

## The evolving Maldivian tuna fishery and its increasing dependence on the anchored FADs

A RiyazJauharee & M Shiham Adam  
Marine Research Centre, Ministry of Fisheries and Agriculture, Maldives

### Abstract

In the past 15 years Maldivian pole-and-line tuna fishery has undergone many changes. The obvious change being the fishery changing from a few species fishery (SKJ and YFT) to a multi species fishery targeting pelagic (tuna) to reef fish. The gear used has also changed from a single gear (pole-and-line) to a multi gear (pole-and-line, drift handline, bottom handline and trolling). The decrease in tuna catches in the recent years and the increase in demand for fish both in the local and international markets has prompted this change in the fishery. The decrease in tuna catch has also increased the fishing pressure at the anchored FADs. The study is based on information obtained during the 68 observation trips made by MRC staff onboard tuna fishing vessels. The study showed that more than half of the tuna catch in the Maldives are caught around anchored FADs. In addition, today nearly half the tuna fishing fleet use multiple gears and targets not only YFT and SKJ (using pole-and-line) but a number of species like large YFT, kawakawa, frigate tuna, billfish and several species of reef fish by handline and trolling.

### Introduction

Maldivians have been catching tuna for more than 700 years (Shiham, 2004) from the coastal waters, free swimming schools and around drifting objects in the Indian Ocean. Fishing from “*oivaali*” (local name for drifting objects) around which tuna are found is common among the Maldivian tuna fishermen. Man-made floating objects were first introduced into the tuna fishery in the early 1980s (Naeem and Latheefa, 1994). By 1990 there were 10 FADs deployed around Maldives and the national tuna

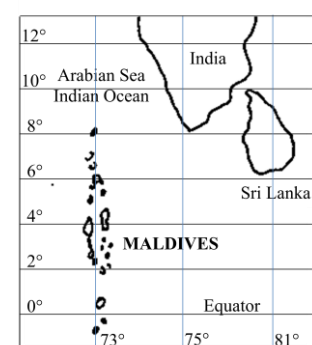


Figure 1: Maldives

catch increased from 30,448 tons in 1980 to 70,082 tons in 1990 (MOFA statistics). Due to its success, today Maldives (figure 1) maintains a network of about 45 FADs (Shainee and Leira, 2011) throughout Maldives, making it the largest network of anchored FADs in the Indian Ocean. The FADs are anchored in deep waters (1 to 2 km) about 20 km from the

shore. Tuna catches in the Maldives reached its peak in 2006 with a reported catch of 166,000t (138,000t of skipjack and 23,000t of yellowfin tuna), and the artisanal fishery of Maldives has been successful in using the anchored FADs very effectively in reducing the search time and fuel spent during fishing operations. Though the fishery targets mainly skipjack and yellowfin tuna it is also catch other species of tuna (Table 1) both around the FADs and from free swimming schools.

**Table 1: Tuna species caught in Maldives**

Common English Name	Scientific Name	Local Name
Skipjack tuna	<i>Katsuwonus pelamis</i>	Kalhubilamas
Yellowfin tuna	<i>Thunnus albacares</i>	Kanneli
Kawakawa	<i>Euthynnus affinis</i>	Latti
Frigate tuna	<i>Auxisthazard</i>	Raagondi

A number of other species are caught as bycatch by the tuna fishery. The bycatch species (Table 2) are never discarded as they are considered as good food fish and can be sold at the local fish market.

**Table 2: Bycatch species in the Maldivian tuna fishery and fishing gear**

English Name	Scientific Name	Local Name	Fishing gear
Rainbow runner	<i>Elagatis bipinnulata</i>	Maaniyaamas	Pole-and-line
Dolphin fish	<i>Coryphaena hippurus</i>	Fiyala	Pole-and-line
Sailfish	<i>Istiophorus platypterus</i>	Fangaduhibaru	Handline
Black marlin	<i>Makaira indica</i>	Mashibaru	Handline
Blue marlin	<i>Makaira mazara</i>	Mashibaru	Handline

Marine Research Centre (MRC) has been documenting the changes in the tuna fishery over several years. The purpose of this paper is to report these changes to the wider scientific community.

## Method

In 2008 and 2009 MRC conducted a number of field activities by being out with the fishermen on their tuna fishing operations. A number of observations were made during these trips which included: all the species caught, fork length of the fish, number of hooks used, position of the schools, association of the schools and fishing time. Over the two years MRC staff took part in 63 such observation trips on board tuna fishing vessels ranging from 60 feet to 100 feet having a crew of 8 to 20 persons depending on the size of the vessel. These

vessels mainly targeted skipjack and yellowfin tuna sometimes using both pole-and-line and handline during the same trip.

### Observations and discussions

Most of the tuna fishing vessels operating in the artisanal tuna fishery of Maldives now have the capacity to carry ice with them thus many of the larger vessels (> 80 feet) go out on multiday fishing trips carrying both pole-and-line and handline gear on board. These vessels target both skipjack and yellowfin using live bait (Table 3). The vessels are fitted with modern navigation equipment and communication systems enabling them find their way back to port even after spending several days out in the open sea when the weather is fine. Fishermen use the on board communication facilities to inform and to obtain information on the locations of the tuna schools. This cooperation between fishermen from different vessels has contributed to reduction in the search time and fuel, while increasing the catch per unit effort.

**Table 3: Live bait species used in the Maldivian tuna fishery**

English Name	Species	Local Name	Fishing method
Silver sprat	<i>Spratelloidesgracilis</i>	<i>Rehi</i>	Pole-and-line
Blue sprat	<i>Spratelloidesdelicatulus</i>	<i>Hondeli</i>	Pole-and-line
Cardinalfishes	Apogonidae	<i>Boadhi, fathaa</i>	Pole-and-line
Anchovy	<i>Encrasicholinaheteroloba</i>	<i>Miyaren</i>	Pole-and-line
Fusiliers	Caesionidae	<i>Muguraan</i>	Pole-and-line&Handline
Silversides	Atherinidae	<i>Thaavalha</i>	Pole-and-line&Handline
Mackerel scad	<i>Decapteruspunctatus</i>	<i>Rimmas</i>	Handline
Bigeyesca	<i>Selarcrumenophthalmus</i>	<i>Mushimas</i>	Handline

### *Pole-and-line tuna fishery*

The Maldives tuna fishery targeting both skipjack and yellowfin tuna is one of the most important fisheries in the Indian Ocean. Skipjack landings in the Maldives amounts to roughly 20% of the reported total Indian Ocean skipjack catch. Catches in the Maldives reached a peak in 2006 amounting to 138,000t, but have been declining since then. Reported catches were only 59,000t in 2010, over 55% lower than the catches in 2006. Nominal catch rates dropped from around 800 kg/trip in 2006 to less than 400 kg/trip in 2010. Traditionally both skipjack and juvenile yellowfin tuna (30-60 cm FL) are caught from livebait pole-and-line fishery (Adam and Anderson, 1996). Even today almost all skipjack and a large

proportion of yellowfin tuna are caught from pole-and-line fishery though a significant amount is now also caught from the handline and longline fishery.

In the past, when the fishermen were engaged mainly in one day fishing operations, they collect livebait in the middle of the night or in the early hours of the day and head out to the open ocean looking for tuna. The free swimming tuna schools are often located by observing birds with the help of powerful binoculars. The most frequently sighted seabird around tuna schools is the Brown Noddy with Lesser Noddy occurring at a lower number. Frigatebirds are most helpful in locating tuna schools as they fly high over the ocean, making it easier to spot them with the help of binoculars. These Frigatebirds are more common in the south of Maldives where large free swimming schools of tuna are more frequently observed. In the fishing operation fishermen do not take ice and return to port by evening with whatever little catch they have as they do not have any means of preserving it.

Today the fishing vessels carry large quantities of fuel, ice and bait making it possible for them to stay out in the open sea for several days. The daily catch is quickly stored in ice as soon as the angling is over. The vessels continue looking for tuna and catching it till they run out of livebait or supplies. When the vessel runs out on livebait it returns to the inshore water of the atolls and collect livebait. The vessels return to port when they have caught a reasonable quantity of tuna or to obtain supplies. These trips may last between 3 to 8 days. Today, fishermen often look for tuna around the fish aggregating devices deployed throughout the country as this reduces the search time hence the fuel spent on looking for tuna. Unlike traditional fishing vessels today's fishing vessels have better facilities for the fishermen – proper bunks and toilets – making it a more conducive for them to spend several days on the vessel.

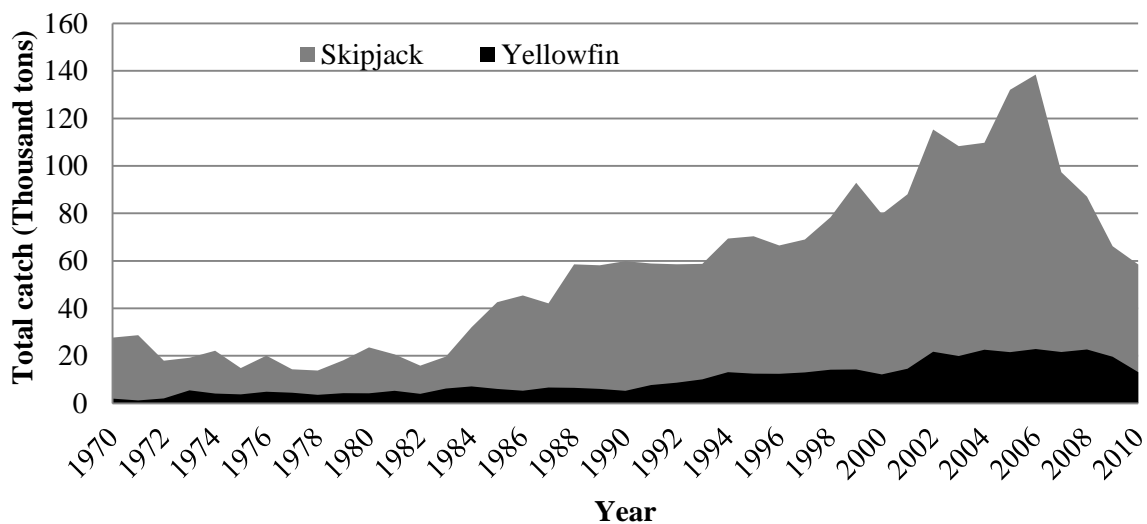
### *Handline tuna fishery*

Yellowfin tuna has been the second most important species of tuna caught by the Maldivian fishermen. Total catches were around 25,000t in 2007 but since then recorded catches declined to 13,000t in 2010, representing about 17% of the tuna catch reported nationally. Since skipjack used to be the preferred tuna by the locals there was no targeted fishery for large yellowfin tuna in the past. But today yellowfin are targeted by both pole-and-line and handline fishery. Since 1990s the greater access to overseas fresh fish markets led to the development of the handline fishery targeting only larger yellowfin (>80cm).

Large yellowfin tuna are caught using handlines. These handlines are made from about 100m of monofilament fishing line (80lbs to 200lbs). One end of the line has a small barbed hook while the other end is attached to a nylon rope (10mm diameter). Livebait (Table 3) are used for catching and attracting the large yellowfin tuna often associated with dolphins. Some schools are few kilometers from the outer edge of the atolls while others are several kilometers from the shore in the open ocean. The fishing operation may last from 3 to 8 days and 4 to 8 handlines are operated simultaneously depending on the size of the boat (80 to 100m). The tuna are caught at the surface and on average it takes about 9 minutes to pull it on board. Once the fish is on the water next to the boat it is gaffed and pulled on board where it is quickly killed by a sharp blow to its head. It is then gutted, cleaned and put in ice. The average handling time is 4 minutes.

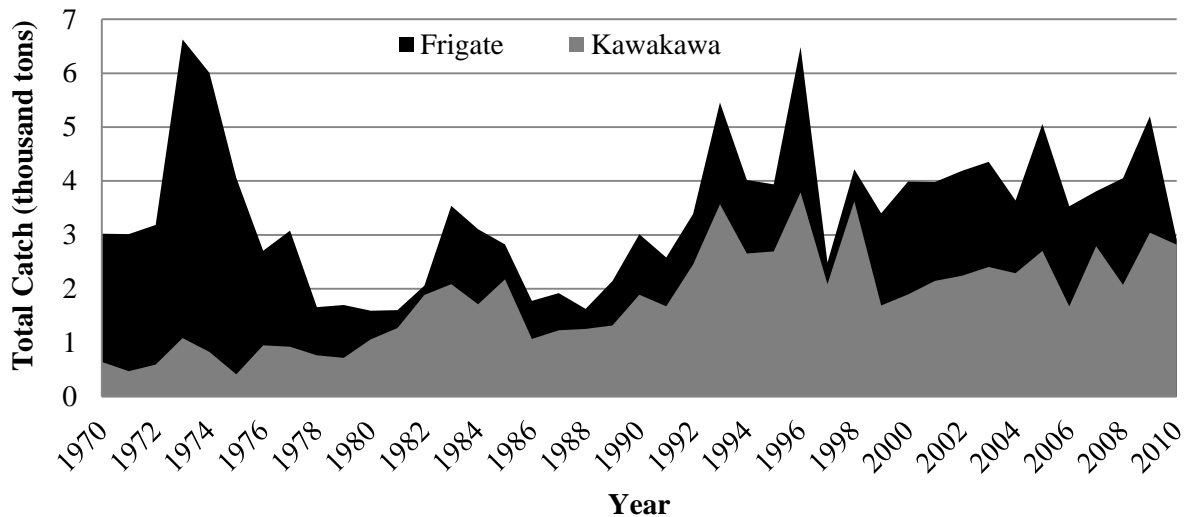
### **Catch**

Catches in the Maldives reached a peak in 2006 amounting to 138,000t, but have been declining since then. Reported catches were only 59,000t of SKJ and 13,000t of YFT (figure 2) in 2010, over 55% lower than the catches in 2006. Nominal catch rates dropped from around 800 kg/trip in 2006 to less than 400 kg/trip in 2010. In the large yellowfin handline fishery the average size of YFT caught was 128±0.53cm in 2010.



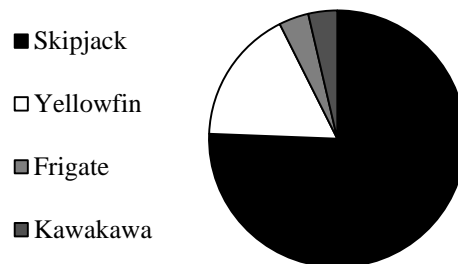
**Figure 2: Total SKJ and YFT landings in Maldives from 1970 to 2010**

Apart from the skipjack and yellowfin the tuna fishery also lands kawakawa and frigate tuna mainly caught by pole-and-line or trolling. A large portion of catch is caught from the inshore, nearshore waters and at the anchored FADs. In the recent years the frigate tuna and kawakawa landings in Maldives has started to decline too (figure 3).



**Figure 3: Total frigate tuna and kawakawa landings in Maldives from 1970 to 2010**

In 2010 about 75% of the total tuna catch was skipjack tuna, while yellowfin contributed to 17% and both kawakawa and frigate contributed to nearly 18% of the tuna catch (figure 4).



**Figure 4: Tuna landings in Maldives - 2010**

During their fishing operations the fishermen frequently check for aggregations of tuna around anchored FADs. Thus many pole-and-line

fishermen begin their fishing operation by visiting FADs in the early hours of the morning, on their way to locate the tuna schools. The FADs are frequently used by the pole-and-line fishermen who target all four species of tuna (Table 1). Observations have shown that more than 50% of all tuna species caught in the Maldives are caught around anchored FADs. In addition to the tuna, rainbow runner and dolphin fish are also caught around the FADs,

**References:**

Shainee, M., Leira, B.J. (2011). On the cause of premature FAD loss in the Maldives. Fisheries Research 109: 42–53

Adam, M.S. (2004). Country review – Maldives. Review of the state of world marine capture fisheries management: Indian Ocean

Naeem, A., Latheefa, A. (1995). Biosocioeconomic assessment of the effects of fish aggregating devices in the tuna fishery in the Maldives. BOBP/WP/RAS/91/006.

MOFA statistics (2010). Ministry of Fisheries and Agriculture, Male’, Republic of Maldives.