

Fig. 1. Humerus (A, C, E) and scapula (G, I) of holotype of *Heliadornis ashbyi*, new species (USNM 237226), compared with the same elements of the modern tropicbird *Phaethon aethereus* Linnaeus (B, D, F, H, J). A–B, Humeri in anconal (cranial) view; C–D, Same in palmar (caudal) view; E–F, Same in dorsal view; G–H, Scapulae in ventral view; I–J, Same in dorsal view. Scale = 2 cm.

*Description.*—Although damaged, there remains enough of the tricipital area of the humerus to ascertain that a distinct, circular, pneumatic foramen was present. The small oval scar for *M. latissimus dorsi caudalis* is situated dorsal to the midline of the shaft, as in *Phaethon* and other Pelecaniformes except the Fregatidae, in which it is on the midline (Olson 1977b:21).

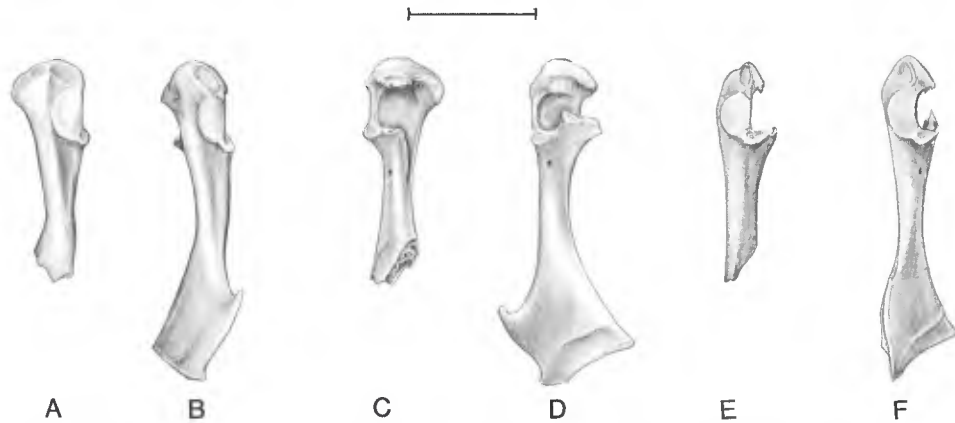


Fig. 2. Coracoid (A, C, E) of holotype of *Heliadornis ashbyi*, new species (USNM 237226), compared with the same element of the modern tropicbird *Phaethon aethereus* Linnaeus (B, D, F). A-B, Ventro-lateral view; C-D, Dorsal view; E-F, Lateral view. Scale = 2 cm.

Details of the scapular end of the coracoid in *Phaethon* are quite variable individually, so that comparisons with the fossil are difficult. In *Heliadornis* the head is not as pointed, and the area of clavicular articulation is not as heavily ossified along the distal margin of ligamental attachment as in *Phaethon*. Such increased ossification in living versus fossil forms is commonly observed in various parts of the skeleton in diverse groups of seabirds and probably has little systematic significance. The scapula of *Heliadornis* differs from that of *Phaethon* only in having the shaft somewhat more robust and the acromion slightly less developed.

*Remarks.*—The highly distinctive reduction and distal displacement of the pectoral crest of the humerus in *Heliadornis* represents an exaggeration of a trend also evident in *Phaethon*, in which the pectoral crest is somewhat reduced and distally displaced as compared with the probable primitive condition seen in the Eocene frigatebird *Limnofregata* (Olson 1977b, fig. 19). Because the humerus of *Heliadornis* appears to be more specialized than that of *Phaethon*, the fossil genus cannot be ancestral to modern tropicbirds. Therefore, *Heliadornis* represents an extinct lineage in the Phaethontidae and can probably be regarded as the “sister-group” of *Phaethon*.

Functional correlates of the humeral morphology of *Heliadornis* are difficult to discern. The reduction of the pectoral crest might represent a trend toward the condition in the Pelecani and Sulae in which there is no deltoid expansion of the humerus into a crest at all. Distal displacement of the pectoral crest is also seen in the gigantic pelecaniform pseudodontorns (Pelagornithidae), but in this instance the crest is greatly enlarged, probably in connection with the assumed sustained gliding flight of these birds (Olson 1985). An even more extreme example of reduction and distal displacement of the pectoral crest occurs in the skimmers of the genus *Rynchops* (Rynchopidae, Charadriiformes), which feed in level flight just at the surface of the water, so the wings cannot be depressed below the horizontal. In the absence of more nearly complete fossil material, it would be of little use to speculate on the mode of life of *Heliadornis*.

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A NEW GENUS OF TROPICBIRD  
(PELECANIFORMES: PHAETHONTIDAE) FROM  
THE MIDDLE MIOCENE CALVERT  
FORMATION OF MARYLAND

Storrs L. Olson

*Abstract.* — Three associated bones from the Middle Miocene (Langhian) Calvert Formation of Maryland are described as a new genus and species of tropicbird, *Heliadornis ashbyi*. This constitutes the only Tertiary record for the previously monotypic family Phaethontidae. The morphology of the humerus of *Heliadornis* was more specialized than in the extant genus *Phaethon*, hence it probably represents an extinct lineage not ancestral to living tropicbirds.

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The modern tropicbirds, long so called because "they are never seen far without either Tropic" (Dampier 1697:53), comprise three species in the monotypic family Phaethontidae. They are highly pelagic, plunge-diving birds that usually nest in rocky cliffs and have such reduced hindlimbs that they are incapable of true walking locomotion. In most respects, tropicbirds are so different from other members of the Pelecaniformes that their affinities have frequently been questioned (Sibley and Ahlquist 1972). Nevertheless, apparently derived characters shared with the Pelecaniformes, such as the totipalmate foot, salt glands situated within the orbit, and the lack of an incubation patch, indicate that the Phaethontidae should be included in that order.

Although the tropicbirds are in many respects primitive (Olson 1977b) and may be expected to be at least as old as other families of Pelecaniformes, several of which are known as far back as the early Eocene (Olson 1985), there has hitherto been no Tertiary fossil record of the Phaethontidae. *Prophaethon shrubsolei* Andrews (1899), from the Lower Eocene London Clay of England was originally described in the Phaethontidae, but was later elevated to the rank of a separate family and order by Harrison and Walker (1976). Ordinal separation of *Prophaethon* is not justified, but the differences between it and *Phaethon*, particularly in the pelvis and hindlimb, warrant the recognition of the family Prophaethontidae (Olson 1977b, 1985). Thus, the three associated bones from the middle Miocene Calvert Formation in Maryland described here, which are referable to the Phaethontidae, constitute the only fossil record of the family apart from Quaternary remains of extant species.

Order Pelecaniformes Sharpe  
Suborder Phaethontes Sharpe

Within the Pelecaniformes, the Calvert fossil can be referred to the suborder Phaethontes by the retention of a procoracoid foramen (lacking in the other suborders), a well developed pectoral crest and a poorly developed acromion process of the scapula (both conditions also occur in the Fregatae but not in the Pelecani or Sulae).

## Family Phaethontidae Bonaparte, 1853

The only skeletal element that can be compared among *Phaethon*, *Prophaethon*, and the Calvert fossil is the coracoid; all the fossil specimens, however, are imperfect. The Calvert fossil resembles the Phaethontidae and differs from the Prophaethontidae in having a larger, more expanded procoracoid process and a more robust shaft of the coracoid.

*Heliadornis*, new genus

*Type-species*.—*Heliadornis ashbyi*, new species; the only included species.

*Diagnosis*.—Differs most markedly from *Phaethon* in the size and shape of the pectoral crest of the humerus, which is smaller, more distally situated, with more prominent muscle scars, and in dorsal view has the proximal margin more nearly parallel with the shaft. In addition, the intumescence of the bicipital crest is more proximo-distally elongate, being more ovoid than circular in shape, the impression for *M. coracobrachialis cranialis* is longer, wider, and incises the bicipital intumescence more deeply, so that the proximo-dorsal corner of the latter is more sharply defined and pointed.

*Etymology*.—Greek, *Heliades* + *ornis*, bird. In Greek mythology the three Heliades were the daughters of Helios and the sisters of Phaëthon; the name, which is masculine, thus reflects the likelihood of the Miocene fossil being the "sister group" of the modern genus *Phaethon*.

*Heliadornis ashbyi*, new species

Figs. 1–2

*Holotype*.—Left humerus lacking distal end and ventral tubercle, left coracoid lacking sternal end and part of procoracoid process, left scapula lacking posterior half, vertebrate paleontological collections of the National Museum of Natural History, Smithsonian Institution, USNM 237226. Collected in association on 24 Dec 1954 by Wallace L. Ashby.

*Locality*.—40 m north of south end of second cliff south of Parker Creek, Calvert County, Maryland.

*Horizon*.—Zone 11 (of Shattuck 1904), about 60 cm below the base of Zone 12, Calvert Formation, Middle Miocene (Langhian).

*Measurements of holotype*.—Humerus: distance from head to distal extent of scar for *M. pectoralis*, 30.2 mm; depth through head, 5.3; proximo-distal extent of bicipital intumescence, 16.0; width and depth of shaft at approximate midpoint (at level of nutrient foramen),  $6.4 \times 5.3$ . Coracoid: dorso-ventral depth through head, 11.0 mm; length and width of glenoid facet,  $8.8 \times 5.2$ ; width and depth of shaft at approximate midpoint,  $5.1 \times 4.4$ . Scapula: width of articular end, 10.0 mm; width and depth of shaft 20 mm from tip of acromion,  $3.4 \times 1.8$ .

*Etymology*.—Dedicated to Mr. Wallace L. Ashby, Jr., who over the past three decades has collected numerous valuable specimens of fossil birds from the Calvert Formation and kept indispensable records of most of his finds (see Olson 1984). Recognition of his considerable contribution to knowledge of the Calvert avifauna is long overdue.

*Diagnosis*.—As for the genus. The species was approximately the size of the living species *Phaethon aethereus* Linnaeus or perhaps slightly smaller.

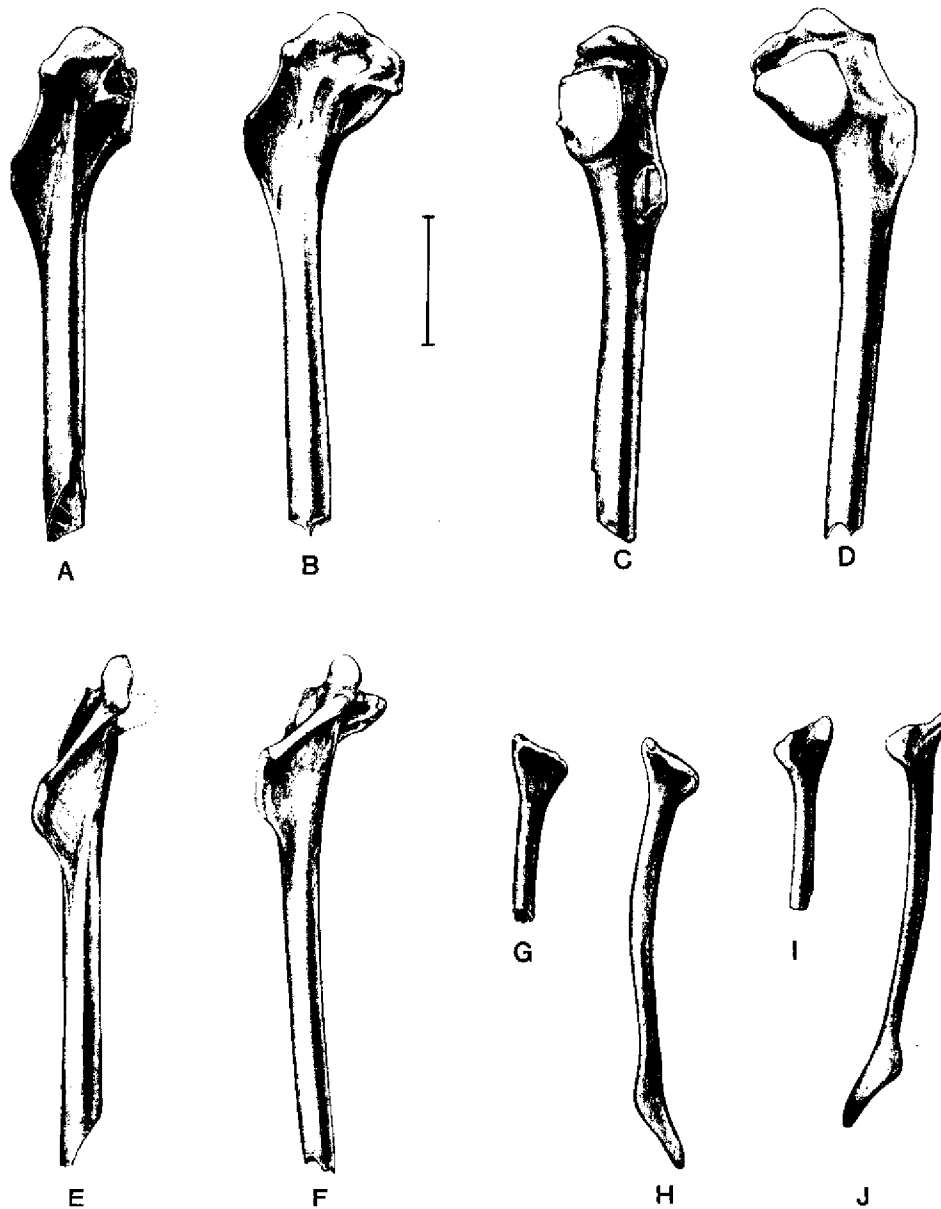


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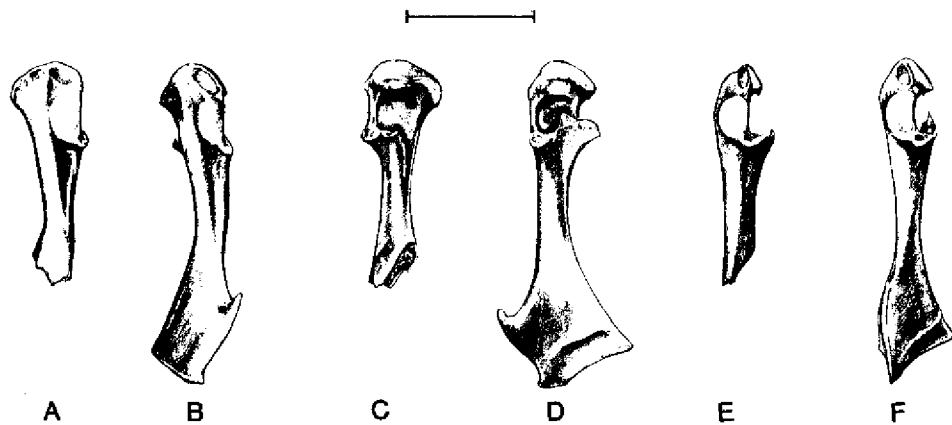


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Mainly because of their cliff-nesting habits, modern tropicbirds occur very infrequently in Quaternary deposits, even on islands where they are known to breed (Olson 1975, 1977a). The holotype of *Heliadornis* is the only Tertiary specimen of tropicbird yet known, despite the fact that in recent years thousands of fossils of marine birds have been recovered from Miocene and Pliocene deposits along the middle Atlantic coast of eastern North America, and in Florida, California, and South Africa. No Tertiary fossil deposits containing marine birds have yet been found in what would have been truly tropical waters. The great rarity of the Phaethontidae in the fossil record would be understandable if Tertiary tropicbirds were also restricted to low latitudes and were as extremely pelagic in their habits as the modern birds.

#### Acknowledgments

For their valuable contributions and not inconsiderable patience I thank Wally Ashby, who waited more than 30 years for this specimen to be described, and Anne Curtis, who waited more than 10 years to see her illustrations of it put to use. I am grateful to Cyril A. Walker, British Museum (Natural History) for lending the coracoid from the holotype of *Prophaethon shrubsolei* for comparison in this and other studies. For bibliographic assistance I thank Leslie Overstreet, and for comments on the manuscript, Ralph Eschelman and Clayton E. Ray.

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