Nocturnal Nest Attendance of Killdeers: More Than Meets the Eye

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Parental effort in shorebirds has been the subject of a number of studies (Norton 1972, Maxson and Oring 1980, Bergstrom 1981, 1986, Cairns 1982, Corkett 1991), suggesting that nocturnal parental behavior might be more variable than previously presumed. We glued 2.65-g radio transmitters (Model PD-2, Holohil Systems, Woodlawn, Ontario) to the lower backs of adult Killdeers (17 males, 15 females) using techniques described by Warnock and Warnock (1993). Radio transmitters weighed approximately 0.03% of a Killdeer’s total mass. Positions of birds were determined by a combination of triangulation and visual resighting using a truck equipped with null system antennas. All Killdeer habitat was accessible by road. We monitored all nocturnal nesting radio-marked Killdeers from 2100 to 0000 PST in order to determine whether the bird was incubating. In order to evaluate nocturnal nest attendance in more detail, we conducted 10 all-night observations (2000–0600) of four incubating Killdeer pairs carrying radio transmitters. For these observations, we parked our radio truck within 200 m of a nest at an angle where we could unambiguously determine if a bird was on the nest based upon radio-signal strength, modulation and direction. If the radio signal was erratic, or coming from an angle away from the nest, we assumed the bird was not incubating. For all-night observations, the incubation period was divided into an early (1 to 12 days after clutch completion) and a late (13 days to hatching; mean incubation period = 24 days; Brunton 1988a) period.

Results.—Twenty-nine breeding Killdeers were tracked from 3 to 63 days (median = 26 days ± SD of 17.5). We collected 96 nocturnal locations on 22 different nesting birds. For the period between 2100 and 0000, 50% of the locations of males (no. observations per bird, \( \bar{x} = 4.3 \pm 1.9, n = 12 \) birds) were from the nest, while 27% of female locations (no. observations per bird, \( \bar{x} = 4.4 \pm 3.1, n = 10 \) birds) were from the nest.

Data from separate all-night nest watches revealed that 78% of the observations (no. observations per bird, \( \bar{x} = 9.7 \pm 7.0, n = 58 \)) of six male Killdeers between 2100 and 0300 were from the nest. While males generally incubated during the night, members...
Fig. 1. Time frame of nocturnal nest attendance of four radiomarked pairs (M, male; F, female) of Killdeers at Jay Dow, Sr. Wetlands during June-July 1994. Dates of observations: (pair 1) 11 July; (2) 16, 20, 23 July; (3) 30 June, 2, 5 July; and (4) 5, 8, 11 July.

of one pair reversed this pattern on two different nights (pair 4; Fig. 1). Mate switches at the nest in the evening generally took place at or just prior to darkness (2000-2100), and morning switches occurred just prior to or at the first light of day (0300-0400; Fig. 1). Weather during these nocturnal observations was basically clear (occasional clouds) and calm, and the temperature rarely fell below 13°C.

Discussion.—Allocation of parental effort in Killdeers is variable, especially with respect to incubation duties. Brunton (1988a) observed higher diurnal nest attendance by Killdeers in the last 12 days of incubation, and males spent significantly more of this time incubating. Nocturnal incubation duties in Killdeers also may be affected by stage of incubation, but we did not have sufficient data to explore this issue. In Wilson’s Plovers (C. wilsonia), males spend more time incubating in the night in the last 12 days of incubation than in the first 12 days (Thibault and McNeil 1995a). In our study, only two of the 10 all-night observations on Killdeers were done on pairs in early incubation. In one case, the male did the majority of nocturnal incubation and, in the other, the female did.

Previously, investigators studying Killdeers have observed only males on nests at night. This was not the case at JDW. Males contributed most of the nocturnal incubation effort; however, one male was observed to incubate through one night, while his mate incubated the majority of two other nights (pair 4, Fig. 1). Among plovers, males tend to adopt the primary parental role. In at least Charadrius, this appears to include accepting the bulk of nocturnal incubation. For example, male Wilson’s Plovers in Texas and Venezuela appear to be the primary nocturnal incubators (Bergstrom 1986, Thibault and McNeil 1995a, b). Also in Snowy Plovers (C. alexandrinus), 90% of the birds incubating at dusk are males, and males are believed to provide the majority of nighttime incubation (Wariner et al. 1986). In both of the above species, females do the majority of daytime incubation. On the other hand, in the more northerly Greater Golden-Plovers (Pluvialis apricaria), males incubate during the day and females during the night (Byrkjedal 1985).

With Killdeers at JDW, mate switching sometimes occurred at regular intervals through the night (pair 2; Fig. 1). Reasons for this variability remain unknown. However, in White-rumped Sandpipers (Calidris fuscicollis) and Wilson’s Plovers, weather has been shown to greatly influence incubation behavior (Carter and Montgomerie 1987, Thibault and McNeil 1995a). Weather has a large influence on diurnal in-
incubation patterns of Killdeers. During daylight hours, especially on hot days, two parents are more effective in keeping egg temperatures at viable levels. Grant (1982) noted that male and female Killdeers at the Salton Sea, California switched nest attendance every 10 to 15 min to belly-soak when temperatures grew hot (see also Schardien and Jackson 1979). Temperature of incubated eggs increases with increasing ambient temperature, and eggs exposed to temperatures over 40°C risk embryonic damage (Grant 1982). Ambient daytime temperatures at our study site frequently rose over 38°C, and belly-soaking Killdeers were commonly observed in 1994. Female Killdeers at our study site were more likely to incubate during daylight hours; however, 36% of our nesting locations \((n = 83)\) of male Killdeers from 0600 to 1600 came from the nest (unpubl. data).

Killdeers typically are classified as obligate, biparental breeders. However, the flexibility of incubation strategies presented here suggests the value of comparative studies of the allocation of parental effort. Given the wide range of environments and latitudes (subarctic to the tropics) in which Killdeers breed, comparative breeding studies on this species would undoubtedly add to knowledge of the evolution of shorebird mating systems. Nocturnal incubation by Killdeers, conducted mainly by males, is more variable than previously thought. Therefore, comparative studies must include analyses of nocturnal behavior.

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Literature Cited


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