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**THE PLEISTOCENE AVIFAUNA
OF ARREDONDO, FLORIDA**

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THE PLEISTOCENE AVIFAUNA OF ARREDONDO, FLORIDA

PIERCE BRODKORB¹

SYNOPSIS: An extensive fauna of Pleistocene vertebrates occurs at Arredondo, Florida. The bone bed lies in a fresh water clay which is here named the Arredondo clay member of the Wicomico formation. The geographic extent of this member includes 10 localities in 3 counties of northern Florida. The sediments were deposited below the present 100-foot contour under cooler climatic conditions during the Illinoian glacial stage. The environment included a fresh water marsh community with nearby scrub. The avifauna of 43 species includes forms still living, interglacial relicts, and glacial indicators. Five living species of birds are added to the fossil record, and six others to the Pleistocene fauna of Florida. Four species are described as new: *Falco readei*, *Colinus sullivanii*, *Dorypaltus prospatus* (n. gen., Charadriidae), and *Cremaster tythus* (n. gen., Icteridae). The name *Podilymbus magnus* Shufeldt is revived. *Limicolavis pluvianella* Shufeldt, from the Oligocene of Oregon, is removed from the Charadriidae; it must be left in *incertae sedis* until the type is restudied.

INTRODUCTION

Arredondo is a settlement about 6 miles southwest of the center of Gainesville, Alachua County, Florida. An extensive fauna of Pleistocene vertebrates occurs here in overburden of two mines of the Levy County Lime Rock Corporation.

Certain of the amphibians and reptiles from the deposit have been referred to in papers by Goin and Auffenberg (1955) and Auffenberg (1956, 1958). Much of the mammalian fauna has been reported by Bader (1957) and Olsen (1958). Fish remains are fairly numerous, but these have not yet been studied. Fresh water and terrestrial snails of the genera *Polygyra* and *Physa* occur locally.

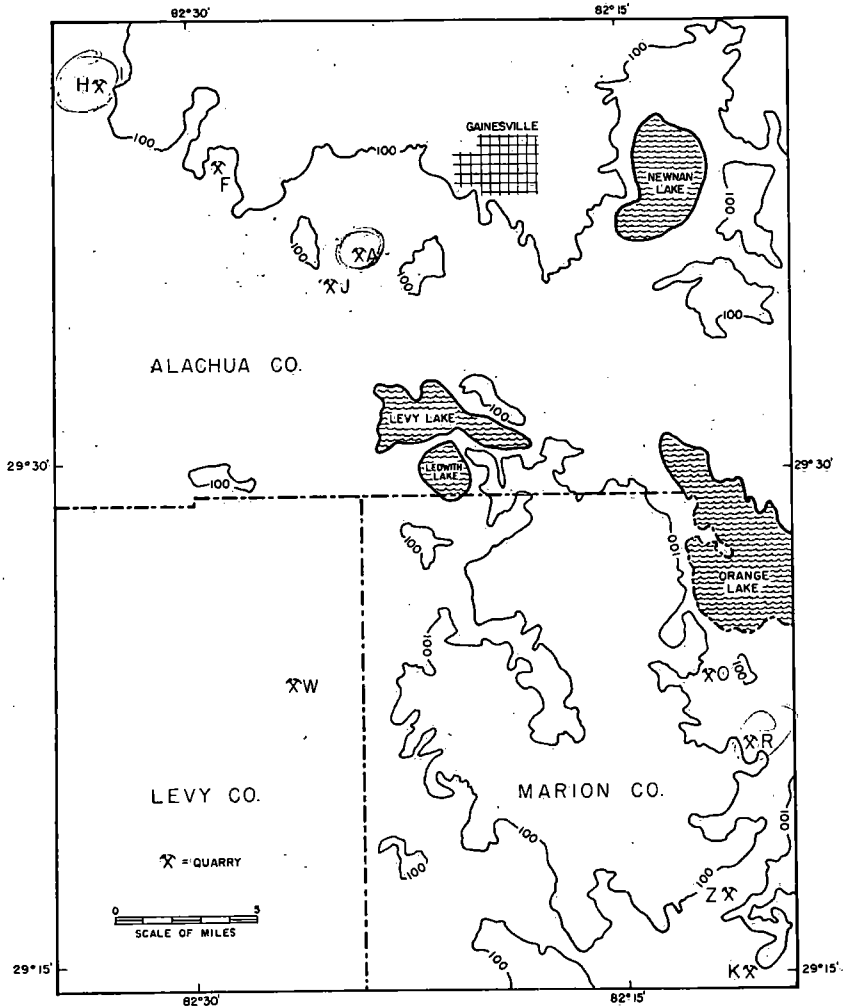
In the 1955 paper cited the name Kanapaha was used for the locality, but later papers have all employed the term Arredondo, which is the closer of the two settlements.

STRATIGRAPHY

The two fossil localities lie just northeast of Arredondo (see map), in the NW $\frac{1}{4}$ sec. 22, T 10 S, R 19 E, Alachua County, Florida. Pit 1 is on property owned by W. H. Damron, and is just north of the right-of-way of the Seaboard Air Line Railway, 0.2 mile southwest of railroad milepost 709. Pit 2 lies directly across the railroad from

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the first locality. Both quarries have surface elevations of about 90 feet (Gunter, 1948, p. 22) and are on the northeast edge of a terrace separating Hogtown Sink and Lake Kanapaha to the north from Levy Prairie and Paynes Prairie to the south.



MAP. Arredondo, Florida, and vicinity. Mines with Arredondo clay exposed: A, Arredondo; F, Fort Clark; H, Haile; J, Kanapaha; K, Kendrick; O, Orange Lake; R, Reddick; W, Williston; Z, Zuber. 100 foot contour indicates approximate shore of Wicomico sea.

The surficial layer (see table 1) is composed of reddish brown sand. This is the "Newberry sand" of Matson and Sanford (1913, p. 32), which has been correlated with the Wicomico terrace formed during the standstill of the sea at 100 feet elevation during the Sangamon interglacial stage of the Pleistocene (Cooke, 1945, p. 281; MacNeil, 1950, p. 99). Matson and Sanford's use of the term "Newberry sand" antedates that of Dennison (1923, p. 628) for a deposit of Permian age, but it is not in current use and is not necessarily endorsed here as distinct from the Wicomico formation.

TABLE 1
STRATIGRAPHIC SECTION AT ARREDONDO, FLORIDA

Bed	Description	Thickness
1	Pleistocene series, Wicomico formation Reddish brown, massive, unfossiliferous marine terrace sand	9 feet
2	Wicomico formation, Arredondo clay member. Blue clay, streaked with yellow; weathers to brown. Grades locally into sandy clay, white sand with alternating bands of yellowish gray, argillaceous sand, and at bottom of bed into blue and blackish brown clay. Surface irregular. Contains shells of terrestrial and fresh water gastropods and vertebrate fossils.	14 feet
Unconformity		
3	Eocene series, Ocala group, Crystal River formation. White, soft and friable, fossiliferous limestone. Surface irregular with many steep-walled solution pipes. Bottom of bed not exposed beyond water table.	14 feet

The bedrock consists of limestone of the Crystal River formation of the Ocala group (Puri, 1953, p. 130). Its surface contains many steep-walled solution pipes and sinks with depths up to 20 feet.

Where the surface of the limestone is relatively low, and particularly in solution pits, a bone-bearing clay layer intervenes between the Wicomico sand and the Crystal River limestone. This clay is a fresh water deposit, as it contains remains of amphibians (*Siren*, *Pseudobranchius*, *Bufo*, and *Rana*) as well as land and fresh water gastropods (*Polygyra* and *Physa*). Evidence will be presented below which indicates that it was deposited under cooler climatic conditions, namely during the Illinoian glacial stage.

Although the clay at Arredondo agrees with the Alachua clay (Dall and Harris, 1892, p. 127) in being of fresh water or terrestrial origin, the two clays differ in lithology, in cycles of sedimentation, and in

faunas. The Alachua formation, at least in its bone-bearing facies, is more yellowish and often contains a high concentration of phosphate. The clay at Arredondo is mostly bluish when freshly exposed and is without important phosphate content. The Alachua clay has no definite relationship to Pleistocene marine terraces, but the Arredondo clay invariably lies below the Wicomico terrace as a member of the Wicomico formation. The vertebrates of the Alachua clay have been assigned to the lower Pliocene (G. Simpson, 1929, p. 259), whereas the Arredondo clay member contains Pleistocene indicators (table 2).

TABLE 2

PLEISTOCENE INDICATORS AT ARREDONDO, FLORIDA

Class AMPHIBIA

Pseudobranchius robustus Coin and Auffenberg. Extinct salamander

Class REPTILIA

Testudo sellardsi Hay. Extinct giant tortoise
Terrapene putnami Hay. Extinct box turtle

Class AVES

Podilymbus magnus Shufeldt. Extinct grebe
Falco readei, n. sp. Extinct falcon
Colinus sullivanii, n. sp. Extinct quail
Porzana auffenbergi Brodkorb. Extinct rail
Fulica minor Shufeldt. Extinct coot
Dorypaltus prospatus, n. g. and sp. Extinct lapwing
Tachycineta speleodytes Brodkorb. Extinct swallow
Cremaster tythius, n. g. and sp. Extinct hangnest

Class MAMMALIA

Desmodus, n. sp., Gut (in press). Extinct vampire bat
Dasyopus bellus (Simpson). Extinct armadillo
Synaptomys australis Simpson. Extinct bog lemming
Aenocyon ayersi (Sellards). Extinct dire wolf
Mammut americanum (Kerr). Extinct mastodon
Tapirus veroensis Sellards. Extinct tapir
Equus sp. Extinct one-toed horse
Mylohyus cf. *gidleyi* Simpson. Extinct peccary
Tanupolama mirifica Simpson. Extinct camel
Tanupolama cf. *americana* Wortman. Extinct camel

The type section is exposed at Pit 1, NW $\frac{1}{4}$ sec. 22, T 10 S, R 19 E, Arredondo, Alachua County, Florida. The term Arredondo clay member is proposed for the 14 feet represented by Bed 2.

The Arredondo clay member has been studied along a northwest-southeast transect 40 miles in length in Marion County (mines near Kendrick, Zuber, Reddick, and Orange Lake) and Alachua County (mines near Arredondo, Kanapaha, Fort Clark, and Haile), and it also occurs at Williston in Levy County (see map). All exposures seen lie in localities whose surface elevation is below the 100-foot contour.

The bottom of the Arredondo clay member, in the areas studied, lies between 55-68 feet above sea level, with its top at 74-89 feet. The upper surface of the Wicomico terrace at these localities is between 90-95 feet above present sea level.

The Ocala uplift began in early Miocene times, and subaerial erosion has since removed most of the younger sediments, to expose the Crystal River formation and expedite sink formation (Vernon, 1951, pp. 184-185). This process, although in a sense continuous since Miocene time and still taking place today, was interrupted by periodic transgressions of the sea. During the subsequent regressions of the sea, fresh water sediments were deposited under a terrestrial environment on the eroded surface of the Crystal River formation during the Miocene, Pliocene, and Pleistocene (Vernon, 1951, p. 193). None of the deposits contain mixed faunas, however, and it is thought that previous reports of mixed vertebrate faunas in these areas resulted from lack of stratigraphic control.

AVIFAUNA

Family PODICIPEDIDAE

Podilymbus magnus Shufeldt.

Pit. 1: right humerus, left ulna. Pit 2: two right coracoids, right and left humeri, two right and one left carpometacarpus, two right and one left tarsometatarsus.

Shufeldt (1913, p. 136) separated the Pleistocene Pied-billed Grebe on the basis of large size, but Wetmore (1937, p. 198) synonymized it with the living *Podilymbus podiceps* because of the sexual dimorphism existing in this genus. Compared with 8 modern specimens, 4 of each sex, the Arredondo material is also large. Measurements are as follows: width of humerus through epicondylar prominences, 7.5-8.0 (*P. podiceps*, 6.4-7.6); height of carpometacarpus through first metacarpal, 6.9 (*P. podiceps*, 5.6-6.3); length of first metacarpal, 5.0 (*P. podiceps*, 3.8-4.6); least width of shaft of tarsometatarsus, 3.0-3.5

(*P. podiceps*, 2.7-3.0 mm.). It therefore seems advisable to revive Shufeldt's name.

Family ANATIDAE

Querquedula discors (Linnaeus).

Pit 2: left coracoid, left carpometacarpus.

Nettion carolinense (Gmelin).

Pit 2: left coracoid.

Spatula clypeata (Linnaeus).

Pit 2: left tibiotarsus. The first record of the Shoveller from the Florida Pleistocene.

Aythya collaris (Donovan).

Pit. 1: left humerus. Pit. 2: left humerus, right tarsometatarsus.

Family ACCIPITRIDAE

Accipiter cooperii (Bonaparte).

Pit 1: right carpometacarpus.

Buteo jamaicensis (Gmelin).

Pit 1: left tibiotarsus.

Family FALCONIDAE

Genus *Falco* Linnaeus

Tibiotarsus with (1) two distal openings under bridge; (2) condyles parallel with each other and with axis of shaft; (3) posterior intercondylar fossa shallow; (4) a pit in anterior intercondylar fossa at medial side of external condyle.

Subgenus *Hierofalco* Cuvier

Tibiotarsus with (1) intercondylar fossa relatively deep distally; (2) intercondylar pit very deep, excavating medial side of external condyle.

Falco readei n. sp.

Figure 1

HOLOTYPE.—Distal end of left tibiotarsus, Brodkorb collection no. 1692. From Illinoian stage of Pleistocene (Arredondo clay member), at Pit 2, Arredondo, Alachua County, Florida. Collected by Ernest H. Reade, Jr., 21 September 1956.

DIAGNOSIS.—Similar to living *Falco* (*Hierofalco*) *mexicanus* Schlegel of western North America, but (1) external ligamental prominence

a small knob; (2) no shelf connecting external ligamental prominence and groove for peroneus profundus; (3) intercondylar pit elongated in an obliquely transverse direction toward anterior edge of external condyle; (4) size about half. Distal width, 8.0; depth of external condyle, 6.5; anterior height of external condyle, 4.7; depth of internal condyle, about 6.5 mm.

Differs from all subgenera mentioned below in having distal end of intercondylar fossa deeper.

Resembles living *Falco* (*Rhynchofalco*) *fuscoerulescens* Vieillot of tropical America in size and in very deep intercondylar pit, but differs further in having pit not round, but obliquely transverse, extending toward anterior edge of condyle; external ligamental prominence much smaller and not forming a shelf.

Resembles the living forms *Falco* (*Falco*) *albigularis* Daudin of tropical America, *Falco* (*Falco*) *subbuteo* Linnaeus of the Palearctic region, *Falco* (*Tinnunculus*) *columbarius* Linnaeus of the Holarctic region, *Falco* (*Erythropus*) *amurensis* Radde of eastern Asia, and *Falco* (*Cerchneis*) *tinnunculus* Linnaeus of the Palearctic region in having external ligamental prominence knob-like, but differs in having intercondylar pit deep and size larger.

Differs from *Falco* (*Cerchneis*) *sparverius* Linnaeus of America in lacking external ligamental shelf; intercondylar pit deeper; size much larger. Differs from the nearly cosmopolitan *Falco* (*Rhynchodon*) *peregrinus* Tunstall in the same characters, except size much smaller.

The new species is much smaller than the Pleistocene *Falco swarthi* L. Miller (1927, p. 152) of California and *Falco oregonus* Howard (1946, p. 178) of Oregon. It is much larger than *Falco ramenta* Wetmore (1936, p. 75) from the Miocene of Nebraska.

The records of *Falco* sp. from the Pleistocene of California (L. Miller, 1912, p. 78, 95, 114; 1925, p. 99) were referred by Lambrecht (1933, p. 751) to *Falco fuscoerulescens*, although later Miller and DeMay (1942, p. 67, 105) denied this determination. It seems possible that they may belong to the present species.

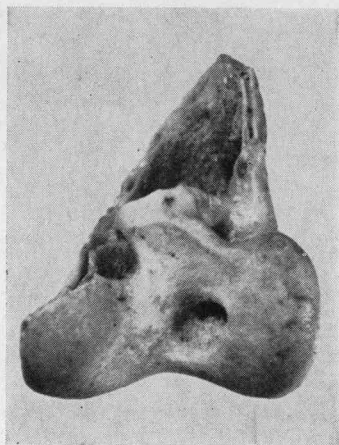


Figure 1

Falco (Rhynchodon) peregrinus Tunstall.

Pit 2: unguis.

Falco (Cerchneis) sparverius Linnaeus.

Pit 2: right carpometacarpus, right tibiotarsus, left tarsometatarsus.

Family TETRAONIDAE

Bonasa umbellus (Linnaeus).

Pit 1: sternum. The Ruffed Grouse is new to the fauna of Florida.

Family PHASIANIDAE

Genus *Colinus* Goldfuss.

Humerus (1) longer than tarsometatarsus, with ratio of metatarsus to humerus 86.94-98.42 per cent; (2) ratio of ulna to humerus 87.79-91.01 per cent; (3) ratio of distal width of humerus to proximal width 69.39-76.14 per cent; (4) ratio of depth of caput humeri to proximal width of humerus 34.69-39.13 per cent; (5) ratio of distance from proximal end of origin of brachialis to distal end of internal condyle and distal width of humerus 79.10-89-71 per cent; (6) medial bar at angle of about 105 degrees to shaft.

Colinus suilium n. sp.

Figures 2-8

HOLOTYPE.—Complete left humerus, Brodtkorb collection, no. 1291. From Illinoian stage of Pleistocene (Arredondo clay member), at Pit 1, Arredondo, Alachua County, Florida. Collected by Ernest H. Reade, Jr., 21 September 1956.

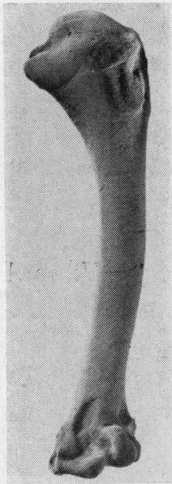


Figure 2

ETYMOLOGY.—Latin, genitive plural of *suile*, pigsty, in reference to the former course of Hogtown Creek through the type locality. Gainesville was called Hogtown in 1830, after the Seminole chief Hogmaster (C. Simpson, 1956).

DIAGNOSIS.—Humerus similar to that of living Central American *Colinus leucopogon* (Lesson) and North American *C. virginianus* (Linnaeus), but (1) larger; (2) region around scar of infraspinatus produced; (3) scar of brachialis larger; (4) entepicondylar prominence large and rising abruptly from shaft; (5) ectepicondyle more rotated; (6) ectepicondylar prominence larger and more deeply notched.

Figure 2.—*Colinus suilium*, n. sp. Holotype humerus, no. 1291. X 1.6.

Differs from *Colinus hibbardi* Wetmore (1944, p. 96) from the upper Pliocene of Kansas in being smaller and in having scar of brachialis smaller. Other critical areas are missing in the material of *C. hibbardi*.

PARATYPE.—Complete right humerus (no. 757), Pit 1.

REFERRED HUMERI.—Pit 1: left proximal (nos. 758, 1290, 1292, 1624). Pit 2: right distal (nos. 1672, 1703), left proximal (nos. 1671, 1673).

Measurements of comparative material are based on 2 modern specimens of *C. leucopogon*, 19 modern specimens of *C. virginianus* (represented by the subspecies *C. v. virginianus*, *C. v. floridanus*, *C. v. coyolcos*, and *C. v. insignis*), and Tordoff's (1951, pp. 25-28) measurements of *C. hibbardi*.

Length, 37.6-37.9 (*C. leucopogon*, 33.7-34.4; *C. virginianus*, 31.7-35.8); proximal width, 9.6-10.4 (*C. leucopogon*, 9.2-9.3; *C. virginianus*, 9.3-9.8); width of shaft, 3.4-3.8 (*C. leucopogon*, 3.1-3.2; *C. virginianus*, 2.6-3.3); distal width, 7.5-7.9 (*C. leucopogon*, 6.8-7.0; *C. virginianus*, 6.3-6.8; *C. hibbardi*, 8.0); depth of head, 3.7-4.1 (*C. leucopogon*, 3.5-3.6; *C. virginianus*, 3.1-3.5); proximal end of brachialis to distal end of internal condyle, 6.3 (*C. leucopogon*, 5.6-5.8; *C. virginianus*, 5.3-6.1; *C. hibbardi*, 6.9).

STERNUM.—Pit 1 (no. 1622). Estimated width of ventral lip of



Figure 3

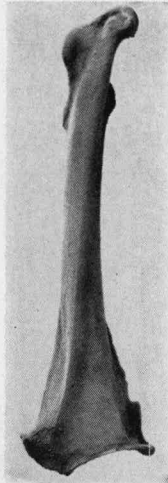


Figure 4



Figure 5

- Figure 3.—*Colinus sullivanii*, n. sp. Referred sternum, no. 1622. X 2.
 Figure 4.—*Colinus sullivanii*, n. sp. Referred coracoid, no. 1623. X 2.
 Figure 5.—*Colinus sullivanii*, n. sp. Referred ulna, no. 1324. X 1.5.

coracoidal sulcus, 11.5 (*C. leucopogon*, 9.6-10.8; *C. virginianus*, 9.2-11.2; *C. hibbardi*, 13.4).

SCAPULA.—Pit 2: left (no. 1648). Acromion narrower and recurved toward medial side, compared with living species. Scapula of *C. hibbardi* unknown.

CORACOID.—Pit 1: right (no. 1623) and left (no. 1294). Pit 2: right (no. 1629) and left (no. 1701). Head depressed as in *C. hibbardi*. Length along medial edge, 29.7-30.3 (*C. leucopogon*, 26.4-26.7; *C. virginianus*, 24.5-28.1); sternal width, 9.2 (*C. leucopogon*, 8.0; *C. virginianus*, 7.3-9.1; *C. hibbardi*, 11.3); head to glenoid facet, 8.7-8.8 (*C. leucopogon*, 7.7-8.2; *C. virginianus*, 7.6-8.7; *C. hibbardi*, 9.1-10.0); depth posterior to furcular facet, 3.4-3.5 (*C. leucopogon*, 2.6-3.0; *C. virginianus*, 2.6-3.3; *C. hibbardi*, 3.4-3.8).

ULNA.—Pit 1: right (no. 1625) and left (no. 1324). Pit 2: left (no. 1702). Brachial impression deep, as in *C. leucopogon* and *C. hibbardi*.

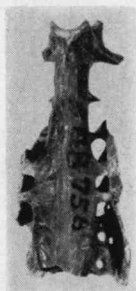


Figure 6

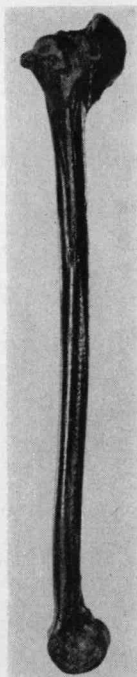


Figure 7

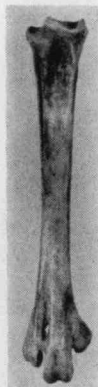


Figure 8

Figure 6.—*Colinus sullivanii*, n. sp. Referred synsacrum, no. 756. X 1.5

Figure 7.—*Colinus sullivanii*, n. sp. Referred tibiotarsus, no. 1545. X 1.5.

Figure 8.—*Colinus sullivanii*, n. sp. Referred tarsometatarsus, no. 1626. X 1.4.

Length, 32.7-33.1 (*C. leucopogon*, 30.0-30.2; *C. virginianus*, 28.5-32.2; *C. hibbardi*, 37.4-38.7); proximal width, 4.1-4.6 (*C. leucopogon*, 3.8-4.1; *C. virginianus*, 3.4-4.3; *C. hibbardi*, 4.8-4.9); distal width, 3.1-3.3; (*C. leucopogon*, 3.4-3.5; *C. virginianus*, 2.6-3.2; *C. hibbardi*, 4.2-4.8); distal depth, 3.9-4.0 (*C. leucopogon*, 3.7; *C. virginianus*, 3.3-3.6).

SYNSACRUM.—Pit 1 (no. 756). Fourth and fifth synsacral vertebrae with transverse processes extending to innomines. Length from first synsacral centrum through fourth transverse process, 12.6 (*C. leucopogon*, 11.7-12.1; *C. virginianus*, 11.2-12.5).

TIBIOTARSUS.—Pit 1: right (no. 1545) and left (no. 1634). Pit 2: right (no. 1649) and left (no. 1704). In proximal view, posterior notch between internal and external articular surfaces deeper than in living species, cutting farther into internal articular surface; in medial view, inner cnemial crest with anterior margin strongly curved, not angled. Length, 58.1 (*C. leucopogon*, 50.3-52.4; *C. virginianus*, 49.8-53.5); width through condyles, 5.4 (*C. leucopogon*, 4.8-5.1; *C. virginianus*, 4.6-5.2); depth of external condyle, 5.5 (*C. leucopogon*, 5.0; *C. virginianus*, 4.6-5.1); depth of internal condyle, 5.2-5.7 (*C. leucopogon*, 5.2-5.3; *C. virginianus*, 4.8-5.5).

TARSOMETATARSUS.—Pit 1: right (no. 1626). Pit 2: left (no. 1647). Second trochlea lower on shaft than in *C. virginianus*, thus resembling *C. leucopogon*. Length, 34.5 (*C. leucopogon*, 29.3-30.3; *C. virginianus* 29.2-32.2); proximal width, 5.8-6.0 (*C. leucopogon*, 5.5; *C. virginianus*, 5.0-5.7; *C. hibbardi*, 6.5); least width of shaft, 2.6-2.7 (*C. leucopogon*, 2.5-2.6; *C. virginianus*, 2.2-2.5; *C. hibbardi*, 3.0-3.1); distal width, 6.5 (*C. leucopogon*, 5.2-5.8; *C. virginianus*, 5.3-5.6; *C. hibbardi*, 6.6-7.0); proximal depth, 6.0-6.1 (*C. leucopogon*, 5.6; *C. virginianus*, 5.2-5.8); width of middle trochlea, 2.5 (*C. leucopogon*, 2.0-2.1; *C. virginianus*, 1.9-2.3; *C. hibbardi*, 2.4-2.9); depth of middle trochlea, 3.4 (*C. leucopogon*, 2.8; *C. virginianus*, 2.6-3.2; *C. hibbardi*, 3.1-3.4).

Family. MELEAGRIDAE

Meleagris gallopavo Linnaeus.

Pit 1: left humerus. Pit 2: left humerus.

Family RALLIDAE

Rallus elegans Audubon.

Pit 2: left scapula.

Rallus limicola Vieillot.

Pit 2: left carpometacarpus, right tibiotarsus.

Porzana carolina (Linnaeus).

Pit 2: left coracoid.

Porzana auffenbergi Brodkorb.

Pit 2: left tibiotarsus (no. 1717).

This species was described from Haile, Florida, on the basis of a humerus (Brodkorb, 1954, p. 103). The presently referred tibiotarsus agrees with that of *P. carolina* in having a relatively stout shaft compared with *Rallus limicola*, but it is larger. Width through condyles, 4.7; depth of external condyle, 4.7; depth of internal condyle, 4.8; least width of shaft, 2.2.

Porphyryla martinica (Linnaeus).

Pit 2: right coracoid.

Gallinula chloropus (Linnaeus).

Pit 2: left ulna, right tibiotarsus.

Fulica minor Shufeldt.

Pit 2: right humerus, left femur, left tibiotarsus, right tarsometatarsus.

Most of these specimens are too fragmentary for specific determination, but the tibiotarsus has the internal condyle relatively deeper than in *F. americana*. Depth of external condyle, 8.7 mm.; depth of internal condyle, 9.0 mm.; ratio, 96.7 per cent.

Family CHARADRIIDAE

Humerus with (1) ectepicondylar process long, with its anconal face somewhat concave; (2) external condyle rotated 45 degrees or less along its internal margin; (3) facet for anterior articular ligament merging gently at its lower end with distal extension of brachial depression, without intervening shelf.

Subfamily VANELLINAE

Humerus with (1) internal condyle a flattened oval, little produced distally; (2) entepicondyle oblique, not produced distally and internally; (3) facet for anterior articular ligament abruptly included laterally; (4) scar of pronator brevis large, expanded laterally, equal to one-third to half width of facet for anterior articular ligament; (5) scar of brachialis deeply excavated, located relatively high with half to one-third its length above level of ectepicondylar process, its distal end above level of articular ligament; (6) foramen in lower portion of brachial depression located directly above internal margin of external condyle; (7) external condyle rotated less than 45 degrees.

Genus *Dorypaltus* n. gen.TYPE OF GENUS.—*Dorypaltus prosphatus* n. sp.

ETYMOLOGY.—Greek, dorypaltos, masculine, a spear-wielder. Greek, prosphatos, not decomposed, of a corpse miraculously preserved.

DIAGNOSIS.—Resembles living South American *Belonopterus* Reichenbach and differs from living Palearctic *Vanellus* Brisson in having (1) entepicondyle only moderately produced medially in area of pit for pronator longus; (2) side of entepicondyle strongly concave opposite scar of anterior articular ligament; (3) area of origin of pronator brevis forming a lengthened oval shelf; (4) ectepicondyle rounded at proximal end, not forming a spur; (5) anconal face of ectepicondyle more concave.Differs from *Belonopterus* in having (1) scar of brachialis still more deeply excavated and wider, extending laterally to meet scar for palmar branch of extensor metacarpi radialis; (2) the latter muscle scar longer and wider, extending distally nearly to level of brachial foramen, and laterally from scar of brachialis nearly to end of ectepicondyle; (3) entepicondyle even less produced laterally, in area of origin of pronator longus.*Dorypaltus prosphatus* n. sp.

Figure 9

HOLOTYPE.—Distal portion of left humerus, Brodkorb collection, no. 1712. From Illinoian stage of Pleistocene (Arredondo clay member), at Pit 2, Arredondo, Alachua County, Florida. Collected by Ernest H. Reade, Jr., 12 September 1956.

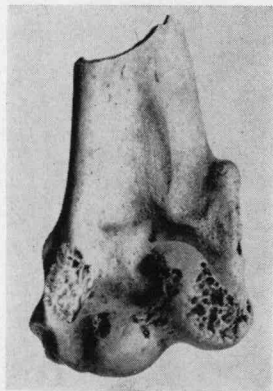
DIAGNOSIS.—Humerus slightly smaller than in *Belonopterus chilensis* (Molina), with ectepicondyle relatively longer. Distal width, 9.5; width through proximal end of ectepicondylar process, 7.4; width of shaft above ectepicondylar process, 6.3; length through external condyle and ectepicondylar process, 7.7 mm.REFERRED SPECIMEN.—Proximal end of right humerus (no. 1713), collected with the holotype; lacks external tuberosity. Slightly smaller than *Belonopterus chilensis*; smaller

Figure 9

Figure 9.—*Dorypaltus prosphatus*, n. g., n. sp. Holotype humerus, no. 1712. X 3.2.

and with internal tuberosity less developed than in *Vanellus vanellus* (Linnaeus).

Since the scars of the origins of the muscles of flexion of the forearm and extension of the distal part of the wing are even better developed than they are in *Belonopterus*, it may be assumed that *Dorypaltus* also used the wings in fighting and was armed with a metacarpal spur.

At present the lapwings occur in all regions of the world except the Nearctic. The presence of a member of the subfamily Vanellinae in the Florida Pleistocene thus bridges this gap in distribution.

Only one extinct genus of plover has been described. This is *Limicolavis pluvianella* Shufeldt (1915, p. 55, pl. 15, fig. 129) from the Oligocene of Oregon, a smaller bird than *Dorypaltus prosphatus*. Inspection of the photograph of the type tibiotarsus of *Limicolavis* indicates that it belongs in some other family, since the distal opening of the tibial bridge lies above the external rather than the internal condyle, and the external condyle is produced distally beyond the internal condyle, while the reverse condition holds in the Charadriidae.

Family SCOLOPACIDAE

Tringa melanoleuca (Gmelin).

Pit 2: left tarsometatarsus. The Greater Yellowlegs is new to the Florida Pleistocene.

Tringa solitaria Wilson.

Pit 2: left humerus. The Solitary Sandpiper is new to the Pleistocene of North America.

Family COLUMBIDAE

Ectopistes migratorius (Linnaeus).

Pit 1: left carpometacarpus.

Zenaidura macroura (Linnaeus).

Pit 2: right coracoid, right ulna, left femur, right tarsometatarsus.

Family STRIGIDAE

Otus asio (Linnaeus).

Pit 2: right radius, right phalanx I, digit II, two right tarsometatarsi.

Family PICIDAE

Colaptes auratus (Linnaeus).

Pit 2: right humerus, left ulna, left tarsometatarsus.

Melanerpes carolinus (Linnaeus).

Pit 2: right ulna. The first fossil record of the Red-bellied Woodpecker.

Family HIRUNDINIDAE

Tachycineta speleodytes Brodkorb.

Pit 2: right coracoid, four right and two left humeri, one right and five left ulnas, left carpometacarpus, right femur. Two of the humeri are from juvenile individuals of this recently described swallow (Brodkorb, 1957, p. 131).

Family CORVIDAE

Corvus brachyrhynchos Brehm.

Pit 2: right tarsometatarsus.

Corvus ossifragus Wilson.

Pit 1: right humerus. Pit 2: left ulna.

Cyanocitta cristata (Linnaeus).

Pit 2: left tarsometatarsus.

Aphelocoma coerulescens coerulescens (Bosc).

Pit 1: right tibiotarsus.

Although *Aphelocoma coerulescens californica* has been reported from the Pleistocene of California (A. H. Miller, 1932B, p. 173), this is the first fossil record of the Florida Scrub Jay. These two races, formerly considered distinct species, are separable osteologically by size.

Family LANIIDAE

Lanius ludovicianus Linnaeus.

Pit 1: left tarsometatarsus. Previously unrecorded from the Pleistocene of Florida.

Family ICTERIDAE

Agelaius phoeniceus (Linnaeus).

Pit 2: right humerus, right ulna, right femur, two right and one left tibiotarsi.

Sturnella magna (Linnaeus).

Pit 2: two left ulnas.

Subfamily CACICINAE

Tibiotarsus with (1) distal margin of intercondylar space oblique, with internal sulcus the deeper one; (2) anterior wall of intercondylar

fossa separated from distal opening of tibial bridge by a sharply raised ridge connecting condyles.

Genus *Cremaster* n. gen.

TYPE OF GENUS.—*Cremaster tythtus* n. sp.

ETYMOLOGY.—Greek, cremaster, masculine, something hanging down like a basket or a bunch of grapes, in allusion to the supposed habits. Greek, tythtos, little.

DIAGNOSIS.—An arboreal icterid agreeing with the living Neotropical oropendolas and caciques of the genera *Ostinops*, *Gymnstinops*, *Zarhynchus*, and *Cacicus* in having tibiotarsus with (1) distal portion of shaft straight, stout, and nearly as wide as condyles; (2) internal ligamental ridge proximal to tibial bridge only moderately developed.

Differs in having (1) external condyle in anterior view parallel with and scarcely protruding from shaft; (2) external ligamental prominence reduced, not forming a shelf; (3) tendinal canal under tibial bridge confined to lateral portion of bone; (4) tibial bridge transverse, with its lateral margin produced proximally to form a bluntly rounded projection; (5) surface of tibial bridge slanting in a smooth plane to meet anterior portion of shaft, which hence continues as a flat surface toward medial edge of bone; (6) upper opening leading under bridge rounded; (7) lower opening with proximal margin forming an obtuse angle, with the short leg lateral; (8) internal condyle but slightly protruding from medial line of shaft; (9) anterior intercondylar fossa deep, forming a pit with sharply defined distal as well as proximal wall.

Less closely allied to the living caciques of the Neotropical genera *Archiplanus*, *Amblycercus*, and *Cassiculus*, but shaft stouter, with condyles scarcely protruding; internal ligamental ridge more weakly developed proximal to bridge.

Bears a superficial resemblance to the tibiotarsus of the larger species of orioles of the genus *Icterus*, particularly *I. icterus* and *I. gularis*, but immediately separable by its stouter shaft with the condyles less protruding from it in anterior view, transverse instead of oblique bridge, and reduced external ligamental prominence.

Cremaster tythtus n. sp.

Figures 10-12

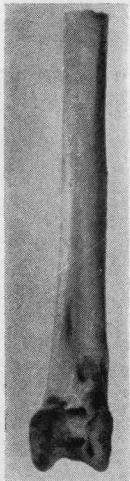


Figure 10

HOLOTYPE.—Distal portion of left tibiotarsus, Brod-

Figure 10.—*Cremaster tythtus*, n. g., n. sp. Holotype tibiotarsus, no. 1663. X 3.

korb collection, no. 1663. From Illinoian stage of Pleistocene (Arredondo clay member), at Pit 2, Arredondo, Alachua County, Florida. Collected by Pierce Brodkorb, 6 May 1956.

DIAGNOSIS.—Structurally closest to *Ostinops decumanus* (Pallas) but separable on generic characters; size much less. Distal width, 3.7; least width of shaft, 2.0; depth of internal condyle, 3.4; depth of external condyle, 3.4 mm.

REFERRED MATERIAL.—Pit 2: right humerus (no. 1664) and right femur (no. 1694).

Humerus agrees with that of *Ostinops*, *Cacicus*, and *Icterus icterus* in having proximal portion contracted, with attachment for infraspinatus only slightly produced. Differs in having (1) subtrochanteric and tricipital fossae (fossae I and II) without partially roofing shelf from medial bar; (2) floor of fossae at a single level; (3) medial bar extending to floor of fossae rather than to external side, and directed at its base toward distal end of bone at angle of 120 degrees to shaft; (4) distal portion of bone strongly rotated and only slightly expanded; (5) brachial depression forming a deep, compressed, steep-walled pit; (6) ectepicondylar prominence extending above level of ectepicondylar process as a shelf which is bent at an angle before reaching shaft. Length, 27.1; proximal width, 7.9; width of shaft, 2.5; distal width, 6.2 mm. The position of the medial bar and the excavation of the pneumatic fossae indicate (Ashley, 1941, pp. 192-194) that the humerus of *Cremaster* is more primitive than that of *Ostinops* or *Cacicus*.

The referred femur agrees more closely with that of *Icterus icterus* than with *Ostinops* in having the condyles lengthened and compressed from front to rear, and the notch for the femoral head of the tibialis anticus more anterior in position. It differs from *Icterus* in having (1) fibular condyle produced

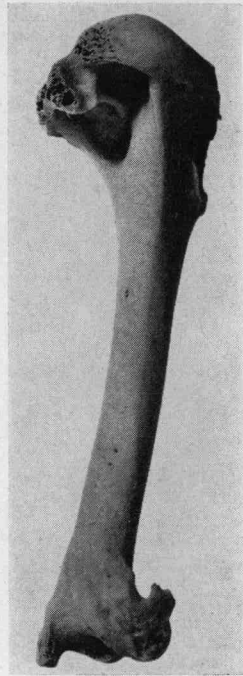


Figure 11

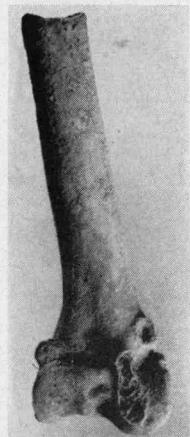


Figure 12

Figure 11.—*Cremaster tyththus*, n. g., n. sp. Referred humerus, no. 1664. X 3.

Figure 12.—*Cremaster tyththus*, n. g., n. sp. Referred femur, no. 1694. X 3.3.

The scrub community was occupied by the Ruffed Grouse (*Bonasa*), Scrub Jay (*Aphelocoma*), and Loggerhead Shrike (*Lanius*). The remaining species of the Arredondo local fauna, insofar as their habits are known, are of wider ecological tolerance. They all might be expected to occur in the ecotone or in the scrub community.

The Scrub Jay is confined to the St. Lucie scrub community. This community occupies well-drained sandy areas dominated by sand pine (*Pinus clausa*) and scrub oaks with evergreen shrubs, including rosemary (*Ceratiola ericoides*), in the understory. The scrub occurs on low dunes near the coast and on certain fossil dune areas in the interior of the state.

Much of the original forest at Arredondo has been destroyed, but the commonest remaining trees include loblolly pine (*Pinus taeda*), mockernut hickory (*Carya tomentosa*), laurel oak (*Quercus laurifolia*), and sweet gum (*Liquidambar styraciflua*). This assemblage of trees is characteristic of mesophytic hammock, the present climatic climax community. Since none of the birds of the Arredondo local fauna is confined to mesophytic hammock, there is no proof of the existence of this community at Arredondo during Illinoian time.

The Florida scrub represents an early stage in a xerosere (Laessle, 1942, p. 96). It succeeds to xerophytic hammock with live oak (*Quercus virginiana*), and further succession leads to the present climatic climax of mesophytic hammock. The presence of the Scrub Jay therefore indicates that the environment at Arredondo has passed through two seral stages and into the present climatic climax since Illinoian time.

INTERGLACIAL RELICTS

On the basis of time and place of origin the Illinoian fauna of Arredondo may be divided into two categories, interglacial relicts and glacial invaders.

The interglacial relicts show a high proportion of endemism. They include *Falco* ^{EXTINCT} *readei*, *Colinus* ^{EXTINCT} *sullium*, *Dorypaltus* ^{EXTINCT} *prospatus*, *Aphelocoma* ^{EXTINCT} *coerulescens* ^{SCRUB JAY} *coerulescens*, and *Cremaster* ^{EXTINCT} *tythius*. Four of these represent species or genera which are now extinct but whose affinities lie to the southwest. *Aphelocoma* still survives in Florida today, although its nearest outposts lie 35-40 miles to the south or east of Arredondo. ^{EXTINCT} ^{HANGNEST} ^(ICTERID)

The species *Aphelocoma coerulescens* has a discontinuous distribution at present. Seventeen subspecies occupy the area from southern Mexico to the Great Basin, and eastward to the Edwards Plateau.

There is then a hiatus of a thousand miles to the range of the Florida subspecies. The survival of this genus in Florida today, as well as of certain other southwestern animals and plants isolated on the peninsula, is explained by the supposedly continuous extension eastward of the sclerophyll woodland of the southwest during late Tertiary times (Pitelka, 1951, pp. 383-384).

GLACIAL INDICATORS

Several species of the Arredondo local fauna comprise a boreal element and are therefore indicative of a cooler climate.

The Ruffed Grouse (*Bonasa umbellus*) is a bird of the northern coniferous forest and adjacent ecotones. During historical times its range extended southward through the Appalachians, but in the lowlands it occurred only as far as Chesapeake Bay (Aldrich and Duvall, 1955, pp. 6-7), and its previous Pleistocene records all lie within its recent range (Wetmore, 1956, p. 52).

Tachycineta speleodytes was the temporal representative of the tree swallow (*T. bicolor*). Today the genus reaches its southern breeding limits on the Atlantic seaboard in Virginia and Maryland, and in the Mississippi Valley near the line of maximum glaciation (Bent, 1942, p. 398).

A boreal element among the mammals is the lemming (*Synaptomys australis*). At present the genus extends southward on the Atlantic coastal plain only to Maryland, with a relict colony in the Dismal Swamp (Miller and Kellogg, 1955, pp. 561-565).

As the three genera *Bonasa*, *Tachycineta*, and *Synaptomys* have their present southern limits 700 miles to the north, their presence in the Arredondo local fauna is thought to indicate a glacial stage. Because of the stratigraphic relationship of the Arredondo clay to deposits of Sangamon age, the fauna is thought to be of Illinoian glacial age.

ACKNOWLEDGMENTS

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