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# OBSERVATIONS OF SHARK AND RAY PRODUCTS IN THE PROCESSING CENTRES OF BANGLADESH, TRADE IN CITES SPECIES AND CONSERVATION NEEDS

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## INTRODUCTION

**N**early 30% of all shark and ray species are now designated as Threatened or Near Threatened with extinction according to the *IUCN Red List of Threatened Species*. This is a partial understanding of the threat status as 47% of shark species have not yet been assessed owing to data deficiency (Camhi *et al.*, 2009; Bräutigam *et al.*, 2015; Dulvy *et al.*, 2014). Many species are vulnerable due to demand for their products and are particularly prone to unsustainable fishing practices (Schindler *et al.*, 2002; Clarke *et al.*, 2007; Dulvy *et al.*, 2008; Graham *et al.*, 2010; Morgan and Carlson, 2010).

Sharks are exploited primarily for their fins, meat, cartilage, liver oil and skin (Clarke, 2004), whereas rays are targeted for their meat, skin, gill rakers and livers. Most shark catch takes place in response to demand for the animals' fins, which command high prices (Jabado *et al.*, 2015). Shark fin soup is a delicacy in many Asian countries—predominantly China—and in many other countries (Clarke *et al.*, 2007). Apart from the fins being served in high-end restaurants, there is a demand for other products in different markets and by different consumer groups, and certain body parts are also used medicinally (Clarke *et al.*, 2007).

India was identified as the second-largest shark product producer in the world between 2000 and 2011 (Dent and Clarke, 2015). Although 11 species of sharks and 24 species of rays were recorded in the waters of the southeastern coast of Bangladesh in 2014 (Jit *et al.*, 2012), data on the trade in shark and ray products in Bangladesh and the associated trade dynamics are scarce and no overall species assessment has been carried out in the area to date. Little information on region-specific trade dynamics and product characterization is available, which is hindering sustainable management. Information is even more scarce in the Bay of Bengal region. As the most underrepresented marine group of species in the Bay of Bengal, elasmobranchs have yet to be recognised as a conservation priority; meanwhile, exploitation continues, largely unregulated and with few, if any management strategies in place.

Catching sharks and rays brings much needed extra income to the poor fishers in the region. During the course of an in-depth study by the authors on the trade dynamics and value-chain analysis of shark and ray products in Bangladesh, it was found that no part of the shark and ray is discarded during processing, with different body parts supplied to different consumer groups both nationally and overseas. One of the aims of this study was to record the products being processed in Bangladesh and their uses.

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◀ The skins of guitarfish, particularly Sharpnose Guitarfish *Glaucostegus granulatus*, being dried at Cox's Bazar, Bangladesh, where one of the principal shark processing centres in the country is located.

## BACKGROUND

At a meeting in 2010, the Bay of Bengal Large Marine Ecosystem (BOBLME) Sharks Working Group identified a lack of basic shark fishery catch and effort data as an issue across its member countries (Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand), noting in particular the lack of data and trained staff; absence of systematic monitoring and control of shark resources; lack of co-operation between stakeholders and government officials, and absence of a baseline assessment on the status of shark populations (Fischer *et al.*, 2012). It is reported that Bangladesh, India and Sri Lanka all lack species-level catch data for the shark and ray species listed in the Appendices of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) at the sixteenth meeting of the Conference of the Parties (Mundy-Taylor and Crook, 2013).

Bangladesh is still not on the global map as a big shark product producer and exporter. However, over the past decade, shark catch data for Bangladesh that has been recorded has shown fluctuations: from a total of 4085 t between 2004 and 2005, gradually declining to 3933 t in 2008–2009 and increasing again in 2013–2014 to 5648 t (FRSS, 2015). Bangladesh is not a very big consumer of shark and ray products and no fin soup is served in the country and yet between 2010 and 2014, no export data were recorded (Fig. 1), showing an anomaly in the trade records. Hence, a full analysis of COMTRADE trade data involving Bangladesh and world import data of shark products from Bangladesh is in progress.

This study was initiated in an attempt to understand both the dynamics and extent of the international and domestic markets for shark and ray species, and the range of products available. Traders and fishers were interviewed to identify the market chain and the position of Bangladesh as a producer in the global market. However, analysis of these data is not within the scope of this paper, which focuses on the data collected at the processing centres, and which aimed to fill some of the gaps of product identification, grading and the partial trade dynamics of Bangladesh. Visits to the landing and processing centres unveiled catches of species that are classified as Vulnerable, Endangered and Critically Endangered, some of which are listed in CITES, and the authors examined the regulations with the aim of determining which community-based measures might need to be adopted for the long-term conservation of these species in the Bay of Bengal region of Bangladesh.

## METHODS

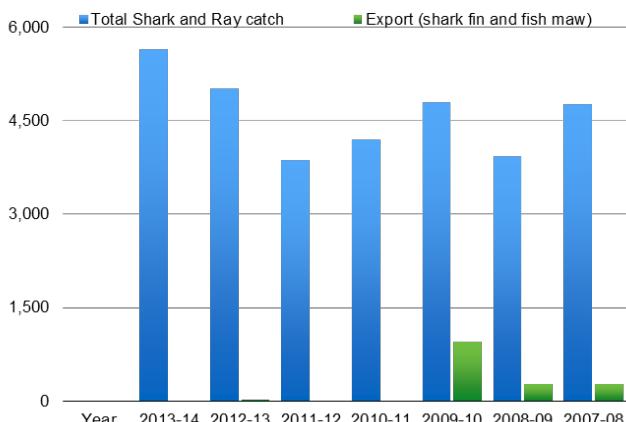
This study was conducted as part of a project undertaken in Bangladesh over a period of one and a half years, which aimed to document the value chain of the shark and ray products domestically and in the international black market. While the authors are working on a consumer behaviour analysis, this small study looked into the catch and

processing of shark and ray products in the Bay of Bengal region of Bangladesh between 2008 and 2014. Data were extracted from annual reports published by the Fisheries Resources Survey System of the Department of Fisheries, Ministry of Fisheries and Livestock (FRSS, 2015).

The products were identified through bi-monthly field visits carried out between June 2016 and March 2017 in Chittagong, Cox's Bazar, Teknaf, and St Martin's Island (South-eastern coast of Bangladesh), where the biggest shark processing centres in the study area are located. Teknaf is particularly important as shark and ray products are exported from there to Myanmar. The authors attempted to build trust with local fishers, shark traders, and processing centre workers to share data on trade and the processing methods of the different products. This was achieved through repeated visits to the processing centres. Traders and workers at the centres were interviewed through snow-ball sampling and through random opportunistic informal interviews with wholesale buyers. The processing of these products was documented through video documentation and photographs. Dried specimens that were difficult to identify were photographed and sent to experts for identification; those recorded before they were killed were identified using Compagno (1984) and Last *et al.*, (2016).

In order to document the availability of these products in the local markets, rapid market surveys were conducted in the study sites. Potential buyers and sellers or middlemen/collectors were asked about the type of products available, the prices in the local markets and their uses. Samples were taken of liver oil for further analysis and of some dried specimens, meat and skin that were difficult to identify, but no products were purchased during the study.

A rapid internet search was conducted to understand if there is a market for collectors of sawfish rostrum, guitarfish nose, skins or any other products as curios. This also aimed to identify any trader providing an online service to collectors for such products from Bangladesh.



**Fig. 1. Sharks caught and exported (in mt) in Bay of Bengal region, Bangladesh, 2008–2014.**

Source: FRSS, 2015. Data include fish maws (dried fish bladders) of shark species.

Processed products	Uses	Used by (L=local use; E=exported)	Size	Availability for local consumers
<b>SHARKS, GUITARFISH and SAWFISH</b>				
Fins	Food	Chinese and many European restaurants and as traditional Chinese delicacy: fin soup (E)	<5 cm: discarded • >5–6 cm: eligible for export	Not available
Fresh meat	Food	Tribal and non-Muslim groups of Bangladesh and international demand (L)	The greater the size, the more the price • Smaller species like Spadenose Shark and some Scalloped Hammerheads are priced lower • Larger species are rarely sold as fresh meat and are expensive	Less available; rarely sold by vendors
Dried meat	Food	Tribal people in Bangladesh (L); Chinese, Burmese and Thai people (E)	>60 cm (a variety of shark species)	Less available
Dried whole shark	Food	Tribal and non-Muslim groups of Bangladesh (L)	30–60 cm	Available
Skin	As leather to make accessories and shoes	100% exported to Myanmar (E) Some instances of exports to Thailand and China (E)	Smaller sharks are not eligible for the skin trade	Not available
Cartilage (vertebrae)	Traditional medicinal uses	Nomadic people in boats (L); Traditional medicine practitioners (L)	Available	Available
Teeth and jaws	Worn on the body	Villagers (L) Nomadic people in boats (L); Traditional medicine practitioners (L)	Available	Available
Fresh liver	Jewellery; curios	Tribal and non-Muslim groups in Cox's Bazar (L)	Rare	Not available
Liver oil	Food	Fish feed industry (L)	Not available	Not available
Intestines	Pharmaceuticals	Burmese people and rarely tribal people in Bangladesh (E/L)	Rare	Not available
Snout (guitarfish)	Food	Not known	The bigger the size the better	All
Rostrum (sawfish)	Curios	Local collectors and trawler owner (L)	Not available	Not available
Discarded species	Museum collections	Researchers or curators (L)	Not available	Not available
<b>RAYS</b>				
Fresh Meat	Food	Crocodile farms, sometimes as bait (L)	Mostly smaller specimens	Rare
Skin	Used as leather for accessories	Tribal and non-Muslim groups of Bangladesh (L) Wider European and Chinese audience accustomed to using luxury products (E)	The bigger the size the better	Not available
Dried meat	Food	Tribal and non-Muslim groups of Bangladesh (L)	All sizes	Available
Dried whole fish	Food	Burmese people (E)	Small	Available
Gill rakers	Chinese medicine Gill plate soup	Burmese people (L/E) Traditional medicine practitioners (E) Chinese restaurants (E)	All sizes	Not available
Tail	Decorative pieces or curios	Fishers and collectors (L)	All sizes	Not available

Table 1. Products being processed from sharks and rays caught in the Bay of Bengal, Bangladesh, and their uses.

**BOX: PROCESSING SHARK PRODUCTS**

No part of the shark or ray is discarded during processing; products comprise fresh and dried meat, skin, vertebrae, jaws, teeth, fins, dried whole fish, intestines, the rostrum of sawfish, liver and liver oil, and gill plates of mobulid rays. All products are exported, and many are also destined for the domestic market (fresh and dried meat, liver oil, bones, jaws, teeth, and intestines, for example).

The bodies of the sharks and rays are taken from the landing sites to the processing centres where they are cleaned in flowing water to remove any dirt and slime. In the case of sharks, experienced butchers remove the four fins after which the body is skinned (in the case of larger specimens) and gutted and the meat cut into manageable pieces. The vertebral column, jaws and sometimes the teeth are extracted and kept separately. The liver is removed and kept in a drum with other livers collected that day.

Both salted and unsalted meat are in demand. It is either salted and placed on thatched roofs to dry, and if international buyers are not readily available, the meat may sometimes be frozen. The intestines are cleaned and also dried. Smaller sharks (mostly Spadenose Shark *Scoliodon laticaudus* and smaller specimens of Spot-tail Shark *Carcharhinus sorrah* (<50 cm)) are slit from the gut and kept for drying. A similar process is used for rays: specimens are washed, skinned, gutted and the meat cut into manageable pieces. For mobulids, the gill rakers are carefully removed and stored. Each product has a different market, with an array of uses (Table I).



**Shark fins, the principal shark product exported from Bangladesh, hanging up to dry in Cox's Bazar.**



**Local men at Cox's Bazar cleaning shark vertebrae, which will be dried and sold to traditional medicine practitioners.**



**Fresh Spadenose Shark *Scoliodon laticaudus* in a mixed catch for sale at a local market in Teknaf.**



**Dried mobulid gill rakers, a newly emerging product in Bangladesh, being prepared for export, Cox's Bazar.**

## LEGISLATION

The two most important regulatory instruments to conserve wildlife and fish in Bangladesh are the *Protection and Conservation of Fish Act, 1950* and *Wildlife (Conservation and Security) Act, 2012*. Whereas the former has no provision for protecting sharks and rays, the latter protects 23 species of shark, guitarfish and sawfish under schedule I, and six species of rays under schedule II. However, this legislation is not implemented although, during the closed fishing season for Hilsha *Tenualosa ilisha* (a fishery employing 2.5 million people and constituting 11% of the total fish catch in Bangladesh) (Islam *et al.*, 2016), sharks are protected by default including in the sanctuaries of the Sundarbans Reserve Forest where bull sharks *Carcharhinus leucas* and the Gangetic River Shark *Glyptis gangeticus* occur. The undocumented international trade in some ray and shark species and the lack of monitoring is evidence that CITES-listed shark and ray species in Bangladesh are protected on paper only.

## RESULTS

### **Product identification and processing**

In Cox's Bazar and Teknaf, many processing centres were identified that have the capacity to turn over thousands of kilogrammes of sharks and rays a day year round except during the monsoon season (June–September). The authors observed that all parts of the shark and ray are processed to meet both domestic demand and international consumption. Products such as dried and fresh meat, skin, vertebrae, jaws, teeth, fins, dried whole fish, intestines, rostrum of sawfish, liver and liver oil, and gill plates of mobulid rays are processed and exported through a complicated market chain (Haque, unpubl. data). Fresh meat, dried meat, liver oil, bones, jaws, teeth, and intestines are also destined for domestic consumption.

### **Rapid market visits**

No shark and ray products were recorded in the local markets as it is taboo for Muslims to eat these products for religious reasons and Muslim shopkeepers are therefore unwilling to keep such items in their shops, with a very few exceptions. These products (dried small sharks, rays, rarely fresh meat or liver) are available to tribal people through selected vendors or, rarely, collected directly from the landing sites.

### **Survey of processing centres**

The processing centres are not very visible as the traders want to keep their businesses out of the sight of competitors and government officials. The authors had to build up trust with the owners of these centres before they were allowed entry. The surveying and documentation of items revealed an array of non-conventional body parts being processed (e.g. dried intestines, heads of hammerheads, vertebrae, jaws, teeth and snouts of

guitarfish) and conventional products (e.g. fins, dried meat, cartilage, liver, liver oil, fresh meat); there was no well-established system or hygienic method applied to the processing of these products (see Box).

Three factories processing and delivering shark and ray liver oil were also identified but the owners were unwilling to divulge any details of their operations to the authors. Many species of conservation concern were identified in the processing centres during the study period (Table 2). However, it was not possible to identify the species of all the specimens at the landing sites and processing centres as most had already been dried during the time of the survey. Hence, 250 samples of dried and fresh fin clips and some meat and skin were collected for analysis (Haque, in prep.). One of the traders shared a copy of his register which showed that he dealt in fresh and dried elasmobranchs, including dried skin (in particular guitarfish) (Table 3).

### **Internet survey**

A rapid internet search revealed interesting insights into the shark meat and liver oil trade in Bangladesh. While shark liver oil, cartilage and various curios are available on a number of online sites targeted at global consumers and collectors, it is unlikely that the fishers in Bangladesh have access to online business services; certainly the traders interviewed during the study period did not use online platforms to sell their products although this could not be confirmed. The authors believe that collectors or traders advertising such products do so opportunistically: registered export and import companies were found to be offering shark meat, fin, and skin online and two liver oil factories are also registered to deliver their products to the international market. The authenticity of the companies, their capacity to export or their previous trade records could not be checked. This area of trade should be explored in order to gain a more complete picture of the trade.

## DISCUSSION

### **Undocumented shark and ray fishery in Bangladesh**

So far it has been assumed that there is no targeted shark fishery in Bangladesh (Haroon, 2010). However, the authors observed and confirmed by interviewing the owner of a processing centre, that many trawlers carry large iron hooks for the purpose of targeting sharks or other big fish. This practice has reportedly been carried out in the Bay of Bengal region of Bangladesh for decades, without any detailed documentation of the trade and is currently being examined by the authors. While no stock assessment has ever been conducted in the Bay, the fishers interviewed reported that their catches had drastically declined. One fisher stated that “*There used to be a time when I could catch at least a thousand rays in five to six days, whereas now I come back with one ray in a seven-day trip, losing a lot of money and increasing the debt to the trawler owners*”.

Species	Local name in Bangladesh	Common Name	IUCN Red List Status	CITES Status
<b>SHARKS</b>				
<i>Alopias sp.</i>	Not known	Thresher shark	VU	Appendix II
<i>Carcharhinus amboinensis</i>	Bhota handog, boli hangor	Pigeye Shark	NA	Not listed
<i>Carcharhinus limbatus</i>	Boli hangor	Blacktip Shark	NA	Not listed
<i>Carcharhinus sorrah</i>	Moilla hangor, Dari hangor	Spottail Shark	NA	Not listed
<i>Galeocerdo cuvier</i>	Chitra boli, Bagha hangor	Tiger Shark	NT	Not listed
<i>Rhincodon typus</i>	Timi hangor	Whale Shark	EN	Appendix II
<i>Scoliodon laticaudus</i>	Kala hangor, Khola hangor	Spadenose Shark	NT	Not listed
<i>Sphyraena lewini</i>	Haturi hangor, Kaunna hangor	Scalloped Hammerhead Shark	EN	Appendix II
<b>RAYS</b>				
<i>Aetobatus narinari</i>	Fota Badura	Spotted Eagle Ray	NT	Not listed
<i>Brevitrygon sp.</i>	Faisi/faina	Whipray	NT	Not listed
<i>Gymnura japonica</i>	Podoni	Japanese Butterfly Ray	DD	Not listed
<i>Gymnura poecilura</i>	Podoni	Longtail Butterfly Ray	NT	Not listed
<i>Himantura leoparda</i>	Chita Shlapata	Leopard Whipray	VU	Not listed
<i>Himantura uarnak</i>	Chita Shlapata	Reticulate Whipray	VU	Not listed
<i>Himantura undulata</i>	Chita Shlapata	Bleeker's Variegated Whipray	VU	Not listed
<i>Mobula japanica</i>	Shing Swain	Spinetail Devil Ray	NT	Appendix II
<i>Neotrygon kuhlii</i>	-	Bluespotted Stingray	DD	Not listed
<i>Pateobatis uarnacoides</i>	Shlapata	Bleeker's Whipray	VU	Not listed
<i>Rhinoptera javanica</i>	Sawin/Ghpara	Javanese Cownose Ray	VU	Not listed
<b>GUITARFISH</b>				
<i>Glaucostegus granulatus</i>	Pitambori, Gerenga	Sharpnose Guitarfish	VU	Not listed
<i>Glaucostegus obtusus</i>	Pitambori, Gerenga	Widenose Guitarfish	VU	Not listed
<i>Rhina australis</i>	Bang	Bengal Guitarfish	VU	Not listed
<i>Rhinobatos annandalei</i>	Fota Pitambori	Bowmouth Guitarfish	DD	Not listed
<b>SAWFISH</b>				
<i>Pristis pristis</i>	Khorkhor, Aissa, Fulaissa	Sawfish	CR	Appendix I

**Table 2.** Species encountered in the processing centres during the study period.

Year	Species group/product	No. of skin pieces (wet)	No. of whole bodies	Weight (kg)	Buying price (BDT) <sup>1</sup>	Sourced from
Dec 2012 Jan–Dec 2013	Shark	-	-	-	154,540	Cox's Bazar
	Liver	-	-	-	3,000	Cox's Bazar
	Shark	-	-	5,511.5	1,011,520	Cox's Bazar
	Guitarfish		172	3,872		Mohipur <sup>2</sup>
	Guitarfish					
	Skin			8,284	6,244,170	<sup>2</sup> Mohipur, Alipur, Cox's Bazar
Jan–Dec 2014	Big sharks	-	75	1,080.5		<sup>2</sup> Alipur, Cox's Bazar
	Shark	-	311	7,629		<sup>2</sup> Alipur, Cox's Bazar
	Guitarfish skin	14,885	-	-	7,826,065	<sup>2</sup> Alipur, Cox's Bazar
	Fin set (4)	311	-	93.5	118,390	<sup>2</sup> Alipur, Cox's Bazar
	Guitarfish	159	-	3,669		<sup>2</sup> Alipur, Cox's Bazar
	Tiger shark skin	-	-	-	4,900	Cox's Bazar
Jan–Dec 2015	Guitarfish skin	9,725	-	-	4,498,440	<sup>2</sup> Alipur, Cox's Bazar, Chittagong
	Guitarfish	-	372	7,663		<sup>2</sup> Alipur, Mohipur, Cox's Bazar, Chittagong
	Shark	-	350	11,721		<sup>2</sup> Alipur, Mohipur, Cox's Bazar, Chittagong
	Fin set (4)	766	-	174.5	178,480	<sup>2</sup> Alipur, Mohipur, Cox's Bazar, Chittagong
	<b>TOTAL</b>				<b>20,039,505</b> <b>USD250,494</b>	

**Table 3.** Trade records of one processing centre in Cox's Bazar dealing in fresh and dried elasmobranch and dried skin (especially Sharpnose Guitarfish *Glaucostegus granulatus*), 2012–15. <sup>1</sup>Exchange rate 1USD= 80BDT.

<sup>2</sup>Alibur and Mohibur are in the south central coastal region of Bangladesh (outside the study area).

The shark and ray catch is important for the fishers for the high price it commands in the international market. No regulatory or legal governance currently manages or documents this trade, which presents tremendous conservation hazards for these species. The different products documented and the example given of just one trader's capacity to trade in such large volumes (Table 3), is an indicator of a large-scale fishing effort that needs to be monitored and regulated.

#### **Conservation concern**

Illegal, unreported and unregulated (IUU) fishing and trade may be posing unsustainable pressure on the shark and ray populations in the Bay of Bengal. This study has identified four species listed in CITES Appendix II (i.e. *Sphyra lewini*, *Alopias* sp., *Rhincodon typus* and *Mobula japanica*) and the Appendix I-listed *Pristis pristis* through direct observation and identification of products in the processing centres. Many other species are also being processed for consumption (Table 2). Owing to the lack of baseline data and species-specific research available for sharks and rays in Bangladesh on breeding, ecology, habitats, or catch patterns, it is of cardinal importance that specific research is undertaken to answer conservation questions about these populations in the Bay of Bengal and for evidence-based and effective conservation action plans and policies to be put in place.

**“ THERE USED TO BE A TIME WHEN I COULD CATCH AT LEAST A THOUSAND RAYS IN FIVE TO SIX DAYS, WHEREAS NOW I COME BACK WITH ONE RAY IN A SEVEN-DAY TRIP, LOSING A LOT OF MONEY AND INCREASING THE DEBT TO THE TRAWLER OWNERS ”**

Artisanal fisher in Cox's Bazar

#### **CONCLUSIONS**

The shark and ray fishery and the domestic and international trade in related products has existed in Bangladesh for many years, with fluctuating trade dynamics and catch patterns. Due to the lack of regulation and documentation of this trade, and without any appropriate export documentation or evaluation of the sustainability of these species, the presence of opportunistic and registered businesses involved in the processing and trade of fish products poses increased pressure on targeted catch effort. Fishers stated that the population of sharks and rays in the Bay had decreased.

While the fishers have demonstrated a willingness to work for the conservation of these species (Haque, in prep.), some of the traders say that the sharks are caught as bycatch, and that not to trade in them would have a serious impact on their businesses. It is therefore extremely important to consider the perspective and motivations of the various stakeholders and their socio-economic needs. The introduction of a soft regulatory regime is recommended before a strict policy and action plan is established to regulate the trade in the Bay of



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**Local women at a fish drying centre in Cox's Bazar, holding dried Spadenose Shark *Scoliodon laticaudus*.**

Bengal. It is recommended that countries adjacent to the Bay of Bengal collaborate with each other to identify the best measures required to improve monitoring and the documenting of this trade, and thus help to conserve the shark and ray populations of the region.

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