

Breeding Flight Display in the Female White-rumped Sandpiper
(*Calidris fuscicollis*)

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Courtship behavior in the shorebird subfamily Calidridinae usually involves an aerial component. Typically the males hover at varying heights above the ground, giving a variety of trilled and whistled songs (Pitelka et al. 1974). In a social context, female flight is limited to intersexual chases (Pitelka 1959, Holmes 1966) and interpair aggression (Ashkenazie and Safriel 1979). Independent female aerial display or female participation in the aerial display of the male is virtually unreported. I present here my observations of an incident of female participation in the aerial flight display of the White-rumped Sandpiper (*Calidris fuscicollis*) at Barrow, Alaska.

The White-rumped Sandpiper breeds throughout much of the Canadian Arctic, but only in small numbers does it extend westward along the arctic coast of northern Alaska, where it is an occasional breeder (Pitelka 1974, Kessel and Gibson 1979). The species is polygynous (Pitelka et al. 1974), and the males stop displaying and leave the breeding grounds at Barrow once laying is completed. The cessation of courtship activity may be quite early. For example, in both 1979 and 1980 at Barrow, male White-rumped Sandpipers arrived and were seen courting females on 6 June. Displays ceased a week later, not occurring after 13 and 14 June, respectively, in the 2 yr.

On 6 June 1979, a pair of White-rumped Sandpipers was observed in active courtship on a study plot 3 km southwest of the Naval Arctic Research Laboratory (for description of site, see Myers and Pitelka 1975). The two birds first flew upward, side by side in a paired flight at an angle of approximately 70° from the ground. About 10 m above the ground, they stopped within 0.5 m of each other and hovered with rapidly vibrating, shallow wingbeats. The male hovered just slightly above the female and repeatedly gave his typical series of "poing-zee" notes (the "ng-oik" call of Drury 1961). They hovered for between 5 and 10 s and then descended slowly and silently to the tundra together, landing 2 m apart. As they glided downward, their wings were held in a "V" position above their backs, similar to the position of a male Dunlin's (*Calidris alpina*) wings as he descends and terminates an aerial display (Holmes 1966). Unlike the Dunlin, however, both sexes immediately folded their wings upon landing. The pair fed together briefly; then the male began a nest-cup display. The female joined him and entered the cup, while he stepped out and gave the "poing-zee" call

series from the rim of the cup. In general, this display was similar to that reported for other calidridine sandpipers (Holmes and Pitelka 1964; Holmes 1966, 1973; Ashkenazie and Safriel 1979). The male called for about 10 s, then walked away from the nest-cup. The female immediately followed, and the pair again began feeding.

A few minutes later, they initiated a second paired flight, similar in all respects to the first. Immediately upon landing, however, the male began to chase the female on the ground (the "Sharp-tailed Grouse dance" of Drury 1961; see also Parmelee et al. 1968). The chase proceeded for several meters and ended when the male did a wing-raising or "wing-up" display, typical of several other calidridine sandpipers (Holmes 1966, Pitelka et al. 1974, Myers 1979). The male White-rumped Sandpiper was then chased off by a male Pectoral Sandpiper (*Calidris melanotos*).

The male rejoined the female several minutes later and repeated the ground courtship chase. As it terminated, they again began feeding. They subsequently fed about 25 m apart, and then the female flew directly toward the male, giving a "chreep" call note, quite distinct from the typical "zeet" call note of the White-rumped Sandpiper. The call was similar to but softer than the call note of a female Pectoral Sandpiper. As the female neared the male, he took flight and joined her. They repeated the paired flight for a third time, the male giving "poing-zee" calls during the hovering stage. After they landed, another ground chase ensued, ending for the third consecutive time with a male wing-up. A bout of feeding followed, interrupted by the male initiating a fourth ground chase. This chase also ended in a male wing-up. The female then flew off, calling "chreep" several times as she did so. The male followed her, and together they flew several hundred meters and were lost from view.

One aspect of the behavioral sequence described above is particularly significant when it is compared to published accounts of sandpiper behavior. The female participated in an apparently ritualized hovering flight display, with wing movements deviating markedly from typical female flight patterns. Such deviations have been recorded in the females of only two other calidridine species, the Pectoral Sandpiper (Pitelka 1959) and the Sanderling (*Calidris alba*) (Parmelee 1970). This unusual female behavior has not been noted previously in Barrow White-rumped Sandpiper populations (F. A. Pitelka pers. comm.), nor has it been observed in other populations in Canada (Drury 1961, Parmelee et al. 1968, R. Cartar, pers. comm.) and eastern Alaska (pers. obs.). Thus,

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any interpretation of the isolated observation reported here is premature. Clearly, a long-term study of marked individuals is essential before we can fully understand the social milieu of this and other breeding displays.

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LITERATURE CITED

- ASHKENAZIE, S., & U. N. SAFRIEL. 1979. Breeding cycle and behavior of the Semipalmated Sandpiper at Barrow, Alaska. *Auk* 96: 56-67.
- DRURY, W. H., JR. 1961. The breeding biology of shorebirds on Bylot Island, Northwest Territories, Canada. *Auk* 78: 176-219.
- HOLMES, R. T. 1966. Breeding ecology and annual cycle adaptations of the Red-backed Sandpiper (*Calidris alpina*) in northern Alaska. *Condor* 68: 3-46.
- . 1973. Social behavior of breeding western sandpipers *Calidris mauri*. *Ibis* 115: 107-123.
- , & F. A. PITELKA. 1964. Breeding behavior and taxonomic relationships of the Curlew Sandpiper. *Auk* 81: 362-379.
- KESSEL, B., & D. D. GIBSON. 1978. Status and distribution of Alaska birds. *Studies Avian Biol.* 1: 1-100.
- MYERS, J. P. 1979. Leks, sex, and Buff-breasted Sandpipers. *Amer. Birds* 33: 823-825.
- , & F. A. PITELKA. 1975. Wet coastal plain tundra II. *Amer. Birds* 29: 1136.
- PARMELEE, D. F. 1970. Breeding behavior of the Sanderling in the Canadian high Arctic. *Living Bird* 9: 97-146.
- , D. W. GREINER, & W. D. GRAUL. 1968. Summer schedule and breeding biology of the White-rumped Sandpiper in the central Canadian Arctic. *Wilson Bull.* 80: 5-29.
- PITELKA, F. A. 1959. Numbers, breeding schedule, and territoriality in Pectoral Sandpipers of northern Alaska. *Condor* 61: 233-264.
- . 1974. An avifaunal review for the Barrow region and north slope of arctic Alaska. *Arctic Alpine Res.* 6: 161-184.
- , R. T. HOLMES, & S. F. MACLEAN, JR. 1974. Ecology and evolution of social organization in arctic sandpipers. *Amer. Zool.* 14: 185-204.

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Myology and Histology of the Phalloid Organ of the Buffalo Weaver (*Bubalornis albirostris*)

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Bubalornis is a monotypic genus of the family Ploceidae that together with its closest relative, *Dinemellia*, constitutes the subfamily Bubalornithinae (Moreau and Greenway 1962, Bentz 1979). In the Buffalo Weaver (*B. albirostris*) the phalloid organ is a blunt conical appendage of the cranial cloacal wall. It was first mentioned in the literature by Lesson (1831), who did not illustrate it but briefly described it. Sushkin (1927: 30), in a supplement to a larger paper, described and illustrated the phalloid organ and informally described and poorly illustrated the muscles that contributed to its formation. Sushkin's general description of the phalloid organ is basically correct and need not be repeated here. The purposes of this paper are to illustrate the structure more clearly, to describe formally and illustrate more clearly the associated musculature, and to examine the phalloid organ from a histological standpoint. Sushkin (1927: 32) noted the need for microscopical sectioning of the phalloid organ to determine whether or not the core consisted of erectile tissue. King (1981: 140) incor-

rectly paraphrased Sushkin's comments by stating that the phalloid organ was nonerectile.

The phalloid organ is a stiff, slightly bent, feathered structure (Fig. 1). It is not perforated, possesses no discernable ducts, and is covered by a continuation of abdominal skin. Its size in males may approach 25 mm in length (Hartert 1917). Male phalloid organs viewed in this study were 13-15 mm in length. It is not a true penis and is in no way homologous with the internal cloacal penes of Struthionidae, Rheidae, or Anatidae. It is a unique structure among birds. Females of the species, however, do possess a rudimentary phalloid organ (Fig. 1b). Its size in females averages 4 mm in length (Hoesch 1952).

Myology.—Sushkin's anatomical illustration (1927: 32) is somewhat confusing and perhaps understandably so. In the present study, muscles were stained with an iodine stain (Bock and Shear 1972). This greatly enhances the visibility of individual muscles as well as muscle-fiber direction. Dissection was carried out under a dissection microscope, and illustra-