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

RUAN Luyao1,2, LI Xiaobo1,2,3*, ZHOU Changfu4 and Robert R. REISZ2,3

1 College of Earth Sciences, Jilin University, Changchun, Jilin 130061
2 Dinosaur Evolution Research Center of Jilin University, Changchun, Jilin 130012
3 Department of Biology, University of Toronto Mississauga, Ontario, Canada L5L 1C6
4 College of Earth Science and Engineering, Shandong University of Science and Technology, Qingdao, Shandong 266590

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-shell’ 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 gamara (Brinkman and Peng, 1993) and Sinemys brevispinus (Tong and Brinkman, 1993) both from the Luohandong Formation of Inner Mongolia. (2) Manchurochelys manchoukuoenensis 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 sympleiomorphies 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 kansensis, 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) Changnachelys bohlini, another species found in Gansu Province, was excavated from the Xiagou Formation (Brinkman et al., 2013). (9) Genus Dracochelys, whose holotype Dracochelys bic apis was from the Tugulu Group of Xinjiang (Gaffney and Ye, 1992). (10) Genus Wugia includes two species, Wugia hutubeiensis (Matzke et al., 2004) and Wugia efremoni (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 Chengzhe 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. brinkmanii 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 Chengzhe 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

Acknowledgements: This work is granted by NSERC (Canada)
References


About the first author

RUAN Luyao; born in 1998 in Taizhou City, Zhejiang Province; junior from Jilin University. She is now interested in the study on turtle fossils from Jehol Biota. Email: ruanluyao1@163.com; phone: 13756076629.

About the corresponding author

LI Xiaobo; Male; born in 1982 in Qitai County, Xinjiang Uygar Autonomous Region; Ph.D; Graduated from Jilin University, lecture of College of Earth Sciences, Jilin University. He is now interested in the study on continental environment and vertebrates evolution. Email: lixiaobo@jlu.edu.cn; phone: 18686486582.