

Nutcracker nesting and egg dates from the literature—adjusted using Mewaldt's breeding chronology data (1956)—indicate that from British Columbia to California first-day nest construction dates range from 1 February to 18 May. Although the available nesting records support the premise that the nutcracker is an early nesting strategist, I suggest here that in some years nesting continues later into the season in response to local conditions. The onset and duration of the nesting season for this species probably varies regionally and from year to year. Local factors such as weather conditions and cone crop production the previous fall are probably the ultimate controls of nutcracker nesting.

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Lek behavior of the Buff-breasted Sandpiper.—In the early part of June 1972 we observed a lek-like mating system of Buff-breasted Sandpipers (*Tryngites subruficollis*) at the Firth River, Yukon Territory (69° 23' N, 139° 25' W). Our observations were opportunistic, as time from other work permitted. While incomplete, they substantiate the developing picture of *Tryngites*' social behavior and add new details.

Study area and methods.—Most observations were made in an area approximately 3 km² adjacent to the Firth River and about 15 km from the coast of the Beaufort Sea. The topography was rolling tundra. Habitat varied from low marshy areas with many small ponds to higher drier slopes and knolls. During the display period Buff-breasts were found mainly in the better drained locations. Closely-spaced sedge tussocks approximately 20 cm high and 25 to 50 cm in diameter characterized these areas.

Although male Buff-breasts are larger than females (Oring, *Auk* 81:83–86, 1964), the sexes are not always evident in the field (cf. Pitelka et al., *Am. Zool.* 14:183–202, 1974). We called birds engaging in active wing-lifting display, males, and those that did not display in this manner, females. That this is not always correct is indicated by observations of females displaying while on migration (Oring, 1964) and occasionally on the breeding ground (R. T. Holmes, pers. comm.).

Breeding chronology.—We noted the first displaying Buff-breasted Sandpipers on 1 June, although display could have begun 1 or 2 days earlier when observers were absent from the area. On 3 June birds were displaying actively but by 7 June display had nearly ceased.

Males apparently left the breeding area soon after the courtship period. There was a marked decline in sightings of Buff-breasts after 7 June when display was last noted. Virtually all sightings after 7 June were of single birds, and few were observed on the display grounds. Those seen were usually in wetter, marshy areas and may have been birds away from nests.

We discovered the first of 8 nests on 10 June. All nests were on fairly dry slopes with numerous sedge tussocks; they appeared to be well scattered over suitable habitat. As Pitelka et al. (1974) and Parmelee et al. (*Bull. Natl. Mus. Canada* 222:1–229, 1967) also noted, there was no tendency for nests to be concentrated near display grounds. Each time an incubating bird flushed it flew off silently. We never saw 2 Buff-breasts in the vicinity of a nest. The presence of just one adult at nests and with broods (found to be a female in the 3 cases that the adult was collected) led Sutton (*Arctic* 20:3–7, 1967) to conclude that Buff-breasted Sandpipers were probably polygamous and that males deserted the females on termination of egg-laying. Bailey (*Birds of Arctic Alaska. Colorado Mus. Nat. Hist., Popular Series No. 8, 1948*) had previously reported that male Buff-breasts

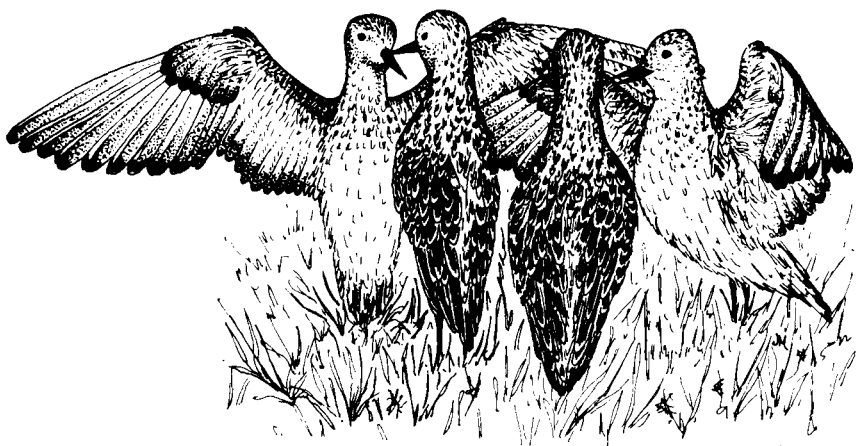


FIG. 1. Two male Buff-breasted Sandpipers displaying to two females (corresponding to 2D of Oring 1964). Evidently of a higher intensity than 2C, this display often occurred when a neighboring male attempted to display on a rival's territory.

do not have brood patches. Pitelka et al. (1974) affirmed that *Tryngites* is polygamous and that males do not incubate. Our observations strongly support the presence of polygamy in this species.

Territorial behavior of males.—Males were distributed in small groups, numbering from 3 to perhaps 10 at several different locations. Within each group individual males were spaced at intervals of approximately 25–50 m.

Males actively chased intruders from their territories. Chases frequently occurred when a male with no females on his territory went to a territory where females were present. The encroaching male normally attempted to display to these females but was always driven off by the “resident” male whereupon it flew back to its own territory. Since birds could not be recognized individually, we could not be sure that individual males consistently defended the same area.

Display behavior.—On 3, 4 June a group of approximately 8 presumed males were observed displaying between 21:00 and 02:30, providing most of our observations of behavior on the lek. It was our impression over the subsequent 3 days that displays were most vigorous in the soft light of the night hours when the sun was low in the sky.

Displays of the Buff-breasted Sandpiper have been described during spring migration (Rowan, Br. Birds 20:186–192; Oring, 1964) and from breeding areas (Parmelee et al., 1967). All display postures noted at the Firth River were described at least in part in those papers but we did not observe all the displays listed therein. The numbering system used by Oring (1964) is retained here.

Males displayed more or less constantly while under observation, but were particularly vigorous when females were nearby. By far the most common display on the breeding ground involved the lifting of a spread wing to a nearly vertical position from which it was “waved” (display 1A), revealing the contrasting light underwing with its delicate and precise markings. Transitory variations and other movements observed by Oring (1964) with this display were noted (1B, 1C, 2A), with the addition that the displaying

bird might also jump up and down (termed "flutter jumping" by Pitelka et al. 1974). Oring (1964) twice observed females displaying in this manner in Oklahoma. Although we could not be positive of sexes, all displays appeared to be given exclusively by territory-holders (considered here to be males).

Two-wing displays were evidently of a more intense nature. While one-wing displays were commonly given by lone males, two-wing displays were only noted when other birds were present on a territory. Oring (1964) saw display 2C (both wings extended laterally, primaries pointed above the horizontal) only by lone males; when females were present 2C was replaced by 2D (both wings spread, primaries below the horizontal). At the Firth River, both of these displays were performed while females were present on territories but if a displaying rival encroached on a territory, the 2 males seemed most often to perform 2D. In several instances resident males continued this high intensity courtship display while an intruding male also displayed within 0.5 m (Fig. 1).

If neighboring males intruded during less intense displays (e.g. 2C), the resident usually immediately broke off displaying and chased the intruder. Males would occasionally fight while displaying at close quarters as described by Parmelee et al. (1967). Sometimes 2 males displaying close together would fly up vertically together to a height of 5 to 10 m, their legs trailing (similar to 2F of Oring 1964, except that it occurred between males and was agonistic in nature). This display was also noted by Parmelee et al. (1967) and by Murdoch (pp. 71-72 in Bent, U.S. Natl. Mus. Bull. 146, 1929). The intruder would usually break away, landing some distance away, presumably on his territory. A "vertical flight" could also ensue after an interloper landed near a territory-holder giving the single-wing display.

Behavior of females.—Females were seen near displaying males in parties of 3 to 8 birds. Certain males seemed to be more attractive than others since it was common to find several females in one territory and none in others; however, our inability to distinguish individual birds prevented us from determining whether the same males were consistently favored and whether individual females were always attracted to the same male.

It seemed unusual for just one female to be present on a male's territory. Females in loose groups wandered through territories, often making feeding movements. They responded to both two-wing displays. Periodically, females would assume an upright posture and walk on "tip toes" towards a displaying male (cf. Oring 1964). Suddenly, all females in the territory would hurriedly approach the male as a group and make pecking motions at the base of his bill or cheek. Occasionally, a male was backed up against a tussock by the advancing females. The male's outstretched wings seemed to "embrace" them at times. Up to 5 females were seen in these compact, closely-spaced display groups. Rapid "tik" notes were heard at this time. It was during such high intensity displays that neighboring males were most apt to fly in and attempt to posture near the females. The situation is not always so straightforward as described here, however, since males have been collected among birds in these compact groups near a displaying individual at Barrow, Alaska (R. T. Holmes, pers. comm.). Copulation was not observed.

Discussion.—Pitelka et al. (1974) have recently discussed the evolution of social organization in calidridine sandpipers. Most species have stable pair bonds and maintain large territories which are used for feeding as well as display; this is the conservative pattern. Other species have progressively more specialized breeding behavior, exhibiting forms of "serial" polygamy. The array culminates in promiscuity in the Pectoral Sandpiper (*Calidris melanotos*), the Ruff (*Philomachus pugnax*) and *Tryngites*. In these species territories are small and serve mainly for display and mating. Males do not incubate or care for the young. The Buff-breasted Sandpiper and the Ruff show an "exploded lek" and a lek

mating system respectively. *Tryngites* departs from the classical lek situation in that territories tend to be larger and the locations of display grounds may change between years. Our observations support this interpretation of *Tryngites*' breeding behavior.

Parmelee et al. (1967) reported that display areas were abandoned on Jenny Lind Island, N.W.T., and that displaying males would suddenly appear in new locations. It is possible that such shifts could explain the short display period observed at the Firth River. However, since we did not find displaying males in other locations after 7 June, despite visits by several observers over a wide area of similar habitat, we conclude that the display period was very brief in 1972. The early departure of males from breeding habitat is probably adaptive in that it would increase food resources available for the female and young and reduce activity near nests which might attract predators (cf. Pitelka, Condor 61:233-264, 1959).

The conspicuous light flash from the waving exposed underwing surface has been remarked upon by others (Parmelee et al. 1967, Pitelka et al. 1974). This feature was particularly striking during the twilight hours typical of the latitude at Firth River in early June. The flashing was visible at long distances and, as Parmelee et al. (1967) pointed out, drew attention to birds that otherwise would have been overlooked. Pitelka et al. (1974) suggested that the wing flashing might serve an important locator function to females since display grounds change location from year to year. If the display period is normally as short as indicated by our observations, this function would assume added importance.

The occurrence of display associated with pairing, both in flocks on migration and leks on the breeding ground, invites further speculation. An important function of lek behavior apparently is to ensure that a few particularly "fit" males fertilize most females (Tinbergen, pp. 375-378 in D. A. Bannerman, *The birds of the British Isles*, Vol. 9. Oliver and Boyd, London, 1960). The less than two weeks of display of Buff-breasted Sandpipers at the Firth River in 1972 is much shorter than the display period of the Ruff and other lek species (Tinbergen 1960). Although the spring of 1972 was abnormally delayed, short summers at this latitude would preclude long periods for display on the leks even in normal years; this time conceivably could be too brief to permit the establishment of stable relationships among males and to ensure the fertilization of females. If this is so, the same groups of birds might maintain their association throughout spring migration to the breeding ground, constituting a "moving lek." The desirability of more systematic study of the breeding behavior and ecology of the Buff-breasted Sandpiper is obvious.

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Sandhill Cranes feeding on ducklings.—On 8 July 1972 while watching a pair of Sandhill Cranes (*Grus canadensis*) at Malheur National Wildlife Refuge, Harney Co., Oregon, I saw an adult male crane kill and eat a 1- to 5-day-old Gadwall (*Anas strepera*) duckling.

I first saw the cranes at 17:40 sitting near the north shore of Boca Lake. At 18:36