



## **Jurassic floras with Siberian affinities in south-western Mongolia**

The Nomingiin-Gobi depression in south-western Mongolia was located in the Jurassic at the boundary of the Siberian and Euro-sinian paleofloristic realms. Any data on floral assemblages from this region are thus crucial for understanding relationships between these major paleobiogeographic units.

The first fossil plants were collected in the Shar-teeg locality of the Nomingiin-Gobi depression in 1987 during the Soviet-Mongolian paleontological expedition headed by J.M. Gubin. Provisional determination of these fossils led E.L. Lebedev and M.P. Dudenko to suggest their Middle or Late Jurassic age. In 1989 I had occasion to make additional collections in two localities of the area, namely in Shar-teeg and in a section of the gorge (sair) Elstijn-am, 15 km SSE of Shar-teeg.

In the Elstijn-am section floral remnants occur in yellowish claystones, mudstones, and sandstones. In this particular locality ferns and gymnosperms dominate both in the number of specimens and of species. Among ferns, *Coniopteris* is represented the most abundantly, by four unnamed species. Two of them are illustrated here (Fig. 1A, B). Mass occurrences of buds and leaves of *Czekanowskialean*s are common on some bedding planes. Presumably *Czekanowskia* ex gr. *ngida* Heer 1876 is represented there. As its epidermal structures have not been studied, this determination must remain provisional. The other *czekanowskialean* species are *Phoenicopsis angustifolia* Heer 1876 and *Phoenicopsis* sp. The most common conifer is *Pityophyllum nordenskjoeldi* (Heer 1876). *Neocalamites pinitoides* (Chachlov 1924) and *N.* sp. may occur in great numbers of specimens. Bennettitaleans *Anomozamites* sp. 1 (Fig. 1C) and *A.* sp. 2 seem to be important in this flora. The remaining identified plant remnants are: *Selaginella* sp., *Radicites* sp., *Cladophlebis nebbensis* (Brongniart 1828), *Ginkgo* sp. *Podozamites* sp., and *Conites* sp.

In the section of Shar-teeg conifers dominate, represented by *Pityophyllum nordenskjoeldi* which occurs also in Elstijn-am. The finding of problematic seeds resembling those of *Baisia hirsuta* Krassilov 1982 is remarkable as this species is typical for the Early Cretaceous of Mongolia and Siberia (Krassilov 1982) but does not occur in the Elstijn-am assemblage. The presence of two species of bryophyte *Thallites* in Shar-teeg and complete lack of bennetitaleans seems significant in characterizing ecological conditions in the locality. The remaining identified plant remnants are: *Equisetites* ex gr. *ferganensis* Seward 1907, *E.* sp., two species of *Coniopteris*, *Klukia* sp. resembling Middle Jurassic species from Western Darvaz, *Phoenicopsis angustifolia*, and three species of *Pityospermum*.

There are several differences between these two assemblages which probably reflect changes in the composition of floral assemblages in the area. The Elstijn-am

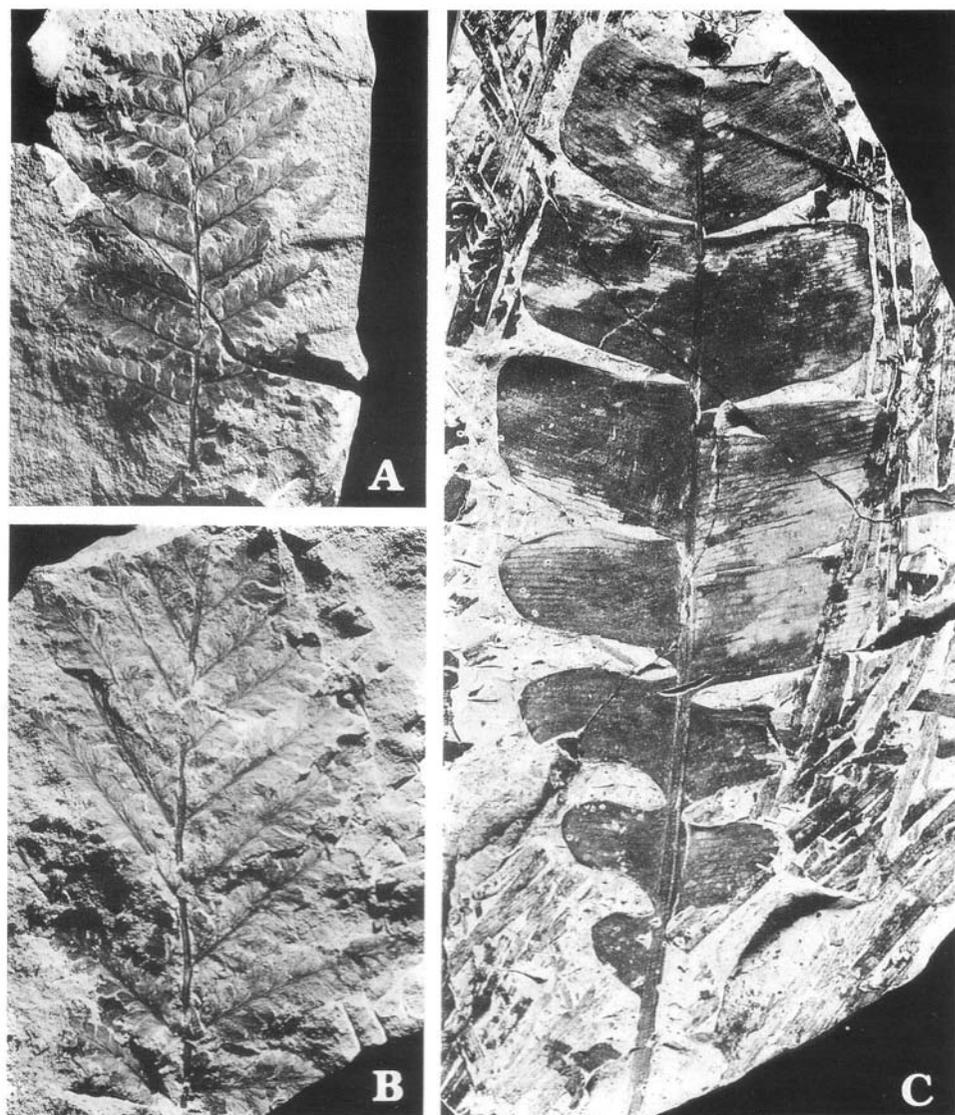


Fig. 1. Representative plant species of the Elstijn-am Middle Jurassic flora of south-eastern Mongolia; natural size.  $\square$ A. *Coniopteris* sp. 1.  $\square$ B. *Coniopteris* sp. 2.  $\square$ C. *Anomozamites* sp. 1.

locality is evidently of greater age. *Coniopteris*, so abundant in it, becomes less common in the younger Shar-teeg locality. The sphenopsid *Neocalamites* plays an important role in the Elstijn-am flora together with the gymnosperms *Czekanowskia*, *Phoenicopsis*, and *Pityophyllum*, whereas in Shar-teeg the bryophyte *Thallites* and the gymnosperms dominate, associated with problematic seeds of *Baisia*, which are absent in the supposedly older flora. Among less common plants, the bennetitalean *Anomozamites* seems restricted to the older, and fern *Klukia* to the younger, assemblage.

Two species are of primary importance in the dating of the Nomgijn-gobi floras: *Neocalamites pinitoides* of the Elstijn-am flora and *Baisia* ex gr. *hirsuta* represented

in the flora of Shar-teeg. The first species is known from the Early Jurassic of England, Crimea, Taurkyr, and Gissar but *Baisia* occurs in the Early Cretaceous deposits of Char-chetel in Shine-us chudag region of Mongolia and late Neocomian Turgin Beds east of the Baykal Lake area. Despite these differences in age of occurrences of these particular species in other regions, both the Nomgijn-gobi floral assemblages are most probably of Jurassic age.

From paleofloristic point of view the Shar-teeg flora is close to floras of the Siberian paleofloristic realm, being located geographically at its southern margin (Vachrameev 1975, 1983). This is expressed especially in the abundance of *Coniopteris* which, according to Teslenko (1970) had its acme in the Siberian floras of the Middle Jurassic. Also the mass occurrence of *Czekanowskia* ex gr. *ngida*, *Phoenicopsis angustifolia*, *Pityophyllum nordenskjoeldi*, as well as the presence of *Baisia* ex gr. *hirsuta*, are in agreement with Siberian affinities of these floras. The only important Euro-Sinian floral element is the fern *Klukia* and this suggests a somewhat transitional position of the Nomgim-gobi region.

## References

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