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THE AVIFAUNA OF THE PLEISTOCENE
IN FLORIDA

(WITH SIX PLATES)

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THE AVIFAUNA OF THE PLEISTOCENE IN FLORIDA

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(WITH 6 PLATES)

Pleistocene deposits of fossils containing numerous bones of birds have been known for years in the western part of the United States in the Fossil Lake area in Oregon, and in the asphalt beds and caverns of California, but such material in other sections of our country to date has been decidedly rare and of limited amount. It is of interest, therefore, to discuss recent discoveries of abundant avian remains in Pleistocene beds in several localities in Florida, with representation of a far larger number of species than has been found at any previous time in the East.

Early report of birds in the Pleistocene in Florida came from the excavations at Vero on the east coast which initiated the argument regarding the antiquity of man in that area (see fig. 1). There were found here remains of a jabiru described by E. H. Sellards, and later there came another collection from which Shufeldt named as new a gull, a teal, and a heron. More recent excavations by J. W. Gidley and by F. B. Loomis, and subsequent work by Doctor Gidley and C. P. Singleton near Melbourne, not far from Vero, have brought to light many bird bones, while investigations initiated by Walter Wetmore Holmes near St. Petersburg on the west coast, in what is known as the Seminole Field, have uncovered the most extensive series of fossil bird bones that have as yet been found in the eastern part of our country. This series is supplemented by bones collected in several localities in Manatee County by J. E. Moore, by a few bird bones secured by Mr. Holmes from a Pleistocene cave deposit near Lecanto in central Florida, and by specimens from several localities in the collections of the Florida State Geological Survey.

The geologic conditions under which these fossils, other than those from the cave, are found are briefly as follows: At or below sea level on the east coast of Florida is a bed of cemented sand and broken marine shells that has been called the Anastasia formation, the Number One stratum, or the Coquina layer. At the Seminole Field near St. Petersburg, the corresponding layer is of fine white sand containing many mollusks, less compact than the beds at Melbourne and

Vero. This lower bed is overlaid by a stratum of fine white to light brown sand, from a few inches to several feet thick, containing occasional lenses or groups of marine shells and, locally, accumulations of fossilized bones. This is the Number Two layer, usually referred to as the bone bed, a deposit that is generally thicker on the east coast than on the west. From this bone bed have come fossil vertebrate

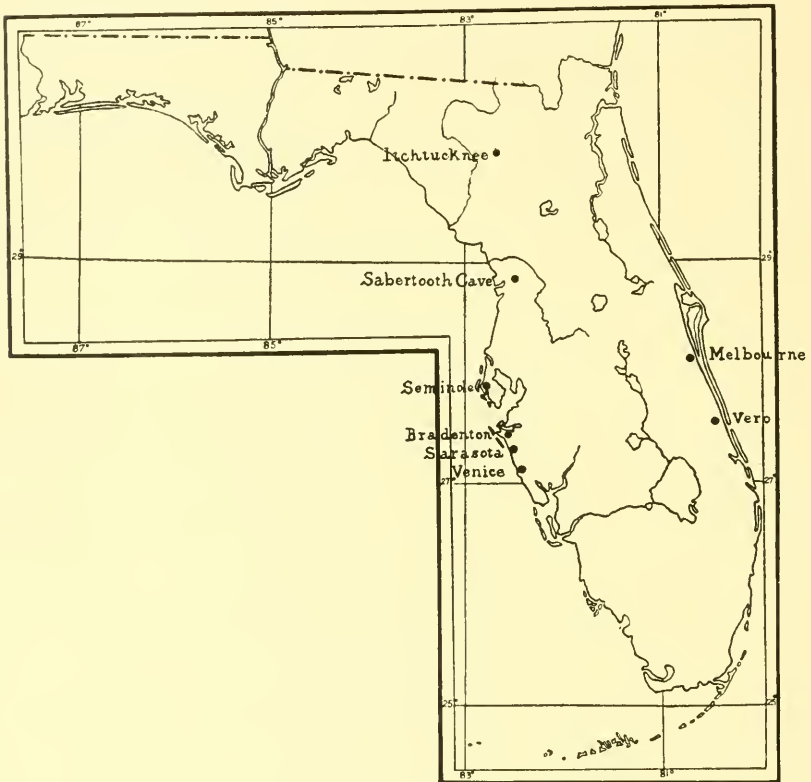


FIG. 1.—Localities where collections of fossil birds have been made in Florida.

remains. Above this bone bed appear Recent deposits of sand or humus that form the present surface, though in places the bone bed is exposed.

The actual age of the specimens from the beds in question has been subject to some discussion. Dr. O. P. Hay¹ holds that the Number

¹ Journ. Washington Acad. Sci., vol. 20, August 19, 1930, p. 335; and in earlier papers.

Two bed or stratum dates back to the early part of the Pleistocene, probably to the Aftonian period. In this he seems to be upheld by Dr. Wythe Cooke.¹ Dr. G. G. Simpson² considers it more probable that these deposits are of late Pleistocene age than that they date from the earlier part of that period. Doctor Simpson further concludes that the faunas from the Number Two bed of the east coast, from Sabertooth Cave, and from the Seminole area "represent a single phase of geologic time."

The writer cites these diverse opinions here without attempt to offer evidence from the bird material in favor of either one.

DISCUSSION OF THE AVIFAUNA

The five principal localities here considered with their fossils may be now treated briefly, but before taking these up in detail it is of interest to note that though grebes, cormorants, herons, ducks and geese, jabirus and other water loving birds are represented among the birds of these deposits, there have been found as yet no sandpipers, plovers, or other shorebirds, nor any terns or gulls (*Larus vero* of Shufeldt being the yellow-crowned night heron). The lack of gulls is of interest particularly since gulls are absent also from the Pleistocene of California, where only one bone of a gull has been identified in several hundred thousand specimens examined.³

In the present studies there have been identified 65 forms of birds from the Pleistocene of Florida. Of these three are fossil species of the Pleistocene, two of them, a teal, *Querquedula floridana*, and a turkey, *Meleagris tridens*, being known only from Florida, while the third, *Teratornis merriami*, was described originally from the deposits of Rancho La Brea in California.

There are nine forms that have not been reported from modern Florida. Among these is a shearwater, *Puffinus puffinus*, a pelagic species of wide range in the Atlantic Ocean and the Mediterranean Sea that comes here in all probability merely as a casual straggler. The trumpeter swan, *Cygnus buccinator*, now nearly extinct, bred formerly in the interior of the continent, ranging south in migration to Texas. The whooping crane, *Grus americana*, a breeding form of the interior of North America, now nearly extinct, has been reported uncertainly from Florida. A small gray crane may be the Cuban bird or the little brown crane of western North America. The California vulture,

¹ Amer. Journ. Sci., vol. 12, 1926, pp. 449-452.

² Bull. Amer. Mus. Nat. Hist., vol. 54, February 19, 1929, p. 572.

³ See Miller, Loye, Condor, 1924, pp. 173-174, and 1930, p. 117.

Gymnogyps californianus, comes only from the West Coast in modern times, while an eagle, *Geranoaëtus* sp., has a modern form in South America and fossils in the Pleistocene of California. The jabiru, *Jabiru mycteria*, Mexican turkey vulture, *Cathartes aura aura*, and wood-rail, *Aramides cajanea* are species known today from tropical America.

The 53 forms remaining that are found in modern Florida are listed below. Most of them are common today in the areas under study either as permanent residents or as migrants from the north during winter.

<i>Colymbus auritus</i>	<i>Cathartes aura septentrionalis</i>
<i>Podilymbus podiceps</i>	<i>Coragyps urubu</i>
<i>Phalacrocorax auritus</i>	<i>Buteo jamaicensis</i>
<i>Anhinga anhinga</i>	<i>Buteo lineatus</i>
<i>Ardea herodias</i>	<i>Buteo platypterus</i>
<i>Casmerodius albus</i>	<i>Haliaeetus leucocephalus</i>
<i>Egretta thula</i>	<i>Pandion haliaëtus</i>
<i>Hydranassa tricolor</i>	<i>Polyborus cheriway</i>
<i>Florida caerulea</i>	<i>Falco sparverius</i>
<i>Butorides virescens</i>	<i>Colinus virginianus</i>
<i>Nycticorax nycticorax</i>	<i>Melcagris gallopavo</i>
<i>Nyctanassa violacea</i>	<i>Grus canadensis</i> (large form)
<i>Botaurus lentiginosus</i>	<i>Aramus pictus</i>
<i>Plegadis</i> sp.	<i>Rallus elegans</i>
<i>Gnara alba</i>	<i>Rallus longirostris</i>
<i>Cygnus columbianus</i>	<i>Gallinula chloropus</i>
<i>Branta canadensis</i>	<i>Fulica americana</i>
<i>Branta canadensis hutchinsi</i>	<i>Zenaidura macroura</i>
<i>Anas platyrhynchos</i>	<i>Tyto alba</i>
<i>Anas rubripes</i>	<i>Otus asio</i>
<i>Anas fulvigula</i>	<i>Strix varia</i>
<i>Nettion carolinense</i>	<i>Corvus brachyrhynchos</i>
<i>Nyroca valisineria</i>	<i>Corvus ossifragus</i>
<i>Nyroca affinis</i>	<i>Agelaius phoeniceus</i>
<i>Erismatura jamaicensis</i>	<i>Megaquiscalus major</i>
<i>Lophodytes cucullatus</i>	<i>Quiscalus quiscula</i>

Among these species there are 26 that have not before been recorded in the Pleistocene age, a considerable addition to the 114 modern species known previously from deposits of that period.

The fact that at this writing 140 species of the birds found living today in that area of North America included in the limits of the official Check-list of the American Ornithologists' Union are known as fossils in the Pleistocene illustrates clearly the stability in form of our existing species of birds, since this number is more than 15 per cent of the total living list (not counting subspecies) for the region

in question. Progress in our knowledge of these matters has been so rapid that it may be confidently predicted that eventually all of our existing species, except those of small size, will be identified in Pleistocene deposits. As conditions are seldom favorable for preservation of small bones of fragile texture, not much can be known of the smaller birds as fossils, for their preservation in that state is highly fortuitous. We may dream, however, of the discovery of ancient caves, inhabited long ago by Pleistocene owls, with great accumulations of bones of small birds from the pellets of these nocturnal predators—caves that have been hermetically sealed for tens of thousands of years that chance may bring to attention and so give us unexpected information on a fascinating subject.

As his studies in avian paleontology have progressed the writer has become convinced that evolution of our existing birds so far as differentiation of species is concerned has taken place principally in the late Tertiary, and that variation since that time has been of slight degree, confined apparently to minor differences (in color and dimension) such as are used in our modern studies to distinguish the less definitely marked of geographic races or subspecies. As our information increases it appears that some of the differences that we consider today as of subspecific value were in existence in birds of the Pleistocene, for example in the gray cranes and in the turkey vultures, and have persisted to the present without apparent change, a striking example of stability in these groups.

The diversity in the bird life of North America at the time of the coming of the rigors of the Ice Age must have been truly remarkable since it would seem to have included most of our modern forms together with a host of others now extinct that are slowly becoming known from the fossil record. The entire period since the opening of the Pleistocene has been one of extermination rather than of evolution, a process that continued steadily until men appeared as the most active factor contributing to its progress.

THE SEMINOLE AREA

The region surrounding the small settlement of Seminole, not far from St. Petersburg, Pinellas County, Florida, has been designated as the Seminole area (see pl. 1). In 1924 Mr. Walter Wetmore Holmes discovered here a scute from the glyptodon *Chlamytherium septentrionale*, and through continued search during the succeeding 5 years unearthed numerous other fossil bones including among them many remains of birds. It is the Holmes collection of fossil birds that initiated the writer's present studies on the Pleistocene avifauna of Florida.

According to data secured from Mr. Holmes and from a paper on the mammals of these beds by Doctor Simpson¹ of the American Museum of Natural History, the fossil bones come originally from one deposit in the area in question, many of them being obtained by excavating in the original deposit, some coming from erosional wash and redeposit by Joe's Creek which runs through this area, and some from the dump along a drainage canal cut through this region. The bone-bearing layer is from 1 to 2 feet thick. According to Simpson "the lowest bed exposed is of white sand, with numerous marine shells, correlated by Cooke with the Anastasia formation of the east coast, and hence the equivalent of stratum No. 1 at Vero and Melbourne. Above this, sometimes with a barren sand layer intervening, is the bone bed, equivalent in age and character with stratum No. 2. This is generally overlain by a sandy soil, derived from it by weathering." Gidley has distinguished above this in places deposits of sand and muck that he considers equivalent to stratum Number Three of the east coast.

The list of mammals from this area as determined by Doctor Simpson is extensive and includes among its 49 species a capybara, a bear, *Arctodus floridanus*, a saber-tooth tiger, two ground-sloths, two glyptodons, tapirs, peculiar pigs, camelids, mastodon, and elephant that are considered typically Pleistocene species, in addition to opossums, moles, rabbits, rodents, skunks, minks, and deer of the same form as those occurring in the modern fauna.

The bird remains collected by Mr. Holmes include 52 forms, this being the largest assemblage of fossil species secured to date at any point in the eastern portion of North America. The importance of the collection is very evident from examination of the list that follows. A teal, *Querquedula floridana*, a huge condor, *Teratornis merriami*, and a turkey, *Meleagris tridens*, are extinct species of the Pleistocene, the first and last being known only from Florida. The jabiru, *Jabiru mycteria*, the Mexican turkey vulture, *Cathartes aura aura*, and the wood-rail, *Aramides cajanca*, are forms that at the present time range in tropical America and are not now known in the present limits of the United States. An eagle, *Geranoaëtus* sp., has its only living representative in South America though Pleistocene forms have been found in California. Most remarkable are remains of the California condor, *Gymnogyps californianus*, and a larger condorlike vulture, *Teratornis*

¹ Simpson, George Gaylord, Pleistocene mammalian fauna of the Seminole Field, Pinellas County, Florida, Bull. Amer. Mus. Nat. Hist., vol. 54, February 19, 1929, pp. 561-599, 22 figs.

merriami. Bones of the former are abundant in the Pleistocene asphalt beds of California and the species is known today from northern Lower California north into California. It has never been recorded before in the eastern part of the country. *Teratornis* has been known previously only from the Pleistocene of California, its occurrence in beds of similar age in Florida indicating a former broad range that carried it clear across the continent. The occurrence of the whooping crane, *Grus americana*, and of two forms of the brown crane, one large and one small, is also of interest. There are 20 modern forms in the collection that have not previously been recorded as fossils.

Following is the list of species from this area:

<i>Colymbus auritus</i>	<i>Teratornis merriami</i>
<i>Podilymbus podiceps</i>	<i>Buteo jamaicensis</i>
<i>Phalacrocorax auritus</i>	<i>Buteo lineatus</i>
<i>Anhinga anhinga</i>	<i>Buteo platypterus</i>
<i>Ardea herodias</i>	<i>Geranoaëtus</i> sp.
<i>Casmerodius albus</i>	<i>Haliaeetus leucocephalus</i>
<i>Hydranassa tricolor</i>	<i>Pandion haliaëtus</i>
<i>Florida caerulea</i>	<i>Polyborus cheriway</i>
<i>Butorides virescens</i>	<i>Meleagris gallopavo</i>
<i>Nyctanassa violacea</i>	<i>Meleagris tridens</i>
<i>Botaurus lentiginosus</i>	<i>Grus americanus</i>
<i>Jabiru mycteria</i>	<i>Grus canadensis</i> (large form)
<i>Plegadis</i> sp.	<i>Grus canadensis</i> (small form)
<i>Guara alba</i>	<i>Aramus pictus</i>
<i>Cygnus columbianus</i>	<i>Rallus elegans</i>
<i>Branta canadensis</i>	<i>Rallus longirostris</i>
<i>Branta c. hutchinsi</i>	<i>Aramides cajana</i>
<i>Anas fulvigula</i>	<i>Gallinula chloropus</i>
<i>Anas</i> sp.	<i>Fulica americana</i>
<i>Nettion carolinense</i>	<i>Zenaidura macroura</i>
<i>Querquedula floridana</i>	<i>Strix varia</i>
<i>Nyroca affinis</i>	<i>Corvus brachyrhynchos</i>
<i>Nyroca</i> sp.	<i>Corvus ossifragus</i>
<i>Cathartes aura aura</i>	<i>Agelaius phoeniceus</i>
<i>Coragyps urubu</i>	<i>Megaquiscalus major</i>
<i>Gymnogyys californianus</i>	<i>Quiscalus quiscula</i>

MANATEE COUNTY

From Mr. J. E. Moore of Sarasota, Florida, there have come three small collections of bones made at as many points in Manatee County.

The first of these was forwarded to me through Dr. George Gaylord Simpson, and comes from deposits near the mouth of Hog Creek near Sarasota, Florida. These are said¹ to have been found in a stratum

¹ Simpson, G. G., Florida State Geol. Surv., 20th Ann. Rep., 1929, p. 274.

of blue clay 8 to 14 inches thick overlying limestone from 11 to 12 feet below the surface. The birds are accompanied by remains of *Smilodon floridanus*, *Megalonyx*, *Myiodon*, *Chlamytherium*, *Boreostracon*, *Tapirus*, elephant, mastodon, and other Pleistocene mammals. The bird bones are dull black in color and are heavily fossilized. The presence of the California condor is notable. The following species are represented:

<i>Phalacrocorax auritus</i>	<i>Gymnogyph californianus</i>
<i>Botaurus lentiginosus</i>	<i>Meleagris gallopavo</i>

A second collection forwarded by Mr. Moore was obtained from a canal within the city limits of Bradenton, the locality being known as the Florida Avenue pit. The type material of *Parelephas floridanus* Osborn¹ came from this point. Mr. Moore (in a letter) states that remains of *Chlamytherium*, *Glyptodon* and *Bison latifrons* were obtained here also. The bird bones examined vary from dull brown to dull black in color and are well fossilized. The night heron and ruddy duck are here first recorded from the Pleistocene of Florida and from these excavations come the best remains of *Teratornis*. The following species are represented:

<i>Ardea herodias</i>	<i>Teratornis merriami</i>
<i>Egretta thula</i>	<i>Meleagris gallopavo</i>
<i>Nycticorax nycticorax</i>	<i>Grus canadensis</i>
<i>Anas fulvigula</i>	<i>Fulica americana</i>

The third collection was obtained by Mr. Moore at Venice Rocks, two miles south of Venice, Florida. The material is fragmentary and varies from light brown to black in color, some bones being more heavily mineralized than others. Following is the complete list of species:

<i>Buteo jamaicensis</i>	<i>Querquedula floridana</i>
<i>Buteo lineatus</i>	<i>Nyroca affinis</i>
<i>Haliaeetus leucocephalus</i>	<i>Erismatura jamaicensis</i>
<i>Casmerodius albus</i>	<i>Jabiru mycteria</i>
<i>Anas</i> sp.	

SABER-TOOTH CAVE

According to information supplied by Mr. W. W. Holmes, and a published account by Dr. George Gaylord Simpson² the sink known as Saber-tooth Cave (see pl. 2) is located in a bed of Ocala limestone

¹ Amer. Mus. Nov., No. 393, December 24, 1929, p. 20.

² Pleistocene mammals from a cave in Citrus County, Florida, Amer. Mus. Nov., No. 328, October 26, 1928, pp. 1-16, 11 figs.

(Eocene) 1 mile northwest of Lecanto, Citrus County, Florida, on property belonging to Mr. D. J. Allen. Several years ago Murray Davis with some companions obtained there the canine tooth of a saber-tooth tiger (*Smilodon* sp.) which was sent to the Florida State Geological Survey. Subsequently Mr. Holmes made arrangements for a thorough examination through the cooperation of Mr. Herman Gunter, Mr. J. E. King, and Mr. Allen. The work was done under Mr. Holmes' direction in February and March, 1928.

The entrance to this cave is described¹ as being "through a broad sink terminating in two vertical shafts. Immediately under these the floor of the cave was from 25 to 40 feet below the shaft mouths and there apparently has never been an entrance practicable for large living mammals. On the floor below the sink and in pockets elsewhere was a deposit of red earth or clay in which were found numerous remains of Pleistocene animals, apparently representing a distinct unit fauna. There also occurred in the cave a younger bed of sand and humus containing no extinct mammals but with numerous remains of the recent white-tailed deer of the region."

The bird bones from these deposits are relatively few in number and are all fragmentary. They are light in color, somewhat stained by the reddish earth in which they were found, and present the chalky appearance usual in bones from limestone caves.

The 10 species of birds identified offer little worthy of remark as all are found in the same area at the present time. The barn owl, *Tyto alba*, regularly inhabits caves. The two vultures, *Cathartes* and *Coragyps*, sometimes nest in or about caverns. Occurrence of the other species must be considered as due to chance except that possibly the screech owl and barred owl may have sought shelter in the cave.

The bird bones are associated with remains of the saber-tooth tiger, a capybara, a fossil dog, ground sloth, horse, tapir, a camelid, and mastodon among Pleistocene species, together with a number of mammals that occur at the present time in this area.

The list of species follows:

<i>Nyroca affinis</i>	<i>Colinus virginianus</i>
<i>Cathartes aura septentrionalis</i>	<i>Meleagris gallopavo</i>
<i>Coragyps urubu</i>	<i>Tyto alba</i>
<i>Haliaeetus leucocephalus</i>	<i>Otus asio</i>
<i>Falco sparverius</i>	<i>Strix varia</i>

COLUMBIA COUNTY DEPOSITS

From collections in the Florida State Geological Survey obtained in Columbia County about 3 miles northwest of Fort White, Mr. Her-

man Gunter has forwarded a number of bird bones for examination. Dr. G. G. Simpson, who has reported on the mammals from this deposit, states¹ that part of this material was collected by J. Clarence Simpson of High Springs, with additional specimens obtained by L. G. Getzen and J. D. Lowe. The site is about a mile below the springs at the head of the Itchtucknee River. Following these earlier collections a considerable number of bird bones were obtained by Mr. and Mrs. H. H. Simpson of High Springs during the latter months of 1930. These latter specimens came to hand as the present report was being completed and have added decidedly to information concerning birds from this area. The bird bones are brown in color and are heavily fossilized. Associated mammalian remains include *Hydrochoerus*, *Myiodon*, *Equus*, *Tapirus*, *Mylohyus*, *Mastodon*, and *Archidiskidon columbi*.

Notable among the birds are the jabiru, the extinct teal, *Querquedula floridana*, and the trumpeter swan. Curiously enough the collection contains no remains of hawks or vultures.

Following is the list of identified species:

<i>Colymbus auritus</i>	<i>Querquedula floridana</i>
<i>Podilymbus podiceps</i>	<i>Nyroca valisineria</i>
<i>Phalacrocorax auritus</i>	<i>Nyroca affinis</i>
<i>Ardea herodias</i>	<i>Lophodytes cucullatus</i>
<i>Nycticorax nycticorax</i>	<i>Pandion haliaëtus</i>
<i>Jabiru mycteria</i>	<i>Meleagris gallopavo</i>
<i>Cygnus buccinator</i>	<i>Grus americanus</i>
<i>Branta canadensis</i>	<i>Aramus pictus</i>
<i>Branta canadensis hutchinsi</i>	<i>Rallus elegans</i>
<i>Anas platyrhynchos</i>	<i>Gallinula chloropus</i>
<i>Anas rubripes</i>	<i>Fulica americana</i>
<i>Anas fulvigula</i>	

VERO AND MELBOURNE DEPOSITS

The deposits at Vero have attracted the greatest public attention because remains of man were found there associated with bones of mammals currently considered of Pleistocene age. Among other specimens secured at this locality were a few bones of birds that were described by Shufeldt in 1916.² In this account there are listed the turkey vulture, *Cathartes aura*, barn owl, *Tyto alba*, great blue heron, *Ardea herodias*, and several other species not certainly identified. Three forms were described as new, a teal, *Querquedula floridana*, a

¹ Florida State Geol. Surv., 20th Ann. Rep., 1929, p. 270.

² Florida State Geol. Surv., 9th Ann. Rep., 1917, pp. 35-41.

supposed heron, *Ardea sellardsi*, and a supposed gull, *Larus vero*, the two latter proving invalid (see beyond under *Meleagris gallopavo* and *Nyctanassa violacea*).

Two bones forwarded by Mr. Gunter to the present writer include the cormorant, *Phalacrocorax auritus*, and turkey, *Meleagris gallopavo*. Mammal remains from this area include *Hydrochoerus*, *Canis ayersi*, *Smilodon floridanus*, *Felis veronis*, *Megalonyx jeffersonii*, *Myiodon harlani*, *Chlamytherium septentrionale*, *Tatu bellus*, three species of *Equus*, *Tapirus veroensis*, *Mylohyus*, a camelid, *Archidiskidon columbi*, and *Mastodon americanus*.

Near Melbourne (see pl. 3) in Brevard County, Dr. F. B. Loomis of Amherst College located a further deposit which was worked partly in cooperation with Dr. J. W. Gidley of the United States National Museum. Subsequently Doctor Gidley carried on extensive work in this general region during three winters, being assisted by Mr. C. P. Singleton of Melbourne. Later Mr. Singleton worked in these excavations for the Museum of Comparative Zoölogy. Bird material obtained has been scattering but has included some important finds. All of the specimens secured have been available for the present study. The specimens vary in state of preservation, some being heavily fossilized and others having a chalky texture. The latter are quite fragile. The bones vary from light to dark brown in color.

The shearwater that comes first on the list may be a species of accidental occurrence as it ranges regularly at sea or about islands. The jabiru and the extinct teal, *Querquedula floridana*, are represented, as are a large and a small form of the gray crane, *Grus canadensis*. These birds accompanied species of mammals of supposed Pleistocene age.

Following is a list of the birds that have been identified:

<i>Puffinus puffinus</i>	<i>Buteo lineatus</i>
<i>Phalacrocorax auritus</i>	<i>Haliaeetus leucocephalus</i>
<i>Ardea herodias</i>	<i>Polyborus cheriway</i>
<i>Casmerodius albus</i>	<i>Colinus virginianus</i>
<i>Nyctanassa violacea</i>	<i>Meleagris gallopavo</i>
<i>Jabiru mycteria</i>	<i>Grus americanus</i>
<i>Branta canadensis hutchinsi</i>	<i>Grus canadensis</i> (large and small forms)
<i>Querquedula floridana</i>	<i>Strix varia</i>
<i>Cathartes aura septentrionalis</i>	
<i>Buteo jamaicensis</i>	

ACKNOWLEDGMENTS

In the identification of these specimens the writer is indebted to the American Museum of Natural History for the loan of a skeleton of

the jabiru, and to Dr. Hildegard Howard, of the Los Angeles Museum of History, Science and Art, for bones of *Teratornis* and certain other important material for comparison.

Mr. W. W. Holmes, in addition to his specimens which he has most generously placed in the United States National Museum, has supplied much important information both in letters and in personal conversations. Ornithologists stand greatly indebted to him for the care and effort that he has given to the collection of his material which has caused such an increase in our knowledge of the fossil birds of this area. Photographs illustrating the Seminole area and Sabertooth Cave were obtained from him. Thanks are due to Mr. J. E. Moore for important specimens that he has forwarded for the national collections. Dr. Thomas Barbour has kindly forwarded for study material collected by C. P. Singleton. Dr. J. W. Gidley has furnished data with regard to the deposits on the east coast and has supplied certain photographs. Drawings illustrating this report have been made by Mr. Sidney Prentice.

ANNOTATED LIST

Order COLYMBIFORMES

Family COLYMBIDAE

COLYMBUS AURITUS Linnaeus

Horned grebe

Colymbus auritus Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 135.

In the Holmes collection from near St. Petersburg there are one complete and several broken humeri. Part of another humerus is contained in collections from the Itchtucknee River, Columbia County, in the Florida State Geological Survey. All are similar to those of the modern birds. The species is known previously from the Pleistocene of Fossil Lake, Oregon, and from cavern deposits in Tennessee.

PODILYMBUS PODICEPS (Linnaeus)

Pied-billed grebe

Colymbus podiceps Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 136.

In the Holmes collection from the Seminole Field there are limb bones of several individuals of this species which are similar to those of modern individuals. Other bones are found in the series from the Itchtucknee River, Columbia County, in the Florida State Geological Survey. This grebe today ranges throughout North and South

America. As it has been recorded in Pleistocene beds in Oregon and California (McKittrick) its presence in deposits of that age in Florida indicates a similar wide distribution for North America during the Ice Age.

Order PROCELLARIIFORMES

Family PROCELLARIIDAE

PUFFINUS PUFFINUS (Brünnich)

Manx shearwater

Procellaria puffinus Brünnich, Orn. Bor., 1764, p. 29.

A left metacarpal with the fourth metacarpus missing was secured by J. W. Gidley near Melbourne, March 18, 1929. This shearwater as a species now ranges from Norway south into the Mediterranean, breeding in Iceland, the Azores and other islands, and at least casually on Bermuda. At the present time it occurs rarely along the coasts of North America. It has not been recorded previously as fossil nor has it been known before from Florida.

Order PELECANIFORMES

Family PHALACROCORACIDAE

PHALACROCORAX AURITUS (Lesson)

Double-crested cormorant

Carbo auritus Lesson, Traité Orn., 1831, p. 605.

Cormorants of this type apparently were as widely distributed in Florida during the Pleistocene as they are today, for in the collections here under review there are found the lower end of a tibio-tarsus and part of an ulna from stratum Number Two at Melbourne secured by J. W. Gidley, part of an ulna from Hog Creek, near Sarasota, obtained by J. E. Moore in 1928, and a sacrum and three fragments of humeri from the Holmes collections in the Seminole Field. In the collections of the Florida State Geological Survey there are a complete humerus, part of an ulna and other bones from the Itchtucknee River, Columbia County, another humerus, white in color, from Rock Springs in Orange County that is very doubtfully Pleistocene in age, and still another humerus from the north bank of the canal west of the railroad bridge at Vero.

The resident cormorant of this group found now in Florida, *Phalacrocorax auritus floridanus*, is smaller than the bird from farther north and west, *Phalacrocorax auritus auritus*, which comes to Florida as

a migrant during the winter season. It is interesting to observe that the distal ends of two humeri in the Holmes collection from the west coast differ decidedly in size, the transverse breadth across the trochleae in one being 15.8 mm. and in the other 18.2 mm., thus exhibiting differences similar to those that mark the larger and smaller modern races. It appears possible that differentiation between these two forms may have occurred in the Pleistocene, though on the other hand these two specimens may be merely extremes of individual variation existing at that time. On this scanty material the writer does not venture to identify the two as belonging certainly to distinct subspecies.

Family ANHINGIDAE

ANHINGA ANHINGA (Linnaeus)

Snake-bird, water-turkey

Plotus anhinga Linnaeus, Syst. Nat., ed. 12, vol. 1, 1766, p. 218.

The snake-bird is represented by the distal end of a left humerus collected in the Number Two bed near Melbourne by Doctor Gidley on May 3, 1929.

This species has not been recorded previously as a fossil.

Family ARDEIDAE

ARDEA HERODIAS Linnaeus

Great blue heron

Ardea herodias Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 143.

The genus *Ardea* is represented by four cervical vertebrae and two fragmentary metatarsi from Melbourne, collected by Gidley; by the lower end of a metatarsus and the upper part of a coracoid from the Seminole Field collected by Holmes; and by the lower end of a tibio-tarsus from Bradenton collected by J. E. Moore. The upper and lower ends of metatarsi and a broken tibio-tarsus are included in collections in the Florida State Geological Survey from the Itchtucknee River, Columbia County. All are referred here to the species *herodias* without consideration of the possible occurrence of the great white heron, *Ardea occidentalis*, confined today to southern Florida, since so far as present information goes these two supposed species are indistinguishable in their skeletons. The two specimens from the Seminole Field are larger than any modern bird seen, suggesting that possibly there was a larger heron of this type in existence in the Pleistocene. The differences are shown in the following measure-

ments: Modern *Ardea herodias* (seven specimens, including two from Florida); metatarsus, transverse breadth of trochleae 16.2-17.3 mm., smallest transverse breadth of shaft 5.9-7.0 mm.; coracoid, transverse breadth of head 13.8-15.7 mm. Fossils from Seminole Field: metatarsus, transverse breadth of trochleae 18.4 mm., smallest transverse breadth of shaft 8.2 mm.; coracoid, transverse breadth of head 17.3 mm. The material is considered too fragmentary for further consideration at this time.

CASMERODIUS ALBUS (Linnaeus)

Egret

Ardea alba Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 144.

The lower end of the left tibio-tarsus of a young individual is found in the collections made by W. W. Holmes in the Seminole Field. Another was identified in material collected near Venice by J. E. Moore. An ulna of an individual of large size was included in collections made near Melbourne by C. P. Singleton, in 1928, for the Museum of Comparative Zoölogy.

This species has not been recorded previously as a fossil, the only other reference to its possible occurrence in the Pleistocene being that of Shufeldt,¹ where a fragmentary metatarsus is listed as possibly from this species.

EGRETTA THULA (Molina)

Snowy heron

Ardea thula Molina, Sagg. Stor. Nat. Chili, 1782, p. 235.

A partly complete metatarsus collected at Bradenton by J. E. Moore is the first record of this species as a fossil. The specimen comes from a small individual. The snowy heron is fairly common in Florida at the present time, and formerly existed there in large numbers. It has not been recorded previously as a fossil.

HYDRANASSA TRICOLOR (Müller)

Louisiana heron

Ardea tricolor Müller, Vollst. Naturs. Suppl., 1776, p. 111.

The lower end of a right metatarsus comes from the Seminole Field near St. Petersburg.

The present species is here first recorded as a fossil.

¹ Florida Geol. Surv., Ninth Ann. Rep., 1917, pp. 40-41.

FLORIDA CAERULEA (Linnaeus)

Little blue heron

Ardea caerulea Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 143.

This species, common in modern Florida, is represented by the lower end of a right tibio-tarsus and the distal portion of a right femur secured by W. W. Holmes in the Seminole Field.

This heron is here first reported certainly in fossil deposits.

BUTORIDES VIRESCENS (Linnaeus)

Little green heron

Ardea virescens Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 144.

A right metatarsus and the lower end of a left tibio-tarsus were collected in the Seminole Field deposits by W. W. Holmes. The metatarsus measures 51.7 mm. in length.

The green heron is here found fossil for the first time.

NYCTICORAX NYCTICORAX (Linnaeus)

Black-crowned night heron

Ardea nycticorax Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 142.

The lower end of a tibio-tarsus was obtained by J. E. Moore, at Bradenton, and a similar specimen was collected at the Itchtucknee deposit by Mr. and Mrs. H. H. Simpson. This heron, which is common in Florida now, has been found previously in the Pleistocene of Rancho La Brea in California.

NYCTANASSA VIOLACEA (Linnaeus)

Yellow-crowned night heron

Ardea violacea Linnaeus, Sys. Nat., ed. 10, vol. 1, 1758, p. 143.*Larus vero* Shufeldt, Journ. Geol., vol. 25, Jan.-Feb. (Jan.), 1917, p. 18;

Florida State Geol. Surv., Ninth Ann. Rep., 1917, p. 40, pl. 2, fig. 21.

The proximal ends of two left coracoids represent this heron in the material obtained by W. W. Holmes in the Seminole Field.

The type of *Larus vero* Shufeldt, a left metacarpal secured at Vero, Florida (U. S. Nat. Mus. Div. Vert. Pal. No. 8832), on examination proves to be the yellow-crowned night heron. This species has not been recorded before in the Pleistocene.

BOTAURUS LENTIGINOSUS (Montagu)

American bittern

Ardea lentiginosa Montagu, Suppl. Orn. Dict., 1813, text and plate.

Parts of two humeri were obtained by W. W. Holmes in the Seminole area, and of another by J. E. Moore on Hog Creek near Sarasota, Florida. This inhabitant of marshes is widely distributed in Florida at the present time.

Family CICONIIDAE

JABIRU MYCTERIA (Lichtenstein)

Jabiru

Ciconia mycteria Lichtenstein, Abhandl. Kön. Akad. Wiss. Berlin (Phys. Klass.), for 1816-1817, 1819, p. 163.*Jabiru? weillsi* Sellards, Florida State Geol. Surv., 8th Ann. Rep., 1916, p. 146: pl. 26, figs. 1-4, text-fig. 15.

Apparently the great jabiru stork was common in Florida during the Pleistocene as it is represented in the present collections by many fragments of bones from a number of localities. In the Seminole Field near St. Petersburg W. W. Holmes obtained a number of fragmentary specimens, including parts of the tibio-tarsus, coracoid, scapula, ulna, and metacarpus. Most of these are well fossilized though one fragment appears quite modern. A fragment from the head of a tibio-tarsus was obtained by J. E. Moore near Venice. A perfect metacarpal, a coracoid, and part of a metatarsus are found in collections from the Itchtucknee River, Columbia County, in the Florida State Geological Survey. At Melbourne in the excavations on the golf links J. W. Gidley secured the lower end of a right metatarsus, and parts of an ulna and a metacarpus from the Number Two stratum. In the collection made at Melbourne by C. P. Singleton for the Museum of Comparative Zoölogy there are parts of three right and one left tibio-tarsi and both extremities of a right metatarsus with the central part of the shaft gone.

After careful comparison of the type specimen of *Jabiru weillsi*, a right humerus obtained at Vero, Florida, there is nothing evident to separate it from the modern *Jabiru mycteria*. It was differentiated in the original description principally on larger size, but, though large, it is equalled by modern birds in dimension, and is similar to them in its conformation. The original description gives the total length of the type humerus as 280 mm. Since then the bone has been broken and restored, in this process being lengthened until now it is 293 mm.

long, the extra length being obviously due to crushing of the shaft and the separation of these parts. In a previous publication¹ the present writer indicated that *sellardsi* was probably equivalent to modern *mycteria*, a belief that is now substantiated.

The fossil material indicated above shows the same range in individual variation in size as is found in the modern material examined.

The jabiru is also known from the Pleistocene of Cuba.¹

Family THRESKIORNITHIDAE

PLEGADIS sp.

Glossy ibis

The lower end of a left tibio-tarsus from the Seminole Field collected by W. W. Holmes is from a juvenile bird and shows little evidence of fossilization. It is not practicable to determine whether it represents *Plegadis falcinellus* or *P. guarauna*, both of which occur in Florida.

GUARA ALBA (Linnaeus)

White ibis

Scolopax alba Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 145.

The distal ends of right and left humeri, of two right ulnae, and the lower end of a left tibio-tarsus were collected by W. W. Holmes in the Seminole Field. The white ibis is locally common in Florida at the present time.

This ibis is here first reported as a fossil.

Order ANSERIFORMES

Family ANATIDAE

CYGNUS COLUMBIANUS (Ord)

Whistling swan

Anas columbianus Ord, in Guthrie's Geogr., 2d Amer. ed., 1815, p. 319.

The proximal ends of right and left coracoids were obtained by W. W. Holmes in collecting in the Seminole Field. In modern times this swan is found in winter occasionally in Florida, mainly along the Gulf Coast, its principal winter range in eastern North America being farther north.

The whistling swan has been known previously as a fossil only from the Pleistocene beds at Fossil Lake, Oregon.

¹ Amer. Mus. Nov., No. 301, Feb. 29, 1928, pp. 2-3.

CYGNUS BUCCINATOR Richardson

Trumpeter swan

Cygnus buccinator Richardson, Faun. Bor.-Amer., vol. 2, 1831, (1832), p. 464

One entire and three fragmentary humeri, a metacarpal, a coracoid, and a tibio-tarsus are included in the Florida State Geological Survey collections from near the head of the Itchtucknee River in Columbia County (Catalog nos. V-4576; V-4589; V-4599; V-4598, 2 specimens; V-4599 and V-4826). These bones are in an excellent state of preservation, part being dark and part light in color. They agree perfectly with the modern bird, and are larger and stronger than the corresponding bones in the whistling swan. This fine bird, known previously from the Pleistocene of Fossil Lake, Oregon, formerly ranged widely through interior and western North America but at the present time is at so low an ebb of abundance as to be nearly extinct. It wintered formerly from southern Indiana and southern Illinois to Texas but has not been reported previously from Florida.

BRANTA CANADENSIS (Linnaeus)

Canada goose

Anas canadensis Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 123.

From the Seminole Field this goose, a common species on the northern part of the Gulf Coast of modern Florida, is represented by the lower end of a left tibio-tarsus and the distal ends of right and left ulnae. Two ulnae and a broken metacarpal are found in collections in the Florida State Geological Survey from near the head of the Itchtucknee River in Columbia County.

BRANTA CANADENSIS HUTCHINSI (Richardson)

Hutchins' goose

Anser hutchinsii Richardson, Faun. Bor.-Amer., vol. 2, 1831 (1832), p. 470.

In the Holmes collection from the Seminole Field near St. Petersburg there is a distal end of a left ulna of the *Branta* type that is a counterpart of *B. canadensis* except for its smaller size. Part of an ulna comes from the Itchtucknee River, and material secured near Melbourne for the Museum of Comparative Zoölogy by C. P. Singleton includes a right humerus that also has the same characters. These are identified as from the Hutchins' goose, a species rarely recorded from modern Florida. Current custom in recognizing this bird as a subspecies of the Canada goose is here followed though some doubt may be expressed as to whether the two are not specifically distinct.

This form is here identified certainly for the first time in a fossil state, the only previous records being open to question. Shufeldt¹ has recorded it uncertainly from the Pleistocene of Fossil Lake, Oregon, listing it in his final table with a query.²

ANAS PLATYRHYNCHOS Linnaeus

Mallard

Anas platyrhynchos Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 125.

Two humeri of the mallard, strong and robust bones, were collected in the Itchtucknee River deposits in Columbia County by Mr. and Mrs. H. H. Simpson.

Remains of other ducks of the mallard type from the Seminole Field, collected by W. W. Holmes, include parts of humeri, an ulna, a metacarpal, and parts of several coracoids, all in such fragmentary form that it is not expedient to attempt to identify them specifically. Parts of two humeri of similar status were obtained by J. E. Moore near Venice. Probably the black duck and mallard are both represented.

The mallard is a regular migrant to Florida.

ANAS RUBRIPES Brewster

Black duck

Anas obscura rubripes Brewster, Auk, 1902, p. 184.

Collections from the Itchtucknee River, Columbia County, made by Mr. and Mrs. H. H. Simpson, include a humerus and a metatarsus of this species, which has not been recorded previously as a fossil.

Like the mallard the black duck comes regularly to winter in Florida.

ANAS FULVIGULA Ridgway

Florida duck

Anas obscura var. *fulvigula* Ridgway, Amer. Nat., vol. 8, February, 1874, p. 111.

A metacarpal and the proximal and distal ends of two humeri are equal in size to a female of this species and are identified as this bird. These specimens come from the Holmes collection from the Seminole Field. In material obtained by J. E. Moore at Bradenton there is part of another humerus.

¹ Bull. Amer. Mus. Nat. Hist., vol. 32, July 9, 1913, pp. 147, 156, pl. 33, fig. 414.

² See also Shufeldt, Auk, 1913, p. 39, and Science, vol. 37, February 21, 1913, p. 307, where this same record is given as *Branta canadensis hutchinsi* (?).

Collections in the Florida State Geological Survey from near the head of the Itchtucknee River, Columbia County, contain two entire and four broken humeri, a coracoid, and two radii (the last being identified tentatively on basis of agreement in size and contour). Apparently the species was common in that area. These represent the first records for the Florida duck in a fossil state. This species breeds abundantly in Florida at the present time.

NETTION CAROLINENSE (Gmelin)

Green-winged teal

Anas carolinensis Gmelin, Syst. Nat., vol. 1, pt. 2, 1789, p. 533.

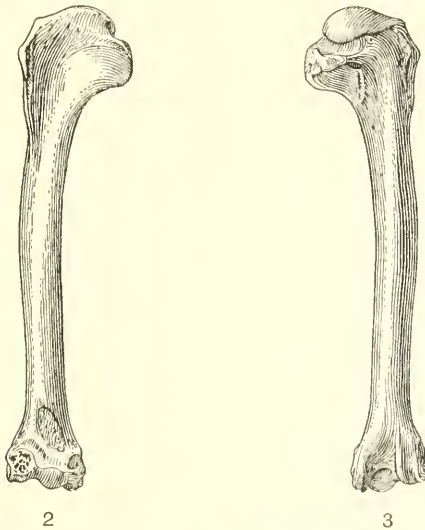
In material collected by W. W. Holmes in the Seminole Field there are parts of two right and two left humeri, of right and left ulnae, and a left coracoid. The humerus in this species is distinctly shorter than in the blue-winged teal.

This duck has been reported previously from the Pleistocene of Oregon, and from several localities in California.

QUERQUEDULA FLORIDANA Shufeldt

Querquedula floridana Shufeldt, Florida State Geol. Surv., Ninth Ann. Rep., 1917, p. 36, pl. I, fig. 4, pl. II, fig. 25.

The type specimen of this teal (figs. 2-3) was collected in stratum Number Two at Vero, Florida, and is now in the collections of the



FIGS. 2-3.—Type of *Querquedula floridana* Shufeldt (natural size).

United States National Museum. While closely similar to the humerus of the living blue-winged teal, *Querquedula discors*, the fossil is heavier and stronger throughout both in the shaft and in the proximal and distal ends. It thus bears out the characters assigned to it in the original description.

In the Holmes collection from the Seminole Field there is one right and one left humerus nearly complete, and the fragments of three or more others that correspond very closely to the type specimen. With them are three broken metacarpals. A portion of a humerus was secured by J. E. Moore near Venice. The proximal half of a right humerus was collected by C. P. Singleton at Melbourne for the Museum of Comparative Zoölogy. There are also a number of bones from the Itchtucknee River deposits, Columbia County, in the collections of the Florida State Geological Survey.

Following are measurements of the four complete humeri at hand.

Type, Vero, Florida, total length 65.8, transverse diameter through trochleae 9.9, transverse diameter through head 16.1, transverse diameter of shaft at center 5.4 mm.

Two specimens, Seminole Field, total length 65.7-70.2, transverse diameter through trochleae 10.3-10.5, transverse diameter through head 15.3-15.6, transverse diameter of shaft at center 5.1-5.3 mm.

Three modern *Querquedula discors*, two males and one female, measure as follows: total length 65.4, 65.9, 61.8, transverse breadth through trochleae 9.7, 10.0, 9.2, transverse breadth through head 13.8, 14.0, 13.1, transverse diameter of shaft at center 4.7, 4.8, 4.6 mm.

NYROCA VALISINERIA (Wilson)

Canvasback

Anas valisineria Wilson, Amer. Orn., vol. 8, 1814, p. 103, pl. 70, fig. 5.

A complete ulna is found in collections made by Mr. and Mrs. H. H. Simpson on the Itchtucknee River in Columbia County.

This species in Florida is a winter migrant from the north.

NYROCA AFFINIS (Eyton)

Lesser scaup duck

Fuligula affinis Eyton, Monogr. Anatidae, 1838, p. 157.

A left humerus collected in the Number Two bed at Melbourne by J. W. Gidley in 1926, with a right metatarsus in the Holmes collection from the Seminole Field, part of an ulna obtained near Venice by J. E. Moore, and four complete and one fragmentary humeri, two

ulnae, a metacarpal, and a tibio-tarsus from the head of the Itchtucknee River, Columbia County, constitute definite record of this duck. Some miscellaneous fragments from near St. Petersburg belong probably to this species but cannot be certainly identified. There is also a complete ulna from Saber-tooth Cave near Lecanto, collected in 1928 by W. W. Holmes. These form the only certain Pleistocene records for this duck which is found in abundance in Florida during winter at the present time.

ERISMATURA JAMAICENSIS (Gmelin)

Ruddy duck

Anas jamaicensis Gmelin, Syst. Nat., vol. 1, pt. 2, 1789, p. 519.

The ruddy duck is represented by a metacarpal collected near Venice by J. E. Moore. This species is a common visitor to Florida during the winter.

LOPHODYTES CUCULLATUS (Linnaeus)

Hooded merganser

Mergus cucullatus Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 129.

A humerus was obtained on the Itchtucknee River, Columbia County, by Mr. and Mrs. H. H. Simpson.

Order FALCONIFORMES

Family CATHARTIDAE

CATHARTES AURA AURA (Linnaeus)

Mexican turkey vulture

Vultur aura Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 86.

In the Holmes collection from the Seminole Field there is the distal end of a right tibio-tarsus and the shaft of a left coracoid of a turkey vulture that are decidedly smaller than these bones in the modern bird of the United States, but that agree exactly in dimension with a specimen of the Mexican form from Matamoras. They are identified as typical *aura* which is here first recorded from within the limits of the United States, its modern range being from Mexico south to Panama and Columbia, including Cuba and Jamaica. The transverse breadth of the distal end of the tibio-tarsus in the Pleistocene specimen is 11.0 mm. The modern specimen of *aura* from Matamoras (U. S. N. M. 1442) is exactly similar. In a series of eight modern birds of *septentrionalis* from Florida, Virginia, Maryland, and Penn-

sylvania this measurement ranges from 12.2 to 13.1 mm. with an average of 12.6 mm. The fossil bone in form is exactly like the modern *aura*.

The existence of remains of two evidently distinct races of the turkey vulture in the Pleistocene deposits of Florida, of which one is now northern and the other southern in range is puzzling. Since the two forms are found in different deposits, *septentrionalis* coming from Vero and Melbourne on the east coast and Lecanto in the central part of the state, and *aura* from near St. Petersburg, if it is assumed that the record of *aura* is not due to a stray individual out of its normal range, it seems probable that the bone deposits in question were formed at different periods during the Ice Age.

CATHARTES AURA SEPTENTRIONALIS Wied

Turkey vulture

Cathartes septentrionalis Wied, Reis. Nord-Amer., vol. 1, 1839, p. 162.

The distal part of a left ulna obtained near Melbourne by C. P. Singleton in 1928 for the Museum of Comparative Zoölogy, and a fragment of a left metacarpal collected by W. W. Holmes in Saber-tooth Cave at Lecanto, Florida, are similar in size to the turkey vulture found today in Florida. Shufeldt¹ has reported this bird from Vero, Florida, and from his figured specimen it is evident that the large northern bird was the one represented.

This form ranges today throughout the greater part of the United States, being absent only in the north, and has had extended range for a long period of time, since it is known from the Pleistocene deposits of California.

CORAGYPS URUBU (Vieillot)

Black vulture

Uultur urubu Vieillot, Ois. Amer. Sept., vol. 1, 1807, p. 23, pl. 2.

Numerous fragments of bone from the Seminole Field include parts of metatarsus, tibio-tarsus, coracoid, humerus, and metacarpal, while from Saber-tooth Cave at Lecanto there are two bones, the distal part of a tibio-tarsus and the upper portion of a metatarsus, the latter from a juvenile individual. All this material was collected by W. W. Holmes. These remains are similar in size and form to those of modern individuals.

¹Journ. Geol., 1917, p. 18; Florida State Geol. Surv., Ninth Ann. Rep. 1917, p. 36, pl. 1, fig. 2.

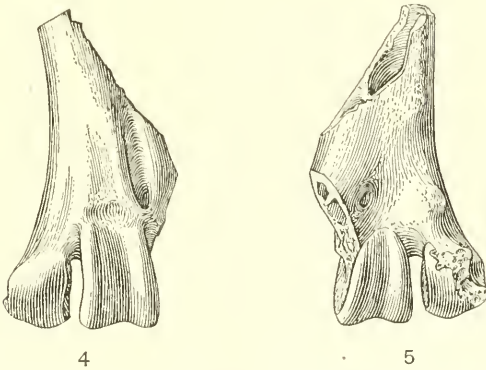
The greater abundance of remains of the black vulture over those of the turkey vulture in these deposits is worthy of comment as indicating possibly the relative abundance of these two birds during the Pleistocene. The black vulture is first known as a fossil from this area.

GYMNOGYPS CALIFORNIANUS (Shaw)

California condor

Vultur californianus Shaw, Nat. Misc., vol. 9, 1797, pl. 301.

In the material secured on Hog Creek, near Sarasota, Florida, by J. E. Moore in 1928, there is part of the distal end of a left metatarsus (see pl. 4, and figs. 4-5) that agrees so exactly in form and



FIGS. 4-5.—Fragmentary metatarsus of California Condor (*Gymnogyps californianus*) from near Sarasota (natural size).

dimension with two modern specimens of the California condor that there is no hesitancy in identifying it as that species. It may be remarked that *Gymnogyps* has the middle trochlea of the metatarsus decidedly smaller than the South American condor *Vultur*, this serving to distinguish the metatarsus in these two genera without difficulty.

In collecting in the Seminole area W. W. Holmes obtained a bit of a right humerus comprising the ulnar trochlea with the adjacent external parts, and the distal end of a right radius that are identified as remains of this species.

The previously known range of the California condor has been entirely western as it has been found living in the coast ranges of California from Santa Clara County south into northern Lower California, ranging in earlier days north to the Columbia River. Though

it has been reported casually east to Arizona, according to Swarth¹ these records lack confirmation. Miller² has identified an ulna from cave deposits of uncertain age near Las Vegas, Nevada. The same author³ in writing of the occurrence of this species in the Pleistocene asphalt beds of Rancho La Brea at Los Angeles, California, says that it is the most common of the American vultures in these deposits, its remains occurring in almost incredible abundance. With large series of Pleistocene material for examination he found remarkable uniformity when compared with bones from modern specimens.

The report of this species from the Pleistocene of Florida is the first note of the occurrence of a condor-like bird in eastern North America and gives an entirely unexpected extension of range for this species during the Ice Age. Discovery of further remains will be awaited with interest.

Family TERATORNITHIDAE

TERATORNIS MERRIAMI L. H. Miller

Teratornis

Teratornis merriami L. H. Miller, Univ. California Publ. Geol., vol. 5, September 10, 1909, p. 307, figs. 1-9.

Among fossils collected by W. W. Holmes in the Seminole area there were found a number of small fragments of bones from what was evidently a very large form of bird. After some study it was clear that these were from some large vulture so that on preliminary examination they were placed among remains assigned to the condors. Critical study indicated certain puzzling differences from both the California and the South American condors and it was with much surprise that they were found to come from the great *Teratornis* known previously only from California where its remains have been found in the asphalt deposits at Rancho La Brea, McKittrick and Carpinteria.

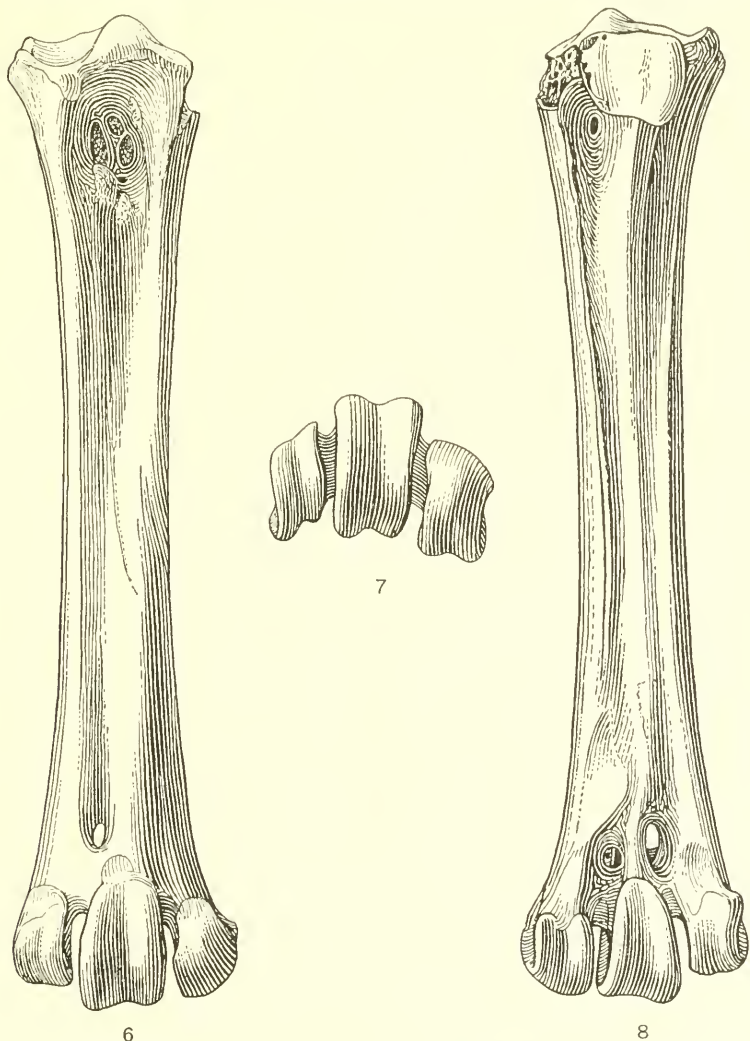
As stated above the remains from the Holmes collection are all highly fragmentary. The distal end of a left ulna (figs. 9-11), one of the most characteristic bits, agrees minutely in its somewhat intricate details with two specimens of *Teratornis* from California. Two bits of humeri include the articular surface of the head and the radial trochlea of a left humerus. There are further the distal ends

¹ Pac. Coast Avif., No. 10, May 25, 1914, p. 83.

² Condor, 1931, p. 32.

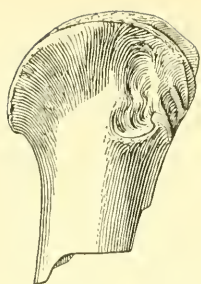
³ Carnegie Inst., Washington, Publ. No. 349, August, 1925, p. 81.

of left and right radii and the lateral facets from the head of a left coracoid. These likewise in size and detail are like the corresponding parts in *Teratornis*. In fact the agreement is so close that there is no basis for differentiating the Florida bird from that of California.

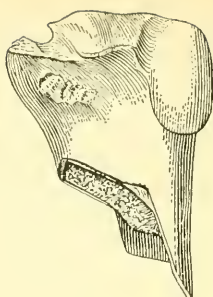


FIGS. 6-8.—Metatarsus of *Teratornis merriami* from Bradenton (natural size).

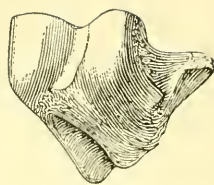
With the material described above at hand it has been highly gratifying to find in specimens collected by J. E. Moore at Bradenton a nearly complete metatarsus (pl. 5, and figs. 6-8) and a broken femur (fig. 12) that likewise agree in close detail with the bird of California.



9



10



11

FIGS. 9-11.—Distal end of ulna of *Teratornis merriami* from the Seminole area (natural size).

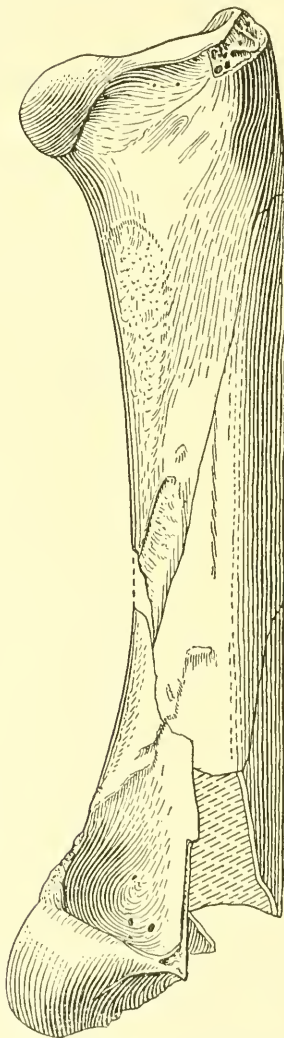


FIG. 12.—Femur of *Teratornis merriami* from Bradenton (natural size).

The femur was in a fragile condition and was received in several pieces. These have been so skillfully joined by N. H. Boss that they illustrate well the form of the bone.

The identification of this form from Florida is one of the most unexpected results of this study of the Pleistocene from Florida and indicates a wide range in Pleistocene times for this peculiar bird.

Family ACCIPITRIDAE

BUTEO JAMAICENSIS (Gmelin)

Red-tailed hawk

Falco jamaicensis Gmelin, Syst. Nat., vol. 1, pt. 1, 1788, p. 266.

The red-tailed hawk is represented in the W. W. Holmes collection from the Seminole Field by the distal end of a left metatarsus, the lower ends of two left tibio-tarsi, and a left coracoid. J. E. Moore secured part of an ulna near Venice. Gidley collected the lower portion of a left humerus in the lower part of the Number Two bed on the golf links at Melbourne. The species occurs today in Florida, and has been recorded previously as fossil in the Pleistocene of California.

The red-tailed hawk has been known for many years as *Buteo borealis*, the original reference being *Falco borealis* Gmelin, Syst. Nat., vol. 1, pt. 1, 1788, p. 266, where it is species No. 75. The preceding species, No. 74, *Falco jamaicensis* on the same page is based on the cream-colored buzzard of Latham¹ described from a specimen from Jamaica, evidently an immature of the red-tailed hawk. As the name *jamaicensis* comes first on the page in question in Gmelin's work it will replace the familiar *borealis* as the specific name for this hawk.

BUTEO LINEATUS (Gmelin)

Red-shouldered hawk

Falco lineatus Gmelin, Syst. Nat., vol. 1, pt. 1, 1788, p. 268.

The red-shouldered hawk was apparently as common in Pleistocene times as today, for it is represented by a number of fragmentary bones. Holmes obtained a left humerus lacking the head and the distal ends of two tibio-tarsi from the Seminole area. J. E. Moore secured part of a metatarsus near Venice. In excavations on the golf links at Melbourne Gidley secured a nearly complete left metatarsus in 1926, a fragment of another in 1928, and a broken left femur in 1930. The red-shouldered hawk is represented in modern Florida by a resident form *Buteo lineatus alleni* that besides differing in color

¹ Gen. Syn. Birds, vol. 1, pt. 1, 1781, p. 49.

from the northern race is slightly smaller, and by a migrant form *Buteo lineatus lineatus* that is present in winter and is slightly larger. The specimens from the west coast are from slightly smaller birds than those from Melbourne, suggesting that possibly two forms are presented in the fossil material. This cannot be definitely decided from the bones now at hand.

The red-shouldered hawk is here first recorded in fossil form.

BUTEO PLATYPTERUS (Vieillot)

Broad-winged hawk

Sparvius platypterus Vieillot, Tabl. Encycl. Méth., vol. 3, 1823, p. 1273.

In the Seminole Field in Pinellas County, W. W. Holmes obtained the distal end of a left humerus, and the proximal part of a left metacarpus. This species has not been recorded previously as a fossil.

The broad-winged hawk today is a winter visitor to Florida arriving from the north in October and departing in March.

GERANOÆTUS sp.

Eagle

The distal ends of three ulnae obtained by W. W. Holmes in the Seminole Field come from an eagle of this genus, which was represented in the Pleistocene of California by two species *G. fragilis* and *G. grinnelli* and of which there is one living species *G. melanoleucus* in South America. The bones from Florida agree in size with the latter. The material is considered too fragmentary to warrant specific determination at the present time. The genus is here first recorded from eastern North America.

HALIAEETUS LEUCOCEPHALUS (Linnaeus)

Bald eagle

Falco leucocephalus Linnaeus, Syst. Nat., ed. 12, vol. 1, 1766, p. 124.

The bald eagle is represented by fragments from the Seminole Field, and by two broken radii from Saber-tooth Cave, near Lecanto, collected by W. W. Holmes, as well as by part of an ulna collected near Venice by J. E. Moore and a number of bones from near Melbourne, obtained by Gidley and Singleton. The collection made by Singleton for the Museum of Comparative Zoölogy contains part of a metacarpal. Several of the Melbourne specimens are practically complete, and show no differences from the modern bird which is common at present in Florida.

PANDION HALIAËTUS (Linnaeus)

Osprey

Falco haliaëtus Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 91.

A nearly complete left metatarsus was obtained by J. W. Gidley on April 5, 1929, in the Number Two bed at Melbourne where it was associated with remains of a peculiar extinct bear, *Arctodus floridanus*. In 1930 a femur was secured in the Itchtucknee deposits by Mr. and Mrs. H. H. Simpson. These are the first reports of the osprey in the Pleistocene of our continent.

Family FALCONIDAE

POLYBORUS CHERIWAY (Jacquin)

Audubon's caracara

Falco (cheriway) Jacquin, Beytr. Gesch. Vögel, 1784, p. 17, pl. 4.

On the golf course near Melbourne, Gidley collected an ulna that is identical with that of modern birds. On the west coast W. W. Holmes obtained numerous remains in the Seminole Field, these including parts of humeri, ulnae, a femur, a tibio-tarsus, and several metatarsi. Two fragmentary humeri and the lower end of a tibio-tarsus are similar in size to small modern specimens of the caracara from Florida. Parts of four metatarsi agree in having the distal trochleae distinctly smaller than in any of the three modern birds seen. Ulnae and part of a femur also seem smaller than usual. It will be recalled that two subspecies of this caracara are now recognized, *Polyborus cheriway cheriway* of northern South America, and *Polyborus cheriway auduboni* of Florida and the southwestern part of the United States south into Mexico, the former being smaller in size. The smaller fossil bones here under discussion seem to show approach to the modern race of South America.

Remains of the caracara are common in the Pleistocene deposits of California but are here reported for the first time outside that State. In Florida the species at the present time is peculiar to the prairies of the Okeechobee and Kissimmee regions, where it is locally common.

FALCO SPARVERIUS Linnaeus

Sparrow hawk

Falco sparverius Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 90.

Material collected in Saber-tooth Cave at Lecanto, Florida, in 1928 by W. W. Holmes includes parts of right and left tibio-tarsi of this species, a common bird in this area at the present time.

Order GALLIFORMES

Family PERDICIDAE

COLINUS VIRGINIANUS (Linnaeus)

Bob-white

Tetrao virginianus Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 161.

In material collected by W. W. Holmes in the Seminole area remains of the quail may be said to be common since this species is represented by six humeri more or less complete and part of an ulna. It is likewise common in the collection from Saber-tooth Cave near Lecanto where two humeri, a metatarsus and two femora were obtained. In excavations on the golf links at Melbourne in February, 1928, Gidley secured two humeri at the line of contact between stratum Number One and stratum Number Two.

These bones all appear similar to those of modern quail. The species is abundant in Florida, and has been previously reported as a fossil from Pleistocene cavern deposits in Tennessee.

Family MELEAGRIDIDAE

MELEAGRIS GALLOPAVO Linnaeus

Turkey

Meleagris gallopavo Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 156.

Ardea sellardsi Shufeldt, Journ. Geol., Jan.-Feb. (publ. Jan.), 1917, p. 19.

In the series of bird bones obtained in the Seminole area, Pinellas County, by W. W. Holmes, remains of the wild turkey far outnumber those of any other species represented; they include 98 fragments of metatarsi, tibio-tarsi, femora, coracoids, humeri, ulnae, and metacarpi. Most of these have been broken into small bits. The specimens exhibit the usual variation in size found in series of wild turkey bones, and do not differ from modern specimens. In the material collected on Hog Creek, near Sarasota, by J. E. Moore in 1928 there is included parts of a femur and a tibio-tarsus, the latter considerably worn. The proximal end of a metatarsus has been forwarded by Mr. Moore as taken at Bradenton. In Saber-tooth Cave near Lecanto Holmes obtained a single spur core from the metatarsus of a male individual. Collections in the Florida State Geological Survey from near the head of the Itchtucknee River, Columbia County, include metatarsi, femora, humerus, ulnae, and other bones, all more or less

fragmentary, and part of a sternum. There is part of a metatarsus in the same collections from the north bank of the canal between the Florida East Coast Railroad and the highway at Vero. Gidley collected a broken metatarsus near Melbourne March 1, 1928, and Singleton in the same year working in this same deposit for the Museum of Comparative Zoölogy secured parts of humerus, metatarsus, and tibio-tarsus. The wild turkey must have been abundant in Florida during the Ice Age.

The type specimen of *Ardea sellardsi* Shufeldt,¹ the distal end of a right tibio-tarsus, proves on examination to be from a wild turkey. The bone is from an individual apparently barely adult and of small size, possibly from a young female. The condyles are worn and abraded in such a manner as to mask their true form, leading to error in the earlier identification. The type in question is equalled in size by the smallest in a considerable series of modern wild turkey bones examined. *Ardea sellardsi* thus becomes a synonym of *Meleagris gallopavo*. The specimen was taken in Pleistocene deposits in stratum Number Three, near Vero, Florida.

MELEAGRIS TRIDENS sp. nov.

Characters.—Metatarsus (pl. 6, and fig. 13) similar to that of *Meleagris gallopavo* Linnaeus² but male with three-pointed spur core.

Description.—Type, U. S. Nat. Mus. No. 12052. Central portion of shaft of right metatarsus, collected by W. W. Holmes, in the Seminole area, Pinellas County, Florida. Shaft strong, flattened antero-posteriorly below, and more rounded above; anterior face with a wide, shallow groove that becomes obsolete at level of central spur; below this the anterior face is ridged and shallowly grooved by tendons leading to the toes; external side of shaft rounded; internal side more flattened, spurs rising from a common base in a broad buttress of bone projecting obliquely inward from the inner side of the posterior surface; central spur strong and heavy (tip partly broken away); with an accessory spur above and below of smaller size, the upper one slightly more acute than a right triangle in outline, relatively broad transversely, with the distal extremity widened laterally so that in form it is like a cog in a cogwheel; distal accessory spur longer, more slender, with a conical, rather sharp point; outer surface of buttress supporting spurs broadly grooved for the passage of tendons that in life passed down the back of the metatarsus; a distinct, rather narrow,

¹ Journ. Geol., Jan.-Feb. (publ. Jan.), 1917, p. 19. See also Florida State Geol. Surv., 1917, Ninth Ann. Rep., pp. 38-39, pl. 2, fig. 15.

² *Meleagris gallopavo* Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 156.

shallow groove across the base of the spur core buttress on the anterior side, to allow passage of another tendon. Bone brown in color, well fossilized.

Remarks.—In size and form the specimen here described is similar to the ordinary turkey, *Meleagris gallopavo*, except for the three points of the spur core. Description of it as a new species has been withheld for 2 years to allow careful consideration of its peculiarities. These are susceptible of three interpretations: (1) that the bone is pathological and therefore aberrant, (2) that it is simply an individual variant, and (3) that it represents a distinct species.

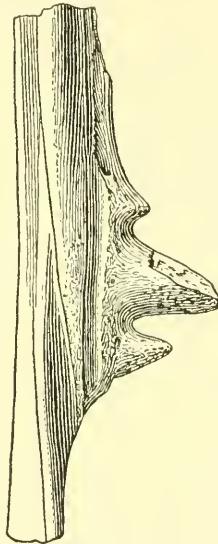


FIG. 13.—Fragmentary metatarsus (type) of *Meleagris tridens* (natural size).

With regard to the first it needs only casual inspection to determine that the entire bone, including the spur cores is entirely normal and without any indication of disease. The very regularity and symmetry of its development indicate that the increased number of spurs is not due to any injury. As for the second supposition, in the past two years the writer has examined critically all of the specimens of wild turkeys that have been available to him, has seen the tarsal bones of a considerable number, one hundred or more, that have come from Indian pueblos in the Southwest and elsewhere, has seen several hundreds of domestic turkeys, and has talked with persons who have reared domestic turkeys for years without learning of any instance where a male turkey had more than a single spur. Under these circumstances

it has seemed entirely logical to consider this specimen as representative of a peculiar species. Among numerous other tarsal bones in the material from the Florida Pleistocene it stands unique, indicating probable rarity. It is possible that some of the bones from other parts of the skeleton that have been identified as *Meleagris gallopavo* belong to *M. tridens* but this cannot be determined.

It may be remarked that multiple spurs are not unusual among gallinaceous birds of the Old World, though hitherto unknown in any American species. The pheasants of the genus *Ithaginis* regularly have two or more pairs of spurs in the male. The same is true of *Polyplectron*, while according to Ogilvie-Grant¹ duplicate spurs occur in *Haematortyx*, *Caloperdix*, and *Galloperdix*. The vulturine guinea fowl, *Acryllium vulturinum*, frequently has two to four lumpy spur-like processes on the tarsus.

The type of *Meleagris tridens* is so fragmentary that it affords few measurements. The transverse diameter of the shaft just below the spurs is 9.0 mm. The buttress supporting the spurs is 30.6 mm. long. The form may be ascertained from the accompanying figure.

Order GRUIFORMES

Family GRUIDAE

GRUS AMERICANA (Linnaeus)

Whooping crane

Ardea americana Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 142.

Remains of cranes obtained by W. W. Holmes in the Seminole Field, Pinellas County, include fragments of metacarpus, tibio-tarsus and femur, and of three ulnae. Two fragmentary ulnae and one radius are in the collections of the Florida State Geological Survey from the Ichucknee River area in Columbia County. Gidley collected part of an ulna from stratum Number Two at Melbourne in 1930, and Singleton secured part of another ulna in the same beds in June, 1929, when collecting for the Museum of Comparative Zoölogy. All are easily distinguished from the bones of other cranes found with them by their much greater size.

Though the whooping crane was recorded from Florida by early ornithologists, in recent years doubt has been cast upon these reports and the species seems not to have been certainly found in modern

¹ Cat. Birds Brit. Mus., vol. 22, 1893, pp. 221, 222, 260.

times south of Georgia. These records from the Pleistocene are therefore of exceptional interest. This species is now nearly extinct, only a few individuals being known to exist in the interior of our country. It has not been recorded previously as a fossil.

GRUS CANADENSIS (Linnaeus)

Gray crane

Ardea canadensis Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 141.

Remains of gray cranes are common in the deposits at Melbourne and in the Seminole area, and contain representatives of two forms, one large in size and the other small. The large form has the dimensions of *Grus canadensis pratensis* Meyer, the Florida crane, which is resident in Florida today, and is supposed to be that race. There is now recognized however another race, *Grus canadensis tabida* Peters, of more northern and western range that resembles *pratensis* in size, but differs in coloration, so that there is no certainty as to the form that ranged in Florida during the Pleistocene. This larger bird is represented in the Pleistocene collections by a coracoid, a femur, and part of a metacarpal, all secured by Gidley near Melbourne, and the head of a metatarsus and the symphysis of a lower mandible collected by Holmes in the Seminole area, as well as by part of a tibio-tarsus secured by Moore at Bradenton.

The smaller race from the Florida Pleistocene has the dimensions of the little brown crane, *Grus canadensis canadensis*, that now ranges in the western half of the United States, and might be supposed to be that form were it not that the Cuban crane, *Grus canadensis nesiotis*, is a bird of equally small dimension. In fact the differences between *G. c. canadensis* and *G. c. nesiotis* seem to rest on color characters that appear not to have been definitely worked out. The small form is represented in the Pleistocene collections at hand by the distal end of a humerus, parts of two radii, and two coracoids from Melbourne, obtained by Gidley, and the distal end of a humerus secured by Holmes in the Seminole area.

The occurrence of these two races in the Pleistocene of Florida is suggestive of the modern condition in the western part of the United States, where a large gray crane and a small one occur together during migration over a considerable area.

Family ARAMIDAE

ARAMUS PICTUS (Meyer)

Limpkin

Tantalus pictus Meyer, Zool. Ann., vol. 1, 1794, p. 287.

The distal end of a left humerus was collected by W. W. Holmes in the Seminole area. Parts of five metatarsi and a broken tibiotarsus are found in collections from the Itchtucknee River deposits in Columbia County, the specimens being in the Florida State Geological Survey. All these are similar to the corresponding bones in modern birds. The species is of regular occurrence in Florida at the present time. It has not been recorded previously as a fossil.

Family RALLIDAE

RALLUS ELEGANS Audubon

King rail

Rallus elegans Audubon, Birds Amer. (folio), vol. 3, 1834, pl. 203.

In the Seminole area W. W. Holmes secured a complete right femur, and Mr. and Mrs. H. H. Simpson obtained a humerus in the Itchtucknee beds in Columbia County. These bones of this species are distinguished from the clapper rail by larger size.

This rail, common in Florida now, inhabits mainly fresh-water marshes. It has not been recorded previously as a fossil.

RALLUS LONGIROSTRIS Boddaert

Clapper rail

Rallus longirostris Boddaert, Tabl. Planch. Enl., 1783, p. 52.

The distal end of a humerus comes from the Seminole area, collected by W. W. Holmes. The clapper rail is a sedentary species inhabiting salt-water marshes that is common at the present time along the coast of Florida, where several subspecies, slightly differentiated from one another, occur in different geographic areas.

It has not been reported previously as a fossil.

ARAMIDES CAJANEA (Müller)

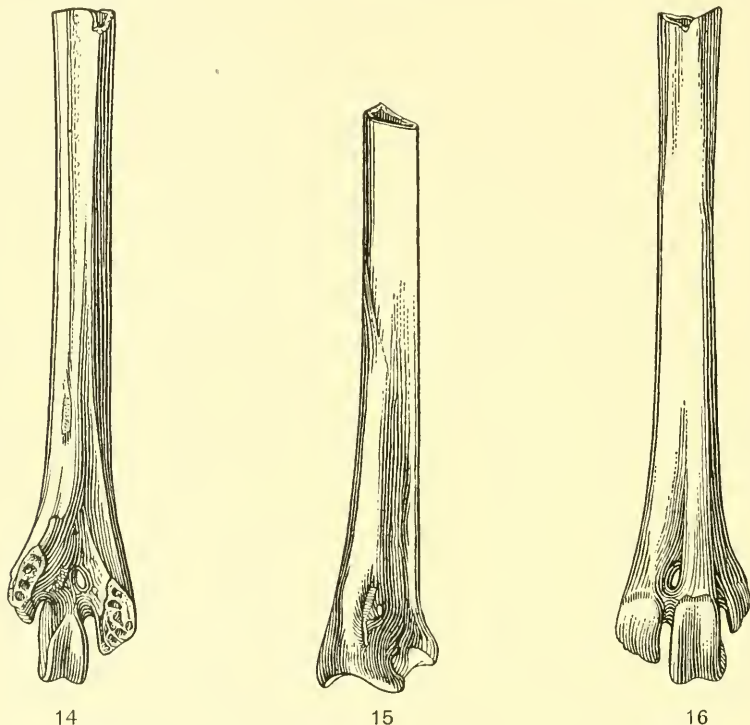
Wood rail

Fulica cajanea Müller, Vollst. Nat. Suppl., 1776, p. 119.

The determination of two fragmentary metatarsi (see figs. 14-16) and a nearly complete femur collected by W. W. Holmes in the Seminole area as belonging to a form of wood rail, a group of birds comprising several forms that range now from southeastern Mexico south

to Argentina, has been another of the unexpected finds in the present collection. The two metatarsal bones are well fossilized, one being black in color and the other brown. The femur contains somewhat less mineral.

Identification to species of these bones has been difficult owing to lack of material for comparison. That they are not related to the large *A. ypecaha* and *A. saracura* of the area from southern Brazil southward is obvious. Likewise it is evident on close study that they



FIGS. 14-16.—Metatarsi of the wood rail *Aramides cajanca* from the Seminole area (natural size).

are from a bird larger than *A. axillaris* and its allies, which are among the smallest forms of the group. They are smaller than *albiventris*, but agree with *A. cajanca*, which now ranges in two or more subspecies from Panama southward into Brazil, and are identified as of that group on this basis. The genus has not been previously recorded north of southeastern Mexico nor has it been previously encountered as a fossil. Its occurrence in the Pleistocene of Florida is quite in keeping with the various types of mammals of South American affinity that come from these same beds.

GALLINULA CHLOROPUS (Linnaeus)

Gallinule

Fulica chloropus Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 152.

Parts of four humeri were collected by W. W. Holmes in the Seminole field on the west coast, and another humerus was secured on the Itchtucknee River, Columbia County, by Mr. and Mrs. H. H. Simpson. The species, abundant in present day Florida, has not been recorded previously as a fossil.

FULICA AMERICANA Gmelin

Coot

Fulica americana Gmelin, Syst. Nat., vol. 1, pt. 2, 1789, p. 704.

Bones of this species collected in the Seminole area by W. W. Holmes include one entire and two fragmentary humeri and the distal ends of two tibio-tarsi. Parts of a humerus and a coracoid were obtained by J. E. Moore at Bradenton. A number of other limb bones are found in the collections of the Florida State Geological Survey from the Itchtucknee River area in Columbia County.

The coot is found now in abundance in Florida in winter and a few remain to nest during summer. The species has been reported previously from the Pleistocene of Oregon.

Order COLUMBIFORMES

Family COLUMBIDAE

ZENAIDURA MACROURA (Linnaeus)

Mourning dove

Columba macroura Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 164.

Two metacarpals and the proximal end of an ulna from the Seminole Field, obtained by W. W. Holmes, are in size similar to the modern forms of the mourning dove of North America, being larger than the bird of the West Indies.

Order STRIGIFORMES

Family TYTONIDAE

TYTO ALBA (Scopoli)

Barn owl

Strix alba Scopoli, Annus I. Hist.-Nat., 1769, p. 21.

In the collection obtained by W. W. Holmes in Saber-tooth Cave at Lecanto in 1928 there are a number of fragmentary bones of the

barn owl, including parts of the femur, tibio-tarsus, metatarsus, and ulna. The species is quite common in modern Florida.

Family STRIGIDAE

OTUS ASIO (Linnaeus)

Screech owl

Strix asio Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 92.

Parts of two humeri of the screech owl were collected by W. W. Holmes in Saber-tooth Cave near Lecanto. This bird is common and widely distributed in Florida.

STRIX VARIA Barton

Barred owl

Strix varius Barton, Fragm. Nat. Hist. Penn., 1799, p. 11.

The barred owl, a common species in Florida at the present time, seems to have had equally wide distribution during the Pleistocene. In the Seminole area W. W. Holmes obtained a number of fragments including parts of the metatarsus, humerus, ulna, and metacarpus. In the excavation of Saber-tooth Cave at Lecanto Mr. Holmes further obtained a nearly complete femur. J. W. Gidley secured part of a metatarsus in the golf links area at Melbourne. The species has not been previously recorded as a fossil.

Order PASSERIFORMES

Family CORVIDAE

CORVUS BRACHYRHYNCHOS Brehm

Crow

Corvus brachyrhynchos Brehm, Beitr. Vogelk., vol. 2, 1822, p. 56.

Numerous remains of the common crow were secured by W. W. Holmes in the Seminole area, indicating that this species was as common during the Pleistocene as it is in Florida at the present time. Crows have been recorded previously from Ice Age deposits in California but not before from the Pleistocene of eastern North America.

CORVUS OSSIFRAGUS Wilson

Fish crow

Corvus ossifragus Wilson, Amer. Orn., vol. 5, 1812, p. 27, pl. 37, fig. 2.

A humerus, lacking the head, was obtained by W. W. Holmes in the Seminole area, this being the first report of this species for the

Pleistocene. The bone is similar to that of the common crow but is decidedly smaller. The fish crow is widely distributed through the Florida Peninsula today.

Family ICTERIDAE

AGELAIUS PHOENICEUS (Linnaeus)

Red-winged blackbird

Oriolus phoeniceus Linnaeus, Syst. Nat., ed. 12, vol. 1, 1766, p. 161.

A right humerus lacking the distal end, and a left one with part of the head missing, were secured in the Seminole area by W. W. Holmes. This is a common resident of marshes throughout much of North America and abounds today in Florida. It has not been identified certainly before from the Pleistocene.

MEGAQUISCALUS MAJOR (Vieillot)

Boat-tailed grackle

Quiscalus major Vieillot, Nouv. Dict. Hist. Nat., vol. 28, 1819, p. 487.

The proximal portion of a right humerus found by W. W. Holmes in the Seminole area comes from an individual of small size. These grackles are common in Florida, ranging mainly about water. The species has not been recorded before from the Pleistocene.

QUISCALUS QUISCULA (Linnaeus)

Crow blackbird

Gracula quiscula Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 109.

A nearly complete left humerus secured by W. W. Holmes in the Seminole Field comes from an individual of small size. This grackle, common in modern Florida, has not been recorded previously from the Pleistocene.



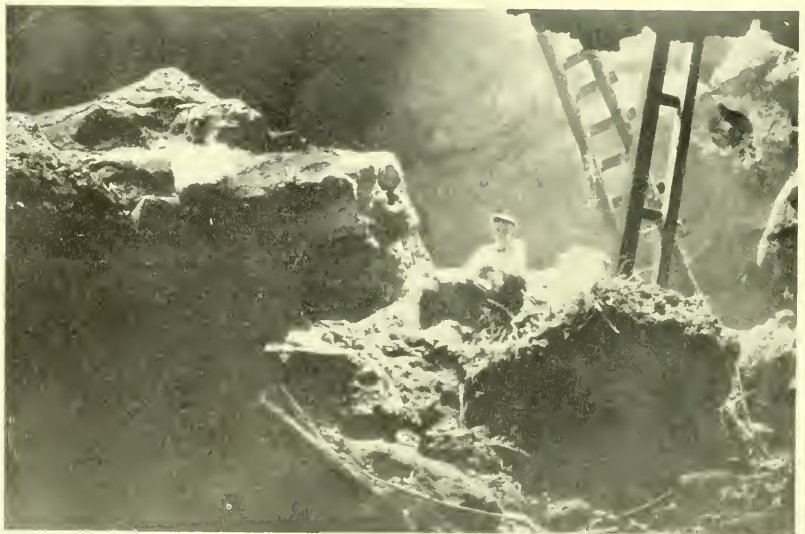
1. General view of the Seminole area with excavation in foreground.
Photograph by W. W. Holmes.



2. Stratification in excavation at Seminole with the bone bearing layer indicated by two trowels at center. Photograph by W. W. Holmes.



1. Entrance to Saber-tooth Cave near Lecanto, Fla.



2. Excavations in Saber-tooth Cave.



1. Stratification at Melbourne, the bone bearing layer being the dark band through the center. Photograph by J. W. Gidley.



2. Excavations on the golf links at Melbourne, Fla. Photograph by J. W. Gidley.



At left fragmentary metatarsus of California condor, collected by J. E. Moore at Venice, Fla., compared with modern specimen at right. (Natural size.)



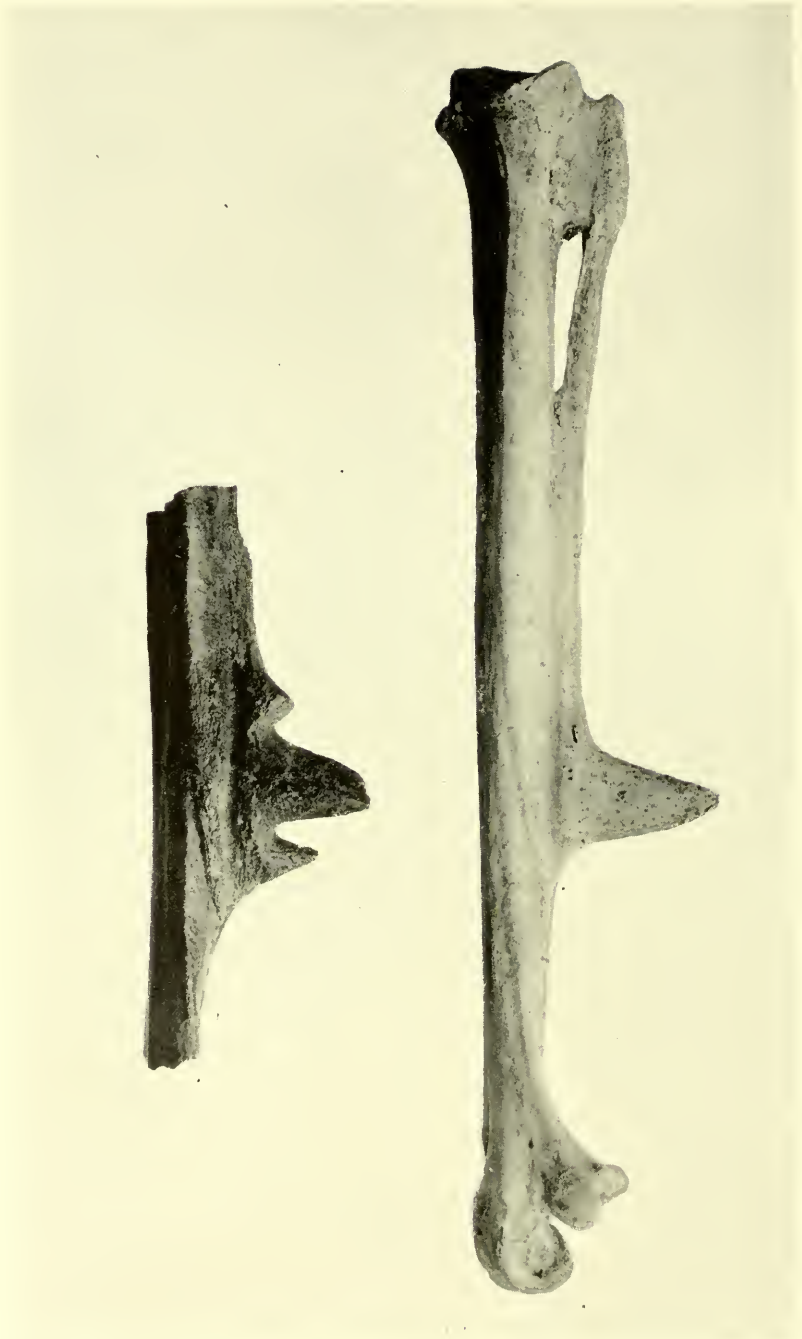
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1. Metatarsus of *Teratornis merriami* obtained by J. E. Moore at Bradenton, Fla.
(Natural size.)



2

2. Femur of *Teratornis merriami* obtained by J. E. Moore at Bradenton, Fla.
(Natural size.)



At left type of *Melcagris tridens*, compared with metatarsus of modern male *Melcagris gallopavo merriami*. (Natural size.)