Why Do Parrots Talk? Venezuelan Site Offers Clues

The world’s longest-running study of wild parrots shifts focus to a new question: What do parrots say to each other in the wild?

HATO MASAGUARAL, CALABOZO, VENEZUELA—Back in July 1985, while studying raptors on this working cattle ranch, Steve Beissinger noticed a pair of green-rumped parrotlets nesting in a hollowed-out fence post. “Parrots usually nest high in the treetops, which makes them extremely difficult to study, but these were nesting just a few feet off the ground,” recalls Beissinger, an ecologist at the University of California, Berkeley. “I immediately wondered, ‘Would they nest in artificial boxes?’ ”

Two years later, after experimenting with designs, Beissinger constructed a faux box from a 1-meter-long piece of PVC pipe lined with wire mesh and removable lids on top and bottom. He filled the bottom of the tube with wood shavings, hung the contraption from a post at the ranch, and waited. About a month later, a pair of the parakeet-sized birds known scientifically as *Forpus passerinus* took up residence. The next year, Beissinger added 40 more PVC boxes, and many were soon occupied.

Today, the ranch’s fence lines look like a parrotlet condo development. Pairs are busy nesting, with females sequestered inside the boxes with eggs and chicks. They emerge when their mates return from foraging with crops full of seeds to share with the family, while all parties exchange short peeping calls. Meanwhile, fledglings congregate in loud, raucous groups in the nearby mango trees, also calling for their next meals.

Although Beissinger didn’t realize it in 1987, he had launched the world’s longest-running study of wild parrots, a project that is entering its 24th year—making it the parrot equivalent of Jane Goodall’s long-term study of chimpanzees in Tanzania and Cynthia Moss’s elephant project in Kenya. And just as those studies tracking individual animals changed our understanding of chimpanzees and elephants, this one is opening new windows into the minds and behaviors of parrots.

The ranch site “is a phenomenal system,” says Noel Snyder, a retired ornithologist with the U.S. Fish and Wildlife Service in Portal, Arizona, and it has yielded “a gold mine of data” because the birds “can be observed throughout their lives and manipulated experimentally.”

Thanks to Beissinger’s nesting boxes, which now number 106, researchers have discovered details of the parrotlets’ ecology and life histories, and the project has now entered a new phase focusing on their communicative skills. Last week, researchers led by graduate student and ornithologist Karl Berg of Cornell University reported that the contact calls of wild parrotlet nestlings—vocalizations that function much like a name—are not genetically programmed.
Family ties. Wild parrotlet chicks and mother cozy up in an artificial nesting box.

Instead, they learn these calls from their parents, almost like human children learning their names, Berg and colleagues reported in a paper in the Proceedings of the Royal Society B.

Berg’s is the first study to provide experimental evidence for learned vocalizations in wild parrots. Because both male and female parrots learn new calls throughout life (in contrast to most songbirds, in which only young males learn), Berg and others say that parrots may be the best animal model yet for investigating how humans acquire speech.

Finding out what parrots are saying to each other in the wild, and why, requires long-term data and a deep understanding of parrotlet ecology—which is what the ranch site provides, Berg says. “You can’t just walk into the forest and start swapping eggs between nests” to find out if calls are innate or learned, he says. “You have to know the parents’ pedigrees.” Adds Berg’s thesis adviser, Jack Bradbury, a behavioral ecologist and professor emeritus at Cornell, “There is nothing like [the ranch site] for parrots anywhere else on the planet.”

Talking back
Since the days of Aristotle, people have known that parrots are smart, with sharp memories and an uncanny ability to mimic human words and speech. Like humans, parrots are a social species that has evolved rapid-fire vocalizations to communicate with their conspecifics. In captivity, parrots do not simply react when humans speak to them (something dogs, cats, chimpanzees and other animals do as well); they also articulate responses, almost as if talking back. Sometimes, as Alex, the famous African Gray parrot who was studied for 30 years, demonstrated, captive parrots will even use words in the correct context (Science, 11 February 2000, p. 980).

Did Alex really “talk”? Despite his impressive accomplishments, researchers continue to debate the meaning behind his words. Many say that a true understanding of parrots’ communicative talents also requires understanding what purpose those abilities serve in the wild and why they evolved in the first place. Why would a bird spend so much time, energy, and brainpower on vocalization, wonders Timothy Wright, a behavioral ecologist at New Mexico State University in Las Cruces, who discovered dialects in the calls of yellow-naped Amazon parrots. “What is the advantage to the individual of learning all these vocalizations?”

Bradbury agrees that captive parrots are “great mimics and clever. But the question was always, ‘Why?’ What are they doing in the wild?” That would necessitate these behaviors? He has proposed that parrots, which live in dynamic flocks, may be using their vocal mimicry to help negotiate flock separations and mergers. For instance, orange-fronted conures exchange contact calls in late afternoon when recruiting others to their sleeping roosts.

Answering such questions with wild parrots isn’t easy. The logistics are “formidable,” Snyder says. Most parrot species are long-lived, nest high in the canopy, and travel long distances. They are difficult to outfit with radio transmitters—or even standard bird bands—because some species can tear these off with their powerful beaks. Even telling males apart from females is a chore for most species because the two often look identical.

Enter the ranch site, where Beissinger’s original interest was in parrot ecology. “Parrots are one of the most threatened groups of birds in the world [one-third of New World species are at risk of extinction], because of poaching and habitat loss, and yet we know so little about them in the wild,” he says. “Here was a chance to find out something about what they do.”

Over the years, Beissinger and his team have banded more than 8500 parrotlets, documented 3000 nesting attempts, and followed the fates of 16,000 eggs. The parrotlets are surprisingly tolerant of the scientists, who monitor the boxes daily, marking each egg with a coded number, and later handling the chicks, weighing and measuring them, and fixing aluminum and plastic colored bands on their tiny legs. Records are kept of every banded bird and its pedigree, so researchers know who is related to whom.

In a string of papers published in journals such as Animal Behaviour, Auk, and Ecology Letters, Beissinger and his colleagues reported the parrotlets’ complex social system, in which males outnumber females and strongly monogamous pairs will fight fiercely over highly prized nest boxes. (This may help explain why the tiny birds tolerate researchers’ handling rather than give up those boxes.) A single bird can rarely defend a nest on its own, so if a parent dies or is poached, the entire family is often lost as other birds move in, kill the nestlings, and take over the box. That finding influenced the drafting of wild bird import regulations in the United States.

Beissinger’s research laid the groundwork for Berg’s communication studies. “We worked out all the ecology, demography, the social systems, the hatching asyn-
chrony,” which means that chicks in a nest can range in age from a few days to 2 weeks old, Beissinger says. “And because we knew all of that, Berg could start investigating the vocalizations,” which he began doing 5 years ago for his doctoral thesis.

**Into the wild**
In captivity, parrots imitate human voices and other sounds. But in the wild, as Bradbury and other researchers have shown, parrots imitate each other. They match calls as pairs and as groups and will even match vocal dialects.

To begin to understand how parrotlets learn such vocalizations, Berg started with their contact calls, the fundamental parrot call. Even Berg admits that to human ears, it doesn’t sound like much—just a series of simple peeps. Our ears aren’t able to hear the variation and information in the calls because “they are just too fast,” Berg says. “The parents can make 20 contact calls in the time it takes you to sneeze.” When slowed down for our ears, a parrotlet’s single peep sounds more like eh-ehhh-gehhhhill-grrrrr-whoeeeeee. (Listen to contact calls at normal speed, and slowed down, at http://vimeo.com/26317334.) “You can’t make sense of their vocalizations just by listening. You can’t imitate their calls like you can whistle a songbird’s tune,” Berg says. “The only way we can study them is by converting their calls to spectrograms, then running these through computer programs” that search for subtle similarities and that

Bradbury and colleague Kathryn Cortopassi spent years developing.

Parrotlets, like other parrots, use contact calls in a variety of ways to communicate with other members of their flocks. For instance, when a male returns to his nesting box, he emits his peep. In response, his mate may make her call, or both their calls, as if saying, “I hear you, Joe. It’s Betty here.” Berg suspects that other information is also being communicated. “There is a lot more in that call than ‘Hi, honey, I’m home,’” he says.

He hasn’t proved that yet, however. Indeed, pinning down the fundamental biology and cognition behind parrot calls has been difficult. Researchers hadn’t even demonstrated that the calls are learned, rather than innate, although captive studies had suggested this. Bradbury, who studied orange-fronted conures, a larger parrot, in Costa Rica, suspected that the conures learned their “chee” contact call while still in their nests, “but it was just impossible to get a large enough sample size to show this,” he says. He was lucky if he had one nest a season to study.

Berg, working at the ranch with 106 nesting boxes and 20 years of bird pedigrees, had the perfect setup to explore the question. He swapped complete clutches among nine nests so that chicks were raised by unrelated foster parents, who had different calls from those of the biological parents; he used eight other nests as controls. After the chicks hatched, Berg made weekly video and audio recordings inside the nests as well as outside during the parents’ arrivals and departures.

In the Cornell Lab of Ornithology, Berg compared spectrograms and statistically analyzed 5000 such calls. He found that the parents provided a basic call template, which each chick learned and slightly modified to make its own unique contact call. Nestlings in the same family acquired slightly similar calls no matter who their biological parents were, enabling family members to recognize each other after they left the nest. Like humans, parrotlets have extended parental care, with parents feeding fledglings for another 3 weeks. The young birds roost in large, communal groups with as many as 300 other recently fledged chicks—which makes it just that much harder for the parents to find their own kids,” Berg says. “They’d never manage without the contact calls.”

Others find the study convincing and want more. “Berg’s study gets at the heart of why they are learning that initial contact call of the parents,” Wright says. “Through the parrotlets we have the opportunity to find out if this kind of learning extends into adulthood. It seems that it does, because the parrotlet pairs match their calls—but, again, why?”

One obvious next question is whether parrotlet parents deliberately give chicks contact calls, as human parents give children their names. No other species has yet been shown to do this, but such a behavior would help the young birds establish identities in their highly social communities, Berg says.

Others are intrigued by how young the birds are when they begin to learn the calls. “Berg’s study shows that the parrotlets are capable of vocal learning at a very early stage,” notes Ofer Tchernichovski, a biopsychologist at Hunter College in New York City. “Is it similar to speech learning in human infants?”

Berg points out that scientists still debate how and when language emerges in human infants (Science, 21 May 2010, p. 969). “Parrots could be the best animal model for investigating this question,” he says, noting that like human infants, parrots are born dumb and utterly helpless, and have extended dependent childhoods and relatively large brains. Also like humans, parrots hit a key developmental milestone when they begin to learn their “names.” “There’s a moderate convergence between parrots and humans,” he says.

“In some ways, our results are not surprising,” Berg says of his study. “But what is surprising is that we pulled this off in the wild.”

—Virginia Morell