

contains much that is valuable and original, and very little that should be criticized. In a short review it is perhaps inevitable that disproportionate emphasis is given to criticism, and if my review of Zink's paper gave the impression that his work was seriously flawed, I am guilty of failing to have achieved a reasonable balance. Zink's work is innovative and thought-provoking, and I urge everyone interested in geographic variation to study it.

LITERATURE CITED

- ATCHLEY, W. R. 1983. Some genetic aspects of morphometric variation. Pp. 346-363 in *Numerical taxonomy* (J. Felsenstein, Ed.). NATO ASI Ser., Ser. G, Ecol. Sci., No. 1. Berlin, Springer-Verlag.
- BARROWCLOUGH, G. F., N. K. JOHNSON, & R. M. ZINK. 1985. On the nature of genic variation in birds. *Curr. Ornithol.* 2: 135-154.
- BERVEN, K. A., & D. E. GILL. 1983. Interpreting geographic variation in life-history traits. *Am. Zool.* 23: 85-97.
- BOAG, P. T., & P. R. GRANT. 1981. Intense natural selection in a population of Darwin's finches (Geospizinae) in the Galápagos. *Science* 214: 82-85.
- CATTELL, R. B. 1966. The Scree test for the number of factors. *Multivar. Behav. Res.* 1: 245-276.
- ENDLER, J. A. 1977. Geographic variation, speciation, and clines. *Monogr. Pop. Biol.* 10. Princeton, New Jersey, Princeton Univ. Press.
- JAMES, F. C. 1983. Environmental component of morphological differences in birds. *Science* 221: 184-186.
- KOEHN, R. K., A. J. ZERA, & J. G. HALL. 1983. Enzyme polymorphism and natural selection. Pp. 115-136 in *Evolution of genes and proteins* (M. Nei & R. K. Koehn, Eds.). Sunderland, Massachusetts, Sinauer Associates, Inc.
- LEWONTIN, R. C. 1974. The genetic basis of evolutionary change. New York, Columbia Univ. Press.
- LINSDALE, J. M. 1928. Variation in the Fox Sparrow (*Passerella iliaca*) with reference to natural history and osteology. *Univ. California Publ. Zool.* 30: 251-392.
- MCKECHNIE, S. W., P. R. EHRLICH, & R. B. WHITE. 1975. Population genetics of *Euphydryas* butterflies. I. Genetic variation and the neutrality hypothesis. *Genetics* 81: 571-594.
- RISING, J. D. 1988a. [Review of Zink (1986)]. *Auk* 105: 217-219.
- . 1988b. Geographic variation in sex ratios and body size in wintering flocks of Savannah Sparrows (*Passerculus sandwichensis*). *Wilson Bull.* 100: 183-203.
- TOFT, C. A., & P. J. SHEA. 1983. Detecting community-wide patterns: estimating power strengthens statistical inference. *Am. Nat.* 122: 618-625.
- ZINK, R. M. 1986. Patterns and evolutionary significance of geographic variation in the *Schistacea* group of the Fox Sparrow (*Passerella iliaca*). *Ornithol. Monogr.* 40. Am. Ornithol. Union, Washington, D.C.
- . 1989. The study of geographic variation. *Auk* 106: 157-160.

Received 23 September 1988, accepted 23 September 1988.

Response to P. R. Ehrlich, D. S. Dobkin, and D. Wheye

ELOISE F. POTTER¹

Ehrlich, Dobkin, and Wheye (1986) provided a useful service by bringing to the attention of ornithologists Beattie's (1985) evidence that metapleural glands of ants produce secretions that include antibiotic plant auxins and that ants spread these secretions over their entire bodies. The suggestion that secondary acquisition of those antibiotic secretions would be an "important reason" for anting by birds is appropriate and worthy of further investigation. However, I submit that Ehrlich et al. (1986) have no scientific basis for their opinion that certain hypotheses pertaining to the adaptive significance of anting are "more reasonably" acceptable than others. Unfortunately the authors failed to read and consider Potter and Hauser (1974), the most recent paper on anting that has appeared in *The Auk*.

Potter and Hauser (1974) determined that anting was most frequently reported from those portions of the United States where thunderstorms occur 30 to 50 times per year. These are places where the weather is alternately dry and wet during the summer and early fall. Such conditions promote the simultaneous loss, and thus the simultaneous replacement, of feathers that would have dropped gradually in dry weather or in a climate with rain daily throughout the molting period.

Potter and Hauser (1974) documented the correlation of anting and sunbathing in wild birds with the rapid loss and replacement of feathers in particular feather tracts. The birds studied ant while replacing feathers in the wing, the tail, and the lower underparts. All of these parts of the body are readily accessible to the bill. Birds sunbathe while replacing feathers on the head, the back, the neck, and the upper breast. These parts of the body are not readily accessible to the bill.

¹ North Carolina State Museum of Natural Sciences, P.O. Box 27647, Raleigh, North Carolina 27611 USA.

To the best of my knowledge, there is no significant correlation of anting with ectoparasite infestation or with the need for removal of stale lipids. On the contrary, the peak of anting (as well as the peak of sunning, water-bathing, preening, scratching, and dusting) occurs in summer and early fall, when the birds of species known to ant are mostly in fresh plumage and thus have a relatively low quantity of mites and stale preen oil in their feathers.

Although Potter (1970) and Potter and Hauser (1974) do not claim that soothing skin irritated by unusually rapid feather replacement is the *only* reason birds ant, I believe that explanation deserves open-minded consideration by those who propose other hypotheses. Combating bacterial and fungal infections of the skin (Ehrlich et al. 1986) may be an "important reason" for birds to ant. If so, proponents of that hypothesis should be able to determine that skin infections are a problem for wild birds, that individual birds apply ants to the site of the infection, and that the peak of anting activity by wild birds correlates with the sea-

son of the year when skin infections are most prevalent among wild birds. Until such evidence is forthcoming, I shall consider the hypothesis proposed by Ehrlich et al. (1986) less tenable than the explanation offered by Potter and Hauser (1974).

LITERATURE CITED

- BEATTIE, A. J. 1985. The evolutionary ecology of ant-plant mutualisms. Cambridge, England, Cambridge Univ. Press.
- EHRlich, P. R., D. S. DOBKIN, & D. WHEYE. 1986. The adaptive significance of anting. *Auk* 103: 835.
- POTTER, E. F. 1970. Anting in wild birds, its frequency and probable purpose. *Auk* 87: 692-713.
- , & D. C. HAUSER. 1974. Relationship of anting and sunbathing to molting in wild birds. *Auk* 91: 537-563.

Received 8 August 1988, accepted 9 August 1988.