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SPHAGNUM BERINGIENSE (SPHAGNACEAE, BRYOPHYTA) IN RUSSIA

SPHAGNUM BERINGIENSE (SPHAGNACEAE, BRYOPHYTA) В РОССИИ

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Abstract

Distribution of *Sphagnum beringiense* in Russia is revealed based on a revision of herbarium collections. The species occurs in Yamal and Tazovsky Peninsulas, in eastern Taimyr, Yakutia, and Russian Far East from Chukotka to Primorsky Territory. Description and illustrations of the species based on Asian specimens are provided, its distribution in Russia is mapped and key to identification of species from subgenus *Subsecunda* with multi-layered epidermis is given.

Резюме

В результате ревизии гербарных коллекций выявлено распространение *Sphagnum beringiense* в России. Вид встречается на восточном Таймыре, в Якутии, на Дальнем Востоке от арктических районов Чукотки до Приморского края, единичные находки известны в Западной Сибири (Ямал, Тазовский полуостров). Приводится описание вида и его иллюстрации, основанные на азиатском материале, карта распространения в России и ключ для определения видов рода *Sphagnum* подрода *Subsecunda* с многослойным гиалодермисом.

KEYWORDS: subgenus *Subsecunda*, Asian Russia.

INTRODUCTION

Sphagnum beringiense A.J. Shaw, R.E. Andrus & B. Shaw was recently described from Arctic Alaska (Shaw *et al.*, 2008). It belongs to the subgenus *Subsecunda* (Lindb.) A.J. Shaw (Shaw *et al.*, 2010) and resembles *S. platyphyllum* (Lindb. ex Braithw.) Sull. ex Warnst. in appearance, but differs in having fascicles of spreading and pendent branches. Microscopically, it is most similar to *S. contortum* Schultz. *Sphagnum beringiense* was detected in Russia for the first time from recent collections of one of the authors (VEF), made in Taimyr (Fedosov *et al*., 2011). A revision of herbarium materials from Asian Russia was subsequently undertaken by the senior author (AIM). Specimens identified as *S. platyphyllum* and *S. contortum* from LE, MHA, MW, PTZ, and SASY were mainly studied, ca. 130 specimens in total were checked. Among them, ca. 50 specimens were re-identified as *S. beringiense*. At the same time, in 2015 K. Flatberg revised collections of O.M. Afonina from Chukotka in LE and also identified *S. beringiense* (Flatberg *et al*., 2016). In addition, the species was identified from Yakutian collections of the senior author (AIM) and third author (EAI) and from some other recent collections of VEF, O.Yu. Pisarenko, A.G. Bezgodov and I.V. Czernyadjeva. In this paper, we summarize the data on distribution of *S. beringiense* in Russia and its ecology. Morphological description is based on specimens from Taimyr Peninsula, Varngel Island, Chukotka, and Yakutia.

TAXONOMIC TREATMENT

Sphagnum beringiense A.J. Shaw, R.E. Andrus & B. Shaw, Syst. Bot. 33: 471. 2008. Fig. 1

Plants medium-sized to large, in small patches, yellowish-green, grayish-yellow or, occasionally, yellowish-green with pinkish tint. Terminal bud weakly differentiated. Capitulum well delimited, round. Stems light brownish, rarely yellow or green, hyalodermis well differentiated, 2–3(–4)-layered, efibrillose and non-porose. Sclerodermis well delimited, consisting of small thick-walled cells, light yellow to reddish-brown, occasionally dark brown. Stem leaves short to elongate lingulate-triangular, 0.8–1.1(–1.5) mm long and 0.6–0.9 mm wide, marginal border narrow, usually not widened at leaf base. Hyaline cells in distal 1/3–1/2(–2/3) portion of stem leaf fibrillose and usually non-septate, on convex surface with numerous thin-ringed or non-ringed pores 5–8 μm in diam. along commisures, on concave surface with numerous or few weakly ringed or non-ringed pores 4–6 μm in diam. Branch fascicles with 1–2 spreading and 1–2(–3) pendent branches. Branch leaves in the middle part of spreading branches ovate to ovate-lanceolate or almost round, concave, 1.3–2.1 mm long and 0.8–1.3 mm wide,

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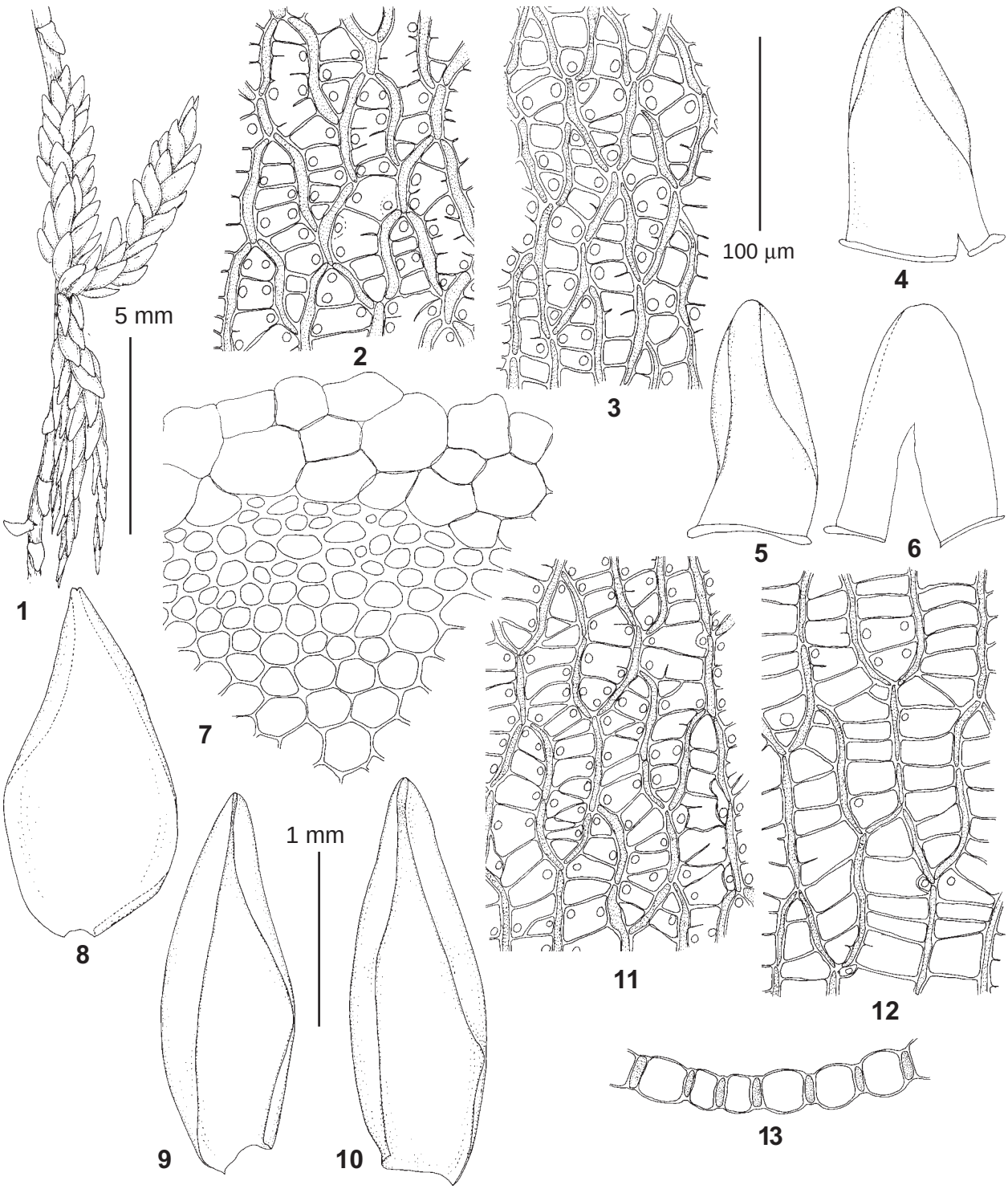

Fig. 1. *Sphagnum beringiense* A.J. Shaw, R.E. Andrus & B. Shaw (from: Russia, Vrangel Island, 13.VIII.1985, *Afonina 60*, LE). 1 – part of stem and branch fascicle, dry; 2 – cells on convex surface of stem leaf in its distal portion; 3 – cells on concave surface of stem leaf in its distal portion; 4–6 – stem leaves; 7 – stem transverse section; 8–10 – branch leaves; 11 – cells on convex surface of branch leaf; 12 – cells on concave surface of branch leaf; 13 – leaf transverse secion. Scale bars: 5 mm for 1; 1 mm for 4–6, 8–10; 100 µm for 2–3, 7, 11–13.

weakly secund; hyaline cells on convex surface with rounded ringed or thinly ringed pores in continuous or discontinuous rows along comissures, on concave surface without pores or with few or more numerous rounded pores 4–6 µm in diameter. Chloropyllous cells in branch leaf transverse section lens-shaped or rectangular, equally open on concave and convex surfaces and with equally thickened walls on both ends (Fig. 1: 13). Gametangia and sporophytes not seen in specimens from the territory of Russia.

Differentiation. *Sphagnum beringiense* is most similar to *S. platyphyllum* in appearance, and occasionally it looks like *S. contortum*. It differs from *S. platyphyllum* by well developed branch fascicles consisting of both spreading and pendent branches (the latter usually absent in *S. platyphyllum*) and by stem leaves smaller than branch leaves (vs. stem leaves are equal in size or larger than branch leaves). There also is some difference in hyalodermis structure between these species, *i. e.*, in *S. beringiense* hyalodermis is 2–3(–4)-layered, while in *S. platyphyllum* it consists of 2–1 layers of hyaline cells. *S. beringiense* shares with *S. contortum* 2–3-layered stem hyalodermis, lingulate-triangular shape of stem leaves, which have fibrils and pores in their distal portion; however, stem leaves of *S. beringiense* are larger, 0.8–1.1(–1.5) vs. 0.7–1.mm long, they usually have numerous large pores on both surfaces, while stem leaves of *S. contortum* have few pores on convex surface and numerous pores on concave surface; furthermore, pores on convex surface of branch leaves are different in these species: they are medium-sized and thin-ringed and form more or less continuous rows along commisures in *S. beringiense*, and are much smaller, in discontinuous rows in *S.contortum*.

Ecology. *S. beringiense* predominantly grows in various types of moist and wet tundra with intermediate conditions in terms of inorganic nutrition. These are communities with dominance of sedges, cotton grasses, dwarf willows, dwarf arctic birch, blueberry, and hygrofilous mosses.The species also occupies mires of various types: according label information, these are sedge-cotton grass-sphagnous mire in brook valley; cotton grass-sedge mires in river flood valleys; low hillocky mire with *Calamagrostis langsdorfii, Carex saxatilis, C. eleusinoides, Calliergonella lindbergii, Straminergon stramineum,* and *Aulacomnium palustre*; sedge-sphagnous mire in mountain saddle; flat hummocky bog; polygonal mires; shrublet-sedge-mossy subalpine and hanging bogs. The species was also collected in forested mires, mainly with larch and occasionally with *Alnus fruticosa*, in wet willow thickets and in swampy meadows with *Calamagrostis* and sedges in flood plains*,* on wet rock outcrops and on rocky mountain slopes. Among accompanying species, *Sphagnum teres, S. tundrae* and *S. warnstorfii,* as well as *Tomentypnum nitens, Straminergon stramineum, Oncophorus virens, Paludella squarrosa,* and *Scorpidium* spp. are most common.

Distribution. Among eight species of the subgenus *Subsecunda* known from Asian Russia, *S. beringiense* turned out to be one of the most widespread. It is rather common in Taimyr, Yakutia and Chukotka and is known from few localities in West Siberia and southern part of Russian Far East (two localities in Amurskaya Province and one in Primorsky Territory, Fig. 2). In North America its distribution area is restricted to the western coastal area (Alaska, Washington and British Columbia) (Shaw *et al.*, 2008). So, generally the distribution is to be attributed to Beringian pattern.

Most old collections from Asian Russia identified as *S. contortum* actually belong to other species. Specimens from northern areas of Siberia and Russian Far East were re-identified mainly as *S. beringiense*, whereas collections from southern territories with oceanic climate turned out to be *S. inexspectatum*. *Sphagnum contortum* is apparently absent in East Siberia and Russian Far East, while its presence in West Siberia needs in confirmation. *Sphagnum platyphyllum* was also reported from many regions of Asian Russia (Ignatov, Afonina, Ignatova *et al.*, 2006). We can confirm its presence in Kamchatka Peninsula, Iturup Island, Sakhalin Island, Buryatia, and Yakutia, but its distribution area should be studied in more detail.

*Selected specimens examined***:** ASIAN RUSSIA: **Yamalo-Nenetskyj Autonomous District:** Yamal Peninsula: Vicinity of Ngaranato Lake (70°17'N; 68°57'E), 4.VIII.1981, *Rebristaya* (LE); vicinity of Syunyaj-Sale Settlement, terrace of Lower Khorutta River (66°55'N; 71°00'E), 8.VIII.1996, *Rebristaya* (LE); Tazovskyj Peninsula: without exact locality, 1986, *Rebristaya* (LE). **Krasnoyarsk Territory, Taimyrsky Autonomous District**: Taimyrsky State Reserve: Bikada River lower course near Bikada field station (74°50'N; 106°10'E), 15.VIII.1988, *Pospelova* (MW); northern shore of Taimyr Lake, Ledyanaja Bay, Karovyj Cape (74°24'35"N; 99°29'11"E), 28.VI.2004, *Fedosov Sph28* (MW); same locality, Primetnyj Creek basin (74°29'43"N; 99°42'01"), 8.VII.2004, *Fedosov Sph10* (MW); same locality, Ledyanaja Bay NE shore (74°26'N; 99°43'40"E), 13.VII.2004, *Fedosov Sph51* (MW); same locality, Perevalnyj Creek canyon (74°27'41N; 99°42'32"E), 23.VII.2004, *Fedosov Sph39* (MW); vicinity of Malaja Logata River mouth (73°25'N; 98°24'E), 8VIII.1988, *Pospelova s.n.* (MW); vicinity of Ary-Mas field station; Novaja River valley (72°27'N; 101°30'E), 1.IX.2007, *Fedosov 07A-1-4, 07A-1-8, 07A-1-9* (MW); Kotuykan River valley near Merkyu River mouth (70°19'53.22''N; 106°50'12.3''E), boggy duct bank, 15.VII.2011, *Chinenko s.n.* (MW); Khatanga Settlement vicinity, watershed eastward Kotuy River lower course (71°40'N; 102°34'E), 18.VIII.2004, *Fedosov s.n.* (PTZ, MW); vicinity of the Fomich River mouth, Anabarka River valley (72°09'60"N; 110°45'70E), 15.VII.2008, *Fedosov 08-52* (MW); vicinity of Medvezhja River mouth (71°09'47"N; 102°42'18"E), boggy terrace of Kotuy River, 16.VII.2005, *Fedosov 05-567* (MW); the same place (71°09'15"N; 102°40'16"E), 21.VI.2005, *Fedosov 05-29* (MW); Khatanga settlement outskirts, Eriechka river upper course, Nyamakit-Daldyn mouth, Eriechka River valley opposite Sare-Mas Creek mouth, 9.VIII.2013, *Fedosov 13-3-0891* (MW); Khatanga settlement outskirts, Kotuy River lower course, Rotuy River valley slope opposite Eriechka River mouth, terrace, 21.VIII.2013, *Fedosov 13-3-1171* (MW). **Republic Sakha/Yakutia:** Lena River estuary vicinity, Lyalkina Mt. (Kharaulach Ridge spur) near Tiksi Settlement, 28.VIII.1988, *Filin s.n.* (MW); Anabarsky Distr., 90 km northward Saskylakh Settlement, Anabar River right bank near Srednyaja River mouth, 11.VIII.1979, *Egorova* (IRK); Kytalyk resource reserve (70°49'52"N; 147°30'25"E), Berelekh Creek right bank, 26.VII.2005, *Maksimov PTZ 12764, 12765, 12766* (PTZ); Kytalyk resource reserve (70°49'52"N; 147°30'25"E), Berelekh Creek left bank, 27.VII.2005, *Maksimov PTZ 12767* (PTZ); Indigirka River lower course, Malaya Ercha River basin; Bolshoy Tugutchan Creek, 2.VIII.1974, *Afonina* (LE); Oymya-

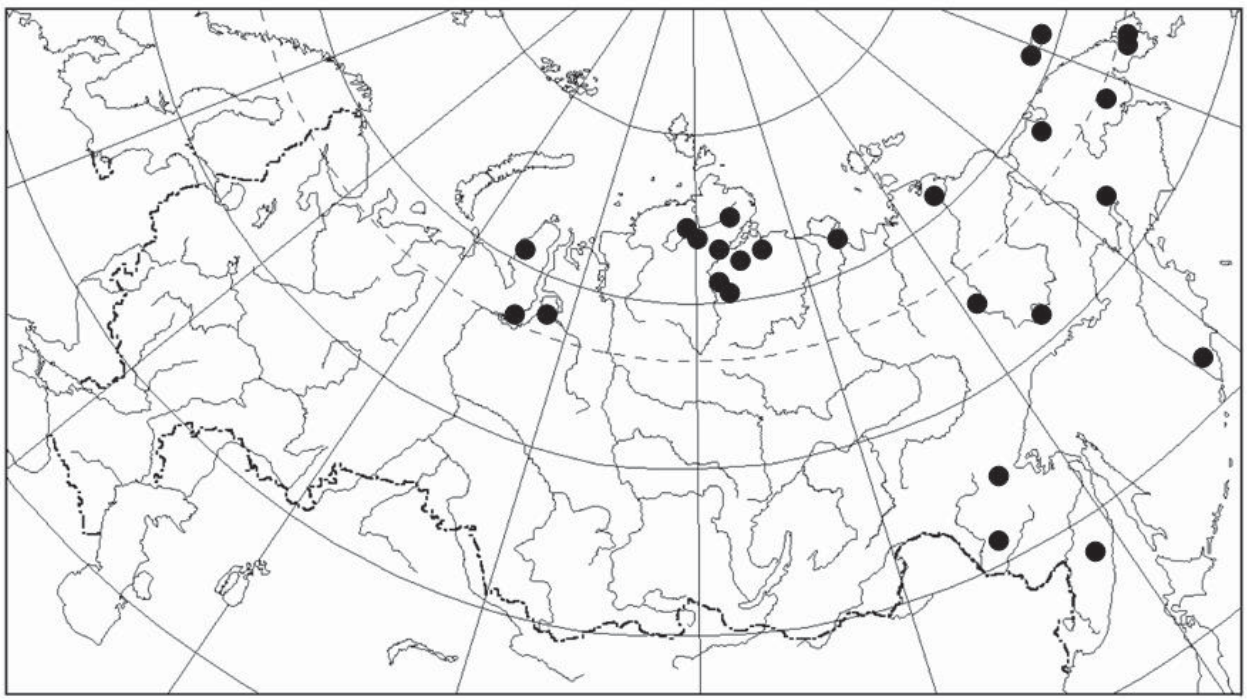

Fig. 2. Distribution of *Sphagnum beringiense* in Russia.

kon District, 10 km westward Ust'-Nera Settlement (64°32'57"N; 143°00'25"E), *Betula exilis* dominated larch forest near Yt-Yuryakh Creek, 4.VIII.2015, *Ignatov & Ignatova 15-1456* (MHA); the same area, *Betula exilis* & sedge dominated bog in flood plain of Indigirka River, 6.VIII.2015, *Ignatov & Ignatova 15-1423* (MHA). **Chukotsky Autonmous District:** Vrangel Island: Lednikovaja River basin (71°12'N; 179°00'E), 23.VII.1985, *Afonina 2* (LE); Somnitel'naja River valley, 13.VIII.1985, *Afonina 60* (LE); Drem-Hed Mt. (71°25'N; 179°47'W), 29.VII.1985, *Afonina 59* (LE); vicinity of Somnitel'naja Bay, Bazovyj Creek upper course (70°56'N; 179°37'W), 16.VIII.1985, *Afonina 24* (LE); Neozhydannaja River middle course (70°54'N; 178°50'E), 12.VII. 1985, *Guljaev s.n.* (LE); hot springs in Gil'mimliveem Creek basin 15 km eastward Ioni Lake (65°48'N; 173°15'W), 26.VII.1977, *Afonina* (LE); vicinity of Ioni Lake, Ioniveem Creek middle course, Ioni Mt. (65°53'N; 173°44'W), 5.VII.1977, *Afonina s.n.* (LE); Anadyr' River basin; vicinity of Enmyvaam Creek, Belaja River tributary, 13.VIII.1980, *Afonina s.n.* (LE); Anadyrskyj District, Pekul'nej Ridge southern edge, Yuzhnyj Pekul'nejveem River middle course (65°15'N; 174°31'E), 10.VIII.1979, *Afonina s.n.* (LE); Vostochno-Tundrovskyj District, Bol'shoj Anuyj River right bank watershed between Khetachan and Krichal'skaja Rivers, 24.VII.1951, *Kovyleva s.n.* (MW); Chaunskyj Distr., watershed between Lelyuveem and Umrel'skaja Rivers 22 km SE Neitlyn Settlement, 8.VI.1953, *Gryazev s.n.* (MW); Anadyr' River upper course, Talitva Mt., 6.VIII.1931, *Tyulina s.n.* (MW); Anyui Plateau, vicinity of Bilibin Settlement (68°04'N; 166°25'E), 18.VIII.1972, *Afonina s.n.* (LE); Anadyr River basin; vicinity of Baran'e Lake (66°54'N; 175°15'E), 2.VIII.1980, *Afonina s.n.* (LE); Palyavaam River middle course, 22.VII.1989, *Afonina s.n.* (LE); Anuyjskoe Plateau, Kyten River Canyon; 19.VIII.1977, *Andreev s.n.* (LE). **Kamchatsky Territory**: Penzhinskij Distr., vicinity of Ust'-Penzhino Settlement, 5.VIII.1960, *Kildyushevskij 72/7* (LE); Kamchatka Peninsula, Ust'-Bol'sheretskij Distr., middle course of Bannaya River (52°54'N; 157°30'E, 600 m alt.), 7.VIII.2002, *Czernyadjeva 52* (LE). **Magadan Province**: Ten'kinsky District, Detrin River floodplain ca. 43 km upsream its mouth, 24.VII.1972, *Blagodatskikh s.n.* (LE). **Amurskaya Province**: Tom' River basin (upper course), 9.VIII.1926, *Kuzeneva 29* (LE, PTZ); Sutar River basin; vicinity of Konstantinovskij mine, 16.IX.1926, *Selivanova 193* (LE); Norsky Nature Reserve, Opasny Creek valley (50°58'N, 130°10'E), 6.VII.2010, *Bezgodov 232* (PTZ). **Primorsky Territory:** Pozharsky District, vicinity of Blagoveschenka Village, Kotrovod Creek lower course, 2.IX.1949, *Kolesnikov s.n.* (LE).

Key to identification of *Sphagnum* species from subgenus *Subsecunda* with multi-layered stem hyalodermis in Russia

1. Stem leaves are equal in size or larger than branch leaves and similar to branch leaves in shape; stem hyalodermis 2–1-layered ..... *Sphagnum platyphyllum*
— Stem leaves considerably smaller than branch leaves, lingulate-triangular; stem hyalodermis 2–3(–4)-layered 2
2. Stem leaves 0.8–1.1 mm long, with numerous large pores on both surfaces in distal leaf portion; in branch leaves hyaline cells on convex surface with medium-sized, rounded, ringed or thinly ringed pores in continuous rows along commisures, on concave surface without pores or with few pores, rarely with more or less numerous pores ..... *S. beringiense*
— Stem leaves 0.7–1.0 mm long, on convex surface with small pores in cell angles and on concave surface with larger and more numerous ringed pores; in branch leaves hyaline cells on convex surface with very small ringed pores in discontinuous rows along commisures and on concave surface without pores or with singular pores ..... *S. contortum*

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