

- MACKENZIE, D. I. 1982. The dune-ridge forest, Delta Marsh, Manitoba: overstory vegetation and soil patterns. *Can. Field-Nat.* 96:61-68.
- ROBERTSON, R. J., AND R. F. NORMAN. 1977. The function and evolution of aggressive host behavior towards the Brown-headed Cowbird (*Molothrus ater*). *Can. J. Zool.* 55:508-518.
- ROTHSTEIN, S. I. 1971. Observation and experiment in the analysis of interactions between brood parasites and their hosts. *Am. Nat.* 105:71-74.
- ROTHSTEIN, S. I. 1975a. An experimental and teleonomic investigation of avian brood parasitism. *Condor* 77:250-271.
- ROTHSTEIN, S. I. 1975b. Evolutionary rates and host defenses against avian brood parasitism. *Am. Nat.* 109:161-176.
- ROTHSTEIN, S. I. 1976. Experiments on defenses Cedar Waxwings use against cowbird parasitism. *Auk* 93:675-691.
- ROTHSTEIN, S. I. 1978. Mechanisms of avian-egg recognition: additional evidence for learned components. *Anim. Behav.* 26:671-677.
- ROTHSTEIN, S. I. 1982. Successes and failures in avian egg and nestling recognition with comments on the utility of optimality reasoning. *Am. Zool.* 22: 547-560.
- SOUTHERN, W. E., AND L. K. SOUTHERN. 1980. A summary of the incidence of cowbird parasitism in northern Michigan from 1911-1978. *Jack-Pine Warbler* 58:77-84.
- WALKINSHAW, L. H. 1961. The effect of parasitism by the Brown-headed Cowbird on *Empidonax* flycatchers in Michigan. *Auk* 78:266-268.

The Condor 89:901-902
© The Cooper Ornithological Society 1987

BILL-SWEEPING BEHAVIOR OF A MEXICAN CHICKADEE¹

MILLICENT S. FICKEN AND ROBERT W. FICKEN

Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, WI 53201

Key words: Mexican Chickadee; *Parus sclateri*; hole-nesting; antipredator behavior.

Although hole-nesting may reduce predation as compared to open-nesting, predation pressure may still be of sufficient magnitude to have selected for similar defensive behavior in unrelated hole-nesters (e.g., Haartman 1967). Here we describe bill-sweeping, a probable anti-predator behavior, at an unusual nest site of the Mexican Chickadee (*Parus sclateri*). Bill-sweeping had been previously reported only in the White-breasted Nuthatch, *Sitta carolinensis* (Kilham 1968).

We observed a Mexican Chickadee nest at Rustler Park in the Chiricahua Mountains (Cochise County), Arizona, for several hours a morning for 4 days. This nest, apparently excavated by the chickadees, was in an approximately 25-m tall ponderosa pine (*Pinus ponderosa*). The nest hole was approximately 15-m high and was unusual in its location about 6 m from the trunk on the underside of a nearly horizontal branch (about 20-cm diameter) that angled about 20° downward. We observed the nest with Leitz 10 × 40 Trinovid binoculars. On our first day of observation (15

May 1986), both parents brought small insects. By 17 May larger caterpillars were being brought. However, no fecal sacs were removed even on the final day of observation (19 May), indicating that the young were probably only about 1 day old when we discovered the nest (Hinde 1952).

On 15 May we observed bill-sweeping three times by the presumed female (so judged because this individual followed bill-sweeping by entering the cavity and remaining inside at least 15 min, probably indicative of brooding, a behavior absent in male parids). She perched in the nest hole, leaned forward so that her whole body was suspended below the nest hole and swept the area immediately below the nest with the object(s) in her bill in an arc of about 120°. On two subsequent mornings, despite several hours of observations on each, no sweeping was observed. On 19 May, however, five bouts of sweeping occurred in 75 min of observations. Two of these bouts involved dabbling movements, consisting of rapid jabs with the insects immediately under the nest cavity; the remaining incidents entailed sweeping with the insects in an arc. In all cases the area below the nest (toward the trunk of the tree) was anointed with numerous small insects that appeared to be beetles.

Few detailed accounts of the nest sites of Mexican Chickadees occur in the literature, but Brandt (1951) noted that the nests are often high and in dead limbs.

¹ Received 29 September 1986. Final acceptance 22 April 1987.

We could find no reports of this or any other species of *Parus* excavating a cavity on the underside of a horizontal limb. This location would seem to make the nest less vulnerable to predators than the more typical cavity in a vertical position.

Haartman (1957) noted that in hole-nesting birds, a number of convergent adaptations occur, mainly those functioning to reduce predation and intra- and interspecific competition. For example, snake-like hissing occurs in many parids and some other unrelated hole-nesters (Hinde 1952, Haartman 1957). Bill-sweeping has been described in detail by Kilham (1968) in the White-breasted Nuthatch, and the behavior is similar in many respects to what we observed in the chickadee. The area around the nest is swept or dabbed by objects in the bill, primarily crushed beetles, although nuthatches also use fur, feathers, and plant material. Kilham (1968) speculated that crushed beetles contain repellent substances, and identified blister beetles, *Meloe angusticollis*, as the probable source (Kilham 1971). Nuthatches intensified sweeping when squirrels were near the nest. Kilham (1968) suggested that the sweeping may reduce nest competition; however, as squirrels may also be nest predators, we suggest that the behavior may reduce predation. For the Mexican Chickadee, which excavates its own nest, and the cavity is quite small, most likely sweeping is directed primarily at potential predators rather than interspecific competitors. Kilham (1968) had suggested that bill-sweeping may be unique to the White-breasted Nuthatch; the

closely related Red-breasted Nuthatch (*Sitta canadensis*) applies sap to the vicinity of the nest but is not known to sweep.

Despite numerous studies of nesting parids (e.g., reviews of Hinde 1952, Perrins 1979), bill-sweeping has never been reported previously. We speculate that in the Mexican Chickadee sweeping may be a response to unusually heavy predator pressure by the numerous small mammals and reptiles in its montane habitat. Bill-sweeping is thus another example of convergent behavioral evolution in hole-nesters.

We thank C. M. Weise and K. Apel for their comments. Publication No. 96 of the University of Wisconsin-Milwaukee Field Station.

LITERATURE CITED

- BRANDT, H. 1951. Arizona and its bird life. Bird Research Foundation, Cleveland, Ohio.
 HAARTMAN, L. VON. 1957. Adaptations in hole-nesting birds. *Evolution* 11:339-347.
 HINDE, R. 1952. The behaviour of the Great Tit (*Parus major*) and some other related species. *Behaviour Supplement II*.
 KILHAM, L. 1968. Reproductive behavior of White-breasted Nuthatches. I. Distraction display, bill-sweeping and nest-hole defense. *Auk* 85:477-492.
 KILHAM, L. 1971. Use of blister beetle in bill-sweeping by White-breasted Nuthatch. *Auk* 88:175-176.
 PERRINS, C. 1979. British tits. London, Collins.

The Condor 89:902-906
 © The Cooper Ornithological Society 1987

FEMALE FLOATERS AND NONBREEDING SECONDARY FEMALES IN HERRING GULLS¹

GARY W. SHUGART

Animal Behavior, Department of Psychology NI-25, University of Washington, Seattle, WA 98195

MARY A. FITCH

5230 16th Ave. NE, Seattle, WA 98105

GLEN A. FOX

Wildlife Toxicology and Surveys, Canadian Wildlife Service, Ottawa, Ontario K1A 0E7, Canada

Key words: Larus argentatus; gulls; sex ratio; floaters; secondaries; female pairs; female competition.

A small portion of gull nests contain supernormal clutches either in single or double nests (see Conover 1984 for review). Behavioral studies of attendants at

these nontypical nests indicate that a breeding (i.e., egg laying) secondary female or a female pair usually is involved (Hunt and Hunt 1977, Fitch and Shugart 1983, Kovacs and Ryder 1983). Apparently, these females are attempting to breed after failing to heterosexually pair. This interpretation is supported by the occurrence of female pairs/secondary females in populations with male shortages (Hunt et al. 1980, Conover and Hunt 1984, Coulson and Thomas 1985) and successful rearing of offspring by female pairs/secondary females (Fitch and Shugart 1983, Kovacs and Ryder 1983).

¹ Received 3 October 1986. Final acceptance 22 April 1987.