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A New Species of the "Pigmy Goose," *Anabernicula*, from the Oregon Pleistocene, with a Discussion of the Genus

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INTRODUCTION

When the occurrence of *Anabernicula* in the late Pleistocene deposits of Fossil Lake, Oregon, was first noted (Howard, 1946, p. 171), comparatively little was known of the genus. The genotypic *Anabernicula gracilenta* Ross (1935), described as a "pigmy goose" and placed in the subfamily Anserinae (Order Anseriformes), was based on tarsometatarsi from the late Pleistocene asphalt deposits at McKittrick, with referral of a single specimen of the same element from the similar deposits at Rancho La Brea. Other skeletal elements from Rancho La Brea were later assigned (Howard, 1936, p. 35) but, except for the humerus, were not studied in detail. The humerus so closely resembled the type of the previously described *Branta minuscula* Wetmore (1924), from the Plio-Pleistocene[2] of Benson, Arizona, that the two species were synonymized under the name *Anabernicula minuscula* (Howard, *loc. cit.*).

The first intimation that more than one species of *Anabernicula* was represented in the fossil record was the discovery that the humeri from

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[2] Lance (1960, p. 156) states that the Benson beds are "probably of Lower Pleistocene age, and . . . . are in deposits that are continuous with underlying beds that probably represent Pliocene deposition."

Fossil Lake were distally dissimilar to those from Rancho La Brea (Howard, 1946, p. 172). Only the proximal end of this element is preserved in the type of *A. minuscula*, and only a cast of this was at hand. Closer similarity of the proximal end of the Oregon humeri to the Arizona cast than to the specimens from California was suggested, but specific assignment was withheld pending further study. The question of taxonomic allocation of the genus was also raised at this time, and a review of all material assigned to *Anabernicula* was recommended. Since then the separation of the Arizona and California species has been recognized and the name *A. gracilenta* restored to the record (Howard, 1964, p. 286).

Under a research fellowship from the John Simon Guggenheim Memorial Foundation, examination of *Anabernicula* material from all localities from which it has been recorded has been possible. Nearly 300 fossil bones of many different skeletal elements from seven localities have been studied in detail: 28 from Fossil Lake, two from Benson, 100 from McKittrick, 150 from Rancho La Brea, and seven from three cave deposits in New Mexico and Nevada. These have been compared with Recent skeletons of different species of the Anserinae (Dendrocygnini and Anserini) and the Anatinae (Anatini and Tadornini).

The first result of the study has been the recognition of the fact that the Fossil Lake material represents a distinct species, which is herein described as new. Of even greater significance, however, is the considerable information contributed concerning variability of individual populations and the taxonomy, ecology, and distribution of the genus as a whole.

ACKNOWLEDGMENTS

Specimens of *Anabernicula* from Fossil Lake, Oregon, were obtained on loan from the American Museum of Natural History (A.M.N.H.) and the University of California at Los Angeles (U.C.L.A.), with one bone also available in the Los Angeles County Museum (L.A.C.M.) collections. The type, and Ross' original series of tarsometatarsi of *A. gracilenta*, and all associated skeletal elements in the collection from California Institute of Technology locality 138, at McKittrick, California (now in the collections of the Los Angeles County Museum), were at hand, as well as the large series of *Anabernicula* bones in the Rancho La Brea collections of the Los Angeles County Museum. Studies and measurements of the type humerus of *A. minuscula* in comparison with humeri from Fossil Lake, McKittrick, and Rancho La Brea were made at the United States National Museum of the Smithsonian Institution through the courtesy of Dr. Alexander Wetmore and Dr. Lewis Gazin; the asso-

ciated coracoid of this species was borrowed for this study. The few specimens of *Anabernicula* recorded from caves in Nevada and New Mexico, all in the collections of the Los Angeles County Museum, were re-examined.

Skeletons of Recent anseriforms were examined at the United States National Museum, the University of California Museum of Vertebrate Zoology, the Pierce Brodkorb collection in the University of Florida, and the Los Angeles County Museum; a skeleton of *Cereopsis novaehollandiae* was lent by the Museum of Vertebrate Zoology. While in the eastern United States, I had the benefit of personal consultation with Dr. Glen E. Woolfenden, whose excellent study of the osteology of the Anseriformes (1961) has greatly clarified the skeletal characteristics of the subdivisions of this difficult order. To Dr. Woolfenden, to the above-named museums and their curators, and to the John Simon Guggenheim Memorial Foundation, I extend my grateful appreciation for their cooperation.

The photographs were made by Mr. George Brauer.

The taxonomy of the Order Anseriformes follows Delacour (1954).

DESCRIPTION

Of the total of 31 bones from the late Pleistocene of Fossil Lake, Oregon, previously identified as *Anabernicula* sp. (Howard, 1946, p. 171), 28 have been re-examined for the present study. Elements included are coracoid, scapula, humerus, ulna, carpometacarpus, femur, and tarsometatarsus. The single scapula, proximal end of tarsometatarsus, and fragments of femur are insufficient for reliable specific analysis, although possible distinctions from *A. gracilenta* are suggested. Even the nearly complete carpometacarpus and two proximal ends of this element cannot with certainty be distinguished from *A. gracilenta.* In the humerus, ulna, and coracoid, however, clear distinctions between the Oregon and California populations are discernible. Differences can also be noted in comparison with the humerus and coracoid of *A. minuscula*, the only elements known of this Arizona species. The Oregon species, is, therefore, here recorded as new to science.

A few generic characters of the humerus, tarsometatarsus, carpometacarpus, coracoid, and femur of *Anabernicula* were previously cited (Howard, 1964, pp. 285–286). The present study has revealed still other characters of generic importance, particularly as they indicate relationship to the tribe Tadornini, but serve to distinguish *Anabernicula* from the existing genus *Tadorna.* It is, therefore, important to present an emended generic diagnosis.

ORDER ANSERIFORMES

SUBFAMILY ANATINAE

GENUS *ANABERNICULA* ROSS

Anabernicula Ross, 1935, pp. 107–114.

TYPE: *Anabernicula gracilenta* Ross.

EMENDED DIAGNOSIS: Scapula combining gooselike anterior extension of acromion with ducklike absence of proximal foramen; distinguished from *Tadorna* by more even depression of space between acromion and glenoid facet dorsally, and straighter, less attenuated acromion. Coracoid: ventral margin of triosseal canal rounded and heavy, with no overhang of furcular facet; upper end of bone above procoracoid facing slightly posteriorly (less internally than in *Branta*); internal distal angle blunt and thick dorsoventrally as in tadornines; distinguished from *Tadorna* by straighter procoracoid and less extensive depression of triosseal canal. Humerus: attachment of head of triceps muscle separated from external tuberosity by short space, and shaft immediately distal thereto raised to a distinct apex as in *Tadorna;* distinguished from *Tadorna* by distinct right-angled shoulder between head and capital groove, and short, rounded bicipital crest. Ulna: humero-ulnar depression well marked and bordered anconally by ridge; olecranon prominent and directed abruptly proximad from internal cotyla; external cotyla deflected medially at its distal tip; distinguished from *Tadorna* by pointed distal tip of external cotyla and, distally, by small external condyle and less laterally protruded carpal tuberosity. Carpometacarpus: process of metacarpal 1 prominent and more attenuated than in *Tadorna*, frequently with exostosis at tip; external surface of proximal end more rugose than in *Tadorna*, with distinct ridge connecting cuneiform and scapholunar ligamental attachments, and the latter attachment more posteriorly placed. Femur: shaft straight, trochanter slightly raised above proximal articulation, with pointed, forward-projecting tip; intercondylar space (anteriorly) wide and clearly defined; internal condyle rounded and thrust more laterally than in *Branta*, resembling *Tadorna;* shaft above fibular and external condyles bearing two large muscle scars of nearly equal size, at approximately right angles to each other; distinguished from *Tadorna* by more medial, less posterior, rotation of proximal end and more acute angle between head and iliac facet. Tibiotarsus: outer cnemial crest slender and markedly curving to a hooked tip, and proximal articular surface overhanging shaft posteriorly as in *Tadorna;* distally, supratendinal bridge deeply inset; relatively more slender bone than in *Tadorna*, with supratendinal bridge tipped posteriorly so as to lie horizontally

rather than vertically (facing proximally rather than anteriorly). Tarsometatarsus: hypotarsus short, with square-cornered outline in inner profile, undercut at its distal contact with shaft; internal border of shaft forming slight longitudinal ridge lateral to internal border of hypotarsus; posterior surface of shaft below hypotarsus with short, narrow, longitudinal groove medial to external margin of shaft, and broad, rounded ridge below central and internal crests of hypotarsus; shaft slender, with condyles flaring distally as in geese; condyles smaller and more abruptly flared from shaft than in *Tadorna*, and internal condyle less elevated.

Anabernicula oregonensis, new species

Figures 1–2

TYPE: Complete left humerus, A.M.N.H. No. 3548.

PARATYPES: Complete left ulna, A.M.N.H. No. 3546, and left coracoid, U.C.L.A. No. 1960/12.

LOCALITY AND AGE: Fossil Lake, Oregon, late Pleistocene.

DIAGNOSIS: Humerus with apex of shaft more acute than in *Anabernicula gracilenta*, closer to *A. minuscula;* head higher and more rounded in contour than in *A. minuscula*, closer to *A. gracilenta;* depression of shaft anconally between apex and pneumatic fossa more oblique than in either *A. gracilenta* or *A. minuscula;* also, head more rotated anconally and internally, with median crest projecting at more abrupt angle from shaft, external tuberosity more prominent, and bicipital furrow narrower and with more steep-sided median margin; distally, attachment of anterior articular ligament (seen in lateral view) rounded in palmar profile, and facet facing more directly palmad than in *A. gracilenta* (distal end lacking in type humerus of *A. minuscula*); attachment of pronator brevis larger and situated very near margin of attachment of anterior ligament. (See fig. 1A, B.)

Ulna with shaft straight and slender; junction of external condyle with shaft more gradual than in *A. gracilenta*, and carpal tuberosity more markedly downcurved. (See fig. 1C.)

Coracoid with region of triosseal canal less excavated than in *A. gracilenta;* ventral margin of bone below furcular facet thicker; scapular and glenoid facets oval as in *A. gracilenta* (more rounded in *A. minuscula*), but glenoid facet distinguishable from that of *A. gracilenta* by more prominent flare ventrally and laterally toward its distal edge. (See fig. 2A, B.)

MEASUREMENTS OF TYPE HUMERUS: Length, 98.1 mm.; breadth proximally across bicipital crest, 19.7 mm.; breadth across head and

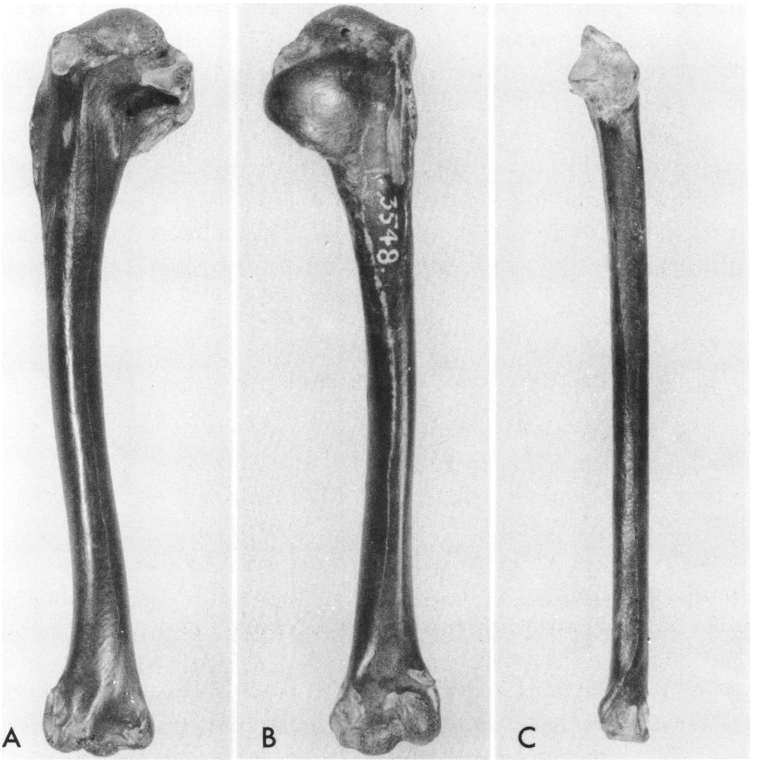

FIG. 1. *Anabernicula oregonensis*, new species. A, B. Type humerus, A.M.N.H. No. 3548, anconal and palmar views. C. Paratype ulna, A.M.N.H. No. 3546, palmar view. Natural size.

external tuberosity, 14.8 mm.; depth of head, 7.7 mm.; breadth of distal end, 14.3 mm.

MEASUREMENTS OF PARATYPES: Ulna: length from external condyle to internal cotyla, 88.3 mm.; breadth of proximal end, 9.8 mm.; depth of external condyle, 8.7 mm.; maximum breadth of distal end through carpal tuberosity and greatest flare of external condyle, 10.2 mm. Coracoid: length from head to internal distal angle, 48.4 mm.; distance from procoracoid to head, 14.3 mm.; breadth of furcular facet, 9.4 mm.; breadth below furcular facet across triosseal canal, 9.0 mm.; depth of internal side of shaft below furcular facet, 3.2 mm.

REFERRED MATERIAL FROM FOSSIL LAKE, OREGON: Two complete, one incomplete, three distal, and seven proximal ends of humeri (A.M.N.H. Nos. 3521, 3546, 3546D, and 3677, and U.C.L.A. No. 1960/13);

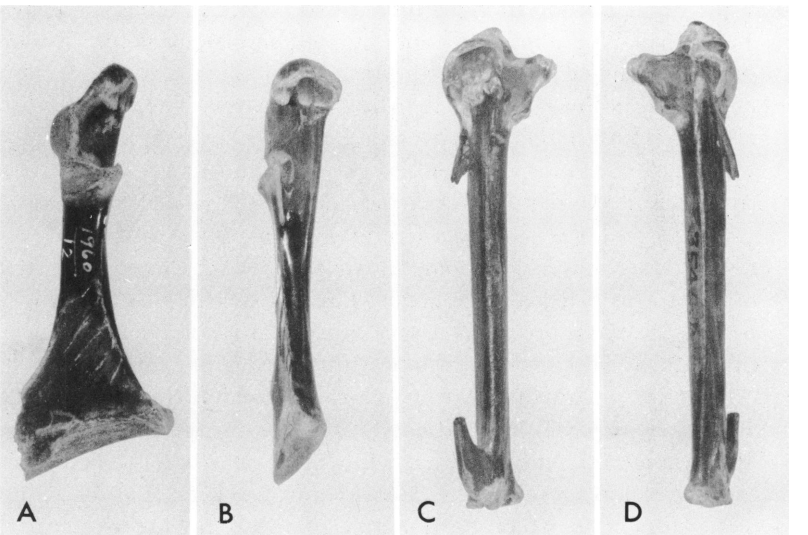

FIG. 2. *Anabernicula oregonensis*, new species. A, B. Paratype coracoid, U.C.L.A. No. 1960/12, dorsal and internal views. C, D. Referred carpometacarpus, A.M.N.H. No. 3546D, internal and external views. Natural size.

two incomplete ulnae (both A.M.N.H. No. 3546); one complete and two proximal ends of carpometacarpi (A.M.N.H. Nos. 3546D, 3546, and 3677); three coracoids (A.M.N.H. Nos. 3510 and 3518, and L.A.C.M. No. 3279); one scapula lacking coracoidal articulation (A.M.N.H. No. 3677); one incomplete and one proximal fragment of femora (A.M.N.H. Nos. 3500 and 3677); one proximal fragment of tarsometatarsus (A.M.N.H. No. 3677); all re-examined for this study. Two ulnae (University of California Museum of Paleontology No. 31794) and a carpometacarpus (University of Oregon No. F1620) from Fossil Lake, previously assigned to *Anabernicula* sp. (Howard, 1946), were not re-examined, but are presumably referable to *A. oregonensis*.

DESCRIPTION OF REFERRED MATERIAL: The humeri exhibit considerable variability in size (see table 1). The most notable variation in anatomical characteristics is observed distally in the extent and depression of the brachial impression. The impression is smallest, flattest, and most medially situated in the type. At the opposite extreme is the larger, more depressed, and more laterally extended impression in specimen A.M.N.H. No. 3521, with various intergradations of size, depth, and extent in the other five specimens in which the distal end is preserved.

The proximal portion of right ulna (A.M.N.H. No. 3546) is heavier than in the paratype ulna, and more curved; similar curvature is found in most specimens of *A. gracilenta*. The pointed tip of internal cotyla is better observed in this specimen than in the paratype. The referred distal end of ulna resembles the paratype in all respects.

The referred coracoids are even less excavated in the area of the triosseal canal than is the paratype coracoid and, on the whole, are relatively heavier than those of *A. gracilenta* (see table 1 for range in size).

The characters of the carpometacarpus, scapula, femur, and tarsometatarsus are as listed for the genus. Possible specific characters of *A. oregonensis* as distinguished from *A. gracilenta* are as follows: carpometacarpus with slightly more prominent lobe at distal edge of external trochlear crest; scapula with straighter acromion, less crooked at tip; tarsometatarsus with larger proximal internal cotyla. Each of these elements is larger than the average of comparable elements of *A. gracilenta*. The coracoids of *A. oregonensis* also average large. It is notable, however, that the humeri and ulnae appear to be proportionately smaller, and are exceeded in some measurements by humeri and ulnae of *A. gracilenta;* the minimum humerus of *A. oregonensis* is smaller than any specimen of *A. gracilenta* humerus. (See table 1.)

The tibiotarsus of *A. oregonensis* has not been recognized.

ECOLOGIC CONSIDERATIONS

The relationship of the fossil *Anabernicula* to the tribe Tadornini is clearly confirmed by this study. In fact, so similar are many of the fossil elements to those of *Tadorna tadorna* (and to a lesser extent to those of *T. ferruginea*), that the possibility of generic identity had to be considered. Distinctions are evident, however, and have been indicated in the foregoing emended diagnosis of the genus *Anabernicula*.

The close resemblance of skeletal elements of *Anabernicula* and *Tadorna* further narrows the allocation of the fossil genus to the shelducks, as contrasted with the sheldgeese. This anatomical resemblance of the fossil genus to the more strictly aquatic tadornines appears to extend, as well, to the habits of the extinct birds. At the localities in which the most significant representation of *Anabernicula* occurred, the avifauna was from 25 per cent to more than 90 per cent aquatic and included many ducks. At Fossil Lake, Oregon, the entire deposit is lacustrine, and the avifauna was 94 per cent aquatic. At the type locality of *A. minuscula*, near Benson, Arizona, 73 per cent of the bird bones were of aquatic species. At McKittrick locality 138, from which *A. gracilenta* was described, the avifauna

was 25 per cent aquatic and included quantities of duck bones in addition to approximately 100 specimens of *Anabernicula*. In the Rancho La Brea collection at the Los Angeles County Museum, all but a dozen of the 150 or more bones of *Anabernicula* (representing 23 or 24 individuals) were found in the pit excavated by the Southern California Academy of Sciences (Academy Pit), which is outstanding for being considerably richer in remains of water birds than any of the other Rancho La Brea deposits analyzed (Howard, 1962b, p. 20). Ten *Anabernicula* bones occurred in L.A.C.M. Pit 16, also recognized as having attracted water birds. A single bone referable to *Anabernicula* was found in each of two other pits (although one of these is of questionable identification). Pits such as L.A.C.M. Nos. 3 and 4, which, although more fossiliferous than the Academy Pit, were poor in aquatic species, showed no evidence of *Anabernicula*. Except for Ross' (1935, p. 111) reference to three tarsometatarsi of *A. gracilenta* in the University of California at Los Angeles collections (one from Rancho La Brea, two from McKittrick), the material excavated by the University of California from the asphalt localities has not been analyzed for the occurrence of *Anabernicula*.

A few *Anabernicula* bones have been recorded from Pleistocene cave deposits in Nevada and New Mexico (Howard, 1952, 1962a). At Smith Creek Cave, Nevada (with three *Anabernicula* bones), 22 per cent of the avifauna was aquatic and included nine species of ducks. Of all localities from which the genus has been cited, only the two New Mexico caves do not have a large representation of aquatic forms; there were, however, a few fossil duck bones in each collection in addition to one to three *Anabernicula* bones.

VARIABILITY WITHIN POPULATIONS

Each separate population of *Anabernicula*, i.e., at Fossil Lake, Oregon, and at McKittrick and at Rancho La Brea, California, exhibits a notable range in size (see table 1). In fact, the range between maximum and minimum dimensions of specimens in the best-represented elements is such that were only the extremes to be found, the temptation to name two species in each assemblage would be strong. It is noteworthy, however, that the small, complete humerus of *A. oregonensis* is differentiated from the small individuals of *A. gracilenta* by the same characters that separate the larger individuals of the two species. The same is true of the coracoids. Other elements are not sufficiently well represented in the Oregon material to exhibit marked variability. The coracoid, humerus, ulna, carpometacarpus, femur, and tarsometatarsus in the California

TABLE 1

SIZE RANGE OF *Anabernicula oregonensis* AND *Anabernicula gracilenta* (MEASUREMENTS IN MILLIMETERS)

Measurements	*Anabernicula oregonensis*			*Anabernicula gracilenta*					
	Fossil Lake			McKittrick			Rancho La Brea		
	Min.	Max.	Av.[a]	Min.	Max.	Av.[a]	Min.	Max.	Av.[a]
Coracoid									
Length to distal angle	44.7	52.0	48.3 (4)	43.2	51.8	47.2 (8)	41.5	50.0	45.5 (27)
Breadth across triosseal canal[b]	8.4	9.1	8.8 (4)	7.3	9.1	8.0 (8)	6.7	9.1	7.7 (13)
Scapula									
Greatest diagonal breadth from glenoid facet to tip of acromion	—	—	14.6 (1)	11.2	13.9	12.8 (6)	11.3	12.7	11.9 (7)
Breadth of shaft posterior to glenoid facet	—	—	6.1 (1)	4.5	5.7	5.2 (6)	4.6	5.6	5.1 (8)
Humerus									
Greatest length	85.0	98.6	93.9 (3)	89.5	103.5	98.2 (5)	87.4	98.4	92.7 (6)
Proximal breadth from external tuberosity through bicipital crest[c]	17.6	21.5	20.0 (9)	19.7	22.7	20.8 (13)	18.9	21.2	20.0 (10)
Breadth of distal end	13.1	15.0	14.5 (7)	14.5	16.3	15.5 (7)	13.7	16.1	14.7 (14)
Ulna									
Length to internal cotyla	—	—	88.3 (1)	87.0	94.0	90.0 (3)	80.5	91.7	86.1 (9)
Breadth of proximal end	9.8	10.6	10.2 (2)	9.2	11.1	10.2 (11)	9.1	10.8	9.8 (15)

TABLE 1—(Continued)

Measurements	*Anabernicula oregonensis* Fossil Lake			*Anabernicula gracilenta* McKittrick			Rancho La Brea		
	Min.	Max.	Av.[a]	Min.	Max.	Av.[a]	Min.	Max.	Av.[a]
Carpometacarpus									
Greatest length	—	—	62.6 (1)	56.0	60.5	57.8 (7)	54.7	63.1	58.7 (20)
Breadth across proximal trochlea	5.7	6.8	6.1 (3)	5.6	6.4	5.9 (10)	5.3	6.6	6.1 (23)
Femur									
Internal length	—	—	—	50.5	51.6	50.6 (3)	46.1	52.0	49.6 (7)
Proximal breadth through head	—	—	11.4 (1)	10.9	11.0	11.0 (3)	10.0	11.3	10.7 (7)
Tarsometatarsus									
Greatest length	—	—	—	55.1	63.6	59.6 (7)	56.0	63.3	58.9 (5)
Breadth of proximal articulation	—	—	11.7 (1)	10.3	11.7	10.9 (11)	9.9	11.7	10.7 (9)
Breadth of internal cotyla	—	—	5.7 (1)	4.5	5.2	4.9 (8)	4.5	5.3	4.8 (7)
Anteroposterior depth of internal cotyla	—	—	6.5 (1)	5.5	6.3	5.7 (8)	5.4	6.2	5.7 (7)

[a] Figures in parentheses indicate number of specimens from which the average was derived. In cases in which a single specimen was available, the measurement is placed in the "average" column.

[b] This measurement in *A. minuscula* is 8.3 mm.

[c] This measurement in *A. minuscula* is 20.6 mm.

populations show considerable range in size.

The available comparative skeletal material is not sufficient to afford an analysis of size range of Recent tadornines, but from figures given by Delacour (1954, pp. 207–260) on measurements of skins, it is clear that many species in this tribe are known to have a large size differential, particularly between the sexes. A size range comparable to that of the fossils is observable, also, in a series of 16 skeletons of Recent *Branta nigricans*.

Of the two populations of *A. gracilenta* from California, the population of Rancho La Brea averages slightly smaller than that from McKittrick in most elements, notably so in the humerus and ulna (see table 1). Possibly the Rancho La Brea and McKittrick populations of *A. gracilenta* were tending toward racial separation. Of the measurable Rancho La Brea specimens, all but five (one humerus, two carpometacarpi, two coracoids) were taken from the Academy Pit. The McKittrick specimens are all from California Institute of Technology locality 138. There is slight evidence to suggest that the McKittrick avifauna at locality 138 was younger than that of the Academy Pit, Rancho La Brea. DeMay (1941, p. 58) compared the avifauna of this McKittrick locality with one of the University of California's McKittrick collections, two Pleistocene Rancho La Brea pits (L.A.C.M. Pits 3 and 4), and one Rancho La Brea pit of early Recent age (L.A.C.M. Pit 10) on the basis of percentage of individuals of extinct species, and other criteria thought to be correlated with age. A somewhat similar comparison was made of 13 Rancho La Brea pits (Howard, 1962b, pp. 12–13). Both McKittrick locality 138 and the Rancho La Brea Academy Pit collections occupy intermediate positions between the older Pits 3 and 4 on the one hand, and the more Recent Pit 10 on the other. The Academy Pit, however, appears to be closer to the older pits, whereas McKittrick 138 is closer to Pit 10. The University of California's McKittrick locality analyzed by DeMay appears closer to the Academy Pit in age. Study of the *Anabernicula* content of that locality might throw further light on the matter of possible development of races of *A. gracilenta*.

DISTRIBUTION

The few *Anabernicula* specimens from Shelter Cave and Little Hatchet Mountain Cave, New Mexico, previously recorded by genus only (Howard, 1962a, p. 242), have been re-examined in the course of the present study. Both occurrences should now be recorded as *A. gracilenta*. Each collection includes a coracoid which is distinguishable from that of

A. minuscula on the basis of more oval scapular and glenoid facets, and from that of *A. oregonensis* by less prominent flare of the glenoid facet, and greater excavation of the triosseal canal below the brachial tuberosity. A fragment of humerus from Shelter Cave has enough of the shaft proximally to show the rounded, less acute apex of the anconal face, characteristic of *A. gracilenta* as distinguished from either of the other species.

The three specimens from Smith Creek Cave, Nevada, previously referred to *A. minuscula* (Howard, 1952, p. 53), were recently reassigned to *A. gracilenta* (Howard, 1964, p. 286). The species *A. minuscula* is, therefore, confined to the single occurrence in the early Pleistocene of Arizona. The distribution of *A. gracilenta*, on the other hand, is now extended geographically to include three states, California, Nevada, and New Mexico. It shares the late Pleistocene scene with *A. oregonensis*, confined to the single Oregon locality. Whether *A. minuscula* bore any ancestral relationship to either of the later Pleistocene forms cannot be determined from the two incomplete elements of the Arizona species.

These records of *Anabernicula*, together with the middle Pleistocene occurrence of *Brantadorna* (Howard, 1963, p. 8) from Vallecito Creek, California, suggest that the tribe Tadornini was once a common member of the North American avifauna, although it does not occur on this continent today. Perhaps the group had a longer North American history, and these Pleistocene forms represent the last of its distribution here. Recognition of the tribe among older fossils might, however, prove difficult; evolutionary changes would presumably further complicate the peculiar combination of gooselike and ducklike characteristics. Existing genera and species of Tadornini are present in Pleistocene records from South America, Europe, and Asia. This fact would suggest that the Pleistocene fossil *Anabernicula* bore no direct ancestral relationship to the present-day forms of these other continents.

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