

Kamot: the first scholarly investigation of human-shark conflict in Sundarbans

RAJ SEKHAR AICH

Professor in psychology, human-shark transdisciplinary research

Sister Nivedita University

rajsekhar.aich@gmail.com

PRIYANKAR CHAKRABORTY

Bharati Vidyapeeth Institute of Environmental

Education and Research (BVIEER)

priyankar.jour@gmail.com

ABSTRACT

This article is the first comprehensive scholarly introduction to the century-old conflict between humans and 'Kamots' (the local term for sharks) in the Sundarbans, West Bengal, India. Historically, humans preyed on sharks, and sometimes, the sharks preyed on humans. Utilizing a multispecies and knowledge system lens, this article explores the conflict between two species who effectively impact each other's lives and waterscapes they share in the brackish contact zone of the Hooghly River. Primarily based on local knowledge system, we create some baseline information about this conflict and attempt to describe the local understanding of Kamot; incidents of Kamot bites and the circumstance of occurrence; the effect of these bites on the people, how they were treated, and finally attempt to identify the traumatogenic sharks of the region which might be associated with the bites.

KEYWORDS: fishers' ecological knowledge; human-shark conflict; Kamot; knowledge system; multispecies; Sundarbans

1 Introduction

The Sundarbans is part of the largest delta on planet earth. It is a densely forested mangrove area famous for its Royal Bengal tigers (*Panthera tigris tigris*). The current area of the Sundarban tiger reserve starts from about 60 km away from the bustling metropolitan of Kolkata, West Bengal. The men and women of the region go into the jungle to earn a living, and this is where they encounter tigers, often leading to fatal 'accidents' (the colloquial term for animal bites and predation on humans). Bengal tigers being a keystone species, this human-nonhuman animal (hereafter animal) conflict has received significant global attention (Chowdhury et al. 2016a; Uddin et al. 2015; Chowdhury et al. 2016b). There remains another human-animal conflict in the region, spanning at least a century -- the conflict between humans and Kamots, a seldom talked about aquatic predator. The bite of this predator is supposedly so sharp that people do not even realize that they have lost a limb until they are out of the murky waters of the Ganga. However, there has been no in-depth scholarly investigation of the human-Kamot conflict in the region. Only a handful of brief English literature and limited Bengali publications mentions the topic (Banerjee 2013; Chowdhury et al. 2013; Aich 2020). Hence, global knowledge about the phenomena is scarce, and correspondence with the International Shark Attack Files revealed very little about these shark encounters (personal email correspondence with Aich, 2020). Consequently, this article creates the first in-depth scholarly investigation of human and Kamot conflict in the Sundarbans based on local knowledge. The primary objective of this article is to bring this 100-year-old human-animal conflict to the global scholastic and general population. The specific objectives of this research are - 1) Describing local understanding of Kamot. 2) Describing incidents of Kamot bites and the circumstance of occurrence. 3) Describing the effect of Kamot bites on the people and how they were treated locally. 4) Identifying possible traumatogenic Kamots in Sundarbans associated with the biting using fishers' ecological knowledge.

2 Genesis of the research

The year was 1972. Young Samir took a trip to Canning (60 km from Kolkata and 30 km from Gosaba, the entry point and major settlement near Sundarban tiger reserve). It was a beautiful morning at 5:30 am as the sun gently skimmed over the maroon Matla River (a tributary of the Ganga). Seeing the cool water, they jumped into the river for a quick dip. All proficient swimmers, the boys were having fun, splashing around,

and going further and further into the heart of the river. Suddenly, a boatman spotted them and started shouting at them- “Get out of the water immediately!” Flummoxed, they began to swim towards the boat frantically. The young boys got onto the boat unhurt, but the boatman was livid- “Don’t you know there are Kamots in this water?” That story was from the first author’s father almost fifty years ago. For a long time, he had forgotten about the Kamot and the stories the locals had around them. However, as a transdisciplinary human-shark researcher, after returning to India completing his last project where he worked with human and White Pointer interaction through cage diving in New Zealand, the first author was moved to investigate the reality of these stories. Based on accounts, we (first and second authors) have heard of the sharpness of their bites, and knowing that sharks can swim up rivers (WWF n.d.; Dwyer et al. 2020; Morgan et al. 2011; Chen and Twilley 1999; Martin n.d.; Thorburn and Morgan 2004; Citrus Reef 2021), we hypothesized Kamots are sharks. To investigate this matter in-depth, in September 2019, we packed our bags for Sundarbans. Consequently, this article presents the findings on a seldom talked about human-animal conflict based on our fieldwork among humans and the elusive Kamot.

3 Field sites, interlocutors, methods, and methodology

3.1 Field sites

Our primary field sites were the Sundarbans and Kolkata. The Sundarbans mangrove delta is situated in the southeastern part of West Bengal, with a substantial part of it in Bangladesh, and the Hooghly River (a distributary of the Ganga) passes through it to meet the Bay of Bengal. It is located between 21°27’30” N to 22°30’00” N (latitude) and 89°02’00” E to 90°00’00” E (longitude), comprising around 2000 sq. km of pristine mangrove forest and is one of the most productive ecosystems globally (Chakraborty et al. 2021). It is also recognized as a UNESCO world heritage site with diverse floral and faunal wealth (Sarkar and Bhattacharya 2003). More than 370 fish species have been reported from the Indian Sundarbans (Chakraborty et al. 2021), and among them, 40 species are cartilaginous fishes comprising 13 shark species (Mishra et al. 2019). Many fishes recorded from the Sundarbans are marine species that flourish in the region because of fluctuating salinity and other factors (Chakraborty et al. 2021). Moreover, the mosaic of environments mangroves form is a vital fish habitat in tropical estuaries and lagoons globally (Blaber 2007). The Sundarbans are a highly variable habitat for many fish species, including sharks.

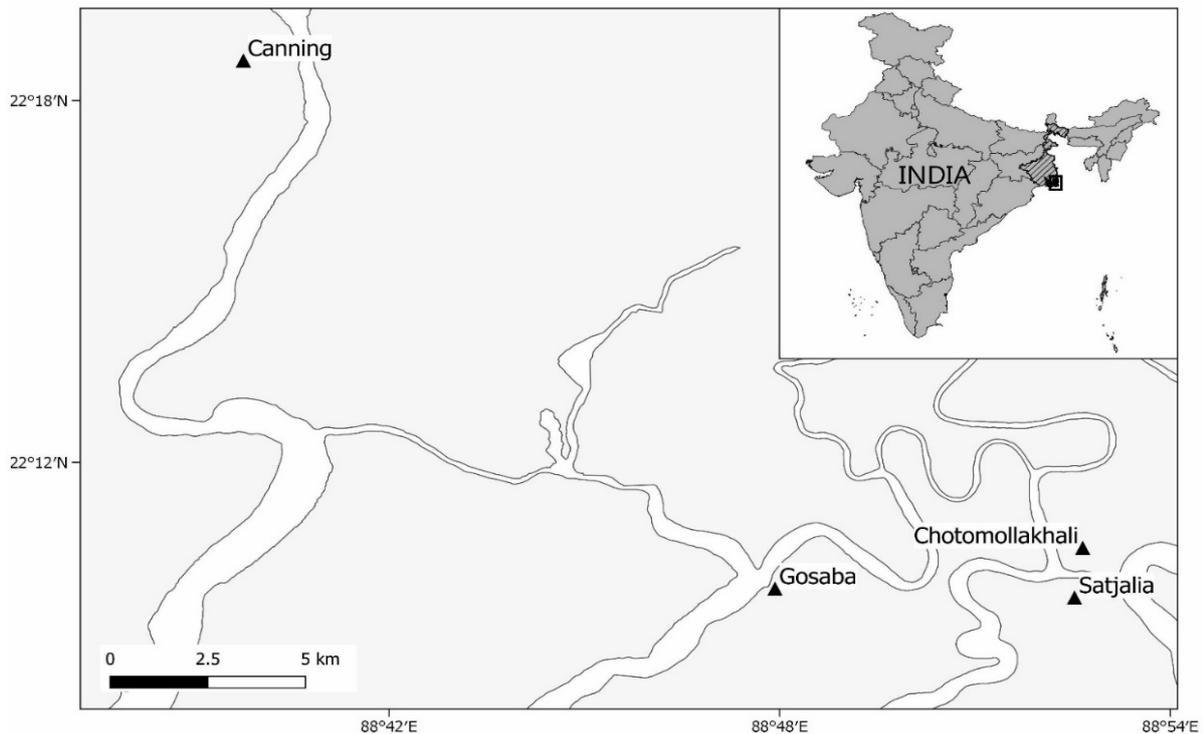


Image 1. Map showing the general localities in Sundarbans where the interviews were conducted. Inset map (top right) showing the location of West Bengal (hashed black), eastern India, and Sundarbans (box) in the southeastern part of West Bengal (Priyankar Chakraborty).

3.2 Data collection methods

Data was collected through structured and unstructured interviews and visual documentation. Face-to-face interviews were conducted from December 2019 to March 2020 with more than 50 people in the Sundarbans region, including local knowledge holders like the fishers, doctors, teachers, and Kamot bites survivors. The proper names of the interlocutors were used with their permission. There were three visits to the Sundarbans and three more sessions with experts who lived in the Sonarpur region in the outskirts of Kolkata. Dictaphone and cameras were used to collect audio-video of the respondents. Further field visits were scheduled but could not be completed due to the global pandemic, and telephonic data were collected till the beginning of 2021.

3.3 A multispecies approach and human-animal conflict

CEESP (The Commission on Environmental, Economic and Social Policy) defined human-wildlife conflict as that which “...occurs when the needs and behaviour of wildlife impact negatively on the goals of humans or when the goals of humans negatively

impact the needs of wildlife” (Madden 2010, 248). In that same token, in this article, we explore how the lives of the humans and sharks were affected by each other’s agency. Sharks and other animals have been historically considered out of the sphere of anthropological investigation, and humans have been seen as the only focus of anthropology. Arguing against this approach, this article was inspired by the methodological framework of Multispecies Ethnography (ME) (Dashper 2020; Ellis et al. 2018; Gannon and Gannon 2017; Gillespie and Narayanan 2020; Hohti and Tammi 2019; Kirksey and Helmreich 2010; Mason 2016; Satsuka 2018; Sepie 2017; Vanutelli and Balconi 2015; Wilkie 2015). ME is more than a human approach to ethnographic research and writing (Locke 2015; Piers Locke and Muenster 2015). ME challenges the scholarly tradition of human exceptionalism that presents humans as separate from other life forms and therefore possessing exclusive agency for understanding and having a significant impact in shaping the socio-cultural, political, and economic environment of the world we are all part of (Haraway 2008; Singer 2014; Faier and Rofel 2014).

Globally, multispecies ethnographers have explored human interactions, encounters, and cohabitations with various species, including agrarian, companion, and wild animals (Galvin 2018; Lorimer 2006; Waters et al. 2019; Barua 2014), microbes and plants (Archambault 2016; Greenhough 2012), insects (Nxumalo and Pacini-Ketchabaw 2017; Davies and Riach 2019), and birds (Isaacs 2019). There has been research on large predators and their relation with human communities, including tigers, hyenas, bears, and even crocodiles (Baynes-Rock and Thomas 2015; Boonman-Berson, Turnhout, and Carolan 2016; Pooley 2016). Furthermore, scientists have focused on investigating human-animal conflict with various species (Ambarl 2019; Khan et al. 2020; Datta-Roy, Ved, and Williams 2009; Can et al. 2014; Margulies and Karanth 2018). In India, there have been multispecies investigations of human-animal conflict with predators such as tigers (Aiyadurai 2016; Chowdhury et al. 2016a; Chowdhury et al. 2016b). However, social scientific or human-shark research (including human-shark conflict) are still limited. Of late, there has been some interest in social scientific investigations with sharks (Neff 2015; Apps, Dimmock, and Huveneers 2018; Apps et al. 2016; Richards et al. 2015). A handful of scientists have also investigated the effect of human-shark conflict from a social science perspective (Neff and Hueter 2013). Furthermore, human-shark conflict and its effect on humans has been investigated ecologically and biologically (Ahčan et al. 2014; Amin, Ritter, and Wetzel 2015; Amin, Ritter, and Kennedy 2012). However, most of this research has not been from a multispecies perspective, and humans and sharks have been considered separate in epistemological paradigms.

In his previous research, the first author argued for a multispecies ethnographic perspective of human-shark research (Aich 2021 2022). While working with the sharks of New Zealand, he elaborated on a dynamic contact zone (Pratt 1991) created between the lives of the sharks and humans encountering each other in the Foveaux Strait, shaped by both their agencies (Aich 2022). Based on those experiences, we wanted to attempt a similar approach with human-shark interaction in the Sundarbans. However, the same strategy could not be executed for this research because of six principal challenges - 1) Catching sharks is not allowed in the Sundarbans, which gives us only a minimal idea about the diversity and ecology of the animals. 2) There are no tagged sharks in the region, providing data about their whereabouts. 3) Because of the turbid water of Sundarbans, we cannot see a coin two inches below the surface, let alone a well-camouflaged shark. 4) There is no place or activity in the Sundarbans where encounters with sharks predictably happen (like in the case of shark tourism industries globally). 5) There is no cultural representation of sharks in Sundarbans, even if there is a significant representation of the other two significant predators (tigers and crocodiles). There is no cultural narrative relating the communities with Kamots: no art, no folklore, nothing. 6) Further fieldwork was not possible because of the pandemic. From our fieldwork, we gathered that Kamots were seen and treated as a nuisance and resource of the local community, nothing more. Hence, even if the intention was to do so, this research could not be conducted and written like a full-fledged multispecies ethnography. However, it is inspired by a multispecies transdisciplinary perspective, utilizing synergized methods of ethnography and fishers' ecological knowledge, and acknowledges and elaborates on the affective agency of both species on each other's lives. These interactions happen in the brackish contact zone of the Ganga, leading to conflict, where humans predate on the sharks, and sometimes the sharks predate on the humans. As elaborated in later sections, shark bites impact the physical lives of humans and their mental and social lives as well. On the other hand, there is a perceived negative effect on the population of sharks in the region and possibly the environment due to severe anthropogenic effects.

3.4 Fishers' ecological knowledge

Due to insufficient information about white sharks of New Zealand, Crawford (2017) utilized a knowledge system analysis to create a holistic white shark knowledge base from science experts and native and indigenous knowledge holders. Similarly, insufficient natural science knowledge on this study's topic combined with a lack of

opportunity to conduct in-depth ecological research ourselves, a knowledge system analysis and traditional knowledge became significant here. We utilized fishers' ecological knowledge (FEK) to collect data on Kamots, especially to ascertain the possible species responsible for biting. The knowledge, understandings, and experiences of local fishers are relevant because they hold extensive data on the resources they use and the environments in which they work. In environmental conservation, fishers' ecological knowledge has been utilized to guide the protection and management of marine animals and ecosystems (Neis et al. 2016; Ribeiro et al. 2021). They have also helped contribute data about rare and endangered species that are hard to come by (Leeney 2015; Bonfil et al. 2018; Pottie et al. 2021). It is crucial to consider that the knowledge generated from interviewing the fishers is not mere conjecture, especially since there is a repetition of themes created from multiple interviews. Indeed, scholars over the decades have argued about the significance of native and indigenous knowledge for learning about the lives of animals and conservation strategies (Rayne et al. 2020; Barnhardt 2007; Mavhura and Mushure 2019; Hens 2006; Grove 1996; Gadgil, Berkes, and Folke 1993; Hegde, Yenagi, and Kasturiba 2013; Barnhardt and Oscar Kawagley 2005; Bloom and Deur 2020; Borona 2019; Tharakan 2015).

4 Describing what the locals understand as Kamots

“We are eating the Kamots, and the Kamots are eating us” - Khitish, 2019

At the end of 2019, we conducted a recce expedition. Our first interlocutor was Mr. Khitish in Canning. Khitish is a painter who lived in the Sundarbans all his life. We sat down with Khitish and some of Sundarban long-term residents over cups of tea in his museum room, filled with ancient artefacts unearthed from the region. Khitish noted that Kamot is the regional term for all sharks. We asked him how he knew they were sharks and not crocodiles. Khitish explained that the bite type of the Kamot is much different from that of the crocodile. A crocodile will always try to take the entire body of the human, but a Kamot often takes just one bite. The crocodile tears the meat, but the Kamot cuts it. Following this, we showed him sharks' images to enquire if they were indeed what he understood as Kamot, and he agreed. He also mentioned that Kamot is what we call '*Hangor*' or sharks in Bengali. He recalled that as a young boy, he and his friends used to see large fins of Kamots breaking the water's surface and their sparkling skin (the shine of dermal denticles of shark skin) as they played in the sunlight. They believed that Kamots came up the creeks to give birth because they often saw smaller

Kamots swimming with bigger ones and assumed they were the pups with the mother. Kshitish also observed that the fish always turned upside down while biting because its snout was long, and the mouth was underneath. His friend Bimal mentioned that before the ban on catching them, they used to eat them, dry the flesh and use them as bait for catching crab and fish.

However, Shamol, a fisher of the region, argued that now there are fewer sharks in the water due to the dramatic degradation of habitat. He said that there had been a tourism boom in the region, causing significant environmental strains. The increase of motorized boats using cheap kerosene instead of petrol, food wrappers and other plastic waste causes water pollution, which is harming the lives of the sharks and other fish, creating pressure on the fishing community. Furthermore, he pointed out that the river's depth has also decreased over the decades, and trawlers near the ocean mouth catch many fish, especially the bigger ones, which may mean that the lives of the animals have been jeopardized.

The local experts in all the interviews agreed to the fundamental premise that Kamots are indeed sharks. The locals had experience with them from time immemorial, but anthropogenic effects have decreased their numbers in the region. Hence, based on decades of knowledge of locals cohabiting with the animals and identifying them accurately, our hypothesis seemed to hold that Kamots are indeed sharks.



Image 2. Priyankar showing a fisher the shark teeth shape to confirm if Kamots are sharks (Raj Sekhar Aich).

5 Describing the Kamot bites and the circumstance of their occurrence

To investigate the stories of the actual shark bites, we needed to go into the fringe areas of the human settlements in Sundarbans. So, from Canning, we travelled to Gosaba and met up with members of the Sundarban Tiger Widow Welfare Society, a team of men and women tirelessly working for the welfare of the local community, supporting victims of not only tiger but crocodile and shark bites as well. The society's secretary, Mr Ashim Gyan, became an invaluable resource, and with Gosaba as our base, our expedition continued. From then on, we travelled from island to island, and from the subsequent two field visits, a dynamic story began to emerge about the human-Kamot encounter in the region. The bites happened when people were swimming, fishing, or doing other aquatic activities. However, most of the bites happened during the harvesting of 'Meen' (prawn larvae). Often, the bites were not perceived immediately, maybe a slight tingling on their legs until the water around them turned red. On the other hand, there were also cases where the sharks charged at them, even till riverbanks.

A resident of Gosaba recalled a story when he was crossing the Matla River on a steamboat 30 years ago. He could see a young lady wearing a pink sari standing knee-deep in the river water and fishing. Suddenly, she fell over into the water, and blood-curdling cries shattered the peace of the early morning, the murky water around her fast-turning red. People rushed to help, and as they lifted her out of the water, they realized that a Kamot had bitten her entire right foot. Another older gentleman recalled how a young boatman pushing a boat out of the jetty was pulled under when he went into waist-deep water. His friends went to help, but he had already lost much flesh from the hips and calves due to the bite. People used a local remedy to relieve the intense pain - they sat him down on a sack of sugar till help arrived.

Khitish also recalled an incident from some 30 years ago when he saw a man being dragged into the water by a Kamot. However, this large man was so strong that he hauled the fish out into the banks, even though chunks of his hamstrings were bitten off. Describing another instance, Krishna Kali Mandal, an expert of the region, mentioned that he remembered being on the Matla River once when men were getting their cattle to cross the river. Two men would be on each side of the cattle as they waded across the river. At least three times, he saw that in the middle of the crossing, the river would turn red and when the cows got out of the water, some of them would have lost a leg. We enquired how he knew it was a Kamot and not a crocodile. He replied that the cows would not be thrashing when the bite happened. It was as if the cow that got bit did not feel anything. However, the moment it was out of the water, its leg

would be missing, like being cut off with a saw.

These incidents were not uncommon in the region and went back to more than a hundred years. For example, Sir Daniel Mackinnon Hamilton, touted as the 'Father of Gosaba', offered rewards to people to catch and kill tigers and sharks in the Sundarbans in the late 1800s (Mandal 2018). However, the bites seemed to drastically increase when the Meen industry was introduced about 40 years ago, especially for women. Because of the limited scope for agriculture, men worked in the jungles to gather fish, crab, wood, and the prized Sundarban honey. That is where the 'accidents' happened. The women's job was to tend to their families, children, and home. However, extreme poverty pushed them to wade into the murky waters of the nearby rivers to collect fish, crustaceans, and Meen, which earned them as little as 50 cents to \$2 for an entire day's work. They waded in close rows in waist-deep waters walking along the length of the river, which is where they encountered the Kamot. We think that during the Meen harvesting practice, the length of time the people were in the water combined with the number of people creating commotion in the water increased the chances of the women being bitten. In contrast, other activities did not require being in the water for such long stretches.

There are reportedly hundreds of Kamot bite incidents strewn across the Sundarbans. One such incident took place in 1996 when Komola Mondol of Hetal Bari village, Chotomollakhali, was catching Meen in the water. Komola was 25-26 at the time; she got into the river with some of her friends at 7 am. Suddenly, she felt a deep burning sensation in her legs. She did not see anything but knew something was wrong. She tried to get out but realized something held her thigh and tried to drag her into the water. She pushed it away and managed to reach the banks when a large Kamot charged at her. The Kamot beached into the banks of the river, following her. However, she could push the animal's head away with both her hands. The Kamot turned away, but she also cut her hand in the process and passed out on the riverbanks.

Satjelia village panchayat, Jelepara village, had another devastating story. Nir-mala Gyan (name changed) had gone down to collect Meen. The year was 2000, and she was around 35 at that time. There were three people in a row; she was in the middle. Something bumped her from behind (a usual strategy for sharks to assess a potential prey is to bump with their snout). She turned around and saw a large dorsal fin in the water. By the time she could ask the person next to her to grab her, the shark had already begun biting down on her hip. The Kamot dragged her underwater. After a while, she managed to surface and push the shark away with her left hand. She swam to the riverbank, but the shark had already bitten off her hand. She could see the trail

of her blood flowing downstream from the riverbank and the shark following it towards her with her hand in its mouth. She lost consciousness, only to regain her senses a few days later in the middle of the night at the Gosaba hospital. She received around 100 stitches from her calves to her buttocks. It took her six months to get over her physical injury but a year to get over the associated pains. However, even after 20 years, she can barely forget the trauma. Nirmala noted that it was unlucky that she was bitten and wished it did not happen. Nevertheless, she also felt that she came in the way of the shark. That was the path of the shark, and the people encroached upon its territory, she exclaimed; “What was the fish supposed to do? Besides, the Kamots must have been running out of food due to overfishing, so they were biting humans.” The latest confirmed case of Kamot bite we could document was from 2013 when during the Ganga Puja, a young boy of 12 while swimming across the river, was reportedly bitten and taken away by two sharks simultaneously, and his corpse was not recovered.

When there were too many Kamot bites in a region, sometimes in retaliation, locals tied live kittens with a rope and put them in the water. The splashing and cries of the kitten seemed to have attracted the sharks, which were then killed, similar strategies of using water splashing has been used for generations in shark catching communities (Ségur 2020).

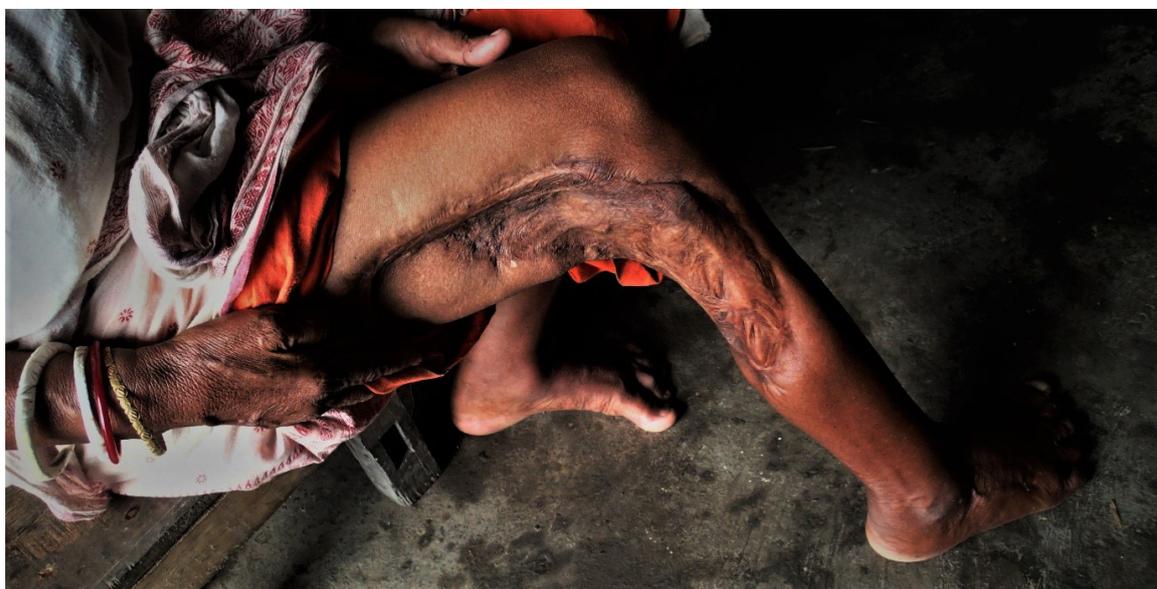


Image 3. Komola Mondol's shark bite from 1996 (Raj Sekhar Aich).



Image 4. A shark bite on a man from 1997 when he was in the water, fishing (Raj Sekhar Aich).

Image 5. A shark bite from the early 2000s (Raj Sekhar Aich).



6 Describing the effect of Kamot bites on the people and how they were treated locally

The shark bites had disastrous effects on the soft human flesh, causing severe disabilities, maiming, discomforts lasting for decades, and sometimes even fatalities. Not just that, the bites had significant financial, social, and emotional tolls, particularly on the women. Some women completely stopped getting into the water, which was an integral part of their relationship with the environment they were born and brought up. They could not earn money or even take care of their children, which added to the financial and logistical burdens and were thus pitied by society and family members. Then there was the personal struggle of losing their beauty, needing help to perform basic tasks around the house, and having nightmares and post-traumatic stress disorder due to the terrifying shark bite. Till very recently, shark bite affected people did not get much support. For tiger bites, people get financial support and medicine. On the other hand, there are stories of communities coming together to support each other. A local doctor of Gosaba mentioned that years ago, he had treated a young girl who had lost her left leg due to a shark bite. He and other community members had supported her for a long time and even helped her achieve her college degree.

We had the opportunity of interviewing Dr Girendranath Mondol in Sonarpur. He is a senior doctor who spent 28 years at the Gosaba block primary health centre, from 1984 to 2012. He treated more than 50 shark bite victims and never lost a patient. Mr Mondol recalled that there was no electricity during his years of working there. So, he had to do all his treatments and even operations under the kerosene lanterns light. Communication was terrible in those days, and even if he had access to medicines, they had to be transported from Kolkata on boats and took weeks to arrive. He advised fishers to carry sugar and old clothing to be prepared in the event of a shark bite. If bites happened, they were supposed to tie the affected area firmly with the piece of clothing and sugar, which stopped the loss of blood and helped in hemostasis. This traditional knowledge needs further positivistic investigation; however, it should not be annulled merely because of its source. Indeed, some evidence backing such treatment strategies can be found in modern research (Mphande et al. 2007; Wiggins 2018). According to him, the chance of infection in the case of tiger bites was higher, but the infection rate was lower for Kamot bites due to the nature of the bite and the saline water in which the bites happened. However, often the patients did not come to him right away and instead had local practitioners patch them up. When they came to him a few days later, their wounds had already been infected, and if a more significant nerve got severed,

there was no regeneration there, which led to some persistent issues.

The doctor noticed that the bites were generally on the fleshy parts around the hips and thighs. The worst cases he witnessed were when the sharks caught the people by the side of the stomach; sometimes, the intestines used to come out. However, as long as there was no injury to the intestine, he could take care of it. There was no other medical help, so he did all that was needed, even pushing the intestines in with his fingers and pulling the skin to stitch it all up because there was no other way. Even if there was a bit of bleeding or soil inside the wound, it was naturally washed out. He stated that such a crude treatment method would never be allowed in a proper hospital, but, out in the middle of the Sundarbans, he did what he could with his limited resources so that the person could live. Sometimes, it took him as long as seven hours to do the stitching; sometimes, they needed intravenous fluid, antibiotics, and ointment for 5-10 days. He had even treated patients with so much injury that it took 3-4 months to recover. We asked the doctor why the victims felt nothing when bitten. He commented that it was possibly because the bites were unexpected and fast, combined with the razor-sharp teeth of the Kamots, that they did not have time to register if something had happened. He also said that even if the humans were aware of the bite when it happened, perhaps a high adrenaline rush in their body and hyperactivation of the sympathetic nervous system was why they felt no immediate pain.

7 Identifying possible traumatogenic Kamots in Sundarbans using fishers' ecological knowledge.

Many shark bites, several fatal, were documented in the river Hooghly from the 1600s till the early 1900s (Global Shark Attack File n.d.). However, references of shark bites in Sundarban have been scarce (e.g., Chowdhury et al. 2013; Banerjee 2013), which leaves the species of sharks responsible for the injuries unidentified. To address this, we turned to the fishers of Sundarbans, who hold knowledge about the region's aquatic resources, which they have accumulated and transferred through generations.

7.1 Challenges in identifying Kamot species from bites

The narratives of the people bitten did not prove helpful to pinpoint the Kamot species associated with the bites. The reason was that no photographs were taken after the bites, and the people bitten could only provide crude descriptions of the animals that bit them. The shortage of information is because the visibility of the river is limited,

even in shallow waters, especially during the monsoons. Furthermore, the Kamots that bit were not caught. Sometimes, the realization that they were bitten happened much later than the actual time of the bite, which meant they did not see the Kamot. Also, during the incidents, the people nearby were more concerned with saving the person's life, so they paid no attention to the Kamot. These precluded us from identifying the Kamot species responsible for biting from the victims' accounts.

7.2 Kamot species diversity in the Sundarbans

In the Sundarbans, shark fishing is prohibited, and consequently, they are never seen in wet markets. Therefore, examining a specimen to determine whether it is capable of causing injuries to humans was not possible. Hence, we relied on fishers' ecological knowledge to discover sharks potentially associated with biting. From the Indian Sundarbans, 13 shark species have been listed (Mishra et al. 2019). Among the reported sharks, some are classified as traumatogenic (e.g., Bull shark, black-tip shark, tiger shark). In comparison, others are considered harmless to humans (e.g., Winghead shark, Pondicherry shark, grey bamboo shark) (Froese and Pauly 2021).

The critically endangered Gangetic shark (*Glyphis gangeticus*) has been reported from the Sundarbans and, until recently, was believed to be an actual freshwater shark found only in the Hooghly River system (Burton 2021). However, recent records of the species from the Arabian Sea (Jabado et al. 2018) shows that similar to other euryhaline sharks this species is not exclusively a freshwater species. Many researchers opine that bites attributed to the Gangetic shark are possible cases of mistaken identity because the teeth (especially those on the lower jaw) prevent them from biting into human flesh (Burton 2021; Roberts 2006). Also, the sympatric and more aggressive bull shark (*Carcharhinus leucas*) creates confusion in identification. In 2021, the magazine 'Sudu Sundarban Charcha' (Lahiri 2020), a Bengali publication that writes about Sundarbans, released an edition investigating the story of Kamot. In our communication, Lahiri and his team provided an archival image of a shark jaw discovered in the Bangladesh portion of Sundarbans, which seems to be a Gangetic shark jaw (Image 6).

Fishers mentioned a Kamot they called the '*Gung Kamot*' named after its habit of travelling up to the freshwater reaches of the Ganges (locally called '*Gung*'). They pointed out that the species is ferocious and will readily strike, sometimes even jumping out of the water trying to bite. The description provided by the fishers included 6-9 feet in length, bronze-coloured dorsum and very pointed and sharp teeth. The fishers were sure that the Gung Kamot bites people. Kshitish had also mentioned that the Gung Kamot

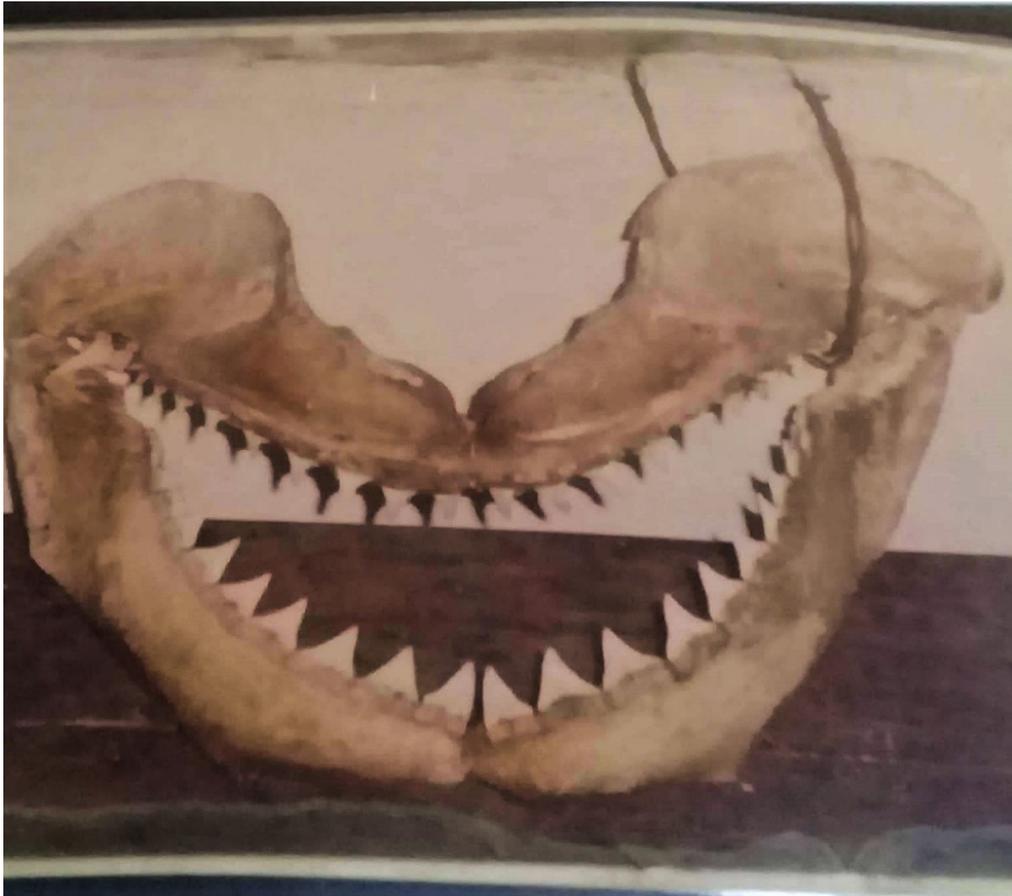


Image 6. Photograph of the shark jaw from the Bangladesh side of the Sundarbans, possibly that of a *Glyphis gangeticus* (Jyotirindranayan Lahiri).

would come to the surface and turn upside down, remaining completely motionless. It would be so still that even birds would come and sit on it. However, when people swam near it, the Kamot would turn around to bite them. We could not find any repetition of this information in other interviews, nor could we find any reference to such behaviour in sharks.

We interviewed Sonnasi Joddar, a fisher who has fished in the Sundarbans for more than half a century. He recounted one incident where he was fishing near the river mouth and had caught a 20-foot-long shark. He said that there were two smaller sharks with the bigger one, which he identified as female. According to him, the smaller ones were its babies. The shark was so immense that he could not bring it up on the boat and had to release it. Tiger sharks generally exceed 15 feet in length (Schneider 1990), and they have been listed from Sundarbans. So, it is possible that what Mr Joddar recounted was a giant tiger shark. Furthermore, since he was fishing in the vicinity of the Bay of Bengal (the mouth of the river Ganges), the possibility that it could have

some other enormous shark also remains.

We asked the fishers about the teeth shape and size and whether they noticed any difference in dentition among different Kamots. They mentioned that all Kamots have concentric teeth rows, and they grow as the animal matures. They also said that some Kamots have almost needle-shaped, comb-like teeth. They explained that when Kamots are small, they have needle-like teeth and prey on small fishes, but as they grow, they have more prominent, serrated teeth for hunting bigger food, which is why the ones that injure humans are always ranging between 5-9 feet in length. The fishers were able to provide information on some Kamot species that never attain more than three feet of length, and they were sure that those species were not responsible for biting people. They call them 'Dudhe Kamot', which translates into milky shark. The milk shark (*Rhizoprionodon acutus*) has been reported from the region, and the fishers agreed when presented the photograph of the shark.

In our efforts to discern shark species responsible for bites using FEK, we learnt that the most common Kamot species responsible is the 'Pet-Mota-Kamot', which translates to fat-bellied shark. The characters described by the fishers were; usually five to nine feet in length, sometimes larger; grey to grey-brown and bronze in colour with a white belly; no spots or reticulations on the body; large teeth. Based on fishers' knowledge and the existing literature on sharks of the Sundarbans, we hypothesize that six species are likely to bite humans. We referred to several sources for size comparison (e.g., Ebert et al. 2021; Froese and Pauly 2021). We present the species list in detail in table 1.

Characters	Length	General body colour	Body without spots and reticulations	Conspicuous teeth
Blacktip shark (<i>Carcharhinus limbatus</i>)	+	+	+	+
Bull shark (<i>Carcharhinus leucas</i>)	+	+	+	+
Blacktip reef shark (<i>Carcharhinus melanopterus</i>)	+	+	+	+
Ganges shark (<i>Glyphis gangeticus</i>)	+	+	+	+
Spottail shark (<i>Carcharius sorrah</i>)	+	+	+	+
Broadfin shark (<i>Lamiopsis temmincki</i>)	+	+	+	+

Table 1. A list of Kamots (sharks) from the Sundarbans, possibly responsible for bites based on existing literature and fishers' ecological knowledge. Presence of character indicated by (+).

Among the other sharks reported from the Sundarbans, the tiger shark (*Galeocerdo cuvier*) reaches lengths more than five feet and have been recorded to be traumatogenic in other parts of the world. However, the interviewees said they had never seen any bars or reticulations on any shark in the Sundarbans region, a distinct species feature. Hence, we did not include it in our list. The fishers also said they never came across any Kamot having a hammer-shaped head, so the winghead shark (*Eusphyr a blochii*) was excluded. Like the milk shark, the commonly recorded size of the spadenose shark (*Scoliodon laticaudus*), the grey bamboo shark (*Chiloscyllium griseum*) and the Pondicherry shark (*Carcharhinus hemiodon*) generally do not fit the Pet-Mota-Kamot classification, and they were left out. The zebra shark (*Stegostoma fasciatum*) has been left out because it has multiple dark spots and banding on its body which the interviewees mentioned never to have observed. The Kamots we have listed are not exhaustive, as Sundarbans is an open water system where tidal incursion and other abiotic factors play a prominent role in the distribution of fishes (Chakraborty et al. 2021). Accordingly, the possibility of previously unrecorded species of sharks in the Sundarbans is not far-fetched, and it is even possible that some unrecorded species were responsible for biting humans. Similarly, some shark species recorded earlier could be absent from the region due to anthropogenic activities.



Image 7. Raj drawing the image of Kamot teeth from fishers' description (Raj Sekhar Aich).

8 Future research

This article is merely an introduction to the topic. Valuable knowledge was retrieved from learning about this conflict, particularly about the societal resilience of these shark bite incidents and the diversity and ecology of the sharks in the region. However, this investigation has created a scope of extensive future research. Why isn't there a single artistic/spiritual representation of sharks from the region? In most native cultures that share lives with large predators, the animals are represented in artistic and spiritual images (Saunders 1994; Zhang and Chen 2019). These images can be of reverence, fear, and even awe or beauty. Even in India, most large predators who occasionally prey on humans have generally been represented somehow, from Goddess Durga's lion to the crocodile of Khodiyar Maa and the tiger of Bono Debi in the Sundarbans. Then why not the Kamot? Also, what is the current conservation status of sharks in the region? Why were a majority of the people being bitten reported very little or no pain during the time of the bite? Finally, what is the post-traumatic impact of Kamot bites on humans? These are some critical questions that need to be further investigated.

9 Conclusion

This study used local knowledge to investigate the unexplored conflict between humans and sharks in the Indian Sundarbans. We utilized a multispecies approach to investigate the impact of both species connected in the conflict. The primary objective of this article was to bring this 100-year-old human-animal conflict to the global scholastic and general population. The specific objectives of this research were to describe the local understanding of Kamot, incidents of Kamot bites and the circumstance of occurrence, the effect of Kamot bites on the people, and how they were treated locally, and identify possible traumatogenic Kamots in Sundarbans using fishers' ecological knowledge. We found; the local experts agreed to the fundamental premise that Kamots are indeed sharks. They had experience with them from time immemorial, and there is possibly a decrease in their contemporary numbers because of anthropogenic effects. We described Kamot bites and how these bites affected people physically, socially, and financially. We also described how these bites were treated. Finally, through FEK, we proposed six species of sharks that may be associated with the bites on people in the region.

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