

The Selective Persistence of Local Ecological Knowledge: Honey Collecting with the Jenu Kuruba in South India

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Introduction

A jungle tribe, the Jenu-Kurubas gather the honey in the month of June. Having hit upon a hive in a hollow tree, they tie a bamboo, the short cut branches of which form a convenient ladder, to the tree during the day time and at night, provided with a basket attached to a long rope and lined with leaves, they climb up with a strongly smoking torch which they hold near the hive. The alarmed and half stunned bees fly away and their honeycombs are removed and let down in the basket. Whilst thus engaged, the Kurubas have a peculiar song, made

for the occasion and expressing their feigned sympathy with the spoiled bees, so rudely disturbed of their nightly rest. (Richter 1870: 73)

Honey collection has seemingly changed little among the forest dwelling Jenu Kuruba in Kodagu, Southwest India, although many changes have come to the subcontinent since the time of the British Raj. The introduction of automobiles, cell phones, and cheap plastic can seem to overwhelm local cultural diversity with foreign influences. Yet some traditions remain extraordinarily stable across generations even in the absence of written records and formal instruction. Cultural evolution theory addresses how cultural traits within a population persist through interaction among ecological, social, and individual influences (Boyd and Richerson 1985). When population- and individual-level factors both promote the continued motivation to learn a cultural trait and constant access to demonstrators, then we expect to see long-term persistence. If either of these processes is unsupportive to cultural transmission, either no motivation to learn or nobody to learn from, then we expect to see change in and loss of cultural knowledge over time.

In the first part of this paper, we examine the current ecological and sociological pressures on the transmission of honey collecting knowledge. We show how this body of cultural knowledge is correlated to its compatibility with other skills, preferences and norms, learning context, and the current state of the environment. Henrich and Henrich (2010) demonstrate the adaptive value of Fijian food taboos during pregnancy and breastfeeding due to selective learning on the part of mothers who copy the knowledge of elder kin and prestigious individuals in their community. However, the researchers do not attempt to understand how factors outside this narrow cultural domain can affect the acquisition of food taboos. Current studies of social learning and cultural evolution tend to favor quantitative models that often neglect

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the context of a bit of knowledge in the greater cultural complex and the non-independence of cultural transmission.

In the second part of the paper, we look at the personal process of social learning. Unlike genes, cultural information can be acquired through many social routes, some of which maintain stability in a body of knowledge in the face of change better than others. Barth (1990) has shown how the transmission of specialized ritualistic knowledge via the ‘conjurer’ teaching style in Melanesia contrasts with the ‘guru’ style of southeast Asia, with great consequences for the distribution of ritualistic knowledge. The guru style of learning leads to a more stable and less geographically diverse body of knowledge over time. Similarly, in this case study with the Jenu Kuruba, we analyze the factors and processes that lead to the preservation of cultural diversity over time.

Ecological and Social Context of the Study Site

The district of Kodagu is a hill station in the Western Ghats on the southern border of Karnataka, southwest India. Set in one of the 34 biodiversity hotspots in the world (Conservation International 2011), the region boasts many protected areas, including Rajiv Gandhi Nagarhole National Park, as well as a thriving adivasi (“first dweller”) population. The weather and topography of Kodagu make the region well suited for coffee cultivation. Temperatures fluctuate between 28°C in the summer and 11°C in the winter with an annual 1200 mm of rainfall—most of that coming from the southwest monsoon from June–August (Vaast *et al.* 2009). In addition to coffee, Kodagu is also known for its honey production, which is at its peak at the beginning of the southwest monsoon (May–June). A second, less abundant honey season comes in November and December just before the little rains of the northeast monsoon.

Honey collecting has been and still is an important economic and ritualistic activity for the Jenu Kuruba, who number about 30,000 individuals living in and around the reserve forests in the state of Karnataka (Census of India 2001). *Jenu* means honey in the local dialect. Although some Jenu Kuruba have migrated to cities and towns, many continue to live in the forest supplementing wage labor on coffee estates with household cultivation of rice, coffee, and sweet potato. The Jenu Kuruba also collect minor forest products, such as fruit, bamboo, mushrooms, tubers, tree moss, a pod called seege kai (*Acacia sinuata*), and of course, honey. Most villages are located 0–5 km inside forest boundaries where indigenous (adivasi) populations now have rights to dwell (Macura *et al.* 2011).

The Reserve Forests (RF), currently covering 30% of Kodagu, were created by the Karnataka Forest Department in 1878 to manage timber production (IMFN 2008; Macura *et al.* 2011). Rights for adivasi populations were codified regionally when the RFs were created, but have generally been restricted to gathering firewood and grazing cattle. Previously,

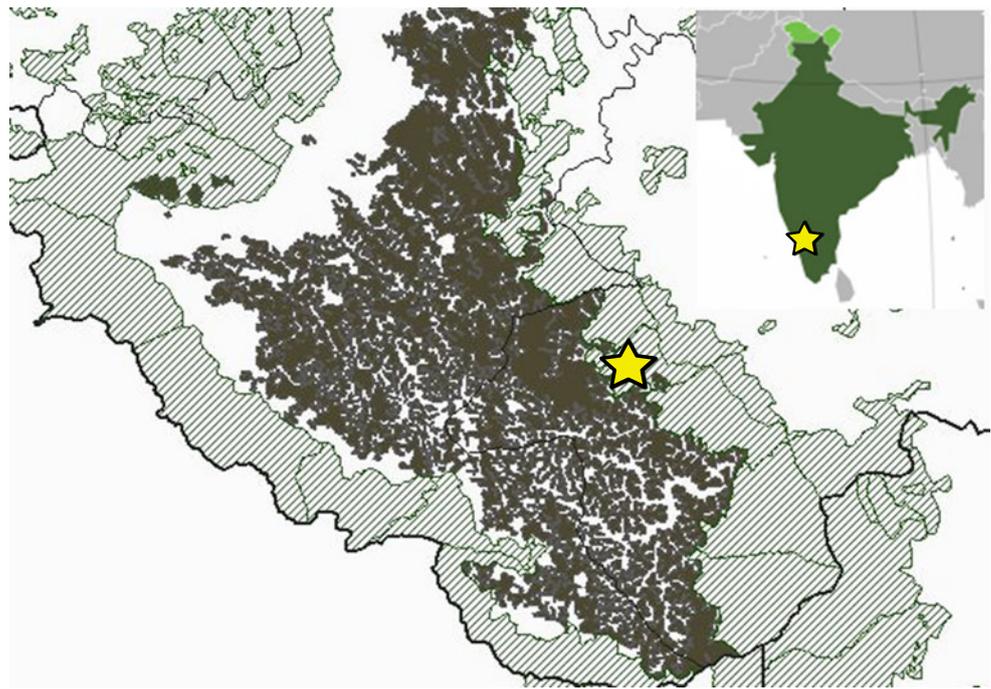
many activities such as gathering minor forest products and hunting may have been tacitly allowed in some RFs. But when the *raison d’être* of the RF changed to that of conservation, many communities were shifted to forest boundaries in the last 50 years and saw banned activities more strictly monitored.

As a nation-wide response to the curtailed rights of adivasi populations, The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act was passed in 2006. This gives adivasis rights to inhabit forest areas, collect minor forest products, use the products of rivers and lakes, and to graze animals. It also guarantees communal rights to intellectual property and traditional knowledge, and rights for the clearance of land for government funded facilities such as roads, schools, fair price shops, and electric lines. This Act ensures continued access to the forest and rights to collect honey to the forest-dwelling Jenu Kuruba. By the end of the fieldwork period in December 2009, government surveyors had visited the study site to initialize the process that will grant individual titles to parcels of land inside the RF, and the infrastructure had been put in place for electricity although it was not connected. The other relevant government program, with three locations in Kodagu, is the Large Scale Adivasi MultiPurpose society (LAMPs)—a cooperative for selling minor forest products such as honey at a fair price. A LAMPs pass gives official permission to collect minor forest products and LAMPs offices will process and sell the forest products collected by adivasis, who receive a share of the profit. The society also tries to motivate collectors by offering prizes.

Traditional-style villages tend to be sprawling affairs. Households are surrounded by a swept patio with garden areas or tracts of forest between them to maintain independence and privacy. People build their homes with thatch roofs and bamboo-slat walls. They own only a few material items besides clothes and cooking implements. Sometimes close kin will build houses in clusters of two or three with a shared patio area. Non-traditional villages are government built resettlement areas on the edge of protected areas where rows of concrete houses have narrow pathways between them and front doors looking into one another. Usually, people from non-traditional villages are immersed in the local modern system, where the tribal individuals are often working in remunerated jobs (Laval 2008). These resettlement areas are a consequence of a long and complicated relationship between the Karnataka Forest Department and adivasi populations (Dowie 2011).

We chose a collection of five villages situated 1–3 km inside the RF adjacent to the National Park (Fig. 1). These are traditional-style villages where people have continued access to the forest, yet have fewer restrictions from the Forest Department than communities inside the National Park. Two of the five villages are inaccessible except by foot in the rainy season, and are about a 20–40 min walk from the road. None of the villages had running water or electricity. Since the time

Fig. 1 Map of land use in the district of Coorg, Karnataka. Star indicates location of villages. Green hatchings show reserve forests; dark grey fill, area under coffee cultivation. (Data from French Institute of Pondicherry, 1997)



of Richter's writing, the Jenu Kuruba have seen many attempts to influence their use of the forest.

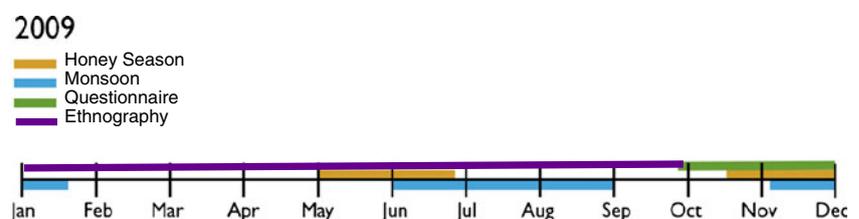
Methodology

We combined qualitative ethnographic and participant observation, structured and unstructured interviews on honey collecting, and a population-wide questionnaire. The lead author visited 28 Jenu Kuruba villages in Kodagu in Jan–Mar 2009 to select the field site, ask about honey collecting, and gauge variation in the socioecological context of the region. We selected the field site on the basis of continued honey collecting behavior—one of the first requirements of informal social learning is access to the learning environment (Ruddle and Chesterfield 1977). KD settled into Chottepare, one of a cluster of five villages, and used the major honey season in May and June to accompany collectors on honey collecting trips and fleshed out observations with interviews structured around the question, “What does one need to know to have a successful honey collecting event?” She also performed a census of the five villages at the study site to gather information

on population size, age, education, and honey collecting experience. Interactions occurred in the local dialect of Kannada with an experienced translator (Fig. 2).

Near the end of the fieldwork year (Fig. 2) we used our previous observations and experience to construct a questionnaire, which KD circulated during the minor honey season. From the five villages in our sample, KD interviewed 90% of the men who had ever collected honey (≥ 16 years old, $n=91$), and 90% of the boys ($n=56$). All questionnaire items were pre-tested with an independent sample. The questionnaire included four sections: 1) honey collecting experience, 2) prestige rankings, 3) social learning, and 4) expectations for the future. In the section on honey collecting experience, we asked informants about their last honey collecting trip and what type of honey they collected, how many stings they had, about any allergic reactions, and whether they like honey collecting. In the section on prestige ranking, we had people free list respected individuals in the community and elicited the reason for their prestige (Bernard 2006). To understand patterns of social learning, we asked people, “How did you learn to... (climb trees, make a smoky torch, cut the honey combs, sing a honey collecting song)?” Finally expectations about honey collecting in the

Fig. 2 Schedule of activities during the year of fieldwork



future: “Was there more or less honey in the forest 30 years ago?” “Why is there more/less honey in the forest now?”

Social Organization and Behavioral Norms

Flexibility seems to be the key to the Jenu Kuruba social environment. Social norms promote inter-personal independence, and knowledge, beliefs, values, and skills are taken to be highly individualistic matters. Even the names for the forest can vary among people according to its personal significance. Women avoid moving in the forest for reasons of personal security and gender expectation and refer to it merely as *kadu*, meaning “forest” in Kannada. Men who pass through the forest on their way to work also label it as *kadu*, but men who spend more time in the forest and depend on it more heavily for their livelihood have over 25 names for parts of the forest. Children may learn these names or make up their own as they desire. There is no insistence on teaching or semantic conformity, though there can be consensus due to the necessity of shared understanding.

The Jenu Kuruba are also nominally patrilineal, though lineages have little meaning outside of organizing marriages and people have trouble recalling kin greater than two generations removed. Couples marry between the ages of 14 and 20, initially living virilocally and then moving to a nearby neolocal residence sometime after the birth of the first child. Elders try to maintain independence and receive assistance from their kin only when absolutely necessary. Social norms prohibit eating food in the house of a married child or sibling. Gift giving between non-related adults is minimized to avoid creating obligations.

In terms of power relationships, informal leadership predominates through the exercise of influence (Johnson and Earle 2000). When we asked informants to list individuals by degree of prestige, those who “helped out others” were listed far more often than wealthy or elderly individuals. Age and gender form the major structural hierarchies. Kin terms are added as a suffix to personal names when addressing senior relatives of both genders. Women are generally expected to be domestically subservient, as *yajamana* means both husband and village headman.

The Learning Environment of Honey Collecting

Four different species of honey bees live in the dry deciduous forests of Kodagu, ranging in size from 0.5 to 3 cm. The smallest species is a stingless bee known as *nasarajenu* (*Trigona* spp.), which builds its hives in hollow bamboo stems. A colony can contain up to 1 kg of honey believed to have medicinal properties. The second smallest bee, *Apis florae*, is known as *koljenu*, or sometimes as *kaddijenu*, stick-bee, because it makes its hives in dense shrubs or small tree cavities. *Koljenu* hives can produce 1–3 kg of honey. This is often the first kind of

honey that children learn to collect because it is easily accessible and application of a little smoke will expose the comb by dislodging its blanket of protective bees.

The next largest bee, *thudujejenu* (*Apis cerana*) is about the same size and temperament as the Western honey bee. This bee nests in dark, enclosed places like tree cavities and old termite mounds from which it derives its alternate name *uttajenu*, or anthill-bee. *Thudujejenu* colonies can produce several kilograms of thick, amber honey in moderately accessible combs. Combs can be found without climbing trees, and like the smaller bee species, the smoke from a cigarette is enough to subdue the hive. Steadiness of hand and a calm demeanor is all one needs to slowly detach and remove the honeycombs for these species.

Beehives and bee trees are not considered personal property among the Jenu Kuruba. When a man finds a *thudujejenu* hive, he blows softly into the cavity opening to assess how many bees are in the colony and thus how much honey there will be. If he hears only a subdued buzzing, he decides the honey is not ready yet and will keep the location a secret. He will return to check the hive later on, although there is a risk that someone else might discover the hive. There are few beehives near the village because new colonies are quickly spotted. The discoverer knows other people may harvest it, so the combs are often raided before there is an optimum amount of honey.

The largest species, known as *hejjenu* (*Apis dorsata*), is the giant honey bee indigenous to south and southeast Asia. In the forests of Kodagu, this bee makes large exposed combs on the underside of high, sturdy tree branches. Colonies can produce 10–30 kg of honey that is thinner and paler than *thudujejenu* honey. Bee stings from *hejjenu* are extremely painful and add an extra element of risk to an activity that already takes place 10–40 m off the ground. Because of this, *hejjenu* honey is collected at night when the bees are less active. In order to collect *hejjenu* honey a large quantity of thick smoke is necessary, and the collector must climb out onto a branch and use a long knife to detach the combs into a basket. Great skill and courage is needed to do this in the midst of a swarm of large, angry bees.

At least two people are required to collect *hejjenu* honey, but groups of 3–8 are the most common. When foraging tasks are cooperative, group composition matters because it affects who instructs whom. In group activities, the division of labor for some tasks means that different types of knowledge will have different learning pathways. Men divide up the tasks into (a) cutting the honey combs, (b) making and holding the smoky torch, (c) assisting lowering the baskets of honey and bringing up new baskets, and (d) processing and storing the honey in containers. Honey collectors can shift tasks between trips, although specialization often occurs with some people preferring or being unsuited to certain tasks. For example, risk-prone young men in their mid-20’s at the peak of their tree climbing abilities usually cut the honey combs (Dempsey *et al.* 2012). Once men reach the age of 40 or so, their tree climbing ability has declined.

Similarly, some men are known for making the best smoky torches, and some prefer to raise and lower the baskets. Singing a honey collecting song for hejjenu is, in contrast, a joint endeavour. Few people know a whole song from memory, but many can sing along with others. Men do not begin learning songs until their late teens, when they are capable of climbing the big trees. Groups containing older men will usually sing songs, while groups with only young men may neglect this aspect of honey collecting either through disinterest or lack of knowledge.

Regardless of their role, the honey is divided evenly among all participants and there are no requirements or proscriptions for inclusion in a collecting event. The wax is sometimes saved for household purposes (mending pots, for example), and the honey is placed into bottles or tins. Although honey can store well for over a year, it is usually either sold or eaten by the collector's relatives in a shorter time. Sometimes people save small amounts for medicinal purposes. It is common to heat honey with a variety of herbs and spices to make medicine for a cough or cold. The concoctions are made and the medicine consumed in the home.

Because collecting honey can be periodically quite lucrative people often combine wage labor on the coffee estates and cultivation for household consumption with extraction of forest products. A flexible wage labor system allows individuals to work when they desire, for the most part according to their knowledge, skill, and preferences. Hejjenu sells for 60–80 Rs per kilogram and thudujejenu fetches about 100 Rs/kg. (In 2009, 50 Rupees were roughly equal to 1 US\$.) During the months of October and November, household heads ($n=64$) reported income from forest products varying between 0 and 6000 Rs for the previous 2 weeks. Forest products were responsible for 0–100% of total income during that period. Wage labor could bring 1200 Rs/week for men (125 Rs/day, 6 days/week); thus successful honey collecting can easily exceed a day's or several days' wages. When people collect enough honey, they will make the 15 km trip to the LAMP society. Otherwise they will sell to local shops and middlemen for a lower price. A skilled or interested honey collector will take off several days a week from wage labor to search for and collect honey in the forest, others may only collect opportunistically while en route to and from work.

Honey collecting seems to be transitioning away from a spiritual and subsistence activity to a profitable economic pursuit, especially for younger men. This has contributed to the preservation of collection-related skills and knowledge, but not maintenance of its spiritual aspects (Demps *et al.* 2012). One collector compares the loss of traditional medicinal knowledge to honey collecting: “now no one knows [traditional medicine] because there is no demand to buy the plants, like there is for honey.” Another informant remarked that “now people treat honey collecting like a job. People

used to sing songs when they went. I don't know any of the songs my father used to sing.” Participation in a market economy has often been observed to drive the loss of traditional ecological knowledge, except in the cases where people have continued access to local resources and cultural reasons for its persistence (Godoy *et al.* 2009; Gómez-Baggethun *et al.* 2010; Reyes-García *et al.* 2012). For now, economic motivation ensures that the practical aspects of honey collection are being maintained in this population, unlike some other domains of specialized knowledge.

Most all specialized traditional medicinal knowledge has already been lost. About 50% of adults (men and women) at the study site know how to make a home remedy for a cough or cold with honey. Out of all 28 villages that we visited, we could find no one who knew the specialized medicinal knowledge that used to be practiced by gurus. Specialized traditional medicinal knowledge is transferred through a single line of guru and apprentice. If transmission fails for one generation, the knowledge is lost. The last curing ritual took place in 1985. No apprentices were trained for the next generation and now the knowledge has been entirely lost. Because home remedies can be learned and taught by many different people, if one or two or even more people do not learn the recipe, there are still many more cultural demonstrators available. It is a combination of economic motivation to collect honey and a flexible transmission system that maintains this knowledge.

Interpersonal Variation in Ability and Learning Context

Different types of knowledge can have different transmission pathways, and these affect the stability of different types of knowledge over time. Two things chiefly determine which bits of culture an individual acquires: 1) what a person is able to learn, and 2) from whom they learn it. Some men do not learn to cut hejjenu combs because they are risk-averse, they might instead focus on making smoke. Likewise, a man living in a village outside the forest might never encounter a person who can teach him to cut the hejjenu combs. Variation in cultural knowledge among individuals affects the overall distribution of knowledge in the population.

A biological constraint on honey collecting is an allergic reaction to bee stings. Out of the men and boys with honey collecting experience who participated in the questionnaire, 16.4% claim to have a moderate to severe allergy to bee stings. With a reported average of 4–5 stings per collecting event (8–9 for hejjenu, 4 for thudujejenu, and 1–2 for koljenu), it is not likely that a collector will escape unharmed. One of the most active collectors explained that he no longer feels the bee stings because he has been stung so many times. Yet we also encountered two men who had stopped collecting because of the bee stings. Thus, physiological differences inherited or developed through the lifecycle can affect behavioral acquisition.

Personal preferences also play a role in the self-selection of honey collectors. Not all boys who collect honey will collect as adults, and some adults only do minor honey collecting. When we asked children with honey collecting experience ($n=20$) whether they liked it, 61% replied positively. Among men ($n=94$), this number jumps to 81%. We asked the nine men who had not collected honey in the last 5 years why they stopped: three reported that they had gotten too old, three said they work on the coffee estates now, two men reported being afraid and disliking the bee stings, and one person was crippled from a fall out of a tree. With several economic pursuits to choose from, personal preferences can easily affect learning motivation, especially in a society such as this where learning will only occur if one shows an interest. Economic opportunities also influence why people start collecting honey. There are two economic groups in these villages: a small minority of men who do not have to collect forest products, and a majority of those who do or have in the past. The sons of members in the first group are not motivated to learn honey collecting skills and they do not attribute prestige to honey collecting.

In addition to personal attributes and preferences, an individual's social context is very important. A novice honey collector can only observe those people to whom he is physically near. As we have said, most people spend a good deal of time around same-sex kin. Some people might live in the same village with a very successful collector from whom they have the opportunity to learn. We observed this interpersonal variation by asking people about how they acquired their knowledge of the four honey collecting skills (Fig. 3).

Unsurprisingly, there is a great deal of variation in how the Jenu Kuruba learn to collect honey. As one collector said, "Some people will learn just by watching others, other people you have to teach." No skill is passed on only through teach-

ing, observation, or hands-on learning; there is variation both within and between skills transmission. Tree climbing, which must be practiced, has the greatest number of hands-on learners. Like many athletic abilities, watching others and coaching can help improve technique, but one must ultimately devote a lot of time to personal training. Singing the honey song, on the other hand, cannot be learned on one's own, and arises from a combination of teaching and observation. Fathers, brothers and elder kin all appear as important teachers, but no one category dominates (Demps *et al.* 2012). Friends are important only for tree climbing. This makes sense because children practice with peers at a similar skill level. Availability of kin, access to knowledgeable demonstrators, age of learning and willingness of demonstrators to tolerate the presence of a naive person will all influence which social learning strategies are possible.

While the population-level factors mentioned in the first part of this paper have an impact on the proliferation of a behavior, it ultimately falls to the individuals in a society to learn and transmit the components of that behavior between generations. Ability, the desire to learn and practice, and social context providing opportunities and motivation for learning all interact to determine if and how a person collects honey. Fortunately, this heterogeneity has minor affects on the transmission of honey collecting as a whole because a wide variety of learning strategies are used. This flexible system of social learning contributes to a high transmission of knowledge between generations. Young men can choose whom they will observe, although they will usually accompany close kin. The collectivistic behavior of singing the honey song is disappearing because it needs to be performed in concert with other individuals and spiritual activities are no longer closely tied to success at honey collecting.

Fig. 3 Self-reported demonstrators for socially learned honey collecting skills. Column widths represent proportion of responses for each skill category and sample sizes are labeled inside each box. Data from individuals aged 6 years and up who report knowing the skills

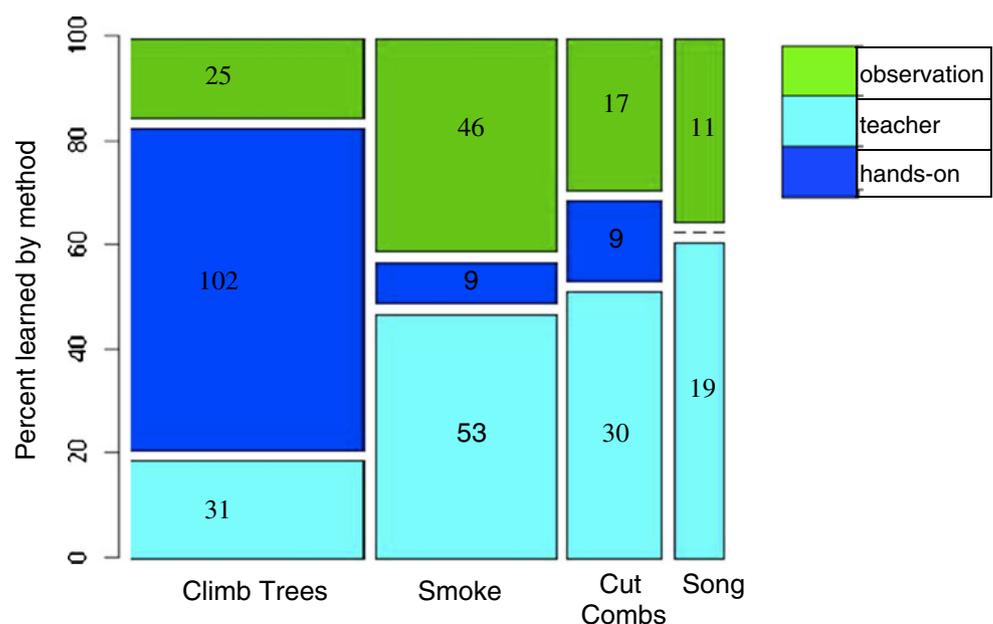


Table 1 Explanations for decreasing amount of honey in the RF

Why is there less honey in the forest now?	Percent responses (n=121)
Forest fires	52%
Bee disease	14%
Pesticides on coffee estates	13%
More people collecting honey	10%
Less forest (fewer trees & flowers)	7%
It is part of the bees' cycle	2%
Other	2%

Change in the Forest, the Future of Honey Collecting

When asked whether there is more honey in the forest now compared to 30 years ago, 89% of our respondents replied that there is less honey now.¹ Forest fires are the most commonly listed reason for a decrease in bee colonies because they destroy the vegetation that is food for the bees (Table 1). At a distant second, people say that a disease has come to the bees in the last 40 years. The virus, which is decimating Western honey bee populations, has been found in the Indian subcontinent and is affecting bee populations there as well (Keystone Foundation 2001). Honey production in Kodagu was nearly decimated by the Thai Sac Brood virus in 1991–1992, but resistant colonies have since recovered (Barlagne *et al.* 2009). The Jenu Kuruba also cite pesticides on the nearby coffee estates and the fact that more people are collecting honey—Jenu Kurubas and outsiders. We do not have any confirming data on pesticide use, although area under coffee cultivation has almost doubled in the last 45 years (Garcia *et al.* 2009). If more people begin collecting due to economic motivation, this may negatively impact bee populations in the future, and thus negatively affect honey collecting. Currently, demand for honey from this region outstrips supply (Barlagne *et al.* 2009).

An NGO, the Kadi Board, provides training for what the Jenu Kuruba call “scientific” honey collection. Their goal is to teach people to harvest sustainably. Although we did not observe any meetings during 2009, our informants reported on past training. “We should not to take or destroy the [brood portion] of the honey comb,” they said. “They told us how to retie [the brood portion] to the tree when we finish collecting.” The hope is to maintain healthy bee populations in the face of increasing numbers of collectors. The Kadi Board also provides material and training for household beekeeping of thuduvejenu. Boxes and protective clothing were given to people who attended the training and wanted to keep bees near their house. To do this, people have to get a colony from the forest, which is

¹ 7% replied that there is the same amount of honey in the forest now; 2%, that there is more, 2% reported that they didn't know.

complicated because the queen must be captured, and it is difficult to isolate her from thousands of other bees in a tree cavity. We saw a lot of unused boxes lying around. Several people who were keeping bees seemed pleased to do so. Traditionally, thuduvejenu has been kept in overturned clay pots with holes drilled in the sides.

Access to modern facilities has improved since the Recognition of Forest Rights Act was passed. All the villages have had solar lights installed recently and bore wells with hand-pumps drilled. The government also installed electricity in one of the study villages after the completion of data collection. Only time will tell how this changes village dynamics and attitudes. The passage of the Recognition of Forest Rights Act guarantees continued access to the forest and the wild honeybees therein. As long as it remains economically worthwhile to collect honey and individuals are interested in learning, the Jenu Kuruba will be able to demonstrate and observe this activity. If resources become depleted, or economic demand drops or ceases altogether, so will honey collecting. So far, honey collecting has been able to adapt to the vast changes in India and the district of Kodagu since Richter observed honey collecting in 1870. For now, honey collecting persists and adapts to changing socioeconomic conditions as young boys continue to learn and pass on the skills involved.

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