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Investigating tiger poaching in the Bangladesh Sundarbans

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Journal articles

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ABSTRACT

Tigers (*Panthera tigris*) are Critically Endangered in Bangladesh with only 106 individuals remaining. Poaching is one of the major reasons for the rapid decline in tiger numbers across their entire range. In Bangladesh, very little is known about the utilization of tiger parts, and few details exist to date regarding their acquisition and trade. This research is an original study that explores the local usage, poaching, and trade of tiger parts in the Sundarbans of Bangladesh for the first time. Semi-structured qualitative interviews were conducted with 141 respondents in the villages around the Bangladesh Sundarbans from December 2011 to June 2013. The respondents include Village Tiger Response Team members (n=46/141), general members of the village community (n=62/141), and tiger killers (n=33/141). The study revealed the local use of, and belief in, the medicinal values of tiger parts is diverse (e.g. medicinal uses, as protection from "dangers" in the forest, and to enhance personal social status and/or wellbeing), and that virtually all parts of the tiger are used including teeth, bones, meat, tongue, genital organs, claws, furs, and whiskers. The research concludes that 65% of the respondents use and/or believe in the benefits of tiger parts, 20% do not use or believe, 9% do not want to talk about the use of tiger parts and 6% are coded 'don't know'. Of the respondents who reported using and/or believing in the benefits of tiger parts, 52% used tiger parts, and 96% believed in the benefits of tiger parts in spite of personal consumption or not. A local trade of tiger parts is present in the villages around the Bangladesh Sundarbans where tiger parts are traded via local middlemen or friends or families with little or no money. Five groups were identified that are involved in tiger killing: villagers, poachers, *shikari* (local hunters), trappers, and pirates. Villagers kill tigers in the village predominantly for safety, while other groups kill inside the forest professionally or opportunistically. Poachers kill tigers purely for money, but the diverse incentives for the other groups are more complex. *Shikari's* motives are multi-faceted, encompassing excitement, profit, esteem, and status arising from providing tiger parts for local medicine. Pirates, on the other hand, not only kill tigers for profit and safety, but also as a 'protection service' to the community. The results further illustrate that each group that engages in the killing of tigers submit tiger parts to the commercial trade in exchange for money. This study, additionally, found that a recent commercial demand for tiger bones exists in the Bangladesh Sundarbans; however, the commercial trade of tiger skin was always present. In the Bangladesh Sundarbans, the tiger killers locally tan the skin using local ingredients (potash alum, blue vitriol, salt), and bury the rest of the body to collect the bones later. The price range of a skin varies between BDT 40,000-90,000 (USD520-1,169); for bones BDT 1,500-3,000/kg (USD20-39) and for a canine

BDT 1,000-7,000 (USD13-91). Non-local Bangladeshi traders from other cities come and buy the bones from the tiger killers. Note, the trade chain for bones and skin are separate in the Bangladesh Sundarbans. The secondary data documented 46 incidents of tiger or tiger parts being traded in the Bangladesh from 1981 to 2015, of which most of them are confiscation of tiger/tiger parts by the law enforcement authorities (n=26). The overall tiger poaching situation in Bangladesh is complex and requires a multifaceted conservation approach based on the local benefits of tiger conservation that is generated by new development measures, combined with stronger enforcement. These suggested conservation efforts may likely represent the only sustainable solution to maintain a steady tiger population in the Bangladesh Sundarbans.

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CHAPTER 1: INTRODUCTION

TIGERS IN GENERAL

Tigers *(Panthera tigris*) are the largest cat species in Asia. Tiger populations have declined by 98% within last 100 years and more than half of the populations have declined within the last ten years (Seidensticker 2010; Goodrich et al. 2015). Tigers are 'Endangered' and three of the nine sub-species (Bali tiger, Javan tiger, and Caspian tiger) are extinct (Goodrich et al. 2015). Additionally, tiger habitats have declined to 7% of the original range, and are now found in 13 countries only: Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Lao PDR, Malaysia, Myanmar, Nepal, Russia, Thailand, and Vietnam (Figure 1.1) (Dinerstein et al. 2007; Goodrich et al. 2015). Direct tiger loss (tiger killing for tiger parts and as a result of human tiger conflict), habitat destruction, and poaching of tigers' prey are the main reasons for diminishing tiger populations across the entire tiger range (Dinerstein et al. 2007; Ahmad et al. 2009).

TIGER POACHING AND TRADE

Tiger poaching with the intention of supplying tiger parts for the traditional Asian medicine is a major challenge for tiger conservation (Mills and Jackson 1994; Nowell 2000; Dinerstein et al. 2007; Moyle 2009; Alves et al. 2013; Stoner and Pervushina 2013). The use of tiger parts in traditional Asian medicine was first documented as a serious threat to the tiger population in a TRAFFIC report in 1994 (Mills and Jackson 1994). Nowell (2000) presented comprehensive work on the use of tiger parts in traditional medicines in the south Asian countries. A great deal of work has been conducted on trade and international demand for tiger parts in most of the tiger range countries such as the illegal market trade in Sumatra, Indonesia (Plowden and Bowles 1997; Shepherd and Magnus 2004; Ng and Nemora 2007); the black market for tiger parts in China (Moyle 2009; Wong 2013); trade of tiger parts in Myanmar (Shepherd and Nijman 2008; Nijman and Shepherd 2015); big cat trade in Thailand and Myanmar (Oswell 2010); the market of tiger parts from wild and captive tigers in China after the domestic trade ban in 1993 (Nowell and Ling 2007); tiger poaching, trafficking and detection rate in India which identifies 73 districts as current tiger crime hotspots (Sharma et al. 2014); and seizures of tiger parts in tiger range countries (Verheij, Foley and Engel 2010; Stoner and Pervushina 2013). These studies predominantly present data based on undercover market surveys or from seizure records. However, not much is known about the poaching activities, poachers' motivation and the poaching method (Ahmad et al. 2009; Tilson et al. 2010). Some studies have documented

general hunting patterns of mammals in the tiger range countries (Madhusudan and Karanth 2002; Aiyadurai et al. 2010; Aiyadurai 2011; Gubbi and Linkie 2012; Velho, Karanth and Laurance 2012), but few studies have been conducted specifically to understand tiger poachers and poaching activities. Martin (1992) reported the poisoning of tigers in the Chitwan national park, Nepal, to supply tiger bones to the commercial demand. Tilson et al. (2010) briefly documented three types of poachers (professional, amateur opportunistic, and members of military and police) and poaching methods (snares made of metal cable and poison) in Sumatra, Indonesia, and urged the need of an in-depth study. Wright (2010) documented the tiger killing and trade activities of a tiger poacher in India. In India, poachers travel with their families to tiger habitats and set camps near the forest. The men go to the forest and kill tigers by guns; or setting snare traps, electrocution traps; or by poisoning tiger's kill (Wright 2010).

Kenney et al. (1995) developed a tiger simulation model based on the data from Chitwan national park, which indicates that even if poaching is effectively controlled, the extinction risk still remains due to demographic and environmental factors. Linkie et al. (2003) evaluated the poaching pressure on tiger and the prey species (muntjac, sambar, serow, mouse deer) in Kerinci Seblat national park, Sumatra, from confiscations of snare traps. In this area, the poaching pressure on the prey species is higher than the tiger species. Chapron et al. (2008) showed the impact of poaching and prey depletion on the size of tiger population. They suggested that tigers require larger populations to survive as opposed to other big cats (i.e. leopard, cougar). In other words, they are vulnerable to a slight increase in mortality, and unlikely to recover within a short period if the population declines. Moreover, the growth rate of tiger population is slower than other cat species, hinting that poaching tigers is highly threatening. On the other hand, prey population is an important component for tigers' survival. Prey recovery efforts will be futile if tiger mortality rate reaches 15% (Chapron et al. 2008). The findings of these studies highlight the importance to further investigate the specific factors linked to tiger population decline. These findings assume a delicate combination of different conditions required to secure the long-term survival of tigers around the world.

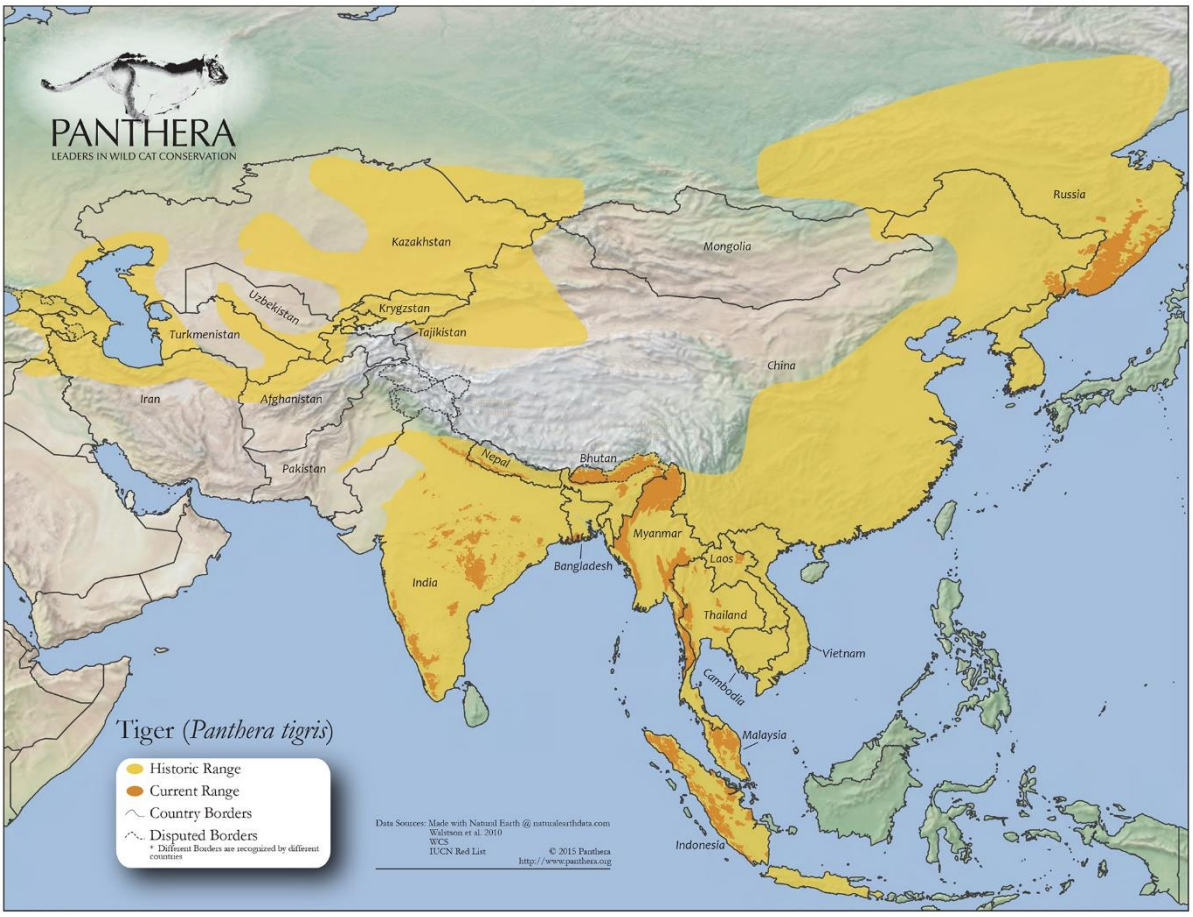

Figure 1.1 Present and past distribution of tiger habitats in the world. Figure reproduced from Panthera.

BANGLADESH AND THE BANGLADESH SUNDARBANS

Bangladesh was part of British India referred to as 'East Bengal' from 1757 to 1947. It became a part of Pakistan and was officially named "East Pakistan" from 1947 to 1971. Bangladesh was declared as an independent country in 1971 after a liberation war for 9 months, where 3 million people died. After independence, the scar of the war was visible in the economy and development of the country.

Even though almost forty-five years have passed since independence most people of Bangladesh are still considerably poor. Most people live in rural areas with limited modern facilities, and are dependent on agriculture where paddy (rice) is the main agricultural crop. Bangladesh contains more than 160 million people within an area of 147,570 km^2 (Bangladesh Bureau of Statistics 2012). The high population density and low economy have increased corruption, and Bangladesh is ranked as one of the most corrupt countries

in the world (Transparency International 2015). Corruption not only affects the developmental activities of a country, but also hampers the efforts of conservation organizations (Roy, Alam and Gow 2013; Bennett 2015; Smith et al. 2015). In Bangladesh, due to bribery and misuse of the administrative power by the forest officials, poachers and traders kill animals and cut down trees illegally inside the forest (Chowdhury and Izumiyama 2014).

According to the Ministry of Environment and Forests, 17% of the total land area of Bangladesh is under forest cover. The accuracy of this figure, however, is questionable and more likely to be 7.7% (Alam 2009). Among the total forest area remaining in Bangladesh, the Bangladesh Sundarbans comprises about 44% of the forest coverage (Tamang 1993).

In the Sundarbans, tree roots grow vertically up from the land, fish leave the water to walk, and crabs climb trees. In addition, the Sundarbans is the world's only mangrove forest containing tigers, harboring the last remaining tiger population of Bangladesh (McGregor 2010).

In Bengali, *sundor* means beautiful and *bon* means forest. Hence, the meaning of the Sundarbans is "beautiful forest". The Sundarbans' border spans between India and Bangladesh, and is the largest mangrove forest in the world comprising an area of 10,000 km^2. The Bangladesh side comprises 60% of the Sundarbans, which equates to an area of 6,017 km^2 (Iftekhar and Islam 2004). It includes three wildlife sanctuaries: Sundarbans East, Sundarbans West, and Sundarbans South. The Bangladesh Sundarbans is also considered a UNESCO World Heritage Site (declared in 1997). Tiger habitats in the tiger range countries have been declared as Tiger Conservation Landscape (TCL). TCLs are areas that can provide habitat to five tigers, and the presence of tigers in these locations has been confirmed in the last ten years. Depending on the population status, prey population, habitat area, threats to tigers, and conservation status measures, the TCL are categorized as Class I, II, III IV where threats are lowest in Class I and highest in Class III (Sanderson et al. 2006). Tiger habitats with insufficient data are listed as Class IV (Sanderson et al. 2006). The Sundarbans has been declared as Class III TCL of global priority, indicating that threats exist and probably cannot be sufficiently mitigated within next ten years (Sanderson et al. 2006).

CLIMATE CHANGE AND NATURAL DISASTERS IN BANGLADESH

Bangladesh not only suffers from poverty and corruption, but the geographic location of the country, also makes the population vulnerable to climate change. Bangladesh is situated in South-east Asia, surrounded by India on its East, West, and North borders, as well as Myanmar on the East and Bay of Bengal on the South borders (Figure 1.2). About 10% of the country is only 1 m above the mean sea level (Mallick, Amin and Rahman 2011). Considering the current sea level rise predictions, a 28 cm sea level rise is likely to occur in Bangladesh within the next 30-50 years which will decline 96% of the tiger habitat in the Sundarbans (Loucks et al. 2010). Climate change has negative impacts on the livelihoods and life style of the coastal people including scarcity of pure drinking water, malnutrition, extreme poverty, health problems, loss and damage in crop cultivation, fisheries, poultry, vegetable gardens etc. (Nasreen, Hossain and Azad 2013).

The most common natural calamities of the country are floods, cyclones, land erosions, droughts, and landslides. The southern part of the country is susceptible to cyclones due to the presence of the coastal line. The most devastating cyclone in Bangladesh's history was in 1970, which resulted in a death rate of 500,000 people; whereas cyclone Gorky, in 1991, was responsible for the death of around 140,000 individuals (Shamsuddoha and Chowdhury 2007). The Sundarbans of Bangladesh is situated in the South-Western corner of the country and acts as a shield to protect the people living in the adjacent villages of the forest from natural disasters. Nevertheless, the people living in the adjacent villages of the forest are the most affected victims of recent cyclones. Cyclones cause salinity intrusion in the area and destroy crop fields, which ultimately lead to people losing their livelihood. In recent years, cyclone Sidr (2007) and cyclone Aila (2009) are rated amongst the most devastating cyclone occurrences. Cyclone Sidr caused the death of 3,363 individuals around the Bangladesh Sundarbans (GoB 2008). Additionally, as a result of cyclone Aila, around 500,000 people were displaced from their homes (UNICEF n.d.). Given their frequent occurrence and devastating impact, they are a pervasive threat for humans, Sundarbans and the animal species in the forest.

PEOPLE'S DEPENDENCY ON THE BANGLADESH SUNDARBANS

There is no human settlement inside the Bangladesh Sundarbans, but the mangrove forest is surrounded by eight *upazilas* (sub-districts) (Figure 1.2). Thousands of people living in the adjacent areas of the Bangladesh Sundarbans enter the forest every day to collect forest resources such as fish, timber, honey, nypa leaf (*Nypa fruticans*), shrimps, and crabs (Ahmad et al. 2009). The people living in the surrounding villages have to struggle with the

tigers that live in the forest since they enter the villages sometimes. The people of these villages also struggle with pirates in the forests, cyclones, and limited livelihood options (Inskip et al. 2013). These people mostly identify with Islam or Hinduism. They pray together and perform special rituals to keep them safe from the tiger (Jalais 2010).

HUMAN-TIGER CONFLICT IN THE BANGLADESH SUNDARBANS

Before independence (1971), tiger killing records were not documented in the area due to political unrest. Moreover, due to high rates of human casualties by tiger attack during land reclamation from the forest for cultivation, tigers of this area were categorised as 'man-eaters,' and in 1883, the government started rewarding people for tiger killing (Eaton 1990; Chakraborthy 2010). After independence was declared, the Wildlife (Preservation) Act, 1974, banned tiger killing in the country. Though the Bangladesh government banned tiger killing, conflicts between human and tigers were still present in the area (Hendrichs 1975; Siddiqi and Choudhury 1987; Helalsiddique 1998; Gani 2002; Reza, Feeroz and Islam 2002; Khan 2004; Islam, Alam and Islam 2007; Denzau and Denzau 2010).

The Bangladesh Sundarbans probably face the highest rate of human tiger conflict in the world (Barlow, Ahmad and Smith 2013). According to the Forest Department record (from 1984 to 2006), on average about 20-30 people are killed each year during their forest resource forays (Ahmad et al. 2009). However, Barlow (2009) argued that the actual number of human casualties should be higher than the Forest Department data suggest as the latter does not record the forest resource users who succumb to their injuries due to tiger attack or enter the forest without permit. Considering only the Forest Department record, the Bangladesh Sundarbans has the highest level of human deaths caused by tiger attack with a mean of 22 deaths per year and over the years, the number of human deaths has remained relatively consistent (Barlow, Ahmad and Smith 2013). The human tiger conflict in the Bangladesh Sundarbans has been a great conservation issue for many years. Recently, several studies have been conducted to explore the socio-economic dimensions of the human tiger conflict in the area (Ahmad et al. 2009; Khan 2009; Barlow et al. 2010; Inskip et al. 2013, 2014; Rejuan 2014).

TIGER POACHING IN THE BANGLADESH SUNDARBANS

Tiger poaching situation in the Bangladesh Sundarbans has never received attention despite representing a major threat for tigers' survival in the world. The Bangladesh Tiger Action Plan (BTAP) was developed to provide guidelines for tiger conservation efforts over

eight years from 2009 to 2017 (Ahmad et al. 2009), and a subsequent BTAP Research and Monitoring Agenda was drafted to summarise and prioritise research and monitoring needs (Barlow et al. 2011). Tiger poaching is presented as a high priority threat for the Bangladesh Sundarbans tiger population since poaching and the associated trade have the potential to decimate a population over a short period of time (Kenney et al. 1995; Ahmad et al. 2009; Aziz et al. 2013).

Despite these recent conservation efforts, very little is known about tiger poaching, trade, and consumption in Bangladesh to date. Its secretive nature and the absence of investigative work make it difficult to have information regarding poaching techniques (Gani 2002; Ahmad et al. 2009). The existing knowledge is scant and variable; for instance, the Forest Department recorded nine poaching incidents in the Bangladesh Sundarbans during the period of 1996-2000 (Gani 2002), whereas recent evidence originating through conversations with arrested poachers suggests that four tigers were poached during a three months period across 2010 and 2011 alone. This information suggests that either poaching has increased, or that the earlier figures were flawed.

Despite this lack of information, the tigers of the Bangladesh Sundarbans, like tigers from other tiger countries, are most probably facing poaching to supply the known international demand (Nowell 2000; Nowell and Ling 2007; Ahmad et al. 2009). The neighboring tiger countries India and Myanmar are experiencing rampant poaching (Nowell and Ling 2007), so the possibility of Bangladesh Sundarbans tiger population remaining unscathed in the face of on-going poaching activities is low. Again, there is no information on the scale or causal factors of the consumption, i.e. little is known about the cultural, religious, economic, and medicinal values of tigers and tiger parts to the consumer.

Without collecting more information on these factors, conservationists are unable to develop targeted strategies to combat poaching, trade, and consumption of tiger parts in the Bangladesh Sundarbans. The research project conducted as part of this thesis presents a first in-depth study of tiger poaching, trade, and consumption of tiger parts in the Bangladesh Sundarbans. This research investigation does not only represent a determined scientific effort to gather detailed information on the nature, but also on the motivations for tiger poaching and consumption behaviors. In order to develop relevant solutions to the problems associated with tiger poaching, which will ultimately generate lasting changes in the activities of poachers, traders and consumers, this research project has set

specific targets to identify and tackle the social, economic, and other factors which drive their behaviors.

PROJECT AIM AND OBJECTIVES

The aim of this project is to increase the understanding of the factors required to effectively reduce poaching, trade and consumption of the Sundarbans tigers, and therefore, to improve their conservation prospects. The findings of this research will inform and guide recommendations for a country-specific anti-poaching effort for tiger conservation.

The objectives are:

Objective 1: To understand the local consumption of tiger parts in the Bangladesh Sundarbans

Objective 2: To understand the tiger poaching activities in the Bangladesh Sundarbans

Objective 3: To understand the trade of tiger parts in the Bangladesh Sundarbans

Objective 4: To make recommendations which contribute to the development of an anti-poaching strategy for the Bangladesh Sundarbans tigers

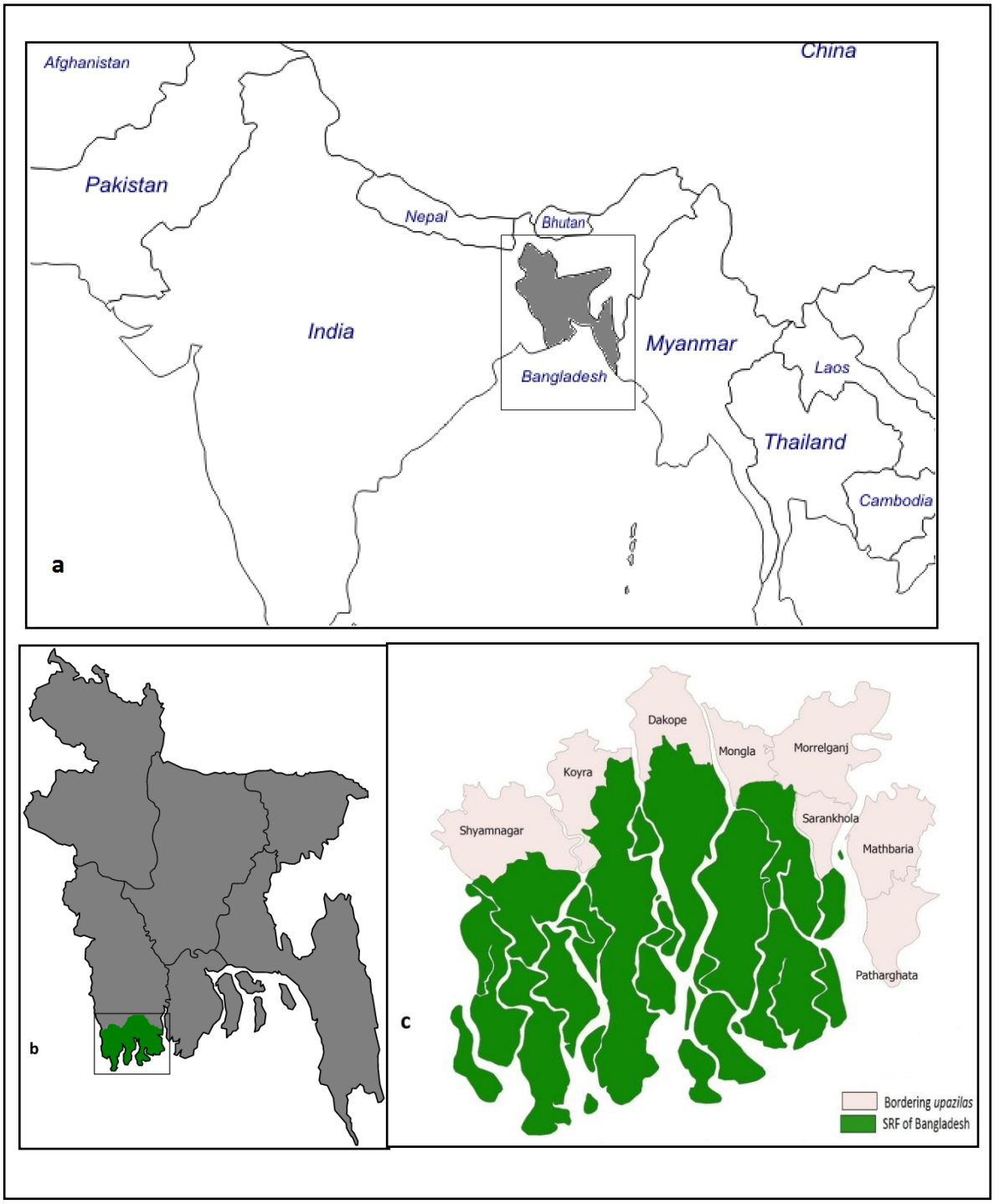

Figure 1.2 The location of Bangladesh (a), the Bangladesh Sundarbans (b) and the surrounding *upazilas* of the Bangladesh Sundarbans.

TIGERS IN BANGLADESH

Tiger is the national animal of Bangladesh and a symbol of pride. Once, tigers were found almost all over the Bangladesh (Mitra 1957), but due to habitat degradation and tiger killing, the remaining population is now confined only to the Sundarbans. The forest area of the Bangladesh Sundarbans has the capacity to provide home to a large tiger population and it was estimated that the Bangladesh Sundarbans has the largest tiger population of the world with 300-500 individuals (Barlow 2009). However, a recent census by the Forest Department by camera trapping confirms a rapid decline of the tiger population in the forest, having only 106 individuals (Dey et al. 2015).

In the Bangladesh Sundarbans, spotted deer (*Axis axis*), wild boar (*Sus scrofa*) and barking deer (*Muntiacus muntjak*) are recorded as prey of tiger. Amongst these targets, spotted deer is the main prey species and presents 70% of the tigers' diet (Reza, Feeroz and Islam 2002). The tigers' intake also occasionally consists of rhesus macaque (*Macaca mulatta*), leopard cat (*Prionailurus bengalensis*), Indian porcupine *(Hystrix indica*), adjutant (*Leptoptilos javanicus*), crabs, and fish (Reza, Feeroz and Islam 2002; Khan 2004). The spotted deer is illegally hunted by the people living around the Bangladesh Sundarbans, either for local consumption or to sell their meat (Khan 2004; Ahmad et al. 2009; Mohsanin et al. 2012). Each year, at least 10,000 deer are killed for deer meat consumption in the area (Mohsanin et al. 2012).

The tigers of the Sundarbans East Wildlife Sanctuary show a significant habitat preference for freshwater holes, sea beaches, forest edges, forests, grassland and river banks (Reza, Feeroz and Islam 2001). Conversely, Khan and Chivers (2007) reported somewhat different findings, which encourage further research investigation into the behavioural diversity of this tiger species. According to their observations, tigers have no significant habitat preferences among mangrove woodlands, grasslands, sea beaches, and transitional areas, but have habitat preferences that they associate with specific activities i.e. feeding, resting, defecation and interaction.

In 2010, the governments of all tiger range countries pledged to double the global tiger population by 2022 in the 'global tiger summit' held in St. Petersburg, Russia. The goal of doubling tiger numbers by the next tiger year (Chinese calendar) is known as Tx2. The tiger population of the Bangladesh Sundarbans is considered highly valuable since it has the potential to contribute significantly to meet the Tx2 goal. Despite being a threatened population, little research has been conducted on the tigers of the Bangladesh

Sundarbans. This is the fourth PhD research that specifically focuses on an aspect of the tigers of the Bangladesh Sundarbans (Khan 2004; Barlow 2009; Inskip 2013).

Previously, Khan (2004) studied tiger ecology by assessing the Bengal tiger's prey population structure and density. The study found that the individual density of tiger's prey species in the Bangladesh Sundarbans are 20.9/km^2 for spotted deer, 0.5/km^2 for wild boar, and 6.5/km^2 for rhesus macaque; and the density of spotted deer, the main prey species of tiger was low in sea-beach and high in transitional zones. In addition, Khan's (2004) research also identified the Bengal tiger's preferences for prey species from scat analysis where spotted deer was the most frequent (78%). The other species found during the scat analysis were wild boar, rhesus macaque, Indian crested porcupine, leopard cat, Ganges river dolphin (died in the fishing net, which was thrown away and floated to the bank, and finally eaten by the tiger), lesser adjutant, red jungle fowl, mud crab and monitor lizard. The research project also evaluated the use of four different types of habitats in relation to the activities of the tigers (mention above as Khan and Chivers 2007). Finally, another facet of the research was to enhance understanding of human-tiger interactions and their intensity.

Barlow (2009) studied the evolutionary adaptations of the Bengal tigers in the Sundarbans, which included their population density, population size, movement patterns, relative tiger abundance in the Bangladesh Sundarbans, and the scale and historic trend of human-tiger conflict. Bengal tiger (*Panthera tigris tigris*) is the largest sub-species of tigers. Barlow (2009) reported that, the skull and body size of the Bengal tigers of the Sundarbans are smaller than other Bengal tigers of other tiger habitats, and this might be a result of not having a larger prey species (*Cervus unicolor*) in the area. The home range size of the female tigers (no data on male tigers) in the Bangladesh Sundarbans is also quite small (14.2km^2) (Barlow 2009; Barlow et al. 2011). The smaller home range size of the tigers in the Bangladesh Sundarbans indicated a healthy prey population and also a large carrying capacity for the tigers (Barlow 2009; Barlow et al. 2011). Considering the total area of the forest and the home range size of the female tigers, the population size for the Bangladesh Sundarbans was estimated as 330-500. Barlow (2009) also reported that, a tiger cross a water body (up to 1.5 km wide) every 2-3 days. The maximum distance travel by a tiger is 11.3km/day with a mean of 3.57 km/day (Barlow 2009).

As part of a third PhD project, Inskip's (2013) research provided an in-depth understanding of the human-tiger conflict by analyzing the risks posed to the human lives and their

livelihoods, the villagers' acceptance capacity for the tigers, and the driving factors involved in the killing stray tigers that enter into the bordering villages of the Bangladesh Sundarbans. To explore local perceptions and socio-economic context of human-tiger conflict, Inskip (2013) identified the locally-relevant problems. More than 50% reported that tiger is the primary problem. This study also reported that tiger killing behavior in the village is not purely retaliatory, but also includes fear of getting attacked, lack of responses from the authority, and personal or social incentive (collecting tiger parts) (Inskip 2013; Inskip et al. 2014).

THIS RESEARCH

The research conducted as part of this thesis represents the fourth PhD research on tigers in the Bangladesh Sundarbans, and is targeted to provide knowledge on a new and important dimension of the Bangladesh tigers. Bangladesh Forest Department published the Bangladesh Tiger Action Plan (BTAP) 2009-2017 in 2009 which listed the strategic actions for tiger conservation within eight years (2009-2017) (Figure 1.3). One of the strategic actions to reduce direct tiger loss in the Bangladesh Sundarbans is to 'determine the nature and scale of tiger poaching and trade in tiger parts' (Figure 1.3). Moreover, tiger poaching has been identified as a high priority threat for the tigers of the Bangladesh Sundarbans (Ahmad et al. 2009; Aziz et al. 2013). The BTAP stressed the need to understand the tiger poaching situation and other activities related to poaching in the Bangladesh Sundarbans (Ahmad et al. 2009). This study hopes to fill this knowledge gap identified by the Bangladesh Tiger Action Plan for a better conservation plan of the tigers (Figure 1.3).

STUDYING CLANDESTINE ACTIVITY

This study has been conducted to understand a clandestine activity by gathering in-depth information on poaching, trade and local uses and beliefs of tiger parts in the area. To gain knowledge on poaching, trust was built between the researcher and the participants. The participants are the local people who are living in the villages around the Bangladesh Sundarbans, and have some direct or indirect experiences regarding tiger poaching, trade, local uses and beliefs of tiger parts, pirates, deer poaching or other illegal activities inside the forest. Specialized methods (i.e. randomized response technique, nominative technique, unmatched-count technique, grouped answer method, bean method, surveys with negative questions etc.) by asking indirect questions have been developed to study clandestine activity (Nuno and St. John 2014). This analysis aims to reveal the object of the enquiry in a transparent and confidential manner that protected the anonymity of the

participants and allowed issues to be raised and discussed in a friendly, informal and exploratory manner for more in-depth data. The objectives of the study were explained to each participant prior to data collection and the interviews were conducted only after getting full consent from the participants. The ethical clearance for this research was obtained from the University of Kent and the Zoological Society of London (ZSL).

THESIS STRUCTURE

There are three data chapters (Chapter 2, 3 and 4) in this thesis. Each data chapters describe the methods followed for data collection elaborately. The following chapter (Chapter 2) is the first data chapter, explores the nature and scale of local uses and belief system related to tiger parts in the Bangladesh Sundarbans. A detail of the medicinal uses of tiger parts in the Bangladesh Sundarbans is discussed in this chapter. In Chapter 3, a detailed profile of the different groups of tiger killers and their motivations for tiger killing is stated. The last data chapter (Chapter 4) documents the commercial trade of tiger or tiger parts in Bangladesh. It explains how the demand for tiger parts is emerging in the country. Finally, the last chapter (Chapter 5) explores the significance and limitations of this study and draws all the chapters together to suggest conservation recommendations and further research need.

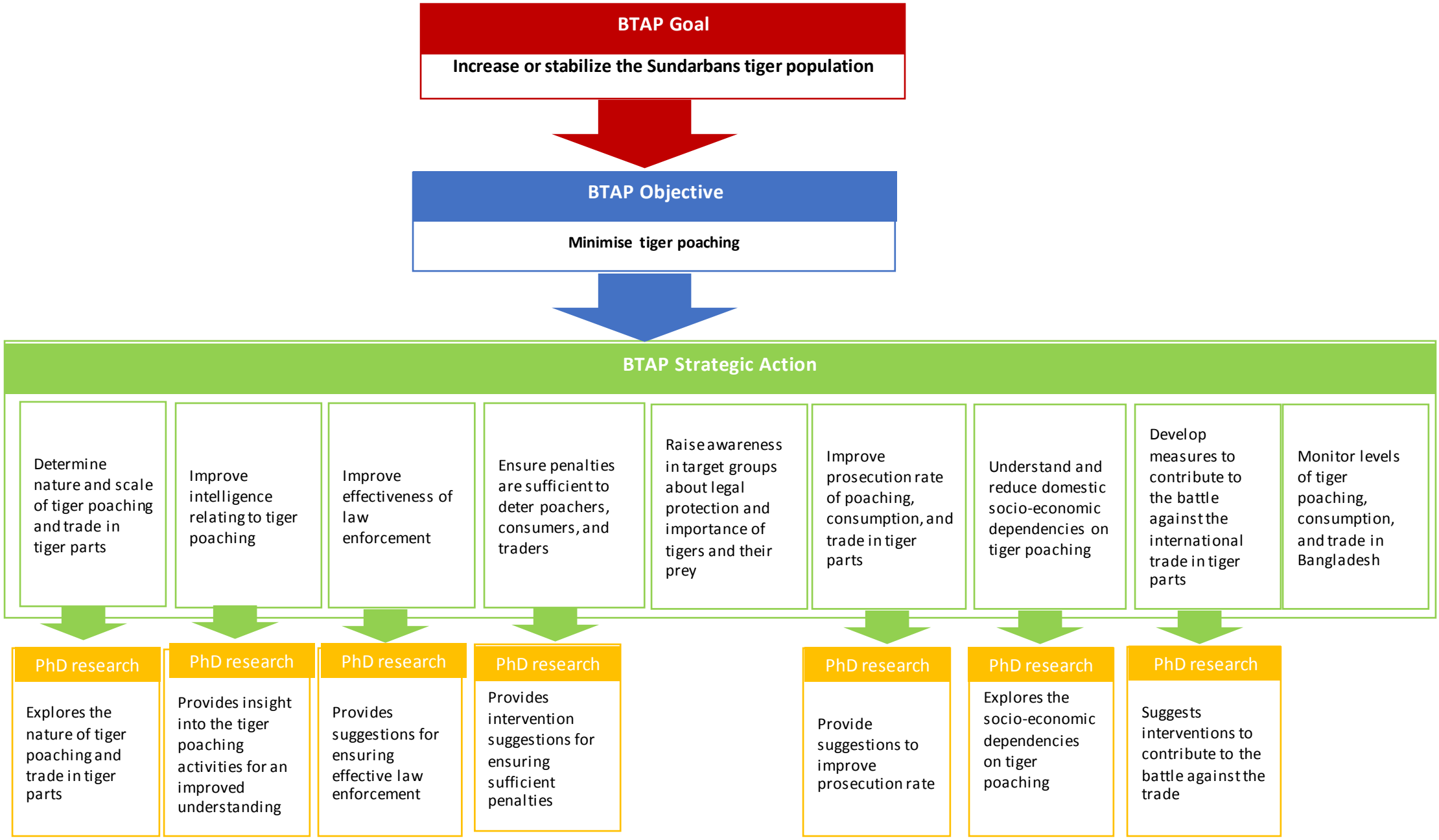

Figure 1.3 The development of this research based on the Bangladesh Tiger Action Plan's goal, objective and strategic actions.

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CHAPTER 2: LOCAL USAGE OF TIGER PARTS AND ITS ROLE IN TIGER KILLING IN THE BANGLADESH SUNDARBANS

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Saif, S., Russell, A. M., Nodie, S. I., Inskip, C., Lahann, P., Barlow, A., Greenwood, C., Islam, M. A. and MacMillan, D. C. (2016). Local usage of tiger parts and its role in tiger killing in the Bangladesh Sundarbans. *Human Dimensions of Wildlife,* 21(2), pp.95-110.

ABSTRACT

This study explored the local medicinal and traditional values of tiger parts and associated beliefs, and its link to the commercial trade in the Bangladesh Sundarbans. We conducted semi-structured qualitative interviews (n=139) in the villages around the Bangladesh Sundarbans with the Village Tiger Response Team members (n=46/139), general members of the community (n=62/139) and tiger killers (n=31/139). We found that the local use of, and belief in, the medicinal values of tiger parts is widespread and that virtually all parts of the tiger are used. We found 65% of the respondents used and/or believed in the benefits of tiger parts, 20% did not use or believe, 9% did not want to talk about the use of tiger parts and 6% were coded 'don't know'. Of the respondents who reported using and/or believing in the benefits of tiger parts, 52% used tiger parts and 96% believed in the benefits of tiger parts. People believed in and used tiger parts for diverse purposes including medicinal uses, as protection from "dangers" in the forest, and to enhance personal social status and/or wellbeing. We established that local usage is a significant threat to the tiger population of the Bangladesh Sundarbans as it motivates stray tiger killing for collecting tiger parts for both local use and commercial demand, and provides the opportunities for poachers and the commercial trade to flourish.

Key words: tiger, Bangladesh Sundarbans, tiger trade, traditional medicine, qualitative research

INTRODUCTION

Tigers *(Panthera tigris)* are endangered with about 3,000 wild tigers left in 13 tiger range countries (Chundawat et al. 2011). Tiger poaching is considered a major threat to tiger's survival, and the commercial trade of tiger parts for the traditional Asian medicine is believed to be the main driving factor of tiger poaching throughout its range (Nowell 2000; Nowell and Ling 2007; Shepherd and Nijman 2008; Alves et al. 2013). However, literature on poaching is only now emerging (Oswell 2010; Verheij, Foley and Engel 2010; Stoner and Pervushina 2013; Sharma et al. 2014; Nijman and Shepherd 2015).

Although several studies have reported on the traditional uses of tiger parts in Asian medicine (Nowell 2000; Ellis 2005), knowledge and understanding of the local use of tiger parts by people living in tiger habitat, and possible links to poaching and the commercial trade are sparse for most countries. Greater understanding of the role of local consumption in the observed decline of tiger numbers is potentially of great importance to future conservation strategies including traditional enforcement measures (Dinerstein et al. 2007; Verheij, Foley and Engel 2010), and to inform the emerging policy debate around alternatives (Challender and MacMillan 2014).

The tiger population of the Bangladesh Sundarbans of between 300-500 individuals is one of the largest remaining populations of wild tigers on earth (Barlow 2009). Recently there are indications that commercial demand for tiger parts by the non-local traders exist in the area (Saif, Rahman and MacMillan in press), and it is likely that the population may be declining rapidly due to poaching activities (Aziz et al. 2013). Moreover, a recent census showed a rapid decline in tiger numbers in the Bangladesh Sundarbans, leaving the tiger population around 100 (Dey et al. 2015). Although some studies reported about the local use of tiger parts in the Bangladesh Sundarbans (Khan 2004) and other countries (Bolton 1972; Solanki and Chutia 2004), there has been no in-depth understanding of the uses and beliefs of tiger parts by local people and possible links to the burgeoning commercial trade. This article sought to: (a) describe local use of tiger parts and associated local beliefs, and (b) explore the links of local traditional practices to the commercial trade either directly by supplying tiger parts or indirectly through creating 'opportunities of entry' for commercial traders.

METHODS

Study area

The Sundarbans is the largest mangrove forest in the world situated in the Ganges-Brahmaputra Delta (Ahmad et al. 2009), spanning the border between Bangladesh and India. The Bangladesh Sundarbans is surrounded by eight *upazilas* (sub-districts) of which six (Shyamnagar, Koyra, Dacope, Mongla, Morrelganj and Sarankhola) are immediately adjacent to the Bangladesh Sundarbans (Figure 2.1). The remaining two *upazilas* (Mothbaria and Pathorghata) are on the east side of the Bangladesh Sundarbans and not connected directly to the forest; separated by the river Baleshwar (Figure 2.1).

The Forest Department has divided the Bangladesh Sundarbans into four ranges: Satkhira, Khulna, Chandpai and Sarankhola (Figure 2.1), around which there are 76 bordering villages. About 350,000 people living in these bordering villages and most are directly dependent on the natural resources of the forest for their livelihood including honey collectors, wood collectors, fisherman, nipa leaf (*Nypa fruticans*) and thatching grass collectors (Tamang 1993). Annually in the Bangladesh Sundarbans, it is estimated that about 20–50 people are killed by tiger attack during resource extraction forays into the forest (Ahmad et al. 2009; Denzau and Denzau 2010; Barlow, Ahmad and Smith 2013) and people of both the Hindu and Islamic religion perform special rituals and worship forest deities such as *Banbibi*, *Dakshin Rai* and *Ghazi* to protect them on their forest sojourns (Eaton 1990; Jalais 2010).

Although the wildlife of the Bangladesh Sundarbans is now protected in law since the Wildlife (Preservation) Order of 1973, wildlife hunting was once legal and higher officials used to hunt wildlife with the help of local people known as *shikaris* (Rangarajan 2001). Due to the high level of human casualties by tigers during land reclamation from the forest for cultivation the government used to recruit the *shikaris* to kill tigers, especially the 'man-eaters' (Gani 2002; Chakraborthy 2010). After hunting was banned the tradition of *shikaris* for wildlife hunting did not stop and continued to be practiced covertly for enjoyment, social esteem (Saif, Rahman and MacMillan in press). The wildlife of the forest are also killed by pirate gangs who patrol in the waterways of the Bangladesh Sundarbans; kidnapping and collecting money from the local people who wish to fish or enter the Bangladesh Sundarbans (Inskip et al. 2013).

In collaboration with the Forest Department, WildTeam, a local conservation NGO developed Village Tiger Response Teams (VTRT) in areas where there were significant

human-tiger conflicts. Team members are drawn from members of the village community, and as unpaid volunteers (Rejuan 2014). These community-based volunteer teams are trained and experienced in dealing with stray tiger situations in the villages and knowledgeable about forest resource collection practices. At the time of this research in 2011-12 there were 29 VTRTs in the surrounding *upazilas* (Figure 2.1). This number has now grown to 49 in 2013.

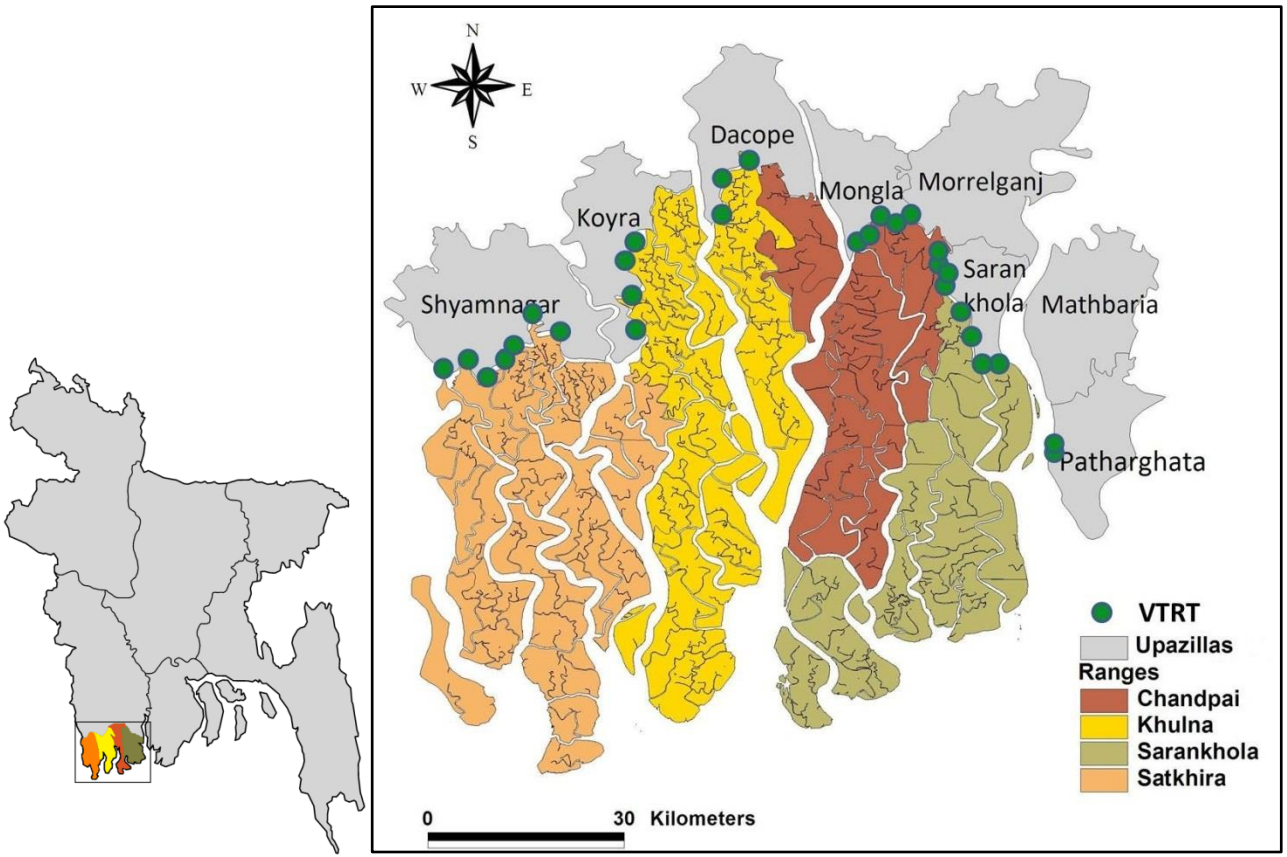


Figure 2.1 The Bangladesh Sundarbans with four administrative ranges, eight surrounding *upazilas* and locations of the Village Tiger Response Teams. The country level map shows the location of the Sundarbans in Bangladesh.

Sampling strategy and interview approach

We wanted to focus on collecting in-depth personal accounts of local beliefs and practices associated with tigers and tiger parts in the villages around the Bangladesh Sundarbans. We used an inductive approach known as grounded theory for data collection. The grounded theory approach does not test hypotheses but rather focuses on developing an understanding of the research topic and explanatory theory from a social process of data gathering from a position of trust with the respondents (Glaser and Strauss 1967). We conducted semi-structured interviews with mostly open ended questions with the members of village community living around the forest, continuing until nothing new was learned or in grounded theory terminology, the data has become saturated (Newing et al. 2011). This approach has been used in other studies for an in-depth understanding of wildlife use, consumption or killing (Pratt, MacMillan and Gordon 2004; MacMillan and Phillip 2010; MacMillan and Han 2011).

Purposive sampling was used whereby members of the village community living around the Bangladesh Sundarbans with different levels and, forms of knowledge about and engagement with tiger killing were actively sought. These groups can be categorised into: (a) VTRT members, (b) general members of the community and (c) tiger killers. For the VTRT category we initially conducted meetings with the members of each VTRT and explained the research and ethical issues involved. The most appropriate members of the team for subsequent, more in-depth interviews were then identified based on their knowledge and experience on the use and collection of tiger parts, wildlife poaching (some VTRT members were involved in wildlife killing in the forest before joining the VTRT), stray tiger killing and pirate activity. On average 1-3 persons from each team were subsequently interviewed. In total we carried out 46 interviews with the VTRT members.

General members of the community were selected based on their knowledge and experience of the traditional use of tiger parts, either through owning or having tiger parts, wildlife poaching, stray tiger killing, and pirate activities. General villagers were selected using snowball sampling (Newing et al. 2011) with initial introductions by VTRT members. Interviewees included honey collectors, wood cutters, fishermen, day labours, shopkeepers, jewellery makers, *kobiraj* (local doctor), tailors, businessmen, carpenters, tiger victims, teacher and forest staff. In total, 62 interviews were carried out with the general members of the village community.

Interview guides were used for the VTRT members and the general members of the community, focusing the medicinal, cultural and economic values of tiger parts, the consumption and collection of tiger parts, and the attitudes towards tiger killing. The VTRT interview guide also focuses on the motivations of joining VTRT, their role during stray tiger situation and their knowledge on tiger poaching and anti-poaching efforts.

The third targeted group was the 'tiger killers'. This group comprised any individual who had killed a tiger inside the forest, either deliberately for money or opportunistically. The same interview guide for the general members was used for the tiger killers but, where the opportunity allowed, the interviewer probed for more sensitive details about tiger killing activity. The tiger killers were selected using the snowball sampling strategy (Newing et al. 2011) through various local village contacts and by reference to police records. Some general members of the community who mentioned that they had been involved in tiger killing incidents in the forest were subsequently categorized as a respondent of the 'tiger killer' group. In total we conducted 31 interviews with tiger killers, of which 3 were professional poachers, 27 were opportunistic killers during deer hunting trip and one person admitted killing a tiger to save his life.

Data collection and analysis

Collecting data on the use of tiger parts and its link with tiger trade and killing was difficult in Bangladesh due to the absence of any pre-existing information on the subject, the illicit nature of the research topic and the cultural barriers for an urban female Bangladeshi researcher conducting research in typically conservative villages. It was unrealistic to expect that the interviewees would answer truthfully to incriminating questions asked directly to them by an outsider (Solomon et al. 2007; St. John et al. 2011). Hence, to gain the level of trust necessary for interviewees to talk about a sensitive topic trust building activities (i.e. following socio-cultural norms, having lunch at their place, showing pictures, teaching their children, participating in their daily activities) were carried out with the interviewees and their families prior to interviews (Gavin, Solomon and Blank 2010). The name and address of the interviewees were not asked and the interviewees were assured of anonymity. To convince tiger killers to be interviewed, we agreed that they would be describing tiger killing events in the third person (i.e. he/she/someone killed a tiger), without mentioning anyone's involvement in the process by name. The tiger killer (all male) was also assured before the interview that the source of his knowledge or experience on killing would not be requested. To verify sensitive data provided by the respondents, similar question was asked more than once by rephrasing the question

during different phases of the interview process. The researchers were confident that trust had been established when interviewees from this group showed them tiger parts they had obtained from tiger killing. All the interviews were carried out in Bengali exclusively by the main researcher to maintain consistency and trust.

A total of 139 interviews were conducted in the four administrative ranges between December 2011 and June 2013. The 139 respondents were members of 54 bordering (n=39) and non-bordering (n=15) villages, situated in six immediate adjacent *upazilas* (Table 2.1). Depending on the main livelihood of the respondents, 65 respondents were identified as forest going people, 54 were non-forest going people; and 20 were classified as others which includes the people who stopped going to the forest for safety (n=10) or old age (n=6), and forest staff (n=4) (Table 2.1). The age of the interviewees varies between 22 and 90. Out of 29 VTRTs, 26 teams were covered by the data collection exercise, with three remaining VTRTs not contactable due to political unrest in those locations.

The interviewees were mostly men (n=131/139) as all the VTRT members and tiger killers are men. Due to purposive sampling, mostly men were identified/selected for interviews based on their experiences on usage of tiger parts and tiger killing.

Data on use of tiger parts, trade and poaching and other issues related with these were coded (Newing et al. 2011) and thematic models were developed to identify the links between different components. Comparing the models and identifying the words most often used by the respondents (e.g. believe, use, medicinal values, tiger parts, excitement, looking for, asking for, *shikari*, *kobiraj*, recent demand, trader) we were able to identify emergent themes and issues. The rigour and accuracy of our descriptions and interpretations were tested by going through the data several times, triangulating the information from different interviewees, and examining them to find out the common threads and patterns (Newing et al. 2011). Qualitative data analysis software 'QSR N-Vivo 10' was used for data management (Bazeley 2007) and to ensure all data were included during the analysis. To test for differences between the respondents' characteristics and tiger parts related attributes Pearson's Chi-square test. Significant unstandardized residuals (values above z=+/- 1.96 at p<0.05) were used to explore significant differences.

Table 2.1

Social data of the respondents.

	Range				Village		Gender		Livelihood		
	Satkhira	Khulna	Chandpai	Sarankhola	Border	Non-Border	Male	Female	Forest	Non-Forest	Other
VTRT	14	7	22	3	42	4	46	0	22	20	4
General Villagers	18	14	21	9	50	12	54	8	25	27	10
Tiger killers	11	6	7	7	27	4	31	0	18	7	6

RESULTS

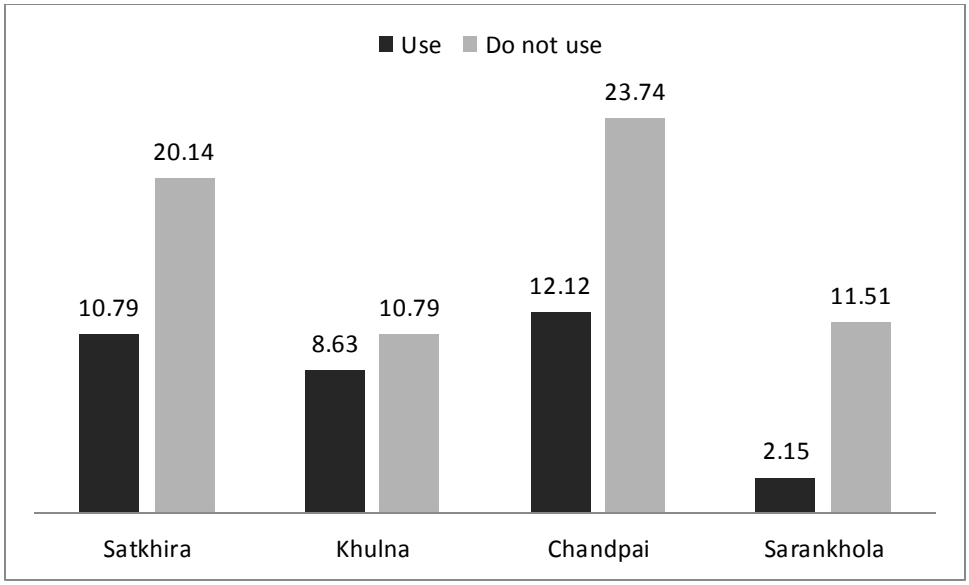
Local beliefs and uses of tiger parts

We found 65% of the respondents (n=90/139) used and/or believed in the benefits of tiger parts, 20% (n=28/139) reported they did not use or believe in the benefits of tiger parts, 9% (n=13/139) would not talk about using tiger parts, and 6% (n=8/139) were coded 'Don't know'. Of the respondents who reported using and/or believing in the benefits of tiger parts 52% (n=47/90) used tiger parts and 96% (n=86/90) believed in the benefits of tiger parts (Figure 2.2). Across the four ranges, we found that the number of respondents who use tiger parts are lower than who never used tiger parts (Figure 2.2); and the numbers of believers in the benefits of tiger parts are higher than non-believers except in the Sarankhola range (Figure2.2).

We found that the respondents reported believing in the medicinal and spiritual benefits of tiger parts are significantly higher in Satkhira range and lower in Sarankhola range (χ^2=8.49, df=3, p=0.037), and significantly higher number of tiger killers believe in the medicinal and spiritual benefits of tiger parts (χ^2=4.08, df=1, p=0.043) (Table 2.2). The respondents who use tiger parts are significantly more likely to believe in the benefits of tiger parts (χ^2=22.74, df=1, p<0.001).

People believe in and use tiger parts for diverse purposes including medicinal uses, as protection from 'dangers' in the forest, and to enhance personal social status and/or wellbeing (Table 2.3). Some believers (n=22/86) reported that every part of a tiger has a use. However, 17% (n=23/139) of respondents reported that tiger skin is not used locally due to their high price in the commercial black market.

Canines are sought for local medicinal or spiritual purposes by the villagers. Among the respondents, 11 tiger canines and three rings containing pieces of tooth were observed.



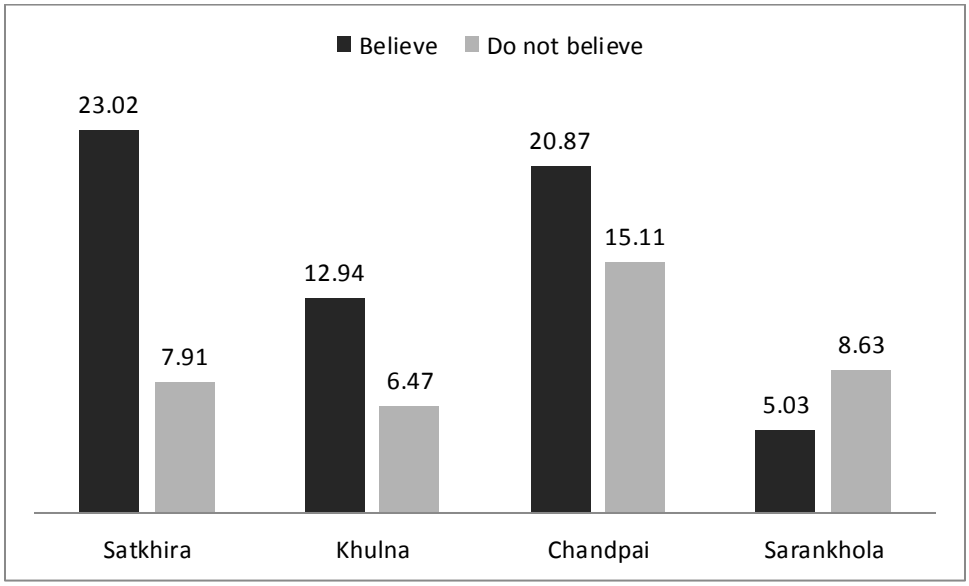


Figure 2.2 Percentages of the users of tiger parts and believers in the values of tiger parts in four ranges.

Respondents also reported about the use of tiger canines by the pirates in the Bangladesh Sundarbans. A friend of a pirate gang leader [12] mentioned: *''he [the gang leader] has locket [of a canine]. Normally the pirates wear the ring or locket when they come to villages to meet-up with their families as it enhances sexual virility.''*

Table 2.2 Statistical relation between the respondents believing in and using tiger parts with different characteristics.

	Believers			***Users***		
	χ^2	**df**	**p**	**χ^2**	**df**	**p**
Sampled group VTRT v general members v tiger killers	4.496	2	0.106	3.876	2	0.144
Involved in tiger killing 'VTRT and general members' v tiger killers	4.089	1	0.043*	2.296	1	0.130
Livelihood Forest going v non-forest going v other	1.43	2	0.489	0.532	2	0.766
Village bordering v non-bordering	0.035	1	0.852	0.152	1	0.697
Ranges Satkhira v Khulna v Chandpai v Sarankhola	8.496	3	0.037*	4.144	3	0.246

Table 2.3 Local uses of tiger parts as believed by the respondents.

Use for		Tiger parts													
		Canine	Other teeth	Bone	Claw	Meat	Furs	Whiskers	Tongue	Genital organs	Liver	Scat	Milk	Pugmark	Total
Pain	Rheumatism	n=17		n=7	n= 3		n=5	n=5			n=3				**40**
	Body pain	n=17	n=4	n=11	n=7	n=4	n=1	n=9	n=1	n=1					**55**
Various disease	Heart disease	n=2	n=2				n=1								**5**
	Skin disease	n=1													**1**
	Cancer			n=3		n=4				n=1					**8**
	Bone marrow	n=1	n=1												**2**
	Eye disease	n=1	n=1												**2**
	Liver disease					n=3			n=2	n=1					**6**
	Kidney disease		n=1												**1**
	Asthma				n=1	n=2		n=3		n=1					**7**
	Female disease (child delivery complication	n=2		n=3		n=3			n=1	n=9					**18**
	Elephantiasis								n=1						**1**
	Dysentery					n=1	n=2	n=1				n=1			**5**
	Sores							n=6							**6**

		Canine	Other teeth	Bone	Claw	Meats	Furs	Whiskers	Tongue	Genital organs	Liver	Scat	Milk	Pugmark	Total
Various disease	Wounds from tiger attack					n=1									**1**
	Ear problem												n=1		**1**
	Haemorrhoids			n=1											**1**
	Chicken pox			n=1											**1**
	All disease	n=4		n=2	n=6	n=4				n=1					**17**
Protection	From disease	n=7	n=4		n=5	n=3		n=6				n=4			**29**
	From enemy	n=2	n=1												**3**
	From bad spirit	n=7	n=1	n=1	n=4	n=1		n=3							**17**
Pesticide	Keep insects away from home	n=1	n=2	n=4	n=1	n=3						n=4			**15**
	Keep insects away from livestock			n=6		n=1									**7**
Sexual	Virility for men			n=1		n=1		n=1		n=10					**13**
	Contraception for women			n=1					n=1					n=3	**5**
Behavioural/ Social	Brings good fortune	n=3													**3**
	Earns respect	n=5	n=1												**6**
	Tiger like temperament	n=11	n=1		n=1							n=1		n=7	**21**
	Enhance beauty by jewellery	n=43	n=11		n=24										**88**
	Total	**124**	**30**	**41**	**52**	**31**	**9**	**34**	**6**	**24**	**3**	**10**	**1**	**10**	

Local beliefs about a specific bone locally known as '*lucky mon'* or *'kathi*' (meaning stick) was also reported by 9% (n=13/139) of respondents. The precise position of this bone in the tiger's body was described differently by different respondents. For example, some said it is the clavicle while others described it as the right or left bone of either the fore or hind leg. However, the respondents mentioned this as being the most powerful part of tiger's body as it has the power to cure anything. This view is underpinned by the belief that during food scarcities the tiger will lick this particular bone and be able to survive without food for up to 40 days.

In addition to using tiger parts 20% (n=28) of respondents also reported that other objects could acquire medicinal or spiritual power through contact with tigers, for example the use of *taga* to remove waist pain. This is a black thread which villagers wrap around a tiger's waist when it is killed. The thread is then worn around the waist of a person suffering back pain. Along with *taga* tigers' pugmarks (i.e. tiger's footprint) are also valuable to the members of village community. Some respondents (n=8/139) reported that they fill the pugmark with rice and then feed the rice to children or dogs to give them 'courage of a tiger'. Eating the soil of a pugmark was also reported (n=4/139) as a contraception option due to a local belief that tigers only give birth once every twelve years. This is no longer widely believed as women are known to have become pregnant despite consuming pug-marked soil. Women typically use tiger parts for medicinal or protection purposes only while men are more interested in medicinal and luxury use. For example, during field work 13 men were observed wearing tiger parts as jewellery whereas no woman were seen or reported wearing tiger part jewellery to enhance beauty. This may be related to the local belief that tiger jewellery enhances manly attributes such as leadership, virility and aggression. One woman [107] mentioned that: *''a tiger tooth ring makes a person aggressive. Elderly persons forbid to use it as it can break-up the family.''*

In the Bangladesh Sundarbans, beliefs surrounding the benefits of tiger parts are very simple and informal; not as specific as the traditional Asian medicines. For example one respondent was using deer teeth mistakenly believing them to be tiger teeth. There is no specific method for using tiger parts and most of the tiger parts are used by wearing an amulet, ring or locket, having it home or eating a small portion of it.

The role of the Kobiraj

Kobiraj play a crucial role in fuelling the traditional use of tiger parts in the Bangladesh Sundarbans. *Kobiraj* are the local doctors who provide hand-made medicine from plants or

animal parts to all manner of illnesses and afflictions. If the members of the community are not sure about the use of a particular tiger part they believe the *kobiraj* will know how to use it to cure a disease or to solve a problem and because of this when villagers obtain tiger parts they often store them for future use. There were many stories of *kobiraj* using tiger parts to treat and cure seriously ill people. The patient can take tiger part to the *kobiraj* to be made into a *maduli* (amulet) for the patient to wear or to keep in his house. Sometimes the *kobiraj* will also make the *maduli* with a tiger part from their own collection. Money is offered for the service with rates dependent on the treatment and the patient's need. A respondent [96] stated: *'two years ago I bought a maduli from a kobiraj for BDT 200[about USD2.6]. It has tiger bone and fur.'* In some cases the *kobiraj* do not provide the tiger part if the price is not right. According to one villager [96]: *''a kobiraj had a canine and asked for BDT 20,000 [about USD258]. I offered him BDT 5,000 [about USD65] but he didn't give it to me.''*

The members of the village community trust the *kobiraj* and believe in the medicines with tiger parts. A respondent [110] reported: *''I am using it [the amulet] for the last 6 years for rheumatism….one day I'll be cured.''* Respondents reported that local people believe in these medicinal values as this is the only option they have in the area. A respondent [45] mentioned: *''it takes several hours to go to hospital. Most of the time people go with a patient and bring back a dead body.''*

Sources of tiger parts

Finding and collecting tiger parts in the villages might take some time but tiger parts were available in all the villages surveyed. A respondent [76] stated: *''who says it is not available! There is no shortage of parts!''* One major source of tiger parts is from tigers that are killed when they stray into villages. Eight tigers were killed by villagers between 2008 and 2014 before they could be tranquilised and re-released by the Forest Department and VTRTs (Rejuan 2014). Some respondents (n=7/139) reported that their main motivation for killing stray tigers was to collect tiger parts for medicinal purpose or to make money (Table 2.2). During stray tiger incidents thousands of villagers gather to kill or see a dead tiger. It is hard and dangerous to get close to the dead tiger as everyone wants to take tiger parts and canines and the other teeth are the first target to be taken by them. It is not possible to take the canine or any tooth by pulling by hand, so axes are used to break the jaw bone. A respondent [79] reported: *''I hit the mouth severely with axe, I put my hand into the mouth of the tiger to grab some broken teeth, but someone else hit my hand with his axe and I lost one of my fingers…….but finally I could collect some broken*

teeth and canine.'' And [44]: *''thousands of people took parts. People took whatever they could. Even the children …took the furs and there were no furs at the end.''*

Respondents also reported that tigers killed inside the forest by the professional tiger poachers, opportunistic tiger killers i.e. *shikaris* or deer trappers, and these tigers are an important source of tiger parts. However, general members of village community do not go into the forest to kill tigers. Few respondents (n=15/139) reported that they occasionally found dead tigers (often with a bullet) inside the forest and although partly rotten, they could still collect canines, teeth, claws and bones (Table 2.3).

Local trade of tiger parts

A local trade i.e. the trade of tiger parts within the members of village community for traditional use exists in the villages around the Bangladesh Sundarbans. Respondents reported that members of the village community who do not possess tiger parts can access them when needed. Finding tiger parts is not difficult if family members or friends possess them. Family, friends and neighbours give tiger parts mostly for free as they want to help people to overcome a problem (Table 2.4). One respondent [39] mentioned: *''if needed they will give it, but won't take money. Villagers are very simple... helpful.''* Another respondent was observed to hang a skull in his yard so that people can collect and use it for free when they are in trouble (Table 2.4).

People first enquire about tiger parts among their friends and family and if unsuccessful they go to the other people who might have tiger parts such as a *shikari* or other forest users. If they do not know a *shikari* they find a person who knows the *shikari* and who can act as a middleman to collect tiger parts as it is very unlikely that someone will give tiger parts to an unknown person. For example, a *kobiraj* [71] and owner of tiger parts said: *''about 10-15 days ago a man from Jorsingh came and asked me for tiger bone, claws or canine for his child. I said I don't have any as we can't give it to everyone…….only to the close ones.''*

The local trade becomes more commercial when it involves a middleman. Sometimes the middleman needs to go to the owner more than once to convince him/her to give or find the required body part. When the owner of the tiger parts agrees to give or find the requested tiger parts the buyer usually gives the owner some money. Here the price of the tiger parts may depend on the financial solvency of the buyer. As one respondent stated [84]*: ''he gave me tiger part in a paper, like a mustard seed for BDT 500 [about USD6.5], I*

gave him BDT 200 [about USD2.6] and told him I shall give the rest later as I couldn't afford to give him all.''

Tiger parts are also use for maintaining good relationships (Table 2.4) or as a bribe. One respondent [2] who was arrested for deer poaching stated: *''I gave the canine to the lawyer to make him happy.''* During data collection a few of the respondents (n=4/139) also offered tiger parts as a gift to the researcher. Sometimes people/tourists come to visit the villages and ask for tiger parts as a 'souvenir'. In exchange they offer money or another valuable luxury item (e.g. alcohol). A respondent [108] mentioned: *''a man from India came to visit the area and after seeing my ring he offered me his gold ring for my ring [with tiger canine]. Then I realized my ring is very valuable and I didn't give him my ring.''*

Apart from the occasional trade of tiger parts with outsiders many respondents (n=36/139) reported about a more recent commercial demand for tiger parts especially bones arising from non-local Bangladeshi traders. The traders offer money and collect any amount of tiger parts they can get. The price for 1 kg of tiger bones varies in different areas with many respondents (n=40/139) reporting a price of around BDT 5,000-6,000 (USD64-77), but this can vary considerably depending on the trade network and bargaining power of the main players. For example, one respondent reported [110]: *''I sold tiger bone for 500 BDT/kg [about USD6.5] after the cyclone Sidr, I know the price is higher in other places but I have no other option here.''*

Table 2.4

Source and motivation for collecting tiger parts with supporting evidence from respondents' narratives.

Source of tiger parts	Motivation	Supporting evidence from respondents' narratives
Stray tiger	Medicinal	[85]: *''we were taking the carcass [of the tiger] to the office [from the village] and within a blink a lady came with a knife, cut off the male genital and run away... They believe it has high medicinal value.''* [71]: *''my husband brought these parts [from a dead stray tiger] and gave me as I know the medicinal values.''* [59]: *''if there are 1,000 people, 1,000 people will take the waist measurement as this is useful for waist pain.''*
Stray tiger	Money	[79]: *''a man asked me to collect a canine for him and he will give me BDT 2,000 [about USD26] for that. So during a stray tiger incident I went with an axe to kill it [tiger].''*
Stray tiger	Exotic item	[86]: *''everyone was taking tiger parts so did I…some furs. I didn't take to use it. We saw it and showed it to others.''*
Kobiraj	Medicinal	See main text
Friends/family	Medicinal	[06]: *''I gave it [ring] to my neighbour as she was suffering from rheumatism.''* [19]: *''we hang it so that people can collect it whenever they need it.''* [11]: *''I am taking it to X village to give my cousin as she is suffering from female disease.''*
Friends/family	For benefits	See main text
Friends/family	Maintain good relation	[1]: *''I gave a pair of earrings made of gold and claws, as a gift at the wedding of my boss's daughter [in capital city Dhaka]. They are very rich, but my gift was very unique and they will remember it...They were very happy.''*

Source of tiger parts	Motivation	Supporting evidence from respondents' narratives
Dead tiger in the forest	Medicinal	[20]: *''we [respondent, his uncle & cousin] saw a dead tiger half rotten…I took 2 bones as they have medicinal values. My uncle and cousin didn't take separately as they can collect from me when needed…They trust me.''*
Dead tiger in the forest	Money & exotic item	[23]: *''3-3.5 years ago, I saw a dead tiger…I threw a stick to check….there was a bullet in the right hind leg. About 1 feet [of the body] was rotten…We took 4 canines, 10 claws, whiskers, and some bones. We buried the bones. We didn't take the skin as the leg was rotten…we didn't know whether someone will buy it or not...we didn't take any risk…We divided the tiger parts [with his fishing partners], I sold 2 canines for BDT 1,000 [USD13] each. I know about the demand but I won't sell the claws…I want to keep them as a collection.''*
Shikari	Medicinal	[19] *''we have it here so that people can collect it when they need it.''*
Shikari	Medicinal (via middleman)	[114]: *''My cousin's wife was suffering from waist pain, she couldn't work. We heard that ring with bone or tooth is useful. My cousin couldn't find any tiger parts. I asked a man who was close to a shikari. He arranged a very small piece of canine. He asked BDT 500 [USD6.5], we could only give him BDT 200 [USD2.5].''*
Shikari	Money (via middleman	[101]: *''he asked for tiger parts as someone [external buyer] was looking for tiger parts and offered him money for as much as he can give. I informed [him] that I'll look for tiger parts to the shikaris.''*

DISCUSSION

Studies have been conducted on the local use and consumption of tiger parts by community people in some tiger habitats; in most cases killing tiger is a taboo in the indigenous communities, and tiger meat consumption mostly occurs if a tiger is killed for self-defence, followed by rituals to get rid of the sin for killing tiger (Bolton 1972). Moreover, except few exceptions (Chakravorty, Rochow and Ghosh 2011), there is no local use of tiger parts in the neighbouring country India (Seidensticker, Christie and Jackson 2001) and is unheard of in the Indian Sundarbans (B. Wright, per. comm. May 20, 2012). In the past few centuries, tigers were killed in the Indian sub-continent for trophy hunting by the Maharajas and British colonial officers (Rangarajan 2001). However, deliberate killing of tigers by the community people to collect tiger parts for local use has never reported except the Bangladesh Sundarbans (Saif, Rahman and MacMillan in press). In the Bangladesh Sundarbans, it is the first in-depth study to find out the local uses and beliefs of tiger parts and its connection to commercial trade. The study found that the community people believe in and use tiger parts for medicinal and spiritual purposes, and also give tiger parts to their friends and family within the villages or outside to help them or to maintain good relations, and to gain benefits. These tiger parts are collected from the dead stray tigers, dead tigers found in the forest or via the community members who kill tiger in the forest opportunistically.

Tiger parts have been using in the traditional Asian medicine for a very long time and the medicinal values and methods of using are very specific, and well documented in their literature (Nowell 2000; Ellis 2005). However, in the Bangladesh Sundarbans the use of tiger parts is very subtle and there is no specific recipe or method for making or consuming the medicines. In absence of a specific tiger parts people may use another part.

Out of four ranges, we found that the numbers of believers in the benefits of tiger parts are higher in 3 ranges (Figure 2.2). The recent seizures of tiger parts in the Sarankhola range may restrain some respondents from reporting. Believing in the benefits of tiger parts does not cost money or involve any risk. This may also cause the higher number of believers than the users in all the ranges (Figure 2.2).

We also found that a commercial demand for tiger parts arising from non-local Bangladeshi traders is emerging in the villages around the Bangladesh Sundarbans. Professional tiger poachers are the main supplier of tiger parts to this recent commercial demand (Saif and MacMillan in press; Saif, Rahman and MacMillan in press) and we did

not find any evidence that the community members go to the forest to kill tigers to collect tiger parts for the local medicinal or spiritual uses. However, we believe that the local use of tiger parts is a threat to the tiger population in the Bangladesh Sundarbans for several reasons. First, we could not draw a distinct line between the local uses of tiger parts and the commercial trade, as local use and commercial trade are linked through the community members who use or belief in the medicinal or spiritual values of tiger parts. We believe that the uses and beliefs of the members of the local community acts as a window of opportunity for non-local Bangladeshi commercial traders to come to the villages around the Bangladesh Sundarbans and, we found evidence that some tiger parts from the local users are being sold to these external buyers, i.e. commercial traders or tourists. Second, stray tiger killing is a threat for the tiger population in the Bangladesh Sundarbans (Aziz et al. 2013), and the local use of tiger parts and the commercial demand, certainly contribute to the high level of stay tiger killing (Inskip et al. 2014). Lastly, the existence of the local use and beliefs of tiger parts gives the opportunity to the opportunistic tiger killers to sell the tiger parts either directly to the members of the community or through a local middleman.

We could not quantify how many tigers are killed in the Bangladesh Sundarbans to provide tiger parts for the local use or to the traders. However, collection of tiger parts from stray tiger may be linked to the high number of stray tigers that are killed (>50%) in the recent years. For example, from 2008 to 2014 in the villages around the Bangladesh Sundarbans, out of 14 stray tiger incidents (where a stray tiger was trapped/surrounded by hundreds of villagers), eight were killed, two tranquilized and released by the government, and only four were successfully chased back to the forest (Rejuan 2014). We found that one of the motivations for killing tigers rather than chasing them back into the forest was to obtain tiger parts, and it is possible that tiger fatalities in these situations would had been lower if there were no demand for tiger parts either for local use or to give to the external traders. Moreover, we found that the uses or beliefs of tiger parts is significantly higher in Satkhira Range and this may be linked to the high number of stray tiger killing in this range (4 out of 8).

In Bangladesh, tigers are critically endangered (IUCN Bangladesh 2015) and tiger poaching is a high priority threat (Aziz et al. 2013). We believe that, any human action that causes unnatural elimination of tiger from the Bangladesh Sundarbans is a threat towards its

survival; and it is to be welcomed that the presence of the VTRTs has led to saving two stray tigers from the village in support with the Forest Department and WildTeam.

We found significant evidence for deliberate tiger killing in the forest and we found that possession of tiger parts is significantly higher among the respondents who go to the forest to kill deer or tiger. Although the Wildlife (Preservation & Protection) Act, 2012 declared tougher punishment for killing tigers in the Bangladesh Sundarbans, the existence of such laws is not in itself sufficient to reduce poaching unless it is enforced (Pratt, MacMillan and Gordon 2004). Enforcement may be challenging as the commercial trade is becoming stronger and is already in the hands of organised criminals with great experience and the right contacts to avoid prosecution or serious punishment. However, we believe a very focused and organised anti-poaching effort that ensures the prosecution and punishment of the poachers and commercial traders in Bangladesh will reduce the poaching pressure on the tigers of Bangladesh. The Forest Department in collaboration with WildTeam and Panthera (conservation organisation) have planned to implement such effort in the Bangladesh Sundarbans to minimize tiger and deer poaching in the forest (Panthera n.d.).

An effective long term strategy might be to aware people about their development opportunities for tiger conservation in the region (Challender and MacMillan 2014). One obvious option would be to provide inexpensive modern medical care in the local communities as an alternative to the *kobiraj* as due to the low income of the community people and long distance of the hospitals from the villages the community people largely rely on the *kobiraj* for treatment. This initiative would be challenging considering the population size in the villages. However, free medical facilities are provided to the villagers of several tiger reserves in India by Satpuda Foundation (wildlife conservation NGO) through a 'Mobile Health Unit' and a similar initiative would be an option to dissipate the local people's belief in tiger parts. Moreover, the social awareness campaigns could be tied to development projects and, embedded the message against medicinal values of tiger parts and that tiger killing is in conflict with development opportunities. Alternative livelihoods are often suggested as mechanism for avoiding human wildlife conflict and deterring poaching (Woodroffe, Thirgood and Rabinowitz 2005; Gubbi and MacMillan 2008; Dickman 2010). Some organisations are working to implement eco-tourism projects involving community people, but it is still in the planning phase.

In other areas large-scale relocations of people have been suggested as a means of conserving tigers through reducing the pressure of forest resources and allowing prey species to recover (Harihar, Pandav and Goyal 2009). This is a controversial approach (Rangarajan and Shahabuddin 2008) but this option is currently being explored for the Bangladesh Sundarbans, by GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit, a development organisation) in collaboration with the Ministry of Labour and Empowerment. The plan would involve the voluntary relocation of people from the villages around the forest to mid-sized cities to reduce pressure from the forest, and will provide trainings and guidance to the livelihood options in the new area for those who are willing to relocate. While we believe that the relocation of some people from the villages around the Bangladesh Sundarbans may have a little impact on the local demand of tiger parts in the area, as less people means less demand and it will narrow down the opportunities for the external buyers looking for tiger parts. However, we do not believe that relocation will reduce poaching significantly which is the highest threat for the tigers, because the professional tiger poachers have well establish business here and it is very unlikely that they will stop poaching and voluntarily move to a new place to establish a new livelihood option.

As poaching is a main threat to the Sundarbans tigers (Aziz et al. 2013), the pristine of local demand for tiger parts and the escalating nature of the commercial trade there, is a significant risk that all of these large scale investments, medical and livelihood benefits may not produce positive results for tiger conservation, unless local people can be persuaded over time to actively oppose the use and trade of tiger parts. A multi-faceted approach, based on the local benefits of tiger conservation generated by new development measures, combined with stronger enforcement is likely to be the only sustainable solution in the Sundarbans.

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CHAPTER 3: WHO IS KILLING THE TIGER AND WHY?

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ABSTRACT

This study documents the range of people involved in tiger killing in the Bangladesh Sundarbans, their motives and methods for tiger killing, and their links to the commercial trade. Using a snowball sampling method, 141 in-depth qualitative interviews were conducted with the Village Tiger Response Team members (n=46/141), general members of the community (n=62/141), and tiger killers (n=33/141) between December 2011 and June 2013. We identify 5 groups: villagers, poachers, *shikaris,* trappers, and pirates, each with different motives, methods and networks. Villagers kill tigers in the village predominantly for safety, while other groups kill inside the forest professionally or opportunistically. Poachers kill tigers purely for money, but for others the motives are more complex. Local hunter's *(shikari)* motives are multi-faceted, encompassing excitement, profit, and esteem and status arising from providing tiger parts for local medicine. Pirates kill tigers for profit and safety, but also as a 'protection service' to the community. The recent emerging international trade in tiger bones introduced by the non-local Bangladeshi traders to the area provides opportunity to sell tiger parts in the commercial trade, and acts as a motive for tiger killing across all groups.

Keywords: Bangladesh Sundarbans, poaching, qualitative research, tiger, wildlife trade

INTRODUCTION

Tigers (*Panthera tigris*) have declined across their entire range and now occurs only in 13 countries. Poaching is a major cause of this decline with the demand for tiger parts the main driver of tiger poaching (Nowell 2000). This study focuses on the problem of tiger poaching in the Bangladesh Sundarbans which, only a few years ago, was considered as a 'tiger stronghold' with an estimated population of between 300 and 500 animals (Ahmad et al. 2009), but current estimates indicate the population has fallen to only 106 tigers (Dey et al. 2015).

In the Bangladesh Sundarbans, tiger poaching has been identified as a high priority threat (Aziz et al. 2013) but we know little about tiger poaching in the Bangladesh Sundarbans. Although a few studies have explored the behaviour of tiger killing in villages, human-tiger conflict, and the local usage of tiger parts and its link with killing tigers in the Bangladesh Sundarbans (Khan 2009; Barlow et al. 2013; Inskip et al. 2013, 2014; Saif et al. 2016), no study has yet been conducted to understand the range of people involved in tiger killing in the forest, their motives and methods for tiger killing, and their links to the commercial trade. Our aim is to establish who is killing tigers, why and how with a view to designing more effective conservation interventions that complement existing law-enforcement efforts. This type of study is rare in the published tiger conservation literature, but is essential baseline information upon which effective and sustainable tiger conservation strategy and actions can be implemented.

METHODS

Study area

The Sundarbans is the largest mangrove forest in the world spanning the border between Bangladesh and India. On the Bangladesh side, it covers an area of 6,017 km^2 (Ahmad et al. 2009). The Bangladesh Forest Department (FD) has divided the forest into 4 ranges: Satkhira, Khulna, Chandpai and Sarankhola which are surrounded by 8 *upazilas* (sub-districts) (Figure 3.1).

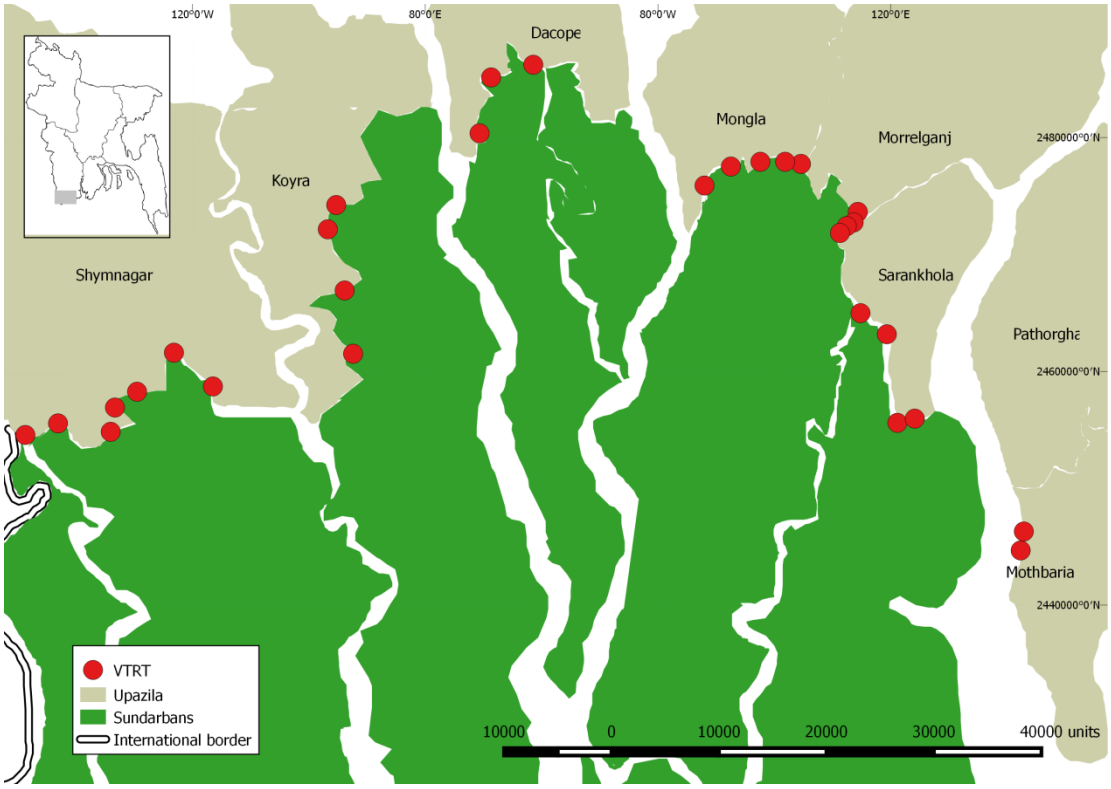

Figure 3.1 The Bangladesh Sundarbans and the locations of 29 VTRTs and surrounding *upazilas.*

Tiger killing history

Social elites have practiced tiger killing in the Indian-subcontinent for centuries as 'sport' (Rangarajan 2001). Local hunters, known as *shikaris* were employed as guides and trackers to support these hunts (Chakraborthy 2010). Described as 'low-caste' individuals, who were looked down upon by other community members (Rangarajan 2001; Chakraborthy 2010), they assumed a stronger identity in the days of the British Raj, establishing a strong social bond with the British hunters (Sramek 2006), not unlike the relationship observed on Scottish sporting estates between the gentleman sportsman and his local highland *ghillie* (MacMillan and Leitch 2008; MacMillan and Phillip 2010). During the British period, the *shikaris* were also hired and rewarded to kill tigers in the Sundarbans due to high human casualties (Rangarajan 2001; Chakraborthy 2010).

Sampling strategy and interview approach

We carried out semi-structured interviews to gain information on tiger poaching/killing with local people in the 4 administrative ranges between December 2011 and June 2013. Informal interviews were also conducted with a researcher, 2 journalists, a police officer, and a lawyer.

Using mostly open-ended questions, the approach was partly inductive allowing informants to discuss all the issues they felt relevant and continued until the data became saturated (Newing et al. 2011). This approach has been used in other studies for an in-depth understanding of wildlife killing (Pratt, MacMillan and Gordon 2004; MacMillan and Han 2011) with ethical clearance obtained from the Zoological Society of London (ZSL) and the University of Kent.

In deciding our research strategy, we considered several factors. First, we thought it unrealistic to expect interviewees would answer truthfully to any directly incriminating questions about illegal wildlife killing for profit (Solomon et al. 2007). Second, we were also cognisant of the need to overcome any reservations the people may have about being questioned by an urban, well-educated female Bangladeshi on a sensitive subject. We therefore decided to invest considerable time (1-7 days) building trust with each respondent. To gain this trust, we spend time socialising (e.g. having lunch at their place, showing photos, teaching their children), and participating in their daily activities.

To verify sensitive data, similar question was asked more than once by rephrasing the question during different phases of the interview. The reliability of information obtained was assessed by asking details about timing and place– for example if the event took place before or after cyclone Sidr (November 2007) or Aila (May 2009), or which government was in the power, or which grade his son/daughter was (the researchers were confident that trust had been established when many interviewees showed tiger parts they had obtained). In order to convince tiger killers to take part in the interview, we agreed that they would be able to describe tiger killing events in the third person (i.e. he/she/someone killed tiger), without mentioning anyone's involvement in the process. The tiger killer was also assured before the interview that the source of his knowledge or experience of killing would not be requested.

The name and address of the interviewees were not asked or recorded, and the interviewees were assured of anonymity and all the interviews were carried out in Bengali exclusively by the main researcher to maintain consistency and trust. As some respondents were very uncomfortable about giving too much personal information such as their religion, we omitted any non-essential personal questions. To avoid any false or misleading answers no direct financial incentives were provided to the interviewees (Gavin, Solomon and Blank 2010). The interviews generally lasted for 2-4 hours. Interviewees were offered snacks during the interview; the interviews lasted for more than 2 hours were conducted with breaks in the middle, and lunch/dinner was offered as a traditional gesture.

Purposive sampling was used whereby members of the village community with different levels and forms of engagement with tiger killing were actively sought. These groups are: 1) members of Village Tiger Response Team (VTRT), 2) general members of the community and 3) people who have killed tiger.

VTRT members are unpaid volunteers, drawn from members of the village community who help prevent tigers being killed if they enter into a village. Formed by WildTeam, a conservation NGO, each VTRT is located in areas with significant human-tiger conflicts (Figure 3.1). VTRT members are trained and experienced in dealing with situations when tiger enters villages and knowledgeable about village life and forest resource collection practices.

Initially we conducted meetings with the members of each VTRT, and explained the research and ethical issues involved. The most appropriate member/s of the team for subsequent, more in-depth interviews were then identified (n=46) based on their knowledge and experience on wildlife poaching, tiger killing when a tiger enters the village (hereafter, village tiger) and pirate activity. On average 1-3 persons from each team were interviewed. The interview guide (Appendix I) focusing on the motivations of joining a VTRT, their role when a stray tiger enters a village, and what they understood to be the uses and values of tiger parts and tiger poaching.

General members of the community (n=62) were selected based on their knowledge and experience of tiger parts, wildlife poaching, tiger killing in village, and pirate activity. Interviewees were recruited using snowball sampling (Newing et al. 2011) with initial introductions by VTRT members in the community. Interviewees included honey collectors, wood cutters, fishermen, day labours, shopkeepers, jewellery makers, *gunin* (people who recite spiritual scripts to ward off tigers), *kobiraj* (local doctors), tailors, businessmen, carpenters, and tiger victims. The interview guide used (Appendix II) focused on the attitudes and behaviours of the people about village tiger situations, tiger killing, dead tiger, local and commercial trade of tiger parts and poaching.

'Tiger killers' were also interviewed, comprising any individual who killed a tiger inside the forest. The same interview guide for the general members was used for this group but, where the opportunity allowed, the interviewer probed for more sensitive details about tiger killing activity. The tiger killers were selected using the snowball sampling strategy through various local contacts and police records. Some general members of the community, who mentioned that they were involved in tiger killing incidents in the forest,

were subsequently categorized as a respondent of this group. In total, we conducted 33 interviews with tiger killers, of which 5 were poachers, 27 were opportunistic killers i.e. *shikaris*, and 1 person admitted killing in self-defence.

Data analysis

Data on poaching, killing, trade and other related issues were coded and thematic models were developed to identify the links between different components (Pratt, MacMillan and Gordon 2004). Comparing the models and identifying the words most often used by the different 'actors' (e.g. *shikari*, pirates, poison, guns, recent demand, trader, etc.) allowed emergent themes and issues to be identified. We used the Institutional Analysis and Development (IAD) framework for the structural presentation of the data (Ostrom, Walker and Gardner 1994). IAD is a robust framework for describing the components of a system and establishing interactive links among them. In this chapter, people engaged in killing tiger, transporting and trading are the components, with trade for commercial and cultural reasons and social relationships as the interactive links. The rigour and accuracy of our descriptions and interpretations were tested by going through the data several times, triangulating the information from different interviewees, and examining them to find common patterns (Newing et al. 2011). Qualitative data analysis software 'QSR N-Vivo 10' was used for data management and to ensure all data were included during the analysis.

RESULTS & DISCUSSION

Semi-structured interviews (n=141) were conducted in 54 villages (39 which bordered the Sundarbans and 15 which did not). Using the main livelihood of the respondents as an indicator, respondents were identified as forest going people (n=67), non-forest going people (n=54); and as others (n=20), which includes the people who had stopped going to the forest for safety reasons (n=10) or old age (n=6), and 4 FD staff.

Attributes of the community and tiger habitat

The Bangladesh Sundarbans is surrounded by 76 bordering villages, home to around 350,000 people, most of the villagers are dependent on the natural resources of the forest for their livelihood including honey collectors, wood collectors, fisherman, nipa leaf (*Nypa fruticans*) and thatching grass collectors (Ahmad et al. 2009). Globally few areas within tiger range are as populated with so many humans that are also heavily dependent on forest resources as the Bangladeshi Sundarbans. Conflict between tigers and humans is inevitable here and some of the highest recorded levels of human mortality from tiger attack occur here, with an estimated 20 to 50 villagers killed annually during resource extraction forays into the forest (Ahmad et al. 2009; Barlow et al. 2013). Prior to the formation of the VTRTs a

significant number of tigers were also killed annually. For example, it was recorded that between 2008 and 2012, a total of 8 tigers were killed in the villages (WildTeam data). Our research has established that tiger killing is in part about protection of villagers and livestock, but is also motivated by the desire to obtain tiger parts for local use or pecuniary rewards from the international trade with participation in killing also motivated by excitement and bravado.

Rules in use

There is no legal basis for any tiger killing. Following independence in 1971, Bangladesh Wildlife (Preservation) (Amendment) Act, 1974 banned tiger killing in Bangladesh, amended in 2012. The Forest Act, 1927 (amended in 2000) banned the carrying of guns into the forest. Enforcement of these laws falls largely to the FD, which is the custodian of the forest and its wildlife in Bangladesh while the coastal border is guarded by the Bangladesh Coast Guard. The recently formed Rapid Action Battalion (RAB) and Bangladesh Police conduct search operations for pirates and other criminals inside the forest. Since 2010 the national Government provides compensation to the family of a tiger victim equivalent to around BDT 100,000 (USD1,282).

Our research has established that tiger killing activity occurs both in the village and in the forest. In the village, there is a mutually agreed norm that tiger killing is carried out by 'the group' to avoid individuals being punished (Inskip 2013). Inside the forest, tiger killers do not follow any specific rules as tiger killing depends on motives and for most of the actors killing is an opportunistic act (Saif and MacMillan in press).

Actors involved in tiger killing

We identified 5 groups of actors involved in tiger killing: village tiger killers (i.e. villagers who participate in tiger killing during village tiger situation), and those that killed in the forest: poachers, *shikaris,* trappers*,* and pirates.

Villagers

During village tiger situation, thousands of people gather armed with axes, sticks, bamboo sticks, billhooks, etc. to kill the tiger. FD and VTRT members try to restrain the crowd. However, the tiger often gets killed if it attacks someone or does not return to the forest before sunset and at times the situation may get out of hand as the crowd becomes more exited and agitated. As one interviewee [34] mentioned: *''The FD wants to save the tiger but they cannot even go close to it as the public will hit them too.''*

Villagers typically act as a group for safety reasons, but also to avoid punishment for killing the tiger. Motivations for participation vary depending on the individual, from excitement to retribution. Interviewees reported that villagers want to kill the stray tiger because they feared for their lives or their livestock, but also for revenge for previous tiger attacks. People who risk death to confront a tiger are highly regarded, and the esteem gained from a brave act may also act as a motive. As one interviewee [85] reported: *''everyone who is brave hits the tiger."* Moreover, in 2011 a man who was killed by a tiger after he had pulled its tail in an act of 'bravery' is locally revered as a 'courageous' villager. Others mentioned that they actively participate in tiger killing to collect parts for traditional medicine or to sell. For example, one interviewee [79] mentioned: *''a man asked me to collect a canine for him and he will give me BDT 2,000 [USD26]. So I went with an axe to kill it [tiger].''* Regardless of motive, villagers collect almost everything they can get from dead tiger, including teeth, skin, bones, and whiskers for the local and commercial trade.

Poachers

Interviewees (n=43/141) reported that poachers kill tigers and sell tiger parts. Of these, 5 confessed about their direct involvement in tiger poaching activities in 2 ranges (Sarankhola and Satkhira), and their narratives provide an in-depth description of poachers' activities. In groups of 4-6 people, typically disguised as fishermen to avoid attention; they set snare traps inside the forest to catch deer or wild boar, and then place a dead carcass on a known tiger trail laced with poison [e.g. Furadan (n=11/33), Basudin (n=2/33), or Ripcord (n=2/33)].

After killing a tiger, poachers take the skin off in one piece from head to tail, including the claws and whiskers. They also bury body parts in a safe location, which they monitor, waiting for the meat to decompose and the right opportunity to sell. Tiger poaching is the main livelihood of the poachers. Using a trustworthy commercial network of buyers, many have been killing tigers and selling the skin commercially for 20 years. To optimise their profit they may liaise with several buyers, depending on the part being offered for sale [131]: *''when a tiger dies…we take the skin off, throw away the internal organs and take the rest. We sell the dry meat and bones to 1 buyer and the skin to another.''*

Interviews revealed a rising number of covert poaching incidents. Although we could not quantify this trend, interviewees did relate it to recent reports about non-local Bangladeshi traders from larger cities offering 'big' money (USD65/kg for bones). Furthermore one poacher (whose group had killed a total of 27 tigers between 2010 and 2012), stated that

tigers were becoming increasingly scarce and poachers now had to roam wider afield to meet demand.

Group members of poaching gangs are either relatives or friends, but tensions over money and other issues can lead to frequent turnover on the gang's membership. For example, one poacher [123] stated: *''I used to kill tigers with my uncle and cousins. They poisoned a tiger…sold the parts but didn't inform me. Later, I was informed about that deal from the buyer. I felt insulted and stopped working with them.''* Females are not involved in poaching but help in the village i.e. by burying bones in the house yard.

Shikaris

All hunting is illegal in the Sundarbans, but *shikaris* kill game covertly, primarily for personal consumption or to treat guests on special occasions. They are highly respected within the community and known respectfully by the honorific 'X *shikari*'. *Shikaris* who do not possess their own gun, borrow guns from gun owners in return for meat or on occasion, tiger parts. The proportion divided between the gun owner and the *shikaris* can vary depending on their needs and the total amount of game killed. Gun owners lend their guns only to those whom they trust not to divulge their identity. In one case, villagers recounted how a *shikari* injured by a tiger, insisted his teammate first return the gun to the owner, before bringing help from the village.

Shikaris typically go to the forest in small groups. To keep the noise low, only 2-3 of them enter the forest, others wait in the boat. Inside the forest they climb a tree which has new leaves or seasonal fruit, or if they see animal tracks nearby. Facing against the wind, they make noises and play with leaves, mimicking rhesus monkeys, to attract deer (deer consume the leaves monkeys drop). They also make 'deer calls' (mating/alert calls) locally known as *'kui'* to attract deer. Some *shikaris* (n=7/27) also go for hunting at night using torchlight to identify animals by the reflection from their eyes. The *shikaris* recite the religious verses while putting the bullet into the gun to make the game 'halal'.

All *shikaris* interviewed (n=27/27) confessed that they had killed a tiger at least once in their lifetime. When the tiger dies, the *shikaris* take the skin off and bury the body in the forest, and later dig out the bones. If the tiger does not die nearby the *shikaris* usually do not try to track the tiger for their safety. The wounded tiger may die somewhere else, and interviewees (n=13/141) have reported of seeing dead tigers with bullet holes in the forest.

Table 3.1

Statements of some *shikaris* expressing their motives to kill tiger in the forest.

TK: Tiger Killing

TK Motive	**Supporting evidence from *shikaris* narratives**
Safety	[19]: *''We were in the tree and the tiger was walking around us… it was almost evening and the tiger was still there…. It was getting dark and we kill the tiger''* [54]: *''we hunt deer… kill tiger if we see it… for our safety''*
Excitement	[105]: ''*The excitement is in shooting….I have shot a tiger from tree''* [6]: *''Hunting means hunting of animals. Except monkey shikari kills everything inside the forest…. tiger, deer, adjutant, monitor lizard, python…''* [110]: *''as a hobby…. If get a tiger then kill it, if not no problem''*
Retaliatory	[128]: *''my younger brother, who was studying in class IX, was killed by tiger. So I was so desperate to kill tigers''* [6]: *''we killed a deer and suddenly a tiger came and started to eat the deer. Within this time, the shikari changed the bullet to LG and shot in the head….spot dead…. He cut the abdominal side with a billhook and was uttering heart....heart... [to eat]. His brother was killed by a tiger....we didn't let him to eat''*
Money	[14]: *''interested in tiger killing… If you kill one tiger you will get 5 lacs [USD6,490], if you kill deer you will get 10,000 [USD130]''* [10]: *''tiger poaching is not my main business. It is an extra income''*
Opportunistic	[105]: *''we saw a tiger and decided to kill it as we didn't find any deer on that day''*

Our research findings suggest that the *shikaris*' motives for tiger killing are complex, driven by different socio-economic factors such as safety, excitement, retaliation, and money (Table 3.1). The narrative accounts of the *shikaris* and other interviewees suggest that *shikari's* tiger killing is opportunistic in nature as they generally go to the forest to kill deer, but once a tiger is spotted, should the opportunity to make a kill arise, the *shikaris* kill the tiger and take the parts. However, *shikaris* may not always know a trustworthy dealer to sell tiger parts, especially for skins, as these are most risky to sell. Hence, prices vary greatly depending on the circumstances and will often accept quite low prices due to the risks involved. For example, one *Shikari* [52] stated: *''I sold it [the skin] for BDT 10,000 [USD130]. I cannot give it to anyone…only to [those] you can trust.'' Shikaris* also mentioned that sometimes after killing a tiger they take only the canines and claws which can be traded easily in the local community, but will leave the skin because it is too risky to sell. In several cases, *shikaris* (n=3/27) were coerced into giving skins to commercial traders for free because they were threatened that they would be reported to the authorities.

Although it proved impossible to estimate the total number of tigers killed by *shikaris* annually from our data, our evidence suggests that they are responsible for a significant number of tiger kills and, like poachers, are finding it harder to kill tigers due to a dwindling tiger population. As one *Shikari* [88] stated: *''in the 90's I used to take the skin from 5-10 tigers each year…after 2000…only 4-5.''*

Trappers

Interviewees reported that many villagers go to the forest to set traps for deer. Trappers are socio-economically different than the *shikaris* in terms of the killing method, motive, and social status. The trappers kill deer predominantly to sell or consume deer meat. They do not have a gun and typically use different types of traps made of rope. Some traps are set in a row of loops, known as *fashi faad,* in which deer become entangled. One interviewee [26] stated: *''we set traps in 10-12 places and after that start to check the traps to see if deer are trapped or not. If a deer is trapped we cannot go to check the others as it takes time to process the trapped deer.''* Some interviewees (n=21/141) reported that a tiger can release itself from these traps unless the loop is stuck around its neck. Another trap, known as *chitka,* pulls the animal into the air. This trap is made of rope to catch deer, but can trap a tiger if the rope is strong enough or iron chain is used.

Although the use of iron chain suggests tigers may occasionally be the prey, for trappers, all our accounts indicate that killing a tiger is largely accidental. One interviewee [26]

recounted: *''3 years ago we set trap at Subdhe-Khal for deer…and found a female tiger trapped. We killed the tiger by beating with sticks.''* Indeed, many trappers who find a dead tiger will eschew the opportunity of taking tiger parts because, lacking a trustworthy network, and may face significant difficulties and risks in selling. According to one trapper [26]: *''we knew about the demand…we were scared…we didn't take the skin.''* Another [96] described how they found a dead tiger hanging from a *sundari* tree, and became scared and *"moved to another place.''*

Pirates

The main business of the pirates is extortion and kidnapping. Typically, fishermen are required to give a certain amount of money to the local pirate gang each season depending on how many boats, trawlers or fishermen they have in their team. After paying the money the fishermen get a receipt from the pirates as a proof, which needs to be shown if they encounter the pirates again during the same fishing season. Some local fishermen are also required taken hostage or kidnapped to extort money. According to the interviewees, pirates are present everywhere in the forest and each pirate group, just like tigers, has their own range. The pirates try to hide their location to protect themselves from the authorities. A woman [37] who was stumbled into their hideout while collecting wood stated: *''they held me up for the whole day…took BDT 300 [USD4] but gave me rice and salt to eat. At midnight they moved out from there and released me so that I could not reveal their new location to anyone.''*

Interviewees reported that most of the pirates are actually members of village community, and come to the village covertly to meet their families. Some pirate leaders give money to build mosque and villagers respect them. Pirates have never kidnapped any tourist, NGO worker or researcher.

Many interviewees (n=71/141) reported that pirates kill tigers inside the forest for safety and money. A former pirate member said that when pirates go to a new place they look for pugmarks to see whether there is a tiger nearby. If they find pugmarks, they try to track the tiger and shoot it. An interviewee [6] described a tiger killing incident when he was visiting his pirate friend: *''the trawler was in Char-Meghna…the tiger was crossing the river, the trawler followed it slowly…the tiger entered the forest, 2 pirates got down and shot it 4 times.''* Some interviewees (n=11/141) mentioned seeing tiger parts while they were held as prisoners of the pirates and their statements describe pirates processing tiger parts for trade e.g. [15]: *''I was kidnapped 3 times…in 2007, 2008 and 2010, last time they took me in*

their trawler….A tiger limb hung out from a sack……with skin and claw…a very big sack. The pirate told me 'see we killed a tiger, so how long will it take to kill you!' '';

[119]: *''around 2008-09, I have seen 2 skins in the trawler of X gang.…They told me both the skins are of female tigers.'';*

[136]: *''They were tanning a skin by hanging it from a rope.''*

Although collecting ransom is the main business of the pirates, many interviewees reported that pirates allege that they also kill tigers to protect the villagers. A fisherman [10.10][1] mentioned: *''a tiger which used to cross the river was killed before it came to the village. They [pirates] told us 'don't worry, it's been fixed.''*

It is not known how many tigers are killed by pirates, but numbers may be significant. For example, in 2009, a pirate leader visited a researcher's project boat to see how the researcher lives inside it and the leader mentioned that his group had recently killed 2 tigers within 15 days. Another pirate associate reported that his gang killed 2 tigers within 5 months in 2013. One interviewee mentioned seeing a large number of skins when he was kidnapped [26]: *''6-7 months ago…I was kidnapped…saw 12 tiger skins…I do this business [trapping], I can recognize it well.''*

Interaction among actors

Community members' relationship with tigers is broadly aligned with an open access regime, where there is no regulative authority for establishing mutually agreed and enforceable rules and norms. Hence, tiger killing follows the 'tragedy of the commons' dilemma (Hardin 1968). According to this phenomenon, every individual involves in exploitation for personal benefit without taking the responsibility of conserving resources. This phenomenon contrasts with other hunter and gatherer communities of Canadian North that have developed their own institutional structure for the systematic exploitation of wildlife (Padilla and Kofinas 2014).

Villagers kill tigers in the village and may also participate as a group member of a pirate or poaching gangs in the forest. The groups that operate in the forest act independently of each other but they are connected through sharing the same trade network for selling tiger body parts. For example, there is some evidence that pirate gangs are in collaboration with poachers in dealing with international trader networks (A. S. M. Rejuan per. comm. 3

[1] Data collected in 2010 before the data collection period for this study

October, 2014). Pirate gangs may also kidnap villagers who have specific skills in trapping or processing tiger parts.

The different tiger killing actors also interact with the law enforcement staff (i.e. RAB, Police, FD) and the VTRT members. In villages, the VTRT and the FD try to stop villagers from killing tiger but most arrests are restricted to poachers and trappers who are using poisons and snare traps.

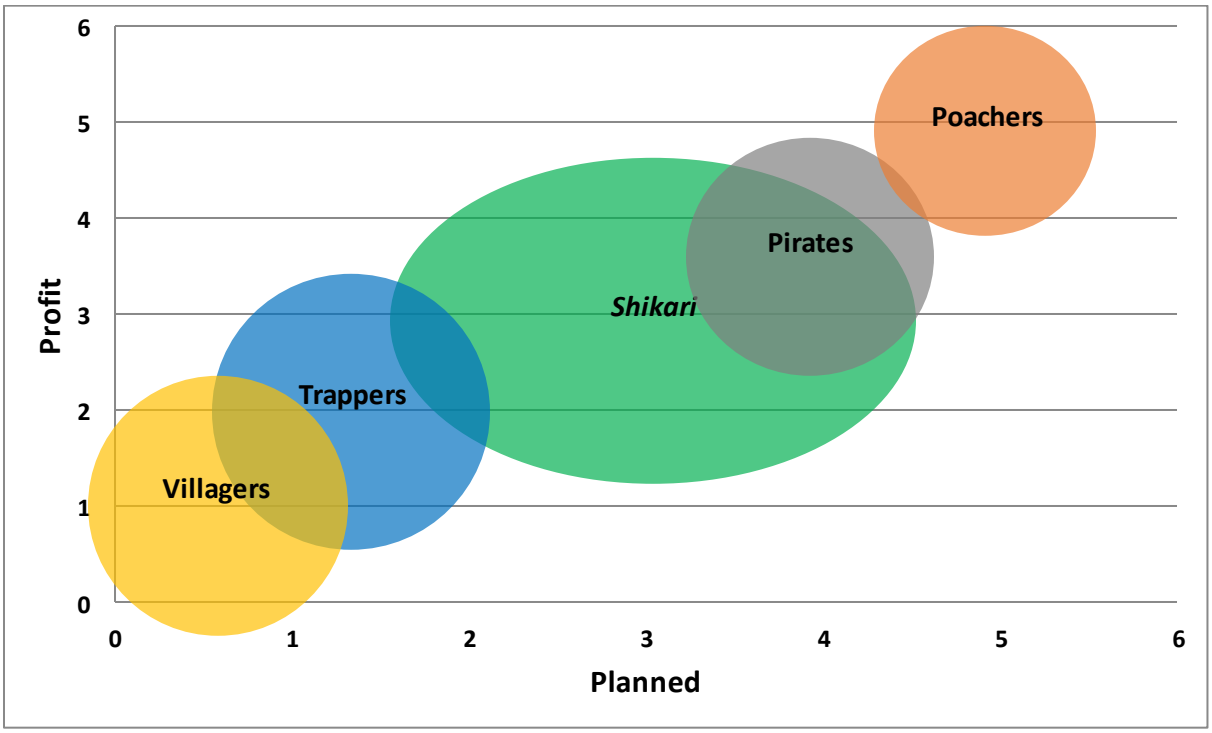

Figure 3.2 Position of the tiger killers in terms of planning and profit.

The Venn diagram depicts the tiger killing behaviour of different groups involved in tiger killing activities. Placing the poachers at the highest position followed by the pirates, the *shikaris* occupy the central and larger area as diverse motivations and situations involve for their tiger killing behaviour (1 is the lowest and 5 is the highest). However, the trappers occupy slightly lower position than the *shikaris* considering their opportunistic tiger killing incident followed by the villagers at the bottom, as tiger killing situation only arises when a tiger enters into villages.

Figure 3.2 graphically depicts the behaviour of different groups involved in tiger killing activities in terms of the main distinguishing characteristics (profit and planning). The degree of overlap suggests the extent of any collaboration in the killing and trade. For example, poachers kill tigers only for profit, all tiger killing is meticulously planned, and evidence suggests they sell parts often in collaboration with pirates. *Shikaris* also kill tigers,

but occupy a more central position as they have more diverse motives. Trappers occupy slightly lower position than the *shikaris* considering the more opportunistic element and have less ability to profit due to poor commercial networks.

Table 3.2
Different tiger killing groups in the Bangladesh Sundarbans identified by using IAD Framework: methods and motives for tiger killing, conservation interventions and research needs.

	Villager	**Poacher**	***Shikari***	**Trapper**	**Pirate**
Planned	Very rarely	Always	Sometimes	Rarely	Mostly
Method	Clubbing	Poisoning	Shooting	Trapping	Shooting
	–	–	Shooting from tree	–	Trailing
	–	–	Lamping	–	–
Motive	Commercial trade	Commercial trade	Commercial trade	Commercial trade	Commercial trade
	Retaliatory killing	–	Retaliatory killing	–	–
	Safety	–	Safety	–	Safety
	Consumption	–	Consumption	Consumption	Consumption
	Local trade	–	Local trade	Local trade	–
	Excitement	–	Excitement	–	–
	Social esteem	–	Social esteem	–	–
Place	Village	Forest	Forest	Forest	Forest

	Villager	**Poacher**	***Shikari***	**Trapper**	**Pirate**
Conservation intervention	-Create awareness of limitations of tiger medicine -Provide modern medical facilities -Ensure VTRT sustainability	-Law enforcement -Appoint special prosecuting lawyers -Ban furadan -Develop hotline by maintaining anonymity	-Handover of guns in exchange of social benefits/incentives -Law enforcement -Develop hotline by maintaining anonymity	-Alternative livelihood options -Law enforcement - Develop hotline by maintaining anonymity	-Law enforcement -Negotiate terms to protect tigers from poachers -Conduct research on pirate activity - Develop hotline by maintaining anonymity
Research need	-Number of villagers use tiger parts	-Number of poachers active in the area -Explore poacher's network -Scale of tiger killing by poachers	-Number of *shikaris* active in the area -Explore *shikaris'* network -Scale of tiger killing	-Number of trappers active in the area -Explore trapper's network -Scale of tiger killing	-Number of pirates active in the area -Explore pirate's network -Scale of tiger killing

Conservation challenges and possible interventions

In the Bangladesh Sundarbans, the existence of many tiger killers with many and diverse motives creates challenges for tiger conservation. We suggest that tougher enforcement efforts alone will not succeed in reducing tiger killing and that a much more dynamic and multi-faceted strategy that addresses the different motives and opportunities for tiger killing is required to meet the global goal of doubling the wild tiger population by 2022 (GTRP 2011).

In 2012, the new Wildlife (Preservation & Protection) Act of Bangladesh introduced tougher punishments for tiger killing (7 years imprisonment); however, this law is not enough to combat poaching without effective enforcement measures (Pratt, MacMillan and Gordon 2004). The lucrative nature of the tiger trade enables poachers and their well-placed clients to hire experienced lawyers that can help them evade punishment and there are numerous examples where those arrested have been acquitted during the legal process and avoided punishment (Saif et al. 2016). To combat this situation we suggest that, well-funded conservation NGOs could hire specialist prosecuting lawyers to act against poachers. This judicial approach has been successfully deployed in other parts of the world such as the Congo (PALF 2010). Moreover, several respondents mentioned about the lack of a trustworthy crime reporting system which restrained them from reporting poaching related activity. A hotline number maintaining the anonymity of the informer could also be introduced to assist patrolling operations by the FD.

Between 2010 and 2015, an increase in the number of tiger skins and skeletons that have been seized in Bangladesh has been observed. Most of these skins lack bullet marks or other external wounds and suggest that the tigers were poisoned (Saif et al. 2016). Poisoning is the trademark of professional poaching gangs. Banning Furadan and other poisons used for poisoning tigers may not stop poaching completely, but it will increase costs and reduce activity at least for a short time until the poachers find alternatives (Aziz 2015). However, given that the tiger population of the Bangladeshi Sundarbans is collapsing quickly, any measure that will slow down poaching will contribute positively to conservation efforts.

We do not believe that relocation will reduce poaching significantly in the Bangladesh Sundarbans, though it has been suggested as a means of conserving tigers and is reportedly favoured by communities such as the Gujjars of north-east India (Harihar, Verrissimo and MacMillan 2015). This option is currently being explored by GIZ and Bangladesh

government, and would involve the voluntary relocation of people from the villages to mid-sized cities to reduce pressure from the forest, and will provide training and guidance about new livelihood options. We believe that this may help to improve tiger habitat by reducing pressure from the forest; however, commercial poachers are well established, and it is very unlikely that they will stop poaching which is lucrative and voluntarily relocate to establish a new livelihood option.

Many countries shoot poachers on-sight for protecting wildlife (Messer 2010) and currently the Bangladeshi government is attempting to eradicate pirate activity in the forest, leaving 41 pirates dead within last year alone (Dhaka Tribune 2015). In our view killing of humans violate the principle of proportionality on the basis that the severity of the crime and the punishment do not correspond, and we would like to suggest a less hostile approach. For example, by offering an amnesty and an alternative livelihood, in exchange for assisting the FD with tiger conservation and anti-poaching efforts (Hakim 2011).

We would also argue that law enforcement alone may not be the best approach to curtail tiger killing by *shikaris*. An important priority must be to enlist greater support for tiger conservation amongst the population. For example, by providing accessible medical facilities for the community people, which will also reduce their dependencies on tradition al tiger medicines (Saif et al. 2016). Hunting and trapping activities that exist within the local community can also be tackled through a range of positive incentives. *Shikaris* do not solely hunt for money or food, but also for pleasure and excitement and this challenges conservation as they operate illegally but with community support and compliance. The guns used for hunting by the *shikaris* are mostly licenced, and are legal issued on the basis of personal security. One idea worth pursuing would be to provide a 'voluntary gun amnesty with perks' whereby guns are handed over to the government in exchange for other rewards *or* a replacement pistol which will fulfil the security purpose of the owner. (Pistols are unlikely to be used to kill tigers safely). Other incentives that might compensate *shikaris* include government provided education/medical facilities to their families, or special social activities with national heroes e.g. cricketers. Bangladeshi cricket players ("The Tigers") are famous celebrities throughout the country and often participate in animal welfare campaigns and might be easy to engage for this purpose.

For trappers, alternative livelihood provision would reduce their dependency on trapping as a source of income. For example, training to add value to dairy products would be an option to explore, as most villagers also possess cows, buffaloes and goats. Similar initiative has

been successful in the Ecuadorian Amazon where local hunters have diversified into chocolate production (Halle and Puyol 2014). Moreover, in the Indian Sundarbans a civil organization has started an alga-culture project and significantly changed the lifestyle of the community people (Ghosh 2015). Similar projects to grow and supply algae/seaweed in the cosmetic industries can be implemented in the Bangladesh side as an alternative livelihood option which will also have positive benefits in terms of climate change and ecosystem services.

The formation of VTRTs in 2009 appears to have successfully reduced the number of village tiger killings (there have been no village tiger incidents in the last 2 years). However, these teams do not have the capacity to deal with deliberate tiger killing in the forest. Their scope is limited due to the lack of institutional authority (Rejuan 2014) and their voluntary basis. One option might be to support their activities by providing mediation and negotiation services for compensation between the FD and villagers affected by tigers. This happens in the Corbett Tiger Reserve of India, where the Corbett Foundation has intervened to support a role by mediating between Indian FD and the community; however, the involvement of NGOs can be problematic as the level of support they can offer will depend on external funding and the political environment (Rastogi et al. 2014).

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CHAPTER 4: TRADE OF TIGER PARTS IN THE BANGLADESH SUNDARBANS

To be submitted as:

Saif, S. and MacMillan, D. Trade of tiger parts in the Bangladesh Sundarbans.

ABSTRACT

This study explores the commercial trade of tiger parts in the Bangladesh Sundarbans. To get an in-depth understanding of the commercial trade of tiger parts, 141 semi-structured qualitative interviews were conducted in the villages around the Bangladesh Sundarbans between December 2011 and June 2013. The participants were Village Tiger Response Team members (n=46/141), general members of the village community (n=62/141), and tiger killers (n=33/141). Secondary data on tiger parts seizures and trade were collected from the Bangladesh Forest Department, CITES Trade database and newspapers. We found that, the commercial demand for tiger bones exists in the Bangladesh Sundarbans, and arose recently. However, the commercial trade of tiger skin was always present. In the Bangladesh Sundarbans, the tiger killers locally tan the skin using locally available ingredients (potash alum, blue vitriol, salt), and bury the rest of the body to collect the bones later. We found that, the price range of a skin varies between BDT 40,000-90,000 (USD520-1,169); for bones BDT 1,500-3,000/kg (USD20-39) and for a canine BDT 1,000-7,000 (USD13-91). We also found significant differences between the original prices and the perceived prices for skin and bones reported by the respondents, where the perceived prices are higher than the original prices. Non-local Bangladeshi traders from other cities come and buy tiger bones from the tiger killers. The skin trade depends on the networking capacity of the tiger killers. Moreover, we found that the trade chain for bones and skin are separate in the Bangladesh Sundarbans. From the secondary data, we documented 46 incidents of tiger or tiger parts trade in the Bangladesh from 1981 to 2015, of which most of them are seizure records of tiger/tiger parts by the law enforcement authorities (n=26). We found that tiger parts from the professional or opportunistic tiger killers are leaked to the commercial trade and the existence of the non-local Bangladeshi commercial trade is a serious threat for the tigers in the Bangladesh Sundarbans.

INTRODUCTION

The unprecedented surge in the illegal wildlife trade is an impediment to wildlife conservation. The value of illegal wildlife trade excluding fisheries and timber is between USD7.8 and USD10 billion per year (GFI 2011); and together with fisheries and timber, illegal wildlife trade is the fourth largest global illegal trade after narcotics, human trafficking and weapons (WWF 2012). The use of animal parts in the traditional Asian medicines is one of the driving factors of wildlife trade, and makes Southeast Asia a wildlife trade hotspot (Nijman 2010). Tiger (*Panthera tigris*) is one of the species most affected by wildlife trade (Nowell 2000; Sanderson et al. 2006; Walston et al. 2010; Stoner and Pervushina 2013). Since 2000, a minimum of 1,425 tigers have been seized in the tiger range countries (except Cambodia), which may represent only a fraction of the tigers involved in the trade (Stoner and Pervushina 2013).

The international trade of tiger parts was banned by the Conventional on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1975 (except Amur tiger, which was banned in 1987) (Hemley and Mills 1999). Despite having legal protection and various political commitments, tiger populations continue to decline and are wiped out from many habitats due to poaching of parts to supply the commercial tiger trade (Dinerstein et al. 2007; Walston et al. 2010).

In Bangladesh, the tigers are Critically Endangered (IUCN Bangladesh 2015) and highly threatened by poaching (Ahmad et al. 2009; Aziz et al. 2013; Saif and MacMillan in press). A recent commercial demand for tiger bones by non-local Bangladeshi traders in the Bangladesh Sundarbans is the main driving factor of tiger poaching in the Bangladesh Sundarbans (Saif, Rahman and MacMillan in press). Detailed study on tiger trade has been conducted in other tiger range countries as well, especially in the neighbouring countries India and Myanmar (Shepherd and Nijman 2008; Oswell 2010; Sharma et al. 2014; Nijman and Shepherd 2015). Even though researchers and conservationists generally overlooked the tiger trade in the Bangladesh Sundarbans before (Mills and Jackson 1994), they are concerned now due to recent seizure of tigers and their parts within the country. Understanding the tiger trade in Bangladesh is an urgent need for tiger conservation (Ahmad et al. 2009). This is the first study which aims to understand the commercial trade of tiger parts in the Bangladesh Sundarbans i.e. exploring traders' activities, trade routes, prices of different tiger parts, and the role of commercial trade in tiger killing in the Bangladesh Sundarbans.

METHODS

Study Area

The Sundarbans is the largest mangrove forest in the world situated in the Ganges-Brahmaputra Delta (Ahmad et al. 2009), spanning the border between Bangladesh and India. On the Bangladesh side, the Sundarbans cover an area of 6,017 km^2 (Ahmad et al. 2009). The forest is surrounded by 8 *upazilas* (administrative sub-districts) of which 6 (Shyamnagar, Koyra, Dacope, Mongla, Morrelganj and Sarankhola) are immediately adjacent to the Bangladesh Sundarbans (Figure 4.1). The remaining 2 *upazilas* (Mothbaria and Pathorghata) are separated by the river Baleshwar (Figure 4.1) and on the east side, not connected directly to the forest. The Bangladesh Forest Department (FD) has divided the tiger habitat of the Bangladesh Sundarbans into 4 tiger ranges: Satkhira, Khulna, Chandpai and Sarankhola, around which there are 76 bordering villages.

About 350,000 people live in these bordering villages, and the majority are directly dependent on the natural resources of the forest for their livelihoods such as honey collection, wood collection, fishing, nipa leaf (*Nypa fruticans*), and thatching grass collection (Ahmad et al. 2009). It is estimated that annually tigers kill about 20–50 people in the Bangladesh Sundarbans during resource extraction forays (Ahmad et al. 2009; Barlow, Ahmad and Smith 2013).

Since 1974, the law demands the protection of tigers and other wildlife in the Bangladesh Sundarbans. However, the tradition of trapping wildlife especially deer, and tiger killing is not extinguished, and continues to be practiced covertly (Saif, Rahman and MacMillan in press). Pirate gangs, additionally, patrol the waterways of the Bangladesh Sundarbans. They kill the wildlife of the forest as well as kidnap and collect money from the local people who wish to fish or enter the forest (Inskip et al. 2013).

The close proximity of the villages to the forest often causes tigers to stray inside them, fuelling human-tiger conflict. Over the years, villagers have killed many tigers during stray tiger incident. Different motivations to kill stray tiger and factors associated with accepting stray tiger killing behaviour have developed among the villagers (Inskip et al. 2014). WildTeam, an NGO working for tiger conservation in Bangladesh, in collaboration with the Bangladesh Forest Department has developed the Village Tiger Response Teams (VTRTs) in areas where there was significant human-tiger conflict. Team members are drawn from members of the village community as unpaid volunteers (Rejuan 2014). These community-based volunteer teams are trained and experienced in dealing with stray tiger situations in

the villages, and knowledgeable about village life and forest resource collection practices. At the time of this research in 2011-12 there were 29 VTRTs in the adjacent *upazilas* (Figure 4.1). This number had grown to 49 by 2013.

In the Bangladesh Sundarbans, different groups are involved in tiger killing, which include villagers, poachers, *shikaris*, trappers and pirates (Saif and MacMillan in press; Saif, Rahman and MacMillan in press). Each group have their different motivations and methods for killing (Inskip et al. 2014; Saif, Rahman and MacMillan in press). The villagers kill tigers in the village when a tiger intrudes, and the other units kill tigers in the forest professionally or opportunistically (Saif, Rahman and MacMillan in press). The diverse motivations for tiger killing by these groups include retribution, safety, excitement, social esteem, collection of tiger parts for medicinal or spiritual purposes, local trade, commercial trade, and lack of response from the authority (Inskip et al. 2014; Saif and Macmillan in press).

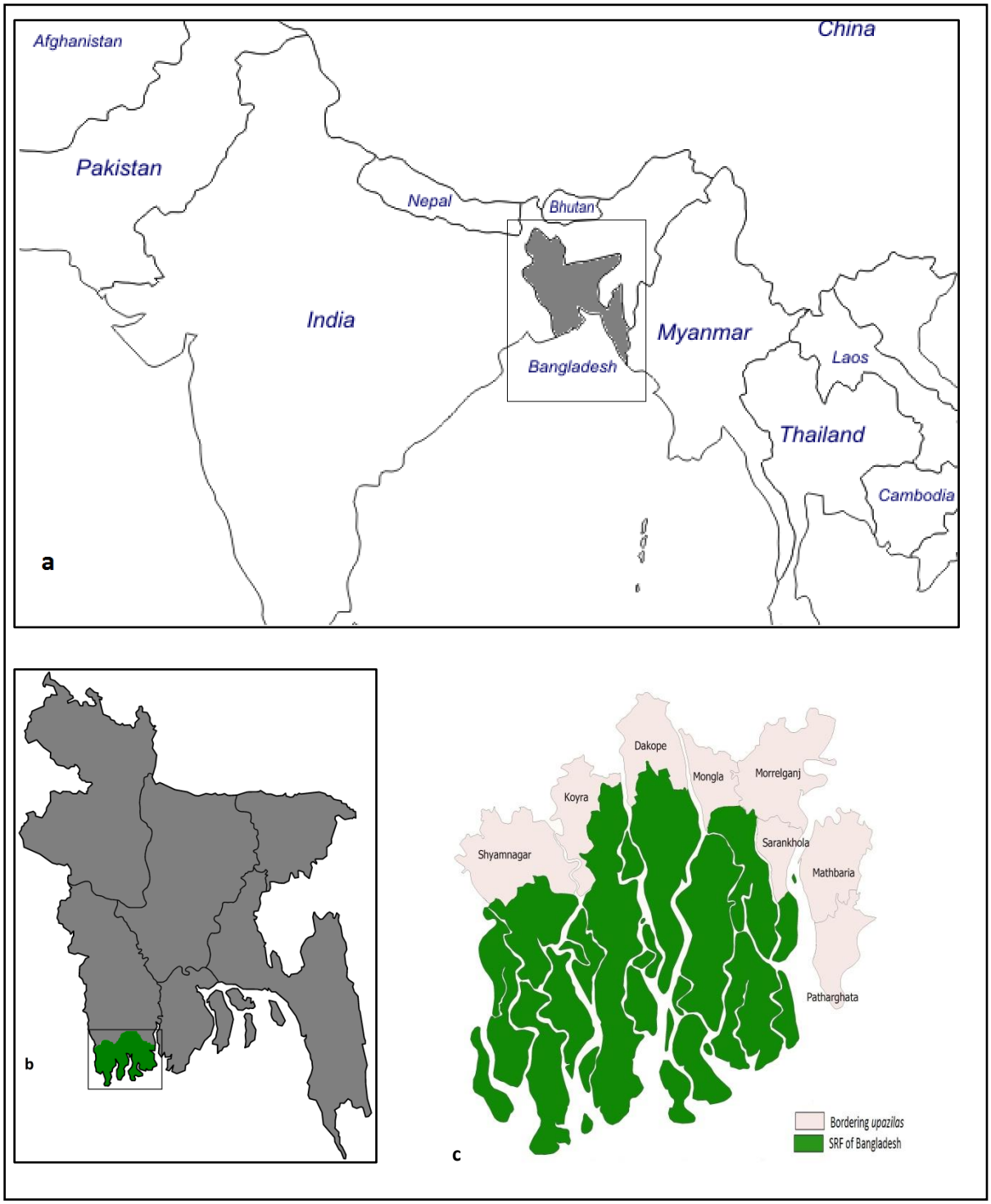

Figure 4.1 The geographical location of Bangladesh (a), the Bangladesh Sundarbans (b) and the adjacent *upazilas* (c).

Sampling strategy and interview approach

We eschewed specialized methods that have been developed to study clandestine activity indirectly (St. John, Edwards-Jones and Jones 2010). Instead, we reveal the object of our enquiry in a transparent and confidential manner that protects the anonymity of the informants and allow issues to be raised and discussed in a friendly, informal and

exploratory manner. Semi-structured interviews were conducted with the members of the village community in the 4 administrative tiger ranges between December 2011 and June 2013. Out of 29 VTRTs, 26 teams were covered by the data collection exercise, with 3 remaining VTRTs not contactable due to political unrest in those locations. Data on the scale of human-tiger conflict was collected from WildTeam. Informal interviews also conducted with 1 researcher, 2 journalists, 1 police officer, and 1 lawyer.

The approach was partly inductive and consisted open ended questions allowing informants to discuss all the issues they felt relevant; the method was continued until nothing new was learned i.e. the data became saturated (Newing et al. 2011). This approach has been used in other studies for an in-depth understanding of wildlife killing, such as, poaching in Mongolia (Pratt, MacMillan and Gordon 2004), cetacean by-catch in South Korea (MacMillan and Han 2011), illegal wildlife harvest by trapping in Vietnam (MacMillan and Nguyen 2013), and the hunting of exotic species in the gulf of Guinea-Bissau (Carvalho et al. 2015).

Our research strategy was influenced by four factors. Firstly, as the collection and use of tiger parts is illegal in Bangladesh, we thought it was unrealistic to expect the interviewees to answer truthfully to any directly incriminating questions about illegal wildlife killing for profit (Solomon et al. 2007; MacMillan and Han 2011). Secondly, we were cognisant of the potential cultural issues associated within traditional communities when being approached by an urban, well-educated female Bangladeshi researcher. Thirdly, we were aware of the paucity of pre-existing information; and lastly, we felt the need to build trust between the researcher and the respondent.

To gain the level of trust necessary for interviewees to talk about a sensitive topic, trust building activities (i.e. following socio-cultural norms, having lunch at their place, showing pictures, teaching their children, participating in their daily activities) were carried out with the interviewees and their families prior to interviews (Gavin, Solomon and Blank 2010). As some respondents were very uncomfortable about giving too much personal information such as their religion due to the sensitive nature of the study, we omitted any non-essential questions relating to personal information. To verify sensitive data provided by the respondents, similar question was asked more than once by rephrasing the question during different phases of the interview process. The reliability of information obtained was assessed by asking details about timing and place – for instance we inquired whether an event took place before or after cyclone Sidr (November 2007) or Aila (May 2009), or

which government was in the power, or which grade his son/daughter was in. The researchers were confident that trust had been established when many interviewees from this group showed them tiger parts they had obtained from tiger killing. In order to convince tiger killers to take part in the interview, we agreed that they would be able to describe tiger killing events in the third person (i.e. he/she/someone killed a tiger), without mentioning anyone's involvement in the process by name. The tiger killer was also assured before the interview that the source of his knowledge or experience on killing would not be requested.

The name and address of the interviewees were not asked or recorded and the interviewees were assured of anonymity and all the interviews were carried out in Bengali exclusively by the main researcher to maintain consistency and trust. To avoid any false or misleading answers, no financial incentives were provided to the interviewees (Gavin, Solomon and Blank 2010). The interviews generally lasted for 2 to 4 hours. All the interviewees were offered snacks during the interview; the interviews lasted for more than 2 hours, contained breaks in the middle, and lunch/dinner was offered as a traditional gesture.

Purposive sampling was used whereby members of the village community living around the Bangladesh Sundarbans with different levels and forms of engagement with tiger killing were actively sought. These groups can be categorised into: 1) VTRT members, 2) general members of the community and 3) tiger killers.

For the VTRT category, we initially conducted meetings with the members of each VTRT, and explained the research and ethical issues involved. The most appropriate member/s of the team for subsequent, more in-depth interviews were identified based on their knowledge and experience on wildlife poaching, stray tiger killing and pirate activity. On average 1-3 persons from each team were interviewed. A semi-structured interview guide with mostly open-ended questions was used for each VTRT member, focusing on the motivations of joining VTRT, the VTRT's role during stray tiger situation, the medicinal, cultural and economic values of tiger parts, the consumption and collection of tiger parts in the villages, tiger poaching and anti-poaching efforts. In total we carried out 46 interviews with the VTRT members.

General members of the community were selected based on their knowledge and experience on encountering outside traders or tourists looking for tiger parts, community people's attitude and scope to kill stray tiger for selling tiger parts (i.e. canine, claw, fur, whiskers), prices of different tiger parts, processing tiger parts for preservation or

transportation, and trade routes. Villagers were recruited using snowball sampling (Newing et al. 2011) and were initially introduced by the VTRT members in the community. Interviewees included honey collectors, woodcutters, fishermen, day labours, shopkeepers, jewellery makers, *gunin* (people who recite spiritual scripts to keep away tiger for safety), *kobiraj* (local doctor), tailors, businessmen, carpenters, tiger victims, teachers, and forest staff. In total, 62 interviews were conducted with this group. The interview guide focused on the commercial demand of tiger parts, outside traders looking for tiger parts, prices of tiger parts, trade routes and scope for the community people to collect tiger parts from dead tiger in the village or forest for selling to the commercial traders.

The third targeted group was the 'tiger killers'. This group comprised any individual who had killed a tiger inside the forest, either deliberately for money or opportunistically. The same interview guide for the general members was used for the tiger killers but, where the opportunity allowed, the interviewer probed for more sensitive detail about tiger or wildlife trade in the area. The tiger killers were selected using the snowball sampling strategy (Newing et al. 2011), either through various local village contacts, or direct reference from police records. Some general members of the community who mentioned that they had been involved in tiger killing incidents in the forest were subsequently categorized as a respondent of the 'tiger killer' group. In total, we conducted 33 interviews with tiger killers, of which 5 were professional poachers, 27 were opportunistic killers during hunting trips to the forest i.e. *shikaris*, and one other person has admitted killing a tiger to save his life.

To develop the tiger trade database and analysis the seizure records of tiger parts within Bangladesh, secondary data were collected from the Bangladesh Forest Department record, CITES Trade Database, and newspaper articles.

For analysis, data on commercial demand of tiger parts, presence of commercial traders in the villages around the Bangladesh Sundarbans, process to preserve tiger parts, prices of tiger parts and trade routes were coded (Newing et al. 2011), and thematic models were developed to identify the links between different components (Pratt, MacMillan and Gordon 2004). Comparing the models and identifying the words most often used by the respondents (e.g. outside traders, buyers, high price, recent demand, tiger bone, looking for tiger parts, recent demand, etc.) allowed emergent themes and issues to be identified. The rigour and accuracy of our descriptions and interpretations were tested by going

through the data several times, triangulating the information from different interviewees, and examining them to find out the common threads and patterns (Newing et al. 2011). Qualitative data analysis software 'QSR N-Vivo 10' was used for data management (Bazeley and Jackson 2013) and to ensure all data were included during the analysis.

Statistical analysis

Statistical analysis was performed in SPSS (version 21, IBM). Pearson's Chi-square test was conducted between the different characteristics of the respondents and the respondents reported about outside traders. Significant unstandardized residuals (values above z=+/-1.96 at $p<0.05$) were used to explore significant differences in the Pearson's Chi-square test. Kolmogorov-Smirnov test was conducted to test the normality of the data of the prices of different tiger parts (perception and original) and Mann Whitney U test was performed to find out the significant differences among the prices. No analysis was possible for age of respondent, as many respondents appeared unsure about their actual age due to the lack of birth registration system in the area.

RESULTS

In the Bangladesh Sundarbans, different groups of local people kill tigers with distinct motivations. From each group tiger parts go to the commercial trade network. About 26% of the respondents (n=36/141) reported that traders from other cities come in the villages around the Bangladesh Sundarbans looking for tiger parts. Significantly higher number of forest going people reported facing outside traders (χ^2= 9.32, df=2, p=0.009), which suggest that the traders predominantly target the forest going people as a source of tiger parts (Table 4.1). Moreover, the respondents of the Satkhira range reported significantly (χ^2= 8.63, df=3, p=0.035) about the outside traders (Table 4.1).

Table 4.1 Statistical relations between different respondents.

	χ^2	df	p
Sample group **VTRT v general members v tiger killers**	0.89	2	0.639
Livelihood **Forest going v non-forest going v other**	9.32	2	0.009*
Village **Bordering v non-bordering**	0.42	1	0.515
Ranges **Satkhira v Khulna v Chandpai v Sarankhola**	8.63	3	0.035*
Users **Users v non-users of tiger parts**	0.79	1	0.374
Believers **Believers v non-believers of the traditional values of tiger parts**	0.084	1	0.772

After a tiger is killed, the tiger parts go through several steps to reach its final destination in the country- the capital city Dhaka, or the port city Chittagong, or the bordering country India.

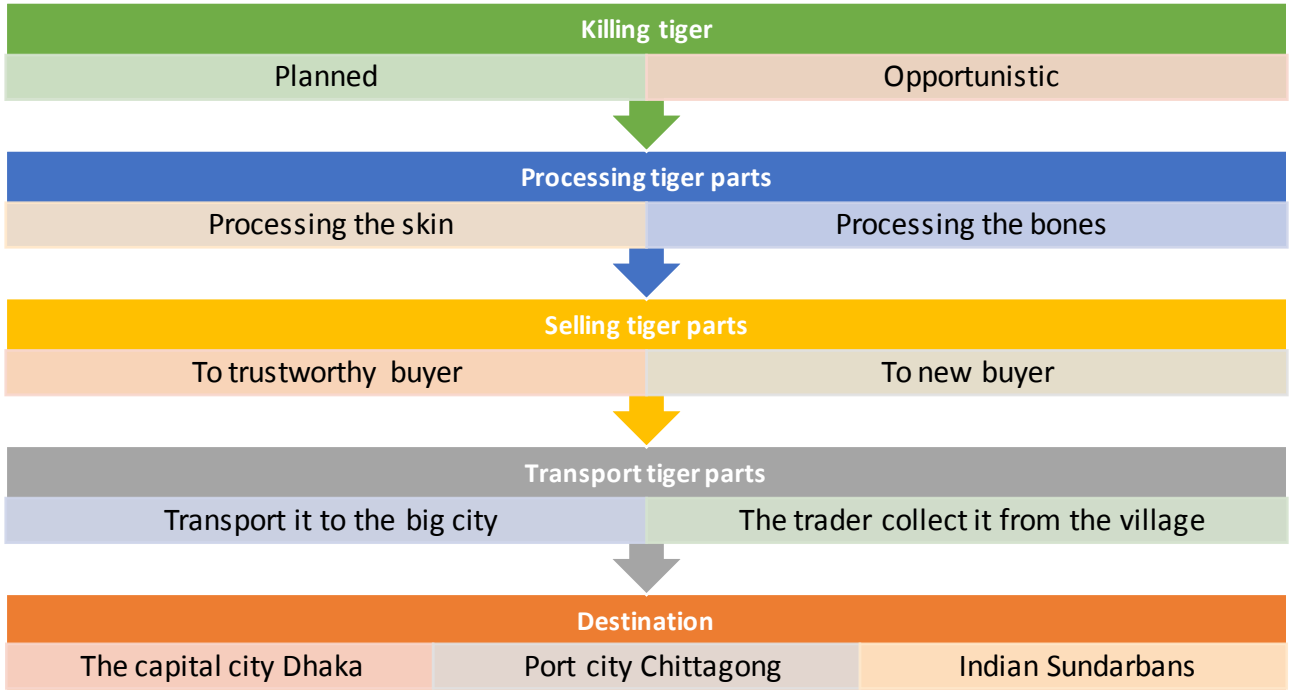

Figure 4.2 Different steps of tiger trade from the Bangladesh Sundarbans.

The emerging trade

In the Bangladesh Sundarbans, the practice of killing tigers has been prominent for a long time, and tiger killing is embedded in the culture and social activity of people living around the forest (Jalais 2010). Due to high level of human casualties by tiger attack during land reclamation from the forest for cultivation, tigers were 'labelled' as man-eaters; in 1883, the government enforced a policy to reward people for killing tigers (Eaton 1990; Chakraborthy 2010). After independence in Bangladesh (i.e. 1971), tiger killing was banned by the Wildlife (Preservation) Act of 1974. Despite the existence of the wildlife act, tiger killing by the community people continue covertly in the forest for excitement, safety, retaliation or money; or in the village when a tiger intrudes into it (Gani 2002; Khan 2004; Inskip et al. 2014; Saif, Rahman and MacMillan in press). During the period when tiger killing was rewarded, the tiger killers needed to hand over the skin as a proof of the kill. However, from the statements of the respondents in this study, we infer that the tiger killers continue to collect skin of tigers even after the ban of tiger killing since the skin has commercial value. Moreover, the tiger killers in the forest or in the villages try to collect tiger parts such as canine, claws, bones, whiskers or furs due to the existence of a local trade in the villages around the Bangladesh Sundarbans for medicinal or spiritual purposes (Saif et al. 2016).

From the narratives of the respondents, we found that the commercial trade of tiger skin was always present in the Bangladesh Sundarbans. However, the commercial demand for other tiger parts (i.e. bones) is recent; Bangladeshi traders from other cities influence this new demand of certain tiger parts. Some statements of the respondents about the trend of tiger parts are:

[133]: *''They killed 2 tigers during 1996-97 and sold only the skins for BDT 80,000- 100,000 [USD1,038-1,298]. At that time, there was no demand for bones….buried those …nearby.";*

[133]: *''the demand for other parts [bones] is recent...6-7 years.'';*

[111]: *''In 2007-08 for the first time I heard that you can also sell bones.'';*

[127]: *''Tiger is decreasing… they are being killed for a long time…..for a very long time....we knew. But for the last 10 years it is very frequent.'';*

[56]: *''From 2008-09… we are hearing that even the tiger's bones have high price.'';*

[64]: *''Now at present, we are hearing that even the bones have high value. People from outside are coming looking for it.''*

[50]: ''*People come looking for canine or 'kathi' or bones. Those who are looking for bones, they want it for business.''*

These statements suggest that the commercial demand of tiger bones in the Bangladesh Sundarbans exists, and the Bangladesh Sundarbans have become a target of the commercial trade within the last 10 years. This issue may be a crucial factor in the tiger population decline.

Processing of tiger parts

After killing a tiger, the tiger killers try to take the skin off as precisely as possible to keep the skin quality high, as the price of tiger skin depends on the quality of the skin. Usually the tiger killers try to take the skin off in one piece from head to tail, including the claws and whiskers. A respondent stated [97]: *''there is a technique to skin it. Claws, eyes [the skin]… everything will come up smoothly. Nothing will damage.''* and [120]: *''the skin of the nose is very delicate. You have to take all the meat from there carefully otherwise it will rot.''* In some cases the opportunistic tiger killers cannot take the skin off perfectly due to lack of time or skill. For example a *shikari* stated [10]: *''we cut the head and took rest of the skin. It is hard and time consuming to take the skin off from the head.''* Nonetheless, few respondents (n=2/141) reported that tiger killers recruited them to take off skin from the tigers killed by the tiger killers. One of these respondents was taken to the forest to skin a tiger, which was killed by a pirate group. Another respondent, who was around 60 years old when the interview was conducted, confessed skinning hundreds of tigers in his entire life. He started skinning tigers at the age of 15 when he used to row boats in order to take the *shikaris* to the forest for hunting. He also reported that during 1990s, he used to take skins of 8-10 tigers yearly killed by others; after 2000, the number drops down to 4-5. The tiger killers gave him BDT 4,000-5,000 [USD52-65] for skinning a tiger.

After taking the skin off from a tiger, the skin is processed for preservation. To preserve the skin, it needs to dry in sunlight with salt, potash alum ($K_2SO_4.24H_2O$) and blue vitriol ($CuSO_4 \cdot 5H_2O$). The proportion of salt, potash alum and blue vitriol for tanning a skin is 2kg, 1kg and 0.5kg respectively. After mixing all these ingredients, the skin is kept into a clay pot. After a day or two the skin is placed in the sunlight to dry. This method of preservation is known as 'local tan', and can preserve skin for 6-12 months. The local tan usually takes 1-3 days depending on the sunlight. A well-tanned skin does not have any smell. To preserve the skin properly and before exporting it to the commercial trade chain,

the skin needs to go through 'chemical tan,' which takes place in the tanneries of Dhaka. However, a *shikari* [120] reported that it is possible to do the chemical tan in Jessore city situated closer to the Sundarbans. In the tanneries the price of chemical tan for a tiger skin is BDT 5,000-7,000 [USD65-90].

Due to the commercial demand of tiger bones, tiger killers also take the bones with meat and bury them in a safe place nearby, from where they can monitor them regularly. A poacher stated [131]: *''we wait in trees for 4-5 days. When a tiger dies …take the skin off, throw away the internal organ and bring the rest.''* They bury the bones for the meat to decompose, and wait for the right time to trade it, which includes finalising deal and low risk. A poacher was arrested with a tiger skin on his way to the capital Dhaka. Later the bones of the tiger were found buried in the yard of one of his relative's house. It is reported that females of the family helped him bury the bones in the village.

Price of tiger parts

There is no fixed price for tiger parts in the black market trade of the Bangladesh Sundarbans. The price greatly depends on (a) the links between the buyers and tiger killers; and (b) the amount or quality of the tiger parts offer to them.

Skin

The price of skin depends on the length, and the price decreases if the head, tail, claws or whiskers are absent. According to the respondents' narratives, the skins that are 9 to 10 ft. long starting from the head to the tip of the tail are considered long skins. The price of this kind of skin is high.

About the price of tiger skin, the respondents mentioned:

[110]: *''The price depends on the quality of the skin, if the skin doesn't have whiskers than the price may be BDT 80,000 [USD1,040] instead of 100,000 [USD1,300].'';*

[76]: *''the skin needs to take off with the claws. If any claw is detached than the price will drop. The tail needs to be together. If the skin is 9-10 ft. long than in Bangladesh you can sell it for BDT 150,000 [USD1,950] but if the skin is 8 ft. or shorter than that, then the price is BDT 5,000 per ft.'';*

[78]: *''the price of a skin depends on its length, now the price [range] is BDT 100,000-150,000 [USD1,298-1,348] for a 10 ft. skin.'';*

[76]: *''if the shikaris see a tiger which is 10 ft. long [skin] then there is no way it can go alive''.;*

[129]: *''If the skin is 10 or more than 10 ft. long than the price is very high.''*

The price of a good quality skin is generally offered as BDT 10,000 per ft. [USD130/ft.]. However, the final price received by the tiger killers greatly varies from the price offered before showing the skin to the trader (Table 4.2), and the opportunistic tiger killers rarely get the price promised by the traders after showing the skin (more in 'trading tiger parts' section).

In the trade of tiger parts from the Bangladesh Sundarbans to the international market, the tiger killers are in the first part of the trade chain, and the first group to receive the money by selling tiger parts to the commercial trade. The price received by the tiger killers varies in different transaction and mainly depends on the trade network and the bargaining power of the main players (Table 4.2).

Table 4.2 Prices of different tiger parts received by tiger killer from traders.

Prices of tiger parts	**Statement**
Price of skin	[105]: *''we sold the skin for BDT 17,000 [USD220]. They offered us BDT 30,000 [USD390] but after showing only gave that. I got the larger share than others as I have killed the tiger.''*
Price of skin	[133]: *''They killed 2 tigers during 1996-97 and sold only the skins for BDT 80,000 [USD1,040] and 100,000 [USD1,300].''*
Price of skin	[18]: *''the skin with the claws was sold for BDT 25,000 in 1990 (around) to give it to a high officer in Satkhira district.''*
Price of skin	[73]: *''He gave us BDT 45,000 [USD585] [for a 9.5 ft. long skin].''*
Price of skin & bone	[123]: *''Before Sidr [2007] we brought the skin, skull and the bones. Sold the bones [6 kg] to our regular buyer for BDT 1,000 per kg and the skull with 4 canines for BDT 10,000. The chairman of 'X' Union sent a car to my house for the skin and gave BDT 40,000 [USD519]. I got BDT 8,000 [USD104] in my share.''*

Prices of tiger parts	Statement
Price of skin	[52]: *''once I got only BDT 5,000 [USD65] and another time BDT 10,000 [USD130].''*
Price of skin	[120]: *''The price of a 6 ft. skin is around BDT 15,000-20,000 [USD195-260], 8 ft. BDT 30,000-40,000 [USD390-520], 9 ft. BDT 100,000 [USD1,300] above 9 ft. 150,000-200,000 [USD1,948-2,598].''*
Price of bone	[73]: *''we dig up the bones from the jungle…. 10kg 700g. We sold those for BDT 3,200 [USD42] per kg.''*
Price of bone	[131]: *''He buys bone for BDT 2,000-2,500 [USD26-33].''*
Price of bone	[135]: *''3-4 years ago the price was 500/kg. I sold 12 kg of bones in Bagerhat. They gave me BDT 5,000 [USD65].''*
Price of canine	[73]: *''we sold 4 canines for BDT 9,500 [USD123] in this village.''*
Price of canine	[76]: *''2 years ago…sold a canine for BDT 5,000 [USD65]. Now the price is 10,000 [USD130].''*
Price of canine	[110]: *''I sold 4 canines to 4 different people... BDT 4,000 [USD52] each. They came from Dhaka and Mongla. I am shikari so they asked me whether I have any.''*

Respondents who are not involved in tiger killing or trading tiger parts reported their perception on the prices of different tiger parts (Figure 4.3). There is a significant difference (Mann Whitney U test) between the perceived price and the original price of skin ($p=0.001$) and bone ($p=0.01$). Yet, there is no significant difference (Mann Whitney U test) between the perceived and original price of canine ($p=0.25$). In the Bangladesh Sundarbans, the price range of a skin varies between BDT 40,000-90,000 (USD520-1169); for bones BDT 1,500-3,000/kg (USD20-39) and for a canine BDT 1,000-7,000 (USD13-91) (Figure 4.3).

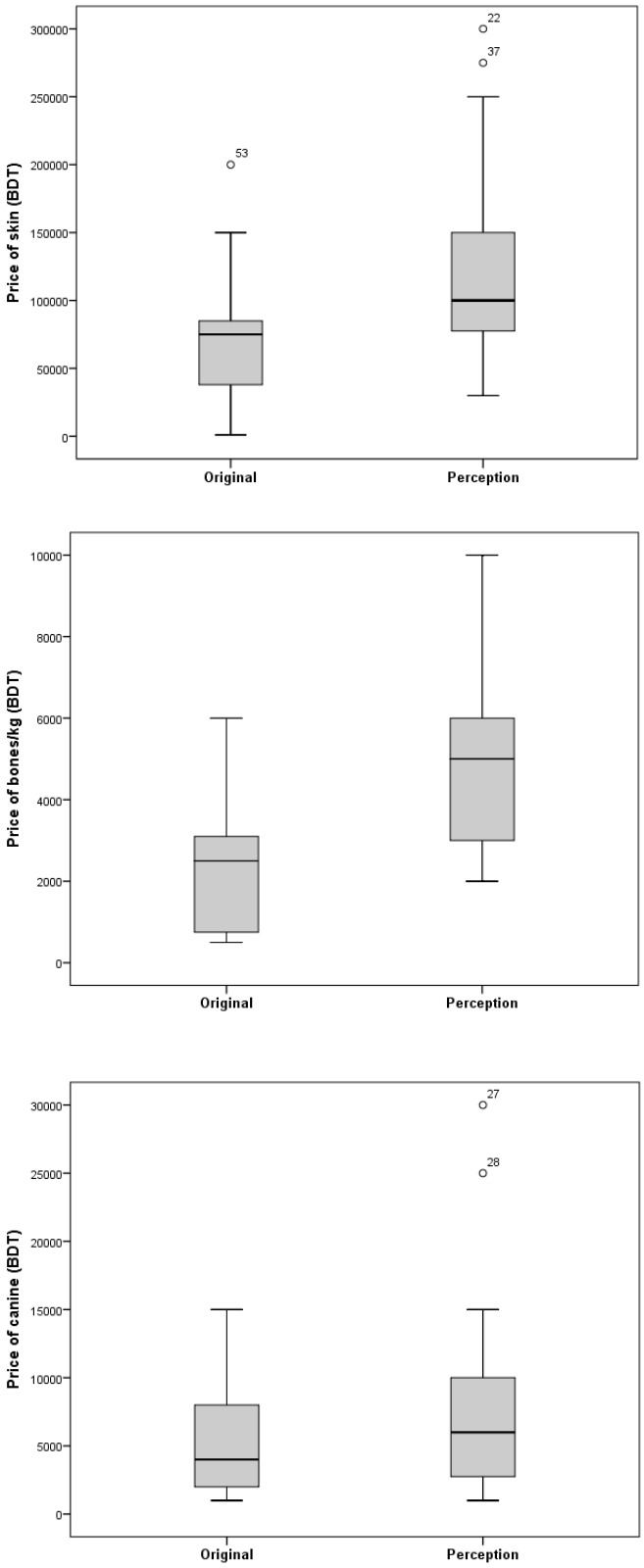

Figure 4.3 Boxplots showing the price ranges (original and perception) of tiger skin, bone and canine in the Bangladesh Sundarbans.

Other parts

From the respondents' narratives we found that, selling tiger bones is less complicated than selling tiger skin because (a) bones are easier to hide; (b) bones do not need tanning or processing for preservation; it can be buried directly; (c) it is easier to contact the buyers of bones; and (d) without the skull it is hard to draw attention of other people. Due to the existence of commercial demand of tiger bones in the villages by non-local Bangladeshi traders, it is easier even for the opportunistic tiger killers to communicate with the non-local traders.

Some respondents (n=40/141) reported that in general the price of bones is BDT 5,000 [USD65] for 1 kg. However, there is no fixed price for tiger bones and varies with different traders and the amount of bones provided to the traders, i.e. the traders pay higher price for per kg of tiger bones if anyone can provide many tiger bones (Table 4.2). This is evident in the following respondent's statement [110]: *''sold 5-7 kg bones for BDT 500 [USD6.5] per kg. I know the price is higher in other places but this is what they offer here. I don't have other option here''* and [129]: *''for the bones, if you give 1 kg then it is BDT 1,500-2,000 per kg [USD20-25/kg]. If it is whole skeleton than in total it is BDT 8,000-10,000 [USD104-130].''*

The commercial trade mainly includes skin and tiger bones and skull with canines. Outside buyers are aware through their family and friends and go to the villages around the Sundarbans for a small piece of tiger parts; they also offer money to anyone willing to provide them with tiger parts. The price for these transactions depends on the need and financial ability of the person who wants to buy it. This notion is apparent in the following respondent's claim [120]: *''Last year an advocate from Bagerhat told me that 'you are a renowned shikari... if you can give me a canine [of tiger] I'll give you BDT 10,000 [USD130] for the canine and some more as your prize'. ''*

Trading tiger parts

The tiger parts go through several hands before reaching their final destination and the price increases with every transaction. The tiger killers in the Bangladesh Sundarbans are at the starting point of the supply chain of tiger parts from the Bangladesh Sundarbans, and it is very likely that they receive the lowest amount among all the people involved in the trade chain. However, the price for tiger parts that the particular group 'tiger killers' receive largely depends on their personal connections with trade networks. A poacher (whose main business is killing tiger) usually develops a strong trade network and receives

more money than opportunistic tiger killer. The poachers kill tigers, locally tan it and supply their parts through teams or family members to the traders mostly in the capital Dhaka. This claim is evident in the report that several poachers were arrested on their way to Dhaka or in the Khulna (the biggest city near the Bangladesh Sundarbans) (Table 4.3). The opportunistic tiger killers, on the other hand, sell tiger parts in or around the Bangladesh Sundarbans. They face obstacles for selling the skin and rarely receive proper price for the tiger parts. The opportunistic tiger killers reported that most of the time they were defrauded by the traders after showing tiger skins. They also mentioned that they only collect the canines, claws and/or the bones, but not the skin as it involves high risk. Finding a genuine buyer for this type of transaction is uncertain and involves high risk as well.

The statements of some respondents such as:

[36]: *''7-8 years ago they [trapper] found tiger and sold it but didn't get the money. The Jessore people [buyer] told that they will give BDT 100,000 [USD1,300]. They came here and said they didn't bring the money so asked to go with them to Jessore for collecting money. They [trapper] went there... had dinner with them, in the morning they [buyer] said 'do you want to go to jail? Go home or we will call the police… you came to sell tiger skin here.' They [buyer] gave BDT 1,000 [USD13] for conveyance.''*

[52]: *''I was waiting for deer in a tree but a tiger came. I killed the tiger. At that time there was a trade for skin. People used to say that the price of a skin is BDT 100,000-150,000 [USD1,300-1,950] but after killing it I found the price is BDT 10-20,000 [USD130-260]. It is a black market so we took whatever the buyer offered… They used to say 'kill it I'll give BDT 20-50,000 [USD260-650],' but once I got only BDT 5,000 [USD65] and another time BDT 10,000 [USD130].''*

[53]: *''At first they tell you the price but after showing the skin the price changes… they are all fraud... You cannot fix the price without showing it to them because they say they need to see the colour, size etc. and once you show it to them then they blackmail you... People never get proper price for selling skin.''*

[64]: *''In 2002, some people of Betkashi bought it from Gabura…. the buyers were in a boat. They exchanged the skin and money in the boat. They brought the money from the boat in the village and saw the notes of BDT 500 on the top, the rest were white papers.''*

[73]: *''you cannot sell skin by verifying prices with other people. If you do that then the authority will know. Outsiders offer BDT 10,000 [USD130] for per ft. of the skin… but they are unknown.. can't trust them. So I am happy with the price I get here.''*

[110]: *''there are 2 types of buyers. Original buyer and the fraud buyers - who will not give you the money.''*

suggest that the opportunistic tiger killers may not always have proper link with the traders for selling tiger parts, and often get blackmailed by the buyers after showing tiger parts especially for the skin trade. However, a *shikar*i who confessed selling several tiger skins reported that this happens only with the opportunistic tiger killers who are not regular client of the buyers by stating [120]: *''sometimes it happens, not always. If someone is new then it happens, not with the regular client.''*

Skin & bone trade network

From the narratives of the respondents, we found that there may be 2 different networks operating for tiger skin and for tiger bones as the buyer of tiger skin can be anyone who has money or who knows the buyer. The buyers of skins include high officials, butchers, skin traders or local community representative (i.e. chairman). On the other hand, the buyers of tiger bones are only outside traders.

Although the traders of tiger parts may buy the skin and bones together, we found that the traders of skins and bones are different and operated by two separate trade networks in the Bangladesh Sundarbans. The trade of tiger skin was always present in the area for its financial value in the commercial market. Two tiger killers reported [73]: *''there are 3-4 groups only in this village. Their main business is skin business. They buy any kind of skin. They give BDT 200-500 [USD2-6] for deer skin.''* and [120]: *''all the butchers buy otter skin [illegal]. The price is BDT 1,000 [USD13].''*

Local butchers, who trade skins such as cow, goat, buffalo, otter, and deer, operate the tiger skin trade as well. Conversely, the trade of tiger bones was introduced in the area by outside traders searching for tiger bones; they motivated local people to kill tigers in order to earn money. In other words, we found that the skin and bone trade networks are mostly separate in Bangladesh. The following excerpt reveals a tiger killer's experience of selling tiger parts

[73]: *''we sold 4 canines for BDT 9,500 [USD123] in this village. He bought it for business. .. then we took the skin to a businessman here, he deals with all sorts of skins. He asked*

whether the authority knows about it. We said no one knows. He said he will wait for a week to see whether anyone knows or not. He kept that with him for a week and then gave us BDT 45,000 [USD585] and said he won't give more than that as he will sell it for BDT 50,000 [USD650]. We cannot verify it so we [7 people] divided the money among us. The skin was 9.5ft long. After 15 days we dig up the bones from the jungle…. 10kg 700g. We sold those for 3,200 per kg. The people who buy bones check the bones to see if we mix bones of other animal, they recognize it very well.''

Traders

The traders are non-local Bangladeshis from other cities. The respondents reported that 'non-local people' come looking for tiger parts from Dhaka (n=18), Khulna (n=11), Jessore (n=5), Mongla (n=5), Chittagong (n=5), Gabura (n=3), Barisal (n=2), Satkhira Sadar (n=4) and Morrelganj (n=1).

Few respondents (n=7) reported that tiger killers take the tiger skin to the Indian Sundarbans to sell. A respondent reported [TG11][2]: *''they took the skin and bones to India and sold the skin for INR 80,000 [USD1,204], they could not sell the bones.''* Two respondents, in addition, mentioned about a specific trader situated at 'Rayenda' (Sarankhola range).

We found that tiger killers give tiger parts as a gift or bribe to continue their act. They also exchange tiger parts for their protection from any kind of legal action or prosecution. This perception is evident in the account of the following tiger killer [123]: *''we sell the bones to the bone trader Mr X.. This is his business. We gave the skin to the chairman. He asked for a skin before. We cannot continue our business without keeping him happy.''*

Transferring tiger parts

The villagers usually have the phone numbers of the traders and call them whenever they can provide some parts. The traders usually come to collect the goods within a day, either with a minibus or motorcycle. A respondent mentioned [110]: *''the traders come from Dhaka and Barisal. I only know these 2 groups. They came here few times in motorcycle and minibus. If I call them today, they will come by tomorrow.''*

Key informants reported that the poachers send tiger parts to Dhaka. Sometimes their female family members wear tiger skin underneath their sari [Bangladeshi traditional cloth] to help carry the tiger skin to the capital. Poachers also transfer tiger parts (skins

[2] Data collected in 2011 before the data collection period for this study

and bones) in a big sack covered with fruits or other thing. A respondent reported [82]: *''my friends used to kill tigers. They used to send the skin to Asadganj of Chittagong in the packet of dry fish. I know it very well. They told me…. BDT 50,000 [USD650] for each skin…. 2-4 skins in a year.''*

Tiger trade database

We developed a tiger trade database for Bangladesh based on the seizures and legal trade (Table 4.3). The data for the tiger trade database were collected from the secondary data sources i.e. Forest Department records, newspaper articles, and CITES Trade database.

Table 4.3 Tiger trade database.

The shaded rows show legal trade or no arrests

SL No.	Date of seizure	Place of occurrence	Parts seized/ found	Quantity	Notes	Reference
1	25 August, 2015	Khulna	Skin	1	From a house in Khulna Customs Gate	http://www.theindependentbd.com/printversion/details/13247
2	10 August, 2015	Mandarbaria canal inside the forest	Skin	3		http://www.abc.net.au/news/2015-08-10/bangladesh-shoots-dead-six-alleged-tiger-poachers/6685048
3	12 May, 2015	Village: Sonatola Upazila: Sarankhola Closest forest range: Sarankhola	Skull	1		http://www.thedailystar.net/country/poacher-held-tiger-bones-skull-81914
			Skull	1		
			Bones	157		
4	20 February, 2015	Village: Bhandaria Upazila: Pirojpur Closest forest range: Sarankhola	Skin	1	Also seized 14 deer skin and fake currency of BDT 200,000	http://newagebd.net/96915/one-held-with-14-deer-hides-1-tiger-hide-in-pirojpur/#sthash.7u7NIkYk.6X4wwL8R.dpbs
5	5 February, 2015	Village: Kumira Upazila: Tala Closest forest range: Sarankhola	Skin	1	The arrestee was selling the skin for BDT 150,000 [USD1,948]	http://www.dailyinqilab.com/2015/02/05/238062.php

SL No.	Date of seizure	Place of occurrence	Parts seized/ found	Quantity	Notes	Reference
6	18 January, 2015	Dhaka (capital city)	Skin	1	Skin had 3 bullet marks. Also seized 5 deer skins	http://www.customstoday.com.pk/bangladesh-rab-seizes-illicit-6-tiger-deer-hides-clutches-5-smugglers/
7	13 January, 2015	Upazila: Morrelganj Closest forest range: Sarankhola	Skin Skull Bones Teeth	1 1 24 29	Arrested from the bus station to go to Dhaka	http://www.kalerkantho.com/online/country-news/2015/01/14/175173# http://www.dhakatribune.com/crime/2015/jan/14/royal-bengal-tiger-skin-seized-3-held
8	15 October, 2014	Satkhira Sadar Upazila: Satkhira Closest forest range: Satkhira	Skin	2	Also seized bullets	http://www.thedailystar.net/6-poachers-held-with-tiger-skins-in-sundarbans-46140
9	27 January, 2014	Sited at Lawdobe area of Chandpai Range	Tiger	1	A wounded tiger was sited with snare on its limb and eventually removed from the forest	http://www.thedailystar.net/poachers-still-active-in-sundarbans-8991#sthash.rLlKGekB.dpuf
10	3 June, 2013	Online	Canine	1	A canine was on sale in a Bangladeshi online shopping website for BDT 200,000 [USD2,598]	Researcher (Samia Saif)
11	13 April, 2013	Dhaka	Skin	1	RAB arrested 2 foreigners with a	http://www.amardeshonline.com/pages/latestnews

					skin in Dhaka	/2013/04/13/3851#.VX7AsvlVhHw
SL No.	**Date of seizure**	**Place of occurrence**	**Parts seized/ found**	**Quantity**	**Notes**	**Reference**
12	December 2012	Bank of Mader river Koikhali Satkhira range	Dead tiger	1	Skull and some bones were absent from the carcass. Skin was decomposed	WildTeam data
13	9 December, 2012	Village: Dhangmari Upazila: Dacope	Teeth	2	Arrested 2 persons who collected tiger teeth from a stray tiger killed on 6 November, 2012	Forest Department record
14	11 June, 2012	Dhaka	Cubs	3		http://archive.thedailystar.net/newDesign/news-details.php?nid=237987
15	8 December, 2011	Mothbaria, Pirojpur Closest forest range: Sarankhola	Skin Skull Bones	1 1 Whole skeleton	Police arrested a local villager with a tiger skin from the bus station on his way to Dhaka. Later the skeleton was found from the ground of his relative's house	http://www.dhakanews.info/tiger-skin-seized/
16	16 February, 2011	Village: Tafalbari Upazila: Sarankhola	Skin Skull Bones	3 4 138		Forest Department record; The Daily Star, 17 February, 2011
17	2010	Bangladesh to USA	Bones	11	Collected from dead tiger and	CITES Trade database

					sent to USA for scientific purpose (genetic analysis)	
SL No.	**Date of seizure**	**Place of occurrence**	**Parts seized/ found**	**Quantity**	**Notes**	**Reference**
18	2010	Bangladesh to UAE	Tiger	2	Collected from captivity and sent for breeding	CITES Trade database
19	24 August, 2009	Khulna	Skin	1		Forest Department record; The Daily Shomokal, 29 July, 2010
20	2 July, 2009	South Rajapur Sarankhola Closest forest range: Sarankhola	Skin	1	Skin had 2 bullet mark	Forest Department record
21	2009	Bangladesh to USA	Sample	101	Collected from wild and sent for scientific purpose	CITES Trade Database
22	21 March, 2008	Village Bolabunia Upazila: Botiaghata, Khulna	Skin	1		The Daily Shomokal, 29 July, 2010
23	4 October, 2006	Ghaziabad border East Delhi, India	Skin	2	Two Bangladeshis were arrested with two tiger skins in India. They confessed that they were smuggling the skins to Bangladesh	TRAFFIC Bulletin seizures and prosecutions March 1997- March 2010
24	2 November, 2006	Village: Sonatola Upazila: Sarankhola	Skin	1		Forest Department record; Verheij, Foley and Engel 2010

		Closest forest range: Sarankhola				
SL No.	**Date of seizure**	**Place of occurrence**	**Parts seized/ found**	**Quantity**	**Notes**	**Reference**
25	2006	Bangladesh to Kuwait	Tiger	2	2 tigers from captivity were sent to Kuwait Zoo	CITES Trade Database
26	2004	Village: Chalitabunia Upazila: Sarankhola Closest forest range: Sarankhola	Skin	1		Forest Department record; Verheij, Foley and Engel 2010
27	2003	24 Pargana of India, Near Bangladesh Sudnarbans border	Skin	2		Verheij, Foley and Engel 2010
28	2002	Shyamnagar (Ghagmari kheyaghat)	Skin	1		The Daily Shomokal, 29 July, 2010
29	9 September, 2002	Jongra Patrol Station	Dead tiger	1	Authority found a dead tiger with bullet	Forest Department record
30	9 September, 2001	Dhangmari	Dead tiger	1	Half of the skin was taken off	The Daily Shomokal, 29 July, 2010
31	2001	Bangladesh to USA	Specimen	32	Specimens from wild were sent for scientific purpose	CITES Trade Database
32	May 2001	Kaliganj Closest forest range: Satkhira	Skin	12	Bangladesh Rifles seized the skins	Khan 2004; The Daily Ittefaq, 7 May, 2001
33	29 May, 2000	Village Machura Upazila: Mothbaria	Skin	1		Forest Department record

		Closest forest range: Sarankhola				
SL No.	**Date of seizure**	**Place of occurrence**	**Parts seized/ found**	**Quantity**	**Notes**	**Reference**
34	11 October, 1999	Jhumjhupur Upazila: Jessore	Skin	1	Skin without tail	Forest Department record
35	2 August, 1999	Near Amorbunia Patrol Station, Chandpai Range	Dead tiger	1	Tiger was killed by a *shikari* was also killed by that tiger	Forest Department record
36	15 June, 1999	Satkhira Range	Dead tiger	1		Forest Department record
37	19 May, 1999	Kunokhali Bharani, Shakbaria Patrol station, Khulna Range	Dead tiger	1		Forest Department record
38	14 November, 1998	Village: Bogi Upazila Sarankhola Closest forest range: Sarankhola	Skin	1		Forest Department record
39	1997	Dhaka	Claw	-	Observed in a souvenir shop	Gillie 1997
			Teeth	-		
40	9 July, 1991	Satkhira to Dhaka	Skin	4	Skins were seized in a bus from Satkhira to Dhaka	The Daily Shomokal, 19 July, 2010
41	1990	Kholpotua River, Satkhira	Skin	8	Seized in a boat	The Daily Shomokal, 19 July, 2010
42	1990	Bangladesh to UK	Tiger	3	Sent for breeding from captivity	CITES Trade database
43	1987	Bangladesh to USA	Skin	1		CITES Trade database

SL No.	Date of seizure	Place of occurrence	Parts seized/ found	Quantity	Notes	Reference
44	1985	Bangladesh to Canada	Skin	1		CITES Trade database
45	1984	Bangladesh to UAE	Skin	1		CITES Trade database
46	1981	UK to Bangladesh	Tiger	2	Sent for Bangladesh Zoo	CITES Trade database

The trade database shows 46 incidents of tiger/tiger parts seizure and/or trade from 1981 to 2015 (August). These include seizures of tiger/tiger parts by the law enforcement authorities (n=26), finding dead tiger in the forest (n=6), selling tiger parts online or in souvenir shop (n=2), sending tiger/tiger parts (legal trade) abroad for scientific or conservation purpose (n=10), arrests of Bangladeshi traders with tiger parts in India (n=1), and arrest of a trader with tiger parts in Bangladesh-India border (n=1) (Table 4.3).

The line graph (Figure 4.4) of the number of seizure incidents of tiger skins and other parts, reveals the increase in number of seizures within the last few years. The highest number of seizures in the history of Bangladesh was in 2015 within a span of only 8 months (Jan-August).

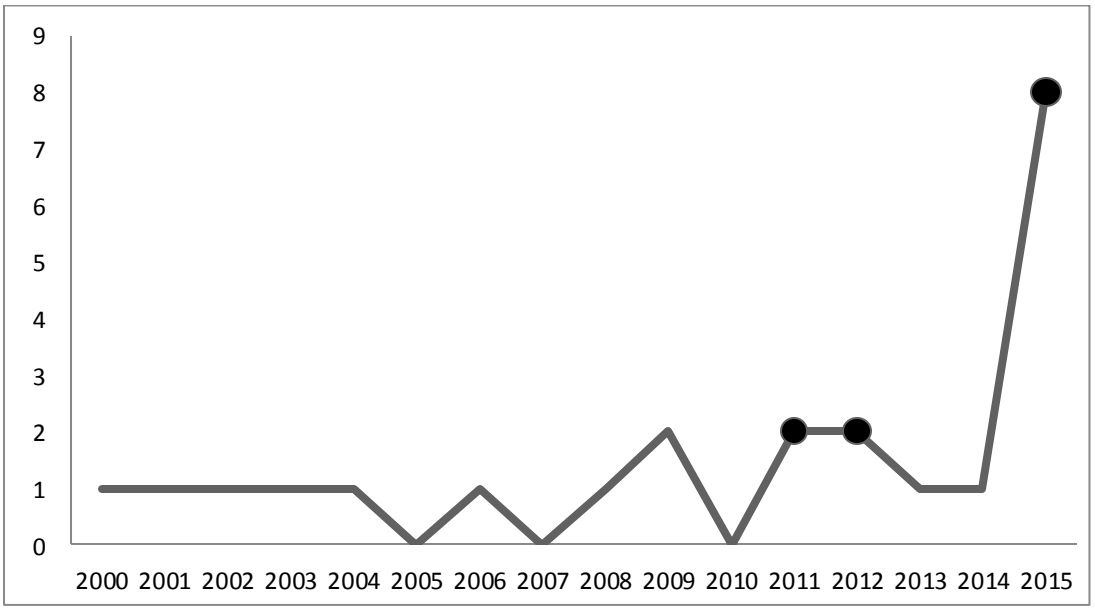

Figure 4.4 Number of seizures of tiger parts in Bangladesh (from 2000 to August 2015).

The line shows the number of tiger skin seizure in each year. The black dots indicate seizure of skin and bones.

DISCUSSION

The high volume of tiger parts' seizure incidents cast attention on the operation of tiger trade in the last few decades (Hemley and Mills 1999). Monitoring of the trade and seizure records is imperative to understand the success of the anti-poaching and law enforcement efforts (Sharma et al. 2014). Due to the clandestine nature of the trade, it is hard to detect the activities and scheme of the mechanism. Nevertheless, trade data has been documented in some of the tiger range countries via various methods: the seizure records, undercover operations, researcher-subject trust relation, and so on (Nowell 2000; Ng and

Nemora 2007; Shepherd and Nijman 2008; Moyle 2009; Oswell 2010; Verheij, Foley and Engel 2010; Stoner and Pervushina 2013; Sharma et al. 2014; Nijman and Shepherd 2015). Bangladesh is primarily absent from the regional studies due to the paucity of trade statistics (Mills and Jackson 1994; Nowell 2000; Ahmad et al. 2009). This is the first in-depth study to understand the nature of tiger trade in the Bangladesh Sundarbans. The findings of this study reveal the trade of tiger parts in the Bangladesh Sundarbans and the links of the local tiger killer with the commercial traders. Due to the limited scope of the research, we could not focus on trade beyond the Bangladesh Sundarbans.

Local and commercial trade

A local demand for tiger parts exists in the area for the medicinal and spiritual purposes and thus a local trade (Saif et al. 2016). The local trade involved little or no money and the villagers give tiger parts to their families and friends as a social service (Saif et al. 2016). However, this local trade and interlinked with the commercial trade of tiger parts as this local trade acts as a window of opportunity to the commercial traders to enter the local community asking for tiger parts (Figure 4.5).

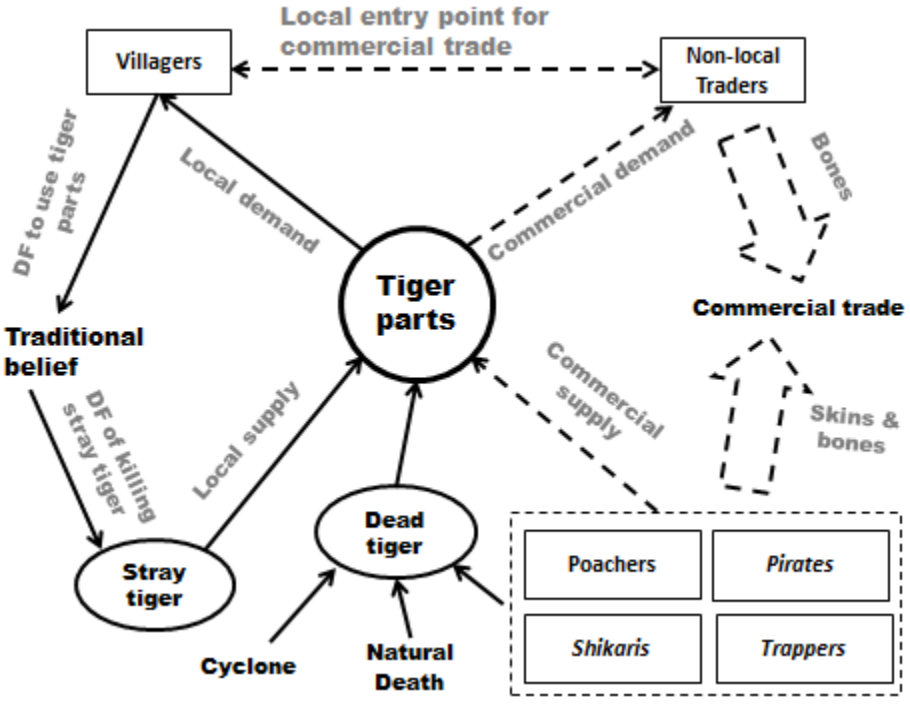

Figure 4.5 The flow web of tiger parts in the villages around the Bangladesh Sundarbans. The tiger-parts centred web depicts the local (black arrow) and commercial (dotted arrow) trade of tiger parts in the Bangladesh Sundarbans. DF: Driving Factor.

Effects of the trade on tiger population

Tiger killers sell tiger parts to the commercial traders looking for those parts in the villages. However, we found that poachers (i.e. who plan to kill tigers to sell tiger parts) have strong trade networks and take tiger parts to other cities, rather than selling them to the outside traders coming to the villages. A recent study documents the existence of local trade of tiger parts in the Bangladesh Sundarbans, i.e. trade of tiger parts within the members of the community for medicinal or spiritual purposes with little or no money involved (Saif et al. 2016). Local trade has always been prevalent for its widespread belief of medicinal and spiritual value; it is important to note that the users are limited (Saif et al. 2016). We believe that the tiger population in the Bangladesh Sundarbans is collapsing principally due to commercial trade having multiple adverse effects. Firstly, poaching to supply tiger parts can wipe out a population in a short period of time (Kenney et al. 1995) and from the seizure records we can state that seizure rate has increased more than double in the last few years (Figure 4.4). The sudden increase in the rate of confiscation of tiger parts for commercial supply indicates two possibilities: 1) since most poaching activities are left undetected, poaching might occur more frequently than being accounted for (Eliason 1999), or 2) enforcement is working better (Sharma et al. 2014). Both cases suggest tiger killers are operating in the forest and are a big threat for the critically endangered tiger population of Bangladesh. Secondly, the Bangladesh Sundarbans is considered the most human-tiger conflict prone zone (Barlow, Ahmad and Smith 2013). However, no stray tiger incident has occurred in the last two years, and the number of human casualties has also dropped down drastically in the last two years (WildTeam data). Thirdly, anecdotal evidence reports free roaming of livestock in the first 5 km of the forest in the Sarankhola range (M. A. Aziz per. comm. 16 April, 2014), which indicates there are no tigers in the fringes at the east side of the forest. Tigers take up empty spaces (i.e. not a home range of any tiger) for their home range; empty spaces in the forest imply that the forest contains fewer tigers than its carrying capacity of 300-500 (Barlow 2009). Finally, the information learned from the tiger killers such as their remark of encountering fewer tigers in the forest to skin, and visiting other ranges for killing tigers, suggest that tiger population is collapsing in the Bangladesh Sundarbans. In the absence of any robust data on the population size, we need to rely on the evidence we have to protect the species before it is too late.

Women's involvement in the trade

A recent study states that solely men operate the tiger killing events in the forests or villages (Saif, Rahman and MacMillan in press). However, this study reveals the involvement of women in trading or processing tiger parts for preservation in the villages around the Bangladesh Sundarbans. Though women's role in killing tiger for commercial trade is not usually documented, their active participation in the trading of tiger parts or other animals is prevalent (Nowell 2000; Moyle 2009; Wright 2010; Arnold et al. 2011).

Trade chain: skin & bone

We found that the demand for tiger bones, in particular, is recent in the Bangladesh Sundarbans signifying that the commercial traders that supply tiger bones focus on this area as a source of tiger parts. It is probable that this demand is due to the traditional Asian medicines, which is the major reason for dwindling tiger population throughout the entire range (Nowell 2000; Stoner and Pervushina 2013). The recent demand for tiger parts acts as a motivation for the local people to kill tigers in the forest and the village when the tiger intrudes in it (Saif et al. 2016). The high demand for tiger skin, however, is perpetual due to its lucrative value. The traders of tiger bones may buy tiger skins or vice versa. However, we believe that the trade chains for the skins and bones are different, and mostly operated by different traders. This specialized trade system has been also found in China (Lhasa, Kunming and Xining) where some trades deal with tiger skin and some with bone (Wong 2013). The different trade chains for the skin and bones are possibly due to the recent interest of the non-local Bangladesh traders for bones in the area, whereas the skin trade was present for a long time. We believe that the demand for the skin and bones will remain separate as skin is predominantly used as a luxury item, while the bones for traditional Asian medicines. Over time, the traders might buy both the skins and bones from the tiger killer if they manage to develop their networks; for instance, in Sariska tiger reserve of India, a trader bought the skin and bones from the same poacher but on different days in order to sell to the next man of the trade chain (Wright 2010).

Trade route

We found that the respondents of Satkhira range and forest going people reported comparatively more about the outside traders looking for tiger part. We believe, this may be due to the presence of more opportunistic tiger killers in the Satkhira range than others; from the seizure records in the Satkhira range, we see that tiger skins were seized with bullets, i.e. tigers were probably killed by opportunistic killers (*shikaris* or pirates) (Saif, Rahman and MacMillan in press). From this study we found that professional tiger

killers (i.e. poachers) have strong networks to sell tiger parts and predominantly supply tiger parts in the big cities to the traders. The trade database shows that recently (in 2014-15) most of the tiger parts were seized in or near the Sarankhola range (n=4/6). No bullet marks in the skins suggest that Sarankhola is a hotspot for the poachers as poachers kill tigers with poison bait (Saif, Rahman and MacMillan in press). Moreover, most of the recent seizures of tiger parts were in Satkhira and Sarankhola range. By combining the seizures' data and respondents' narratives, we believe that there are at least three routes for trading tiger parts from the Bangladesh Sundarbans. The first one is from the Satkhira range to the Indian. Satkhira range shares border with India and respondents from Satkhira range reported the selling of tiger skin to India from the Bangladesh side. Since the seizures and respondents reported the exchange of skins only, we claim that this route is primarily used for trading tiger skins rather than bones. The second route is from the Bangladesh Sundarbans to the capital city Dhaka. Most of the seizures were made in the places on-route to Dhaka. Moreover, the respondents reported that the outside traders come from Dhaka. Lastly, the third route is from the Bangladesh Sundarbans to Chittagong which shares border with Myanmar.

Prices of tiger parts

The price of tiger parts is hard to quantify in illegal trade. The price increases with every transaction before the product reaches the final consumers. Generally, the traders obtain a big share of the profits rather than the tiger killers (Nowell 2000; Damania et al. 2003). We believe that the prices for tiger parts found in this study received by the tiger killers are the lowest within the trade chain (from tiger killers in the Bangladesh Sundarbans to the final consumers). Due to the recent demand for tiger bones it was beyond the scope of the study to compare the price change over time. It is very important to monitor the trade market and any price change for tiger bones since even a slight increase in price has the potential to decimate a small tiger population in a short span of time (Damania et al. 2003).

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CHAPTER 5: DISCUSSION

Due to lack of prior research, extensive knowledge about tiger poaching was limited when I initiated my PhD (Ahmad et al. 2009). Initially, the Bangladesh Forest Department did not support this research since the predominant perception was that the tigers in the Bangladesh Sundarbans were safe from the poachers. I realized the importance of the research when I started my data collection. The issues surrounding tiger killing in Bangladesh was multifaceted and needed to be located within its local territorial condition. Some areas of significance were the local people's distinct belief regarding tiger parts, and the diverse incentives to kill tigers in the Bangladesh Sundarbans.

Tiger poaching is one of the major threats for tigers' survival (Walston et al. 2010). National and international commitments had been made, and several actions (i.e. SMART patrolling, enacting new legislation, social campaigns) had been undertaken to protect tigers from poachers. The Bangladesh Forest Department published the Bangladesh Tiger Action Plan in 2009 as a step towards tiger conservation in the country. Tiger poaching had been identified as a high priority threat for the tigers in Bangladesh (Ahmad et al. 2009; Aziz et al. 2013). Previously, Bangladesh Sundarbans was considered as a stronghold of tiger population with an estimated of 300-500 tigers, probably the largest population in the world (Barlow 2009). Recently, however, Bangladesh Forest Department conducted a census, which confirmed that only 106 tigers were left in the area, showing a sharp decline in tiger's number (Dey et al. 2015). Due to this rapid decline, the wildlife experts of Bangladesh stressed on the importance of terminating tiger poaching. Despite all the conservation efforts, the overall tiger-poaching scenario in the Bangladesh Sundarbans is surreptitious. In order to instigate prompt and profound conservation measures, greater depth of knowledge concerning the nature of local consumption, poaching, and trade of tiger parts was required. This study is the first in-depth research on tiger poaching in the Bangladesh Sundarbans providing a unique insight and detailed analysis of the tiger killing activities.

The findings of this investigation had been provided to the WildTeam, who are working in collaboration with the Bangladesh Forest Department, USAID and Panthera for tiger conservation in the Bangladesh Sundarbans. Additionally, suggestions had been incorporated in the anti-poaching plan for conserving tigers in the Bangladesh Sundarbans, and shared with TRAFFIC and INTERPOL.

Apart from Bangladesh, tigers are endangered due to poaching in other parts of the world as well (Stoner and Pervushina 2013; Sharma et al. 2014; Nijman and Shepherd 2015). Proactive conservation strategies were unsuccessful in many places since poachers discovered new methods to hunt animals (Galster, Schaedla and Redford 2010). This particular research is a pertinent addition to the sparse knowledge on tiger poaching, and indicated the necessity of an in-depth research on different aspects of tiger killing (who, why and how). Studies had been conducted on tiger poaching in other tiger countries. However, those studies principally focused on the commercial trade market, policy issues, enforcement activities or ecological impact (Kenney et al. 1995; Oswell 2010; Verheij, Foley and Engel 2010; Rastogi et al. 2014; Sharma et al. 2014). A conservation plan focusing merely on professional tiger poachers might not reduce poaching significantly if the other groups involved in tiger killing are disregarded. The socio-cultural conditions in each tiger habitat is unique, hence, different conservation measures is required for distinct geopolitical territory. This study showed that the tiger killing scenario in the Bangladesh Sundarbans is complex i.e. the mechanism involved different groups and motivations which demand a broader engagement for tiger conservation.

The world is well aware of the use of tiger parts in traditional Asian medicine (Nowell 2000; Ellis 2005). This study explored the local tradition and perception regarding the benefits of using tiger parts in the Bangladesh Sundarbans by the people living in the adjacent villages. Bangladeshi practices of using tiger parts were entirely different from the traditional Asian medicines. Unlike traditional Asian medicines, there was neither prescribed medicine, nor any specific recipe for producing medicine with tiger parts in the Bangladesh Sundarbans. Hence, knowledge of using tiger parts for medical purposes was based on genealogy i.e. the ideologies and belief system recycled over the years. The precariousness of the belief system of the medicinal use of tiger parts made the use or belief widespread in the area. The absence of any documented medicinal values made the local people believe in the benefits of tiger parts for almost all problems.

Conservation efforts cannot be successful in the Bangladesh Sundarbans without developing a plan that includes pirates. Pirate activity in the Bangladesh Sundarbans was a sensitive issue; similar to tiger poaching, it was also a matter of great concern for conservationists. No studies had been conducted so far to explore pirate activities in the Bangladesh Sundarbans. The available literature showed that pirates kill tigers' prey and

tigers inside the forest (Inskip 2013). This PhD research is the first study that provided valuable insight on pirate activity related to tiger killing in the Bangladesh Sundarbans.

CHAPTER CONTRIBUTIONS

Figure 5.1 showed the contributions of the chapters towards the research objectives.

Chapter 1 provided background information on tiger poaching in the world, the need for this research, and the research objectives. This research had been developed with the Bangladesh Tiger Action Plan's objective in mind i.e. 'minimise tiger poaching' (Ahmad et al. 2009).

Chapter 2 provided a detailed understanding of the local belief and use of tiger parts in the Bangladesh Sundarbans. Both qualitative and quantitative data were used to explain the nature and structure of the consumption of tiger parts' in the area. This chapter, furthermore, discussed the existing local trade of tiger parts within the community for varied purposes in relation to the existing perceptions of the locals about tiger parts. In other words, this chapter explored the significance of the association of local use and belief with the commercial trade of tiger parts and tiger killing.

Chapter 3 presented the complex scenario of tiger killing in the Bangladesh Sundarbans by providing a vivid account of the different groups of people involved in tiger killing, their motivations, and methods for killing tigers.

Chapter 4 explored how the commercial trade of tiger parts in the Bangladesh Sundarbans operates. It contained an in-depth account of the trading methods, which include the processing, preserving and transferring of tiger parts after killing from the Bangladesh Sundarbans to the commercial traders. This chapter also documented the tiger trade database for Bangladesh.

This research challenged the dominant specialised research methods employed for studying clandestine activities. Chapters 2, 3 and 4 provided a detailed and extensive account of the methods used for collecting sensitive data. Most researchers argued that studies in conservation social science often do not demonstrate rigorous method (Fox et al. 2006). This research would help to fill that void. Specialized methods had been developed to study clandestine activities in conservation (Nuno and St. John 2015).

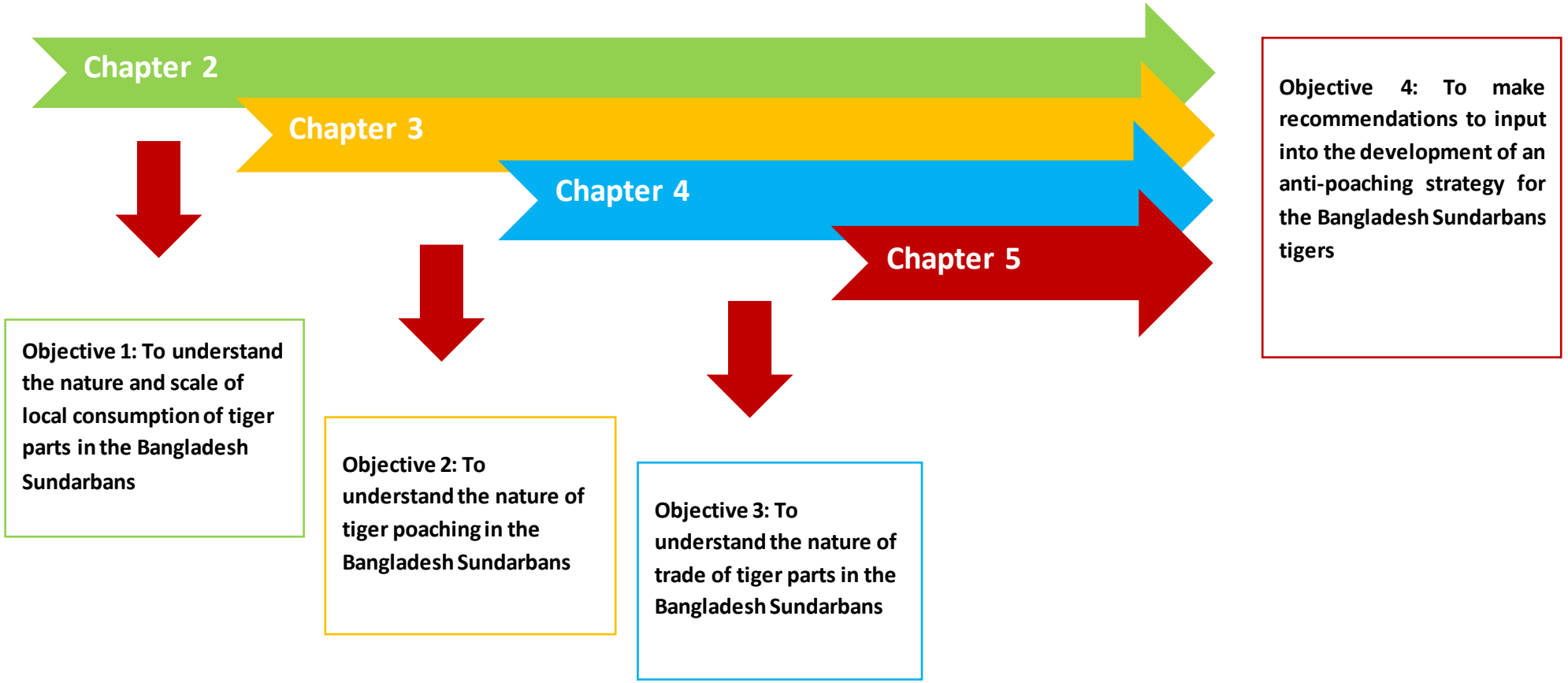

Figure 5.1 Chapters' contributions to the research objectives.

Most of the methods involved indirect questioning, or the results were based on statistical assumptions (Solomon et al. 2007; St. John, Edwards-Jones and Jones 2010). This study demonstrated a conservation related social research method on clandestine activities by gaining trust and respect of the local people. The methodological description of this research would help both the social and natural science researchers in conservation and would benefit the development of conservation related social research.

LIMITATIONS OF THE RESEARCH

Information on tiger poaching in Bangladesh was non-existent. The initial plan for this PhD research was to explore the nature and scale of tiger poaching, trade and local consumption of tiger parts in the Bangladesh Sundarbans. Due to the sensitive nature of the data, data collection was difficult and required time in the field. As a result, it was not possible to determine the scale of tiger poaching and trade of tiger parts in the Bangladesh Sundarbans within the time span of this PhD. Moreover, due to the lack of any pre-existing literature on tiger poaching in the Bangladesh Sundarbans, this study primarily focused on an in-depth narrative account of local consumption, poaching and trade with little quantitative analysis.

Due to the sensitivity of the study, the responsiveness towards sensitive questions (e.g. do you use tiger parts; do you believe in the medicinal values of tiger parts; do people kill tigers in the forest) might had been lower than reality. For instance, the beliefs about tiger parts were widespread in the area; almost everyone was aware about the existence of this belief system in the villages whether they concur with it or not. However, some respondents reported that they never heard of any local use or belief about tiger parts despite its ubiquitous knowledge. They further claimed that they are unaware of any tiger-killing incident in the forest or in the villages.

Though this research focused on tiger poaching, trade and local consumption of tiger parts, the pirate activities in the Bangladesh Sundarbans could not be ignored since these independent factors were all linked to one another. The involvement of the pirates in tiger killing, trade and tiger parts' consumption suggested a need to explore their undertakings in the Bangladesh Sundarbans. Conclusions regarding pirate immersion in tiger killing, trade or consumption, were based on the information provided by the family members of the pirates, former pirates, and villagers who were kidnapped by the pirates in the forest.

Data collection directly from pirate gang members was not possible as it was exceedingly dangerous and unsafe.

CONSUMPTION, POACHING AND TRADE OF TIGER PARTS IN BANGLADESH AND OTHER TIGER HABITATS

Consumption of tiger parts

Tiger parts were mostly used for the traditional Asian medicines in several countries of South Asia. This study claimed that the local use of tiger parts in the Bangladesh Sundarbans was different than the usage of tiger parts in the traditional Asian medicine. For instance, in the Bangladesh Sundarbans, there was no specific procedure for processing tiger bone for medicinal purposes; people wear an amulet with a small piece of bone, or eat a small piece of bone with banana or food. In the traditional Asian medicine, there was a particular manufacturing technique for tiger bone medicine; tiger bones were consumed as tiger wine (i.e. tiger bones are soaked in wine), tiger gelatine and raw bone powder which was mixed with other dried ingredients to make tonics or balms (Lee 1996; Nowell 2000; Ellis 2005).

In the Bangladesh Sundarbans, local people mentioned that a specific bone called '*lucky mon*' was deemed the most powerful cure for any ailment (Saif et al. 2016). In literature, this bone was mentioned as 'floating bone;' in China, which was considered as a symbol of power (Nowell 2000).

Though there was a pattern of similarity between the consumption of tiger parts in the Bangladesh Sundarbans and Traditional Asian medicine, the difference occurred in the influence of local belief on the usage of tiger-parts in each territory. Among other tiger parts, tiger penis was used to increase sexual virility both in the Bangladesh Sundarbans and traditional Asian medicine. Yet, in the Bangladesh Sundarbans, a small piece of it was placed in an amulet to wear on the body (Saif et al. 2016), while it was consumed as tiger penis wine, soup or pill in the traditional Asian medicine (Lee 1996; Nowell 2000).

Tiger poaching

This study found that the professional poachers use carbofuran pesticide for killing tigers in the Bangladesh Sundarbans. This method for tiger killing was also observed in tiger habitats of Nepal, Indonesia and India (Martin 1992; Tilson et al. 2010; Wright 2010). However, in other countries, professional tiger poachers also used steel traps to kill tigers (Wright 2010). Unlike the Bangladesh Sundarbans, in the neighbouring country India,

professional poachers travelled from one tiger habitat to another in a small bus with their families. The families set camps near the forest and sold toys or flowers as a cover, and the men went to the forest with a local man to kill tigers (Wright 2010). In the Bangladesh Sundarbans, the commercial demand for tiger parts came from non-local traders, but for tiger killing only the locals went inside the forest (Saif, Rahman and MacMillan in press).

Trade of tiger parts

The price of tiger parts in the Bangladesh Sundarbans and in the international commercial market varied greatly. In the Bangladesh Sundarbans, the local trade involved little money as the local people gave tiger parts to their friends and families to help them. The price of the tiger parts in the commercial trade was depended on the burgeoning power and networking capacity of the tiger parts owner/seller. However, this study found that tiger bones and tiger skins were the main tiger parts used in the commercial trade. The commercial price range for tiger bones in the Bangladesh Sundarbans was around BDT 1,500-3,000 [USD20-39]/kg (Chapter 4). In the international market the price of tiger bones was very high. For example, in Taiwan the price of a bottle of tiger wine containing 10g of powdered tiger bones was USD10 (Lee 1996). A tiger wine bottle containing tiger bones in Taiwan in 2012 was USD340 (Stoner and Pervushina 2013). In China, the price range of raw tiger bone in 2005-06 was USD10-180/g (Nowell and Ling 2007). Comparing the price in international market, the price of tiger parts in the Bangladesh Sundarbans was quite low. Though, considering the comparative lower price of tiger parts in the Bangladesh Sundarbans, a poacher might still get around USD200-390 (the bones of one tiger weigh around 10 kg) only for the bones. The price range of tiger skin in the Bangladesh Sundarbans was USD520-1,169 (Chapter 4). In total, a poacher could earn around USD720-1,559 from one tiger in the Bangladesh Sundarbans, which is greater than the average annual income i.e. USD718 earned by the people living around the Bangladesh Sundarbans (Inskip et al. 2013). The middlemen and the international traders might be taking the main profits from tiger trade; nonetheless, the poachers earn a huge profit as well since the cost of killing tigers was very little. For example, in India the poachers needed to invest INR40 (<USD1) for poison, or INR900 (USD13.5) for steel traps (Wright 2010).

TIGER CONSERVATION IN BANGLADESH

The Bangladesh Sundarbans was the home of the largest tiger population, consisting of 300-500 tigers. Unfortunately, this is not true anymore. The tiger population of Bangladesh

has declined, and only 106 tigers are left in Bangladesh (Dey et al. 2015). The findings of this research and the high rate of tiger parts' seizures in the country showed that, poachers are operating in the forest and killing tigers to supply their parts to the emerging commercial trade. The country needs immediate actions to conserve the remaining tigers since poaching can wipe out the entire population in a short period of time (Dinerstein et al. 2007; Walston et al. 2010).

As a part of tiger conservation in Bangladesh, Bangladesh Forest Department published the Bangladesh Tiger Action Plan in 2009, which highlighted the threats and challenges of tiger conservation in Bangladesh, set for an action plan from 2009-2017. As intended in the action plan, WildTeam developed the Village Tiger Response Team (VTRT) in 49 villages to deal with stray tiger situations. In addition to that, a local awareness programme was initiated in the villages around the Bangladesh Sundarbans to raise consciousness and responses towards tiger conservation. In 2014, WildTeam, started USAID funded 'Bagh' project to conserve the Bengal tigers in the Bangladesh Sundarbans. The national campaign started in February 2016; a tiger caravan travels in different parts of the country to spread knowledge about tigers and raise awareness of their endangerment. As a part of this project, a national dialogue for the protection of the tigers in the Bangladesh Sundarbans was held in Dhaka, Bangladesh on March 2, 2016. Delegates from the Bangladesh Forest Department, Department of Environment, Ministry of Home Affairs, Bangladesh Police, Bangladesh Coast Guard, Border Guard Bangladesh, Bangladesh Judicial system, members of USAID, WildTeam and Bangladesh Centre for Advanced Studies (BCAS), and the PhD researcher (Samia Saif) were present in the dialogue to discuss the possible collaboration within the departments to stop poaching. Moreover, the researcher had a meeting with INTERPOL (the wing dealing tiger poaching in tiger range countries). Based on the discussion of the national dialogue, meeting with INTERPOL and findings of this research, the following recommendations have been made for tiger conservation in the Bangladesh Sundarbans.

CONSERVATION RECOMMENDATIONS

In the Bangladesh Sundarbans, the existence of multiple tiger killers with diverse motives creates challenges for tiger conservation. We suggest that tougher enforcement efforts alone will not succeed in reducing tiger killing and that a much more dynamic and multi-faceted strategy that addresses the different motives and opportunities for tiger killing is

required to meet the global goal of doubling the wild tiger population by 2022 (GTRP 2011).

Law enforcement

The Bangladesh Government as per the commitment to doubling the tiger population by 2022 is taking steps for tiger conservation. To deter tiger poaching, the Government of Bangladesh formulated a new Wildlife act as 'The Wildlife (Preservation & Protection) Act, 2012' which introduced tougher punishment for tiger killing. However, existence of law is not enough without effective enforcement (Pratt, MacMillan and Gordon 2004). For example, people that have been arrested with tiger parts to supply in the commercial chain have been acquitted due to corruption of the legal process. Professional poachers using poison are least likely to be prosecuted for these reasons. The killing of tiger via poison is the most serious threat to the remaining tiger population, and poison is extensively used to kill tigers in other tiger habitats as well (Martin 1992; Kawanishi et al. 2010; Tilson et al. 2010; Wright 2010). Between 2010 and 2015, a number of tiger skins and skeletons had been seized in Bangladesh. Most skins were without any bullet mark or damage, and included the head, tail, claws and whiskers, suggesting that the tigers were poisoned. Since most poaching activities were undetected, the sudden increase in the rate of seizure indicated that either the frequency of poaching is escalating (Eliason 1999), or there was an improved enforcement action (Sharma et al. 2014). In both cases, it indicated that tiger poachers were operating in the forest causing a big threat for the critically endangered tiger population of Bangladesh. Attention on the seizures and arrests of tiger parts, and the poachers respectively are important steps to stop tiger killing. Yet, the arrests of professional poachers may cause more tiger killing unless the arrested poachers get punishment within a short period of time. Longer judicial process gives the poachers the opportunity to kill more tigers, and collect money to bribe higher officials to get out of jail or even escape free of all charges. For example, the villagers of the same village of a professional poacher (who was arrested with tiger parts) reported that his group members killed tigers to collect the money since he had to spend BDT 900,000 [USD12,676] to close the case. This was a huge amount for a normal villager to arrange within a short span of time without being involved in illegal activity.

To combat this situation we suggest that well-funded conservation NGOs could hire specialist-prosecuting lawyers to act against poachers. This judicial approach has been successfully deployed in other parts of the world such as the Congo (PALF 2010).

Moreover, several respondents mentioned the lack of a trustworthy crime reporting system, which restrained them from reporting poaching related activity. The 'Wildlife Crime Control Unit' of the Bangladesh Forest Department may introduce a hotline number, which will maintain the anonymity of the informer to assist patrolling operations by the Bangladesh Forest Department.

Wildlife crime wing in the judicial system

About 3 million cases are pending in the courts of Bangladesh (UNDP 2013). In the court, tiger poaching cases get less priority compared to other humanitarian cases, and the judicial system takes a long time to complete the poaching cases. In the national dialogue, the judges suggested that the judicial system can have a separate wildlife crime wing to deal with the tiger poaching and other wildlife crime cases. For setting up this wildlife crime wing in the judicial system, the conservation NGOs, and Ministry of Environment and Forests (MoEF) need to work in collaboration with the judicial system.

Ban Furadan

Poisoning is the trademark of professional poaching gangs. We suggest banning Furadan in the market by the Bangladesh Government. Prohibition of Furadan and other poisons used for poisoning tigers may not stop poaching but will simultaneously increase costs and reduce activity for a short time until the poachers find alternative methods (Aziz 2015). Since the tiger population of the Bangladeshi Sundarbans is decreasing rapidly, any measure that will slow down poaching will contribute positively to conservation efforts.

Social incentives

We argue that law enforcement alone may not be the best approach to curtail tiger killing by *shikaris*. An important priority is to enlist greater support for tiger conservation amongst the population. For example, providing accessible medical facilities for the community people will reduce their dependencies on traditional tiger medicines (Saif et al. 2016). Hunting and trapping activities that exist within the local community can also be tackled through a range of positive incentives. *Shikaris* do not solely hunt for money or food, but also for pleasure and excitement; this challenges conservation as they operate illegally but with community support and compliance. The guns used for hunting by the *shikaris* were mostly licenced, and were legally issued on the basis of personal security. One idea worth pursuing would be to provide a 'voluntary gun amnesty with perks' whereby guns are handed over to the government in exchange for other rewards *or* a replacement pistol which will fulfil the security purpose of the owner (pistols are unlikely

to be used to kill tigers safely). Other incentives that might compensate *shikaris* include government provided education/medical facilities to their families, or special social activities (e.g. arranging lunch) with national heroes e.g. cricketers. Bangladeshi cricket players ("The Tigers") are famous celebrities throughout the country and often participate in animal welfare campaigns and might be easy to recruit for this purpose.

Alternative livelihood option

For trappers alternative livelihood provision would reduce their dependency on trapping as a source of income. Training to add value to dairy products is a possible option to explore, as most trappers own cows, buffaloes and goats. A similar initiative has been successful in the Ecuadorian Amazon where local hunters have diversified into chocolate production (Halle and Puyol 2014). Another noteworthy strategy is an alga-culture project as implemented by a civil organization in the Indian Sundarbans, which significantly changed the lifestyle of the community people (Ghosh 2015). The NGOs working in the Bangladesh Sundarbans, in order to enhance livelihood options for the community people, can enforce similar projects to grow and supply algae/seaweed in the cosmetic industries as an alternative livelihood choice. This switch will, additionally, have positive benefits in terms of climate change and ecosystem services (i.e. reducing atmospheric CO_2, mitigating global warming, restoring metal damaged ecosystem, producing biofuel, wastewater treatment) (Chand et al. 2000).

Sustainability of the VTRTs

The formation of VTRTs in 2009 appeared to have reduced successfully the number of village tiger killings (there have been no village tiger incidents in the last 2 years). Nonetheless, these teams do not have the capacity to deal with deliberate tiger killing in the forest. Their scope is limited due to the lack of institutional authority (Rejuan 2014) and their voluntary basis. One option might be to support their activities by providing mediation and negotiation services for compensation between the FD and villagers affected by tigers. This happened in the Corbett Tiger Reserve of India, where the Corbett Foundation has intervened to support a role by mediating between Indian FD and the community. However, the involvement of NGOs can be problematic since the amount of support will depend on external funding and the political environment (Rastogi et al. 2014).

Awareness campaign

Social awareness campaigns for tiger conservation were already prevalent in the villages around the Bangladesh Sundarbans. These campaigns predominantly focused on the importance of the forest as a source of shelter for the villagers since it provided food and protection from natural threats such as cyclones. Though the campaigns enhanced awareness of the local people about the prominent role of the tigers in preserving the Sundarbans, they might have little impact on the professional poachers. A poacher even reported that despite the fact that normal villagers were more aware about the forest and tigers, they were not interested in participating in the campaign. Still, these campaigns are necessary to deal with other aspects of tiger killing such as stray tiger killing, or medicinal beliefs on the benefits of tiger parts. The campaigns should include a message declaring the false medicinal benefits of the tiger parts since most villagers continue to believe in its ability to cure diseases around the Bangladesh Sundarbans.

Negotiation with pirates

The Bangladesh Sundarbans is a dense mangrove forest and undergoes tidal water twice daily. It is almost impossible from outside to understand what is happening inside. The pirates of the Bangladesh Sundarbans live inside the forest and are likely to have a better understanding of the activities inside the forest. Moreover, pirates track tigers to kill for their safety. Bangladesh government is attempting to eradicate pirates' activity in the forest, leaving 41 pirates dead within last year alone (Dhaka Tribune 2015). We would like to suggest a less hostile approach. For example, by offering an amnesty and an alternative livelihood, in exchange for assisting the Bangladesh Forest Department with tiger conservation and anti-poaching efforts (Hakim 2011).

Restrict entrance to the forest and create alternative livelihood options

The people living in the villages around the Bangladesh Sundarbans were greatly dependent on the forest for their livelihood. According to Forest Department record each year more than 300,000 people entered into the forest for resource collection. Thousands of people entered on daily basis (Ahmad et al. 2009). Due to the critical condition of the tiger population in the Bangladesh Sundarbans, the tigers need maximum protection and the scope to grow naturally. In order to accomplish that goal, some parts of the Bangladesh Sundarbans could be restricted for forest resource collection. On the other hand, possible alternative livelihood options are needed to be explored in the area for the forest dependent people. The restriction of human entrance temporarily in particular parts

of the forest is also recommended to mitigate human tiger conflicts (Goodrich 2010; Barlow, Ahmad and Smith 2013).

FUTURE RESEARCH RECOMMENDATIONS

This study is the first in-depth research on tiger killing activities in the Bangladesh Sundarbans. The outcomes have been found from an inductive approach. This research explores an issue of tiger conservation of great concern; at the same time, there are gaps for further knowledge in certain areas. The future research recommendations for tiger conservation in the Bangladesh Sundarbans are:

- To understand the scale of tiger killing in the Bangladesh Sundarbans by the different groups of tiger killers (i.e. poachers, pirates, *shikaris* and trappers)
- To find out the numbers of different groups of tiger killers operating the Bangladesh Sundarbans (i.e. poachers, pirates, *shikaris* and trappers)
- To explore pirate activities in the Bangladesh Sundarbans and its effect on tiger conservation
- To understand the national and international trade of tiger parts from the Bangladesh Sundarbans
- To explore the alternative livelihood options for the local people in the Bangladesh Sundarbans

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APPENDIX I: Semi-structured interview guide for the VTRT members

Participant details	
Interview Number	
Date	
Time of the interview	
Location of the interview	
GPS coordinate	
Name of the village	
Upazila	
Range	
Age	
Gender	
Religion	
Occupation	

Section 1: About you
How many years you have been living in this village?
How many times you have been to the forest in the last 30 days?
Have you seen tiger inside the forest in last 30 days? ☐Yes ☐No
How many times you have seen tiger in the forest in your lifetime?
Do you see/face tigers in the forest more frequently, about the same or less frequently amount as you did five years ago?
On average in one year, how many times did you see tigers in the forest five years ago?
On average in one year, how many times do you see tigers in the forest now?
Do you think tiger are decreasing in the forest? ☐Yes ☐No ☐Don't know
If yes, why tigers are decreasing inside the forest? ☐Tigers are dying naturally ☐ Poaching ☐Habitat destruction ☐Food scarcity ☐Others
Tell me how you joined the VTRT team.
Why did you decide to join the VTRT team?
Why do you think this village needs a VTRT team?
Are you proud to be amber of the VTRT team?
Are you respected by other villagers because you are in the VTRT team?
Would other villagers want to be selected to join the VTRT team?

If yes, why?
Section 2: Stray tigers in the village
Does tiger come in this village in last 5 years?
If yes, how many times tigers come in this village in last 5 years?
Is the number of tigers coming into the village increasing or decreasing in last 5 years?
How many times the tiger was killed in last 5 years?
Tell me about the situation when a tiger comes to the village.
What is the role of a VTRT member when a tiger is in a village?
If the tiger is killed, how many people are involved in tiger killing?
How the villagers kill a tiger in the village?
Why the villagers (some of the) want to kill the tiger?
Who plays the lead role(s) in killing?
What do the villagers do with the dead tiger?
Do the villagers collect tiger parts of tiger killed in the village?
Which tiger parts the villagers want to collect?
How do they take the tiger parts from a dead tiger?
What do the VTRT members do when there is a dead/killed tiger in the village?
Are some dead tigers taken to the Forest Department?
How many of all the tigers killed in the village are taken to the Forest Department?
What does Forest Department do with the dead tiger?
Do people go to the Forest Department to collect tiger parts after they post-mortem the tiger?
If yes, who goes there to collect tiger parts?
How many people go there to collect tiger parts in the FD?
Does everyone manage to get tiger parts from the FD?
What tiger parts do the people want to collect?
For what reasons they want to collect the tiger parts?
Do the Forest Department give tiger parts to the people or do people have to pay money to collect tiger parts from the Forest Department?
Section 3: Uses of tiger parts in your village
Which tiger parts are used by local people?
Which tiger parts are more likely to be sold to outsiders?
Approximately how many people in this village have you seen using tiger parts in your lifetime?
If yes, is it possible to lend tiger parts for medicinal purpose (if someone is sick) from the

villagers anytime of the year? ☐Yes ☐No ☐ Don't know
Do people have to pay money to lend tiger parts for medicinal purpose from the villagers? ☐Yes ☐No ☐ Don't know
If yes, how much for which part?
Is there any local doctor in this village who use animal parts as medicine? ☐Yes ☐No ☐ Don't know
Please tell me about the local doctor.
Have you ever used parts for medicinal/spiritual/religious purposes in your lifetime?
If Yes, how many times?

What are the different uses and prices of tiger parts for use in the village?

In each box enter the price per unit quantity of tiger part used – if there are different uses within a category or different qualities (e.g. high quality canines for sex performance and low quality for headaches please make a note). If not used for any of the purposes leave blank.

Part	Medicine	Decoration/ Jewellery	Spiritual	Religious	Excitement	Others (please specify)	Don't know	Notes
Canine								
Other teeth								
Skin								
Bones								

Claws								
Whiskers								
Meat								

What are the different uses and prices of tiger parts for use outside the village (e.g. in the cities)

In each box enter the price and quantity of tiger part used – if there are different uses within a category or different qualities (e.g. high quality canines for sex performance and low quality for headaches please make a note) If not used for any of the purpose s leave blank.

Part	Medicine	Decoration/Jewellery	Spiritual	Religious	Excitement	Others (please specify)	Don't know	Notes
Canine								
Other teeth								
Skin								

Bones								
Claws								
Whiskers								
Meat								

Section 4: Tiger Poaching
Is it possible to collect/buy tiger parts for various purposes from poached tigers in the Sundarbans area? ☐Yes ☐No ☐Don't know
Is it possible to collect/buy tiger parts from poached tigers in this area/village/range? ☐Yes ☐No ☐Don't know
From which area/village/range it would be possible to get the tiger parts from poached tigers? ☐Sarankhola ☐Chandpai ☐Khulna ☐Satkhira ☐ …… (Other specific area mentioned by the interviewee)
Is it easier to buy/obtain tiger parts from poached tigers now than 5 years ago? ☐Yes ☐No ☐ Don't know
Are the prices of tiger parts from poached tigers higher now than 5 years ago? ☐Yes ☐No ☐ Don't know
On average, how many tigers are poached in this village/range in last 5 years?
Pirates
Do pirates kill tigers inside the Sundarbans? ☐Yes ☐No ☐Don't know
What is the main reason for the pirates to kill tigers in the forest? ☐Poaching ☐Safety ☐Others
How many pirates are living inside the forest?
How many pirate groups are involved in tiger killing inside the Sundarbans?

How many people are needed to kill a tiger?
On average how many tigers do pirates kill in one year?
How many days are needed to kill a tiger?
How do the pirates kill tiger in the forest? (equipment, planning)
How do they collect the equipment?
What do they do after killing it?
Do they involve normal villagers/fishermen in skinning?
Do they know who has the skill in the village to take the skin off properly?
How many people in this village have the skill to take the skin off properly?
How do they learn to take the skin off properly?
What is their occupation?
How do they transport the tiger parts?
Do they involve normal villagers/fisherman in transporting? ☐Yes ☐No ☐ Don't know
How do they involve the villagers/fishermen in transporting?
Where do they send the tiger parts?
Which tiger parts do they send?
Poachers
Do deer poachers kill tigers if they see a tiger? ☐Yes ☐No ☐ Don't know
How often do the deer poachers kill tiger?/How many tigers do the deer poacher kill tiger in the forest in one year?
Tell me how the dear poachers kill a tiger in the forest.
Do you think normal villagers kill tigers inside the Sundarbans secretly? ☐Yes ☐No ☐ Don't know
Is there any other group killing tiger in the forest? ☐Yes ☐No ☐ Don't know
Section 5: Anti-Poaching strategy
Are the villagers aware of the Wildlife Preservation Act? ☐Yes ☐No ☐ Don't know
What are the changes need to make within the existing laws?
How is the law enforcement situation for poaching?
How is the law enforcement situation for consumption?
What are the social impacts of being arrested?
What are the social impacts of being sentenced for poaching?
What should be done to improve arrest and prosecution rate?

APPENDIX II: Semi-structured interview guide for the general members of the village community

Participant details	
Interview Number	
Date	
Time of the interview	
Location of the interview	
GPS coordinate	
Name of the village	
Upazila	
Range	
Age	
Gender	
Religion	
Occupation	
Section 1: About you	
How long are you living in this village?	
Tell me about your family.	
What do you do for your living?	
How many rooms do you have in your house?	
How many times do you go to the forest in one month?	
What do you do inside the forest?	
How do you feel about the tigers in the Sundarbans?	
Have you seen a tiger in the Sundarbans in your lifetime?	
If yes, have you seen tigers in the Sundarbans in last 5 years?	
How many times have you seen tigers in the Sundarbans in last 5 years?	
What time of the day you have seen tigers in the forest? ☐Morning ☐Afternoon ☐ Evening ☐ Night ☐Other	
Please describe the incident(s).	
What do you think; tigers are increasing or decreasing in the forest? ☐Increasing ☐Decreasing ☐Don't know	

If increasing, why tigers are increasing in the forest? ☐Seeing tigers more frequently ☐Tigers are coming from outside ☐Tigers giving more birth ☐ People not killing tigers ☐Others
If decreasing, why tigers are decreasing inside the forest? ☐Tigers are dying naturally ☐ Poaching ☐Habitat destruction ☐Food scarcity ☐Others
Section 2: Stray tigers in the village
Why do you think tigers stray in the village?
How many tigers have you seen in the village in your life?
Can you remember the last time a tiger came to your village? *Check it with different incidents which might suggest the year, month such as which party was in power, whether it was before cyclone or after, or not, how old your daughter was then, etc.*
Is the number of stray tiger incidents in the village decreasing/increasing in last 5 years?
Why the stray tiger incidents are decreasing/increasing in the village?
What were you doing when the tiger was in the village?
What were your family members doing when the tiger was in the village?
What was the attitude of your family towards the tiger?
Men, women, children, leaders, do all act in the same way towards the tiger?
Are all tigers that come to your village killed? If not all how many are killed?
How the villagers kill a tiger?
What happened to the dead tiger?
Do people collect tiger parts from the killed tiger?
If yes, how many people collect or try to collect tiger parts from the killed tiger?
How do they take the tiger parts from a dead tiger?
What do the VTRT members do when there is a dead/killed tiger in the village?
Do VTRT members try to save the tiger?
If Yes, do they succeed?
What do you think of the VTRT?
Are some dead tigers taken to the Forest Department?
How many of all the tigers killed in the village are taken to the Forest Department?
What does Forest Department do with the dead tiger?
Do people go to the Forest Department to collect tiger parts after they post-mortem the tiger?
If yes, who goes there to collect tiger parts?
How many people go there to collect tiger parts in the FD?
Does everyone manage to get tiger parts from the FD?

What tiger parts do the people want to collect?
For what reasons they want to collect the tiger parts?
Do the Forest Department give tiger parts to the people or do people have to pay money to collect tiger parts from the Forest Department?
Section 3: Uses of tiger parts
Which tiger parts are used by local people?
If yes, is it possible to lend tiger parts for medicinal purpose (if someone is sick) from the villagers anytime of the year? ☐Yes ☐No ☐ Don't know
Do people have to pay money to lend tiger parts for medicinal purpose from the villagers? ☐Yes ☐No ☐ Don't know
If yes, how much for which part?
Why people give tiger parts for free?
Is there any local doctor in this village who use animal parts as medicine? ☐Yes ☐No ☐ Don't know
Please tell me about the local doctor.
Would you like to take parts from the dead tiger for medicinal/spiritual/religious purposes?
Which tiger parts would you take if you got a chance?
How do you know about these medicinal/spiritual/religious values of the tiger parts?
Have you ever used tiger parts for medicinal/spiritual/cultural purposes?
If yes, please explain (what, why, when and how it was collected)
How many times you have used tiger parts for medicinal/spiritual/cultural purposes during your lifetime?
Have you seen anyone using tiger parts for medicinal/spiritual/cultural purposes during your lifetime?
If yes, please explain (who, what, why, when and how it was collected)
Do you keep tiger parts in the home?
If yes, why?
Do people admit to others that they have tiger parts?
What do you feel about consuming tiger parts?
How to collect tiger parts for consumption?
Is the national authority/law is against the consumption of tiger parts?
Do people arrive from outside to buy tiger parts?
Which tiger parts are more likely to be sold to outsiders?
If yes, where do they come from?
Are they successful in buying tiger parts?

Are they buying the parts for themselves or to sell them to someone else?
Are the selling prices higher for them?
What tiger parts are available or can be bought?
Are these parts available all the time of the year?
Is it possible to order tiger parts?
How long do I have to wait to get the tiger parts?
Are there any specific persons from whom it may be bought?
Are there any specific places/markets where tiger parts are available?
How do they know that they are real?
Is it possible to sell other animal parts as tiger parts?
Who are the buyers of the fake tiger parts?
What is the price difference between real and fake tiger parts?

What are the different uses and prices of tiger parts for use in the village?

In each box enter the price per unit quantity of tiger part used – if there are different uses within a category or different qualities (e.g. high quality canines for sex performance and low quality for headaches please make a note). If not used for any of the purposes leave blank.

Part	Medicine	Decoration/Jewellery	Spiritual	Religious	Excitement	Others (please specify)	Don't know	Notes
Canine								
Other teeth								
Skin								
Bones								

Claws								
Whiskers								
Meat								
Others(specify what)								

What are the different uses and prices of tiger parts for use outside the village (e.g. in the cities)

In each box enter the price and quantity of tiger part used – if there are different uses within a category or different qualities (e.g. high quality canines for sex performance and low quality for headaches please make a note) If not used for any of the purposes leave blank.

Part	Medicine	Decoration/Jewellery	Spiritual	Religious	Excitement	Others (please specify)	Don't know	Notes
Canine								
Other teeth								
Skin								
Bones								

Claws								
Whiskers								
Meat								
Others(specify what)								

Section 4: Tiger Poaching
Do people kill tigers inside the forest?
Do you know whether tigers are killed inside the Sundarbans recently? Then to check it with different incidents such as which party was on power, whether it was before cyclone or after, whether it was before the immobilization of the tiger or not, how old your daughter was then, etc.
Who are the tiger killers? ☐Pirates ☐Poachers ☐Others ☐Don't know
Do the killers involve the villagers in tiger killing/transferring tiger parts?
Do you know how tigers can be killed inside the Sundarbans?
How many people as a team go to kill a tiger?
Whom do they include in the team to kill a tiger?
How many times in a year do they go to kill a tiger?
Are they always successful?
Is there any specific season/month for killing a tiger?
How long does it take to kill a tiger?
What equipment do they carry to kill a tiger?
What methods/traps do they use for killing a tiger?
How do they make the traps?

What are the common materials to make traps?
How do they select sites for killing a tiger?
How deep inside the forest they have to go for killing?
What are the difficulties and risks while killing a tiger?
What do they do with the tiger after killing?
How and where do they transfer the tiger/body parts?
What precautions do they take while killing a tiger?
What precautions do they take while going to the forest to kill a tiger?
What are the risks of killing and transferring tiger?
What precautions do they take while transferring a dead tiger/tiger parts?
About how many tiger killing or hunting groups exist in the Sundarbans?
What is the daily routine of a poacher?
Section 5: KAP towards poaching (knowledge, attitude & practice)
Are tiger poaching activities discouraged by the villagers or family members?
Is the successful kill of a tiger a symbol of strength or masculinity?
Does it improve the reputation of the hunter within a village?
According to local people, what are the incentives for people to kill tigers?
How much is the monthly income of the people who kill tigers?
What other activities do they do for their livelihood?
Is it enough for them?
What else could increase their income/ standard of living? Is it because they are poor they hunt tigers?
Which job opportunity/income sources are available for him/her?
Are they willingly doing this or someone forcing them to do?
If yes, who and how?
What are their feelings about killing a tiger? (Proud/guilty) During the killing and afterwards
Do the police try to stop tiger killing?
Do their family members know what they are doing?
Do their family members support them in tiger killing?
Do they go to kill a tiger mainly for their own (family included) purpose, to sell parts in the village or for selling it to outsiders?

APPENDIX III: Social data of the respondents' code.

The religions of some respondents were recognized from their narratives.

Code	Gender	Sampling group	Main livelihood	Religion	Other
1	Male	VTRT	Non-forest going	Muslim	
2	Male	Tiger killer	Non-forest going	Muslim	Showed tiger parts
6	Female	General member	Non-forest going	Muslim	Wife of a pirate
7	Male	VTRT	Forest going		
10	Male	Tiger killer	Forest going	Muslim	
10.10	Male	General member	Forest going	Muslim	
11	Male	Tiger killer	Forest going	Muslim	Showed tiger parts
TG11	Male	NGO staff	-	Muslim	
12	Male	General member	Forest going	Muslim	Showed tiger parts
15	Male	VTRT	Forest going	Muslim	
18	Male	General member	Non-forest going	Muslim	Showed different animal parts
19	Male	Tiger killer	Other	Muslim	Stop going to the forest due to age
20	Male	General member	Forest going	-	
23	Male	General member	Forest going	-	
26	Male	Tiger killer	Forest going	Muslim	Showed tiger parts
34	Male	VTRT	Other	Muslim	
36	Male	General	Forest Going		

		member			
37	Female	General member	Forest going	Muslim	
39	Male	VTRT	Non-forest going	-	
44	Male	VTRT	Forest going	Muslim	
45	Male	VTRT	Forest going		
47	Male	VTRT	Forest going	Muslim	Showed tiger parts
50	Male	VTRT	Forest going		
52	Male	Tiger killer	Other	Muslim	
53	Male	Tiger killer	Other	Muslim	
54	Male	General member	Forest going	Muslim	
55	Male	General member	Forest going	-	
56	Male	General member	Forest going		
59	Male	General member	Non-forest going	Muslim	
63	Male	VTRT	Non-forest going	Muslim	
64	Male	VTRT	Non-forest going	Muslim	
71	Female	General member	Forest going	Muslim	
73	Male	Tiger killer	Forest going	Muslim	
76	Male	Tiger killer	Forest going	Muslim	Showed tiger parts
78	Male	General member	Non-forest going	Muslim	Showed tiger parts
79	Male	VTRT	Non forest going	Muslim	

82	Male	VTRT	Non-forest going	Muslim	
84	Male	General Member	Non-forest going	-	
85	Male	General member	Other	Muslim	Forest staff
86	Female	General member	Forest going	Muslim	
88	Male	Tiger killer	Forest going	Muslim	
96	Male	General member	Non-forest going	Muslim	
97	Male	VTRT	Non-forest going	Muslim	
101	Male	General member	Non-forest going	-	
104	Male	General member	Other	Muslim	Stop going to the forest for safety reason
105	Male	Tiger killer	Not-forest going	Muslim	
107	Female	General member	Non-forest going	Muslim	
108	Male	VTRT	Non-forest going	-	
109	Male	General member	Non-forest going	Hindu	
110	Male	Tiger killer	Non-forest going	Muslim	
111	Male	VTRT	Non-forest going		
114	Male	VTRT	Forest going	Muslim	
119	Male	General member	Forest going		
120	Male	Tiger killer	Forest going	Muslim	

123	Male	Tiger killer	Forest going	Muslim	
126	Male	General member	Other		FD staff
127	Male	Tiger killer	Forest going		
128	Male	Tiger killer	Not-forest going	Muslim	
129	Male	Tiger killer	Forest going	Muslim	
131	Male	Tiger killer	Forest going	Muslim	
133	Male	Tiger killer	Forest going		
135	Male	Tiger killer	Forest going		
136	Male	General member	Forest going	Muslim	

APPENDIX IV: Tiger parts observed in the villages around the Bangladesh Sundarbans for local use