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[Note]

The function of the crown cementum of *Teleolophus*, an Eocene deperetellid perissodactyl

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Teleolophus is a genus of the Deperetellidae (Mammalia; Perissodactyla; Ceratomorpha), which lived in the Eocene of Asia (McKenna and Bell, 1997). One of the unique features of the genus is the presence of the dental crown cementum in the postcanine dentition (Radinsky, 1965). Radinsky (1965) briefly reported a wear facet on the crown cementum, which extends from the wear facet of the metaloph, in the upper molars of *Teleolophus*. However, the function of the crown cementum in *Teleolophus* has not been well studied yet.

Here, we briefly mention the functional wear facets observed on the crown cementum of the molars of *Teleolophus magnus*. The new specimens of *T. magnus* reported here (Fig. 1) are housed in the Mongolian Paleontological Center (MPC), Ulaanbaatar, Mongolia. They were discovered from the upper Eocene Ergilin Dzo Formation at the Khoer Dzan locality (Tsubamoto *et al.*, 2011) of southeastern Mongolia. This research was partly supported by KAKENHI (nos. 21770265 and 23370044).

The crown cementum of *Teleolophus* is preserved as yellowish brown to yellowish white deposition on the crown (Fig. 1; Radinsky, 1965). It is distinguished from the sedimentological matrix in that it lacks sand grains (MPC-M 30/338; Fig. 1A) and that it is harder and less easily removed from the enamel than the sedimentological matrix at least in the specimens from the Khoer Dzan locality. An upper third molar, MPC-M 30/337 (Fig. 1 B), preserves a large cementum between the protoloph and the metaloph, with small ones on the distal, buccal, and mesial faces of the crown. The cementum between the lophs shows a basin-like structure and has a wear facet continuous with that on the metaloph. The junction between the cementum and the metaloph on the wear facet is smooth without a difference in level. An lower second molar, MPC-M 30/339 (Fig. 1 C), also preserves a large cementum between the protolophid and the hypolophid. This cementum also has a wear facet continuous with that on the protolophid, without a difference in level.

The cementum between the lophs/lophids of the molars in *Teleolophus* functionally acts as a continuous shearing surface of the lophs/lophids as well as a occlusal basin between them, playing a important role during the mastication (Fig. 2). The larger mesially-tilting wear fact on the [metaloph + cementum] occludes with the smaller distally-tilting wear facet on the hypolophid. The smaller mesially-tilting wear fact on the protoloph occludes with the larger distally-tilting wear facet on the [protolophid + cementum]. Therefore, the large cementum between the lophs/lophids fulfills its function as a large cutting surface and grinding basin during the mastication. This function of the crown cementum in *Teleolophus* differs from that in living hypsodont horses and elephants, which contributes to make uneven patterns with the enamel on the horizontal occlusal surface of the tooth. The lophs/lophids of the molars in *Teleolophus* are high and transversally oriented (Fig. 1 B, 1 C), indicating dominant lateral jaw movements during the mastication. However, the mesiodistally longer wear facets on the [metaloph/protolophid + cementum] against the shorter wear facets on the protoloph/hypolophid (Fig. 2) imply some degree of mesiodistal jaw movements during the mastication. Another possible function of the crown cementum in *Teleolophus* is to play a role of supporting its relatively thin and high lophs and lophids.

The deperetellids have been traditionally

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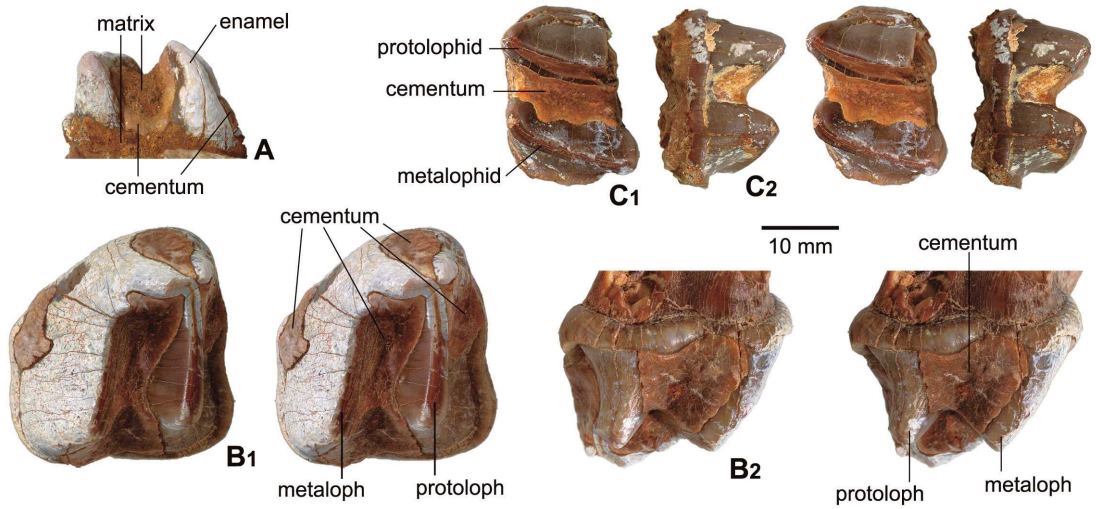

Fig. 1. Molars of *Teleolophus magnus*, showing the cementum. **A**, MPC-M 30/338, a left mandibular fragment with a second molar, buccal view. **B**, MPC-M 30/337, a right upper third molar : B_1, occlusal view (stereo pair) : B_2, lingual view (stereo pair). **C**, MPC-M 30/339, a left lower second molar : C_1, occlusal view (stereo pair) : C_2, buccal view (stereo pair).

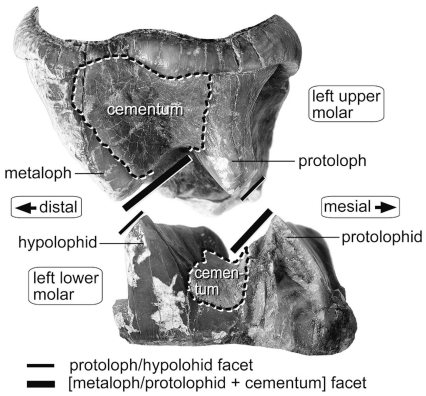

Fig. 2. Schematic occlusal relationships of the left molars in *Teleolophus magnus* in lingual view (modified from MPC -M 30/337 and 30/339 ; not to scale).

assigned to the Tapiroidea (Radinsky, 1965; McKenna and Bell, 1997). However, a recent study on enamel microstructure (Koenigswald *et al*., 2011) has implied a rhinocerotoid affinity for the deperetellids because the deperetellids have vertical Hunter-Schreger Bands (with horizontal Hunter-Schreger Bands in the deep layer) on the postcanine teeth as observed in the rhinocerotoids. The dental crown cementum does not occur in the tapiroids (Radinsky, 1965), although it occurs in several lineages of mammals such as rhinocerotids, equids, and elephantids. Therefore, the presence of the crown cementum in *Teleolophus* also supports the idea that the deperetellids are phyletically related not to the Tapiroidea but to the Rhinocerotoidea among the ceratomorph perissodactyls.

Dental cementum in fossil teeth is capriciously preserved (Fortelius, 1982). It is often mistaken for matrix and is removed during the preparation process in many cases (Radinsky, 1965). The presence of the cementum in *Teleolophus* advises a careful fossil preparation of mammalian dentition in order not to over-clean the cementum, which sometimes bears functionally and phyletically important information.

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