



## A second specimen of *Manchurochelys manchoukuoensis* Endo & Shikama, 1942 (Testudines: Eucryptodira) from the Early Cretaceous Yixian Formation of western Liaoning, China

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### Abstract

Within the Early Cretaceous Jehol Biota of China, the turtle *Manchurochelys manchoukuoensis* Endo & Shikama, 1942 was one of the first discovered tetrapod fossils, but no additional information on this enigmatic taxon has become available during the past half century since its discovery. Here, a new turtle skeleton from the Yixian Formation of western Liaoning Province is identified as referable to *M. manchoukuoensis* on the basis of an elongate oval shell, long and narrow second to fourth vertebral scutes, and two suprapygals, of which the second is much larger than the first. This specimen therefore represents the second specimen of *M. manchoukuoensis*, the holotype of which was probably lost during World War II. This discovery not only provides essential material that allows the validity of *M. manchoukuoensis* to be tested, but also substantially expands understanding of its bony anatomy, especially with regard to cranial morphology. Among other features, *M. manchoukuoensis* is characterized by a postorbital that does not contact the quadrate/squamosal and a deep temporal emargination, which support a close relationship with *Sinemys* spp. and distinguish it from the co-existing *Ordosemys liaoxiensis*. A cladistic analysis that includes *M. manchoukuoensis* further supports the hypothesis that Sinemydidae is a monophyletic group that includes *Sinemys* spp. and *Dracochelys bicuspis*.

**Key words:** Eucryptodira, Sinemydidae, *Manchurochelys manchoukuoensis*, Yixian Formation, western Liaoning, Jehol Biota

### Introduction

Within the Early Cretaceous Jehol Biota of China, the turtle *Manchurochelys manchoukuoensis* Endo & Shikama, 1942 was one of the first tetrapod fossils to be discovered, together with the choristodere *Manchurosuchus splendens* and the lizard *Yabeinosaurus tenuis*. Unfortunately, the type specimen of *M. manchoukuoensis* (a partial shell with a partial pelvic girdle and hindlimbs, collected from the Yixian Formation of Tsotzushan, Yixian, western Liaoning Province) was probably lost during World War II, together with many other valuable fossils including the type specimens of *M. splendens* and *Y. tenuis* (e.g. Ji 1995; Gao *et al.* 2000; Liu 2003). During the last two decades a great number of turtle fossils have been recovered from the Jehol Biota, and an additional species of *Manchurochelys* was erected: *M. liaoxiensis* Ji, 1995, from the Yixian Formation of western Liaoning. Since then, all additional turtle fossils from the Yixian Formation of western Liaoning have been assigned to *M. liaoxiensis* (e.g. Li & Liu 1999; Liu 2003; Tong *et al.* 2004), but that species has been referred to the genus *Ordosemys*, resulting in the combination *Ordosemys liaoxiensis*. Consequently, no new information on *M. manchoukuoensis* has become available over the course of the last half century.

A new turtle skeleton collected from the Yixian Formation of western Liaoning shows several characters, such as a shell that is longer than wide, and second to fourth vertebral scutes that are long and narrow. These characteristics are clearly distinct from the co-existing *Ordosemys liaoxiensis* but match those reported by Endo & Shikama (1942) in the original description of *Manchurochelys manchoukuoensis*. The new fossil is