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Anna's Hummingbirds

Photo by Marceline VanderWater

Barn Owl Nestlings Recognize and Communicate with Each Other

By Gillian Rice



Amélie Dreiss with research subject. Photo © Lionel Pousaz

Barn Owl (*Tyto alba*) nestlings (owlets) each have an individual vocal signature that is recognized by its nestmates. In a recently published study, Amélie Dreiss of Lausanne University, Switzerland, and her colleagues have found that the owlets use their unique calls in a "sibling negotiation system" to negotiate for food.

"Previously, only a few research studies show that parents or siblings can individually recognize young animal offspring or other siblings, says Dreiss. "Juvenile Greylag Geese can recognize each other, for example."

To avoid the costs of physically competing for limited food resources, animals communicate their motivation and ability to compete. Barn Owl nestlings remain in their nest for about nine weeks and have ample time to communicate vocally with their siblings.

Once the owlets are old enough to swallow the rodent prey without maternal help (from around 2 weeks onwards), the mother leaves the nest to hunt for prey with the father. Dreiss and colleagues describe how the single food item brought by a parent Barn Owl to the nest is indivisible; only one owlet receives food on each parental visit. Sibling Barn Owls vocally advertise their hunger level to their nestmates during long parental absences, in order to receive priority access to food when the parents return.

The Swiss researchers observed and monitored wild Barn Owls breeding in nest

boxes. "We exchanged an equal number of nestlings, about four days after hatching, between 19 pairs of nests," explains lead researcher Amélie Dreiss. "This is called a cross-fostering experiment, which is often performed in bird studies." [see sidebar]

Also, three weeks prior to fledging, (at around 55 days old), the researchers brought some owlets to the lab for vocalization experiments. At least one owlet was left in a nest to prevent the parents from abandoning a nest. After three days and nights, nestlings were returned to their nests and fledged with similar success and similar body mass to nestlings not removed from the nest. (Note: the veterinary services of the local Swiss state approved all experimental procedures to ensure that the Barn Owls were not stressed or harmed during the study).

The research team studied various features of owlet calls. Characteristics like call duration, loudness (dB), and frequency variation (kHz) can distinguish owlets. "Interestingly, siblings call similarly suggesting that most of the variation in these call features are genetically inherited," reports Dreiss. "In contrast, no call features are related to the nest of rearing indicating that sharing the same environment does not explain why nestmates adopt similar vocal behavior."

Surprisingly, one lab experiment revealed that humans (students), who had never heard Barn Owls, could discriminate among the owlets' calls without any training.

To an owlet, its sibling's call reveals its

CROSS-FOSTERING EXPERIMENTS

Amélie Dreiss explains:

"Cross-fostering allows identification of which part of behavior or morphology is due to genetic factors (or to early developmental factors) or to the environmental rearing conditions. We investigate which plays the larger role: the 'nest of origin' or 'nest of rearing'."

"Strangely, in many birds, the parents accept cross-fostering young, and it appears that they rear the cross-fostering young exactly the same way as their own young. It is the same phenomenon that even permits cuckoos to lay eggs in the nest of other species. Bird parents usually do not recognize their young at birth. The recognition may hence develop later. In the Barn Owl, we have not tested whether parents recognize their young. Until the first flight at least, parents do not have to recognize them, because the young do not change locality. In some bird species, parents do recognize their offspring vocally. For instance, this is important for penguins because young are lost in big colonies."

identity, position in the age hierarchy of the brood, gender, and absolute age. Usually one owlet calls alone during long periods of time. Nestlings avoid calling simultaneously, otherwise they might have to call more (and expend even more energy) in order to transfer the same amount of information. In the absence of parents, the most vocal owlet induces its nestmates to retreat from the contest for food as soon as parents return to the nest with a food item.

Why should owlets signal their intention to compete to their siblings? The researchers suggest that if the owlets didn't communicate among themselves as much vocally, this might increase competition for the single food item (such as a vole or mouse) upon a parent's



Owlets in nest box (Western Switzerland). Photo © Madeleine Scriba

return. Should owlets pretend to be hungrier than they really are? Probably not, as a single nestling makes up to 5000 calls per night when parents are absent. Each call contains substantial noise energy, so the sibling negotiation process is expensive in terms of energy and effort. Barn Owl nestmates are full siblings (paternity other than by the male of a bonded pair is rare), so each owlet has indirect fitness gains if its sibling obtains enough food and if food is distributed fairly according to need.

Nestlings retreat from a contest when facing highly vocal siblings. "Sibling negotiation can be thought of as a form of altruism between related individuals, because its primary function is to reduce the level of sibling competition," says Dreiss.

In some other bird species, when parents make brief visits bringing food, offspring suddenly escalate their begging behavior in an attempt to be louder than their siblings. This behavior has evolved because in those species the food brought by parents is divisible, that is, each nestling may receive some of the food. Therefore, by escalating begging a nestling can hope to receive a larger than equal share of the food. The

situation with Barn Owls is different. Siblings communicate vocally at a relatively low rate but for long periods of time.

In an earlier experiment, Dreiss and colleagues found evidence of cognitive abilities used to resolve conflicts over the share of resources. Owlets listen to competitive interactions between other owlets. They gather information on the competitive role played by two vocally interacting nestmates (which called first) and remember this for a few minutes before using it to adjust their own vocal behavior.

Two ecological factors might influence the evolution of the social and cognitive abilities to recall siblings' hunger states: parental feeding rate and the size of food items. Parent

Barn Owls feed their brood every hour, on average, with relatively large food items. Therefore, owlets' hunger levels do not vary quickly: individuals who receive food are satiated for a while; hungry owlets can wait several minutes to a few hours before being fed.

Barn Owls occur on every continent but Antarctica. Most research on vocal analyses has been done on European Barn Owls, but *Birds of North America Online* indicates that with a few exceptions, vocal patterns are

similar between the North American and European races of this species. 🦉

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BARN OWLS IN ARIZONA

"Ah, one of my favorite birds!" exclaims MAS member Walter Thurber, a regional coordinator for the Arizona Field Ornithologists and compiler of the Carefree Christmas Bird Count. He continues: "Barn Owls are uncommon permanent residents locally. The only place I know where they are regular is in the mineshafts at the Spur Cross Ranch Conservation Area. The site is off limits to the public for safety reasons, but sometimes the owls will roost in the nearby Jewel of the Creek Preserve. There are mineshafts in the Cave Creek Regional Park too and Barn Owls have been there in the past, but I don't have current information."

Thurber reports: "We just concluded a two-year bird study in the McDowell Sonoran Preserve. We tallied 128 species, but no Barn Owl. I found a hole in an earthen embankment along Lost Dog Wash that looked like a possible Barn Owl nest or roost site, but we never found an owl there."

According to the *Arizona Breeding Bird Atlas*, relatively more Barn Owls are found in habitats such as Sonoran Desert uplands and the adjacent wooded dry washes, and in agricultural settings. They can be found in urban areas and will nest behind the mass of dead fronds of untrimmed palms. MAS member Matt VanWallene reports that a Barn Owl nested in a tree in his Chandler backyard. "Unfortunately the nest failed resulting in several broken eggs and two dead chicks," says VanWallene. "I dissected many owl pellets, however, containing skulls of small creatures."

The Arizona Field Ornithologists North American Migration Count (held the second Saturday in May annually) reported no Barn Owls in 2012, but three in 2011. Reports on aField.org include several observations during 2013 at, for example: Rio Salado Project, Tres Rios, Glendale Recharge Ponds, Avondale Bridge on the Gila River, and two Chandler locations.