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Research Advances

New Discovery of *Nyssidium* from the Yong'ancun Formation in Jiayin, China

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Objective

Follicular fruits in raceme infructescences with sub-parallel longitudinal ridges attached to the shoots were assigned to a widely used extinct genus of *Nyssidium,* which was suggested by Iljinskaja (1974) as the earliest appropriate generic name for this kind of fruits. Additionally, based on the fossil fruits usually co-occurred with *Trochodendroides* leaves, *Nyssidium* was widely deemed to the fruits of *Cercidiphyllum*-like or *Trochodendroides* plants. *Nyssidium arcticum* (Heer) Iljinskaja was a common component of the Late Cretaceous and Paleogene floras from the Northern Hemisphere, which was now the earliest fossil record of this genus from the Late Cretaceous (Yong'ancun Formation) in northeast China. This new discovery is important to explore the geological distribution of this genus and even to provide more fossil materials for the divisions and correlations with the Late Cretaceous terrestrial strata of northeast China.

Methods

The specimens of *Nyssidium arcticum* described here were collected from the upper part of the Yong'ancun Formation, Jiayin County of Heilongjiang Province. The fossil fruits are preserved as impressions and compressions, and were photographed using 3D super depth microscopy systems (Keyence VHX-5000). All specimens we collected are housed in the Paleontological Museum of Liaoning (PMOL) in Shenyang, China.

Results

The follicular fruits of *Nyssidium arcticum* are in raceme infructescences, 40–80 mm in length and 20–30 mm in width, elliptic or conical in outline, with 4–16 follicles spirally arranged, borne singly or in pairs on short stalks (Figs. 1a–f). Follicles are oval or obovate, and the total length of each follicle is 5–8 mm including the stalk; the width in the middle is up to 4 mm, gradually attenuated from the middle to the top apex and the base attaching a short stalk (Figs. 1b–d). It is worth mentioning that most follicles have fine sub-parallel longitudinal ridges on the surface and ventral sutures, and no transverse striations were discovered. Fossil fruits of *N. arcticum* preserved both dispersed and in racemose infructescences. Virtually, compared with *N. jiayinense* discribed by Feng et al. (2000), the present specimens have many similarities in the size, shape and the quantity of follicles, but the follicles in *N. jiayinense* usually possess fine transverse ridges on the surface.

Combined with the morphologic features, such fossil fruits should be assigned to *N. arcticum*, which enriched the Yong'ancun flora. As a consequence, the fossil records of *Nyssidium* distribution in Jiayin area could range from the Late Cretaceous to the Paleogene deposits.

Discussion

These distinctive fossil elongated fruits with subparallel longitudinal ridges, ventral sutures and thin transverse striations that usually co-occurred with *Cercidiphyllum*-like or *Trochodendroides* leaves have been known for many years, however, the nomenclature of this taxon has been disputed for a long time due to the systematic relationships of these early fossil records still remained obscure. Actually, the name *Nyssidium* Heer was considered as the earliest appropriate generic name and widely used for this kind of fossil fruits.

At present, the earliest fossils of *Nyssidium* in China were collected from the Yong'ancun Formation of the Late Cretaceous sediments in Jiayin, while in North America and Northeastern Asia, the earliest occurrence of this genus could be traced to the Early Cretaceous (Albian). The genus *Nyssidium* was widely distributed in the Cretaceous and Paleogene deposits of Northern Hemisphere, which could provide reliable fossil materials for the strata and floras correlations.

Conclusion

Nyssidium arcticum collected from the Yong'ancun Formation (Santonian) in Jiayin, NE China, which is earlier than *Nyssidium jiayinense* discovered from the

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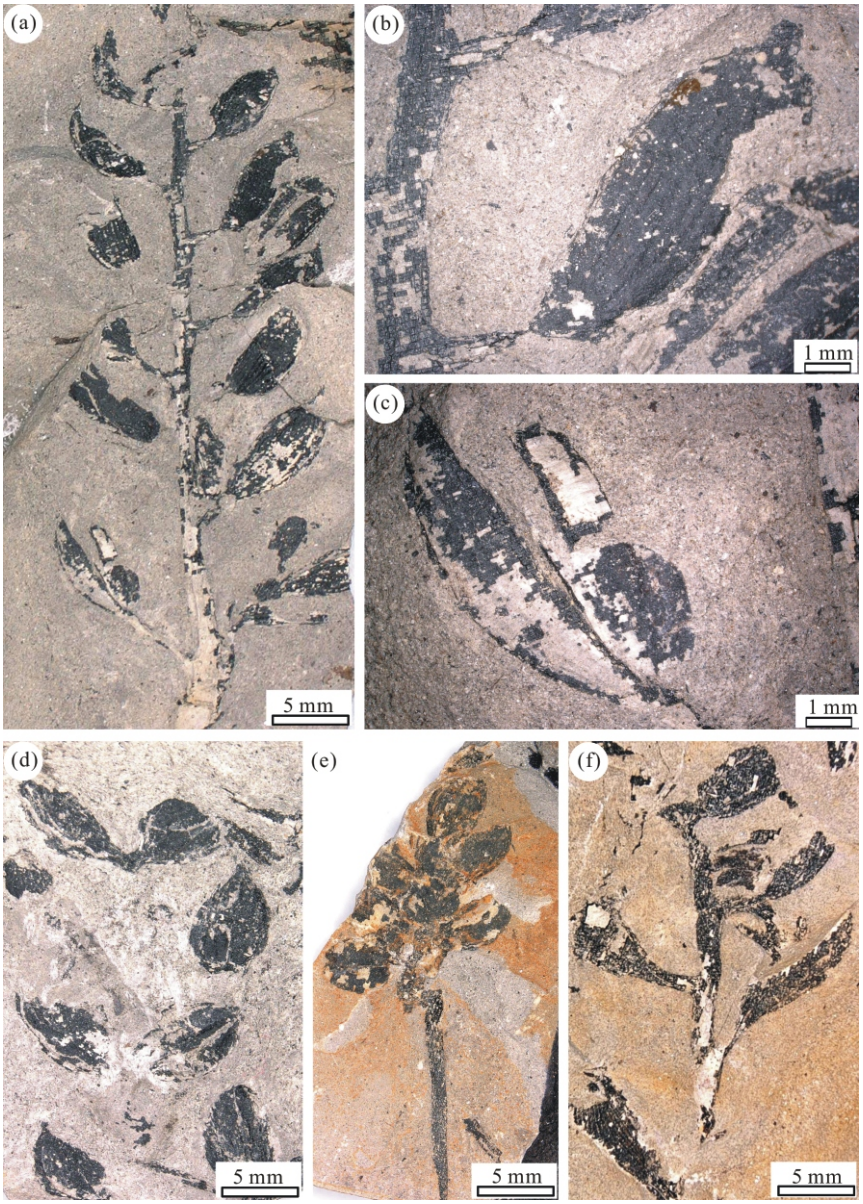

Fig. 1. *Nyssidium arcticum* collected from the Yong'ancun Formation, NE China.
(a), (e–f) showing the raceme infructescences; (b–c) showing the longitudinal ridges and ventral sutures (the enlargement of part 1); (d) showing the dispersed follicles.

Paleocene deposits of the Wuyun Formation. This finding extends the strata distribution of this genus and provides important fossil materials for the Late Cretaceous terrestrial strata and floras correlations with Russia and North America.

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