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# China's Practice of Shark Bycatch Mitigation in Tuna Fisheries

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As an essential component of the marine living resources, sharks play an active role for the stability and diversity of the marine ecosystem. Due to the unique biological characteristics, i.e. slow growth, delayed maturation, long reproductive cycles, low fecundity and long life spans, sharks are of high economic value, and their products have won great popularity in the international market, especially the demand for shark meat and fins in China and southeast Asia.

In the past 3 decades, affected by new industrial fisheries and emerging markets, sharks have suffered increased fishing pressure[1]. According to statistics from International Union for Conservation of Nature and Natural Resources (IUCN), 29% of 465 kinds of shark species were threatened to high, very high or extremely high risk of extinction, within which 47 were endangered or critically endangered[2]. Now until September 2014, there are 8 shark species listed in the appendix II of the Convention on International Trade in Endangered Wild Fauna and Flora" (CITES), i.e. Basking shark (*Cetorhinus maximus*), whale shark, (*Rhincodon typus*), the white shark (*Carcharodon carcharias*), Oceanic whitetip shark (*Carcharhinus longimanus*), Scalloped Hammerhead shark, (*Sphyrna lewini*), Hammerhead shark (*Sphyrna mokarran*), (*Sphyrna zygaena*) and porbeagle sharks, (*lamma nasus*).

According to the FAO report, global shark catches had tripled from 1950 to 2000, reaching a historical record of 893,000 tons[3]. However, since the beginning of the 21st century, shark catches have declined. And in 2009 it was about 750,000 tons[4]. However, due to lack of data and the shark discards as bycatch,

[1] Castro, J.I.; Woodley, C.M.; Brudek, R.L. A preliminary evaluation of the status of shark species. FAO Fisheries Technical Paper. No. 380. Rome, FAO. 1999. 72p.
[2] IUCN status of shark species, Sharksavers， from http://www.sharksavers.org/files/8013/3702/5512/IUCN_Status_of_Shark_Species_Shark_Savers.pdf accessed 2014/10/2
[3] 2014 the world state of fisheriers and aquaculture
[4] Fischer, J., Erikstein, K., D'Offay, B., Barone, M. & Guggisberg, S. 2012. Review of the Implementation of the International Plan of Action for the Conservation and Management of Sharks, FAO Fisheries and Aquaculture

the real catches may be much larger than the reported statistical data[5]. And only a few fishing activities can take full advantage of all parts of the shark, while mostly people just make use of shark fins, liver and skin[6].

Shark fishing, including targeted fishing, non-targeted catch, bycatch, commercial fishing, sport fishing etc.[7]. Bycatch refers to catch that a fisher did not intend to catch either because of economic or regulatory reason, but could not avoid, referred to as 'incidental catch' or 'byproduct'[8] [9] [10] [11] [12]. According to statistics, in the 1980s, approximately one-third of shark catches came from bycatch[13], and by 2000, the bycatch ratio of shark rose to 50%[14], especially in the longline and purse seine tuna fisheries in the high seas and in EEZs through bilateral access agreements[15]. And because tuna longline fisheries mostly take place in the high sea, it has aroused great attention from the international society[16]. Bailey K has pointed out that, in the pelagic longline fishery with tuna and tuna-like species as target fishes, the bycatch ratio of shark reaches 1/4[17] [18]

Circular No. 1076. Rome, FAO. 120 pp.

[5] 戴小杰，东太平洋主要集中中上层鲨鱼生物学和生态学研究（博士论文），华东师范大学，2004

[6] 粮农组织海洋资源处，渔业管理：1. 鲨鱼的养护与管理，粮农组织负责任渔业技术准则，第四号增补。罗马，粮农组织，2001：P4
FAO technical guidelines for responsible fisheries. No.4 Fisheries management (Chinese version)

[7]粮农组织海洋资源处，渔业管理：1. 鲨鱼的养护与管理，粮农组织负责任渔业技术准则，第四号增补。罗马，粮农组织，2001：P4
FAO technical guidelines for responsible fisheries. No.4 Fisheries management (Chinese version)

[8] Kieran Kelleher, Discards in the world's marine fisheries: an update, FAO fisheries technical paper 470, Food and Agriculture organization of the United Nations, Rome, 2005: 2P

[9] FAO, Report of the expert consultation on international guidelines for bycatch management and reduction of discards, FAO Fisheries and Aquaculture Report No. 934, Rome, 2010: 12P

[10] International guidelines on bycatch management and reduction of discards, food and agriculture organization of the united nations, Rome, 2011: 4P

[11] Eric L. Gilman, Bycatch governance and best practice mitigateon technology in globay tuna fisheries, Marine Policy, 35(2011): 590-609PP

[12] Cosandey-Godin, A. and A. Morgan. 2011, Fisheries bycatch of sharks: options for mitigation, Ocean science division, Pew environment group, Washington, DC.

[13] Bonfil, R. 1994. Overview of world elasmobranch fisheries. Fisheries Technical Papers. Rome.

[14] Stevens, J., R. Bonfil, N.K. Dulvy, and P. Walker. 2000. The effects of fishing on sharks, rays, and chimaeras (chondrichthyans), and the implications for marine ecosystems. ICES Journal of Marine Science 57: 476-494.

[15] 鲨鱼养护及管理国际行动计划

[16] 中国鲨鱼产业报告（China Sharks Industry Report），中国水产流通与加工协会组编，中国农业出版社，北京，2013.4

[17] Swamy K. Shark fisheries in Fiji: their management and issues forfuture concern. IN FAO. Case studies of the management of Elasmobranch fisheries. FAO Fisheries Technical Paper, No. 378, part 1. Food and Agriculture Organization of the United Nations, Rome, Italy; 1999.

[18] Bailey K, Williams PG, Itano D. By-catch and discards in western pacific tuna fisheries: a review of SPC data holdings and literature. Oceanic Fisheries Technical Paper no. 341. South Pacific Commission, Noumean, New Caledonia; 1996.

[19], sometimes may be as high as 50%[20]. The blue shark is the major bycatch species.

1. China's regulations and practice in shark protection

China's efforts in shark protection mainly focus on two aspects, the management in fishing and the management in trade. China's catches of shark mainly from bycatch, especially the bycatch in tuna fisheries. In the tuna fisheries in Indian Ocean, the major shark bycatch species used to be blue shark, shortfin mako and cceanic whitetip shark. Due to the IOTC resolution 13/06, CPCs shall prohibit to retain onboard, tranship, land or store any part or whole carcass of oceanic whitetip sharks[21]. The Chinese tuna vessels have release oceanic whitetip shark after catch. The annual total amount of shark bycatch ranged from 100mt to 400mt from the year 2007-2012. The shark bycatch ratio was less than 10%, with the lowest of 1.3% in 2007.

Table 1: china's shark bycatch in indian tuna fishery (unit: mt)

| Year | Blue Shark | Shirtfin Mako | Oceanic Whitetip | Tuna in total | Shark Bycatch Percentage |
|---|---|---|---|---|---|
| 2007 | 112 | 34.7 | N/A | 10558 | 1.3% |
| 2008 | 341.2 | 64.9 | N/A | 6437 | 5.6% |
| 2009 | 241 | 75.3 | 55.8 | 3744 | 9.0% |
| 2010 | 102 | 122.8 | 160 | 7435.2 | 4.9% |
| 2011 | 34 | 35.4 | 34 | 2006 | 4.9% |
| 2012 | 66 | 72.9 | 7.7 | 4982 | 2.8% |

Data source：China's National Reports to the Scientific Committee of the Indian Ocean Tuna Commission, 2008-2013

[19] Heberer CF, McCoy MA. Overview of pacific fishing agencies and institutions collecting shark catch data. Honolulu: Western Pacific Regional Fishery Management Council; 1997.
[20] Ito R, Machado W. Annual report of the Hawaii-based longline fishery for 1998. Administrative Report H-99-06. US National Marine Fisheries Service Southwest Fisheries Science Center, Honolulu, HI, USA; 1999.
[21] IOTC resolution 13/06 on a scientific and management framework on the conservation of sharks species caught in association with IOTC managed fisheries,

China's management of wild living resource, including the management of fisheries resources such as shark adheres to the principle of sustainable utilization and conservation. To response to FAO's IPOA-shark, China has made multiple efforts in enhancing the surveillance and monitoring or shark related fishery.

1.1 comply with the CMM of RFMOs

Since tuna RFMOs passed the CMM to reduce shark bycatch, China has conducted a positive collaboration and cooperation in the management of tuna bycatch. The main regulations and practices are as follows:

1.1.1 mandatory installment of VMS in distant water vessels with shark bycatch

In 2012, Office of the Ministry of Agriculture has formulated the "Interim Measures for the management of distant water fishing vessel position detection" (Agriculture Office fishery 2012 [4]), requires all vessels engaged in the production of distant water fishing to install VMS, and the provincial fishery offices are responsible for the regular monitoring of the vessel positions. Vessels operating in the Indian ocean have to report their position every 4 hours, with information of vessel names, geographic location (latitude and longitude), and the time and date of being at that position. Ministry of Agriculture has a dynamic status monitoring and annual review of the implementation. Vessels lack of VMS are not allowed to have DWF, and can't get the permission from MOA.

1.1.2 vessels are required to record the fishing activities and catches in the logbook

According to "Office of the Ministry of Agriculture on the notice of regulating tuna fishing logbook" (Agriculture Office fishery [2008] No. 44), all vessels engaged in tuna longline fishing are required to fill in the "fishing logbook," send the fishing logbook (with specified name, boat number and name of owned enterprise) to the tuna technology group at Shanghai Ocean University via mail

or email before March 31 next year. The tuna technology group is responsible for the summary and analyse of the statistical data, and draw an annual report to Bureau of Fisheries MOA before May 31. The captain of each fishing vessel is responsible for the filling of the logbook which should be signed with his name. Also in the notice "on strict compliance with international management measures for tuna" (Agriculture Office fishery [2013] No. 21) clearly states, "In the fishing logbook, the species and quantity of shark bycatch should be accurately recorded."

1.1.3 Observers being sent to fishing boats to record and report the fishing activities

In the notice "on strengthening the management of ocean fisheries observers" (Agriculture Office fishery [2010] No. 123), the qualification of national observers are clearly stated as follows: with the bachelor or equivalent degree on the majors of fishery resources, marine fishery science or marine biology, or relevant specialized knowledge and experiences; with the capability of scientific research and English skills, good health, generally no older than 40, being able to adapt to the work on sea. The MOA Ocean Fisheries Training Center is responsible for the training of the observer candidates. Only those candidates who pass the exams will be selected to the observer talent pool for future assignment. Meanwhile, employers of the observers are responsible for the daily management and contact of the observers, as well as provide assistance to observers for the data collection, collation, summary and analysis. At the same time, fishing vessels with observers have the responsibility to facilitate the work of observers on board.

1.1.4 shark finning is strictly prohibited, also fin weight does not exceed 5% of the total weight.

In the notice "on strict compliance with international management measures for tuna" (Agriculture Office fishery [2013] No. 21), special provisions of shark bycatch has been made in section 9. In addition to prohibited species, the tuna

fishing should make full use of the captured sharks. shark fin weight retained on board must not exceed 5% by weight of shark bodies until fishing boats to reach the first port of discharge." Meanwhile, in the Indian Ocean, it is not allowed to retained, transship and unload the Bigeye tresher (*Alopias superciliosus*).

1.1.5 reported regularly to the FAO and RFMOs shark bycatch data

China started to report shark bycatch data sine 2007 to IOTC.

Chinese fishing boats in the WCPFC has received boarding and inspection from the United States, New Zealand and other countries for more than 40 times. There was only one case of violation for the regulation of no-discard of shark body after finning in Novermber 2012. The ship has received punishment (cancellation of fishing permit for six months, registered in the WCPFC, back to the home port for further investigation) [22].

1.2 Active participation in the reseach and study of sharks biology and life history characteristics

China has adopted a positive attitude in the investigation shark resource. Institutes and laboratories such as the MOA Key Laboratory of East China Sea and offshore fishing resources development and utilization, the East China Sea Fisheries Research Institute of Chinese Academy of Fishery Science, the Key Laboratory of Sustainable Ocean Fishery Resources in Shanghai Ocean University, have conducted lots of relevant researches and studies with the financial support from the state and municipal city governments. Institutes and scholars have a long time research on the age and growth, biology, shark population, distribution, habitat and fecundity, either through samples collected by fishermen and observors, or by personal participation in resource surveys to collect shark biology and ecology data, especially the species like the blue shark（*Prionace glauca*）， the crocodile shark（*Pseudocarcharias kamoharai*）.

1.3 Trade restrictions

[22] 中国鲨鱼产业报告

According to the notice from the ministry of Forestry, all the non-Chinese origin species listed on the Appendixes I and Appendix II of "Convention on International Trade in Endangered Species of Wild Fauna and Flora" (CITES) are approved as the national protect wildlife[23]. Therefore, the 8 species of sharks listed in CITES Appendix II are protected as the national key protected wild animals.

According to China's "Aquatic Wildlife Conservation implementing regulations," except for the need for resource surveys and scientific research, capture and killing the above mentioned shark species are strictly prohibited. For the shark bycatch during fishing operations, it should be immediately and unconditionally released. Shark and related products are not allowed to sale and purchase. Otherwise, not only the catch, but also the gears and other catches will be taken away. A fine of 10 times of the profit will be charged or even resort to prosecution[24].

The Ministry of Agriculture, the State Administration for Industry and Commerce, General Administration of Customs, Ministry of Public Security jointly issued a notice "on the operation to crack down on illegal capture and use of aquatic wildlife behavior emergency notice" in 2011 to strengthen the protection of aquatic wildlife, and to crack down illegal capture and business use of aquatic wildlife, including sharks.

In addition to these governmental regulatory provisions, China Aquatic Products Processing and Marketing Alliance has operated in the form of non-profit community organizations on shark trade management. To adhere to the principle of sustainable development of shark resources, CAPPMA encourages enterprises to increase investment in technology to further intensify efforts to develop processed products, to improve the utilization of sharks. And this organization has strived to establish a shark products traceability system, to

[23] 《林业部关于核准部分濒危野生动物为国家重点保护野生动物的通知》，1993 年 4 月 14 日，林护通字〔1993〕48 号，http://www.arq.gov.cn/Article/flfg/jjf/nlzrzyhjbh/200701/8163.html， accessed 2014/10/4

[24] 水生野生动物保护实施条例(农业部令第 1 号)（2013 年修正本）根据 2013 年《国务院关于修改部分行政法规的决定》(国务院令第 645 号)进行修正

strengthen investigation and research of fishing, processing, production, trade and utilization of shark populations, and to enhance effective protection of the sustainable use of sharks.

For example, Zhejiang Puqi was once China's largest shark processing place. In the 1990s, 90% of shark products in the domestic shark market were handled and processed there. But now the scale of shark processing companies has shrink to 3 from more than 20. Moreover, with the help of research institutions, the utilization of shark is more than 90%, with products such as shark cartilage capsules, shark powder, shark meat, dried fish floss and fish feed etc.

1.4 public advocacy of shark protection

On the one hand, the Ministry of Agriculture provides training courses for fishermen about international and domestic fisheries laws and regulations, prohibited shark species, and the identification of different shark species. Meanwhile, every fishing boat has a picture of the prohibited sharks species for further detection and distinguish.

On the other hand, sport and entertainment stars are invited to advocate on shark conservation. One of the campaign is called "protection of sharks, refusing to eat shark fin", which has received the support of hundreds of entrepreneurs. The Executive Chairman of China's largest online trading company Alibaba, Jack Ma said he hadn't eat shark fin for 2 years, and revealed that Alibaba has closed part of the shark fin trade. The State Council also acknowledged that in three years there would be prohibits on the consumption of shark fin at official banquets.

2. Discussion

Currently in shark conservation and management there still exist the following problems: 1. the difficulties in identifying shark species (especially when sharks are headed, gutted or finned at sea); 2. For lack of some basic data, such as fishing effort, catch, species for stock assessment, sex, length and age of fish catches; 3. in international waters, the responsibility populations of

resources is not clear, on straddling fish gather information without the cooperation mechanisms. These are the same problems faced by China in shark management.

Because sharks are migratory fish stocks, and natural populations of some shark species are in small quantities[25]. Therefore, it is difficult to assess its stock population. In the case of lack of sufficient scientific data, the precautionary approach should be adopted in the protection and conservation of shark resources.

Although there are 8 shark species listed on CITES Appendix II, but there are still 2 problems during implementation: 1. the decision-making mechanism of CITES is agreed by two-thirds majority. But the specific implementation is depended on national laws and measures, which may take several months or even longer time; 2. it is difficult to identify the class on shark products in international trade. Therefore, in addition to list shark species into CITES Appendix, FAO and RFMOs should assume greater responsibility in the conservation of shark resources.

For China, to minimize shark bycatch is the responsibility and obligation of China as a CPC. Therefore, firstly, a National Shark Conservation Action Plan for China should be developed as soon as possible. At present, domestic laws for shark management include "Fisheries Law," "Wildlife Conservation Law," "Marine Environmental Protection Law" and other terms related to sharks. But the provisions and terms are usually dispersed. So specific laws and regulations should be implemented to regulate shark-fishing activities. China can also learn from international experience to improve shark conservation legislation.

Second, improve shark catch data reporting system, and establish fin database. Currently China's shark statistics are mainly reported as tuna shark bycatch. Because of insufficient education, fishermen may have problem in the identification of shark species. Moreover, lack of tools to identify sharks and

[25] 粮农组织海洋资源处，渔业管理：1. 鲨鱼的养护与管理，粮农组织负责任渔业技术准则，第四号增补。罗马，粮农组织，2001：54pp
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lack of fish scientists and researchers also result in poor reliability of shark data. Therefore, in addition to strengthening propaganda of shark information to fishermen, a simple and easy identification system should be designed to record the shark catch and other relevant data. The establishment of a database for shark fin is also recommended to provide reliable methods for the identidication of shark species[26].

Third, proper control of shark fin trade. China is not a important shark fishing nation, but an important importer of shark fins. Therefore, china should regulate shark fin trade activities for the purpose of shark protection. Currently in Hong Kong China, there is a testing for shark DNA to confirm whether the species belongs to illegal fishing. In this regard, the mainland could borrow the method.

Fourth, actively strengthen publicity and encourage the whole society to foster awareness of the marine ecosystem, to reduce the consumption of shark fins, shark meat and shark leather products. Vigorously promote aquatic wildlife protection laws and regulations, and promote the popularity of aquatic wildlife conservation science knowledge.

In addition, it should be encouraged to strengthen cooperation with the international shark conservation agencies and organizations, such as the IUCN, and PEW, from which China may have some new ways and methods for the protection of shark species.

In conclusion, China has made great effort on the mitigation of shark bycatch in the tuna fishery not only in the fishing stage and in the trade stage. But there is more to do and work on a better ecosystem.

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[26] 中国鲨鱼报告白皮书