RECENT ADVANCES IN THE STUDY OF AVIAN EVOLUTION IN THE CARIBBEAN AND THEIR IMPLICATIONS FOR CONSERVATION

NEDRA K. KLEIN[1,2]

[1]*Department of Ornithology, American Museum of Natural History, Central Park West at 79th St. New York, NY 10024-5192;* [2]*Present address: Division of Science, Truman State University, Kirksville, Missouri 63501, USA; e-mail: nklein@truman.edu*

AT THE 1997 ANNUAL MEETING of the Society for Caribbean Ornithology in Aruba, I organized a roundtable discussion on recent advances in the study of avian evolution in the Caribbean and their implications for conservation. The participants were Dr. Jon Barlow, Dr. Herbert Raffaele, Dr. Robert Ricklefs, Ms. Marlene Walker, and myself. The goal of this roundtable was to have the panel participants present some of their recent findings regarding evolutionary and taxonomic relationships among Caribbean birds, and the implications of these findings for conservation efforts in the region. Instead of summarizing the presentations of the panel participants, which can be found in the published abstracts from the meeting (*El Pitirre*, Vol. 10[3], 1997) and Ricklefs and Bermingham (1997), I will instead present some of the major themes and conclusions from the discussion, and outline important areas for future work.

Although James Bond discussed the origin of West Indian birds (Bond 1963, 1978), and presented taxonomic treatments of them (Bond 1956, 1985), his ideas were essentially subjective decisions about history, relationships, and taxonomic distinctiveness of island populations (i.e., which populations should be considered separate species). Other authors have also discussed the taxonomic status of Caribbean birds (e.g., Cory 1892, Hellmayr 1936, Sibley and Monroe 1990), but their conclusions were also largely subjective and based on individual beliefs about how different an island population has to be to be considered a distinct species or genus. Neither Bond nor the other authors did formal objective analyses, and this resulted in many inconsistencies regarding the taxonomic status of populations, and erroneous conclusions about the evolutionary history of many Caribbean birds. In recent years, several scientists have been engaged in investigations of the phylogenetic relationships and distinctiveness of West Indian species and populations of birds, emphasizing the use of molecular genetic data in combination with morphological and behavioral data. Using modern, objective methods, we are now gaining a much better understanding of the evolutionary history, species limits, and genetic distinctiveness of Caribbean birds. Our results promise to alter common assumptions about levels of biodiversity in the region (i.e., that there is low avian biodiversity) and the conservation importance of West Indian birds.

One of the main findings of recent systematics research on indigenous Caribbean birds is that they are often genetically very divergent from their mainland relatives. When a species is found on more than one island, the individual island populations are also often genetically divergent from each other (Klein and Brown 1994, Seutin et al. 1994, Ricklefs and Bermingham 1997). These results suggest that West Indian lineages are either relatively old and have been isolated for a long period of time, or that, due to random genetic drift associated with founding events and population bottlenecks occurring on islands, they have a higher apparent rate of molecular evolution than do their mainland counterparts. Since a stated goal of conservation biologists is the preservation of genetic diversity (O'Brien 1994, Hughes et al. 1997), high levels of genetic divergence in the Caribbean avifauna implies that many populations of Caribbean birds and their habitats are deserving of major conservation efforts. Although many current funding opportunities involve research on North American migrants that winter in the Caribbean, there ought to also be a concentration of funding and research priorities on locally breeding birds.

High priority should be given to research and conservation of resident Caribbean birds also because there are certainly more species than currently recognized, and thus higher biodiversity than currently assumed. There may be many cases of "cryptic" species, as well as many species designations based only on subjective criteria, which should be abandoned in favor of objective criteria for determining species limits. The Stripe-headed Tanager (*Spindalis zena*), for example, is currently classified as a single widespread, polytypic species (Hellmayr 1936, Bond 1985). In their studies of plumage and vocalizations, Garrido et al. (1997) determined that we should recognize four species of *Spindalis*. My

studies of mitochondrial DNA sequences and plumage suggest that there is an objective, scientific rationale for recognizing at least five species (Klein, in prep). A taxonomy in which five species of *Spindalis* are recognized means that four islands or island groups would have an endemic *Spindalis* (the Bahamas, Cuba, Hispaniola, and Puerto Rico), with the fifth species occurring on Cozumel, Cuba, and Grand Cayman. Knowledge of the existence of more endemic species could have a positive effect on the proportion of resources allocated towards conservation efforts on an island.

One of the points made by several island representatives at the discussion was that pride in wildlife indigenous to individual islands is heightened if these species are considered unique (endemic). Promoting pride in endemic birds has been a major force in the success of conservation efforts on some islands. In addition to biodiversity and genetic diversity issues, there is thus a public relations and education rationale for promoting investigations of species limits, but using objective criteria so that there is a defensible, scientific basis for any taxonomic decisions that result in recognizing more endemic species.

I want to emphasize here that intimate knowledge of individual island populations is a crucial part of this whole process. Although museum study skins are available for most West Indian species, and these have served us well as aids in identifying morphologically distinct populations that should be investigated further, information on behavior, especially vocal behavior, is also extremely important in directing our attention to island populations that may look similar but have been isolated for enough time to have evolved vocal differences. These are good candidates for evaluation of species level taxonomy. When combined with genetic data, information on behavior and morphology can often provide an unambiguous rationale for revising taxonomies and recognizing additional species. I therefore encourage as many Caribbean residents as possible to get to know your local birds.

I also want to emphasize that for those of us who do our field work in the Caribbean but return to our laboratories and institutions in other parts of the world to analyze our data, there is an obligation to make our results available to local Caribbean workers and institutions so that they can be used in conservation planning. Unfortunately, it takes a lot of time and financial support to conduct molecular genetic studies, and publishing the results can occur several years after the initial acquisition of the specimens. Something to be discussed at future Society of Caribbean Ornithology meetings is how best to quickly make available our results so that they can be used locally, but not hinder our ability to later publish our findings in journals that require the results to be previously unpublished.

Some other important questions to consider in making conservation decisions were mentioned during the discussion. The first of these is what happens to the remaining avifauna when one species disappears from an island. Since most species are integral parts of ecological communities, the disappearance of any one species would affect many others. This provides a justification for conserving local populations, even if they are not taxonomically distinct from other populations.

Secondly, many species are not uniform in abundance throughout their distributions; some populations are going to be more vulnerable than others. Another focus of research and conservation efforts should be the identification of vulnerable populations of widespread species, and institution of conservation plans that aim to preserve these vulnerable populations.

LITERATURE CITED

BOND, J. 1956. Check-list of birds of the West Indies, 4th ed. Academy of Natural Sciences, Philadelphia, Pennsylvania.

BOND, J. 1963. Derivation of the Antillean avifauna. Proc. Acad. Nat. Sci., Phila. 115:79-98.

BOND, J. 1978. Derivations and continental affinities of Antillean birds. Pp. 119-128 *in* F.B. Gill (ed.), Zoogeography in the Caribbean. Proc. Acad. Nat. Sci., Phila. Spec. Pub. 13.

BOND, J. 1985. Birds of the West Indies, 5th ed. Collins, London England.

CORY, C. B. 1892. Catalogue of West Indian birds. Publ. by the author, Boston, Massachusetts.

GARRIDO, O. H., K. C. PARKES, G. B. REYNARD, A. KIRKCONNELL, AND R. SUTTON. 1997. Taxonomy of the Stripe-headed Tanager, genus *Spindalis* (Aves:Thraupidae) of the West Indies. Wilson Bulletin 109:561-594.

HELLMAYR, C. E. 1936. Catalogue of birds of the Americas and the adjacent islands in Field Museum of Natural History including all species and subspecies known to occur in North America, Mexico, Central America, South America, the West Indies, and islands of the Caribbean Sea, the

Galapagos Archipelago, and other islands which may be included on account of their faunal affinities. Vol. 13, Part 9, Zool. Ser., Publ. 365. Field Mus. Nat. Hist., Chicago.

HUGHES, J. B., G. C. DAILY, AND P. R. EHRLICH. 1997. Population diversity: its extent and extinction. Science 278:689-692.

Klein, N. K., and W. M. Brown. 1994. Intraspecific molecular phylogeny in the Yellow Warbler (*Dendroica petechia*), and implications for avian biogeography in the West Indies. Evolution 48:1914-1932.

O'BRIEN, S. J. 1994. A role for molecular genetics in biological conservation. Proc. Natl. Acad. Sc. USA 91:5748-5755.

RICKLEFS. R. E., AND E. BERMINGHAM. 1997. Molecular phylogenetics and conservation of Caribbean birds. El Pitirre 10:85-92.

SEUTIN, G., N. K. KLEIN, R.E. RICKLEFS, AND E. BERMINGHAM. 1994. Historical biogeography of the Bananaquit (*Coereba flaveola*) in the Caribbean region: a mitochondrial DNA assessment. Evolution 48:1041-1061.

SIBLEY, C. G., AND B. L. MONROE. 1990. Distribution and taxonomy of birds of the world. Yale Univ. Press, New Haven, Connecticut.

DESPLAZAMIENTO DE LLOROSAS DE PUERTO RICO (*NESOSPINGUS SPECULIFERUS*) POR EL HURACÁN GEORGES

RAÚL A. PÉREZ-RIVERA
Departamento de Biología, Universidad de Puerto Rico, Humacao, Puerto Rico 00791

LA LLOROSA DE PUERTO RICO (*Nesospingus speculiferus*) es el único género de aves endémico de Puerto Rico. Para principios, y tal vez hasta mediados de este siglo, la distribución del ave estuvo limitada al bosque de Maricao y la Sierra de Luquillo (Wetmore 1916, Danforth 1936, Biaggi 1970). No obstante, la protección de áreas y la designación de éstas como bosques estatales, el abandono de ciertos renglones agrícolas y el restablecimiento de bosques en dichas localidades ha beneficiado a esta ave y ha permitido además, la colonización de éstas nuevas áreas de bosques. Para la década del 1970 observé al ave en Toro Negro, en donde ya era una de las aves más comunes. El ave también fue informada para el Bosque de Carite (Pérez-Rivera y Maldonado 1977) y localidades de Cidra (Pérez-Rivera 1979). En el 1988, observé al ave en Comerio. En fín, en la actualidad, el ave se puede encontrar en bosques montanos de la parte central de Puerto Rico y en cafetales de sombra con buena cubierta. No obstante, el ave no ha sido informada de áreas urbanas.

El 21 de septiembre de 1998, el huracán Georges llegó a Puerto Rico con vientos sostenidos de 110 millas/hr y ráfagas hasta de 170 millas en las partes centrales de la Isla. El meteoro entró por la parte este (Ceiba) y salió por el oeste (Cabo Rojo) unas 18 horas más tarde. Todo Puerto Rico sintió el embate de la fuerte tormente. Bosques como El Yunque (en la parte este) y Carite (parte este-central) quedaron seriamente afectados.

Es conocido que los huracanes desplazan a las aves de sus lugares naturales. Wiley y Wunderle (1993) resumen este asunto y ofrecen una buena selección de referencias sobre el tema. El miércoles 23 de septiembre, visité la Urb. Aponte (Cayey) y para mi sorpresa observé a dos llorosas, junto a otras aves, examinando el remanente de un árbol de mango (*Mangifera indica*). El pueblo de Cayey, queda a unas 3-4 millas lineales del Bosque de Carite, por lo que es probable que las aves observadas hayan sido individuos desplazados de dicho bosque. Por otro lado el sábado 26 de septiembre, mientras llevaba a cabo un censo de pitirres (*Tyrannus dominicensis*) en el campus del Colegio Universitario de Humacao, noté a un ave que era consistentemente atacado por los pitirres. Cuando el ave cansada se posó en la rama inferior de un árbol de caoba (*Sweitenia mahogani*) pude identificarla como una llorosa. El ave persistió y pernoctó en el mismo árbol que los pitirres. La llorosa es sumamente común en el área del Yunque cuya parte sur queda