

AGING AND SEXING BLACK-HEADED GROSBEAKS IN ALTERNATE PLUMAGE

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Abstract.—Because male Black-headed Grosbeaks (*Pheucticus melanocephalus*) display delayed plumage maturation special care must be taken in distinguishing among the age-sex classes of this species. I present a method for scoring the plumage brightness of Black-headed Grosbeaks and a scheme by which plumage characteristics can be used to distinguish age and sex classes. Males in first alternate plumage can be separated from females primarily by the presence of black feathering on the face or chin, black rectrices, or black upper wing coverts and from males in definitive alternate plumage principally by the presence of brown primaries. I was not able to determine the age of females in alternate plumage, but by using feather wear I was able to distinguish adult female from juvenile grosbeaks. Finally, males in first basic plumage are generally brighter than females in first basic plumage, so most juveniles can be sexed by plumage characteristics.

EDAD Y SEXO DE *PHEUCTICUS MELANOCEPHALUS* EN PLUMAGE DE TRANSICIÓN

Sinopsis.—Debido a que la maduración del plumaje en los machos de *Pheucticus melanocephalus* es lenta debe tenerse mucho cuidado para poder distinguir entre las diferentes etapas de edad-sexo de esta especie. Presento un método para clasificar la brillantez del plumaje de estas aves y un esquema mediante el cual las características del plumaje pueden ser utilizados para distinguir la edad y el sexo. Los machos en su primer plumaje de transición pueden ser distinguidos de las hembras por la presencia de plumas negras en la cara o barbilla, rectrices negras o cobijas superiores del ala negras. Los machos en plumaje de transición definitivo se diferencian de las hembras por tener las primarias de color pardo. No pude determinar la edad de hembras en plumaje transicional. Sin embargo, utilizando el desgaste de las plumas pude diferenciar entre hembras adultas y juveniles. En aves en su primer plumaje básico, note que generalmente los machos son mas brillantes que las hembras. El sexo de la mayoría de los juveniles se puede determinar por características particulares del plumaje.

In several of the conspicuously sexually dichromatic passerine species that breed in North America males delay attaining a definitive alternate plumage for one year, spending their first spring and summer in a generally dull, but highly variable, first alternate plumage (Rohwer et al. 1980). In some of these species the male first alternate plumage closely resembles the male definitive alternate plumage; in others it more nearly resembles the plumage of females; and in some, such as the Black-headed Grosbeak (*Pheucticus melanocephalus*), it varies between these extremes. Thus, correctly determining the age of males of these species presents a challenge, as well as an opportunity for distinguishing several age classes

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of males. In this paper I present a scheme for age and sex determination of Black-headed Grosbeaks in alternate plumage in the spring and summer. Guides currently available for aging and sexing Black-headed Grosbeaks (e.g., North American Bird Banding Manual 1984, Oberholser 1974, Sheppard and Collins 1971) are either inaccurate or incomplete and can lead to errors in aging and sexing this species.

METHODS

This paper is based on three seasons (1984–1986) of summer (May–August) fieldwork in central New Mexico during which I captured over 500 Black-headed Grosbeaks of all age-sex classes. Each bird was color banded and its plumage coloration and pattern recorded (see Appendix). Based on plumage characteristics, I assigned each bird to an age-sex class at the time of capture. For brevity I will follow the terminology of the U.S. Fish and Wildlife Service Bird Banding Laboratory by referring to males in first alternate plumage as SY (second year), males in definitive alternate plumage as ASY (after second year), females in at least their first alternate plumage as AHY (after hatch year), and birds still in juvenal/first basic plumage as HY (hatch year).

I tested the validity of my aging and sexing technique by recapturing marked individuals in subsequent years and by collecting a series of female and SY male grosbeaks. Twenty-nine birds that I recorded as females and 11 birds that I recorded as SY males at the time they were initially banded were recaptured the following year. All “females” retained their female plumage (none matured into an ASY male) and all “SY males” acquired a definitive alternate plumage. This confirmed my ability to distinguish between female and SY male grosbeaks and also indicated that males delay attaining a definitive alternate plumage for only one spring.

I recaptured one male that had been banded as an HY bird in the previous year. It returned in a typical first alternate plumage (i.e., not a definitive alternate plumage). In addition, I held 13 males in captivity for their first winter. Although some of these males attained an adult-male-like plumage, none acquired a complete definitive alternate plumage. (The two brightest males each attained plumage scores [see Appendix] of 44, two points higher than the brightest SY males that I handled in the wild, but they still retained all juvenal primaries and some juvenal secondaries.) These results support the assumption that yearling males do not molt from a first basic into a definitive alternate plumage and, thus, that males in a definitive alternate plumage are at least two years old (ASY).

As an independent test of my key, I collected 25 birds between 13 May and 14 June that were either females or SY males. Each bird was assigned an age-sex class before it was dissected and its sex positively determined. In all cases I was able to assign the correct sex to a bird by examining its plumage.

AGING AND SEXING

Because Black-headed Grosbeaks are sexually dichromatic, ASY males can be readily distinguished from females. ASY males have a jet black head including the chin, flashy black and white wings and tail, and a brilliant rufous breast, rump, nape, and flanks. In contrast, females have a brown head with buffy to white (occasionally lemon yellow) crown and superciliary stripes and a pale chin. Their wings are brown and buff and their breast, nape, rump, and flanks are generally dull rufous to buff with a variable amount of streaking.

The most difficult age-sex class to distinguish is SY males because they display a variable plumage that at one extreme is much like the plumage of a female and at the other extreme much like that of an ASY male. Dull plumaged SY males can be distinguished from females on the basis of four plumage characteristics: (1) black feathering on the face or head (particularly between the crown and superciliary stripes), (2) black feathering on the chin (even very spotty black), (3) black upper wing coverts, or (4) black rectrices with bold white terminal spots on the underside. In a sample of 106 SY male grosbeaks I found that 96.2% have some black feathering on their face or head, 87.7% had some black feathering on their chin, 67.0% had black upper wing coverts, and 63.2% had one or more adult (black) rectrices. All SY males that I examined had at least one of these features, so the absence of all of these characteristics indicates that the bird is a female. Many females have a relatively bright rufous breast, nape, and/or rump with little or no streaking while some SY males show little rufous pigmentation and heavy streaking of the same regions. Contrary to the Bird Banding Manual these traits cannot be used to separate females and yearling males.

The presence of a brood patch indicates that a bird is a female, but care must be taken in what is called a brood patch. Both male and female Black-headed Grosbeaks sit on eggs (Weston 1947, Ritchison 1983) and both ASY and SY male grosbeaks have a large patch of bare skin on their belly and breast during the incubation period. Only in females does the patch become highly vascularized and puffy, and only such a puffy brood patch should be used to identify females.

Bright SY males can be distinguished from ASY males on the basis of their brown and indistinctly spotted (as opposed to black and boldly spotted) primaries and secondaries and, secondarily, by the presence of brown and indistinctly spotted rectrices. In a sample of 106 SY males, all had juvenal primaries, 93.7% had completely juvenal secondaries, and 91.5% had one or more juvenal rectrices.

I was unable to age females by plumage. I attempted to distinguish SY and ASY females on the basis of feather wear, assuming that ASY females had undergone a prebasic molt of their primaries and secondaries and that SY females had not (Oberholser 1974), but I could detect no consistent differences even between marked birds that I knew to be SY and ASY.

Oberholser (1974) suggested that males in a second nuptial plumage

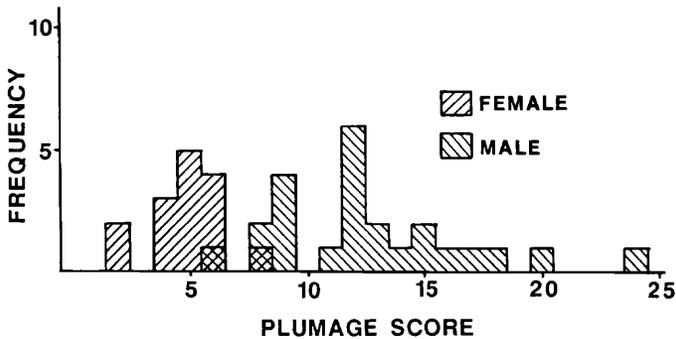


FIGURE 1. Distribution of plumage scores of juvenile Black-headed Grosbeaks of known sex.

differ from males in third and subsequent nuptial plumages by having a more extensive crown stripe, duller rufous breast and flanks, less black on the chin, and browner wings and tail. My observations indicate that this is not the case. Considerable intra-male plumage variation exists in these characters, but after the acquisition of the second nuptial plumage, the variation is not age related. The plumage scores of the second and third nuptial plumages did not change in the one male for which I was able to make such a comparison. Moreover, the plumage scores of 10 males known to be in a second alternate plumage had the same median value (46) and a similar range (42–47) as the plumage scores of 42 males known to be in at least a third alternate plumage (range = 39–48; $P > 0.15$; Mann-Whitney U -test). No ASY male lost or gained more than 3 points on its plumage score between years, and there was no tendency for ASY males to either increase or decrease in plumage scores between years ($P > 0.14$; sign test).

After 1 June it becomes important to distinguish HY individuals from AHY females. These two age-sex classes of grosbeaks overlap completely in plumage color and pattern, so aging characteristics other than plumage pigmentation must be employed. Examination of the skull for pneumatization (North American Bird Banding Manual 1984) is the most reliable way to distinguish AHY female from HY Black-headed Grosbeaks, but thick skin about the cranium can make skull aging difficult. Fortunately, there are other characteristics that can be used at least for the months of June, July, and August. The presence of a vascularized brood patch indicates that a bird is an AHY female. Conversely, juvenal feathering on the flanks identifies HY birds. Young grosbeaks molt the majority of their juvenal plumage soon after fledging, but frequently retain fluffy juvenal feathers along their flanks at least until 1 August. A third distinguishing feature is the degree of feather wear of the remiges and rectrices. By mid to late summer when HY birds begin to appear the remiges and rectrices of AHY females are very worn while those of HY birds are fresh with untattered edges.

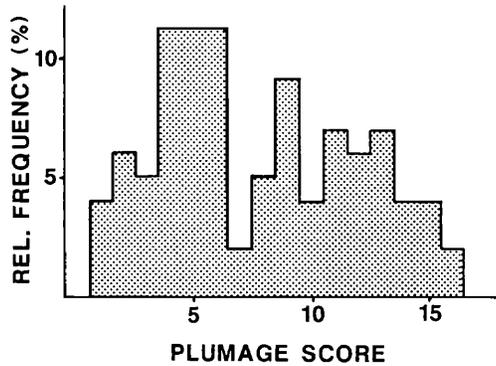


FIGURE 2. Distribution of plumage scores of juvenile Black-headed Grosbeaks netted at Cedar Crest, New Mexico.

The banding manual proposes that eye color be used to separate HY and AHY birds. I found that eye color differs very subtly between HY and AHY grosbeaks, the eyes of young birds having a slightly grayer cast than the deep chocolate brown of adults. Because the difference is so slight, I recommend that eye color be used only when other aging techniques are not feasible and after one has examined several known HY and AHY grosbeaks.

Finally, I found that it is often possible to distinguish the sex of HY grosbeaks using plumage characteristics. Relative to females, male HY grosbeaks generally display brighter rufous pigmentation of the breast, flanks, nape, and crown stripe and less streaking on the breast. In a sample of 39 HY Black-headed Grosbeaks of known sex, I found very little overlap in the plumage scores (see Appendix for methodology) of the two sexes (Fig. 1, $P < 0.001$; t -test). Moreover, for the 98 HY birds that I banded and released, I found a highly bimodal distribution of plumage scores (Fig. 2) suggesting sexual dichromatism. Because the two sexes overlap slightly in appearance and the indexing methodology is complex and requires practice, I have not attempted to include a means for distinguishing male and female HY grosbeaks in the key. Researchers who need to determine the sex of HY grosbeaks should use the indexing method outlined in the Appendix to score a sample of HY grosbeaks of known sex and then compare unknown birds to this standard.

**PROPOSED REVISED KEY FOR AGING AND SEXING
BLACK-HEADED GROSBEEKS**

- 1A Black feathering between crown and superciliary stripes, or black chin feathers, or black outer rectrices with bold white terminal spots, or black upper wing coverts Male (see 2)
- 1B Area between crown and superciliary stripes gray/brown, chin buff to white, rectrices brown with indistinct terminal spots, upper wing coverts brown with no contrast with remiges Female/HY (see 3)

- 2A Most primaries or secondaries brown with indistinct spots, or some rectrices brown with indistinct terminal spots SY
 2B Primaries and secondaries black with bold white markings and rectrices black with bold white terminal spots ASY
 3A January through May AHY-Female
 3B June through August see 4
 3C September through December see 5
 4A Flight feathers faded, worn, frayed or flight feather molt or vascularized brood patch AHY-Female
 4B Flight feathers bright, fresh and unworn with no evidence of molt or vascularized brood patch HY-U
 5A Skull incompletely pneumatized HY-U
 5B Skull completely pneumatized U-U

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LITERATURE CITED

- OBERHOLSER, H. C. 1974. The bird life of Texas. Vol. II. Univ. of Texas Press, Austin.
 RITCHISON, G. 1983. Breeding biology of the Black-headed Grosbeak in northern Utah. *West. Birds* 14:159-167.
 ROHWER, S. A., S. D. FRETWELL, AND D. M. NILES. 1980. Delayed maturation in passerine plumages and the deceptive acquisition of resources. *Am. Nat.* 115:400-437.
 SHEPPARD, J., AND C. COLLINS. 1971. Banding worksheet for western birds. Supplement to *West. Bird Bander*.
 U.S. FISH AND WILDLIFE SERVICE AND CANADIAN WILDLIFE SERVICE. 1984. North American bird banding manual. Department Manuals and Reports Division, Ottawa, Ontario.
 WESTON, J. G., JR. 1947. Breeding biology of the Black-headed Grosbeak. *Condor* 49: 54-73.

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APPENDIX

I quantified the relative plumage brightness of Black-headed Grosbeaks by scoring 16 feathered regions on a scale from 0 (dullest/most feminine) to 3 (brightest/most masculine). The sixteen scores were then added together giving an overall brightness index for that bird. Below are listed the sixteen characters that I used in this index. To devise a four point scale for characters such as the rufous of the breast, flanks, nape, and rump, one must first handle enough birds to get a feel for the extremes and then assign categories accordingly.

- 1) Eye stripe color: no stripe by default scores 3 in color. Otherwise, 3, bright rufous; 2, dull rufous; 1, bright buff; 0, dull buff.
- 2) Crown stripe color: same scale as eye stripe color.
- 3) Head color: 3, black; 0, brown (intermediate scores not used).
- 4) Chin color: 3, black; 0, buff or white (intermediate scores not used).
- 5) Breast color: 3, bright rufous; 2, dull rufous; 1, bright buff; 0, dull buff.
- 6) Breast streaking: 3, no streaking; 2, faint streaking; 1, distinct but not bold streaking; 0, bold streaking.
- 7) Flank color: same scale as breast color.
- 8) Flank streaking: same scale as breast streaking.
- 9) Belly: 3, a large patch of yellow feathers $>2\text{ cm} \times 1\text{ cm}$; 2, a patch of yellow feathers $<2\text{ cm} \times 1\text{ cm}$ and containing more than five feathers; 1, five or fewer yellow feathers; 0, no yellow feathers.
- 10) Nape color: same scale as breast color.
- 11) Nape streaking: same scale as breast streaking.
- 12) Rump color: same scale as breast color.
- 13) Rump streaking: same scale as breast streaking.
- 14) Upper tail: 3, more than six black tail feathers; 2, three to six black tail feathers; 1, one or two black tail feathers; 0, all tail feathers brown.
- 15) Under tail: 3, all tail feathers black with bold white terminal spots; 2, some tail feathers brown and indistinctly spotted but both outer tail feathers black with bold terminal spots; 1, only one outer tail feather black with a bold terminal spot; 0, both outer tail feathers brown and indistinctly spotted.
- 16) Upperwing: 3, primaries, secondaries and coverts all black with bold white spots; 2, some but not all primaries or secondaries black with bold white spots; 1, only the coverts black, contrasting with brown primaries and secondaries; 0, primaries, secondaries, and coverts brown with indistinct spots.