



# Phylogeny of New Earliest Paleocene (Puercan) Peripitychid ‘Condylarths’ from the Great Divide Basin, WY

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## Abstract

An earliest Paleocene (Puercan) fauna discovered by the late James Honey and Malcolm McKenna in the lower China Butte Member of the Fort Union Formation in Wyoming’s Great Divide Basin (GDB) contains a diverse mammalian faunal assemblage, including a number of ‘condylarth’ taxa. Preliminary studies by others have suggested that this faunal assemblage may be correlative with the early Puercan Littleton fauna in the Denver Basin, due to multiple shared taxa. The fauna from UCM locality 2011035 includes at least three new peripitychid ‘condylarth’ genera. One new genus (referred here to Gen. et sp. nov. A) is based on a left dentary containing p3 – m3, is 10-12% larger than *Conacodon delphae* (the largest documented species of *Conacodon*) and appears similar in morphology to *Auraria urbana* but differs in having more inflated cusps. A second new genus (Gen. et sp. nov. B) is based on left and right dentaries containing Lp3 – m3 and Rp4 – m3, respectively. This new taxon appears close in molar morphology to species of *Conacodon*, differing primarily in its larger size and morphology of the p4. Finally, the third new genus of peripitychid from the GDB (Gen. et sp. nov. C) is based on two right dentaries containing p4 – m3 and p3 – m3, as well as a left dentary containing p4 – m2. This new taxon appears close in morphology to *Oxyacodon archibaldi*, sharing a distinct paraconulid but differing in the placement of the paraconid. To examine the relationships between these new taxa and other Puercan peripitychids from the Western Interior of North America, a phylogenetic analysis was performed using 20 ‘condylarth’ taxa and 56 dental characters. Characters were aggregated from previous phylogenetic analyses of ‘condylarth’ taxa and scored based on comparative study with specimens from several museum collections as well as descriptions of teeth from the literature. The preliminary phylogenetic analysis suggests that Gen. et sp. nov. A appears closely related to *Auraria urbana* and *Ampliconus browni*, while Gen. et sp. nov. B appears to be a sister group to the Conacodontines, and Gen. et sp. nov. C forms a clade with *Oxyacodon archibaldi*. If prior estimates of an early Puercan age for UCM locality 2011035 are correct, then the occurrence of three new peripitychid taxa suggest that mammalian diversity is higher than previously thought for the earliest Paleocene.

## Geologic Setting

Decades of paleontological fieldwork in the eastern Great Divide Basin (GDB) by James Honey and Malcolm McKenna produced a large and diverse assemblage of fossil mammals (3,200+ specimens). The research locality, UCM loc. 2011035 is early Puercan in age and has produced over 350 mammalian fossils, dominated by dentaries and a small percentage of upper dentitions. UCM loc. 2011035 lies ~50 m (166 ft) above the base of the Fort Union Formation in the China Butte Member (Hettinger *et al.*, 2008) in the GDB. Using the North American Land Mammal Ages (NALMA) as the biochronological framework, the fauna is hypothesized to represent the early Puercan Interval Zone (Pu1). This is based upon the presence of *Protungulatum donnae*, which marks the earliest Puercan boundary as well as the absence of *Ectoconus* which marks the middle Puercan boundary (Pu2) (McComas & Eberle, 2015).

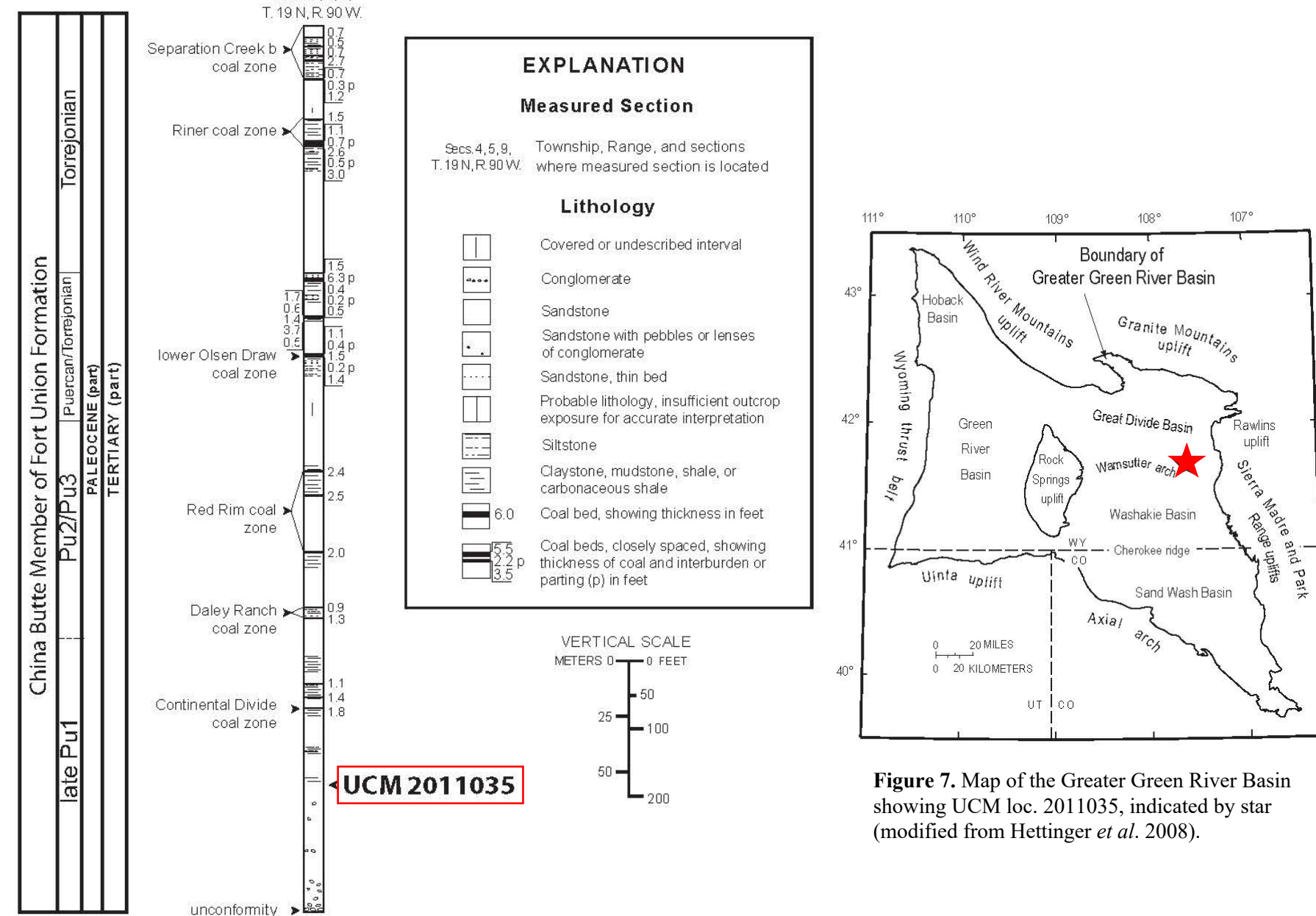


Figure 6. Stratigraphic section showing the position of UCM loc. 2011035 (modified from Hettinger *et al.* 2008).

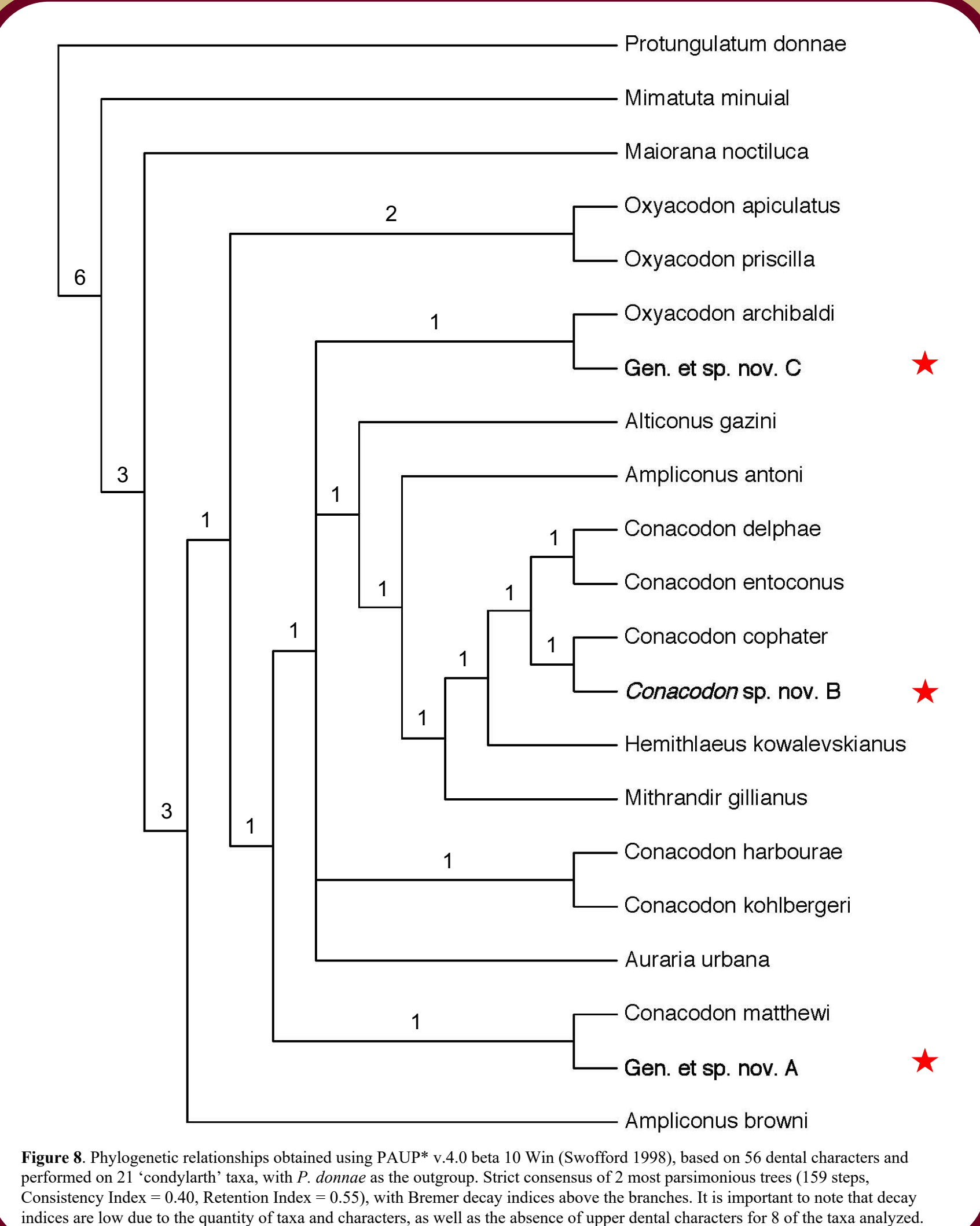
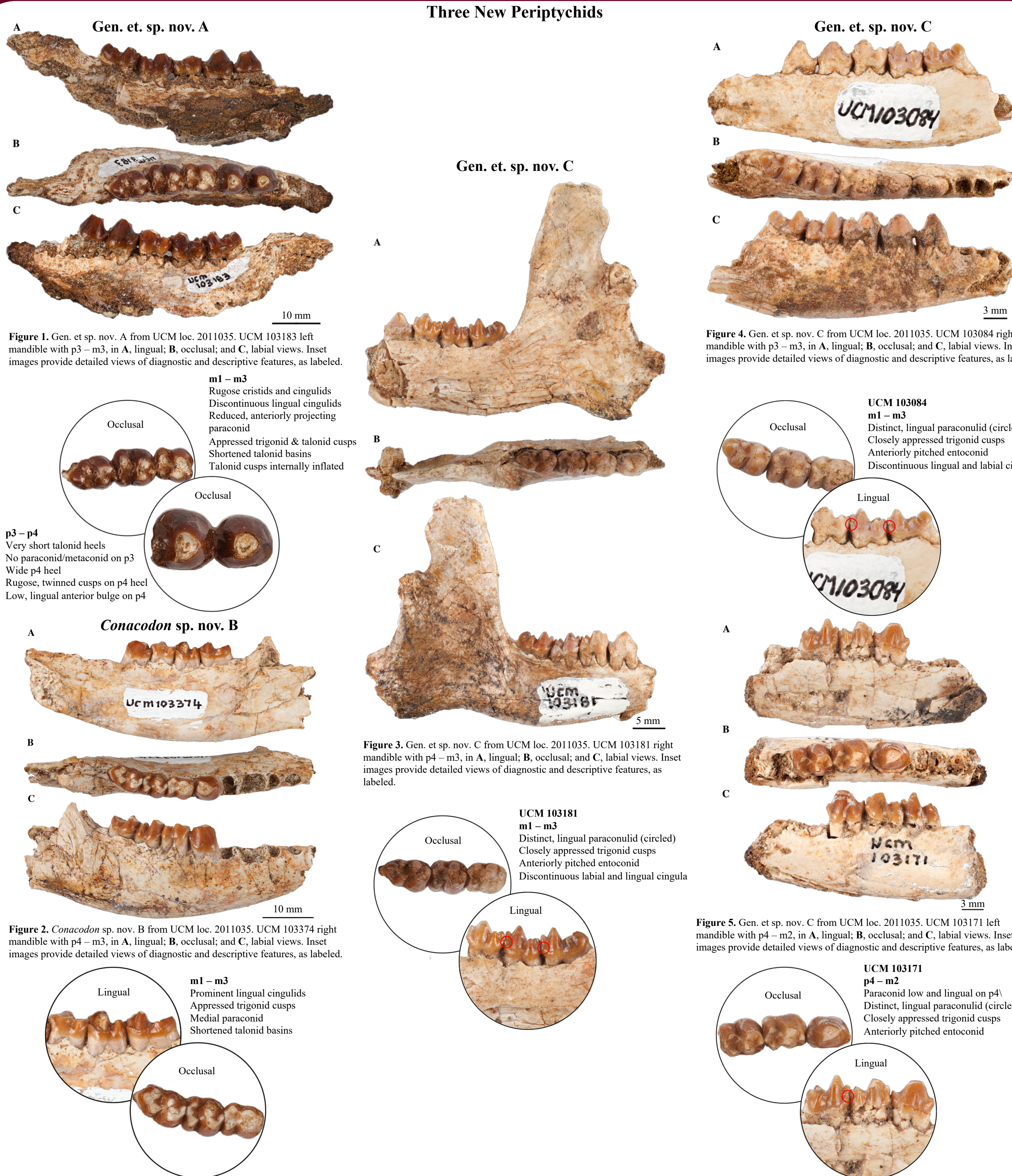


Figure 8. Phylogenetic relationships obtained using PAUP\* v.4.0 beta 10 Win (Swofford 1998), based on 56 dental characters and performed on 21 ‘condylarth’ taxa, with *P. donnae* as the outgroup. Strict consensus of 2 most parsimonious trees (159 steps, Consistency Index = 0.40, Retention Index = 0.55), with Bremer decay indices above the branches. It is important to note that decay indices are low due to the quantity of taxa and characters, as well as the absence of upper dental characters for 8 of the taxa analyzed.

## Conclusions

The three new taxa from the GDB increase the known diversity of early Puercan peripitychid ‘condylarths’. Gen. et sp. nov. A appears to be a sister taxon to *Conacodon matthewi*. *Conacodon* sp. nov. B appears to belong among the Conacodontines. Gen. et sp. nov. C forms a clade with *Oxyacodon archibaldi*. Our phylogenetic analysis suggests that Puercan conacodontines are paraphyletic, and future discovery in the Great Divide Basin should resolve the diversity of this family. This hypothesis will continue to be tested through the incorporation of more complete material and additional ‘condylarth’ taxa.

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Figure 9. Photo of UCM field crew (from left to right): Nicole Neu-Yagle, Maddy Atteberry, Bob Hettinger, Wendy Hettinger, and Jeannine Honey. Taken by Jaelyn Eberle, 2017.