Evolution and Taxonomy of White-Cheeked Geese

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researchers) provide a fascinating review of some complexities of Earth's climate changes and fluctuations. Sheldon emphasizes how challenging it is to distinguish microevolutionary change from phenotypic plasticity, asserting that

> I am not aware of any study published [in birds] which has established that a change in the mean phenotype is due to evolution caused by climate change, although there are several that have demonstrated that marked phenotypic changes related to climate change are not explained by evolution…. (p. 159)

Such precaution is also evident in Newton's (2008) chapter on climate change in migratory birds, but not in Cox's book. Sheldon's and Both's chapters, among others, emphasize the different responses to climate even within species over short distances. Different authors help us appreciate how—rigorously—to identify avian population trends in relation to climate (Lindström and Forchhammer), recognize real changes in geographic range (Brommer and Møller) and migration timing (Lehikoinen and Sparks), and determine population consequences of climate forcing (Saether and Engen) such as how synchronously populations fluctuate spatially, and whether species belong to the "tub" or "tap" category. A chapter on host–parasite interactions (Merino and Møller) is one of several that acknowledge the need to include in our models the complexities of species interactions, in contrast to most habitat-suitability models and other single-species approaches (well reviewed by Thuiller and Münkemüller).

Møller et al.'s book suffers from a lot of typographical errors and considerable repetition among chapters (e.g., multiple references to the interaction of invasive malaria and warming threats to endemic Hawaiian birds). Taxonomic and regional biases of the authors are also fairly obvious: besides Barn Swallows, we hear much about Great Tits (*Parus major*), Blue Tits (*P. caeruleus*), and Pied Flycatchers (*Ficedula hypoleuca*).

Both books, but Møller et al.'s in particular, identify in every chapter numerous foci for future effort, and the latter's penultimate (conservation) chapter (Miller-Rushing, Primack, and Sekercioglu) is excellent. Sadly and ironically, despite the desperate need for further research toward understanding the effects of probably the most decisive experiment in human history, including the incredibly complex ways this experiment will affect birds and their ecosystems, funding for this kind of research is drying up because of budget crises and growing opposition to inconvenient science by a powerful political-industrial complex (especially in the United States; see Oreskes 2010, Sherry 2011). I hope that both these books will rouse diverse audiences to increase conservation of birds on the basis of improved scientific understanding of their responses to global change.—Thomas W. Sherry, *Department of Ecology and Evolutionary Biology, Tulane University, New Orleans, Louisiana 70118, USA. E-mail: tsherry@tulane.edu*.

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Evolution and Taxonomy of White-cheeked Geese.—Bertin W. Anderson. 2010. AVVAR Books, Blyth, California. vi + 495 pages, many tables, graphs, and figures, and 23 colored plates of dorsal and ventral views of specimens. ISBN 0970850441. Paperback, $30.00.—A third shoe has fallen with the publication of Anderson's evaluation of H. C. Hanson's 193 subspecies of white-cheeked geese (i.e., Canada Geese [*Branta canadensis*]). The first two "shoes" were volumes written by Hanson and principally edited and privately published by Anderson (Hanson 2006, 2008). Hanson, working for the Illinois Natural History Survey and largely supported by the U.S. Fish and Wildlife Service, spent most of his life studying white-cheeked geese and worked toward a better taxonomic understanding that would be of aid in management of this morphologically complex species. A fourth volume is in the offing.

Chapter 1 of the current volume reviews the taxonomic history of white-cheeked geese, although many would question some of the authorities cited, and sets the goal of objectively determining whether a case can be made to support Hanson's major conclusions. Chapter 2 is essentially the methods section, describing the scoring system that Anderson used to quantify plumage color and patterns. For his analysis, Anderson used 16 plumage characters that were assigned values of "1 or =/> 3," although in table 2.1 where these are defined, they are given values of 1–3, 1–4, 1–5, and 1–8, with intermediate values used if needed for plumage characters. Standard measurements and a series of bill measurements were taken and ratios were used (particularly ratio of toe length to tarsus length—in three of Hanson's species of large geese these were >1.0, whereas in Arctic geese these were <1.0). He proposes six size classes (SC) from 1 (*minima*) to 6 (*maxima*). About two-thirds of specimens within a given SC were separable from those of an adjacent SC for any given measurement, and >80% could be distinguished with the use of several measurements. Chapters 3 through 6 discuss size-class variation within age and sex classes, the effects of sample size (a sample of <10 was virtually useless using his methodology), the reproducibility of plumage scores, and the taxonomic value of migrant specimens. He concluded that (contra opinion in the literature) migrants, who often formed the bulk of the specimens of a sample, are highly useful. He demonstrates, with ample statistical support, that current nomenclature does not accurately reflect the morphological variation found

among the white-cheeked goose populations—a conclusion that anyone who has tried to identify small geese from small samples collected over several seasons would readily agree with!

In chapter 7, Anderson analyzes variation within and among Hanson's taxa and clinal variation within "Grassland and Rocky Mountain taxa," "Rocky Mountain and Boreal Forest taxa," "*B. hutchinsoni* [groups]," and "*B. hutchinsoni*: Boreal Forest taxa." Anderson continues to examine clinal variation among Hanson's *B. canadensis* complex in chapter 8 and among 39 of the ~100 taxa that Hanson described in his "arctic-geese" in chapter 9. He concludes that there is no clinal variation among any of the groups (except possibly in size among Arctic populations) and that nearest neighbors are usually not the closest related, opening the possibility that there is more than one evolutionary line within these groups and that these lines intertwine.

Chapters 10 and 11 are the core of this publication. In these chapters Anderson conducts two cluster analyses. In the first he used 2,555 specimens in 71 taxa of "large" geese of the *canadensis* and *maxima* complexes recognized by Hanson plus four "potential taxa," and in the second he used 1,712 specimens of 54 taxa of Hanson's Arctic geese plus two potential taxa. These dendrograms yield nine "stems" of large geese and six "stems" of Arctic geese recognized by Anderson as allospecies. Chapter 12 poses an evolutionary scenario "through the quantitative study of 4,500 specimens." The small geese of the West Coast were derived from the earliest stocks dating back to 1–2 million years (based on several DNA studies cited). They then began spreading eastward, reaching the east coast, and spread south to north as glaciers receded. He postulates that there were reciprocal waves of movement of geese from east to west and west to east, as glaciers advanced and retreated, creating the intertwining evolutionary branches. For the situation where the nearest neighbor was not the closest relative, he "cherry picks" from several DNA studies, going back to 1977, to support his schema.

Chapter 13 discusses the taxonomy of the white-cheeked geese, comparing the American Ornithologists' Union's (1957) classification with Hanson's, although he has difficulty deciding to which AOU subspecies many of Hanson's should be assigned. Intergradation among taxa is examined from high and low tundra, Hudson Bay islands, Hudson Bay lowlands, and the Aleutian Islands. He then explores intergradations among stems of the large geese and provides common names for Hanson's taxa and the undescribed taxa within each of his stem allospecies (table 13.4 for large geese and table 13.6 for Arctic geese). It is interesting to note that *B. c. parvipes* is apparently included within *B. c. traverersi*, yet Hanson and Anderson (Hanson 2006) use *B. c. gavini* as the "6th stem" of Arctic geese.

The last two chapters, 15 and 16, cover demographics, management, hunting, distribution, and a guide to identification. The value of these chapters depends on the interests of the readers and they will probably have little of value for most.

The final section of color plates illustrates some of the color and pattern characters used in the scoring or the cluster-analysis dendrograms in chapters 10 and 11 (plates 1 and 2). Plates 3 through 23 are dorsal and ventral photos of 96 taxa, illustrating examples of all 9 stems of large species from figure 10-1 (plus *B. occidentalis occidentalis*) and all six stems of Arctic geese from figure 11-1.

Anderson presents different totals for specimens examined at different places in the book (e.g., 2,090 large geese and 2,555 in chapter 10; 1,278 Arctic geese and 1,712 geese, respectively, in chapter 2; and a total of 4,500 elsewhere). Banks reported that Hanson had more than 1,800 skins and skeletons, but Anderson's totals indicate a large number (estimated at ~2,000) that have not been reported on. Plus, he cites at least six undescribed taxa and undoubtedly will formally characterize his new name combinations in a fourth volume.

Richard C. Crossin and I visited Bert and his wife in the early 1990s. We were impressed with his collection even then, and amazed by his intricate knowledge of individual specimens and their provenance without looking at the tags. The huge collections of white-cheeked geese assembled by Hanson and Anderson pose a major problem. The holotypes for Hanson's taxa have been deposited at the Field Museum of Natural History, but the Illinois Natural History Survey apparently retains most of his specimens, although it has dispersed the bulk of its vertebrate collections. What will happen to Anderson's ~2,000 specimens?

Finally, some judgment must be made on the contribution of this work, which represents untold years of effort by two skilled biologists. There are many flaws in this volume, both taxonomic and editorial—not surprising in the publication of a manuscript of this size, written by one author over many years and completed by another, whose views sometimes differed. There is no question that they have demonstrated that white-cheeked geese exhibit a degree of morphological variation that may be unique in the ornithological world and certainly is not elucidated by DNA studies to date. Incidentally, in seven studies of white-cheeked geese from 1957 to 2003 by other authors that involved over 1,600 samples, not a single voucher was saved, which essentially negated most of their value, and which certainly cannot be reproduced considering the amount of variation in small geographic areas proved by the studies of Hanson and Anderson. Banks (2007, 2009) concluded that these tomes negated the solid work done earlier by Hanson. Reluctantly, this author believes that the AOU Committee on Nomenclature should petition the International Commission on Zoological Nomenclature to negate all names and name combinations proposed in these works, considering the lack of competence and interest in alpha-taxonomy today.—Robert W. Dickerman, *Division of Birds, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico, 87131, USA. E-mail: bobdickm@unm.edu.*

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Moments of Discovery: Natural History Narratives from Mexico and Central America.—Kevin Winker, Ed. 2010. University of Florida Press, Gainesville, Florida. xiii + 384 pp., 50 black-and-white illustrations. ISBN 9780813034171. Cloth, $75.00.—A guiding premise for compiler and editor Kevin Winker in collecting these 20 narratives is that "when studying biological diversity and its distribution there is no better way to begin than to read the works of our predecessors." Certainly that would hold true for scientific literature, but Winker also wanted to convey a sense of place and capture some of the gritty, fearsome, and humorous experiences of biological field work that were often only transmitted via oral storytelling in camp or back on campus. Most of the accounts come from graduate students and faculty of North American academic institutions between the 1930s during "the heyday of whole-organism natural history" to the 1990s when Latin American students worked shoulder-to-shoulder with graduate students from the United States. Most of the narratives took place, at least in part, in Mexico, but all of the countries in Central America were visited by at least one of the authors. Through their support and encouragement, George Lowery at Louisiana State University and George M. Sutton were "godfathers" of several of the expeditions. One of Sutton's students, Dwain Warner, former professor and curator of birds at the University of Minnesota and Cornell University alum, authored one of the accounts and featured prominently as the major professor of several of the account authors, including Winker. (A photograph taken at Rancho Rinconada in Tamaulipas, Mexico, that includes Sutton and Warner in Sutton's classic *At a Bend in a Mexican River* [Paul S. Eriksson, New York] documents that intellectual lineage.)

Winker assembled these first-hand observations in order to "grasp the often phenomenal changes that have since occurred, not only among the countries, environments, and peoples concerned but also in the natural sciences." The narratives range in length from a few to over 40 pages and vary in style from almost unadulterated field notes dominated by names of people, places, and lists of birds to extended descriptions and reminiscences complete with dialogue. Miguel Álvarez del Toro, writing shortly before his death, recounted a 20-day zoological expedition to El Triunfo, Chiapas, Mexico. In his search for the Horned Guan (*Oreophasis derbianus*), he vividly described dangers (disease, venomous snakes, Jaguars [*Panthera onca*]), beauty ("gardens of ephiphytes"), and an exhilarating observation of a Harpy Eagle (*Harpia harpyja*) attacking a small deer. Del Toro lamented the loss of Mexico's natural treasures as a short-sighted trade of the flight of the quetzal and voice of a tinamou for "the hysterical barking of starving dogs or the satisfied grunts of pigs." This is a great moment in the life of an outstanding naturalist (to borrow from John Terres).

Most of the earliest expeditions that were the sources of the collected narratives were based on collecting birds: Robert F. Anderle (1950s and 1960s; Mexico, Guatemala, and Costa Rica), Walter W. Dalquest (1940s, Mexico), Robert W. Dickerman (1950s, Mexico; and 1968, Panama, Honduras, and Guatemala), Stephen W. Eaton (1970, Mexico to Panama), Ernest P. Edwards (1940s, Mexico), John T. Emlen, Jr. (1930, Honduras; 1960s and 1970s, Mexico), Joe T. Marshall, Jr. (1942, El Salvador), Paul S. Martin (1948, Mexico), Charles G. Sibley (intermittent trips from 1939 to 1950, Mexico), and Dwain W. Warner (intermittent trips from 1949 to 1973, Mexico). Paul S. Martin in his perceptive account, "Green Mansions of Tamaulipas," noted that although the days of such intensive bird collecting were long past, "our research efforts and publications helped to support Mexican conservationists in their establishment in 1985 of the El Cielo Biosphere Reserve." This reflects the change in the natural sciences from collecting to hypothesis testing that is captured in the narratives by the "third generation" of ornithologists (John M. Bates, Paul D. Haemig, Joyce Heck, John H. Rappole, and Kevin Winker) during their ornithological research.

Sandwiched among these accounts of primarily scientific research are reminiscences of recording bird songs by Lula C. Coffey; memories of Don Owen-Lewis, a British liaison officer to a group of Mayan Indians in British Honduras that became Belize; and Walter A. Thurber, who went to El Salvador in the mid-1960s to foster science education for the U.S. State Department. In his narrative he wrote about his scientific studies and observations as well as the educational programs that he developed using his birdsong recordings and photographs to reestablish ties between Salvadorans and their natural heritage.

This book need not be read from cover to cover. Instead, it is a sampler that captures some of the history of scientific collecting, natural-history studies, and ornithological research in Middle America. Winker has done a valuable service by assembling the writings that otherwise might have remained as the aging field notes of a scattered assortment of biologists. Those who have a personal connection to the places and people mentioned will enjoy this collection of narratives, but it is also a worthwhile read for anyone interested in the scientific foundation of conservation in a biologically diverse corner of the world.—R. Todd Engstrom, *Tall Timbers Research Station, 13093 Henry Beadel Drive, Tallahassee, Florida 32312, USA. E-mail: engstrom@bio.fsu.edu.*