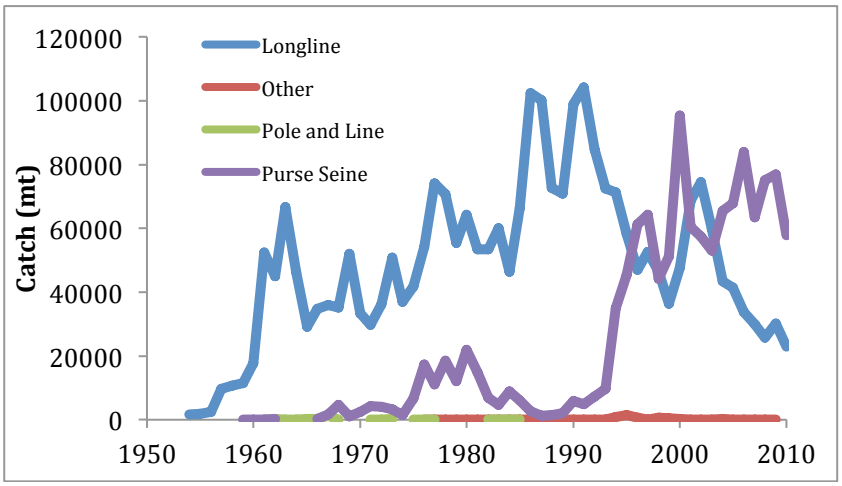


Figure I.2.1.1. Catches of bigeye tuna in the EPO from 1950 to 2010, by gear type.

Stock assessment

In 2011, the IATTC conducted an updated assessment of the stock. The results of this update indicate the following (**Figure I.2.1.2**):

- The current ratio of spawning biomass $B_{current}/B_{MSY}$ is estimated at 1.21. This indicates that that **the stock is not in an overfished state**. Since 2005, there has been an increasing trend in biomass, subsequent to IATTC management measures initiated in 2004. However, under the current levels of fishing mortality, recent spikes in recruitment are predicted not to sustain this increasing trend.

- The ratio of $F_{current}/F_{MSY}$ is estimated at 1.08, indicating that **overfishing was occurring on average in the most recent three years (2008-2010)**.

- The estimate of MSY is 81,000 tonnes. MSY has been reduced to about half its level in 1993, when the expansion of the floating-object fishery began, as the overall selectivity from all fleets combined shifted towards smaller individuals. Since bigeye tuna can grow to be quite large (close to 200 cm), catching them when they are small results in a loss of potential yield, i.e. the catches that could be taken by other gears that target larger individuals, such as longlining. This is known as "growth overfishing".

- As for all stock assessments that use MSY-based reference points, the assessment of stock status is highly sensitive to the assumed relationship between spawning biomass and recruitment (the base case assessment did not assume one). The results are more pessimistic if a stock-recruitment relationship is assumed. The results are also more pessimistic if a higher value is assumed for the average size of the older fish, if lower rates of natural mortality are assumed for adult bigeye, and if only the late period of the fishery (1995-2009) is included in the assessment.

The estimated increase in biomass since 2005 is driven by an increasing trend in the catch rate of Japanese longline vessels. These catch rates appear to have leveled off in 2009 and 2010. In addition, stock projections at the 2008-2010 average level of fishing

mortality indicates that the spawning biomass will fall below the MSY level. For these reasons, ISSF is taking a cautious view about the status of EPO bigeye.

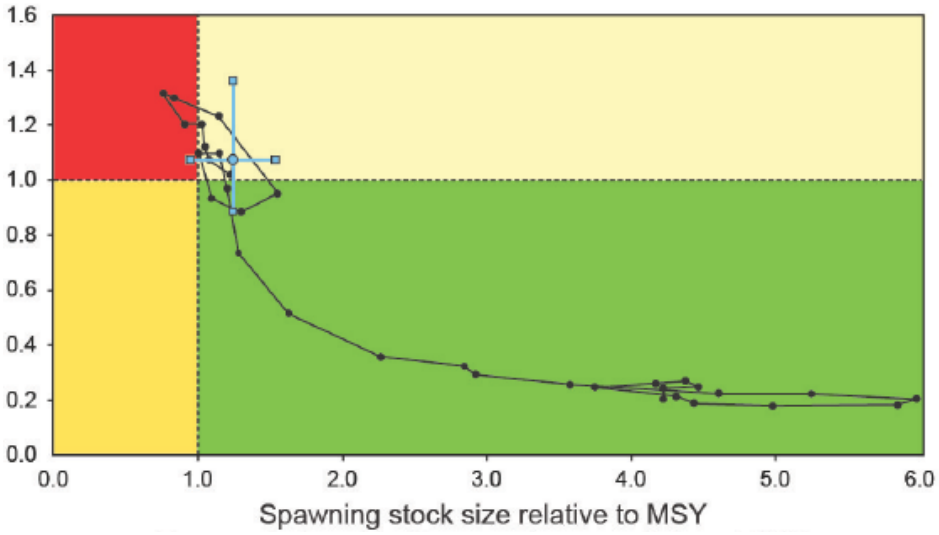


Figure I.2.1.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for bigeye tuna in the EPO. The blue cross represents relative spawning biomass in 2010 and relative fishing mortality for 2008-2010. Colors are taken from IATTC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main conservation measure established by the IATTC for bigeye is Resolution C-11-01, which includes an annual fishing closure for purse seine vessels greater than 182 tons carrying capacity. This measure calls for:

- A 62-day closure for purse seiners greater than 182 tons capacity in 2011, 2012 and 2013;
- A seasonal closure of the purse seine fishery in an area known as "El Corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
- A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas during 2011 and 2012;
- Bigeye catch limits for the main longline fishing nations

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	81	2010	
Five-year average catch (t)	100	2006-10	
MSY (t)	81	2010	
F/F_{MSY}	1.08	2008-2010	
B/B_{MSY}	1.21	Start of 2011	
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes. If catches continue to be above MSY, overfishing and a subsequent decline in biomass would be expected to occur in the near future.

Ratings for EPO Bigeye tuna		
Stock abundance	YELLOW	$B > B_{MSY}$. The much-improved perception of stock status in the 2010 assessment has been corroborated by the 2011

		assessment. However, projections indicate that recent recruitments will not sustain the 2008-2010 average level of fishing mortality and the stock is expected to fall below B_{MSY} in a few years.
Fishing mortality	YELLOW	F > F_{MSY}. According to the 2010 assessment, the IATTC management measures in place appeared to be effectively limiting the fishing mortality on the stock. However, F is now above the MSY level and the regulations need to be strengthened.
Environment (Bycatch)	YELLOW ORANGE	70% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks, non-target species in general). There is 100% observer coverage on large purse seiners. 29% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). There will be 5% observer coverage on large longliners

September 2010 changes with respect to the April 2010 ISSF Stock Status Report (the EPO BET stock was rated Orange then): The 2010 assessment by IATTC estimated a much-improved status. Instead of rating it Green in its September 2010 update, ISSF chose Yellow to be precautionary.
May 25, 2011, Update: The 2011 assessment by IATTC corroborates that biomass is above the MSY level, and therefore the B factor could be rated Green. However, it is maintained in Yellow in this update because projections at the current F indicate that spawning biomass will soon fall below this level.
August 2011 update: Bycatch rating for longliners in the EPO has been changed from Yellow to Orange. Some of the major fleets using this gear did report catches of non-target species to IATTC (particularly sharks and billfishes) but the reporting is erratic. This situation may improve in the future with the new observer program for longliners.

I.2.2 Yellowfin in the EPO

Yellowfin catches in the EPO in 2010 were about 255,000 tonnes, a 4% increase from 2009. The main fishing gear is purse seine, and recent catches by this gear are about 60% of the record high caught in 2002 (**Figure I.2.2.1**). Catches from longline vessels have also declined substantially in recent years.

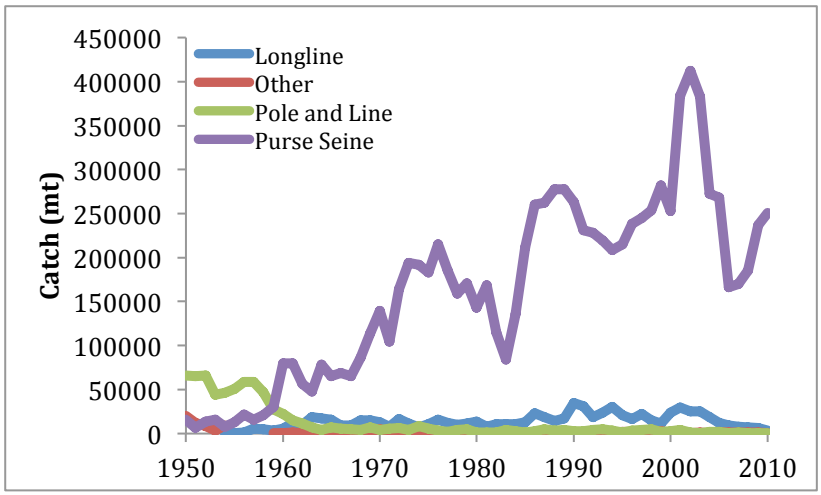


Figure I.2.2.1. Catches of yellowfin tuna in the EPO from 1950 to 2010, by gear type.

Stock assessment

The 2010 assessment used the same methodology as the previous one, with updated data. The assessment results indicated the following (**Figure I.2.2.2**):

- The current (beginning of 2011) ratio of spawning biomass $B_{current}/B_{MSY}$ is estimated to be 0.71, indicating that **the stock is in an overfished state**. Spawning biomass has decreased since 2009 with a possible increase during the fourth quarter of 2010; it is projected to increase again at the current level of fishing mortality.

- The ratio $F_{current}/F_{MSY}$ is estimated to be 0.86, indicating that **overfishing is not occurring**.

- MSY is estimated to be 263,000 tonnes. Increasing the average weight of the yellowfin caught could increase the MSY.

- The assessment of stock status is highly sensitive to the assumed relationship between spawning biomass and recruitment (the base case assessment did not assume one). The results are more pessimistic if a stock-recruitment relationship is assumed. The results are also sensitive to the natural mortality assumed for adult yellowfin and the length assumed for the oldest fish.

Analyses made using the base case assessment results indicate that increasing fishing mortality would change the long-term catches only marginally, while reducing the spawning biomass considerably. Because of this, and taking into account the more pessimistic estimates of stock status obtained when a stock-recruitment relationship is assumed, ISSF believes that fishing mortality for yellowfin tuna in the EPO should not be allowed to increase.

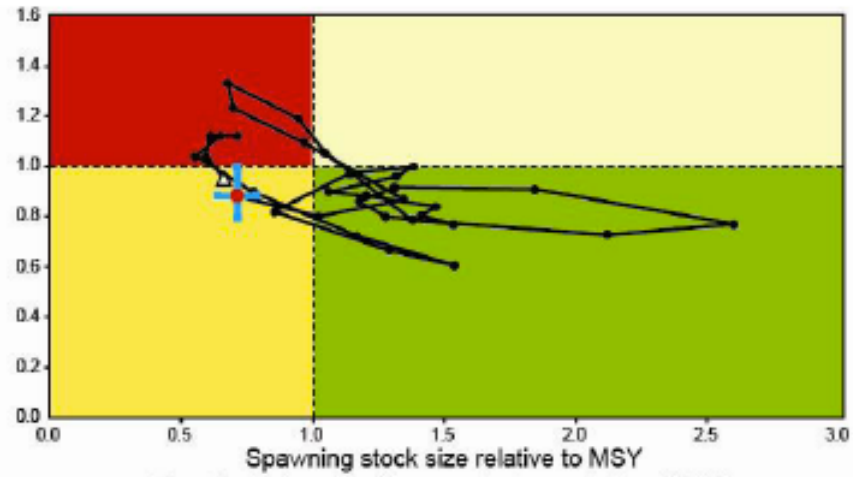


Figure I.2.2.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for yellowfin tuna in the EPO. The white dot represents relative spawning biomass in 2011 and relative fishing mortality for 2008-2010. Colors are taken from IATTC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main conservation measure established by the IATTC for yellowfin is Resolution C-11-01, which includes an annual fishing closure for purse seine vessels greater than 182 tons carrying capacity. This measure calls for:

- A 62-day closure for purse seiners greater than 182 tons capacity in 2011, 2012 and 2013;
- A seasonal closure of the purse seine fishery in an area known as "El Corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
- A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas during 2011 and 2012;

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	255	2010	
Five-year average catch (t)	210	2006-10	
MSY (t)	263	2010	
F/F_{MSY}	0.86	2008-2010	
B/B_{MSY}	0.71	Start of 2011	Decreasing since 2009
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for EPO Yellowfin tuna		
Stock abundance	ORANGE	B < B_{MSY}. Spawning biomass is projected to increase rapidly above B_{MSY} at the current level of fishing mortality, but this should be corroborated by the next assessment.
Fishing mortality	YELLOW	F < F_{MSY}. Although the point estimate of current F is below F_{MSY} (so it could be rated Green), it is highly unlikely that increased fishing effort will result in significantly increased sustained catches, but it will significantly reduce spawning biomass.
Environment (Bycatch)	GREEN	62% of the catch is made by purse seining on tuna-dolphin associations. Dolphin mortality is managed and closely monitored by AIDCP, with 100% observer coverage.
	YELLOW	17% of the catch is made by purse seining on FADs. Several bycatch mitigation measures are in place (turtles, sharks, non-target species in general). There is 100% observer coverage on large purse seiners.
	GREEN	17% of the catch is made by purse seining on free schools of yellowfin.
	ORANGE	3% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds).

September 2010 changes with respect to the April 2010 ISSF Stock Status Report (the EPO YFT stock was rated Yellow then): There has been no change in the ratings of B and F since then, other than separating F and B factors.
May 25, 2011, Update: The 2011 IATTC assessment indicates that spawning biomass has now dropped below the MSY level. The spawning biomass estimate for the start of 2011 indicates an upturn relative to the last quarter of 2010, and projections at the current level of F indicate that spawning biomass will soon increase above the B_{MSY} level. The B factor is rated Orange in this update, awaiting the results of the next assessment.
August 2011 update: Bycatch rating for longliners in the EPO has been changed from Yellow to Orange. Some of the major fleets using this gear did report catches of non-target species to IATTC (particularly sharks and billfishes) but the reporting is erratic. This situation may improve in the future with the new observer program for longliners.

I.2.3 Skipjack in the EPO

Skipjack catches in 2010 were about 147,000 tonnes, a large (36%) decrease from 2009. Catches have dropped to one-half of the 2009 level. Skipjack catches in the EPO are

notoriously variable: A similarly large decline was observed between 1999 and 2001. Purse seine fishing dominates the catches (over 99% of the total) (**Figure I.2.3.1**).

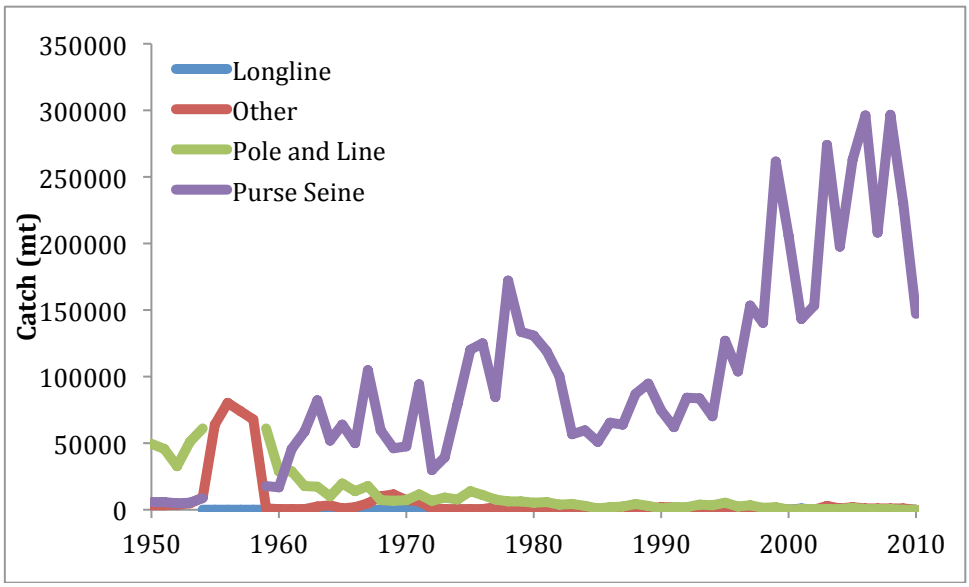


Figure I.2.3.1. Catches of skipjack tuna in the EPO from 1950 to 2010, by gear type.

Stock assessment

The last full assessment for skipjack tuna was in 2005, although an evaluation of a set of fishery indicators was given in 2011. The 2005 analyses demonstrated a high degree of uncertainty, particularly with respect to the determination of MSY reference points. To provide an alternative to using MSY-based reference points, in 2011 IATTC scientists used a simple assessment model to generate indicators for biomass, recruitment, and exploitation rate, which allows comparison of current indicator values with the levels observed historically. The average weight is below its lower reference level, which can be caused by one or more of the following: Over-exploitation, above-average levels of recruitment in recent years, or by shifts in the distribution of fishing effort to offshore areas.

The continued decline in average weight concerns some scientists and, combined with leveling off of catch rates and a decline in catch, may indicate that the exploitation rate is around the MSY level. The main concern with the skipjack stock is the constantly increasing exploitation rate. However, the data- and model-based indicators have yet to detect any adverse consequence of this increase.

A full stock assessment is planned for 2012.

Management measures

The main conservation measure established by the IATTC for skipjack is Resolution C-11-01, which includes an annual fishing closure for purse seine vessels greater than 182 tons carrying capacity. This measure calls for:

- A 62-day closure for purse seiners greater than 182 tons capacity in 2011, 2012 and 2013;

- A seasonal closure of the purse seine fishery in an area known as "El Corralito", west of the Galapagos Islands, where catch rates of small bigeye are high;
- A full retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas during 2011 and 2012;

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	147	2010	
Five-year average catch (t)	237	2006-10	
MSY (t)	N/A		
F/F_{MSY}	≤1		
B/B_{MSY}	>1		
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for EPO skipjack tuna		
Stock abundance	GREEN	B > B_{MSY}.
Fishing mortality	GREEN	F ≤ F_{MSY}. There is some concern with the constantly-increasing exploitation rate; however, fishery indicators do not show detrimental effects on the stock to-date.
Environment (Bycatch)	YELLOW	64% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks, non-target species in general). There is 100% observer coverage on large purse seiners.
	GREEN	34% of the catch is made by purse seining on free schools of skipjack.

September 2010 changes with respect to the April 2010 ISSF Stock Status Report (the EPO SKJ stock was rated Green then): There has been no change in the ratings of B and F since then, other than separating F and B factors.
May 25, 2011, Update: No change.

II. WESTERN AND CENTRAL PACIFIC OCEAN (WCPO)

RFMO: Western and Central Pacific Fisheries Commission (WCPFC)
Last Scientific Committee (SC) meeting: August, 2010
Last Commission meeting: December, 2010.
Tuna stocks managed: WCPO Yellowfin, WCPO Bigeye, WCPO Skipjack, North Pacific Albacore (also managed by IATTC), South Pacific Albacore, Pacific Bluefin (also managed by IATTC).
Data sources: The main sources of information for this section are WCPFC (2010) and Harley et al. (2011) for catch and stock status data.
Last update: May 5, 2011.

II.1. CATCHES

About 53 percent of the world production of tuna is from the western and central Pacific Ocean (WCPO). Catches of skipjack, yellowfin, bigeye and albacore in 2009 were 2,487,000 tonnes, a 3% increase from 2008. There has been a general tendency for the total catch to increase since 1980 (**Figure II.1.1**). This increase has been particularly pronounced for skipjack tuna.

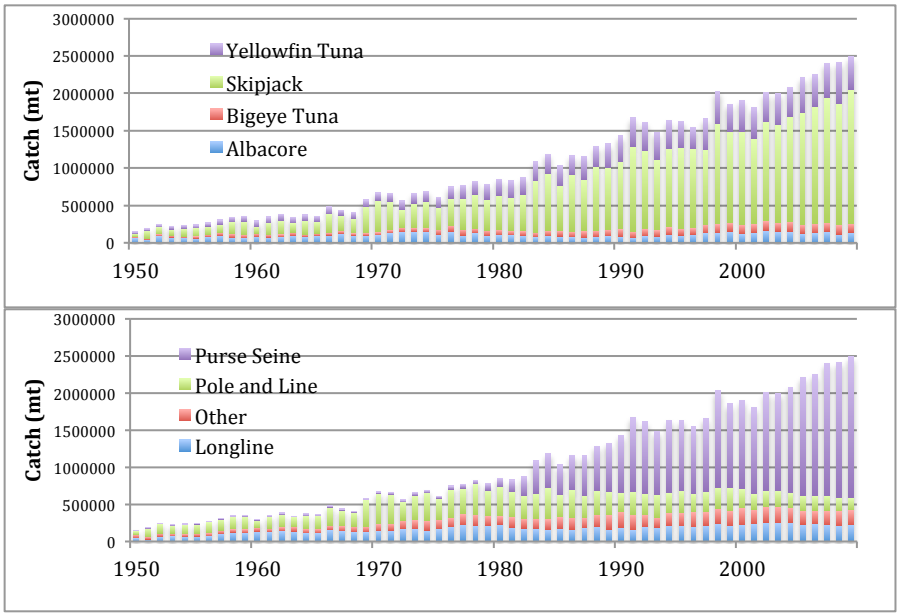


Figure II.1.1. Trends in catch (mt) of albacore, bigeye, skipjack and yellowfin in the WCPO region, by species (top) and gear (bottom), 1950-2009.

Average catches for the five-year period 2005-2009 provide an indication of the recent performance of the fisheries (**Figure II.1.2**): Skipjack accounts for 69% of the catches in weight, followed by yellowfin (20%), albacore (6%), and bigeye (5%). Purse-seine vessels take about 74% of the total catch, followed by pole-and-line vessels (8%), longliners (10%), and a variety of other gears (8%).

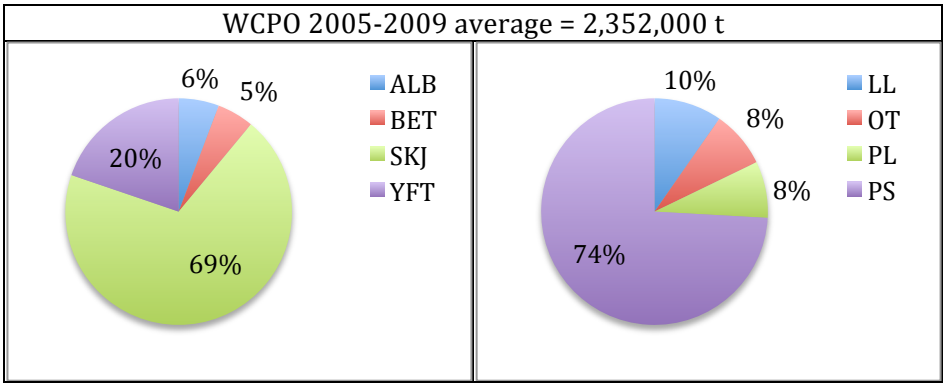


Figure II.1.2. Average 2005-2009 catches of skipjack, yellowfin, bigeye and albacore tuna in the WCPO. The graph on the left shows the percentages by species, and the graph on the right shows the percentages by gear type.

II.2 WCPO STOCK STATUS

II.2.1 Bigeye in the WCPO

Bigeye catches in 2009 were about 118,600 tonnes, a 6% decline from 2008. The main fishing gear is longline, although catches by this gear have been declining from a high in 2004 (**Figure 2.1.1**). In contrast, catches from purse seine vessels have been relatively stable since 2005.

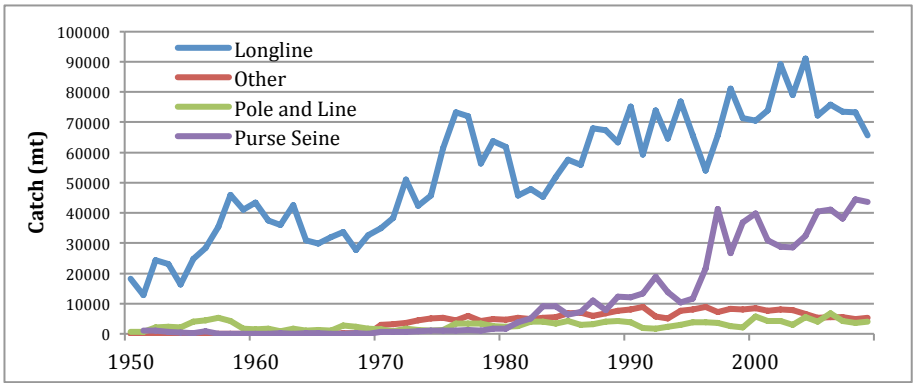


Figure I.2.1.1. Catches of bigeye tuna in the WCPO from 1950 to 2009, by gear type.

Stock assessment

The 2010 assessment conducted by SC6 (the 6th meeting of the Scientific Committee) is comparable to the 2008 and 2009 assessments, though there are differences in catch and effort data, size frequency and a few different structural assumptions. The updated assessment indicated the following:

- The ratio of $F_{current}/F_{MSY}$ is estimated at 1.41, indicating that **overfishing is occurring**. In order to reduce fishing mortality to F_{MSY}, a 29% reduction in fishing mortality is required from the 2005–2008 level. Considering historical levels of fishing mortality, a 31% reduction in fishing mortality from 2004 levels is required (consistent with the aim of CMM2008-01), and a 20% reduction from average 2001–2004 levels. In comparing the 2009 and 2010 assessments using

the same time window of data to compute MSY benchmarks, the 2010 base model is more optimistic with a lower $F_{current}/F_{MSY}$ ratio.

- The ratio of spawning biomass $B_{current}/B_{MSY}$ is estimated at 1.34. This indicates that that **the stock is not in an overfished state**.

- The estimate of MSY is 73,800 tonnes. MSY has been reduced to less than half its levels prior to 1970 through harvest of small bigeye. Current catches (147,500 tonnes) are approximately double the MSY. Much of this disparity is due to recent recruitment estimates being much higher than the long-term historical average, on which the MSY is based. For the higher level of recruitment estimated for 1999-2008, the maximum yield is 132,000 tonnes.

- As for all stock assessments that use MSY-based reference points, the assessment of stock status is highly sensitive to the assumed relationship between spawning biomass and recruitment. Under an alternative stock-recruitment assumption, overfishing would be taking place at a higher rate ($F_{current}/F_{MSY}$ = 1.97), and the stock would be in a slightly overfished state ($B_{current}/B_{MSY}$ = 0.97).

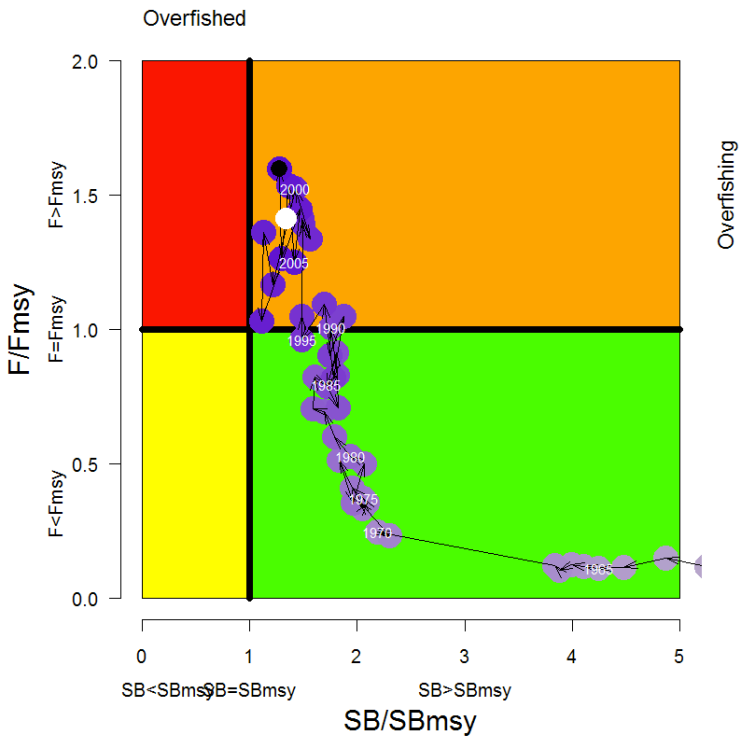


Figure II.2.1.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for bigeye tuna in the WCPO. The white dot represents the current level. Colors are taken from WCPFC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure for bigeye established by the WCPFC CMM 2008-01 which aims to reduce fishing mortality by 30%. The measure calls for:

- A 3-month closure of fishing on FADs in EEZ waters of PNA countries and on the High Seas;
- A limitation in the number of vessel days in PNA EEZs and equivalent measures for other EEZs;
- A high seas vessel day limit, allocated by flag;
- A closure of several high seas pockets;
- A requirement to submit FAD management plans, including information on strategies used to implement the closure and other measures for reducing small bigeye mortality;
- A full-retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
- 100% Regional observer coverage for all purse seine vessels fishing on the high seas, on the high seas and in waters under the jurisdiction of one or more coastal States, or vessels fishing in waters under the jurisdiction of two or more coastal States during the same trip;
- Gradual reductions in the bigeye catch by longliners of Members that caught more than 2,000 tonnes in 2004 (does not apply to Small Island Developing States);
- A limitation of each Member's fishing capacity not to exceed the 2001-2004 or 2004 level.

In addition, CMM 2009-02 provides more guidance on some elements of CMM 2008-01 that were ambiguous, particularly on the FAD closure and full retention requirements.

In 2009 and 2010, the WCPFC SC evaluated the efficacy of CMM-2008-01 and concluded that this measure, even if fully implemented, is extremely unlikely to achieve the objective of reducing fishing mortality on bigeye tuna to at least 30% below the level experienced either in 2004 or the annual average of the period 2001–2004. This conclusion was corroborated in subsequent analyses by SPC/OFP (2010b). The measure is in force for all of 2011 and it is expected that WCPFC will revisit it at its 2011 annual meeting.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	119	2009	
Five-year average catch (t)	123	2005-09	
MSY (t)	74	2009	
F/F_{MSY}	1.41	2005-08	
B/B_{MSY}	1.34	2007-09	Increasing 2005-2009
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes. The assessment model estimates that recent catches have been sustained by higher-than-average levels of recruitment, which have also maintained biomass above the B_{MSY} level. However, the stock is expected to become overfished in the near future.

Ratings for WCPO Bigeye tuna		
Stock abundance	GREEN	$B \geq B_{MSY}$. The stock has been subjected to overfishing for over one decade, but has not become overfished due to higher-than-average levels of recruitment in recent years.
Fishing mortality	ORANGE	$F > F_{MSY}$. The WCPFC management measures in place are insufficient to end overfishing.

Environment (Bycatch)	ORANGE	58% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
	YELLOW	30% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks). There is 100% observer coverage on part of the purse seine fleet.
	GREEN	4% of the catch is made with purse seining on free schools, with little impact on non-target species.
	YELLOW	3% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the WCPO BET stock was rated Yellow then): The separate ratings for F and B in 2011 allow for directly addressing the failure of CMM-2008-01 to reduce F (Orange).

II.2.2 Yellowfin in the WCPO

Yellowfin catches in the WCPO in 2009 were about 433,800 tonnes, an 11% decrease from 2008. The main fishing gear is purse seine, which has been generally increasing. Catches are also taken by a number of mixed gears in the Philippines and Indonesia, and by longliners (**Figure II.2.2.1**).

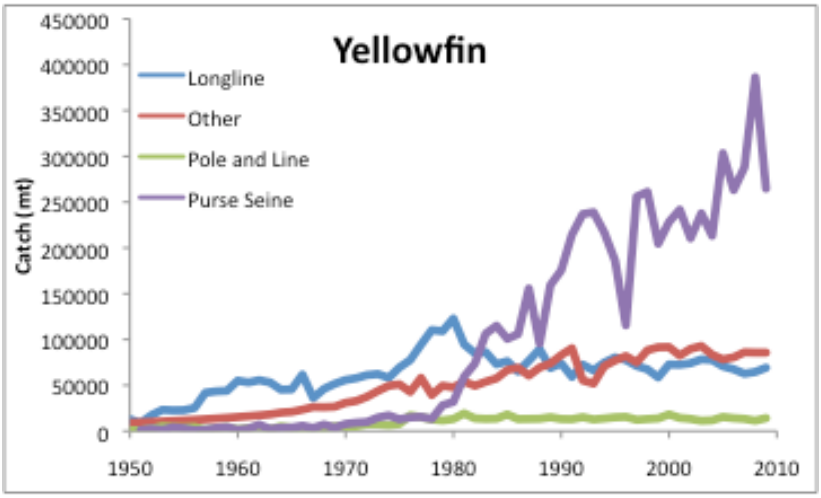


Figure II.2.2.1. Catches of yellowfin tuna in the WCPO from 1950 to 2009, by gear type.

Stock assessment

The last yellowfin assessment was conducted in 2009 (Langley et al. 2009). The results were generally more optimistic than those from the previous assessment and indicated that (Figure II.2.2.2):

- The stock is not in an overfished state as spawning biomass is above the B_{MSY} level ($B_{current}/B_{MSY}$ = 1.19 to 2.41).

- The ratio $F_{current}/F_{MSY}$ is estimated to range between 0.41 and 0.85, indicating that overfishing is not occurring.

- MSY is estimated to be 497,000 to 767,000 tonnes.

- The optimistic estimate of overall stock status should be tempered by the patterns estimated at a sub-regional level. The western equatorial Pacific, from which 95% of catches are taken, is at least fully exploited with no potential for a substantial increase in fishing effort.

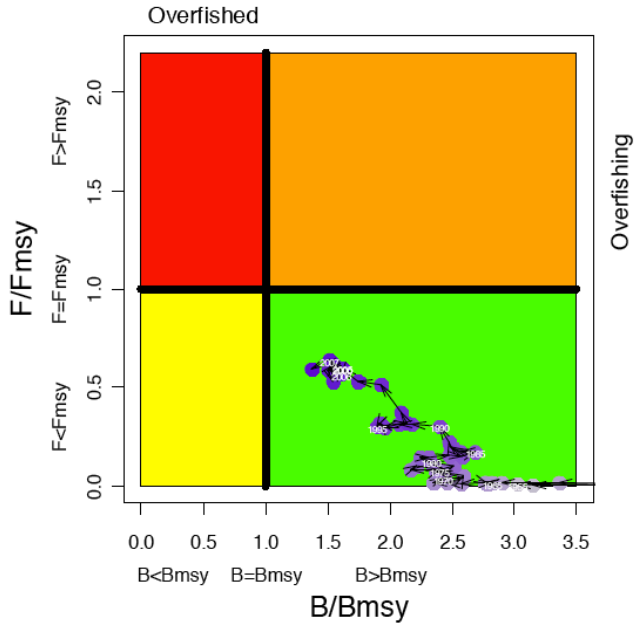


Figure II.2.2.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for yellowfin tuna in the WCPO, 1952-2008. Colors are taken from WCPFC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure for WCPO yellowfin established by the WCPFC is CMM 2008-01 which aims to ensure that yellowfin fishing mortality will not exceed the 2001-2004 or 2004 level. The measure calls for:

- A 3-month closure of fishing on FADs in EEZ waters of PNA countries and on the High Seas;
- A limitation in the number of vessel days in PNA EEZs;
- A closure of several high seas pockets;
- A requirement to submit FAD management plans;
- A full-retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
- 100% Regional observer coverage for all purse seine vessels fishing on the high seas, on the high seas and in waters under the jurisdiction of one or more coastal States, or vessels fishing in waters under the jurisdiction of two or more coastal States;
- A limitation of each Member's fishing capacity not to exceed the 2001-2004 or 2004 level.

In addition, CMM 2009-02 provides more guidance on some elements of CMM 2008-01 that were ambiguous, particularly on the FAD closure and full retention requirements.

In 2009 and 2009, the WCPFC SC evaluated the efficacy of CMM-2008-01 and concluded that this measure is achieving its objective of limiting fishing mortality on yellowfin to sustainable levels.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	433	2009	
Five-year average catch (t)	465	2005-09	
MSY (t)	494-767	2008	
F/F_{MSY}	0.41 - 0.85	2006-08	
B/B_{MSY}	1.19 - 2.41	2006-08	
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for WCPO Yellowfin tuna		
Stock abundance	GREEN	B > B_{MSY}.
Fishing mortality	YELLOW	F < F_{MSY}. Although the overall estimate of current F is below F_{MSY}, this is not the case in the tropical region (where 90% of the catch is taken). Due to heavy fishing effort in this region, there is little or no room for increased fishing pressure on the stock overall.
Environment (Bycatch)	YELLOW	32% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks). There is 100% observer coverage on part of the purse seine fleet.
	GREEN	32% of the catch is made with purse seining on free schools, with little impact on non-target species.
	ORANGE	20% of the catch is made by other gears such as gillnets, with unknown impacts on non-target stocks.
	ORANGE	14% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the WCPO YFT stock was rated Yellow then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

II.2.3 Skipjack in the WCPO

The WCPO Skipjack stock supports the largest tuna fishery in the World, accounting for 40% of worldwide tuna landings. Catches in 2009 were the highest on record, about 1,790,000 tonnes, a 9% increase from 2008. Purse seining, which accounts for 85% of the catches, has been increasing steadily for three decades. In contrast, pole-and-line fishing has been declining steadily (**Figure II.2.3.1**).

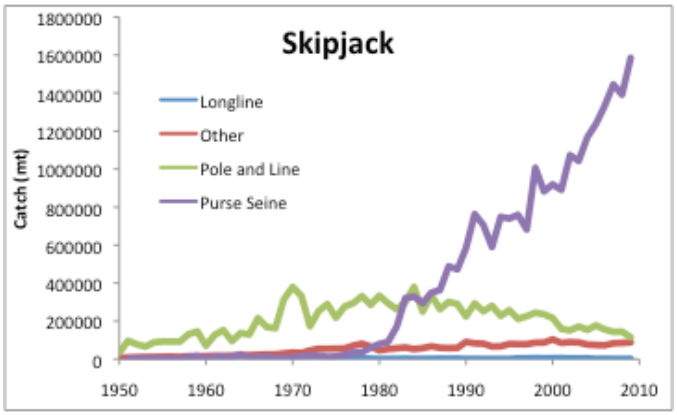


Figure II.2.3.1. Catches of skipjack tuna in the WCPO from 1950 to 2009, by gear type.

Stock assessment

The 2010 updated assessment gave similar results to the previous (2008) assessment, and indicated the following (**Figure I.2.2.2**):

- Fishing mortality rates tended to be higher during the last decade than for the preceding period. The ratio $F_{current}/F_{MSY}$ is estimated to be 0.34, indicating that the stock is moderately exploited and **overfishing is not occurring**.

- The **stock is not in an overfished state** as spawning biomass is above the B_{MSY} level ($B_{current}/B_{MSY}$ = 2.67).

- MSY (based on long-term recruitment and a steepness of 0.75) is estimated to be 1.38 million tonnes. The maximum yield at the somewhat higher recruitment levels of the past ten years (1999-2008), and assuming steepness of 1, would be 1.8 million tonnes.

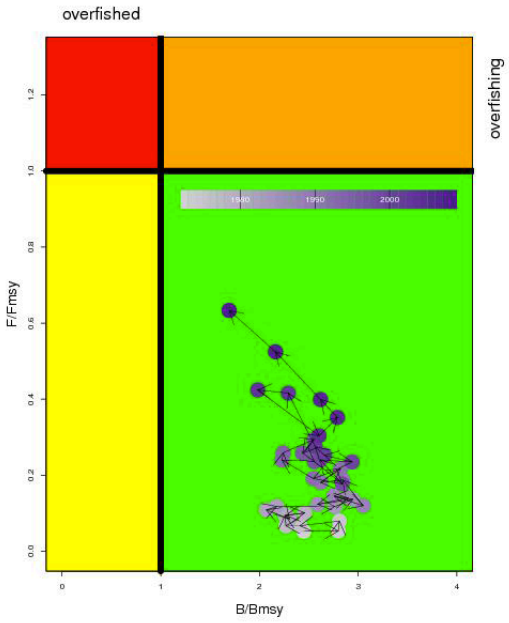


Figure 2.2.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for skipjack tuna in the WCPO. Colors are taken from WCPFC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure for WCPO skipjack established by the WCPFC is CMM 2008-01 which is targeted at conserving yellowfin and bigeye./ However, the measure also affects skipjack fisheries. The measure calls for:

- A 3-month closure of fishing on FADs in EEZ waters of PNA countries and on the High Seas;
- A limitation in the number of vessel days in PNA EEZs;
- A closure of several high seas pockets;
- A requirement to submit FAD management plans;
- A full-retention requirement for all purse seine vessels regarding bigeye, skipjack and yellowfin tunas;
- 100% Regional observer coverage for all purse seine vessels fishing on the high seas, on the high seas and in waters under the jurisdiction of one or more coastal States, or vessels fishing in waters under the jurisdiction of two or more coastal States;
- A limitation of each Member's fishing capacity not to exceed the 2001-2004 or 2004 level.

In addition, CMM 2009-02 provides more guidance on some elements of CMM 2008-01 that were ambiguous, particularly on the FAD closure and full retention requirements.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	1,784	2009	
Five-year average catch (t)	1,628	2005-09	
MSY (t)	1,376		
F/F_{MSY}	0.34	2007-2009	

B/B_{MSY}	2.67	2009	
Catch at F_{MSY} (t)	1,800		Assuming current level of high recruitment
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes. Overfishing is not taking place even if current catches are above MSY; that is because recent recruitment levels are higher than average.

Ratings for WCPO skipjack tuna		
Stock abundance	GREEN	$B > B_{MSY}$.
Fishing mortality	GREEN	$F \leq F_{MSY}$.
Environment (Bycatch)	YELLOW	56% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks). There is 100% observer coverage on part of the purse seine fleet.
	GREEN	30% of the catch is made with purse seining on free schools, with little impact on non-target species.
	YELLOW	10% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the WCPO SKJ stock was rated Green then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

II.2.4 Albacore in the South Pacific Ocean

South Pacific albacore extends beyond the WCPFC Convention Area. However, the stock is assessed by WCPFC. Catches in 2009 were about 67,000 tonnes, a 33% increase from 2008. The main fishing gear is longline, accounting for 95% of the catch (**Figure II.2.4.1**). Relatively minor amounts are taken by other gears like troll.

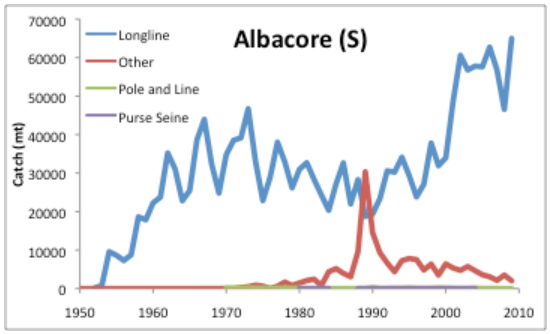


Figure II.2.4.1. Catches of albacore tuna in the southern Pacific Ocean from 1950 to 2009, by gear type.

Stock assessment

The last assessment was in 2009, conducted by SC5 (the 5th meeting of the Scientific Committee). The assessment indicated the following:

- The estimated ratio $F_{current}/F_{MSY}$ is 0.24, indicating that **overfishing is not occurring**.

- The estimated ratio of spawning biomass $B_{current}/B_{MSY}$ is 1.4. This indicates that that **the stock is not in an overfished state**.

- The estimate of MSY is 97,600 tonnes.

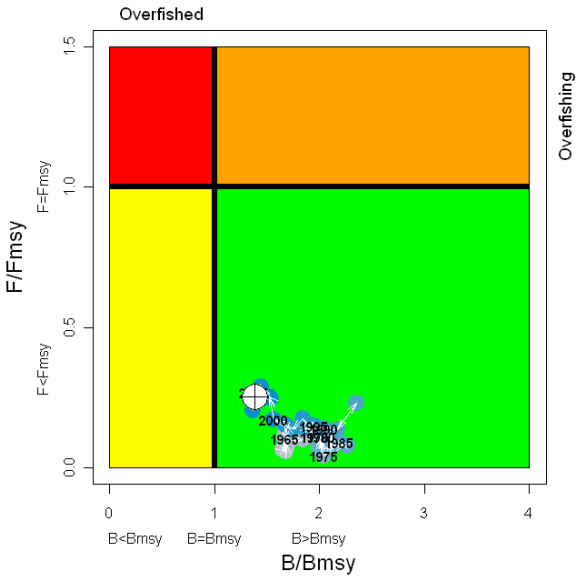


Figure II.2.4.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for albacore tuna in the South Pacific Ocean. The white dot represents the 2005-2007 level. Colors are taken from

WCPFC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure for south Pacific albacore established by the WCPFC is CMM 2005-02 which aims to limit fishing mortality by establishing a cap on the number of vessels by each Commission member. This capacity limitation if for the number of vessels not to increase the 2005 level, or the 2001-2004 average. Together with CMM 2005-03 (a similar measure for the North Pacific), the two measures also prevent fishing effort targeted at albacore from shifting to between the northern and southern stocks.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	67	2009	
Five-year average catch (t)	61	2005-09	
MSY (t)	98	2008	
F/F_{MSY}	0.25	2005-07	
B/B_{MSY}	1.4	2005-07	
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for South Pacific albacore tuna		
Stock abundance	GREEN	B > B_{MSY}.
Fishing mortality	GREEN	F < F_{MSY}.
Environment (Bycatch)	ORANGE	95% of the catch is made by longlining. Several bycatch mitigation measures are in place (turtles, sharks, sea birds).
	GREEN	3% of the catch is made by trolling, with little impact on non-target species.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the S. Pacific ALB stock was rated Green then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

II.2.5 Albacore in the North Pacific Ocean

North Pacific albacore extends beyond the WCPFC Convention Area. It is managed jointly by WCPFC and IATTC, and it is assessed by the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC). Catches in 2009 were about 77,500 tonnes, a 15% increase from 2008. The main fishing gears are longline and pole-and-line, which together account for accounting for 73% of the catch, followed by troll (**Figure II.2.5.1**). Catches by longlining have shown a decreasing trend since 1997.

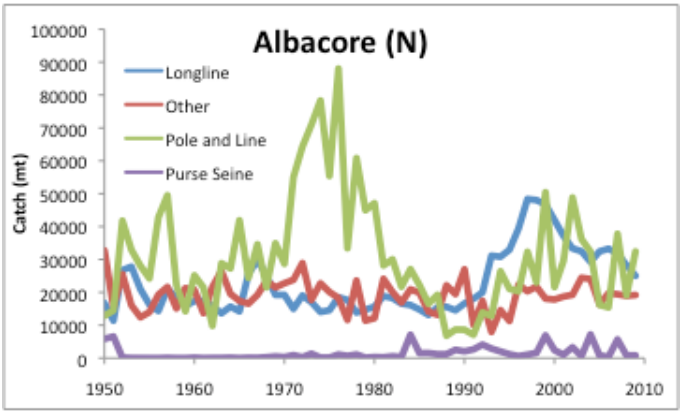


Figure II.2.5.1. Catches of albacore tuna in the northern Pacific Ocean from 1950 to 2009, by gear type.

Stock assessment

The most recent assessment of north Pacific albacore was in 2006, using data through 2005 (ISC 2006). There has been no complete assessment since then, but one is planned for 2011. The assessment concluded that:

- The stock is not in an overfished state.

- Fishing mortality is higher than many commonly-used reference points that are used as proxies for F_{MSY} (except F_{MAX}, the rate that maximizes yield-per-recruit).

Management measures

The main binding conservation measure for North Pacific albacore established by the WCPFC is CMM 2005-03 which aims to limit fishing mortality by establishing a cap on the number of vessels by each Commission member. This capacity limitation if for the number of vessels not to increase the 2005 level, or the 2001-2004 average. Together with CMM 2005-02 (a similar measure for the South Pacific), the two measures also prevent fishing effort targeted at albacore from shifting to between the northern and southern stocks.

In the IATTC, Resolution C-05-02 called for members not to increase fishing effort directed at North Albacore beyond the current (2005) level.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	77	2009	

Five-year average catch (t)	75	2005-09	
MSY (t)	66-100	2005	
F/F$_{MSY}$	1≤	2002-05	
B/B$_{MSY}$	>1	2002-05	
Catch at F$_{MSY}$ (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for North Pacific albacore tuna		
Stock abundance	GREEN	B > B$_{MSY}$.
Fishing mortality	YELLOW	F ≤ F$_{MSY}$. Although the point estimate of current F is below various F$_{MSY}$ proxies (so it could be rated Green), it is highly unlikely that increased fishing effort will result in significantly increased sustained catches, but it will significantly reduce spawning biomass. Both IATTC and WCPFC have measures in place to limit fishing effort or fishing capacity targeted on this stock. The last assessment (2006) is outdated; a new assessment will be conducted in 2011.
Environment (Bycatch)	ORANGE YELLOW GREEN	40% of the catch is made by longlining. Several bycatch mitigation measures are in place (turtles, sharks, sea birds). 32% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish species. 23% of the catch is made by trolling, with little impact on non-target species.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the N. Pacific ALB stock was rated Yellow then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

III. INDIAN OCEAN (IO)

RFMO: Indian Ocean Tuna Commission
Last Scientific Committee (SAC) meeting: December, 2010
Last Commission meeting: March, 2010.
Tuna stocks managed: IO Yellowfin, IO Bigeye, IO Skipjack, IO Albacore.
Data sources: The main source of information for this section is IOTC (2010).
Last update: May 5, 2011.

III.1. CATCHES

About 24 percent of the world production of tuna is from the Indian Ocean (IO), making this the second largest region for tuna fishing after the western and Central Pacific Ocean. Catches of skipjack, yellowfin, bigeye and albacore in 2009 were 861,000 tonnes, a 5% decline from 2008. There has been a general tendency for the total catch to decline since 2005, when a record 1.2 million tonnes were caught (**Figure III.1.1**).

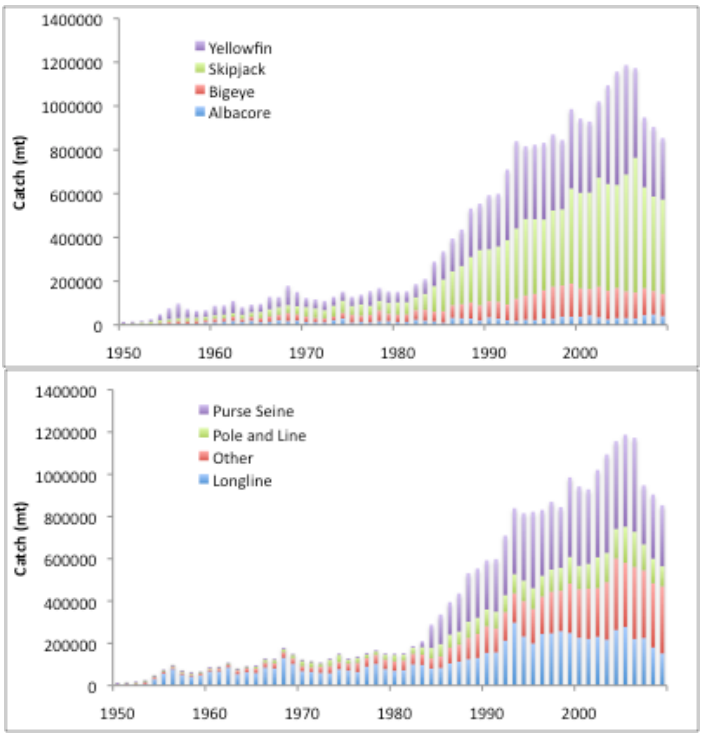


Figure III.1.1. Trends in catch (mt) of albacore, bigeye, skipjack and yellowfin in the IO region, by species (top) and gear (bottom), 1950-2009.

It should be noted that the problem of piracy in the Indian Ocean, especially in the vicinity of Somalia, has had an important impact in the tuna fisheries. For example, the fishing capacity of the European purse seine fleet has decreased by 25% from the 2005-2008 average due to vessels leaving the IO to fish in other regions. Similarly, vessels from other fleets such as Japanese, Taiwanese and Korean longliners have shifted their areas of operations, sometimes to other oceans; some local fleets such as those of Kenya and Seychelles have been affected as well.

Average catches for the five-year period 2005-2009 provide an indication of the recent performance of the fisheries (**Figure III.1.2**): Skipjack accounts for 49% of the catches

in weight, followed by yellowfin (36%), bigeye (11%), and albacore (4%). Purse-seine vessels take about 35% of the total catch, followed by longline (21%), pole-and-line (13%), and a variety of other gears (31%), including hand line and gillnets.

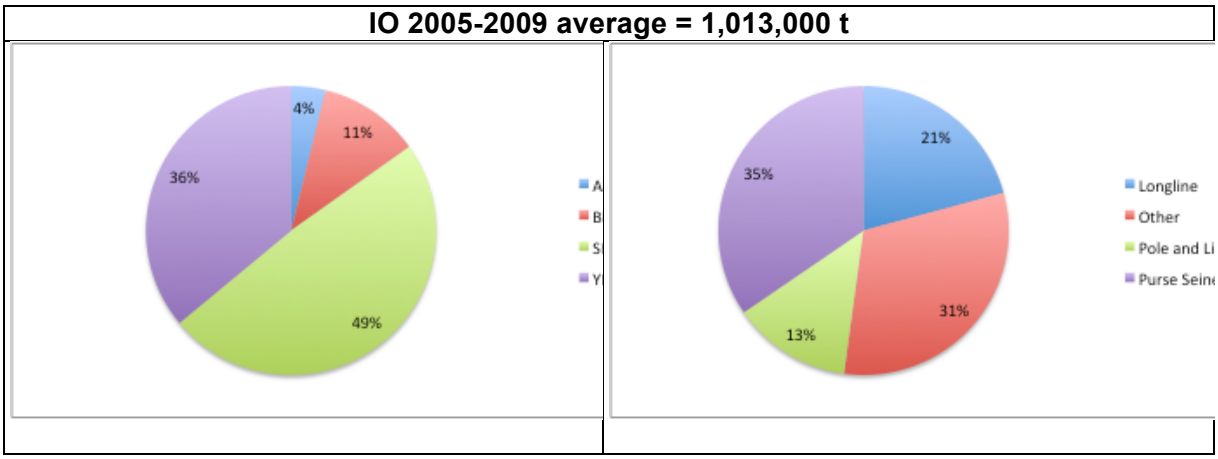


Figure III.1.2. Average 2005-2009 catches of skipjack, yellowfin, bigeye and albacore tuna in the IO. The graph on the left shows the percentages by species, and the graph on the right shows the percentages by gear type.

III.2 IO STOCK STATUS

III.2.1 Bigeye in the IO

Bigeye catches in 2009 were about 102,000 tonnes, a 4% decline from 2008. The main fishing gear is longline, although catches by this gear have been declining from a high in 2004 (**Figure III.2.1.1**). In contrast, catches from purse seine vessels have been relatively stable since 2000.

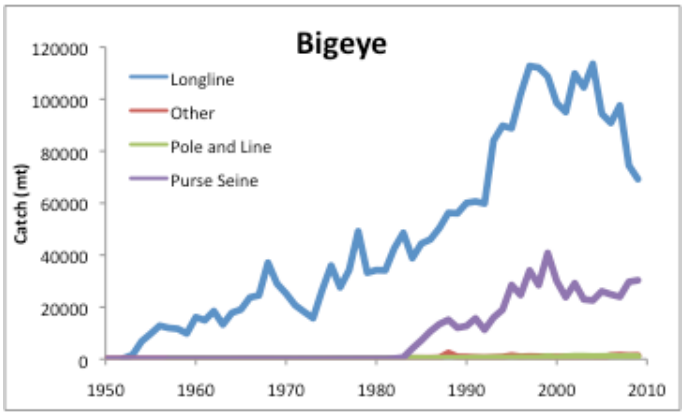


Figure III.2.1.1. Catches of bigeye tuna in the IO from 1950 to 2009, by gear type.

Stock assessment

The 2010 assessment conducted by the Scientific Committee (SC13) gave similar results to the 2009 assessment in terms of average trends. However, the uncertainty in the results was perceived to be greater than before, perhaps as a result of the SC having considered a much broader range of model assumptions than before. The updated assessment indicated the following:

- The ratio of $F_{current}/F_{MSY}$ is estimated at 0.79, indicating that **overfishing is not occurring**.

- The ratio of spawning biomass $B_{current}/B_{MSY}$ is estimated at 1.20. This indicates that that **the stock is not in an overfished state**.

- The median estimate of MSY is 114,000 tonnes. Given that the mean annual catch for the period 2005-2009 was 114,600 t, it appears that the stock is being exploited at around its maximum level.

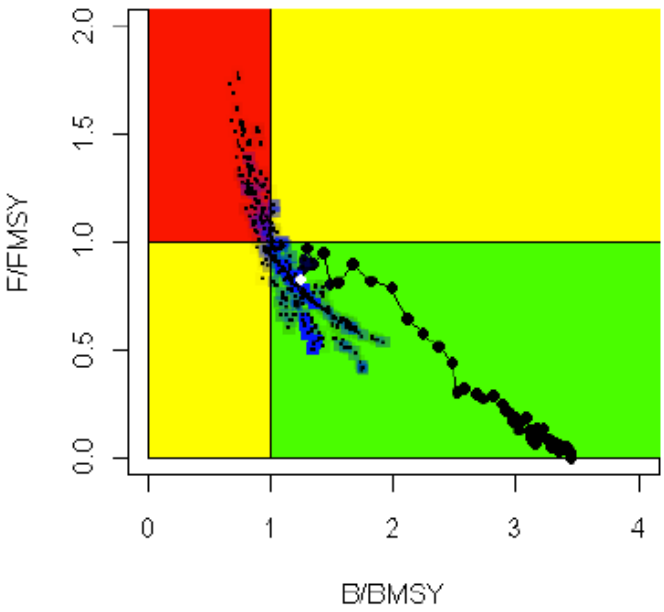


Figure III.2.1.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for bigeye tuna in the IO. Black circles represent the annual median values over time (white circle is 2009). Dots and blue squares indicate uncertainty in the current status estimated from models that make different assumptions. Colors are taken from IOTC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure established by the IOTC for bigeye is Resolution 10/01, which affects vessels greater than 24 m as well as smaller vessels fishing on the high seas. This measure calls for a one-month closure for purse seiners and longliners in an area of size 10°x20°. The effect of the closure in Resolution 10/01 on the status of IO tuna stocks cannot be evaluated yet.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	102	2009	
Five-year average catch (t)	115	2005-09	
MSY (t)	114	2009	
F/F_{MSY}	0.79	2009	
B/B_{MSY}	1.20	2009	Increasing 2005-2009
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for IO Bigeye tuna		
Stock abundance	GREEN	$B > B_{MSY}$.
Fishing mortality	GREEN	$F < F_{MSY}$.
Environment (Bycatch)	ORANGE	75% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
	YELLOW	18% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
	GREEN	5% of the catch is made with purse seining on free schools, with little impact on non-target species.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the IO BET stock was rated Green then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

III.2.2 Yellowfin in the IO

Yellowfin catches in 2009 were about 281,000 tonnes, a 11% decrease from 2008. The main fishing gears for which catches have declined recently are purse seine and longline (**Figure III.2.2.1**). In contrast, catches from pole-and-line vessels have been relatively stable. Catches by gillnet have become more important in recent years. Overall catches have declined by 45% from a record high of 517,000 tonnes in 2004.

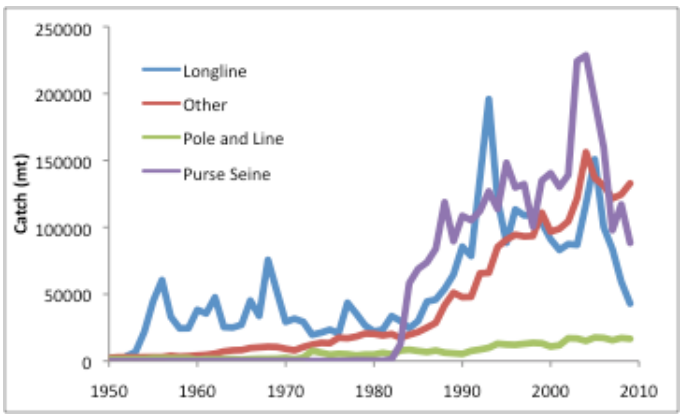


Figure I.2.2.1. Catches of yellowfin tuna in the IO from 1950 to 2009, by gear type.

Stock assessment

The 2010 updated assessment gave more optimistic results to the previous (2009) assessment, and indicated the following (**Figure III.2.2.2**):

- The ratio of $F_{current}/F_{MSY}$ is estimated at 0.99 (range: 0.85-1.39), indicating that the situation is **close to overfishing**. The assessment indicates that overfishing probably occurred in recent years. SC13 noted that if the fishing effort that has been displaced recently due to piracy returns to traditional fishing areas, then catches (and F) will likely increase.

- The **stock is approaching or is already in an overfished state** as spawning biomass is close to or below the B_{MSY} level ($B_{current}/B_{MSY}$ = 1.11. Range: 0.93-1.25).

- The median estimate of MSY is estimated to be 320,000 tonnes. During the period 2003-2006, catches substantially exceeded this level and the stock experienced a rapid decline.

While the point estimates from the base case model used by SC13 suggest that the stock is not overfished and not being overfished, ISSF takes a cautious view about the status of IO yellowfin, taking into consideration the statements made by SC13 that the stock may be approaching an overfished condition and that overfishing has taken place recently.

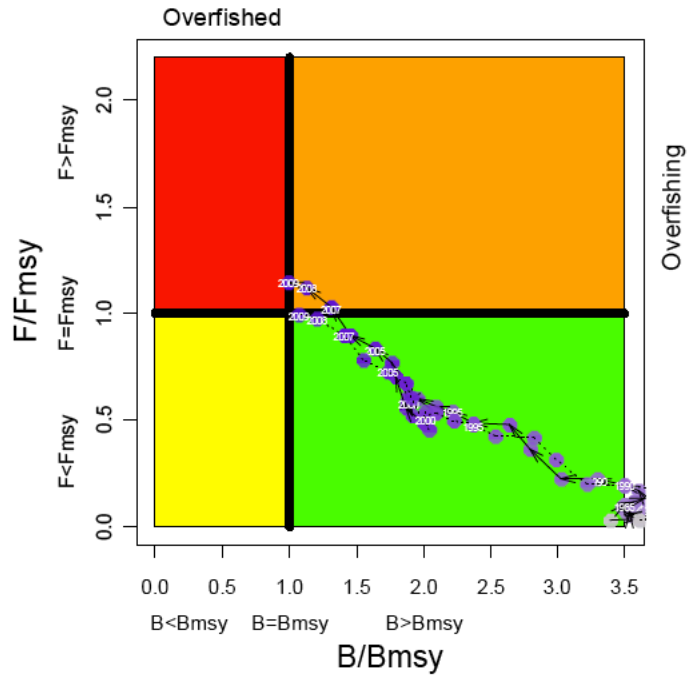


Figure III.2.2.2. Temporal trend in the ratios Bcurrent/B_{MSY} (x-axis) and Fcurrent/F_{MSY} (y-axis) for yellowfin tuna in the IO. Trajectories are presented for two alternative models that make different assumptions about the relationship between stock size and average recruitment. Colors are taken from IOTC reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure established by the IOTC for yellowfin is Resolution 10/01, which affects vessels greater than 24 m as well as smaller vessels fishing on the high seas. This measure calls for a one-month closure for purse seiners and longliners in an area of size 10°x20°. The effect of the closure in Resolution 10/01 on the status of IO tuna stocks cannot be evaluated yet.

The IO yellowfin stock has been of concern because the catches in 2003-2006 exceeded the MSY level. Since then, catches have decreased considerably. It is thought that much of that decrease is due to fishing effort being displaced to zones in the IO with lower catch rates or into other oceans, as a result of piracy. The IOTC SC has expressed concern that catches could increase again if the piracy situation is reversed, and recommended

that the Commission limit catches to 300,000 tonnes or less. In Resolution 10/01, the IOTC established a series of meetings for members to agree on a quota allocation scheme, with a view to possibly adopting a Total Allowable Catch or similar measures in the future.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	288	2009	
Five-year average catch (t)	371	2005-09	
MSY (t)	320	2009	
F/F_{MSY}	0.99	2009	Range: 0.85-1.39
B/B_{MSY}	1.11	2009	Range: 0.93-1.25
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for IO Yellowfin tuna		
Stock abundance	YELLOW	B ≈ B_{MSY}. According to the SC, the stock is likely to be currently in, or approaching, an overfished state.
Fishing mortality	GREEN	F ≈ F_{MSY}. If fishing effort displaced because of the piracy problem returns to traditional fishing areas, an increase in F could be expected.
Environment (Bycatch)	ORANGE	30% of the catch is made by gillnets, a gear expected to have high bycatch rates. No mitigation measures are in place and monitoring is extremely deficient.
	YELLOW	18% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
	GREEN	18% of the catch is made by handlines, expected to have little impact on bycatch species.
	ORANGE	15% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
	GREEN	12% of the catch is made with purse seining on free schools, with little impact on non-target species.
	YELLOW	6% of the catch is made by pole-and-line fishing, with small bycatch of non-target species but unknown impacts on baitfish stocks.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the IO YFT stock was rated Orange then): The 2010 assessment by IOTC estimated a more optimistic status. ISSF rated it as Yellow in its December 2010 update. There has been no change in the ratings of B and F since the 2010 update, other than separating F and B factors.

III.2.3 Skipjack in the IO

Skipjack catches in the Indian Ocean in 2009 were about 430,500 tonnes, almost the same as in 2008. Purse seine (39%) and gillnets (37%) dominate the catches, followed by pole-and-line (17%) (**Figure I.2.3.1**). The pole-and-line catches have been decreasing since 2005.

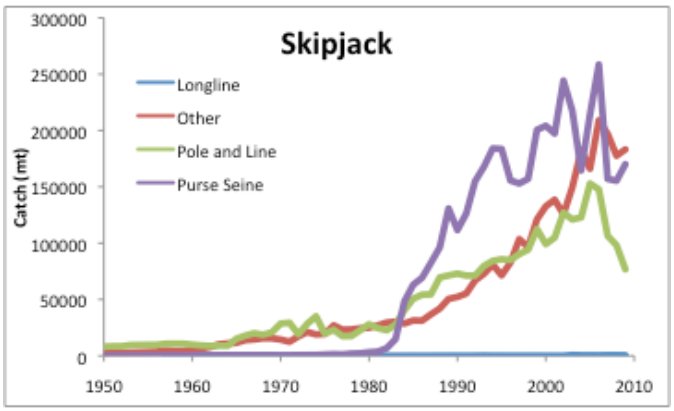


Figure I.2.3.1. Catches of skipjack tuna in the IO from 1950 to 2009, by gear type.

Stock assessment

No formal stock assessment of skipjack has ever been conducted in the Indian Ocean, although one is planned for 2011. Analyses of tagging data indicate that current exploitation rates are moderate. Given that skipjack are highly productive and that IO catches have essentially tracked the progression of fishing effort, the IOTC SC has not been particularly concerned with the status of the stock.

Management measures

The main binding conservation measure established by the IOTC for skipjack (indirectly) is Resolution 10/01, which affects vessels greater than 24 m as well as smaller vessels fishing on the high seas. This measure calls for a one-month closure for purse seiners in an area of size 10°x20°. The effect of the closure in Resolution 10/01 on the status of IO tuna stocks cannot be evaluated yet.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	441	2009	
Five-year average catch (t)	502	2005-09	
MSY (t)	N/A		
F/F$_{MSY}$	N/A		Tagging data suggest a moderate exploitation rate
B/B$_{MSY}$	N/A		
Catch at F$_{MSY}$ (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for IO skipjack tuna		
Stock abundance	YELLOW	Unknown. A stock assessment is planned for the first time in 2011.
Fishing mortality	GREEN	F < F$_{MSY}$? Analyses of tagging data suggest that the current exploitation rate is moderate.
Environment (Bycatch)	ORANGE	40% of the catch is made by gillnets, a gear expected to have high bycatch rates. No mitigation measures are in place and monitoring is extremely deficient.
	YELLOW	38% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).

	YELLOW	15% of the catch is made by pole-and-line fishing, with small bycatch of non-target species but unknown impacts on baitfish stocks.
	GREEN	4% of the catch is made with purse seining on free schools, with little impact on non-target species.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the IO SKJ stock was rated Green then): The 2010 rating was based on IOTC analyses of fishery indicators that suggest a healthy stock. The 2011 Yellow rating for B reflects the default rating in the absence of a formal quantitative assessment; the Green rating for F reflects estimates of moderate exploitation rates from analyses of a large-scale tagging program conducted by IOTC.

III.2.4 Albacore in the IO

Albacore catches in the Indian Ocean in 2009 were about 40,500 tonnes, a 16% decrease from 2008. Allmost all catches are made by drifting longlines (**Figure III.2.4.1**). It is worth noting that the estimates of catches since 2003 have increased substantially compared to earlier years, primarily as a result of a revision of catches by Indonesia.

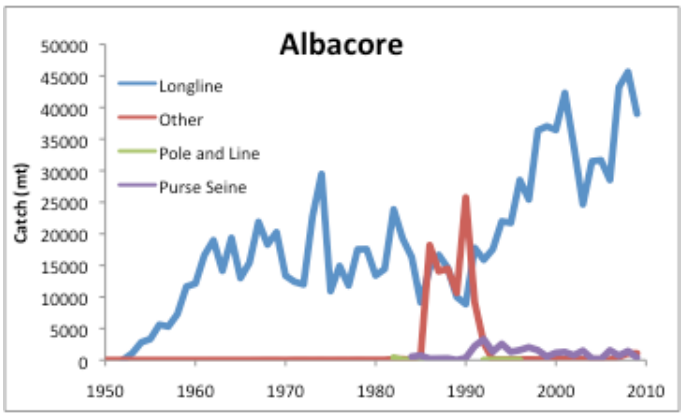


Figure I.2.3.1. Catches of albacore tuna in the IO from 1950 to 2009, by gear type.

Stock assessment

Based on preliminary analyses undertaken by the SC in 2008, there are no indications that that the IO albacore stock is overfished. As well, overfishing is not likely occurring. The SC plans to carry out a new assessment in 2011, which is necessary given the changes in the estimates of landings.

Management measures

IOTC Resolution 09/02 is a limitation of fishing capacity applicable in 2010 and 2011. It limits the number of vessels greater than 24 m fishing for albacore to the number and capacity that existed in 2007.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	41	2009	
Five-year average catch (t)	39	2005-09	
MSY (t)	N/A		
F/F_{MSY}	N/A		Tagging analyses estimate moderate exploitation
B/B_{MSY}	N/A		
Catch at F_{MSY} (t)	N/A		

TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for IO albacore tuna		
Stock abundance	YELLOW	Unknown
Fishing mortality	YELLOW	Unknown
Environment (Bycatch)	ORANGE	Almost 100% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the IO ALB stock was rated Green then): The 2010 rating was based on preliminary assessment results by IOTC. The 2011 Yellow ratings for B and F reflect the default rating in the absence of a formal quantitative assessment.

IV. ATLANTIC OCEAN (AO)

RFMO: International Commission for the Conservation of Atlantic Tunas (ICCAT)
Last Scientific Committee (SCRS) meeting: October, 2010
Last Commission meeting: November, 2010.
Tuna stocks managed: AO Yellowfin, AO Bigeye, Eastern AO Skipjack, Western AO skipjack, North AO Albacore, South AO Albacore, Mediterranean Albacore.
Data sources: The main source of information for this section is ICCAT (2011).
Last update: May 5, 2011.

IV.1. CATCHES

About 10 percent of the world production of tuna is from the Atlantic Ocean (AO). Catches of skipjack, yellowfin, bigeye and albacore in 2009 were 395,000 tons, about the same as in 2008. There has been a general tendency for the total catch to decline since the mid 1990s (**Figure IV.1.1**).

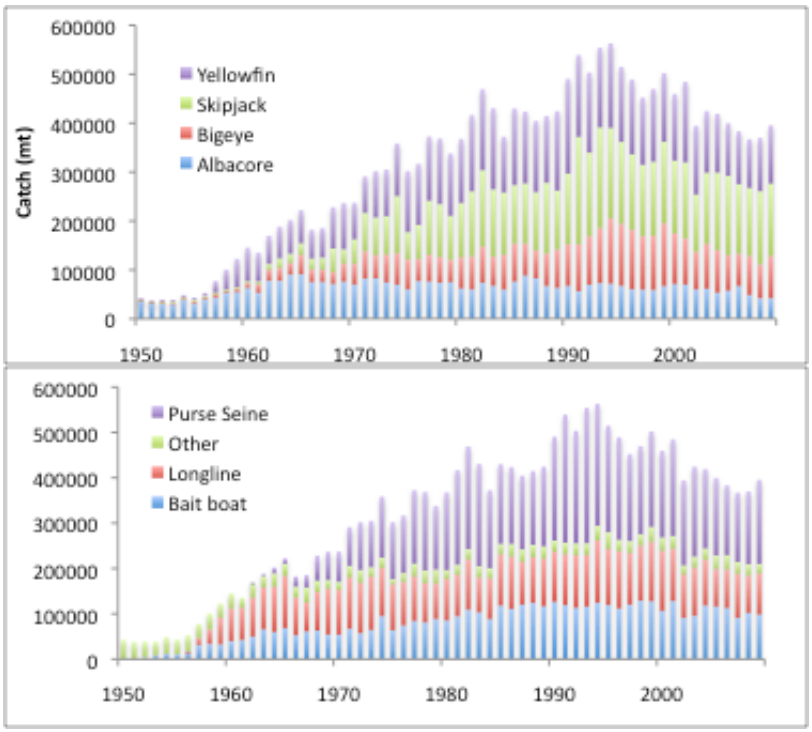


Figure IV.1.1. Trends in catch (mt) of albacore, bigeye, skipjack and yellowfin in the AO region, by species (top) and gear (bottom), 1950-2009.

Average catches for the five-year period 2005-2009 provide an indication of the recent performance of the fisheries (**Figure IV.1.2**): Skipjack accounts for 39% of the catches in weight, followed by yellowfin (28%), bigeye (19%), and albacore (13%). Purse-seine vessels take about 43% of the total catch, followed by pole-and-line vessels (27%), longliners (23%), and a variety of other gears (7%).

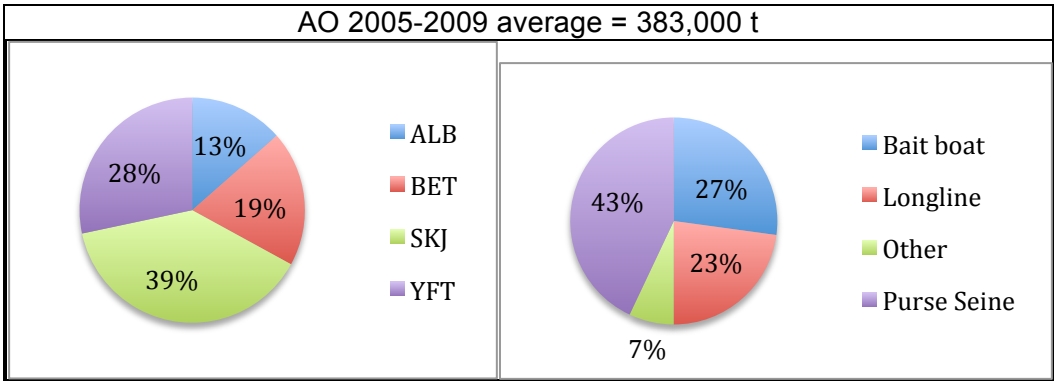


Figure IV.1.2. Average 2005-2009 catches of skipjack, yellowfin, bigeye and albacore tuna in the AO. The graph on the left shows the percentages by species, and the graph on the right shows the percentages by gear type.

IV.2 AO STOCK STATUS

IV.2.1 Bigeye in the AO

Atlantic bigeye catches in 2009 were about 86,000 tonnes, a 24% increase from 2008. The annual increase in catches was evident for all major gear types: Purse seine (increased 47%), pole and line (21%) and longline (17%). Catches by longline, the main fishing gear, declined sharply between 1999 and 2006, but they have been increasing since then (**Figure IV.2.1.1**).

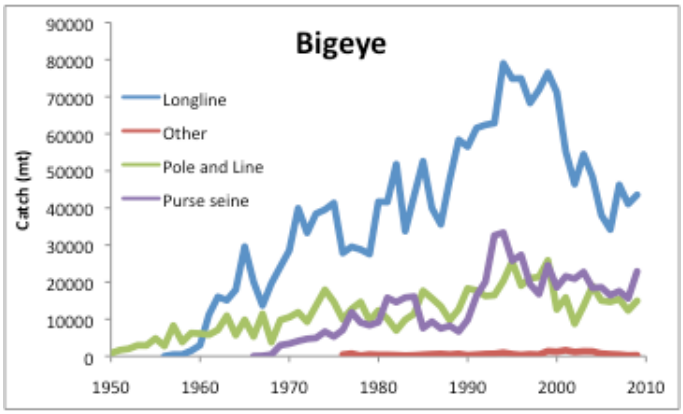


Figure IV.2.1.1. Catches of Atlantic bigeye tuna from 1950 to 2009, by gear type.

The 2010 assessment conducted by SCRS gave somewhat more optimistic results than the 2007 assessment. The following conclusions were reached by SCRS, based on combining several model-data sets:

- The ratio of $F_{current}/F_{MSY}$ is estimated at 0.95, indicating that **overfishing is not occurring**. However, there is uncertainty in this estimate. Estimates of $F_{current}/F_{MSY}$ from the model runs considered plausible ranged from 0.65 to 1.55.

- The ratio of spawning biomass $B_{current}/B_{MSY}$ is estimated at 1.01. This indicates that that **the stock is not in an overfished state**. There is also uncertainty in this estimate. Estimates of $B_{current}/B_{MSY}$ from the model runs considered plausible ranged from 0.72 to 1.34.

- The estimate of MSY is 92,000 tonnes (range: 79,000 to 102,000 tonnes). MSY has been reduced considerably through harvest of small bigeye. Current catches (86,000 tonnes) are slightly below MSY.

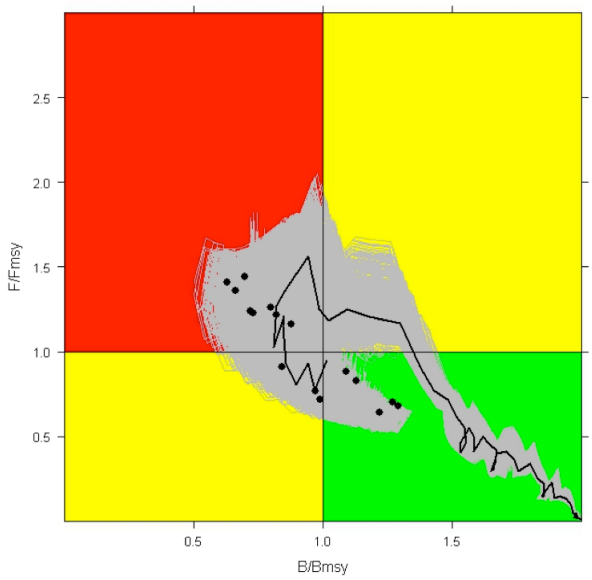


Figure IV.2.1.2. Temporal trend in the ratios $B_{current}/B_{MSY}$ (x-axis) and $F_{current}/F_{MSY}$ (y-axis) for bigeye tuna in the AO. The shaded area represents the 80% confidence limits for the historical trajectory (1950-2009) and the solid line represents the median estimated from several models. Points depict structural uncertainty in current status from various other models. Colors are taken from ICCAT reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The main binding conservation measure established by ICCAT for bigeye is Recommendation 10-01, which amended several previous Recommendations. This measure calls for:

- A Total Allowable Catch of 85,000 tonnes, with catch limits given to ICCAT members
- A limit on the number of longline and purse seine vessels by several countries
- A one-month closure of fishing by pole-and-line and purse seine vessels in an equatorial area of size 5°x10°.
- Five percent observer coverage on longline vessels targeting bigeye.

It should be noted that the 2009 catch was slightly above the TAC. There is concern that fishing capacity remains high, and is probably growing due to longline and purse seine vessels moving from the IO into the AO due to piracy.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	86	2009	
Five-year average catch (t)	74	2005-09	
MSY (t)	92	2009	Range: 79-102
F/F_{MSY}	0.95	2009	Range: 0.65-1.55
B/B_{MSY}	1.01	2009	Range: 0.72-1.34

Catch at F_{MSY} (t)	N/A		
TAC (t)	85	2011	

NOTES: Catches and MSY are in thousand tonnes.

Ratings for AO Bigeye tuna		
Stock abundance	GREEN	$B \approx B_{MSY}$.
Fishing mortality	YELLOW	$F \approx F_{MSY}$. The 2009 catch was slightly above the TAC and fishing capacity remains high. The stock should be monitored closely.
Environment (Bycatch)	ORANGE	55% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
	YELLOW	20% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
	YELLOW	20% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. Some of the baitboats in the Gulf of Guinea fish together with the purse seiners, thus becoming like a single fleet.
	GREEN	5% of the catch is made with purse seining on free schools, with little impact on non-target species.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO BET stock was rated Yellow then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

IV.2.2 Yellowfin in the AO

Yellowfin catches in 2009 were about 119,000 tonnes, an 8% increase from 2008. The main fishing gear is purse seining (about 60% of the catch) (**Figure IV.2.2.1**). Purse seine catches have shown a general decrease since the early 1990s.

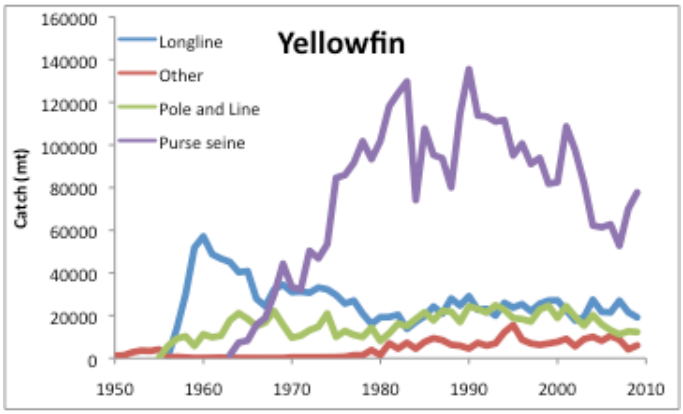


Figure IV.2.2.1. Catches of yellowfin tuna in the AO from 1950 to 2009, by gear type.

Stock assessment

The most recent full assessment of yellowfin tuna, which used data through 2006, was carried out in 2008. A new assessment is planned for 2011. The results of the 2008 assessment showed that (**Figure IV.2.2.2**):

- The ratio of $F_{current}/F_{MSY}$ is estimated at 0.86, indicating that **overfishing is not occurring**.

- The ratio of spawning biomass $B_{current}/B_{MSY}$ is estimated at 0.96. This indicates that that **the stock in 2006 was in a slightly overfished state**. Since then, catches have remained 15% to 30% below the MSY level which would be expected to result in further rebuilding of biomass to a higher level ($B_{current}/B_{MSY}$ > 1). However, this remains to be corroborated by the next assessment.

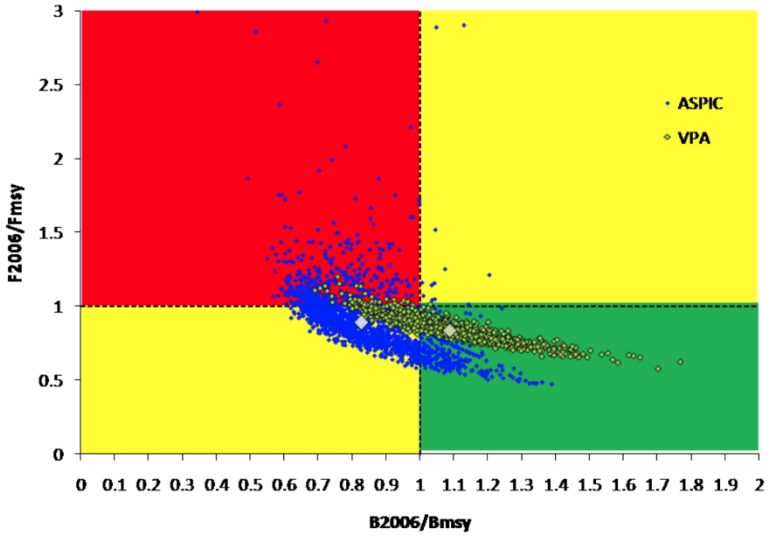


Figure IV.2.2.2. Temporal trend in the ratios Bcurrent/BMSY (x-axis) and Fcurrent/FMSY (y-axis) for yellowfin tuna in the AO. The point estimates are shown as the large diamonds and the array of points reflect bootstrap estimates of uncertainty. Colors are taken from ICCAT reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

Recommendation 93-04 requires ICCAT members to not allow the effective fishing effort exerted by their fleets to exceed the 1992 level. "Effective fishing effort" is a variable that may be difficult to manage through time, because fishing technology and fishing know-how change all of the time. ICCAT does not evaluate compliance with this measure, perhaps as a result of this technical difficulty. In any case, the total yellowfin catches have generally decreased since 1992, so this is not of concern at the present time. However, there is concern that fishing pressure on the stock could increase in the near future with the recent movement of purse seine and longline vessels from the IO into the AO due to piracy. This situation should be monitored closely.

The time-area closure established for bigeye through Recommendation 10-01 also affects yellowfin.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	119	2009	
Five-year average catch (t)	108	2005-09	
MSY (t)	131-147	2006	
F/F_{MSY}	0.86	2006	

B/B_{MSY}	0.96	2006	
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for AO Yellowfin tuna		
Stock abundance	YELLOW	B < B_{MSY} in 2006. It is likely that it has increased since then because catches have been well below MSY. However, this should be confirmed by the next assessment.
Fishing mortality	YELLOW	F < F_{MSY}. Although the point estimate of current F is below F_{MSY} (and thus it could be rated Green), it is highly unlikely that increased fishing effort will result in significantly increased sustained catches, but it will significantly reduce spawning biomass.
Environment (Bycatch)	GREEN ORANGE YELLOW YELLOW	50% of the catch is made with purse seining on free schools, with little impact on non-target species 20% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient. 12% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. Some of the baitboats in the Gulf of Guinea fish together with the purse seiners, thus becoming like a single fleet. 10% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO YFT stock was rated Yellow then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

IV.2.3 Skipjack in the Eastern AO

There are two (eastern and western) skipjack stocks in the Atlantic. Skipjack catches in the eastern Atlantic Ocean in 2009 were about 122,500 tonnes, a 4% decrease from 2008. Purse seine (67%) and pole-and-line (27%) dominate the catches (**Figure IV.2.3.1**). The purse seine catches have been decreasing since the early 1990s, while catches by other gears have remained stable.

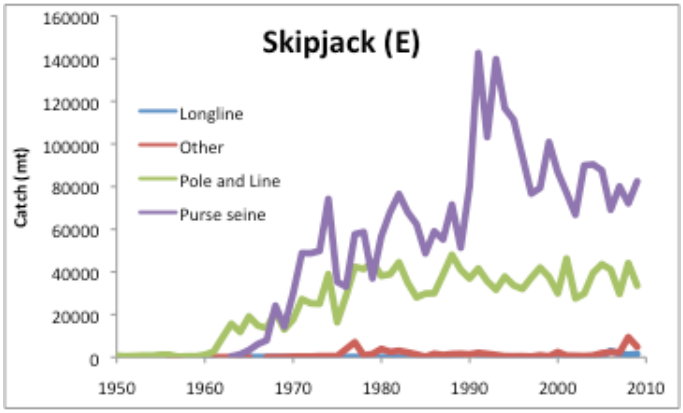


Figure IV.2.3.1. Catches of skipjack tuna in the eastern AO from 1950 to 2009, by gear type.

Stock assessment

The stock was assessed by SCRS in 2008, using data up to 2006. Different models were used, and the results were characterized by high uncertainty. The SCRS concluded that overfishing is not occurring and the stock is not overfished (**Figure IV.2.3.2**).

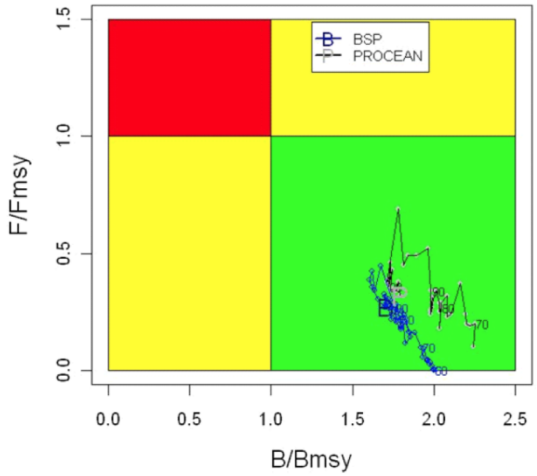


Figure IV.2.3.2. Temporal trend in the ratios Bcurrent/B_{MSY} (x-axis) and Fcurrent/F_{MSY} (y-axis) for skipjack tuna in the eastern AO. The lines show the trends in the estimated biomass and fishing mortality ratios over time, using different assessment models. Colors are taken from ICCAT reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

The time-area closure established for bigeye through Recommendation 10-01 also affects this skipjack stock.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	122	2009	
Five-year average catch (t)	122	2005-09	
MSY (t)	143-170	2006	
F/F_{MSY}	<1		
B/B_{MSY}	>1		
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for Eastern AO skipjack tuna		
Stock abundance	GREEN	B > B_{MSY}.
Fishing mortality	GREEN	F < F_{MSY}.
Environment (Bycatch)	YELLOW	62% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).
	YELLOW	27% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. Some of the baitboats in the Gulf of Guinea fish together with the purse seiners, thus becoming like a single fleet.

	GREEN	5% of the catch is made with purse seining on free schools, with little impact on non-target species

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO-East SKJ stock was rated Green then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

IV.2.4 Skipjack in the Western AO

There are two (eastern and western) skipjack stocks in the Atlantic. Skipjack catches in the western Atlantic Ocean in 2009 were about 25,700 tonnes, a 17% increase from 2008. Pole-and-line fishing dominates the catches (90%), followed by purse seining (6%) (**Figure IV.2.4.1**). Pole and line catches have remained relatively stable (although highly variable) during the last two decades, while purse seine catches have declined.

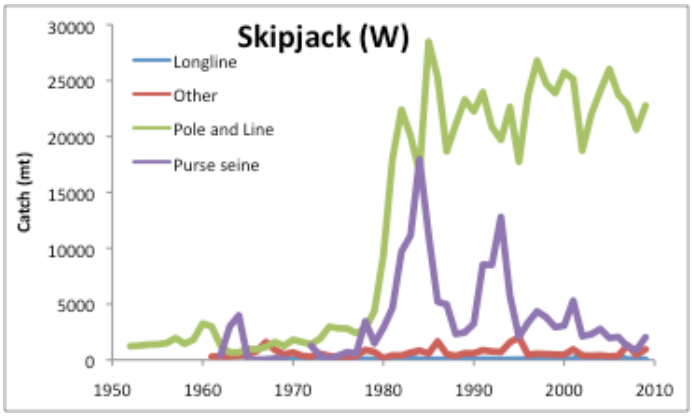


Figure IV.2.4.1. Catches of skipjack tuna in the western AO from 1950 to 2009, by gear type.

Stock assessment

The stock was assessed by SCRS in 2008, using data up to 2006. Different models were used, and the results were characterized by high uncertainty. The SCRS concluded that overfishing is not occurring and the stock is not overfished (**Figure IV.2.4.2**).

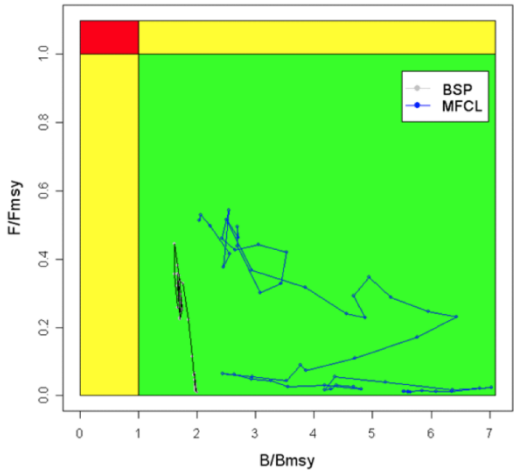


Figure IV.2.4.2. Temporal trend in the ratios Bcurrent/B_{MSY} (x-axis) and Fcurrent/F_{MSY} (y-axis) for skipjack tuna in the western AO. The lines show the trends in the estimated biomass and fishing mortality

ratios over time, using different assessment models. Colors are taken from ICCAT reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

ICCAT has not adopted conservation and management measures for this stock.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	26	2009	
Five-year average catch (t)	26	2005-09	
MSY (t)	30-36	2006	
F/F_{MSY}	<1		
B/B_{MSY}	>1		
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for Western AO skipjack tuna		
Stock abundance	GREEN	B > B_{MSY}.
Fishing mortality	GREEN	F < F_{MSY}.
Environment (Bycatch)	YELLOW YELLOW	90% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. 5% of the catch is made by purse seining on floating objects (including FADs). Several bycatch mitigation measures are in place (turtles, sharks).

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO-West SKJ stock was rated Green then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

IV.2.5 Albacore in the North AO

There are three stocks of albacore tuna in the ICCAT Area: North Atlantic, South Atlantic and Mediterranean. Albacore catches in the North Atlantic in 2009 were about 15,400 tonnes, a 25% decrease from 2008. Catches are made by a variety of fishing gears including pole-and-line (35%), troll (29%), trawl (18%) and longline (17%) (**Figure IV.2.5.1**). Between 2006 and 2009, catches have declined by 38%.

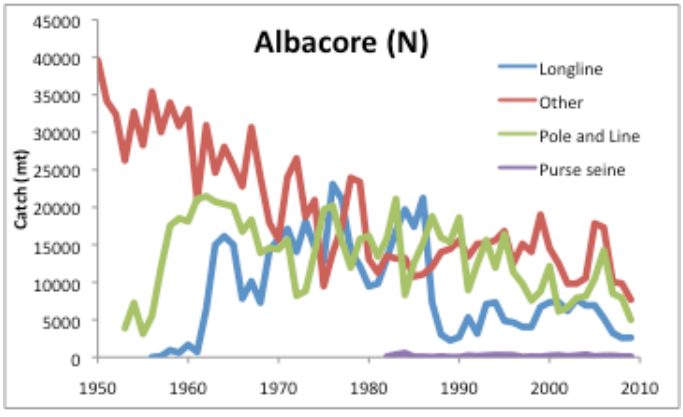


Figure IV.2.5.1. Catches of albacore tuna in the North Atlantic Ocean from 1950 to 2009, by gear type.

Stock assessment

The most recent assessment for the northern stock of albacore was conducted by SCRS in 2009 using data from 1930 to 2007. The analyses indicate that:

- The ratio of $F_{current}/F_{MSY}$ in 2007 is estimated at 1.05, indicating that **overfishing was occurring**. This ratio has been greater than 1.0 almost every year since 1955, indicating that overfishing has been going on for five decades. The catches have declined substantially below MSY since 2007, and it would be expected that F has decreased below F_{MSY} by now. However, this cannot be confirmed until a new assessment is conducted.

- The ratio of spawning biomass $B_{current}/B_{MSY}$ in 2007 estimated at 0.62. This indicates that that **the stock is in an overfished state**.

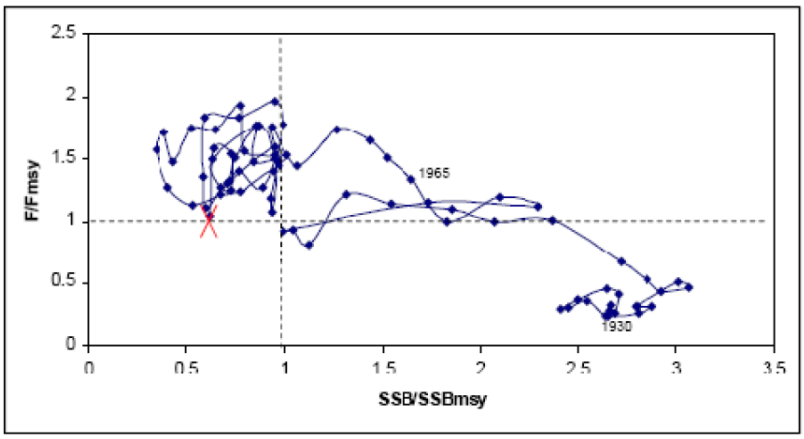


Figure IV.2.5.2. Temporal trend in the ratios Bcurrent/B_{MSY} (x-axis) and Fcurrent/F_{MSY} (y-axis) for albacore tuna in the northern AO. The line shows the trend in the estimated biomass and fishing mortality ratios over time, using different assessment models. The red X marks the 2007 ratio values. Colors are taken from ICCAT reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

ICCAT Recommendation 98-08 limits the number of vessels targeting northern Atlantic albacore in each member country to the average level of 1993-1995.

Recommendation 09-05 established a Total Allowable TAC of 28,000 tonnes for 2010-2011, following the advice of the SCRS. It should be noted that TACs in previous years were set higher than the recommended scientific advice.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	15	2009	
Five-year average catch (t)	26	2005-09	
MSY (t)	29	2007	
F/F_{MSY}	1.05	2007	Range: 0.85-1.23
B/B_{MSY}	0.62	2007	Range: 0.45-0.79
Catch at F_{MSY} (t)	N/A		

TAC (t)	28		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for North AO albacore tuna		
Stock abundance	ORANGE	B < B_{MSY}. Abundance increased between 2000 and 2005, but then decreased again. There is no clear evidence of a sustained increase in biomass.
Fishing mortality	YELLOW	F ≈ F_{MSY}. The 2007 ratio was slightly above 1.0. Since catches have been substantially below the MSY level since then, it is expected that F has fallen below F_{MSY}. However, this should be confirmed through the next assessment. There is a TAC to reduce fishing mortality that has been set following scientific advice to rebuild the stock.
Environment (Bycatch)	YELLOW GREEN ORANGE ORANGE	35% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks. 29% of the catch is made with trolling, with little impact on non-target species 18% of the catch is made with pelagic trawling, with some impact on non-target species. Monitoring of bycatch is poor. 17% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles). Monitoring is deficient.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO-North ALB stock was rated Orange then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

IV.2.6 Albacore in the South AO

There are three stocks of albacore tuna in the ICCAT Area: North Atlantic, South Atlantic and Mediterranean. Albacore catches in the South Atlantic in 2009 were about 22,800 tonnes, a 21% increase from 2008. Catches are made primarily by longline (56%) and pole-and-line (43%) (**Figure IV.2.6.1**).

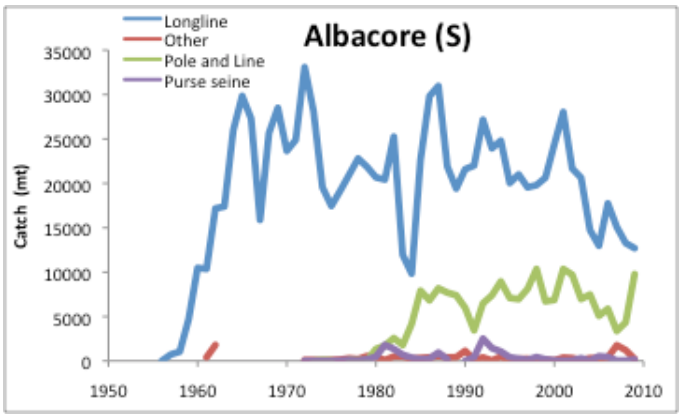


Figure IV.2.6.1. Catches of albacore tuna in the south Atlantic Ocean from 1950 to 2009, by gear type.

Stock assessment

The most recent assessment for the southern stock of albacore was conducted by SCRS in 2007 using data from 1970 to 2005. A new assessment is planned for 2011. The 2007 analyses indicate that (**Figure IV.2.6.2**):

- The ratio of $F_{current}/F_{MSY}$ in 2005 is estimated at 0.63, indicating that **overfishing was not occurring**. Since then, catches have remained below the MSY level, and therefore F would be expected to have remained below F_{MSY}. However, this cannot be confirmed until a new assessment is conducted.

- The ratio of spawning biomass $B_{current}/B_{MSY}$ in 2005 estimated at 0.91. This indicates that that **the stock was in an overfished state**. The SCRS projected that spawning biomass would increase after 2005 if the catch was kept at 25,000 tonnes. The actual annual catches in the period 2006-2009 have been below that level, so the stock is expected to have increased. However, this cannot be confirmed until a new assessment is conducted.

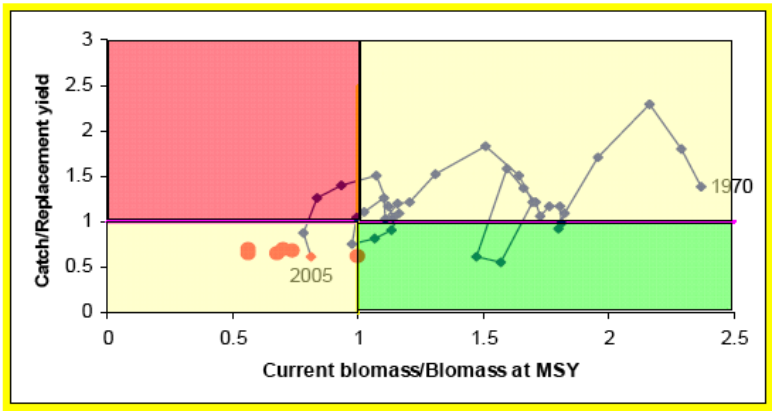


Figure IV.2.6.2. Temporal trend in the ratios Bcurrent/B_{MSY} (x-axis) and Fcurrent/F_{MSY} (y-axis) for albacore tuna in the southern AO. The line shows the trend in the estimated biomass and fishing mortality ratios over time, using different assessment models. The circles are the current state of the stock for all the sensitivity runs. Colors are taken from ICCAT reports and do not necessarily correspond to the colors used for ratings in the ISSF Stock Status Report.

Management measures

ICCAT Recommendation 07-03 established a catch limit of 29,900 tonnes in 2008-2011 for South Atlantic albacore, following the advice of the SCRS. This limit is expected to be reviewed in 2011 after the stock assessment.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	23	2009	
Five-year average catch (t)	21	2005-09	
MSY (t)	33	2005	
F/F_{MSY}	0.63	2007	Range: 0.47-0.90
B/B_{MSY}	0.91	2007	Range: 0.71-1.16. Expected to be increasing
Catch at F_{MSY} (t)	N/A		
TAC (t)	30		

NOTES: Catches and MSY are in thousand tonnes.

Ratings for South AO albacore tuna		
Stock abundance	YELLOW	B < B_{MSY}. The ratio in 2005 was slightly below 1. Given the catches that occurred in 2006-2009, the stock is expected to have increased. However, this needs to be confirmed by the 2011 assessment.

Fishing mortality	GREEN	F < F_{MSY}. Management measures are in place to limit F.
Environment (Bycatch)	ORANGE	56% of the catch is made by longlining. Several mitigation measures are in place (sharks, turtles, sea birds). Monitoring is deficient.
	YELLOW	43% of the catch is made by pole-and-line fishing, with unknown impacts on baitfish stocks.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO-South ALB stock was rated Yellow then): There has been no change in the ratings of B and F since then, other than separating F and B factors.

IV.2.7 Albacore in the Mediterranean

There are three stocks of albacore tuna in the ICCAT Area: North Atlantic, South Atlantic and Mediterranean. Albacore catches in the Mediterranean in 2009 were about 4,000 tonnes, a 35% increase from 2008. Catches are made primarily by longline (79%) and the remainder by other surface gears (**Figure IV.2.7.1**).

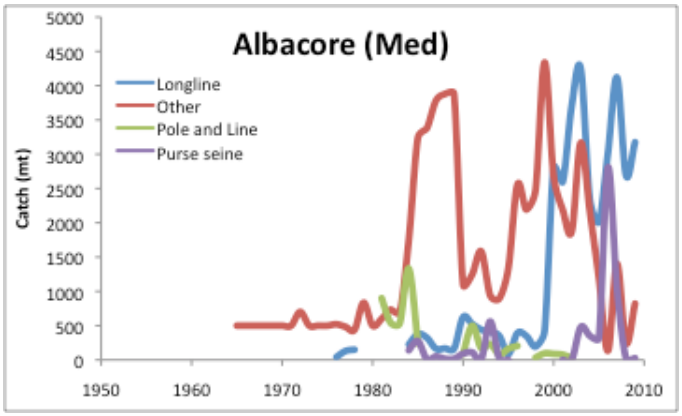


Figure IV.2.7.1. Catches of albacore tuna in the Mediterranean Sea from 1950 to 2009, by gear type.

Stock assessment

The Mediterranean albacore stock has never been assessed, so its status is unknown. The SCRS noted that there are major deficiencies with the data reported to ICCAT. Nevertheless, a stock assessment is planned in 2011.

Management measures

There are no conservation and management measures for Mediterranean albacore.

Summary

QUANTITY	ESTIMATE	YEARS	Notes
Most recent catch (t)	4	2009	
Five-year average catch (t)	5	2005-09	
MSY (t)	N/A		
F/F_{MSY}	N/A		
B/B_{MSY}	N/A		
Catch at F_{MSY} (t)	N/A		
TAC (t)	None		

NOTES: Catches are in thousand tonnes.

Ratings for Mediterranean albacore tuna		
Stock abundance	ORANGE	Unknown. Monitoring of basic fishery statistics is extremely poor and has made it difficult to assess the stock.
Fishing mortality	ORANGE	Unknown. Monitoring of basic fishery statistics is extremely poor and has made it difficult to assess the stock. No management measures are in place.
Environment (Bycatch)	ORANGE ORANGE	90% of the catch is officially reported as made by longlining. Several mitigation measures are in place (sharks, turtles). Monitoring is very deficient. 10% of the catch is made by other surface gears, including gillnets. Monitoring is very deficient.

Note of changes with respect to the April 2010 ISSF Stock Status Report (the AO-Med ALB stock was rated as Unknown then): In the 2011 report, the default rating for F and B should be Yellow due to the lack of an assessment. ISSF has chosen to rate it instead as Orange to be precautionary, owing to the data deficiencies for the stock.

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APPENDIX 1. SUMMARY OF IMPACTS BY MAIN GEAR TYPES ON NON-TARGET SPECIES

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

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

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

Gillnet fishing. ORANGE

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

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

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

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

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

Handlines. GREEN

This mode of fishing typically results in small bycatch rates.

Longlining. ORANGE

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

shark), and others which are likely to be more vulnerable because of their low reproductive rates (e.g., porbeagle and thresher sharks).
Sea Turtles. Some turtles are also caught in longline operations as bycatch, many of which are discarded (including live releases). All RFMOs have some type of mitigation measure in place. Roughly one half, or more, of the turtles caught are alive, so the main mitigation measures aim to dehook them and release them alive.
Sea birds. Some sea birds are also caught in longline operations as bycatch, especially in higher latitudes. Most (~90%) sea birds caught are dead when brought onboard, so the best practice for mitigation is to avoid their being hooked, which is the main type of mitigation measure used by the RFMOs. Of particular concern are albatrosses and petrels.
Other finfish. After tunas and sharks, longline operations catch a number of other finfishes. Some of these include very productive species such as dolphinfish ("mahi-mahi") that are not of immediate concern. Longlining also catches marlins, some of which are estimated to be overfished.

Mid-water trawling. ORANGE

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

Pole-and-line fishing. YELLOW

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

Purse seining on free schools: GREEN

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

Purse seining on FADs: YELLOW

Purse seining on FADs (anchored FADs, drifting FADs and natural logs) generally has bycatch rates of non-target species that are higher than those of free school sets.
Sea Turtles. The number of turtles that die in purse seine fishing operations is very small. Nevertheless, it is relatively easy to release turtles when caught alive and this is the main mitigation measures used by RFMOs.
Sharks. FAD purse seine fishing operations catch several species of sharks, some of which, based on catch trends, may have been declining in abundance in recent years, such as oceanic white tip and silky sharks.
Sea birds. Mortality of other sensitive species like seabirds in FAD operations is almost nonexistent.
Other finfish. FAD fishing does result in large catches of other finfish such as dolphinfish ("mahi-mahi"). Currently, it appears that these catches do not

adversely impact the abundance of these species which are very productive and resilient to fishing. Rather, the main problem with these bycatches is one of utilization (waste), since the majority of these are discarded at sea so that the fish holding tanks can be reserved for the more valuable tunas.

Purse seining on tuna-dolphin associations. GREEN

Marine mammals. In the EPO, purse-seine fishermen have learned to take advantage of the association between yellowfin schools and herds of dolphins that is prevalent in the region. Fishermen maximize their catches of yellowfin by setting their nets around these associations. Mortality of dolphins was very high early on, but the IATTC estimates that it has since the late 1980s declined by 98% after fishermen and scientists developed techniques for releasing the dolphins alive after a set, and retaining the tunas. Some scientists believe that there is an un-quantified level of mortality after the sets, caused by stress, and this remains a controversial issue. However, based on fishery-independent surveys, the abundance of most dolphin populations in the region is estimated to be either stable or increasing, while a few may be declining. The Agreement on the International Dolphin Conservation Program (AIDCP) establishes allowable dolphin mortality limits; current (2009) levels are one-fourth of that level. There is a 100%-coverage observer program in place for these operations. Catches of non-target species in these operations are very small.

Trolling. GREEN

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

RFMO-SPECIFIC BYCATCH MONITORING AND MITIGATION MEASURES

IATTC

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

Sea Turtles. Resolution C-07-03 requires fishermen to release sea turtles entangled in FADs or caught in longlines and to avoid encircling them with purse seine nets. The resolution also calls for research to mitigate sea turtle bycatch, especially with gear modifications.

Sharks. Resolution C-05-03 discourages shark retention and establishes a limit in the amount of shark fins that can be landed, relative to the total weight of shark bodies that must be retained. This ratio of fin-to-body-weight acts as a disincentive to target sharks because the shark carcasses occupy hold space on the vessel and have little market value. The Resolution also mandates reporting of shark catches to IATTC. Resolution C-11-10 prohibits the retention of oceanic whitetip sharks and requires the release of specimens that are alive when caught.

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

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

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

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

WCPFC

Sea Turtles. CMM 2008-03 instructs WCPFC members to implement the FAO (2009) guidelines for reducing sea turtle mortality, and requires longline operators to use line cutters and de-hookers to handle and promptly release sea turtles caught or entangled. The measure also requires purse seine operators to avoid setting on turtles if possible and to disentangle/release them when caught alive.

Sharks. CMM-2009-04 requires reporting of shark catches and discards by gear type and species. The measure also established a limit on the ratio of shark fins to total shark weight that can be retained onboard fishing vessels, and encourages the release of live sharks. WCPFC has initiated a research plan aimed at improving statistics and observer coverage on sharks and conducting assessments for key shark species (Clarke and Harley, 2010).

Sea birds. CMM 2007-04 requires longliners operating south of 30°S or north of 23°N to use at least two of several imitigation measures such as weighted branch lines or tori (bird-scaring) lines. The measure also encourages mitigation research to be conducted by WCPFC members.

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

Monitoring and mitigation research. With the exception of sharks under CMM 2009-04, reporting of bycatch species is not mandatory at WCPFC, so much of the information available comes from observer programs. The WCPFC has a Regional Observer Program that, since 2010, is intended to have 100% coverage on purse seine vessels that fish on the high seas or between two or more EEZs. As these

data become available and are analyzed by the Scientific Committee, monitoring should improve. National observer programs are also run by WCPFC members, but it is not clear that all of the bycatch information collected in those programs is made available to the SC for integrated analyses. For longline fisheries, observer coverage is poor overall. Much of the information available is from bilateral EEZ access agreements in Pacific Island countries. Observer coverage for distant-water fleets is extremely low.

IOTC

Sharks: The IOTC has adopted measures that address shark conservation concerns. Resolution 05/05 established a limit on the ratio of fin weight to total shark weight that can be retained onboard a fishing vessel, and encouraged the release of live sharks in fisheries that do not target sharks. Resolution 10/12 prohibits the retention on board of all species of thresher sharks, a group that is thought to be particularly vulnerable due to its low productivity. In addition, Resolution 10/12 requires data reporting to IOTC, especially for fisheries targeting sharks.

Sea Turtles. Resolution 09/06 requires IOTC members to mitigate sea turtle mortality and to provide data on turtle bycatch to the SC. The measure has specific requirements for longline and purse seine operators to facilitate the appropriate handling and release of live turtles.

Sea birds. Resolution 10/06 (which supersedes various prior measures) requires longliners operating south of 25°S to use at least two of several imitigation measures such as weighted branch lines or tori (bird-scaring) lines. The measure also requires IOTC members to provide data on interactions between fisheries and sea birds to the SC.

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

ICCAT

Sharks: Recommendations 04-10, 05-05 and 06-10 established a limit on the ratio of fin weight to total shark weight that can be retained onboard a fishing vessel, and encouraged the release of live sharks in fisheries that do not target sharks. Recommendation 07-06 limits mortality on porbeagle and North Atlantic shortfin mako. Recommendations 09-07, 10-07 and 10-08 prohibit the retention on board of bigeye thresher, oceanic white tip and several species of hammerhead sharks. All of these measures have a reporting requirement associated with them; Recommendation 10-06 prohibits the retention of shortfin mako onboard vessels flagged to countries that do not report catches for this species.

Sea Turtles. Recommendation 10-09 set up reporting requirements for sea turtle interactions and mandates its scientific committee to assess, by 2013, the impact of tuna fisheries on sea turtle populations. The measure has specific

requirements for longline operators to be trained on appropriate handling and release of live turtles so as to maximize their survival.

Sea birds. Recommendation 07-07 requires longliners operating south of 20°S to use at least two of several mitigation measures such as weighted branch lines or tori (bird-scaring) lines. The measure also requires ICCAT members to collect and report data on interactions between fisheries and sea birds.

Other finfish. Longliners also take Atlantic blue and white marlin as bycatch, both of which are thought to be overfished. ICCAT adopted Recommendation 06-09 (extended through 2011 by Recommendation 10-05), a rebuilding plan that limits the amount of marlins that longliners can catch and land. The SCRS has noted that the stocks can potentially rebuild under this plan, but verification is needed through a new assessment.

Monitoring and mitigation research. ICCAT has specific requirements for reporting data on sharks, sea turtles and sea birds. For the most part these are not complied with fully, but the situation is improving over time. Recommendation 10-10 requires members to have at least 5% observer coverage (for vessels over 15 m) in their national observer programs for longline, purse seine and pole-and-line fisheries.