

NOTES ON *LOPHOZIA* III. SOME TAXONOMIC PROBLEMS IN  
*LOPHOZIA* SECT. *LOPHOZIA*

ЗАПИСКИ ПО РОДУ *LOPHOZIA* III. НЕКОТОРЫЕ ТАКСОНОМИЧЕСКИЕ  
ПРОБЛЕМЫ В ГРУППЕ *LOPHOZIA* SECT. *LOPHOZIA*

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Abstract

Analyses of miscellaneous materials of green-gemmous *Lophozias* have shown: (1) *L. silvicola* is a distinct species from *L. ventricosa*. (2) *L. iremelensis* is synonymous with *L. ventricosa* and treatment of the former as conspecific with *L. wenzelii* is erroneous. (3) *Jungermannia groenlandica* is a distinct variety of *L. wenzelii*. (4) The separating of the sect. *Guttulatae* is unfounded because of absence of constant defining features from sect. *Lophozia*. So, sect. *Guttulatae* should be rejected. (5) *L. silvicoloides* seems to be a more or less common species of East Siberia and Far East with a few disjunctions in Europe. The species is close on the one hand to *L. silvicola* and on the other hand to *L. ascendens*. Two new combinations are proposed: *Lophozia ventricosa* var. *guttulata* (Lindb. et H. W. Arnell) Bakalin comb. nov. and *Lophozia wenzelii* var. *groenlandica* (Nees) Bakalin comb. n. The key for identification of Holarctic's green-gemmous *Lophozias* is presented.

Резюме

На основании изучения разнообразного материала по видам *Lophozia* с зелеными выводковыми почками показано, что: (1) *L. silvicola* является ясно отличимым от *L. ventricosa* видом. (2) Синонимом *L. ventricosa* является *L. iremelensis*, отождествление которой с *L. wenzelii* неверно. (3) Таксон, описанный под именем *Jungermannia groenlandica*, должен рассматриваться в качестве разновидности *L. wenzelii*. (4) Выделение секции *Guttulatae* необоснованно, поскольку не имеется ни одного принципиально отличного признака от секции *Lophozia*. (5) *L. silvicoloides* довольно широко распространена на территории Восточной Сибири и Дальнего Востока и имеет отдельные дизъюнкции в Европе. Этот вид сближается, с одной стороны, с *L. silvicola*, а с другой с *L. ascendens*. Предлагаются две новых комбинации: *Lophozia ventricosa* var. *guttulata* (Lindb. et H. W. Arnell) Bakalin comb. nov. и *Lophozia wenzelii* var. *groenlandica* (Nees) Bakalin comb. n. Приводится ключ для определения зеленопочковых видов рода *Lophozia*.

Admittedly the genus *Lophozia* represents one in the most polymorphous and difficult genera of hepatics in Holarctic. Further, its division into species is a very intricate question and the specific limits were treated variously not only by different hepaticologists, but also by one specialist during one or two decades (compare Schljakov, 1969 and 1980). I believe that green-gemmous *Lophozias* represent the biggest problem in the genus, but probably the troubles are more obvious because the species are more common than other ones.

After critical study of collections of this genus in BM, KYO, LE, MHA, MUB, MW, NMW,

ПМАЕ, PZV, STR, SYKO, and UPS I came to the following conclusions on some parts of this group. Problems around *L. savicziae* were discussed by Bakalin (2000), and the complex *L. wenzelii-schusteriana* will be discussed in a separate article.

I. *L. SILVICOLA* -- *L. VENTRICOSA* PROBLEM

In the recent publications (Paton, 1999; Grolle and Long, 2000) *L. longiflora* (Nees) Schiffn. is usually separated from *L. ventricosa* (Dicks.) Dum. However, the latter species is treated very broadly as including phases with both biconcentric oilbodies and nonbiconcentric ones. Paton (1999) mentioned three main distinguishing features: *L. longiflora* is supposed to differ

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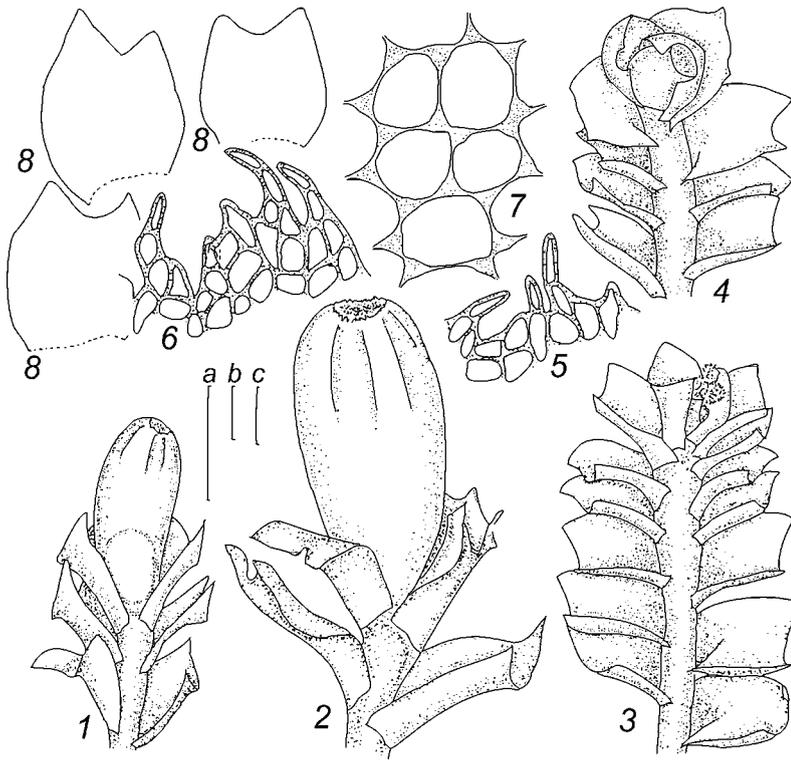


Fig. 1. *Lophozia ventricosa* var. *longiflora* (Nees) Macoun (1-4 – from: Russia, Murmansk Prov., Konstantinova 11.X.1994 (KPABG); 5-6, 8 – from: UK, Durham, Fitzgerald 22.IV.1962 (NMW), 7 – from: Ireland, Fitzgerald 1.VI.1965 (NMW)): 1-2 – shoots with perianths; 3-4 – sterile shoots; 5-6 – perianth's mouth; 7 – cells in the midleaf; 8 – leaves; ; scales: a – 1 mm, for 1-4, 8; b – 50  $\mu$ m, for 5, 6; c – 20  $\mu$ m, for 7.

from *L. ventricosa* sensu Paton by its ciliate perianth, large leaf trigones and almost constant occurrence on decaying logs. These differences seem very critical to me. *L. ventricosa* sensu Paton (according to Paton's conclusion, l.c.) can develop a dentate-ciliate perianth, sometimes large and convex trigones and may occur on rotting wood. I cannot agree with the usage of these characters (cf. Schljakov, 1980). Separating of *L. longiflora* seems to be incorrect if the "nonbiconcentric" phase in *L. ventricosa* is retained. Since Grolle and Long (2000) neotypified *L. ventricosa* by plants with nonbiconcentric oilbodies, *L. longiflora* can not be separated from *L. ventricosa* at the species level because of the absence of any constant differences. So, *L. longiflora* is treated here as a variety of *L. ventricosa*. In this case, plants with biconcentric oilbodies should be named *L. silvicola*.

The differences between *L. ventricosa* (Fig. 1) and *L. silvicola* (Fig. 2) are shown in Table I. Further, very characteristic of *L. silvicola* are trilobate leaves with shallowly crescentic sinuses, frequently occurring in all modifications of this species. Similar leaves are observed in

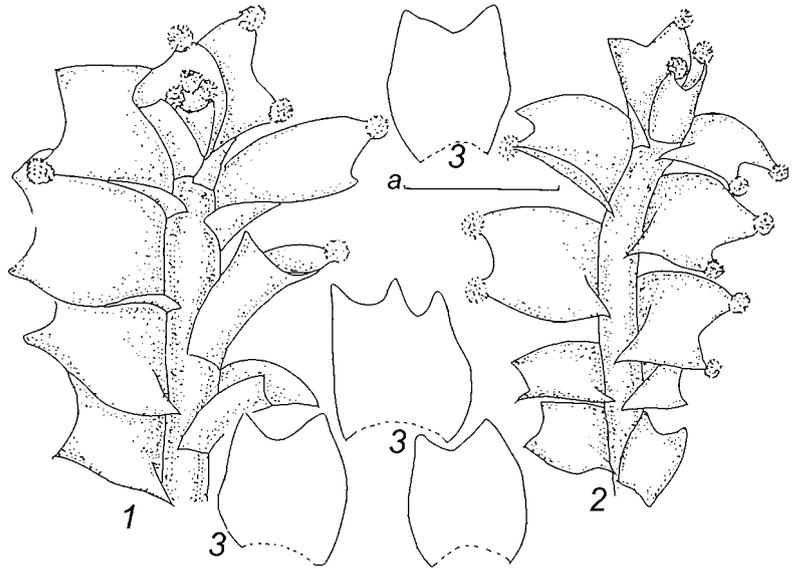
*L. ascendens* (Warnst.) Schust. and *L. longidens* (Lindb.) Macoun. Shape of trigones is a valuable feature according to Schljakov (1980). Thus *L. ventricosa* versus *L. silvicola* has peculiarly curved cell lumens which were not observed in mod. *pachyderma* of the latter species (cf. figs. 1.7. and 3.3.).

Additional distinguishing features that can be used are (1) size of trigones – *L. ventricosa* has moderately to large convex trigones as a rule, in comparison to the almost always concave ones of *L. silvicola*; (2) *L. silvicola* never develops cilia of 3-4 cells on perianth's mouth, that are characteristic for *L. ventricosa*, and its var. *guttulata* (Lindb. et H.W. Arnell) Bakalin<sup>1</sup>, especially.

One of varieties of *L. ventricosa* is var. *confusa* Schust. It includes mainly lax-leaved plants of the species (Fig. 4.). The instability of the armature of the perianth mouth and the leaf shape suggest that this variety appears to be an ancient little-specialized satellite of its species, more or less close to *L. silvicola*, *L. wenzelii*

<sup>1</sup> – *Lophozia ventricosa* var. *guttulata* (Lindb. and H.W. Arnell) Bakalin comb. nov. – Basionim: *Jungermannia guttulata* Lindb. et H.W. Arnell In: Musci As. Bor.: 51

Fig. 2. *Lophozia silvicola* Buch (from: Russia, Karelia, Bakalin 15.VII.1998 (KPABG): 1-2 - sterile shoots; 3 - leaves; scale a - 1 mm, for 1-3.



and *L. schusteriana*. The lax-leaved phenotypes of var. *confusa* may be confused with *L. silvicola*, and *L. wenzelii*, probably. The additional distinguishing features from *L. silvicola* are: (1) characteristic "capitate" apex of shoots, (2) width of cells in the midleaf attaining 22-26  $\mu\text{m}$  in lax-leaved shoots of *L. ventricosa* versus 25-30  $\mu\text{m}$ , (3) the absence of trilobate leaves with crescentic sinuses. *L. wenzelii* s.str. easily differs from var. *confusa* by its concave to cupped leaves, narrow, mainly semilunate sinus and by specific brown-yellowish pigmentation without reddish coloration. For the differentiation of var. *confusa* from *L. wenzelii* var. *groenlandica* see below.

As many other polymorphous species *L. silvicola* can develop somewhat anomalous forms which create confusion. I observed *L. silvicola* with "funnelate" base of the leaves, but other

distinguishing features (Table 1) were kept. Leaves of *L. silvicola* mod. *colorata-pachyderma* (Fig. 3.) lose their typical appearance frequently, and some are the widest below the middle. However, the characteristic trilobate leaves with shallowly crescentic sinuses can be observed in those forms, even. Sometimes, leaves of mod. *pachyderma-colorata* look like those of *L. savicziae* Schljak., also by large leaf-cells (the width of them can attain 30  $\mu\text{m}$  in the midleaf), but *L. silvicola* may be easily recognized by leaves decurved from the stem versus cupped leaves of mod. *pachyderma* of *L. savicziae* (cf. Bakalin, 2000).

## II. WHAT IS *LOPHOZIA IREMELENSIS* SCHLJAK.?

*Lophozia iremelensis* was described on the basis of three specimens from the South Ural (Schljakov, 1998b). According to the original

Table I. Comparison of *L. silvicola* and *L. ventricosa*

Features	<i>L. silvicola</i>	<i>L. ventricosa</i>
structure of oil bodies	biconcentric	non-biconcentric
shape of leaves	explanate, subhorizontally inserted, almost never form a "funnel" with the stem, leaves decurved from the stem	somewhat slightly conduplicate, frequently subtransversely orientated, always with a funnel at the base, lobes directed to the apex of the stem
gemmae distribution	gemmae are clustered on the ends of the lobes and those clusters are descended down from the apex	gemmae early deciduous and concentrated merely on the apex of the shoots
bracteole	mainly lanceolate	mainly bilobate
sinus of the bracts	not decurved from the perianth	decurved from the perianth
perianth's teeth	apical cell of teeth 1.5-2.5 as long as wide	apical cell of teeth 2.5-4 as long as wide

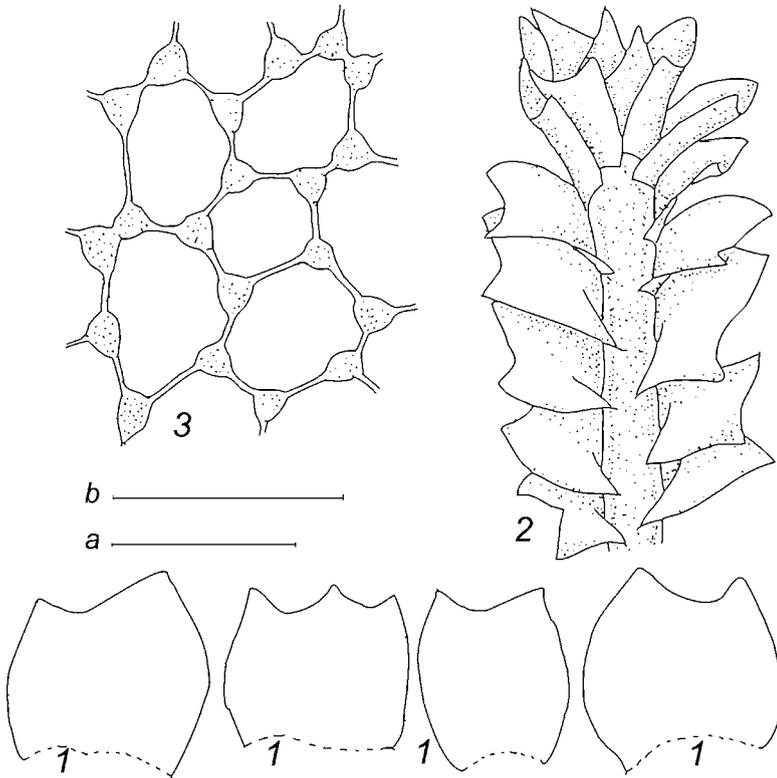


Fig. 3. *Lophozia silvicola* Buch mod. *pachyderma-colorata* (from: UK, Wales, Glamorgan, Fitzgerald, IV.1962 (NMW)): 1 – leaves; 2 – sterile shoot; 3 – cells in the midleaf; scales: a – 1 mm, for 1-2; b – 50  $\mu$ m, for 3.

descriptions it differs from other taxa of *Lophozia* in “almost explanate leaves with obtuse lobes”. These features are almost impossible to measure so I was confused as to the status of this taxon.

Subsequently, Grolle and Long (2000) treated *L. iremelensis* as synonymous with *L. wenzelii* on the basis “Vana, pers. comm.”. These authors stated that Vana had studied authentic material of *L. iremelensis*. This is not quite correct. Really, as I was informed by curators of LE and MHA, where type specimens are deposited, Vana studied duplicates, which were extracted from samples by Dr. Ignatov and were sent him for identification. Then Vana determined them as *L. longiflora*. This happened some years before Schljakov studied the collection. So, the author of *L. iremelensis* did not see the specimens examined by Vana and I cannot be assured that “duplicate” of the latter contained the same species as in the envelope with the inscription: “*Lophozia iremelensis*. *Holotypus*”.

The analysis of authentic specimens of *L. iremelensis* (borrowed from LE and MHA) confirms its identity as *L. ventricosa*. The ho-

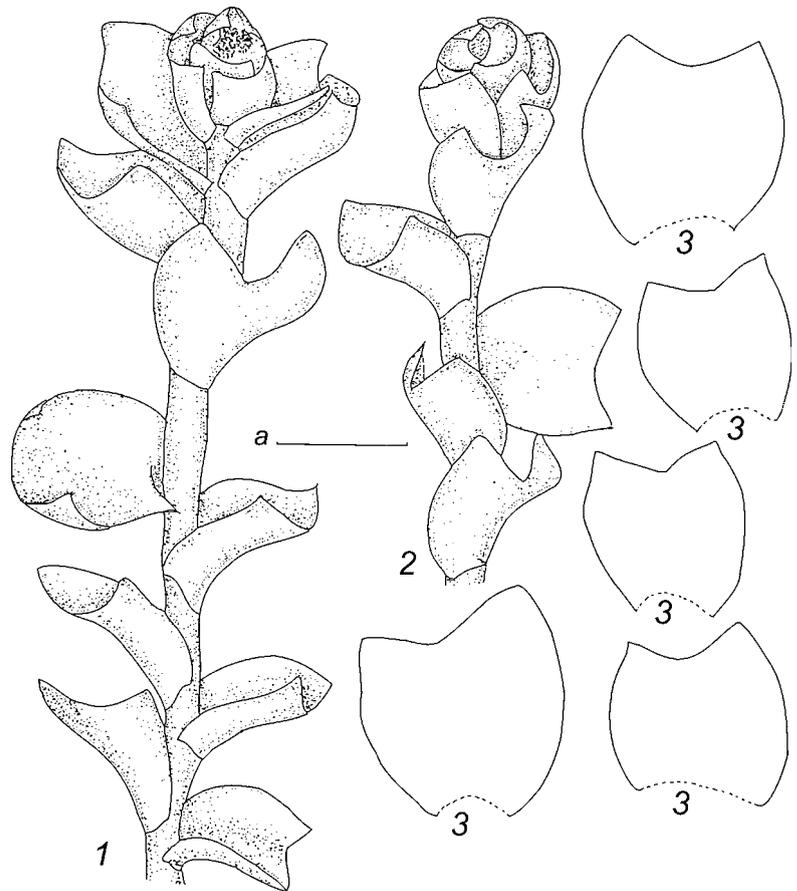
lotype and the isotype contain only lax-leaved plants of the latter species with characteristic features listed in Table 1 (Fig.5.). However, the paratype from the Mt. Bolshoi Irmel' was separated by Schljakov into two microscopic parts which contain only *L. sudetica* (Hueb.) Grolle with the characteristic rusty-brown pigmentation. One part contains antheridial shoots only (MHA), but the other contains sterile plants with numerous rusty-brown gemmae (LE). On the basis of the holotype I consider *L. iremelensis* to be synonymous with *L. ventricosa*.

*Lophozia ventricosa* (Dicks.) Dum. Recueil Observ. Jungerm.: 17. 1835. – *Lophozia iremelensis* Schljak. Novosti Sist. Nizsh. Rast. 32: 180. 1998. syn. nov.

### III. WHAT IS *JUNGERMANNIA GROENLANDICA* NEES EX GOTTSCHKE, NEES ET LINDENBERG?

Since its description (Gottsche et al., 1844) *Jungermannia groenlandica* (= *Lophozia groenlandica* (Nees) Macoun) has been variously interpreted. Stephani (1902) considered it as a distinct species, and placed it to genus *Sphenolobus*. But Müller (1954) believed *J. groenlandica* only to be a peculiar form of *L. wenzelii*. Further, Damsholt (1994) lectotypi-

Fig. 4. *Lophozia ventricosa* var. *confusa* Schust. (from: Russia, Karelia, Bakalin 16.VII.1998 (KPABG)): 1-2 – sterile shoots; 3 – leaves; scale a – 1 mm, for 1-3.



fied this species and treated it as a synonym of *L. wenzelii*. Finally, Schljakov (1998a) stated that Damsholt's conclusion was erroneous, and retained specific level for the taxon. However, according to Schljakov (l.c.), Damsholt's lectotypification is correct.

My investigation of the genus discusses this problem again.

Damsholt (1994) described the history of the taxon in detail, convincingly substantiating the lectotype, and his lectotypification appears to be correct. However, Damsholt's description of lectotype plants is very brief, and he does not give convincing support for the main result of his work, i.e. synonymy of *J. groenlandica* to *L. wenzelii*. Damsholt's description of the lectotype plants is as follows: "The stem is purplish black ventrally, with extensive mycorrhizae in the ventral half or more. The leaves are 2-lobed, with mostly blunt lobes (only occasional with a 3-lobed leaf), somewhat concave, with shallow lunate sinuses. The gemmae are light-

green (brownish now by age), 2-celled, angular to stellate. The female bracts are 2-3-lobed; bracteole lanceolate, connate with one bract. The perianth is long exserted, plicate in the upper third, contracted to the mouth; the perianth mouth has a few 1-celled teeth". So, this description is a very formal one and can be referred also to *L. savicziae* Schljak., *L. schusteriana* Schljak. and *L. groenlandica* sensu Schljakov. I estimate, of course, that the brief description is a result of the microscopic size of the specimen and its critical condition, but these reasons do not free us from the necessity to decide the status of taxon.

The type description (Gottsche and al., 1844), earlier figures and other description based on type material may be more informative than a study of a microscopic, half-destroyed lectotype.

*J. groenlandica* was described by Nees (Gottsche et al., 1844) as "*Jungermannia amphigastriis nullis, caule adscendente simplici dichotomove ventre parce radiculoso, foliis*

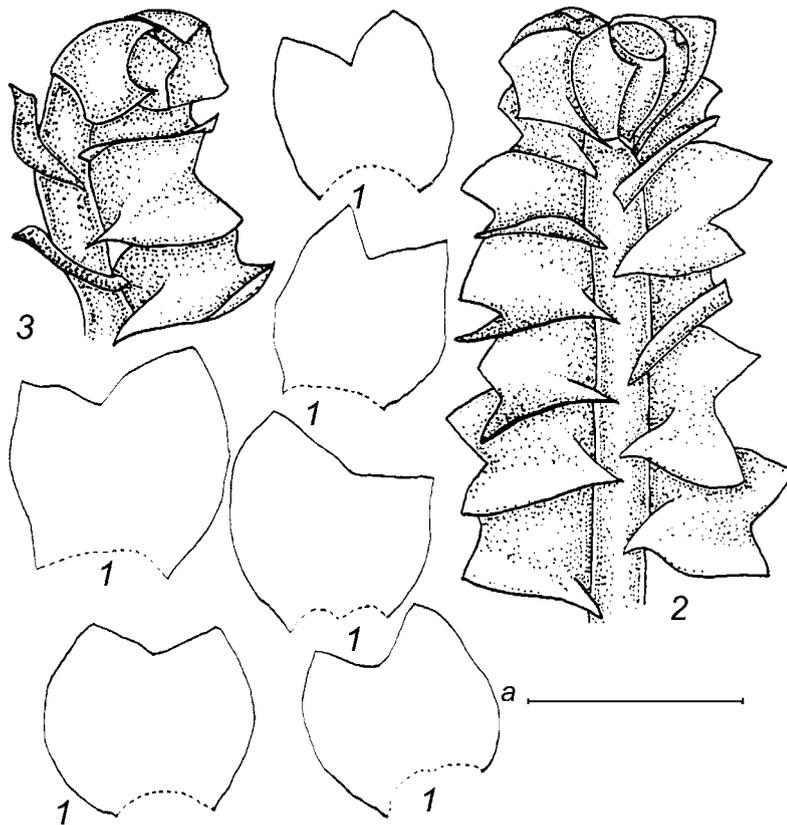


Fig. 5. *Lophozia ventricosa* (Dicks.) Dum. (from holotype of *Lophozia irmelensis* Schljak., Russia, Bashkiria, Ignatova 30.VIII.1990, LE): 1 – leaves, 2-3 – sterile shoots; scale a – 1 mm for 1-3.

*semiverticalibus in dorso contiguis molibus decurrentibusque suborbiculatis convoluto-concavis subrepandis margine ventrali arcuato sinu obtuso bi-tridentatis dentibus obtusis acutisve inflexis inaequalibus, involucri foliis basi connatis trifidis erectis, perianthio obovato angulato ore 4-5-fido denticulato*".

*Jungermannia* without amphigastria, stem ascending, simple dichotomous branched, ventral segment rhizoidal, leaves obliquely inserted, in dorsal part slightly decurrent, suborbiculate, convolute-concave, slightly decurved, ventral margin arched, bi- to trilobate, sinus and lobes obtuse, inflexed, unequal, bracts connected at base, trilobate, erect; perianth obovate, angulate, mouth 4-5-lobate, dentate". Habitat in Greenland, densely caespitose, among *Jungermannia minuta* Schreb. (*Sphenolobus minutus*) in tufts, with capsules. (Trans. from original).

Müller (1954) studied authentic material of the taxon and considered it a peculiar form of *L. wenzelii* differing from the latter by: (1) rotundate leaves directed to the apex, (2) brownish cell walls in the lobes.

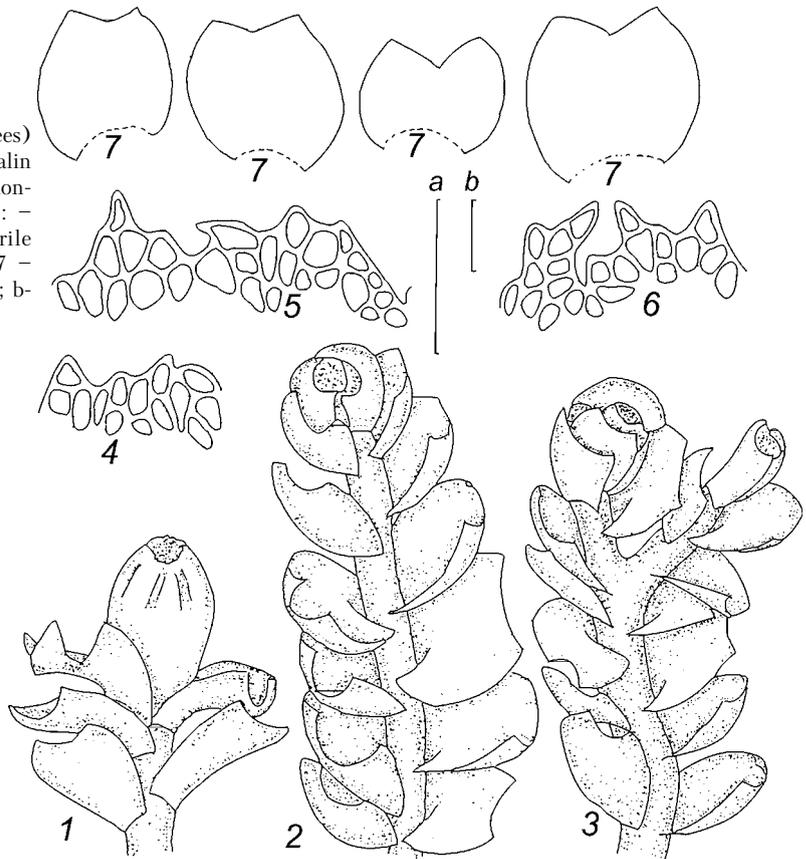
The figure of *J. groenlandica* in "Flora Danica" (Steenstrup & Lange, 1858) is especially interesting, because it was depicted by Gottsche on the basis of authentic specimens. In the fig-

ure one can see creeping to slightly ascending shoots with sub-imbricate, partly trilobate leaves, with sinus from semilunate to  $\gamma$ -shaped, the width of the leaves exceeding their length.

Further, Prof. Konstantinova kindly proved me a description and figures made by herself in 1996 from the lectotype. "Type specimens of *J. groenlandica* is microscopic and was repeatedly soaked and very old, so to determine of original pigmentation of plants seems to be impossible. Consequently, we limited features of the leaves only, those somewhat polymorphous, bi-, more rare trilobate, rotundate-quadrangulare, the widest below the midleaf, slightly oblique inserted, sinus semilunate to obtuse, cells in the midleaf attain 22-25  $\mu\text{m}$  in width, with moderate to gibbous trigones".

Some traits placed in the above description are somewhat suspicious for the typical *L. wenzelii* (cf. Schuster, 1969; Schljakov, 1980). These features are: (1) polymorphous sinus, (2) sometimes trilobate leaves, (3) sometimes large convex trigones, (4) habitat in "*Jungermannia minuta*". I studied about 300 specimens identi-

Fig. 6. *Lophozia wenzelii* (Nees) Steph. var. *groenlandica* (Nees) Bakalin (from: Russia, Murmansk Prov., Konstantinova 15.VI.1996 (KPABG)): - 1 - perianthous shoot; 2-3 - sterile shoots; 4-6 - perianth's mouth; 7 - leaves; scales: a - 1 mm, for 1-3, 7; b - 50  $\mu$ m, for 4-6.



fied as *L. groenlandica*, *L. wenzelii*, and *L. rufescens* Schljak. from LE, PZV, MHA, MW, SYKO and KPABG for the purpose of clearing up the status of *J. groenlandica*. As it turned out, plants conspecific with the lectotype of the taxon have some peculiar features, but should be included in the limits of *L. wenzelii*'s variability. I treat them as a distinct taxon in the variety level: *Lophozia wenzelii* var. *groenlandica* (Nees) Bakalin comb. et stat. nov. (Basionym: *Jungermannia groenlandica* Nees in G., L. et N., *Synopsis Hepaticarum*, 1844, p. 114.) It is distinguished from var. *wenzelii* by the following features:

1. A sinus descending to 1/3 of leaf length vs. 1/7-1/5.

2. Sinus is extraordinarily polymorphous: U-, V-,  $\gamma$ -shaped and semilunate, vs. shallowly crescentic.

3. Trigones are distinct, often bulging, vs. concave.

4. Ventral segment of the stem often larger, to 4-5 cells wide vs. 2-3.

5. Mouth of perianth frequently ciliate (with cilia of 2(3) cells), vs. lobate.

This combination of features seems to be result of insufficient humidity. The description of a variety follows (Fig. 6.):

Usually mesophytic, over boggy patches, more often on moist sandy or clayey soil, prostrate with obscurely ascending apices. Shoots brown-yellow-greenish to blackish-brown, mostly 0,5-1.2 mm broad, 0.5-3.0 cm long, the stems 200-500  $\mu$ m broad. Stems brownish, rarely green-yellowish-brown, to brown, rarely red-brown or purple-brown in ventral parts, with numerous colourless rhizoids which may be reddish or reddish-brown at base. Leaves yellow-brownish or (seldom, in shady places only) green, in distal part and base usually rather brown, obliquely to subtransversely inserted, mostly rather dense, subvertically oriented and cupped or saucer-shaped with the concavity turned toward stem apex, broadly orbicular to ovate, with both margins rather strongly arched, widest near, slightly above or (oftener) typically below the

Table 2. A comparison of *L. ventricosa* var. *confusa* Schust. and *L. wenzelii* var. *groenlandica* (Nees) Bakalin

Feature	<i>L. ventricosa</i> var. <i>confusa</i>	<i>L. wenzelii</i> var. <i>groenlandica</i>
leaf base	funnelate	non-funnelate
leaf shape	slightly conduplicate, asymmetrical	more or less concave to capped, symmetrical
direction of lobes	lobes divergent, the distance between ends of lobes ca. 0.7-0.9 of the leaf width	lobes not divergent, the distance between ends of lobes ca. 0.5-0.7 of the leaf width
perianth mouth	longidentate to ciliate with teeth of 2-4 cells	obtuse lobulate to crenulate
perianth's teeth	apical cell of teeth 2.5-4 as long as wide	apical cell of teeth 1.5-2.5 as long as wide
gemmae	mainly triangular to quadrate	mainly quadrangular to pentagonal
width of ventral segment	1-2(3) cells	2-5 cells
pigmentation of shoot	green to green-brown, frequently green-brown-reddish, especially on well insolated places	brown-yellow-greenish to blackish-brown

middle, width:length ca. 0,9-1,2:1,0; the incurved and usually equal lobes broadly triangular and mostly blunt to obtuse, the sinus V- or r-shaped with width ca.0,4-0,7 of leaf width and descending to 0,2-0,4 of leaf length. No underleaves. Cells with more or less thin walls and distinct moderately bulging trigones to strongly collenchymatous; median cells 22-27(30) x 24-30(35)  $\mu\text{m}$ ; cuticle smooth; oilbodies 4-12(17) per cell, mostly small, 3.0-4.5 x 4.0-6.0  $\mu\text{m}$ , some spherical and 3.5-5.0  $\mu\text{m}$ , uniformly finely granulate, never biconcentric. Gemmae pale green to colourless, when immature rarely slightly brownish, when gemmiparous on brown border of leaf; mostly 2-celled, weakly polygonal to pentagonal, rarely quadrate, 19-25 x 20-25  $\mu\text{m}$ .

Dioecious. Gynoecia with bracts more or less obovate, usually 2-3 lobed, one of those connected with two-lobed or unlobed bracteole, lobes triangular, bluntly rounded to blunt to acute, entire-margined. Perianth obpyriform, deeply plicate, at least above, mouth shallowly plurilobate, with small, almost uniformly 1-2 celled teeth.

During the study of miscellaneous specimens identified as *L. groenlandica* by Schljakov it turned out that his concept of *L. groenlandica* includes both *L. wenzelii* var. *groenlandica* and *L. ventricosa* var. *confusa*. As I wrote above, var. *confusa* is a primitive member of *L. ventricosa* s.l. and I estimate that it is the closest to *L. wenzelii* in the *L. silvicola-ventricosa* group. Indeed, current confusion of *L. wenzelii* with *L. ventricosa* (or *L. longiflora*), noted by many writers, e.g. Paton, 1999, Schljakov, 1980, etc. is

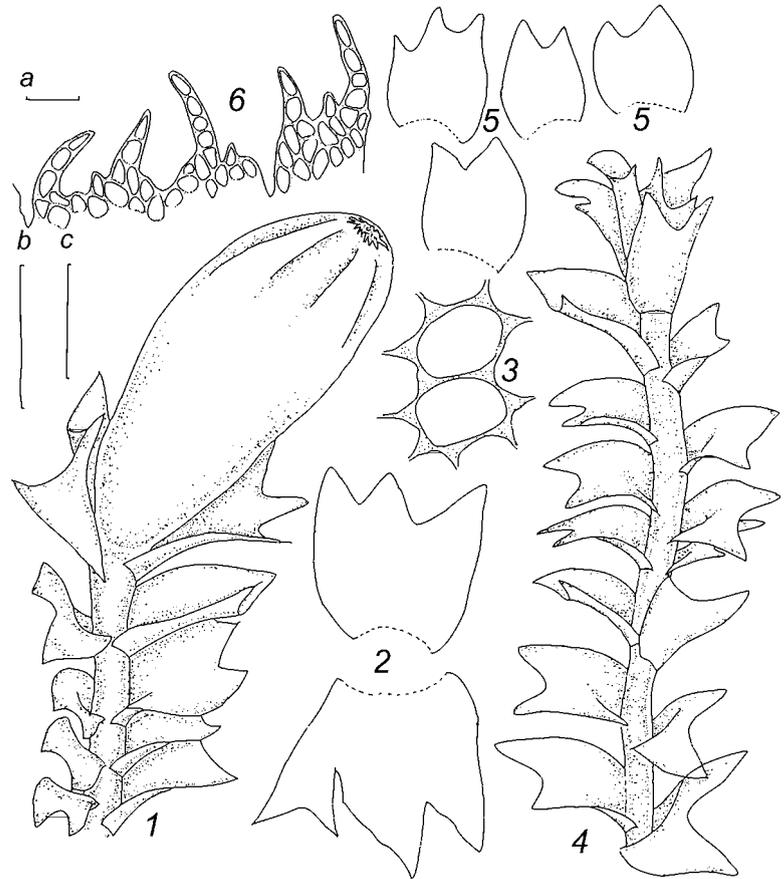
based on the identification of var. *confusa* as *L. wenzelii* s.l. Defining features of the two taxa are in Table 2.

#### IV. ON THE SECTION *GUTTULATAE* SCHLJAK.

In 1974 Schljakov described a new section *Lophozia* sect. *Guttulatae* including *L. longiflora* and *L. ascendens*. The main uniting features appear to be as follows (Schljakov, 1974, 1980): (1) the base of the leaf clinging the stem infundibularly, (2) cells of the leaf build into longitudinal rows directed to the sinus, (3) cells of the leaf with large or sub-large trigones, (4) margins of the sinus of the bracts inflected from the perianth.

Grolle (1983), Grolle and Long (2000), and some other authors accepted the section. However, in my opinion, the separating of the section appears to be unfounded. My arguments are follows: (1) sinus of the bracts is inflected in *L. ventricosa* var. *longiflora* (Nees) Macoun, but can be more or less explanate in var. *guttulata* or undulate in var. *confusa*; besides, *L. ascendens* almost always has explanate sinus; (2) large trigones seem to be a result of habits, so, in shady and moist places (where both species are rarer, indeed) mods. *mesoderma* and *leptoderma* can be observed, besides, the little or moderate trigones are usual in *L. ventricosa* var. *confusa*; (3) the direction of the cell rows (a) on the one hand, seems to be an unstable feature, because it is possible to observe any variants of those rows in a single specimen (b) on the other hand, longitudinal rows towards the sinus can be observed in the every sections recognised by Schljakov (cf. Schljakov, 1980b); (4) funnelate base of the leaf can be observed

Fig. 7. *Lophozia silvicoloides* Kitag. (1-2, 4 - from Japan, Honshu, Kitagawa 14.VIII.1964 (KYO, holotype); 3, 5-6 - from Russia, Primorsky Territory, Gambaryan 1993 (KPABG)): 1 - perianthous shoot; 2 - bracts and bracteole; 3 - cells in the midleaf; 4 - sterile shoot; 5 - leaves; 6 - perianth's mouth; scales: a - 50  $\mu$ m, for 6, b - 50  $\mu$ m, for 3, c - 1 mm, for 1-2, 4-5.



almost always in *L. ventricosa*, on the contrary, *L. ascendens* develops funnelate base in mod. *leptoderma* only, on the other hand sometimes the same leaf-base can be observed in *L. silvicola* (see above).

Therefore, my conclusion is that sect. *Guttulatae* can not be segregated from sect. *Lophozia*.

#### V. ON THE *L. SILVICOLOIDES* N. KITAG.

*Lophozia silvicoloides* is a little-known species reported from only a few localities of Japan and the Northern part of the Kolyma Nagor'ye in Russia (Kitagawa, 1965; Schljakov, 1982). However, the study of the miscellaneous herbarium materials has revealed that this species seems to be more or less common in East Siberia and Russian Far East, and has rare disjunction in Europe.

*Lophozia silvicoloides* (Fig. 7.) is close to *L. silvicola* in its narrow explanate leaves and biconcentric oilbodies on the one hand and on the other hand to *L. ascendens* mod. *leptoderma* in its laciniate-dentate perianth mouth and

the funnelate leaf base. According to the original description and my data *L. silvicoloides* almost always develops perianths. So, to separate it from *L. ventricosa* is very easy<sup>1</sup>. A more difficult problem is the relationship of *L. silvicoloides* and *L. ascendens* mod. *leptoderma* and (especially) mod. *prostrata*. Creeping forms of the latter occur very seldom in Europe, but they are more common in the South of Russian Far East. These forms differ from *L. silvicoloides* in: (1) nonbiconcentric oilbodies, (2) explanate leaves with obtuse lobes, (3) peculiar straw-greenish pigmentation of the shoots, and (4) coloration of the ventral segment of the stem, which is clearly brownish in creeping shoots, but it never acquires the red-purplish pigmentation that is characteristic of *L. silvicoloides*.

<sup>1</sup> - Besides the armature of the perianth mouth in *L. silvicoloides* the leaves are more strongly secund dorsally and the leaf cells are somewhat larger (the cells 27-40  $\mu$ m near the leaf apices, in *L. ventricosa* - to 30  $\mu$ m).

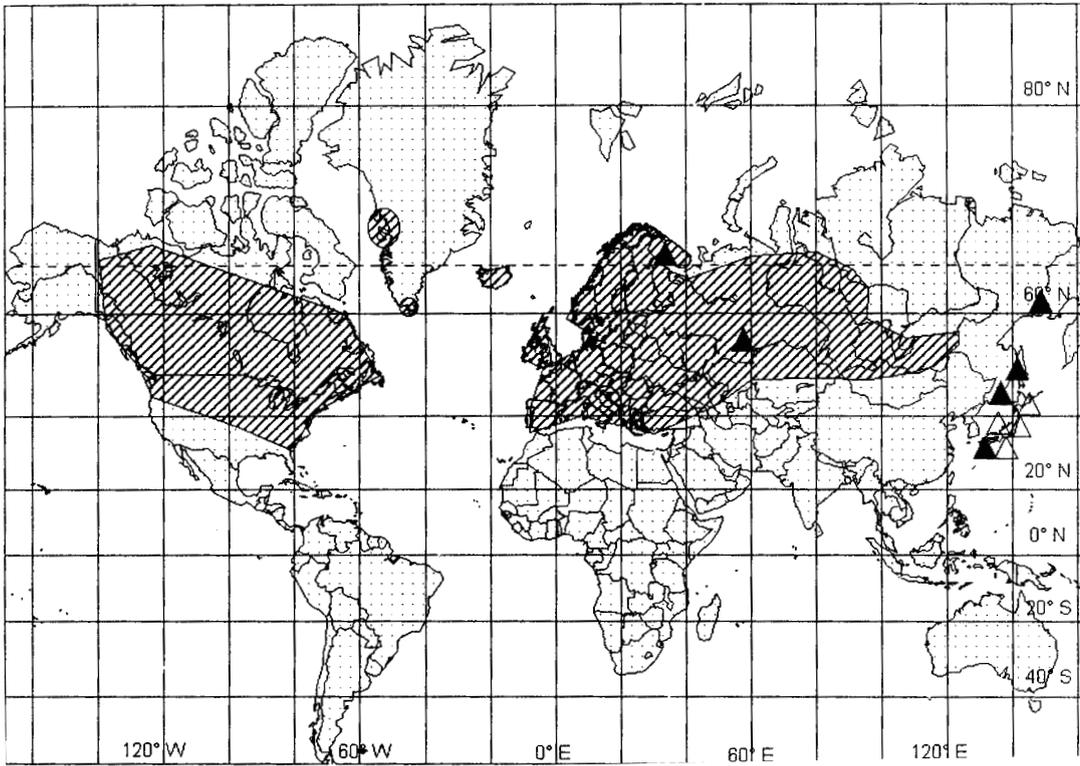


Fig. 8. The distribution of *L. silvicoloides* Kitag.: solid triangles – specimens examined, open triangles – literature records, and *L. silvicola* Buch.: hatched area.

The analysis of species' distribution has shown that *L. ventricosa* is not vicarious with *L. silvicoloides*, and the two taxa have partly coinciding areas (Fig. 8).

Specimens of *L. silvicoloides* examined:  
 RUSSIA: Murmansk Province. Murmansk, vallis Ujutaensis, leg. V.A. Bakalin 22.X.99. (KPABG, duplicate in KYO). South Ural. Bashkiria, Beloretzk Distr. leg. E.A. Ignatova 31.IX.90. (MHA). Magadan Province. Kolyma Riv., Kulu settl. leg. L.S. Balagodatskikh 29.VIII.79 (KPABG). Khabarovskiy Kray. Sovgavansky Distr., Koppi settl. leg. Lebedinskaya IX.70. (KPABG). Primorsky Kray. Partizansky Distr. Olkhovaya Mt. leg. S.K. Gambaryan 1993. (KPABG).  
 JAPAN: Honshu. Pref. Gifu, near Shino-Ike, Mt. Ontake. leg. N. Kitagawa 14.VIII.64 (KYO, holotype).

PRELIMINARY KEY TO HOLARCTIC SPECIES OF GREEN-GEMMOUS LOPHOZIAS BASED PRINCIPALLY ON EURASIAN SPECIMENS<sup>1</sup>

- 1. Perianth mouth lobulate with cilia more 4 cells long ..... 2
- Perianth mouth not lobulate or plants sterile ..... 5

- 2. Lobules of perianth's mouth sparse, unistratose cilia usually not more 2(3) cells long, the last cell of cilia to 2 x as long as wide, plants of moist habitats with concave to cupped symmetrical leaves, usually no red or purple pigmentation of the shoots . . . *L. wenzelii*
- Leaves not concave, (or cupped, but then they are strongly dorsally secund with acute lobes and with dense rhizoids mats – *L. lacertata*) frequently with red or purple pigmentation ..... 3
- 3. Sinus descending to 1/3-1/2 of leaf length, leaves decurved from the stem, symmetrical, oilbodies nonbiconcentric, shoots peculiarly straw-greenish pigmented, as a rule with numerous ascending gemmi parous shoots with undifferentiated ventral merophyte; ventral segment of the stem is the same colour with dorsal one, rare (mod. *leptoderma*) brownish to brown without any trace of red or purple pigmentation ..... *L. ascendens*
- Sinus descending to 1/3 of the leaf length, leaves asymmetrical, oilbodies biconcentric or nonbiconcentric, ascending shoots uniform-

<sup>1</sup> – *Lophozia subapiculata* Schust. et Damsh. is treated here as a synonym of *L. ventricosa*, although the former may deserve the status of a separate variety of the later.

- ly absent, ventral merophyte differentiated, ventral segment usually purple-brown pigmented . . . . . 4
4. Leaves decurved from the stem, oilbodies biconcentric, bracteole present . . *L. silvicoloides*  
 – Leaves cupped, oilbodies nonbiconcentric, bracteole absent . . . . . *L. lacerata*
5. Leaves concave (not conduplicate!) to cupped, without funnelate base; width of the leaf nearly equal to the leaf length, sinus crescentic, rare angulate . . . . . 6  
 – Leaves explanate, decurved from the stem or conduplicate, the base of the leaf usually clasping the stem, leaf width considerably less than its length, rarely more or less equal . . . . . 10
6. Leaves very polymorphous: bilobed, with a prominent tooth of antical margin and irregularly 3(4)-lobed; perianths and ends of lobes frequently violet pigmented . . *L. heteromorpha*  
 – Leaves not polymorphous, bilobed, rarely trilobed; no violet pigmentation . . . . . 7
7. Leaves strongly dorsally secund, almost transversely inserted, rhizoids in dense mat, lobes acute . . . . . *L. lacerata*  
 – Leaves symmetrical or subsymmetrical, lobes obtuse, rare (*L. savicziae*) acutish, but then cells in the midleaf exceeding 30  $\mu\text{m}$  width; rhizoids moderate to sparse . . . . . 8
8. Width of the cells in midleaf exceeding 30  $\mu\text{m}$ ; oilbodies (15) 20-50 per cell, at least 50% biconcentric; leaves obliquely inserted, gemmae 5- to polygonal, shoots usually peculiarly orange-brown coloured . . . . . *L. savicziae*  
 – Width of cells in midleaf not exceeding 30  $\mu\text{m}$ ; oilbodies up to 15(20) per cell, biconcentric or non-biconcentric, leaves moderately oblique to almost subhorizontally inserted, gemmae 3-4(5)-angular . . . . . 9
9. Oilbodies biconcentric, leaf cells usually with convex to large trigones; leaves slightly asymmetrical to almost symmetrical, almost subhorizontally inserted, gemmae triangular to quadrangular . . . . . *L. schusteriana*  
 – Oilbodies nonbiconcentric, cells usually with only small trigones, leaves more or less symmetrical, slightly oblique to almost transversely inserted, gemmae quadrangular rarer pentangular . . . . . *L. wenzelii* s.l.
10. Base of the leaf clinging the stem, leaves conduplicate, lobes directed to the apex and forming “capitate” top of shoot, trigones usually convex to gibbous, cell lumen peculiarly decurved, oilbodies nonbiconcentric, trilobate leaves lacking crescentic sinuses, gemmae early deciduous and concentrated on the apex of the shoots, sinus of bracts incurved from the perianth . . . . *L. ventricosa*  
 – Funnelate base almost uniformly absent, leaves not conduplicate, deflected from the stem, not forming “capitate” top, trigones small to moderate, rare bulging, cell lumen not decurved, oilbodies biconcentric or nonbiconcentric, trilobate leaves with crescentic sinus present almost always, sinus of the bracts not inflected . . . . . 11
11. Oilbodies biconcentric, sinus descending to 1/4 of the leaf length, leaves asymmetrical, shoots bright green to green-brownish and red brown, creeping, ventral segment clearly differentiated from the dorsal one, commonly brown to red or purple, perianth mouth with 1-2 celled teeth . . . . . *L. silvicola*  
 – Oilbodies nonbiconcentric, sinus descending to 1/3 -- 1/2 of leaf length, leaves symmetrical, shoots peculiarly straw-greenish coloured, usually with numerous ascending gemmiparous shoots, ventral segment with the same pigmentation as the dorsal one, or brownish to brown (mod. *leptoderma*), without any red or purple traces, perianth mouth lobulate with cilia of up to 9 cells, obligate epixylous species . . . . . *L. ascendens*

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## LITERATURE CITED

- BAKALIN, V.A. 2000. Notes on *Lophozia* I. What is *Lophozia silvicola* Bush var. *grandiretis* Buch et S. Arnell. – *Arctoa*. **9**: 111-114.
- BUCH, H. 1933. *Lophozia silvicola* Buch sp. nov. – *Ann. Bryol.* **6**: 125-129.
- BUCH, H. 1936. Suomen Maksasammalet. – *Helsinki*, 116 pp.
- DAMSHOLT, K. 1994. On the identity of *Jungermannia groenlandica* Nees. – *J. Hattori Bot. Lab.* **75**: 173-178.
- DICKSON, J. 1790. Fasciculus Secundus Plantarum Cryptogamicarum Britanniae. – *London*, 31.
- DILLENIUS, J.J. 1741. Historia Muscorum. – *Oxonii*. [republication: 1811. *Edinburgi*], xxi + 576.
- DU MORTIER, B.C. 1875. Hepaticae Europae. – *Bull. Soc. Bot. Belg.* **13**: 1-203.
- GOTTSCHKE, C.M., J.B.G. LINDENBERG & C.G. NEES ab ESENBECK 1844. Synopsis Hepaticarum. – *Hamburgi*, 834.
- GROLLE, R. 1976. Verzeichnis der Lebermoose Europas und benachbarter Gebeite. – *Feddes Repert.* **87**: 171-279.
- GROLLE, R. 1983. Hepatics of Europe including the 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.
- HOOKE, W. J. 1816. British Jungermanniae. – *London*, xxviii + 84, 88 tables.
- LONG, D. G. 1979. Hepatic types of James Dickson in the Edinburg herbarium. – *J. Bryol.* **10**: 241-244.
- KITAGAWA, N. 1965. A revision of the family Lophoziaaceae of Japan and Adjacent Regions. 1. – *J. Hattori Bot. Lab.* **28**: 239-291.
- MICHEL, P.A. 1729. Nova Plantarum genera. – *Florentiae*, 234.
- MÜLLER, K. 1954. Die Lebermoose Europas. Band VI. Auflage 3. Lieferung 5. – *Leipzig*, 641-756.
- NEES VON ESENBECK, C. G. 1836. Naturgeschichte der deutschen Lebermoose. Vol. 2. – *Berlin*, 500.
- PATON, J. A. 1999. The liverwort flora of the British Isles. – *Colchester*, 626.
- SAUKEL, J. 1985. Zum Merkmalsbestang einiger Mitteleuropäischer Arten der Lebermoosgattung *Lophozia* (Dum.) Dum. (Sektion *Lophozia*). – *Stapfia* **14**: 149-185.
- [SCHLJAKOV, R. N.] ШЛЯКОВ, Р. Н. 1974. Новые таксоны рода *Lophozia* Dum. emend. Schljak. – [New taxa of genus *Lophozia* Dum. emend. Schljak.] *Новостям сист. низш. раст.* [Novosti Sist. Nizsh. Rast.] **11**: 350-354.
- [SCHLJAKOV, R. N.] ШЛЯКОВ, Р. Н. 1980. Печеночные мхи севера СССР. Т.3. – [Liverworts and Hornworts of North of the USSR. Vol. 3.] *Л., Наука* [Leningrad, Nauka], 190.
- [SCHLJAKOV, R. N.] ШЛЯКОВ, Р. Н. 1982. Печеночные мхи севера СССР. Т. 5. – [Liverworts and Hornworts of North of the USSR. Vol. 5.] *Л., Наука* [Leningrad, Nauka], 196.
- SCHLJAKOV, R. N. 1998a. On the *Lophozia groenlandica* (Nees) Macoun. – *Arctoa* **7**: 191-196.
- [SCHLJAKOV, R.N.] ШЛЯКОВ, Р.Н. 1998b. Два новых таксона мохообразных с Южного Урала и Алтая. – [Two new taxa of Bryophytes from South Ural and Altai] *Новостям сист. низш. раст.* [Novosti Sist. Nizsh. Rast.] **32**: 180-183.
- SCHMIDEL, C. C. 1783. Dissertatione Botanici. – *Erlangae*.
- SCHUSTER, R. M. 1969. Hepaticae and Anthocerotae of North America. – *New York and London*, 1062
- STEENSTUP, J. & J. LANGE 1858. Flora Danica. – *Copenhagen* 15(44): 21.
- STEPHANI, F. 1902. Species Hepaticarum. Vol. II. – *Geneva*, 615.
- WEBER, F. 1815. Historiae Muscorum Hepaticorum Prodromus. – *Kiliae*, 160.