Status of the Shark Fishery Ban in the Maldives and the Implementation of the National Plan of Action on Sharks

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Abstract

Sharks have always exhibited an economic significance to the Maldives. In the 1970s, a highly targeted artisanal fishery for sharks had developed and at the same time a newly introduced tourism industry was developing in the country. In comparison with the tuna fishery of the country, the shark fishery was a minor fishery with a small community of fisherfolk involved. From the onset of the commercial shark fisheries, the shark fisheries were in conflict with other stakeholders, the dive tourism sector and the pole and line tuna fishery. The contribution of shark fisheries to the economy was miniscule compared with the implications of over-exploitation of sharks on the thriving dive tourism industry. These factors played a major role in the shark fisheries management of the country. The management measures taken were unsuccessful in resolving the conflicts, which culminated in the declaration of the complete shark fishery ban in 2010. After the ban, measures were taken to mitigate the impact of the management decision on the former shark fishermen. In order to assess the bycatch levels of sharks in the tuna longline fishery, a new logbook system accounting for shark bycatch was implemented in 2012. Bycatch assessments for shark species complexes; hammerhead sharks, thresher sharks, oceanic white tip sharks and mako sharks had been carried out. To improve the reporting of bycatch, training on the identification of oceanic sharks was provided to tuna longline fishermen. Further, with the purpose of determining the effectiveness of the shark ban on reef sharks, a citizen-science programme known as the Maldives Sharkwatch programme was commenced after the declaration of the reef shark fishery ban in the 2009. Data collection is done through the dive tourism sector. The programme is ongoing and is into its fifth year. Recently the Maldives has also developed the National Plan of Action on the Conservation and Management of Sharks. The action plan has been presented to the stakeholders and is in the process of being finalized.

Introduction

For more than a thousand years, fisheries have been the main source of food and income for the Maldives (Anderson and Hafiz, 1996). Tuna has always dominated the catch and for centuries the Maldives has been a tuna fishing nation. It was in the 1970s with the inception of tourism and major developments in trade, small-scale fisheries on reef fishes and sharks developed. Shark fisheries were one of the most lucrative fisheries, among the small-scale fisheries. Higher prices were paid for the exports of shark fins and liver oil of deepwater sharks (Anderson and Ahmed, 1993).

Shark fisheries' contribution to the economy was minuscule compared to the tuna fisheries which dominated the fisheries sector (MRC, 2009). Over the years, the rise in global exploitations on sharks rose concerns over the sustainability of sharks. This led to the rise in awareness on the vulnerability of sharks to over-fishing and called for locally new management measures for sharks in the Maldives.

The purpose of this paper is to provide an overview of the shark fisheries of the Maldives and the factors that led to the complete fishery ban and provide an update on the recent developments in shark resources management.

History of shark fisheries of the Maldives

Sharks were first exploited in need of their crude liver oil. In olden days, there was a significant demand for the shark liver oil. The fishing boats of the Maldives were made of wood and to prevent the wood from decaying, crude liver oil of sharks were applied to the boats. The high demand for shark liver oil led to the development of a traditional shark fishery, *maa keyolhukan* (big line fishing). Large sharks such as the tiger shark (*Galeocerdo cuvier*) and sometimes the bluntnose sixgill shark (*Hexanchus griseus*) and the whale shark (*Rhinocodon typus*) were targeted. This subsistence shark fishery gradually evolved to a commercial fishery. In the 1960s, Japanese longliners came into the central Indian Ocean and this introduced Maldivian fishermen to new fishing techniques (Anderson and Ahmed, 1993). Further, in the 1970s widespread motorization of the fishing fleet took place and with major developments in trade, new markets were opened for the fishermen. These developments and new fishing techniques led to the development of commercial shark fisheries. By the early 1980s, there were three types of shark fisheries in the Maldives; the deepwater gulper shark fishery, the reef shark fishery and oceanic shark fishery.

Status of the shark fisheries

Deepwater gulper shark fishery

In the early 1980s, Japanese buyers came in looking for shark liver oil rich in squalene. Squalene was a substance used for the pharmaceutical products and cosmetics. Livers of gulper sharks (*Centrophorus* spp.) were found to have high levels of squalene. Japansese market for squalene-rich liver oil led to the development of gulper shark fishery. The high price of squalene-rich liver oil attracted many fishermen to the fishery. The fishery boosted in the early couple of years and reached its peak between 1982-1984 (Figure 1). After the peak, there was a drastic decline in catches. The declining trend continued till the collapse of the fishery. The sudden drop in catches was attributed to two main factors. Gulper sharks lived in cold deep nutrient deficient waters. Hence they would have much slower growth rates compared to shallow water sharks. Gulper sharks inhabit depths of 250-800m and in the Maldives, as atoll slopes are very steep, this depth is very limited around the atolls. Since the gulper sharks' habitat is very confined throughout the country, it was believed these deepwater sharks were of a very small stock and the high fishing pressure exhausted the small stock of the gulper sharks (Anderson and Ahmed, 1993).

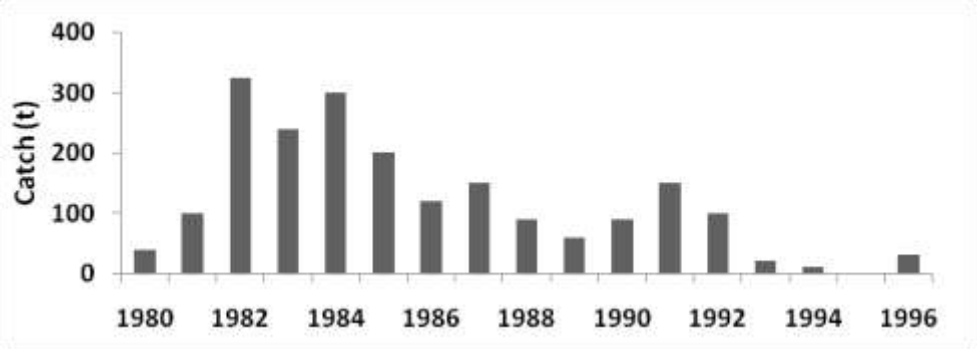

Figure 1 shows the gulper shark catch

Reef shark fishery and oceanic shark fishery

Having introduced to new fishing techniques, the fishermen started exploiting the reef associated sharks. Gillnets and longlines were used to target the reef associated sharks. Some of the reef sharks that were caught were white tip reef shark (*Triaenodon obesus*), black tip reef shark (*Carcharhinus melanopterus*), silver tip shark (*Carcharhinus albimarginatus*) and grey reef sharks (*Carcharhinus amblyrhynchos*).

For the oceanic shark fishery, longlining was carried out. The catch included silky sharks (*Carcharhinus falciformis*), oceanic white tips (*Carcharhinus longimanus*), silver tips (*C.albimarginatus),* thresher sharks (*Alopias* spp.) and mako sharks (*Isurus* spp.)

Since shark fisheries were a minor fishery, little importance was given in collecting catch information on shark fisheries. The shark fisheries was a solely an export-oriented one, the local consumption of sharks would be negligible it was assumed the whole shark catch would be exported. As a result, assessments on shark fishery status were carried out by estimating catch from the export data of shark fins. The exported fins were not distinguished by the type of fishery; hence the estimated catch was the combined catch from reef shark and oceanic shark fisheries.

Prior to 1970s, shark catches were estimated to be roughly 500mt (Figure 2). From the late 1970s, a steep rise in shark catches was seen. This was the time when commercial shark fisheries developed. For most of the years, the average annual catch was 1400mt with 1000-2000mt of inter-annual variations in the catch. The differences in shark catch in between the years could be due to the demand of fins in the export market (MRC, 2009). In 2004, shark fisheries attained its peak of 2700mt. After the peak, the fishery showed significant declines in catches and by 2008 had equaled to the level of shark fishing prior to late 1970s (Figure 2).

The significant drop in shark catch after 2004 was believed to be caused by over-exploitation of shark stocks (MacAllister and Partners, 2002) or the decrease in fishing effort (Sinan et al., 2011). For many of the prominent shark fishing islands, the number of fishing vessels engaged in shark fishing has decreased over the years. The most prominent shark fishing island, *Kulhudhuffushi*, in 1992 had 80 boats which was reduced to 10 in 2008 (Sinan et al., 2011). Many socio-economic factors had driven the fishermen away. In a study done by Anderson (et al., 2011), it was found that the number of youth entering the shark fishery in *Kulhudhuffushi* were becoming less and the fishing group of the island had aged. However, this particular issue was not only affecting the shark fishery, the entire fisheries sector was being affected.

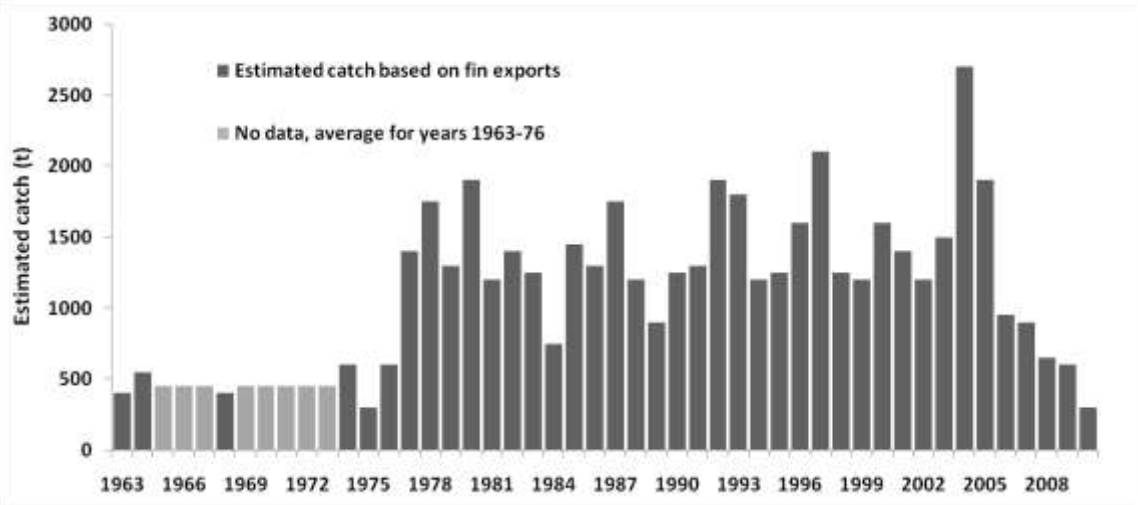

Figure 2 shows estimated shark catch for reef shark fishery and oceanic shark fishery

Conflicts between shark fishermen and other stakeholders

Since its inception, the shark fisheries had major conflicts with other stakeholders. The dive tourism industry had issues with reef shark fishermen and pole and line tuna fishermen had issues with shark fishermen. Divers complained that due to reef shark fishing, reef sharks sightings were becoming few. A study in 1993 revealed that a single grey reef shark allowed to live in its habitat would generate about 3300USD per year than when fished in need of its fins which would generate only 32USD (Anderson and Ahmed, 1993).

Pole and line tuna fishermen complained of low tuna catch due to fishing of oceanic sharks. The fishermen believed that having sharks particularly silky sharks (*C. falciformis*) around the tuna schools helped to keep the school together and thus increased the availability of tuna catch.

Shark management measures

Most of the management measures on shark fisheries were taken to reduce these conflicts. The first management measure on shark fisheries was to prohibit shark fishing in tuna fishing grounds during daytime. To reduce the conflict with dive tourism industry, nine prominent shark watching points were included in the first 15 marine protected areas of the Maldives. Furthermore to reduce this conflict, a ten year moratorium on shark fishing was announced in 1998 in seven atolls important for tourism. However, in 2008, even after 10 years of a moratorium on reef shark fishing in the major tourism zones, dive tourism industry complained of diminishing reef shark sightings. The tourism industry is the main foreign income generating sector, and shark watching is considered as an important part of diving. In addition to growing importance of conserving sharks for the dive tourism industry, the decreased status of shark fisheries pressed for immediate management actions. As a result, with the purpose of conserving the reef associated sharks, a fishery ban on reef sharks was imposed in 2009. A year later in 2010, as oceanic shark fishing could pose negative impacts on the pole and line tuna fishery, a complete ban on shark fishing within the entire Exclusive Economic Zone (EEZ) was declared.

Measures to minimize the impact of shark fishing ban on fishermen

After the declaration of the complete shark fishing ban in 2010, a gear-buy-back scheme was implemented for the shark fishermen. 206 fishermen participated in the scheme and shark fishing gear, longlines and nets were bought at depreciated values. Majority of the fishermen has received compensations. In addition to the gear-buy-back scheme, the former shark fishermen were given priority in a soft-loan scheme implemented by the government. Few months after the complete ban was declared, Ministry of Fisheries and Agriculture (MoFA) initiated a Shark Trust Fund. The main purpose of the trust fund was to provide assistance to shark fishermen in finding alternative livelihoods. Since the dive tourism industry would largely benefit from the reef shark fishing ban, the tourism sector was asked to contribute to the Shark Trust Fund. However, having over 98 tourist resorts, only two resorts contributed to the trust fund.

Socio-economic impact of shark ban on former shark fishermen

A study led by the Marine Research Centre of MoFA, in collaboration with the Bay of Bengal Large Marine Ecosystem (BoBLME) project assessed the socio-economic impact of complete shark ban on former shark fisherfolk. Seven islands notable for shark fishery were chosen for the study and about 125 fishermen took part in the survey. The survey findings are to be published by the end of 2014.

Issues in the full implementation of shark ban

Governance issues

After complete ban on shark fishing was declared, the major issue faced in the implementation of shark ban was the ongoing sale of shark souvenirs. Shark jaws were being sold at a majority of souvenir shops. MoFA was hugely criticized, for not being able to stop the trade of shark souvenirs. The fishery ban imposed by MoFA only prohibited the exploitations on sharks but it did not ban the trade of shark products. The regulation of trade, import and export of any commodity including marine products in the Maldives is in the mandate of the Ministry of Economic Development. Since the beginning of complete shark ban, MoFA has been negotiating with Ministry of Economic Development to impose a ban on local and international trade of shark souvenirs within the Maldives.

Bycatch of sharks in tuna longline fishery

Currently 19 vessels are operating in the tuna longline fishery. Longlining for tuna is allowed from 100nm up to the limit of the Maldives' EEZ. In 2012, new logbooks on tuna longlining were launched. The new logbooks ensure the byctach of sharks to be recorded to species-complex levels. The condition of shark bycatch are also to be recorded as whether the incidentally caught shark was released with no damage, released with minimal damage, released with major damage or was dead at the time of release. In January of 2013, taxonomy trainings on oceanic sharks were provided to the crew of two longline vessels. The training was provided with assistance from BoBLME project by the Marine Research Centre in collaboration with Fisheries Management

Division of MoFA The training materials for the workshop was obtained from the Indian Ocean Tuna Commission's (IOTC) identification guides on Shark and Ray Identification in Indian Ocean Pelagic Fisheries.

Figure 3 shows the shark bycatch from a total of 16 longline vessels in 2013. The most frequently caught species-complex of sharks was the mako sharks (*Isurus* spp.), which was followed by thresher sharks (*Alopias* spp.) and oceanic white tips (*C. longimanus*). Hammerhead sharks (*Sphyrna* spp.) were the least caught species-complex.

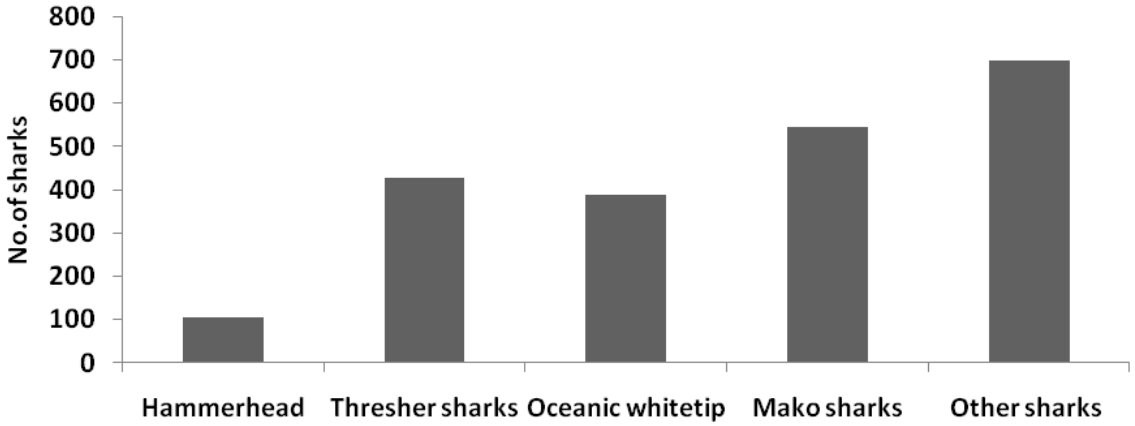

Figure 3 shows the number of sharks caught per species in 2013

Figure 4 shows a breakdown of shark bycatch of 2013 per species-complexes by month. An increasing trend for shark bycatch has been noticed in 2013. The highest number of sharks was recorded during the period August to December. This could be due to increased effort in collecting logbook information by the longline vessels and more vessels joining the fishery. In the beginning of 2013, five vessels were operating and by December of 2013 a total of 16 vessels were in the fishery.

Thresher sharks (*Alopias* spp.) were recorded to be fairly the same for most of the months, with an average of 30 sharks per month, except for May which recorded more than 50% rise in catch in comparison to the other months (Figure 4). Although the oceanic white tip shark (*C. longimanus*) catch dominated the shark bycatch in February, March and July did not show any significant peaks in catch and the catch remained fairly the same throughout the year except in January. Hammerheads (*Sphyrna* spp.) were the least recorded shark with many months without any catch. However, hammerheads showed an unexpected peak in June, where it even dominated the shark bycatch for the month, before dropping to zero catch for the next three months. Mako sharks (*Isurus* spp.) were the most recorded shark complex and dominated the catch for the months, April, May, August, October and November (Figure 4).

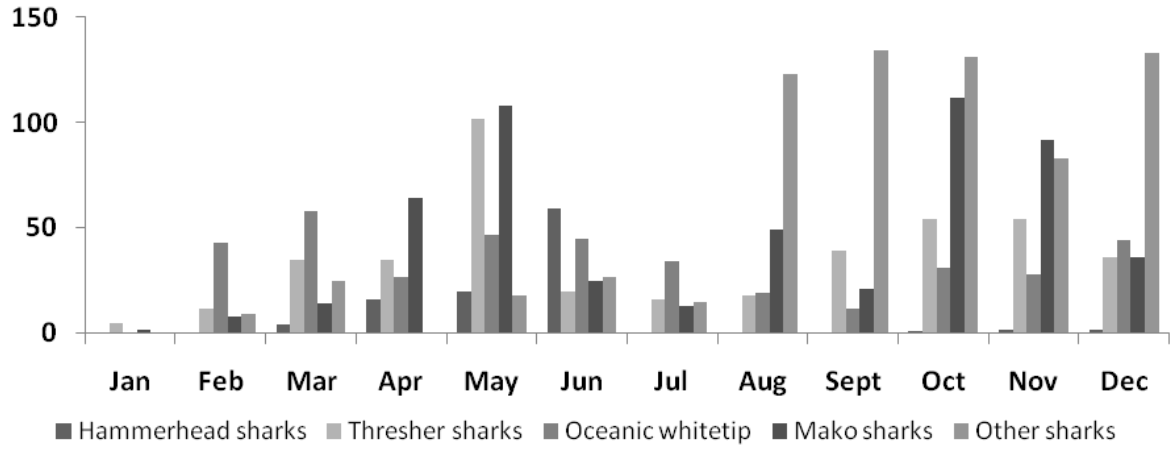

Figure 4 shows a breakdown of types of sharks caught by month

Maldives Sharkwatch Programme

After the fishery ban on reef associated sharks was declared in 2009, Sharkwatch programme was initiated under the Darwin Reef Fish Project, collaboration between the Marine Research Centre and Marine Conservation Society (UK). The purpose of the programme was to assess the effectiveness of the reef shark ban as well as gain an understanding of the abundance of reef associated sharks at the time of the reef shark ban. Sharkwatch is a citizen-science programme and tourism sector is largely targeted for data collection. The country having over 98 resorts, and majority having a dive centre on it, on a single day numerous dives would be undertaken by the dive tourism industry; hence the dive centres were encouraged to take part in data collection.

Sharkwatch uses the roving diver technique, where the surveyor swims for approximately 45-50 minutes and counts the number of sharks encountered on that dive. Over the four years of the Sharkwatch programme, an increasing effort in surveying and an increase in shark encounters were noticed. The increase in shark sightings could be due to the increased effort in surveying. Results of the four years showed the most encountered shark has been white tip shark (*T. obesus*), followed by grey reef shark (*C. amblyrhynchos*), and the black tip reef shark (*C. melanopterus*). The programme has also assisted in identifying hotspots for sharks (Sattar el at., 2014).

Future management

NPOA-Sharks

In collaboration with BoBLME project, the Maldives has developed the National Plan of Action on the Conservation and Management of Sharks (NPOA-Sharks). A stakeholder consultation to present the NPOA-Sharks took place on 10th of April 2014. Stakeholders including former shark fishermen, relevant government authorities, and representatives of tuna longline fishery, attending the one day workshop. The overarching goal of the Maldives NPOA-Sharks is to ensure the implementation

and observation of the total shark ban. Some of the actions of the NPOA-Sharks include the strengthening of the existing Shark Trust Fund, developing a local shark identification guide and conducting taxonomy trainings targeting longline fishermen.

Conclusion

Continuation of shark fisheries could have adverse effects on the most prominent economical sectors, the tourism industry and pole and tuna fishing industry, a complete ban on shark fishing was declared. For further management of shark resources, a NPOA-Sharks has been developed. Future efforts would be focused towards effective monitoring of shark ban and improving the reporting mechanism of shark bycatch.

References:

Anderson, R. C. and Hafiz, A., 1996. Status of tuna research and data collection in the Maldives. In: A. A. Anganuzzi, K. A. Stobberup and N. J. Webbs, eds. Proceedings of the 6th Session of Expert Consultation on Indian Ocean Tunas, Sri Lanka, 25-29 September 1995, IPTP. Colombo: s.n., pp. 373.

Anderson, R.C. and Ahmed, H., 1993. The Shark Fisheries of the Maldives, Male': Ministry of Fisheries and Agriculture and FAO Rome. pp.73

Anderson, R.C., Adam, M. S. and Saleem, M. R., 2011. Shark longline fishery in the nothern Maldives, Maldives: Paper presented at the Seventh Session of IOTC Working Party on Ecosystem and Bycatch, pp.24

McAllister, E. and Partners , 2002. Kulhudhuffishi Shark Fisheries Review, Male': Regioanal Developmenet Project Northern Development Region, Ministry of Planning and National Development and Asian Development Bank, pp.32

MRC, 2009. Status of Shark Fishery 2, Male': Marine Research Centre, Ministry of Fisheries and Agriculture, pp.31

Sattar,S.A., Wood,E., Ushan, M.,Ali, K., 2014. Overview of the Sharkwatch Programme: 2009-2013. Darwin Reef Fish Project, Marine Research Centre/Marine Conservation Society (UK), Ministry of Fisheries and Agriculture, pp.30

Sinan, H., Adam, M. and Anderson, R. C., 2011. Status of Shark Fisheries in the Maldives, Male': Paper presented at Seventh Working Party on Ecosystems and Bycatch, Maldives 24-27 October 2011, pp.9