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# COOPERATIVE BREEDING IN THE TROPICAL MOCKINGBIRD (*MIMUS GILVUS*) IN THE PANAMA CANAL ZONE

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**Anidación comunal en la Paraulata llanera (*Mimus gilvus*) en Panamá.**

**Key words**: *Mimus gilvus*, Tropical Mockingbird, cooperative breeding, DNA fingerprinting, Panama.

## INTRODUCTION

Tropical Mockingbirds have a large geographic range from southern Mexico to northern South America to coastal eastern Brazil and the southern Lesser Antilles (Sibley & Monroe 1990). Throughout this wide range, primarily in lowland areas, they inhabit open, often seasonally arid, environments such as llanos but also cleared or residential, areas. They are omnivorous. Occasionally, they attempt to kill small birds such as Yellow-bellied Seedeaters (*Sporophila nigricollis*) (ESM, pers. observ.) and *Anolis* lizards (Wunderle 1981) but are most often seen taking fruit, especially from royal palm (*Roystonea* spp.) and an exotic fig (*Ficus religiosa*) in our study area, and foraging for invertebrates on the ground.

Throughout their range, they usually are reported to live in pairs but they have been little studied. For example, near Maracaibo, Venezuela, Paredes *et al.* (2001) describe Tropical Mockingbirds as monogamous and territorial yearlong. However, in the central Venezuelan llanos, they are reported to reproduce communally (Laurent 1990). Here we document cooperative breeding for Tropical Mockingbirds in central Panama. We show that groups of birds jointly defend territories and help feed nestlings. We also document relatedness of the participants through DNA fingerprinting. The occurrence of cooperative breeding is interesting because this population is derived from released captive birds (Chapman 1941).

Tropical Mockingbird did not appear in a field guide to birds in the former Canal Zone (Sturgis 1928) so it is likely they arrived after 1928. Deignan (*fide* Wetmore *et al.* 1984) reported one singing mockingbird in Balboa, Panama, in 1932. Wetmore *et al.* (1984) relates that about 100 birds were released from a ship docked in Balboa, on the Pacific slope of Panama, in 1935. The sex ratio and survival of this release is, of course, unknown. Chapman thought the birds he collected in 1938 and 1939 were a smaller race from

TABLE 1. Composition of five contiguous cooperatively breeding Tropical Mockingbirds groups in Gamboa, March 1995.

| Group/Ind. no. | Sex | Wing (mm) | Tarsus (mm) | Weight (g) | Feeding trips/h |
|---|---|---|---|---|---|
| 1a | Male | 128 | 40.7 | 73.0 | No data |
| 1b | Male | 125 | 39.7 | 71.0 | No data |
| 1c | Female | 115 | 42.0 | 81.0 | No data |
| 1d | Female | 115 | 41.9 | 63.0 | No data |
| 2a | Male | 125 | 42.9 | 68.5 | 3.0 |
| 2b | Male | 117 | 40.8 | 66.0 | 5.0 |
| 2c | Male | 124 | 41.3 | 67.0 | 1.3 |
| 2d | Female | 115 | 43.8 | 74.0 | 3.7 |
| 2e | Female | 118 | 39.5 | 71.0 | 3.7 |
| 3a | Male | 126 | 42.5 | 73.5 | No data |
| 3b | Male | 118 | 43.4 | 71.0 | No data |
| 3c | Female | 114 | 41.1 | 74.0 | No data |
| 3d | Female | 114 | 41.4 | 73.5 | No data |
| 4a | Male | 115 | 39.3 | 66.0 | No data |
| 4b | Male | 128 | 44.6 | 75.5 | No data |
| 4c | Female | Not captured | | | |
| 5a | Male | 130 | 43.5 | 67.0 | 2.0 |
| 5b | Male | 130 | 44.8 | 73.0 | 2.0 |
| 5c | Male | 113 | 41.1 | 71.0 | 3.0 |
| 5d | Female | 116 | 41.0 | 72.0 | 2.0 |
| 5e | Not captured | | | | |

Venezuela, *melanopterus*. Wetmore determined that they are of the race *tolimensis* from western and southern Colombia. He reported wing measurements of 116.2–129.5 mm (121.7) for male *tolimensis* versus 109.1–119.8 mm for *melanopterus*. Our measurements agree that it is the larger form (115–130 mm, averaging 123.3 mm, n = 12 males, Table 1). Thus the released birds were probably from Colombia but we do not know if cooperative breeding is found in birds there. Thus the question of whether the released birds were from a cooperatively breeding population or whether they developed cooperative breeding in their new environment is unanswered.

## FIELD OBSERVATIONS

We noticed that Tropical Mockingbirds appeared in groups during field work in Panama from 1990 to 1994. In February and March 1995, we captured, colored banded, and took blood samples from 21 adult Tropical Mockingbirds in Gamboa, Republic of Panama. They were restricted to habitats consisting of mowed grass interspersed with trees and bushes typical of suburban areas. Some of the banded birds on the periphery of such habitat consisted of pairs. There were six breeding groups in our study area, the center of town bordered by the Panama Railroad line, Jadwin Ave., Murwin and Sibert Roads.

TABLE 2. Band-sharing coefficients for two Tropical Mockingbird groups in Gamboa, March 1995.

| Group 1* | 1a | 1b | 1c | 1d | Nestling 1 | Nestling 2 | | |
|---|---|---|---|---|---|---|---|---|
| 1a | X | 0.56 | 0.51 | 0.40 | 0.45 | 0.62 | | |
| 1b | | X | 0.42 | 0.14 | 0.57 | 0.69 | | |
| 1c | | | X | 0.50 | 0.56 | 0.62 | | |
| 1d | | | | X | 0.62 | 0.63 | | |
| Nestling 1 | | | | | X | 0.67 | | |
| Nestling 2 | | | | | | X | | |
| | | | | | | | | |
| Group2 | 2a | 2b | 2c | 2d | 2e | Nestling 1 | Nestling 2 | Nestling3 |
| 2a | X | 0.49 | 0.74 | 0.15 | 0.55 | 0.55 | 0.62 | 0.64 |
| 2b | | X | 0.47 | 0.33 | 0.51 | 0.56 | 0.55 | 0.69 |
| 2c | | | X | 0.27 | 0.70 | 0.48 | 0.62 | 0.73 |
| 2d | | | | X | 0.48 | 0.69 | 0.61 | 0.57 |
| 2e | | | | | X | 0.39 | 0.53 | 0.43 |
| Nestling 1 | | | | | | X | 0.65 | 0.62 |
| Nestling 2 | | | | | | | X | 0.67 |
| Nestling 3 | | | | | | | | X |

*Individuals numbered as in Table 1.

This area encompassed 8.01ha of which approximately 10% was uninhabitable due to buildings, streets, and a swimming pool. We studied five groups totaling 21 birds (Table 1), one group of several adults was inside a restricted area and inaccessible. Many of the same colorbanded individuals were observed until 2001, when our annual trips to Gamboa ended.

Feeding data were obtained for two groups (2 & 4, Table 1). Group 2 consisted of three males and two females all of which fed their three nestlings. The smallest male (Table 1, 2b) fed the most while the two females fed equally. The nestlings hatched 3 March and feeding data were obtained from 1-h observations on 7, 8, and 15 March. Group 4 consisted of three males, one female, and one uncaptured member (female ?). Their nest contained two nestlings and all five group members contributed to feeding them (Table 1).

We performed DNA fingerprinting on groups 1 and 2 using Jeffrey's probe 33.15 (Jeffreys *et al.* 1985). Details of blood sampling and fingerprinting techniques are presented in Stutchbury *et al.* 1998. Group 1 consisted of two males and two females (Table 1). The relationships between the adults and the adults and the nestlings in each group are presented in Table 2. Both groups consisted of mostly close relatives, with an average band-sharing amongst the adults of 0.42 for group 1 and 0.47 for group 2, which complicates the assignment of parentage. The close relationship between all the adults in each group is expected if the population was founded by a small population 70 years ago. In group 1 the female 1d is related to all others in the group, except male 1b, to which it is clearly unrelated. Male 1a and male 1b are related, perhaps as first order relatives. Female 1d is the mother of both nestlings and male 1b is the father of at least nestling 1 but nest-

TABLE 3. Novel band analysis for two Tropical Mockingbird groups in Gamboa, March 1995.

| Group 1* | Adult pairs* | | | | | |
|---|---|---|---|---|---|---|
| Nestling No. | 1a & 1d | 1a & 1c | 1b & 1d | 1b & 1c | | |
| 1 | 2 | 2 | 0 | 1 | | |
| 2 | 0 | 2 | 0 | 2 | | |
| Group 2 | Adult pairs | | | | | |
| Nestling No. | 2a & 2d | 2a & 2e | 2b & 2d | 2b & 2e | 2c & 2d | 2c & 2e |
| 1 | 0 | 2 | 1 | 2 | 0 | 3 |
| 2 | 2 | 1 | 1 | 1 | 0 | 1 |
| 3 | 0 | 0 | 0 | 0 | 0 | 1 |

*Male listed first in each possible pairing combination.

ling 2's father could be either male 1a or 1b according to novel band analysis (Table 3). In group 2, female 2d is unrelated to all adult males yet closely related to all three nestlings (Table 2). Female 2e is possibly related to female 2d (r = ¼) and possibly related to all nestlings (r = ¼), but not as closely as is female 2d. Males 2a and 2c are closely related (r = ½). Both appear less closely related to male 2b (r = ¼). The parents of nestling 1 were either male 2c and female 2d or male 2a and female 2d (Table 3). The parents of Nestling 2 were male 2c and female 2d. The parentage of Nestling 3 could be any combination of the adult group but male 2c and female 2d could be the parents of all nestlings. Thus there is evidence for reproductive skew (Emlen 1996) in these mockingbirds but more data are needed before it can be described and analyzed.

In the Venezuelan llanos, Laurent (1990) found Tropical Mockingbirds living in groups of from two to six individuals, similar to group sizes we observed in Panama. But 7 of her 16 (44%) study groups consisted of only two birds (pairs). In contrast, all of the birds in our downtown Gamboa study site were in groups, with pairs found mainly in marginal habitats adjacent to forest, which is avoided by mockingbirds. The facultative nature of communal breeding in this species needs more study.

What conditions might have contributed to the development (or continuance if common in the source population) of cooperative breeding in this introduced population? As in Galápagos mockingbirds, Tropical Mockingbirds in the Isthmus of Panama defend yearlong territories and the usable habitat is likely saturated (Curry & Grant 1990). It is possible that the original release was highly male-biased because males are preferred in captivity for their singing ability. A skewed sex ratio is another aspect that may promote group-living (Curry & Grant 1990). We noticed that safe nest sites may be an important and rare commodity in addition to habitat saturation. The birds nested in artificially safe places, e.g., inside a 3-m high fence surrounding a pool placed in a palm surrounded by the pool border, 3 m up in a *Pandanus* spp., a tree-like plant with large sharply serrated leaves, in a large and dense hibiscus bush surrounded by a busy road. All groups appeared to be dependent on man-made habitat for nest sites and foraging on mowed grass and feeding on fruits from introduced plants. They also nested in the dry season when invertebrate

food for nestlings is uncommon (Stutchbury & Morton 2001). Perhaps the helpers provided sufficient food for raising young in this relatively predator-free, but food-poor, time (Morton 1971). We hope that these preliminary observations will stimulate more research on these cooperative breeding mockingbirds.

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