Project Perch's mission is to protect and nurture the Burrowing Owl in SE Florida.
A real life HOOT, join now!

Project Perch's BuOw Blog 18 **Friday, June 13, 2014**

Implications of a Genetic Depression

The Cam Pair

When we first installed the cam, it was aimed at the Prolific Pair, but during installation we disturbed the owls and they moved across the street (See BuOw Blog 7). So we trenched lines all the way down to where the cam is now. There were 2 juveniles at the cam burrow and their parents were right next door in a natural burrow. Once again the installation process disturbed the owls and the parents moved across the street. So the cam was focused on the colony's two youngest owls. We were just relieved to finally have some owls on screen.

Philopatry

In the spring of 2012, the Cam Owls were born in this burrow, making it their natal burrow. When the juveniles were about 9 months old, their parents went 20 feet to the north and excavated a new burrow and then moved into it. So the juveniles never had to move, but got to stay right at home in their natal burrow. This is the exact opposite of juvenile dispersal and called philopatry. Millsap and Bear observed three cases where fathers excavated new nest burrows 10-50 meters away, moved and let their sons go onto breed in their natal burrows.[1] It may be safer for the son to stay in his natal burrow while a more experienced father excavates a new burrow nearby. It also allows a father and son to share a territory. Millsap and Bear's study documented a high rate of male philopatry where more than one-third of all young males settled on their natal territory.[1] They saw a general pattern of young males inheriting their natal burrows when their fathers underwent breeding dispersal or died.[1]

The Cam Pair – Brother and Sister

We were drafting language to go on the EarthCam site and I played a joke on the teacher at the school. I sent her this draft language for her approval: "Peek into the secret lives of these polyamorous birds! Do the youngest owls find mates or do they just mate with each other? Stay tuned to see whether an incestuous choice pays off or their secret is revealed when their owlets emerge." At the time it was a joke, but then we started to see the juveniles mating on camera. At first James (James Currie, Birding Adventures) didn't believe they were mating and kept questioning the possibility. So I researched it based on the belief that documented inbreeding in wild birds was rare. By the end of May 2013 we were all talking about whether these two closely related birds could form a pair bond and mate.

Inbreeding in Communal or Colonial Birds

When I first researched it, I found an article that documented inbreeding in superb blue wrens.[2] At the end of their article Craig and Jamieson indicated that more recent work had shown that extreme outbreeding could be equally or more disadvantageous than extreme inbreeding and several species achieved a mixture in between.[2]

I found another discussion in the Ecology and Evolution of Cooperative Breeding Birds.[3] It explained that in the past, observations of animal dispersal had been taken as evidence of inbreeding avoidance.[3] Several species showed various degrees of incestuous mating, especially colonial birds and ones with limited dispersal patterns.[3] Intersexual dominance may be the bigger determinate, because daughters did not avoid mating with their fathers and sisters did not avoid mating with their brothers.[3] Sub adult males have been stopped by their mothers from mating, but instead of inbreeding avoidance this could be governed by dominance instead, as mothers are more dominant than sub adult males.[3]

So we first had to think about the owls as colonial and compare their habits with other cooperative breeders. Florida burrowing owls are also non-migratory. As their population declines and gets more fragmented, they are a bird with a very limited dispersal pattern. Maybe finding a mate is not that easy. But the Cam Pair could establish a pair bond and mate even though they were brother and sister and that is exactly what they did. In June of 2013, Tropical Storm Andrea hit and the Cam Pair's burrow flooded and they lost their young. They had produced at least one nestling together and probably more but their first nest had failed. They re-nested in December of 2013 and in February of 2014, 5 more owlets emerged.

February 9, 2014 - The Cam Pair with 3 Owlets from their 2nd Brood

I had written Dr. Mealey about the Cam Owls being so closely related. A genetic depression in the Florida burrowing owls is a concern of his.[4] He believes there may be so few owls in Southeast Florida that their populations have become isolated with a limited dispersal pattern.[4] He told me to focus on dark eyed owls (See BuOw Blog 11) because they were indicative of a genetic depression.[4] When the Cam Pair had their five owlets, we looked for juveniles with recessive colored eyes, but they all had dominant, bright yellow eyes. Dr. Mealey also told me to find an article by Millsap and Bear on double-brooding because he remembered some instances of inbreeding documented there.[4]

Inbreeding in Florida Burrowing Owls

During the 1987-1988 mating season, Millsap and Bear documented four pairs of mating owls who were parent and offspring.[5] Three sons paired with their mothers and one daughter paired with her father.[5] Although the paternity of the owlets from one of the mother-son pairings could not be confirmed, the son from the first brood provisioned his mother during laying and incubation of the second brood and also helped raise the second brood.[5] This represented 13% of all of the pairs where both adults were identified.[5] They considered parent-offspring mates not uncommon.[5] They observed copulation attempts between 80 day old siblings and a one year old male nested successfully with his mother.[5] The Cam Owls may now be the first documented brother-sister mates, but this may be a common occurrence.

Territory Tenure and Reproductive Success

Millsap and Bear's data showed that after the death of a mate, females usually dispersed and males did not.[1] They wrote the following: "Although this could be interpreted as a mechanism to promote avoidance of inbreeding in a population where natal philopatry was common, it might also reflect a premium by females on males with prior experience on a territory."[1] They hypothesized that if a resident male owl died and there was a son, the widow was certain to pair with a mate who was unfamiliar with the territory unless she mated with her offspring.[1] "If male familiarity with a territory influences reproductive success, it could also explain the potential discrepancy in mate fidelity between migratory and non-migratory burrowing owl populations."[1] When they arrive in spring, all males can be equally unfamiliar with the current year's distribution of food and cover on the territory regardless of their tenure or past experience. [1] As a consequence, there may be little advantage in females returning to the same territory to pair with a previous mate.[1]

If prior experience on a territory is a crucial factor influencing reproductive success, then it would explain why natal philopatry is common. In a short lived species like burrowing owls, it would also explain mother-son and other related pairings and as burrowing owls become scarce their dispersal pattern becomes more limited. These factors combined may cause the rate of inbreeding to increase from a healthy balance in a colonial species to an unhealthy level that cannot be sustained. Dr. Mealey is right when he says the Florida burrowing owls need to be tested genetically to see just how inbred they are.[4]

Sources:

[1] Millsap, Brian and Cindy Bear. May, 1997. Territory Fidelity, Mate Fidelity, and Dispersal in an Urban-Nesting Population of Florida Burrowing Owls. Journal Raptor Research Report 9, pp. 91-98.

[2] Craig, John L. and Ian G. Jamieson. 1988. Incestuous Mating in a Communal Bird: A Family Affair. American Naturalist, Vol 131, No 1.

[3] Koenig, Walter and Janet Dickinson, editors. 1990. Ecology and Evolution of Cooperative Breeding Birds. Cambridge University Press. ISBN 10:0521530997.

[4] Dr. Brian Mealey, 2013. Personal Communication.

[5] Millsap, Brian and Cindy Bear. June, 1990. Double-Brooding by Florida Burrowing Owls. The Wilson Bulletin, Vol 102, No 2, pp. 313-317.