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Intraspecific brood parasitism in Purple Martins

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Intraspecific brood parasitism is the laying of eggs in the nest of a conspecific, or in rare instances the physical transport of an egg to another female's nest (Brown and Brown 1988, 1996). This behavior is relatively common among birds (Yom-Tov 1980, Rohwer and Freeman 1989) and is often seen in colonial species (e.g. Brown 1984, Emlen and Wrege 1986, Brown and Brown 1989, 1996, Morton et al. 1990). In one of the best studied cases, that of the highly colonial Cliff Swallow (*Petrochelidon pyrrhonota*), brood parasitism may be a consequence of coloniality, with opportunities for parasitizing nests enhanced by dense nesting. Brood parasitism is costly for those birds that serve as hosts but may benefit the perpetrators by increasing their reproductive success and helping to prevent total reproductive failure (Brown and Brown 1988, 1996).

Less is known about intraspecific brood parasitism in another colonial swallow, the Purple Martin (*Progne subis*). A recent study of martins using DNA techniques revealed that intraspecific parasitism may be common at times in a Maryland population (Morton et al. 1990). In one colony, 36% of the offspring in the nests of yearling females apparently originated from parasitic eggs laid by other females (Morton et al. 1990). However, a long-term study of Purple Martins in Texas revealed no evidence of brood parasitism, based on the pattern of egg laying (Brown 1997).

Brood parasitism is especially interesting because it may promote the formation of breeding colonies in Purple Martins. Alternative reproductive tactics such as extrapair mating and intraspecific brood parasitism potentially provide gains in fitness for their perpetrators (Westneat and Sherman 1990, Brown and Brown 1998). This has led to the suggestion that females may cluster near high-quality males to solicit extrapair copulations (Wagner 1993, Wagner et al. 1996) and that males may try to recruit other males to settle nearby in order to seek extrapair copulation with their mates (Morton et al. 1990). If we are to evaluate the importance of alternative reproductive tactics in the evolution of avian coloniality, we must know if and how often brood parasitism occurs in colonial species such as Purple Martins from various parts of their range. I looked for evidence of brood parasitism as part of a study on the costs and benefits of coloniality in martins in northeast Oklahoma (Davis 1998).

METHODS

My study was conducted in residential backyards in Tulsa and Wagoner counties, Oklahoma, between early March and late July 1997. The study area included the cities of Tulsa, Sand Springs, Broken Arrow, Coweta, and Bixby. Fifteen different colonies were studied intensively. The martin houses at each site were at least 10 m from the closest building and 5 m or more from the nearest trees. The majority of the martin houses were aluminum and mounted on top of retractable steel poles about 5 m above the ground. I could lower most of the houses to check nests. I began nest checks in late April to determine date of first egg laying. Once egg laying began, I checked each nest every other day in most colonies.

I inferred intraspecific brood parasitism whenever two or more eggs appeared in a nest during a 24-hour period. Because a female bird cannot lay successive eggs at intervals of less than 24 hours, the two-egg-a-day method is widely used to document intraspecific brood parasitism (Brown 1984, Brown and Brown 1989, 1996).

RESULTS AND DISCUSSION

Intraspecific brood parasitism occurred in seven of 394 nesting attempts (3.6%). Clutch sizes of these nests ranged from five to seven eggs. Six of the seven instances occurred in colonies containing more than 10 pairs.

In the largest colony (54 nests), I found evidence for intraspecific brood parasitism in two nests. Nest checks on the afternoons of 3 and 7 May revealed one complete nest with green leaves (A18). Three days later, on the afternoon of 10 May, I found four eggs in the nest. Because there were no eggs on 7 May, the first egg was probably laid on 8 May. The final clutch size of this nest was six eggs. Twenty-seven other clutches were initiated within five days of A18. In the second nest (B17), a complete but empty nest was recorded on 10 May. Four days later, on 14 May I found five eggs. The final clutch size of B17 was also six eggs. Thirty-three other clutches were initiated within five days of B17.

In the next largest colony (34 nests), one nest which contained no eggs on 13 May had four eggs two days later on 15 May. Eight other clutches were initiated within five days of this nest. I observed the fourth incident of brood parasitism in a colony of 18 nests. This nest began laying earliest in this colony (8 May) with the next clutch not initiated until 16 May. One egg was found on 8 May, but on 11 May there were five eggs.

A colony of 13 nests had two nests that were parasitized. I checked the nests on 12 May, and no eggs were found in either nest. On 14 May, I counted four and five eggs in these nests. Eight other females initiated clutches within five days. Final clutch sizes for these nests were seven and six eggs, respectively.

The smallest colony where brood parasitism occurred had seven nests. On 7 May I noted that a nest was empty, but on 9 May I found three eggs in that nest. The final clutch size for this nest was six eggs; six other clutches were initiated within five days.

My results are interesting especially in comparison to those of Brown (1997, pers. comm.) who studied Purple Martins at a site in north central Texas only about 300 km south of my study site. Brown also checked hundreds of nests and found none that had been parasitized. Yet, I found a much lower incidence of brood parasitism than Morton et al. (1990) in Maryland who found that 36% of nestlings in some nests were parasitic offspring. There would appear to be obvious differences between the Texas, Oklahoma, and Maryland populations in reproductive tactics. Geographic differences in intraspecific brood parasitism also exist in Cliff Swallows: a study in California suggested that brood parasitism occurred in only 3.7% of the nests (Smyth et al. 1993), compared to 22–43% of the nests in Nebraska (Brown and Brown 1989, 1996).

Although the incidence of brood parasitism appeared to be relatively low in my study, the frequency of parasitic laying may have been slightly higher than I estimated. I scored each nest as containing only one parasitic egg, but at least two of the nests probably had two parasitic eggs. Furthermore, my method of inferring whether parasitism occurred was conservative because if the perpetrator laid an egg in a host's nest the day before or the day after the host began laying, I would assume it belonged to the host and not count it as parasitic.

Unfortunately, I have no information on the identities of the females who laid parasitic eggs. Identifying parasites is difficult, and for martins would require either continual observation of select nests (Brown and Brown 1989) or molecular parentage analyses (Morton et al. 1990), which were beyond the scope of this study. In the Cliff Swallow, all parasitism was perpetrated by females resident in the colony that maintained nests of their own, and these females usually parasitized their close neighbors (Brown and Brown 1989). This was probably the case for Purple Martins, although the large number of floaters in most martin populations (Brown 1997) suggests that nonresidents of the colony also might have been responsible.

Among the Purple Martin clutches that contained parasitic eggs, four nests appeared to be parasitized early in the laying period. In their study of Cliff Swallows, Brown and Brown (1989, 1996) also found that parasitism occurred early in the host's laying period and sometimes up to three days prior to egg laying by the host. This timing may cause host females to stop laying earlier than normal, resulting in smaller clutches than those laid by nonparasitized females (Brown and Brown 1996, 1998). Contrary to the results for Cliff Swallows, however, parasitized nests in my study did not contain smaller clutches than nests not known to have been parasitized. If anything, the Purple Martin nests that were parasitized contained more eggs than other nests: five had clutches of six eggs and one had a clutch of seven.

I did not have enough observations to detect any effect of colony size on brood parasitism in Purple Martins. However, I found no parasitism in the smallest colonies. Larger colonies in some species contain greater percentages of nests with brood parasitism due to the increased opportunities there for engaging in alternative reproductive tactics such as brood parasitism (Hoogland and Sherman 1976, Westneat et al. 1990, Brown and Brown 1996).

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NOTES

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Late record of the Purple Martin for Oklahoma.—On 1 November 1998, we observed a female Purple Martin (*Progne subis*) perched on the porch of a lowered and closed martin house in our backyard in northeastern Broken Arrow, Tulsa County, Oklahoma. The martin house was only about 2 m off the ground and its entrances all plugged for the winter. The bird sat on an intermediate tier, shielded from the heavy rain that continued throughout the time the bird was present, and we photographed it. We first saw it at about 0950 CST, and it remained there continually until we last saw it at about 1450. The bird disappeared as soon as the rain stopped, and we did not see it again. Judging from the almost complete lack of blue feathering on the bird's back and the light undertail coverts (Brown, C. R., Purple Martin (*Progne subis*), In: The birds of North America, A. Poole and F. Gill, eds., No. 287, Acad. Nat. Sci., Philadelphia, and Am. Ornithol. Union, Washington, DC., 1997), the bird was a yearling female. It did not seem to be injured or sick and appeared only to be trying to escape the driving rain. Until this, we had seen no Purple Martins around our martin houses since early September.