

A PETREL-LIKE BIRD FROM THE LATE EOCENE OF LOUISIANA: EARLIEST RECORD FOR THE ORDER PROCELLARIIFORMES

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Abstract. — The earliest known certain record of the avian order Procellariiformes is a *Pterodroma*-like fossil represented by the distal end of a tibiotarsus, reported herein, from the late Eocene Yazoo Formation of Louisiana. Sediments bearing this bird appear to have been deposited on the continental shelf far from the Eocene coast line of the Gulf of Mexico, and associated fossils include a sea snake, a primitive whale, numerous chondrichthian and marine teleost fishes, and a large marine invertebrate fauna.

Given the relative abundance of the modern "tube-nosed swimmers," it is somewhat surprising that the Procellariiformes do not have a more comprehensive fossil record (Brodkorb 1963, Olson 1985a). This may be due in part to their pelagic habits, and also to the fact that most major finds of fossil birds have been from the Northern Hemisphere, whereas the Procellariiformes are predominantly distributed in the Southern Hemisphere.

The order is thought to be ancient, but the fossil record has yet to provide much support for this assumption. The avifauna of the late Cretaceous greensands of New Jersey, recently revised by Olson & Parris (1987), includes 8 or 9 genera and 9 or 10 species, of which two genera and species show some similarities with the Procellariiformes. However, given the fragmentary nature of the material and the mosaic nature of many early Paleogene birds, positive identification must await the discovery of more complete material. Paleogene procellariiform fossils are rare. Albatrosses (Diomedidae) range only back to the Upper Oligocene (Olson 1985a). Excluding fossils of neospecies, the storm-petrels *Oceanodroma hubbsi* (Oceanitidae) from the late Miocene of California, and a species of *Oceanites* from the early Pliocene of South

Africa, as well as a diving-petrel *Pelecanoides* (Pelecanoididae) from the early Pliocene of South Africa (Olson 1985b), all other fossil species of the order are contained within the Procellariidae. With the exception of the present find, the fossil record of the Procellariidae extended back only to the early Oligocene of Belgium, by a fossil humerus described as *Puffinus raemdonckii* (Brodkorb, 1962). Thus, the find of a fossil close in morphology to *Pterodroma* from a marine late Eocene locality in Louisiana is of particular interest, and extends the range of the order Procellariiformes back one geologic epoch.

The fossil reported here is the distal end (28.5 mm) of a left tibiotarsus (Fig. 1), CCVC (Centenary College Vertebrate Collection) 001004, collected by BMP during February of 1984, from a pit in an oil well field west of the village of Tullos, Louisiana (La Salle Parish); west of the Union Pacific Railroad, but within the "city" limits. The locality is from the late Eocene Jackson stage (early Priabonian age) of the Tullos Member of the Yazoo Formation (Murray 1961).

Other amniote vertebrates from Tullos include a zeuglodontid whale (either *Zygorhiza kochii* or *Basilosaurus cetoides*) (Harris & Veatch 1899), and the giant sea snake *Pterospheenus schucherti* (McPherson &

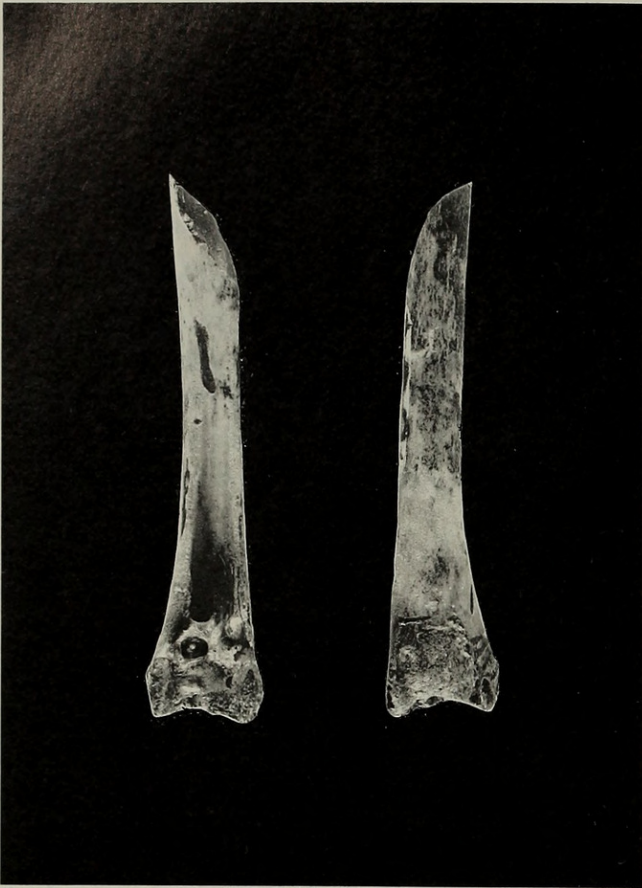


Fig. 1. Distal end of left tibiotarsus of late Eocene petrel-like (*Pterodroma*-like) bird (CCVC #001004) herein reported. Actual length of fossil, 28.5 mm. Left, anterior view; right, posterior view.

Manning, 1986), which is thought to have reached a length of some seven to eight meters. Additional vertebrates include eight species of Selachii, three species of Batoidae, and four teleost fishes (McPherson & Manning 1986). In addition, there is a large fauna of benthic foraminifera, some planktonic foraminifera (Godfrey 1983), two mollusks and four echinoderms (fauna listed in McPherson & Manning 1986). The Tullos fauna is similar to that of two other Yazoo Formation localities, Montgomery Landing and Copenhagen (Beard 1978). With the exception of the procellariiform bird described here and a marine crocodilian from the Copenhagen locality (Beard 1978), the sharks, rays, teleost fishes, and whale all appear in various localities (McPherson & Manning 1986). Thus, the Tullos site represents a marine setting that depos-

ited as its primary facies a prodeltaic clay, probably on the continental shelf far from the Eocene coast line of the Gulf of Mexico. The relative absence of planktonic foraminifera in the fauna is thought to be accounted for by turbidity and relatively shallow water depths (Godfrey 1983).

The distal tibiotarsus from the Tullos locality agrees most favorably in size and morphology with *Pterodroma externa*, the White-necked Petrel of the South Pacific (casual off Pacific coast of Middle America, A.O.U., 1983), differing only in minor morphological detail. Measurements, in mm, of the fossil, compared with means from ten specimens (five male and five female) of *P. externa* are as follows:

Greatest width across condyles:	fossil 5.9; <i>P. externa</i> 5.87
Width external condyle:	fossil 6.0; <i>P. externa</i> 6.09
Width internal condyle:	fossil 5.2; <i>P. externa</i> 5.41
Least width shaft:	fossil 3.2; <i>P. externa</i> 2.89

Morphologically, the fossil differs from *P. externa*, as follows: tendinal groove broader and extends further proximally up shaft; slighter greater excavation of tendinal groove at base of tendinal bridge; external condyle more greatly excavated; and less notching and excavation on mid-margin of internal condyle. Because the tibiotarsi of many species of *Pterodroma* are very similar morphologically, comparison specifically with *P. externa* is not thought necessarily to indicate a specific close relationship with that species, rather to indicate the general size and proportions of the fossil.

Feduccia examined all of the genera in the collections of the Smithsonian's National Museum of Natural History, and concluded that generic allocation within the Procellariiformes based on the distal tibiotarsus is possible, but identification of this fossil must remain tentative until additional

material is discovered. The fossil agrees in general morphology with the species of *Pterodroma* examined, and differs from other procellariiform genera. The tibiotarsus of *Calonectris* has the anterior intercondylar area much more excavated with a deeper tendinal groove; in *Pachyptila*, the external condyle in external view is elevated around the rim and the condylar region is not as tapered as in *Pterodroma*. In *Bulweria*, there is relatively less intercondylar distance and the tendinal groove is less deeply excavated. *Procellaria* is a larger genus, and the distal condylar region ends with slight internal inflexion, and the internal condyle is relatively wider. The species of *Puffinus* are also relatively large, and the shaft of the tibiotarsus is relatively broader as it meets the condylar region, and is more tapered than in *Pterodroma*.

With the exception of this fossil and two species of *Fulmarus*, all other Tertiary Procellariidae from the Northern Hemisphere have been referred to the genus *Puffinus* (Olson 1985a), and to our knowledge this is the only Tertiary procellariiform reported anywhere between Bone Valley, Florida, and Argentina. Olson (1985a) examined a humerus of a *Bulweria*-like bird from the upper Oligocene of South Carolina, and concluded that, "... some diversity of shearwater and petrel-like birds existed in the Atlantic as early as the Oligocene." With the discovery of the late Eocene Tullos bird described herein, it is apparent that this diversity extends much further back in time, as expected, and the probability of finding many more earlier procellariiform fossils appears to be very good.

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