BREEDING BIOLOGY OF THE BLACK-HEADED GROSBEAK IN NORTHERN UTAH

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Although the Black-headed Grosbeak (*Pheucticus melanocephalus*) is a common breeding bird in many parts of western North America, little is known about its breeding biology. Apart from a few anecdotal reports (Bent 1968), information on the breeding biology of this species comes from a single study performed in California (Weston 1947). The objective of the present study was to examine the breeding biology of a population of Black-headed Grosbeaks in northern Utah.

STUDY AREA

The study was conducted at Malibu-Guinavah Forest Camp (Cache National Forest), 10 km east of Logan, Cache County, Utah. The area, at 1500 m elevation, is located on the flat bottom of Logan Canyon, with the Logan River cutting diagonally across the eastern section. The vegetation is discontinuous woodland, which is characterized by a heavy growth of grasses in the open areas and a dense understory of wild rose (*Rosa woodsii*), Blue Elderberry (*Sambucus coerulea*), hawthorn (*Crataegus rivularis*), Chokecherry (*Prunus virginiana*), and Sierra Willow (*Salix wolfii*). The dominant trees in the area are Box Elder (*Acer negundo*), Dusky Willow (*Salix melanopsis*), and River Birch (*Betula fontinalis*). Numerous Mountain Alder (*Alnus tenuifolia*) can be found along the stream banks with occasional Narrowleaf Cottonwood (*Populus angustifolia*) and Green Ash (*Fraxinus lanceolata*) dispersed over the area. Because of recreational improvements by U.S. Forest Service personnel, the canopy is discontinuous.

METHODS

I made field observations almost daily from 1 April through 31 August in 1977 and 1978 at the Malibu-Guinavah Forest Camp. Approximately 850 hours were spent observing birds or nests and observations were equally distributed throughout the day. Territorial boundaries were delimited by plotting on a map those locations where intraspecific aggressive behavior occurred. If a part of a territory could not be determined by observation of boundary disputes, the outermost points of utilization were connected by straight lines to form a polygon of maximum size. Hatching dates were obtained by inspecting the nests. When this was impossible, these dates were estimated within 1 or 2 days on the basis of the behavior of the adults. In all cases, either fledging was observed, or young known to have been in the nest the previous day were seen in nearby trees or shrubs a day later. Thirty-one adults (24 males and 7 females) were captured and marked with combinations of colored leg bands, numbered aluminum bands, and felt pens. In addition, 21 nests were located, and colored and aluminum bands were placed

on 20 nestlings. Observations at such nests were made with 7× 35 binoculars at distances of 4-8 m, using natural vegetation as a "blind." A stopwatch was used to time the activities of breeding adults.

RESULTS AND DISCUSSION

The first birds arrived in the study area during the first 2 weeks in May. Although Weston (1947) reported that males arrive about 6 days before the females, my observations indicated that many of the first birds to arrive were already paired. Grosbeaks continued to move into and through the area for the next 2 weeks or longer. Banding returns suggested that the first birds in the study area were often those that nested in the area the previous year. These birds, however, did not always remain in the study area. Six birds banded in 1977 were observed in the study area early in the 1978 breeding season; two of these previously banded birds (one male and one female) remained to nest in the study area.

Because many birds arrived already paired, observations of courtship behavior were limited. Weston (1947:55) stated that "the only type of display seen was a nuptial flight," i.e., the male uttered loud songs from some exposed perch near a female and then suddenly flew out, performing a song-flight in the air above the female. My observations indicated that such song-flights were not utilized solely for courtship. On several occasions males were observed performing song-flights during "singing duels" with neighboring males.

The Pair Bond

During the early part of the breeding season (before nesting began), paired birds foraged together within their territories. Females usually followed as the males moved through the territory feeding and singing. Paired birds sometimes fed as close together as several centimeters, or more commonly in different parts of the same tree or bush or in adjacent trees or bushes. Vocalizations given by the birds as they moved through their territories included chip and wheet calls. Chip calls were given by both sexes and appeared to function as location calls. Wheet calls were given only when a bird was moving, e.g., when flying a short distance from bush to bush or when flying from the nest after incubating the eggs.

As stated above, males often sang as they foraged. Such song apparently served a territorial function and was probably used by the female in maintaining contact with the male. Females infrequently sang while foraging near the male (Weston 1947; pers. obs.). Female song has also been reported in the Rose-breasted Grosbeak (*Pheucticus ludovicianus*; Ivor 1944a, Dunham 1965). Such song may play some role in pair-bond maintenance.

Territorial Behavior

In the Black-headed Grosbeak, singing by the male appears to be the most important factor in acquiring and retaining a territory. However, singing by itself is apparently not sufficient to maintain a territory. Early in the breeding

season agonistic encounters involving chasing and even physical contact occurred. Nearly all chases involved males, although several female-female chases were observed. On three occasions females were observed chasing males. No instances of actual physical contact were noted in these female-female or female-male encounters. Weston (1947:56), however, described a conflict between mated pairs in apparent defense of their respective territories in which the females were more aggressive than the males. The females "repeatedly postured and flew at each other, and at each attack, loud songs, calls, and sounds of bodily contact could be heard." Weston reported no other instances of female song in territorial encounters. I observed two instances of singing by females in such situations. On one occasion, a female chased a male and, upon landing, sang one loud song. On another occasion a female appeared to engage in a brief singing duel with a neighboring male.

Following territory establishment, Black-headed Grosbeaks became progressively less aggressive. This change in behavior was quantified in two ways. First, male singing rates tended to decline as the season progressed (Figure 1). A second indicator of this decline was the distribution of intraspecific agonistic encounters (chases or actual physical encounters). Figure 2 summarizes this distribution for the 1977 and 1978 breeding seasons. It is

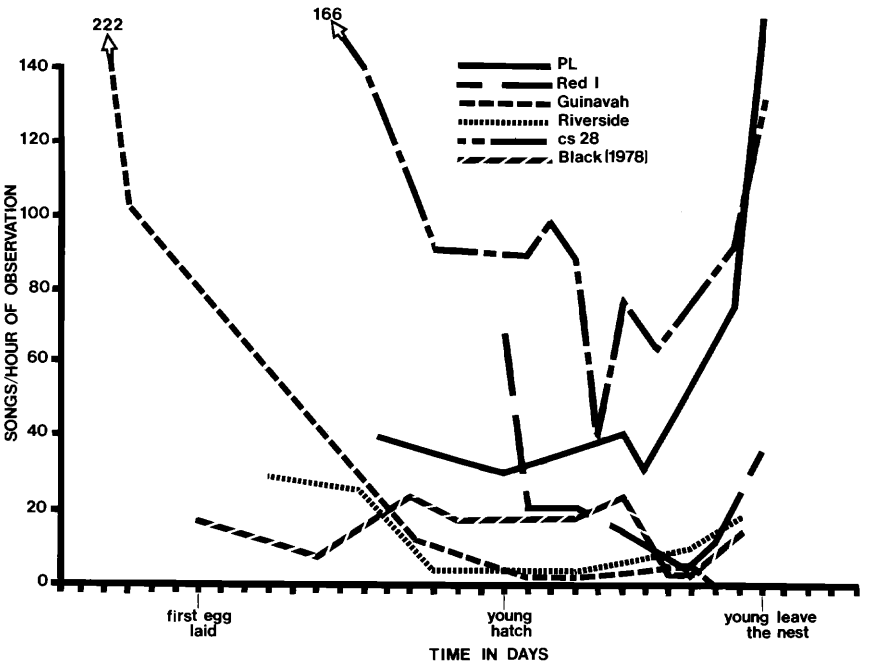

Figure 1. Singing rates of selected male Black-headed Grosbeaks during the 1977 and 1978 breeding seasons.

apparent that after egg-laying began there was a substantial drop in the number of encounters and, later, such agonistic behavior disappeared altogether. In the days prior to and immediately after the young left the nest, males and females responded weakly, if at all, to the presence of other grosbeaks. Similar behavior has been reported in the Rose-breasted Grosbeak (Dunham 1964).

Territories in the study area averaged about 2.7 ha (n = 12, range: 1.9 - 3.9). Previous investigators of the Black-headed Grosbeak have not indicated territory sizes. However, Dunham (1964, 1965) found that the average size of 20 Rose-breasted Grosbeak territories was 0.8 ha (range: 0.3 - 1.8).

Nest site selection and nest construction

Nesting usually occurred in deciduous bushes and trees, usually at a height of 2-7 m above the ground (n = 21, $\bar{x}$ = 4.1). Weston (1947) listed height records for 163 nests and found the average to be about 3 m above ground. The nest is bulky and loosely constructed, and composed of slender twigs, plant stems, and rootlets.

Nests were generally built by the female. Weston (1947:60) reported that he had "never seen a male carrying nesting material nor in any way aid in the actual construction of the nest." However, Finley (1907) mentioned seeing a male grosbeak carrying a twig in his beak. On several occasions I observed

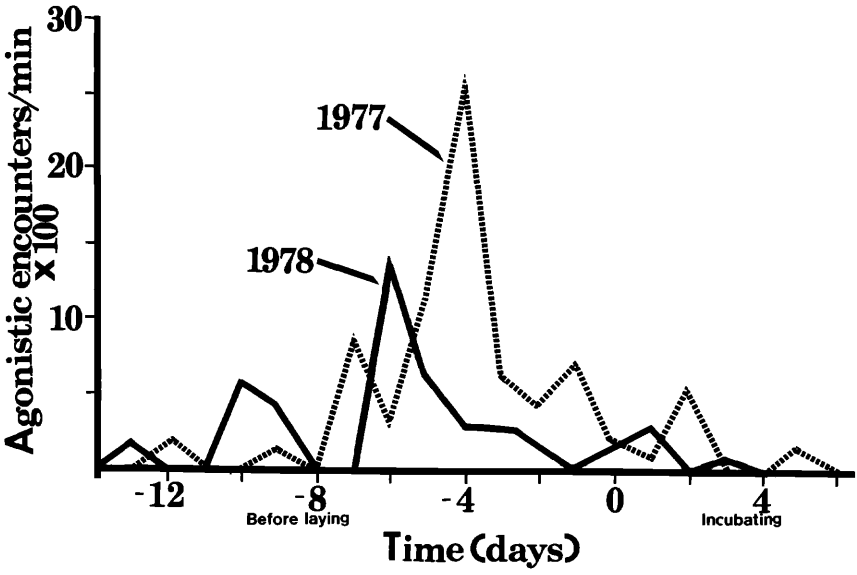

Figure 2. Distribution of intraspecific agonistic encounters (chases and/or actual physical encounters) among male and female Black-headed Grosbeaks (day 0 = first egg laid).

males assisting in nest construction. In all pairs observed, however, most of the construction was performed by the female.

Construction of nests took from 3-4 days with most of the building occurring in the morning. Visits to the nest became less frequent and more irregular as the day progressed, and in the afternoon nests were sometimes visited without any nesting material. During the final stages of construction, females spent less time placing new material in the nest and, instead, spent more time readjusting material already there (Weston 1947; pers. obs.).

Following the completion of the nest there was a period of 2-5 days before the first egg was laid. The eggs were laid at intervals of approximately 24 hours, and the usual set consisted of two to four eggs ($\bar{x}$ = 2.8, n = 14). Weston (1947) indicated that the average clutch consisted of 3.3 eggs (n = 192).

Incubation

Both sexes incubated during the day (Head 1902, 1904; Weston 1947; pers. obs.), while the female incubated at night (Weston 1947; pers. obs.). During the day, eggs were incubated about 97% of the time, about 41% of the time by males and 56% by females. The average length of each incubation period for 10 males was about 35 minutes (range: 2.5 to 100) and for 10 females, about 51 minutes (range: 11 to 130).

Both sexes were surprisingly vocal on and around the nest. Males frequently sang while incubating. At times this song appeared to be in response to the singing of neighboring males; i.e., a male that was quietly incubating would begin to sing upon hearing a neighboring male sing. At other times the male's singing appeared to be a signal to the female. When a male's period of incubation was due to end he often began to sing. Generally, the female appeared at the nest within a few seconds.

Whereas incubating males often sang to inform the female of their apparent intention to leave the nest, incubating females appeared to convey the same information with chip calls. Males generally returned to the nest within a few seconds upon hearing their incubating mate's call note.

On many occasions a male or female approached the nest and found its mate quietly incubating. At these times, the approaching bird frequently uttered chip calls or sang. The incubating bird, upon hearing its mate, would then leave the nest (usually after uttering several chip calls). Rose-breasted Grosbeaks also behave in this manner when changing places on the nest (Ivor 1944a,b; Allen 1916). As mentioned previously, when grosbeaks flew from the nest they nearly always uttered one or more wheet calls. Such calls apparently informed the mate that the bird on the nest was leaving and resulted in faster change-overs. Rarely were nests left uncovered for more than a few seconds ($\bar{x}$ = 9.7 sec, n = 74).

The incubation period ranged from 12-14 days, with most eggs hatching at 13 days. Eggs in a clutch usually hatched on the same day, and in no case were more than 2 days required for the hatching of all eggs in a clutch.

Parental Care

During the first few days post-hatching adults maintained the same "schedules" as when incubating. Both adults fed and brooded the young, and their behavior when changing places on the nest was similar to that during incubation, with one significant difference. During incubation an approaching female usually uttered chip calls to inform the male of her presence but during the brooding period females were more likely to sing (Figure 3). After fledging, such songs were used by females to maintain contact with the young (Ritchison 1983).

Males and females contributed equally to the feeding of the young throughout the nestling period. And, surprisingly, the number of feeding trips to the nest was found to remain rather constant throughout that period (Figure 4). However, later in the nestling period adults appeared to bring larger food items, and they frequently brought more than one item per trip to the nest.

As the young developed both parents spent progressively longer periods off the nest. By the 7th day post-hatching the parents brooded much less constantly, although the young were still covered a good part of the time (Figure 5).

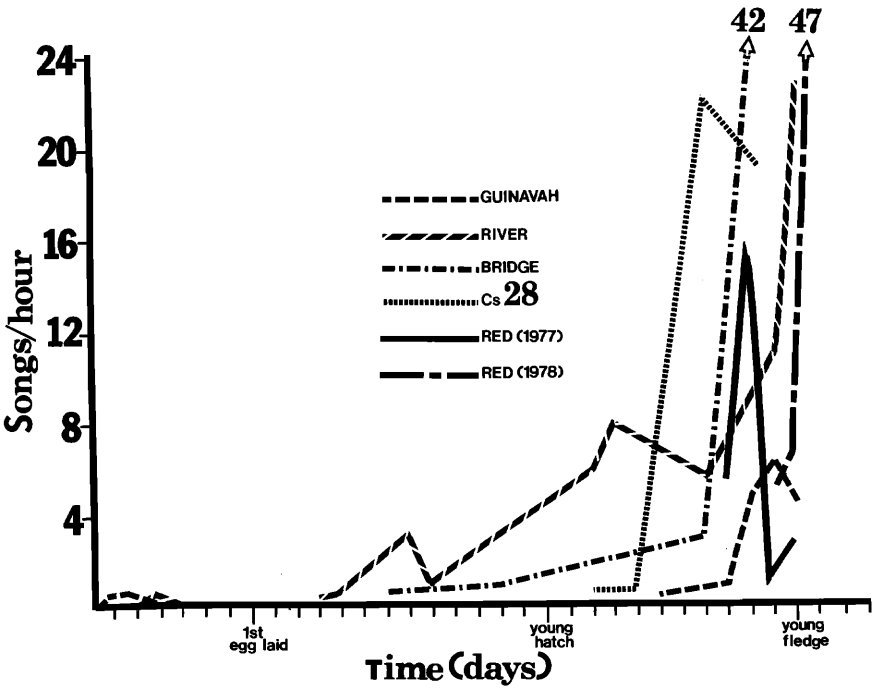

Figure 3. Singing rates of selected female Black-headed Grosbeaks during the 1977 and 1978 breeding seasons.

On the 8th day the eyes of the young began to open, and by the 9th day they were usually wide open. At this stage the young were brooded infrequently, the time spent brooding being dependent on the weather (Weston 1947; pers. obs.). Adults approaching the nest to feed the young usually vocalized, uttering either chip calls or songs. Upon the arrival of an adult at the nest, young grosbeaks immediately began to utter begging calls. At times young grosbeaks responded to the chip calls of their parents and began calling before the adults arrived at the nest.

Young grosbeaks left the nest as early as the 9th day post-hatching, although departure at 10-14 days post-hatching was more common ($\bar{x}$ = 11.5, n = 21). After leaving the nest the young scattered among the shrubs near the nest, perching on low branches. During the first few days after leaving the nest, the young were rather quiet. As the fledglings are unable to fly at this time, they remained within a restricted area and the adults appeared to have little trouble locating and feeding them (Weston 1947; pers. obs.). If, however, an adult was unable to locate a young bird, it would begin to utter chip calls and songs. Upon hearing their parents' vocalizations, young grosbeaks responded by uttering phee-oo and hunger-distress calls. In this manner the parents and young were able to maintain contact.

After the young attained flight (approximately 15 days post-hatching) maintaining contact between parents and young became more difficult. When parents had food for the young but were unsure of the location of the young, the parents uttered chip calls or, more frequently, songs. Upon hearing a

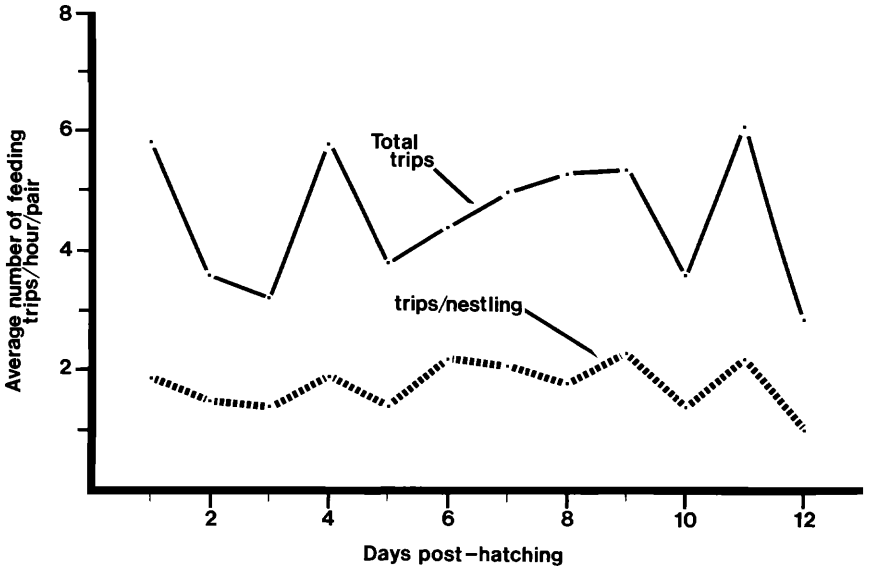

Figure 4. Average number of feeding trips made by pairs of Black-headed Grosbeaks (n = 8) throughout the nestling period.

parent sing, a young grosbeak would fly to within a few meters or less of the adult and, if not fed immediately, would begin calling.

At this stage (2-3 weeks post-hatching), family groups no longer remained within their territories. Because of this wandering, it was difficult to observe specific family groups over long periods and, therefore, the duration of such groups remains unknown. Weston (1947) reported seeing young grosbeaks being fed by adults in early August, but he was unable to determine the actual length of the dependent period. In the Rose-breasted Grosbeak, Watts (1935) and Dunham (1965) reported that adults continued to feed the young after they had molted into their first winter plumage in at least some cases, and the family groups remained together until migration. Ivor (1944a,b), however, reported adult Rose-breasted Grosbeaks striking young on the bill after feeding them, beginning 27 days after hatching. He suggested that this may have been a weaning procedure, the "adults still reacting to begging with food, but to the adult appearance of the young with aggression."

Since males appeared to leave the nesting area before the females or young, later in the season family groups consisted solely of females and their

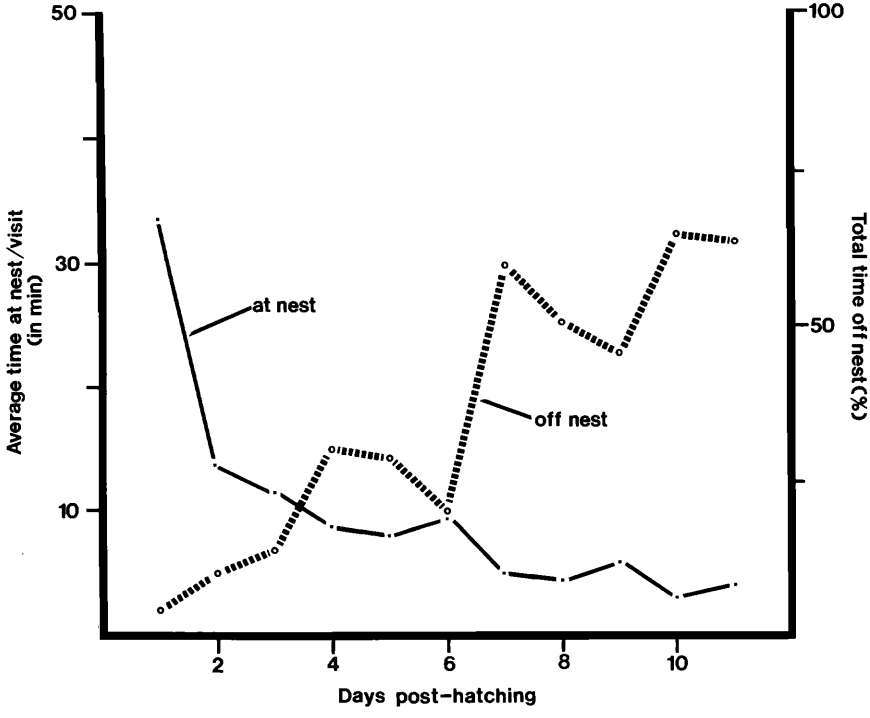

Figure 5. Average amount of time spent on and off the nest by pairs of Black-headed Grosbeaks (n = 8) throughout the nestling period.

young (Weston 1947; pers. obs.). Resident females and young began leaving the study area in early August, with the last groups leaving the study area in mid-to late August. Transients were seen in the area into early September.

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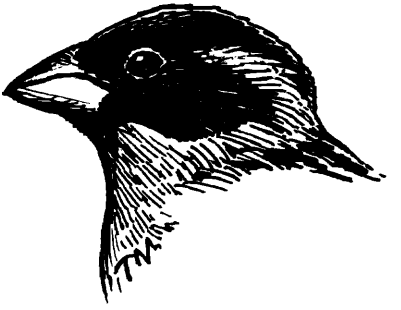

Black-headed Grosbeak *Sketch by Tim Manolis*