

## Research Advances

# The Discovery of the Bivalve Fossil *Arguniella* from the Lower Cretaceous Shangkuli Formation in Northern Greater Khingan Mountains, China: Implications for Stratigraphic Correlation



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## Objective

Typical Early Cretaceous non-marine bivalve fossils from Eastern Asia are represented by the *Arguniella-Sphaerium* assemblage, and they were important members of the Jehol Biota. Historically, the genus *Arguniella* in western Liaoning had been mistakenly identified as the Jurassic *Ferganoconcha*, re-identified as *Arguniella* with

specific names being still retained, and recently revised to the valid species *Arguniella ventricosa* that established in the Transbaikalia regions of Russia. In the present paper, new materials of *Arguniella* from the Argun area of northern Greater Khingan Mountains are reported (Fig. 1). The locality is important because it is near the type location where the genus was originally established. Furthermore, some Jehol-type fossils similar to those in

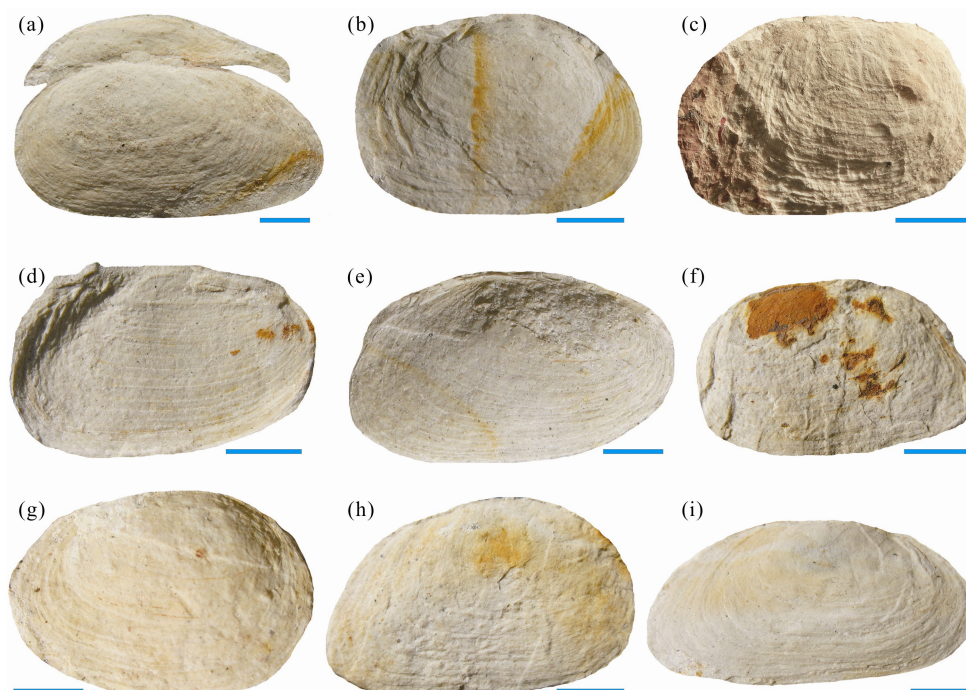


Fig. 1 Photos of fossil *Arguniella* collected from the Lower Cretaceous Shangkuli Formation.

(a)–(i). *Arguniella* Kolesnikov. (a) left valve and a part of right valve, sk001. (b) external mold of left valve, sk002. (c) right valve, sk004. (d) external mold of left valve, sk005. (e) right valve and part left valve margin, sk022. (f) left valve, sk026. (g) right valve, sk018. (h) right valve, sk019. (i) right valve, sk020. All of specimens are stored in the College of Earth Sciences, Jilin University. Scale bars represent 5 mm.

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western Liaoning were also recently discovered in northern Greater Khingan Mountains. Therefore, these new bivalve fossils would be significant for stratigraphic correlation of the Lower Cretaceous in northeast Asia.

## Methods

The fossils were collected from an outcrop adjacent to the Shangkuli Village, Argun, Inner Mongolia. The fossiliferous beds belong to the lower part of Lower Cretaceous Shangkuli Formation of the Xinganling Group, which is composed of volcanic-sedimentary strata that are widely distributed in northern Greater Khingan Mountains. As previously known, fossils from the Shangkuli Formation include *Eosestheria middendoffii*, *Ephemeropsis trisetalis*, *Coptoclava longipoda*, and *Equisetites* sp. However, bivalve *Arguniella* had never been reported before the current study.

## Results

The fossils are buried within the volcanic silt (ash). They were studied and tentatively identified as *Arguniella ventricosa* and *Arguniella* sp., but they are reported only with the genus name, because the species attribution will need further research. The bivalve shells vary in shapes (Fig. 1), which might be the result of post-depositional deformation. Some individuals are quite similar to *Arguniella lingyuanensis* from western Liaoning, which had been revised to *Arguniella ventricosa*.

The type specimen of the genus was originally discovered from the lower part of volcanic-sedimentary successions and extend to the lower part of a coal-bearing strata in the upper reach of the Argun River, and the fossiliferous strata can be correlated to the Late Jurassic to Early Cretaceous Xinganling Group and Chailainur Group in current research area. The Shangkuli Formation yields fossils of typical Jehol Biota (EEL assemblage), and the isotopic data suggest a depositional age similar to that of the Yixian Formation in western Liaoning, which is middle Early Cretaceous (Hauterivian-Aptian). Therefore,

the Shangkuli Formation bridges the correlation between the Yixian Formation in western Liaoning, the Turga Formation in Transbaikalia, and the Tsagantsav Formation in eastern Mongolia.

The geochronological range of the *Arguniella* has been considered to be Late Jurassic-Early Cretaceous, but mainly the Early Cretaceous. In southwestern Mongolia, the Dariv Formation contains the fresh-water bivalves *Arguniella ovalis* KOL, and *Arguniella compacta* KOL, which were attributed by Russian geologists to the base of the Upper Jurassic (Calloviaian to Oxfordian). Sauropod bones in the Dariv Formation may belong to *Mamenchisaurus*, which has never been found from the deposit younger than the Upper Jurassic. In western Liaoning, *Arguniella* may be present in the Late Jurassic Tiaojishan Formation in Linglongta, but the genus is much more diverse and extensively distributed in the Lower Cretaceous strata.

## Conclusions

The non-marine bivalve fossils of *Arguniella* were discovered from the Lower Cretaceous Shangkuli Formation, in Argun, northern Greater Khingan Mountains. The Shangkuli Formation can be correlated to the Yixian Formation in western Liaoning, Turga Formation in Transbaikalia, and Tsagantsav Formation in eastern Mongolia. However, a more comprehensive study is needed to analyze the Early Cretaceous fossils and strata from both these areas.

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