

Research Article

# Traditional Ecological Knowledge and Sustainable Practices in Indigenous Hunting Among the Galo Tribe of Arunachal Pradesh

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## Abstract

The Galo tribe in the study area relies on a diverse range of indigenous hunting techniques, essential for their livelihood and food security. Hunting holds a crucial place in the community's traditional culture, with locals employing unique methods and trapping techniques rooted in their indigenous knowledge. These approaches are environmentally friendly and demand minimal investment. The main objective of the research is to assess the Traditional Ecological Knowledge (TEK) and sustainable practices in indigenous hunting among the Galo tribe of Lower Siang and Lepa Rada districts of Arunachal Pradesh. To achieve its objective, this study relies on purposive sampling and primarily gathers data through a field survey of hunters encompassing their historical hunting practices, techniques employed in hunting, the species they target and the timing of their hunting activities. On the other hand, snowball sampling technique has been employed in identifying the hunters. The data collection is conducted using household schedules administered through interview methods. Information on the hunted species was collected based on hunter's reports and the remains (skulls, skins, horns and teeth) found in the villages. Hunters actively demonstrated various traps and techniques, occasionally creating models to explain their mechanisms. It was found out that hunting is intricately connected to their Traditional Ecological Knowledge (TEK) and cultural heritage, a legacy handed down through generations. Notably, information regarding indigenous hunting techniques in this area is limited. Therefore, this study aimed to document the traditional knowledge associated with the indigenous hunting practices practiced by the Galo tribe in the Lower Siang and Lepa Rada districts of Arunachal Pradesh.

## Keywords

Galo Tribe, Hunting, Indigenous Techniques, Traditional Ecological Knowledge (TEK), Wildlife

## 1. Introduction

Traditional hunting techniques have been recorded in different geographical regions of the world in accordance with the cultural entities of ethnic groups [11, 6]. Same is the situation in the state of Arunachal Pradesh where the tribal people are completely dependent on the forests and the rivers.

Hunting and bushmeat utilization are integral parts of the sociocultural traditions of many rural and tribal communities of the forest zone [14].

Hunting of wild animals for sustenance has been the way of life for many tribal communities all over the world [5]. It also

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holds a significant role in the lifestyle of the tribal communities in Arunachal Pradesh. Hunting is still central to the culture of the people of Arunachal Pradesh; many of them are still hunters and gatherers, e.g., among tribes of Eastern Arunachal Pradesh, hunting is integral to shifting cultivation and its associated culture since time immemorial. [10].

In ancient times, the lack of readily available clothing necessitated people to engage in hunting not just for sustenance but also to procure materials for crafting garments. The primary emphasis was on fulfilling fundamental needs such as clothing and food. As societies progressed, a transformation occurred in the pursuit of status.

As communities progressed and fundamental needs were satisfied, a significant transition unfolded. Hunting evolved beyond mere survival, transforming into a symbolic representation of social standing and prestige. The accumulation of resources, often attained through successful hunting, started to signify an individual's elevated status within the community.

This societal shift denoted a progression from hunting for sheer survival to using it as a means to showcase affluence and influence. The connection between success in hunting and an elevated social status became more pronounced, influencing cultural narratives and reinforcing the notion that hunting skills contributed to an individual's or a community's perceived standing in society.

Hunting is intricately connected to their Traditional Ecological Knowledge (TEK) and cultural heritage, a legacy handed down through generations. Traditional tools, characterized by being eco-friendly and naturally degradable, are predominantly used for hunting. Hunters are often highly skilled observers of wildlife due to their extensive field experiences. They interact closely with wildlife species, often spending long hours in natural environments, which allows them to accumulate a wealth of information about local fauna. This knowledge is often passed down through generations and it provides valuable insights into the distribution, abundance and behaviour of various species. Hunting is not just a means of acquiring food for the people in the study area, it is a cultural practice with spiritual, social and economic dimensions deeply woven into the fabric of their identity.

For the present study, the Galo tribe of the two districts, Lower Siang and Lepa Rada of Arunachal Pradesh have been taken. There are almost uniformities in traditional culture and Traditional Ecological Knowledge (TEK) of the people in the two districts.

The information on indigenous hunting tools and techniques among the Galo tribe of Arunachal Pradesh is scanty. Thus, this study was conducted to assess the traditional knowledge and hunting practices of hunters in the study area and exploring their understanding of wildlife.

#### *Study Area*

The study area includes the two districts of Arunachal Pradesh viz., Lower Siang and Lepa Rada. Lower Siang district is located between 27° 33' 27" N to 28° 3' 2.844" N and 94° 12' 39.672" E to 95° 8' 13.092" E with an average elevation

of 636 m, covering a total area of 2,553km<sup>2</sup>. The district was carved out of West Siang and East Siang districts and declared operational on 22 September 2017 and became the 22<sup>nd</sup> district of Arunachal Pradesh. According to the 2011 census Lower Siang had a population of 37,120.

Lepa Rada district is one of the 25<sup>th</sup> districts of Arunachal Pradesh with its headquarters at Basar. The district is centrally located; hence the name is given Lepa Rada (Lepa means center of a center). Lepa Rada district is located between 27° 46' 21.252" N to 28° 3' 43.128" N and 94° 28' 42.204" E to 94° 57' 11.52" E with an average elevation of 759 m. The district was created in 2018 by bifurcating the Lower Siang district. It covers a total area of 982.67km<sup>2</sup> with a total population of 14,490 (census 2011).

The proposed study area is inhabited by the Galo tribe and hunting is a part of their traditional culture. They eat most of the wild animals that are available in their vicinity. They have numerous techniques of trapping and hunting animals. The local people employ a number of indigenous hunting techniques based on their traditional ecological knowledge.

## **2. Materials and Methods**

The current research is fundamentally explanatory in nature, aiming to analyse hunters' knowledge regarding the indigenous hunting tools and techniques they employ. To achieve its objective, this study relies on purposive sampling and primarily gathers data through a field survey of hunters encompassing their historical hunting practices, techniques employed in hunting, the species they target and the timing of their hunting activities. On the other hand, snowball sampling technique has been employed in identifying the hunters. The data collection is conducted using household schedules administered through interview methods in Lower Siang and Lepa Rada district of Arunachal Pradesh.

In Lower Siang district, 59 villages were surveyed, with 117 households sampled. In Lepa Rada district, 50 villages were surveyed, encompassing 89 households. Village level data was collected from key informants such as the village headmen (gaon-burrahs) and other important people in the village. Village level information on number of households, number of hunters and other socio-economic parameters were collected.

Discussions with officials in various departments of the local district administration and local assistants/guides aided in identifying and selecting the villages. Selection was based on the availability of hunters in each particular village. In each village, key informants were interviewed first and then households were visited based on the presence of hunters. Interviews were conducted with the assistance of local field assistants proficient in the local dialect and belonging to the same tribe.

To comprehend historical animal demographics, the scrutiny of animal remains, including skulls, horns, teeth, skin etc., has served as crucial evidence, providing valuable insights

into the types of animals that were prevalent decades ago.

Furthermore, hunters generously shared their expertise by demonstrating a spectrum of hunting traps. In some instances, they crafted models of these traps, explaining their mechanisms and functionality.

### 3. Results

The indigenous community in the study area have developed a diverse range of hunting tools and techniques that are not only eco-friendly but also sustainable. These methods of hunting are deeply ingrained in their culture and traditions, reflecting a harmonious relationship with their natural environment.

They employ a variety of distinctive hunting techniques rooted in their own traditional knowledge. Following are the indigenous hunting techniques used by the hunters in the study area:

1. Bow and Arrow (*Wri/upuk*): The use of bow and arrow, combined with a poison known as "*aamu*" derived from mountain leaves, is a traditional hunting technique employed to capture various animals, including tigers, bears, wild boars, wild cats.

The process involves the application of *aamu*, a potent poison extracted from certain leaves found in the mountains, onto the arrow tips. Plants such as *Croton tiglium*, *Tacca integrifolia*, *Wallichia densiflora* etc., are used to poison arrows for hunting. Interestingly, it is believed that the leaves from higher altitudes possess a greater toxicity compared to those from lower valleys. This poison enhances the lethality of the arrow, making it an effective tool for hunting.

Hunters meticulously coat the arrowheads with the poison, ensuring that it adheres to the tips securely. The poisoned arrows are then used in conjunction with a bow for hunting purposes. When an animal is struck by such an arrow, the poison takes effect, incapacitating the creature and making it easier for hunters to track, locate and secure their catch.

2. *Komaa* (bow trap or arrow rest)

- (i) Targeted species: Tiger, leopard
- (ii) Materials used: Bow, poisoned-arrow, woods, cords and special grey wax
- (iii) Typically used bait: Carcass
- (iv) Season: Anytime

*Komaa* is a deadly traditional trap used to hunt tigers or leopards that prey on domestic animals. It is also dangerous to humans. The trap is usually set on the path leading to a carcass previously killed by the predator, as these animals often return to their kills.

A bow is tied to a strong upright pole (*maagww*) planted in the ground. A long horizontal plank (*maakoo*) is attached to this pole. At the other end of the plank, two more upright poles are fixed into the ground. These poles hold a toggle stick (*laksin*), which is connected to the bowstring (*raek*).

A poisoned arrow (*mopum*) coated with special grey wax (*ywrken*) is placed in the bow, pointing toward the expected

position of the animal. A slip ring (*tarvk*) made from cane or another material is tied around the *maakoo* plank. Trip wires or cords (*maahen*) extend from the *tarvk* and are fixed to a stake (*maahen rwwgvv*). The trip wires are stretched near the entrance of a fenced-off area where the bait (*hoyaa*) is placed. When the tiger or leopard enters and trips the wire, the bow releases the arrow, striking the animal.

- (a) Experienced hunters know how to adjust the height and length of the *komaa* based on the animal's size.

The height (KH) of the *komaa* is calculated based on the animal's footprint circumference, which is twice the circumference of the animal's footprint. This ensures the arrow strikes the abdomen. Where (FPc) is the circumference of the animal's footprint.

$$KH = FPc \times 2$$

If the height is only  $FPc \times 1$ , the arrow will hit the legs instead.

- (b) If the trip wire is very tight, the arrow will hit the head, if the wire is loose, the arrow will strike the rear of the animal and if the wire is too stiff, the arrow might hit the mouth or even miss the target entirely. By carefully adjusting these factors, hunters increase their chances of a successful hunt.

3. *Tvruu ruunam* (pitfall method):

- (i) Targeted species: Elephants
- (ii) Materials used: Dead leaves and dry weak branches
- (iii) Typically used bait: No bait required
- (iv) Season: Anytime

This method was practiced in earlier times but has now become a thing of the past. A deep pit was dug in such a way that once an animal fell in, escape was impossible. The pit was camouflaged with dead leaves and twigs, supported weakly across its opening. Once the animal fell in, it was killed.

In ancient times, this technique was specifically used for capturing elephants. A large pit, known as *tvruu* (meaning "elephant pit"), was excavated along an elephant's path and concealed with tree branches and leaves. Elephants were sometimes deliberately guided toward these traps. These pits were typically dug along regular migration routes and barricades were sometimes built to direct the elephants toward them. In some cases, sharp spikes were embedded at the bottom of the pit to ensure the animal's death upon falling.

4. *Gumdii* (cage trapping method):

- (i) Targeted species: Cat family (tiger, leopard, civets)
- (ii) Materials used: Bamboo, cane, woods and long flat planks for door
- (iii) Typically used bait: Decoy or lure animal is used
- (iv) Season: Anytime

This practice is primarily employed to ensnare fierce and troublesome animals like tigers and leopards. A sturdy, two-roomed cage is constructed using wood at a predetermined location. In one of the rooms, a domestic animal is placed as bait, which vocalizes throughout the night, luring the predator. The bait animal is positioned out of the predator's reach, separated by an additional wall.

The moment the predator enters the other room in an attempt to capture the prey, a mechanism is triggered, causing the door to drop automatically and confine the animal. If the trapped animal belongs to the tiger family, the shamans interpret omens. Depending on the omen, either the shaman or the person responsible for setting up the trap must execute the animal. This hunting technique is employed very rarely.

#### 5. *Beepak* (monkey hunting by luring in the tree)

- (i) Targeted species: Monkey
- (ii) Materials used: Bow, arrow, *orok* (type of short sword)
- (iii) Typically used bait: Maize, millet, banana
- (iv) Season: Anytime

*Beepak* is a ritualistic form of monkey hunting performed to avenge the forest god when believed to be responsible for an epidemic in the village. A priest determines the cause of the epidemic by invoking malevolent forest deities and examining the egg yolk. If the forest god is found to be the cause, the ritual is conducted in the form of a hunt.

To execute the hunt, monkeys are lured using millet, bananas and maize, which are hung on the branches of a large tree in a targeted area. This process continues for 10 to 20 days, allowing the monkeys to develop a habit of gathering at the same tree. As they grow accustomed to feeding there, they eventually begin to slumber in the tree at night.

Once the monkeys have settled into this routine, the hunters surround the tree in the early morning, armed with bows, arrows, *orok* (a type of short sword) and sticks. To eliminate any means of escape, smaller surrounding trees are felled, forcing the monkeys to remain in the selected tree. With no way out, they are easily shot and those attempting to flee to the ground are killed using an *orok* or sticks.

In earlier times, when the monkey population surged and posed a threat to crops, people organized hunting expeditions to address the issue. The initial step involved identifying the group of monkeys and herding them towards a particular large tree. Once all the monkeys had ascended the tree, a group of individuals encircled the tree and cleared the nearby trees. An artificial barrier made from branches and leaves was constructed around the tree and concealed cages, known as *beepur*, were positioned in the gaps.

With all preparations complete, people gathered around the tree, some armed with clubs, while others began shooting at the monkeys. Left with no alternatives, the monkeys often resorted to jumping from the tree, where they would either be struck with clubs or captured in the cages. This technique sometimes resulted in the hunting of numerous monkeys in a single day.

#### 6. *Beelu ganam* (monkey hunting by luring inside the cage)

- (i) Targeted species: Monkey
- (ii) Materials used: Bamboo, *orok* (type of short sword), rattan or cane, wooden poles and sticks
- (iii) Typically used bait: Maize, millet, banana
- (iv) Season: Anytime

*Beelu Ganam* is a traditional technique used for capturing

monkeys inside a cage by luring them with food. This method closely resembles *gumdii* (cage trap); however, unlike *gumdii*, where the shutter closes automatically upon the animal's entry, *Beelu Ganam* requires manual operation of the shutter by the hunter.

Similar to the *beepak* hunting technique, monkeys are gradually habituated to the presence of food, such as maize, millet and bananas, over a period of 10 to 20 days. The cage used in this method is rectangular in structure and equipped with a single manually operated shutter. The successful execution of the trap relies entirely on the hunter's ability to control the timing of the shutter's closure.

The cage is strategically placed in forested areas frequently visited by monkeys. Once installed, food items are hung inside the cage to attract them. A string is attached to the shutter, with the hunter remaining concealed in nearby vegetation a few meters away while holding the other end of the string. Upon confirming that a sufficient number of monkeys have entered the cage, the hunter pulls the string, thereby closing the shutter and trapping the animals inside.

#### 7. *Hosi purnam* (Porcupine hunting by thumping the ground)

- (i) Targeted species: Porcupine
- (ii) Materials used: Conical basket of open-hexagonal woven
- (iii) Typically used bait: No bait required
- (iv) Season: November to February

Certain porcupine species exhibit heightened sensitivity to ground vibrations, reacting to thumping sounds by fleeing their burrows. To exploit this behaviour, hunters employ a method that involves careful observation and strategic trapping.

Initially, hunters survey burrow entrances for signs of recent activity, such as freshly dug soil or freshly cut vegetation. Once an active burrow is identified, all possible exit points are discreetly sealed using *sipur* (a traditional barrier material) to prevent escape.

Following the closure of exits, the ground above the burrow is repeatedly struck with logs, generating vibrations that trigger the porcupines' instinct to flee. As the animals emerge in response to the disturbance, they are captured in strategically placed baskets.

#### 8. *Buuyyv yvnam/hinnam* (hunting of mouse by beating the bush)

- (i) Targeted species: Mouse
- (ii) Materials used: Sticks
- (iii) Typically used bait: No bait required
- (iv) Season: October to January (after the harvesting in wet rice cultivation field)

It is a technique where rats that dwell in the bush are driven out to open space by beating the bush by a group of people. People on other side kill the escaping rats.

#### 9. *Kiiruu innam* (hunting small variety of porcupine)

- (i) Targeted species: *Hokii* (small porcupine variety)
- (ii) Materials used: Cane, sticks, bamboo



(iii) Typically used bait: No bait required

(iv) Season: November to February

The *hokii*, a small variety of porcupine, inhabits caves and rock crevices. As a nocturnal species, it primarily forages at night, consuming leaves, fruits, bark and roots. Their dwelling areas are typically clustered around rocky landscapes.

The hunting techniques for *hokii* vary slightly between Bam and Dari villages (Lepa Rada). In Bam, a converging barrier is constructed along both sides of the trail leading to the burrows, guiding the porcupines toward a designated trapping area. In contrast, the method used in Dari does not involve channelization.

In both techniques, hunters position themselves near the burrows after securing basket traps at the entrances. Once they confirm that the porcupines have moved a sufficient distance from their burrows, the traps are set in place. To drive the animals back, hunters strike a *taakop* (a split bamboo instrument that produces sound), causing the frightened porcupines to retreat into their burrows, where they are subsequently captured in the baskets.

10. *Horv -mootum gwnam* (stalking hunting of ground dwelling animal)

(i) Targeted species: Wild boar, deer

(ii) Materials used: Bow and arrows

(iii) Typically used bait: No bait required

(iv) Season: December to February

Although the term *horv* specifically refers to wild boar, it is also used as a general term for hunting. Skilled hunters possess the ability to distinguish the footprints of a targeted animal, differentiating them not only from other species but also from individuals within the same group.

Tracking an animal can be an extended process, sometimes taking more than a day. Despite days of persistent pursuit, a hunter may not always succeed in capturing the prey. The practice of tracking often becomes an addictive pursuit, drawing hunters deeper into the challenge. In some cases, their intense focus on hunting causes them to neglect agricultural activities, ultimately leading to food shortages in their households.

11. *Mwkv millwknam or mwkv yaablwknam* (burrow fumigation):

In this method porcupines and rats are killed by fumigation. Burrow dwelling animals or rodents are killed by fanning or blowing the smokes into the tunnel.

11.1: *Aruu yablwknam* (fumigation by fanning)

(i) Targeted species: Porcupine

(ii) Materials used: Dry leaves, fire, *sipur* (bamboo basket), *orok* (type of short sword)

(iii) Typically used bait: No bait required

(iv) Season: November to February

Porcupines that dwell in burrows with extra-large inner chambers do not readily emerge, even when the ground above is struck forcefully. In this technique, similar to *Hosi Purnam*, a *sipur* (conical basket) is used. As natural burrow dwellers, porcupines create hidden exits to escape in times of danger. These exits are sealed with *sipurs* before a fire is lit at the main entrance. Smoke is then fanned into the burrow using a fan palm leaf, forcing the animals to flee. As they attempt to escape, they are trapped in the basket.

11.2: *Buuruu huunam* (fumigation by blowing smoke method)

(i) Targeted species: Rat

(ii) Materials used: Bamboo tube, husk, straw, fire, *buupur* (funnel-shaped basket)

(iii) Typically used bait: No bait is required

(iv) Season: December to January

A bamboo tube (internode) with one sealed end and the other open (*middu*) is used for this technique. A small hole is made near the sealed end. First, a handful of straw is pressed into the tube, followed by husk, burning ash and more straw. Once these materials are placed inside the *middu* is blown into forcefully from the open end, causing smoke to emerge from the hole near the sealed end.

Before directing the smoke into the burrow, all exit holes are carefully surveyed and sealed using a *buupur* (funnel-shaped basket) to trap escaping rodents. Once it is ensured that all exits are properly blocked, the *middu* (hunting bamboo tube) is inserted into the main entrance, and smoke from the burning husk is blown inside. The fleeing rats are caught in the *buupur*, while others often suffocate within the burrow. The dead rats are later retrieved by digging them out.



Figure 1. Buuru huunam.



**Figure 2.** Buupur to catch escaping rats from holes.

## 12. `Peegok and `kvpil (imitating the call):

This is a method that involves mimicking the sounds of animals, particularly deer and squirrel. Hunters employ various techniques to replicate these sounds, often using a folded leaf in their mouth or flute. Reeds, bamboo, grass blades and sheath leaves are used for producing sounds.

### 12.1: `Peegok (imitating the call of deer)

- (i) Targeted species: Deer
- (ii) Materials used: Reeds or bamboo tube
- (iii) Typically used bait: No bait required
- (iv) Season: Throughout the year

*Peegok* is crafted from a small bamboo culm or a reed, approximately the size of a finger, with one end sealed by a node. The culm is carefully tapered near the node using a knife to make it thinner. A tiny, elongated slit is then carved into this thinned section. When blown from the open end, the *peegok* produces a sound resembling that of a fawn. Hunters position themselves in a concealed spot with a clear view of the surroundings, luring the approaching animal and successfully taking it down.

### 12.2: `Kvpil (calling squirrel method)

- (i) Targeted species: Squirrels
- (ii) Materials used: Leaves of grass or plant
- (iii) Typically used bait: No bait required
- (iv) Season: Throughout the year

In this method before calling, the hunter selects a suitable spot where he can remain concealed, take aim and strike his target. This technique is typically carried out under the canopy of trees, amidst vines and climbers.

A blade of grass, a plant leaf or the sheath leaves of wild cardamom is placed between the lips. When blown, it produces a sharp, whistling sound that attracts squirrels. At times, snakes are also lured by the sound.

## 13. *Tonam* (ambushing method or stand hunting method)

During the fruiting season of certain trees like *Bvlam*, *Bulum*, *Dwkaa*, *Empv*, *Hwwcwr*, *Hwwlum*, and *Hwwrek* (*Ficus* species), animals and birds are drawn to these spots to feed on fallen fruits or those still on the branches. Similarly, they visit hoi (natural salt licks) to consume mineral-rich rocks. Hunters remain concealed or in ambush, waiting for the arrival of these animals or birds to successfully hunt them.

13.1: `Hwwro tonam (ambushing while sitting on a concealed platform near the fruit bearing tree)

- (i) Targeted species: Deer, bear, wild boar
- (ii) Materials used: Bow, arrows, wooden sticks, ropes
- (iii) Typically used bait: No bait required
- (iv) Season: June to August

Hunting is both an art and a pastime, often indulged in as a rewarding diversion after a day of hard work in the fields. Some farmers have established a habit of departing their fields in the afternoon to engage in hunting around seasonal fruit-bearing trees like *bvlam*, *paake*, *hwwlum*, *dwka*, *takkuk*, and *tango*. These trees often attract animals such as deer, boars, bears and porcupines, as they come to feed on the fallen fruits scattered on the ground.

In preparation, the hunter constructs a concealed platform at a short distance from the tree, from which they can remain hidden and ambushed, ready to take a shot at any animal that approaches the fruit. Care is taken to avoid startling the animals, as they possess a heightened sensitivity to scents and even minor disturbances in the forest, such as recent tree cutting near the *hwwro* tree.

During the ambushing period, the hunter refrains from activities that might release odors, such as smoking, using cosmetics or consuming pungent foods. They even take care not to cough, ensuring that their presence remains undetected. It is crucial to exercise extreme caution to avoid misidentifying domestic animals or humans as wild animals, as there have been numerous instances where hunters have unintentionally harmed people.

### 13.2: *Kvgaa tonam* (squirrel shooting spot)

- (i) Targeted species: Squirrel
- (ii) Materials used: Bow, arrow
- (iii) Typically used bait: No bait required
- (iv) Season: September to October

The fruits of certain trees, such as *Taqoo* and *Tasi*, are a favourite food of squirrels. In the evening, large numbers of them gather to feed. Typically, squirrels do not eat the fruits on the tree but carry them elsewhere. Even when they do eat on the tree, they never leave empty-handed they always take one fruit back home.

These trees are often individually owned and carefully nurtured, with competing vegetation cleared to allow the tree to stand alone. Squirrels generally avoid climbing the trunk directly, preferring to ascend via climbers that reach the tree from a short distance away. Hunters take advantage of this by

preserving one such climber. If none is available, a stick is placed as a makeshift ladder. A small obstruction is set on the ladder at a strategic point, though it is usually not tied.

In preparation for the fruiting season, the hunter ensures all necessary arrangements are in place well in advance. A hideout is set up near the climber or ladder and the trunk of the tree is wrapped in banana leaves to make it slippery, preventing squirrels from climbing directly.

Before the squirrels arrive in the evening, the hunter hides in a good spot, making sure that if an arrow misses, it won't fly toward a village. The hunter waits patiently as the squirrels climb up the tree and does not disturb them. Once enough squirrels have gone up, the hunter starts shooting as they come down. Squirrels climb down the same vine or branch they used to go up and when they reach an obstacle, they stop for a moment. This pause gives the hunter the perfect chance to aim and shoot.

After a successful hunt, farmers smoke some of the captured squirrels, reserving them for consumption during the upcoming Mopin festival. This practice reflects a sustainable approach to resource utilization and the preservation of cultural traditions.

#### 13.3: *Hoi tonam* (ambushing near natural salt lick)

- (i) Targeted species: Deer, varieties of dove and monkey
- (ii) Materials used: Bow, arrow
- (iii) Typically used bait: No bait required
- (iv) Season: Throughout the year

In some areas, natural salt licks can be found, characterized by black, clay-rich soil. Hunters remain concealed under nearby bushes, waiting with bows and arrows. *Hodum* (barking deer), monkeys, and *Kwji* (a variety of green dove) gather in large numbers to consume the mineral-rich soil, particularly in the afternoon when the sun's rays warm the area. When the animals arrive, they are attacked with bows and arrows.

#### 14. *Menjap* (deadfall method)

In hilly terrain, steep slopes limit the movement of ground animals, forcing them to follow specific, convenient paths or gaps in the hills. These frequently used routes, known as *Bypaa* or *Apa*, become the only viable passage for animals. Typically, such paths are owned by individual families and serve as ideal locations for setting traps.

Since these are permanent routes, they offer a reliable hunting strategy. However, hunters must check the traps daily to prevent trapped animals from decomposing.

##### 14.1: *Odo* (simple deadfall or stone slab trap)

- (i) Targeted species: Rats
- (ii) Materials used: Flat stone, stick, bamboo split
- (iii) Typically used bait: Maize, colocasia, dried meat or fish, banana and millet
- (iv) Season: December to January

This contraption is set up for trapping purposes. It involves using a circular stone plate, approximately one foot in diameter, designed to capture small animals such as rats, squirrels and birds. The stone plate is positioned with one end raised at

an angle of about 45 degrees, supported by a loose mechanism. Beneath it, a bait is placed, connected to a triggering mechanism.

When an animal tugs at the bait, it releases the triggering key, causing the stone to fall onto the unsuspecting animal. Farmers utilize this method in their jhum fields to combat the rat infestation that poses a threat to their crops. Various food items like maize, bananas, wild fruits and *opo* (un-brewed beer) are employed as bait to attract the targeted animals.



Figure 3. *Odo*.



Figure 4. Animal trapped in *Odo*.

##### 14.2: *Hogum* (complex-deadfall)

*Hogum* traps are of two types: *Gumpek* and *Gumtu* (or *Kolu Gumtu*). These traps consist of heavy banana trunks or tree logs raised over bait. Sometimes, stones are added to increase weight. When the trigger is touched, the entire pile collapses, making it effective for capturing both ground-dwelling and arboreal animals, such as monkeys.

In certain areas with densely forested steep slopes, the movement of ground-dwelling animals is restricted, forcing them to use specific passes as their regular routes. These paths can extend for several hundred meters. Along these well-worn trails, farmers set up a series of *Hogum* traps, collapsible, box-like enclosures with openings at both ends and heavy



weights on top.

As animals followed their habitual routes, they would unknowingly enter the concealed trap, triggering a floor mechanism that caused the weights to collapse, trapping them. However, in recent times, the use of *Hogum* traps has declined in favour of more advanced and efficient trapping methods. Additionally, these locations are often situated far from villages, making it impractical to check and maintain the traps daily. As a result, animals left unchecked in the traps would often be found in a decomposed state.

Around fifty years ago, these traps were regularly used with successful results. However, today, such practices have been completely abandoned.

#### 14.2.1: `Gumpek (path-deadfall without lure)

- (i) Targeted species: Porcupine (big and small variety)
- (ii) Materials used: Trunks, sticks, rope, stones
- (iii) Typically used bait: No bait required
- (iv) Season: September to January

*Gumpek* is set across an animal's path, using two heavy banana trunks or tree logs tied together and suspended horizontally by cords and catch sticks on both sides. Beneath this suspended weight, a trigger mechanism is positioned. When an animal steps on the trigger, the support gives way, causing the heavy logs to fall, crushing and killing the animal instantly.

#### 14.2.2: `Gumtuu or koluu `gumtuu (lured-deadfall)

- (i) Targeted species: Porcupine (big and small varieties)
- (ii) Materials used: Logs, sticks, rope and stones
- (iii) Typically used bait: Wild banana fruits are used
- (iv) Season: September to January

*Gumtuu* is made using heavy banana trunks or logs, tilted at an angle and held in place with a cord tied around the weight and a carrying bar above it. Below the weight, a bait stick is planted, which also serves as the trigger. When the bait is pulled, the weight falls, crushing the animal.

Before setting the trap, the area is baited for a few days to entice the animals. Once it is confirmed that the animals have visited the spot and eaten the bait, the trap is then set.

#### 15. *Bettvk / oktvk* (strangulation method)

In this method, the game is killed by strangulating. This method involves quick killing of animals and birds. The method is applicable for only small and medium sized animals like squirrel, rat, ground-birds and porcupine and in some cases, deer are also caught.

##### 15.1: *Uju* (small triangular-trap)

- (i) Targeted species: Rat and squirrel
- (ii) Materials used: Bamboo, cane, spring pole
- (iii) Typically used bait: No bait required
- (iv) Season: November to December

The method is known as *ujuu tennam* or *higaa panam*. The main body of this is a triangular trap. The *uju* has a trigger in the middle of the triangle. It is fixed on the pole, across the stream meant for rats to cross the stream or path. While crossing the stream through bamboo pole, animal pass through the trap, move the trigger and are killed by strangu-

lation. Such games are collected in the morning.



Figure 5. *Uju* fixed to trap rats in the forest.



Figure 6. Rat trapped in *Uju*.

##### 15.2: *Rvvpvv* (big triangular-trap)

- (i) Targeted species: Rat, squirrel, bird, civet and some-time small variety of porcupine
- (ii) Materials used: Bamboo, cane, spring pole
- (iii) Typically used bait: No bait required
- (iv) Season: November to December

This technique is similar to *Uju*, but on a larger scale and fixed to the ground. Before setting the traps, the area is thoroughly examined to identify a location where the movement of the targeted species is more frequent. The spot is then divided into two sections by constructing an artificial wall with leaves and branches to guide the movement of the birds and animals.

Small gaps, sized to fit the traps are left in the wall, where the traps are placed. As animals and birds pass through these gaps, they are captured. Occasionally, snakes and frogs are also trapped. This method is non-selective, as it captures any animal that crosses through the gaps.

##### 15.3: *Gorvv* (bow-shaped trap)

- (i) Targeted species: Rat, squirrel and bird
- (ii) Materials used: Bamboo, cane
- (iii) Typically used bait: Commonly used baits are corn,



banana, rice grains and unbrewed rice beer, etc.

(iv) Season: November to December

*Gorvv* resembles a bow, with the trap attached at one end. It is secured either on the ground or within the branches of trees. Farmers deploy it around their fields to capture mice and squirrels that threaten their crops. A small pit is excavated and bait is placed inside, adjacent to the trap's door.

On occasion, birds can also become unintentional captives in *gorvv*. The same *gorvv* can be utilized over several years, and when not in use, they are preserved by smoking them.



Figure 7. Rat trapped in *Gorvv*.

15.4: *Potoo* or *gwok* (twitch-up snare)

- (i) Targeted species: Porcupine (big or small variety), civet, deer, cat family (tiger or leopard), etc.
- (ii) Materials used: Bamboo, rope, spring pole
- (iii) Typically used bait: No baits required
- (iv) Season: Almost throughout year, however movement of animal is more during November and December months.

*Potoo* or *gwok* is a use of *jugwr* (spring pole) mechanism. Here one end of the noose is tied to spring pole and snare noose is fastened to a bamboo split making a shape of “6”. A notch is cut in wooden stake and fixed on the ground uprightly to hold the snare. Small twigs are used for holding noose open. Unaware of the noose fixed on its path, when animal put its head inside the noose and drag it leads to releasing of the key and get killed by hanging.

15.5: *Hwtka* (powered-snare for trapping civets and ground dwelling birds)

- (i) Targeted species: Ground birds and civets
- (ii) Materials used: Special string made of bark, bamboo splits and spring pole
- (iii) Typically used bait: Bait required
- (iv) Season: December to January

This is another variation of a noose trap, strategically positioned in an anticipated location. A small clearance is created and the *dotak*, which serves as the primary triggering

mechanism and is affixed to bait, is placed inside the circular arrangement of the noose on the ground. The opposite end of the noose is fastened to a small upright stick, much like drawing a longbow.

When a bird engages with the bait, it releases the key, causing the noose to swiftly tighten around the bird's neck. On occasion, a larger version known as *hwtka* is also constructed for capturing animals like civets. *Hwtka* is installed at the field's periphery to apprehend birds that pose a threat to the crops.

15.6: *Twkcvp* or *moinam*

- (i) Targeted species: Mouse
- (ii) Materials used: Spring pole, cord
- (iii) Typically used bait: No bait required
- (iv) Season: Throughout the year

This technique is known as *twkcvp* and the process is called *moi* or *moinam*. Very few people know the technique and hardly use the technique. Equipment is prepared out of available materials in the spot. Technique is exclusively used in front of exit rat hole.  $\cap$ -shaped peg made of flexible sapling especially *nvjwr* is fixed in the ground near the mouth of rat hole. The peg is split into two parts after fixing on the ground. A cord is tied to a spring pole and noose is made at another end of cord with a wooden toggle. Then wooden toggle is passed under the “ $\cap$ ” shaped peg and trigger is attached. After fixing it, soil from main entry hole is dugged so that rat is running toward the escaping hole and caught.

16. *Govk*: This is a noose trap positioned along an animal's pathway. When an animal inserts its head into the concealed noose, the noose swiftly tightens with a sudden jerk, capturing the animal by the neck. Porcupines, civets and wild fowl are the most frequently caught animals using this noose trap.

17. *Buuko Kwgnam*: Rats take up residence inside lengthy bamboo stalks, creating burrows within the inter-knot spaces. To collect these rats, a process is employed where one end of the bamboo is blocked with a long basket called a *buupur* to capture any rats attempting to escape. From the opposite end, a long cane is inserted to encourage the rats to exit the bamboo.

18. *Buuhe pvvnam*: Bush rats are forced out of the underbrush by striking it with sticks. As the fleeing rats make their escape, they are captured and dispatched by boys stationed at the other end.

19. *Kobu abnam*: Rats inhabiting in woodpiles are eliminated using arrows. In this process, one person strikes the woodpile from one end, while another, armed with bow and arrows, closely monitors the movement of the agitated rats within the stack of wood and proceeds to eliminate them. Before taking the shot, the person at the other end is advised to maintain a safe distance to prevent accidents.

Rats inside the house are also dispatched using bows and arrows, although setting traps within the house is discouraged.

20. *Kiirup*: This is a communal hunting practice in which dogs are employed to flush out concealed animals. The hunters are typically divided into two groups for this endeavour.

Proficient marksmen position themselves at the exit points where the animals are expected to emerge, while the other group, accompanied by dogs (known as *kiimen*), drives the animals towards these points.

The spoils of the hunt, including shares for the dogs are distributed among the hunters. As the tradition goes, the individual who initially wounded the animal is entitled to the head of the game. Given the considerable risks involved, thorough pre-hunting briefings are deemed essential.

21. *Pok*: It is a trapping technique involving the use of a cane rope and it is strategically placed in the path of animals such as wolves, dhole and wild boars. This traditional method is also employed for hunting larger animals like clouded leopards and bears.

The process begins by creating a barrier in the animals' pathway, typically made with bamboo or wood. Within this barrier, a specific path is left open for the animals to pass through. However, this path is rigged with a cane rope trap. The cane rope is set up in a way that, when triggered, it ensnares the animal. As the animals move along the designated path, they encounter the cane rope trap. When the animal engages with the trap, the cane rope tightens around it, effectively trapping and immobilizing the creature. This allows

hunters to approach and secure their catch.

22. *Poochik*: It is a very simple noose trap, with one end of the string securely fastened to a nearby tree or log, while the other end, featuring a concealed noose, is strategically placed along the anticipated path of animals such as deer, boars and bears. As a result, when these animals pass through, they become ensnared by the noose, tied to the tree. If they attempt to free themselves by struggling, the noose tightens further, ultimately leading to their demise.

The traditional tools and techniques of hunting embody a profound connection to the land and a deep respect for wildlife. Crafted from locally sourced materials and informed by generations of knowledge, these methods reflect a sustainable approach to resource management. By utilizing techniques that minimize environmental impact and respecting seasonal wildlife movements, indigenous communities have sustained themselves for centuries while preserving the delicate balance of ecosystems. This intimate relationship with nature underscores a cultural reverence for the land and its inhabitants, emphasizing the importance of maintaining traditional practices to ensure the continued well-being of both people and wildlife in the study area.

**Table 1.** Showing different varieties of animal hunting techniques in the study area.

Sl. No.	Tools/Techniques	Materials Used	Species Targeted	Season
1	<i>Wrri/upuk</i>	Poison	Deer, wild boar, bear, monkey, squirrel	Both winter and summer
2	<i>Komaa</i>	Poisonous arrow, wooden poles, cane, special wax	Leopard, bear, deer	Both winter and summer
3	<i>Ṭvruu ruunam</i>	Dead leaves, weak branches, wooden poles	Elephant	Winter
4	<i>Gumdi</i>	Bamboo splits, cane, wooden poles, long and broad plank	Any big animal of tiger family and civet	Mostly Winter
5	<i>Beepak</i>	Bows and arrows, wooden sticks, clubs and gun	Monkey	Both winter and summer
6	<i>Beelu ganam</i>	Bamboo, cane, wooden poles, sticks	Monkey	February to September
7	<i>Hosi purnam</i>	Bamboo basket, wooden stick	Porcupine	September to May
8	<i>Buuyvv yvvnām</i>	Long sticks	Rat	October to January
9	<i>Kiiruu innam</i>	Sticks, bamboo basket, cane	Small variety of porcupine	Throughout the year
10	<i>Horv mootum gwnam</i>	Bow and arrow	Any animal	December to February
11	<i>Mwkv millwk and mwkv yablwknām</i> (Burrow fumigation method)			
11.1	<i>Aruu yablwknām</i>	Dry leaves, fire, bamboo basket	Rat, porcupine	September to May
11.2	<i>Ṭbuurūu huunām</i>	Bamboo tube, rice husk, straw, fire, bamboo basket	Rat	December to January
12	<i>Peegok and kypii</i> (Call imitating method)			

Sl. No.	Tools/Techniques	Materials Used	Species Targeted	Season
12.1	<i>Peegok</i> (deer calling method)	Bamboo tube, bow and arrow	Deer	Throughout the year
12.2	<i>Kvpil</i> (squirrel calling method)	Leaf of grass or leaf of wild cardamom, bow and arrow	Squirrel	Throughout the year
13	<i>Tonam</i> (ambushing method)			
13.1	<i>Hwwro tonam</i>	Bows and arrow, wooden sticks, ropes	Deer, bear, wild boar	June to August
13.2	<i>Kvgaa</i>	Bows and arrow	Squirrel	September to October
13.3	<i>Hoi tonam</i>	Bows and arrow	Deer, monkey	Throughout the year
14	<i>Menjap</i> (deadfall method)			
14.1	<i>Odo</i>	Flat stone, wooden sticks bamboo split	Rat and squirrel	December to January
14.2	<i>Hogum</i>	Wood and stone	Porcupine, wild cat	Winter
14.2.1	<i>Gumpek</i>	Logs, wooden sticks, natural vine, stones	Porcupine	September to January
14.2.2	<i>Gumtuu/ Kolu gumtuu</i>	Logs, wooden sticks, natural vine, stones	Porcupine, wild boar, tiger	November to December
15	<i>Bettvk/ Oktvk</i> (Strangulation method)			
15.1	<i>Uju</i>	Bamboo split, cane, spring pole	Rat, squirrel	November to December
15.2	<i>Rvvpv</i>	Bamboo split, cane, spring pole	Rat, squirrel, small variety of porcupine, civet	November to December
15.3	<i>Gorvv</i>	Bamboo, cane	Rat, squirrel	November to December
15.4	<i>Potoo or gwok</i>	Bamboo split, bark rope, spring pole	Porcupine, deer, tiger	November to December
15.5	<i>Hwtka</i>	Bamboo split, bark rope, spring pole	Civet	December to January
15.6	<i>Twkcvp / moinam</i>	Any strong vine, spring pole	Burrow dwelling rat	Throughout the year
16	<i>Govk</i>	Fibre wire or local rope	Porcupine, civet and wild fowl	Both winter and summer
17	<i>Buuko Kwgnam</i>	Long cane	Rat	Both winter and summer
18	<i>Buue pvvnam</i>	Sticks	Bush Rat	Both winter and summer
19	<i>Kobu abnam</i>	Bows and arrows	Rat	Both winter and summer
20	<i>Kiirup</i>	Dogs are used to trap the animals	Specially deer	Spring
21	<i>Pok</i>	Bamboo or wood barrier and cane rope	Wolve, dhole, wild boar, leopard, bear	Both winter and summer
22	<i>Pochik</i>	Trap (fibre wire or local rope)	Deer, porcupine, wild cats	Both winter and summer

Source: Fieldwork 2022-2023

The hunting techniques mentioned above are eco-friendly and require minimal investment. The traps and methods predominantly utilize natural materials such as stones, bamboo, wood and local fibers, which are readily available in the vi-

cinity. In ancient times in the study area, the primary motivation for hunting was the procurement of food. Additionally, hunting among the local tribal population is intricately connected with poverty, commerce and cultural and customary



practices [4].

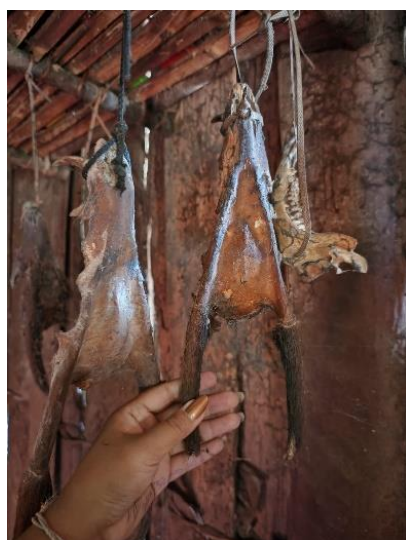
Most hunting activities take place during the winter season, primarily due to improved visibility. It was observed in the study area that hunters did not adhere to a fixed hunting schedule but rather engaged in hunting when convenient.

Data on hunted species were collected based on hunter's reports and the recording of animal remains such as skulls, skins, horns and teeth found in the villages.

Remains of animals that are hunted:



*Figure 8. Tiger skin.*



*Figure 9. Deer horn.*



*Figure 10. Wild boar jaw.*



*Figure 11. Deer horns.*



*Figure 12. Horn of hunted animals.*



*Figure 13. Wild boar teeth.*

## 4. Discussion

The hunting techniques practiced in the study area, are notably eco-friendly and require minimal financial investment. These methods are deeply rooted in indigenous knowledge systems and draw upon readily available natural resources such as stones, bamboo, wood and locally sourced plant fibers. The use of such biodegradable and non-mechanized materials ensures that the environmental impact of hunting remains minimal. Traditional traps and snares crafted by the Galo people reflect a harmonious relationship with nature, prioritizing sustainability and low resource consumption.

Historically, the primary motivation for hunting among the people was subsistence. However, it has led to low wildlife abundance [7, 9, 12]. For many households, hunting contin-

ues to provide a supplementary source of food and income, especially during times of economic hardship or when agricultural yields are low.

Seasonality also influences hunting activities. Most hunting occurs during the winter months, a period marked by improved visibility due to sparse foliage and drier terrain, which facilitates easier tracking of animals and greater success rates. Additionally, colder temperatures help preserve meat longer without spoilage. However, the absence of a rigid or formalized hunting schedule reveals a flexible, opportunistic approach rooted in local realities. Rather than adhering to pre-determined hunting calendars, individuals and groups often decide to hunt based on convenience, availability of time and community needs.

Taken together, these observations affirm that hunting practices are not merely survival strategies, but expressions of a sophisticated ecological and cultural system. They reflect a conscious adaptation to the environment, governed by practicality, cultural meaning and sustainable resource use. Recognizing and preserving these practices, while also addressing the socio-economic pressures that may threaten their continuity, is essential for designing culturally informed and ecologically sound wildlife management policies.

## 5. Conclusion

The indigenous people living in the vicinity of forests depend on wildlife for food, trade, cultural purposes and income [15, 8, 1-3]. Traditional hunting practices play a multifaceted role in their livelihood, cultural heritage and food security. The utilization of eco-friendly techniques and indigenous knowledge reflects a sustainable approach rooted in the community's historical connection with the natural environment. These methods are deeply intertwined with their cultural heritage, having been transmitted across generations.

Hunting has been one of the traditional ways of life from the time of their ancestors and people knew and implemented the Traditional Ecological Knowledge (TEK) in hunting [13]. However, not everyone can excel as a proficient hunter, especially when pursuing larger animals. It demands a high level of skill in comprehending animal behaviour, including their movement patterns, dietary preferences and more. A hunter relies heavily on keen listening skills rather than solely on sight or smell. They possess the ability to discern subtle movements within the forest, distinguishing between various creatures such as snakes, birds, civets, deer, boars, bears, monkeys, tigers and elephants.

Through the examination of droppings and footprints, a hunter can ascertain the species, size and even the sex of animals, along with their visiting times, movement directions and anticipated locations. Clear, sunny days following extended rainy periods are among the most opportune times for animal encounters. However, caution is important when aiming at an animal, particularly with boars and bears, as these creatures may retaliate even when injured. Boars, in

particular, charge rapidly and recklessly toward the source of an arrow or bullet, posing a danger to anything in their path. During such encounters, hunters seek refuge behind large tree trunks to protect themselves. Hunters meeting accident with boar and bear were common in olden days.

Analysis of the remains of hunted animals indicates that the study area was once teemed with a wide variety of India's tropical wildlife. Hunting practices were traditionally conducted using eco-friendly tools that were less precise and naturally biodegradable. The local community possess a profound Traditional Ecological Knowledge system that fosters a symbiotic relationship with the environment.

## Abbreviations

TEK    Traditional Ecological Knowledge

## Author Contributions

**Himadri Dutta:** Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft

**Tomo Riba:** Resources, Supervision, Writing – review & editing

**Sailajananda Saikia:** Supervision, Writing – review & editing

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## Conflicts of Interest

The authors declare no conflicts of interest.

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