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The Fruit Bats of Sulawesi

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By Scott Heinrichs and Kirsty Zahnke

On the equator, in the heart of Indonesia, is a land of active volcanoes, dramatic mountains, lush lowland rain forests, and misty montane cloud forests. Its coastline is dotted with beautiful beaches and mangroves, and its coral reefs are some of the most pristine in the world. This land is Sulawesi, home to an exotic array of wildlife, including no less than 62 species of bats.

The 19th-century naturalist Alfred Russell Wallace was the first to observe that the Indonesian archipelago is inhabited by two distinct sets of wildlife--one apparently belonging to the Asian continent and one to the Pacific-Australian continent. Wallace suggested that Sulawesi, which lies adjacent to the boundary between these two continents, may at one time have been connected to both.

Sulawesi is famous for its unusual wildlife, such as the odd looking babirusa (*babi* means pig and *rusa* means deer in Indonesian). Male babirusas have both upper and lower tusks; the top set grows up through the skull and curls back into the forehead. Of the 127 mammal species native to Sulawesi, 79 of them are endemic, that is, they exist nowhere else on earth.

Bats make up approximately half of all the mammal species in Sulawesi. Even though the island is substantially smaller than Borneo, Sumatra, or New Guinea, it boasts a greater number of species of old-world fruit bats (Pteropodidae). It also has the greatest number of cave-dwelling fruit bat species found anywhere in the world. Sulawesi fruit bats range in size from large, 700-gram, black flying foxes (*Pteropus alecto*) to the petite black-capped fruit bat (*Chironax melancephalus*), which, at only 12 to 17 grams, is one of the smallest flying foxes in the world. Many have distinct features; the Harlequin bat (*Styloctenium wallacei*) has badger-like facial stripes; *Neopteryx frosti* (no known common name) is distinguished by a reticulated pattern on its wing membrane; and the signal-winged flying fox (*Acerodon celebensis*) has blond fur.

Sulawesi's fruit bats, like fruit bats in many tropical zones, play extremely important roles in maintaining the often fragile forest ecosystem. Fruit bats have been found to be "high-quality" seed dispersers for many plants, moving more seeds than other fruit-eating animals to areas where the seeds are likely to germinate. Of the more than 300 species of plants found in Southeast Asia, the Pacific Islands, and tropical Africa that rely upon bats for seed dispersal or pollination, nearly half are of economic importance to humans, yielding products such as timber, dyes, tannins, medicine, and food.

In the fall of 1995, we spent six weeks in Sulawesi surveying the island for future study sites for Kirsty's dissertation work, at the same time assessing the need for bat conservation and education. Starting in the south, our first stop was the town of Watansoppeng, where a large number of black flying foxes roost in the town center. We arrived in mid-afternoon and saw that several large trees surrounding the soccer field were filled with hundreds, if not thousands, of bats fanning themselves in the midday heat. When the local children noticed us, they swarmed around us hoping to get their picture taken. Realizing we were interested in the bats, they began clapping their

school books together, thinking we wanted to see the bats fly. (This thought appears to be widespread; the same thing has happened to us often in different countries.) We discovered the bats are quite welcome in this village and are relatively protected, thanks to local mythology, which predicts that the town of Watansoppeng will collapse if the bats ever leave.

Our drive north along the Trans-Sulawesian highway was not so pleasant, however, as we couldn't help but notice that the power lines were littered with dead flying foxes. We counted about 50 bats over approximately 30 miles of highway. The cause of this tragedy seemed apparent: power lines in that area are closer together than most, and the bats probably use the wires to rest on but are electrocuted during takeoff when their wings accidentally graze another wire.

The next day some helpful people in the tiny, central town of Nanggala led us to a huge stand of bamboo nearly 20 yards tall. Within the bamboo, we saw large camps of two species of flying fox. We couldn't identify the first, but immediately recognized the other from its blond fur and almost entirely black wings as the endemic signal-winged flying fox. Returning at dusk to watch the bats leave for their feeding sites, we observed that the female signal-winged flying foxes had large pups and did not leave the roost or their pups until total darkness.

At the northern tip of Sulawesi, we visited the Tangkoko-Batuangus Nature Reserve. This beautiful park is situated on a coral reef, with black volcanic sand beaches and abundant wildlife. Some of the most visible animals by day are black macaque monkeys (*Macaca nigra*) and red knob hornbills (*Rhyticeros cassidix*). At night we could easily spot the spectral tarsier (*Tarsius spectrum*), a small primate with gogglelike eyes and a long tufted tail, as it climbed down from its treetop sleeping quarters to forage.

We spent three nights outdoors at the reserve, catching bats in mist nets we stretched across assorted sites. Near a clearing along the forest edge, we captured short-nosed fruit bats (*Cynopterus brachyotis*), which have white-rimmed, rounded ears. Asian lesser false vampires (*Megaderma spasma*) were abundant both times we placed the net by a hollow tree roost. This carnivorous bat has long ears and a nose leaf to help it locate prey such as grasshoppers, moths, and lizards. At the second tree roost, we also found Sulawesi Rousette fruit bats (*Rousettus celebensis*), including females carrying young. This species is very similar to the Rousette fruit bat (*Rousettus amplexicaudatus*) but has longer, reddish fur and a fuzzier face. The Rousette fruit bat is a small, usually cave-dwelling species which we found to be very common on Sulawesi and, not surprisingly, discovered in our net on several occasions.

One of our last stops, on the return trip south, was an officially protected area called Bantimurung. This park is known for its impressive waterfall, its limestone hills with numerous caves, and the large number of butterfly species found here. We set our nets over a small stream at dusk and within 15 minutes had our first bat, a small flying fox, black, with very long pointed ears. We tried to match the bat to our key, but it didn't fit the description of any bat confirmed on Sulawesi. We are still examining the possibility that it may be a new species of *Pteropus*. A little later, we saw something we'd never expected as we walked over to check the nets--it was the moment Scott had been waiting for since he first began studying bats 13 years earlier. In the light of our headlamps, we could just make out a pair of yellow-spotted wings, and Scott knew right away it was a Pallas's tube-nosed fruit bat (*Nyctimene cephalotes*), one of the most unusual looking bats in the world. Its namesake tubular nostrils project outward from the muzzle, but it is not yet known what purpose they serve. This bat has a very pungent smell and a greenish hue to its coat, possibly because of a symbiotic relationship with algae.

Later, as we were removing a group of Rousette fruit bats from the net, Kirsty was nearly knocked down by a large bat as it hit the mesh. It was a bare-backed fruit bat (*Dobsonia crenulata*), so named because its wing membranes meet in the middle of the back, giving the appearance of a hairless or bare back. Sulawesi is home to three species of *Dobsonia*: *D. exoleta*, *D. crenulata*, and *D. minor*, all of which roost in caves. *D. minor*, the lesser bare-backed fruit bat, was first discovered on Sulawesi in a burial cave we had visited earlier in the trip. We, too, had seen bats in the cave on our guided tour, roosting and flying about in the tallest, darkest burial chambers.

By contrast, the caves at Bantimurung were not so sheltered from tourists and had almost no bats, probably because of constant disturbance. After this last part of our survey of Bantimurung, we were directed to a nearby village that had several trees and bamboo stands with camps of signal-winged flying foxes and Pteropus. The residents told us that the Pteropus had just arrived a few months before. About 2,000 bats had come to roost above the few houses that made up the village, and neither the villagers nor the bats seemed affected in any way by this arrangement. It's not uncommon to see bats living near towns in Sulawesi, and in three different villages we saw bats roosting above or very close to people's homes.

Unfortunately, our pleasure at witnessing this peaceful relationship between bats and people was marred by our growing realization that many Sulawesians hunt and eat fruit bats without regard for the bats' future. The consumption of bats is common in the non-Muslim and Chinese populations, found mainly in northern Sulawesi. In other areas, bats are used in traditional medicine as cures for asthma or kidney ailments. In southern Sulawesi, we met a prominent Muslim businessman who regularly eats bat kidneys to treat his asthma. In the north, we met a school teacher who admitted that, even though he knows continued hunting of bats is causing a decline in their populations, he continues to eat bats because he likes the taste. Bats are caught by nets, air rifles, and even kites with fish hooks attached to their strings. The kites are flown in the evening, near roosting trees, as the bats are leaving to feed. Many bats can be caught quickly and with few deaths, which is important because they are sold in the markets alive. In a market in Ujung Pandang, we saw a single vendor selling more than 100 black flying foxes, some with pups. As Sulawesi's human population grows, its road systems are bettered, and the rain forests get logged and fragmented at an increasing rate. Fruit bat populations may soon be at great risk, and Sulawesi could lose some of its most important living treasures.

Although this is a disheartening scenario, we saw many reasons for hope in Sulawesi. There are numerous ways for local people to benefit from fruit bats through development of ecotourism. Kirsty has just begun a project to survey the national parks and determine fruit bat population densities, which should provide enough baseline data to formulate a conservation strategy. She will also be supplying educational materials about the importance of fruit bats to local wildlife personnel and developmental organizations. They in turn can teach the people of Sulawesi how these bats affect their lives and why conservation is beneficial. Such a change in perspective won't come overnight, but we are committed to finding practical solutions the people of Sulawesi can use to preserve and benefit from their own natural resources.

[SIDEBAR]

Television Film Brings Plight of Sulawesi's Bats to Wide Audience

Many BCI members have seen "Castaways of Sulawesi," a film that has been shown several times on PBS TV's Nature program in the United States. This superb film amply documents the beauty and value of Sulawesi's bats but also graphically shows the distressing reality of children "kite fishing" for flying foxes, and of live bats being brutally packaged for market. Several of you have called or written the BCI office to express concern for the fate of bats in Sulawesi, and we would like to take this opportunity to respond.

The practice of hunting and eating bats is a common and entrenched custom on many Pacific islands, as has frequently been reported in this magazine. No doubt many methods used, from kite-fishing to mass commercial slaughter, are cruel--unconscionably so to those of us who treasure these gentle creatures. But these cultures don't share our perspective, and their habits will change only if they can somehow see the connection between killing too many bats and the eventual demise of their forests and their livelihood.

Changing attitudes through education is what BCI does best, and our successes in the past include several Asian and Pacific island areas with the same issues and dynamics as Sulawesi: We have helped communities from American Samoa to Indonesia and Thailand gain appreciation for their bats as vital contributors to their environment.

To pursue an educational campaign in Sulawesi, or in any other remote area, requires tremendous resources and planning, as well as substantial tolerance of differing views. We have had continuous small successes in such endeavors, as have many of our members. For example, we supported bat biologist Dr. Marty Fujita in conducting seminars, lectures, and press conferences across Indonesia, generating numerous articles in the news media. While we continue to chip away at the problem, we should all be pleased to see the plight of bats being broadcast to a significant audience in such a powerful way.

[AUTHOR BIO]

Scott Heinrichs worked as an animal keeper for 15 years. He is a member of the AZA Bat Taxon Advisory Group and has advised many zoos on their bat collections and exhibits. He has also been a bat educator for the past ten years, developing and presenting bat programs and workshops for zoos, museums, and libraries.

Kirsty Zahnke worked six years as an animal keeper and will now be pursuing a Master's Degree in Conservation Biology. She has just spent an intensive three months in South Sulawesi, surveying the fruit bats of the Bantimurung area. She is also an accomplished nature photographer.



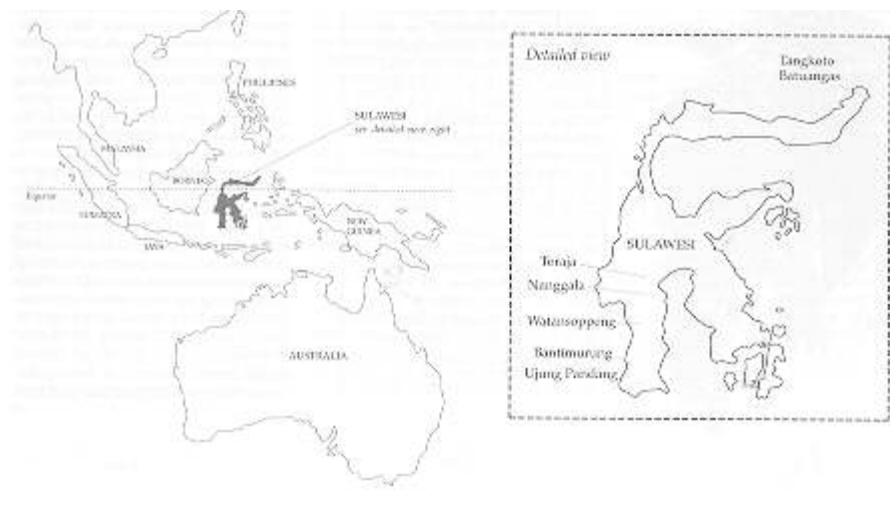
A colony of old world fruit bats cover a tree in the protected area of Bantimurung in South Sulawesi.



For schoolchildren in the town of Watansoppeng, the sight of hundreds of black flying foxes hanging from every bough of a tree is commonplace. Thanks to local folklore, bats are relatively protected in this town.



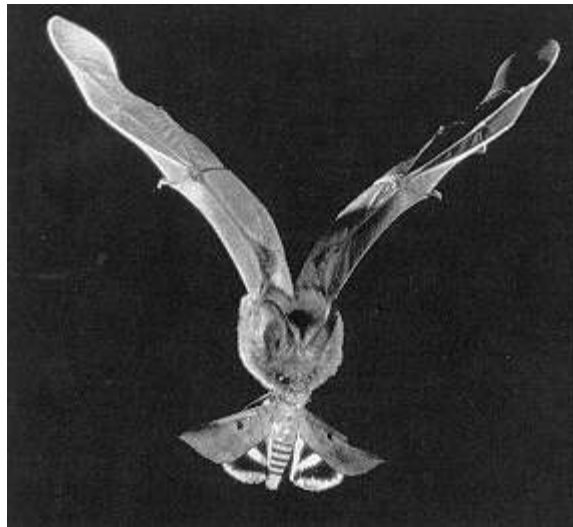
Signal-winged flying foxes roost in bamboo at the village of Nanggala. This large, blond bat has white coloration on the front of its wings, which it is thought to use as a signalling device.



Map of Sulawesi



Sulawesi Rousette fruit bat



Asian lesser false vampire bat with moth

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