Executive Summary Of The Status Of The Albacore Tuna Resource

(from IOTC-2004-SC-R [EN])

BIOLOGY

Albacore (*Thunnus alalunga*) is a temperate tuna living mainly in the mid oceanic gyres of the Pacific, Indian and Atlantic oceans. Indian Ocean albacore is distributed from 5°N to 40°S. In the Pacific and Atlantic oceans there is a clear separation of southern and northern stocks associated with the oceanic gyres that are typical of these areas. In the Indian Ocean, there is probably only one southern stock because there is no northern gyre.

Albacore is highly migratory species and individuals swim large distances during their lifetime. To do this albacore is capable of thermoregulation, has a high metabolic rate, and advanced cardiovascular and blood/gas exchange systems. Pre-adults (2-5 year old albacore) appear to be more migratory than adults. In the Pacific Ocean, the migration, distribution availability, and vulnerability of albacore are strongly influenced by oceanographic conditions, especially oceanic fronts. It has been observed on all albacore stocks that juvenile are concentrated in cold temperate areas (for instance in a range of sea-surface temperatures between 15 and 18°C), and this has been confirmed in the Indian Ocean where albacore tuna are more abundant north of the subtropical convergence (an area where these juvenile have been heavily fished by driftnet fisheries during the late eighties (Figure 2). It appears that juvenile albacore show a continuous geographical distribution in the Atlantic and Indian oceans in the north edge of the subtropical convergence. Albacore may move across the jurisdictional boundary between ICCAT and IOTC.

The maximum age reported for Indian Ocean albacore is 8 years. However, this may be an underestimate as albacore have been reported live to at least 10 years in the Pacific Ocean.

Little is known about the reproductive biology of albacore in the Indian Ocean but it appears, based on biological studies and on fishery data, that the main spawning grounds are located east of Madagascar between 15° and 25°S during the 4th and 1st quarters of each year (Figure 1). In the Pacific Ocean, albacore grow relatively slowly (compared to skipjack and yellowfin) and become sexually mature at about 5-6 years old. Like other tunas, adult albacore spawn in warm waters (SST>25°C). It is likely that the adult Indian Ocean albacore tunas do yearly circular counter-clockwise migrations following the surface currents of the south Tropical gyre between their tropical spawning and southern feeding zones. In the Atlantic Ocean, large numbers of juvenile albacore are caught by the South African pole-and-line fishery (catching about 10.000 t yearly) and it has been hypothesized that these juveniles may be taken from a mixture of fish born in the Atlantic (north east of Brazil) and from the Indian Ocean.

Overall, the biology of albacore stock in the Indian Ocean is not well known and there is relatively little new information on albacore stocks.

FISHERIES

Albacore are caught almost exclusively under drifting longlines (98%), and between 20° and 40°S (Table 1, Figure 1), with remaining catches recorded under purse seines and other gears (Table 1).

A fleet using drifting gillnets targeting juvenile albacore operated in the southern Indian Ocean (30° to 40° South) between 1985 and 1992 harvesting important amounts of this species. This fleet, from Taiwan,China, had to stop fishing in 1992 due to a worldwide ban on the use of drifting gillnets. Albacore is currently both a target species and a bycatch of industrial longline fisheries and a bycatch of other fisheries.

The catches of albacore increased rapidly during the first years of the fishery, remaining relatively stable until the mid-1980s, except for some very high catches recorded in 1973, 1974 and 1982. The catches increased markedly during the 1990's due to the use of drifting gillnets, with total catches reaching around 30,000 t. Catches have steadily increased since 1993, after the drop recorded in 1992 and 1993 as a consequence of the end of the drifting gillnet fishery. Catches from 1999 to 2003 averaged 35,000 t. The total catch in 2003 was relatively low at 24,000 t.

Longliners from Japan and Taiwan,China have been operating in the Indian Ocean since the early 1950s and they have been the major fishers for albacore since then (Table 1). While the Japanese albacore catch ranged from 8,000 t to 18,000 t in the period 1959 to 1969, in 1972 catches rapidly decreased to around 1,000 t due to changing the target species mainly to southern bluefin and bigeye tuna, then ranged between 200 t to 2,500 t as albacore became

a bycatch fishery. In recent years the Japanese albacore catch has been around 2,000 to 3,000 t. By contrast, catches by Taiwanese longliners have increase steadily since the 1950's, averaging around 10,000 t by the mid-1970s'. Since 1998 catches have been around 20,000 t, equating to just over 60 % of the total Indian Ocean albacore catch.

The catches of albacore by longliners from the Republic of Korea, recorded since 1965, have never been above 10,000 t. Other fleets for which important catches of albacore have been recorded in recent years are a fleet of fresh-tuna longliners operating in Indonesia, with catches recorded around 3,000 t, and a fleet of deep-freezing longliners operating under flags of non-reporting countries (NEI-Deep freezing), with current catches of albacore between 5,000 t and 10,000 t (Figure 3).

Large sizes of albacore are also taken seasonally in certain areas (Figure 5), most often in free-swimming schools, by the purse seine fishery, as bycatch of the tropical tunas targeted by this fishery (catching an average 1600 t of albacore yearly during the period 1990-2002).

A unique feature of Indian Ocean albacore fisheries is that this is the only ocean where juvenile fish are infrequently targeted by fisheries (few small albacore being caught by longliners), when in all other oceans (South and North Atlantic, and Pacific) various surface fisheries have been actively targeting these small fish and sometimes producing the majority of albacore catches. This observation would not be valid if in fact, the small fishes taken off the west coast of South Africa are biologically from the Indian Ocean.

AVAILABILITY OF INFORMATION FOR STOCK ASSESSMENT

Nominal Catch (NC) Data

The catches of albacore recorded in the IOTC databases are thought to be complete, at least until the mid-1980s. The fleets for which the majority of the catches of albacore are recorded have always reported good catch statistics to the IOTC. The catches of albacore recorded for Illegal and/or Unregulated and/or Unreported (IUU) fleets (recorded mostly as NEI- in the IOTC Database), which have been operating in the Indian Ocean since the early 1980s, have always been estimated by the Secretariat.

Catch-and-Effort (CE) Data

Catch and effort data are fully or almost fully available up to the early 1990s but only partially available since then, due to the almost complete lack of catch and effort records from IUU and the Indonesian longline fleet.

The effort statistics are thought good quality for most of the fleets for which long catches series are available, with the exception of Taiwan,China (1990-92) and the whole series for the Republic of Korea and Philippines. The use of data for these countries is, therefore, not recommended.

Size Frequency Data

In general, the amount of catch for which size data for the species are available has been very low and the amount of specimens measured per stratum are considered to be insufficient. The quality of this dataset is, therefore, thought poor.

For longline fisheries size frequency data is only available since 1964. Japan is the only country that has been reporting size-frequency data on a regular basis. Nevertheless, in recent years, the number of specimens measured is very low in relation to the total catch and has been decreasing year by year. The size-frequency statistics available from the two other main longline fleets are either very incomplete (Taiwan,China for which only four years are available) or inaccurate (Republic of Korea), which invalidates their use.

The recovery of size data from port sampling regarding fresh tuna longline fleets landing in Phuket, Penang, Sri Lanka and, recently Indonesia, continued in 2002 and 2003, with many specimens of albacore measured. It was also noticed that large amounts of albacore landed in Mauritius by deep-freezing longliners have been also sampled by Mauritian scientists.

Albacore caught in the Indian Ocean are mainly taken at large sizes, in contrast to other oceans, where substantial quantities of juvenile albacore are also taken. Therefore, it could be expected that yield per recruit would be better in the Indian Ocean than in other oceans

Data related issues for albacore

- Lack of size-frequency data from the Republic of Korea and Philippines, Taiwan,China since 1989 and low sample sizes for the Japanese longline fleet.
- Poor knowledge of the catches, effort and size-frequency from fresh tuna longline vessels, especially from Taiwan,China and several non-reporting fleets.
- Poor knowledge of the catches, effort and size-frequency from non-reporting fleets of deep-freezing tuna longliners, especially since the mid-eighties.
- Lack of accurate catch, effort and size-frequency data for the Indonesian longline fishery, except in the most recent years.
- Poor knowledge of the catches, effort and size-frequency data for non-reporting purse seiners.

STOCK ASSESSMENT

The WPTMT conducted a series of analyses based on fitting a production model to various combinations of catch-and-effort data (from Japanese and Taiwanese longline fisheries, and the Taiwanese gillnet fishery). The results of one of the analyses suggested that the stock could be below the level that would produce MSY and that the current fishing mortality is above that required to achieve the MSY, while the remainder failed to produce plausible parameter estimates. In all analyses, there was a discrepancy between the observed and predicted CPUE trends for the most recent years (Figure 5) and the model could not explain appropriately the apparent lack of response in the CPUE to the increase in the catch. Several explanations have been proposed, including a possible increase in productivity of the albacore stock due to a change in environmental conditions, or the inability of the CPUE series to adequately reflect changes in the population abundance. Regarding the first hypothesis, the size frequency data does not offer any evidence supporting the hypothesis of recent increased recruitments.

MANAGEMENT ADVICE

A stock assessment for Indian Ocean albacore (*Thunnus alalunga*) was attempted in 2004 by the Working Party on Temperate Tunas. Results of the analyses conducted were considered unreliable, although one of the results suggested that current catch levels might not be sustainable. Other indicators, such as the average size in the catch and catch rates , have not shown declines in recent years.

Taking into account the absence of a reliable assessment of the status of albacore tuna and the need for a precautionary approach, the SC recommended that the Commission be very cautious in allowing increases in catch or fishing effort until the problems with the assessments have been resolved.

ALBACORE TUNA SUMMARY

Maximum Sustainable Yield :	unknown
Current (2003) Catch:	24,000 t
Mean catch over the last 5 years	35,000 t
Current Replacement Yield	-
Relative Biomass (B_{curr}/B_{MSY})	unknown
Relative Fishing Mortality (F_{curr}/F_{MSY})	unknown
Management Measures in Effect	none

Table 1. Catches of albacore tuna by gear and main fleets for the period 1950-2003 (in thousands of tonnes). Data as of 20 November 2004.

Gear	Fleet	Av99/03	Av54/03	54	55	1956	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Longline	China																											
	Taiwan,China	20.3	9.7	0.1	0.3	0.5	0.7	1.0	1.2	1.1	1.4	1.3	1.6	1.5	1.1	1.7	1.6	7.6	7.7	7.2	7.0	7.0	12.0	17.4	6.4	9.7	9.8	12.8
	Japan	2.7	4.6	2.7	3.1	5.1	4.7	6.3	10.4	11.1	15.2	17.6	12.6	17.8	11.4	13.1	14.1	10.1	8.6	4.9	3.3	1.4	2.0	2.8	1.3	1.2	0.4	0.4
	Indonesia	2.5	0.5																					0.0	0.1	0.1	0.1	0.2
	Republic of Korea	0.1	1.3												0.5	0.6	6.2	0.9	4.4	1.7	2.5	3.9	9.1	9.8	3.9	4.2	2.2	4.6
	Other Fleets	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.9	0.2	0.7	0.6	0.5	0.4	0.2	0.1	0.0	0.1	0.1
	Total	34.1	18.0	2.8	3.3	5.6	5.3	7.3	11.6	12.1	16.6	19.0	14.2	19.4	13.2	15.6	22.0	19.4	20.9	14.5	13.4	12.8	23.5	30.3	11.7	15.3	12.5	18.2
Line	Total	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All	Total	35.3	20.3	2.8	3.3	5.6	5.3	7.3	11.6	12.1	16.6	19.0	14.2	19.5	13.2	15.6	22.0	19.4	20.9	14.5	13.4	12.8	23.5	30.3	11.7	15.3	12.6	18.2

Gear	Fleet	Av99/03	Av54/03	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03
Purse seine	France	0.4	0.2						0.3	0.5	0.2	0.2	0.2	0.0	0.0	0.9	1.4	0.3	0.3	0.4	0.4	0.5	0.5	0.2	0.4	0.7	0.3	0.6
	Spain	0.3	0.2						0.2	0.1		0.0	0.1		0.1	1.1	1.5	0.9	1.8	0.6	0.8	1.0	0.3	0.2	0.4	0.3	0.2	0.5
	Other Fleets	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.1	0.5	0.4	0.4	0.5	0.8	0.2	0.4	0.3	0.3	0.3
	Total	1.0	0.5		0.0	0.0	0.0	0.0	0.6	0.7	0.2	0.2	0.3	0.0	0.3	2.2	3.3	1.3	2.6	1.3	1.6	2.0	1.6	0.6	1.2	1.3	0.8	1.4
Baitboat	Total	0.0	0.0				0.4	0.0	0.0	0.0		0.0		0.0			0.0	0.0	0.0	0.0	0.0		0.0					
Longline	China																											
	Taiwan,China	20.3	9.7	15.0	11.0	12.3	21.9	17.0	13.9	6.2	11.1	13.1	11.0	7.1	5.8	13.1	11.1	12.0	14.4	14.2	16.9	15.2	21.6	22.5	21.7	26.1	20.3	11.1
	NEI-Deep-freezing	6.7	1.5							0.0	0.7	0.7	1.7	1.0	1.2	2.5	1.8	3.2	4.1	4.1	7.0	4.6	10.0	10.9	8.8	6.1	3.9	3.9
	Japan	2.7	4.6	0.4	0.6	1.2	1.3	1.7	1.8	2.3	2.5	2.3	1.3	0.9	1.0	1.0	1.8	1.3	1.8	2.0	2.4	3.2	3.2	2.3	2.6	3.0	3.2	2.4
	Indonesia	2.5	0.5	0.3	0.2	0.2	0.2	0.2	0.3	0.3	0.1	0.3	0.3	0.4	0.4	0.3	0.5	0.4	0.6	0.7	1.3	1.6	1.5	1.7	2.7	2.9	2.6	2.6
	Seychelles	0.7	0.1																					0.0	0.4	0.8	1.1	1.2
	France-Reunion	0.4	0.1													0.0	0.0	0.1	0.1	0.1	0.3	0.2	0.3	0.3	0.5	0.6	0.3	0.3
	Republic of Korea	0.1	1.3	2.0	1.8	1.0	0.7	0.6	0.4	0.5	0.4	0.5	0.4	0.3	0.2	0.3	0.1	0.1	0.2	0.1	0.2	0.3	0.2	0.1	0.2	0.1	0.0	0.1
	Other Fleets	0.7	0.3	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.1	0.2	0.2	0.6	0.6	0.6	0.7	0.7	0.8	0.5	0.2	0.3	0.8	0.7	0.4	0.6	0.7	0.8
	Total	34.1	18.0	17.7	13.7	14.8	24.2	19.7	16.7	9.3	14.8	17.0	15.0	10.3	9.1	17.8	16.1	17.7	22.0	21.7	28.5	25.4	37.5	38.5	37.2	40.2	32.3	22.4
Gillnet	China																											
	Taiwan, China	0.0	1.8							0.7	15.2	12.2	14.4	14.4	21.1	9.0	1.3											
	Total	0.0	1.8							0.7	15.2	12.2	14.4	14.4	21.1	9.0	1.3											
Line	Total	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
All	Total	35.3	20.3	17.7	13.7	14.8	24.6	19.7	17.3	10.8	30.2	29.5	29.7	24.6	30.6	29.2	20.7	19.1	24.7	23.1	30.1	27.5	39.2	39.2	38.5	41.6	33.1	23.9

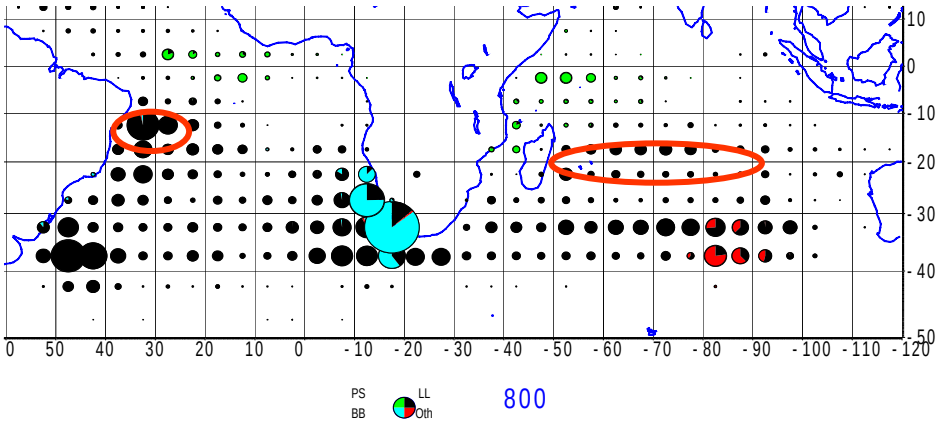


Figure 1. Average albacore catches by gear during the period 1985-2000; the two circles show the spawning zones in the Indian and Atlantic Oceans, this spawning occurring during the last and first quarters

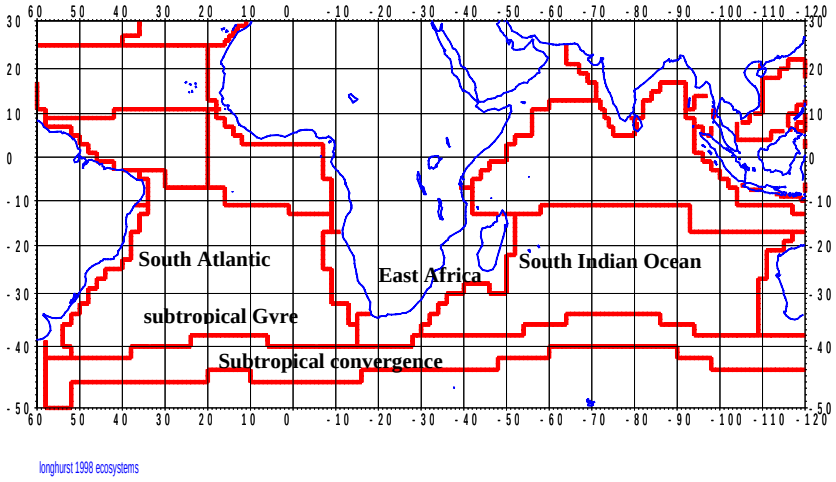


Figure 2. Ecological areas as proposed by Longhurst (1998)

Figure 3: Catches of albacore per fleet and year recorded in the IOTC Database (1963-2002)

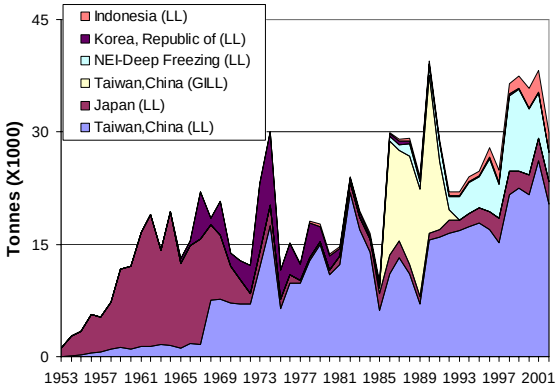
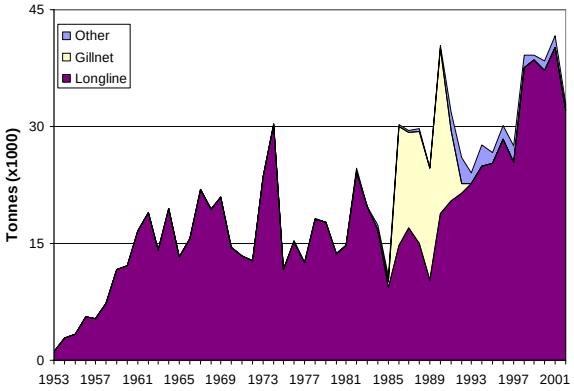


Figure 4: Catches of albacore per gear and year recorded in the IOTC Database (1963-2002)



Note that the catches series estimated during 2003 include catches assigned to each species after allocation of species aggregates to individual species by the Secretariat (2002 catches series only accounted for catches recorded under individual species in the IOTC database).

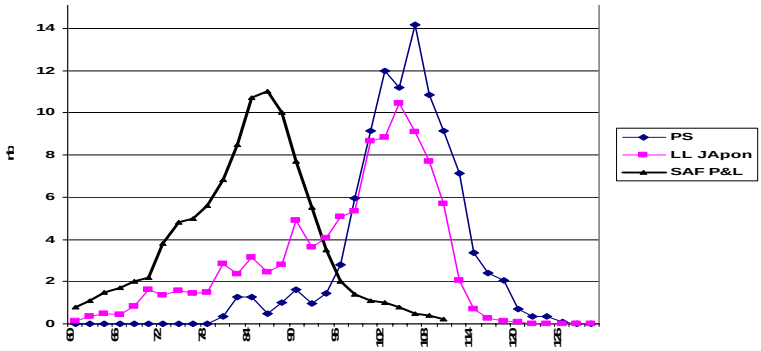


Figure 5. Average sizes of albacore taken by various fisheries in the Indian Ocean, longliners and purse seiners, and by the pole-and-line fishery in the west coast of South Africa (Atlantic Ocean).

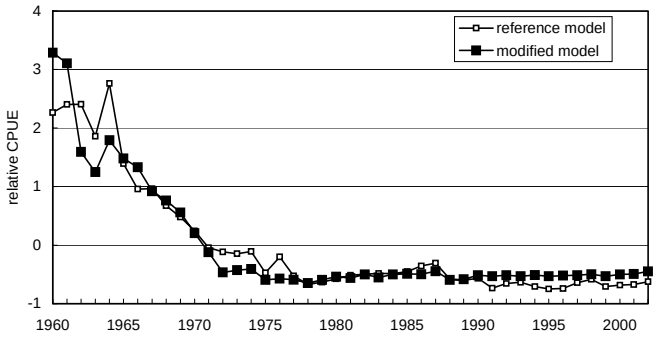


Figure 6. Standardized CPUEs for the reference and modified models. The CPUE for the modified model were calculated using only from Area 2 and Area 4 where albacore is generally abundant. Both CPUEs were adjusted with taking the difference to mean and dividing it by the standard deviation.