A NEW SPECIES AND A NEW FAMILY FOR THE MOSS FLORA OF RUSSIA

INTRODUCTION

Extensive exploration of the moss flora of Primorski Territory resulted in numerous records of species with generally southern distribution, including Fissidens hyalinus Wilson & Hooker (Ignatov et al., 2007), Homaliodelphus turgionianus (Mitt.), Dixon & P. Vard., Neckera konoi Broth. ex Cardot, N. polyclada Müll. Hal., N. goughiana Müll. (Ignatova et al., 2009), and Ephemerum spinulosum Bruch & Schimp. (Ignatov et al., 2013). At the same time, collecting activity was mostly concentrated on the Sikhote-Alin Mt. Range, whereas bryophyte flora of the East Manchurian Mountains situated westward and separated from the Sikhote-Alin by the Korean lowland, was hitherto insufficiently explored.

The East Manchurian Mountains is a mountain area at the western spoors of the Changbai Range with the highest point in Paektu Mt. (Changbai) at 2744 m a.s.l. Spreading eastward, the Manchurian mountains become lower and disappear near the Khanka lowland in the southern fridge of the Russian Far East. Within the Russian Far East, these spoors stretch from the Khanka Lake shore in the north to the Tumangan River mouth near the border with North Korea. In their Russian part, the East Manchurian Mts. are low (mostly not higher than 600–700 m a.s.l.), broadleaved forested, commonly with numerous rock outcrops. Unique liverwort records made there by Bakalin motivated us for a field trip with the aim of the moss flora exploration. Thus, we have recently visited Sinyaya Mt. – one of the highest points of the East Manchurian Mts. within Russia. Among others, a remarkable epiphytic moss was collected there. It attracted our attention in the field due to its habitual similarity with Orthotrichum diaphanum Brid., the species unknown in Siberia, the Russian Far East and China. However, further microscopic study revealed that the specimen contains Venturiella sinensis (Venturi) Müll. Hal. The species, the species with temperate amphipacific distribution, can be collected there. It is considered to be the southernmost record of this species in Russia.

Plants minute, dark green, creeping along bark, with ascending, lighter colored shoots. Stem with differentiated central strand, bearing brownish rhizoids on scarcely differentiated ventral surface of its plagiotropic portion, jucalicious in ascending distal portions, densely foliated, irregularly or pinnately branched. Leaves imbricate, erect when dry, spreading when wet, 0.5–1×0.25–0.5 mm in creeping shoots, 1.4–2.0×0.5–0.7 mm in ascending shoots, from ovate base abruptly or gradually (in upper leaves) narrowed into hyaline acumen 0.1–0.7 mm long, reaching the half of leaf length in upper leaves, flat or twisted in upper leaves, serrulate; margins flat, mostly entire (excepting acumen); ecostate; upper laminal cells (43–)50–90(–106)×18–30 μm, elongate-hexagonal to elongate-rhomboidal, smooth, thin-walled or slightly collenchimatose, gradually or abruptly transiting to linear, thick-walled cells of hyaline acumen, in proximal part along margins in several rows quadrate, rounded-quadrate and transversely rectangular, (14–)18–26×25–35 μm, slightly collenchimatose, in 1–2 marginal rows often with slightly thickened transverse walls. Cladophiacous. Perichaetial leaves pale, sheathing, similar to lower leaves of ascending shoots. Setae short, ca. 0.5–0.7 mm, straight. Capsules 1–1.2 mm long, immersed, erect, symmetric, short cylindrical, pale yellow, smooth to irregularly longitudinally rugose, with numerous unicellular stomata in proximal half; exothecal cells rectangular, rather thin-walled; annulus 59–74 μm wide, persistent, composed of 3–4 rows of hyaline, inflated, ellipsidal cells; peristome hapleolpideous, of 16 well developed, undivided, narrow-triangular, papillose, orange teeth up to 200 μm long, spreading to reflexed when dry; operculum bright orange, conic-rostrate. Calyptrae campanulate, almost fully covering capsules, lobed at base, plicate, with serrate plicae, naked. Spores large, 33–40 μm, papillose.

Variation. North American specimens of V. sinensis were segregated in a separate variety, angusti-annulata Griffin due to the difference in width of annuli, 57–69 μm in North American plants vs. 69–129 μm in Asian plants, and the shape of distal tiers of annular cells, which are quadrate to octagonal in American plants vs. ellipsooidal to rhomboidal in Asian plants (Pursell & Allen, 2007). In this respect Russian specimen corresponds to “American” var. angusti-annulata rather than to East Asian type variety, though the studied Japanese specimen had annuli ca. 63–66 μm wide, and thus, fitted to “var. angusti-annulata” as well. At the same time, our specimen remarkably differs from American population both in capsule length and spore size, the only remaining distinctive characters between var. angusti-annulata and the type variety. Rather large spores (22–40 μm) exactly fit neither to inland Asian specimens from Korea (25–36 μm) and China (23–37.5 μm), nor to American specimens (21–30 μm), but they correspond to Japanese specimens, where spore size varies from 21 to 45 μm. Likewise, capsule length in few mature capsules from our specimen is 1–1.2 mm, less than in American plants (1.2–1.5 mm) and somewhat less than in Asian ones. However, a restricted number of specimens available for our study precludes an exact placement of our specimen, so we refer it to V. sinensis s.l.

Differentiation. By growth on tree trunks and having campanulate and plicate calyptrae, V. sinensis resembles species of the genus Orthotrichum, according to our field impression, especially O. diaphanum, which also shares with Venturiella hyaline hair points of leaves. However, creeping plants with ecostate leaves, elongate-hexagonal upper leaf cells and single peristome are unique among species of the Russian moss flora. It differs from other species of the family Erpodiaeae in having smooth leaf cells and peristomate capsules.

Ecology. In newly revealed locality, the species was found on bark of Quercus mongolica in dry oak-dominated deciduous forest. Further examination of this spot of forest has not revealed any other tree colonized by the species. Griffin and Sharp (1971) noted xeric climatic conditions as characteristic for the areas inhabited by V. sinensis in North America, where it occurs on trunks of Acer; Ulmus, Quercus, and Juniperus, as well as on sandstone outcrops (Redfearn, 1970; Richardson, 2010). In Japan and China, V. sinensis is a rather common epiphytic plant in deciduous forests and in city areas (Noguchi & Iwatsuki, 1988; Wu et al., 2011). The latter note corresponds to the observation of ecology of the whole Epodiaeae in Yunnan (Wen-Zhang & Shevock, 2015), where it actively colonizes deciduous trees in areas transformed by human activity and even favor some level of disturbance.

Distribution. The species occurs in East Asia (Japan, China, Korea, Taiwan and Thailand) (Noguchi & Iwatsuki, 1988; Wu et al., 2011; Printarakul et al., 2014) and southern states of USA (Arkansas, Oklahoma and Texas), where it is represented by var. angusti-annulata (Pursell & Allen, 2007) (Fig. 2). It is generally associated with temperate and tropic climatic conditions, but occurs neither in the Mediterranean nor in the Madrean floristic region. It penetrates northward to Jilin in China and to Hokkaido Island in Japan (Suzuki, 2016). Tan & Iwatsuki (1996) mentioned V. sinensis among floristically important moss taxa. According to Iwatsuki (1972), in Japan the species avoids areas with deep snow cover; this pattern well corresponds with our finding in the East Manchurian Mts., the territory with least amount of snow within Primorsky Territory. Redfearn (1986) considered V. sinensis as a taxon of critical importance, which was a component of Arcto-Tertiary flora and dispersed into the Interior Highlands of USA during the Pleistocene.
Fig. 1. *Venturiella sinensis* (from: Russia, Primorye Territory, Fedosov, Pisarenko & Bakalin s.n., MW). 1 – habit, dry; 2–3 – habit, wet; 4 – calyptra; 5 – peristome tooth; 6 – capsule; 7 – median leaf cells; 8 – exothecium and stoma; 9 – upper leaf cells; 10–12 – leaf apival parts; 13 – stem transverse section; 14 – perichaetial leaf; 15–18 – stem leaves; 19 – basal leaf cells. Scale bars: 2 mm for 1; 1 mm for 2–4, 6; 0.5 mm for 14–18; 0.2 mm for 10–12; 100 μm for 5, 7–9, 13, 19.
Specimens examined: Primorsky Territory, Khankaiskij Dist., near a sharp bend in the road A183 ca. 3 km southward from the top of Mt. Sinyaya (44°50'00.4"N – 131°41'49.0"E, ca 350 m. alt.), in oak dominated deciduous forest, on bark of Quercus mongolica, 23.VIII.2016, Fedosov, Pisarenko & Bakalin s.n. (MW). S+.

Four genera are recognized in the family Erpodiaceae by most authors, including Erpodium, Venturiella, Aulacopilum and Wildia (Crum, 1972; Vitt, 1984; Goffinet et al., 2009), otherwise three latter genera are placed into one variable genus Erpodium (Stone, 1997). Species in this family share a creeping growth, pinnate branching, somewhat complanate shoots, undifferentiated costa, oblate-hexagonal leaf cells, and mitrate calyptra (De Luna, 1995). Their distribution is generally associated with tropical and subtropical regions (Fig. 2). Wen-Zhang & Shevock (2015) note that in southern China species of the Erpodiaceae increased their occurrence in areas where urbanization of rural landscapes took place. According to their observation, moderately shaded trunks of solitary trees are an especially favorable habitat for species of the family, since moderate amount of direct sunlight contributes to their ability to compete against other bryophytes with less drought tolerance.

In general, the East Manchurian Mts. provide the house for several taxa which do not pass the Khanka lowland and do not occur in the Sikhote-Alin Mountain Range, despite potential ability to grow there due to a similar climate and landscape. In addition to the warmest climate within the Russian Far East (Ivashinin, 1999), the low amount of snow also contributes to climatic peculiarity of the area. This is the only place where representatives of several temperate and presumable paleotropical relict taxa of vascular plants (Cakile edentula, Cyperus teniùspica, Fimbrystilis dichotoma, Hypericum laxum, Lipocarpha microcephala, Mitrasacme indica, Utricularia caerulea, Ruppia megacarpa) occur in Russia (Kozhevnikov & Kozhevnikova, 2014) and this trend involves bryophytes as well. For instance, at least three taxa of liverworts, i.e., Cylindrocolea kiaeri (Austin) Vâña, Odontoschisma pseudogrosseverrucosum Gradst., S.C. Aranda & Vanderp. and Scapania ciliata Sande Lac. are known in Russia only from the East Manchurian Mts. (Aranda et al., 2014; Choi et al., 2012; Ellis et al., 2016). The East Manchurian flora is well represented in Kedrovaya Pad’ Strict Nature Reserve, that was regarded as the least disturbed area within Russian Manchuria (Vasiljev et al., 1984). The Russian part of The East Manchurian Mts. is therefore a promising area for bryological exploration. Some Manchurian taxa widely distributed in North Korea and Chinese Jiín are likely to be found there.

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LITERATURE CITED


