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NOTES ON LOPHOZIA V. COMMENTS ON SECT. SUDETICAE, LONGIDENTATAE AND SAVICZIAE

ЗАПИСКИ ПО РОДУ LOPHOZIA V. ТАКСОНОМИЧЕСКИЕ КОММЕНТАРИИ ПО СЕКЦИЯМ SUDETICAE, LONGIDENTATAE AND SAVICZIAE

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Abstract

Taxonomy, distribution, and ecology of little known taxa of section *Sudeticae* Schljakov (*L. lacerata* N. Kitag., *L. schusteriana* Schljakov, and intraspecific taxa of *L. wenzelii* (Nees) Steph.) are discussed. *Lophozia wenzelii* var. *massularioides* var. nov. is described. *Lophozia wenzelii* var. *litoralis* (Arnell) comb. nov. is proposed. The identification key to intraspecific taxa of *Lophozia wenzelii* is presented. Separating the sect. *Longidentatae* R.M. Schust. from the sect. *Lophozia* seems to be unfounded due to the absence of defining features. The new circumscription of the sect. *Lophozia* and list of its species are presented. *Lophozia* sect. *Savicziae* Bakalin sect. nov. is described. Its defining features are an unstable structure of oil-bodies and unstable stem tissue differentiation.

Резюме

Обсуждены морфологические связи, распространение и экология малоизвестных таксонов секции *Sudeticae* Schljakov (*L. lacerata* N. Kitag., *L. schusteriana* Schljakov, внутривидовые таксоны *L. wenzelii* (Nees) Steph.). Описана *Lophozia wenzelii* var. *massularioides* Bakalin *var. nov.* Предлагается новая комбинация *Lophozia wenzelii* var. *litoralis* (Arnell) Bakalin *comb. nov.* Выделение в качестве самостоятельной секции *Lophozia* sect. *Longidentatae* R.M. Schust. необосновано и она должна быть сведена в синонимы с sect. *Lophozia*. Приводится уточненное описание sect. *Lophozia* и список входящих в нее видов. Описана *Lophozia* sect. *Savicziae* Bakalin *sect. nov.* Ее характерными признаками являются нестабильность строения масляных телец и непостоянность дифференциации тканей стебля.

1. ON THE SECTION *SUDETICAE* SCHLJAKOV

The section *Sudeticae* of the genus *Lophozia* was described by Schljakov (1980), with *Lophozia sudetica* (Huebener) Grolle as a type species of the section. Schljakov description (1980: 113) includes characteristics difficult to evaluate: "Plants robust. Stems rigid. Leaves symmetrical, as a rule, with little sinus, concave. Leaf cells commonly with triangle thickenings, but sometimes with bulging ones" (transl. from Latin by V. Bakalin). Many hepaticologists accepted this section (e.g. Grolle & Long, 2000) because its characteristics are well-felt in the microscopic study of specimens.

The section includes four species: *Lophozia sudetica, L. lacerata, L. schusteriana* and *L. wenzelii* (Schljakov, 1980; Bakalin, 2002) whose gemmae color ranges from brown to colorless and greenish. Yet Grolle and Long (2000) confined the section only as including one species: *Lophozia sudetica* (Huebener) Grolle. The including both species with brown and colorless gemmae in this section is somewhat questionable and may be need further studies. On the other hand, even if *L. sudetica* is not closely related to other member of sect. *Sudeticae*, in practice all species may have very similar appearance resulting in numerous misidentifications.

Three uniting characteristics of species of this section are as follows: (1) the clearly rigid shoots in contrast to species of all other sections of *Lophozia*, (2) the presence of

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brownish to red gemmae pigmentation (at least sometimes) in the most species of section: brownish coloration in *L. lacerata* N. Kitagawa (including type material), the pinkish or salmon (Schuster, 1969: 595) to slightly yellowish-brownish coloration of gemmae in some *L. wenzelii* (Nees) Steph. phases and clearly brown color of gemmae in *L. sudetica* and (3) a highly similar appearance of all species. Thus, I retain the treatment of *Sudeticae* as separate section in the same volume as defined by Schljakov (1980).

Lophozia sudetica, an arctomontane species, is the most common taxon of *Lophozia* in the northern Holarctic, but it is distributed southwards to 35° N on mountains ranges in East Asia (North-East China, Piippo, 1990), to 40° in Spain and Portugal (Schumacker, Vana, 2000) and sometimes descends from those ranges of North Holarctic to coniferous forests in the boreal zone or it is found in subtropical islands up to 32° in Madeira (Schuster, 1969). *Lophozia sudetica* and the limits of its variability were discussed previously in Bakalin (2003b). Other three species are discussed below.

Identification key to species of sect. *Sudeticae*

1. Mature gemmae clearly brown; leaves very oblique to almost horizontally inserted; mid-leaf cells mainly 18-22 μm wide . . *L. sudetica*
— Mature gemmae green to colorless or slightly brownish; leaves almost horizontally to oblique or transverse inserted; mid-leaf cells mainly 22-30 μm wide 2
2. Leaves very oblique to almost horizontally inserted, oil-bodies biconcentric, plants without red coloration . . *L. schusteriana*
— Leaves slightly oblique to transverse and subtransverse inserted, oil-bodies nonbiconcentric, plants sometimes with red coloration . . 3
3. Leaves strongly dorsally secund; perianth lacerate into long lobules, with lobules exceeds 5-7 cells in length, bracteole absent (mainly East-Asiatic species) . . *L. lacerata*
— Leaves symmetrical to slinghtly dorsally secund; perianth denticulate to shortly lobulate, with lobules not more than 3(-4) cells in length, bracteole present . . . . . *L. wenzelii*

LOPHOZIA WENZELII (NEES) STEPH.

This species grows in arctomontane habitats and is distributed in northern Europe, but reachs 30° N in Asian and eastern North American mountain ranges. It appears to be absent in the high Arctic, with the exception of Greenland (Schuster & Damsholt, 1974). *Lophozia wenzelii* grows among mosses and hepatics, but rarely forming pure mats. It is observed in moss tundra habitat and oligotrophic bogs interspread within boreal forests zone. In rare cases it grows along the peaty banks of streams on fine-granulated soil or on somewhat dry rocks.

In tundra habitat this species grows in microdepressions between heaths-lichens or moss patches. Frequently it is observed in wet (var. *wenzelii*) or dry (var. *groenlandica*) crevices of gravely barrens and rocks (including cliffs in seacoasts). Rarely, it grows on decaying wood (var. *groenlandica*, only), where it mixes with *Cephalozia* spp., *Barbilophozia lycopodioides* (Wallr.) Loeske, etc. Sometimes it is observed on the banks of streams and brooks or puddles in forbs-shrubs, moss, and moss-dwarf-shrub forests where it grows with *Cephalozia* spp., *Tritomaria quinquedentata* (Huds) H. Buch, *Orthocaulis kunzeanus* (Huebener) H. Buch, *Scapania* spp., etc. This species (var. *groenlandica*) is part of stream bank communities in tundra habitat where it mixes with *Anthelia juratzkana* (Limpr.) Trev. and *Pleurocladula albescens* (Hook.) Grolle. Sometimes this species is observed in nival bryophyte communities (var. *lapponica* and var. *groenlandica*) with *Anthelia juratzkana*, *Marsupella boeckii* (Aust.) Lindb. ex Kaal., *Nardia breidleri* (Limpr.) Lindb., *Pleurocladula albescens*, etc. It grows on sandy slopes and on bare ground patches of cryogenic origin in tundra habitat, where it is presented by miniature forms (var. *lapponica*), or it grows sandy spots on river banks and large rivulets (var. *litoralis*). The main habitats of this species (at least for var. *wenzelii*) are oligotrophic bogs, where *L. wenzelii* sometimes grows in pure mats or mixed with *Gymnocolea inflata* (Huds.) Dumort., *Scapania* spp. (the most frequently with *S. paludicola* Loeske et Müll.Frib.), *Cephalozia* spp., *Cladopodiella fluitans* (Nees) H. Buch, etc.

Most of the specimens classified as *Lophozia wenzelii* in various herbaria according to Schuster (1969), Schljakov, 1980 and my

observation represent other species, mainly *L. ventricosa* (Dicks.) Dumort.; thus, the differentiation and distribution of these species needs clarification. The species concept of *L. wenzelii* in present account based mainly on Schljakov and Schuster papers (l.c.). *Lophozia wenzelii* differs from *L. ventricosa* in concave to cupped leaves (versus slightly lengthways conduplicate); leaf insertion line straight and transverse to somewhat oblique (versus incurved with ventral half oblique, but dorsal one almost transverse); rigid leaves margin (versus delicate to sometimes undulate); perianths' mouth denticulate to lobulate with end cell of lobule or teeth 1.2-1.5 as long as wide (versus dentate to almost ciliate perianths' mouth with end cell of cilia or teeth about 2.0-3.0 as long as wide); constant presence of brownish-yellow pigmentation of plants (on the contrary in *L. ventricosa* brownish-yellow pigmentation are characterized only for its var. *longiflora*).

Lophozia wenzelii includes five varieties (including var. *wenzelii*). The key for their identification is presented below.

Identification key to intraspecific taxa of *Lophozia wenzelii*

1. Shoots 1-2 mm wide; ventral segment of stem from 1 to 6 cells wide; leaves more or less symmetrical with semilunate sinus, plants grow mainly in wet hollows in bogs 2
— Shoots 0.3-2 mm wide; ventral segment of stem 3-6 cells wide, leaves symmetrical or not, with sinus v- or γ-shaped, plants of more dry conditions, frequently grow on soil with destroyed vegetation cover, in tundra habitat on stony substrates, in bogs on ridges . . 3
2. Ventral segment of the stem 3-6 cells wide, undifferentiated in pigmentation on the dorsal surface; microcellous layer in the stem is absent; shoots yellowish to brown-yellow; distributed in the southern part of specific area (known only in the Caucasus) . . . . . var. *massularioides*
— Ventral segment of the stem about 1-2(3) cells wide, brown; microcellous layer in the stem presents; shoots mainly brown to brown-yellowish and rusty-brown; distributed in the boreal part of area . . . . . var. *wenzelii*
3. Shoots about 1-2(3) mm wide, brown to yellow-brown without red or rusty pigmentation; leaves largest in lower half of leaf length . . . . var. *groenlandica*
— Shoots about 0,3-0,7 mm wide; leaves largest in about half of leaf-length, or below, but in this case, plants with rusty to red-brown pigmentation 4
4. Plants yellowish-brownish, in full sun sometimes blackish to bright black with purple tips; distributed in tundra communities . . . . . var. *lapponica*
— Plants rusty-brown to red-brown, distributed of places with disturbed vegetation caver, on soil near brook banks or in subalpine belt on mountains . . var. *litoralis*

LOPHOZIA WENZELII VAR. *WENZELII*

The type variety of the species is characterized by symmetrical leaves with semilunate sinus. It grows mainly in peat-moss bogs within specific area, but is extremely rare in Asia and North America.

Studied specimens: **Eurasia:** FAROES 23.V.1896 Jensen C. (LE); GERMANY *Riesenbirge*. 5.X.1899 Schiffner V. (LE); GREAT BRITAIN *Ireland*. Cavan (H30) VI.1961 Fitzgerald, J.W. (NMW C96.17.440), *Wales* Merionethshire (48) 16.VIII.1952 Richards, P.W. (NMW C87.8.270); SWEDEN *Angermaland*. 08.VII.1872 Arnell H.W. (LE), *Pitea Lappmark*. 18.VIII.1926 Stonholm C. (LE), *Scania*. 25.III.1921 Hovgard A. (LE), *Sodermanland*. 10.IX.1921 Tarnlund C.A. (LE), Torne Lappmark VIII.1942 Arnell S.W. (LE); SCHWEIZ *Davos*. 21.VII.1992 Onipchenko (MHA), 25.VII.1992 Onipchenko (MHA), 19.VII.1992 Onipchenko (MHA); RUSSIA *Altai* Kuznetski Alatau 26.VI.2000 Konstantinova (KPABG-101993), *Caucasus*. Teberda Reserve. 30.VIII.1999 Onipchenko (MHA), 6.IX.1994 Onipchenko (MHA), *Commander Archipelago*. Bering Island. 11.VIII.2002 Bakalin (KPABG 103277), *Kamchatka Peninsula*. Central Kamchatka.VIII.2001 Bakalin (KPABG 103906, 103908) VIII.2002 Bakalin (KPABG 104082); East Kamchatka VIII.2001 Bakalin (KPABG 103753); *Karelia Republic*. Loukhi District. 4.VIII.1998 Filin V.R. (KPABG-100467) 13.VIII.1993 Notov (KPABG-100480), *Komi Republic*. Vorkuta District. 6.VIII.1969 Kil'dyushevsky I., Zheleznova (SYKO), Inta District. 19.VIII.1973 Lashchenkova A.N. (SYKO), Troitsko-Pechyorsky District 20.VI.1989 Zheleznova (KPABG-101041);*Krasnoyarsk Territory*. Evenkiya, Baikitsky District. 28.VII.1992 Shcherbnya S. (MHA); *Murmansk Province*. Iokanga River. 23.VII.1965 Schljakov R.N. (KPABG 3870), Kandalaksha District. 29.VII.1988 Konstantinova (KPABG 3878), Krasnoshchel'ye. 14.VII.1965 Avdymuratova K.I., Schljakov (KPABG 3876), Kharlov Island. 28.VI.1964 Schljakov (KPABG 3871), Khibiny Mountains. 2.VII.1970 Schljakov (KPABG 3875), 16.VIII.1971 Schljakov (KPABG 6912), 9.VIII.1974 Konstantinova (KPABG NK-1101-2-74), 24.VIII.1974

Konstantinova (KPABG NK-1150-3-74), 13.VII.1975 Konstantinova (KPABG 3873), 18.IX.1975 Schljakov (KPABG RS-59-75), 17.IX.1989 Konstantinova (KPABG 3872); *Yamalo-Nentsk Authonomous District*. Tazovsky Peninsula. 28.VIII.1964 Soldatenkova Yu.P. (MHA).

LOPHOZIA WENZELII VAR. *GROENLANDICA* (NEES) BAKALIN

This variety is more common in the northern part of specific area, but is sometimes observed in the southern part as well. It grows on small ridges in bogs, and on finely-granulated soil in cliff crevices; above 60° N this variety took part in forming of mesophytic communities in the tundra zone, but it is absent in the high Arctic. Taxonomy of this taxon was discussed earlier (Bakalin, 2001).

Studied specimens: **North America:** U.S.A. *Alaska* Seward Peninsula 18.VII.1992 Potemkin (KPABG-102753).

Eurasia: GREAT BRITAIN *Wales*. Radnorshire 8.IV.1965 Fitzgerald J.W. (NMW C96.17.394); SCHWEIZ *Graubunden Davos*. 22.VII.1992 Onipchenko (MHA), 15.VII.1992 Onipchenko (MHA), 17.VII.1992 Onipchenko (MHA); SPITSBERGEN *Kings Bay District*. 27.VII.1956 Arnell S.W. et Mårtensson O. (LE); SWEDEN *Bohuslan*. 11.VII.1892 Arnell H.W. (LE); *Dolarne*. VIII.1942 Arnell (LE); *Torne Lappmark*. 5.VIII.1947 Arnell (LE); RUSSIA *Altai*. 14.VII.1991 Ignatov (MHA), 31.VII.1993 Ignatov (MHA), 23.VI.1989 Ignatov (MHA), 2.VII.1990 Ignatov (MHA), 1.VII.1989 Ignatov (MHA), 21.VII.1993 Ignatov (MHA), 8.VII.1990 Ignatov (MHA), 16.VI.1989 Ignatov (MHA), Kuznetsky Alatau 30.VII.1996 Lapshina (KPABG-103186) Konstantinova 8.VII.2000 (KPABG-102033) 6.07.2000 (KPABG-101967) 29.VI.2000 (KPABG-102000), *Amur Province*. Udokan Range. 11.VIII.2000 Bakalin (KPABG-101697), *Bashkiriya Republic*. Beloretsk Distrikt. 7.IX.1990 Ignatova (MHA); *Caucasus*. Teberda Reserve. 31.VII.1994 Onipchenko (MHA), 21.VII.1994 Onipchenko (MHA), 11.VII.1994 Onipchenko (MHA), 23.VII.1982 Vaulina E.L. (MHA), 1.IX.1985 Onipchenko (MHA),17.VIII.1985 Onipchenko (MHA), 3.VIII.1986 Ignatova (MHA), 23.VII.1982 Onipchenko (MHA), 3.VIII.1986 Ignatova (MHA); *Karelia Republic*. Loukhi District. 19.VII.1998 Bakalin (KPABG). 27.VII.1937 Auer A.V. (TUR); *Komi Republic*. Vorkuta District. 15.VIII.1969 Kil'dyushevsky I., Zheleznova (SYKO), 7.VIII.1969 Kil'dyushevsky I., Zheleznova (SYKO), 24.VII.1969 Kil'dyushevsky I., Zheleznova (SYKO), Pechyora District. 10.VII.1970 Kil'dyushevsky I., Zheleznova, Frolova V.A. (SYKO), Troitsko-Pechyorsky District. 18.VII.1973 Bibikova T.V. (SYKO), Ukhta District. 24.VII.1971 Kil'dyushevsky I., Zheleznova (SYKO), 24.VII.1971 Kil'dyushevsky I., Zheleznova (SYKO), *Krasnoyarsk Territory*. Igarsky District. 6.VIII.1958 Tyrtikov A.P. (MHA); Taimyr Peninsula, Varlygina T.I. (KPABG-102148); *Koryak Uplands*. 24.VII.1987 Kuzmina E.Yu. (KPABG-100122) 31.VII.1986 Kuzmina E.Yu. (KPABG-100213); *Murmansk Province*. Apatity. 17.VII.1968 Schljakov (KPABG), Kandalaksha District. 12.VIII.1989 Konstantinova (KPABG 2720), 13.VIII.1989 Konstantinova (KPABG 2793), 15.VIII.1989 Konstantinova (KPABG 2857), 16.VIII.1989 Konstantinova (KPABG 2913, NK-163-18-91), 20.VIII.1991 Konstantinova (KPABG NK-217-5-91), Pechen'ga District. 21.VIII.1979 Schljakov R.N. (KPABG), Khibiny Nountains. 27.VIII.1969 Ramenskaya M.L. (KPABG MR-9-69), 16.VIII.1973 Konstantinova (KPABG 3856), 21.VII.1973, 22.VII.1978 Schljakov (KPABG); *Perm' Province*. Vishersky Reserve. 23.VII.1994 Bezgodov (MHA), South Baseg. 9.VI.1994 Ignatov, Bezgodov (MHA); *Yakutiya Republic*. Udokan Range 3.VII.2000 Bakalin (KPABG-101658).

LOPHOZIA WENZELII VAR. *LAPPONICA* H. BUCH ET S.W. ARNELL

(Lectotype: Sweden, Torne Lappmark, Jukkasjärvi sn. 5.VIII.1945 O. Mårtensson, UPS!; for lectotype illustration see Bakalin, 2003b).

The taxon characterized by creeping or in dense mats, sometimes ascending plants. In comparison with var. *wenzelii*, the shoots of var. *lapponica* are somewhat more rigid and considerably smaller (not more than 0,7(1,0) mm wide). Shoots greenish, yellow-greenish to brownish-yellow, brown-blackish and black with no traces of red or rusty pigmentation, but sometimes with purple colored tips in bright black individuals. Cells in the leaf middle about 18-25 mm broad with small thickenings, concave to convex and bulging. This variety typically grows in the tundra belt of mountain ranges at elevation greater than 1000 m a.s.l. in the northern Holarctis, yet sometimes occurs on rocks in the forest zone north of the Polar Circle.

Previously (Bakalin, 2003b) I showed, that var. *lapponica* does not have any morphological intergradation to *Lophozia rufescens*, in other words with *L. sudetica* var. *anomala* (contrary to Schljakov, 1980); thus, it is not conspecific to *L. sudetica*. Further, it is highly probable the treatment of this variety in Schuster (1969) is wrong, because the plants of his var. *lapponica* (Schuster, 1969: fig. 212: 6-9) have cells in the mid-leaf about 30-38 мм (versus 18-25 of plants in type collection) and shoots 2.2-2.8 mm wide (versus 0.7-1.0 in type). Schlajkov (1980) estimated that var. *lapponica* sensu Schuster should be referred to as *Lophozia savicziae*.

Studied specimens: **North America:**

CANADA *Mt. Carthew*. C.D. Bird & E.J. Lakusta 27.VII.1966 (ALA C 95. 3. 2311).

Eurasia: NORWAY *Sprenbacken*. 12.VII.1882 Lindberg S.O. (LE); SVALBARD ? Berggren S. (LE); SWEDEN *Torne Lappmark*. 5.VIII.1947 Arnell S.W. (LE); 5.VIII.1945 Mårtensson O. (UPS, lectotypus), 18.VIII.1946

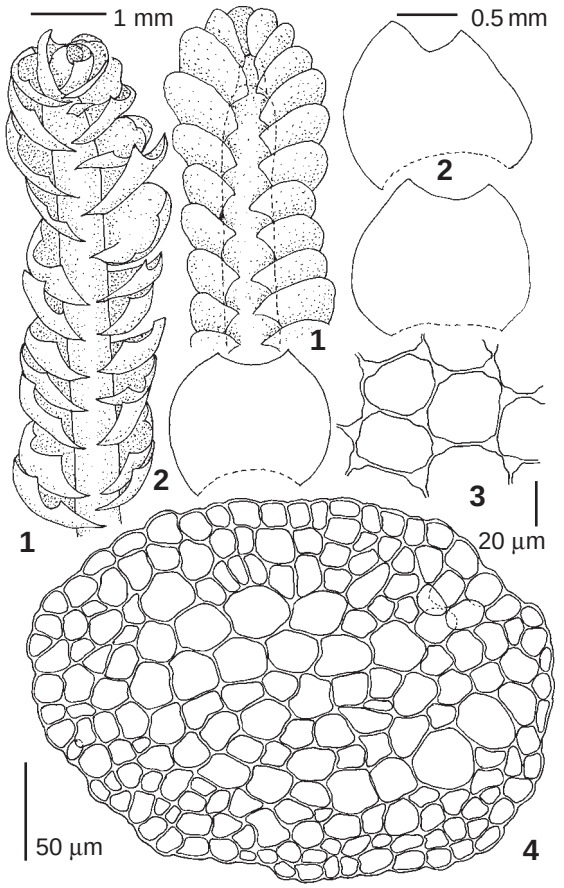

Fig. 1. *Lophozia wenzelii* var. *massularioides* var. nov. 1 – shoots; 2 – leaves; 3 – cells in the midleaf; 4 – stem's crossection. Scales: 1 mm – for 1; 0.5 mm – for 2; 20 µm – for 3; 50 µm – for 4. (holotype, MHA)

Mårtensson O. (UPS), VIII.1954 Arnell S.W. (UPS); RUSSIA *Komi Republic*. Vorkuta District. 30.VII.1969 Kil'dyushevsky I., Zheleznova (SYKO); *Murmansk Province*. Kandalaksha District 09.VIII.91 Konstantinova (KPABG), Sal'nyye Tundry Massif 08.VII.2001 Bakalin (KPABG-8968), Khibiny Mountains 04.IX.1998 Bakalin (KPABG-9309); *Yakutia Republic*. Kodar Range. 24.VII.2000 Bakalin (KPABG-101372).

LOPHOZIA WENZELII VAR. *LITORALIS* (ARNELL) BAKALIN **comb. nov.** – *Jungermannia alpestris* var. *litoralis* Arnell, 1901. Husnot, Hepat. Gall. [Exsicc.] n.207. – *Lophozia alpestris* var. *litoralis* (Arnell) Schiffn. 1905. Lotos 53 [n.s. vol. 25]: 111. Type: [Sweden] "Gestrikland, auf der Insel Storskommaren. VIII.1898 Arnell H.W.", LE!

This taxon is morphologically connected to var. *lapponica*, but differs in chestnut to rusty-brown pigmentation and habitat ecology. Var. *litoralis* has been determined from some gatherings in Europe and northern Asia, but its actual distribution is very poorly known. This taxon grows on finely-granulated soil in areas with disturbed vegetation cover, among mosses in lax mats, and (rarely) on wet cliffs.

Studied specimens: **Eurasia:** SWEDEN *Gestrikland*, auf der Insel Storskommaren. VIII.1898 Arnell H.W. (isotypus,LE); SCHWEIZ *Davos*.15.VII.1992 Onipchenko (MHA), 17.VII.1992 Onipchenko (MHA), 18.VII.1992 Onipchenko (MHA), 22.VII.1992 Onipchenko (MHA), 24.VII.1992 Onipchenko (MHA),1.VIII.1992 Onipchenko (MHA); RUSSIA *Komi Republik*. Vorkuta District. 30.VII.1969 Kil'dyushevsky I. (SYKO), 31.VII.1969 Kil'dyushevsky I., Zheleznova (SYKO), Inta District. 15.VII.1971 Lashchenkova A.N. (SYKO), Pechyora District. 03.VIII.1971 Kil'dyushevsky I. (SYKO), 03.VIII.1971 Kil'dyushevsky I., Zheleznova (SYKO); *Murmansk Province*. Sal'nyye Tundry Massif. 02.VII.2001 Bakalin (KPABG-8817) Teriberka River. 05.VIII.1977 Schljakov R.N. (KPABG); *Taimyr Peninsula*. West Taimyr. 11.VIII.1983 Matveeva N.V. (LE), 07.VIII.1986 Zanockha L.L. (LE); *Chita Province*. Udokan Range. 06.VII.2000 Bakalin (KPABG-101498).

LOPHOZIA WENZELII VAR. *MASSULARIOIDES* BAKALIN **VAR. NOV.** (Fig. 1)

Plantae pro more succulente, flavis vel flavi-fuscescens. Caulis in sectione transversali cellulis leptodermaticis subaequemagnis, segmento ventrali e cellulis 4-6 et pluribus lato. Folia applanato-ovata vel suborbiculari-ovata.

Plants yellow to brownish-yellow. Shoots about 1.5-2.5 mm wide and 0.7-2.0 cm long. Stem without microcellous layer; with wide (up to 4-6(-7) cells) ventral segment; the pigmentation of ventral and dorsal segment of the stem does not differ.

Holotypus: *Rossia, Caucasus borealis, Praedium interdittum Teberdaense, Mons Chatipara Minor. Ad rupes inter plantas Rhorodendroni caucasicae socialiter crescentes.* 31.VIII.1983 V.G. Onipchenko. *In herbarium hepaticorum Horti Bot. Princip. Acad. Sci. Rossicae (MHA) conservatur.*

Paratypus: *Ibid, Mons Chatipara Major. Ad rupes inter plantas Juniperinii communiae socialiter crescentes.* 17.VIII.1986 E.A. Ignatova. *In herbarium hepaticorum Horti Bot. Princip. Acad. Sci. Rossicae (MHA) conservatur.*

Var. *massularioides* (named due to the similarity of its stem morphology with *Massularia* Schljakov, i.e. *Schistochilopsis* (N. Kitag.) Konstantinova) is known only from the

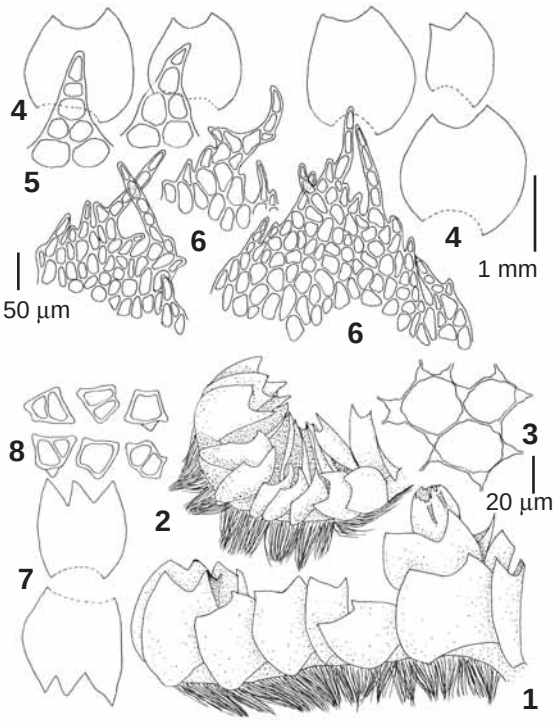

Fig. 2. *Lophozia lacerata* N. Kitag. 1 – perianthos shoot; 2 – sterile shoot; 3 – cells in the midleaf; 4 – leaves; 5 – endings of leaf lobes; 6 – mouth of perianth; 7 – female bracts; 8 – gemmae. Scales: 1 mm – for 1, 2, 4, 7; 20 µm – for 3, 8; 50 µm – for 5, 6. (1-6 from holotype, KYO; 7-8 - from Kuzmina E.Yu. 24.VII.1988 Koryak Uplands, LE)

type collection. It represents the southern variant of *L. wenzelii*. This taxon is characterized by the absence of a microcellous layer in the stem, peculiar yellow pigmentation, and the wide ventral segment of the stem, that does not differ from the dorsal segment in pigmentation. Var. *massularioides* has been identified in the subalpine belt in the northern Caucasus (2800-3000 m a.s.l.) on soil under the overgrowth of *Rhododendron caucasicum* and *Juniperus communis*.

LOPHOZIA LACERATA N. KITAG. (Fig. 2.) (holotype: Taiwan, Mt. Hsüeh-Shan. 1961. Shun-Jchi Uéno, KYO!)

The species is characterized by olive-green to greenish- or yellowish-brown coloration of plants; concave, sometimes imbricate, ovate to obovate when straightened; 0,8-1,4 mm long and 0.8-1,2 mm wide and strongly dorsally second leaves, those almost transverse inserted, with leaf insertion line incurved from subvertical and vertical in dorsal half, but oblique on ventral one, sinus descending to 1/5–1/3(–2/5) leaf length, U- to V-shaped; nonbiconcentric, granulate oil-bodies 7-10 per cells, spherical 5-8 mm to irregularly oval; dioecious inflorescence; absence of bracteole; lacerate into long lobules perianth and gemmae greenish to colorless or sometimes brownish, 1-2-celled, (4-)5-angled.

This species was keyed in Kitagawa, 1965 and in Bakalin, 2001.

Montane, mainly East-Asiatic species. It grows on decaying wood in subalpine belt in Japan where also frequently occurs on the base of *Pinus pumila* Pall. stems; sometimes it is observed in the tundra zone (Yakutia, Koryak Upland, Commander Archipelago), where it grows on dying peat-mosses or on bare ground of cryogenic origin near *Empetrum nigrum* and *Rhododendron kamtschaticum* patches in pure mats or mixed with *Barbilophozia hatcheri*.

This species was newly recorded for Russia in the Koryak Uplands (Konstantinova & Kuzmina, 2002). Shortly afterwards, *Lophozia lacerata* was found on the Kamchatka Peninsula (Czernyadjeva & Potemkin, 2003); other localities up this time were still unpublished (see list of studied specimens). The finding of the species in the Caucasus is somewhat surprising and cannot be explain satisfactorily (Fig 3).

Lophozia lacerata is a poorly known species with obscure limits of morphological variability. The strongly dorsally secund leaves, and incurved leaf insertion resembles ones of *Tritomaria*. In addition, *L. lacerata* is somewhat similar to *Tritomaria quinquedentata* (Huds.) H. Buch in the structure of its gemmae and its capsula (see Kitagawa, 1965).

Kitagawa (1965) estimates, that *L. lacerata* due lobulate perianth may be confused with *L. silvicoloides* N. Kitag. From the latter *L. lacerata* differs by concave to cupped, dorsally secund leaves and nonbiconcentric oil-bodies. I think that it is more difficult to differentiate this species from *L. wenzelii* (especially in sterile condition). These two species are similar in concave, almost transverse inserted leaves. *L. lacerata* differs from the latter in (1) strongly dorsally secund leaves, (2) deep, up to 2/5 leaf length, U-shaped leaf sinus (*L. wenzelii* var. *groenlandica* can have more or less deep sinus, but it is always γ-shaped), and (3) acute

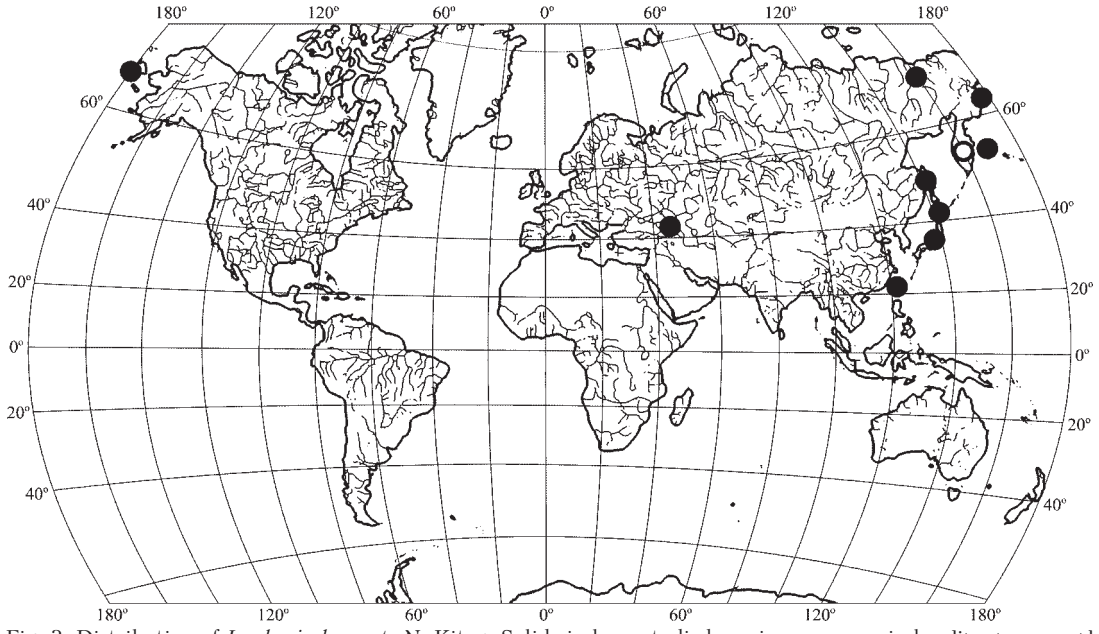

Fig. 3. Distribution of *Lophozia lacerata* N. Kitag. Solid circles – studied specimens; open circle – literature report by Czernyadjeva & Potemkin (2003)

leaf lobes of sterile shoots, (4) strongly incurved leaf insertion line, (5) dense rhizoids, and (6) wine-red pigmentation of the ventral stem side. Nevertheless, it is sometimes difficult to identify even perianthous plants. The study of authentic material (KYO) revealed that the perianth mouth varies from long- to shortly lobulate and the leaves vary from strongly dorsally secund to almost symmetrical. Those forms somewhat resemble *L. wenzelii* in appearance. In this case, the defining features are the absence of bracleole in *L. lacerata* and the longer end-cell of lobula in perianth's mouth (cell about 2-4 as long as wide versus 1,5-2,5 as long as wide).

Studied specimens: **Eurasia:** JAPAN *Insula Kirilensis*. 16.XII.1929 S. Bergman (KYO); *Honshu*. 4.XI.1962 N. Kitagawa (KYO); TAIWAN *Mt. Hsüeh-Shan*. 1961. Shun-Jchi Uéno. (KYO-holotypus); GEORGIA *Caucasus*. Bakuriani. 14.IX.1956 Abramova A.L. (LE); RUSSIA *Chukotka Authomonous Regoin*. Pekul'nejskoye Lake. 31.VIII.1986 Kus'mina E.Yu. (LE, KPABG); *Commander Archipelago*. Bering Island. 7.VIII.2002 Bakalin (KPABG 103458); *Koryak Uplands*. Khatyrka River. 24.VII.1988 Kus'mina E.Yu. (KPABG); *Sakhalin Island*. Korsakoff Cap. 1908 U. Faurie (KYO); *Yakutia Republic*. Lower of Indigirka River. 3VIII.1974 Afonina (LE).

LOPHOZIA SCHUSTERIANA SCHLJAKOV (Fig. 4)

(holotype: Canada, N.-E. Ellessmere Is. 27.VII.1955 R.M. Schuster, S, isotypus in KPABG!)

This species was reported in some localities in northern part of North America (Schuster, 1969) and in one locality in Russian Far East (Schljakov, 1980). During the study of *Lophozia* specimens in KPABG and LE as well as during the field trips this species was found in some localities in Europe and northern Asia. These findings altered existing notion about the taxon's area and its ecological preferences.

The species has a rather Arctic circumpolar distribution. American and Asiatic forms of *L. schusteriana* are somewhat different from their European counterparts. As it was pointed out, in America the species "associated with ledges and cliffs, and with exposed rocks, on either north or northwest-facing cliffs, in direct sun to permanent shade, or on exposed peaty soil over weathered mountain slopes ..." (Schuster, 1969: 590), and is found together with *Dicranum* spp., *Racomitrium lanuginosum* (Hedw.) Brid., *Sphenolobus minutus* (Schreb.) Berggr. Schuster observed this species growing in northeastern Greenland in habitats similar to those in Europe, for instance in areas with a combination of moss and hepatic species and percolating waters as in the Murmansk Province. The mod. *laxifolia-viridis-leptoderma-latifolia* (also found in Greenland: Schuster, 1969) was collected in the Khibiny Range (Murmansk Province). It grows on the lower parts of

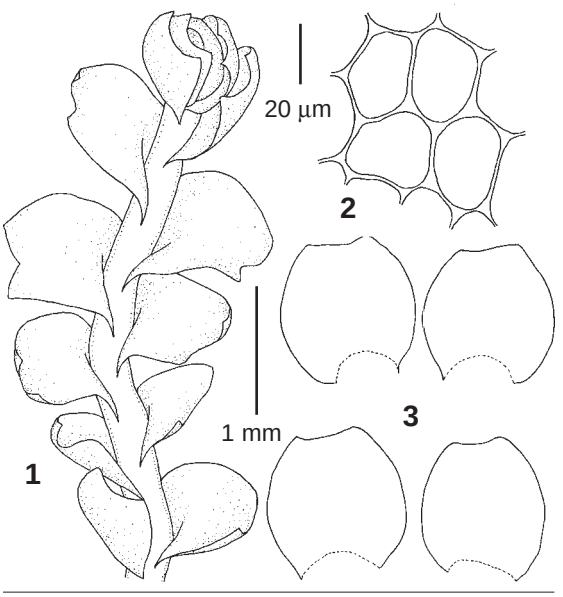

Fig. 4. *Lophozia schusteriana* Schljakov. 1 – sterile shoot, 2 – cells in the midleaf, 3 – leaves. (from Bakalin 11.VIII.2002, Bering Island, KPABG-103630).Scale bars 1 mm – for 1, 3; 20 µm – for 2.

Sphagnum mats where there is a constant flow of percolated water. In the Murmansk Province the species was collected also in a cotton grass-mosses oligotrophic mountain bog mixed with *L. ventricosa*, *Chiloscyphus pallescens* (Ehrh.) Dumort. and *Orthocaulis kunzeanus* near the base of a slope, and in the crevices of gravely barrens mixed with *Pleurocladula albescens*, *Tritomaria quinquedentata* and *Nardia insecta* Lindb. near snow glacier. This species rarely occurs in peat-moss bogs in pure mats on the slopes of *Sphagnum* ridges (mainly on *Sphagnum fuscum* (Schimp.) Klinggr.) or it is found in such habitats with *Scapania paludicola* and *Orthocaulis atlanticus* (Kaal.) H. Buch. *L. schusteriana* can be found with *Pleurocladula albescens* on humus-covered stones in temporary springs or on cliffs covered by finely-granulated soil near permanent springs, in pure mats, or with *Calypogeia muelleriana* (Schiffn.) Müll.Frib.and *Plectocolea subelliptica* (Lindb. ex Kaal.) Evans.

Some forms of *L. schusteriana* can be confused with at least three species: *L. wenzelii*, *L. ventricosa*, and *L. savicziae*.

This species differs from *L. wenzelii* in biconcentric oil-bodies, very oblique (to almost horizontal) inserted leaves and somewhat in armature of the perianth (acute-teethed versus obtuse-teethed). The characteristic feature of *L. schusteriana* is also yellowish pigmentation of the shoots. Schuster (1969) stated the absence of red pigmentation and the presence of yellow coloration as a very characteristic feature of the species. However, my observations have shown that red pigmentation is also extremely rare in *L. wenzelii*, and that *L. schusteriana* can be bright-green with no traces of yellow pigmentation.

The morphological variability of *L. schusteriana* is poorly known due to a lack of sufficient study material. However, today it can be pointed out that the pattern of its variability is similar to *L. wenzelii*. For example, in the Khibiny Mountains (Murmansk Province) I collected plants with leaf sinus and leaf shape resembling *L. wenzelii* var. *groenlandica*. This likeness is reinforced by convex trigones in leaf cells (characteristic in both *L. schusteriana* and *L. wenzelii* var. *groenlandica*). Var. *groenlandica* differs from the *L. schusteriana* in the following characteristics: broad ventral segment of the stem (3-6 cells versus 1-2(3) cells); granulate nonbiconcentric oil-bodies; and slightly oblique to almost transverse inserted leaves.

The study of specimens of *L. schusteriana* an a xerophitic condition has shown that the creeping shoots of this species have leaves largest in lower half or even in lower third of leaf length. The leaves of these forms somewhat resemble the leaves of *L. savicziae*. Schuster & Damsholt (1974) also identified the morphological intergradation of *L. schusteriana* to "*L. ventricosa* var. *grandiretis*" (i.e. *L. savicziae*) due to biconcentric oil-bodies and broad leaves. *L. schusteriana* differs from the *L. savicziae* in the following ways: absence of red pigmentation in the ventral leaf base (common in *L. savicziae*); 3-4-angled gemmae versus (4-)5-polygonal gemmae in *L. savicziae*; granulate oil-bodies, about 10-20 per cell (versus faintly granulate to homogenous and about (15-)20-40(-50) oil-bodies per cell in *L. savicziae*). The difference in size of leaf cells (cf. Schuster and Damsholt, 1974) is not constant, due to occurrence (especially in East-Asiatic part of *L. savicziae* area) the *L. savicziae* mod. *densiretis* with leaf cells about 24-30 µm of wide.

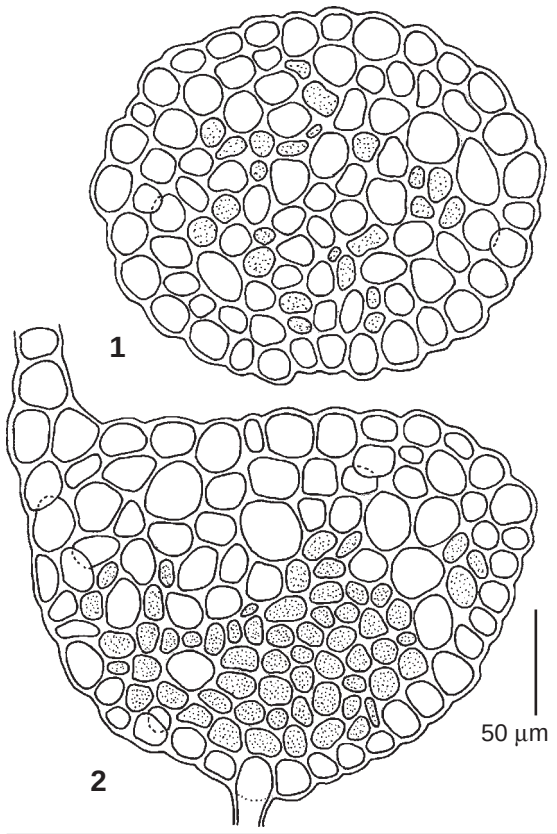

Fig. 5. *Lophozia longidens* (Lindb.) Macoun. 1 – stem's crossection of ascending part of shoot, 2 – stem's crossection of creeping part of shoot. (from Bakalin 24.VII.1998 Karelia, Paanajärvi National Park, KPABG). Hatched area - cells infested by fungal hyphae.

Lophozia ventricosa differs from *L. schusteriana* in nonbiconcentric oil-bodies, narrower leaves whose length exceeds the width, and a leaf base that clings to the stem infundibularly.

Studied specimens: **North America:** CANADA *British Columbia*. Bridal Fall. 6.X.1995 Konstantinova (KPABG), *N.-E. Ellessmere Is*. 27.VII.1955 R.M. Schuster (isotypus, KPABG).

Eurasia: RUSSIA *Gydan Peninsula*. Chugor'yakha River. 17.VII.1991 Czernyadjeva I.V. (LE); *Kamchatka Peninsula*. South Kamchatka. VIII.2001 Bakalin (KPABG 103800); *Commander Archipelago*. Bering Island. 11.VIII.02 Bakalin (KPABG 103630, 103631); *Murmansk Province*. Khibiny Mountains. 18.IX.2000 Bakalin (KPABG 9321, 9325, 9327, 9331, 9332, 9333) Gremyakha-Vyrmes Massif 13.IX.2002 Konstantinova (KPABG 9501) Chunatundra Massif 28.VI.2002 Bakalin (KPABG 9680) 27.VI.2002 Bakalin (KPABG 9646); *Chukotka Authonomous Region*. Ioni Lake. 7.VII.1977 Afonona(LE).

2. ON THE SECTION *LOPHOZIA*

The section *Lophozia* and allied taxa have been previously discussed in my paper (Bakalin, 2001), but new data on some species warrants a discussion of this section again.

It was shown (Bakalin, 2001) that section *Guttulatae* Schljakov cannot be segregated from the section *Lophozia*. Now, after analyses of *Lophozia longidens* (Lindb.) Macoun and *L. ascendens* (Warnst.) R.M. Schust. material, I propose that section *Longidentatae* R.M. Schust. should also be synonymized with section *Lophozia*.

The main defining features of section *Longidentatae* were cited by Schuster (1969) as follow: "narrow and subvertically oriented leaves with drawnout, narrow lobes; the relatively subtransverse line of insertion of the upper portions of the leaves; the very obviously ascending to suberect gemmiparous shoots,the smaller stems, nearly free of micorrhizal infection and only 9-12 cells high in maturity with little dorsiventral differentiation of the medulla; the longly ciliate-dentate perianth-mouth lobes; and more or less obviously dentate perichaetial bracts" (Schuster, 1969: 494). This section included two species: *L. ascendens* and *L. longidens*, with the latter as the type.

Nevertheless, both species have creeping forms (frequently found in *L. longidens* and rarely in *L. ascendens*) and have oblique inserted leaves, a stem more than 12(-15) cells high, and a strongly differentiated ventral microcellous layer (Fig. 5-6.). Moreover, *L. lacerata* and *L. silvicoloides* both have a long lobulate-dentate perianth mouth. On the contrary, longly lobulate perianth mouth is not constant in *L. longidens*. Finally, dentate bracts sometimes occur in some forms of *L. ventricosa*.

The absence of intergradation between *L. longidens* and *L. ascendens* was shown by Schljakov (1980) who referred *L. ascendens* to section *Lophozia*.

Previously, Meylan (1924) treated *L. longidens* as a subspecies of *L. ventricosa* and this point of view is perhaps not too far from reality. Indeed, some green-gemmous forms of *L. ventricosa* (frequently in shady places in forests) are sometimes not differentiable from *L. ventricosa* var. *ventricosa* and even *L. silvicola* H. Buch.

Therefore, I conclude that section *Longidentatae* can not be segregated from section *Lophozia*.

Sectio *Lophozia* - Sectio *Longidentatae* Schust. 1969. Hep. Anth. North Amer. 2:531 **syn. nov.**

The diagnosis of the section *Lophozia* in the present concept is as follows:

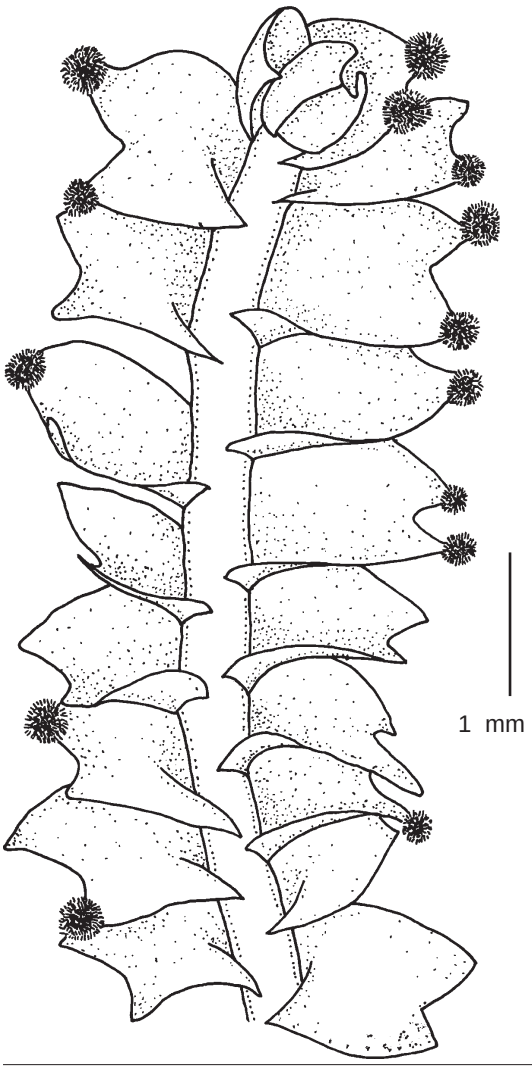

Fig. 6. *Lophozia ascendens* (Warnst.) R.M. Schust. mod. *prostrata*. Shoot. (Gambaryan S.K. 29.VIII.1986 Khabarovsk Territory, Komsomol'sky Strict Nature Reserve, VLA).

Plants creeping to ascending. Shoots brownish, or more often obscurely or bright green; more rigid than shoots of section *Excisae*, but more lax than those in section *Sudeticae*. The differentiation of the stem tissues is constantly evident (with the exception of thin ascending or proliferous shoots in some species). Leaves more or less oblique inserted, with width exceeding or, more often less than length. Cells with the clear, frequently convex thickenings. Mouth of the perianth dentate to ciliate and lobulate. Antheridial bracts without teeth near base.

Now the section includes 8 species: *Lophozia ventricosa* (type of section), *L. silvicola*, *L. silvicoloides*, *L. ascendens*, *L. longidens*, *L. lantratoviae* Bakalin, *L. austro-sibirica* Bakalin and *L. nepalensis* Bakalin (for the description and treatment of the latter three species see Bakalin, 2003a, other species described and illustrated in Schuster, 1969; Schljakov, 1980; Kitagawa, 1965; Bakalin, 2001, etc.).

3. *LOPHOZIA* SECT. *SAVICZIAE* BAKALIN *SECT. NOV.*

Plantae rigidiusculae, ad normam rufulocolor. Segmentum caulis ventrali e cellulis ad 4-6 lato. Caulis in sectione transversali cellulis leptodermaticis subaequemagnis aut cum strato cellularum minorum medullae partis ventralis. Cellulae foliorum in parte folii media ad normam ultra 30 mm latae et 35 mm longae. Corpuscula oleosa in cellula (15-)20-30 et plura, homogena vel granulata cum sphaerulus centralibus.

Typus*: Lophozia savicziae* Schljakov (Type: Russia, Peninsula Kolaënsis, montes Chibiny, 25.VII.1971 R.N. Schljakov, LE!).

Plants rigid, usually peculiarly chestnut-rusty pigmented. The microcellous layer of the stem unstable. Ventral segment of the stem to 4-6 cells in width. Leaves almost transversely inserted, usually concave to cupped, widest below the middle. Cells large, usually exceeding 30 x 35 μm in the leaf middle. Oil-bodies plural, 20-40(-50) per cell, homogenous or scarcely papillose to granulate biconcentric. Gemmae (4-)5-polygonal, colorless.

The section includes the single species – *Lophozia savicziae*. This poorly known species distributed mostly in Russia was discussed earlier (Bakalin, 2000).

Schljakov (1980) included *Lophozia savicziae* in sect. *Heteromorphae* R.M. Schust. together with *L. groenlandica* sensu Schljakov, auct. non (Nees) Macoun and *L. major* (C.E.O. Jensen) Schljakov (i.e. *L. polaris* (R.M. Schust.) R.M. Schust. et K. Damsholt). Of these, *L. groenlandica* sensu Schljakov included three taxa: *L. ventricosa* var. *ventricosa*, *L. wenzelii* var. *groenlandica* (Nees) Bakalin and *L. heteromorpha* R.M. Schust. (see Bakalin, 2001). The section *Heteromorphae* was originally described by Schuster (1969) for the single species, *Lophozia heteromorpha* R.M. Schust. Schljakov (1980)' approach to the sect.

Heteromorphae expands its to include species characterized by: (1) direction of the cells-rows to sinus, (2) large ventral stem merophyte, and (3) "weakly but exactly thick-walled stem-cells". In regards to the first character, it have been shown (Bakalin, 2000, 2001) that cell-rows to sinus are observed in an overwhelming majority of species in many sections (according Schljakov, 1980) and so do not differentiate any sections. Secondly, a large ventral merophyte is observed in sect. *Excisae* Schust. and sect. *Sudeticae* Schljakov. Thirdly, thick-walled stem cells are observed in sect. *Sudeticae* and can be absent in *L. heteromorpha*.

Thus, defining traits of the section *Heteromorphae* are quite unclear. I believe that Schljakov attempted to unite some unlike taxa in a single section. It is almost impossible to find any features uniting the three (*Lophozia heteromorpha, L. savicziae* and *L. polaris*) taxa. Striking traits of *L. savicziae* – inconstancy quantity and structure of oil-bodies, but *L. heteromorpha* – dentate ventral margin of antheridial bracts and frequently occurring 3-(4)-lobate sterile leaves (versus other taxa of genus, having almost constantly bilobate leaves). So, I proposed to limit sect. *Heteromorphae* by *L. heteromorpha* as it was done by Schuster (1969). *L. savicziae* can be referred to as a separate section.

Some remarks on the history of treatment of section *Heteromorphae* are necessary. In 1969 Schljakov (1969) described plural oil-bodies in *L. murmanica* Kaal. A year later Schljakov (1970) described a new section of *Lophozia* sect. *Murmanicae* Schlajkov with a single member: *L. murmanica*. In the latter publication the concept of this species has changed greatly. Besides plural minute oil-bodies, Schljakov also described scanty granulate one in *L. murmanica*. He (Schljakov, 1970) placed *L. wenzelii* var. *lapponica* H. Buch and S.W. Arnell and *Jungermannia alpestris* var. *major* C.E.O. Jensen as synonymous with the *L. murmanica* and treated var. *major* as only a "form of species with colored gemmae" (l.c.: 325).

On illustration of section type species (Schljakov, 1970) is depicted by plants with strongly differentiated ventral microcellous layer in the stem, 3-4-angulate gemmae, and an elongated, short-ciliate perianth mouth. Schljakov described a section just for this species, but pointed out that although previously described plants (Schljakov, 1969), "differ from many other populations of species in structure of the stem, quantity and size of oil-bodies, they nonetheless without doubt represent the same species" (Schlajkov, 1970: 328). Later (Schljakov, 1973) Schljakov refuted his prior conclusion. He described *L. savicziae* as a new species. The latter species has plural oil-bodies. Other phases of former "species" he retains within the limits of *L. murmanica*.

In 1980 Schljakov treated his *L. murmanica* sensu Schljakov-1970 as synonymous with *L. groenlandica*. Characteristics of *L. murmanica* sensu Schljakov-1969 may be observed in figure of *L. savicziae*, and characteristics of *L. murmanica* sensu Schljakov-1970 may be observed in figure of *L. groenlandica* in Schljakov's handbook "Liverworts of the North USSR" (1980). Thus, sect. *Murmanicae* was described for Schljakov's "*L. groenlandica*" as a type, but not *L. savicziae*.

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