

## An Early Cretaceous *Ginkgo* ovulate organ from the Inner Mongolia, China

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Abundant Ginkgoalean leaf fossils were collected and described from the Lower Cretaceous of the Huolinhe Basin, Inner Mongolia, North China. However, up to now, Ginkgoalean reproductive organ fossils have never been found in the Huolinhe Basin. In this study, a well-preserved *Ginkgo* ovulate organ are reported from the Early Cretaceous Huolinhe Formation of the Huolinhe Basin. This ovulate organ bears a cluster of (up to 6) ovules at the apex of a peduncle. The ovules are each seated in a collar, four developed ovules directly attached to the peduncle, other two aborted ovules terminated in a short pedicel. The epidemis of the ovulate organ is also investigated detailedly. This is the first discovery of *Ginkgo* ovulate organ in the Huolinhe Basin.

The unequivocal and reliable ovulate organs of *Ginkgo* are very rare. Detailed comparisons between the new *Ginkgo* with other reliable *Ginkgo* ovulate organs reveal that the new material differs from any of them. A new species is established. *Ginkgo yimaensis* from the Middle Jurassic Yima Formation of Henan, China, is the oldest known *Ginkgo* ovulate organ (ZHOU & ZHANG, 1989). ZHOU (1994) named the ovule-bearing organs similar to *G. yimaensis* with long pedicles on a peduncle as *Ginkgo yimaensis* type (or Jurassic type or ancestral type), while others like *G. biloba* without obvious pedicles called *Ginkgo biloba* type (or modern type). The Palaeocene species *Ginkgo cranei* distinctly belongs to modern type (ZHOU et al., 2012). The Early Cretaceous *Ginkgo apodes* with short pedicels when young, but sessile when mature, was considered as the oldest modern type ovulate organs (ZHENG & ZHOU, 2004). In ovulate organ structure, the new species is closely comparable to *G. apodes*. The present study further corroborates that the modern *Ginkgo* type ovulate organ first appeared in the Early Cretaceous, and also provides new evidence for *Ginkgo* evolutionary history.

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