THE DESIGNATION OF BIRDS' RANGES.

BY JOSEPH GRINNELL.[1]

Linné, in 1758, stated of a certain bird: "Habitat in America septentrionali." The geographic idea is here exemplified, in its simplest terms, namely, by country, indefinitely.

A greater degree of explicitness, but still involving the purely geographic concept, is illustrated in the A. O. U. Check-list, second edition, 1895, where the distribution of a certain bird is given as: "Rocky Mountain region, west to the Pacific coast; north to British Columbia, and south to Mexico and the West Indies." Here are used regional names as designating outlying or peripheral positions of occurrence; the cardinal directions are employed to advantage.

A great expansion of this peripheral method is to be found in Ridgway's "Birds of North and Middle America" which is so well known to my readers as to make it unnecessary to cite an example. Not only general political areas are given, but usually a series of towns or cities. The positive usefulness of the method has been amply demonstrated by practice. But even if useful in practice, the designation of animals' and plants' ranges by the employment solely of geographic place names has a serious failing, in that it rarely gives any indication of *cause* of delimitation. The correlation of occurrence of a species with certain climatic, topographic and floral peculiarities of the territory exclusively occupied by it is an exceedingly significant one. For no one will deny that the species is controlled, and not only that but directively modified through time, by environment; in other words, the evolution and persistence (versus extinction) of species is bound up in the evolution, multiplication and persistence (versus elimination) of areas of relatively uniform environmental conditions. These areas comprise the ranges or habitats of animals.

Now it is true that this important concept has been incorporated by very many systematists in more or less measure in their designations of birds' ranges, along with the purely geographical terms. The reader will recall such phrases as the following: Inhabits the southern moister sections of; dry western plains; humid Pacific

[1] Read at meeting of the American Ornithologists' Union, Pittsburgh, Pa., Nov. 13, 1924.

coast strip; treeless areas; sandhill region of southwestern Kansas; blue-oak belt of the Sierras; mangrove swamps; tundras; etc., etc. Any of these phrases is more or less helpful toward the expression of significance in occurrence; but such phrases are usually vague and rarely come anywhere near setting forth the full situation. There is needed some thoroughgoing classification of both world and local areas, based upon the critically important factors bearing upon the existence of living things, within them, and involving appropriate names that can be used in defining the ranges of both plants and animals.

In a recent article in 'Science' (LVI, Sept. 22, 1922, pp. 336–338) the herpetologist, E. R. Dunn, deals with this subject under the title "A Suggestion to Zoogeographers." He sets forth many of the difficulties pertaining to such systems of habitat designation as that by regions, realms and faunas, that by life zones, and that by plant formations. He calls zoologists sharply to task for not casting about in other fields for possible tools to work with, and then proceeds to set forth the advantages of using physiographic regions, these as having been described and named for the United States by Nevin M. Fenneman (Annals Assoc. Amer. Geographers, VI, 1916, pp. 19–98, pl. 1 [map]). Dunn's arraignment made me prick up my ears (as it were), and I went right after Fenneman's article and map. But, I found no such exact definition, in Fenneman's Major Divisions, Provinces, and Sections, and no such close correlation with the distribution of birds and of mammals, at least in the West, as Dunn would lead one to expect. An example from Fenneman will serve to explain this physiographic method of mapping and naming: Berkeley, California, lies within what he terms the "Pacific Mountain System" Major Division, within the Pacific Border "Province," and within the California Coast Ranges "Section." A contemplation of birds and mammals in that particular part of the United States shows such rare coincidence in their ranges with the areas outlined as to convince me of the altogether *non*-significance of this physiographic system with respect to animal speciation. The potent factors of climate do not come in for recognition at all.

I had several talks with Dr. C. O. Sauer of the Department of Geography, University of California, on this general topic of range

designation, and found that he and his associated geographers have adopted, as the basis for their study of cultural distribution geographically, a system which they feel is the most significant yet proposed, based upon an analysis of climates. It will be accepted by everyone, of course, that man forms no exception to the rest of the animal kingdom in his dependence upon the critical factors of environment for existence and persistence; that he has been, and is, molded in his physical form, in his habits, and in his mental attributes by quite the same influences as control the course of evolution of other mammals.

The best presentation of this climatic basis of habitat designation to date is that (which I was directed to by Dr. Sauer) by Professor W. Köppen, of Hamburg, entitled (translated) "Classification of climates according to temperature, precipitation, and annual march" (Petermann's Geogr. Mitteilungen [Gotha, Justus Perthes], 1918, Sept.–Oct.–heft). This last factor of climate, the "annual march," while thus third in sequence of enumeration and of probable importance, is nevertheless of great bearing upon plant and, therefore, upon animal existence. It involves the alternation of dry and wet seasons, of cold and warm seasons, of variable versus relatively uniform climates. It has to do with the botanists' "associations," many of them. "Precipitation" is, of course, one phase of humidity.

Köppen has classified the climates of the world on a sound quantitative basis of meteorological data, and his map sets forth this classification with names of areas for the whole world, often taken from dominant plants or general vegetational features. For North America the scale of the map is too small to admit of much practical adoption of his names. But with the accumulation of meteorological data here and the plotting of it on Köppen's scheme, which I understand is under way, we shall soon be provided with an adequate set of named areas for bird range designation on the really significant, climatic basis.[1]

In this connection it will be a satisfaction to some of my readers, as it has been to me, to observe that the gist of C. Hart Merriam's

[1] Since the above was written the following important contribution upon the subject has appeared: R. J. Russel, 'Climates of California', Univ. Calif. Publ. Geography, vol. 2, October 22, 1926, pp. 73–84, colored map.

life-zone tenet, temperature control, is now receiving confirmation upon the basis of a vastly greater accumulation of meteorological figures and distributional facts than were at his disposal 25 to 35 years ago. Also, as I have pointed out many times, the most useful system of range designation must also recognize humidity, that is, rainfall, as a controlling factor, as S. F. Baird and J. A. Allen long ago contended; and then the plant formations, "associations" of the modern ecologists, also must come into the scheme. I cannot help here referring to the work of Chapin on African birds as meeting, in his distributional treatment of species, what appear to me to be about the most thoroughly high standards to date.

To summarize: A distinct advance in bird range designation over the strictly topographic one, by political province or place-name designation, is that incorporating in greatest practical detail the facts of climatic control. Ranges of species should eventually be set forth, especially in such standard, authoritative lists as the A. O. U. Check-list, in terms of climatic areas, these being mapped and appropriately named on the basis of temperature, of rainfall, and of annual march. In the present stage of development, until such locally detailed maps are available for the United States, the synchronous use of the life-zone system, the system of faunal subdivisions of life zones, the system of associations, and the concept of the "ecologic niche" [all of these, be it noted, in combination] will serve us most exactly and *significantly* in defining the modes of occurrence of species. To repeat, my plea is for the most phylogenetically significant system of designating birds' ranges.

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