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Original article

A new genus of male cones of voltzialean affinity, *Uralostrobus voltzioides* nov. gen., nov. sp., from the Lower Permian of the Urals (Russia)[☆]

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ABSTRACT

A new genus and species of male cones of coniferophyte from the Lower Permian (Artinskian and Kungurian) deposits of the Urals, Russia is described: *Uralostrobus voltzioides* Naugolnykh nov. gen., nov. sp. The cone shows characters typical of some representatives of conifers belonging to the order Voltziales: more or less isometrical bracts of rhombic shape, prolonged sporangia with attenuate apices, and bisaccate pollen of *Illinites*-type. General information on the associated female seed scales and vegetative leafy shoots is given as well.

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1. Introduction

Coniferophytes as a group of higher plants were widespread in the Permian period, especially in the Northern hemisphere, and after that they began to be intensively and rapidly diversified, which resulted in the appearance of several families, typical of the Triassic but having their evolutionary roots deep in the Permian (Clement-Westerhof, 1974; Miller, 1982; Meyen, 1987, 1997; Kerp et al., 1990; Mapes and Rothwell, 1991; Looy et al., 1999; Rothwell et al., 2005; Hernandez-Castillo et al., 2009). Traditionally, in palaeobotanical studies of Palaeozoic conifers the main attention is given to their female reproductive organs. Compared to the female cones and their isolated dwarf shoots of Permian conifers, during recent decades only a few publications were focused directly and exclusively on the male cones of that plant group. Nonetheless, the male reproductive organs are significant for taxonomy and systematics of early conifers, especially if information about their *in situ* pollen is obtained.

The present paper focuses on the description of coniferophyte male cones, which were found in the Lower Permian deposits of the Urals, Perm and Sverdlovsk regions (Russia). The *in situ* pollen grains

were extracted from the best preserved cone, which was selected as a holotype. All the male cones described here are attributed to a new genus and species, *Uralostrobus voltzioides* Naugolnykh nov. gen., nov. sp., most probably of voltzialean affinity.

2. Material and methods

The material studied includes four well-preserved specimens of male cones originating from three Early Permian localities from the Middle and Southern Cis-Urals (Fig. 1; Table 1; regional geology is considered after Chuvashov et al., 1990), in the Perm and Sverdlovsk Regions, Russia:

- Locality A: **Sobolevsky quarry**. This locality is disposed near the City of Krasnoufimsk (Sverdlovsk region), 3 km southwest from the Krasnoufimsk railway station. Stratigraphically, it belongs to the Lower Permian, Artinskian stage, Upper Artinskian Substage, Sargian Horizon (= Sargian Regional Stage), Divjinskian Fm. (= Divjinskaya Suite);
- Locality C: **Rakhmangulovo**. This locality is a small quarry near Rakhmangulovo Village, Krasnoufimsk District, 20 km east of the City of Krasnoufimsk. It belongs to the Lower Permian, Kungurian Stage, Lower Kungurian Substage, Philippovian Horizon (= Philippovian Regional Stage), Sabanakovian Fm. (= Sabanakovskaya Suite);

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