

BIRDS FROM THE MIOCENE OF SHARKTOOTH HILL, CALIFORNIA

By LOYE MILLER

For nearly half a century a small eminence just north of the Kern River, where it emerges from the mountains in Kern County, California, has borne the local name of Sharktooth Hill. Unrecorded thousands of beautifully preserved shark teeth have been taken from the loose sands along its eroded flanks. Whales, sea lions and several species of maritime birds have likewise been recovered from the deposit that is assigned to the Temblor phase of Upper Middle Miocene age. Mr. Edward Mitchell of the University of California, during a search for mammalian remains, retrieved a small number of bird bones which he most generously presented to me. They constitute the basis for this study.

ACKNOWLEDGMENTS

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Technical descriptions of bird material from the area were first published by Wetmore (Proc. Calif. Acad. Sci., 19, no. 8, 1930:35-93), who recorded a shearwater, a gannet and a gigantic goose. Since then, nothing has come to my attention that deals with the avifauna of the locality.

MATRIX

The fossil-bearing stratum consists of a fine gray sand of fairly uniform texture that crumbles easily in the fingers, and the shark teeth along with the smaller bones are generally obtained by passing the crumbled material through coarse sieves.

Unlike the beautifully preserved skeletons from the Lompoc Miocene (Miller, Carnegie Inst. Wash. Publ. 349, 1925:109-117), the bird remains are fragmented and are totally unassociated. Petrification, however, is complete and there is very little corrosion except in the case of *Morus vagabundus*.

Marine mammals, however, are represented by some articulated skeletons which fact would indicate deposition of the formation under relatively calm water.

THE BIRD FAUNA

PROCELLARIIFORMES

Puffinus inceptor Wetmore (*op. cit.*) was described from a distal fragment of the humerus in the collections of the California Academy of Sciences as the first bird known from the Sharktooth Hill quarry. He mentions a second imperfect specimen of *Puffinus*, also, but does not allocate it to species. This paper describes two new species of the genus.

***Puffinus priscus* new species**

Type.—No. 58185, Mus. Paleo., Univ. Calif., Berkeley; the distal third of a left humerus.

Locality and age.—From locality V-2401, Sharktooth Hill, Temblor Formation, Upper Middle Miocene.

Diagnosis.—The specimen differs from *P. inceptor* Wetmore (1) in having a thinner, flatter shaft; (2) in having a longer, more slender ectepicondylar process, that is, less triangular; (3) this process

is set closer to the radial condyle and the condyle overhangs it more sharply; (4) the radial condyle is relatively larger and is prolonged farther toward the median line of the shaft; (5) the ulnar condyle is smaller and the entepicondyle is less extended distally; (6) the intercondylar furrow is far less open; (7) the brachial depression is narrower and is less extended up the shaft (proximally); (8) the attachment of the anterior articular ligament is broader and higher.

The specific name signifies "that which has passed away."

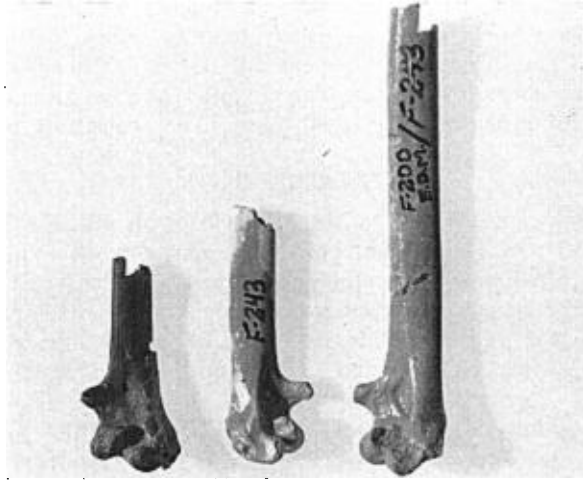


Fig. 1. Type specimens of *Puffinus inceptor* (left), *Puffinus priscus* (center), and *Puffinus mitchelli* (right) from the Miocene of Sharktooth Hill, Kern County, California. All figures are natural size.

Puffinus mitchelli new species

Type.—No. 58184, Mus. Paleo., Univ. Calif., Berkeley; the distal half of a right humerus.

Locality and age.—From locality V-2401, Sharktooth Hill, Temblor Formation, Upper Middle Miocene.

Diagnosis.—The specimen differs from *P. inceptor* (1) in being much more robust; (2) the intercondylar furrow is much less open; (3) the ectepicondylar process is less developed; (4) the attachment of the anterior articular ligament is more strongly developed; (5) the ulnar condyle is less extended beyond the radial condyle, which would seem to set the axis of flexure at the elbow more nearly at right angles to the general line of the humerus; (6) the ectepicondylar process is less triangular in shape; (7) the brachial depression is less extended up the shaft; (8) the shaft is broader and thicker; (9) the shaft narrows down less rapidly in passing proximally from the region of the condyles.

The species is named in honor of Edward D. Mitchell, the collector, who shows great promise in paleontology.

Remarks.—The great width of the intercondylar furrow in *P. inceptor* gives the impression (see table 1) that the bone is larger than it really is. With the three fossils in hand, it is seen to be intermediate in size between *P. priscus* and *P. mitchelli*.

The more distal position of the ulnar condyle, together with this open intercondylar furrow, sets the species *inceptor* aside from all other species of shearwater, fossil or Recent, that I have been able to examine. Were it a bird in full flesh and plumage today, it would doubtless be assigned to a separate subgenus at least.

Such an assembling of several congeneric species in one locality is not really out of order. In many years of patrolling the Los Angeles County beaches, I have retrieved four species of shearwaters that had been cast up by the sea.

The present study indicates that there were at least three species of shearwater (*Puffinus*) in the Sharktooth Hill area at the time of deposition. Wetmore (*op. cit.*) described *Puffinus inceptor* and recorded an unspecified fragment of the same genus which may or may not be assignable to one of the species described above. All three seem to have been larger birds than *P. diatomacus* known from the Lompoc shales, which are of the same age, but lie on the open Pacific side of the Coast Range barrier to the west, and from the Lomita shales of southern California.

TABLE 1

MEASUREMENTS IN MILLIMETERS OF THE DISTAL END OF THE HUMERUS IN *Puffinus*

	Miocene — Sharktooth Hill			Recent — California	
	<i>P. inceptor</i>	<i>P. priscus</i>	<i>P. mitchelli</i>	<i>P. griseus</i>	<i>P. opisthomelas</i>
Breadth through condyles	10.0	7.5	8.5	9.5	7.5
Width through shaft	6.0	6.3	7.0	8.0	5.7
Thickness of shaft	3.5	3.5	4.2	4.3	3.0

PELECANIFORMES

Morus vagabundus Wetmore

The type specimen of this species is the extreme distal end of the right humerus said by Wetmore (*op. cit.*) to be "similar to *Morus serrator* but decidedly smaller." A proximal fragment of the humerus collected by Mr. Mitchell is definitely of the genus *Morus*, and in size it corresponds very closely with the type fragment. It is about as large as *Sula nebouxi* with which it is here compared. Weathering of the specimen has taken away much detail.

The shaft of the bone is heavier and tapers more gradually from the expanded head toward the elbow. The caput humeri is more broadly rounded and the great pneumatic fossa is more sharply overhung on the axial side but less so on the lateral border. The fossa as a whole is smaller and the pneumatic foramen at the bottom of it is smaller and is not cribriform. The total length of the fragment is 91 mm., the diameters at the smallest point in the shaft are 9.2×7.6 mm.

Morus sp.

A second solid specimen in the collection is a proximal fragment of the ulna from a gannet as large or slightly larger than *Morus bassana*, which in turn is 30 per cent larger than *M. vagabundus* as measured by Wetmore. Details have been lost, but the specimen is definitely of the genus *Morus* and is much less pneumatic than any of the boobies at hand. In *Sula nebouxi* there is a large pneumatic foramen under the palmar lip of the external cotyla and a smaller one similarly located under the internal cotyla. Both of these foramina are lacking in the fossil specimen. Post-mortem wear has obscured finer details of ligamental attachments.

ANSERIFORMES

Branta sp.

A single fragment, the proximal end of an ulna, is assigned to the genus *Branta* which it resembles more closely than it does either *Anser* or *Chen*. The goose, *Presbychen abavus*, described by Wetmore from Sharktooth Hill, was a large bird, "intermediate in dimension between the largest of Canada geese and the whistling swan."

The fragment in hand is far too small to represent Wetmore's species. The specimen is too imperfect to encourage specific assignment.

CHARADRIIFORMES

Recurvirostra sp.

The distal third of an ulna in the collection represents a shore bird which is not appreciably different from the Avocet (*Recurvirostra americana*). Stilt, curlew, plover, godwit, oyster-catcher, gull—all are different. In fact, if the bone were from a Recent Indian midden, it would be assigned without hesitation to *Recurvirostra americana* ♀. There are not sufficient characters to the distal end of the ulna in the great and diversified group of the shore birds to encourage me to be more specific in the assignment.

The importance of the specimen lies in the suggestion that there were shallows or sand bars in the general area at the time of deposition.

THE MIOCENE PICTURE

During parts of the Miocene, much of Pliocene time and possibly longer, the present San Joaquin Valley was a great inland sea bordering the Sierra Nevada on the continental side and cut off from the open Pacific to the westward by the low but probably rising Coast Range. This western barrier may have been interrupted at one or more places as, for example, through the Cuyama region, but the barrier was nevertheless effective. The deposit at Sharktooth Hill suggests a minor tidal basin along the eastern border of this sea such as one finds today along the eastern shore of the Gulf of California, for example, in the region of Tapolobampo or of Mazatlán.

Whales, sea lions, sharks and maritime birds help to sketch in a picture of a fairly shallow embayment into which tidal currents eddied quietly through many years of Miocene time. Drifting in from deeper waters or floating off of nearby sand bars, the carcasses of various vertebrates accumulated here to finally settle to the bottom of relatively quiet waters. Some skeletons were completely disarticulated, others were less so. Regrettably, the birds have yielded only single elements thus far. Without optimism the paleontologist would not long survive. May we not hope then that the future will bring us more complete pictures of the birds from Sharktooth Hill?

SUMMARY

After thirty years' neglect the Sharktooth Hill Miocene quarry has yielded a small increment of bird remains. Two specimens represent earlier described species, two new species of shearwater are described, and other fragments are assigned to two genera heretofore unrepresented from the formation, *Branta* and *Recurvirostra*. The significance of the avifauna is discussed.

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