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ON THE ORIGIN OF SPECIES THROUGH HETEROPATRIC DIFFERENTIATION: A REVIEW AND A MODEL OF SPECIATION IN MIGRATORY ANIMALS

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ABSTRACT.—Differentiation and speciation without extended isolation appear to be common among migratory animals. Historical oversight of this is probably due to temporal distortion in distribution maps and a tendency to consider that lineages had different historical traits, such as being sedentary or much less mobile. Mobility among cyclic migrants makes population isolation difficult, and diminished levels of intraspecific differentiation occur in avian migrants (I term this “Montgomery’s rule”). Nevertheless, many lineages have differentiated despite increased mobility and a high propensity for gene flow, conditions that speciation theory has not addressed adequately. Populations of seasonal migrants usually occur in allopatry and sympatry during a migratory cycle, and this distributional pattern (heteropatry) is the focus of a model empirically developed to explain differentiation in migratory lineages. Divergence arises through disruptive selection from resource competition and heterogeneously distributed cyclic resources. Heteropatric speciation is a type of ecological speciation in which reproductive isolation increases between populations as a byproduct of adaptation to different environments that enhances breeding allopatry and allochrony despite degrees of sympatry that occur during the nonbreeding period in migration cycles. Mating or pair bonding in nonbreeding areas is rare. Patterns such as leapfrog migration and limited morphological divergence suggest that differentiation is driven by these ecological factors rather than by sexual selection or nontemporal changes in the resource base itself, although the additional presence of either of the latter would have additive divergent effects. Migratory lineages provide a largely neglected series of natural experiments in speciation in which to test predictions stemming from this model and others focusing on ecological speciation.

Key words: adaptation, allopatric speciation, cyclic migration, ecological speciation, leapfrog migration, migratory lineages, sympatric speciation.

Sobre el Origen de las Especies Mediante Diferenciación Heteropátrica: una Revisión y un Modelo de Especiación en Animales Migratorios

RESUMEN.—La diferenciación y la especiación en ausencia de aislamiento extendido parece ser común entre los animales migratorios. Es probable que el haber pasado por alto este patrón históricamente se deba a la distorsión temporal de los mapas de distribución y a una tendencia a considerar que los linajes presentaban rasgos distintos anteriormente, como ser sedentarios o mucho menos móviles. La movilidad de los migrantes cíclicos hace que el aislamiento de las poblaciones sea difícil y existen niveles reducidos de diferenciación intraspecífica en las aves migrantes (denomino a esto la “regla de Montgomery”). Sin embargo, muchos linajes se han diferenciado a pesar de su alta movilidad y de ser propensos al flujo genético, condiciones que la teoría sobre la especiación no ha abordado adecuadamente. Las poblaciones de migrantes estacionales usualmente se encuentran en alopatria y en simpatria durante un ciclo migratorio y este patrón de distribución (heteropatría) es el foco de un modelo desarrollado empíricamente

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