FOSSIL BIRDS OF FLORISSANT, COLORADO:
WITH A DESCRIPTION OF A NEW
GENUS AND SPECIES OF CUCKOO

ROBERT M. CHANDLER
Department of Biological and Environmental Sciences
Georgia College & State University, Milledgeville, GA 31061-0490

ABSTRACT—Specimens of fossil birds, both skeletons and feathers, have been known from deposits near Florissant, Colorado since the late 1870s. Three species of birds have been named from this area. One specimen is tentatively identified as belonging in the Coraciiformes (rollers and their relatives). The phylogenetic relationships of the other two species are unclear and they have been placed into Aves: incertae sedis. A recently collected fossil with an almost complete skeleton, except for the skull, is a very important find. Herein this specimen is described as a new genus and species with affinities to the arboreal cuckoos (Cuculiformes, Cuculidae, Cuculinae) of the Old World.

INTRODUCTION

The fossil birds from Florissant, Colorado are few but extremely interesting for several reasons. The two best preserved and prepared specimens have affinities with two Old World groups of birds: rollers (Coraciiformes: Coraciidae; Olson, 1985:139) and cuckoos (Cuculiformes: Cuculidae, Cuculinae; described herein). Modern rollers and cuckoos (subfamily Cuculinae) are found in Europe, Africa, and southern Asia to Australia. Rollers get their common name from their acrobatic flight. They are medium-sized birds that do not walk well, but have a labored hop when on the ground. In trees they fly from perch to perch and seldom climb. The Old World "typical" cuckoos (Cuculinae) are best know because they all are parasitic breeders, laying their eggs in other birds nests. These medium-sized birds are good fliers, some migrating long distances.

The first fossil bird described from the Florissant Lake Beds was a new genus and species of small oscine perching bird (Passeriformes), Palaeospiza bella (Allen, 1878:443). Wetmore (1925:190) felt that though P. bella was "handsome to look upon" it lacked sufficient characters to show a relationship with any known group of birds. Therefore, he placed it in its own family, Palaeospizidae. In his "Catalogue of fossil birds, Part 5 (Passeriformes)" Brodkorb (1978:216) listed P. bella under Aves Incertae Sedis and mentioned that "even the ordinal assignment may be incorrect." Olson (1985:139) stated that he had examined the specimen and "Because it is anisodactyl it is most likely some sort of coraciiform."

The next fossil bird to be described was in 1880 when Edward Drinker Cope described a plover, Charadrius sheppardianus, from the "Amyzon Shales" near Florissant. Olson (1985:175) examined the holotype and found it "impossible even to assign the specimen to order, much less to genus." Therefore, he assigns the specimen to Aves incertae sedis. Another avian species from Florissant is Fontinalis pristina, which was originally identified by Lesquereux (1883) as a moss, but this was later rectified by Knowlton (1916) who recognized it as a feather.
METHODS AND MATERIALS

The Florissant fossil cuckoo was identified and described using the skeletons of modern species of birds in the comparative osteology collection in the Ornithology Division, Florida Museum of Natural History (UF); the Division of Birds, the Field Museum of Natural History (FMNH); and Georgia College Ornithology Collection (GCOC). After comparing and eliminating all other orders and most of the living families of birds the following specimens were used for comparison and detailed descriptive osteology. Cuculidae: *Centropus superciliosus* (UF 33856), *Clamator cafer* (FMNH 319965), *Clamator glandarius* (UF 38176, 38731), *Coccyzus erythropthalmus* (GCOC 579), *Crotophaga ani* (UF 38970), *Cuculus canorus* (UF 38175), *Cuculus saturatus* (FMNH 357422), *Geococcyx californiana* (FMNH 317279); Musophagidae: *Corythaixoides leucogaster* (UF 21422), *Musophaga rossae* (UF 38727), *Tauraco corythaix* (UF 38726); Opisthocomidae: *Opisthocomus hoazin* (UF 33314); Bucconidae: *Bucco teetus* (UF 33259), *Chelidoptera teuebrosa* (UF 33263), *Monasa atra* (UF 33260), *Monasa morphoeus* (UF 33261).

The osteological terminology used is from Howard (1929) and *Nomina Anatomica Avium* (Baumel, 1979). The Latin terms are replaced by the English equivalents. All measurements are in millimeters and were taken with dial calipers.

SYSTEMATIC PALEONTOLOGY

Order Cuculiformes
Family Cuculidae
Subfamily Cuculinae
Genus *Eocuculus* new genus

Diagnosis—Tarsometatarsus cuculiform obligate zygodactyl, which differs from types found in Psittaciformes, Piciformes, and Sandcoleiformes; postcranial skeleton like that of a small, arboreal cuculid approximately the size of *Coccyzus erythropthalmus* except that the skeleton is robust and the tarsometatarsus is short like that of *Cuculus saturatus* and *C. canorus*; *Eocuculus* differs from all other known fossil cuckoos by its small size and robust skeleton.

*Eocuculus cherpinae* new species

Figs. 1-3.

Holotype—DM 10682 slab and counter slab DM 10683 consisting of a partial associated skeleton (missing the head) with feather impressions. Collected by Colette Cherpin and Jeffery Carpenter and donated to the Denver Museum of Natural History on 24 May 1993.

Plastotypes—Silicone molds made from DM 10682 and DM 10683 are stored with the holotype at the Denver Museum of Natural History.

Formation and age—Florissant Formation, late Eocene, early Chadronian North American Land Mammal Age, approximately 32.0-34.0 Ma.

Locality—Clare Ranch in Teller County, Colorado. Lake George map T13S, R71W, Sec. 11.

Diagnosis—Same as for genus.
Etymology—Genus derived from the Latin for *eo* meaning early plus *cuculus* meaning a cuckoo. Trivial name *cherpinae* feminine for the surname Cherpine. This new species is named in honor of Colette Cherpin, one of the collectors of the holotype, who died tragically in an automobile accident in 1994 at age 25. Colette was an enthusiastic amateur paleontologist who made a significant contribution to the science of paleornithology.

Measurements (mm)—Left humerus: length - 27.0, distal width - 5.4; Left ulna: length - 27.0; Right ulna, length - 27.7; Left radius, length - 24.7; Left carpometacarpus, length - 15.2, proximal depth through MCl - 4.9; Left Digit II, phalanx 1, length - 6.9, greatest depth - 3.1; Left Digit II, phalanx 2, length - 6.0; Synsacrum, length - 23.1; Left tibiotarsus, length - 33.7; Right tibiotarsus, length - 32.5; Left tarsometatarsus, length - 17.0, proximal depth - 3.7; Right tarsometatarsus, length -17.0, proximal width - 4.0, distal width - 4.2.

**GEOLOGIC SETTING**

Florissant Fossil Beds National Monument is located at the geographical center of Colorado, about 40 miles west of Colorado Springs. Geographically the area is referred to as the Rocky Mountain Peneplain with an average elevation of 2800 m. Geologically the Monument and the surrounding area were formed by several episodes of uplift and erosion during the late Cretaceous, continuing into the late Eocene (70 to 35 mybp). Uplift exposed a large intrusive batholith, which today is the Pike's Peak Granite. The Florissant valley drainage system was impounded by pyroclastic flow from a nearby volcano, which formed Lake Florissant. Fine-grained mud, silt, and volcanic ash were deposited in the lake, entombing elements of the surrounding area’s biota. Although vertebrate fossils are rare (MacGinitie, 1953; Meyer and Weber, 1995), the compacted lacustrine sediments preserved many plants and insects in wonderful detail. The extraordinary quality of the preservation is shown by the presence of feather impressions on the slab and counter slab of Eocuculus (Fig. 2).

**DESCRIPTION AND COMPARISONS**

*Eocuculus cherpinae* is a small arboreal cuckoo (Cuculiformes: Cuculidae) based on the apomorphic condition of an accessory articulating process, or sehnenhalter, on the trochlea of Digit IV of the tarsometatarsus, which has Digit IV permanently reversed for obligatory zygodactyly. Obligate zygodactyly also occurs in parrots (Psittaciformes: Psittacidae), toucans and jacamars (Piciformes: Ramphastidae and Galbulidae, respectively), and the Eocene zygodactyl birds (Sandcoleiformes: Sandcoleidae), but each of these has its own unique apomorphic condition of the sehnenhalter (Olson, 1983; Houde and Olson, 1992) for their arboreal life styles.

Osteological characteristics of the post-cranial skeleton of *Eocuculus* are more similar to species in the genus *Cuculus* (Cuculidae), e.g., the Common (*C. canorus*) and Oriental (*C. saturatus*) cuckoos of the Old World. These cuckoos have shorter but more robust wing and leg bones as compared to the Great Spotted Cuckoo, *Clamator glandarius* (Cuculidae), New World cuckoos (Coccyzinae), ground-cuckoos (Neomorphinae), and the anis (Crotophaginae). The coccyzine, neomorphine, and crotophagine cuckoos and *Clamator* all have a gracile skeleton with the shaft of the humerus bowed in along the internal surface, ulna with prominent secondary papillae,
posteriorly bowed femur, and proportionately longer tibiotarsus and tarsometatarsus. *Eocuculus* and *Cuculus* have a straighter humerus, no prominent secondary papillae, straight femur, and a shorter leg. The ground-cuckoos have much longer legs, especially the tarsometatarsus, for being cursorial.

*Eutreptodactylus itaboraiensis* Baird and Vickers-Rich 1997 from the late Paleocene is the earliest known fossil cuckoo in the family Cuculidae. The characteristic cuculiform sehnenhalter is not as well developed as in extant cuculids and therefore differs from *Eocuculus*, which has completed the rotation of the accessory articulating process of Digit IV.

Primitive ground birds blend avian bony characteristics from three families of birds: Musophagidae (turacos), Opisthocomidae (hoatzin), and Cuculidae (cuckoos). *Foro panarium* (Foratidae) Olson 1992 first appears in the fossil record in the Lower Eocene Green River Formation, Wyoming. Because of the mosaic nature of this bird Olson (1992) "by default" placed it into the Cuculiformes. *Foro panarium* has long legs like the ground-cuckoos and therefore is unlike *Eocuculus*.

Also of note from the early Eocene are fossils of cuckoos tentatively identified only to order from the Naze, London Clay, Essex, England (Feduccia, 1996:167; pers. obs. 1998). The diverse flora and fauna of the Naze are represented in the private collection of Michael Daniels, but have not yet undergone rigorous taxonomic study.

The only named European fossil cuckoo is *Dynamopterus velox* (Milne-Edwards, 1892) from the Eo-Oligocene Phosphorites du Quercy, France. This purported cuckoo is at least three times larger than *Eocuculus* but of uncertain affinities.

The earliest North American record for a typical cuckoo in the family Cuculidae is *Neococcyx maccorquodalei* (Weigel, 1963) from the early Oligocene, Cypress Hills Formation, southwestern Saskatchewan. The holotype of *N. maccorquodalei* is the distal end of the right humerus (SMNH 1420). *Neococcyx maccorquodalei* is slightly larger (great est distal width, 6.2 mm) than *Eocuculus cherpinae* (5.4 mm). Also, *Eocuculus* is more like *Cuculus* and differs from *Neococcyx* by having a larger entepicondyle, a deeper intercondylar furrow, and a straighter humer al shaft. Weigel based his comparisons on the Yellow-billed Cuckoo, *Coccyzus americanus*, which is closest in size and osteological features.

The only other North American fossil cuckoo is *Cursoriococcyx geraldinae* (Martin and Mengel, 1984) from the early Miocene, Martin Canyon A Local Fauna of Logan County, Colorado. *Cursoriococcyx* is a ground-cuckoo (Cuculidae, Neomorphinae) and therefore differs from *Eocuculus* by its larger size and longer legs.
Figure 1— Eocuculus cherpinae, new species, holotype slab (DMNH 10682, above) and counter slab (DMNH 10683, below).
Eocuculus cherpinae is the earliest record of an arboreal cuckoo (Cuculidae, Cuculinae) from the middle Tertiary of North America. It shares certain osteological similarities with species in the Old World genus Cuculus. Eocuculus cherpinae is yet another example of a member of the Paleocene global avifauna (Olson, 1989). It was during the Paleogene when the global climate decay began and there was a transition from a tropical and more equitable climate to a more seasonal climate with broader daily temperate range and distinctive seasons (Wolfe, 1980). Eventually this climate decay led to the Great Ice Age of the Quaternary and the fragmentation of the global avifauna into the relictual distribution for birds we have today (Olson, 1989). The global avifauna has been preserved for us at such important fossil localities as the Naze, London Clay, Essex, England; Green River and Willwood formations, Wyoming; Messel oil shales, Germany; and from the Phosphorites du Quercy, France (Feduccia, 1996:167-169).
ACKNOWLEDGMENTS

I would like to thank Dr. Richard K. Stucky, Curator in Earth Sciences at the Denver Museum of Natural History for giving me the opportunity to study this extraordinary specimen. I would like to thank the collectors, the late Ms. Colette Cherpin and Mr. Jeffery Carpenter, for donating this specimen to the DMNH; their donation allowed a significant specimen to be added to the scientific body of knowledge on fossil birds. Comparative osteological and fossil specimens, were made available by J. William Hardy, Curator of Birds, and S. David Webb, Curator of Vertebrate Paleontology, Florida Museum of Natural History. Linda D. Chandler and William P. Wall read this manuscript and made many helpful comments. Linda D. Chandler skillfully made the figures.

REFERENCES