SHORT COMMUNICATIONS

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MATING SYSTEM OF THE DUSKY ANTBIRD, A TROPICAL PASSERINE, AS ASSESSED BY DNA FINGERPRINTING

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Abstract. We studied the genetic mating system of the Dusky Antbird (*Cercomacra tyrannina*) in Panama using multilocus DNA fingerprinting. We found no evidence of extra-pair fertilization (EPF) in 15 offspring of nine families. We also found no evidence of intraspecific brood parasitism (ISBP) for 13 offspring in eight families.

Key words: Cercomacra tyrannina, *Dusky Antbird, DNA fingerprinting, extra-pair fertilizations, tropical birds.*

Assessments of mating systems based solely on behavioral observations, even reasonably detailed ones, may not accurately represent genetic mating systems in natural populations of birds. This knowledge has arisen largely from the recent application of powerful molecular methods, primarily multilocus DNA fingerprinting (see Fleischer 1996 for review). In songbirds, 70–80% of socially monogamous species studied using DNA and/or protein methods have shown clear evidence of extra-pair fertilization (EPF; Westneat 1990, Birkhead and Møller 1992, Stutchbury and Morton 1995).

Most studies of songbirds have dealt with Temperate Zone breeders. The only studies known to us of tropical, socially monogamous birds (Telecky 1989, Fleischer et al. 1994, Robertson and Kikkawa 1994) have revealed high mate fidelity (0% EPF). We predict that most tropical, behaviorally monogamous song birds also will exhibit genetic monogamy because in over 60% of such species (Morton 1979, 1980) pairs are sedentary year-round on territories, maintain long-term pair bonds, and nest asynchronously with other pairs (Stutchbury and Morton 1995). We present here results of multilocus DNA fingerprinting that reveal no EPF or intra-specific brood parasitism (ISBP) in a sample of clutches of the Dusky Antbird (*Cercomacra tyrannina*), a tropical, sedentary and behaviorally monogamous passerine.

METHODS AND MATERIALS

Dusky Antbirds were marked with unique color band combinations in Parque Nacional Soberania, Gamboa, Panama Province, Republic of Panama during the nonbreeding (dry) season from 1991 through 1995, and during the breeding season in 1993 and 1994. Dusky Antbirds were common in second-growth habitat, reaching densities of 3 per hectare (Morton et al., unpubl. data). Observations and playbacks of Dusky Antbird song were used to establish the identities of territorial occupants (see Morton and Derrickson 1996 for more details on field methods). Once we established that a pair occupied a territory, the area was systematically searched for nests. Many empty nests were found, possibly because of prior predation. We found that Dusky Antbirds, like most tropical passerine species, have complete clutch sizes of two or fewer eggs.

When a nest containing eggs or young was located, we used song playbacks to lure adults into mist nets placed near the nest. Blood samples from adults and nestlings were taken from the brachial artery (Wingfield and Farner 1976) and a volume of lysis buffer (TE-SDS) approximately equal to the volume of whole blood was added. Predation was very high and all eggs left in the nest initially in our 1993 season disappeared within 2–3 days. This forced us to remove eggs from nests (after catching and bleeding parents) and to incubate them long enough so that sufficient DNA could be obtained from the embryos. DMSO lysis buffer (Seutin et al. 1991) was used to store these tissue samples. Samples were transported on ice and stored at −20°C.

Whole genomic DNA was isolated as in Fleischer et al. (1994) and subjected to multilocus DNA fingerprinting using the Jeffreys 33.15 and 33.6 probes (Jeffreys et al. 1985) and standard methods (see Loew and Fleischer 1996 for specific protocols).

Following the approach of Westneat (1990), the two adults defending a nest were excluded from co-parentage if an offspring's profile contained three or more fragments that could not be assigned to either putative parent (non-attributable bands). Band sharing coefficients (S of Lynch 1990) were calculated from a presence/absence matrix of same-sized fragments for putative related and unrelated individuals. To assess the possibility that our data could not reveal EPFs, we substituted the nearest putative unrelated adult for one parent (the sham) and then counted the number of non-attributable fragments and calculated S (Fleischer et al. 1994).

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We used the distribution of S between non-excluded parents and nestlings to determine likelihood of parentage for nests with only one parent. Values which fell below those for established relatives were considered genetic mismatches, whereas values which fell within those for known first-order relatives were considered genetic matches (parent was not excluded). In addition, we used background S to calculate a predicted S for r = 0.5 (i.e., parent-offspring, full siblings; Jeffreys et al. 1985). We used a binomial power test to determine the highest proportion of EPFs that could be present in the population without our detecting them in our sample.

RESULTS

We generated fingerprint profiles for 21 adults and 21 offspring for both probes. We were able to reliably score one nest-attending male's profile for only one of the probes (Jeffrey's 33.6). The 21 offspring came from 12 nests; we could not fingerprint nest attendants from two clutches, however. Of the remaining 10 nests, profiles were generated for both putative parents from seven nests (a total of 11 offspring). We were able to fingerprint only the female for one nest (two offspring) and only the male for two nests (four offspring). Thus 15 offspring in nine families could be tested for EPF and 13 in eight families could be tested for intra-specific brood parasitism (ISBP). All clutches were derived from different territories/pairs and thus represent independent observations.

An average (± SD) of 35.0 ± 6.4 fragments combined over both probes was scored per lane. Band sharing (S) between random (presumably unrelated) individuals averaged 0.24 ± 0.03 (n = 10), whereas S between individuals within mated pairs averaged 0.29 ± 0.09 (n = 7). For the seven complete families, the number of non-attributable bands in offspring profiles (n = 11) averaged 0.82 per offspring (range 0 to 2 for both probes combined). Average S between the adults and offspring was 0.60 ± 0.07 (n = 21). Predicted S for parent-offspring was 0.62 (Jeffreys et al. 1985).

Our analysis using 10 sham males revealed an average of 8.1 ± 2.0 non-attributable fragments and an S of 0.29 ± 0.04 for both probes combined (Fig. 1). These values differ significantly from the values calculated for nest-attending adults ($P < 0.001$). Thus, there is sufficient variability to detect EPFs and we concluded that there were no EPFs in the seven complete families.

The values of S between the offspring and the single adult of the three incomplete families averaged 0.66 ± 0.06 (n = 6). These values fall within the range of S between offspring and non-excluded adults so we concluded that there were no genetic mismatches between single adults and offspring. Thus, we found no evidence of EPF for a total of 15 offspring among nine clutches and no evidence of ISBP for a total of 13 offspring among eight clutches.

DISCUSSION

Our analyses provide no evidence for EPF or ISBP in the Dusky Antbird. However, our results do not rule out the possibility that EPF or ISBP occur in our study populations of Dusky Antbirds. Because of our relatively small sample size of nests and nestlings our results are significantly different from an EPF rate of 18.5% of nestlings (binomial test, 0.05 level). Nonetheless, it does appear that EPF and ISBP are both relatively rare occurrences in the behavioral repertoires of the Dusky Antbird.

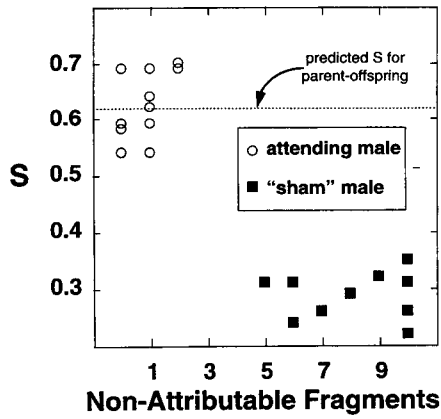

FIGURE 1. Values of S (band-sharing coefficient) for comparisons of attending males and offspring versus "sham" males and the same offspring plotted against the number of non-attributable fragments in the attending or sham male's DNA profile. Dashed line is the value of S predicted for parent-offspring comparisons from background S (see text).

Our results are concordant with those of three previous studies of extra-pair parentage in socially-monogamous tropical passerines (as well as in many sedentary, Temperate Zone passerines) and differ considerably from results from most studies of temperate breeding, migratory species (references above). If our results hold for this and other tropical species, this would suggest that genetic monogamy may still be the dominant form of mating system in socially monogamous songbirds simply because more songbird species live in the tropics than in the Temperate Zones. We urge more DNA analyses of parentage in *tropical* songbirds, coupled with detailed breeding biology data, to confirm the generality of this prediction and to identify its causes.

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ON THE BEHAVIOR OF THE BLACK SWIFT[1]

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Abstract. The behavior of Black Swifts was studied in southern California from 1990 to 1992. Four types of aerial interactions were distinguished: (a) group chase, (b) pair chase, (c) pair contact, and (d) touch and grasp. The latter two interactions can be intraspecific or interspecific. Aerial copulation was not observed. Nestlings, from age 18 days onward, and adults gave hostile or deterrence displays by wing-raising. Begging by nestlings was silent but aggressive toward the adult. Silent begging may be an antipredator strategy for a species that produces a single chick per season. Nestlings have a far more conspicuous white facial marking than adults; this may function as a target signal to guide food delivery in the dimly lit nesting conditions and as an aid for the adult to find the nest when arriving late at night. Adults roosted on the nest for the first half of the nestling period and then most roosted on the cave walls. During incubation and early brooding, an adult always remained at the nest, and food transfer between adults was observed during this period.

Key words: behavior, aerial and hostile displays, begging, roosting, Cypseloides niger.

Swifts as a group are remarkably uniform in shape, which makes them difficult to identify, and their aerial lifestyle makes them difficult to observe. As a result, little is known about their behavior, even for common species. This is especially true in the New World swifts.

The subfamily Cypseloidinae contains 12–13 species, most of which are tropical or semitropical in distribution. All are similar in body shape, and most have uniform dark plumage and facial markings, which in some are distinctive. All species in the subfamily nest in sites behind waterfalls, in caves, or deep gorges, on sea cliffs, and in sea caves. Moisture, inaccessibility

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