A NEW AVIAN FOSSIL FROM KERN COUNTY, CALIFORNIA

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The first avian fossil from the Pyramid Hill sands of the San Joaquin Valley, Kern County, California, was presented to the Los Angeles County Museum of Natural History in 1964 by Mr. Dick Bishop of Bakersfield, California. The specimen was recovered from a sand quarry discovered by Bishop, which he and Ed Mitchell of the Museum worked extensively in 1961. The site is recorded as Los Angeles County Museum of Natural History (LACM) locality 1626. Fish, chelonian, and mammalian remains, as well as invertebrates, have come from the same locality, but have not yet been reported upon. From other Pyramid Hill sites, presumably of the same age, a cetacean has been described (Kellogg, Smithsonian Misc. Coll. 87 (2): 1, 1932) and mollusks identified (Barbat, in Kellogg, op. cit. p. 1, and Addicott, U.S. Geol. Surv. Prof. Paper 525-C:104, 1965). On the basis of the molluscan identifications, the age of the Pyramid Hill sands is placed as early Miocene (Vaqueros "formation" or "stage"). The fauna is, therefore, older than that of the well-known Sharktooth Hill deposits of the San Joaquin Valley, which contain a middle Miocene marine vertebrate assemblage of more than fifty species, ten of which are avian (see Mitchell, Special Publ. Kern Co. Historical Soc. and Kern Co. Mus., 1965; and Howard, Los Angeles Co. Mus. Contrib. Sci. 114: 1, 1966).

The Pyramid Hill avian bone is an upper end of left coracoid. In the triangular outline of the head, with space between the brachial tuberosity and the forward-directed furcular facet, the bone shows a basic relationship to the coracoid in cormorants and anhingas. The shape of the procoracoid and scapular facet, and the flattening of the shaft adjacent to the scapular facet are also cormorantlike characters. Other features of the bone, however, show modifications paralleling those found in divers, such as penguins and auks, in which the head overhangs the shaft and the triosseal area is narrowed anteroposteriorly, and swollen in its lower portion.

The specimen undoubtedly represents an undescribed form, which is hereby named.

Plotopterum, new genus
(*Plot*, swimming; *pterum* from *pteron*, wing)
Type: *Plotopterum joaquinensis*, new species.

Diagnosis: Narrow, heavy coracoid with head overhanging triosseal canal; antero-internal contour below head rounded; space between furcular facet and brachial tuberosity a deep, triangular groove extending to upper surface of head; lower half of triosseal canal markedly convex, with deep-cut longitudinal groove separating convexity from glenoid facet; neck heavy, only slightly depressed adjacent to coracohumeral surface.

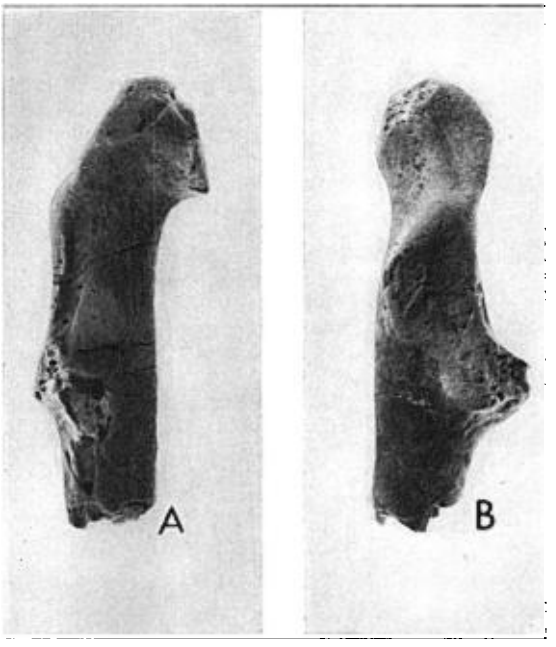

FIGURE 1. Type coracoid of *Plotopterum joaquinensis*, n. sp., LACM 8927. A, internal view; B, external view. ×2

Plotopterum joaquinensis, new species
Figure 1

Type: Upper end of left coracoid, LACM no. 8927, collected by Dick Bishop, 1964.

Locality and age: LACM locality 1626; center of SE¼ of Sect 15, T 28 S, R 29 E, Rio Bravo Ranch quadrangle, USGS, 1954; in unconsolidated sandstone, 50 feet above light gray (Walker?) formation. Early Miocene (Vaqueros).

Diagnosis: See Generic Diagnosis.

Description: Coracoid close in size to that of *Phalacrocorax penicillatus* in measurement from head to procoracoid, but markedly narrower in anteroposterior dimension, and round, not angular, in antero–internal contour; triosseal canal swollen immediately above procoracoid; deep, narrow groove paralleling glenoid facet internally; head overhanging shaft antero–internally; forward-facing furcular facet flat, irregular in outline, but more round than oval; deep groove separating this facet from brachial tuberosity, wider on internal face, narrowing proximally; bicipital attachment a deep, round pit; neck thick, rounded and smoothly contoured; below neck, at level of

middle of glenoid facet, shaft becoming angular at antero-external edge, and area below glenoid and scapular facets flattened; glenoid facet slightly depressed, blending into shaft without flare, and blending below into scapular facet; scapular facet flat, not cup-shaped; coracohumeral surface rising almost vertically above glenoid facet, broad, centrally depressed, irregular in shape, but more oval than crescentic; procoracoid thick and apparently short (tip broken).

Measurements: Distance from scapular facet to tip of head, 22.0 mm; breadth below head across triosseal canal, 7.4 mm; greatest depth from triosseal canal through glenoid facet, 8.0 mm.

DISCUSSION

The swelling of the lower part of the triosseal canal in the fossil coracoid, the narrowness and thickness of the bone in this area and through the neck, and the anterior overhang of the head are characters found in marine birds such as the penguins and alcids. Although taxonomically unrelated, these two groups of birds are alike in the modification of the wing bones toward a flipper-like condition adapted to under water "flight." Even in those alcids still capable of aerial flight, the coracoid has similar characters. The swelling of the lower triosseal region tends to narrow and deepen the passageway for the pectoral tendon, and presumably afforded support to the tendon so as to strengthen the upstroke of the wing in swimming. The channel is even more constricted and deeper in the alcids and penguins than in *Plotopterum*, suggesting that the fossil bird may not have been the equal of these other birds as a swimmer.

It is difficult to determine from this incomplete coracoid whether or not the extinct bird had completely lost the power of aerial flight. The modifications of the bone are entirely different from those found in the coracoid of the flightless cormorant, *Nannopterum*. In *Nannopterum* the modifying process has been one of degeneration, whereas the evidence indicates that in *Plotopterum* the wing had assumed a secondary function as a strong swimming organ. The fact that the modifications of the coracoid parallel those of the coracoid of penguins and auks suggests that the wing elements were shorter and more flattened in the fossil than in the cormorants and anhingas. Obviously *Plotopterum* represents a trend in aquatic adaptation sufficiently distinct from either of these two existing groups to warrant the designation of a separate family, to be known as the Plotopteridae.

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REDISCOVERY OF THE NESTING GROUNDS OF NEWELL'S MANX SHEARWATER (*PUFFINUS PUFFINUS NEWELLI*), WITH INITIAL OBSERVATIONS

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Newell's Shearwater or Ao (*Puffinus puffinus newelli* Henshaw), sometimes considered a race of the Manx Shearwater, is one of the most poorly known of the seabirds of Hawaii. In recent years no nesting sites have been known. Henshaw (1902) stated, "This bird was first obtained by Mr. M. Newell on the island of Maui in the spring of 1894, several of them having been taken from their burrows by the natives and brought to Mr. Newell alive." Munro (1941) mentioned that Mr. Alanson Bryan found skins of the Ao in about 1900 in the Gay and Robinson collections from Kauai. Bryan (1908) reported hearing the call of what he thought was the Ao in the valleys of Molokai. Munro (1944) expressed the opinion that the mongoose had no doubt killed all of them that nested on Hawaii, Maui, and Molokai. He further stated, "It may still nest in remote valleys on the north side of Kauai or perhaps Niihau. By some it is thought to be extinct and if so there are only about seven specimens in existence." Kauai, as the only major island without the mongoose, has frequently been suggested as the primary nesting area of the Ao. King and Gould (1967) concluded that Kauai is now the primary and possibly the only breeding locality of Newell's Shearwater. They estimated its population on Kauai to be in the low thousands. Locally, the annual autumnal misfortune of the Ao "falling" out of the sky onto lighted highways, parks, football fields, and buildings was well known to residents on the eastern side of Kauai. Swedberg sent about 40 of these "downed" birds to the Smithsonian Institution in 1966.

Specific information leading to the discovery of the nesting grounds came from Mr. Eddie Goo. While searching for his dogs after a pig hunt in the Moloaa Forest Reserve on Kauai in early July 1967, he found the dogs atop a 457-m ridge with black and white feathers in their mouths.

On 25 July 1967 a helicopter dropped us on this ridge at 22° 10′ N and 159° 21′ 50″ W, overlooking Moloaa Bay which was 4 km away to the northeast. From this precipitous, knife-like ridge of the Makaleha Mountains we could see the bridge on State Route 56 that crosses Moloaa Stream. There was a moderately dense tree canopy on portions of the ridge and almost everywhere there were dense, impenetrable stands of uluhe or false staghorn fern (*Dicranopteris linearis*). A landing was not possible in the dense uluhe, which in places was 3 m tall, so we jumped to the ground. We cut a trail southeasterly along the wet, earthen ridge toward Puu Ehu for approximately 0.5 km. As we proceeded along the ridge we noticed a shearwater skull, white feathers, hog feces containing feathers, and a rotten egg below a burrow. The egg was a light beige color and measured 36 mm by 61 mm. At 10:40 we heard a sudden chorus of shearwaters calling from their burrows about 90 m ahead of us.

At 11:00 we located an occupied burrow and dug out a nestling Ao. Based on later observations we estimated that it was about eight days old. The burrow was semicircular in shape, about 1.5 m long, and had two entrances. It was 12 m below the crest of the ridge on a 65-degree slope that made climbing difficult. The soil was a reddish-brown clay. Uluhe