

CONTRIBUTIONS TO THE MARSHALL LAMBERT SYMPOSIUM

LATE PALEOCENE MAMMALIAN BIOCHRONOLOGY OF THE FORT UNION GROUP IN NORTH DAKOTA: *PLESIADAPIS* (PLESIADAPIFORMES) FROM THE BRISBANE, JUDSON, AND WANNAGAN CREEK QUARRY LOCAL FAUNAS

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This study focuses on *Plesiadapis* because it has been used to define the subdivisions of the Tiffanian (Ti) Mammal Age in North America. A reevaluation of previously described (Holtzman, 1978) *Plesiadapis* material from the Brisbane Locality (Slope Formation, Grant County), and Judson Localities (uppermost Slope Formation or lowermost Bullion Creek Formation, Morton County), together with new observations from the Wannagan Creek Quarry (upper Bullion Creek Formation, Billings County), provide the basis for a revised interpretation of the Ti3-Ti4 boundary in North Dakota.

Erickson (1991) reported the presence of *Plesiadapis* cf. *P. fodinatus* Jepsen and *Plesiadapis* sp. from Wannagan Creek Quarry. These identifications were based on preliminary analysis and are not supported by more detailed investigation. *Plesiadapis fodinatus* has curved and crested entoconids on M_1 and M_2 , and talonids on P_3 and P_4 with distinct entoconids. None of the Wannagan Creek Quarry specimens show these characteristics, and there is no compelling evidence to suggest more than a single species is represented. *Plesiadapis* specimens from the Wannagan Creek Quarry are most similar to *P. rex* (Gidley) and *P. churchilli* Gingerich. *Plesiadapis churchilli* is larger than *P. rex*, has the P_2 variably present, a significant diastema between the P_3 and I_1 , and almost always has mesostyles on the M^1 . The Wannagan Creek Quarry sample has six specimens that preserve the mandible immediately anterior to the P_3 . In five of those specimens there is an alveolus for the P_2 , although in one of the five it is a very shallow pit. There is a significant diastema on all eight specimens preserving the anterior portion of the mandible. All Wannagan Creek Quarry specimens of M_1 have a mesostyle. Comparison of tooth measurements show the Wannagan Creek Quarry specimens to be somewhat larger than the sample of *P. rex* from Cedar Point Quarry (Gingerich, 1976) and somewhat smaller than *P. churchilli* from Long Draw (Gingerich, 1976) and Roche Percée (Krause, 1978). Although *P. churchilli* is larger than *P. rex*, there is considerable overlap in size. On the basis of these characteristics, the sample from Wannagan Creek Quarry is interpreted as *P. churchilli*.

Specimens from the Judson Localities and Wannagan Creek Quarry samples show similar conditions for most characteristics. The only noted differences are the variable presence of a mesostyle on the M^1 and the consistent presence of P_2 . The presence of a P_2 is a characteristic of *Plesiadapis rex*, but the Judson sample is small (two specimens) and five of six specimens of *P. churchilli* from the Wannagan Creek Quarry retain a P_2 . The Judson Localities specimens are unlike *P. rex* in generally having mesostyles on the M^1 and in having a diastema between P_3 and I_1 . The specimens from the Judson Localities are similar in size to the sample of *P. rex* from Cedar Point, and smaller than *P. churchilli* from Long Draw, Roche Percée, and Wannagan Creek Quarry. There is, however, considerable overlap in tooth size represented by these collections. Size suggests assignment of the Judson Localities specimens to *P. rex*; the

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majority of the morphologic features are more like *P. churchilli*. The Judson Localities sample is here considered to be *P. cf. P. churchilli*.

The Judson and Brisbane Locality taxa, previously considered to be conspecific, show some interesting differences. Salient features seen in the Brisbane specimens include the variable presence of mesostyles on all upper molars, the absence of a paraconule on the P³, the variable presence of a centroconule on I¹, and smaller entoconids and a restricted opening of the talonid between the entoconid and the trigonid on the lower molars. The absence of a P³ paraconule is variable in *Plesiadapis anceps* Simpson, but is present in *P. rex* and *P. churchilli*. The absence of a centroconule on I¹ is characteristic of *P. anceps*, but this cusp is present in *P. rex* and *P. churchilli*. The one Brisbane Locality specimen that lacks a centroconule has a very rugose area of enamel between the laterocone and mediocone. The variable presence of molar mesostyles is characteristic of *P. rex*. The specimens from the Brisbane Locality are smaller than specimens from the Judson Localities and those from the Wannagan Creek Quarry. They are comparable in size to and somewhat smaller than specimens of *P. rex* from Cedar Point.

The proportions of the lower dentition also distinguish the Brisbane sample from the Judson Localities and Wannagan Creek Quarry samples. The P₄ length from the Brisbane sample is longer relative to the length of the M₁, with the average M₁ length divided by the average P₄ length being 1.28. The same value for the Judson sample is 1.33 and the value for the Wannagan Creek Quarry sample is 1.38. This ratio reflects an apparent shortening of the P₄ in *Plesiadapis churchilli*, which has the highest M₁/P₄ length value of any North American species of *Plesiadapis*. Considering the differences between the *Plesiadapis* specimens from the Judson and Brisbane Localities and the characteristics of the specimens in the Brisbane sample, the Brisbane specimens are best assigned to *P. rex*.

The Brisbane Locality is near the base of the Slope Formation. The exact stratigraphic position of the Judson Localities is undetermined, but they are near the top of the Slope Formation or base of the Bullion Creek Formation. The Wannagan Creek Quarry is near the top of the Bullion Creek Formation (20 m below the H T Butte lignite). The presence of *Plesiadapis churchilli* indicates Wannagan Creek fauna can be assigned to the Ti4 biochron. The presence of *P. rex* indicates a Ti3 age for the Brisbane Locality fauna. The presence of *P. cf. P. churchilli* at the Judson Localities is not definitive, but suggests that this local fauna may belong to the Ti4 biochron. If this is true, then the Ti3-Ti4 transition occurs within the Slope Formation at a level significantly lower in the Fort Union Group section than previously thought. Confirmation of this interpretation will require a reanalysis of the Brisbane and Judson faunas in light of the better-defined biochronologic framework that now exists.

Erickson, B.R., 1991, Flora and fauna of the Wannagan Creek Quarry: Late Paleocene of North America: Science Museum of Minnesota, Science Publication, n.s. v. 7, no. 3, p. 1-19.

Gingerich, P.D., 1976, Cranial anatomy and evolution of early Tertiary Plesiadapidae (Mammalia, Primates): University of Michigan, Museum of Paleontology Papers on Paleontology, no. 15, p. 1-141.

Holtzman, R.C., 1978, Late Paleocene mammals of the Tongue River Formation, western North Dakota: North Dakota Geological Survey, Report of Investigations 65, p. 1-88.

Krause, D.W., 1978, Paleocene primates from western Canada: Canadian Journal of Earth Science, v. 15, no. 8, p. 1250-1271.