PLIOCENE BIRDS FROM CHIHUAHUA, MEXICO

By Hildegarde Howard[1]

ABSTRACT: Seven birds from the Yepómera fauna of the Rio Papigochic valley, Mexico are discussed, only one of which had been previously recorded from the area. All appear to be extinct, and one is described as a new genus and species.

The Pliocene deposits exposed in the valley of the Rio Papigochic, western Chihuahua, Mexico, have received considerable attention from geologists and paleontologists. A discussion of the deposits, with map, list of mammals recorded, and large bibliography has been presented by Lance (1950).

The area yielding the most fossils centers around the small towns of Rincón de la Concha and Yepómera. Although several collecting localities are involved, the mammalian fauna is more or less uniform (Lance, 1950:7) and is known as the Yepómera Fauna (formerly Rincón Fauna). The age is considered to be middle Pliocene (Hemphillian).

The California Institute of Technology (CIT) collected extensively in the Rincón-Yepómera area from at least ten separate fossiliferous localities. Bird bones were recovered at three of these: Arroyo de los Burros (CIT locality 276), Arroyo de las Barrancas Blancas (CIT locality 286) and Arroyo de los Poños (CIT locality 289). All California Institute of Technology material is now part of the collections of the Los Angeles County Museum (LACM).

The only avian species so far recorded from the Yepómera Fauna is a small flamingo, *Phoenicopterus stocki*, described from locality 289, with a total of nine bones referred, including the type (Miller, 1944). Nine more bird bones from locality 289, two from 276, and three from 286 are included in the collections. The list of avian species as now recognized includes seven species, as follows:

Avian Species in the Yepómera Fauna	Number of specimens
Locality 276	
Phoenicopterus stocki (flamingo)	1
Erolia (?), sp. (small shorebird)	1
Locality 286	
Wasonaka yepomerae, n. gen., n. sp. of duck	3
Locality 289	
Phoenicopterus stocki	12
Eremochen cf. *russelli* (goose)	1
Oxyura, sp. (duck)	3
Anas bunkeri (teal)	1
Mimidae (?) (thrasher-like bird)	1
	23

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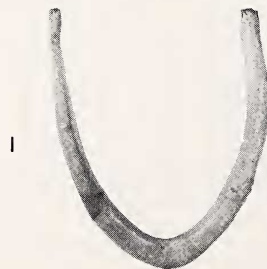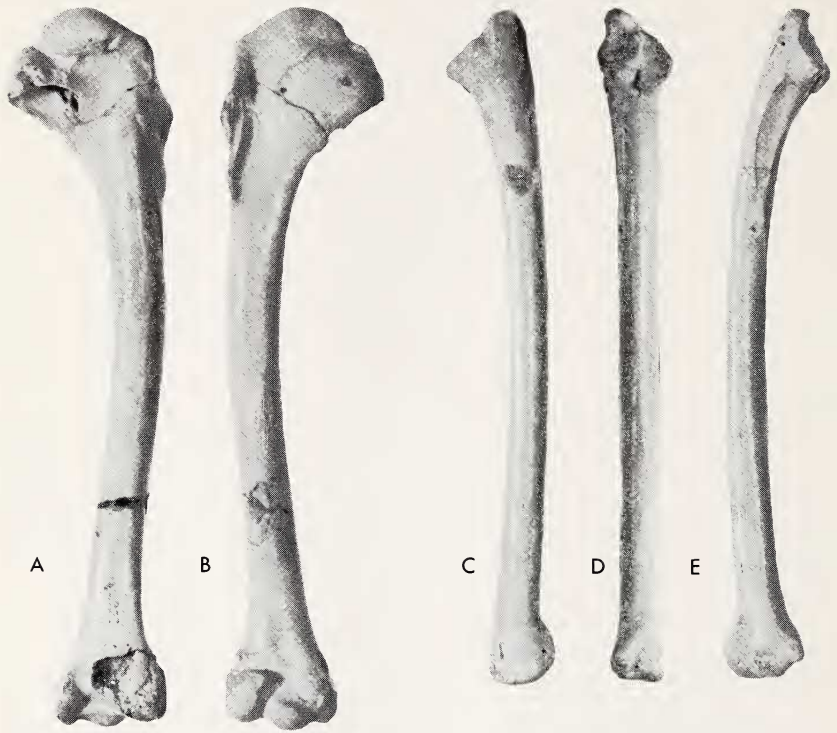
With the exception of the one passerine, all of the avian species are aquatic, and fit well into the picture of ephemeral lakes or marshes such as suggested by Lance (1950:8). The representation is too small to be of any significance as an age indicator. Probably all of the species are extinct, although the shorebird and the passerine cannot be definitely determined. The two extinct forms that have been previously recorded, *Eremochen russelli* and *Anas bunkeri* are both typically Pliocene, the former lower Pliocene, the latter middle Pliocene into late Blancan (early Pleistocene).

DESCRIPTION OF MATERIAL
Phoenicopterus stocki

Except for the type tibiotarsus, the specimens previously referred to this small species (Miller, 1944) were not individually listed. They have since been catalogued, and are as follows: right and left distal ends of tibiotarsus, LACM 4624 and 4626, proximal end of tibiotarsus figured by Miller (1944:78), LACM 4623; two left distal ends of humeri discussed by Miller (1944:80), LACM 4629 and 4630; proximal fragments of left ulna, LACM 4627, and left carpometacarpus, LACM 4628; and distal fragment of left tarsometatarsus, LACM 4625. To these may now be added a fragment of scapula (LACM 9731), and proximal and distal ends of radius (LACM 9732-9733) from the type locality (loc. 289), and a right distal end of humerus (LACM 4616) from locality 276, all of which are smaller than comparable elements of six Recent specimens of *P. ruber*. The humerus (4616) falls between the two previously recorded specimens of this element of *P. stocki* in size.

Measurements compared with Recent specimens of *P. ruber*:

Humerus, breadth distal end, *P. ruber*, 21.6-24.9 mm.
    LACM 4630, 19.2 mm.
    LACM 4616, 20.0 mm.
    LACM 4629, 21.9 mm.
Ulna, breadth proximal end, *P. ruber*, 14.8-16.3 mm.
    LACM 4527, 13.6 mm.
Radius, breadth distal end, *P. ruber*, 9.7-10.6 mm.
    LACM 9733, 8.7 mm.
Radius, minimum and maximum dimensions of proximal end, *P. ruber* 6.1 mm. x 8.1 mm. — 6.8 mm. x 8.6 mm.

Figure 1. A—E, *Wasonaka yepomerae*, n. gen., n. sp.: A-B, type humerus, LACM 4620, anconal and palmar views; C, D, E, paratype ulna, LACM 4619, external, palmar and internal views. F—G, *Anas bunkeri* Wetmore, referred coracoid, LACM 4621, anterior and posterior views; H—I, *Wasonaka yepomerae,* paratype furcula, LACM 4618, posterior and anterior views; J, *Eremochen* cf. *russelli* Brodkorb, referred scapula, LACM 9734, dorsal view.   x 1.
Photos by George Brauer.

LACM 9732, 5.9 mm x 7.3 mm.

Carpometacarpus, breadth proximal trochlea, *P. ruber*, 7.7-8.7 mm.

LACM 4628, 7.4 mm.

Scapula, breadth from glenoid facet to shaft posterior to acromion, *P. ruber*, 11.0-12.6 mm.

LACM 9731, 10.4 mm.

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Anseriformes

Anserinae

Eremochen cf. *russelli*

Fig. 1, J

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A scapula (LACM 9734) from locality 289, with well-marked forward projection of the acromion, resembles this element in the geese except for the large dorsal pneumatic fossa adjacent to the coracoidal facet. In size the specimen approximates scapulae of Recent *Anser hyperboreus*. The coracoidal facet is, however, smaller, and in place of the dorsal fossa there is a very slight depression. Although there is great variability in this element among Recent genera of geese, in none is the pneumatic fossa so subordinated.

Eremochen russelli, from the lower Pliocene of Malheur County, Oregon, is based on a proximal end of humerus as type, with scapula, carpometacarpus and tibiotarsus referred (Brodkorb, 1961:175-176). The scapula has been loaned for this study through the courtesy of Dr. J. A. Shotwell of the Museum of Natural History, University of Oregon. As in the Mexican scapula, this element of *Eremochen* is nonpneumatic in the area of the coracoidal facet; there is even less indication of a depression than in the Mexican fossil. In size, angularity of the anterior tip of the glenoid facet, and development of the muscle scar posterior to the acromion, ventrally, the Oregon and Mexican scapulae are markedly alike. The coracoidal facet appears slightly larger in the former, and, possibly, the acromion is more laterally and dorsally developed (unfortunately the tip of the acromion is broken away in the Oregon scapula so, its proximal extent cannot be determined). Considering the great variability that may be found in this element among individuals of a species in living geese, the notable similarities between the Mexican scapula and that of *Eremochen russelli*, leave no alternative but to allocate the Mexican fossil to the genus *Eremochen*. In view of the deviations in some characters, and the slight age difference, the species assignment is tentative.

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Anatinae

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Three species of ducks are included in the Yepómera avifauna. The one species recovered from locality 286 is represented by a furcula, humerus and ulna, probably all of one individual. The bones suggest a duck of about the size of a mallard (*Anas platyrhynchos*) but with more slender wings. Relationship is perhaps closer to the perching ducks (tribe Cairinini) than to the

dabblers (Anatini). Woolfenden (1961:109) found the osteological characters of these tribes so similar that he recommended grouping them together. However, at least between *Anas* (including species formerly allocated to *Chaulelasmus, Spatula, Mareca, Nettion* and *Querquedula*), and the cairinine genera *Aix, Sarkidiornis* and *Cairina,* there appear to be a few recognizable differences in the humerus and furcula. The fossil humerus combines many of the characters found in *Anas* with others that seem to be more typical of *Aix* or *Sarkidiornis.* The furcula is even more similar to that of the perchers, although, at the same time being quite distinctive. The new genus and species herein described is, therefore, tentatively allocated to the Cairinini. For convenience of identification, however, *Anas platyrhynchos* is used as a basis of comparison in the detailed description.

Wasonaka, new genus

Type: *Wasonaka yepomerae,* new species.

Generic diagnosis: Humerus with attachment of external head of triceps muscle depressed and distinctly bordered below head by curved line terminating at median edge of long, oval pectoral scar; pectoral scar appressed to shaft at proximal edge of deltoid crest; deltoid crest outwardly flared, and external surface excavated below heavy proximal border; on palmar surface, bicipital furrow markedly depressed externally at base of prominent proximal border of deltoid crest; distal edge of bicipital crest well above level of termination of deltoid crest; distally, impression of brachialis anticus muscle a small oval; entepicondylar process prominent and tending to overhang attachment of pronator longus muscle. Furcula relatively straight and V-shaped, with practically no posterior flexure of symphysis; symphysis thickened anteroposteriorly, lacking lines or depression anteriorly, bearing blunt furcular process posteriorly; dorsal surface of symphysis visible in posterior view, forming angular junction with posterior surface; coracoidal tuberosity of clavicle distinct, but small and papilla-like.

The generic name is derived from *wasona-ka,* meaning "duck" in the language of the Tarahumar Indians of Chihuahua, Mexico.

Wasonaka yepomerae, new species
Fig. 1, A-E and H-I

Type: Right humerus complete except for broken edges of bicipital and deltoid crests, internal tuberosity and anconal surface of external side of distal end; LACM 4620: collected by California Institute of Technology field party in 1946.

Locality and age: LACM (CIT) locality 286: Arroyo de las Barrancas Blancas, ¼ mile east of town of Yepomera, state of Chihuahua, Mexico; middle Pliocene (Hemphillian).

Paratypes: Furcula (LACM 4618) lacking tips of both clavicles; and left ulna, complete (LACM 4619); both bones found associated with type humerus at locality 286.

Diagnosis: See generic diagnosis.

Detailed description: Humerus (fig. 1, A-B) resembling that of *Anas platyrhynchos* in (1) length, (2) distinctness and extent of attachment of external head of triceps muscle, (3) long, oval pectoral scar appressed to shaft, (4) small, oval impression of brachialis anticus muscle, (5) angular apex of palmar surface of shaft above distal condyles, terminating at median edge of impression of brachialis anticus and about on a longitudinal line with center of external condyle, (6) attachment of anterior articular ligament facing slightly distally, and contour angular in internal profile; distinguished from *A. platyrhynchos* by (1) shaft more slender and more curved, (2) anconal contour of head more evenly rounded, with less overhang over capital groove, (3) groove narrower, (4) deltoid crest flared and connecting with shaft (at its distal tip) at an abrupt angle, (5) external surface of deltoid crest excavated, with (6) heavy proximal border undercut on palmar side by deep bicipital furrow, (7) bicipital crest shorter relative to length of deltoid crest, (8) intermuscular line distal to bicipital crest at extreme edge of shaft, (9) entepicondylar prominence more pronounced and tending to overhang attachment of pronator longus muscle, (10) internal condyle more round, less oval, and tending to constrict intercondylar groove toward anconal side.

Furcula (fig. 1, H-I) V-shaped as in some species of *Anas*. Distinguished from this element in *Anas* as follows: coracoidal tuberosity smaller and papilla-like; symphysis thickened and less flexed posteriorly; junction of dorsal and posterior surfaces angular and marked by lines on posterior surface that separate at the midpoint and continue downward to merge with the blunt furcular process; anterior surface of symphysis flatter and unmarked by lines or depression.

Ulna (fig. 1, C-E) longer and more slender than in *Anas platyrhynchos*, with relatively narrower impression of brachialis anticus muscle (see Table 1); external ligamental attachment notably produced onto palmar surface at base of olecranon; external cotyla extending from pitlike depression adjacent to external ligamental attachment and terminating in long, narrow lip appressed to palmar side of shaft; bicipital attachment a well-marked papilla; inter-cotylar area compressed near olecranon, reflecting similar constricting of intercondylar groove of humerus; distally, external condyle less prominent than in *Anas,* both in depth and height.

Measurements: Humerus, greatest length, 92.6 mm.; breadth proximally from internal tuberosity to bicipital crest, 19.7 mm.; greatest breadth distal end, 14.2 mm.; least transverse breadth of shaft, 6.4 mm. Furcula, height of symphysis measured immediately adjacent (but not through) furcular process, 4.8 mm.; anteroposterior depth of symphysis (measured at same place), 3.4 mm. Ulna, greatest length, 86. 5 mm.; length to internal cotyla, 79.8 mm.;

breadth across proximal cotylae, 9.7 mm.; breadth distal trochlea, 5.9 mm.; depth external condyle, 8.9 mm.; height external condyle, 9.2 mm.

Discussion: In the anseriform humerus, a well-flared deltoid crest with excavated external surface and prominent proximal border undercut on palmar side by deep bicipital furrow, is usually accompanied by a short, raised pectoral scar, as for example, in the geese and the tadornines. The long pectoral scar appressed to the shaft accompanies a smoothly rounded external surface of deltoid crest and shallow bicipital furrow in *Anas*. Among the anatid humeri examined, those of *Aix* (tribe Cairinini) have a combination of appressed long pectoral scar, and characters of the deltoid crest approaching the condition in the fossil though the excavation of the crest is less marked. *Sarkidiornis* (also of the tribe Cairinini) has a well excavated external surface of the deltoid crest, but, in this genus, the pectoral scar is short, and there is no marked depression of the bicipital furrow.

The furcula is more subject to individual variation than is the humerus, and is, therefore, less reliable as a generic marker. The anteroposteriorly thickened symphysis appears in several anseriform genera, but is most characteristic of the geese and tadornines. The fossil furcula is distinguished from both of these groups by the well marked coracoidal tuberosity. Thickening of the symphysis also occurs among the Cairinini, and, in *Sarkidiornis,* is accompanied by an angular junction of dorsal and posterior surfaces and separated lines leading to the furcular process as in the fossil bone. However, the whole symphyseal area is more swollen in the Recent specimen examined. In less marked degree a tendency to thickening of symphysis and double lines merging with the furcular process occurs in some individuals of the genus *Aix*. The small, papilla-like coracoidal tuberosities and blunt furcular process of the fossil are also more like the conditions found in the cairinine genera than in the Anatini. However, the cairinines examined have a more U-shaped furcula, with the symphyseal area narrower dorsoventrally, and more rounded. The flat anterior surface of symphysis in the fossil, and comparative lack of posterior flexure have not been observed in any of the Recent ducks.

If, as is believed, the ulna and humerus of *Wasonaka yepomerae* came from the same individual, the ratio of length of the two elements is most closely approximated among the tadornines (see Table 1). Compared with *Anas platyrhynchos,* the fossil ulna is approximately 5 mm. longer than the maximum of six Recent specimens, while the fossil humerus is slightly smaller than the average of the Recent form. In *Cairina* and *Aix,* the ulna is relatively short as in *Anas*; the ulna of *Sarkidiornis* is not available for comparison.

Anas bunkeri
Fig. 1, F-G

A nearly complete coracoid (LACM 4621 from locality 289), lacking only the sternocoracoidal process, is teal-like in general contours and size, but

is stockier than in *Anas crecca, A. cyanoptera,* or *A. discors,* with shorter, broader upper end (see Table 2). As the character of heaviness is the chief diagnostic feature of *A. bunkeri,* described (Wetmore, 1944:92) from a car-pometacarpus in the upper Pliocene of Kansas, it seems proper to allocate this coracoid to that species.

Other characters that distinguish the Mexican coracoid from that of Recent teals are: head lower, and brachial tuberosity lower relative to level of top of glenoid facet; coracohumeral surface more depressed, and bordering

TABLE 1

Proportions of *Wasonaka yepomerae* and *Anas platyrhynchos* Compared
(Ratios in per cent)

	Wasonaka yepomerae	*Anas platyrhynchos* (6 specimens)		
		max.	mean	min.
Furcular symphysis:				
Ratio of anteroposterior				
depth to height	71.0	59.2	54.9	49.2
Humerus				
Ratio of least breadth				
of shaft to length of element	6.9	7.5	7.3	7.0
Ratio of length of bicipital				
crest to length of deltoid				
crest (both measured to tip of head)	74.0	81.2	79.7	78.4
Ulna[a]				
Ratio of breadth across				
proximal cotylae to length	12.1	14.1	13.6	13.3
Ratio of depth of external				
condyle to length	11.1	12.4	12.1	11.6
Ratio of height of external				
condyle to length	11.5	13.3	12.9	12.0
Ratio of breadth-to-length				
of surface for attachment				
of brachialis anticus muscle[b]	19.5	34.3	31.4	28.6
Ulna/Humerus				
Ratio of length of ulna to				
length of humerus[c]	86.2	79.9	78.7	77.8

[a]Length of ulna measured from distal-most extent of external condyle to palmar edge of internal cotyla.

[b]This ratio in *Tadorna* is 20.9-23.1

[c]This ratio in *Tadorna* is 86.4-88.6

TABLE 2

Measurements and Proportions of Teal Coracoids, Fossil and Recent
(Measurements in millimeters; ratios in per cent)

	Anas bunkeri (referred)		Anas crecca (11 specimens)			Anas cyanoptera and A. discors[a]		
	LACM 4621	USNM 12833	max.	mean	min.	max.	mean	min.
a. Length to internal angle	32.3	....	35.1	33.1	31.0	34.5	33.8	32.0
b. Distance from head to underside of scapular facet	10.3	10.8	11.7	11.0	10.2	11.7	11.2	10.8
c. Breadth below furcular facet, across triosseal canal	5.0	5.2	5.3	4.8	4.5	5.2	4.9	4.7
d. Breadth of neck measured on anterior face	4.7	4.6	5.0	4.4	4.2	4.9	4.4	4.2
e. Least breadth of shaft below procoracoid	3.3	3.4	3.8	3.3	3.0	3.7	3.4	3.2
f. Depth of shaft below procoracoid	3.3	3.2	3.0	2.8	2.7	3.1	2.8	2.6
g. Distance from top of glenoid facet to internal edge of furcular facet	5.6	5.3?	6.9	6.2	5.7	6.7	6.4	6.3
Ratio of measurement c to measurement b	48.5	48.2	45.1	44.1	42.6	45.4	44.1	42.4
Ratio of measurement d to measurement g	84.0	86.7	78.0	71.5	65.5	74.3	69.2	65.5

[a]Measurements on two available specimens of Anas discors agreed so closely with those of four specimens of A. cyanoptera that the two species are grouped together.

contours more curved (anteriorly concave, posteriorly convex); glenoid facet depressed at center so that posterior edge appears to protrude more prominently.

The coracoid of *A. bunkeri* was not described from the type locality, but has since been recorded from the middle Pliocene of Oregon (Brodkorb, 1958:252) in association with carpometacarpi that compare favorably in all respects with the type of the species. Unfortunately this coracoid lacks both ends, and only a minimum breadth of shaft is recorded. Brodkorb (1958:253) lists this dimension as 3.7 mm., a breadth .3 mm. greater than that of the Mexican fossil. However, both specimens fall within the size range of this dimension as measured in a series of coracoids of Recent *A. crecca*. As noted above, the heaviness of the Mexican bone is notable particularly in the upper end.

In a recent listing of the localities from which *A. bunkeri* is known (Brodkorb, 1964:225), the late Blancan (early Pleistocene) Hagerman Lake beds of Idaho are included. In 1965 correspondence with the present writer, Brodkorb states that the listing is tentative and is based on a coracoid (U.S. Natl. Mus. 12833) assigned by Wetmore (1933:11) to "*Querquedula,* sp."

Through the courtesy of Dr. Lewis Gazin, Curator of Vertebrate Paleontology, United States National Museum, I have had the opportunity to examine this bone. The specimen includes the upper ⅔ of the element, but unfortunately the surface of the furcular facet is eroded, and the anterior edge is broken away. Nevertheless, in all characters that are preserved, this specimen and the coracoid from Mexico agree, *eg.,* the upper portion is broad, the head and brachial tuberosity are seemingly low, the coracohumeral surface is depressed and curved, and the glenoid facet is depressed.

A number of other teals have been described from the late Tertiary. With the exception of *A. eppelsheimensis,* from the lower Pliocene of Germany, none have the characteristic stocky proportions of *A. bunkeri,* and the fossil here at hand. The German specimens, fragments of coracoid, humerus and wing phalanx, have never been compared in detail with the North American teals, and there has been no opportunity to examine the material now. However, the description of the coracoid of *A. eppelsheimensis* (Lambrecht, 1933:362) characterizes the glenoid facet as being semicircular in form, in contrast to the outwardly projected contour found in *A. crecca.* As there is some individual variation in this contour within *A. crecca,* I cannot be certain of the diagnostic value of this character without seeing the specimen. It does, at least, suggest distinction from the Mexican coracoid, in which the glenoid facet is outwardly projected.

Oxyura, sp.

Right and left proximal ends of femora (LACM 9735 and 9736) from locality 289 resemble *Oxyura jamaicensis* in having a large head prominently

protruding from the shaft, with slightly depressed space below on the internal face of the shaft. The proximal tip of the trochanter is broken on both specimens, but the trochanter appears to be blunt anteriorly as in *O. jamaicensis*. The chief difference to be observed between the fossil fragments and the Recent specimens is the more oval shaft of the former. A proximal half of ulna (LACM 4631), also from locality 289, resembles this element in *O. jamaicensis* in the deeply excavated anconal edge of the attachment of the brachialis anticus muscle, and the general depression of the entire attachment, resulting in a flattened internal surface of the shaft. The fossil differs from *O. jamaicensis*, however, in having a clearly defined intercotylar ridge; in the Recent species the two cotylae blend into one another without a ridge. In breadth and depth of proximal end, the fossil falls within the size range of *O. jamaicensis*, but appears to be slightly stouter in diameters of the shaft. The shaft measurements agree closely with those of the ulna from the middle Pleistocene of Vallecito Creek, California, referred to *O. bessomi* (Howard, 1963:13); unfortunately, however, the proximal end is not preserved in the latter bone. In view of the fragmentary condition of the femora, and the impossibility of making direct comparison with the geologically younger, *O. bessomi*, the Mexican bones are referred only generically. The possibility of relationship between the California and Mexican birds should be kept in mind should further material become available at either locality.

Charadriiformes
Erolia (?) sp.

A fragment of distal end of ulna (LACM 4617) from locality 276 agrees in size and general characters with Recent specimens of this element of the Least Sandpiper, *Erolia minutilla*. Definite identification is impossible from this fragment, and it is highly unlikely that the Recent species is represented in this Pliocene deposit.

Passeriformes
Mimidae ?

An incomplete humerus, lacking proximal extremity (LACM 4622), from locality 289, suggests the thrashers in contours, and is only slightly larger than Recent specimens of *Toxostoma redivivum* from California.

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