

A PLEISTOCENE AVIFAUNA FROM ROCK SPRING, FLORIDA

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ROCK SPRING issues from a limestone bluff approximately 6 miles north of Apopka, Orange County, Florida, in the north-central portion of section 15, T. 20 S., R. 28 E. The fossils here reported were taken from Rock Spring Run within 200 yards of the source. The bone-bearing, argillaceous sands represent an old channel fill overlying the Ocala limestone, which is exposed in portions of the stream bed. Lateral erosion of the sands exposes the fossils. The bones are well mineralized and most are not waterworn. The frequent occurrence in association of bones from what appear to be the same individual indicates that the material has not been reworked and that the bones are the same age as the matrix. Pleistocene age of the site is indicated by the presence of mastodon (*Mammut americanus*), horse (*Equus* sp.), tapir (*Tapirus veroensis*), peccary (*Platygonus* sp.), and camel (*Tanupolama mirifica*) in association with the bird material.

H. James Gut (1939) discovered the site; John Mann, Jack Todd and, particularly, Gerald Lintner obtained additional specimens. This report is based on all the avian elements the four collected. The material is now in the collection of Pierce Brodkorb at the University of Florida.

AVIFAUNA

The total number of bird bones available was approximately 1025, of which more than half were identifiable to species (Table 1). The 35 species and one additional genus determined make this locality one of the richer avian fossil deposits known. Four species are additions to the list of fossil birds of North America; four others are reported for the first time as fossils from Florida.

Gavia immer was known previously as a fossil in North America only from the Pleistocene of California, although Brodkorb (1953:214) refers to an ulna from Lake Monroe, Volusia County, Florida, as "near *immer*." Complete bones included in the 47 specimens from Rock Spring are three coracoids, two carpometacarpi, and one each of the following: humerus, ulna, radius, femur, and tibiotarsus. The major portion of a cranium is also present.

Among the 29 bones identified as *Ardea herodias* is an extremely large carpometacarpus 116.4 mm. in length. The length of the carpometacarpus in three *A. occidentalis* ranges from 96.4 to 100.9 mm.; in 33 *A. h. herodias* from 93.5 to 107.1 mm.; and in three *A. goliath* from 97.4 to 103.6 mm. (Adams, 1956 MS:70, 74, 75). The carpometacarpus in five *A. h. wardi* ranges from 108.0 to 113.0 mm. I can detect no qualitative differences between the fossil and *A. herodias*, and it seems likely that the fossil would fit within the range of a larger series of *A. h. wardi*.

In addition to the four elements assigned to *Nycticorax nycticorax* is the distal 20 mm. of a right tarsometatarsus that differs in several characters. The trochlea for digit 2 does not protrude as far medially and posteriorly, and the trochlea for digit 4 is extended

distally, thus the three trochleae appear more equal and parallel than in other herons; also the metatarsal facet lies closer to the trochleae. Measurements of the fossil are as follows: width of shaft distal to metatarsal facet, 6.3 mm.; width through condyles, 10.3 mm.; distance from distal end to center of metatarsal facet, 11.4 mm. This element, which was compared with all North American herons and some extralimital forms, may represent an additional species.

Ajaia ajaja was known previously as a fossil only from the Pleistocene of California. The Rock Spring deposit yielded the distal portion of a right tarsometatarsus.

Of the 1025 bird bones 620 were those of ducks. I was able to assign approximately half of these to eight species. *Aix sponsa* is recorded on the basis of a complete right humerus. Shufeldt's specimens of this species from Fossil Lake, Oregon, have been assigned to *Spatula* by Howard (1946:176). More recently, Pleistocene records of the species have been published for Ontario (Wetmore, 1958:9) and Kansas (Stettenheim, 1958:198). The Rock Spring specimen constitutes the first fossil record of this species from Florida.

Mergus serrator, hitherto known as a fossil only from Oregon, is the most abundant bird in the Rock Spring deposit. Maxillae, mandibles, portions of the syrinx, as well as whole specimens of all the long bones are present.

Aythya collaris was recorded from the Pleistocene of Crystal Springs, Florida, by Brodkorb (1956:158), but was published too late to be incorporated in the fossil checklist (Wetmore, 1956).

A method of separating the humeri of the Anatinae from those of the Aythyinae, based on certain characters of the pneumatic fossa, became apparent while working on the duck material from Rock Spring. In the Anatinae the fossa is deeper and partially excavates the medial bar. The construction is such that the palmar surface of the bar is not completely visible. Furthermore, the fossa usually possesses many bony struts. In the Aythyinae the pneumatic fossa is shallower, and the medial bar is essentially continuous with the shaft, exposing its palmar surface. Struts within the fossa are rare; in most cases the wall is solid. These characters enabled me to assign more than 100 specimens of river and diving ducks to their respective subfamilies; the specimens included several extralimital forms and all North American species with the exception of *Anas diazi*, *Bucephala islandica*, and *Camptorhynchus labradorium*. The humeri of two specimens of the Rosy-billed Pochard (*Metopiana peposaca*) of South America agree in all respects with those of the Anatinae. This deviation from what seems a reliable method of distinguishing the two subfamilies may be of phylogenetic significance, for Delacour and Mayr (1945:25-26) consider *Metopiana*, along with *Netta rufina* and *Aythya erythroptalma*, to "constitute a bridge between the river ducks and the more specialized pochards of the genus *Aythya*. . . ."

Four bones in the collection belong to the order Charadriiformes. I was able to identify one of these to species and two to genus. A left tibiotarsus, lacking only the cnemial and rotular crests, is of *Limnodromus scolopaceus*. The element measures 60.0 mm. from distal condyles to proximal articulating surfaces. The same measurement taken from eight specimens of *L. scolopaceus* ranged from 55.4 to 65.4 mm.; seven specimens of

L. griseus vary from 52.2 to 55.7 mm. Although *L. griseus* has been reported from the Pleistocene of California, this is the first record of *L. scolopaceus* as a fossil.

The distal three-quarters of a left humerus and a fragment of the distal portion of a

TABLE I
PLEISTOCENE BIRDS FROM ROCK SPRING, FLORIDA

Species	No. of bones	No. of individuals
<i>Gavia immer</i> . Common Loon	46	3
<i>Podiceps auritus</i> . Horned Grebe	1	1
<i>Podilymbus podiceps</i> . Pied-billed Grebe	18	4
<i>Phalacrocorax auritus</i> . Double-crested Cormorant	106	8
<i>Anhinga anhinga</i> . Anhinga	14	2
<i>Ardea herodias</i> . Great Blue Heron	29	3
<i>Casmerodius albus</i> . Common Egret	7	1
<i>Nycticorax nycticorax</i> . Black-crowned Night Heron	4	1
<i>Botaurus lentiginosus</i> . American Bittern	2	1
<i>Ciconia maltha</i> . extinct stork	2	1
<i>Ajaia ajaja</i> . Roseate Spoonbill	1	1
<i>Anas fulvigula</i> . Mottled Duck	2	1
<i>Anas acuta</i> . Pintail	1	1
<i>Anas carolinensis</i> . Green-winged Teal	4	2
<i>Anas discors</i> . Blue-winged Teal	4	2
<i>Aix sponsa</i> . Wood Duck	1	1
<i>Aythya collaris</i> . Ring-necked Duck	3	2
<i>Aythya affinis</i> . Lesser Scaup	55	15
<i>Mergus serrator</i> . Red-breasted Merganser	226	24
<i>Coragyps atratus</i> . Black Vulture	1	1
<i>Buteo jamaicensis</i> . Red-tailed Hawk	1	1
<i>Haliaeetus leucocephalus</i> . Bald Eagle	2	1
<i>Pandion haliaetus</i> . Osprey	11	1
<i>Meleagris gallopavo</i> . Turkey	10	2
<i>Grus canadensis</i> . Sandhill Crane	6	2
<i>Aramus guarana</i> . Limpkin	40	6
<i>Gallinula chloropus</i> . Common Gallinule	1	1
<i>Fulica minor</i> . extinct coot	1	1
<i>Limnodromus scolopaceus</i> . Long-billed Dowitcher	1	1
<i>Larus</i> sp. undetermined gull	2	1
<i>Ectopistes migratorius</i> . Passenger Pigeon	1	1
<i>Strix varia</i> . Barred Owl	2	1
<i>Megaceryle alcyon</i> . Belted Kingfisher	1	1
<i>Dendrocopos borealis</i> . Red-cockaded Woodpecker	1	1
<i>Corvus ossifragus</i> . Fish Crow	1	1
<i>Richmondia cardinalis</i> . Cardinal	1	1
Totals	609	98

left carpometacarpus are from a large gull, genus *Larus*. The fossil humerus shows minor differences from humeri of one *L. hyperboreus* and of two *L. marinus*, particularly in the region of the internal condyle and the entepicondyle. The fossil possibly represents an undescribed species. Its measurements are: greatest width of the distal condyles, 20.5 mm.; least width of the shaft, 9.0 mm.

The proximal portion of a left humerus of *Megaceryle alcyon* is the first fossil record of any member of the order Coraciiformes from North America. The bone agrees in all respects with that of the modern species.

Dendrocopos borealis, hitherto unrecorded as a fossil, is included on the basis of a partial left humerus. The genus *Dendrocopos* has been recorded from the Pleistocene of Carpenteria, California, by Miller and DeMay (1942:121, 68).

Four bones from Rock Spring are from passerine birds. Two were identified to species. *Richmondia cardinalis*, represented by a complete right carpometacarpus, was previously unknown as a fossil. *Corvus ossifragus*, represented by a fragmentary coracoid, is recorded from several other Pleistocene deposits in Florida.

PALEOECOLOGY

Most of the species from the Rock Spring deposit normally occur in riparian or aquatic situations. Certain of these, particularly *Podilymbus podiceps*, *Anhinga anhinga*, *Anas discors*, *Aix sponsa*, *Aramus guarana*, and *Gallinula chloropus*, are generally inhabitants of fresh water. Three species of ectothermal vertebrates, *Rana catesbeiana*, *Chelydra* cf. *serpentina*, and *Alligator mississippiensis*, further substantiate a fresh-water environment at the time of deposition.

Together with the fresh-water species are three birds generally found on salt water in Florida. These are *Mergus serrator*, by far the most abundant species in the collection, *Gavia immer*, and *Podiceps auritus*. The occurrence together of species generally associated with salt water with those associated with fresh water suggests that the sea was nearer to the spring than at present.

The spring lies immediately east of the Pamlico shore line (MacNeil, 1950, map), and it seems likely that the bones were deposited during Pamlico or post-Pamlico time. The Pamlico shore line represents a rise of the sea some 25 to 35 feet above its present level. This rise in sea level probably made Rock Spring Run a sluggish depositing stream, possibly subjected to tidal flow.

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