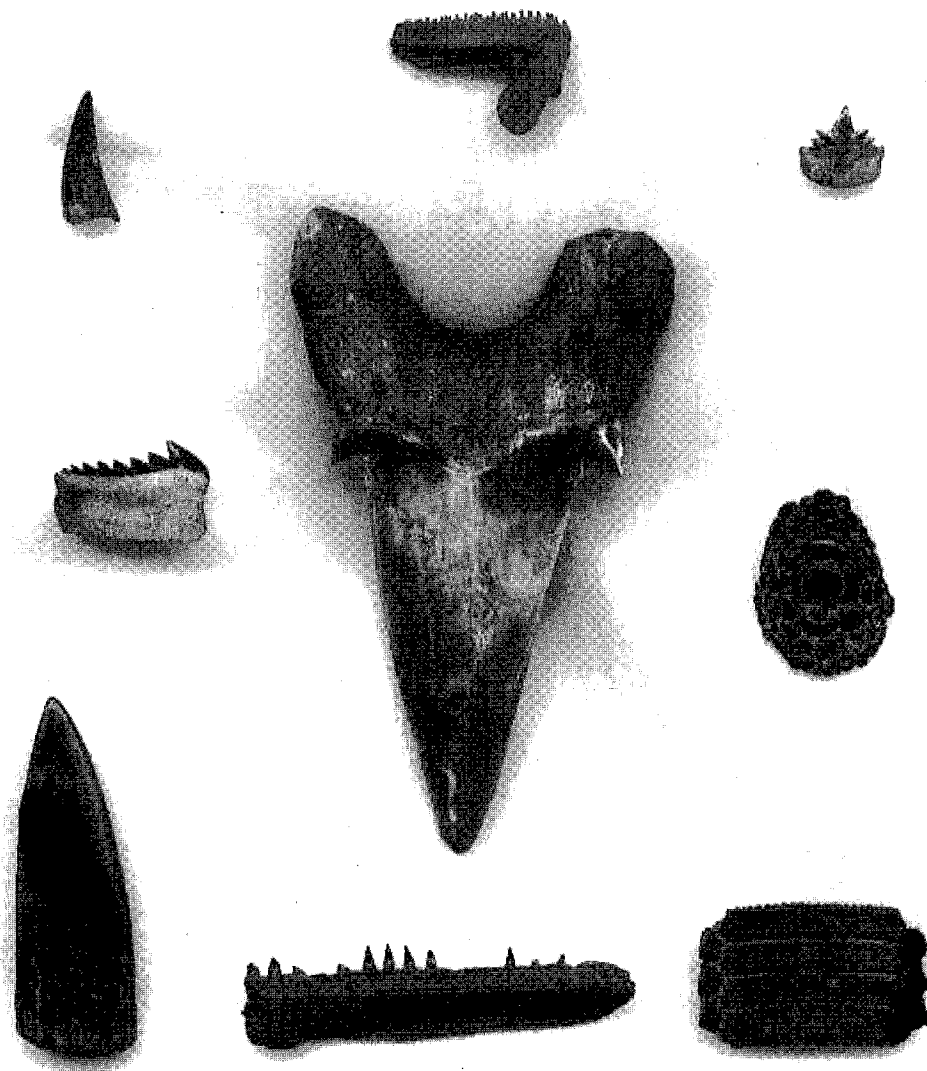


Virginia Division of Mineral Resources  
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Fisher/Sullivan Site  
(Nanjemoy Formation) Stafford County, Virginia**



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Robert E. Weems and Gary J. Grimsley, Editors

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## Part 6. Early Eocene Birds from Eastern North America: A Faunule from the Nanjemoy Formation of Virginia

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### ABSTRACT

Fossil bird remains from the Fisher/Sullivan Site, Stafford County, Virginia, come from marine sediments of the Potapaco Member of the early Eocene Nanjemoy Formation and are equivalent in age to the London Clay of southeastern England, which has produced many fossil birds. The 33 specimens from the Fisher/Sullivan Site are referable to at least 11 species and constitute the first early Eocene avifauna known from eastern North America. The taxa represented include a pseudodontorn (Pelagornithidae); various shorebird-like species, some with similarities to the Burhinidae, Rostratulidae, and Phoenicopteridae; and three species of Caprimulgiformes/Apodiformes. Only the pseudodontorn was pelagic, all the other being shore or land birds, which suggests rather unusual depositional circumstances.

### INTRODUCTION

The earliest part of the Tertiary was a critical time in the origin of orders and families of modern birds. This was a period when birds were diversifying rapidly and were making many evolutionary experiments in response to the new regimes of climate and vegetation that appeared after the end of the Cretaceous. Our knowledge of birds of this age comes mainly from two geographic areas---western North America and western Europe, especially England. In the American west, particularly Wyoming, very fragmentary and minimally informative bird remains have long been known from Paleocene and early Eocene mudstones that have been so thoroughly prospected for mammalian teeth (e.g., Gingerich, 1980). From many of the same deposits, excellent material of fossil birds has been found in recent years in freshwater limestone nodules (e.g., Houde, 1988; Houde and Olson, 1989; 1992). Another prime source of birds of this age has been the lacustrine deposits of the Green River Formation (e.g., Olson, 1987).

On the eastern side of the Atlantic, the beds of the early Eocene London Clay have produced fossil birds in great number, the very best originating in the mudflats at Walton-on-the-Naze in Essex. Most of these are in a private collection and have not been documented in the scientific literature. Although there is a rich Neogene record of birds in eastern North America, fossils of early Paleogene age are quite scarce, consisting mainly of a few Paleocene fossils from Maryland and Virginia (Olson, 1994), and a single toe bone of *Diatryma* from the Lower Eocene of New Jersey (Andors, 1988:42-44).

Recently, however, an intriguing faunule consisting of

33 specimens belonging to at least 11 species of birds offers a first glimpse into the birdlife of eastern North America in the early Eocene. These come from sediments of the Potapaco Member of the Nanjemoy Formation of the early Tertiary Pamunkey Group that are exposed in the bed of an unnamed tributary of Muddy Creek, north of Virginia State Highway 3, in Stafford County, east of Fredericksburg, Virginia. The age of the deposit is early Eocene, corresponding to the early part of calcareous nannoplankton Zone NP 11, and overlaps broadly in age with the London Clay (for details of the geology and paleoecology of this site, termed the Fisher/Sullivan Site, see Weems and Grimsley, Part 1, and other papers in this volume). The fossils were deposited in a nearshore marine environment and were recovered by quarrying the sediment and washing it through screens. The specimens have been cataloged in the collections of the Department of Paleobiology, National Museum of Natural History, Smithsonian Institution, Washington, D. C. (acronym USNM). Identifications were based on comparisons with modern skeletal material housed in the collections of the Division of Birds, Department of Vertebrate Zoology, of the same institution.

### SYSTEMATIC PALEONTOLOGY

**Pelecaniformes**  
**Pelagornithidae**  
*Odontopteryx?* sp.

**Material:** Carpometacarpus, left proximal end lacking most of the alular metacarpal, USNM 496364 (Fig. 1a,b). Collected by Mike Folmer. Width and depth of carpal trochlea, 12.5 X 18.0 mm.

Carpometacarpus, left distal end, USNM 496417 (Fig. 1c,d). Collected by Mike Folmer. Width and depth of articular surface, 10.7 X 14.7 mm. This is quite conceivably from one and the same bone as the proximal fragment.

Pedal digit III, phalanx 1, proximal half, USNM 496365 (Fig. 1e,f). Collected by Mike Folmer. Width and depth of proximal articulation, 9.5 X 9.8 mm. The precise bone of the foot represented by this fragment is only a guess.

**Discussion:** These bones come from a bird about the size of the Peruvian Brown Pelican, *Pelecanus thagus*. The very large pseudotoothed birds of the family Pelagornithidae range in age from Paleocene to relatively late in the Neogene (Olson, 1985). A much needed revision of the complexities of this group has been initiated by K. I.

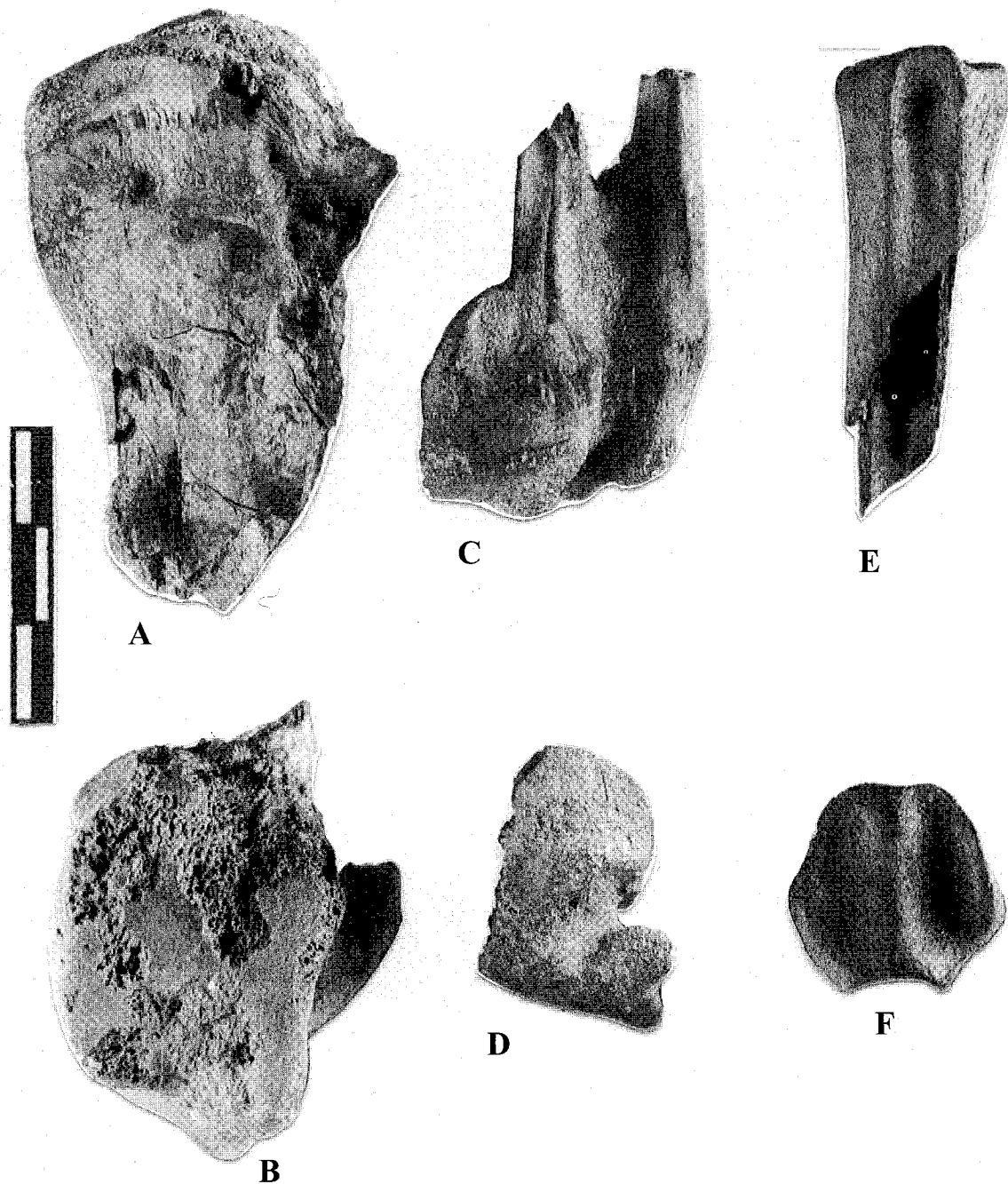


Figure 1. *Odontopteryx?* sp.: A, carpometacarpus, left proximal end lacking most of the alular metacarpal, USNM 496364 (internal view); B, same, proximal view; C, carpometacarpus, left distal end, USNM 496417 (external view); D, same, distal view; E, pedal digit III, phalanx 1, proximal half, USNM 496365 (ventral view); F, same, proximal view. Scale is in 0.5 cm increments.

Warheit and Olson but is still far from completion. At least two species differing in size are known from the London Clay, for which there are numerous names available, the oldest being *Odontopteryx toliapica* Owen, a species that was smaller than the one indicated by the Nanjemoy bones.

The Eocene pseudodontornis were more primitive and differed considerably from the species known from the late Oligocene onward, most of which are referable to the genus *Pelagornis* Lartet. The carpometacarpus from the Fisher/Sullivan Site differs from a specimen from the late Oligocene of South Carolina in having the trochlea in proximal view higher and narrower (Fig. 1b). The two were similar, however, in the flattened rather than rounded trailing edge of the trochlea.

**Charadriiformes**  
**Graculavidae?**

genus and species indeterminate #1

**Material:** Scapula, left, worn and lacking posterior third, USNM 496367 (Fig. 2d). Collected by Tom Parks. Shaft width posterior to articular expansion, 4.3 mm.

Coracoid, left shaft, USNM 496368 (Fig. 2e). Collected by Mike Folmer. Shaft width and depth at midpoint, 4.6 X 3.6 mm.

Humerus, left distal condyles, USNM 496369 (Fig. 2c). Collected by Gary Grimsley. Depth through radial condyle, 8.5 mm.

Ulna, right proximal end, USNM 496370 (Fig. 2a). Collected by Dick Grier, Jr. Proximal width and depth, 8.6 X 9.2 mm. A piece of shaft (USNM 496371) collected independently by Ron Keil appears as if it may have come from the same specimen, although there is no point of contact between the two.

Tibiotarsus, left distal third lacking condyles, USNM 496366 (Fig. 2b). Collected by Richard Brezina. Width at proximal opening of tendinal canal, 8.0 mm; width and depth of shaft approximately one-third the length from the distal end, 4.7 X 4.4 mm.

**Discussion:** Olson and Parris (1987) used the name Graculavidae as a form family to encompass various late Cretaceous/early Tertiary taxa based on fragmentary material showing similarities to basal "charadriiforms" such as the Burhinidae, and to *Presbyornis*, a primitive waterfowl (Anseriformes). It is a convenient catch-all, intended as such, members of which will presumably be removed to their correct families as their anatomy becomes better known (e.g., Olson, in press).

The tibiotarsus listed above (Fig. 2b) is very similar in size and overall morphology to that of the Australian Bush Stone-curlew, *Burhinus magnirostris*, and hence a good candidate for referral to the Graculavidae. Per Ericson (Swedish Museum of Natural History, Stockholm, personal communication) examined it and was convinced that it was not referable to *Presbyornis*. It differs from

*Palaeotringa* Marsh, and *Dakotornis* Erickson, in lacking a foramen in the groove for the tendon of *M. peroneus brevis* (Olson and Parris, 1987). The other elements (Fig. 2a, c-e), though very scrappy, would be compatible with a bird of this size and general structure.



Figure 2. Graculavidae?, genus and species indeterminate #1: A, ulna, right proximal end, USNM 496370 (internal view), with possibly associated piece of shaft, USNM 496371; B, tibiotarsus, left distal third lacking condyles, USNM 496366 (anterior view); C, humerus, left distal condyles, USNM 496369 (palmar view); D, scapula, left, worn and lacking posterior third, USNM 496367 (dorsal view); E, coracoid, left shaft, USNM 496368 (ventral view). Scale is in 0.5 cm increments.

genus and species indeterminate #2

**Material:** Ulna, right distal end, USNM 496372 (Fig. 3a). Collected by Ron Keil. Distal width and depth, 5.9 X 5.4 mm.  
Carpometacarpus, right distal symphysis, USNM 496373 (Fig. 3b). Collected by Mike Folmer. Distal width

