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### Whispers in the Leaves

Eavesdropping on red bat mothers and babies

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Snuggled tightly together, three baby red bats hang in near-total silence amid the leaves all night long, each with one foot grasping a slender branch. Exposed among the tree's foliage, their tiny, fuzzy bodies look like dead leaves or dried fruit. That is their only protection against a rogues' gallery of predators.

Occasionally, the pups might stir a bit, licking one another's faces, grooming their wings or sharing a soft call or a click no louder than a whisper. Then their mother returns from a night of foraging. As she nears her family, she emits a distinctive call that alerts the pups. She hangs alongside them, rubs her muzzle against them, licks their faces and uses her wings to nudge them into place for nursing.

The pups cling to mom with one foot, often wrapping the other around a branch or the base of a leaf. Hungry pups generate a few calls and mechanical clicks as they search for a nipple. Once they begin nursing, both babies and mother typically make a faint humming sound, almost like a cat's purr, that's associated with a gentle vibration. The family of eastern red bats (*Lasiurus borealis*) will spend the day together in the foliage, snuggling, humming, grooming and nursing.

Compare this with the constant clamor inside a nursery cave used by colony-forming species, such as the Mexican free-tailed bats (*Tadarida brasiliensis*) of Texas' Bracken Bat Cave. These mothers have just one pup per year. They deposit their babies in nursery areas where many thousands of pups – as many as 500 per square foot (5,350 per square meter) – are packed on cave ceilings and walls. The 20 million mothers and pups in the cave socialize, groom, chatter, move about and generally maintain a continuous din.

When these moms are ready to nurse, they must somehow locate their own pups amid the mob of squirming infants. Mothers produce repeated "directive calls" while hungry pups try to catch mom's attention with "isolation calls." Both seem to be vocal signatures that help mother and offspring locate each other.

Research has documented a rich vocabulary of Mexican freetail calls, identifying the specific meaning of 20 of them (see "Bat Talk: Do bats possess language?" BATS Fall 2004). Colonial bats are extremely social animals. Red bats, however, spend most of their lives alone, except while mating, rearing young and, sometimes, during migration.

Biologist Erin Gillam of the University of Tennessee, M. Brock Fenton, Biology Chair at the University of Western Ontario, and I studied mother-pup vocalizations in captive eastern red bats. We identified only six distinct calls strong enough for analysis and found far less sophisticated use of vocal communication among red bats than Mexican freetails.

We studied four nursing mothers, three with three pups each and one with four pups, plus six orphaned pups. The bats had been retrieved from the ground, from vegetation or from the sides of buildings and submitted to me (a bat rehabilitator). All the bats had become

accustomed to humans and appeared to call normally.

Adults with young were housed in a large outdoor flight cage. The orphans were kept together in fabric carriers until they began eating whole mealworms and were then transferred to the flight cage. We used high-speed recording systems to capture the interaction calls, usually recording with the microphone less than a half-inch to six inches (1-15 centimeters) from the bat. Recording the soft, continuous clicks of the vibrational hum, however, required gently placing the microphone against each bat's back.

The differences between calls and calling behavior in eastern red bats and Mexican free-tailed bats seem to reflect their very different roosting habits. The situation facing mothers and babies of solitary species differs markedly from that of colonial species.

First, locating offspring is relatively simple for solitary red-bat mothers, while finding the correct free-tailed pup amid thousands jammed together in a cave apparently requires a combination of spatial memory, olfactory cues and identifiable calls from both mother and pup. Red bats may rely more on spatial memory – simply remembering where they left their pups – than vocal cues.

Foliage roosts seem to offer far less protection from predators than tree hollows, caves or crevices. The more-protected young of colonial species typically call loudly and often in the absence of their mothers. Young eastern red bats are usually silent when left alone. The soft vibrational hum is a bit like switching a cell phone from “ring” to “vibrate” when you go to a movie: The phone still rings, but only the recipient notices.

Moreover, the acoustic content of the calls is quite different. Among the highly social colonial species, calls associated with mother-young interactions provide individual signatures by which mother and pup may recognize one another. The most common calls recorded among red bat pups are “FM sweeps” – sounds that vary in frequency and amplitude, and short, mechanical clicks. Although variations were detected among individuals, an analysis suggests little potential for actual signatures. In fact, no consistent, individual call patterns were detected among the red bats in our study.

When the bats were handled, especially if we agitated them by gently rubbing their fur or opening their wings, mothers responded with an FM-sweep distress call, while pups produced a series of clicks. These clicks seem to be louder variants of the soft string of clicks that produce the humming sound during nursing and sometimes among clustered pups. One pup added a long, trill-like screech to the clicks.

Though much of the red bat's acoustic activity is ultrasonic (beyond the range of human hearing), the vibrational hum can often be heard if the bat is held directly against a person's ear (a practice that is not recommended for amateurs).

Our investigations focused on maternal interactions; no adult male bats were included, so their calls were not collected. Our results, nonetheless, demonstrate the striking differences in calls and calling behavior between solitary red bats with exposed roosts and the more gregarious free-tailed bats that enjoy more sheltered homes.

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