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EREMONOTUS MYRIOCARPUS (CARR.) LINDB.& KAAL. – AN ADDITION TO THE HEPATIC FLORA OF RUSSIA

EREMONOTUS MYRIOCARPUS (CARR.) LINDB.& KAAL. – ДОПОЛНЕНИЕ К ФЛОРЕ ПЕЧЕНОЧНИКОВ РОССИИ

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Abstract

Eremonotus myriocarpus(Carr.) Lindb.& Kaal. is for the first time reported from Russia. Description, illustrations, ecological characteristics and distribution of the monotypic genus are provided. The diagnostic characters of, and differences between, *Eremonotus*, *Sphenolobopsis* and *Cephaloziella* are enumerated. *Sphenolobopsis pearsonii* (Spruce) Schust. is excluded from the hepatic flora of Russia.

Резюме

Eremonotus myriocarpus (Carr.) Lindb.& Kaal. приводится впервые для России. Дается детальное описание вида, распространение, экология вида, обсуждаются отличия от ряда фенотипически похожих видов. *Sphenolobopsis pearsonii* (Spruce) Schust. – исключается из флоры России, все его определения с территории России являются ошибочными и должны быть отнесены к *Eremonotus myriocarpus*.

INTRODUCTION

Some years ago E. Urmi told me that in specimens of *Blindia acuta* (Hedw.) Bruch et Schimp. from Bryophyte Murmanica Exiccata he found *Eremonotus myriocarpus*, but unfortunately, he could not find the specimen. He noted too that it is quite possible that *Sphenolobopsis pearsonii* (Spruce) Schust. reported from Murmansk Region is in reality *Eremonotus myriocarpus*. Recently I revised all specimens identified earlier as *Spenolobopsis pearsonii*, as well as some additional specimens of phenotyipically similar species in KPABG and LE. This revealed that all specimens reported from Russia as *Sphenolobopsis pearsonii* (Afonina & Duda, 1989, 1993; Belkina et al., 1991; Konstantinova, 1978; Konstantinova et al., 1992; Schljakov, 1980) should be referred to *E. myriocarpus*. Moreover many more specimens with this species were found including specimens collected in 2000 and studied as fresh material. Nomenclature of Bryophytes follows Ignatov & Afonina (1992) for mosses and Konstantinova & al. (1992) and Konstantinova & Potemkin, 1996) for hepatics.

DESCRIPTION

The following description is based on specimens from Russia, with some additional data (in brackets) from detailed study by Urmi (1978) and Paton (1999), especially on sporophyte which was not found in Russia yet.

Eremonotus myriocarpus (Carrington) Lindb.& Kaal. ex Pearson, Hep. of the British Isles 1: 200-201, 1900. – *Diplophyllum myriocarpum* Carrington in Carrington & Pearson (ed.), Hep. Brit. Exicc. no. 96. 1879.2 (nomen alternativum). – *Hygrobiella myriocarpa* (Carrington) Spruce, on Cephalozia: 75,1982. – *Cephalozia myriocarpa* (Carrington) Lindb., Meddeland. Soc. Fauna Fl. Fenn. 9: 151, 1883. – *Sphenolobus myriocarpus* (Carring.) Grolle, Rev. Bryol. Lichenol. 32: 163, 1963. – *Sphenolobus filiformis* Woll., Hedwigia 48: 345, 1909. – *Anastrophyllum myriocarpum* (Carrington) Schuster, Hep. Anth. North Amer. 2: 750, 1969, nom. inval. – *Anomomarsupella cephalozielloides* auct. non Schuster, Nova Hedwigia 17:79, 1969; Schuster, Hep. Anthoc. North Am., 169, 1974. (Fig. 1).

Plants prostrate with numerous flagellae, in thin mats over moist cliffs or suberect in moss turfs, olive green, brown, dark brown to black, sometimes in more or less

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pure patches (N 342-6-00 and specimens from Koryakiya), but more often mixed with other bryophytes. Shoots to 5-8 mm long and ca. 70-100 μm wide, in antheridial part to 150 μm wide with numerous entirely intercalary, lateral and postical branchies. Stems 45-70 to 87 μm wide, cortical cells 12 -14 x 14-17mkm, thick-walled, striolate, medula ca. 7-9 μm. Rhizoids scattered. Leaves apresed, distant to sometimes approximate or even imbricate especially in gametangial region, complicate bifid, subquadrate, from scale-lake and ca. only 80-90 μm to 150-190 μm with acute sinus ca. (0.4) 0.5-0.6 (0.75) the leaf length. Lobes equal or often slightly unequal, terminating in 1-2 cells, apical cell 9-12 x 9-15 (19) μm, two-celled apex (17)20-28 (31) μm. In material from Pekul'neyskoye Lake (Koryakiya, Far East of Russia), apical cell in uppermost leaves up to 20, sometimes 26 μm. Cells in the leaf lobes quadrate and hexagonal, 6-9 to 12 μm, basally often a little larger and elongate to 12-17 μm long, 12-15 μm wide. Walls more or less equally thickened. Oil-bodies abscent but [obscure oil globules often present, 3-6 per cell, minute to 2 μm]. Leaves usually with 1-3 (5-8 and even more according Schuster, 1988) ocelli, containing a single spherical to elipsoidal oil-body ca. 5 x 5-8 μm [with a minute central glistening globule]. Ocelli (have been seen by me only in specimens from Yuksporlak Pass, Khibiny Mts.) degenerate at once after specimens dry. Underleaves absent. Gemmae absent.

Dioicous. Male and female bracts differ from the leaves in lager size, rounded or (rare) subacute lobes and sinus ca. 1/3-1/2 the leaf length. Male inflorescences 300-320 μm wide, bracts more often in 6-8, rarely in 4 or 10 pairs, concave, each bract contains one massive anteridium with a short biseriate stalk, bracts 28 to 300 x 350 μm as long as wide. Female bracts larger, uppermost 350 x 450 as long as wide. Perianths (are presented in N90-98, Murmansk Region, and in material from Pekul'neyskoye Lake, Koryakiya) oblong with an antical groove and 3 postical keels, ca. 200-350(400) μm wide x 400-700 (1000) μm long, compressed, unistratose, more or less suddenly narrowed to the mouth, mouth lobulate and dentate with teeth 1-2 (3) cells long, apical cell 6-9 x 16-30 (38) μm. [Sporophytes with seta of 8 outer and 4 inner rows of cells with weak nodular thickenings and faint incomplete semi-annular bands, capsule shortly elli psoidal,spores 12-17 μm].

DISTRIBUTION AND ECOLOGY

The monotypic genus, *Eremonotus* Lindb. & Kaal. ex Pears., found in isolated localities in mountains under oceanic and suboceanic conditions. Up to the middle of twentieth century, *E. myriocarpus* was known only from Europe (Szweykowski & Schmarda, 1958). In his monographic study on *Eremonotus* Urmi (1978) described it as an European-East Asian species and provided data on the world distribution of the species, including more detailed distribution maps for Europe. Later, *E. myriocarpus* was discovered in British Columbia (Godfrey & Schofield, 1979), West Greenland (Schuster & Damscholt, 1974 as *Anomomarsupella cephazielloides*) and then in South Greenland (Schuster, 1988). It is reported to be infrequent, but not rare in Norway and Sweden (Soederstoem, 1995). The present world distribution of *Eremonotus* is maped by Konstantinova (2000) but some additional localities were discovered during the present study (Fig. 2).

At present, *E. myriocarpus* is known in Russia from the Far East (Koryakiya) and the northwest (Murmansk Region). In Murmansk Region, it has been found in the Khibiny and Lovozerskiye Mts. (Fig. 2). It is quite possible that this very small hepatic is overlooked and therefore undercollected.

Differentiation. Living plants of *E. myriocarpus* are easily distinguiched from all small *Cephaloziella*-like species (*Cephaloziella* spp., *Sphenolobopsis pearsonii, Marsupella boeckii*) by the total absence of oil-bodies, apart of ocelli that are present in some (mostly basal) leaf cells. But ocelli degenerate at once after specimen dry. It is more likely that dry specimens of *E. myriocarpus* will be confused with *Sphenolbopsis pearsonii*. It differs from the latter in presence of numerous flagellae, exclusively intercalary branches, cortical cells that are much larger than meduallary ones, biseriate anteridial stalks, the shape of perianth (Tabl. 1). *Cephaloziella* species differ from *E. myriocarpus* in the normal lack of postical flagellae, estriolate cortical cells that are mostly similar in diameter to meduallary cells, the presence of underleaves (often) and gemmae, usually dentate female bracts and anteridia with uniseriate stalk. Aside from *Cephaloziella* and *Sphenolobopsis pearsonii, E. myriocarpus* is likely to be mistaken for the small, *Cephaloziella*-like *Marsupella boeckii*. It differs at once from the latter in noncollenchymatous more-or-less equally thickened walls of cells, the striolate cuticule of the cortical cells, the different shape of the leaves, structure of andtoecia and gynoecia (Table 1).

SOME TAXONOMICAL NOTES AND CONCLUSION

The taxonomic position of *Eremonotus* is unclear. This is reflected in the rich synonymy of species in which it has been placed, representing quite a number of genera, including *Jungermannia,Diplophyllum,Anomomarsupella,Hygrobiel-*

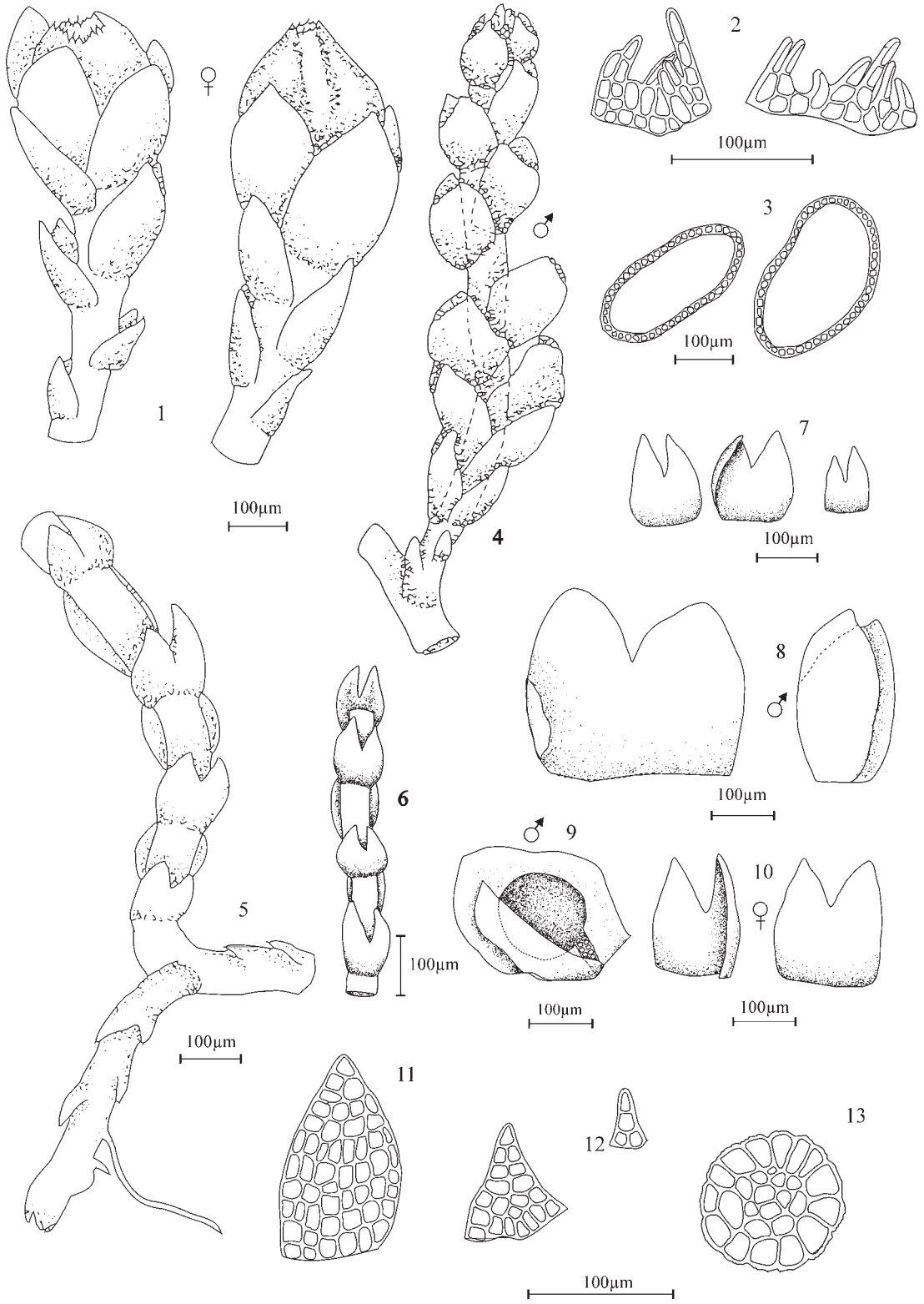

Fig. 1. *Eremonotus myriocarpus* (Carr.) Lindb.& Kaal. ex Pearson. 1 – female shoots with perianths; 2 – cells of perianth mouth; 3 – cross section through perianth; 4 – male shoot; 5 – plant with flagella; 6 – part of sterile shoot; 7 – leaves from sterile shoots; 8 – leaf from fertile shoots; 9 – male bract with antheridia; 10 – female bracts; 11 – cells of lobe; 12 – upper parts of leaf lobe; 13 – cross section of stem.

Table 1. Comparison of *Eremonotus* with *Cephaloziella*-like genera and species

Character	*Eremonotus myriocarpus*[1]	*Sphenolobopsis pearsonii*[2]	*Marsupella boeckii*	*Cephaloziella* spp.
Branching	intercalary, shoots often flagelliform with flagellae lateral or occasionaly postical intercalary	frequent, furcate, terminal-lateral, intercalary innovations from below female inflorescens, flagellae absent	intercalary, often with numerous flagellae	intercalary, exceptionally terminal-lateral, *Frullania* type, postical flagellae and stolones normally absent
cortical cells	large, thick-walled, striolate, ca. 2 times wider than medulla	similar in diameter with medulla, ca. 12- 20 μm	often chlorophyllose, forming well-defined hyalodermis	similar in diameter to meduallary or "occasionaly feebly larger but hardly forming even an ill-defined hyalodermis" (Schuster, 1980)
cuticle	verrucose-striolate in leaves and strongly striolate cortical cells	smooth in cortical cells to smooth ± papillose in leaves	smooth	smooth to ± coarsely verrucose
asexual reproduction	absent	absent	absent	2-celled ovoid to subspherical gemmae
oil-bodies	absent, but 2-3(-8) ocelli per cell are present (in living material only)	present, (1)2-4(7) per cell	colorless, large, 2 (4) per cell, ellipsoidal to ovoid, 3 x 5 to 4-5 x 6.5-8 mkm	present, usually (2)3-9 mkm
underleaves	absent	vestigal, usually reduced to 1-2 celled filament bearing 1-2 apical slime papillae	absent	small or absent
anteridial stalk	biseriate	uniseriate	biseriate	1- or very rarely 2-seriate
female bracts	to 0.5 mm long, without teeth	margins often with teeth or small lobes or both	edentate	larger than leaves, similar in shape, margins usually dentate, even if leaves edentate
perigynium	absent	absent	well developed	absent
perianth	short emergent, compressed, oblong with an antical groove and 3 postical keel	long emergent, obovate-clavate without antical groove	slightly shorter than the erect bracts	exserted for usually considerable distance beyond bracts, usually 4-plicate
perianth mouth	lobulate and dentate with teeth 1-2 cells long	subentire to ciliate-dentate	crenulate with elongate cells	usually unlobed or slightly lobed, more often crenulate or crenulate-dentate

[1] – based on specimens from Murmansk Region; [2] – according Paton, 1999 and Schuster, 1980

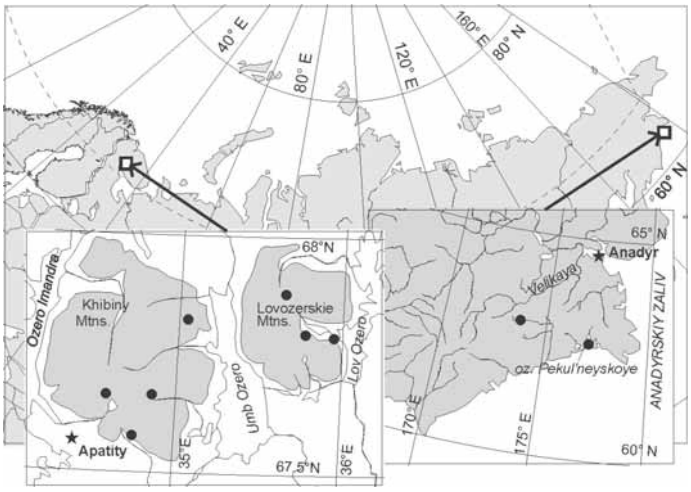

Fig. 2. Distribution of *Eremonotus myriocarpus* (Carr.) Lindb.& Kaal. in Russia.

la, Anastrophyllum and *Cephaloziella,* and families, including *Jungermanniaceae, Cephaloziaceae, Scapaniaceae, Lophoziaceae, Gymnomitriaceae, Cephaloziellaceae* (Urmi, 1978). Recently, it has been referred to *Lophoziaceae* (Urmi, 1978; Grolle, 1983; Paton, 1999) or to *Gymnomitriaceae* (Schuster, 1988, 1996; Grolle & Long, 2000). Schuster (1996) discussed the taxonomic position of *Eremonotus* and assigned it to *Gymnomitriaceae* but to the special subfamily *Eremonotoideae* Schust. There are clear affinities between this genus and *Lophoziaceae* (position and shape of perianth, female bracts etc.), but in many characters, *Eremonotus* is close to *Gymnomitriaceae* (presence of distinct cotrex, character of branching, lack of gemmae etc.). Thus, the taxonomic position of *E. myriocarpus* remains ambiguous and I completely agree with Schuster (1996) and Grolle & Long (2000) that further study (both molecular and anatomical-morphological) is needed to solve this problem.

In spite of the fact that knowledge of the distribution of *E. myriocarpus* has changed in the last half of XX century and undoubtedly some new localities will be discovered in future, this species still should be characterised as an old and relictual. This conclusion is based on its isolated taxonomic position and highly disjunct distribution.

HABITAT

In Murmansk Region, *E. myriocarpus* is restricted to mountains. Its altitudinal range is from the birch forest belt at about 400 m, where it is rare, to montane tundra, where it is probably more frequent and extends to 650 m. It occurs on wet or moist cliffs and boulders, usually on north to north-east-facing slopes. *Eremonotus* can grow as a real epilith, directly on bare moist cliffs, on rocks besides small mountain streams, or on accumulating soil and fine earth in crevices, on ledges etc. With the exception of specimens from Pekul'neyskoye Lake (Koryakiya) all studied specimens are very small and contain a number of degenerated plants. Associated bryophyte species in Murmansk Region are *Amphidium lapponicum, Aneura pinguis, Anthelia juratzkana, Blepharostoma trichophyllum, Cephaloziella arctica, Fissidens osmundoides, Jungermannia polaris, Saccobasis polymorpha, Tritomaria quinquedentata,* in Koryakiya it was found with *Jungermannia polaris, Tritomaria quinquedentata, Orthocaulis quadrilobus, Blepharostoma trichophyllum, Sauteria alpina, Cephaloziella divaricata*. All of these species are Ca-tolerant.

In general, the habitat conditions and bryophyte communities in which *E. myriocarpus* occurs in Murmansk Region are similar to those recorded for this species by Urmi (1978), Schuster (1974, 1988), and Paton (1999).

SPECIMENS EXAMINED

RUSSIA. **Murmansk Region**. **Khibiny Mts.:** Yuksporlak Pass, ca. 650 m. (67^{0}40' N, 33^{0}51' E), on wet cliff, with a small amount of *Anthelia juratzkana, Blepharostoma trichophyllum, Aneura pinguis*, N342-6-00, 22.VIII.2000 Konstantinova (KPABG); valley of Ayquayvenchyok River, on wet cliff in forest, mixed with *Amphidium lapponicum*, N1085, 1.VIII.1974, Konstantinova (as *Sphenolobopsis pearsonii*, Konstantinova, 1978, KPABG); NE part of Khibiny Mtns., lower reach of Mayvaltayok, cliffs along the left tributary in it upper reach, on wet cliff of NE exposition, mixed with *Aneura pinguis, Saccobasis polymorpha, Blepharostoma trichophyllum, Cephaloziella* sp., cum per., N 90-98, 9.VIII.1998, Belkina (KPABG); valley of Malyi Vud'yavr Lake, Takhtarvumchorr Mt., cliffs in Molibdenovyi circus (67°40' N, 33°35 E), in crevices on wet NE exposed cliff, with *Marsupella emarginata* and *Scapania*

crassiretis (21-4-91, 17.VII.1991, Konstantinova). **Lovoserskie Mts**.: Ilmayok Ravine, NNE slope, ca. 650 m, on wet cliff, mixed with *Blepharostoma trichophyllum, Anthelia juratzkana, Saccobasis polymorpha, Jungermannia polaris, Cephaloziella* sp., 73-26-82, 23.VIII.1982, Belkina (as *Sphenolobopsis pearsonii*, Belkina & al., 1991; KPABG); north-west slope of Chivruaylatv, tundra belt, alt. 380 m, in crevice in wet cliff, mixed with *Nardia geoscyphus, Cephalozia pleniceps, Diplophyllum taxifolium*, N 14-13-83, Belkina & Likhachev (as *Sphenolobopsis pearsonii*, Belkina et al., 1991; KPABG); northern slope of Ninchurt Mt. N-facing slope in tundra belt, in narrow cracks of cliffs, on the bottom, just some plants mixed with *Fissidens osmundoides, Anthelia juratzkana, Tritomaria quinquedentata, Blepharostoma trichophyllum,* 50-7, 21.VIII.1983, Belkina & Lichachev (KPABG); **Far East of Russia**: north Koryakiya, Pekul'neyskoye Lake (62°39'N, 177°10'E), cliffs along shore of bay, on fine earth, cum per., 7.VIII.1984, Afonina (as *Sphenolobopsis pearsonii*, Afonina & Duda, 1989, 1993; LE); north Koryakiya, Pekul'neyskoye Lake, on top of hill, in crevices, cum per., 10.VIII.1984, O.Afonina (as *Sphenolobopsis pearsonii*, Afonina & Duda, 1989, 1993; LE); Koryakskoye Nagor'ye, upper reach of Dlinnaya River, Progonnyi Stream (62°59'N, 173°42'E), in crevices of cliffs, some plants with *Jungermannia polaris and Sauteria alpina* in one specimen and *withTritomaria quinquedentata, Orthocaulis quadrilobus, Blepharostoma trichophyllum, Cephaloziella divaricata* in the second one, D1-4, 8.VII.1988, E.Kuzmina, LE, KPABG);

NORWAY. Sor-Trondelag (62°20' N 09°40'E), Hepaticae exiccatae S.O.Lindberg II, N 28.

SOUTH GREENLAND. Kanglkitsog, Tupaussat, east of delta (60°20N, 44°16W) crevices along small stream over diabasic material, with *Plectocolea obovata, Gymnomitrion concinnatum,* N 82-1831, 1982, Schuster.

EXCLUDENDA

All reports of *Sphenolobopsis pearsonii* for Russia are erroneous and this species should be excluded from the flora of Russia.

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I am greatly indebted to E.Urmi, who told me about finding *E. myriocarpus* in Khibiny and brought to my attention the possibility of misidentification of *Sphenolobopsis pearsonii*. I thank O.Afonina and A.Potemkin (curator of LE) for the loan of specimens of *Eremonotus myriocarpus* (as *Sphenolobopsis pearsonii*) from Koryakiya. I am very grateful to Dr. D.Horton for improving the English of the paper. This research was supported by the Russian Fond for Fundamental Research, Grant 00-04-48874.

LITERATURE CITED

[AFONINA, O. M. & J. DUDA] АФОНИНА,О. М., Й. ДУДА 1989. К флоре печеночных мхов северной Корякии. – [On hepatic flora of Northern Korjakia] *Новости сист. низш. раст.* [*Novosti Sist. Nizsh. Rast.*] **26**: *147-149.*

[AFONINA, O.M. & J. DUDA] АФОНИНА,О.М., Й. ДУДА 1993. Печеночные мхи Чукотки. – [Liverworts of Chukotka] *Бот. Журн.* [*Bot. Zhurn.*] **78**(3): *77-93.*

[BELKINA, O. A., N. A.KONSTANTINOVA & V. A. KOSTINA] БЕЛКИНА, О.А., Н.А.КОНСТАНТИНОВА, В.А. КОСТИНА 1991. Флора высших растений Ловозерских гор. Мохообразные и сосудистые растения. – [Flora of higher plants of Lovoserskie Mtns. Bryophytes and vascular plants] *СПб., Наука* [*Sankt-Peterburg, Nauka*]: *1-204.*

GODFREY, J.D. & W.B.SCHOFIELD 1979. New and interesting Hepatics from British Columbia, Canada, and Northern Washington State, U.S.A. II. – *Bryologist* **82**(2): *162-170.*

GROLLE, R. 1983. Hepatics of Europe including Azores: an annotated list of species, with synonyms from the recent literature. – *J. Bryol.* **12**: *403-459.*

GROLLE, R. & D.G.LONG 2000. An annotated check-list of the Hepaticae and Anthocerotae of Europe and Macaronesia. – *J. Bryol.* **22**: *103-140.*

IGNATOV, M.S. & O.M.AFONINA (eds.) 1992. Check-list of mosses of the former USSR. – *Arctoa* **1**: *1-85.*

[KONSTANTINOVA, N.A.] КОНСТАНТИНОВА, Н.А. 1978. Редкий вид печеночника Sphenolobopsis pearsonii (Spruce) Schust. в Хибинских горах. – [Rare liverwort species, Sphenolobopsis pearsonii (Spruce) Schust. in Khibiny Mountains] *Бот. Журн.* [*Bot. Zhurn.*] **63**(7): *1032-1035.*

KONSTANTINOVA, N.A. 2000. Distribution paterns of the Holarctic hepatics. – *Arctoa* 9: *29-94.*

[KONSTANTINOVA, N.A., A. D. POTEMKIN & R. N. SCHLJAKOV] КОНСТАНТИНОВА, Н.А., А. Д. ПОТЕМКИН, Р. Н. ШЛЯКОВ. 1992. Список печеночников и антоцеротовых территории бывшего СССР. – [Check-list of the Hepaticae and Anthocerotae of the former USSR] *Arctoa* 1: *87-127.*

PATON, J.A. 1999. The liverworts flora of the Britush Isles. – *Harley Books, Essex, England. 626 pp.*

[SCHLJAKOV, R.N.] ШЛЯКОВ, Р.Н. 1980. Печеночные мхи Севера СССР. Вып. 3. Печеночники: лофозиевые, мезоптихиевые. – [Hepaticae of the North of the USSR. 3. Lophoziaceae - Mesoptychiaceae] *Л., Наука* [*Leningrad, Nauka*], *188 pp.*

SCHUSTER, R. M. 1966-1992. The Hepaticae and Anthocerotae of North America east of the hundredth meredian. – *New-York-London, Columbia Univ. Press* **1**: *802* (1966); **2**: *1062* (1969); **3**: *880* (1974); **4**: *1333* (1980). *Chicago, Field Museum of Natural History* **5**: *854* (1992); **6**: *937* (1992).

SCHUSTER, R. M. 1988. The Hepaticae of South Greenland. – *Nova Hedwigia* **92**: *1-255.*

SCHUSTER, R. M. 1996. Studies on Antipodal Hepaticae. XII. Gymnomitriaceae. – *J. Hattori Bot. Lab.* **80**: *1-147.*

SCHUSTER, R.M. & K.DAMSHOLT 1974. The Hepaticae of West Greenland from ca. 66° N to 72° N. – *Meddel. om Groenland* **199**(1): *1-373.*

SOEDERSTROEM, L. 1995. Preliminary distribution maps of bryophytes in Norden. Vol.1. Hepaticae and Anthocerotae. – *Mossornas Vanner, Trondheim, 51.*

SZWEYKOWSKI, J. & J. SCHMARDA 1958. Eremonotus myriocarpus (Carr.) Pears. ve Vysokych Tatrach (CSR). – *Biologia* (*Bratislava*) **13**: *440-444.*

URMI, E. 1978. Monographishe Studien an Eremonotus myriocarpus (Carring.) Pears. (Hepaticae). – *Bot. Jahrb. Syst.* (Suttgart) **99**(4): *498-564.*