Received: 13 November, 2011

IOTC-2011-WPNT01-26

Status of frigate tuna (*Auxis thazard*) fishery in the Maldives

Mohamed Ahusan, M. Shiham Adam

Marine Research Centre, Malé, 20025, Republic of Maldives
PO Box 2074, Malé, Republic of Maldives

ABSTRACT

Maldivian tuna fishery exploits about 20% of the Indian Ocean catch with the majority of it comprising of skipjack and yellowfin. Neritic species such as frigate are caught as by-catch or incidentally in the pole and line skipjack fishery of the country. Nominal catch of frigate tuna has dropped to 2900 t in 2010 from 5200 t in 2009. However, a general increasing trend in nominal catch can be observed though there is a small decline in proportion of this species in the total tuna caught. The live-bait pole-and-line fishery landed 93% of the frigate. Effort (number of trips) and the number of mechanized vessels in the fishery are in decline, most probably due to low catches in recent years.

1. Introduction

The Maldivian pole-and-line tuna fishery comprises almost 20% of the tuna caught from the Indian Ocean. Albeit its significance, only two species (skipjack and yellowfin tuna) comprise the majority of the catch while two species of neritic tuna, frigate and kawakawa, are caught incidentally or as by-catch in the pole-and-line skipjack fishery. As a result, contribution of frigate tuna and kawakawa to the nominal catch of the country has remained minor and so has its economic importance. Fishermen who fished near the atolls ventured further away to new fishing grounds as a result of the mechanization of the fishing fleet during 1970s. This led to changes in amount composition of the Maldivian tuna catch where the proportion of oceanic species such as skipjack and yellowfin tuna increased drastically in contrast to neritic species. Introduction of Maldivian tuna to markets other than neighboring countries via canning and export of frozen fish further diminished the importance of frigate tuna for the Maldivian fishermen.

2. Data

Data used for this paper were collected and compiled by the Ministry of Fisheries and Agriculture (MoFA) for its statistical purposes. In addition, length data for estimation of average

weight and size was collected through fishermen field samplers as part of the ongoing Tuna Length Sampling Programme at the Marine Research Centre (MRC). This program which began during the 1980s is still ongoing and has thirteen such samplers contracted at different islands of the country, covering the whole of Maldives.

3. Fishery Status

3.1 Catch trend

Nominal catch of frigate tuna (FRI) fluctuated over the years though a general increasing trend can be observed (figure 1). This increase has been significantly slow compared to SKJ and YFT (figure 2). The growth, most probably, is due to the increased effort with the introduction of larger vessels and more fishermen.

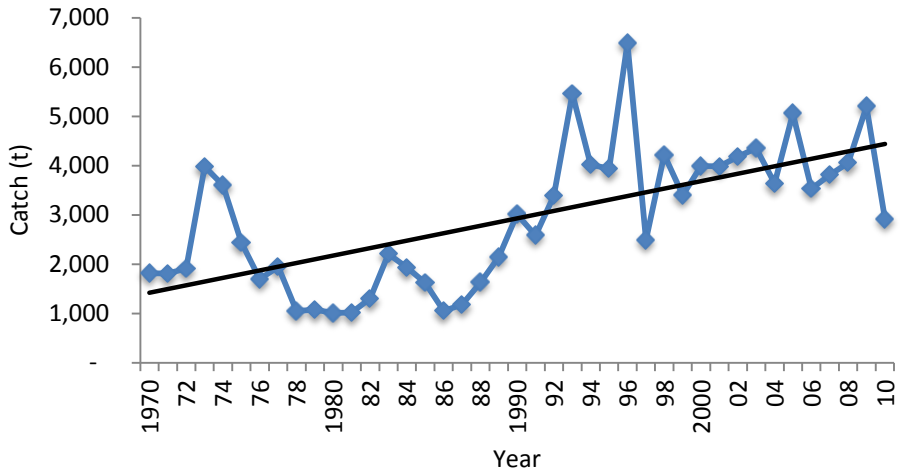

Figure 1. Trend in nominal catch (t) of FRI from 1970 to 2010 as reported by MoFA.

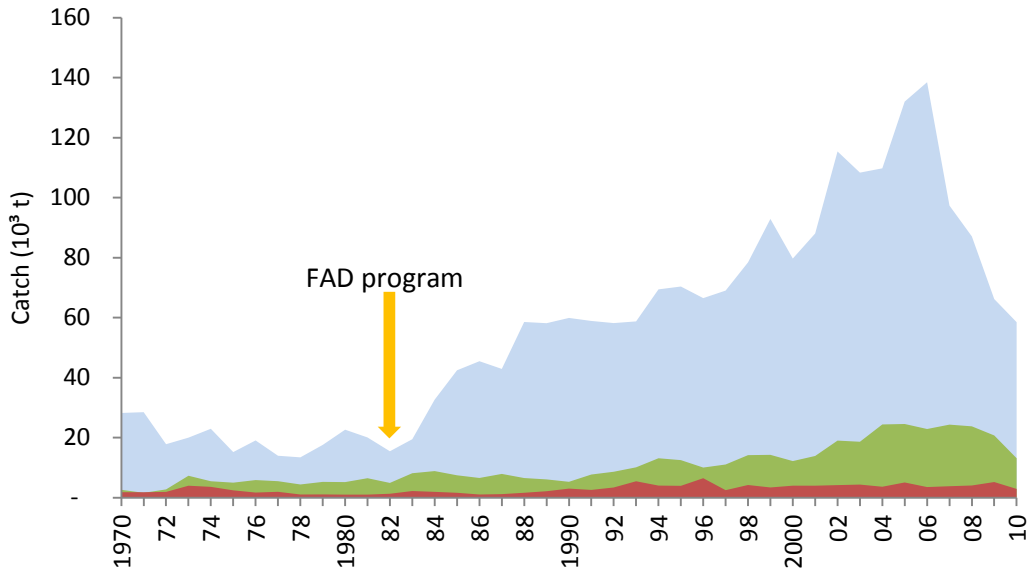

Figure 2. Trends in nominal catches (t) of SKJ (blue), YFT (green) and FRI (maroon) from 1970 to 2010. The arrow marks the commencement of the national FAD programme.

FRI caught in 2010 amounted to 2900 t, a sharp decline from the 5200 t caught in 2009 and comparable to that caught in 1997 (table 1). Exceptionally high (e.g. 2009) as well as low (e.g. 2010) catches could be related to oceanographic conditions where the environment becomes favorable or unfavorable for tuna catch. Previous literature (Anderson, 1987 & 1993; Hafiz and Anderson, 1994 in Anderson et. al. unknown year) has associated high CPUEs of FRI in Maldives to El Niño phenomenon.

Table 1. Nominal catch of the four major tuna species caught in the Maldives, 1995-2010.

Year	SKJ	YFT	KAW	FRI
1995	70,372.00	12,504.00	2,694.00	3,938.00
1996	66,502.00	12,440.00	3,789.00	6,485.00
1997	69,015.28	18,618.78	2,088.52	2,488.34
1998	78,409.43	17,164.32	3,624.30	4,217.39
1999	92,887.82	15,078.90	1,692.07	3,401.69
2000	79,682.55	15,705.86	1,897.53	3,990.15
2001	88,044.12	15,246.67	2,148.71	3,981.82
2002	115,321.77	24,525.27	2,242.01	4,187.50

2003	108,328.96	22,914.13	2,405.66	4,356.17
2004	109,749.26	24,818.10	2,289.57	3,638.62
2005	131,998.25	24,570.92	2,702.75	5,056.36
2006	138,458.35	22,953.54	1,673.84	3,532.19
2007	97,341.79	24,414.84	2,791.12	3,809.64
2008	87,072.15	23,768.77	2,074.83	4,053.49
2009	66,188.62	20,733.01	3,042.13	5,201.20
2010	58,481.39	13,137.16	2,819.48	2,909.40

Despite the growth of nominal catch, contribution of FRI to the total tuna caught has not been amplified. For the period 1970-1997, frigate tuna contributed an average of nearly 7% of the total annual tuna landings, with a record contribution of 20% in 1973. From 1986 to 1997, less than 5% was contributed by this species, as reported by Anderson et al. This proportion remains comparable to this day with 4 and 5% in 2010 and 2009 respectively.

Frigate tuna has been a secondary species for most of the country's tuna fishermen, one reason being the low market value compared to skipjack (SKJ) and yellowfin tuna (YFT). Available data shows that most of the frigate tuna in the Maldives is caught in the north of the country and declines towards the equator. Reasons for this observation could be many including (1) Small sized vessels in the north that mostly does FAD fishing compared to the modern vessels in the south, (2) availability of markets namely small scale processors that require low value species of tuna such as frigate and kawakawa, (3) high abundance/catchability of neritic species in the north than in the south of the country.

3.2 Fleet and gear

Majority of the FRI caught in the Maldives is taken by the live-bait pole-and-line gear (table 2). In 2010, this gear landed 93% of the total FRI caught, followed by trolling with 6%. It is believed that the dominance of PL gear has not been challenged throughout the fishing history of the country.

Proportion of FRI caught by long-line (LL) has remained well below 1% with the highest (0.6%) in 1996, which also recorded the highest FRI catch of the country by all gear types (~6400 t).

The record catch in 1996 could have been due to an increased abundance or catchability of this species in the waters around Maldives. Long-line vessels catch a limited amount of this species, most probably due to the areas of operation of this fleet in the country (i.e. outside of 75 m).

The use of fixed gill net in the Maldives is not common as indicated by the low catch from this gear (~140 t for all types of fish in 2010), which is ~0.002% of all fish caught by all the fisheries in 2010. Kawakawa caught by this gear amounts to only 0.85 t in 2010. The majority of fish caught by fixed gill net is those that inhabit the reef habitats. Less than one ton of FRI was caught by this gear in 2010 which is 0.6% of all fish caught by this gear.

Table 2. Reported catch of frigate tuna (t) by gear type in Maldives.

Year	Pole and line	Trolling	Long line	Hand line	Fixed gill net
1995	3,667.00	270.00	1.00	-	-
1996	6,073.00	351.00	40.00	19.00	1.00
1997	2301.147	176.743	4.814	1.724	3.907
1998	3,828.95	297.68	1.42	77.60	4.06
1999	3,117.06	252.04	0.05	29.49	2.82
2000	3,682.70	274.50	0.01	25.11	7.68
2001	3,672.87	269.08	0.82	24.58	13.41
2002	3,887.42	262.63	0.29	10.84	25.31
2003	4,131.76	160.04	-	32.00	31.00
2004	3,284.54	301.91	2.25	15.50	34.19
2005	4,541.12	248.60	1.27	140.76	55.43
2006	3,196.83	83.12	0.04	252.05	-
2007	3,510.85	102.52	1.43	187.78	-
2008	3,837.71	118.06	2.21	95.49	-
2009	4,739.51	160.15	0.04	294.10	6.19
2010	2,703.67	174.42	0.01	29.44	0.86

Source: MoFA

3.3 Fishing effort

The Maldivian tuna fishery is seeing a slow decline in fishing effort in terms of number of the number of fishing trips made (figure 3) by the mechanized fishing vessels. The year 2010

recorded the lowest effort so far (1995-2010). In 2010, 708 mechanized vessels were active in the fishery in 2010. The average number of active fishing vessels in Maldives is also steadily declining with the lowest number so far in 2010 (table 3). This decline in the number of vessels could be consequent to the cumulative effect of decline in tuna catch, decrease in bait availability and the rise in fuel prices over the recent years.

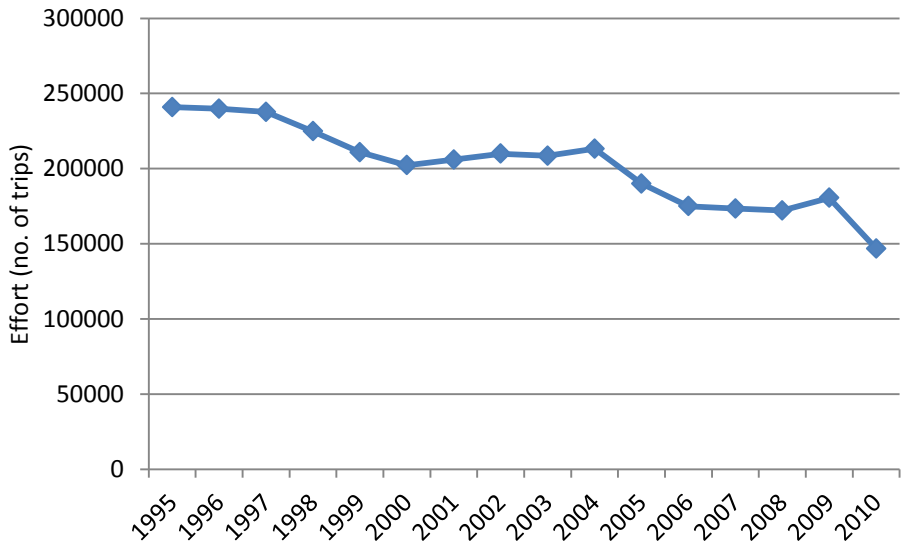

Figure 3. Fishing effort (number of trips) for mechanized vessels, 1995-2010.

Table 3. Average number of vessels engaged in fishery for the period 2002-2010.

Year	Mechanized Fishing Vessel	Sailing fishing vessel	Mechanized trolling vessel	Sailing trolling vessel
1995	1994	183	282	1862
1996	1971	179	309	1994
1997	1927	171	341	1906
1998	1960	174	390	1823
1999	2000	158	366	1776
2000	2009	140	433	1613
2001	1929	135	437	1424
2002	1687	111	367	1168
2003	1721	115	372	1090
2004	1577	107	365	926
2005	1454	108	331	749
2006	1375	111	351	729

2007	1296	113	340	661
2008	1252	112	356	635
2009	1303	25	366	573
2010	967	16	300	412

3.4 Catch per unit effort (CPUE)

Catch per unit effort (CPUE) for the mechanized fishing vessels is somewhat increasing with the exception of some years (figure 3). However, CPUE for 2010 is the lowest in 2010 (19kg/trip) since 2004 which recorded about 17 kg/trip. The years 1996, 2005 and 2009 recorded exceptionally high CPUEs possibly due to environmental factors, as these years did not record anomalous effort (number of trips).

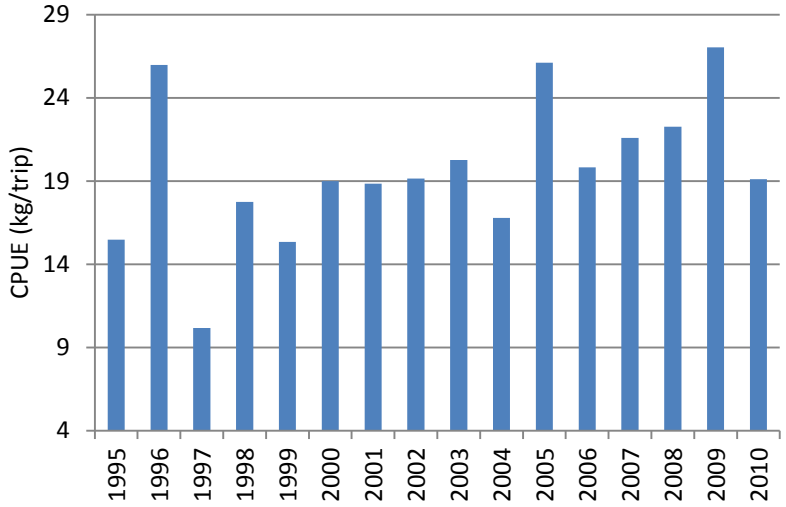

Figure 4. CPUE of frigate tuna for mechanized vessels, 1995-2010.

3.5 Processing

Maldivian tuna exports include frozen, canned, dried, smoked and salted etc. Skipjack tuna is mostly used in canning or is exported frozen while YFT is generally exported as fresh while frigate tuna is generally used to make dried or smoked fish. Another use of FRI tuna is to make the local fish paste *rihaakuru*. The small size of this species makes it suitable for cooking and smoking or drying.

In 2010, companies that export processed fish from Maldives purchased 235.85 tons of marine fish. The amount of FRI in this could not be determined due to technical difficulties with the MoFA database. However, it can be assumed that a significant proportion of this species was purchased by these companies. The remaining FRI is believed to have been bought by the small to medium scale fish processors whose major product is dried or smoked fish targeted to the local and neighbouring overseas markets.

4. Current Research

Being a small proportion of the nominal tuna landings of the country, frigate tuna has received little attention from a scientific point of view. Size data that have been collected as part of the national tuna length sampling program since 1984 is the only form of biological data available on this species.

4.1 Size sampling

Size data for FRI caught in the Maldivian pole-and-line fishery has been collected as part of the long standing tuna length sampling program at MRC. Data from the sampling program and other similar programs have been used to estimate the average size of tuna and tuna like species for the national reporting of fish catch. A significant amount of length data has been collected under the sampling program (figure 4) while the numbers of fish sampled fluctuated through the years as the programme went through various stages. The fundamental issue with collecting size data of FRI is that this species is caught mostly in the absence of a good SKJ or YFT catch. Hence available length data for this species is patchy mostly in the southern atolls.

Length data that has been collected through the length frequency sampling program is patchy and in some cases unreliable. This situation is worsened by the fact that fishermen regard FRI as a secondary species in their catch and hence little importance is given to this species. It is believed that the proposed restructuring of the sampling program would improve this situation.

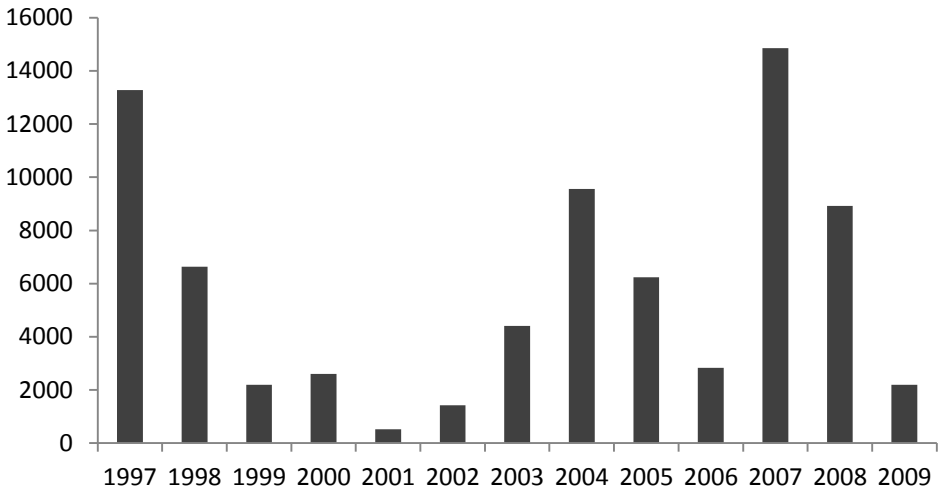

Figure 5. Numbers of FRI sampled under the length sampling program at MRC, 1997-2009.

5. Fishery data

All fishery data are collected by the Fisheries Management Agency (FMA) of the Ministry of Fisheries and Agriculture (MoFA). Traditional catch reporting that used to be voluntary at the island offices has now become mandatory. A logbook system of data collection was introduced in 2010 and so has a web portal been developed to facilitate data entry by the newly appointed fisheries inspectors in different parts of the country. In terms of effort, Maldivian fishermen still report effort in terms of the number of days fishing, which clearly does not represent the current effort of the Maldivian fishing fleets.

6. References

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