

Late Cretaceous Kholokhovchan Flora of Northeastern Asia: Composition, age and fossil plant descriptions



Alexei B. Herman^{a, *}, Alexandra B. Sokolova^b

^a Geological Institute, Russian Academy of Sciences, 7 Pyzhevskii pereulok, 119017 Moscow, Russia

^b Borissiak Paleontological Institute, Russian Academy of Sciences, 123 Profsoyuznaya ulitsa, 117647 Moscow, Russia

ARTICLE INFO

Article history:

Received 18 September 2015

Received in revised form

14 November 2015

Accepted in revised form 15 November 2015

Available online 9 December 2015

Keywords:

Late Cretaceous

Northeastern Russia

Fossil flora

Fossil plant descriptions

Conifers

Angiosperms

ABSTRACT

The Kholokhovchan Flora comes from tuffaceous – terrigenous deposits of the Vetvinskaya Member (Chalbugchan Group) in the Penzhina and Oklan rivers interfluvium, Northeastern Russia. The depositional environment of the plant-bearing deposits is interpreted to have been a freshwater lake. The Kholokhovchan Flora hosts 42 fossil plant species belonging to Marchantiopsida, Polypodiopsida, Ginkgoales, Leptostrobales, Bennettitales, Pinales and Magnoliopsida. It is characterised by diverse angiosperms, less diverse conifers and ferns, by the presence of relatively ancient *Sphenobaiera*, *Phoenicopsis* and *Pterophyllum* together with advanced Late Cretaceous *Taxodium*, *Glyptostrobus* and angiosperms, among which platanoids are quite diverse. The Kholokhovchan Flora is most similar to Penzhina and Kaivayam floras of the Anadyr–Koryak Subregion and Arman Flora of the Okhotsk–Chukotka volcanogenic belt (Northeastern Russia) and should be dated as Turonian–Coniacian. The Kholokhovchan Flora, that populated volcanic plateaus and intermontane valleys, are characterised by a mixture of ancient “Mesophytic” plants with typical Late Cretaceous “Cenophytic” taxa. This peculiar composition probably reflects a gradual penetration of new angiosperm-dominated plant assemblages into older floras: during the Late Cretaceous, “Cenophytic” assemblages migrated along river valleys and other disturbed habitats into the interior of Asia, eventually occupying volcanogenic uplands, and in places replacing the “Mesophytic” fern–gymnospermous communities that existed there. Two new angiosperm species, as well as four the most characteristic conifers of the Kholokhovchan Flora, are described: Cupressaceae gen. et sp. indet. cf. *Widdringtonites* sp., *Taxodium* cf. *olrikii*, *Taxodium* sp., *Glyptostrobus* sp., *Ettingshausenia vetvinskensis* sp. nov. and *Parvileguminophyllum penzhinense* sp. nov.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

In the Cretaceous, Asia was a large land mass surrounded by oceans. During the late Albian and Late Cretaceous time, Northeastern Asia was made up of a mosaic of sedimentary basins. A volcanic upland, the Okhotsk–Chukotka volcanogenic belt, extended along the northeastern margin of the continent (Fig. 1A); coastal plains and shallow shelf existed to the east of the volcanogenic belt, while isolated non-flooded lowlands were situated to the west. Herman (1999, 2011a, 2013) distinguished here three palaeofloristic–palaeogeographic subregions spanning late Albian–Paleocene time with different types of landscapes and sedimentation (Fig. 1A).

The Anadyr–Koryak Subregion (AKSR) comprised a system of palaeobasins with mixed continental–marine sedimentation. Coastal alluvial lowlands and plains of the AKSR were covered with meandering rivers, lakes and swamps. Abundant plant remains were buried in terrigenous coal-bearing alluvial, lacustrine, and palustrine deposits of the subregion. Subsequent marine transgression resulted in a shallow shelf basin with numerous islands, and shallow-water marine sedimentation covered the continental deposits. Well dated marine sediments containing stratigraphically important molluscan (ammonites and inoceramids) fauna interfinger with continental plant-bearing deposits allowing the construction of a well-constrained temporal framework throughout the subregion. Due to this, the AKSR undoubtedly represents the key area for substantiating Cretaceous stratigraphic schemes and for correlation of phytostratigraphic subdivisions with high-resolution marine biostratigraphy. Seven securely dated late Albian–Paleocene phases of floral evolution are distinguished in

* Corresponding author.

E-mail addresses: alexeiherman@yandex.ru (A.B. Herman), klumbochka@mail.ru (A.B. Sokolova).

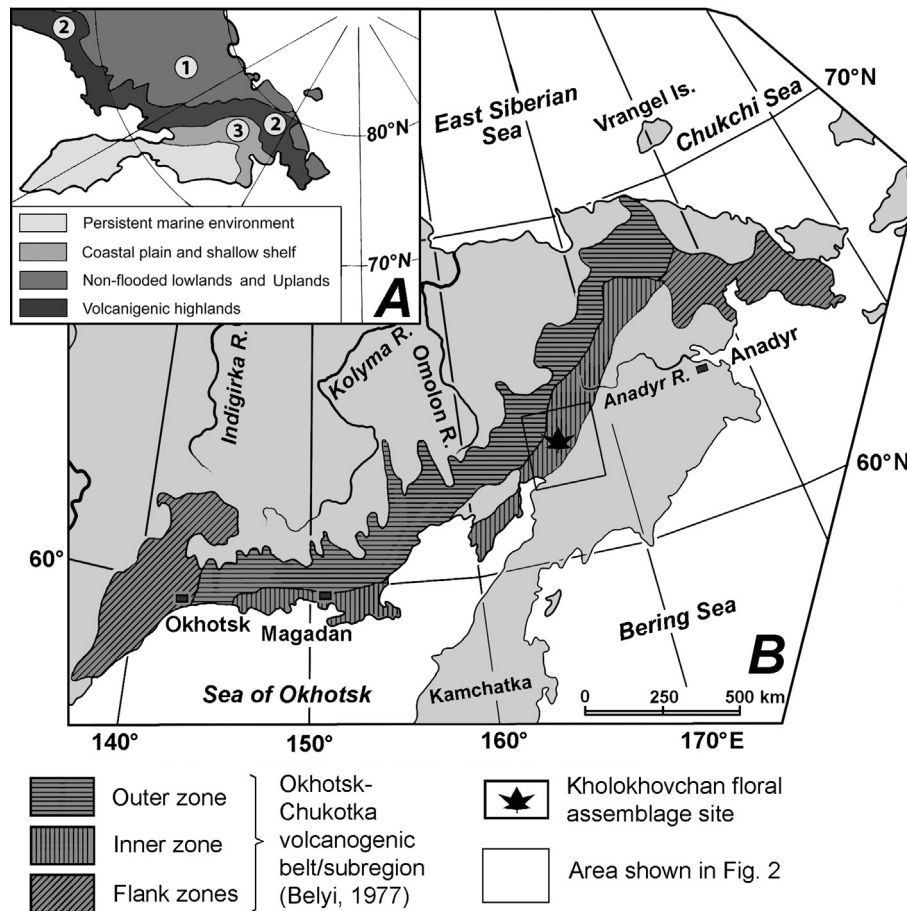


Fig. 1. Latest Albian–Late Cretaceous palaeobotanical–palaeogeographical subregions of the North Pacific Region (A); modern outline of North-Eastern Asia is shown for the Coniacian (after Smith et al., 1981): 1 – the Verkhoyansk–Chukotka Subregion, 2 – the Okhotsk–Chukotka Subregion, 3 – the Anadyr–Koryak Subregion (modified from: Herman, 2013); and geographical and geological position of the Kholokhovchan Flora site (B) (modified from: Shczepetov and Herman, 2013).

the AKSR: the Early Ginter (late Albian), Grebenka (late Albian–Cenomanian–early Turonian), Penzhina (late Turonian), Kaivayam (Coniacian), Barykov (Santonian–early to ?middle Campanian), Gornorechenian (?late Campanian–early Maastrichtian), and Koryak (early to late Maastrichtian–?Danian) (Herman, 2011a, 2013).

The Okhotsk–Chukotka Subregion (OCSR) included volcanic uplands with variably differentiated relief, which were formed in the middle–late Albian. Volcanogenic and terrigenous deposits of the OCSR reflect depositional environments of intermontane valleys and volcanic plateaus. These deposits are exclusively of continental origin, containing frequent plant fossils. The biostratigraphy of these deposits are based mainly on plant megafossils as well as on palaeomagnetic data and isotopic dating. It is obvious that the age determination of purely continental deposits in the OCSR depends on palaeobotanical correlation with securely dated floras of the adjacent AKSR.

The Verkhoyansk–Chukotka Subregion corresponded to a low-lying or slightly hilly plain situated to the west of the volcanogenic belt. This plain was not flooded by the sea, and sedimentation and syndimentary coal accumulation took place here in isolated depressions.

The Late Cretaceous Kholokhovchan Flora from the volcanogenic–terrigenous deposits of the OCSR (Fig. 1B) was named by Lebedev (1987) after the Kholokhovchan River. The plant fossils were collected by him in 1978. Until recently this

floristic assemblage was known only as a list of Lebedev's preliminary identifications (Lebedev, 1987). He concluded that the Kholokhovchan assemblage is correlative to the latest Albian–early Turonian Grebenka Flora from the middle reaches of the Anadyr River. Later Shczepetov and Herman (2013) re-examined this collection and suggested that the Kholokhovchan assemblage is most similar to the Turonian–Coniacian Arman Flora of the Okhotsk–Chukotka volcanogenic belt and, therefore, Turonian–Coniacian or Turonian in age. The present paper focuses on the composition, correlation and age of the Kholokhovchan Flora but we also describe here two new angiosperm species as well as four the most abundant, characteristic and well-documented conifers of this flora. However, we could not visit this flora locality in order to collect more plant fossils and measure the section because the field work is logistically extremely difficult and very expensive in this remote area.

In this paper we use a stratigraphic terminology employed by Belyi (1977) and Herman (2013), the system of suprageneric plant taxa devised by Meyen (1987), the conifer system proposed by Farjon (2005), the angiosperm leaf architectural terminology published in (Herman and Lebedev, 1991), and Krassilov's classification of dispersed angiosperm leaves.

Recent studies (primarily those of the reproductive structures) of Cretaceous angiosperms have shown that a morphological classification of their leaves proposed by Krassilov (1979) seems to be the most effective way of organising of fossil (Cretaceous and

Download English Version:

<https://daneshyari.com/en/article/4746801>

Download Persian Version:

<https://daneshyari.com/article/4746801>

[Daneshyari.com](https://daneshyari.com)