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[Note]

Reappraisal of a supposed chalicotheriid perissodactyl femur from the Pliocene of Yenangyoung, central Myanmar

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Neogene vertebrate fossils from Myanmar have been reported since early 19th century (Clift 1828; Falconer 1868; Lydekker 1883; Noetling 1894, 1895, 1897a, 1897b, 1901). More recently, many more Neogene vertebrate fossils have been reported and described from Myanmar (Colbert 1935, 1938; Nishioka and Takai 2018; Takai et al. 2018a, 2018b; Nishioka et al. 2018; Egi et al. 2018; Saegusa 2018; and references therein). Among the early studies, Noetling (1895) reported the discovery of a femur of a large mammal from the Neogene at Yenangyoung, central Myanmar, and preliminarily identified it as *Rhinoceros* sp. (Perissodactyla, Rhinocerotidae). Then, Noetling (1897a) described this left femur and identified it as *Hippopotamus irravadicus* (Artiodactyla, Hippopotamidae). Later, Hooijer (1951) restudied this specimen and concluded that it appeared to be a chalicotheriid perissodactyl femur. He mentioned that the specimen would be the first record of the family in Myanmar. However, this taxonomic assignment has not been confirmed since then. Here, we reappraise this fossil femur and demonstrate its familial and subfamilial affinities on the basis of the figures by Noetling (1897a). Unfortunately, Noetling did not specify a repository or specimen number and therefore we cannot access the specimen itself.

Systematic paleontology

Family Chalicotheriidae Gill, 1872

Subfamily Schizotheriinae Holland and Peterson, 1914

Schizotheriinae indeterminate

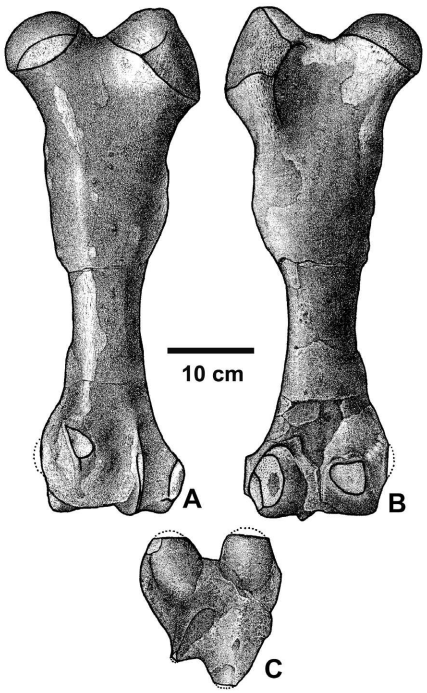

Fig. 1. Schizotheriinae indeterminate, a left femur originally described from the Pliocene of Myanmar by Noetling (1897a). **A**, anterior view. **B**, posterior view. **C**, distal view. A–C, redrawn after Noetling (1897a).

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Material.—A left femur originally described as *Hippopotamus irravadicus* by Noetling (1897a, plate XIX: figs. 1, 1a; plate XX: fig. 1).

Repository and specimen number.—Unknown (Noetling 1897a; Hooijer 1951). However, the specimen is likely stored in the Geological Survey of India (Kolkata, India) because Dr. Noetling was a paleontologist in this institute at that time (Noetling 1894, 1895, 1897a, 1897b, 1901).

Locality.—Yenangyoung (= Yenangyaung), Magway Division, central Myanmar (Noetling 1897a; Hooijer 1951).

Horizon and age.—A ferruginous conglomeratic layer of the Irrawaddy sediments (Noetling 1897a, 1897b); early Pliocene according to Noetling (1897a), but likely mid-Pliocene to late Pliocene according to Hooijer (1951).

Measurements.—The femur length (from the middle of the distal condyles to the top of the greater trochanter) is about 60 cm (Noetling 1897a).

Comparisons.—This femur is large among mammals and has a third trochanter, indicating that it is assigned to the Perissodactyla. The femur is relatively long, implying that it should be assigned to the Rhinocerotidae or Chalicotheriidae.

This femur is distinguished from that of the Rhinocerotidae in having a proximodistally high greater trochanter, a third trochanter on the proximal portion of the lateral side of the shaft, and a moderately small sized trochlea and almost parallel keels of the trochlea in dorsal view (see Handa and Kawabe 2016 and references therein). The third trochanter of the studied femur appears to be developed extremely weakly, although it might be partially broken. If this condition is natural, the studied femur also differs from that of the Rhinocerotidae in having a weak third trochanter. The studied femur is larger than those of most of the extinct and extant Rhinocerotidae (see Guérin 1980). The femoral length of the Indian rhino, *Rhinoceros unicornis*, is comparable to that of the studied femur (Guérin 1980). However, the studied femur differs from the femur of *R. unicornis* in having a proximally projected greater trochanter and a more proximally situated third trochanter. Therefore, it is likely assigned to the Chalicotheriidae.

Among the Chalicotheriidae, this femur is closely comparable to the subfamily Schizotheriinae in having the following characteristics: the greater trochanter is developed and proximodistally high; the apex of the greater trochanter projects proximally; the lesser trochanter is weakly developed; the third trochanter is thin and is situated on the proximal side of the shaft; and the keels of the femoral trochlea are almost parallel with a shallow groove. These characteristics are seen in schizotheriine femora (Handa and Kawabe 2016). Several femora of the Schizotheriinae have been described from North America and Eurasia. The weak lesser trochanter of the studied femur is distinguished from those of *Moropus*, *Tylocephalonyx*, *Metaschizotherium* and *Ancylotherium* (Coombs 1978, 1979; Roussiakis and Theodorou 2001). A femur of an indeterminate schizotheriine species was found from the lower Miocene of Japan (Handa and Kawabe 2016). The studied femur from Myanmar is distinguished from this Japanese schizotheriine femur in having a weak lesser trochanter and the weakness of the third trochanter.

The femur from Myanmar is distinguished from that of the other subfamily Chalicotheriinae of the Chalicotheriidae. Femora of the other subfamily Chalicotheriinae, such as those of *Anisodon grande* (de Blainville, 1849), have only faintly developed lesser and third trochanters (Zapfe 1979; Guérin 2012). These characters are not seen in this femur. In addition, the femur length of *A. grande* is shorter than that of this femur (Zapfe 1979; Guérin 2012). Therefore, this femur is distinguished from the Chalicotheriinae.

In sum, this femur is assigned to the Schizotheriinae (Perissodactyla, Chalicotheriidae). Its generic identification is difficult due to the lack of other important skeletal elements such as cranio-mandibles and teeth.

Remarks.—In Myanmar, the fossil record of the Chalicotheriidae is poorly known, and only some gnathodental remains of the subfamily Chalicotheriinae have been described so far. Tsubamoto et al. (2006) described fragmentary upper and lower molars of the Chalicotheriine from the upper part of the Irrawaddy sediments at the Gwebin locality (likely late Pliocene; Tsubamoto et al. 2012; Takai et al. 2018b), Seikpyu Township, Magway Division. They provisionally identified the specimens as cf. *Nestoritherium* sp., although their generic affinity is still uncertain due to the incompleteness of the fossil material. Chavasseau et al. (2010) described a left mandibular fragment with p3–m1 of the Chalicotheriinae from the upper Miocene part of the Irrawaddy sediments near Magway, Magway Division. Later, Chen et al. (2016) assigned this specimen to a

chalicotheriine species, *Anisodon yuanmouensis* (Gao and Ma, 1997). Chit-Sein and Tin-Thein (2013) also described a right mandibular fragment with m1 from the Tebingan locality, Magway Division, and assigned it to a chalicotheriine species, *Chalicotherium salinum* (Forster-Cooper, 1922) (= *Anisodon salinus*). Nishioka et al. (2018) reported a discovery of a chalicotheriine (low-crowned) right lower molar from the uppermost Miocene/lower Pliocene part of the Irrawaddy sediments at the Chaingzauk locality, Pauk Township, Magway Division. Therefore, the femur in the present study would be first record of the Schizotheriinae in Myanmar, although additional fossils are necessary to completely confirm the presence of this subfamily in the Neogene of Myanmar.

Several Plio-Pleistocene schizotheriine are known from Kenya, Uganda, Ethiopia, Tanzania and South Africa (Coombs and Cote 2010) and China (Gansu and Shaanxi provinces) (Li and Deng 2003; Chen et al. 2012), but their fossil records are still insufficient compared with the Miocene records. Additional discovery of Plio-Pleistocene schizotheriine specimens in the Irrawaddy sediments contributes to the discussion of the paleobiogeography and evolution of Afro-Eurasian schizotheriines.

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