

## **Kawakawa (*Euthynnus affinis*) fishery in Maldives**

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### **ABSTRACT**

Maldivian tuna fisheries have predominantly exploited skipjack and yellowfin tuna throughout history. Hence, kawakawa has been a minor proportion of all the tuna caught in the country. Despite fluctuations, kawakawa landings have gradually increased since 1970. This increase however, is disproportionately small compared to the growth in landings of skipjack and yellowfin tuna. Majority of kawakawa is caught by pole-and-line gear in the north of the country. Effort (number of trips) by mechanized vessels has been slowly declining although CPUE is on the rise. Length data show increased catches in the 50-60cm FL range in recent years compared to late 1990s.

### **1. Introduction**

Maldivian tuna fishery has predominantly exploited skipjack and yellowfin tuna throughout history. Neritic tuna such as kawakawa (*Euthynnus affinis*) has been a minor proportion of the total tuna landings. The dominance of skipjack and yellowfin tuna in the Maldivian tuna fishery increased with the mechanization of the fishing vessels during 1970s and the decline in troll fishery, two fleets which contributed a significant proportion of kawakawa to the national catch. More recently, the hand-line fishery targeted at the large yellowfin tuna that flourished as a direct result of access to overseas markets substantially increased the proportion of yellowfin tuna in the Maldivian tuna exports. As a result, contribution of kawakawa to the national tuna landings further declined.

### **2. Data**

Data collected and published (1995-2010) by the Ministry of Fisheries and Agriculture (MoFA) has been used for this paper. Size data was collected by tuna length samplers through the length sampling program of tuna and tuna like species being carried out by the Marine Research Centre

(MRC) of MoFA. This program, which has thirteen samplers at present, is still ongoing at the Centre.

### 3. Fishery status

#### 3.1. Catch trend

Maldivian fishery landed 2819 t of kawakawa in 2010, roughly 7% less than that caught in 2009 (Table 1). A general increasing trend of kawakawa can be observed despite significant inter-annual variations in catch (Figure 1). The increasing trend is presumably due to higher effort with the increase in vessel sizes and the number of fishermen. In spite of shifting catch rates, contribution of KAW to the total annual landings of tuna and tuna like species in the Maldives has remained minute (Figure 2). This could partially be due to the nature of Maldivian fishermen and locals to prefer SKJ over KAW in their diet as well as targeting of SKJ and YFT by fishermen as the two species fetch a higher market price.

Table 1. Nominal catch (t) of the four major tuna species of the country, 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

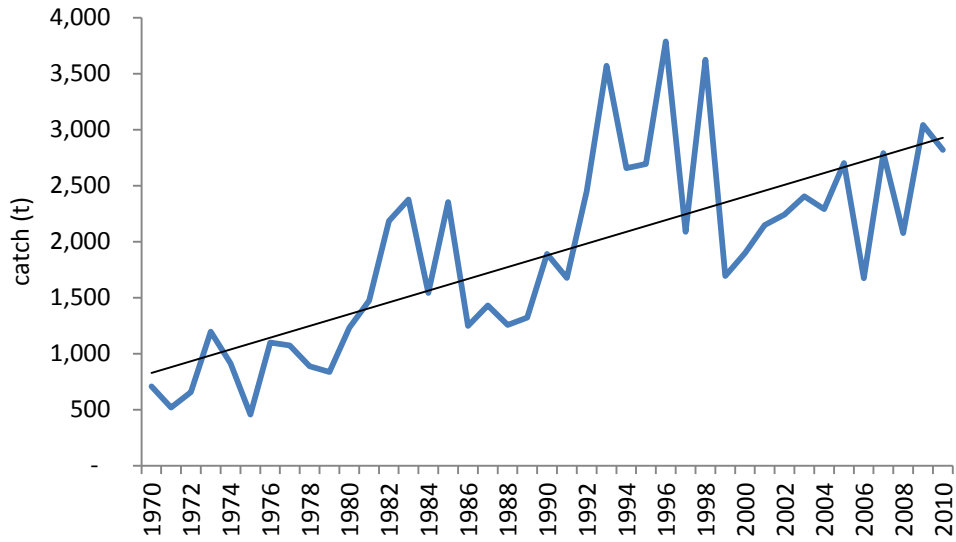


Figure 1. KAW catch (t) in the period 1970 - 2010.

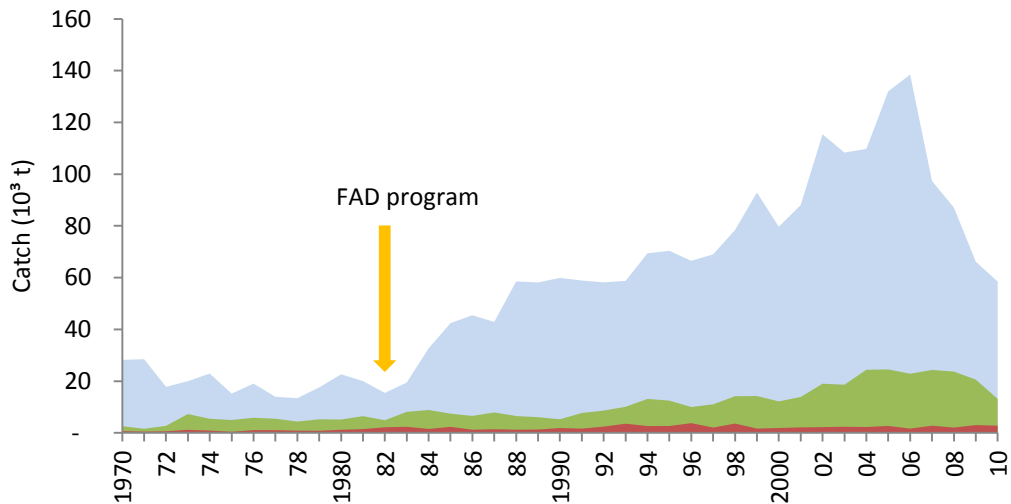


Figure 2. Trends in catches (t) of skipjack (blue), yellowfin (green) and kawakawa (maroon) from 1970 to 2010.

In 2010, kawakawa comprised 3.65% of the four major tuna species caught in the country (skipjack tuna, yellowfin tuna, frigate tuna and kawakawa). This is the highest proportion of kawakawa to the total landings since 1984. Although nominal catch is less, proportion of KAW in 2010 is higher than that of 2009, due to landings of the three remaining tuna species, compared to kawakawa, declining significantly.

Lowest nominal catch of KAW catch since 1990 was recorded in 2006 which also recorded the highest SKJ and YFT catch in the history of Maldives. The low catch this year could have been the result of fishermen targeting SKJ and YFT due to their high catch rates.

Similar to frigate tuna, KAW is also predominantly caught in the northern atolls of the country. A number of socio economic and environmental factors could contribute to this observation including, (1) smaller vessels that fish at the FADs in the north compared to the south, (2) availability of markets (small scale processors that require this species and (3) high abundance/catchability of neritic species in the north compared to the south of the country.

### 3.2.Catch by gear

Majority of Kawakawa in Maldives is caught by pole-and-line gear followed by trolling and hand-line (Table 1). In 2010, PL gear caught roughly 86% of all kawakawa landed. This is significantly higher than that of 2009 (69%). The proportion of PL landed kawakawa was lower in this year due to the high catches of this species by hand-line.

It is believed that kawakawa is caught incidentally or in the absence of pole-and-line SKJ and YFT as, very few or none of the PL vessels are known to practice a targeted kawakawa fishery. Most PL vessels, especially in the south, prefer to fish from free schools of SKJ and YFT in the absence of which fishing is done at the FADs, which could produce a higher catch of neritic species.

Table 2. Kawakawa catch (t) by gear, 1995-2010. PL= pole-and-line, LL=long-line, HL=hand-line.

<b>Year</b>	<b>PL</b>	<b>Trolling</b>	<b>LL</b>	<b>HL</b>	<b>Fixed gill net</b>
1995	1,715	976	3	0	0
1996	2,596	1,028	115	48	2
1997	1,478.36	584.8	11.67	7.84	5.83
1998	2,222.8	961.42	9.93	426.12	3.74
1999	1,233.67	400.76	0.02	56.39	0.5
2000	1,378.07	452.7	0.76	65.5	0.45
2001	1,731.01	339.8	1.5	70.82	3.94
2002	1,807.61	367.97	1.37	52.5	10.5
2003	1,930.79	339.61	0	132	3
2004	1,800.88	411.47	1.62	42.76	32.85

2005	1,996.1	387.03	1	153	85
2006	1,238.34	121.34	1.21	312.84	0
2007	1,846.08	351.62	19.23	574.16	0
2008	1,673.47	219.93	2.28	178.92	0.1
2009	2,098.76	426.41	0.5	516.18	0
2010	2,422.2	368.4	0.04	26.94	0.46

### 3.3. Fishing effort

In 2010, mechanized fishing vessels represented 93% of the fishing effort in terms of number of trips made (Table 3). Mechanized fleet is seeing a declining fishing effort over the recent years. This decline is in par with the decline in number of registered vessels in the fishery. Out of the 967 vessels registered in this category, 708 were recorded as active in fishery in 2010. These vessels however, include those of multiple gear types, an issue that is compounded by the fact that many of the vessels opportunistically use several gear such as pole-and-line and hand line. The average number of active vessels in Maldives is declining with the lowest number so far in 2010. This decline in the number of vessels and effort 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.

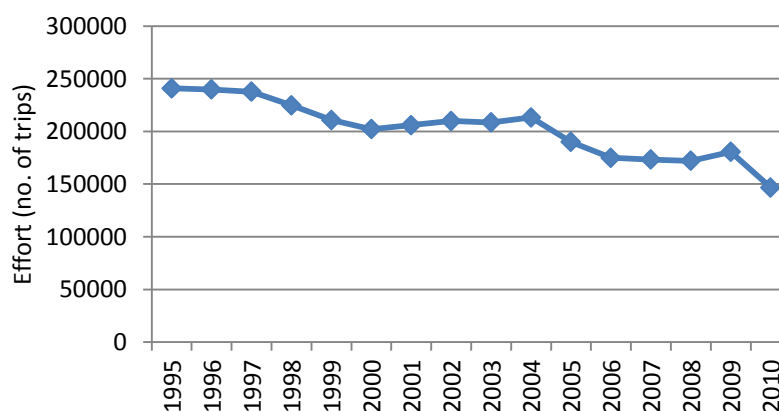


Figure 3. Fishing effort (number of trips) for mechanized vessels, 1995-2010.

Table 3. Fishing effort (number of trips) from 1995-2020.

Year	Mechanised vessels	Sailing vessels	Mechanised trolling	Sailing trolling
1995	240,858	623	6,740	24,086
1996	239,787	724	9,728	20,703
1997	237,661	580	15,899	16,207
1998	224,751	3,020	8,879	15,557
1999	210,816	6,050	10,282	8,041
2000	202,195	6,048	9,160	8,353
2001	205,897	9,508	8,751	5,522
2002	209,839	13,776	9,485	978
2003	208,471	16,495	7,991	513
2004	213,167	430	9,606	1,558
2005	189,941	644	7,616	1,953
2006	175,008	553	6,830	1,540
2007	173,340	1,008	6,973	2,154
2008	172,074	4,440	5,861	1,878
2009	180,537	5,671	6,688	1,972
2010	146,762	3,764	5,800	0

### 3.4.CPUE

Catch per unit effort (CPUE) of kawakawa for mechanized vessels gradually increased through the years with the exception of 2006 and 2008 (Figure 4). The low catch in 2006 could be due to targeting of SKJ because of the extraordinarily high catch rates of SKJ. Highest CPUE for this fleet was recorded in 2010 with 18kg/trip. However, it should be noted that the true CPUE could be higher as mechanized vessels include those that carryout hand-line fishing which targets large yellowfin tuna and this fishery could have a negligible proportion of KAW in their catch.

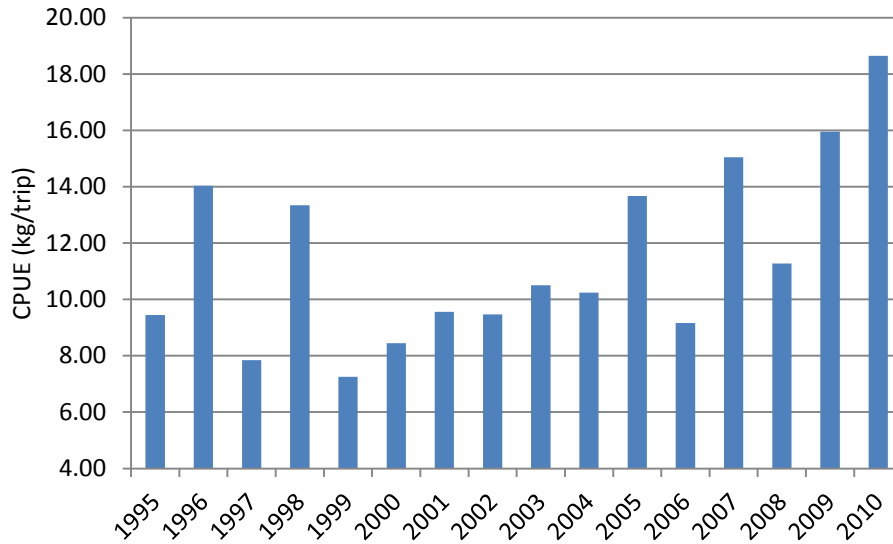


Figure 4. Mechanized vessel CPUE (kg/trip) for kawakawa for the entire Maldives, 1995-2010.

#### 4. Processing

Kawakawa is mostly used to make *rihaakuru* (local fish paste) and also smoked and dried fish for local consumption and export and is not canned or exported frozen unlike SKI and YFT. The small size of the fish and its low price makes this species ideal for such purposes. Recently, companies that were licensed to procure fish from the local fishermen began purchasing kawakawa to be processed into a variety of products. This could promote kawakawa catch especially during low SKJ and YFT catches.

#### 5. Research

Being an incidental catch and of lower economic value and contributing a small proportion of the annual catch, KAW has received little attention similar to frigate tuna. Hence, only limited fishery and size data on this species is available.

##### 5.1.Length sampling

Length data of kawakawa is gathered, along with that of other tuna species caught by the pole-and-line gear, by the Marine Research Centre (MRC). To this end, MRC has a reasonable time-series of length data, some of which has been used to estimate an average size of kawakawa for reporting of the national catch statistics. However, the size data available for the species is

patchy (Table 4) especially for the south of the country and it is envisaged that the proposed restructuring of the tuna length sampling program would address such issues with the program.

The fundamental issue with collecting size data of kawakawa is that this species is caught mostly in the absence of a decent SKJ or YFT catch, especially in the south of the country.

Table 4. Length sampling effort for kawakawa, 1997-2009.

<b>Year</b>	<b>No. sampled</b>
1997	1722
1998	1501
1999	476
2000	299
2001	0
2002	11
2003	255
2004	117
2005	570
2006	238
2007	4708
2008	612
2009	478

Length data from 1997 to 2010 does not show a clear pattern of change in sizes of KAW caught in the Maldivian pole-and-line fishery (Figure 5). However, it can be observed that the sizes for this period ranged between 25 and 57 cm FL and show an increased amount of fish caught in the 50 – 60 cm FL range, compared to 1994 (Figure 6) and the early years of data period. Both data sets, especially 1994 data, had a very low number of catch in this size range. Data for 1994 shows that the majority of this species caught was between 26 and 50 cm FL (Anderson et. al., 1995). It should be noted that lengths for 1994 in the figure are from three islands, H. Dh Kulhudhuffushi, R. Alifushi and Dh. Kudahuvadho, representing the north and the center of the country.

Length data for 1999, 2001, 2002 and 2004 were not used in this paper due to lack of reliability. It is envisaged that the proposed restructuring of the length sampling program would address such issues in the program.



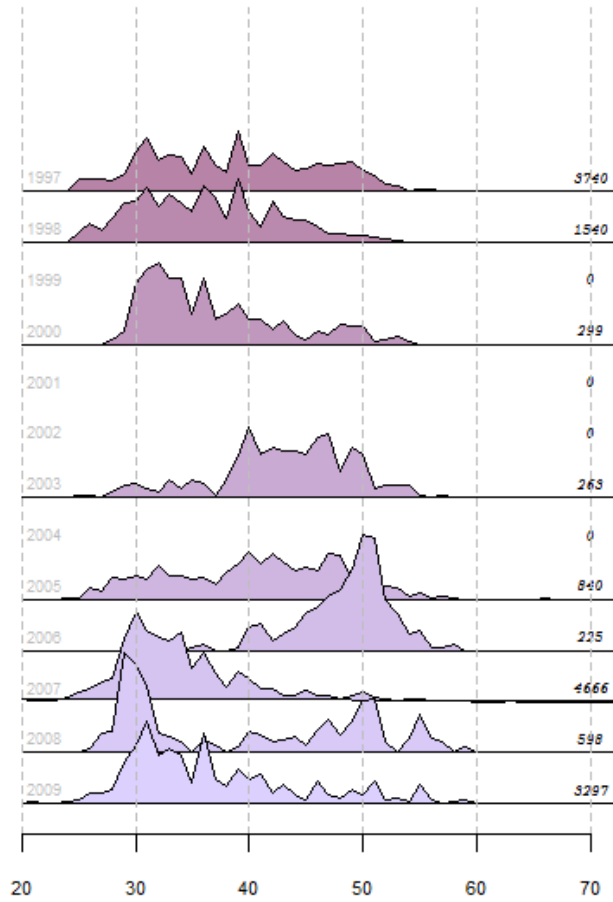


Figure 5. Size distribution of kawakawa 1997-2009 for the whole of Maldives.

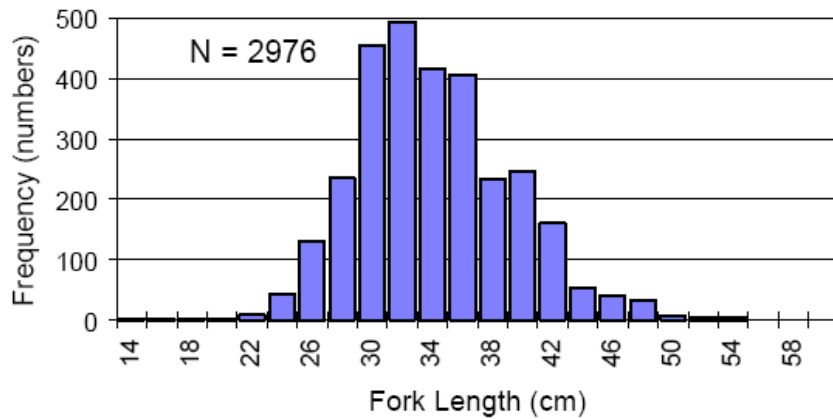


Figure 6. Size distribution of kawakawa for 1994 (data from H. Dh Kulhudhuffushi, R. Alifushi and Dh. Kudahuvadho). Source: Anderson et.al. (1995)

## **6. 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 does not clearly represent the current effort of the Maldivian fishing fleets.

## **7. References**

Anderson, R.C., Hafiz, A. and Adam, M.S. 1995. Review of the Maldivian Tuna Fishery.