

A NEW SPECIES OF *EOCONODON* (TRIISODONTIDAE, MAMMALIA) FROM THE SAN JUAN BASIN, NEW MEXICO

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ABSTRACT—Species of the early Paleocene (Puercan North American Land Mammal Age) triisodontid *Eoconodon* were among the first eutherians in the northern Western Interior to evolve body masses significantly larger than those of the latest Cretaceous mammals of the area. Description of additional specimens of *Eoconodon nidhoggi* from the Tullock Formation, northeastern Montana, sets the stage for formal diagnosis of a new species of *Eoconodon*, *E. ginibitohia* sp. nov., in the Bettonie-Tsosis local fauna, Puercan 2, *Hemithlaeus kowalevskianus* – *Taeniolabis taoensis* Zone, San Juan Basin, New Mexico. The taxonomic diversity of the species of *Eoconodon* as well as their stratigraphic and biogeographic ranges support the hypothesis that the first representatives of the clade entered the Western Interior at the beginning of the Puercan as immigrants from currently poorly sampled areas probably in North America or Asia. During the Puercan the clade both diversified and expanded its biogeographic range in the Western Interior.

INTRODUCTION

Paleocene strata exposed in New Mexico, Colorado, Wyoming, Montana, and Saskatchewan have produced the largest currently available samples of early Paleocene (Puercan North American Land Mammal Age) mammals (Lofgren et al., 2004). Recently, Williamson (1996) analyzed the Paleocene local faunas of the San Juan Basin, which include the triisodontids *Eoconodon coryphaeus* and *E. gaudrianus*. He also recognized that a fragmentary dentary represented a third, new species of *Eoconodon* but did not formally describe it. Archibald (1982), Van Valen (1984 and references cited therein), and Lofgren (1995), among others, have studied Puercan local faunas from northeastern Montana. Two species of *Eoconodon*, *E. nidhoggi* Van Valen, 1978, and “. . . a larger species of *Eoconodon* . . . the size of *E. gaudrianus*” (Van Valen, 1978:58) were recognized in this area.

As a first step in revision of the species of *Eoconodon* known from the North American Western Interior we describe and diagnose the new species of *Eoconodon* from the San Juan Basin previously cited by Williamson and Lucas (1993) and Williamson (1996). For comparative purposes a description of new material of the lower dentition of *Eoconodon nidhoggi* from Montana is presented here. A full analysis of the species of *Eoconodon* found in Montana is the subject of another study by one of us (WAC).

Abbreviations—AMNH, American Museum of Natural History; LACM, The Natural History Museum of Los Angeles County; NALMA, North American Land Mammal Age; NMMNH, New Mexico Museum of Natural History and Science; UCMP, University of California Museum of Paleontology; UMVP, University of Minnesota, Vertebrate Paleontology Collections.

Formats for Locality Designations—LACM = Loc. 0000; NMMNH = loc. 000; UCMP = V-00000. Detailed locality data are on file at these museums and available to qualified investigators.

STRATIGRAPHY

Our knowledge of early Paleocene mammalian faunas has grown from the pioneering work of David Baldwin and E. D.

Cope in the San Juan Basin, New Mexico, to include faunas in areas as far north as southern Canada (see Matthew, 1937; Williamson, 1996; Fox, 1997; Lofgren et al., 2004). Broad biochronologic correlations of these local faunas have been made with a system of North American Land Mammal Ages (NALMA) and constituent Interval Zones (see Archibald et al., 1987; Lofgren et al., 2004). Attempts to refine these correlations have been impaired by biogeographic provincialism and, until recently, lack of both magnetostratigraphic data and radiometric age determinations with which to surmount this barrier.

Characterizations of the early Paleocene Puercan NALMA and two of its Interval Zones, Pu2 and Pu3, were based primarily on local faunas of the San Juan Basin (Fig. 1). Many of the mammalian species definitive of these units ranged no farther northward than the Hanna Basin of southern Wyoming (see Eberle and Lillegraven, 1998a, b); therefore, precise biochronologic correlations of these southern faunas with local faunas farther to the north cannot be made.

Williamson (1996), building on earlier work, defined several biozones based on the Paleocene mammalian faunas of the San Juan Basin. In contrast to NALMA, these are operational units with well-defined boundaries that can be tied physically and directly to other stratigraphic markers including magneto-zones. Durations of the lowest two of these biozones, the *Hemithlaeus kowalevskianus* – *Taeniolabis taoensis* (H-T) and *Taeniolabis taoensis* – *Periptychus carinidens* (T-P) Zones approximate those of the Pu2 and Pu3 Interval Zones of the Puercan recognized by many workers (see Archibald et al., 1987; Lofgren et al., 2004).

Although a series of radiometric ages has been obtained from volcanic ashes in northeastern Montana (Swisher et al., 1993), rocks suitable for radiometric age determinations have yet to be found in either the Hanna or San Juan Basins. In contrast, magnetic-anomaly signatures provide an independent but limited basis for correlation of the sequences of mammalian local faunas in the San Juan Basin and some geological sections in Montana (Fig. 1). Earliest Paleocene, Pu1 Interval Zone faunas are unknown in the San Juan Basin but have been discovered in Colorado, Wyoming, Montana, and Saskatchewan. As far as is currently known all Pu1 local faunas lived during Magnetic Anomaly Chron 29R. H-T and T-P Zone (Pu2 and Pu3) local

	NALMA	Interval zone	San Juan Basin New Mexico	Hanna Basin Wyoming	Magnetic anomaly chrons	Interval zone	Northeastern Montana	Other regions: of Montana – and Wyoming	Canada
Paleocene	Tortonian (To)	To1	Not present	Not represented	28N	To1	Not represented	Not represented	Not represented
			Not represented	Not represented	28R		Farrand Channel local fauna ? <i>E. n. sp.</i>	Not represented	Not represented
	Puercan (Pu)	Pu3	T-P Zone (Taeniolabis Zone) <i>E. coryphaeus</i>	Not present	29N	Pu2-3	Purgatory Hill Garbani Channel local faunas <i>E. cf. E. gaudrianus</i> <i>E. nidhoggi</i>	Simpson Quarry <i>E. sp.</i> Hiatt local fauna <i>E. sp.</i>	Rav-1 <i>E. sp.</i>
		Pu2	H-T Zone (Ectococcus Zone) <i>E. coryphaeus</i> <i>E. gaudrianus</i> <i>E. ginibitohia</i>	<i>E. sp.</i>					
Cretaceous	Lancian	Pu1	Not represented	<i>E. sp.</i>	29R	Pu1	McGuire Creek – Hell Hollow local faunas Not present	Mantua Lentil <i>E. copans</i>	Not present
			Atamo Wash local fauna	Lancian local faunas				Hell Creek Fm. local faunas	Lancian local faunas
					30N				

FIGURE 1. Correlation chart of the major occurrences of *Eoconodon* in the North American Western Interior. Species of *Eoconodon* are listed in bold type. *Eoconodon* is unknown in local faunas of Lancian age. Pu1 and To1 cells labeled “not represented” identify areas lacking mammalian local faunas of the specified age. Cells labeled “not present” identify areas with mammalian local faunas of the specified age that do not include representatives of *Eoconodon*. See text for additional data.

faunas of the San Juan Basin lived during Chron 29N (Williamson, 1996). Most middle (Pu2) or late Puercan (Pu3) local faunas of the northern Western Interior also lived during Chron 29N. To this degree they are contemporaneous, but magnetostratigraphy does not provide the basis for distinguishing H-T Zone from T-P Zone correlatives in the northern Western Interior. To recognize the lack of resolution in this correlation, northern Western Interior local faunas of middle or late Puercan age are designated Pu2–3 undifferentiated. The one possible exception is the Hiatt local fauna, southeastern Montana, that, on the biochronologic criteria used here, is a Pu2–3 local fauna. If the magnetostratigraphic correlation suggested by Hunter et al. (1997) is correct, the Hiatt local fauna lived near the end of Chron 29R and, therefore, is older than any Pu2 or Pu2–3 local fauna currently known.

SYSTEMATIC PALEONTOLOGY

Family TRIIODONTIDAE Trouessart, 1904
Genus *EOCONODON* Matthew and Granger, 1921
EOCONODON NIDHOGGI Van Valen, 1978
(Fig. 2)

Type Specimen—UMVP 1471, left m3.

Type Locality—Purgatory Hill, Tullock Formation, McCone County, Montana (Van Valen and Sloan, 1965) = UCMP loc. V-71202.

Referred Lower Molars—Isolated m1s: LACM 32925 (Loc. 3099 = V-72125), UCMP 145325 (V-73080); m2s: UCMP 145328, 170848 (V-73080); m3s: UCMP 145323 (V-72126), UCMP 145330 (V-73080).

Diagnosis—*Eoconodon nidhoggi* was succinctly diagnosed by Van Valen (1978:58) as follows: “Smallest known species of *Eoconodon*. Lower molars moderately elongate, entocristid complete, trigonid walls rather vertical; upper molars very transverse. M₃l, 7.4 ± 0.1, trd w, 4.4, tald w, 3.7. There is also a large species of *Eoconodon* at Purgatory Hill, the size of *E. gaudrianus*.”

Full descriptions and analyses of the species of *Eoconodon* from northeastern Montana are the subjects of a study being prepared by one of us (WAC). For the purposes of this paper it can be noted that the dimensions of m1 and m2 of the type and only specimen of *E. ginibitohia*, sp. nov., either fall within or are slightly smaller than the observed ranges of variation in the small samples of homologous teeth of *E. nidhoggi* (Table 1). Other criteria for distinguishing these molars are presented in the diagnosis of *E. ginibitohia*, sp. nov. Additional material from northeastern Montana supports Van Valen’s (1978) recognition of a larger species of approximately the same size as *E. gaudrianus*, which is referred to here as *E. cf. E. gaudrianus*.

Description

In addition to the type and three isolated upper postcanines – P3, M2, and M3 – from Purgatory Hill, a small sample of isolated molars of *Eoconodon nidhoggi* has been recovered from Garbani Channel localities, Tullock Formation, Garfield County,

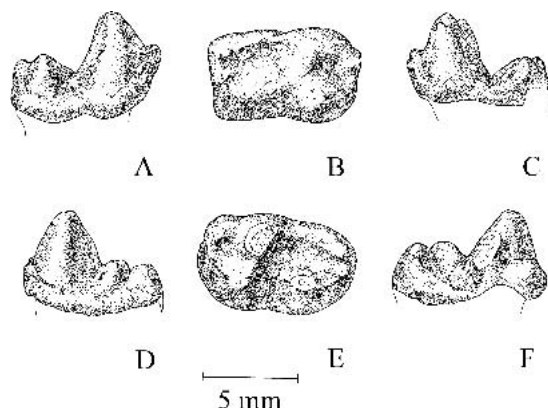


FIGURE 2. *Eoconodon nidhoggi*. A-C, right m2, UCMP 170848; A, labial view; B, occlusal view; C, lingual view. D-F, left m3, UCMP 145323; D, labial view; E, occlusal view; F, lingual view.

TABLE 1. Descriptive statistics for species of *Eoconodon*. Measurements are in mm. Specimens of *Eoconodon coryphaeus* and *E. gaudrianus* from the San Juan Basin are in the AMNH, NMMNH, and UCMP collections. Material of *E. cf. E. gaudrianus* and *E. nidhoggi* from Montana is in the UCMP, LACM, and UMVP collections. Dimensions of the type of *E. copanus* were taken from a cast of the specimen. Abbreviations: CV, coefficient of variation; M, mean; N, number; OR, observed range of variation; SD, standard deviation.

	Length					Width									
	N	OR	M	SD	CV	N	OR	M	SD	CV					
P4															
<i>Eoconodon coryphaeus</i>	16	10.7–13.9	12.4	1.10	8.87	16	5.9–7.8	6.7	0.5	8.06					
<i>E. cf. gaudrianus</i>	4	8.8–9.6	9.3	0.34	3.66	6	4.9–6.5	5.4	0.6	11.30					
<i>E. gaudrianus</i>	2	9.0–11.0	10.0	1.41		2	5.0–6.2	5.6	0.8						
<i>E. ginibetohia</i>	1	6.8				1	3.4								
	Length					Width Trigonid					Width Talonid				
	N	OR	M	SD	CV	N	OR	M	SD	CV	N	OR	M	SD	CV
m1															
<i>Eoconodon coryphaeus</i>	18	10.2–12.2	11.0	0.58	5.27	16	6.8–8.3	7.5	0.5	6.27	18	7.2–9.2	8.2	0.52	6.34
<i>E. cf. gaudrianus</i>	2	8.7–9.3	9.0			2	5.6	5.6			2	5.8–6.1	6.0		
<i>E. gaudrianus</i>	2	8.4–8.6	8.5												
<i>E. nidhoggi</i>	1	7.7				2	4.6–5.5	5.1							
<i>E. copanus</i>	1	9.4				1	5.3				1	4.8			
m2															
<i>Eoconodon coryphaeus</i>	21	11.4–13.7	12.3	0.61	4.96	25	7.0–11.2	9.2	0.8	9.02	19	7.2–11.0	8.9	0.71	7.89
<i>E. cf. gaudrianus</i>	4	9.3–10.1	9.6	0.35	3.65	7	6.4–7.5	6.9	0.5	6.52	7	5.8–6.5	6.2	0.29	4.68
<i>E. gaudrianus</i>	2	8.9–9.8	9.4			2	6.3–7.7	7.0			1	7.6			
<i>E. nidhoggi</i>	3	6.8–7.4	7.1	0.17	2.39	3	4.6–4.8	4.7	0.2	3.40	3	4.4–4.6	4.5	0.11	2.44
<i>E. ginibetohia</i>	1	7.0				1	4.6				1	4.2			
m3															
<i>Eoconodon coryphaeus</i>	16	11.5–14.4	13.2	0.80	6.06	16	7.0–10.3	8.6	0.7	8.14	14	6.3–9.0	7.4	0.59	7.97
<i>E. cf. gaudrianus</i>	4	8.0–8.4	8.2	0.18	2.20	3	5.3–6.2	5.7	0.5	8.25	3	4.6–5.0	4.8	0.20	4.16
<i>E. gaudrianus</i>	2	8.8–9.5	9.1			1	6.5				1	5.6			
<i>E. nidhoggi</i>	3	7.4–7.6	7.5	0.10	1.33	3	4.4–5.6	4.8	0.7	13.96	3	3.7–4.7	4.2	0.50	11.90
<i>E. ginibetohia</i>	1	6.9				1	4.3				1	3.3			

Montana (Fig. 1). Identifications of the positions of the lower molars in this new sample are based on comparisons with the larger species, *E. gaudrianus* and *E. coryphaeus*. To illustrate the differences in size, dimensions of available samples of p4s and lower molars of *E. copanus* from the Big Horn Basin, Wyoming, *E. coryphaeus* and *E. gaudrianus* from the San Juan Basin, and *E. cf. E. gaudrianus* and *E. nidhoggi* from northeastern Montana are given in Table 1. Isolated upper molars of *E. nidhoggi* and the dentition of *E. cf. E. gaudrianus* from northeastern Montana will be described in another study.

m1—Two fragmentary m1s are referable to *Eoconodon nidhoggi*. Their protoconids and slightly lower metaconids are separate cusps only in the upper one-third of the trigonid. The paraconid, distinctly lower and projecting anteriorly, is situated in front of the base of the notch in the protocristid. Differing from m1s of *E. gaudrianus* and *E. cf. E. gaudrianus*, the labial basal cingulid is continuous along the entire length of the tooth. The hypoconid is the largest and highest talonid cusp. Hypoconulid and entoconid are subequal in height and closely approximated to form a transverse ridge. The entocristid extends to the back of the trigonid but decreases in height anteriorly so that the trough-like talonid basin opens lingually behind the metaconid. The two roots are of approximately equal size.

m2—Morphologically, m1s and m2s of *Eoconodon nidhoggi* are very similar. They differ slightly in that the paraconid of m2 is less salient anteriorly and situated only slightly labial to the metaconids, not in front of the notch in the protocristid (Fig. 2). The labial basal cingulid is not as strongly developed as it is on m1.

m3—The last molar is known from the type specimen of *Eoconodon nidhoggi* and two other isolated teeth (Fig. 2). Comparisons of isolated m2s and m3s suggest that in any individual m3 might have been slightly longer (Table 1). In comparison to m2s the trigonid of m3 is slightly lower relative to the height of

the talonid. The protoconid is more robust and slightly higher than the metaconid. On m3s the paralophid extends anterolingually down the protoconid and then turns to reach the small paraconid. On the type the labial basal cingulid is interrupted on the posterolabial side of the trigonid. On the referred molars this cingulid begins below the paraconid and continues as a narrow shelf across the trigonid and talonid before rising to end at the base of the hypoconulid. As on other molars the hypoconid of m3 is the largest talonid cusp and linked to the slightly lower hypoconulid by a strong ridge. The entoconid is distinctly smaller and separated by a groove from the hypoconulid. Extending anteriorly from the entoconid, the entocristid decreases in height and ends at the lingual side of the base of the metaconid. Just posterior to the metaconid the talonid basin is broadly open lingually across the low entocristid. Of the two roots, the posterior is significantly larger and directed posteroventrally; however, unlike m3s of *E. gaudrianus* from the San Juan Basin, the back of the hypoconulid is more vertically oriented and separated from the root by a distinct notch.

Eoconodon ginibetohia, sp. nov.
(Fig. 3)

Holotype—NMMNH P-21622, fragment of a left dentary preserving p4 and m2–3.

Locality and Horizon—NMMNH loc. 317, in the vicinity of Mammalon Hill,

Betonnie-Tsosis Wash, approximately seven km east of the site of the Kimbetoh Trading Post, San Juan Basin, New Mexico. H-T Zone (middle Puercan, Pu2 Interval Zone). Additional locality data are on file at NMMNH.

Diagnosis—Size: dimensions of p4 and m2–3 either just fall within or are slightly smaller than the observed ranges of variation of homologous teeth, where known, of *Eoconodon nidhoggi*

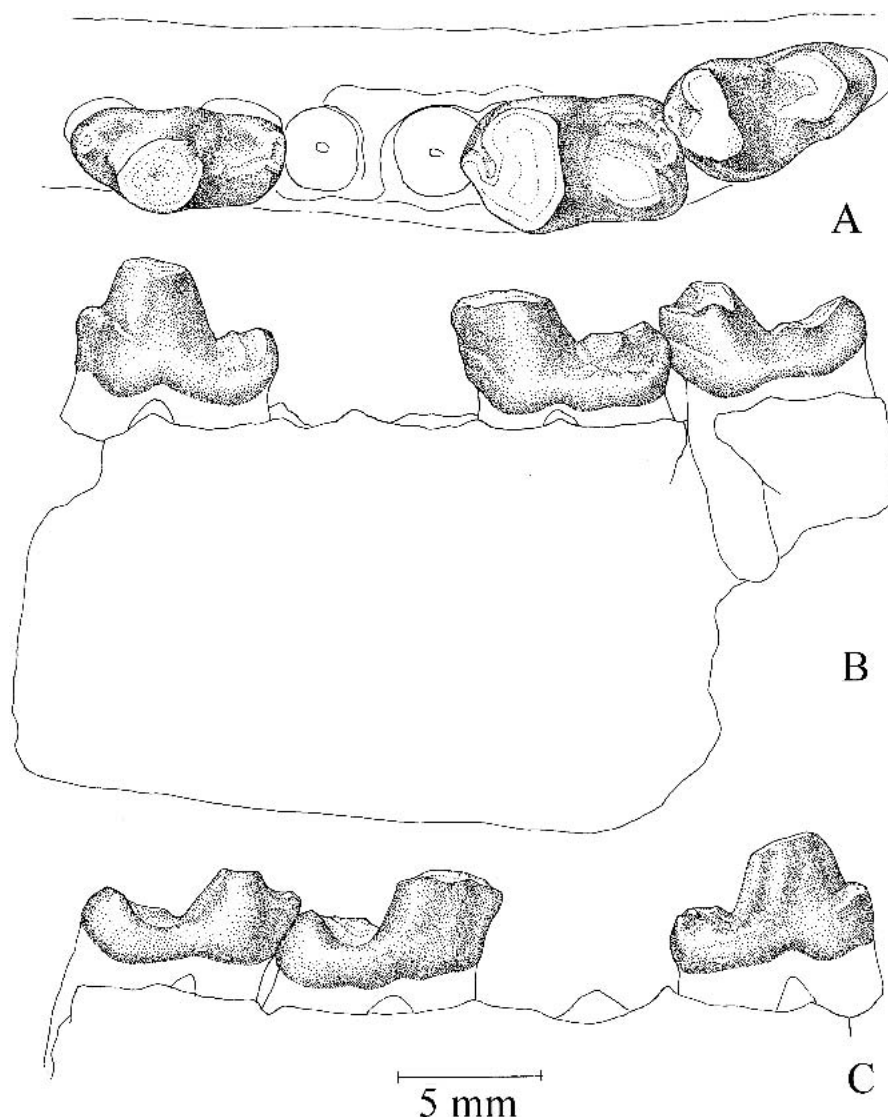


FIGURE 3. *Eoconodon ginibitohia*, sp. nov., fragment of left dentary with p4, m2, and m3, NMMNH P-21622; **A**, occlusal view; **B**, labial view; **C**, lingual view.

and are distinctly smaller than the observed ranges of variation of dimensions of *E. copanus*, *E. gaudrianus*, *E. cf. E. gaudrianus*, and *E. coryphaeus* (Table 1). The m2–3s are distinguishable from those of *E. nidhoggi* by: 1) greater reduction of the paraconid; 2) talonid cusps of m2 and, probably, m3 are relatively smaller and less distinct; 3) the basal cingulid is not as well developed and is incomplete across the labial side of the trigonid, and 4) relative to its trigonid, the talonid of m3 is narrower.

Etymology—Derived from the Navajo *gini bit'ohi*, which means sparrow hawk's nest and has been anglicized as Kimbetoh, Kimbeto, or Kinbeto. In Navajo the name of the species is pronounced GHIN-i-bi-toe-HE-a.

Description

Eoconodon ginibitohia is known only from the holotype (Fig. 3). Previously this specimen was provisionally identified as *Eoconodon cf. E. copanus* (Williamson and Lucas, 1993:122) or *Eoconodon* n. sp. (Williamson, 1996:41).

p4—In comparison to *Eoconodon gaudrianus* and *E. cf. E. gaudrianus*, the anterior cingulid and cingular cusp of p4 of *E. ginibitohia* are larger and its crown, relative to its length, is narrower. The

tip of the protoconid on the type is worn, and it is not possible to determine if this cusp was posteriorly canted as is characteristic of larger species of *Eoconodon*. The broad talonid of p4 is more distinctly subdivided by the crest linking the protoconid and hypoconulid than is the case in *E. gaudrianus* and *E. cf. E. gaudrianus*. The p4 of *E. nidhoggi* has yet to be identified.

m2—Although heavily worn, the paraconid of m2 of *Eoconodon ginibitohia* clearly was smaller and positioned farther labially than that of *E. nidhoggi*. Wear has obliterated the tips of the protoconid and metaconid. What is left of the large, worn hypoconid forms the highest part of the rim of the talonid basin. Unlike *E. nidhoggi*, the entoconid of m2 is not a distinct cusp. Three low cusps form the crenulated posterior and posterolingual margins of the talonid. Anteriorly the entocristid rapidly decreases in height, leaving a broad lingual opening of the gully-like talonid basin. A short basal cingulid is present on the anterolabial side of the trigonid. Another basal cingulid begins at the back of the trigonid, crosses the labial side of the talonid, and then swings upward to the hypoconulid.

The type of *Eoconodon copanus* is an isolated molar that might be an m1 or, possibly, an m2. It differs from the m2 of

NMMNH P-21622 in its distinctly larger size and more distinct separation of its talonid cusps.

m3—The m3 of *Eoconodon ginibitohia* differs from m2 in its slightly shorter length and the narrower widths of the trigonid and, particularly, the talonid. Its paraconid is small. The talonid of m3 is relatively longer and narrower than that of m2 and lacks an external basal cingulid. The rim of the talonid of m3 is worn in the type specimen. What remains suggests that the talonid cusps were not as distinct as they are on m3s of *E. nidhoggi*.

DISCUSSION

Faunas of Late Cretaceous (Judithian and Lancian) and Paleocene age in the North American Western Interior provide a detailed record of mammalian evolution prior to, during, and after the mass extinction used to mark the Cretaceous-Tertiary boundary. Although marred by temporal and geographic gaps, in a global perspective these faunas constitute by far the most comprehensive fossil record of mammalian evolution during this interval. This record cannot be regarded as complete for significant additions continue to be made. For example, Fox and Naylor's (2003) recent description of a new taeniodont from Alberta extended the range of this eutherian lineage from the Puercan (Pu2) back into the Lancian.

Weil and Clemens' (1998 and see Williamson, 1996; Weil, 2002; Clemens, 2002) analysis of the North American record highlighted the role of immigration of several mammalian clades from areas outside the Western Interior in recovery of its taxonomic diversity after the Cretaceous-Tertiary boundary. The record of the multituberculata *Stygimys*, which appears in the northern Western Interior at the beginning of the Puercan, is a prime example. *Stygimys* is not certainly known in Judithian or Lancian faunas of the Western Interior but is a member of a local fauna of Judithian age in Baja California del Norte (Weil, 2002). These records support the hypothesis that the appearance of *Stygimys* in Pu1 faunas of the Western Interior was the product of dispersal from Pacific coastal areas.

The question of whether one or more species of *Eoconodon* were among the Puercan immigrants appearing in the Western Interior cannot be clearly addressed because of both the current uncertainty of the phylogenetic relationships of *Eoconodon* and the incompleteness of the fossil record. In part the former stems from uncertainty concerning the phylogenetic interrelationships of *Eoconodon* with *Protungulatum*, *Baioconodon*, *Oxyprimus*, and *Mimatuta*. The first records of all of these taxa are in Pu1 faunas of the Western Interior. McKenna and Bell (1997) recognized *Protungulatum* as a basal member of their Grandorder Ungulata and assigned *Baioconodon* to the included Order Procreodi and *Eoconodon* to another included order, Cete. Similarly in a classification reflecting a cladistic interpretation of relationships, Archibald (1998 and see Nessov et al., 1998) also placed *Protungulatum* in a basal position within the clade Ungulata, but interpreted *Baioconodon* and *Eoconodon* as closely related members of the Cete. Other cladistic interpretations of the phylogenetic relationships of *Eoconodon*, based primarily on material of *E. coryphaeus*, produced contradictory, inconclusive results (O'Leary and Geisler, 1999:477–8). Because of the limited scope of available morphological data, the phylogenetic relationships of *Eoconodon* remain enigmatic and provide little help in deciphering its biogeographic history. We have adopted McKenna and Bell's (1997) classification of *Eoconodon* as a temporary expedient.

Turning to the currently available fossil record, *Eoconodon* is not represented in the many, some extremely well sampled, Judithian and Lancian faunas of the Western Interior, nor are any other members of the Ungulata in the sense of Archibald's (1998) phylogenetic hypothesis. Following this hypothesis the most closely related sister group to the Ungulata are the "zhe-

lestids." This group is known primarily from Eurasian Cretaceous local faunas, but several members have been recognized in North America: *Gallolestes*, from the Judithian of Baja California del Norte and a broadly contemporaneous site in Texas, *Avitatherium*, from the Judithian of Utah, and *Alostera*, from sites in Alberta, Saskatchewan, and Montana of either Lancian or Pu1 age. Although the morphological differences separating them are great, the working hypothesis that *Eoconodon* shared a common, North American ancestor with these "zhelestids" must be considered.

The available fossil record of *Eoconodon* begins with species discovered at two northern Pu1 localities: *E. copanus* in the Mantua Lentil local fauna, Wyoming, and a significantly smaller, unnamed species in the Hanna Basin, Wyoming (Eberle and Lillegraven, 1998b). There is, however, no evidence of the presence of *Eoconodon* in either the Hells Hollow or McGuire Creek Pu1 local faunas of northeastern Montana (Archibald, 1982; Lofgren, 1995). Samples of these local faunas are large, suggesting its absence is not a product of incomplete sampling. This interpretation is strengthened by the absence of *Eoconodon* in the immense samples of the time-averaged (Lancian and Pu1) Bug Creek assemblages of northeastern Montana (see Lofgren, 1995). Samples of local faunas possibly of Pu1 age in the Denver Basin, Colorado, lack records of *Eoconodon* (Middleton, 1983; Dewar, 2003). Pu1 local faunas have yet to be discovered in the San Juan Basin, New Mexico.

During Pu2 and Pu3, local faunas are known from both the northern and southern Western Interior. Both the currently documented taxonomic diversity and biogeographic range of *Eoconodon* were greater than in Pu1. In the San Juan Basin, New Mexico, three species were present in the H-T Zone (Pu2): *E. coryphaeus*, one of the largest Puercan eutherians, the smaller *E. gaudrianus*; and *E. ginibitohia*, the smallest species. Only *E. coryphaeus* is known in the T-P Zone (Pu3) fauna of the San Juan Basin. Available samples of T-P Zone local faunas are small compared to those of the H-T Zone, and absence of *E. gaudrianus* and *E. ginibitohia*, which are relatively rare in the H-T Zone, could reflect sampling bias. Standhardt (1986, 1995) reported occurrences of *Eoconodon* sp., probably of Puercan age, farther to the south in the Tornillo Formation, Texas (see Williamson, 1996:66–67).

To the north, *E. coryphaeus* is unknown in Pu2–3 local faunas. The large sizes of the available samples of Pu2–3 local faunas in northeastern Montana suggest that it was not a member of these faunas. Two species were present, the larger *E. cf. E. gaudrianus* and *E. nidhoggi*. Fragmentary specimens representing unidentified species of *Eoconodon* from other Pu2–3 localities in Montana (see Buckley, 1994; Hunter et al., 1997) and Canada (Fox, 1989) document the wide biogeographic range of the genus.

The absence of *Eoconodon* or closely related sister species in Lancian local faunas and the increase in biogeographic range and diversity of species of *Eoconodon* from Pu1 to Pu2–3 suggest that this clade expanded its range into the Western Interior at the beginning of the Paleocene and then diversified. This interpretation supports the hypothesis that, in part, recovery of mammalian taxonomic diversity in the Paleocene involved dispersal of several immigrant groups into the Western Interior after the Cretaceous-Tertiary boundary (Williamson, 1996; Weil and Clemens, 1998; Weil, 2002; Clemens, 2002).

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