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Laying Time of the Bronzed Cowbird

Brian D. Peer[1,2,3] and Spencer G. Sealy[1]

ABSTRACT.—We report the first observations of egg laying by the parasitic Bronzed Cowbird (*Molothrus aeneus*). Three direct observations and two estimates of laying times were made at two Northern Cardinal (*Cardinalis cardinalis*) nests. Bronzed Cowbirds laid at 18.2 min ± 1.7 (SE) before sunrise (range 14–24 min). Laying lasted 5–10 seconds. Although the parasitic Brown-headed Cowbird (*M. ater*) and sometimes Shiny Cowbirds (*M. bonariensis*) also lay before sunrise, direct observations of laying by other cowbirds are required before it can be concluded that pre-sunrise laying is an adaptation for brood parasitism. *Received 9 June 1998, accepted 5 Sept. 1998.*

Avian brood parasites that are surreptitious when parasitizing nests may avoid detection by their hosts. Indeed, they often lay their eggs in a matter of seconds; Sealy and coworkers (1995) found this behavior to be unique to the diverse groups of brood parasites. The parasitic Brown-headed Cowbird (*Molothrus ater*) generally lays in the minutes prior to sunrise and it has been suggested that laying at this time, presumably when hosts are less likely to be at their nests, is an adaptation for brood parasitism (Chance and Hann 1942). Scott (1991) found that female Brown-headed Cowbirds lay their eggs an average of 9 min before sunrise, whereas seven potential host species all lay their eggs after sunrise. Shiny Cowbirds (*M. bonariensis*) and, possibly, the nonparasitic Bay-winged Cowbird (*M. badius*) also sometimes lay before sunrise (see Scott 1991), but the data available to Scott (1991) were insufficient to conclude that sunrise laying is an adaptation for brood parasitism. There were no direct observations of laying for the Bronzed Cowbird (*M. aeneus*). Carter (1986) stated only that this brood parasite lays "during dawn hours". Here we report, to our knowledge, the first recorded observations of laying times for the Bronzed Cowbird.

METHODS

Our observations were made at the Welder Wildlife Refuge in San Patricio County, Texas (28° 0′ N, 97° 5′ W) in 1994. Both Bronzed and Brown-headed cowbirds were present during the breeding season. After locating a nest at which a host apparently had not completed laying, we watched it the following morning beginning approximately 30 min before sunrise. We hid far enough away so that hosts or visiting cowbirds were not disturbed. The nests were observed with binoculars when necessary. Sunrise (SR) times were obtained from the website of the United States Naval Observatory Astronomical Applications Department (http://aa.usno.navy.mil/AA/). All times are Central Standard Time.

RESULTS

Three Bronzed Cowbird laying events were observed directly, all at Northern Cardinal (*Cardinalis cardinalis*) nests. On 30 May 1994 we located a cardinal nest (94-16) containing one cardinal egg. The following morning, BDP arrived at this nest at 05:14 (SR − 20 min) and found a Bronzed Cowbird egg that was slimy, suggesting it had been laid recently, plus one cracked cardinal egg. Later the same day the nest contained two cardinal eggs plus the cowbird egg. At 05:06 (SR −

[1] Dept. of Zoology, Univ. of Manitoba, Winnipeg, MB, R3T 2N2, Canada.

[2] Present address: 3163 5th St., East Moline, IL 61244; E-mail: bdpcowbird@aol.com

[3] Corresponding author.

28 min) on 1 June the nest contents were the same, but by 05:14 a second Bronzed Cowbird egg had been laid. Later that day, the damaged cardinal egg was gone and a third cardinal egg had been laid. On the morning of 2 June the female cardinal was accidentally flushed from the nest, and the nest contents were the same as the day before. At 05:14 (SR − 20 min) BDP watched a female Bronzed Cowbird fly directly to the nest, lay an egg, and fly away in 5–10 s. BDP left momentarily at 05:15, but upon returning at 05:19, found four Bronzed Cowbird eggs in the nest. No bird species is known to lay more than one egg per day (Sturkie 1976), thus we assumed a second female had laid an egg in this nest.

Nest 94-22 was found with one cardinal egg on 14 June 1994. On 15 June a female Bronzed Cowbird looked into the nest at 5:19 (SR − 14 min), but she did not lay. On 16 June K. Stewart observed two Bronzed Cowbirds parasitize this nest, one at 05:17 (SR − 16 min) and a second at 05:19 (SR − 14 min). Neither cardinal was present during the laying events and both laying bouts lasted 5–10 s. In addition to the three laying events observed, we estimated the two other laying times by taking the midpoints of repeated visits to the nests (Scott 1991) and found that Bronzed Cowbirds laid their eggs 18.2 min ± 1.7 SE before sunrise (range, SR − 14 to 24 min).

DISCUSSION

Like the Brown-headed Cowbird, and sometimes the Shiny Cowbird (Scott 1991), Bronzed Cowbirds lay prior to sunrise and, similar to other brood parasites, they lay rapidly (Sealy et al. 1995). It is undoubtedly advantageous for brood parasites to lay their eggs when hosts are absent and to lay as rapidly as possible (reviewed in Sealy et al. 1995). Indeed, Neudorf and Sealy (1994) found that hosts of the Brown-headed Cowbird at Delta Marsh, Manitoba, that did not roost on their nests overnight typically arrived at the nests in the morning after cowbird parasitism would have occurred. Female Bronzed Cowbirds have been observed entering host nests at various times of the day, but it is unknown whether eggs were laid (Thurber and Villeda 1980; T. Brush, pers. comm.). While it is possible that eggs were laid during these visits, these females may have been inspecting nests (see below), or they may have punctured host eggs (Carter 1986, Peer 1998).

The female Bronzed Cowbird observed visiting a nest prior to sunrise without laying may have been inspecting this nest to determine whether it was active and ready to be parasitized (see also Mayfield 1961, Nolan 1978). This nest was parasitized by two Bronzed Cowbirds the following morning. The cowbirds were clearly aware of the nest beforehand because they flew directly to it. Similar behavior has been reported for Brown-headed Cowbirds (Hann 1941, Neudorf and Sealy 1994).

The three cowbird species mentioned above are the only icterids known to lay before sunrise. The nonparasitic Bay-winged Cowbird may also lay prior to sunrise (see Scott 1991). Direct observations of laying by the Bay-winged, Giant (*Scaphidura oryzivora*), and Screaming (*M. rufoaxillaris*) cowbirds are required before it can be concluded that pre-sunrise laying in cowbirds is an adaptation for parasitism.

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Temporal Differences in Point Counts of Bottomland Forest Landbirds

Winston Paul Smith[1,3] and Daniel J. Twedt[2]

ABSTRACT.—We compared number of avian species and individuals in morning and evening point counts during the breeding season and during winter in a bottomland hardwood forest in west-central Mississippi, USA. In both seasons, more species and individuals were recorded during morning counts than during evening counts. We also compared morning and evening detections for 18 species during the breeding season and 9 species during winter. Blue Jay (*Cyanocitta cristata*), Mourning Dove (*Zenaida macroura*), and Red-bellied Woodpecker (*Melanerpes carolinus*) were detected significantly more often in morning counts than in evening counts during the breeding season. Tufted Titmouse (*Baeolophus bicolor*) was recorded more often in morning counts than evening counts during the breeding season and during winter. No species was detected more often in evening counts. Thus, evening point counts of birds during either the breeding season or winter will likely underestimate species richness, overall avian abundance, and the abundance of some individual species in bottomland hardwood forests. *Received 15 Nov. 1997, accepted 20 Aug. 1998.*

Improvement and standardization of assessment techniques for monitoring bird populations has received considerable attention (e.g., Ralph et al., 1993, 1995a, b; Hamel et al. 1996). Although most studies of avian population assessment techniques have focused on breeding birds, some have evaluated winter bird populations (Rollfinke and Yahner 1990; Gutzwiller 1991, 1993a, b). Detecting statistically significant changes in avian populations may require an extensive monitoring network (Smith et al. 1993, Hamel et al. 1996). To achieve monitoring objectives using limited resources, protocols that reduce costs and maximize efficiency are required (Smith et al. 1993). Unfortunately, many factors that influence survey efficiency are beyond the control of investigators. For example, detection varies among species, among census techniques (e.g., Grue et al. 1981, Rollfinke and Yahner 1990), and may be influenced by physical or biological factors (Gutzwiller 1993a, b).

If detection probabilities were constant over time, the efficiency of avian surveys could be increased by providing a greater window of opportunity during which surveys could be conducted. However, most species exhibit diel and seasonal variation in detectability. Thus, to optimize sampling effort and reduce sampling variances, monitoring should be focused on periods when species are most frequently detected (Gutzwiller 1993a).

To assess optimal periods of detection, investigators have compared point counts from different times of the morning during the breeding season (Shields 1977, Grue et al. 1981, Robbins 1981, Skirvin 1981) or winter (Gutzwiller 1993a). Only Rollfinke and Yahner (1990), using transect counts, compared morning counts to evening counts during winter. Although birds are generally assumed to

[1] United States Department of Agriculture, Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 2770 Sherwood Lane—Suite 2A, Juneau, AK 99801-8545; E-mail: wpaulsmith@aol.com

[2] USGS Patuxent Wildlife Research Center, 2524 South Frontage Road, Vicksburg, MS 39180.

[3] Corresponding author.