

FOSSIL HETEROMYID RODENTS IN THE COLLECTIONS OF THE UNIVERSITY OF CALIFORNIA.

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ABSTRACT.

Restudy of the collections of Heteromyid rodents in the University of California, especially from the Barstow Miocene, has shown a considerable diversity of forms. A new species of each of the two genera *Perognathoides* and *Peridiomys* are described from these beds. A form from the Thousand Creek, previously identified as *Entoptychus*, is shown to be a *Peridiomys*. The lost holotype of *Cupidinimus magnus* was rediscovered, figured and described.

Recently I had an opportunity to study the important collections of fossil rodents in the University of California.<sup>1</sup> Mr. R. A. Stirton has very kindly accorded me permission to publish a note on the fossil heteromyids in their collections. For this permission, I wish to acknowledge my extreme gratitude.

*Cupidinimus magnus* (Kellogg).

Fig. 1. Kellogg, 1910, Fig. 18; Hall, 1930b, Figs. 11-12; and Wood, 1935, Figs. 65-66.

Synonymy:

*Diprionomys magnus* Kellogg, 1910.

*Diprionomys magnus* Kellogg, Hall, 1930b.

*Cupidinimus magnus* (Kellogg), Wood, 1935.

Holotype:—Univ. Cal. no. 12567, right lower jaw with P/4-M /2.

Horizon and Locality:—Middle Pliocene, Thousand Creek beds, Univ. Cal. locality no. 1103, Humboldt County, Nevada.

It was my good fortune to discover the holotype of this species, which Hall (1930b) reported as apparently having been lost. This specimen (Fig. 1) differs noticeably from the referred specimen (Wood, 1935, Fig. 65, and Hall, 1930b, Fig. 11) in the much greater length of the premolar, and in the shape of its anterior end. There is a distinct notch in the anterior end of the holotype, and the anterior loph is almost twice the length (antero-posterior diameter) of the posterior. No such notch is present in the referred specimen, and the two lophs are subequal in length. In other respects, as far

<sup>1</sup> This study was made while I was Cutting Traveling Fellow in Columbia University.

as can be told, the two forms seem the same. It is unfortunate that both of these specimens are so highly worn that nothing can be told of the details of their patterns. It is quite possible that these two jaws represent distinct forms, but, on the other hand, the differences may be solely due to differences in the angle of wear of the teeth. The discussion of this species by Wood (1935, pp. 145-148) is based on the referred specimen, Univ. Cal. no. 12568. The holotype is certainly referable to no known genus other than *Cupidinimus*.

*Perognathoides halli*, n. sp.

Figs. 2-5.

Synonymy:

*Diprionomys* cf. *tertius* Hall, Hall 1930a (in part)

*Heteromyid* sp., Hall, 1930a.

*Perognathoides tertius* (Hall), Wood, 1935 (in part).

Holotype:—Univ. Cal. no. 28529, maxilla with P 4/-M 3/ Left.

Horizon and Locality:—Uppermost Miocene Barstow beds, Rodent Hill, eleven miles northeast of Hinkley, San Bernardino County, California. Collected by A. M. Alexander and L. Kellogg.

Diagnosis:—About equal in size to *P. quartus* and *P. tertius*; accessory cusps of P 4/ less developed than in *P. quartus* and union of lophs more linguad, being thus much more so than in *P. tertius*; P 4/ slightly wider than M 1/ instead of being equal in width as in the other two species; P /4 equidimensional instead of being elongate antero-posteriorly as in *P. tertius*; well developed H-pattern in lower molars.

The holotype (Fig. 2) is typical of *Perognathoides*. It shows slight indications of the accessory cusps of the proto-loph of P 4/, which are, however, more clearly indicated in a referred specimen, Univ. Cal. no. 28530 (Fig. 3), where there is a distinct groove between the buccal cuspsule and the protocone. There is no trace of a lingual cuspsule, even though the teeth are less worn than in the type of *P. quartus*. The crowns are high, though not as high as in the two Fish Lake Valley species. This difference is especially well known in P 4/, the anterior slope of whose proto-loph is much shorter than in the Fish Lake Valley specimens (compare Figs. 2-3 with Hall, 1930b, Figs. 2 and 5, or Wood, 1935, Figs. 9 and 11). There appear to have been three cusps in the metaloph.

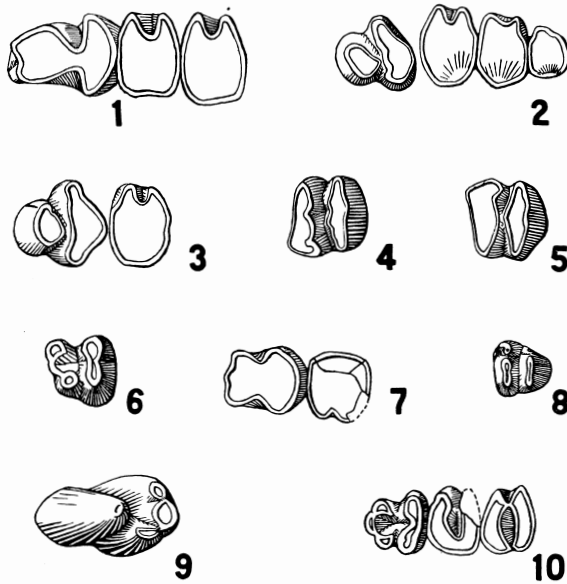


Fig. 1. *Cupidinimus magnus* (Kellogg). Holotype, Univ. Cal. no. 12567, R P /4-M /2, from the Thousand Creek Beds,  $\times 10$ .

Fig. 2. *Perognathoides halli*, n. sp. Holotype, Univ. Cal. no. 28529, L P 4/-M 3/, from the Barstow Beds,  $\times 10$ .

Fig. 3. *P. halli*, n. sp., referred specimen, Univ. Cal. no. 28530, L P 4/-M 1/, from the Barstow Beds,  $\times 10$ .

Fig. 4. *P. halli*, n. sp., referred specimen, Univ. Cal. no. 32589, L M 1/, from the Barstow Beds,  $\times 10$ .

Fig. 5. *P. halli*, n. sp., referred specimen, Univ. Cal. no. 28541, R M /1, from the Barstow Beds,  $\times 10$ .

Fig. 6. *Peridiomys kelloggi*, n. sp. Holotype, Univ. Cal. no. 28535, R P /4, from the Barstow Beds,  $\times 10$ .

Fig. 7. *P. kelloggi*, n. sp., referred specimen, Univ. Cal. no. 28531, L P /4-M /1, from the Barstow Beds,  $\times 10$ . Reversed.

Fig. 8. *P. kelloggi*, n. sp., paratype, Univ. Cal. no. 28537, R M /3, from the Barstow Beds,  $\times 10$ .

Fig. 9. *P. kelloggi*, n. sp., referred specimen, Univ. Cal. no. 28536, L P 4/, from the Barstow Beds,  $\times 10$ .

Fig. 10. *Diprionomys* ("Entoptychus") *minimus* (Kellogg), Holotype, Univ. Cal. no. 12569, L P /4-M /2, from the Thousand Creek Beds,  $\times 10$ .

Table of Measurements.  
(All measurements in millimeters.)

	P / 4 antero-posterior	P / 4 width	protoloph	M / 1 width	protoloph	M / 1 width	metalloph	M / 3 / anterior-posterior	M / 3 / width	protoloph	M / 3 / width	metalloph	P / 4 anterior-posterior	P / 4 width	anterior loph	P / 4 width	posterior loph	M / 1 anterior-posterior	M / 1 width	metallophid	M / 2 width	posterior	M / 2 width	metallophid	M / 2 width	hypopoloid	M / 3 anterior-posterior	M / 3 width	metallophid	hypopoloid
<i>Cupidinimus magnus</i> Univ. Cal. no. 12567, Holotype	...	...	...	...	...	...	...	...	...	...	...	...	1.90	1.05	1.44	1.15	1.50	1.51	1.16	1.65	1.56	...	...	...	...	...	...	...	...	...
<i>Pergnathoides halli</i> Holotype; U. C. no. 28529	1.39	0.95	1.44	1.02	1.44	1.42	1.38	0.90	1.33	1.20	0.72	0.89	0.74	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>P. halli</i> , U. Cal. no. 28530	1.29	0.80	1.50	1.08	1.42	1.38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>P. halli</i> , U. Cal. no. 28541	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1.16	1.38	1.33	...	...	...	...	...	...	...	...	...
<i>P. halli</i> , U. Cal. no. 32589	...	...	...	1.08	1.44	1.34	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Peridomys kelloggi</i> Holotype; U. Cal. no. 28535	...	...	...	...	...	...	...	...	...	...	...	...	...	1.25	1.05	1.25	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>P. kelloggi</i> , Paratype; U. Cal. no. 28537	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0.73	1.00	0.82	...
<i>P. kelloggi</i> , U. Cal. no. 28536	1.22	1.04	1.38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>P. kelloggi</i> , U. Cal. no. 28531	...	...	...	...	...	...	...	...	...	...	...	...	...	1.39	1.01	1.21	1.14	...	...	...	...	...	...	...	...	...	...	...	...	...
<i>Diprionomys minimus</i> Holotype; U. Cal. no. 12569	...	...	...	...	...	...	...	...	...	...	...	...	...	1.08	0.90	1.17	0.95	1.20	...	1.14	1.17	0.96	1.14	1.17	...	...	...	...	...	...

The upper molars of the holotype are so worn that they show practically nothing. They do indicate, however, that, though M 3/ was reduced, it was not excessively so. This is a primitive Perognathine character. The wear affects the teeth in order from rear to front. The posterior end of the maxillary root of the zygoma lies by the posterior end of P 4/. An upper molar of this form (Fig. 4) bears the number Univ. Cal. 32589.

Hall figured (1930a, Fig. 4) another specimen (Univ. Cal. no. 28541), consisting of R P /4-M /1 of this same species. Unfortunately, the premolar seems now to have been lost. The molar is shown in Fig. 5. It possesses a very well marked H-pattern, as is also indicated by Hall's figure. The buccal valley is very shallow, the lingual very deep, extending to the base of the crown. The external cingulum forms a low dam at the buccal end of the valley. There are several points on the periphery of the metalophid where the enamel is reduced to very thin bands, some of which suggest the presence of invaginations in the unworn tooth.

It is difficult at present to determine the detailed relationships of this species other than that it is the most primitive member of the genus, and seems closer in its characters to *P. quartus* than to *P. tertius*.

*Peridiomys kelloggi*, n. sp.<sup>2</sup>

Figs. 6-9.

Holotype:—Univ. Cal. no. 28535, P /4 Right. Paratype, Univ. Cal. no. 28537, M /3 Right.

Horizon and Locality:—Upper Miocene Barstow beds, Rodent Hill, eleven miles northeast of Hinkley, San Bernardino County, California.

Diagnosis:—Primitive species with no trace of anteroconid as a distinct cusp, its place being taken by a narrow, curved crest; faint Y-pattern in M /3, with a small accessory cuspule at the antero-external margin; P 4/ with entocone close to both hypocone and protocone, though nearer the former; no trace of more than one cusp in protoloph of upper premolar; smallest known species of the genus.

<sup>2</sup>I take great pleasure in naming this species for Miss Louise Kellogg, who has done much collecting of small rodents, and who, with Miss Annie Alexander, discovered the locality where this material was found and made the collections.

P /4 has a pattern that is distinctly that of a Heteromyine (Fig. 6), in the large central basin and the union of the two anterior cusps via their anterior edges. This form has progressed further than *Proheteromys* in that the two cusps are not directly united with each other, but are connected by a long, curved crest. This crest seems homologous to some of the cusps that develop in this position in other Heteromyines, though probably not to all. In a worn tooth (Fig. 7, Univ. Cal. 28531), the general effect is very similar to that in *Peridiomys oregonensis* (Wood, 1935, Fig. 100). There are two cusps in the posterior loph, thus separating this species from the other two known forms, each of which has a minute hypostylid as well as traces at least of a distinct anteroconid. The shape of the holotype is a little unusual, the antero-buccal cusp being distinctly anterad of the antero-lingual one.

In M /3, the four main cusps are well developed, as is also the protostylid. The cingulum from this last continues a short distance along the anterior face of the tooth, and swells up into a small cuspule (Fig. 8). There is also a minute hypostylid, a Heteromyine feature. There is a shallow valley separating the cingulum from the metalophid, giving a poorly developed Y-pattern. This tooth seems to be in a stage of evolution similar to that of *P. rusticus* (Wood, 1935, Fig. 97).

Four other teeth, all bearing the number Univ. Cal. 28536, are probably referable to this species. One of these, a left upper premolar (Fig. 9), shows the entocone uniting with the hypocone by a narrow crest, and separated from the protocone by a shallow valley. It would take relatively little further wear to unite the two lophs in this region. Another tooth, also L P 4/, shows this condition reversed, with the entocone and protocone united. This is a characteristic Heteromyine condition, and is identical with the situation in *Peridiomys oregonensis* (Wood, 1935, Fig. 99). The other two teeth with this number are an M /2, which shows nothing of significance, and an M /3 which adds nothing to that described above. These specimens are part of the material Hall (1930a) included under the head of "*Diprionomys cf. tertius*."

This species, then, is a small *Peridiomys*, which has retained many primitive characters longer than did its larger and somewhat earlier relatives. It does not seem to be closely related to any other known forms, but to come closer to *Diprionomys* than did either of the other known species of the genus.

*Diprionomys minimus* (Kellogg).

Fig. 10 and Kellogg, 1910, Fig. 15.

Synonymy:

*Entoptychus minimus*, Kellogg, 1910.

Holotype:—Univ. Cal. no. 12569, lower jaw with P /4-M /2 Left.

Horizon and Locality:—Middle Pliocene Thousand Creek beds, Univ. Cal. locality no. 1103, Humboldt County, Nevada.

Diagnosis:—P /4 with typical Heteromyine pattern, as in *D. agrarius*; anteroconid very far forward; crests unite at both ends, forming well developed central basins in all teeth; all three teeth subequal in size; smallest species of the genus.

This species is certainly congeneric with *D. agrarius* from the Pliocene of Nebraska, and probably with *D. parvus* from the Thousand Creek. It is clearly distinct from this last species, however, being from twenty to twenty-five per cent smaller than the genoholotype in all dimensions. *D. agrarius*, the only other known species of the genus, is even larger than *D. parvus*, and has teeth which are proportionately longer than those of *D. minimus*. The anteroconid of P /4 is far forward, and a central basin is clearly shown. The double union of the lophs of the molars is extremely well developed, this species being very progressive in this respect. *D. minimus* resembles the other members of the genus in possessing a hypolophid longer than the metalophid, a character which, with others, shows that this species is one of the most advanced of all known fossil heteromyids, being almost as specialized as is the recent *Liomys*. It is, of course, quite distinct from this last genus.

*D. minimus* is much further from anything that can be referred to the John Day genus *Entoptychus*, which develops its central lake in quite a different manner, has numerous fundamental differences in the pattern of the premolar, and has rootless, ever-growing teeth, whereas the present species, though somewhat high crowned, has well developed roots. The crowns, indeed, are by no means as high as in *Pero-gnathoides halli* described above. Furthermore, of course, the present species, occurring in the Pliocene, is in the stage of evolution that would be expected of a Pliocene Heteromyid, and is very much more primitive than would be normal for a Pliocene Geomyine, let alone an Entoptychine, the members of which subfamily were distinctly more advanced than any other Geomyoids with which they were contemporaneous (Wood, 1936).

This group of fossils here studied represents several interesting additions to the still sparsely known Tertiary history of the Heteromyids. On the whole, they seem to fit surprisingly well into the scheme of classification adopted by Wood (1935, Fig. 1), although there is still room for much progress before the evolutionary history of this family can be considered to be well known.

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