
A new species of *Tempskya* from the Russian Far East

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In the present paper, a new species of *Tempskya*, viz., *T. neumyvakinii* sp. nov. has been described from the Quaternary deposits of the Razdol'naya River Basin (south-western Primorye). An Early Cretaceous to early Late Cretaceous age has been assigned to these beds, which relates with the deposition of Korkinsian Series.

Key-words—Tree ferns, *Tempskya*, Cretaceous, Russian Far East.

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सारांश

रूसी फार पूर्व से प्राप्त टैम्पस्क्या की एक नई जाति

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रजडोल नाया नदी द्रोणी (दक्षिण पश्चिमी प्रिमोर्ये) के चतुर्थक युगीन निक्षेपों से टैम्पस्क्या की एक नई जाति टै. न्यूमाइवाकिनाई का इस शोध-पत्र में वर्णन किया गया है। इन संस्तरों की प्रारम्भिक क्रीटेशियस से प्रारम्भिक अनंतिम क्रीटेशियस आयु प्रस्तावित की गई है जो कि कोर्किन्सियन श्रेणी के निक्षेपों से इनका सम्बन्ध प्रदर्शित करती है।

UNTIL the recent time on the territory of the former USSR there were reports of several species of the peculiar tree fern—*Tempskya*. Zalessky has found a part of well-preserved false trunk in redeposited state from Mugodzhzar (Western Kazakhstan), and described as *Tempskya rossica* Kidston & Gwynne-Vaughan 1911. In 1945, Prynada described a new species *T. peregrina* on the fragment of false trunk of exclusively adventitious roots from the pebbles of Tasgayan Stage in Amur River, Arkhara River Basin. Shiklina and Khudaiberdyev (1982) also recognized a new species *Tempskya yattsenko-khmelevskii* from the Lower Albian deposits of southwestern Kuldzhutau, Uzbekistan.

Recently, one more species of *Tempskya* was reported by Prynada (1945) from Primorye. Besides, the fragments of the false trunk (22 specimens in total) were found in modern fluvial deposits of Razdol'naya River tributaries in the vicinity of Strugovka, Galenki, Vol'no-Nadezhdinskoye, Pervomajskoye and Kiparisovo settlements, and in the northern Primorye in Alchan River upper-course,

Bikin River Basin (Text-figure 1). Most commonly the fragments of false trunk are 10-20 cm in size and consist of adventitious roots. Only in two specimens from Kiparisovo and Vol'no-Nadezhdinskoye environs, the individual stems with petioles have been found, and they have been studied and described.

SYSTEMATIC DESCRIPTION

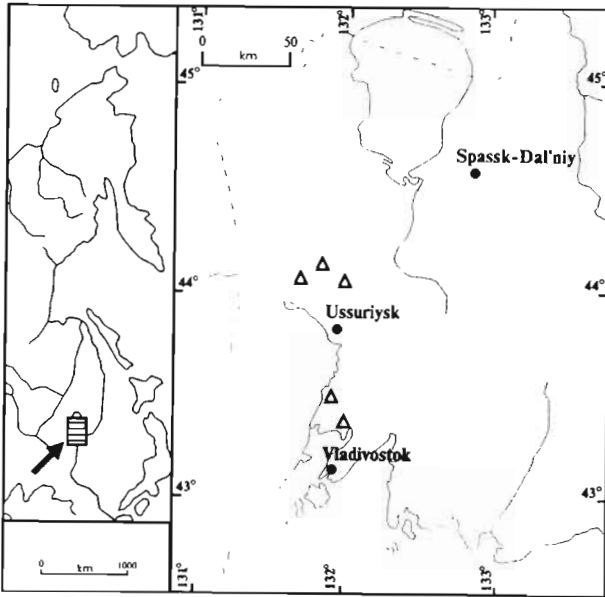
Family—*Tempskyaceae*

Genus—*Tempskya* Corda 1845

Tempskya neumyvakinii sp. nov.

Pl. 1, figs 1-5; Pl. 2, figs 1-5

Description—Both specimens represent the fragments of silicified false trunk, brown to black or red, 6 x 7 x 15 cm in size. In addition to the cross and longitudinal sections, thin sections and polished slabs have been prepared from the remaining parts. The specimens have been studied under microscope in transmitted and reflected light.



Text-figure 1—Localities (triangle) of tree fern *Tempuskyia* in the South-Western Primorye, Russian Far East.

In total, there are 18 individual stems with dorsoventral symmetrical petioles arranged in two rows on one side of the stem, and only adventitious roots on the other side. Internodes are short.

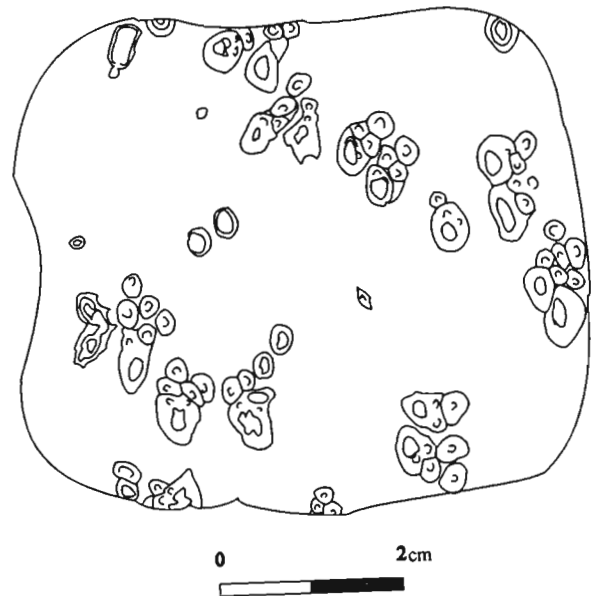
Individual stems are dichotomously branched and 3–5 mm in diameter. The stem outlines across are rounded. In cross section, cortical part, xylem and pith are well seen (Pl. 1, fig. 1; Pl. 2, fig. 2). The cortical part is simple (Ash & Read, 1976) consisting of a thin external layer of parenchyma (isodiametric cells to 30 μm across), a rather wide middle layer-sclerenchyma, and an inner layer - parenchyma (Pl. 2, fig. 3). Xylem part of the stem is represented by scalariform tracheids 30–66 μm in diameter.

In cross section near the individual stem, 3 to 6 leaf traces and petioles are with rounded cross outlines, about 2 x 3 mm in size. Besides, there are 1–2 meristemes on the initial development stages. The leaf

traces meristemes are C-shaped with free edges, somewhat thickened and recurved showing a typical character of ferns (Pl. 1, fig. 1; Pl. 2, figs 2, 10).

The adventitious roots oriented predominantly parallel to the axis main direction (Pl. 2, fig. 1), cover the most part of the false trunk. The adventitious roots are dense due to which the root cortex is deformed while the stele remains undamaged. In rare cases, the root hairs are preserved (Pl. 1, fig. 5).

The root xylem is diarch with protoxylem of exarch type composed of scalariform tracheids. Metaxylem occupies the central part of the conducting bundle and is composed of 2–3 large thin-walled scalariform tracheids with rounded or slightly angular cross section (Pl. 1, fig. 4; Pl. 2, fig. 5). The stele is surrounded by an endodermis narrow ring of 2–3 cell layers. Cortex is made up of thick-walled sclerenchyma cells (10 layers) surrounded by 3–5 layers of smaller cells (Pl. 1, fig. 4). In some areas of



Text-figure 2—Cross section diagram of the false trunk fragment of the holotype of *Tempuskyia neumyvakinii* sp. nov. showing the distribution and orientation of the stems. Specimen no. 2050-14A.

PLATE 1

Tempuskyia neumyvakinii sp. nov.

1. Cross section of the false trunk fragment showing stems with departing petioles and adventitious roots. x 6.3. Specimen 2050-14A (lower side).
2. Longitudinal section of two young adventitious roots. x 40. Thin section 2050-14/10.
3. Transversal section of the young adventitious root and epidermal tissue. Above at the left the pellets are shown. x 60. Polished slab
4. Nearly transversal section of the adventitious root with large and small tracheids of vascular bundle and cortex. x 108. Polished slab 2050-14B.
5. Longitudinal section of roots showing cortex, vascular bundle and root hairs (at bottom). x 40. Thin section 2050-14/9.

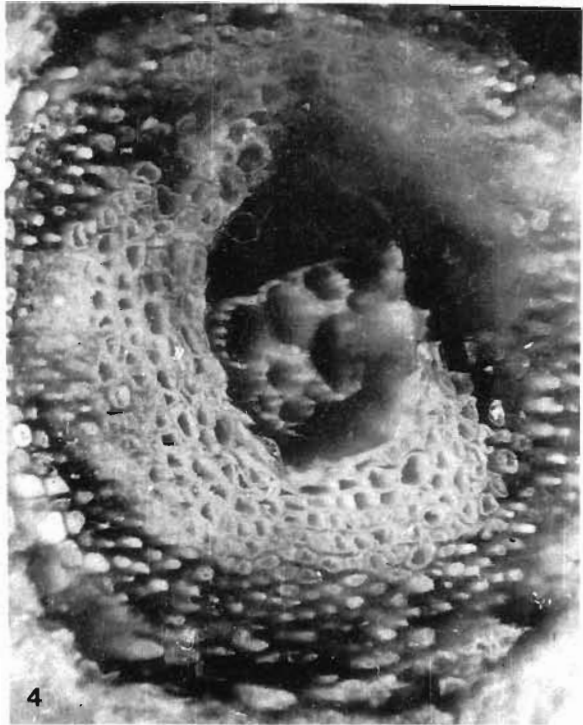
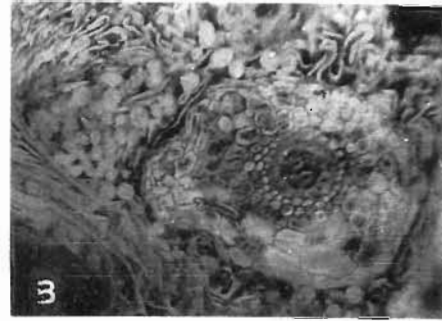


PLATE 1

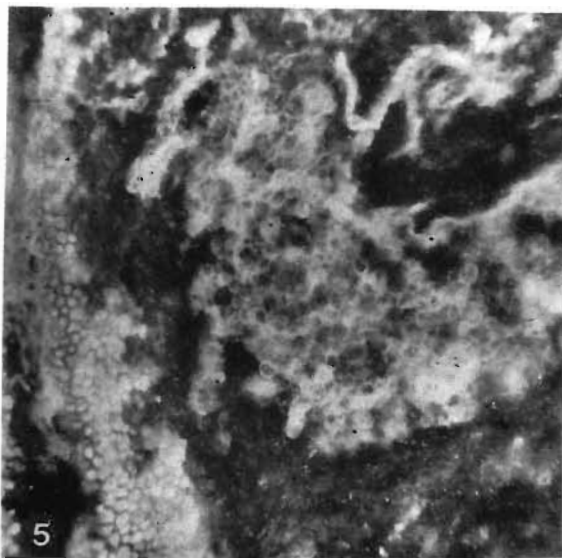
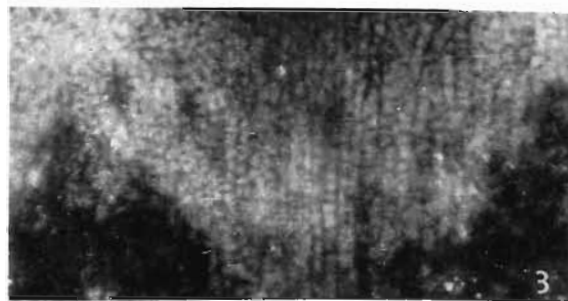


PLATE 2

the false trunk, adventitious roots are enclosed apparently by flattened cells of epidermis with varying thickness. The external cortex part consists of large parenchyma cells 100 μm in size. Cells of 2-3 inner layers adjacent to endodermis are much smaller in size (Pl. 1, figs 2, 3). Shilkina and Khudaiberdyev (1982) consider such large cells as young roots.

Along the three external surfaces of holotype, within and between roots there are variously-shaped cavities of 0.2 mm wide filled with fecal pellets of 30 x 17 to 60 x 42 μm in size (Pl. 1, fig. 3) which are traces of the organisms that parasitized on some plants, in particular on the false trunk of *Tempskya* (Tidwell & Hebbert, 1992). Besides, both holotype and paratype show rather significant areas with traces of micorhiza (Tidwell & Hebbert, 1992).

Diagnosis of species—The false trunk is composed of dorsiventral solenostelic stems 3-5 mm across, branched dichotomously and enclosed in a dense mass of interlaced adventitious roots. In cross section, there are 6-8 meristeles branching in pairs from the main stem. The internodes are short. Adventitious roots are monostelic, diarch, with a xylem of large and small scalariform tracheids.

Comparison—The species of *Tempskya* Corda 1845, under description is similar in some morphological features to the species already known. In stem size it resembles *Tempskya grandis* Read et Brown, *T. wessellii* Arnold, *T. reesidei* Ash et Read, *T. jonesii* Tidwell et Hebbert. In the number of petioles and internode size it shows affinity with *Tempskya grandis* Read et Brown and *T. superba* Arnold. Thus, the present species *Tempskya neumyvakinii* differs from the above known species in having simple three-layer cortex, greater number of petioles and short internodes.

Locality—Quarry 1 km north of the Kiparisovo Rail-way Station (specimen 2050-14); Shmidtovka River, 2 km north-east of Vol'no-Nadezh dinskoye Village (specimen 2050-15).

Age—Because of possible repeated redeposition of the specimens studied, the age and location of the original deposits containing these unusual plants remain open. Most likely, in the South-Western Primorye they were from the continental deposits of the Korkinskian Series including siltstones, sandstones, gritstones, conglomerates and tuffs, which are dated as the end of Early Cretaceous and the beginning of Late Cretaceous.

Holotype—Far East Geological Institute, Far Eastern Branch, RAS, specimen 2050-14, a redeposited fragment of the false trunk from the Quaternary deposits of the South-Western Primorye, 1 km north of the Kiparisovo Railway Station.

Etymology—The species is named after V.Z. Neumyvakin, an amateur rock collector, who collected the material.

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PLATE 2

1. Longitudinal section of the individual stem showing departing petioles (on the left) and adventitious roots (on the right) x 3.5. Polished slab 2050-14A (lower side).
2. Cross section of the false trunk fragment showing stem, petioles and adventitious roots. x 6.3. Polished slab 2050-14A (upper side).
3. Longitudinal section of the stem showing parenchymatous layer of cortex. x 72. Thin section 2050-14/10.
4. Longitudinal section of the adventitious root with large tracheids of metaxylem (middle part) and cortex on both sides. x 7.2. Polished slab 2050-14B.
5. Transversal section of petiole. x 60. Thin section 2050-14/5.