

## ORNITHOLOGY

**Birds of the Mesozoic: an Illustrated Field Guide**

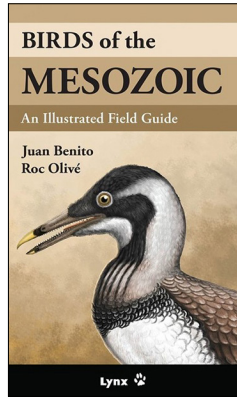
By Juan Benito. Illustrations by Roc Olivé. 2022. Lynx Edicions. 272 pages, 250 colour illustrations, 6 photos, and 16 figures, 35.00 CAD, Paper.

Exactly as the title suggests, this book is structured like a field guide, with species accounts facing plates of reconstructed birds in stereotypical poses. A 48-page Introduction deals with Phylogeny, Taxonomy, Osteology, Plumage, Biology, and the avian Fossil Record. It is followed by 189 pages of species descriptions, providing, in addition to the colour plates, details on morphology, plumage, biology (where available), and notes on the specimens, their measurements, and the locations of fossil sites. The authors include 208 fossil species, all but three coming from Mesozoic sediments.

Before I elaborate on this bare-bones description, a little digression: when I first saw the subtitle on Benito and Olivé's book, I thought it was a joke. Surely, we did not have enough material to reconstruct the appearance of Mesozoic birds or, if we did, it could only be a handful. But I had forgotten *Archaeopteryx*. This remarkable Jurassic fossil—found in Solnhofen, Bavaria, in 1861—was discovered two years after the publication of Charles Darwin's *On the Origin of Species* (John Murray, First Edition 1859). Darwin, when he became aware of it, derived considerable satisfaction at the discovery of this 'missing link'. It was in a perfect state of preservation.

Although several more specimens of *Archaeopteryx* were obtained in the 19th century, the trail of Mesozoic birds mostly went cold until the 1980s when researchers began discovering well-preserved Mesozoic bird fossils in South America and eastern Asia. Since then, the initial trickle of new fossils has become a torrent, with hundreds of new species, mostly from China, being named in the 21st century. Not only has the diversity of material been remarkable, but the preservation of many of the specimens in soft, fine-grained mudstones is outstanding, allowing not only complete bones, positioned as in life, but also feathers to be preserved with minute detail. Even feather colour can sometimes be determined. Consequently, the field guide plates are far less fanciful than I had anticipated at the outset.

The Introduction provides a brilliant summary of avian evolution. An explanation of the classification



of Mesozoic birds is very necessary because only four of the species described here belong to Neornithes, the clade that includes all modern birds. The boundary between dinosaurs and birds is not much dealt with here. Rather, the book provides a diagram of the branching clades from theropod dinosaurs to the basal bird (or bird-like) clade—here termed Avialae—through Pygostylia to Ornithothoraces. The latter divides into Enantiornithes (100 species figured) and Euornithes (36 species), giving rise, via Ornithurae, to Neornithes. Representatives of both major modern clades, Palaeognathae (ostriches, etc.) and Neognathae (the rest), were present in the Late Cretaceous period and hence survived the asteroid strike that probably finished the dinosaurs. All other clades vanished in that cataclysm, if not earlier. To my eye, it is only with Pygostylia (Early Cretaceous) that we have something unequivocally a bird, having a beak without teeth and a fused pygostyle for the tail. The earlier groups look like nothing we can currently relate to—call them dino-birds, perhaps?

Personally, I found the diversity of Mesozoic birds extraordinarily impressive. Suitable bird-preserving sediments have been found from only a short period during the Middle Jurassic. Otherwise, sediments have been discovered from a period of a few million years in the Late Jurassic, 10 million years in the Early Cretaceous, and another 10 million years in the Late Cretaceous. Given that every shape and size of reptile, including many flighted ones, provided competition during those periods and that only small areas of the world have yielded fossils, the discovery of 200+ species of birds seems to indicate a very diverse avifauna during the Mesozoic.

Only 16 of the species figured come from Jurassic sediments, and all but one of those are thought to have been pigeon-sized or larger. The remainder come from the Cretaceous and include many species sparrow-sized or smaller, of which Enantiornithes were the most diverse. This group comprised many species that were either tail-less or had very short tails. Some species had very long tails comprising two or four feathers, all of which consisted of a long vane-less rachis tipped by a short vaned section, making them look like canoe paddles. The latter design includes *Confuciusornis sanctus*, of which thousands of fossils have been found in Liaoning, China, many beautifully preserved.

For those who, like me, were largely ignorant of Mesozoic birds, this is a very thought-provoking

book. It is well written and beautifully illustrated. I enjoyed it immensely. Overall, the message of avian Mesozoic fossils is that, long before the demise of their close relatives, the great dinosaurs, birds had become common and diverse, occupying a wide range of habitats and exhibiting a great diversity of

behaviours. A modern birder, transported back to the Cretaceous, could expect to develop a respectable life list (while keeping a sharp eye out for *Velociraptor*, of course).

TONY GASTON  
Ottawa, ON, Canada

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