


## CONTRIBUTED PAPER

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# Epistemological dimensions of Indigenous honey collection in the Kattunaicken community of South India

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**Article impact statement:** Indigenous epistemologies centered on caring relations with nature offer more holistic forest management models.

## Abstract

Indigenous ecological knowledge (IEK) has proven effective in environmental governance, forest management, and sustainable development, yet it is threatened by globalization and rapid social–ecological changes. In southern India, I investigated the engagement of the Kattunaicken community with the forest, particularly through honey collection, to explore the connection between their Indigenous epistemological identity and their role in caring for the forest and its inhabitants. I conducted 48 interviews and accompanied 11 forest walks as part of walking ethnography with male community members, who are primarily involved in honey collection within the Wayanad district of Kerala. The Kattunaicken identity was intrinsically linked to their knowledge of the forest, with reciprocal epistemological interactions between the community and forest entities (trees, animals, and bees). Honey collection emerged as an epistemological endeavor, manifesting their Indigenous identity through the collective “knowing” of the forest that encompassed sensorial, ethical, and metaphysical dimensions that facilitated harmonious coexistence and care for the forest and its inhabitants. The Kattunaicken world of knowing challenges extractivist interpretations of nontimber forest product collection, emphasizing the importance of Indigenous epistemologies in shaping alternative knowledge construction for forest conservation. Their epistemological framework highlights care as an active process emerging from collective understanding and negotiation among all entities within their shared epistemic realm, fostering a harmonious coexistence that transcends conservation efforts.

## KEYWORDS

epistemology, forest conservation, honey collection, human–nature relations, Indigenous ecological knowledge, Kattunaickens, nontimber forest products

## INTRODUCTION

Indigenous communities have long depended on nontimber forest products (NTFPs) for their survival. They utilize these resources for essential food, fodder, medicines, and materials for construction and handicrafts (Hazarika & Pongener, 2018; Hazarika & Singh, 2018; Levang et al., 2015; Piya et al., 2011). Globally, approximately 300 million people rely extensively on NTFPs for sustenance. In India, nearly 50 million people, primarily the rural poor and Indigenous communities (Angelsen et al., 2014; Shaanker et al., 2005), rely on NTFPs.

During financial downturns, NTFPs often serve as a safety net and provide supplementary or regular cash income for many forest-dwelling communities (Shackleton et al., 2007). In India, NTFPs generate about US\$35 million annually in income and

employ 55% of the forestry labor force (Chauhan et al., 2008; Shiva & Verma, 2002). From 2019 to 2020, about 40% of the total forest revenue in India was NTFP based (Ahamad et al., 2022).

The importance of NTFPs is particularly evident in Kerala, a state in southern India in the highly biodiverse Western Ghats. For Kerala's forest-dwelling communities, NTFPs contribute up to 56% of their total income (Krishnakumar et al., 2012). NTFP sales in Kerala rose 130% from 2009 to 2020 (Kerala Forest Statistics, 2021). In several districts of the Western Ghats, including Palakkad, Kannur, and Wayanad, more than 70% of the tribal communities depend on NTFPs for livelihood (Jerin et al., 2023).

In Wayanad, the Indigenous Kattunaickens have an estimated population of 15,000 (Census of India, 2011). The

Kattunaickens primarily depend on forests, engaging predominantly in the collection and sale of NTFPs. Inhabiting forest-bound villages, they rely on NTFPs for their livelihood; they gather tubers, medicinal herbs, and honey (Anju & Kumar, 2024).

Honey, in particular, is crucial to their income because there is a strong demand and a robust market in Western Ghats (Nath, 2014). A major portion of India's honey production (approximately 60,000 t per annum) comes from wild bees, underscoring the importance of this resource to the Kattunaickens. In 2020, approximately 26 t of honey was collected from Western Ghats forests, generating over US\$126,000 in revenue (Kerala Forest Statistics, 2021). Honey is the most lucrative NTFP in these regions.

For the Kattunaickens, honey has more than economic value; there is deep-rooted, cultural significance to honey hunting (Nath, 2014; Pellissery et al., 2012; Varghese et al., 2015). Indigenous communities engaged in honey hunting often require sustained engagement with the forest and its elements, which shapes their Indigenous identity (Attanapola & Lund, 2013). Thus, honey hunting is not merely a means to attain financial security, but also a way of manifesting identity through knowledge of the forest.

Indigenous peoples often honey hunt with an understanding of the interconnected systems of honey, bees, and trees, all rooted in their own connection to the land (Fijn, 2014). Consequently, honey collection plays a crucial role in shaping and reshaping the community's Indigenous ecological knowledge (IEK) and identity (Matias, 2017). For some Indigenous groups, such as the Jenu Kurumbas of Karnataka, it is even a vital spiritual activity, rooted in IEK passed down orally through generations (Dempis et al., 2012).

Berkes (2012) defines *IEK* as “A cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.” Honey hunters effectively use their IEK to understand local ecology and engage in practices that ensure the bees produce and yield the highest quality and quantity of honey. Traditional tools and techniques, grounded in this knowledge, are often employed to avoid destructive harvesting methods (Varghese et al., 2015). In Mozambique's Niassa Reserve, Indigenous groups have adopted traditional honey collection methods that align with the conservation of the miombo woodlands. These practices, which involve using ropes to climb trees and specific plants to calm bees and selectively harvesting honeycombs while leaving larval combs intact, allow the colonies to thrive and enable repeat harvests from the same trees. Such traditional protection of bees and trees contributes to ecosystem stability, reinforcing conservation efforts in the reserve (Snook et al., 2015).

IEK can effectively inform environmental governance (Mistry & Berardi, 2016), forest management, conservation (Ban et al., 2018), and sustainable development (Senanayake, 2006). Moreover, coproduced knowledge between scientists and Indigenous peoples leads to more effective adaptation strategies for navigating highly variable socioecological conditions than

isolated Western-oriented conservation approaches (Reyes-García & Benyei, 2019). However, IEK is increasingly threatened by globalization, government policies, criticisms of its obsolescence, and rapid social–ecological changes (Fernández-Llamazares et al., 2021; Gómez-Baggethun, 2021). Despite its value, traditional practices based on IEK have often been labeled as “wasteful” and “uncivilized” (Haokip & Aiyadurai, 2023).

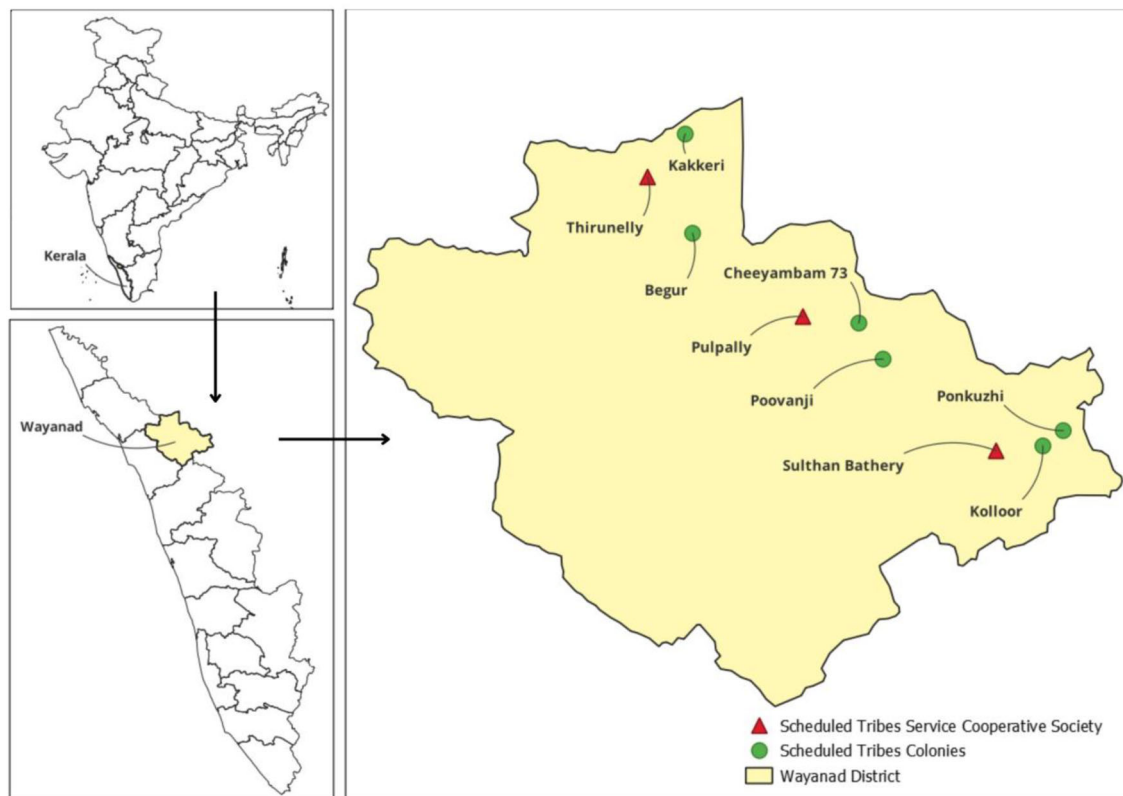
Mainstream conservation paradigms, which frequently rely on human–nature dichotomies, tend to view forests and other ecosystems as wilderness that must be free of people and pristine for effective conservation (Fletcher et al., 2021). This reductive perspective has led to the demonization of IEK and a framing of Indigenous peoples and their activities, such as NTFP collection, as incompatible with conservation. These views have severely limited Indigenous autonomy and facilitated increased state control over indigenous spaces (Dressler & Roth, 2011; Loperena, 2016; Sylvander, 2021).

I studied the Kattunayaka, an Indigenous people in southern India, whose identity is deeply connected to their forest knowledge. I explored their engagement with the forest through honey collection and how this practice aligns with their epistemological (relates to the study of knowledge—its scope, nature, and limits) identity and role in forest stewardship. Moving beyond the conventional view of IEK as a tool for ethnic empowerment, I sought to highlight its crucial role in reimagining and conserving the forest. NTFP collection is a livelihood strategy and an epistemological process that continuously shapes and reshapes Indigenous knowledge systems. This perspective underscores that NTFP access and collection are essential, not as rewards for Indigenous participation in Western conservation frameworks but as necessities for producing IEK required for holistic conservation.

## METHODS

### Study context

I chose Wayanad district in Kerala as my study site because of its abundant forest landscape and the large number of forest-dependent adivasi (India's Indigenous peoples, also known as scheduled tribes or simply tribes) communities (Figure 1). About 18.5% of Wayanad's population is adivasi, with most living near the district's forests, which cover roughly 40% of the area (Census of India, 2011). Land alienation in Wayanad for the adivasis was a reality under British rule and during postcolonial development (Madhavan, 2020). Even now, under the Kerala model of development (which focuses on social development over economic development [Kurien, 1995]) and the radical land reforms, separation of Indigenous people from their forests is prevalent and often pushes them to the forest fringes (Bijoy, 1999; Edison & Devi, 2019; Kjosavik & Shanmugaratnam, 2021; Manjusha & Jojo, 2023). For historically landless ‘hunter-gatherer’ communities, such as Kattunaickens, land reforms and the consequent occupancy of forest fringes came with the condition that they were not allowed to access



**FIGURE 1** Wayanad district and tribal colonies and cooperative societies surveyed in a study of Kattunaicken honey collection.

any forest resources except NTFP (Kjosavik & Shanmugaratnam, 2021). Hence, for Kattunaickens in postcolonial Wayanad, NTFP dependency is a manifestation of their outsider status in Kerala development. Adivasis in Wayanad make their livelihoods from NTFP and other manual work (Sathyapalan, 2010). This is especially true for traditionally nomadic hunter-gatherer communities, such as Kattunaickens, who have no historic ownership of land and depend on forests for their livelihood (Kakkoth, 2005). The Kattunaickens are esteemed for their proficiency in honey collection, making it a significant source of revenue (Jerin et al., 2023).

### Data collection methods and approaches

In January and July 2023, I conducted pilot study in Wayanad in which I interviewed officials from key tribal cooperative societies: Thirunelly, Noolpuzha, and Pulpally. This provided initial insights into adivasi honey collection practices and identified 6 settlements where the highest quantities of honey were collected by the honey collectors (Figure 1).

Primary data collection in 2023 spanned 5 months, starting a month before honey season (April–July). I conducted 48 interviews and 8 forest walks, focusing on community elders and *moopans* (leaders) with over a decade of honey collection experience and youth with at least 5 years of experience. Interviews, lasted 1.5–2 h, explored forest knowledge, relationships with

the forest, and Kattunaicken identity in the context of honey hunting. Summary of the recordings was reviewed and approved by the interviewees. Only men were interviewed because honey collection is predominantly considered men's work. Interview questions are in Appendices S1 and S2.

The 3- to 4-h forest walks with experienced community members who possessed deep knowledge of the forest involved visiting honey-collecting sites and observing interactions between the Kattunaickens and the forest (Figure 2). Walking as an ethnographic method reveals layers of time–space narratives and uncovers complexities and connections that static observations or interviews might miss. It also allows for a sensorial exploration of the relationships between different entities in the field (Cheng, 2014).

Further details of the interviews and forest walks conducted have been appended (Appendices S3 & S4). I obtained ethical clearance for the use of human subjects from the Institutional Ethics Committee (IEC) of the Indian Institute of Technology, Gandhinagar (IEC ID number IITGN/IEC/2023-24/50).

### Data analyses

Interviews were conducted in Malayalam, and responses were transcribed and then translated into English. To analyze data, I used a systematic thematic analysis approach (Nacem et al., 2023).



**FIGURE 2** Cheeni (*Tetrameles nudiflora*) tree with beehives taken during an ethnographic forest walk.

## RESULTS

### Forest knowledge as Indigenous identity

The Kattunaicken community's identity appeared to be intrinsically linked to their knowledge of the *kadu* (forest). Their name, meaning "lord of the forest," reflects this deep connection. As one community member explained:

"We are the Kattunaickens because we have the *dhairyam* [courage] to be in the forest. We have been depending on the forest for centuries. All this is possible because we have the *arivu* [knowledge] about the *kadu*."

For the Kattunaickens, forest *arivu* was expressed as experiential, sensorial, and deeply personal. They believed that truly

knowing the forest requires constant engagement with it. An elder emphasized this point:

"*Kaadariyenamenkil, Kaadirangenam*" (If you want to know the forest, you have to be in the forest.).

This knowledge has been passed down through generations, as one subject shared:

"I have heard stories about the *kadu* from my grandfather, father, and my uncles. Of course, it's a different feeling to experience it, but it never felt strange. I have heard about it so much before that I knew what to do when I went for honey collection the first time with my father and family."

The Kattunaicken worldview extended beyond the physical realm of the forest, encompassing epistemological dimensions. They perceived a reciprocal relationship in which they know the forest and the forest knows them. A respondent from Kakkeri explained:

"*Kadu* knows everything. *Kadu* sees everything, including us. It has *arivu* about our dreams, desires, needs, prayers...everything. Not even a breeze flows in the *kadu* without reason. The breeze we feel right now is because the *kadu* knows we need it."

This relationship was further elaborated on by another respondent:

"...*kadu* knows the Kattunaicken inside out like a parent knows their children. *Kadu* provides for us when we are *shuddham* [pure] and punishes us when we are not. We are *kadinte makkal* [forest's children]. Hence, if we care for the *kadu*, it will also care for us."

### Distinct epistemologies and identities of the *arivu* and *vivaram*

The Kattunaickens distinguished between *arivu* (knowledge) and *vivaram* (information). They said *arivu* is associated with genuine care for the forest, whereas *vivaram* is linked to conservation efforts driven by self-interest. An elder illustrated this distinction when asked whether an outsider could become a Kattunaicken by gaining their forest knowledge:

"[laughs] No, that will make you a *forestukaaran* (forest official). Because you are not getting our *arivu*, you are getting *vivaram* (information) from our *arivu*."

The role of *poorivkar* (ancestors) and *maladbaivangal* (forest gods) is crucial in the Kattunaicken epistemology. Ancestors act as mediators between the community and the forest. The respondent explained:

“We complain a lot to our ancestors when we get in trouble. When we don’t get honey in the forest, when there are aggressive animals, . . . and even when we see *pretham* [ghosts or negative spirits] who make us lost in the forest. It is our dead who tell the kadu about our problem. The kadu gains arivu about us through them.”

This unique worldview shaped the Kattunaickens’ identity and their relationship with the forest. It underscored the deep connection between their Indigenous knowledge, cultural practices, and the forest ecosystem, highlighting the importance of understanding and preserving this relationship in the context of forest conservation and management.

### NTFP collection and manifestation of Kattunaicken identity

NTFP collection was important to the livelihood of the Kattunaickens. Although the community acknowledged the physicality inherent in the collection process, they simultaneously recognized and valued its epistemological dimensions. An interviewee (70 years old) revealed:

“We collect many things from the *kadu- Kizhangu* [tubers], *kalpasam* (*Parmotrema perlatum*), and all kinds of honey. We know how to find all this. We know where to dig and where to look. It would be impossible for the outsiders.”

NTFP collection had a layered epistemological significance in the Kattunaicken worldview. Although they admitted they needed the knowledge to engage in NTFP collection, they also believed collection itself was part of the knowledge production process about the forest. As a community elder from Cheeyembam stated:

“ . . . Every time we engage with the kadu, we start knowing it more and more. We learn if the forest’s *swabhaavam* [character or behavior] has changed from last time.”

For the Kattunaickens, swabhaavam reflected how various forest elements respond to them personally. NTFP collection was central to their understanding of the forest, so barriers to this practice, especially by forest officials, were seen as antagonistic. Officials often restricted forest access informally, particularly in fire-prone seasons. They used warnings of danger from animals and threats of withheld compensation to deter entry. Additionally, by banning knives under the pretext of their use as weapons, they left the commu-

nities defenseless, further discouraging interaction with the forest.

However, all restrictions were lifted during the honey season, typically following the first rains when the wildfire threat diminishes. Forest officials recognized that honey collection was the primary livelihood for the Kattunaickens and consequently granted access to the forest with minimal restrictions. Therefore, honey collection held profound significance for the Kattunaicken communities, not only as a vital economic activity but also as a crucial aspect of epistemic construction of the forest enmeshed with their identity.

### Honey collection and identity formation

Honey collection held immense significance for the Kattunaickens, economically and culturally.

However, the cultural relevance of honey was more profound for the community. As validated by many community members, honey collection was a way in which the Kattunaickens manifested their identity. It required a sustained engagement with the forest, often requiring complete isolation from the outside world. When asked the significance of honey collection to their identity, a 72-year-old resident of Poovanji colony said:

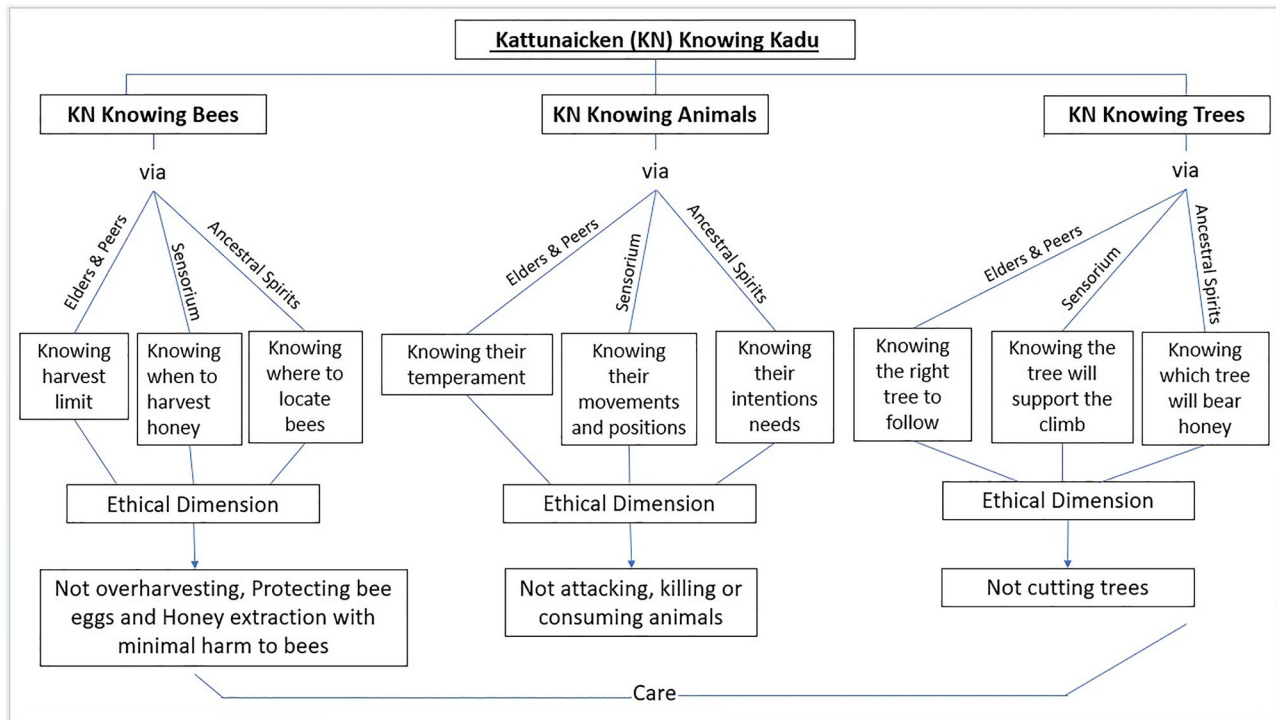
“Collecting *kombu thenu* [big wild honey] from the kadu requires a profound knowledge of the kadu. You will have to stay in the kadu for maybe 2–3 weeks, sometimes even a month, to collect honey. You need arivu about the kadu to find honey, collect it, and return home alive. Only a Kattunaicken can do this.”

Hence, for the Kattunaickens, honey collection went beyond the physical efforts required, including a true understanding of the forest—an epistemological labor that was core to their identity.

However, it was not just the honey the community valued. They enjoyed the opportunity to engage with the forest without restrictions. Several respondents thought that if one was a Kattunaicken, one must collect honey. Kattunaickens looked forward to the honey season for the income the honey would bring and for the journey into the forest.

Typically, honey collectors organized into groups of 5–8 individuals and spent a few weeks to a month in the forest. Each group member was assigned a specific task, and the role of the *kuyilkaara* [the one adept at climbing trees] was considered paramount. The *kuyilkaara*, typically a relatively young member in the community with extensive experience and knowledge, served as the group’s leader during the honey collection process. This individual was entrusted with the responsibility of climbing large trees to gather honey.

For the community, knowing the forest—an indispensable aspect of honey collection—was a prime reason why Kattunaicken identity was intricately entwined with honey collection. This intertwining was apparent when viewed through the lens of forest epistemology, particularly in the con-



**FIGURE 3** Conceptualization of honey collection as an epistemological endeavor—Kattunaicken knowing kadu.

text of honey collection as an epistemological endeavor. During honey collection, the Kattunaickens engaged in a comprehensive knowing of the forest that encompassed 3 primary dimensions: knowing the trees, knowing the animals, and knowing the bees (Figure 3). Each facet of this knowledge dictated the interactions of the Kattunaicken with the forest and reciprocally affected how the forest interacted with them (Figure 4).

### Knowing the trees

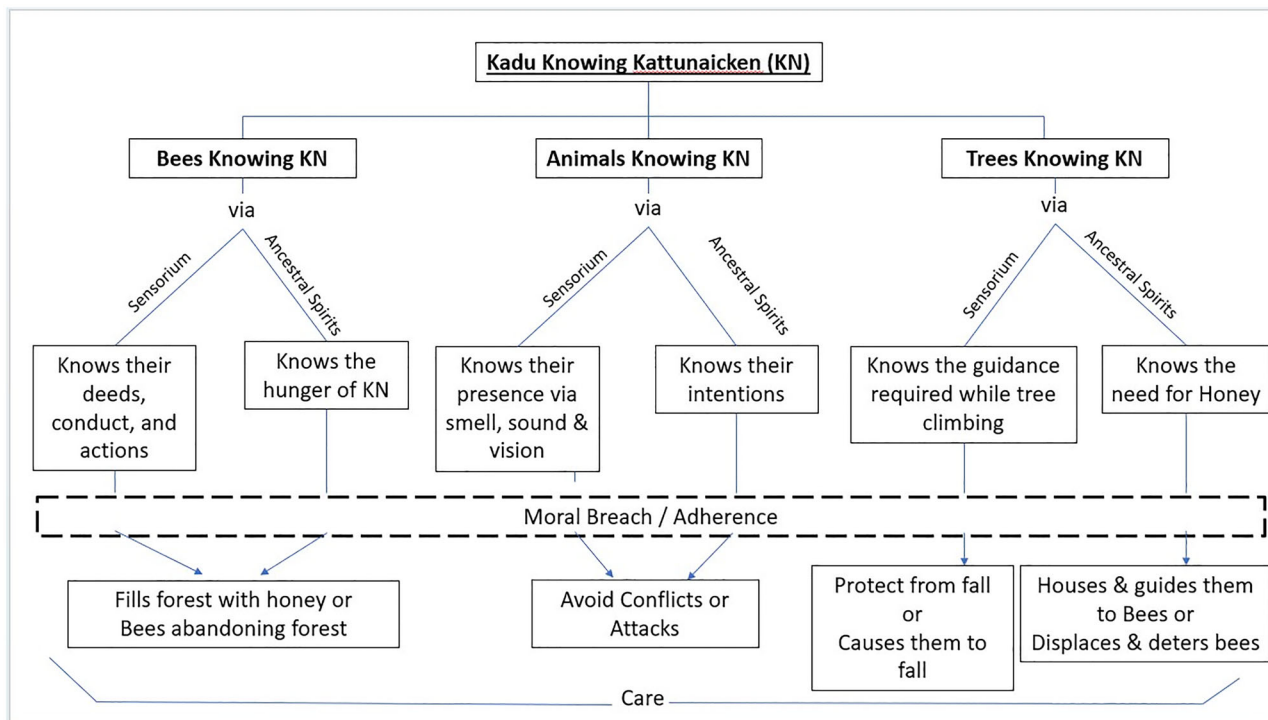
Understanding the trees was paramount in honey collection practice, as emphasized by the Kattunaicken community. The selection of the route was primarily dictated by the trees themselves. Groups strategically determine their direction based on the identification of trees likely to host beehives abundant in honey. The kuyilkaara assumes the role of selecting the tree and guiding the group, leveraging his intimate knowledge of the forest. A respondent who has been a kuyilkaara for 9 years said:

“When we go for honey collection, I have an idea of the tree that would give us honey. That tree would be guiding us the entire journey. Even during the darkest night, I know where to go because the tree leads us. There might be paths in between easier to walk, but I will not take it, because I know the tree will guide us into the right path.”

Discerning which tree to follow was not merely an individualistic endeavor. Rather, it drew on a collective pool of knowledge derived from past experiences, wisdom passed down by elders, and insights gleaned from peers within the community. Hence, knowing the tree was based on maximum collective knowledge. Another honey collector emphasized the importance of this collective knowledge:

“Earlier, I used to go to the trees that I went to with my grandfather to get the first collection. Now, the kadu has changed. The trees have changed. For the past few years, I have been going to trees in the Karnataka forests because other groups in our colony said they made a significant collection there.”

The honey collection trips were often pivoted around the knowledge of the trees and the belief that the trees would provide. However, this knowledge was not unidirectional. The belief that the trees provided was also firmly based on the fact that the trees would also know the Kattunaickens and their needs. Although the Kattunaickens knew the tree that would provide them with honey, the trees also knew the needs of the Kattunaickens and provided a home for the bees. In these reciprocal epistemological relations, ancestral spirits played a significant role in maintaining their linkages. As one respondent recounted his experience during a honey collection trip:



**FIGURE 4** Conceptualization of honey collection as an epistemological endeavor—Kadu knowing Kattunaicken.

“Once we walked tree after tree looking for honey. We walked for days and didn’t find any. So, an elder in our group stopped and prayed to our ancestors. By the end of the day, we found a tree who knew our needs and troubles and gave us a lot of honey. The ancestors spoke to the tree. The tree knew us.”

Interviews revealed sensorial and ethical facets of the tree epistemology. Because climbing huge trees is a daunting task, they often relied on their sensorial understanding of the tree while climbing. Because the collection took place at night with minimal vision, touch and sound were pivotal in navigating the climb. In the Kattunaicken worldview, this interaction with the tree during the climb was perceived as a mutual exchange in which knowledge flowed in both directions. One respondent, who used to be a kuyilkaara, said:

“When I climb the tree, I touch and feel before I make every step. If I feel the branch is weak, I will not proceed there. I hear a creak, and I will not proceed there. I am knowing the tree I am climbing while I am climbing. But the tree is also knowing me. It gives me signals when I am making a misstep. It makes sounds when I am in danger. I don’t fear falling while I climb”.

The ethical dimension of forest epistemology was also integral to honey collection practices among the Kattunaickens. Accord-

ing to their beliefs, Kattunaickens are protected from falls by the trees themselves. However, there is a caveat: if someone behaves unethically—such as harming animals, needlessly cutting trees, or consuming meat or fish before venturing into the forest—the trees are said to discern this impurity. In such cases, it was believed that the maladhaivam residing in the tree might intervene, compelling the climber to jump from the tree. An elder explained:

“Nobody falls from the tree by accident. The ones who are impure jump.”

### Knowing the animals

Encountering wild animals was common in Kattunaicken’s engagement with the forest. Everyday life and practices and the community’s worldview had a distinct space for the faunal elements of the forest. Interviews with the community’s elders revealed the perceptions of animals as equal beings in the forest, gods, and even kinfolks. Fear and respect were common emotions cited regarding their nonhuman cohabitants.

Although the perceptions of wildlife remain unaltered, there was a reimagination of this interaction in the context of honey collection. Honey gathering engendered a prolonged cohabitation of the kadu by the Kattunaicken and the nonhuman inhabitants. This extended proximity facilitated frequent and intimate interactions between the 2. A 33-year-old member of the community said:

“During honey collection, we see tigers, elephants, bears- everything. Unlike here [fringes] where we shout to drive them away into the forest, we must behave differently [in the forest].”

It was evident that in the Kattunaicken imagination, wild animals had legitimate claim to the kadu, just as they did. Hence, it was imperative to know the animals, their intentions, desires, and needs to avoid conflict, especially during journeys into the forest to collect honey. In response to inquiries regarding the potential hazards posed by wildlife encounters, an elder casually brushed aside such concerns, asserting that navigating such encounters was simply part and parcel of a successful journey—one that hinges on knowing the animals and the animals knowing them.

Similar to their comprehension of other facets of the kadu, Kattunaicken’s knowledge of animals encompassed a collective reservoir of knowledge accumulated from past experiences, teachings handed down by elders, insights shared among community members, and the sensory perceptions of the present. Moreover, ancestors played a key role in this epistemic transaction between the Kattunaicken and the wild animals. As elucidated by community members, this integrated knowledge exchange commenced from the moment a Kattunaicken enters the kadu. For example,

“We know these animals [elephants and tigers], even before we lay eyes on them. We can sense their presence through their scent and sound. Their footprints tell us how near they are and where they’re headed. We know their movements and can estimate their numbers. But what’s fascinating is that they also know us. They sense our scent, voices, and our intentions [to collect honey].”

The Kattunaickens demonstrated a nuanced knowing of animals, assessing their mood and temperament during encounters. During forest walks, community members used descriptive terms, such as *paavam* [innocent] and *preshnakekaraan* [troublemaker], to categorize animals, primarily elephants, based on subtle cues such as ear and trunk movements. These excursions also revealed the intricate communication between the Kattunaickens and the animals. The community let animals know of their presence through rustling leaves or striking wood with their knife to produce sound, and animals reciprocated by either remaining on their path or making way for the Kattunaickens. This mutual knowing served as a mechanism for conflict avoidance. Conversations with the community elders often revealed the element of the animals knowing the Kattunaicken (intentions) as key to avoiding conflicts. One community elder said:

“We see tigers during our journey. They are least bothered by our presence. They know we are there to collect honey and not interfere with them. In all my years, I have never been attacked by a tiger.”

However, this aspect of the animal (knowing the Kattunaicken) also shed light on the ethical layers of this distinct epistemology. One respondent said:

“If we have ever wronged [killed] an animal or if we are ever impure, then the animal will punish us. This punishment might be returning without honey and in some cases, not returning ever.”

The ancestors served as vital intermediaries (of knowing) between the animals and the Kattunaicken. In times of imminent danger from animals, the community invoked their ancestors, entreating them to communicate with the animals on their behalf. During such critical situations, the ancestors were believed to intervene and provide assistance to ensure the safety of the Kattunaickens. One respondent corroborated this:

“I remember my grandfather praying to our ancestors when a *komban* [tusker] was right in front of us, and we had nowhere to go. Suddenly, he moved away without hurting us. The portion of the honey collected that night was kept aside for the animals just like our ancestors instructed.... as a token of gratitude.”

The epistemological commonality between the Kattunaicken and the wild animals established a unique connection, firmly situating them within the former’s worldview. This shared knowledge of the forest fostered a perception of these nonhuman entities as kinfolk. This mutual understanding facilitated navigation through the forest with ease and engendered a perception of these beings as equals to the Kattunaickens in status and importance.

## Knowing the bees

In the Kattunaicken conceptualization of kadu as an epistemological space, the bees had an elevated position. Kattunaickens were in agreement on the epistemological superiority of the bees. In my conversation with the younger and elder members of the community, their reverence toward bees for their knowledge of making honey was pronounced:

“Of all the species and beings in this world, only the *eesba* [bees] can make honey. They take the best ingredients in the forest and make it. All this development, and we (human beings) cannot still make honey.”

The epistemological reverence for bees within the Kattunaicken community extended beyond the acknowledgment of their unique knowledge; it encompassed profound respect for their efforts to safeguard this knowledge. The Kattunaicken believed bees have endured hardships to prevent knowledge of them from falling into the wrong hands, thereby safeguarding the forest and its inhabitants. Legends narrate instances where

bees resorted to extreme measures to preserve their secrets. For instance, in one tale recounted by a respondent, a king attempted to extract honey-making knowledge from a bee by tying a thread around its body. Despite the tightening grip of the thread, draining the life from the bee, it remained resolute in its silence, showcasing an unwavering dedication to preserving the forest's integrity.

Oral narratives from the community often painted a more intimate epistemic connection between the bee and the Kattunaicken. The bees knew the needs of the Kattunaicken and would make enough to feed their young ones and the hungry Kattunaicken. Although many community members said the quantity of honey was decreasing, they were adamant that the bees made enough for everyone. One moopan said:

“...there is enough honey for everyone in this forest.”

Like all the epistemic bindings in the forest, the relationship between bees and the Kattunaicken exhibited a reciprocal exchange of knowledge. The Kattunaicken discerned the optimal time for honey collection through various sensory cues, such as observing the bees within the hive and detecting the scent of honey emanating from it. This knowing guided their decision-making process regarding the timing of harvest. Moreover, this knowledge was accompanied by a sense of ethical responsibility and care toward the bees. An elder said:

“We do not collect the honey as soon as eesha make the honey. There is a right time to collect for us and for them [bees]. The first honey they make is for their children. We have no rights over that. The next batch is for us.”

According to the Kattunaicken's worldview, bees had agency and could respond to moral breaches. Should an individual violate the ethical code of the kadu by, for instance, taking honey designated for the bees' offspring, taking more than required, or even entering the forest in a state of impurity, the bees would refrain from returning to that tree to produce honey. One respondent said:

“If you're impure or have mistreated eesha (through overharvest), they will sense a heat from your palms the moment you touch the hive... and they won't return to that tree again.”

Ancestors played a crucial role in sustaining the epistemic relationship and its ethical aspects between the Kattunaicken and the bees. The community prayed to their ancestors, asking them to summon the bees to their kadu and bless them with honey. One 71-year-old stated:

“Every year before the honey season, we pray to our ancestors to summon the bees and fill our kadu with honey. The ancestors hear us and let the bees know our needs. But if we wrong the

bees, the ancestors will not help us. They also warn us when we've done something wrong. That's why the Pulpally forests have less honey—they wronged their bees by killing all their children.”

The symbiotic knowledge exchange between the Kattunaicken and the bees facilitated a harmonious interaction with minimal harm inflicted on either party. Prior to smoking the hive, the Kattunaicken offered apologies to the bees and sang songs to induce a trance-like state in them, allowing for their gentle relocation instead of forceful expulsion. This empathetic approach underscored that the honey collector knows he is intruding on the bees' territory. This sentiment was echoed by numerous community members during the researcher's honey collection expeditions. For example,

“We are invading their homes. Wouldn't we attack if humans did it? It is a small price [bee bites] to pay for what we are doing”.

The Kattunaicken did not perceive bee stings as retaliation; instead, they viewed them as a restrained emotional reaction from the bees, aimed at causing minimal harm to the Kattunaicken.

## DISCUSSION

My findings indicated that for a meaningful integration of IEK with Western-oriented conservation systems, policymakers must recognize the intrinsic connection between the identity of Indigenous communities and the IEK they generate. For Kattunaicken, their profound connection to the forest, manifested through their concept of arivu, challenges conventional understandings of IEK. Here, arivu is not merely a tool for survival or resource management but a fundamental aspect of their identity and worldview. People often understand and engage with the world through their “knowledge systems” (Pascual et al., 2023). IEK is deeply rooted in Indigenous identity and guides people to effectively live within one's environment (Usher, 2000). For Indigenous peoples, this identity is forged through a “meaningful relationship” with the place they live (Attanapola & Lund, 2013). This intrinsic link between knowledge of the place and identity suggests that conservation efforts must encompass the epistemological frameworks of Indigenous communities.

At the core of the Kattunaicken world of knowing is understanding of the forest as an epistemological space, where knowledge is not just acquired but co-created through reciprocal relationships with various forest elements. Here, arivu attributes agency to the kadu within the Kattunaicken worldview. Just as the Kattunaicken knows the kadu, the kadu—with all its elements—knows the Kattunaicken. This mutual knowing guides the interactions between the kadu and the Kattunaicken, shaping their actions accordingly. In many Indigenous communities, forests are not passive backdrops to human activity; rather, they are active participants in ecological and semiotic

networks that shape life (Aronsson et al., 2020; Kohn, 2007). It is this arivu that fosters a form of “care”—distinct from conservation—rooted in mutual recognition and accommodation of each other’s needs. Care acknowledges the forest’s agency, challenges the notion of human–nature dichotomy, and accepts the Kattunaicken as an integral part of the kadu itself. In such Indigenous conceptualization, land becomes a sentient, animated entity that cares for the community (Barreau et al., 2016). In contrast, conservation driven by vivaram can be (if not always) profit oriented, accompanied by ulterior motives. Very often bureaucracy poses forest conservation as a market question (McElwee, 2012; Pokorny et al., 2012) portraying Indigenous peoples who reside in and around forests as obstacles to conservation, thereby marginalizing and vilifying them (Saarinen, 2016; Saunders, 2013).

The identity–knowledge nexus observed among the Kattunaickens is particularly evident in the epistemological dimensions of NTFP collection, especially honey gathering. For the Kattunaickens, these activities are not just economic pursuits but processes of knowledge production and validation that constantly shape and reshape their understanding of the forest. This perspective reframes NTFP collection as a “learning event” (Barreau et al., 2016) contributing to social cohesion and knowledge transmission (Herrmann, 2006). Honey collection, in particular, demands prolonged engagement with the forest, enabling the accumulation and refinement of knowledge. For many Indigenous communities, wild edibles, such as honey, are more than sustenance; they are cultural markers that reflect deep connections to the land, with their collection encompassing complex bodies of knowledge (Turner et al., 2011).

The epistemological engagement with the forest, especially evident during honey hunting, offers a unique perspective on the Kattunaickens’ relationship with forest elements. Their relationships with trees, animals, and bees were characterized by mutual knowing of needs, dreams, and desires and respect. Trees were seen as guides during honey collection, animals as equals and kinfolks coexisting in the forest, and bees as holders of unique knowledge. Many hunter-gatherer groups, such as the Crees of Canada and the Pintupis of Australia, engage with trees and animals as participants in a dialogue rather than as resources to be exploited. This deepens their understanding of the forest and fosters a more intricate relationship with their environment (Ingold, 1996). Honey hunting communities, such as the Meratus, see trees as site markers (Tsing, 2003) and animals as kin or gods (Jolly et al., 2022) who know the community’s need for honey, supporting their coexistence in the forest. Even for many Amazonian Indigenous peoples, nonhuman entities, such as trees and animals, are viewed as powerful beings to be respected and negotiated with. These entities embody the principles of reciprocity, nurturing, and mutual protection, reinforcing the interconnected relationship between humans and the natural world (Virtanen, 2019).

The ancestors play a crucial role in maintaining the ethical dimensions of the epistemological relationship between the Kattunaicken and the kadu. They serve as intermediaries and

advocates, ensuring that the reciprocal relationship between the community and the forest is upheld. When moral codes are breached, the forest’s agency manifests through punishments, such as falling from trees during honey collection, animal attacks, or bees not filling their hives. In many Indigenous worldviews, particularly in the context of honey collection, taboos exist to prevent such breaches. These include prohibitions against felling trees (Hill et al., 2019), overharvesting honey (Volpato & King, 2023), and consuming meat before a honey hunt (Naveh & Bird-David, 2014), all of which are believed to result in divine punishment. The Mapuchas believe that lesser abundance of wild edibles is a punishment from the divine for not asking permission of the forest before gathering or for overharvesting (Barreau et al., 2016). Thus, ancestral spirits often serve as moral guides for these communities (Adom, 2016; Htoo et al., 2022) and carriers of historical knowledge (Yunkaporta, 2020). However, for the Kattunaicken, it is the ancestors who mediate forgiveness, either by reconciling with the kadu or by communicating the reasons for the punishment to the community. This understanding is consistent with other Indigenous traditions, such as the Xhosas of Africa, who view forests as sacred spaces where ancestors speak on behalf of the forest (Cocks et al., 2012), and the Apurina community in Brazil, where ancestors play a key role in maintaining reciprocity between humans and the forest (Virtanen, 2019). Such IEK frameworks can lead to conservation practices that are deeply rooted in respect for the natural world and its intrinsic agency (Ens et al., 2021).

The Kattunaickens’ intimate knowledge of the forest is not merely an individual endeavor, but rather a collective process of knowledge construction. Their understanding of the trees, animals, and bees is informed by a tapestry of experiences—from the insights shared by peers during honey collection trips, to the sensorial cues gleaned through touch, sound, and smell during their forest forays, to the intergenerational stories and wisdom passed down by elders. As observed in other cultures, knowledge production and transmission occur through different channels, including parents, grandparents, and peers (Setalaphruk & Price, 2007; Somnasang & Moreno-Black, 2000). In honey-hunting Indigenous groups, such as the Jenu Kurumbas, parents, peers, and elder kin play a crucial role in teaching young adolescents essential skills. They learn to avoid animal conflicts during honey hunting, cut combs without damaging bee eggs, and safely climb large trees to collect kombu thenu (Demps et al., 2012). Such vertically and horizontally transmitted IEK often includes crucial instructions and rules for the conservation and preservation of sacred forests (Akhmar et al., 2023).

Sensorial experiences are central to Kattunaicken epistemology, especially in the context of honey collection. The Kattunaickens engage in mutual knowing with the forest and its elements through a rich sensory spectrum, including vision, touch, sound, and smell. Before a honey hunt, they touch and feel the trees, which facilitates a deeper connection and understanding of their environment. They use their sense of smell to detect animal presence and their keen auditory and visual

skills to track bees and assess hive maturity and honey content. In Indigenous epistemologies, senses often serve as guides. Interactions with the environment foster empathy for the land, allowing individuals to feel and comprehend its needs. This underscores a sentience that recognizes the intrinsic value of all living and nonliving things and frames them within a moral framework (Cameron, 2022). In Indigenous epistemology, hearing deepens knowledge as an embodied practice (Kim-Cohen, 2009), touch facilitates active exploration of the environment, and smell broadens and enriches lived experiences (Lowe, 2005). These embodied processes enable one to connect with, analyze, predict, and measure changes in a country or the “sentient land.” Indigenous multisensory approaches to ecology offer valuable tools for addressing complex conservation (Cameron, 2022). Margaret Swain (2004) highlights the significance of body knowledge, noting that if it remains overlooked or unacknowledged in conservation research, a valuable source of insight is forfeited.

My findings with the Kattunaicken community strongly suggest that Indigenous engagement in the forest through NTFP collection must be understood as more than a means to uphold Indigenous rights to the land—it is a fundamental necessity for the effective conservation of forests. The Kattunaickens’ traditional honey hunting practices demonstrate a deep, mutual understanding of the kadu that involves care, ethical responsibility, and an acknowledgment of the forest’s agency. Their epistemology of the forest is grounded in strong ethical dimensions that guide their conduct, carefully balancing their own needs with those of the forest elements like trees, animals, and bees.

Indigenous claims to natural resources, including NTFPs, are often deeply personal and emotional and encompass complex social relationships and responsibilities (Tsing, 2003). Crucially, the Kattunaicken traditional practices and knowledge are not rigid; rather, they are situated within the place they reside and are responsive to changing ecological realities. This dynamism allows their IEK-based practices, including NTFP collection, to accommodate measures of control, such as self-imposed harvest prohibitions, resource substitution, and allowing periodic forest recovery based on observed resource levels (Fuentes et al., 2023).

A key tenet of the Kattunaicken epistemology is the understanding that the forest is a sentient being with agency, not separate from the Kattunaicken. There is a deep, reciprocal relationship between the kadu and the Kattunaicken. For Indigenous communities, the ecological aspect of IEK is often more about an awareness of relationships with a place than discrete, categorical knowledge (Wyndham, 2009). This biocultural perspective is exemplified in the Kattunaickens’ recognition of bees as crucial actors with spiritual authority. Bees are not only central to maintaining ecological balance but are also seen as vital participants in decision-making processes within the Kattunaicken’s cultural and spiritual frameworks (Hill et al., 2019). Similar observations have been made among the Luhyas of Western Kenya, where honey collection is for subsistence and part of sustainable resource management (Héger et al., 2023).

However, conceptualizing and managing forests as pristine wilderness would restrict the forest access for and subsistence activities of Indigenous peoples, eroding their traditional and cultural engagement with the forest and consequently forest health. Specifically, in the case of honey collectors, the loss of IEK-based practices, such as ethnomedicine and cosmogony, has contributed to the declining number of bees (Hill et al., 2019). Furthermore, national laws and conservation efforts have often disrupted traditional systems and fragmented governance structures, adversely affecting the livelihoods of Indigenous peoples and broader conservation objectives (Reyes-García et al., 2014; van der Wal et al., 2022).

The Kattunaicken’s relationship with the forest reveals a sophisticated epistemological framework where knowledge and identity are inextricably linked. Their honey collection is an epistemological endeavor in which IEK operates through reciprocal relationships with forest to create a complex system of environmental stewardship that extends beyond resource extraction. Moreover, the role of ancestors as mediators between the community and forest entities establishes an ethical framework that ensures sustainable resource use through spiritual and cultural accountability.

I suggest future research explore how Indigenous epistemologies could inform a radical reimagining of conservation itself—moving beyond Western paradigms of human–nature separation to embrace more relational ways of knowing and being with forests. Critical questions remain about how conservation policies might evolve if forests were regarded as sentient, knowing entities and Indigenous engagement in forest were recognized as vital to knowledge creation and ecological understanding. For policy, this suggests the need to move beyond token “participation” of Indigenous communities to fundamentally restructuring conservation governance around Indigenous ways of knowing. This could mean developing new institutional frameworks that recognize ancestral mediation, spiritual relationships, and collective knowledge production as legitimate forms of forest management, potentially revolutionizing how biodiversity conservation in an era of unprecedented environmental change is approached.

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## REFERENCES

- Adom, D. (2016). Asante Indigenous knowledge systems: Repositories of conservation ethics for Ghana’s biodiversity. *Proceedings of the academic conference of Interdisciplinary Approach*, Vol. 7, No. 2, Sokoto, 4 August 2016, 8–36.
- Ahamad, F., Bhutiani, R., Ruhela, M., & Rai, N. (2022). Non-timber forest products: Current status and development. In K. D. Bahukhandi, N. Kamboj, &

- V. Kamboj (Eds.), *Environmental pollution and natural resource management* (pp. 103–119). Springer International Publishing.
- Akhmar, A. M., Rahman, F., Supratman, Hasyim, H., & Nawir, M. (2023). The cultural transmission of traditional ecological knowledge in Cerekang, South Sulawesi, Indonesia. *Sage Open*, 13(4), Article 21582440231194160. <https://doi.org/10.1177/21582440231194160>
- Angelsen, A., Jagger, P., Babigumira, R., Belcher, B., Hogarth, N. J., Bauch, S., Börner, J., Smith-Hall, C., & Wunder, S. (2014). Environmental income and rural livelihoods: A global-comparative analysis. *World Development*, 64, S12–S28. <https://doi.org/10.1016/j.worlddev.2014.03.006>
- Anju, T., & Kumar, A. (2024). Traditional ecological knowledge and medicinal plant diversity usage among the Mullu Kuruman tribes of Wayanad district of Kerala, India and its implications for biodiversity conservation in the face of climate change. *Trees, Forests and People*, 16, Article 100595. <https://doi.org/10.1016/j.tfp.2024.100595>
- Aronsson, A., Holm, F., & Kaul, M. (2020). Finding agency in nonhumans. *Relations Beyond Anthropocentrism*, 8, 7–14.
- Attanapola, C. T., & Lund, R. (2013). Contested identities of indigenous people: Indigenization or integration of the Veddas in Sri Lanka. *Singapore Journal of Tropical Geography*, 34(2), 172–187.
- Ban, N., Frid, A., Reid, M., Edgar, B., Shaw, D., & Siwallace, P. (2018). Incorporate Indigenous perspectives for impactful research and effective management. *Nature Ecology & Evolution*, 2, 1680–1683. <https://doi.org/10.1038/s41559-018-0706-0>
- Barreau, A., Ibarra, J. T., Wyndham, F. S., Rojas, A., & Kozak, R. A. (2016). How can we teach our children if we cannot access the forest? Generational change in Mapuche knowledge of wild edible plants in Andean temperate ecosystems of Chile. *Journal of Ethnobiology*, 36(2), 412–432. <https://journals.sagepub.com/doi/full/10.2993/0278-0771-36.2.412>
- Berkes, F. (2012). *Sacred ecology* (3rd ed.). Routledge. <https://doi.org/10.4324/9780203123843>
- Bijoy, C. R. (1999). Adivasis betrayed: Adivasi land rights in Kerala. *Economic and Political Weekly*, 34(22), 1329–1335.
- Cameron, L. (2022). Indigenous ecological knowledge systems—Exploring sensory narratives. *Ecological Management & Restoration*, 23(S1), 27–32. <https://doi.org/10.1111/emr.12534>
- Census of India. (2011). *Provisional population totals: Census of India 2011*. Office of the Registrar General & Census Commissioner, Ministry of Home Affairs, Government of India. <http://censusindia.gov.in>
- Chauhan, K. V. S., Sharma, A. K., & Kumar, R. (2008). Non-timber forest products subsistence and commercial uses: Trends and future demands. *The International Forestry Review*, 10(2), 201–216.
- Cheng, Y. (2014). Telling stories of the city: Walking ethnography, affective materialities, and mobile encounters. *Space and Culture*, 17(3), 211–223. <https://journals.sagepub.com/doi/abs/10.1177/1206331213499468>
- Cocks, M. L., Dold, T., & Vetter, S. (2012). “God is my forest”—Xhosa cultural values provide untapped opportunities for conservation: Research article. *South African Journal of Science*, 108(5-6), 52–59. <https://doi.org/10.10520/EJC120713>
- Demps, K., Zorondo-Rodríguez, F., García, C., & Reyes-García, V. (2012). Social learning across the life cycle: Cultural knowledge acquisition for honey collection among the Jenu Kuruba, India. *Evolution and Human Behavior*, 33(5), 460–470. <https://doi.org/10.1016/j.evolhumbehav.2011.12.008>
- Dressler, W., & Roth, R. (2011). The good, the bad, and the contradictory: Neoliberal conservation governance in rural Southeast Asia. *World Development*, 39(5), 851–862. <https://doi.org/10.1016/j.worlddev.2010.08.016>
- Edison, E., & Devi, R. (2019). Tribal land alienation, agricultural changes and food culture transition in Attappady. *South Asia Research*, 39(1), 61–77. <https://doi.org/10.1177/0262728018817858>
- Ens, E., Reyes-García, V., Asselin, H., Hsu, M., Reimerson, E., Reihana, K., Sithole, B., Shen, X., Cavanagh, V., & Adams, M. (2021). Recognition of indigenous ecological knowledge systems in conservation and their role to narrow the knowledge-implementation gap. In C. C. Ferreira & C. F. C. Klütsch (Eds.), *Closing the knowledge-implementation gap in conservation science: Interdisciplinary evidence transfer across sectors and spatiotemporal scales* (pp. 109–139). Springer. [https://doi.org/10.1007/978-3-030-81085-6\\_5](https://doi.org/10.1007/978-3-030-81085-6_5)
- Fernández-Llamazares, Á., Lepofsky, D., Lertzman, K., Armstrong, C., Brondizio, E. S., Gavin, M., Lyver, P., Nicholas, G., Pascua, P., Reo, N., Reyes-García, V., Turner, N., Yletyinen, J., Anderson, E., Balée, W., Cariño, J., David-Chavez, D., Dunn, C., Garnett, S. C., ... Vaughan, M. (2021). Scientists’ warning to humanity on threats to Indigenous and local knowledge systems. *Journal of Ethnobiology*, 41, 144–169. <https://doi.org/10.2993/0278-0771-41.2.144>
- Fijn, N. (2014). Sugarbag dreaming: The significance of bees to Yolngu in Arnhem Land, Australia. *Humanimalia*, 6(1), Article 1. <https://doi.org/10.52537/humanimalia.9927>
- Fletcher, M.-S., Hamilton, R., Dressler, W., & Palmer, L. (2021). Indigenous knowledge and the shackles of wilderness. *Proceedings of the National Academy of Sciences of the United States of America*, 118, Article e2022218118. <https://doi.org/10.1073/pnas.2022218118>
- Kerala Forest Statistics. (2021). Statistics wing, Forest headquarters. Kerala Forest Department, Thiruvananthapuram.
- Fuentes, T. E., Binnquist, C. L., Peña, F. B., Velázquez-Rosas, N., Nicolalde-Morejón, F., Martínez-Domínguez, L., & Blancas, J. (2023). Ritual use of *Ceratozamia totonacorum* (Zamiaceae) leaves in Santiago Ecotlán, Puebla, Mexico: Perspectives on conservation. *Journal of Ethnobiology*, 43(4), 317–327.
- Gómez-Baggethun, E. (2021). Is there a future for indigenous and local knowledge? *The Journal of Peasant Studies*, 49(6), 1139–1157. <https://doi.org/10.1080/03066150.2021.1926994>
- Haokip, T., & Aiyadurai, A. (2023). Thinghang Lou: Linkages between swidden, culture, and ecology in Manipur, Northeast India. *Journal of Ethnobiology*, 43(4), 386–393. <https://doi.org/10.1177/02780771231211381>
- Hazarika, T. K., & Pongener, M. (2018). Potential wild edible fruits of Nagaland, North-east India and its significance in the livelihood and nutritional security of rural, indigenous people. *Genetic Resources and Crop Evolution*, 65(1), 199–215. <https://doi.org/10.1007/s10722-017-0523-3>
- Hazarika, T. K., & Singh, T. S. (2018). Wild edible fruits of Manipur, India: Associated traditional knowledge and implications to sustainable livelihood. *Genetic Resources and Crop Evolution*, 65(1), 319–332. <https://doi.org/10.1007/s10722-017-0534-0>
- Héger, M., Noiset, P., Nkoba, K., & Vereecken, N. J. (2023). Traditional ecological knowledge and non-food uses of stingless bee honey in Kenya’s last pocket of tropical rainforest. *Journal of Ethnobiology and Ethnomedicine*, 19(1), Article 42. <https://doi.org/10.1186/s13002-023-00614-3>
- Herrmann, T. M. (2006). Indigenous knowledge and management of *Araucaria araucana* forest in the Chilean Andes: Implications for native forest conservation. *Biodiversity and Conservation*, 15(2), 647–662. <https://doi.org/10.1007/s10531-005-2092-6>
- Hill, R., Nates-Parra, G., Quezada-Euán, J. J. G., Buchori, D., LeBuhn, G., Maués, M. M., Pert, P. L., Kwapong, P. K., Saeed, S., Breslow, S. J., Carneiro da Cunha, M., Dicks, L. V., Galetto, L., Gikungu, M., Howlett, B. G., Imperatriz-Fonseca, V. L., Lyver, P. O. B., Martín-López, B., Oteros-Rozas, E., ... Roué, M. (2019). Biocultural approaches to pollinator conservation. *Nature Sustainability*, 2(3), 214–222. <https://doi.org/10.1038/s41893-019-0244-z>
- Htoo, M. H. C., Steenhuisen, B., & Verschuuren, B. (2022). The role of spirits in Indigenous ontologies and their implications for forest conservation in Karen State, Myanmar. In C. Coggins & C. Bixia (Eds.), *Sacred forests of Asia* (pp. 246–260). Routledge.
- Ingold, T. (1996). Hunting and gathering as ways of perceiving the environment. In R. F. Ellen & K. Fukui (Eds.), *Redefining nature: Ecology, culture and domestication* (pp. 117–155). Routledge.
- Jerin, V., Lazarus, T. P., & Gopinath, P. P. (2023). Price behaviour of selected non-timber forest products in Kerala. *The Pharma Innovation Journal*, 12(12S), 1819–1827.
- Jolly, H., Satterfield, T., Kandlikar, M., & Suma, T. (2022). Indigenous insights on human–wildlife coexistence in southern India. *Conservation Biology*, 36(6), Article e13981.
- Kakkoth, S. (2005). The primitive tribal groups of Kerala: A situational appraisal. *Studies of Tribes and Tribals*, 3(1), 47–55. <https://doi.org/10.1080/0972639X.2005.11886519>

- Kim-Cohen, S. (2009). *In the blink of an ear: Toward a non-cochlear sonic art*. Bloomsbury Publications. <https://www.bloomsbury.com/in/in-the-blink-of-an-ear-9781441183071/>
- Kjosavik, D. J., & Shanmugaratnam, N. (2021). The persistent Adivasi demand for land rights and the Forest Rights Act 2006 in Kerala, India. *Social Sciences*, 10(5), Article 5. <https://doi.org/10.3390/socsci10050158>
- Kohn, E. (2007). How dogs dream: Amazonian natures and the politics of transspecies engagement. *American Ethnologist*, 34(1), 3–24. <https://doi.org/10.1525/ac.2007.34.1.3>
- Krishnakumar, J., Fox, J., & Anitha, V. (2012). Non-timber forest products: Livelihoods and conservation. *Economic and Political Weekly*, 47(52), 132–139.
- Kurien, J. (1995). The Kerala model: Its central tendency and the outlier. *Social Scientist*, 23(1/3), 70–90. <https://doi.org/10.2307/3517892>
- Levang, P., Lescuyer, G., Noumbissi, D., Dehu, C., & Broussolle, L. (2015). Does gathering really pay? Case studies from forest areas of the East and South regions of Cameroon. *Forests, Trees and Livelihoods*, 24(2), 128–143. <https://www.tandfonline.com/doi/abs/10.1080/14728028.2014.1000980>
- Loperena, C. A. (2016). Conservation by racialized dispossession: The making of an eco-destination on Honduras's North Coast. *Geoforum*, 69, 184–193. <https://doi.org/10.1016/j.geoforum.2015.07.004>
- Low, K. E. (2005). Ruminations on smell as a sociocultural phenomenon. *Current Sociology*, 53(3), 397–417.
- Madhavan, S. (2020). Adivasis and land the story of postcolonial development in Kerala. *Economic and Political Weekly*, 55(30), 48–54.
- Manjusha, K. A., & Jojo, B. K. (2023). Land alienation and subversion strategies on land rights: Perspectives from Attappady. *Journal of Land and Rural Studies*, 11(1), 7–18. <https://doi.org/10.1177/23210249221129389>
- Matias, D. M. (2017). *Sustainability of community forestry enterprises: Indigenous wild honey gathering in the UNESCO Man and Biosphere Reserve Palawan, Philippines* (Doctoral dissertation). Rheinische Friedrich-Wilhelms-Universität Bonn.
- McElwee, P. D. (2012). Payments for environmental services as neoliberal market-based forest conservation in Vietnam: Panacea or problem?. *Geoforum*, 43(3), 412–426. <https://doi.org/10.1016/j.geoforum.2011.04.010>
- Mistry, J., & Berardi, A. (2016). Bridging indigenous and scientific knowledge. *Science*, 352, 1274–1275. <https://doi.org/10.1126/science.aaf1160>
- Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A step-by-step process of thematic analysis to develop a conceptual model in qualitative research. *International Journal of Qualitative Methods*, 22, Article 16094069231205789.
- Nath, S. (2014). *Honey collection and marketing in India*. Keystone Foundation.
- Naveh, D., & Bird-David, N. (2014). How persons become things: Economic and epistemological changes among Nayaka hunter-gatherers. *Journal of the Royal Anthropological Institute*, 20(1), 74–92. <https://doi.org/10.1111/1467-9655.12080>
- Pascual, U., Balvanera, P., Anderson, C. B., Chaplin-Kramer, R., Christie, M., González-Jiménez, D., Martín, A., Raymond, C. M., Termansen, M., Vatn, A., Athayde, S., Baptiste, B., Barton, D. N., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Mwampamba, T. H., Nakangu, B., ... Zent, E. (2023). Diverse values of nature for sustainability. *Nature*, 620(7975), 813–823. <https://doi.org/10.1038/s41586-023-06406-9>
- Pellissery, S., Raja, K., & James, A. (2012). Market integration for inclusive growth: Insights from sociology of the market. *Review of Market Integration*, 4(1), 45–69. <https://journals.sagepub.com/doi/10.1177/097492921200400102>
- Piya, L., Maharjan, K. L., & Joshi, N. P. (2011). Forest and food security of Indigenous people: A case of Chepangs in Nepal. *Journal of International Development and Cooperation*, 17(1), 113–135.
- Pokorny, B., Johnson, J., Medina, G., & Hoch, L. (2012). Market-based conservation of the Amazonian forests: Revisiting win-win expectations. *Geoforum*, 43(3), 387–401. <https://doi.org/10.1016/j.geoforum.2010.08.002>
- Reyes-García, V., & Benyei, P. (2019). Indigenous knowledge for conservation. *Nature Sustainability*, 2, 657–658. <https://doi.org/10.1038/s41893-019-0341-z>
- Reyes-García, V., Paneque-Gálvez, J., Bottazzi, P., Luz, A. C., Guezé, M., Macía, M. J., Orta-Martínez, M., & Pacheco, P. (2014). Indigenous land reconfiguration and fragmented institutions: A historical political ecology of Tsimane' lands (Bolivian Amazon). *Journal of Rural Studies*, 34, 282–291. <https://doi.org/10.1016/j.jrurstud.2014.02.007>
- Saariinen, J. (2016). Wilderness use, conservation and tourism: What do we protect and for and from whom?. *Tourism Geographies*, 18(1), 1–8. <https://doi.org/10.1080/14616688.2015.1116599>
- Sathyapalan, J. (2010). Implementation of the Forest Rights Act in the Western Ghats region of Kerala. *Economic and Political Weekly*, 45(30), 65–72.
- Saunders, F. P. (2013). Seeing and doing conservation differently: A discussion of landscape aesthetics, wilderness, and biodiversity conservation. *The Journal of Environment & Development*, 22(1), 3–24. <https://doi.org/10.1177/1070496512459960>
- Senanayake, S. (2006). Indigenous knowledge as a key to sustainable development. *Journal of Agricultural Sciences*, 2(1), 87–94. <https://doi.org/10.4038/JAS.V2I1.8117>
- Setalaphruk, C., & Price, L. L. (2007). Children's traditional ecological knowledge of wild food resources: A case study in a rural village in Northeast Thailand. *Journal of Ethnobiology and Ethnomedicine*, 3(1), Article 33. <https://doi.org/10.1186/1746-4269-3-33>
- Shaanker, R. U., Ganeshiah, K., Krishnan, S., Ramya, R., Meera, C., Aravind, N., Kumar, A., Rao, D., Vanaraj, G., Ramachandra, J., Gauthier, R., Ghazoul, J., Poole, N., & Chinappa Reddy, B. (2005). Livelihood gains and ecological costs of non-timber forest product dependence: Assessing the roles of dependence, ecological knowledge and market structure in three contrasting human and ecological settings in south India. *Environmental Conservation*, 31(3), 242–253. <https://doi.org/10.1017/S0376892904001596>
- Shackleton, S., Shanley, P., & Ndoye, O. (2007). Invisible but viable: Recognising local markets for non-timber forest products. *International Forestry Review*, 9(3), 697–712. <https://doi.org/10.1505/ifer.9.3.697>
- Shiva, M. P., & Verma, S. K. (2002). *Approaches to sustainable forest management and biodiversity conservation: With pivotal role of non timber forest products*. International Book Distributors.
- Snook, L., Alves, T., Sousa, C., Loo, J., Gratzner, G., Duguma, L., Schrotter, C., Ribeiro, N., Mahanzule, R., Mazuze, F., Cuco, E., & Elias, M. (2015). *Relearning traditional knowledge to achieve sustainability: Honey gathering in the miombo woodlands of northern Mozambique*. XIV World Forestry Congress, Durban, South Africa, 7–11 September 2015.
- Somnasang, P., & Moreno-Black, G. (2000). Knowing, gathering and eating: Knowledge and attitudes about wild food in an Isan village in Northeastern Thailand. *Journal of Ethnobiology*, 20(2), 197–216.
- Swain, M. B. (2004). (Dis)embodied experience and power dynamics in tourism research. In J. Phillimore & L. Goodson (Eds.), *Qualitative research in tourism: Ontologies, epistemologies and methodologies* (pp. 102–118). Routledge.
- Sylvander, N. (2021). 'Territorial cleansing' for whom? Indigenous rights, conservation, and state territorialization in the Bosawas Biosphere Reserve, Nicaragua. *Geoforum*, 121, 23–32. <https://doi.org/10.1016/j.geoforum.2021.02.013>
- Tsing, A. L. (2003). Cultivating the wild: Honey-hunting and forest management in southeast Kalimantan. In C. Zerner (Ed.), *Culture and the question of rights: Forests, coasts, and seas in Southeast Asia* (pp. 24–55). Duke University Press.
- Turner, N. J., Łuczaj, L. J., Migliorini, P., Pieroni, A., Dreon, A. L., Sacchetti, L. E., & Paoletti, M. G. (2011). Edible and tended wild plants, traditional ecological knowledge and agroecology. *Critical Reviews in Plant Sciences*, 30(1–2), 198–225.
- Usher, P. J. (2000). Traditional ecological knowledge in environmental assessment and management. *Arctic*, 53(2), 183–193.
- van der Wal, J. E. M., Gedi, I. I., & Spottiswoode, C. N. (2022). Awer honey-hunting culture with greater honeyguides in coastal Kenya. *Frontiers in Conservation Science*, 2, Article 727479. <https://doi.org/10.3389/fcosc.2021.727479>
- Varghese, A., Nath, S., Leo, R., & Thomas, S. G. (2015). The road to sustainable harvests in wild honey collection: Experiences from the Nilgiri Biosphere Reserve, Western Ghats, India. In C. M. Shackleton, A. K. Pandey, & T. Ticktin (Eds.), *Ecological sustainability for non-timber forest products: Dynamics and case studies of harvesting* (pp. 103–115). Routledge.
- Virtanen, P. K. (2019). Ancestors' times and protection of Amazonian Indigenous biocultural heritage. *AlterNative: An International Journal of Indigenous Peoples*, 15(4), 330–339.
- Volpato, G., & King, E. G. (2023). Tracking changes in social-ecological entanglements: Beekeeping among the Maa-speaking pastoralists of Laikipia,

- Kenya. *Regional Environmental Change*, 23(4), 137. <https://doi.org/10.1007/s10113-023-02133-z>
- Wyndham, F. S. (2009). Spheres of relations, lines of interaction: Subtle ecologies of the Rarámuri Landscape in Northern Mexico. *Journal of Ethnobiology*, 29(2), 271–295. <https://doi.org/10.2993/0278-0771-29.2.271>
- Yunkaporta, T. (2020). *Sand talk: How indigenous thinking can save the world*. Harper Collins Publications.

## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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