

## A New Species of *Niptomomys* (Microsyopidae) from the Early Eocene of Wyoming

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**Key Words.** *Niptomomys* · Microsyopidae · Eocene primates

**Abstract.** A new, relatively large species of *Niptomomys* is described from the late Wasatchian of the Bighorn Basin of Wyoming. The importance of a stratigraphic approach to problems of species-level phylogeny is stressed, and then applied to an investigation of the evolutionary history of *Niptomomys*. The new *Niptomomys* species may have evolved gradually from early Wasatchian *Niptomomys doreenae* in the Bighorn Basin and vicinity, or it may have evolved elsewhere and replaced the earlier form relatively rapidly. The available evidence is not yet sufficient to distinguish between these two alternatives.

### Introduction

Microsyopidae are an important family of archaic North American and European Paleocene and Eocene primates of the suborder or infraorder Platyrrhini. Two subfamilies, Microsyopinae and Uintasoricinae, are generally recognized within this family. The subfamily Uintasoricinae contains four genera: *Niptomomys*, *Uintasorex*, *Berruvius* and *Navajovius*. Of these, *Niptomomys* and *Uintasorex* were the most successful in terms of their stratigraphic and geographic diversity. *Berruvius*, from the Paris Basin in France, is not well known and its affinities are uncertain [Russell, 1964; Szalay and Delson, 1979]. *Navajovius* is known from the late Paleocene locality of Mason Pocket in Colorado [Matthew and Granger, 1921], where it is represented by three specimens. *Navajovius* is also possibly represented

by a single specimen from Quarry 58 of the American Museum of Natural History in the San Jose Formation of New Mexico [Szalay, 1969a]. Alternatively, the latter specimen may represent a very small species of *Niptomomys* [see Bown, 1979].

Two species of *Uintasorex*, *U. parvulus* and *U. montezumicus*, have a fairly wide geographic distribution. *U. parvulus* is known from Bridgerian (middle Eocene) beds in the Bridger Basin of Wyoming [Matthew, 1909], from Powder Wash in the Green River Formation of Utah [Gazin, 1958], and from the Badwater Creek area of Wyoming [Robinson, 1968]. *U. montezumicus* is known from various localities in the Mission Valley and Friars Formations, Uintan (late Eocene) of California [Lillegraven, 1976]. These represent the latest North American uintasoricines, ranging from the early Bridgerian through the Uintan.

*Niptomomys*, the focus of the present paper, is the earliest relatively well-known representative of the subfamily. Only *Navajovius* from Colorado and *Berruvius* from France are older. *Niptomomys* is known from the earliest Eocene Clarkforkian of the Clark's Fork Basin, Wyoming [Rose, 1979] through most of the Wasatchian early Eocene of the central Bighorn Basin, Wyoming [Bown and Gingerich, 1972]. *Niptomomys* is also known from a relatively wide geographic area, stretching from the Four Mile area of northwestern Colorado [McKenna, 1960] to the central and northern parts of the Bighorn Basin in north-central Wyoming [Bown, 1979; Rose, 1979].

*Niptomomys*, like all uintasoricines, is quite small. It is characterized by having lanceolate lower incisors [Bown and Gingerich, 1972], lower fourth premolars that lack paraconids [Szalay, 1969b; Bown, 1979], and lower molars with large, deep talonid basins [McKenna, 1960]. Both upper and lower fourth premolars are rather robust, and upper molars have large trigon basins and buccally placed conules. Postprotocingula may be present on upper molars [Bown, 1979].

We recently restudied most of the known specimens of *Niptomomys*, making use of stratigraphic information where available. Our purpose was to investigate the evolutionary history of this early group of uintasoricine primates.

*Abbreviations used in the text.* AMNH = American Museum of Natural History (New York); PU = Princeton University (Princeton); UM = University of Michigan, Museum of Paleontology (Ann Arbor); YPM = Yale Peabody Museum (New Haven); L = length; W = width.

## Systematic Paleontology

Order Primates

Infraorder Plesiadapiformes

Family Microsyopidae

Subfamily Uintasoricinae

*Niptomomys thelmae*, sp. nov.

*Holotype*. YPM 27577, right mandibular fragment with I<sub>1</sub>, P<sub>3-4</sub>, M<sub>1</sub> (fig. 1).

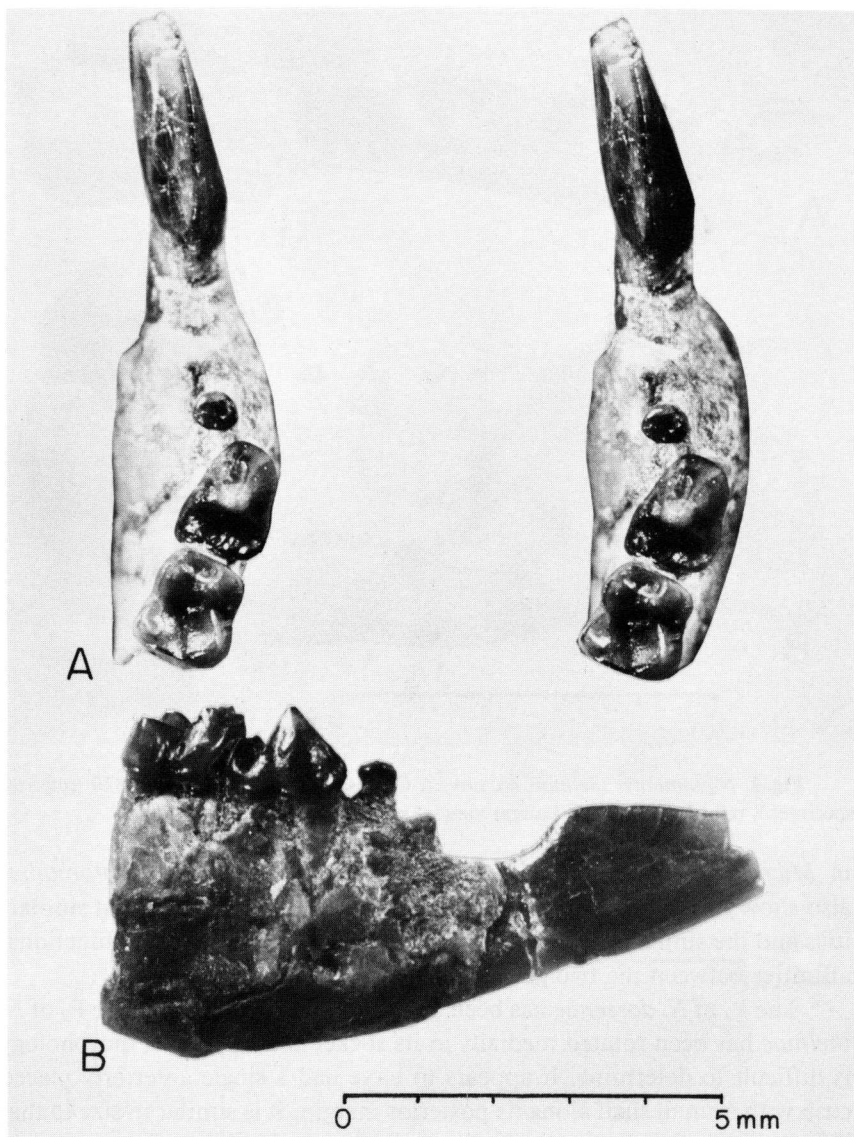
*Locality*. Yale locality 175, Lower Eocene, Lysite beds, Willwood Formation, SW<sup>1</sup>/<sub>4</sub>, NE<sup>1</sup>/<sub>4</sub>, Sec. 1, T48N, R97W, Washakie County, Wyoming.

*Hypodigm*. The type specimen and AMNH 16829, a mandibular fragment preserving P<sub>4</sub> and M<sub>1</sub> and alveoli for M<sub>2-3</sub>, found in 1913 by William Stein at the Head of Ten Mile Creek in Big Horn County, Wyoming (fig. 2).

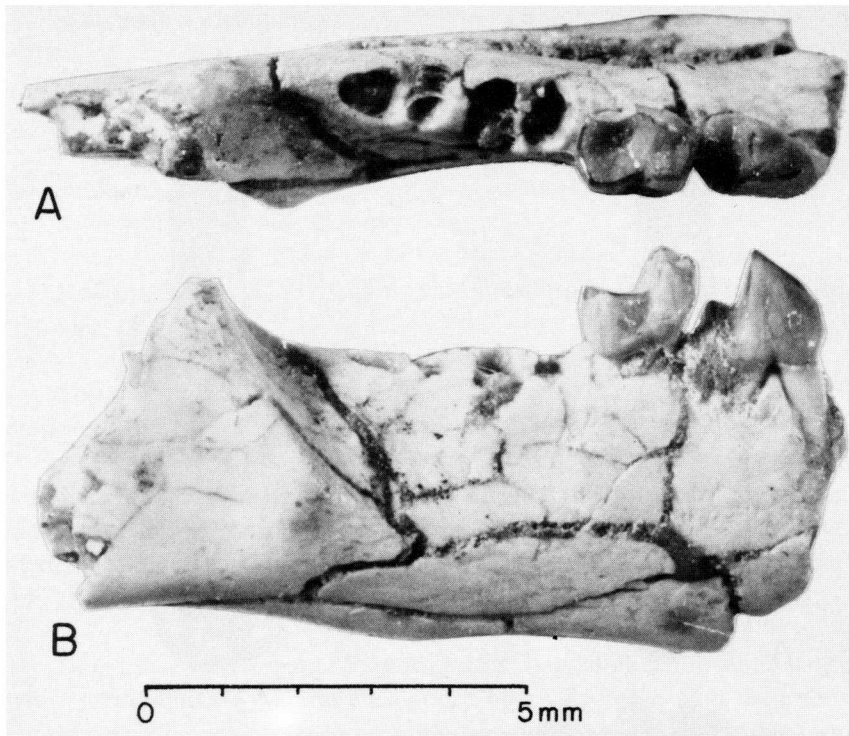
*Diagnosis*. Differs from *N. doreenae* (fig. 3) in being significantly larger, with more robust P<sub>4</sub>. M<sub>1</sub> more expanded bucco-lingually, with reduced or absent paraconid and anteroposteriorly expanded trigonid. Mandible more robust and deeper than in *N. doreenae*.

*Etymology*. Named for Mrs. Thelma Churchill, in recognition of the many contributions that she and her family have made to the promotion of paleontological field work in the Bighorn Basin of Wyoming.

*Description*. As was discussed in Bown and Gingerich [1972], the incisor of YPM 27577 is very similar in morphology to typical microsyopid lower incisors. It has been adequately described by previous authors, but we shall add a comment here concerning its microsyopid affinities. The wear shown on the *N. thelmae* incisor is similar to that seen in species of *Microsyops*. The medial-most surfaces of the incisors wear through their thin enamel covering relatively rapidly and assist in keeping a sharp cutting surface along the superior margin of the tooth. The wear appears heaviest along the superior border of the medial aspect of the incisor in both genera. The posterior lateral expansion of the lower incisor in *N. thelmae* is less well developed and suggests a less marked tapering towards the tip than is seen



**Fig. 1.** *Niptomomys thelmae*, sp. nov. **A** Occlusal aspect of YPM 27577 (holotype), right I<sub>1</sub>, P<sub>3-4</sub>, M<sub>1</sub>, stereophotograph. **B** Lateral view of same specimen.

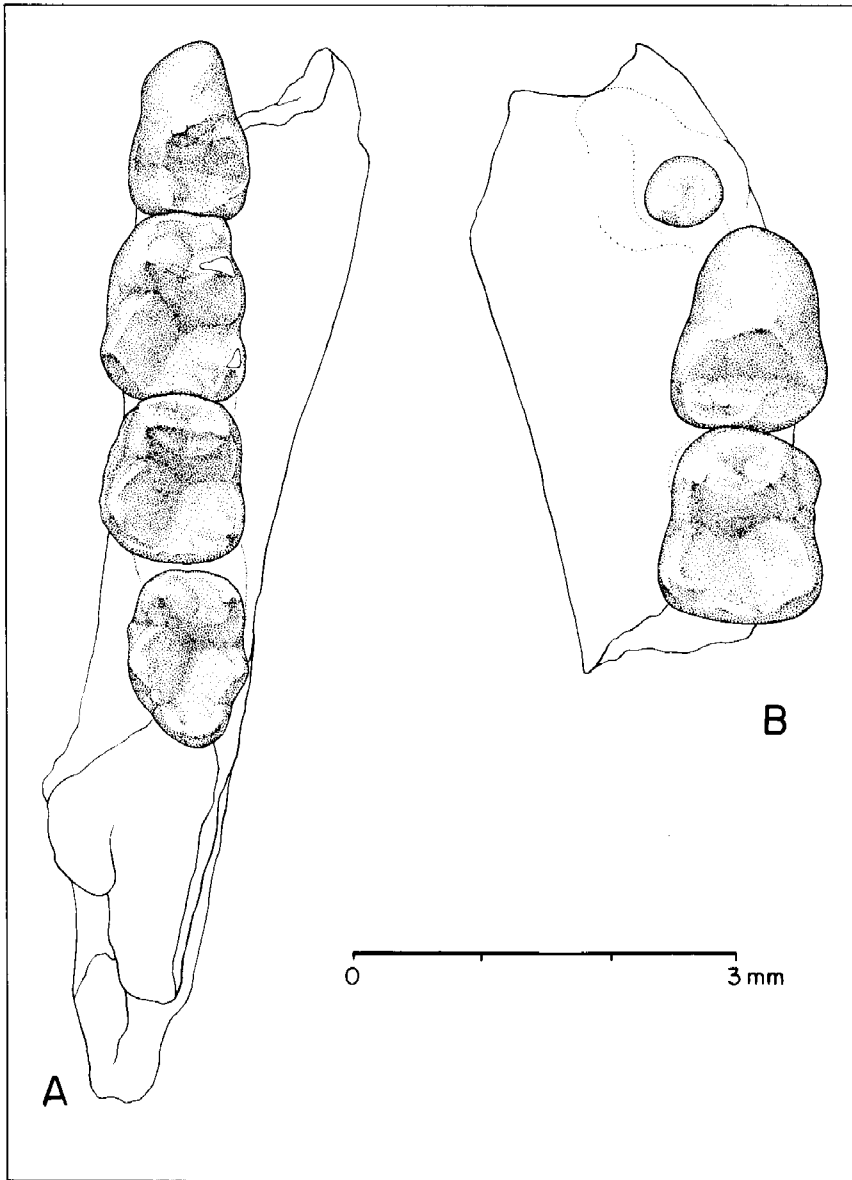


**Fig. 2.** *Niptomomys thelmae*, sp. nov. **A** Occlusal aspect of AMNH 16829 (referred specimen), right P<sub>4</sub> and M<sub>1</sub>. **B** Lateral view of same specimen.

in *Microsypops*. Other lower incisors tentatively assigned to *Niptomomys* also show this characteristic. However, the over-all morphological similarities and the similar wear patterns suggest close phylogenetic and functional affinities between the two genera.

The P<sub>3</sub> of *N. doreenae* has been described by Bown [1979]. The P<sub>3</sub> of *N. thelmae* has been rotated medially in its socket and the crown morphology is difficult to determine. It appears to have had a single anteriorly placed cusp with a small shelf along its posterior margin. It is similar in size to that in specimens assigned to *N. doreenae*.

P<sub>4</sub> is a very robust tooth in both the type and the referred specimen, with dimensions larger than those seen in *N. doreenae*. It has a prominent protoconid, with a metaconid placed high on the medial slope of the protoconid. The protoconid is inflated bucco-lingually along its anterior margin to a much greater extent than is exhibited in *N. doreenae*. The metaconid is



**Fig. 3.** Comparison of lower dentition of *Niptomomys doreenae* with *N. thelmae*. **A** *N. doreenae*, PU 17833, left P<sub>4</sub>M<sub>1-3</sub>, compared with **(B)** right P<sub>3-4</sub>, M<sub>1</sub> of holotype of *N. thelmae*, YPM 27577. Both drawn to same scale. Note size difference, more inflated P<sub>4</sub>, and reduced paraconid on M<sub>1</sub> in *N. thelmae*.

better developed than in any *N. doreenae* material and is nearly equal in height to the protoconid, a condition not seen in the earlier species. There is no paraconid. The talonid area in the type specimen is expanded buccolingually, with the shelf extending more laterally than in *N. doreenae*. There is a small entoconid developed along the posterior medial surface of the talonid shelf.

The  $M_1$  of *N. thelmae* is expanded bucco-lingually in comparison with *N. doreenae*. The trigonid of YPM 27577 lacks a distinct paraconid and has a rather wide paracristid connecting the protoconid and metaconid. In AMNH 16829, a small paraconid is still present. The paracristid is expanded anteroposteriorly in comparison with *N. doreenae*. The protoconid and metaconid are of similar height and are positioned on the margins of the trigonid. The talonid basin in both species of *Niptomomys* is large and quite deep. The hypoconid and entoconid are well developed and are placed at the margins of the talonid basin. The hypoconid is connected to the trigonid by a well-developed oblique cristid. There is a small hypoconulid positioned medial to the mid-line on the postcristid in a similar fashion to that seen in other microsyopids [see Szalay, 1969a]. A small buccal cingulid is present anterior and inferior to the hypoflexid.

The mandibular ramus in *N. thelmae* is more heavily built than that seen in *N. doreenae*. The depth of the mandible below  $M_1$  in YPM 27577 is 3.45 mm, while the mean of the same measurement for five *N. doreenae* specimens is 2.72 mm. The width of the mandible below  $M_1$  in the *N. thelmae* type is 1.4 mm, while the mean of the comparable measurement in the five *N. doreenae* specimens is 1.09 mm. Comparative dental measurements are given in table I.

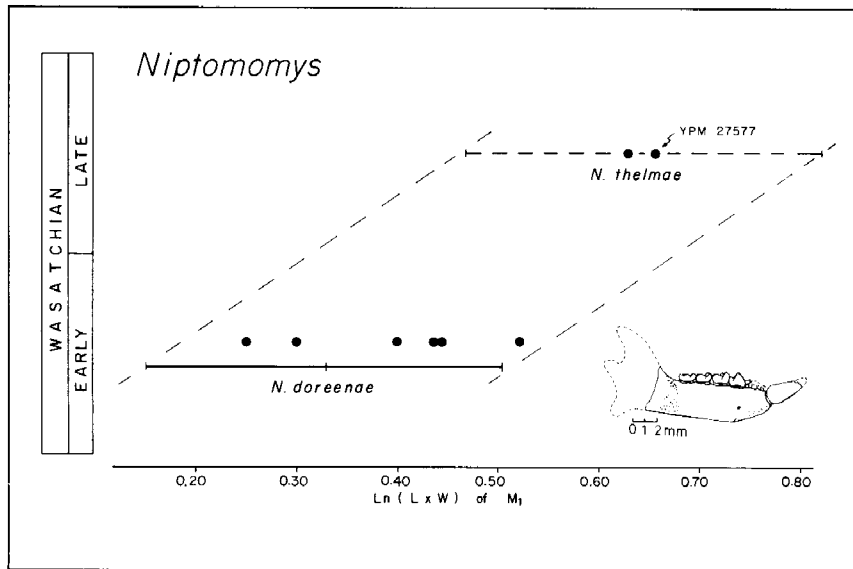
**Table I.** Comparative dental measurements of *Niptomomys thelmae* and *N. doreenae* (all measurements in mm)

	<i>N. thelmae</i>		<i>N. doreenae</i>			
	YPM 27577 (type)	AMNH 16829	AMNH 16828	AMNH 80079	PU 17885	YPM 30665
$P_4L$	1.45	1.55	1.20	1.15	1.25	1.30
$P_4W$	1.20	1.05	0.90	0.90	1.00	0.95
$M_1L$	1.50	1.50	1.20	1.30	1.25	1.30
$M_1W$	1.30	1.25	1.05	1.10	1.00	1.15

## Discussion

Previous authors have chosen to retain all of the specimens of *Niptomomys* in one species, *N. doreenae*. In the examination of species-level phylogenetic change, it is important to make use of stratigraphic information whenever possible [see Gingerich, 1976, 1979, for discussion; Gingerich and Simons, 1977; Gingerich and Gunnell, 1979; Gingerich, 1980, for examples].

When tooth size is plotted against stratigraphic position, two distinct groupings of *Niptomomys* specimens become evident. Figure 4 illustrates



**Fig. 4.** Stratigraphic plot of *Niptomomys* specimens from the early and late Wasatchian of the Bighorn Basin, Wyoming, based on AMNH, PU, UM, and YPM specimens. Ordinate represents relative stratigraphic position of the two samples within the Wasatchian. Abscissa represents the natural log of first lower molar length multiplied by width. Solid bar beneath the *N. doreenae* sample indicates two standard deviations on either side of the mean size for six specimens from the type sample of *N. doreenae* from the Four Mile fauna, Colorado. Heavy broken line through the *N. thelmae* sample indicates expected range of standard deviation on either side of the mean for this species. Light, broken, parallel lines are purely hypothetical, at present, but show one possible phylogenetic trend. More evidence is required to clarify the relationship of *N. thelmae* to *N. doreenae*.



this using the natural logarithm of first lower molar length multiplied by width. The type sample of *N. doreenae* from the Four Mile Creek area and the Bighorn Basin specimens form an early Wasatchian group, and the two specimens here described as *N. thelmae* form a distinct late Wasatchian cluster. Although the fossil record of *Niptomomys* is less well known than would be preferred, a distinct increase in molar size is indicated by the late Wasatchian. This implies a marked increase in body size as well. To determine if this size difference was significant, we subjected the samples to a two-tailed t-test, testing the combined mean of the  $M_1$  measurements for *N. doreenae* specimens from the early Wasatchian Four Mile fauna (0.33) against the mean of the  $M_1$  measurements for the two late Wasatchian *N. thelmae* specimens (0.67). The null hypothesis that these two samples are the same is rejected at the 0.95 level. This indicates that there is a significant size difference between the two samples and supports the recognition of two species.

While it is clear that there are two species represented by this sample of *Niptomomys* specimens, it is not evident from the fossil record how *N. thelmae* evolved. It is possible that *N. thelmae* is a direct descendant of *N. doreenae*. With further fossil collecting, the gap between the two forms may be bridged and a gradual change from one to the other may be documented. This type of phyletic change has been adequately demonstrated by Gingerich [1976, 1980] and others. It is also possible that *N. thelmae* evolved in a different area and represents an immigrant into the Bighorn Basin in the late Wasatchian, replacing the earlier form relatively rapidly. It is not possible, at this time, to give convincing evidence in support of either of these two possibilities.

In either case, by applying stratigraphic information to this sample, it is possible to discern the presence of two species where only one was recognized before. This information is an important diagnostic tool which should not be ignored if an accurate account of species-level phyletic evolution is sought.

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