Primates harvest bee nests in Ugandan National Park

Robert Kajobe

We report the first ever study of stingless bees and their predators in Uganda

BWINDI IMPENETRABLE National Park (BINP), in south-western Uganda, lies on the western edge of the rift valley. This beautiful area is among the biggest natural forests in East Africa (331 km²) and contains both montane and upper elevation lowland forest. In recognition of the large and varied arrays of endemic plants and animals that it supports, BINP is a UNESCO World Heritage site.

The Park is home to no less than half of the world's surviving population of wild mountain gorillas (*Gorilla gorilla berengei*), as well as another ten primate species including chimpanzees *(Pan troglodytes*). In this unique habitat it is not just people but also chimpanzees who are the primary nest-looters of the native African honey bees and honey-making stingless bees found here.

In the first study of its kind, Robert Kajobe of the National Agriculture Research Organisation (NARO), Uganda, and David Roubik from the Smithsonian Tropical Research Institute, USA, have been investigating the ecology of these unusual predator/prey relationships.

This project was undertaken because, to date, most studies on stingless bees have been based on work done in South America and South-East Asia and these have ignored critical characteristics of Afrotropical species, particularly in the context of equatorial habitats. Moreover, inadequate human resource capacity and low infrastructure development have hindered bee research and development in Uganda. As a result, very little nothing is known about the ecology of bee species found in this part of the world.

The lowland part of Bwindi Impenetrable National Park

Robert Kajobe collecting data in the forest

SURVEY OF NESTS AND NEST SITES

For the purposes of this 28-month study, a total of 174 hectares was surveyed for signs of the nesting activities of bees. The majority of the study area was thickly wooded but was not uniform in its vegetation, comprising a variety of different kinds of forestation, growing at a range of different altitudes. The field site also included more than one human dwelling.

Fieldwork was guided by Batwa Pygmies, the indigenous honey-hunters residing near the Park. In some instances, the dwarf honey-guide *Indicator pumilio*, a tiny bird that is endemic to the Albertine Rift Mountains, helped direct the Pygmies to stingless bee nests. The team sought out flying bees at nest entrance tubes on tree trunks, or around underground nests. Walls of the field station and other houses built near the Park were also searched for nests. More nests were discovered using information supplied by the Pygmies and field assistants, who were tracking chimpanzees or gorillas in the same area.

Stingless bees were readily identified according to the local Pygmy names and also by David Roubik. Since the nests of particular stingless species have characteristic architecture, identification could sometimes be corroborated by looking at the placement of a nest and the structure of the nest entrance.

Batwa Pygmies climbed tress to collect specimens of stingless bees for identification

Predation by chimpanzees (centre) and by man (far right)

Having located individual bee colonies in this way, the team then examined each nest for signs of predation. It was often possible to recognise the activity of larger predators, such as gorillas and chimpanzees, by means of their distinctive knuckle marks visible in the substrate around the raided nest. Alternatively, faeces near the nest where the predator had just fed, or its hair, led to positive identification. Others clues to identity were marks left on the nesting substrate, including scratches and tool marks, as well as the discarded tools themselves.

ABUNDANCE AND DIVERSITY OF BINP BEES

The study area contained a total of 228 bees nests, corresponding to an overall density of 39 nests/km^2. Five different kinds of stingless bee (*Meliponula* and subgenera *Axestotrigona* and *Meliplebeia*) were encountered, as well as the honey bee, *Apis mellifera adansonii*. Two morphs of *Meliponula ferruginea* were found, one now a taxonomic synonym: a black form, *M. ferruginea (black)*, and a brown form, *M. ferruginea (brown)*. In addition, the walls of human dwellings contained nests of *Hypotrigona gribodoi*. Hundreds of nests occurred in such houses, yet almost none were located in the forest. Ground-nesting stingless bees were comparatively rare (*M. lendliana*, 1 nest/km^2); colonies of *A. mellifera* located above ground, in tree cavities, were comparatively common (12 nests/km^2).

Field assistants measuring the diameter ofa tree containing a stingless bee nest

PREDATION AND MORTALITY

A significant proportion of bees nests had been raided by primate predators and over a quarter of stingless bee nests (28%) were partly or completely destroyed. Of these, more than a third (36%) had been destroyed by chimpanzees. Other predators, such as civets, gorillas and baboons accounted for a further 10% of destruction.

The most important predators in BINP, however, were undoubtedly humans. In spite of the fact that no one is allowed to enter the Park without permission, it was clear from this study that as many as 54% of losses were directly attributable to the activities of Pygmies.

For many centuries the Batwa people have lived in BINP forest as hunters of wild animals and gatherers of roots, fruits and honey, brood or pollen from bee nests for food, but in 1991 the government of Uganda evicted them when the reserve was declared a national park. Now obliged to forgo hunting and gathering, they have struggled to adapt and continue to raid bees nests as valuable traditional sources of food. Batwa use special tools such as axes and machetes to cut tree trunks and, in the case of the ground-nesting species, hoes to dig the ground to harvest colonies and food stores. This form of predation by humans strongly influences nest distribution and abundance.

Different stingless bee species were not uniformly predated by vertebrates, with predation being most pronounced on the largest species, *M. bocandei* (38%) and the least on the small *M. lendliana* (20%). Generally speaking, nests build closest to the forest floor were more likely to be attacked than those built at some distance above the ground.

However, nest height alone did not confer complete protection: *M. bocandei* nest heights average 16 m above ground but they suffer high mortality, probably because predators locate them by the sounds that these large bees make as they fan their wings near the nest entrance.

Pygmy guides have observed marauding chimpanzees using nest-raiding tools, but such practices were not actually witnessed during the course of the study. Nevertheless, the sticks which they use to harvest brood, honey, and pollen were found on the ground near trees containing stingless bee nests. All trees with active

Identifying colonies by flying activites at the entrance

Tools made and used by chimpanzees to rob nests

The nest entrance for M. ferruginea

colonies had between one and seven tools scattered near the trunk. Ten tools found at the base of four trees containing nests of *M. nebulata* and *M. ferruginea (black)* had a mean length of 33.8 cm, and a mean mid-point diameter of around 0.7 cm.

All sticks had been cleared of attached leaves and twigs. Sticks were missing bark from one or both ends and were peeled as well as chewed; the stems were flexible and believed to be vines or lianas. The bare end was often frayed and smelled strongly of honey, brood and pollen.

Other predators known to be active in the study area did fashion tools, but used their hands, muzzles or claws. In most cases these animals evidently acted as secondary predators, harvesting honey and brood from nests that had recently been opened by humans or chimpanzees.

FURTHER RESEARCH

Robert Kajobe has been awarded a three-year fellowship by the British Ecological Society for his project 'Habitat selection, nest architecture and colony characteristics of equatorial afro-tropical stingless bees of Uganda'. As part of this project, Robert recently visited the Central Science Laboratory (York, UK), where he screened African bee samples (honey bees as well as stingless bees) collected from different agro-ecological zones for pests and diseases. He undertook this work in close collaboration with the National Bee Unit, using not only traditional identification methods (microscopy and taxonomy) but also state-of-the-art molecular diagnostic techniques. This is the first time that research of this type has been undertaken using Ugandan bees and Robert's findings are awaited with great interest.

REFERENCES

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Counting nests of Hypotrigona gribodoi in walls of a mud house. Most nests were on the eastern side