the past decade, however, progress has been made toward a synthesis of neotropical bird distributions that will be exciting to biologists in general. In the present book Jürgen Haffer, a leader in this emerging synthesis, summarizes present understanding of Pleistocene historical influences on neotropical bird speciation.

Haffer points out that Amazonia has not always been a dense, homogeneous green. During Pleistocene dry phases the rain forest survived in high-rainfall areas but was replaced by savanna and other open habitats in low-rainfall areas. As climate fluctuated (the fluctuations possibly, but not yet provenly, being correlated with glacial phases in the temperate zones), these forest "islands" alternately expanded and rejoined and contracted and became separate again, while opposite changes befell the savanna "islands." Haffer reasons that the temporary zones of alien habitat between these fluctuating habitat islands or refugia provided the dispersal barriers needed for speciation. Today, the ranges of neotropical forest bird species, semispecies, and subspecies are not randomly scattered over the map but are focused on a dozen or more major distributional centers. The substantial agreement between the location of these centers deduced from present bird distributions (Haffer's figure 13.1) and the location of the presumed forest refugia deduced from rainfall data (figure 5.7) supports Haffer's interpretation. Compressed within the book, as detailed supporting evidence, are valuable summaries of tropical South America's geological and climatic history; summaries of bird distribution patterns in the lowlands and Andes, emphasizing hybrid zones, zones of intergradation, and ranges of members of superspecies; and (occupying nearly half the book) a technical analysis of toucan and jacamar taxonomy and distributions, to illustrate the data base and the interpretations.

Two methodological problems affect details of Haffer's interpretations, and their solution will be crucial for further advances, though it is unlikely to undermine his basic concepts. First, Haffer deduces locations of distributional centers by a qualitative, intuitive approach (chapter 9): he surveys the data, detects repeated patterns, and lists the species exemplifying each pattern. An obstacle to a quantitative approach is simply the paucity of data available on neotropical bird distributions and relationships, as Haffer notes on p. 1. However, even present information might permit a more objective and quantitative, if crude, locating of distributional centers; for example, by superimposing a transect grid on a map of South America, determining the number of species range borders per unit distance, and identifying distributional centers from the contour lines through this map of border/distance values. Second, the book emphasizes historical factors relevant to dispersal and speciation, and in several instances (pp. 111, 160, 163) Haffer tacitly assumes that present conditions either fail to provide explanations or are to be invoked only as a last resort. Yet, even though savanna habitats as well as montane habitats are today disjunct, some bird species characteristic of these habitats may be able to colonize outlying habitat patches across the existing barriers, and fusions of patches or transient stepping stones may not have been required in the past in order for the birds to spread. Again, the homogeneous green of Amazonia conceals the facts that many forest bird species appear to be patchily distributed in this continuous habitat expanse, that these cases cannot all be dismissed as due to inadequate surveys, and that some cases may be due to the delicate, complex web of competitive relationships in the species-rich community itself. To what extent can we understand dispersal and isolation in terms of present conditions? Yes, historical factors are important in speciation, as Haffer has shown; but what is the relative importance of historical factors and of continuing processes?

For those who care not at all about tropical speciation or South American biogeography, this book will still be valuable in identifying ideal situations for studying numerous ecological and evolutionary problems. How are species-range borders in the middle of continuous forest stabilized (bottom of p. 107)? Where ranges of related semispecies abut without hybridization in continuous forest ("parapatry"), is competitive exclusion behavioral or based on resource preemption? Do some abutting relatives maintain interspecific territoriality, and in these cases do they converge in morphology, voice, or other territorial signals, as Martin Cody has postulated? Where distributions of related semispecies narrowly overlap, what are the niche shifts permitting local sympatry in the overlap zone? To what extent will refugia deduced from distributions of birds, butterflies, mammals, lizards, and plants coincide (pp. 150–157)? Can disjunct distributions of Amerindian stocks be similarly interpreted in terms of post-Pleistocene climate fluctuations, as Betty Meggers suggests? Do the differences in bird species diversity of South American and African rain forests have a historical explanation, such as that more refugia led to more speciation (p. 177)? Haffer's book will provide students with a treasure chest of research problems, until man's accelerating destruction of the richest habitat on earth blurs or obliterates not only the distributional patterns but also some of the species themselves.

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