RECENT ADVANCES IN THE STUDY OF NEOGENE FOSSIL BIRDS

I. The Birds of the Late Miocene-Early Pliocene Big Sandy Formation, Mohave County, Arizona

BY

K. JEFFREY BICKART
Department of Geological Sciences and
Museum of Paleontology
The University of Michigan
Ann Arbor, Michigan 48109

and

Hyde School
616 High Street
Bath, Maine 04530

II. Fossil Birds of the San Diego Formation, Late Pliocene, Blancan, San Diego County, California

BY

ROBERT M. CHANDLER
Museum of Natural History
The University of Kansas
Lawrence, KS 66045

ORNITHOLOGICAL MONOGRAPHS NO. 44

PUBLISHED BY
THE AMERICAN ORNITHOLOGISTS' UNION
WASHINGTON, D.C.
1990

FOREWORD

STORRS L. OLSON

The papers in the present volume represent major additions to our knowledge of two of the larger avifaunas of the North American Neogene, that is, the last half of the Tertiary Period, comprising the Miocene and Pliocene epochs spanning the period from about 22.5 million to 1.8 million years ago. Bickart treats an extremely large collection of bones from a Mio-Pliocene lake deposit, the Big Sandy Formation, in Arizona. This collection, made primarily in the 1940s, had lain unstudied for decades, so that virtually nothing was known of the birds from this locality. By contrast, Chandler's study of the late Pliocene San Diego Formation in California continues the elucidation of an avifauna, the studies of which began in 1933 and to which several workers have contributed periodically for half a century. Even so, the number of species in this avifauna is now more than doubled by Chandler's efforts. Each of these fossil avifaunas comprises nearly 40 species. The number of specimens studied was 2,000+ for the San Diego Formation, and to over a thousand in the case of the Big Sandy Formation. Most of the species described are known from many or most of the major skeletal elements, and in some cases, especially in the Big Sandy Formation, from partial or nearly complete associated skeletons.

There are strong biases in the species composition of all North American Neogene avifaunas, as may be seen from Becker's valuable compilation (J. J. Becker, 1987, *Neogene Avian Localities of North America*. Washington, D.C.: Smithsonian Institution Press). In contrast to Pleistocene avifaunas, which are mainly from cave and tarpit deposits and are heavily influenced by the actions of predators and scavengers, most Neogene fossil birds occur in aquatic or marine deposits. These avifaunas are overwhelmingly dominated by waterbirds, with diurnal raptors and Galliformes frequently present but other terrestrial or arboreal birds nearly always lacking. For example, in each of the extensive avifaunas described here, only a single bone of a passerine was reported. The San Diego avifauna, from a marine formation, is composed almost exclusively of pelagic and nearshore birds, with scant representation even of littoral species, to say nothing of terrestrial or arboreal ones.

In addition to the biases introduced by depositional environments, Bickart suggests another possible source of bias in his avifauna—differential susceptibility of wetland species to disease. The preponderance of individuals in the Big Sandy Formation is of Anatidae and the whole accumulation rather closely resembles the pattern of mortality that might be observed in a modern outbreak of botulinal poisoning. Further taphonomic bias in this fauna is shown by the great underrepresentation of hindlimb elements of ducks, geese, and swans, suggesting that in most instances the legs fell off before the decomposing carcasses accumulated along the lee shore of the lake and were buried.

The Big Sandy avifauna illustrates additional problems facing avian paleontologists. Frequently it was deemed expedient not to apply specific names to various taxa in the fauna but to refer them only to genus, a practice usually resorted to when material is too scanty or poorly preserved to be more certainly identified or diagnosed. But some of the Big Sandy species, such as the two teal-sized species

of *Anas*, are represented by dozens of fossils of most of the major skeletal elements, including some associated material, so that they are much better known than any previously described pre-Pleistocene species of *Anas*. Despite the abundance of material, however, specific identification is still problematic. Even modern species of *Anas* are difficult to separate on criteria other than size. Furthermore, there are several previously named fossil species of North American teal-sized ducks that might be related to one or the other of the Big Sandy teals, but all are based on such fragmentary material that their identity will probably be forever uncertain. Although such taxa might eventually have to be discarded as *nomina vana*, they emphasize the need for some degree of circumspection in assigning specific names to fossil populations.

Although faunal surveys have now generally fallen into disfavor in ornithology, in part, one assumes, because they are inherently descriptive and nonexperimental, they are still absolutely essential to avian paleontology, where so much remains unknown. The two studies here well illustrate the fact that avian paleontology has progressed beyond the game of creating new names for isolated fragments of bone. The next logical step will be to track the history of entire continental or regional avifaunas, to see when certain species, genera, or even families appear and others disappear, or to compare a fossil avifauna with that occurring in the same area today. Fortunately, we are now reaching the point where such comparisons are possible, especially in North America and Europe, where the greatest numbers of paleontologists are concentrated.

California, for example, is rich in fossil marine avifaunas, of which that from the San Diego Formation is the largest. These range in age from early Miocene to Pleistocene (see Becker *op. cit.*). Similarly rich avifaunas are known from the east coast of North America, especially the mid-Miocene Calvert Formation of the Chesapeake Bay region and the early Pliocene Yorktown and Bone Valley Formations in North Carolina and Florida. These will offer interesting future comparisons between the east and west coasts of North America and between contemporaneous large marine avifaunas from South Africa (S. L. Olson, 1983, *S. Afr. J. Sci.* 79:399–402) and Peru (C. de Muizon, 1985, *Geologische Rundschau*, 74:547–563).

With the gift of human imagination we can use studies such as these to take us back millions of years to a California coastline with even more diverse birdlife than today, one with gannets, boobies, and several species of flightless auks. And even farther back in time we find a lakeshore in Arizona where the members of a waterbird assemblage not unlike that of the American West today might have suffered the same ravages of botulinal poisoning that plague their modern counterparts. Yet among the carcasses that accumulated were flamingos, Old World vultures, geese with the diving adaptations of a merganser, and other unusual waterfowl. We are fortunate at least to have the bones of these long-vanished birds to provide us with an ornithological perspective through evolutionary time. Without them, all would be conjecture.

Dept. of Vertebrate Zoology
National Museum of Natural History
Smithsonian Institution
Washington, D.C. 20560