

over-all clinal trends) at the zone of intergradation of the color characters. This Huntington suggests may be due to a heterotic effect caused by the secondary intergradation of the two terminal races. By deciding upon the racial units *after* the variation of the genetically independent characters has been analyzed separately, Huntington arrives at what appears to be a more natural classification than that proposed by Dickinson for the towhee. But even more important, his data are presented in such a fashion as to allow ready incorporation into future studies of this species.

Insular Races

The more critical reader may have noted by this time a special condition of the foregoing critique of the subspecies concept: the published analyses of geographical variation that have been considered are in nearly every case concerned with Holarctic continental species. Our review of the literature convinces us that really critical analyses of this sort are virtually lacking for insular populations, and herein rests a point. Much of the background of the modern subspecies concept has been drawn from taxonomic studies of insular and montane groups, all of which are essentially the same in their marked fragmentation into completely isolated populations. Special emphasis in this respect has been laid on birds, and it is not too much to say that the development of the entire theory of geographical speciation has been dominated in large part by ornithological leadership. Yet a survey of ornithological taxonomic literature, including the long series of papers by Mayr, Zimmer, Amadon, Lack, and others (cf. Mayr, 1951), has convinced us that the morphological and distributional data on relevant bird populations leave much to be desired, and in fact offer very little definitive information on the two central topics, independent character variation and the subspecies-species evolutionary transition, as they apply to insular populations.

This literature is characterized by two outstanding shortcomings. First, a very limited number of characters is used; taxonomic revisions are typically based on studies of variation in size, external proportions, and color. Even the detailed analyses of (continental) geographical variation, such as those by Dickinson and Huntington just discussed, are based on these same few characters. To these we may add Miller's well-known *Junco* revision, which is the most thorough of all such studies on birds known to us. We have already stressed the weaknesses of any infraspecific classification based on limited numbers of characters. It would be of the utmost interest to see an ornithological revision employing the same number and kinds of characters studied by Goldschmidt in *Lymantria* and Moore in *Rana*; these might include internal features, egg color and size, morphological and physiological nestling characters, microscopic barbule structure, epidermal sculpture, and many others. This sort of work may well be rendered unduly difficult by the limitations of standard ornithological materials and methods, and it would perhaps be presumptuous to suggest a shift of technique. Nevertheless, it is important to emphasize the little-appreciated point that ornithological studies do not remotely approach in morphological detail those published on some other groups of animals.

The second shortcoming of ornithological revisions is the paucity of data on the subspecific versus specific status of insular and other isolated populations. It is true that sharp character discontinuities are often set from isolate to isolate; this allopatric pattern occurs in so many groups as to create a striking faunal picture, especially in tropical archipelagoes. Again we need to point out that few characters have been determined to participate in the discontinuities, and little information has been obtained on concordance of variation, especially as it occurs between islands and island groups. Furthermore, it is a fact that many of these striking racial differ-