

## The Paleocene Primate *Plesiolestes* and the Origin of Microsyopidae

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**Abstract.** Comparison of the dental morphology of the Middle Paleocene paromomyid primate *Plesiolestes problematicus* with that of the Early Eocene microsyopid *Cynodontomys latidens* indicates that *Plesiolestes* and *Cynodontomys* are closely related and that the Microsyopidae are derived from paromomyid primates. The Microsyopidae are, therefore, considered to be primates also. The diagnostic primate molar morphology apparently evolved before the petrosal bulla characteristic of most primates was acquired. Evidence presented here supports a derivation of Primates from leptictid insectivores.

**Key Words**  
*Plesiolestes*  
*Cynodontomys*  
Paromomyidae  
Microsyopidae  
Leptictidae  
Origin of primates

### Introduction

Deposits of Middle Paleocene (Torrejonian) age in western North America yield a varied primate fauna. These primates have been assigned to eight genera: *Pronothodectes*, *Elphidotarsius*, *Picrodus*, *Paromomys*, *Palenochtha*, *Plesiolestes*, *Palaechthon* and *Torrejonia*. *Pronothodectes*, *Elphidotarsius*, and *Picrodus* are classified, respectively, in the families Plesiadapidae, Carpolestidae and Picrodontidae; the remaining genera are placed in the Paromomyidae [SIMONS, 1972]. Only two of these genera were previously known to have had Eocene descendants. A species of the plesiadapid genus *Pronothodectes* was ancestral to *Plesiadapis* and *Platychaerops* [RUSSELL, 1964]. The paromomyid *Paromomys* probably gave rise to *Phenacolemur* [SIMPSON, 1955; MCKENNA, 1960].

With specimens of *Plesiolestes problematicus* JEPSEN [1930] now available for study, it appears that *Plesiolestes* also had descendants in the Eocene. As is illustrated below, the dentition of the Early Eocene species *Cyno-*

*dontomys latidens* (family Microsyopidae) is very similar to that of *Plesiolestes problematicus*, indicating that *Cynodontomys* was probably derived from a species of *Plesiolestes* or the closely related Middle Paleocene primate *Palaechthon*. This relationship is important both for the classification of the family Microsyopidae and for problems concerning the origin of the order Primates.

The Microsyopidae are a family of early mammals having molars characteristic of primates and middle ear morphology most similar to that of leptictid insectivores [MCKENNA, 1966]. They are thus of particular importance to studies of the origin of primates. At least two evolutionary lineages of the family are present in the Eocene. The *Cynodontomys-Microsyops-Craseops* lineage (subfamily Microsyopinae) is the best documented [MCKENNA, 1960]. *Niptomomys doreenae* and *Uintasorex parvulus* (subfamily Uintasoricinae) constitute an additional lineage [SZALAY, 1969b; BOWN and GINGERICH, 1972]. SZALAY [1969a] compared the Late Paleocene and Early Eocene species of *Navajovius* with other early primates and concluded that *Navajovius* was more closely related to *Cynodontomys* than to any other genus; however, it now appears to the present writers that *Navajovius* is more closely related to the *Niptomomys-Uintasorex* lineage. *Plesiolestes* and the less well known, possibly congeneric *Palaechthon* [see SIMPSON, 1937] appear to be more closely related to *Cynodontomys*, although they may prove to be ancestral to all of the Microsyopidae.

#### *Dentition of Plesiolestes and Cynodontomys*

*Plesiolestes problematicus* is known at present from maxillary fragments preserving P<sup>4</sup> through M<sup>3</sup>, and from numerous virtually complete mandibles, demonstrating that the lower dental formula of this species was 2.1.3.3. Species of *Cynodontomys* and its descendant *Microsyops* are known from numerous mandibles and two relatively complete skulls preserving almost the entire dentition [MCKENNA, 1966; SZALAY, 1969a]. The dental formula of *Cynodontomys* species is apparently I<sub>1</sub><sup>1</sup> C<sub>0</sub><sup>1</sup> P<sub>3</sub><sup>4</sup> M<sub>3</sub><sup>3</sup>. It is thus possible to derive the lower dental formula of *Cynodontomys* from that of *Plesiolestes* by subsequent loss of the lower second incisor and the canine.

In all linear dimensions *Plesiolestes problematicus* is approximately three-fifths the size of *Cynodontomys latidens*. Both species have an enlarged, procumbent lower incisor (fig. 1). The crown of the incisor is pointed at the tip and rounded at the base. The occlusal surface of the crown in both

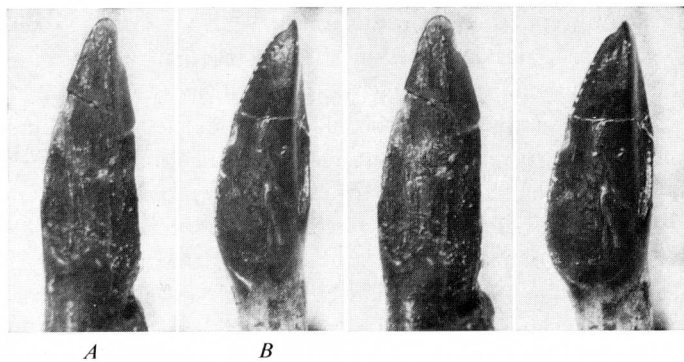


Fig. 1. Occlusal view of left lower incisors of *Plesiolestes* and *Cynodontomys*. A *Plesiolestes problematicus* (Princeton University No. 14149,  $\times 9.6$ ). B *Cynodontomys latidens* (Yale Peabody Museum No. 30506,  $\times 5.2$ ).

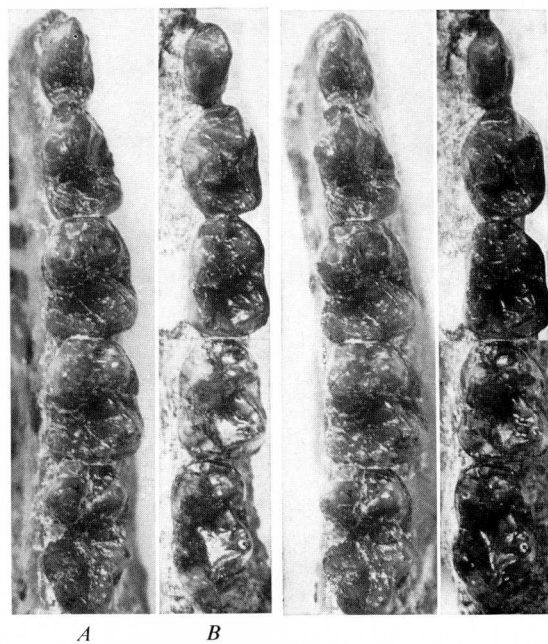


Fig. 2. Occlusal view of right  $P_{3-4}$ ,  $M_{1-3}$  of *Plesiolestes* and *Cynodontomys*. A *Plesiolestes problematicus* (Princeton University No. 14106,  $\times 8.7$ ). B *Cynodontomys latidens* (composite, Yale Peabody Museum No. 27806 and 29759,  $\times 5.2$ ).

species is slightly concave, with an anteroposteriorly oriented central rib which is expanded laterally to form a blade. Medially, the central rib is bordered by a cingulid. Although the lower incisors of *Plesiolestes* and *Cynodontomys* are similarly constructed, the dorsal crest of the blade in the latter genus is relatively higher and more well defined than that of *Plesiolestes*.

The lower premolars and molars of *Plesiolestes problematicus* and *Cynodontomys latidens* are compared in figure 2. In both species,  $P_3$  is tall and double-rooted with a prominent protoconid and no metaconid. The paracristid extends forward from the protoconid to a weakly developed paraconid. A crest extends posteriorly from the protoconid to form the lateral margin of a small heel. This heel has a single undifferentiated crest at its posterior margin. In both genera,  $P_4$  is molariform with a distinct protoconid, paraconid and metaconid forming the trigonid, and with a basined talonid and distinct hypoconid and entoconid. The  $P_4$  of *Cynodontomys latidens* (fig. 2) is relatively wider, and has a somewhat more distinct metaconid and a weaker hypoconid than that of *Plesiolestes*. The relative development of the metaconid on  $P_4$  is variable in *Cynodontomys*, *Plesiolestes* and *Palaechthon*.

The three lower molars of *Plesiolestes problematicus* are of the same proportions and are almost identical in morphology to those of *Cynodontomys latidens* (fig. 2).  $M_1$  has a small but distinct paraconid situated medially to the metaconid, while on  $M_2$  and  $M_3$  the paraconid is reduced to an anterior shelf-like projection of the trigonid. As in *Palenochtha minor*, the protoconid and metaconid are separated by a deep trigonid valley and not joined by a transverse crest as observed in *Paromomys* and *Phenacolemur*. Both *Plesiolestes* and *Cynodontomys* have a well-developed hypoconulid and entoconid which are proximal to each other and form the posteromedial border of the talonid. Both genera have a mesoconid at the anterior end of the cristid obliqua. The lower molars of *Plesiolestes* differ morphologically from those of *Cynodontomys* in the presence of a forward extension of the external cingulid, in having a twinned hypoconulid on  $M_3$ , and in having the hypoconulid and entoconid joined by a crest. Separation of the entoconid and hypoconulid in *Cynodontomys* is functionally related to the development of a hypocone in the upper molars. This hypocone replaces the primitive postprotocingulum (= 'Nannopithecus-fold' of SIMPSON [1955], and others) of *Plesiolestes*.

The upper cheek teeth of *Plesiolestes problematicus* are relatively broader than those of *Cynodontomys latidens*, although the relative development and position of the major cusps, conules and shearing crests is essentially the same in the upper teeth of both species (fig. 3). The  $P^4$  of *Plesiolestes* differs

