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Unambiguous Evidence of Helping at the Nest in Bridled Titmice

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ABSTRACT.—Two instances of helping behavior in Bridled Titmice (*Baeolophus wollweberi*) were observed. In each case, one auxiliary bird assisted in feeding chicks at a nest. Both helpers were male; one a hatching year bird and the other an after hatching year bird. It was possible to quantify the feeding efforts of all three birds at one nest, but not at the other. The importance of our findings lies in the rarity of helping behavior in the titmouse family (Paridae). *Received 30 Sept. 1997, accepted 3 Aug. 1998.*

Animals helping to rear young that are not their own seem to be acting in a way that is detrimental to their personal fitness. The question of why natural selection has maintained cooperative breeding in animal populations has sparked lively debate and considerable research (e.g., Emlen 1982a, b; Brown 1987; Stacey and Ligon 1991; Koenig et al. 1992). Cooperative breeding subsumes a wide variety of social systems among diverse taxa (Brown 1987); it appears that the factors influencing cooperative systems are equally diverse. Discussion of the significance of helping will most likely continue as more is learned about the ecological and phylogenetic relationships of cooperative breeders. Documentation of helping in poorly known species is thus essential to the development of theory in this area.

Here we present observations of one completely banded and one partially banded nesting unit of Bridled Titmice (*Baeolophus wollweberi*). Helpers may occur with some frequency in this species, at least in some areas; 6 out of 10 nests observed over the course of three years in the Huachuca Mountains of Arizona appeared to have had helpers present, and four cases of helpers at the nest have been reported in Durango, Mexico (Nocedal and Ficken, in press). Previous observations of helping behavior in this species have been of limited duration in largely unbanded populations. Thus it has been impossible in most cases to identify helpers, even as to age or sex, or to quantify their contributions. Helping is rare within the tit family (Paridae). The Black Tit (*Parus niger*) of South Africa appears to breed cooperatively on a regular basis (Tarboten 1981) and helpers have been reported occasionally in the Tufted Titmice (*B. bicolor*; Brackbill 1970, Davis 1978, Tarbell 1983). Cooperative breeding within this family is particularly interesting because of the vast amount of information available on the group (Smith 1991 and references therein).

In June 1997 we color banded Bridled Titmice and made systematic behavior observations at seven active nests in two canyons in the Chiricahua Mountains, Cochise Co., Arizona. In 1998 we banded and observed titmice at 21 nests in the same study areas. Each year, one nest was tended by three birds. In 1997, the nest with three birds present was found on 5 June, and contained four young chicks. It was located in a natural cavity in a live oak tree. The first attending bird, an after hatching year (AHY) male, was banded on 8 June. The second, an AHY female, was banded on 16 June. The third bird was banded on 18 June; a hatching year (HY) bird, which was male (based on wing measurement; Gaulin and Christman, unpubl. data). The bird was determined to be an HY bird by lack of feather wear, pale mouth lining (Pyle et al. 1987), and indistinct facial pattern (pers. obs.). Research on a wide array of species with helpers suggests that the HY helper we banded was probably from a previous brood raised by the AHY birds trapped at the nest; however, this supposition remains to be tested for Bridled Titmice. Double brooding does occur occasion-

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ally in our study area. In 1997, adults were observed simultaneously feeding a fledgling and building a nest, and in 1998 a banded pair successfully raised two broods. The chicks were banded in the nest on 19 June. We began observations of the nest after the first two adult birds were banded (16 June), and continued until 24 June. During 16.5 hours of observations, we observed 103 feedings. Thirty-nine (38%) were by the adult male, 39 (38%) by the adult female, and 25 (24%) by the helper. We did not see the adults feeding the HY helper during our nest watches or at any other time. The observations were spread uniformly throughout the day. The nest may have successfully fledged one chick; however, the other three nestlings were lost to predation. The predation of the third nestling occurred during a nest watch; it was taken by a cliff chipmunk (*Eutamias dorsalis*). The chipmunk ran into the hole, grabbed the nestling, and exited rapidly. From the behavior of the chipmunk, it seems probable that it was responsible for taking the other two nestlings. The nest was examined immediately after the predation, and only one chick remained. Until this time, we had avoided looking into the nest after banding the chicks, so we do not know when the first two nestlings disappeared.

In June 1998 we discovered a second instance of helping. Two birds were separately trapped and banded as they exited the nest after feeding nestlings: an AHY female (based on wing measurements and brood patch) and an AHY male (based on wing measurements and song; Ficken, pers. comm.) on 11 and 14 June, respectively. The presence of a third bird was detected on 13 June, after the banding of the first bird, when two unbanded birds were simultaneously observed at the nest cavity carrying food. The final unbanded bird became extremely wary after the trapping of the second bird, and ceased feeding the nestlings. However, it remained near the nest until the chicks fledged, singing and giving alarm calls. It did not remain with the family flock after the chicks fledged. Despite being unable to catch the third bird, we were able to determine that the unbanded helper was male (by song), and that it was an AHY bird (based on facial pattern, tail feather wear, song development, and the absence of independent fledglings in the population at this date). Five chicks were successfully fledged from the nest.

Phylogeny appears to influence the incidence of cooperative breeding (Edwards and Naeem 1993). Why might Bridled Titmice have helpers at the nest when the behavior is generally rare within the family? Parids exhibit some of the demographic and behavioral characters typical of cooperative species (Brown 1974). Most tit species form stable flocks, hold group territories in the non-breeding season, and are highly sedentary; habitat saturation appears to be a constraint on breeding in certain populations (Ekman 1988). In some populations, there appears to be high enough winter mortality so that breeding opportunities open in the spring; in others, floating non-breeders appear to be common (Odum 1942, Weise and Meyer 1979). The similarity between the ecology of titmice and cooperative species has been discussed previously (Ekman 1989, Matthysen 1990).

Bridled Titmice differ from other parids in the timing of natal dispersal which may make helping behavior more likely to evolve. In most well studied tit species, the winter flocks form in the late summer with juveniles dispersing from their natal territories, finding mates, and joining an adult pair (or sometimes multiple pairs) on the adults' territory (Ekman 1989, Matthysen 1990). Juveniles that establish themselves on a territory earlier have a higher dominance rank which in turn leads to higher survivorship over the winter and a higher probability of breeding in the spring (Brawn and Samson 1983, Nilsson and Smith 1988). Early dispersal of juveniles to these winter flocks is therefore under strong selection and young birds leave the parental territory as early as 12 days post-fledging (Nilsson and Smith 1988). Early dispersal appears not to be of primary importance in Bridled Titmice, however. Juveniles remain on the parental territory for a minimum of 34 days and some stay for over six weeks (Christman, unpubl. data). In the case of the HY helper, the individual may not have suffered a fitness cost by remaining on the (presumed) parental territory, though the question of why it assisted in rearing the young remains unanswered. The presence of an AHY helper in 1998 indicates that there may be other reasons why individuals help. Until we have collected more data

on both the behavior and relatedness of helpers to the breeding pair it is not possible to speculate why mature individuals help at the nest in this species.

At present the importance of helping at the nest in Bridled Titmice lies in its relative taxonomic isolation. The fact that this behavior is rare among other members of the family makes this taxonomic group a fertile ground for comparative testing of theories of cooperative breeding.

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LITERATURE CITED

BRACKBILL, H. 1970. Tufted Titmouse breeding behavior. Auk 87:522–536.

BRAWN, J. D. AND F. B. SAMSON. 1983. Winter behavior of Tufted Titmice. Wilson Bull. 95:222–232.

BROWN, J. L. 1974. Alternate routes to sociality in jays—with a theory for the evolution of altruism and communal breeding. Am. Zool. 14:63–80.

BROWN, J. L. 1987. Helping and communal breeding in birds: ecology and evolution. Princeton Univ. Press, Princeton, New Jersey.

DAVIS, M. F. 1978. A helper at a Tufted Titmouse nest. Auk 95:767.

EDWARDS, S. V. AND S. NAEEM. 1993. The phylogenetic component of cooperative breeding in perching birds. Am. Nat. 141:754–789.

EKMAN, J. 1988. Dominance, exposure and time use in Willow Tit flocks: the cost of subordination. Proc. Int. Ornithol. Congr. 19:2373–2381.

EKMAN, J. 1989. Ecology of non-breeding social systems of *Parus*. Wilson Bull. 101:263–288.

EMLEN, S. T. 1982a. The evolution of helping. I. An ecological constraints model. Am. Nat. 119:29–39.

EMLEN, S. T. 1982b. The evolution of helping. II. The role of behavioral conflict. Am. Nat. 119:40–53.

KOENIG, W. D., F. A. PITELKA, W. J. CARMEN, R. L. MUMME, AND M. T. STANBACK. 1992. The evolution of delayed dispersal in cooperative breeders. Q. Rev. Bio. 67:111–150.

MATTHYSEN, E. 1990. Nonbreeding social organization in *Parus*. Curr. Ornithol. 7:209–249.

NILSSON, J.-Å. AND H. G. SMITH. 1988. Effects of dispersal date on winter flock establishment and social dominanace in Marsh Tits, *Parus palustris*. J. Anim. Ecol. 57:917–928.

NOCEDAL, J. AND M. S. FICKEN. in press. Helpers in the Bridled Titmouse (*Parus wollweberi*, Family Paridae). Southwest. Nat.

ODUM, E. P. 1942. A comparison of two chickadee seasons. Bird-Banding 13:154–159.

PYLE, P., S. N. G. HOWELL, R. P. YUNICK, AND D. F. DESANTE. 1987. Identification guide to North American passerines. Slate Creek Press, Bolinas, California.

SMITH, S. 1991. The Black-capped Chickadee: behavioral ecology and natural history. Cornell Univ. Press, Ithaca, New York.

STACEY, P. B. AND J. D. LIGON. 1991. The benefits-of-philopatry hypothesis for the evolution of cooperative breeding: variation in territory quality and group size effects. Am. Nat. 137: 831–846.

TARBELL, A. T. 1983. A yearling helper with a Tufted Titmouse brood. Wilson Bull. 54:89.

TARBOTEN, W. R. 1981. Cooperative breeding and group territoriality in the Black Tit. Ostrich 52: 216–225.

WEISE, C. M. AND J. R. MEYER. 1979. Juvenile dispersal and development of site-fidelity in the Black-capped Chickadee. Auk 96:40–55.

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Swainson's Thrush Caught in Enchanter's Nightshade

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ABSTRACT.—On 10 September 1993, I was tending the banding nets for the Rouge River Bird Observatory (RRBO) at the University of Michigan–Dearborn, Wayne Co., Michigan. On my way down the net lanes, I noticed a bird struggling in the weeds. It was a Swainson's Thrush (*Catharus ustalatus*) thoroughly caught by the wings in the seed pods of a clump of enchanter's nightshade (*Circaea quadrisulcata* syn. *lutetiana*). Despite the bird flapping even more vigorously as I approached, it could not free itself. I disengaged the bird from the plant and returned to the banding lab. The bird was an apparently healthy hatching-year individual that weighed 32.1 grams. (The mean weight of 472 Swainson's Thrushes banded at

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