

## A new genus of small teratorn from the Middle Tertiary of the Taubaté Basin, Brazil (Aves: Teratornithidae)

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*Abstract.*—A new genus and species of Teratornithidae, *Taubatornis campbelli*, is described from deposits of the Tremembé Formation of Upper Oligocene or Lower Miocene age in the Taubaté Basin of São Paulo State, Brazil. These fossils are much older (ca. 25 mya) than the next oldest known teratorn, *Argentavis magnificens*, from the late Miocene of Argentina (ca. 6 mya), and uphold the hypothesized origin of the Teratornithidae in South America. *Taubatornis campbelli* was smaller than other known species of the family and, as with most other occurrences of teratorns, was found syntopic with fossils of New World vultures of the family Cathartidae (Vulturidae auct.).

*Resumo.*—Um novo gênero e nova espécie de Teratornithidae, *Taubatornis campbelli*, é descrito dos depósitos da Formação Tremembé de idade Oligoceno Superior ou Mioceno Inferior da Bacia de Taubaté, Estado de São Paulo, Brasil. Estes fósseis são muito mais antigos (cerca de 25 milhões de anos) que o seguinte mais antigo teratornítideo, *Argentavis magnificens*, do Mioceno Superior (cerca de 6 milhões de anos) da Argentina, e sustenta a hipótese de origen dos Teratornithidae na América do Sul. *Taubatornis campbelli* era menor que todas as demais espécies conhecidas da família e como todas as demais ocorrências de Teratornithidae, foi encontrado sintópico com fósseis da família Cathartidae (Vulturidae auct.).

Fossils from lake deposits in the Taubaté Basin, state of São Paulo, have considerably increased our knowledge of avian diversity of the middle Tertiary of Brazil. The taxa described so far include a giant, flightless gruiform predator (Phorusrhacidae), a vulture (Cathartidae = Vulturidae auct.), flamingos (Phoenicopteridae), two fowl-like birds of the extinct family Quercymegapodiidae (Galliformes), and a screamer (Anhimidae, Anseriformes) (Alvarenga 1982, 1985, 1988, 1990, 1995, 1999; Mourer-Chauviré 2000). These fossils, with numerous others as yet undescribed, have been obtained from a quarry for montmorillonitic clay near the town of Tremembé. The clay deposits are below the level of the

nearby Paraíba River and the quarry is in operation only during the height of the dry season in the Southern Hemisphere winter.

Among the undescribed fossils are two specimens from a rather large bird, within the size range of the Brown Pelican if one includes the large taxon *Pelecanus occidentalis thagus*. We were unable to assign the specimens to any existing family of birds. Later comparison of the tibiotarsus with that of *Teratornis merriami* Miller (1909), of the extinct family Teratornithidae, indicated sufficient similarities to establish the familial placement of the Brazilian fossils.

The teratorns were gigantic, supposedly predatory or scavenging birds of uncertain ordinal affinity. They are known only from

fossils from the Pleistocene of North and South America, and from the Miocene of South America, with an undescribed species also being known from the Quaternary of Cuba (Arredondo & Arredondo, in press; William Suárez & Olson, MS).

#### Materials and Methods

*Material examined.*—*Teratornis merriami*: complete right tibiotarsus LACM B1044; proximal ends of right and left ulnae LACM B7388, G6912. Teratornithidae gen. et sp. nov. from Cuba, photographs of distal ends of right tibiotarsi WS 364, WS 574. Avian skeletons in the Museu de História Natural de Taubaté and the synoptic collection of bones of modern non-passerine families of birds in the Division of Birds, National Museum of Natural History, Smithsonian Institution.

#### Systematics

##### Class Aves

##### Family Teratornithidae

The holotypical tibiotarsus is referable to the Teratornithidae by the following combination of characters: incisura intercondylaris very wide; pons supratendineus very weak and narrow, without a tubercle; condylus medialis in anterior view narrow, in medial view distal edge nearly straight, not rounded; condylus lateralis deep; epicondylus medialis very prominent. The paratypical ulna is referable to the Teratornithidae on the following combination of characters: cotyla dorsalis in proximal view high and narrow; cotyla ventralis in proximal view wide with almost square internal margin; impressio m. scapulotricipitalis single, very large, deep, and quadrangular; incisura radialis extensive, distinct, shallow, and ovoid; tuberculum lig. collateralis ventralis not well developed.

##### *Taubatornis*, new genus

*Type species.*—*Taubatornis campbelli*, new species.

*Diagnosis.*—Compared with *Teratornis* Miller (1909), condylus medialis of tibiotarsus in anterior view narrower, contributing to a markedly wider incisura intercondylaris; condylus lateralis more markedly set off from the shaft; medial epicondyle entirely distal to distal tendinal opening, rather than proximal to it; pons supratendineus simple, without the accessory proximal fork found in some individuals of *T. merriami*. In the ulna, the incisura radialis in *Teratornis* is unique in being a very distinct, sharp-edged depression, pneumatic distally, that appears almost as if the bone had been crushed inward. In *Taubatornis* this area has only a shallow impression, although of about the same relative extent as in *Teratornis*. The genus *Cathartornis* Miller (1910), from Rancho La Brea, California, once thought to be doubtfully distinct from *Teratornis*, now appears to be valid and does not have the distinctive crushed-looking incisura radialis of *Teratornis* (K. Campbell, pers. comm.). Apart from the differences in the incisura radialis, the ulna of *Taubatornis* does not differ substantially from that of *Teratornis*. Thus, if the differences between *Teratornis* and *Aiolornis* Campbell et al. (1999) are consistent, the ulna of *Taubatornis* should differ from that of *Aiolornis* in the same characters.

*Etymology.*—For the Taubaté Basin, Brazil, plus Gr. *ornis*, bird.

##### *Taubatornis campbelli*, new species

Figs. 1–2

*Holotype.*—Distal end of right tibiotarsus, Museu de História Natural de Taubaté MHNT—VT 5154.

*Type-locality.*—Brazil, São Paulo State, 2 km NE of Tremembé, Santa Fe Farm (22°30'S, 45°32'W).

*Horizon and age.*—Tremembé Formation, montmorillonitic clay about 4 m below the most superficial level of shales. Middle Tertiary, late Oligocene or early Miocene.

*Measurements (mm) of holotype.*—Distal width 19.6, depth through lateral condyle

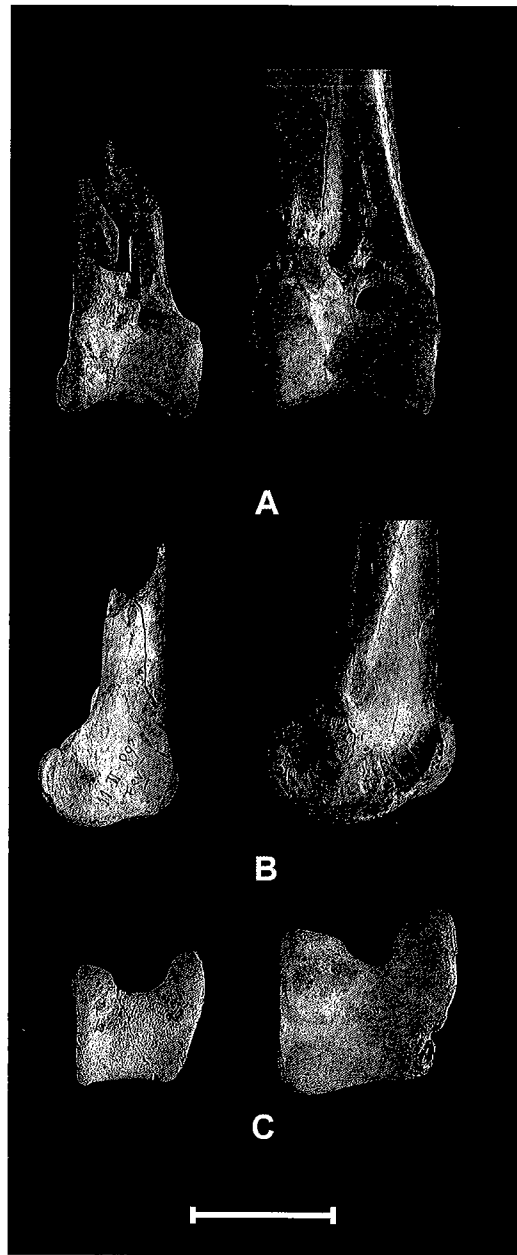


Fig. 1. Distal end of left tibiotarsus of *Taubatornis campbelli* MHNT—VT 5154, holotype (on left in each pair), compared with *Teratornis merriami* LACM B1044 (on right in each pair): A, anterior view; B, medial view; C, distal view. Scale = 2 cm.

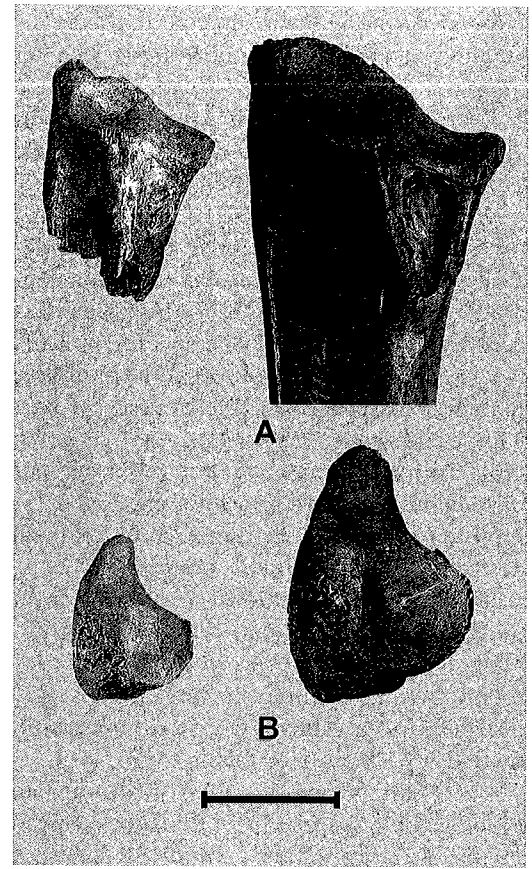


Fig. 2. Proximal end of left ulna of *Taubatornis campbelli* MHNT—VT 5155, paratype (on left in each pair), compared with *Teratornis merriami* LACM G6912 (on right in each pair): A, palmar view; B, proximal view. Scale = 2 cm.

18.8, depth through medial condyle 20.0; height of medial condyle 12.1, shaft width just proximal to tendinal bridge 14.2.

*Paratype*.—Proximal end of left ulna lacking part of the olecranon, Museu de História Natural de Taubaté MHNT—VT 5155.

*Measurements (mm) of paratype*.—Proximal depth (of articulating surfaces) 25.0, proximal width 19.5.

*Etymology*.—Dedicated to our colleague and friend Kenneth E. Campbell, Jr., of the Natural History Museum of Los Angeles County, in recognition of his contributions to our knowledge of the Teratornithidae.

*Diagnosis*.—As for the genus. Despite its

large size among birds in general, this is the smallest species of Teratornithidae so far known.

*Discussion.*—In North America, the Teratornithidae is represented by three species: *Teratornis merriami* Miller (1909), *Cathartornis gracilis* Miller (1910), and *Aiolornis incredibilis* (Howard 1952), originally described in *Teratornis* but elevated to a separate genus by Campbell et al. (1999). Except for one latest Pliocene specimen of the last species, all records of Teratornithidae in North America are Pleistocene in age. *Cathartornis gracilis* was originally known only from two tarsometatarsi. Although additional material is now thought to be referable to this species, this has not yet been described or illustrated (Campbell, pers. comm.). Another teratorn is known from the Quaternary of Cuba, which is to be described as a new species of *Teratornis* (Arredondo & Arredondo, in press). New material, however, shows that it is generically distinct (W. Suárez & Olson, MS).

In South America, apart from a late Pleistocene fragment from Ecuador referred to the Teratornithidae (Campbell & Tonni 1980), all previous records of the family are of the species *Argentavis magnificens*, the largest known flying bird. This is known from four localities in central and northern Argentina, all late Miocene (Huayquerian, ca. 6 mya) in age (Campbell & Tonni 1980, Campbell 1995). Neither the proximal end of the ulna nor the distal end of the tibiotarsus are known for this species, so no comparisons other than size can be made with *Taubatornis*.

*Taubatornis* nearly quadruples the time span through which the Teratornithidae is known, from ca. 6 mya to about 25 mya, and lends further support to the hypothesis that this family is South American in origin and did not arrive in North America until the latest Tertiary (Campbell & Tonni 1980). The presence of a teratorn in Cuba, however, shows that these birds are clearly capable of crossing water barriers and so could potentially have colonized North

America prior to the late Pliocene isthmian connection.

Although *Taubatornis* was a large bird by almost any standard, it is the smallest known teratorn: distal width of tibiotarsus 19.6 mm, vs. 23.5 mm and 25.3 mm in the Cuban teratorn, and 25.9–29.2 mm, (mean 27.7,  $n = 15$ ) in *Teratornis merriami* (data from Fisher 1946). Considering that *Taubatornis* is considerably closer in time to the presumed time of origination of the family in the beginning of the Cenozoic, it might be expected to have more “normal” dimensions than the obviously gigantic taxa that characterized the group in its last 6 million years.

The shales of the lacustrine environment of the Tremembé Formation suggest alternating wet and dry seasons, with fossils indicating periodic mortality of large numbers of small fishes that probably attracted predators and scavengers. These dieoffs may have been responsible for the presence of both *Taubatornis* and the cathartid vulture *Brasilogyys faustoi* (Alvarenga 1985), a species somewhat larger than the modern Black Vulture *Coragyps atratus*. The Tremembé Formation thus conforms to the pattern of almost invariable association of teratorns with New World vultures (Cathartidae) wherever teratorns are found.

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