

AHY vs. 2.13 for HY. This represents 37 vs. 34 stems/m²! Despite the statistical difference, I have reservations about the ecological significance of such a subtle difference in terms of cover from potential predators or microclimatic conditions.

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LITERATURE CITED

BALPH, D. F., & M. H. BALPH. 1983. On the psychology of watching birds: the problem of observer-expectancy bias. *Auk* 100: 755-757.

BERNSTEIN, I. S. 1980. Dominance: a theoretical perspective for ethologists. Pp. 71-84 in *Dominance relations* (D. R. Omark, F. F. Strayer, and D. G. Freedman, Eds.). New York, Garland STPM Press.

LEHNER, P. N. 1979. *Handbook of ethological methods*. New York, Garland STPM Press.

WEATHERHEAD, P. J. 1983. Two principal strategies in avian communal roosts. *Amer. Natur.* 121: 237-243.

———, & D. J. HOYSACK. 1984. Dominance structuring of a Red-winged Blackbird roost. *Auk* 101: 551-555.

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Response to J.-F. Giroux

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Based on a variety of criticisms of our study of roosting Red-winged Blackbirds (*Agelaius phoeniceus*; Weatherhead and Hoysack 1984), Giroux (1985) has argued that we were unjustified in concluding that the roost was structured due to dominance interactions between age classes. We find his argument unpersuasive. First, we are puzzled by a number of his criticisms of our methods because those criticisms were answered in the original paper. For example, Giroux suggested that aging birds was difficult as light decreased. We continued observations "only until poor light conditions precluded distinguishing birds by age class." Giroux claimed that we did not clearly state why some hatching-year (HY) birds might be misclassified as after-hatching-year (AHY) birds. We stated that it was "because the plumage of some HY males was very similar to that of AHY males." Because we discarded observations where we were unsure of a bird's age, we are confident that all males identified as HY were correctly classified. We conceded in the original paper that a small proportion of birds classified as AHY could have been HY individuals. Thus, our conclusion that our data are consistent with predictions is conservative.

Giroux questioned whether our data showed roost structuring as predicted by Weatherhead's (1983) two-strategies hypothesis. For that prediction to be met, two conditions are required. First, there should be differences in the average roosting positions of younger and older birds, and second, the positions occupied by younger birds should be those considered more vulnerable to predators. The first requirement clearly was met, with significant differences between age classes for every feature of roosting position we measured. These included proximity to vegetation

edge, water depth, and two independent measures of vegetation density. Giroux criticized the results for one of the measures of vegetation density because the difference was very small. He did not mention that that result was corroborated by a more substantial difference in vegetation density using an independent method of assessment.

The question of which roosting positions were less vulnerable to predation was less clear because the marsh in which the birds roosted did not allow individuals to achieve simultaneously an interior position, in dense vegetation, over the deepest water. On average, older males roosted in interior positions in dense vegetation but over shallower water than younger males. Younger males roosted in edge positions in sparser vegetation, and because some of those positions were on the outer edge of the vegetation, their positions were on average over deeper water. We considered the positions occupied by older males to be superior for two reasons. First, we assumed that a bird is less vulnerable to predators if surrounded by other individuals than if on the periphery of a group, even if the peripheral position is over water a few centimeters deeper. Second, we assumed that interior positions in dense vegetation would be less exposed to wind than edge positions in sparse vegetation, thereby giving older males an energetic advantage due to less convective heat loss. Although Giroux was critical of these assumptions, we still consider them reasonable. Our disagreement over the predation assumption points to the need for studies designed specifically to determine the nature and pattern of predation on roosting birds.

In addition to testing the prediction that the roost should be structured, we also tested the prediction that dominance of older birds over younger birds would be the mechanism producing the structure. Giroux criticized our data that showed a significant difference in chasing behavior between age classes

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because we observed chases infrequently and we recorded the age of the focal individual only. The first criticism would have some merit, were chasing the sole basis on which we argued behavioral differences relating to dominance. However, for the other behaviors involving aggression (for which sample sizes were larger), the two age classes also differed significantly. With regard to Giroux's second criticism, we do not accept that direct observation of both individuals in an encounter is the only basis for establishing dominance-subordination relationships. Given that only AHY males were observed chasing and only HY males were observed being chased, that the two age classes differed in the observed frequencies with which they exhibited other aggressive behaviors, and that Searcy (1979) demonstrated that AHY males were dominant over HY males in captivity, we feel justified in inferring that differences in roosting positions were due to AHY males dominating HY males.

In summary, we remain satisfied that our results were consistent with our predictions and that the Red-winged Blackbird roost we studied was structured due to the dominance of older males over younger males.

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LITERATURE CITED

- GIROUX, J. F. 1985. Dominance structuring of a Red-winged Blackbird roost: a comment. *Auk* 102: 900-901.
- SEARCY, W. A. 1979. Morphological correlates of dominance in captive male Red-winged Blackbirds. *Condor* 81: 417-420.
- WEATHERHEAD, P. J. 1983. Two principal strategies in avian communal roosts. *Amer. Natur.* 121: 237-243.
- , & D. J. HOYSAK. 1984. Dominance structuring of a Red-winged Blackbird roost. *Auk* 101: 551-555.

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