

DEPENDENCY OF ARTISANAL FISHERS ON SHARKS AND RAYS IN SABAH, MALAYSIA

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ABSTRACT

This paper aimed to understand the dependencies and to provide are socioeconomic status of the artisanal shark and ray fishers in Sabah, Malaysia. Sharks are particularly vulnerable to over-exploitation due to their biological characteristics of late maturity, having few young and some species being long-lived. Worldwide, shark populations are in the decline due to unregulated fishing, much of it to meet the high demand for fins, meat and cartilage. Many countries have asked for actions to be taken to stop the decline in shark populations and to help ensure that the list of species threatened by overfishing does not continue to grow. Although the potential for overexploitation of shark and ray stocks is high but catches of sharks and rays may be critical to the economic viability and the socioeconomic welfare of the fisher communities. In Malaysia sharks and rays are mostly caught bycatch in many fishing gears. The socioeconomic details of the fishers were unknown, but it was believe that artisanal fishers relied on sharks and rays caught as additional income and some fishers catch common ray species for local consumption. Accordingly, Malaysia government engaged the collaborative research and it are urgently needed research for Malaysia to get more information because any management decisions could have a major effect on theseartisanal fishers. A case study is undertaken in the districts of Sandakan and Semporna, Sabah, Malaysia, to identify the potential economic and social impacts of the restrictions on shark and ray catching on fishers and their households.

Keyword: Socioeconomic; Dependency; Artisanal Fishers; Shark and Ray Fishers; Livelihood



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INTRODUCTION

Sharks are particularly vulnerable to over-exploitation due to their biological characteristics of late maturity, having few young and some species being long-lived. Worldwide, shark populations are in the decline due to unregulated fishing, much of it to meet the high demand for fins, meat and cartilage. The increase in catches of shark and rays in the Asian region is attributed largely to the increasing demand for shark fins and manta rays gill rakers.

Nevertheless many countries have asked for actions to be taken to stop the decline in sharks and rays populations and to help ensure that the list of species threatened by overfishing does not continue to grow. In Malaysia, that was the main consent on catch of sharks and rays which is considered as important species, especially in East Malaysia (Sabah, Sarawak and Labuan) due to stock availability and accessibility. Malaysia has identified a number of species of sharks and rays that are banned for export (zero quota); however, the recent proposal for the total banning on catching of sharks and ray is based on the argument related to the possible impact on the tourism industry rather than on the potential impacts on the livelihood of the small fishers whose catches of shark and rays are by accident (bycatch) only. Although the potential for overexploitation of shark and ray stocks is high but catches of sharks and rays may be critical to the economic viability and the socio-economic welfare of the fisher communities (Simon *et al.*, 2008). However actual practices in Malaysia sharks and rays are mostly caught bycatch in many fishing gears such as trawlers and drift nets. Some fishers catch common ray species for local consumption and specific management of these resources poses a very challenging task. Nonetheless the sharks sector is contributing significantly to the livelihood of the small fisher communities especially in Sabah.

Looking forward to Malaysia landing trends of sharks and rays are not targeted but mostly are caught together with other commercially important species when that landings of sharks and rays contribute only a minor portion of around 0.39% (6,067 mt for sharks) and 0.78% (12,281 mt for rays) to the total landing of marine fisheries with total contribution is 1.17% (DoFM, 2017 in press). Landing of rays are higher off Peninsular Malaysia than Sabah, however landing of sharks are higher in Sarawak than Sabah. The contribution of sharks and rays landing in Sabah specifically is still relatively small with landing between 0.09% and 0.16% respectively compare to the total marine fisheries landing. It has been estimated that the annual landings of sharks and rays from Sabah, in general, do not exceed 2% of the total marine landing rate of Malaysia (DoFM, in press 2016). Moreover the last two years from 2015 and 2016 the landing data are decreasing from 18.92% and 31.69% due to awareness among fishers and knowledge of rule and regulation sharing between government fishers. In addition the average annual growth rate of elasmobranchs from 2000-2016 are about declining 4.77%, (Annex 1) this shown that the average sharks contribution in Malaysia to the total landing of marine fishers is small.

According to Ahmad *et al.* (2014) there are at least 63 species of sharks and 82 species of stingrays in Malaysia waters and Malaysia is listed in the third position in the Southeast Asian region. However, the landing data and trade of sharks and stingrays for Malaysia are not recorded up to species level but the landing data of shark and string rays are recorded in two groups 'shark' and 'ray'.

In Asia sharks are fully utilized as in Malaysia sharks where meat shark is widely consumed, and in most states, sharks are used in downstream processing activities. Interestingly, shark meat is consumed as a traditional food by a small community in the eastern part of Sabah. Malaysia consumes almost all parts of sharks such as, meat (wet or salted and dried), fins, cartilage, skin, teeth, jaw and etc. All of these parts have market and added values for higher price.

For highlight the issues this study prepared to examine the fishers dependency on shark and ray resources in Sandakan and Semporna, Sabah with specifically this study will embark on the impacts of shark and ray fishing on socio-culture economy and livelihoods of fishers.

The socioeconomic details of the fishers were unknown, but it was believe that artisanal fishers relied on sharks and rays caught as additional income and some fishers catch common ray species for

local consumption. Accordingly, Malaysia government engaged the collaborative research and it are urgently needed research for Malaysia to get more information because any management decisions could have a major effect on these artisanal fishers. A case study is undertaken in the districts of Sandakan and Semporna, Sabah, Malaysia, to identify the potential economic and social impacts of the restrictions on sharks and rays catching on fishers and their households.

MATERIALS AND METHODS

The activities were started with the preliminary visits to introduce the project to the stakeholders and obtain some background information on study locations required for future research activities. Instrument approach such as Key Informant Surveys (KIS) and Focus Group Discussion (FGD) were also conducted for the participants consisted of related government agencies, local community and fishers at selected fishing villages in Semporna and Sandakan, sharks and rays intermediaries and the Semporna Fisherman Association. During the KIS, the research team managed to compile several issues relating to the practices in sharks and rays catching, market demand and market flows of sharks and rays in Sabah. The researchers also managed to solicit information on the general concerns of the participants on the ways that total ban on shark catching will affect the incomes and livelihoods of some fisher communities. Other important information gathered included the seasonal fishing calendars and harvest levels in general. All the information gathered were used to further refine the questionnaire.

In additional, FGD was conducted using simple structural questions for three different stakeholders such as fishers, NGO's or tourism agencies and market intermediaries. These activities helped to gather information on fishing practices, gear used, fishers livelihood, assets, and their institutional arrangements. Twelve FGD's and five discussions were done to gather stakeholders insights and information on the sharks and rays related issues. From this activities researchers discovered that a smaller proportion of the sharks and rays landed were caught by artisanal fishers compared to trawlers; and there were also misunderstanding issues due to conflicts of interests on the usage of the shark and ray resources.

Before the survey activities, a pilot survey was conducted in Semporna to pre-test the questionnaire as there were specific issues and language barriers at the location. Improvements of the questionnaires were carried based on the feedback from this activity. Pre-test sessions were also conducted to train the enumerators who were members of the local community on the interviewing techniques.

Last but not least activities conducted was survey in two contiguous districts in Sabah with 17 jetties in Sandakan and 11 jetties in Semporna. The data were obtained through the face-to-face interviews of fishers using structured questionnaires. The development of the questionnaire consisted of several stages. It was began by constructing the draft questionnaire based on the objectives of the study. The researchers conducted several focus group discussions (FGD) and key informant surveys (KIS) to improve and validate the questionnaire, to improve the design of the survey and to also gather other pertinent information related to this study. This activity also was conduct to gather stakeholders' insights and information on the shark and ray related issues.

The sampling was selected using the judgmental method from local information and statistics data on the sharks and rays fishers using various types of gears. The sample sites also chosen by internal data regard to sharks and rays landing for selected jetties where most of the sharks and rays were landed. The total sample size in this study included 151 respondents (94 fishers; 62% sample in Sandakan and 57 fishers; 38% sample in Semporna).

RESULTS AND DISCUSSION

Results

Socio Demography of Fishers

Descriptive analysis of the data is carried out to determine the fishers dependency on shark and ray resources in Sandakan and Semporna, Sabah with specifically to embark on the impacts of sharks



and raysfishing on socio-culture economy and livelihoods of fishers. This result also determined the perception on rule and regulation of sharks and sting-rays among the fishers.

Fishers are represented by 127 (84%) boat owners and 24 (15.8%) were the captains or crews in boats or vessels. Usually fisher boats in Semporna usually have between four to five crews in one boat. The average age of fishers in Sabah is 48 years old and about 64% of the fishers are belong to the age category of above 45 years which may imply that the younger generation may be less interested in making fishing as their livelihood. This finding is in line with the national statistics which indicate that the average age of Malaysian fishers is increasing over the years; this may have relevant implication on the future workforce in the fishing industry.

In terms of race in Sabah, the majority of the ethnics are Bajau (47%); this is reflective as 93% of the Semporna fisher are of the Bajau ethnic and Sandakan was represented by the Brunei ethnic group forming about 40.43%. Other ethnics included in the category are Bugis, Butun, Ikaan, Suluk and Tidong ethnics with represent by 14.57%. In additional Eastern Borneo (East Malaysia) they have the Sama Dilaut or Sama of the Sea (more often known as Bajau or Bajau Laut) as one of ethnic groups, they also named as Pelau' (sea gipsies). Both sharks (bambooshark) and rays (kiampau) contribute a large proportion of the income of Pelau' (sea gipsies) in Sabah. The variable on the educational attainment is an important factor when analyzing the household's welfare status. The sample reveals that most of fishers have finished their schooling, at least at the primary or religious or non-formal school levels with 51.66% and 29.80% of them was finished high school levels or certificate or Diploma. Smaller percentages with 18.54% of fishers had no education. This condition is expected especially in the rural areas and when the population is made up of mostly older fishers; they don't have proper school system during their younger days. Nevertheless, the result indicates that fishers generally have a basic education level.

Among the total sampled fishers, the average years of experience in the fishing activities is about 19 years; those in Sandakan have 17 years while those in Semporna have 21 years. Semporna is being relatively more rural than Sandakan and more of the inhabitants live on the islands, it is expected that the community to be involved in the fishing activities much longer since fishing is a primary activity for the coastal communities. Majority of the fishers are having at least 10 years to 29 years of experience with 81.33% of the total fishers. The average of household family size for total sample in Sabah is around seven members with average size of six members in Sandakan and eight members in Semporna. This information is an important indicator to explain the characteristics of total household income and their standard of living. Naturally, larger households would theoretically have higher expenditure requirements.

The majority of the fishers in both districts uses out-board powered engines as indicated by 95% and 98% of the sample in Sandakan and Semporna respectively; the rest of the fishers is using inboard powered engines. Most of the boats, locally called sampan, are made from wood or fiber glass. However, fiber glass boats are common in the artisanal fishing community which is suitable for operating within inshore waters. The majority of fishers invest in fishing equipment is using their own saving as indicated by 67.58%. Other than this source of capital, fishers depend on government subsidies as shown by 18.68% and loan by 13.74%. In most cases the subsidies are received from government programs for boats, nets or engines. Most fishers in Mabul Island using 'Jongkong' a tuna longline boat buy the boat from Tawau and modify the boat for long distance fishing trip with three to four persons in boat. Fishers in this island depend on the tuna catch activities as their main income. During the off tuna season, the fishers in Semporna use the same tuna longlines and drift net depending on the fishing session or monsoon period.

For marketing information majority of artisanal fishers catch sharks and rays by-catch only; each catch fetches different price depending on species, size, demand and total catch from all fishers for the day. Normally if each fishers catch is small, the fisher will use for own consumption. Although there are various ray species that are highly demanded and will fetch very high price, artisanal fishers may not catch them because the species are not targeted for; if caught it is by chance.



Fishers actually catch variety species depend on the fish resources at fishing ground location, however in Semporna some fishers often caught tuna and sharks (bycatch) due to gear types used and fishing ground during the operation. As mention no specific location for shark fishing as sharks always moving with the current and for rays they with catch during north season, however rays is difficult to caught and there have no demand for rays in Semporna like at Kota Kinabalu market.

Table 1 showed the landing of sharks and rays by quantity and value according to districts. For sharks and rays the total catch per trip is around 67kg or value of RM311 per trip compared to total landing of rays with only 48kg or value of RM275 per trip. Total catch of rays in Sandakan is higher with 54kg (value of RM315) compared to 28kg (value of RM147) for Semporna. The data show that the landing of sharks in Semporna is more compared to Sandakan primarily because in Semporna sharks are caught as bycatch during the off tuna season which lasts for three to four months a year. Only 10 fishers are involved in tuna fishing during off tuna season. Most fishers prefer to catch tuna compared to sharks because tuna fetch very high price compared to sharks.

Table 1: Data of Fishers Catch Quantity and Value by Districts, Sabah, Malaysia (kg and RM)

Detail	Statistic	Sharks			Rays		
		Sandakan	Semporna	Sabah	Sandakan	Semporna	Sabah
Total Catch per trip (kg)	Mean	26.03	*199.00	67.21	54.58	27.86	48.24
	N	32	10	42	45	14	59
	Std. Dev.	70.107	187.569	130.380	152.404	24.089	133.724
Total Catch per trip (RM)	Mean	126.00	**849.85	311.60	315.88	147.07	275.13
	N	29	10	39	44	14	58
	Std. Dev.	371.451	****880.493	622.745	***960.998	138.612	840.464

Note: * In case of Semporna, the average catch is 199kg per trip for a five day trips. The average catch is about five fish per trip. Each fish weighs about 35kg normally for a big sized requiem sharks such as *Carcharhinus orrorah*, *Carcharhinus amblyrhynchos*, *Carcharhinus plumbeus* and *Sphyrna lewini*.

****** Price for meat (RM4.50 per kg) excludes fins (sold separately according to the sizes of fins). The prices of fins (dorsal and pectoral) vary from RM120 (38cm long), RM150 (41cm), RM200 (43cm), RM220 (46 cm), RM250 (48cm) and RM300 (51cm). For detail information refer to report by Fatimah *et al.* 2017.

******* The high std. dev. of RM961 is due to the higher catch of rays recorded in Sandakan of about RM6,000 (1,000kg) per trip by a longline fisher during peak season.

******** The high Std. Dev. of RM880 is due to the higher price of big sized fins of sharks amounting to RM1,000 by a longline fisher during off tuna season.

Figure 1 describes the fishing income contribution from sharks and rays landing with majority represented by less than 10% with 72% (109 fishers) and only 9% (13 fishers) contributed income higher at more than 50%. The high contribution represents by off tuna seasons (around three to four month a year) fishers in Semporna and small fishers in Sandakan that was caught rays.

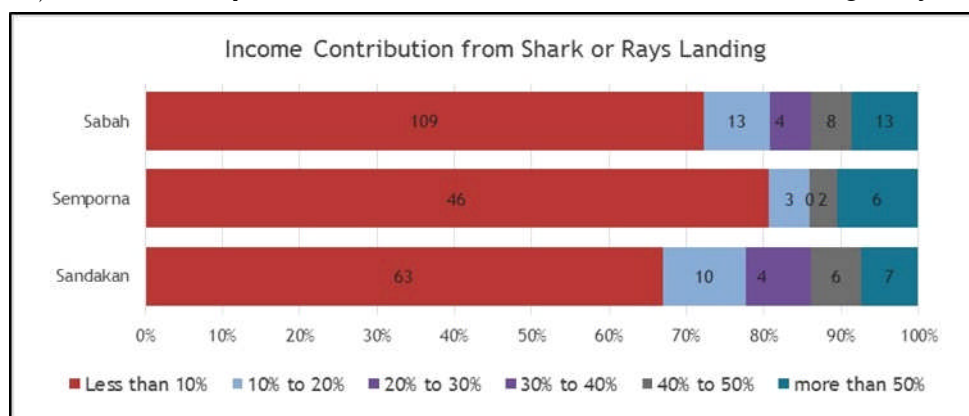


Figure 1. Percentage of Income Contribution from Sharks and Rays Landing.

Fishers Perception for Rule and Regulation of Sharks and Rays

Most species of sharks and rays are migratory. They migrate or straddle between marine protected areas (where ecotourism activities occur) and fishing grounds resulting in conflicts of interest between stakeholder groups e.g. between ecotourism groups and fishers. Collaborative efforts among

stakeholders and between states have been established that enhance usage of better technologies and knowledge for informed decision making.

In order to correct the misconception on shark finning and to address the issue on incidental catches of protected and endangered species, awareness programs on sharks and rays have been intensified. Figure 2 and Figure 3 reported most of the fishers around 65% didn't know about the awareness program for sharks and rays rule and regulation and mostly 68% of them didn't aware about the awareness program. However their have around 16% and 12% of fishers aware regarding to the protected species and no shark finning activities. Looking at the respond of the fishers on the impact of government implement total ban of catching sharks most of fishers mention they have an impact toward them indirectly such as income with 40% and small impact for legal pressure with 1%. However the others 59% of fishers didn't have any idea regard to this issues.

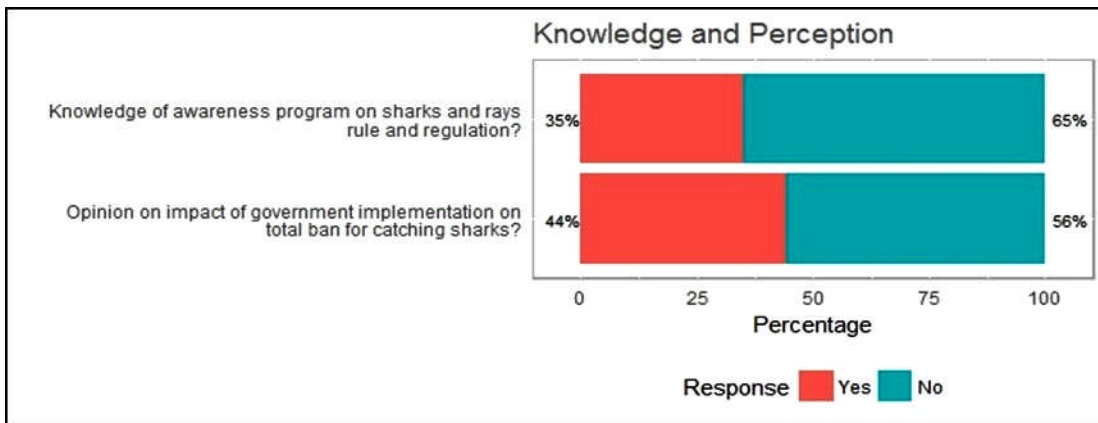


Figure 2. The Knowledge of Awareness and Opinion of Sharks and Rays Rule and Regulation in Malaysia.

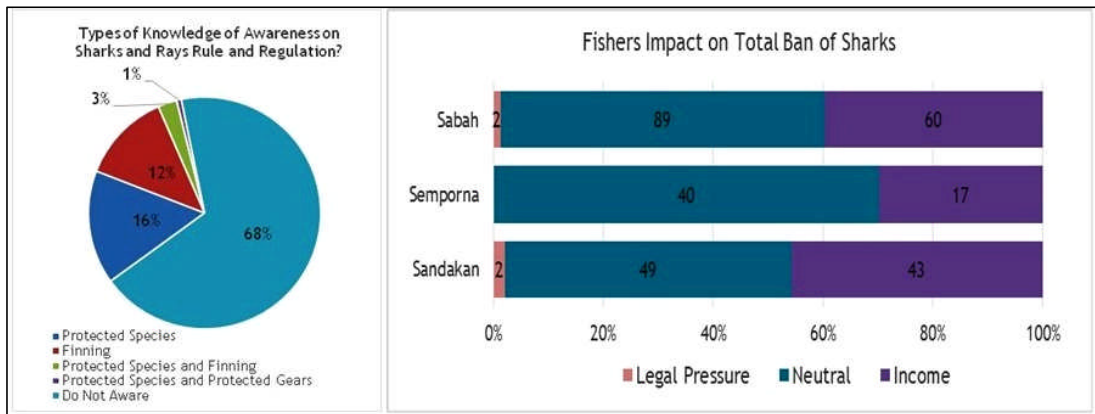


Figure 3. The Detail Knowledge of Awareness and Impact on Total Ban of Sharks in Malaysia.

In Malaysia and other tropical countries, sharks and rays are not targeted by fishers due to the multispecies nature of fish catches. In addition all parts of sharks such as the meat, liver and fins are fully utilized as food while the inedible parts such as the skin and teeth are used for ornamental products and souvenirs. Figure 4 showed the awareness and perception of some suggestion policies and program for sharks. Majority 68% weredisagreed total ban of sharks and 56% werenot aware or disagreed for awareness program on Sharks. However fishers agreed if only total ban implement for endangered species of sharks.

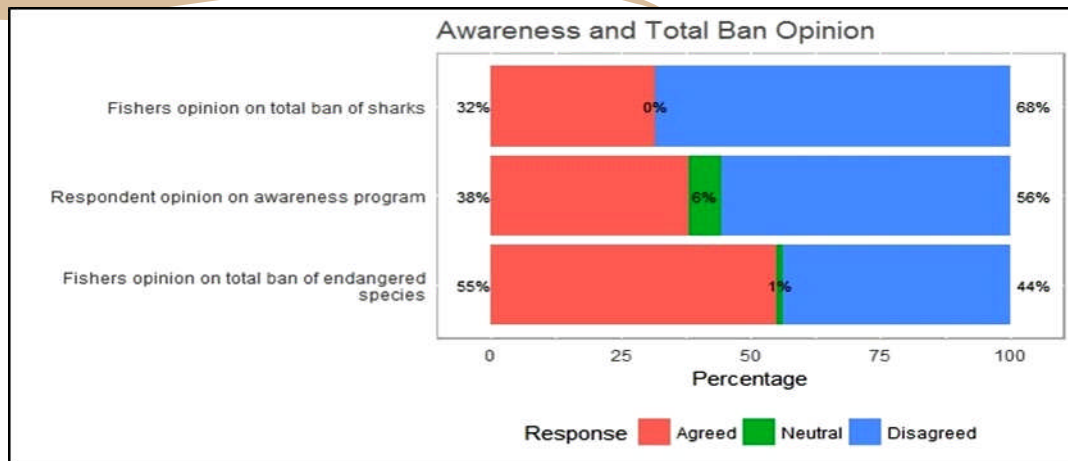


Figure 4. Fishers Responds for Awareness Program and Sharks Ban in Malaysia.

Discussion

Research on marine conservation that reveals the implications on the socioeconomics of the fishery communities involved in sharks and rays fishing are imperative in the formulation of policies related to the management of the shark and ray resources. For example, data on the dependency of the fishers on sharks and rays catching for their livelihood must be taken into account in the preparation of the management policies so that the implementation of the policies can be effective and relevant. Nonetheless, in cases where fishers do not have other choices, for instance among fishers who catch tuna, during the off-tuna seasons, fishers will continue to do their fishing activities and may catch sharks and rays even if their actions violate the management provisions. Thus, if the policies do not have discretionary provision or flexibility and strictly implemented, it will cause losses in income of the fishers. Then alternative sources of income for the fishers must be made available and some form of compensation to cover for the losses in income must be given.

It has been reported that sharks and rays account for a minor component of fishers total catch, so it is likely that the impact of sharks and rays catching will not be large on the profitability of individual boat owners and the household income of fishers; nonetheless, a ban on catching will have a substantial reduction in the revenue of the small fishers since a catch of a shark or ray mean a lumpsum income for the day to a small fisher. Furthermore since the sharks and rays that are caught normally form a small portion of total catch, downstream activities such as processing of the shark and ray parts are carried out to reduce further losses and to cover costs. Sabah is considered as a major producer of sharks and rays in Malaysia, however studies that emphasize on dependency of traditional fishers on the species are lacking.

The fishing sector in Semporna is characterized mainly by artisanal fishers or longlines tuna fishers who fish in specific locations. During the off-tuna season the longlines fishers may catch sharks at the other tuna fishing locations; this situation may have caused misunderstanding among the tourism industry people when divers/tourists say that fishers are slaughtering sharks when actually the fishers do the processing of the fishes at their house.

This misunderstood situation had created concerns about sharks and the effects on the tourism business to the extent that dive operators and conservationists formed an alliance and convinced the state government of thru Sabah Minister of Culture, Environment and Tourism to enforced total ban of shark catching in Sabah. This suggestion was not implementable because all laws related to marine fishers belong to federal government. Furthermore the Federal government has formulated National Plan of Action 2 (NPOA 2) for conservation and management of sharks and rays in Malaysia and the present study emphasizes the needs to study the impact on the livelihood of the small fishers.

CONCLUSION

Fieldwork was done in fishing communities in Sandakan and Semporna districts, Sabah, where people in fishing communities were interviewed about their livelihood situation and their perception towards the proposed total ban on shark fishing. The study has found that the shark and ray catching has implication on the economic situation of traditional fishers in the sense that the bycatch sharks and rays add to their meagre income from fishing of the other species. Many of the small fishers are neutral towards complying with the shark and ray conservation efforts. Furthermore some fishers consider shark and ray catches are not profitable economic alternatives compared to other fish species due to the banning on using of shark longline and large sized gill nets by the government.

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Any suggestion to totally ban the catching of sharks in Sabah must be further evaluated on a bigger sample to determine the effects on the socio-economic livelihoods of the small fishers since the incomes of the small fishers are supplemented by the sales of sharks. Among the traditional fisher community, shark and ray is a relatively small component of total catch. However 59.8% of the fishers consider sharks and 55.2% of them consider rays as one of their main sources of food. That was a proven that the small fishers do not do finning of the sharks and rays; proper communication and information should be relayed to the relevant agencies to avoid misunderstanding when fishers do catch sharks and rays.

Market demand for the shark and ray products do induce the small fishers to continue catching the resources; thus utilization and market traceability of the downstream products of sharks and rays must be monitored and managed to identify inclusion of endangered species. The framework for establishing and coordinating effective consultation involving stakeholders in research, management and educational initiatives within and between States must be developed. In ensuring that sharks and rays are conserved but at the same time all stakeholders in the fishery sector benefit, law and policy reforms are needed which should be supported by systematic and scientific research on biological, economic, social, cultural and environmental aspects.

Nevertheless, a proper management by the relevant government agencies on catching of shark by local is still needed to monitor the impacts on their livelihoods, to ensure that there is sustainable use and to avert overfishing of the resources.

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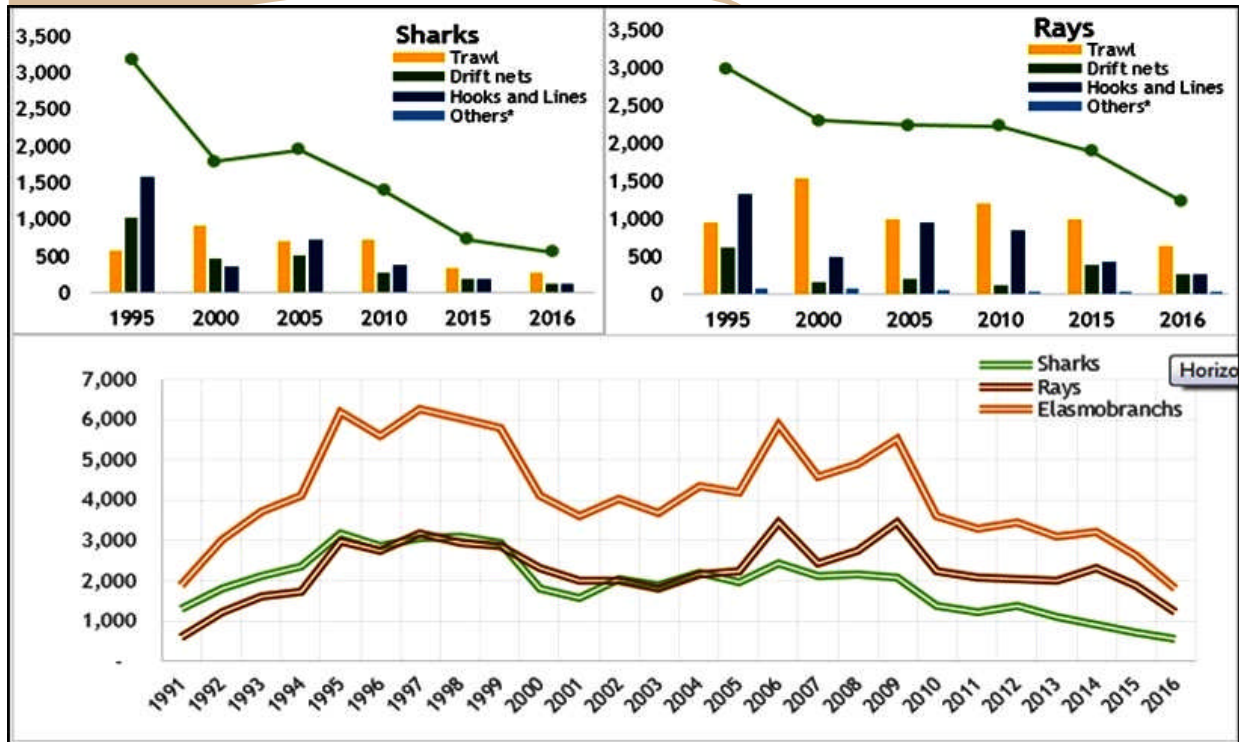


Figure annex 1. Trends of Landing of Sharks and Rays in Sabah, Malaysia, 1991-2016 (mt).

