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BY

HILDEGARDE HOWARD

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FIRST RECORD OF AVIAN FOSSILS FROM THE EOCENE OF CALIFORNIA

HILDEGARDE HOWARD
Research Associate, Los Angeles County Museum

ABSTRACT—The recovery of two avian bones from the Eocene of San Diego, California marks the first recording of bird life in California prior to the Miocene. A new species, *Protostrix californiensis*, (Order Strigiformes) is described, and the Order Gruiformes tentatively recorded.

INTRODUCTION

THE avian record in California has heretofore been limited to Miocene, Pliocene and Pleistocene listings. Reptiles and mammals have been recorded from earlier deposits in the state, but pre-Miocene birds had never been recovered. Now, two separate localities in San Diego, California have yielded one bird bone each from deposits of Eocene age.

The more diagnostic of the two specimens, a humerus, Los Angeles County Museum (LACM) no. 6171, was recovered from one of many chunks of "arkosic" sandy matrix excavated in 1962 by Mr. F. A. Tyler of San Diego from a road excavation in a new housing development east of Lake Murray (LACM locality no. 1723). The matrix contained many mammal fossils, several of which have been identified by Dr. J. R. Macdonald, Curator of Vertebrate Paleontology at the Los Angeles County Museum, as of late Eocene age. Recent mapping of the area (Strand, 1962) indicates that the beds in this area are of the continental Eocene, Poway Formation.

A tibiotarsus (LACM no. 2851), too poorly preserved for definite identification, was found in 1956 by Mr. Joseph Arndt of San Diego, in the quarry of the Pre-mixed Cement Company located in Mission Valley, on Friar's Road near Murphy Canyon (LACM loc. no. 1877). According to Arndt, the specimen came from the Poway Conglomerate about 10 ft. below the contact with the overlying silts. Upon examination of the matrix, Mr. Harry Turver, formerly with the Standard Oil Co. paleontological laboratory in Los Angeles, found no Foraminifera, and stated that the material resembled other matrix specimens taken in the same general area from the continental prongs of the Poway Formation. Recent discussion of this area on Friar's Road (Milow and Ennis, 1961:27) substantiates Mr. Arndt's and Mr. Turver's opinion.

SYSTEMATIC DESCRIPTION

Order STRIGIFORMES
Family PROTOSTRIGIDAE Wetmore 1933

The humerus from locality 1723 is assigned to the Strigiformes on the basis of its well flared distal end with small condyles relatively even in distal contour; and its well inflated, though narrow bicipital surface, with deep bicipital furrow extending well past the median line of the bone.

The bone is considerably stockier and more curved than the humerus of living owls of comparable size, and in this respect superficially resembles the hawks and caracaras. Among the smaller living owls, however, *Surnia* has a humerus of similar proportions and curvature. Other qualitative differences from existing owls are evident, the more basic of which are found in the extinct family Protostrigidae as exemplified in the type distal end of humerus of *Protostrix saurodosis* (Wetmore, 1921) from the Bridger Eocene of Wyoming. Most important are the lateral extension of the ectepicondylar area, delimiting a shallow groove or depression external to the external condyle and obscuring the external ligamental attachments from palmar view; the large attachment of the anterior articular ligament; the merging of the median condyle into the palmar face of the bone without sharp decline; and the absence of a secondary prominence on the distal contour of the median condyle towards the internal side.

Significant differences from *Protostrix saurodosis* justify taxonomic separation, which, at the present state of knowledge of Eocene owls, it seems wiser to consider at the specific, rather than the generic level. The California species is, therefore, designated.

PROTOSTRIX CALIFORNIENSIS n. sp.
Pl. 49, figs. 1 and 3

Type.—Left humerus, partly crushed proximally, lacking head and internal tuberosity,

and internal tip of entepicondyle. LACM no. 6171, collected by F. A. Tyler, June 29, 1962.

Locality.—LACM loc. no. 1723; 300 yards north of intersection of Lake Shore Drive and Jackson Drive, east of Lake Murray, San Diego, California.

Formation and age.—Poway Formation, in 6–12 inch lens of sandy silt, 3 ft. below conglomerate; late Eocene.

Diagnosis.—Relatively short, stocky humerus with marked lateral curvature of shaft; olecranal fossa with slight horizontal depression immediately above median condyle; anconal border of entepicondyle well developed and forming distinct internal margin of internal tricipital groove; internal tricipital groove well internal in position, running diagonally to terminate on internal margin of shaft just above entepicondylar prominence; entepicondylar area broken away at internal tip, but well developed anconal portion and slant of internal margin of shaft suggest development equivalent to that of *P. saurodosis*, and perhaps closest to *Surnia* and *Speotyto* among living owls; attachment of anterior articular ligament facing almost directly palmad, with palmar surface slightly convex, and upper and lower margins slightly curved; groove between attachment of anterior articular ligament and median condyle clearly marked; diagonal groove on palmar surface of median condyle more nearly horizontal in position than in living owls, and median condyle more evenly and smoothly rounded in all contours; area between brachial depression and median condyle shallow, with gradual descent from condyle to depression; brachial impression well centered with respect to lateral margins of shaft, and triangular in shape; external condyle narrow, and slightly sigmoid at proximal tip; intercondylar furrow well marked; ectepicondylar area produced laterally, with groove-like depression adjacent to external condyle on palmar face; external border of ectepicondylar area thickened, rounded in external contour, merging proximally with horizontal muscle scar above condyle, and lacking evidence of the sharp projection found in living owls. Proximally, capital groove well-defined at extreme proximal extremity, but broken below; ligamental furrow broad but shallow; distal extremity of deltoid crest well median in position on shaft, with short intermuscular line extending below; anconally, shaft below head with high, angular apex, sloping steeply on either side; pneumatic fossa less constricted than in *Bubo*.

Measurements.—Length of humerus from distal contour of median condyle to capital groove, 105 mm.; distance from distal extremity of deltoid crest to distal contour of external condyle, 67.8 mm.; greatest breadth of pneumatic fossa, approximately 9.3 mm.; breadth of distal end from ectepicondyle to outer contour of attachment of anterior ligament, 18.6 mm.; breadth of shaft at base of deltoid crest, 8.9 mm.; breadth of shaft immediately above brachial impression, 10.3 mm.

Discussion.—In general size as judged by breadth of distal end of humerus, *P. saurodosis* and *P. californiensis* could fall within the size range of a single species, but qualitative characters serve to distinguish them. Most notable distinctions lie in the relatively heavier shaft in *P. californiensis*, broader, shorter brachial impression, more convex attachment of the articular ligament, more marked groove between this attachment and the median condyle, and between median and external condyles, more rounded median condyle, and more sigmoid external condyle with narrower tip. The characters of the olecranal fossa and brachial depression are less clearly defined in *P. saurodosis* than in *P. californiensis*, but both areas appear slightly more depressed in the California species.

Three other species of Eocene owls have been recorded from North America, all with distal end of tibiotarsus as type, and no humerus available. All are from Wyoming. *Protostrix lydekkeri* (Shufeldt), which is the type of the genus, and *P. leptosteus* (Marsh), and *P. saurodosis*, are from the Bridger Formation; *P. mimica* Wetmore is from the older Wasatch Formation. From the excellent reviews of *P. lydekkeri* and *P. leptosteus* by Wetmore (1933 and 1937, respectively) the peculiarities of these two species that place them in the same extinct genus are clearly shown, notably, the marked narrowing of the external condyle and the heaviness of the internal condyle. As *P. saurodosis* was also found in the Bridger Formation of Wyoming, Wetmore's decision (1933, p. 4) to include it in the genus *Protostrix* is justifiable. *P. mimica* stands apart from the other species by reason of its small size, but even more significantly, when compared with *P. lydekkeri* and *P. leptosteus*, by the heavier external condyle of the tibiotarsus. In fact, Wetmore (1938, p. 28) suggests that the generic assignment of this species may be subject to revision.

Protostrix lydekkeri was obviously a much larger owl than either *P. saurodosis* or *P. californiensis*. But either of the latter species could, I believe, have had a tibiotarsus of the size of that of *P. leptosteus*. In view of the wide geographic separation, and probably slightly later age of the California specimen, I feel that separation of *P. californiensis* from *P. leptosteus* is justified. If more owl bones should be found in the Bridger Formation of Wyoming, the

synonymy of *P. saurodosis* with *P. leptosteus* might be indicated.

Early Tertiary owls have also been recorded in Europe, from the phosphate beds of France of late Eocene-early Oligocene age, as follows: *Bubo incertus* Milne-Edwards, *Asio henrici* Milne-Edwards, *Necrobyas harpax* and *N. rossignoli* Milne-Edwards, *N. edwardsi* Gaillard, and *Strigogyps dubius* and *S. minor* Gaillard. These forms have never been analyzed for possible relationship to the American Protostrigidae, and I would not attempt to do so here on the basis, solely, of the published descriptions at hand. Illustrations of the humerus are available only for *Asio henrici* (Gaillard, 1908, p. 38, fig. 4) and *Strigogyps minor* (Gaillard, 1939, p. 11, fig. 4).

Gaillard's (1908, p. 30–40 and 1939, p. 6–11) descriptions, measurements and illustrations do, however, justify the specific separation of the California owl from any of the European forms. *Asio henrici*, *Bubo incertus* and all three species of *Necrobyas* were undoubtedly smaller birds than *Protostrix californiensis*, whereas *Strigogyps dubius* was markedly larger. *Strigogyps minor*, which most nearly approached *Protostrix californiensis* in size (total length of humerus 118 mm.) is set apart by many peculiarities of structure of the humerus, most notable of which are the reduced deltoid crest and bicipital surface, diminished pneumatic fossa, lateral position of the brachial impression, and longitudinal position of the internal tricipital groove, distally.

P. californiensis does not resemble any Recent species of owl sufficiently to suggest ancestral relationship. Such resemblances as can be noted are probably quite superficial, as for example, the curvature of the shaft and stocky proportions paralleled in *Surnia ulula*, and the broad, short, brachial impression, and median position of the deltoid crest found in *Ketupa javanensis*.

Order GRUIFORMES?
Pl. 49, fig. 2

The tibiotarsus (LACM no. 2851) from locality 1877 lacks the proximal articular surface, both cnemial crests and the posterior and distal contours of the distal condyles; the anterior contour of the condyles is incompletely preserved. Because of the absence of these critical areas, the bone cannot be definitely allocated.

Its stocky proportions suggest galliform or cathartid affinity, but more detailed characters are not upheld by living members of either of these groups. Most notable of the few detailed characters that remain on the fossil specimen are as follows: tendinal canal nearly median in position on shaft; supratendinal bridge narrow and straight, convex anteriorly with small protuberance external to its lower border overhanging the intercondylar fossa; area external to bridge raised, terminating proximally in a small papilla about $4\frac{1}{2}$ mm. above external condyle; groove for peroneus profundus well marked for a distance of at least 7 mm. above (and external to) the papilla; proximally, internal ligamental attachment prominently projected; internal cnemial crest, though broken away, apparently short (terminating above the level of the proximal tip of the fibular crest), nearly median in position on shaft and continuous with rounded median apex of shaft rather than with intermuscular line; intermuscular line internal in position, between internal ligamental attachment and median apex of shaft; fibular crest short, but well set off from shaft throughout its length; internal surface of shaft very slightly rounded below level of fibular crest, and longitudinally bordered along both anterior and posterior margins by intermuscular lines, giving slightly angular contour to shaft; length 110 mm. (approx.), shaft breadth 7.4 mm.

Many of these characters, particularly the prominent proximal internal ligamental attachment, position of intermuscular lines, short, clearly demarcated fibular crest, development of groove for peroneus profundus, and raised area adjacent to supratendinal bridge, are duplicated in the tibiotarsus of *Cariama* (Order Gruiformes), although the proportions of the fossil bone are markedly different than in this slender-legged Recent genus. In general, however, characters of the distal end are closer to those found in gruiforms than to those of any other group. Several extinct genera of Gruiformes are known from the early Tertiary of Wyoming, South Dakota, Nebraska, and New Jersey, and two extinct families are recorded. One family, Geranoididae Wetmore, from the early Eocene, was probably related to the cranes; the other, Bathornithidae Wetmore, known from the lower, middle and upper Oligocene, was related to the cariamas. The California bird may have been related to one of these families.

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Photographs were made by George Brauer, retouched by Pearl Hanback.

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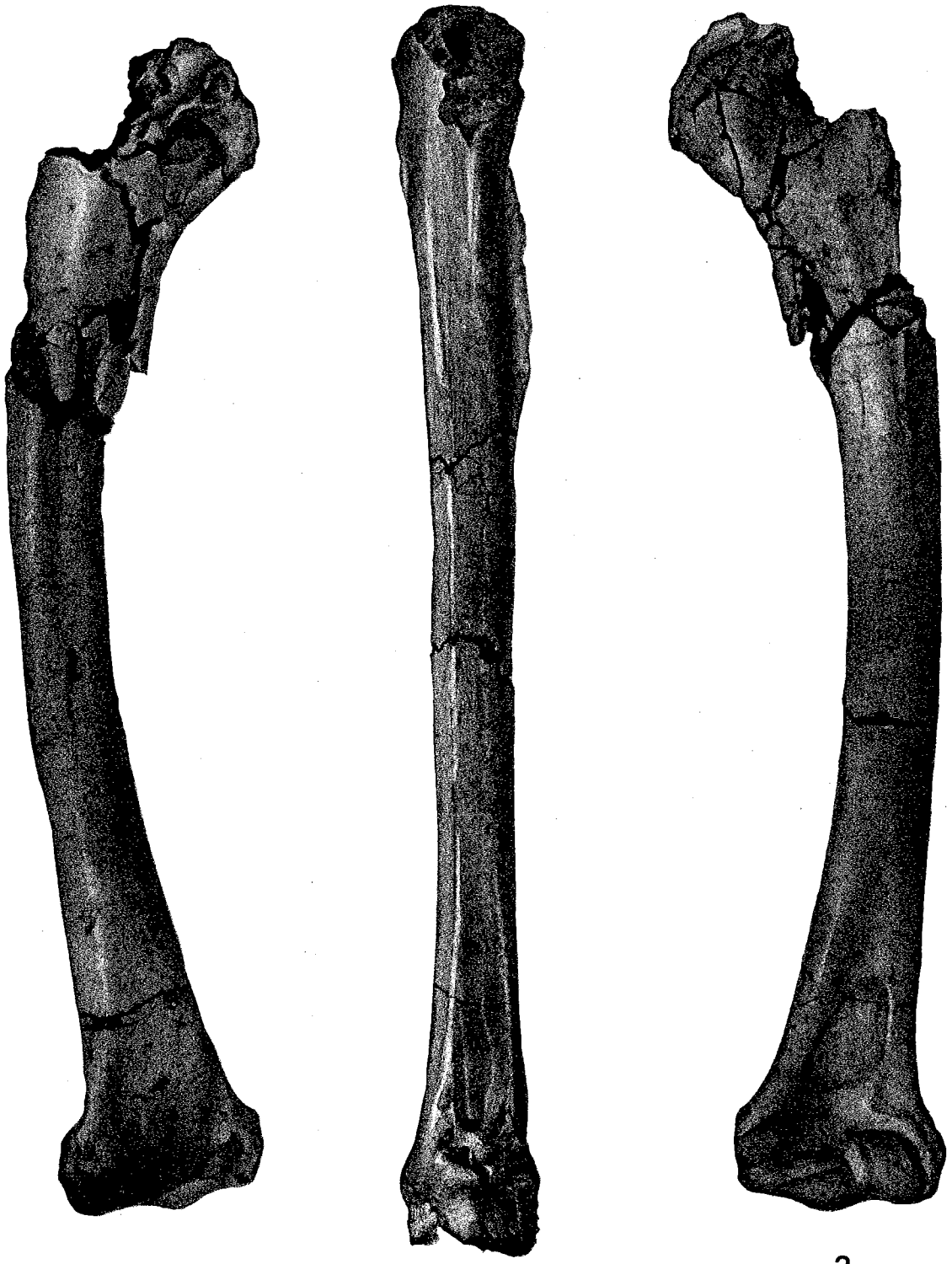
The author contributed $100.00 toward the cost of publishing this paper.

(*Explanation of Plate 49 is on following page*)

EXPLANATION OF PLATE 49

Poway Formation, Eocene, San Diego, California. All figures approximately $\times 1\frac{1}{2}$.

FIGS. *1,3*—*Protostrix californiensis*, n. sp. *1*, anconal view, *3*, palmar view of type humerus LACM no. 6171.
2—Order Gruiformes? Anterior view of tibiotarsus LACM no. 2851.



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