

- row (*Spizella arborea arborea*). *Physiol. Zool.* 41:313-331.
- MOSS, R., AND J. A. PARKINSON. 1975. The digestion of bulbils (*Polygonum viviparum* L.) and berries (*Vaccinium myrtillus* L. and *Empetrum* sp.) by captive ptarmigan (*Lagopus mutus*). *Br. J. Nutr.* 33:197-206.
- PARRISH, J. W., JR., AND E. W. MARTIN. 1977. The effect of dietary lysine on the energy and nitrogen balance of the Dark-eyed Junco. *Condor* 79:24-30.
- RAVELING, D. G. 1979. The annual cycle of body composition of Canada Geese with special reference to control of reproduction. *Auk* 97:234-252.
- RICKLEFS, R. E. 1974. Energetics of reproduction in birds, p. 152-297. In R. A. Paynter, Jr. [ed.], *Avian energetics*. Publ. Nuttall Ornithol. Club No. 15, Cambridge, MA.
- SCOTT, M. L., M. C. NESHEIM, AND R. J. YOUNG. 1976. Nutrition of the chicken. M. L. Scott and Assoc., Ithaca, NY.
- SWANSON, G. A., M. I. MEYER, AND J. R. SERIE. 1974. Feeding ecology of breeding Blue-winged Teals. *J. Wildl. Manage.* 38:396-407.
- WALSBERG, G. E. 1975. Digestive adaptations of *Phainopepla nitens* associated with the eating of mistletoe berries. *Condor* 77:169-174.

Department of Zoology, Washington State University, Pullman, Washington 99164. Accepted for publication 6 October 1980.

Condor 83:179-180
© The Cooper Ornithological Society 1981

INTERSPECIFIC ALLOPREENING SOLICITATION IN FEMALE BREWER'S BLACKBIRDS

NICOLAAS A. M. VERBEEK
ROBERT W. BUTLER
AND
HOWARD RICHARDSON

Intraspecific allopreening—the preening of one individual by another individual of the same species—is widespread among birds (Harrison 1965). To solicit preening, the recipient assumes a particular posture which differs among species (Harrison 1965). Interspecific allopreening and solicitation is rare among birds; solicitation has been reported for five species of cowbirds in captivity: Giant Cowbird (*Scaphidura oryzivora*; Harrison 1963), Bronzed Cowbird (*Molothrus aeneus*; Selander and La Rue 1961), Brown-headed Cowbird (*M. ater*; Selander and La Rue 1961, Rothstein 1977), Shiny Cowbird (*M. bonariensis*) and Bay-winged Cowbird (*M. badius*; Selander 1964). In the wild the practice has been seen in *M. ater* (Selander 1964, Dow 1968, Rothstein 1977), and *S. oryzivora* (Chapman 1928).

On 26 November 1976, from 11:30 to 11:45, we watched a mixed flock of about 25 Brown-headed Cowbirds, 50 Red-winged Blackbirds (*Agelaius phoeniceus*), and 75 (44% males) Brewer's Blackbirds (*Euphagus cyanocephalus*) feeding in a pasture near Cloverdale, British Columbia. We recorded the sex ratio of the Brewer's Blackbirds in this flock because that was the object of our visit. The sex ratios of the other two species were, unfortunately, not determined. When the birds flew from the pasture they settled in a group of black cottonwoods (*Populus trichocarpa*) and started preening. We then noticed a female Red-winged Blackbird preening the head of a female Brewer's Blackbird. Seconds later, the female Red-winged Blackbird moved away from the female Brewer's Blackbird, but the latter followed, sidling up to the female Red-winged Blackbird who resumed preening the female Brewer's Blackbird. We saw (from a distance of about 40 m through telescopes) at least four

female Brewer's Blackbirds solicit allopreening from various female Red-winged Blackbirds. When a female Red-winged Blackbird flew to a new perch, the female Brewer's Blackbird would follow her and continue the soliciting behavior. We made a similar observation at 13:15 on 27 September 1979 near Ladner, British Columbia, where we saw a female Brewer's Blackbird solicit allopreening from a female Red-winged Blackbird, on a telephone wire. When the Brewer's Blackbird approached in the soliciting posture, the Red-winged Blackbird stepped three paces away along the wire. The Brewer's Blackbird immediately approached again and then both birds flew away.

The soliciting female Brewer's Blackbirds assumed a "head-down" posture in which the body feathers were sleeked, the bill was pointed downward and appearing to touch the breast, and the feathers of the crown and nape were fluffed. The "head-down" posture is similar to those described and illustrated by Selander and La Rue (1961) and Rothstein (1977) for Brown-headed Cowbirds, and by Harrison (1963) for Giant Cowbirds. One female Brewer's Blackbird remained immobile in this posture beside a female Red-winged Blackbird for 28 s until eventually the Red-winged Blackbird flew away. We also saw a male Brown-headed Cowbird solicit allopreening from male or female conspecifics or from male Red-winged Blackbirds. This is the first reported observation of interspecific allopreening in an icterid other than cowbirds.

The "head-down" posture as described above is an invitation to be groomed. For allopreening to occur, the individual distance between two birds has to be reduced. This generally does not occur in free-living birds outside the breeding season, except in some species with year-round pair-bonds such as corvids (Verbeek 1972). Harrison (1965) concluded that species which show allopreening are likely to be monomorphic. The three species in this study are strongly dimorphic. In spite of intensive field work, Williams (1952) and Verbeek (1963) did not report inter- or intraspecific allopreening solicitation in Brewer's Blackbirds. Interspecific allopreening has not been reported for Red-winged Blackbirds in nature (Nero 1963, Orians and Christman 1968), but in captivity and in nature intraspecific allopreening has been reported (Selander and La Rue 1961, Rothstein 1977). In captivity, male and female Brown-headed Cowbirds solicit allopreening from each other but they never preen each other (Selander and La Rue 1961, Rothstein

1977). Thus, as far as known, none of these three species allopreens interspecifically, only Red-winged Blackbirds allopreen intraspecifically and only Brewer's Blackbirds and Brown-headed Cowbirds solicit allopreening. It is curious that female Red-winged Blackbirds respond appropriately to the display although they (apparently) do not allopreen each other in nature. It is also curious that female Brewer's Blackbirds solicit allopreening but do not (apparently) allopreen. This suggests that these species have the motor patterns associated with the display and the response.

Most studies of free-living icterids have been made during the breeding season. We hope that our observations will alert others to watch for allopreening solicitation and allopreening in icterids in the non-breeding season as well. The behavior is subtle and may be easily overlooked.

The discovery that solicitation of intraspecific allopreening is not restricted to cowbirds weakens Selander and La Rue's (1961) and Selander's (1964) hypothesis that the function of this behavior is to appease potential hosts. Selander and La Rue (1961) and Harrison (1965) suggested that the invitation display is conciliatory, while Rothstein (1971, 1977) suggested that at least in captive Brown-headed Cowbirds the head-down display is aggressive in nature. Rothstein supported his hypothesis with the observation that female and male Brown-headed Cowbirds in captivity displayed mainly to other females. Although our observations agree with his (female Brewer's Blackbirds displayed only to female Red-winged Blackbirds) we find it difficult to see why only female Brewer's Blackbirds would be aggressive towards female Red-winged Blackbirds, while at the same time male Brewer's Blackbirds did not show similar aggressive tendencies towards male Red-winged Blackbirds. The same difficulty arises when we accept the interpretation that the display is conciliatory.

These observations were made while conducting field work supported by the National Sciences and Engineering Research Council of Canada. We are grateful to M. Ficken, S. Rothstein, and an anonymous reviewer for their helpful suggestions.

LITERATURE CITED

- CHAPMAN, F. M. 1928. The nesting habits of Wagler's Oropendola (*Zarhynchus wagleri*) on Barro Colorado Island. *Bull. Am. Mus. Nat. Hist.* 58:123-166.
- DOW, D. D. 1968. Allopreening invitation display of a Brown-headed Cowbird to Cardinals under natural conditions. *Wilson Bull.* 80:494-495.
- HARRISON, C. J. O. 1963. Interspecific preening display by the Rice Grackle, *Psomocolax oryzivorus*. *Auk* 80:373-374.
- HARRISON, C. J. O. 1965. Allopreening as agonistic behaviour. *Behaviour* 24:161-209.
- NERO, R. W. 1963. Comparative behaviour of the Yellow-headed Blackbird, Red-winged Blackbird, and other icterids. *Wilson Bull.* 75:376-413.
- ORIAN, G. H., AND G. M. CHRISTMAN. 1968. A comparative study of the behavior of Red-winged, Tricolored, and Yellow-headed blackbirds. *Univ. Calif. Publ. Zool.* 84.
- ROTHSTEIN, S. I. 1971. A reanalysis of the interspecific invitation to preening display as performed by the Brown-headed Cowbird (*Molothrus ater*). *Am. Zool.* 11:638.
- ROTHSTEIN, S. I. 1977. The preening invitation or head-down display of parasitic cowbirds: I. Evidence for intraspecific occurrence. *Condor* 79:13-23.
- SELANDER, R. K. 1964. Behavior of captive South American cowbirds. *Auk* 81:394-402.
- SELANDER, R. K., AND C. J. LA RUE JR. 1961. Interspecific preening invitation display of parasitic cowbirds. *Auk* 78:473-504.
- VERBEEK, N. A. M. 1963. An ecological study of the Brewer's Blackbird during the winter. Unpubl. B. Sci. thesis, Univ. British Columbia, Vancouver.
- VERBEEK, N. A. M. 1972. Comparison of displays of the Yellow-billed Magpie (*Pica nuttalli*) and other corvids. *J. Ornithol.* 113:297-314.
- WILLIAMS, L. 1952. Breeding behavior of the Brewer's Blackbird. *Condor* 54:3-47.

Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada V5A 1S6.
Accepted for publication 23 April 1978.

Condor 83:180-182
© The Cooper Ornithological Society 1981

OBSERVATIONS AT A TWENTY-EGG KILLDEER NEST

JOHN T. MUNDAHL
OSCAR L. JOHNSON
AND
MARK L. JOHNSON

Plovers of the genus *Charadrius* typically lay clutches of two to four eggs (MacLean 1972). Supernumerary clutches have been reported for the: Snowy Plover (*C. alexandrinus*) and Chestnut-banded Sand Plover (*C. pallidus*), four eggs (Blaker 1966); Semipalmated Plover (*C. semipalmatus*), five eggs (Havens 1970); and Piping Plover (*C. melodus*), eight eggs (Hussell and

Woodford 1965). We report here a 20-egg nest of the Killdeer (*C. vociferus*), whose normal clutch size is four.

The nest was discovered on 24 April 1978 on a lawn in Brooklyn Park, Minnesota. At the time of discovery the nest contained four eggs. After 6 May, when nine eggs were found, the nest was inspected once or twice daily. Discovery dates of the other 11 eggs are listed in Table 1. Between 11 May and 5 June the nest was watched for a total of 46 h using an automobile as a blind. On 12 May both attending birds were marked by means of a sponge impregnated with India ink and affixed to the nest cup. The nest was apparently abandoned on 16 June and observations were discontinued. We sought to ascertain whether: (1) two or more females were laying in the same nest; (2) the pair consisted of females; or (3) a single female was associated with the nest.

From the laying of the 13th egg to the laying of the