

BRYOPHYTE MOLECULAR BARCODING RECORDS. 7

БРИОЛОГИЧЕСКИЕ НАХОДКИ ПО РЕЗУЛЬТАТАМ ДНК-МАРКИРОВАНИЯ. 7

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Abstract

DNA-barcoding revealed/confirmed the range extension of the following bryophytes: *Lophozia silvicoloides* (Khanty-Mansi Autonomous Area), *Andreaea rothii* (Tuva Republic), *Afoninia dahurica* (Republic of Buryatia), *Trematodon laetevirens* (Murmansk Province).

Резюме

С помощью ДНК-баркодинга выявлены или подтверждены находки за пределами основного ареала следующих видов мохообразных: *Lophozia silvicoloides* (Ханты-Мансийский автономный округ), *Andreaea rothii* (Республика Тыва), *Afoninia dahurica* (Бурятия), *Trematodon laetevirens* (Мурманская область).

KEYWORDS: mosses, new records, molecular markers, nrITS, Russia

INTRODUCTION

This paper continues the series of brief reports of new findings in the course of the bryophyte DNA studies. It presents various finding where the sequencing either confirms species identities, which are ambiguous by various reasons, or disclose their affinities, or support generic placements of certain taxa that have never been investigated for molecular markers earlier, or have never been barcoded previously, or have been barcoded from different parts of the world. Being obtained in the course of screening rather than special projects of a particular

group, such data may remain unsubmitted to DNA databases and stay neglected and not searchable among published materials.

1. *Lophozia silvicoloides* N. Kitag.

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GenBank accession numbers are OP811455 for ITS1-2 nrDNA and OP821982 for *trnL-F* cpDNA.

Specimen: Russia, Khanty-Mansi Autonomous Area, Beloyarsky District, Nature Reserve “Numto” 63.66081°

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N – 70.58116° E, wooded spruce-birch-*Pinus sibirica* swamp with dominance of *Menyanthes trifoliata* and *Sphagnum* species (*S. girgensohnii*, *S. squarrosum*, *S. fimriatum*) in the taiga stream valley, on rotten wood. coll. I.V. Filippov 14.VIII.2022 #030F/3-22, det. A.A. Vilnet, A.D. Potemkin and E.D. Lapshina, YSU-MH-04195, LE B-0026552.

Noticeable admixture among *Symblepharis elongata*, associated with *Lepidozia reptans*, *Cephalozia bicuspadata*.

After description of *Lophozia silvicoloides* from Japan (Kitagawa, 1965) it was reported from Svalbard, European and Siberian Russia (Murmansk Region, Bashkiriya, Taymyr, Yakutiya, Magadan, Khabarovsk and Primorye regions, Sakhalin, Kamchatka, Kuril Islands), Korea, and Alaska in North America (<https://www.catalogueoflife.org/data/taxon/3W4TD>, accessed on 17.XI.2022; <https://www.gbif.org/species/8025634>, accessed on 17.XI.2022). Its identification confirmed by comparison with molecular records that were known from Svalbard, Murmansk Region and Kamchatka Territory (Vilnet *et al.*, 2010, Konstantinova *et al.*, 2020). Newly sequenced accession did not reveal genetic divergence from previously published data in ITS1-2 and *trnL-F* (Mega 11: Tamura *et al.*, 2021). It seems that *Lophozia silvicoloides* is a quite molecularly stable species within its range.

The specimen in question was studied soon after collecting. It contains plants with numerous perianths, mature capsules, and gemmae; oil bides 12–20 per cell with ± distinct but occasionally submerged central homogeneous drop; the perianth mouth diagnostic lobulate-dentate.

2. *Andreaea rothii* F. Weber & D. Mohr

Contributors: O.Yu. Pisarenko, A.V. Fedorova, V.E. Fedosov

Specimen: Russia, Tyva Republic, Mongun-Taiginsky Distr., Southern Macroslope of Mongun-Taiga Mt., watershed of Orto-Shegetay and Toolaity Creeks (50.16230°N, 90.07738°E, ca. 3070 m alt.), boulders near snow bed. Coll. Pisarenko, 28.VII.2019, #NSK2008392 (NSK, dupl MW).

GenBank accession number: OQ067338 for *rps4*.

Due to possessing very strong incrassate costa, the species was referred to *Andreaea crassinervia*. However, molecular obtained sequence of the *rps4* gene is identical with three sequences from GenBank, AF306952, AF478249 and AY312866, representing *A. rothii*, all three apparently based on North American specimens.

Andreaea species are extremely rare in the Republic of Tuva; the arid climate of the region does not favor them. Mongun-Taiga mount is the highest peak of Tuva and all of Eastern Siberia, with a height of 3976 m above sea level. It is located in the extreme south-west of the republic on the border with the Mongolian Altai, at the junction of the Altai and Sayano-Tannuolsky uplifts; the southern

macroslope faces the Great Lakes Basin. The massif is composed of crystalline schists and sandstones with granite intrusions in the center part. The territory belongs to the arid bioclimatic sector. The climate is sharply continental; the character traits are mean annual temperatures below zero with large annual temperature amplitudes and low precipitation (~500 mm) with uneven distribution throughout the year. In the vegetation cover, the forest belt is reduced; the altitudinal column consists of the steppe and high-mountain belts, and the background vegetation of the highlands are *Cobreisa*-dominated communities. At altitudes of more than 3000 m, stone screes predominate, and higher plants are few. The snow line passes at an altitude of 3500–3600 m, but on the slopes of shady exposures, small snow spots in the middle of summer can be found at altitudes of 3000 m and lower. *Andreaea* specimen was collected from just such a habitat.

Previously the species was known in Russia from the northern part of European Russia (Ignatov *et al.*, 2006) and the database of moss flora of Russia provides three localities of the species, in Kola Peninsula (Chiltald Massif), subpolar and polar Urals. This species is common along both Atlantic and Pacific coasts of North America. In Europe this species also is widespread excepting Islandia, Mediterranean Region and East Europe. At the same time, in Asia until present the species was reported from a few localities: in Tibetan (Zhongdian or Shangri-La vicinity), Himalayas (Nepal, Yamphudin) (GBIF, <https://doi.org/10.15468/dl.x2gbuq> Accessed 4.12.2022); generally the record of this species in such a continental area was somewhat unexpected, but molecular data support our identification. Noteworthy, Crum & Anderson (1981) did not refer to *Andreaea crassinervia* several eastern North American specimens which could fit to it morphologically, while Corley *et al.* (1981) considered *A. crassinervia* as a synonym of *A. rothii*.

3. *Afoninia dahurica* Ignatova, Goffinet & Fedosov

Contributors: D.Ya. Tubanova, O.D. Dugarova, S.G. Kazanovsky

Specimen: Russia, Republic of Buryatia, Zakamenskiy District, Dzhidinskiy Ridge, about 10 km to SSE from Mikhailovka Village, floodplain of Buluktay River (tributary of Tzedzhe River), steppe SW slope, outcrops of bedrock, 50°19.053'N, 104°12.364'E, 1037 m a.s.l., on soil, 29.VI.2018, D.Ya. Tubanova #Z183113 (UUH). With sporophytes.

GenBank accession numbers are OP984706 for ITS1-2 nrDNA and OQ025088 for *trnL-F* cp DNA.

The comparison of the newly obtained nucleotide sequence with the accessions from specimens from Zabaikalsky Territory (KP342458, KP342459, KP342464, KP342465) confirmed their identity. The species was described from Zabaikalsky Territory (Ignatov *et al.*, 2015) and was subsequently found in Zakamenskiy District of Buryatia (Ellis *et al.*, 2019). Here we provide an additional records from two new localities in Buryatia:

(1) Dzhidinskiy District, S macroslope Malyi Khamar-Daban Ridge, about 1.5 km to NNE from Khuldat Village, the thickets of willow and poplar, rock outcrops by the road, 50°30.480'N, 104°41.688'E, 752 m a.s.l., on soil-covered rocks 29.VIII.2020, *Tubanova M201419*, *M201421* (UUH), with the sporophytes; (2) Tunkinskiy District, National Park "Tunkinskiy", right riverside of the Margasan River, the rocky slope, 51°40'57"N, 102°53'37"E, 749 m a.s.l., on soil, *Kazanovsky 3114* (IRK), with sporophytes. The species is an endemic for the steppe regions of Transbaikalia.

Trematodon laetevirens Hakel'ier & J.-P. Frahm

Contributors: O.A. Belkina, A.A. Vilnet

Specimen: Russia, Murmansk Province, 68.275°N, 31.006°E, Tuadash-Tundry Mts., right source of Malaya Kon'ya river, altitude 500 m, tundra belt, S-facing gentle slope, dry bedrock outcrops among low-shrub-tundra; on soil over the rock ledge. 11 VII.1988; field number 207-2-88; КРАБГ(М)#7094 Coll. and det. O.A. Belkina [О.А.Белкина]

GenBank accession numbers are OP762027 for ITS1-2 nrDNA and OP773813 for *trnL-F* cpDNA.

The nucleotide sequence data for the specimen from Tuadash-Tundry Mts. were obtained according with protocols described in Belkina & Vilnet (2019). This specimen did not reveal genetic variability with previously tested samples from Murmansk Province, Sweden and Norway in both ITS1-2 and *trnL-F*, and possess with them similar insertion of GCC-motif at the 5'-end of ITS2, which is absent in samples from Kamchatka and Chukotka (Mega 11: Tamura *et al.*, 2021).

Trematodon laetevirens was recently found in Russia (Belkina & Vilnet, 2020) and now it is known in Khibiny Mts. (Murmansk Region), Anadyr' River Basin (Chukotka Autonomous Region) and from Ushkovsky volcano (Kamchatka Peninsula). This species is rare in the world and it was collected only in several locations: in Norway, Sweden (Hallingbäck, 2006), Greenland (Mogensen, 1980, 1983; Humle, 1987; Zander, 2007), Yukon Territory in Canada (Vitt *et al.*, 1987) and adjacent Alaska in the United States (Stehn & Kofranek, 2014). New finding in Tuadash-tundra is the fourth known locality in Russia and the second in European Russia.

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