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Subsistence Strategies and Resource Use Among the Santals of Srirampur in Assam

Saurabh Mardi[1], Hilloljyoti Singha[1*]

[1]Department of Zoology, Bodoland University, Kokrajhar, India.

[*]singha.hilloljyoti@gmail.com

Abstract The Santals, one of India's largest Indigenous tribal communities, are primarily found in regions of India, Bangladesh, Nepal, and Bhutan. They share a common language and cultural traditions. The study discusses how the Santals use natural resources including bushmeat, often gathered from the forest or densely vegetated areas in Srirampur, the west border of Assam in North-east India. A structured survey and interviews were carried out among 111 residents. The interviewed community depended significantly on the forest, collecting natural resources such as food, medicinal plants, and non-timber forest products (NTFPs). Hunting was prevalent in the community. Hunters were significantly younger (21.54±8.21 years old) than non-hunters (47.96±10.19 years old) and most preferred catapults to traps. Mass hunting occurred occasionally and was mostly done by children for leisure. Birds were the most targeted animals, while frogs and rodents were also hunted. The primary driver for hunting was consumption and bushmeat was not sold in markets. Other hunting includes species of mollusks and fish. The illiterate members of the tribe were not aware of NGO and state-led conservation efforts although they supported them. This study discusses Santal culture, Santal attitudes toward natural resources, and stresses the need for governmental intervention and awareness programs.

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Introduction

Santals are one of the largest Indigenous tribes in India, residing in Jharkhand, West Bengal, Assam, Tripura, Bihar and Odisha (Mandal et al. 2020). They also inhabit regions of Bangladesh and Nepal (Sarker 2014). They are recognized as a disadvantaged tribe with respect to social, economic and political status (Sarker 2014). Besides undertaking agriculture as a major livelihood (Sarker 2014), they are hunters and gatherers organizing themselves near forests, jungles, and *beel* (wetland) areas, hunting bushmeat for local consumption (Kharel et al. 2019).

Bushmeat hunting is a crucial resource for many poor rural people around the world (Brown and Williams 2003). Bushmeat provides an accessible source of protein; while hunting and consumption are meaningful elements in their larger culture (Wilkie and Carpenter 1999). In several Northeast Indian rural communities, hunting has a religious and cultural significance (Hillaluddin et al. 2005). However, ecologists identify hunting as one of the primary threats to wildlife in Northeast India (Mishra et al. 2006). Consumption of bushmeat is common in Northeast India (Aiyadurai 2011) and unsustainable hunting practices contribute to decline in wildlife populations and extinction (Aiyadurai 2011; Hillaluddin et al. 2005; Kaul 2004; Mishra et al. 1998).

This study discusses two villages in western Assam, India, dominated by members of the Santal community. We investigate the practice of bushmeat hunting, the importance of bushmeat and non-timber forest product (NTFPs) collection, and awareness and perception about wildlife conservation.

Methods

Study location

Srirampur is a rural town in Hathidhura Tehsil in the district of Kokrajhar, Assam, India. National Highway

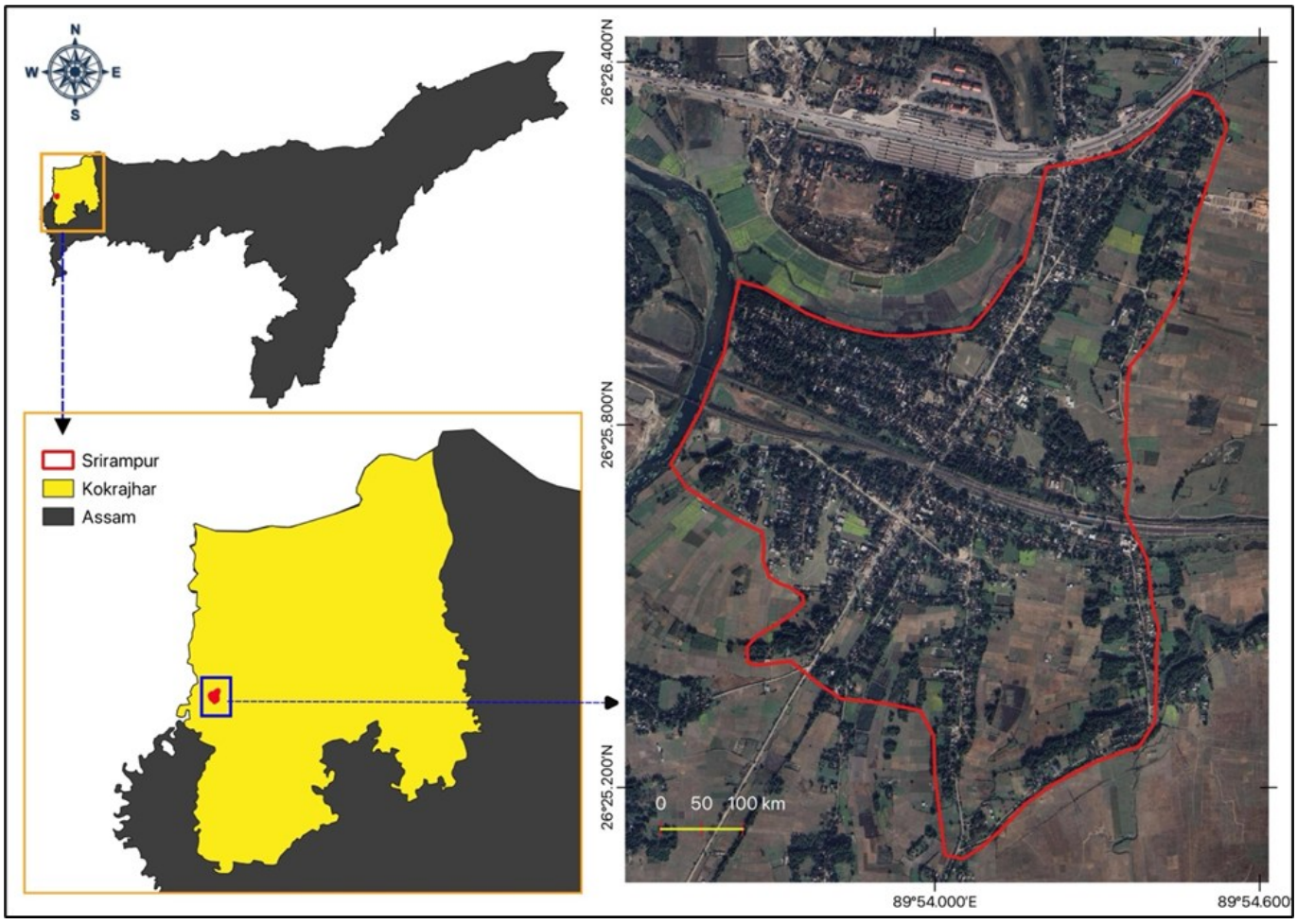

Figure 1 Map showing the study area – Sriampur, Kokrajhar, Assam.

(NH 27) passes north of the town which connects West Bengal in the West. Two kilometers south from the town, there are four villages called Srirampur No. 1, No. 2, No. 3, and No. 4 on both sides of the state highway. The Damra river flows on the west side of the villages, which then joins the river Sankosh, a tributary to River Brahmaputra. The temperatures in summer average 27.64° C to 31.67° C and the average winter temperature is 19.34° to 23.66° C. The average rainfall is about 2,400 mm to 3,000 mm per annum.

The town is inhabited by Assamese and Bengali communities, as well as the Santal tribe. Few residents live close to the market. Most of the population lives outside the town, in the four villages. The town's infrastructure is poor, with only a few schools (serving children up to Secondary level only), one market, one bank, and no hospital. The public market is in the center of the town, and all residents visit it. However, natural forest resources are only sold by Santals. We selected Srirampur No. 1 and No. 2 villages for our study because they were inhabited only by the Santals. Residents speak Santali, the Indigenous language, as well as Assamese, Bengali and Hindi. The first author (SM) is a native Santal of Srirampur and speaks the language. Most of the Santals are Christians; however, they still uphold their traditional rituals. Illiteracy is also common among the Santal tribes of the study area. All households, both literate and illiterate, reared livestock. All households, apart from the literate minority, did not own LPG or electrical stoves.

The region has sparse tree cover and scattered bamboo patches, with the majority of the landscape consisting of agricultural paddy fields (Figure 1). However, every household has home gardens comprising cultivated species (*Areca catechu*, *Artocarpus heterophyllus, Averrhoa carambola, Carica papaya, Litchi chinensis, Psidium guajava, Syzygium cumini,* and others), and naturally growing plant species that create a

mosaic habitat for amphibia, reptiles, small mammals, and birds. Monkeys (e.g., Rhesus macaque, *Macaca mulatta*) are sometimes seen making their way through villages using the bamboo groves as a temporary abode. Large wildlife has not been observed by the locals in their living memory.

Data collection

We used a structured survey for data collection (see supplementary file) after the pilot study. The interview schedule consisted of 14 questions designed to extract information for quantitative analysis focusing largely on the issue of bushmeat hunting and perceptions on conservation. The interviews also helped to collect other general information regarding the tribe. The first author conducted interviews in Santali. Both the study villages were ethnically and culturally inhabited by Santals, and so we considered these two villages as one unit of study area. Out of the 220 households in the study area, we conducted a survey among 75 Santal households from April–June 2020. We selected the households using a random sampling method (Kothari 2004) and obtained verbal consent before conducting the interviews. We interviewed 111 individuals from the population, prioritizing the head or representative of the family (usually males). Sometimes, other family members also supplemented the replies. When no males were present, we interviewed females to inquire about the males' hunting habits. We interviewed other family members because we recognized that it was the children who hunted and not elder males. The hunters were categorized into three age groups: 10–20, 20–30, and over 30. The youngest group was also interviewed, as the pilot survey indicated that they were the ones who had the habit of hunting. Each interview lasted 10–15 minutes.

The respondents were asked about their use of natural resources and the products they extracted from their forest for subsistence activities. We categorized forest products into four categories: NTFPs, medicine, firewood and food. NTFPs in this study were defined as wood mostly used for construction of houses and tools. The type of NTPFs and intensity of extraction was not investigated. Hunters were asked regarding their hunting tools, strategies, motivators, and harvesting success rate. The harvesting success rate was assessed by defining five categories: 10–30% (1–2 animals in five trips), 30 –60% (5 animals in five trips), 60–90% (5–10 animals in five trips), 90–100% (more than 10 animals in five hunting trips) and 0% (none of the above). The drivers and motivations for hunting were assessed by four categories: Personal consumption, festivals, commercial purposes and sport. Occurrence of group hunting i.e., organized hunting groups, in the region was also assessed. During this hunting, people go in groups of more than five. For assessing the frequency of mass hunting four categories were considered: everyday, weekly (once per week), festivals (special occasions), and occasionally (rarely).

The market was also surveyed to verify the sale of forest products, wild meat and other animal products. Conservation awareness, their perceptions and support for wildlife conservation were also assessed.

Analyses

All data were stored in Excel spreadsheet as binary data (i.e., Yes = 1, No = 0). Chi-square analysis was used to determine significant differences among the variables with 0.01 significance level. Yates's correction was used where degrees of freedom was 1 (i.e., between two variables) with 0.01 significance level. Chi square contingency tables were used to test for association between hunters and non-hunters, and between sexes. Z test was used to analyze the average age of hunters and non-hunters at 0.05 significance level. The mean and standard deviation (SD) were estimated respectively. All statistical analyses were done using RStudio (version 4.3.0) (R Core Team; 2023). Graphical representations were created using Microsoft Office Professional Plus Excel 2019 (Version 2304).

Results

All respondents had been to the forest in their locality for collection purposes. All respondents described that they had collected food, NTFPs, medicine, and firewood at roughly equal rates regardless of age and gender ($c^2 = 0.05$, $df = 3$, $P > 0.01$; Figure 2). No female respondents (20) hunted in the community. Among the male respondents (91), we found more non-hunters (59%) than hunters (41%). Hunters tended to be younger (21.54 ± 8.21 years old) than the non-hunters (47.96 ± 10.19 years old) ($Z = 13.87$, $n1 = 54$, $n2 = 37$, $p < 0.05$), although one hunter was 59 years old. Among the hunters, the youngest age group (62% of 10–20 years old) hunted more than the other age groups ($c^2 = 16.43$, $df = 2$, $P < 0.01$). All interviewed students ($n = 10$; age: 15.9 ± 2.68) hunted. The catapult was the weapon of choice of all the hunters, because it was easy to carry. All the

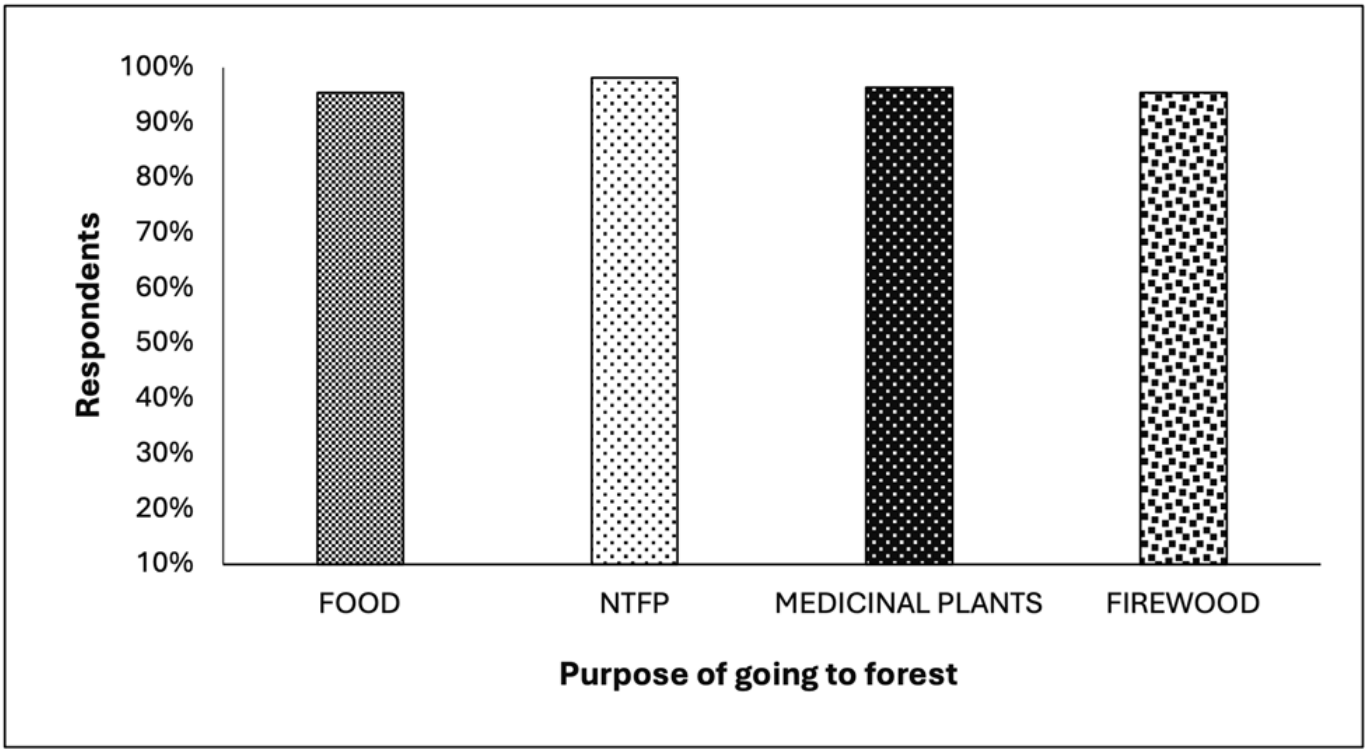

Figure 2 Purpose of going to the forest by the respondents in the study area (Respondents were allowed to provide multiple answers).

hunters preferred going to hunt rather than setting traps. Mass hunting occurred occasionally according to all the respondents. Hunters primarily targeted birds (100%), with rodents a (41%) being their secondary target (c^2 = 24.54, *df* = 2, P < 0.01). The harvesting success rate was significant in the "10–30% category" (73%), in which only 1–2 animals were harvested in five hunting trips (c^2 = 7.81, *df* = 1, P < 0.01). All hunters stated that the primary driver for hunting was consumption. Among the respondents, 73% were significantly aware of the need for conservation (c^2=23.43, *df* = 1, P < 0.01). However, the awareness among students was not significant with 20% not being aware about NGO and state-driven conservation (c^2=2.5, *df* = 1, P > 0.01). There was no significant difference between females who were and were not aware of conservation programs (c^2=2.45, *df* = 1, P > 0.01). However, all respondents expressed their support for conservation programs when they discussed them with the researchers.

Discussion

The results of the study indicate that the Santals in Srirampur depend on natural resources for their livelihood. Their devotion to their traditions and rituals have not eroded with development infrastructure over the last twenty years. All the respondents had been to the forests and home gardens for collection of natural resources. Santal women and children venture out to catch fish and crabs from nearby streams, ponds, and rivers (similar to Barkat et al. 2021). They extract wild edible plants (*Diplazium esculentum, Dioscorea bulbifera etc.)* grown around their house or picked from nearby jungle patches. Common seasonal crop plants such as *Abelmoschus esculentus*, *Manihot esculenta*, *Solanum lycopersicum*, *Solanum tuberosum*, and *Solanum melongena* are grown by almost every household. NTFPs products are used for various reasons such as fuelwood for household fuel use and to sell for cash; bamboo and non-timbers for house construction and also for cash; and bamboo for tools and crafts. Mishra et al. (2006) found Adi tribes in Arunachal Pradesh and Santals in Bangladesh (Barkat et al. 2021) to be heavily dependent on the forest for fuelwood, timber and bamboo for house construction, medicinal plants for cash, and leaf litter for manure. Cooking was done in mud stoves and firewood and NTFPs were used as fuel. Cow dung mixed with hay was wrapped around

sticks and dried and used as an alternate fuel for cooking (Figure 3). Firewood is in high demand and sold regularly. NTFPs such as bamboo species are also grown on Santal land and then sold (Figure 4). Bamboo is an important cash plant for the Santal communities who depend on it for their livelihood. Natural resources such as wild plants, NTFPs and firewood also contribute supplementary income and act as a tool for poverty alleviation (Arnold and Perez 2001; Brown and Williams 2003).

Santals in Alipurduar, West Bengal used 73 medicinal plants (Mandal et al. 2020). However, there was no documentation of medicinal plants in this study. The traditional medicines are not sold in the open market. The residents reported that they generally depend on traditional medicines including prayers and rituals. However, people occasionally use pharmaceutical medicines as well.

The research was constrained because it relied on hunters to recall their harvesting rate. This limitation means that the data might not accurately reflect the actual number of animals harvested, leading to possible overestimations or underestimations of hunting activity. Consequently, the conclusions drawn from these data should be approached with caution. The hunters of the study area did not follow a fixed

Figure 3 Cooking with firewood in mud stove (left), cow dung mixed with hay wrapped on sticks used as alternate fuel for cooking (right). Photographs by Saurabh Mardi.

Figure 4 Sale of firewood (A), Bamboo taken for sale (B), NTFPs collection (C-E). Photographs by Saurabh Mardi.

hunting schedule but hunted when convenient, and even out of boredom (similar to Barkat et al. 2021). Santal hunters pursue rats whenever they come across them while working on cultivated land. Generally, hunting is gender differentiated, being done mostly by men or adolescent boys (similar to Lowassa et al. 2012). All young boys are introduced to hunting by their peers from an early age (<four– five years of age). Hunting was mostly done by catapults and handcrafted traps (Figure 5) which resonates with other studies (Kharel et al. 2019). A study with a Santal tribe in Nepal (Kharel et al. 2019) documented several traditional mammal hunting tools such as *Passi* (snare trap), *Kachhad* (thick spear), *Aapuni* (bow and arrow), *Tunud* (arrow triggered crossbow trap) and *Sitob* (trigger bamboo rat trap). Among these hunting tools, only *Tunud* was used in Srirampur, (Figure 5A) and was set up in agricultural lands for rodents.

Hunters told us that hunting was mostly opportunistic, occurring when they were out collecting natural resources or tending to their grazing cattle. We saw groups of children (five–seven persons) walking with rodent traps to set in the fields and catapults around their necks or in hand looking for opportunistic prey (Figure 6). Mass hunting was not solely a ritual or limited to festivals; it was often unplanned and driven by boredom. Kharel et al. (2019) understood that group hunting among the Santal people is crucial for strengthening social bonds and fostering unity.

Hunters attested to consuming bushmeat, motivated by a desire for personal consumption and a culturally informed interest in hunting (similar to Ceppi and Nielsen 2014; Mavah et al. 2018). They did not cover large distances to hunt and seldom travelled far from their village, although a few hunted in nearby villages when the grazing grounds for cattle changed. Snares and traps were not preferred in this case

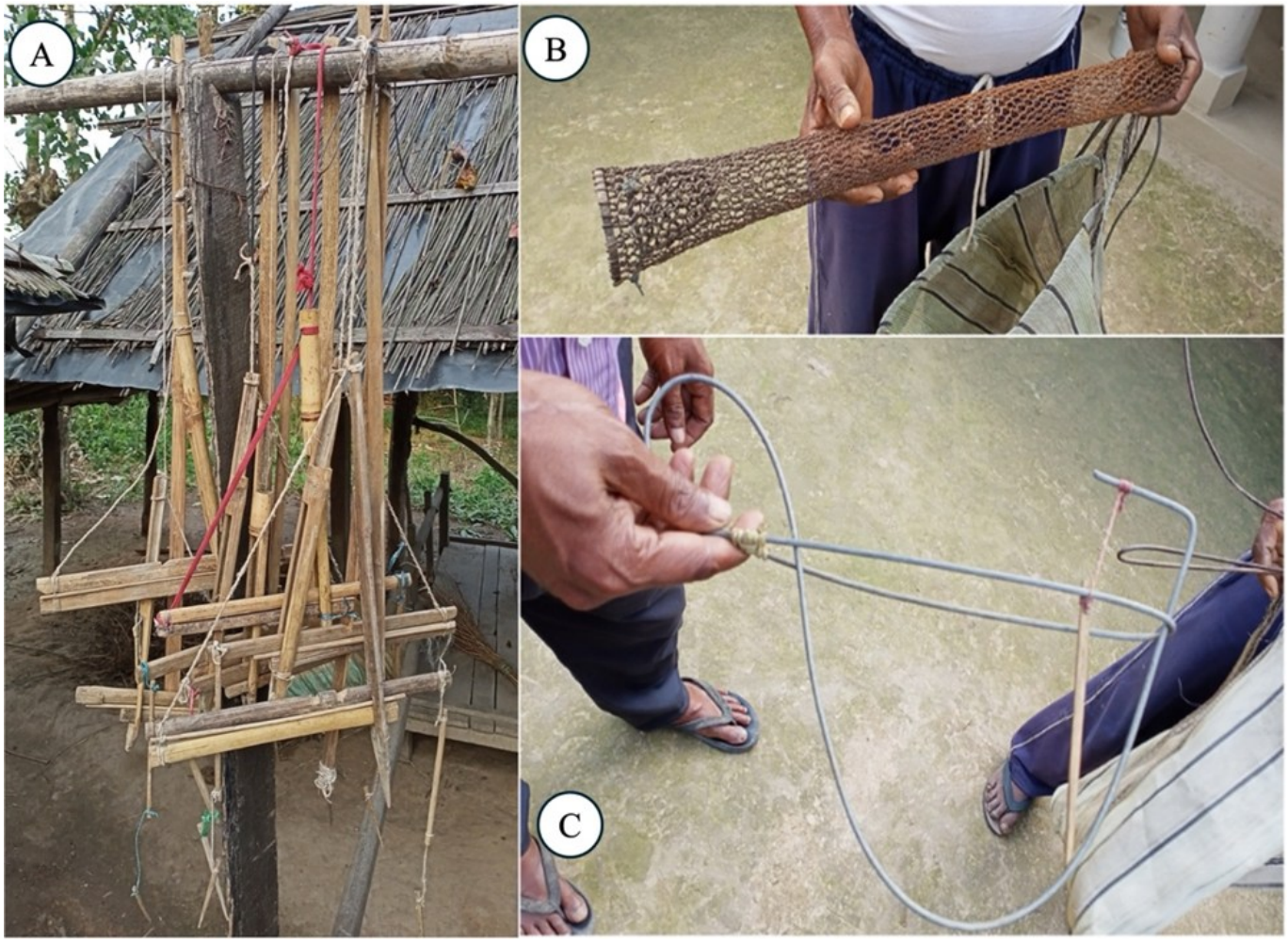

Figure 5 "*Tunud*" Rodent trap (A & B) and Bird trap (C). Photographs by Saurabh Mardi.

because another hunter could collect their kill. These were used in only in areas where their kills would be easily accessible. The hunters did not sell their game in the market, likely because it was less socially desirable to other communities (Luiselli et al. 2019). Traditionally, hunting among the Santals is more tied to subsistence and cultural practices than commercial activities (Barkat et al. 2021). However, the fear of legal repercussions could have also deterred hunters from disclosing information about any potential sale of game, even if it occurred on a smaller scale within their communities. This study highlights the intersection of cultural practices, legal enforcement, and the economic realities faced by communities in Northeast India, shaping both hunting behaviors and the broader sustainability of local ecosystems. All the hunters stated that there had been a drastic reduction in game species. Large wildlife species were absent, which may explain why hunters targeted birds more. Wilcove et al. (2013) suggests that hunters facing these conditions are forced to target smaller species that flourish in human-modified habitats such as birds, rodents and insects. Frog hunting at night is very common in the area.

The residents also did not complain about any wildlife conflicts apart from pests and snakes. However, the absence of such wildlife in this case suggests significant ecological shifts, driven by habitat degradation, overhunting, or changes in land use. The decline or displacement of larger wildlife species might be a result of expanding agricultural land, deforestation, or urbanization, all of which contribute to reducing the natural habitats where these species once thrived. The absence of larger wildlife conflicts is significant because it sheds light on broader environmental changes and the potential loss of

Figure 6 Children hunters with catapults (A) and "*Tunud*" rodent traps (B & C). Photographs by Saurabh Mardi.

species diversity. It may also indicate a shift in the local community's relationship with wildlife, where the focus has moved from managing larger, more complex wildlife interactions to dealing with smaller, more common species. Although there is a lack of records and studies in this region that would discuss bushmeat hunting practices, hunting was done frequently as described by the older residents of the community and the neighboring Santal villages. The older men took pride in sharing information on hunting, a culturally meaningful element of their culture and an integral part of their lifestyle. Older hunters considered farming to be more profitable than hunting, and described hunting as a way to pass the time that was only attractive to the youth.

The market survey showed no sale of wild bushmeat (i.e. large prey) or other wild animal products. However, a very rare sale of rodent meat in the market was recorded (Figure 7). This is because hunting is mostly for household consumption (similar to Barkat et al. 2021). Kharel et al. (2019) found that rat meat is the primary source of meat for the Santal community.

Santal communities in Srirampur told us that they eat many different kinds of food, including insects, birds, rodents, frogs and reptiles (Figure 7). This is supported by studies among the Santal tribe in Nepal (Kharel et al. 2019) and Bangladesh (Barkat et al.

Figure 7 Sale of rodent meat in market (left) and Asian Bullfrog (*Hoplobatrachus tigerinus*) hunted for consumption (right). Photographs by Saurabh Mardi.

2021). This highlights the significance of wild alternative protein in their diet. The Adi tribes in Arunachal also consume numerous species of rodents (Meyer-Rochow et al. 2015). Insects as food is common in North-eastern India among various tribal communities (Chakravorty and Meyer 2011; Roychoudhury and Joshi 1995).

The consumption of rats as a food source is more prevalent across the world, including in African and South American societies. Indigenous groups in all North-Eastern states of India also include rat-eating communities (Assogbadjo et al. 2005; Fiedler 1990; Jori et al. 2005; Malekani and Paulus 1989; Wilkie and Carpenter 1999), while Tribal communities in China, Myanmar, and elsewhere in South-East Asia also appreciate rat meat (Meyer-Rochow et al. 2015). Comparable ratios can be anticipated among the rat-consuming tribal communities in Northeast India. However, they might fluctuate with the seasons (Meyer-Rochow et al. 2015).

Kaul et al. (2004) stresses that it is essential to understand why bush meat is hunted and consumed. Here, hunting was only a secondary activity to supplement household consumption. There appears to be no commercial market for wild meat in the study area. Hunting is losing its cultural significance in the community and is likely to decline over time. Our findings indicate a declining trend in hunting, as non-hunters comprised the majority (59%) of the respondents. Additionally, according to the local residents, the intensity of hunting has decreased over the past two decades. Our findings suggest a decline in hunting activity with increasing age, as evidenced by the relatively young mean age of active hunters (21.54 ± 8.21 years), indicating that participation in hunting diminishes substantially beyond early adulthood. This decline is mostly due to a lack of game species. As a result, they have begun farming to sustain their livelihood (similar to Barkat et al. 2021). Several older residents have stated that they would prefer the new generation of their community to be literate and employed, rather than hunt. A study in Arunachal Pradesh reported that hunting intensity declined in certain villages following the preaching of the Dalai Lama (Mishra et al. 2006).

All interviewees expressed a positive attitude toward nature and wildlife conservation upon discussion with the researchers. They understood the need for forest cover, abundance of wildlife, and need for coexistence with nature. A few interviewees had negative attitudes toward wildlife because of crop damage due to pests and rodents; otherwise, there were no concerns. This suggests that, while the community supports wildlife conservation in principle, the only significant challenge they face in relation to wildlife is the impact of smaller, more common species that directly interfere with their livelihoods. The community was aware of conservation and laws restricting hunting. In addition, respondents with education tended to have more positive perception of wildlife and conservation. The study also recorded a very low literacy rate among the respondents, and all the interviewed females were illiterate. This might be a reason for continuation of

this practice by their children.

The study does not attempt to draw conclusions about the sustainability of extraction and hunting in the region. More intensive and focused research is required to quantify extraction and hunting and evaluate the outcomes of a range of potential conservation interventions. The results suggest that hunting activity is low and probably in decline. Since attitudes are not static, change even within an individual and among individuals will differ, generalizations are hard to make (Kinzig et al. 2013). Professed sympathy toward nature conservation can be argued to be overestimated, as the attitudes and statements expressed in many surveys are not related to real actions or management (Kaiser et al. 1999). Gauging the perceptions of the communities was a challenging task, as respondents may have been guarded or masked their actual views with those held by most of their community. The attitudes and feelings of people concerning conservation policies and wildlife conflicts affect their behavior and understanding, thus it is important to involve local people in conservation planning and decision-making processes. Our survey indicated that the Santal tribe had no exposure to wildlife conservation or awareness programs run by state and NGOs. Education and awareness on sustainable resource management is key, as it helps communities use natural resources without depleting them. We recommend educating the communities and stakeholders on managing land and resources sustainably. This approach merges conservation with socio-economic development for a more sustainable future. In conclusion, a broader perspective on the drivers of poverty, culture, tradition, extraction and use of bio resources and hunting in the Santal community, including all livelihood activities, is required.

Declarations

Permissions: The manuscript has been read and approved by all named authors who satisfied the criteria for authorship but are not listed. Informed consent was given by all interviewees involved in the study.

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Conflicts of Interest: None declared.

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