

# EARLY MIOCENE AVIFAUNA FROM THE POLLACK FARM SITE, DELAWARE<sup>1</sup>

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## ABSTRACT

In contrast to the extensive fossil record of other vertebrate groups, such as fishes and mammals, only 11 specimens of avian fossils, all fragmentary and unassociated, have been recovered from the Pollack Farm Fossil Site near Cheswold, Delaware, a borrow pit during highway construction (now covered) that exposed lower Miocene shelly sands of the Calvert Formation. Taxa represented include *Gavia* small sp. (1 specimen and possibly another); *Morus* cf. *M. loxostylus* (5 specimens); and one large species of pseudodontorn (1 specimen). Other less diagnostic specimens appear to pertain to a rather larger, stockier species of loon (1 specimen) and one probable small gull (1 specimen); yet another avian specimen is unidentified to order. The five avian taxa identified are mostly or exclusively marine in distribution, in contrast to the situation with mammals from the site, in which the diversity of land mammals is higher than that for marine mammals. The avian fossils apparently all belong to species already known from the younger part of the Calvert Formation of the western shore of Chesapeake Bay in Maryland. The composition of the avifauna supports the depositional hypothesis of a nearshore area of a large embayment.

## INTRODUCTION

The recently excavated (now covered) portion of the lower Miocene Cheswold sands (Delaware Geological Survey informal designation) of the lower Calvert Formation at the Pollack Farm Site near Cheswold, Delaware, has thus far yielded a sizeable vertebrate fauna of more than 70 species, mostly from the lower shell bed at the site (see Benson, 1998, fig. 2). Vertebrate fossils identified include 22 cartilaginous and 6 bony fish species (Purdy, 1998), 10 reptilian taxa (Holman, 1998), 8 marine mammal species (Bohaska, 1998), and at least 26 species of land mammals (Emry and Eshelman, 1998). The invertebrate fauna is also extensive, with 104 species of mollusks identified (Ward, 1998). Most of the mammalian species represented are terrestrial, and the site has produced the most diverse Miocene land vertebrate assemblage known from the northeastern United States. The extensive land vertebrate fauna, combined with a diverse marine vertebrate and invertebrate macro- and microfauna, provides an unusual opportunity for significant marine-terrestrial correlations (see Benson, 1998). The depositional environment has been interpreted as the sandy nearshore area of a large embayment, with a subtropical to tropical climate (Ramsey et al., 1992; Ramsey, 1998).

The site has thus far produced few avian fossils, however, all of which are isolated fragments, most poorly preserved. These bird fossils are nevertheless of interest as they comprise the only known sample of the Miocene avifauna of this area and are older (dated at 17.9 Ma; Jones et al., 1998) than are most of the bird fossils from the better-known exposures of the Calvert Formation along the western shore of Chesapeake Bay. The deposits at the Pollack Farm Site are approximately coeval with the "Popes Creek Sand" (Bed 3-A of Ward, 1993; see also Benson, 1998) at Popes Creek, Maryland, from which a number of bird bones are under study by Storrs L. Olson and the author. The upper Calvert Formation is partially coeval with the middle Miocene Pungo River Formation (see Gibson, 1983) of Lee Creek Mine, North Carolina, which has produced abundant avian specimens (Olson and Rasmussen, in press).

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## SYSTEMATIC PALEONTOLOGY

### Order GAVIIFORMES

### Family GAVIIDAE

#### *Gavia* sp.

#### Figure 1A

Material.—Distal fourth of right ulna; USNM (United States National Museum) 476045, collected by R.E. Eshelman, 8 July 1992. Tentatively referred: scapular facet and glenoid facet region of left coracoid, USNM 476046; collected by Smithsonian Institution (SI) field crew.

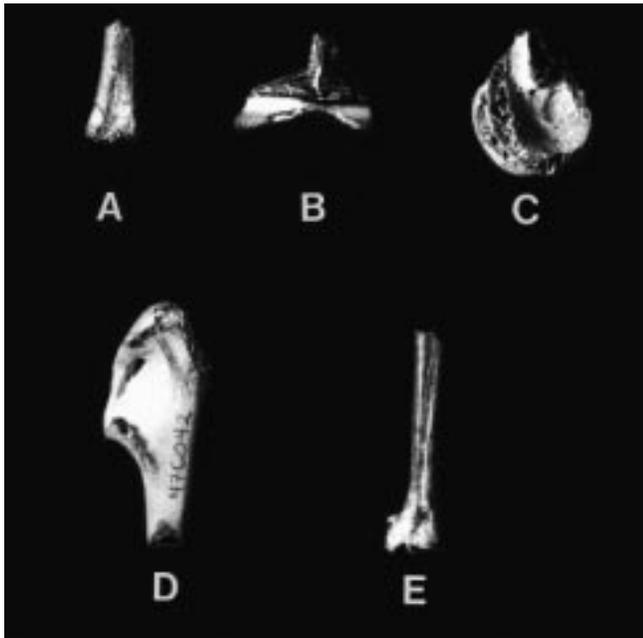
Remarks.—A number of small loon elements from the Calvert Formation of Virginia and Maryland and the Pungo River Formation of North Carolina are apparently from an undescribed species (S.L. Olson, pers. comm., 1997). The Pollack Farm Site ulna is indistinguishable from a specimen of this species, USNM 460030, from the Calvert Formation of Popes Creek, Maryland. The referred coracoid specimen, however, is fragmentary and its assignment must be considered tentative.

#### cf. *Gavia* sp. indet.

#### Figure 1B

Material.—Worn fragment of cranial end of sternum, including base of carina, coracoidal sulcus, and manubrium; USNM 237288, collected by David B. Duke.

<sup>1</sup> In Benson, R.N., ed., 1998, *Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware*: Delaware Geological Survey Special Publication No. 21, p. 149–151.



**Figure 1.** Fossil bird bones from the Pollack Farm Site, Delaware: A, right ulna of *Gavia* sp., USNM 476045 in internal view; B, fragment of cranial end of sternum of cf. *Gavia* sp. indet., USNM 237288 in cranial view; C, middle trochlea of left tarsometatarsus of pseudodontorn sp., USNM 476044 in lateral view; D, sternal half of left coracoid of *Morus* cf. *M. loxostyla* USNM 476042 in internal view; E, distal half of right carpometacarpus of *Morus* cf. *M. loxostyla*, USNM 476041 in external view.

**Remarks.**—This fragmentary, heavily worn specimen appears to be from a species of loon somewhat larger than the previous species; it is heavier than the well-preserved sternum of USNM 237137 from Popes Creek. If correctly assigned to Gaviidae, it may be from *Gavia* cf. *G. egeriana*, a small loon previously known only from the distal ends of humeri from the early Miocene (Ottangian) of Czechoslovakia (Svec, 1982), but specimens from the Calvert Formation of Virginia and Maryland, the St. Marys Formation of Maryland, and the Pungo River Formation of North Carolina have now been referred to this species on the basis of size and relative stoutness (S.L. Olson, pers. comm., 1997). The Pollack Farm Site specimen might well be assignable to the same species which is smaller than any Pliocene or later species of loon.

**Order PELECANIFORMES**  
**Family PELAGORNITHIDAE**

**Genus and species indet.**

**Figure 1C**

**Material.**—Middle trochlea of left tarsometatarsus; USNM 476044, collected by G. Simonson, 4 June 1992.

**Remarks.**—This trochlea is slightly smaller than that of a specimen of *Pelagornis miocaenus* from Charleston, South Carolina (cast USNM 244174). Two or three specimens of pseudodontorns are thought to occur in the Pungo River Formation and the Calvert Formation of Maryland (Olson, 1984; Becker, 1987), and specimens have also been collected in Westmoreland County, Virginia (Olson, 1984). Several species of pseudodontorns occurred in the Miocene (Howard, 1957; Hopson, 1964, 1978; Scarlett,

1972). The systematics of pseudodontorns are poorly resolved (Olson, 1985) even though specimens are not uncommon and they are of nearly worldwide occurrence. This is primarily because pseudodontorn material is usually quite fragmentary, as is the Delaware specimen, and because no recent comprehensive treatment of the group has been produced.

**Family SULIDAE**

***Morus* cf. *M. loxostylus***

**Figure 1D, E**

**Material.**—Sternal half of left coracoid; USNM 476042, collected by David Crew. Distal half of major phalanx of right carpometacarpus; USNM 476041, collected by T. O'Hagan, 6 April 1992. Left phalanx 2 of pedal digit 3; USNM 476043, collected by G. Simonson, 12–13 March 1992. Tentatively referred: centrum of thoracic vertebra, USNM 476047, collected by G. Simonson, 18 May 1992; proximal end of left tibiotarsus, USNM 476049, collected by G. Simonson, 6 April 1992.

**Measurements.**—Coracoid, cranial width: 10.0 mm; cranial depth: 15.3 mm. Phalanx, length: 27.3 mm.

**Remarks.**—The first three specimens listed above are much better preserved than are the other specimens from the Pollack Farm Site. They are clearly referable to a relatively large sulid, probably *Morus loxostylus*, a common species in the Miocene Pungo River Formation of Lee Creek Mine, North Carolina, and the Calvert Formation of Maryland (Wetmore, 1926; Olson, 1984; S.L. Olson, pers. comm., 1992). One or two other species of sulids are also known from the Calvert Formation of Maryland (Wetmore, 1938; Becker, 1987) and the Kirkwood Formation of New Jersey (Olson, 1984).

**Order CHARADRIIFORMES**

**Genus et sp. indet.**

**Material.**—Proximal end of right scapula; USNM 446997, collected by D. Bohaska and crew, 27 April 1992.

**Remarks.**—This specimen is from a medium-sized charadriiform, and appears most likely to be from a rather small species of gull approximately the size of the Laughing Gull, *Larus atricilla*, although due to the fragmentary nature of the specimen its identification must be considered tentative. An unnamed species of gull of this size range occurs in the Calvert Formation (S.L. Olson, pers. comm., 1992).

**Aves indet.**

**Material.**—Proximal portion of alar phalanx 2 digit 2; USNM 476048.

**Remarks.**—This relatively well-preserved element is from an indeterminate bird roughly the size of a small gull, but it is not charadriiform and certainly represents yet another taxon for the Pollack Farm Site.

**DISCUSSION**

The lower Miocene Pollack Farm Fossil Site near Cheswold, Delaware, has yielded few bird fossils in comparison to other classes of vertebrates and invertebrates—only 11 isolated and fragmentary avian specimens assignable to at least 6 taxa are available to date. In contrast to the high diversity of terrestrial mammal species known from the site, all the bird species represented are from groups that are largely

or entirely marine. Marine mammal fossils are also common at the site but are less diverse than the land mammal assemblage.

The species composition of the avifauna from Smyrna lends support to the hypothesis that the Miocene depositional environment at this site was the nearshore area of an embayment (Ramsey et al., 1992; Ramsey, 1998). This is a typical habitat for modern loons and sulids, the two most common taxa at the site, and pseudodontorns which were strictly marine (Olson, 1984). Procellariiforms and alcids, which are relatively common groups represented by two or three species each in the Calvert Formation of Maryland (Becker, 1987), are surprisingly unrepresented in the Smyrna sample. These are generally among the most pelagic of birds, and the absence of these more highly pelagic groups (which could be due to sampling error) is the major difference seen between the avifaunas known from the lower Miocene of Delaware and Maryland.

### REFERENCES CITED

- Becker, J.J., 1987, Neogene avian localities of North America: Washington, D.C., Smithsonian Institution Press, 171 p.
- Benson, R.N., 1998, Radiolarians and diatoms from the Pollack Farm Site, Delaware: Marine-terrestrial correlation of Miocene vertebrate assemblages of the middle Atlantic Coastal Plain, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 5–19.
- Bohaska, D.J., 1998, Fossil marine mammals of the lower Miocene Pollack Farm site, Delaware, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 179–191.
- Emry, R.J., and Eshelman, R.E., 1998, The early Hemingfordian (early Miocene) Pollack Farm Local Fauna: First Tertiary land mammals described from Delaware, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 153–173.
- Gibson, T.G., 1983, Stratigraphy of Miocene through lower Pleistocene strata of the United States central Atlantic Coastal Plain, in Ray, C.E., ed., Geology and paleontology of the Lee Creek Mine, North Carolina, I: Smithsonian Contributions to Paleobiology, v. 53., p. 35–80.
- Holman, J.A., 1998, Reptiles of the lower Miocene (Hemingfordian) Pollack Farm Fossil Site, Delaware, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 141–147.
- Hopson, J.A., 1964, *Pseudodontornis* and other large marine birds from the Miocene of South Carolina: Postilla, v. 83, p. 1–19.
- Howard, H., 1957, A gigantic “toothed” marine bird from the Miocene of California: Santa Barbara Museum of Natural History, Department of Geology, Bulletin, v. 1, p. 1–23.
- \_\_\_\_\_, 1978, Late Miocene marine birds from Orange County, California: Los Angeles County Museum, Contributions in Science, v. 290, p. 1–26.
- Jones, D.S., Ward, L.W., Mueller, P.A., and Hodell, D.A., 1998, Age of marine mollusks from the lower Miocene Pollack Farm Site, Delaware, determined by  $^{87}\text{Sr}/^{86}\text{Sr}$  geochronology, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 21–25.
- Olson, S.L., 1984, A brief synopsis of the fossil birds from the Pamunkey River and other Tertiary marine deposits in Virginia, in Ward, L.W., and Krafft, Kathleen, eds., Stratigraphy and paleontology of the outcropping Tertiary beds in the Pamunkey River region, central Virginia Coastal Plain—Guidebook for Atlantic Coastal Plain Geological Association 1984 field trip: Atlantic Coastal Plain Geological Association, p. 217–223, pls. 1–2.
- \_\_\_\_\_, 1985, The fossil record of birds, in Farner, D.S., and King, J., eds., Avian Biology, 8: Orlando, Academic Press, p. 79–252.
- Olson, S.L., and Rasmussen, P.C., in press, Survey of a middle Miocene and a very extensive early Pliocene avifauna from the Lee Creek Mine, North Carolina, in Ray, C.E., ed., Geology and Paleontology of the Lee Creek Mine, North Carolina, III: Smithsonian Contributions to Paleobiology.
- Purdy, R.W., 1998, The early Miocene fish fauna from the Pollack Farm Site, Delaware, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 133–139.
- Ramsey, K.W., 1998, Depositional environments and stratigraphy of the Pollack Farm Site, Delaware, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 27–40.
- Ramsey, K.W., Benson, R.N., Andres, A.S., Pickett, T.E., and Schenck, W.S., 1992, A new Miocene fossil locality in Delaware [abs.]: Geological Society of America Abstracts with Programs, v. 24, no. 3, p. 69.
- Scarlett, R.J., 1972, Bone of a presumed odontopterygian bird from the Miocene of New Zealand: New Zealand Journal of Geology and Geophysics, v. 15, p. 269–274.
- Svec, P., 1982, Two new species of diving birds from the Lower Miocene of Czechoslovakia: Casopis pro Mineralogii a Geologii, v. 27, p. 243–260.
- Ward, L.W., 1993, Lower Miocene mollusks from the Kirkwood Formation of Delaware: First known collection: Virginia Journal of Science, v. 44, p. 157.
- \_\_\_\_\_, 1998, Mollusks from the lower Miocene Pollack Farm Site, Kent County, Delaware: A preliminary analysis, in Benson, R.N., ed., Geology and paleontology of the lower Miocene Pollack Farm Fossil Site, Delaware: Delaware Geological Survey Special Publication No. 21, p. 59–131.
- Wetmore, A., 1926, Observations on fossil birds described from the Miocene of Maryland: Auk, v. 43, p. 462–468.
- \_\_\_\_\_, 1938, A Miocene booby and other records from the Calvert Formation of Maryland: Proceedings of the United States National Museum, v. 85, p. 462–468.