

Summary of Taxonomic Diversity and Geographic Distribution of Early Cretaceous Turtles of China



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Abstract: The Mesozoic turtle fossils from China provided crucial information for understanding the origin and early evolution of turtles (Li and Tong, 2015; Zhou and Rabi, 2015; Li et al., 2018). From the Early Cretaceous non-marine deposits of China, many well-preserved or little-damaged fossils of the Sinemydidae and ‘soft-shelled’ turtles had been discovered and described (Brinkman et al., 2013, 2017; Li et al., 2015; Shao et al., 2018; Li et al., 2019). To date, up to eleven genera of the Family Sinemydidae from Early Cretaceous strata of China have been reported; they are listed as follows: (1) the Genus *Sinemys* includes *Sinemys lens* (Wiman, 1930) from the Mengyin Formation of Shandong, *Sinemys gamera* (Brinkman and Peng, 1993) and *Sinemys brevispinus* (Tong and Brinkman, 2013) both from the Luohandong Formation of Inner Mongolia. (2) *Manchurochelys manchoukuoensis* was originally discovered in western Liaoning, Yixian Formation (Endo and Shikama, 1942). (3) *Xiaochelys ningchengensis* from Yixian Formation in Inner Mongolia is important for providing information indicating that sinemydids mostly share symplesiomorphies with sea turtles is an artefact (Zhou and Rabi, 2015). (4) More recently, a new species, *Jeholochelys lingyuanensis*, has been erected with many specimens found within the Jiufotang Formation in Lingyuan of Liaoning (Shao et al., 2018). (5) The species *Liaochelys jianchangensis* was from the Jiufotang Formation in western Liaoning (Zhou, 2010a). (6) *Kirgizemys kansuensis*, from Jiayuguan, Gansu Province, is the only known species of the genus reported in China (Danilov et al., 2006). (7) Genus *Yumenemys*, also excavated from Gansu, is represented by the holotype of *Yumenemys inflatus* from the Early Cretaceous (Bohlin, 1953). (8) *Changmachelys bohlini*, another species found in Gansu Province, was excavated from the Xiagou Formation (Brinkman et al., 2013). (9) Genus *Dracochelys*, whose holotype *Dracochelys bicuspis* was from the Tugulu Group of Xinjiang (Gaffney and Ye, 1992). (10) Genus *Wuguia* includes two species, *Wuguia hutubeiensis* (Matzke et al., 2004) and *Wuguia efremovi* (Danilov and Sukhanov, 2006), which were both found in Xinjiang. (11) Genus *Ordosemys* has four currently recognized species: *Ordosemys leios* from Inner Mongolia, Luohandong Formation (Brinkman and Peng, 1993); *O. donghai* from the Chengzihe Formation of Heilongjiang Province (Brinkman et al., 2008); *O. liaoxiensis* discovered in

Beipiao, Liaoning Province, in the Yixian Formation (Tong et al., 2004) and *O. brinkmania* from the Tugulu Group in Xinjiang Province (Danilov and Parham, 2007). As most of those genera have discovered recently, an updated phylogenetic analysis of this clade is yet to be completed. Given the taxic and morphological diversity of the taxa, their comparative paleobiology and paleoecology could also be important research objectives in the future. Trionychidae is a crown group of soft-shell turtles, with the oldest known record from the Early Cretaceous. A total of four species are known from the Early Cretaceous of China. These include *Sinamyda fuchienensis* from the Early Cretaceous Hekou Formation of Fujian, southern China (Chkhikvadze, 2000); “*Trionyx*” *jixiensis* from Chengzihe Formation of Helongjiang (Li et al., 2015); and *Perochelys lamadongensis* from the Jiufotang Formation of Liaoning, northeastern China (Li et al., 2015). The fourth taxon, *Perochelys hengshanensis* has been described recently from Hengshan Formation of Zhejiang Province, southeastern China (Brinkman et al., 2017). The above listed turtles are all members of the Jehol Biota *sensu lato*. The available evidence suggests that they originated and diversified in a relatively short period of time, during the transition from the Late Jurassic to early Early Cretaceous, and some of them appear to be distributed widely; the sinemydid turtles, are stem cryptodires, recorded in Cretaceous to Paleocene deposits in Asia and North America. The eleven genera listed above are distributed mainly in northern China, including provinces like Liaoning, Heilongjiang, Shandong, Inner Mongolia, Gansu, and Xinjiang. Although the oldest member of this family, *Hongkongochelys*, occurs in the Late Jurassic of Neijiang, Sichuan Province. The Xinjiangchelyidae, a crown Cryptodire clade dominated a larger area than Sinemydidae during the Middle-Late Jurassic, and appears to have been replaced by the Sinemydidae in East Asia during the Cretaceous, occurred in SE Asia, Central Asia, and Western and Southern Europe. Therefore, detailed research on patterns of diversity and biogeography of Late Mesozoic turtles in Asia will provide a better understanding their evolutionary history.

Key words: Jehol Biota, testudines, biostratigraphy, biogeography

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