THE LUCAS AUK APPEARS AGAIN

By LOYE MILLER

Just at the turn of the century there appeared the first published record of a fossil bird from the state of California, *Mancalla californiensis* (Lucas, 1901), represented by a fragment of the humerus. Three years later Sinclair (1904) devoted one clause of a single sentence to birds in a report on his exploration of Potter Creek Cave (Pleistocene) in Shasta County. This cavern bird material remained in the collections of the University of California without further attention until the rich deposits of Rancho La Brea revived the subject of paleornithology within the state. During the succeeding thirty years, better than a hundred thousand bird bones have been retrieved from thirty or more localities and a dozen different workers have contributed to the literature of California's fossil birds. The Lucas Auk thus occupies historically a dignified position at the head of a long train of followers.

In 1933 a second specimen of the humerus of this species was retrieved from strata of Pliocene age at San Diego (Miller, 1933). This poorly preserved fragment threw no new light upon the species but it did serve as the stimulus for a careful examination of the type through the medium of a well made cast. The specimen fortunately retained that peculiar relation of the capital groove to the ligamental furrow that I have seen duplicated in no other bird humerus. The identity seems unquestionable and the presence of *Mancalla* in the marine beds at San Diego, one hundred and forty miles to the southward of the type locality, Los Angeles, is of service to paleontology in determining the age of these strata.

By great good fortune we now have a second humerus from the Pliocene beds of San Diego, a specimen that is complete and but slightly water-worn. This bone gives us for the first time the characters of the elbow joint, a part that is lacking in the type specimen. Needless to say, this new find was welcomed with great enthusiasm.

The bone, together with other fragments of the same and other species, was picked up by Mr. John Squyres of San Diego, who very generously donated the material to the University of California at Los Angeles. I would here record my indebtedness to Mr. Squyres, to Director Clinton G. Abbott of the San Diego Museum of Natural History, who brought the material to my attention, and to Dr. Hildegarde Howard, who has contributed valued suggestions and criticism.

Nature of the deposit.—The material here discussed comes from two separate exposures resulting from road cuts in the Mission Hills district of San Diego. The Reynard Way exposure lies on the east side of that highway five hundred yards south of its intersection with Sutter Street. The Five Points Freeway exposure lies on the south side of the freeway beginning one-fifth of a mile west of the intersection of Washington Boulevard and Hawk Street. This exposure runs along the south bank for most of the length of the freeway.

The matrix is a clean gray sand of fairly uniform texture, free from ripple marks or cross bedding, thus indicating water well out from the immediate shore line. Occasional small stones that occur were certainly not water borne but may have come from sea lion stomachs or from kelp holdfasts. The several bones from the one species of diver could not therefore be the result of a rookery accumulation, although there must have been such a rookery on some not far distant islet from which remains were swept to be scattered over the adjacent sea bottom. Bones of whales and seals and teeth of sharks and rays occur abundantly in the same stratum as the bird remains. Some species of typical

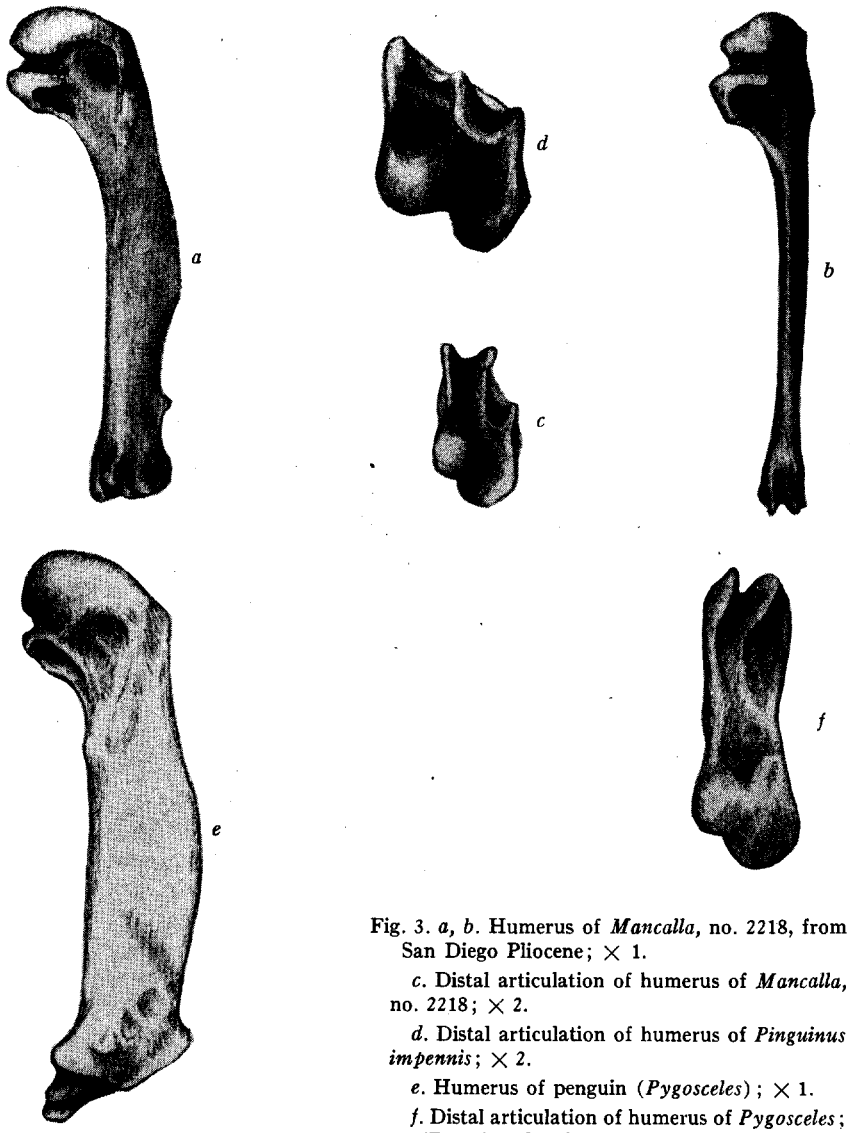

Fig. 3. *a, b.* Humerus of *Mancalla,* no. 2218, from San Diego Pliocene; × 1.

c. Distal articulation of humerus of *Mancalla,* no. 2218; × 2.

d. Distal articulation of humerus of *Pinguinus impennis*; × 2.

e. Humerus of penguin (*Pygosceles*); × 1.

f. Distal articulation of humerus of *Pygosceles*; × 2. (Drawings by the author.)

alcid, a cormorant, and a gull are indicated by other fragments in the collection. Also there is a complete femur that is practically identical with the type specimen of *Pliolunda diegense.*

Study of the remains.—The complete humerus of *Mancalla* came from the Reynard Way cut. Most of the fragments were taken at the Five Points Freeway exposure. The complete bone comes from a smaller bird than did the type specimen and it shows certain osteological divergences. Fragments came from larger birds, but none quite reaches the size of the type. These differences are not beyond the amplitude of age and sex variation in some living species of high variability, although it must be conceded

that a smaller form than *californiensis* may possibly be represented. In this connection it may be noted that Grant and Gale (1931:40) place the San Diego beds at a slightly earlier stage of the Pliocene than the Los Angeles stratum that yielded the type. Possibly *Mancalla* was a variable species that was moving toward gigantism.

The type specimen lacks the distal condyles but the peculiar epicondylar tubercle is preserved. Measuring from this tubercle to the extreme profile of the caput humeri gives us a length of 62.1 mm. The same measurement in the San Diego specimen is 54.3 mm. The ratio of these two figures is 1:1.15. The only two humeri of the Great Auk (*Pinguinus impennis*) in our collection from the kitchen middens of Funk Island differ in length with a ratio of 1:1.18. These two ratios are strikingly similar when one considers that only two specimens of each species are available for measurement. Since comparison is being made between a plaster cast on the one hand and a slightly water-worn original on the other, one should not ascribe too great importance to minute osteological differences. Therefore, until further material is available, a single species is considered adequate to include all the known specimens of *Mancalla*.

Systematic position of Mancalla.—What now of the systematic position of the genus *Mancalla*? Does the complete specimen throw new light upon its relationships? I must confess to a new and accentuated impression of specialization after study of the distal articulation in this latest material. Although we have a humerus that is fundamentally auk-like, the compression is extreme, the external and the internal tricipital groves are profound and are sharply defined by blade-like ridges, the articular condyles are reduced and they are brought together and shifted in position, so that they lie in a line that has rotated from the transverse direction seen in the majority of birds to one far nearer the sagittal plane of the bone, much as we see it in the penguins. The effect must certainly have been a marked reduction of freedom in the elbow joint. Pronation and supination must have practically disappeared, while flexion of the fore arm upon the upper arm could scarcely have been effected. There must have resulted a penguin-like swimming flipper rather than an organ of potential flight that could be folded away in typical bird fashion when its owner came to rest. The recession of the epicondylar prominence up the shaft suggests prolonged extension of the metacarpus, thus adding further to the impression of a flipper type of limb.

In my former paper on the species (1933) the following statement is made: "While it does not show genetic relation to the penguins, there are certain characters, presumably adaptive, that are strongly suggestive of that group, and which at the same time set it off from its nearest relatives, the Auks." Examination of this new material reveals such positive modification of the distal portion of the bone as to make it necessary to recognize the family Mancallidae if we are to harmonize the taxonomy of fossil birds with that of Recent ornithology.

Relation to Pliolunda.—A natural question to ask next would be "Is *Pliolunda diegense* a synonym of *Mancalla californiensis*?" This question was briefly discussed and was answered in the negative in the original description of *Pliolunda* (Miller, 1937). My conclusion was based upon the estimate by Lucas (1901) that *Mancalla* had a body size about equal to that of the Great Auk (*Pinguinus impennis*). On such a score, *Pliolunda* would be a far smaller bird than *Mancalla*.

With this new material at hand, I am inclined to feel that Lucas' estimate of body size was not well founded. The evidence supplied by the San Diego humerus points to *Mancalla* as a bird far more highly specialized toward the flightless habit than was *Pinguinus*. This would justify Lucas' contention that the bones of the pelvic limb would be strengthened in much the same proportion. Lucas may, however, have been under

the impression that the type specimen had lost more length by fracture than was really the case. The ratio of humerus length to femur length within a family group (see table 1) might be taken as a crude index of specialization toward a flightless habit. This ratio in *Lunda* is equal to 1.59:1, in *Pinguinus* it is 1.40:1. The San Diego humerus of *Mancalla* has a length of 65.2 mm. The type of *Pliolunda*, a complete femur, measures 55.7. Comparing these two figures gives a ratio of 1.20:1 which indicates a femur that is relatively larger than that of any other alcid examined. It would also completely refute my assumption of 1937 (p. 376) that the type specimen of *Pliolunda* was too small to be assigned to the species *Mancalla californiensis*.

Table 1

Ratios of Femur to Humerus in Alcids and Penguins

	Humerus	Femur	Ratio
Uria aalge	99.4 mm.	50. mm.	1.98
Cerorhinca monocerata	79.0	40.2	1.96
Brachyramphus marmoratus	48.4	25.0	1.93
Ptychoramphus aleuticus	46.6	28.5	1.63
Lunda cirrhata	79.0	49.4	1.59
Pinguinus impennis	106.8	76.2	1.40
Mancalla californiensis	65.2	.....	.....
Pliolunda diegense	.....	54.2	1.20
Pygosceles adele	73.2	79.5	0.92

The San Diego beds have yielded thus far the fragments of six humeri of *Mancalla* but no associated femur. They have yielded also two complete femora of *Pliolunda* but with no humerus that is unquestionably associated. Both species show kinship to the family Alcidae but at least *Mancalla* is set off by a high degree of specialization. Such specialization may not necessarily have been reflected in the femur.

Pure coincidence may be a large factor in the picture and we must not allow it to overbalance the other values; still it must be conceded that *Pliolunda* might be a synonym of *Mancalla*. The following uncertainties, therefore, still confront us:

1. Are the San Diego humeri too small to be conspecific with the Los Angeles type of *Mancalla californiensis* Lucas? My own reaction is to include them within the range of species variability.

2. Should the femora designated as *Pliolunda diegense* Miller be considered as conspecific with the humeri identified as *Mancalla californiensis*? My own feeling is that there is much in favor of such a point of view but that the case is not proven and that the status should therefore best remain at present unchanged.

Table 2

Measurements of the Humerus of *Mancalla*, no. 2218 U. C. L. A.

Extreme length between articular surfaces	65.0 mm.
Greatest width of shaft	9.8
Thickness of shaft at thinnest point	3.5

SUMMARY AND CONCLUSIONS

1. A complete humerus of *Mancalla* from the San Diego Pliocene is figured and discussed; it is the first specimen to preserve the characters of the elbow joint. The specimen though small is considered to be conspecific with the type of the genus *M. californiensis*.

2. Characters of the elbow joint add greatly to the impression of extreme special-

ization toward a penguin type of flipper. The broader affinities lie with the Alcidae, but the extreme specialization warrants recognition of the family Mancallidae.

3. The possible synonymity of *Pliolunda* is discussed but is held to be inconclusive. The presence in the same exposure of a distal fragment of a humerus representing a true alcid strengthens this point of view.

4. Two new bird-bearing localities of Middle Pliocene age are here recorded.

5. Other vertebrate fossils retrieved from the same exposures include three proximal and two distal fragments of the humerus of *Mancalla,* a distal fragment of a humerus of a true alcid, a complete femur of *Pliolunda,* a number of undetermined bird fragments, a small rodent humerus, a splinter from an ungulate tooth, vertebrae of a whale, and teeth of sharks and rays.

LITERATURE CITED

Grant, U. S., and Gale, H. R.
1931. Catalogue of marine Pliocene and Pleistocene Mollusca of California. Mem. San Diego Soc. Nat. Hist., 1:1-1036.

Lucas, F. A.
1901. A flightless auk, *Mancalla californiensis,* from the Miocene of California. Proc. U. S. Nat. Mus., 24:133-134.

Miller, L.
1933. The Lucas auk in California. Condor, 35:34-35.
1937. An extinct puffin from the Pliocene of San Diego. Trans. San Diego Soc. Nat. Hist., 8:375-378.

Sinclair, W. J.
1904. The exploration of the Potter Creek Cave. Univ. Calif. Publ. Amer. Arch. and Ethn., 2:1-27.

University of California, Los Angeles, California, September 30, 1945.