*Arctoa* (1995) **5**: *45-59*

# ON THE SYSTEMATIC POSITION OF *MYURELLA* AND *BARDUNOVIA, GENUS NOVUS* (PLAGIOTHECIACEAE, MUSCI)

# О СИСТЕМАТИЧЕСКОМ ПОЛОЖЕНИИ *MYURELLA* И *BARDUNOVIA, GENUS NOVUS* (PLAGIOTHECIACEAE, MUSCI)

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Abstract

The genus *Myurella* includes three rather widespread species, *M. julacea* (Schwaegr.) B. S. G., *M. sibirica* (C. Muell.) Reim. and *M. tenerrima* (Brid.) Lindb., and the local endemic of Northern Siberia, *M. acuminata* Lindb. et H. Arnell. The description of the latter species is amended and the species is illustrated for the first time. Also the relationship between *Myurella* and *Platydictya* is discussed, since by some characters *Myurella acuminata* is intermediate between them. From the Baikal area of South Siberia is described *Bardunovia baicalensis* gen. et spec. nova, which is superficially similar to *Myurella acuminata*. *Bardunovia* is closely related to the *Herzogiella-Isopterygiopsis-Myurella-Orthothecium-Platydictya*-complex of Plagiotheciaceae.

Резюме

Род *Myurella* включает в себя три широко распространенных вида, *M. julacea* (Schwaegr.) B. S. G., *M. sibirica* (C. Muell.) Reim. и *M. tenerrima* (Brid.) Lindb., и узколокальный эндемик северной Сибири *M. acuminata* Lindb. et H. Arnell. Приводится расширенное описание вида и его иллюстрации, а также обсуждается предполагаемое родство родов *Myurella* и *Platydictya,* причем *Myurella acuminata* занимает по многим признакам промежуточное положение между ними. Из Прибайкалья описан новый вид и род, *Bardunovia baicalensis* gen. et spec. nova, по ряду признаков сходный с *Myurella acuminata*. *Bardunovia* неиболее близка к комплексу *Herzogiella-Isopterygiopsis-Myurella-Orthothecium-Platydictya*, включаемому в Plagiotheciaceae.

*Myurella* is a small genus of pleurocarps, including four species. *M. julacea* (Schwaegr.) B. S. G. has a rather wide Holarctic distribution and is not rare in many areas, especially in mountains. *M. sibirica* (C. Muell.) Reim. and *M. tenerrima* (Brid.) Lindb. are also widespread, but much rarer in most of their range; these two species are very close, mostly allopatric and have probably only recently evolved from the common ancestor into a northern race, *M. tenerrima*, and a southern *M. sibirica*. The fourth species, *M. acuminata* Lindb. et H. Arnell, was described from a limited range in Northern Siberia and is so far known only from there.

Three common species of *Myurella* can usually be recognized in the field with the naked eye due to their distinctive julaceous appearance. They are characterized by small green or often whitish- or greyish-green plants, very fragile in all parts, rarely branched stem with a well developed central strand, without pseudoparaphyllia, with short and narrow axillary hairs; papillose purplish axillary rhizoids and the absence of rhizoids below the leaf insertion; julaceous or closely imbricate foliage with very concave suborbicular to ovate-lanceolate leaves with an obtuse to acuminate apex and serrulate to strongly dentate margin, especially in basal part, where "compound" teeth occur (formed by upper end of lower cell and lower end of upper cell); lamina cells rather shortly rhombic, short to subquadrate at leaf insertion, smooth, prorate or papillose (the degree of papillosity typically correlate with mar-

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gin serration); dioicous sex condition; rare sporophyte production; perichaetial leaves lanceolate, ecostate, colored, with linear cells; seta slender, straight to somewhat flexuose, smooth; capsule erect and symmetric, oblong-ovoid; annulus deciduous composed of two rows of large cells; peristome teeth transversely striolate below, papillose above, distinctly bordered; endostome complete, with nodulose ciliae as long as segments or somewhat shorter, faintly papillose; operculum conic to conic-apiculate; calyptra cucullate, naked; spores small, ca. 10 μm, faintly papillose. Axillary gemmae in *Myurella julacea* were reported by Hedenaes (1987) and illustrated by Noguchi (1991) form Norway specimen. We have seen numerous gemmae in *M. tenerrima* (Middle Yenisey River, ca. 62°20'N, coll. Lunina 21.VIII.1989 MHA).

The systematic position of *Myurella*, however, has still not received a well-recognized solution. Traditionally it was placed in Theliaceae (Fleischer, 1915-1922; Brotherus, 1925; Corley et al., 1981; Ignatov & Afonina, 1992; Gao & Cao, 1992), because of the similar appearance of gametophytes. Crum & Anderson (1981) noted that *Thelia* and *Myurella* have a quite different peristome structure, and suggest to place the former in Leskeaceae and the latter in Thuidiaceae, near *Heterocladium*. The imperfection of this solution, however, was noted. Later Buck & Crum (1990) transfered *Myurella* to Pterygynandraceae, expanding the conception of this family to pleurocarps with ecostate or weakly costate papillose leaves and more or less perfect hypnoid peristome. This idea was introduced to solve the puzzle of Thuidiaceae-Leskeaceae complex, and a not very close relationship of pterigynandracean genera was admitted by these authors (Buck & Crum, 1990, 1994).

Hedenaes (1987) studies of rhizoid topography of North European pleurocarps and reevaluated the systematic position of *Myurella* greatly. He found that the axillary papillose purplish rhizoids occur only in *Herzogiella, Isopterygiopsis, Platydictya, Myurella, Orthothecium* (HIMOP-complex) and that these genera have some other neglected similarities: (1) easily broken off branches which form an acute angle with the stem (typical for most groups of pleurocarps are firmly attached branches which form ± right angles with the stem); (2) branches little different from the stem; (3) exostome border ± gradually narrowed upward from the transitional zone. Also, Hedenaes (1987) considered that the HIMOP-complex is related to *Plagiothecium* and therefore places *Myurella*, among others, in the Plagiotheciaceae.

The further ideas on the affinities of *Myurella* are discussed here, with the inclusion of two Siberian endemics, *Myurella acuminata* and *Bardunovia baicalensis,* the latter being here described for the first time as a new genus and species.

**Myurella acuminata** Lindb. et H. Arnell, Kongl. Svenska Vetensk. Acad. Handl. 23(10): 141. 1890 Figs. 1,21,23,25.

Type: Siberia, Nizhnyaya Tunguska, 65° 30'N 14.VII.1876 leg. H. W. Arnell (lectotype S!, isolectotype H-BR!); syntype: Siberia, Mjelnitsa 65° 50' 12.VII.1876 (S!).

Plant in lax soft mats, green in youngest parts, mostly golden-brown, very fragile. Stems up to 8 mm long, rarely irregularly fasciculately branched, branches slightly differ from stem, central strand absent, outer cell layer not differentiated or at places cells somewhat larger than the second layer. Rhizoids purplish, granulose, axillary. Pseudoparaphyllia absent. Stem and branch leaves ± densely spirally arranged, strongly concave, their basal part typically form an angle of 70-90° with the stem, the upper part - 10-40°, ± plane above, ovate-lanceolate, 0.25-0.55 mm long, 0.15-0.26 mm wide, acumen about 2/5 of leaf length. Margin serrate at base usually with "compound" teeth, in middle - subentire to serrate (with simple or rarer "compound" teeth). Costa absent. Lamina cells at the apex elongate - 25-40×8-9 μm, the apical cell – 50-80 μm, in the middle rhombic to rhombic-elliptic, 20-25×8-10 μm, at the base shorter, up to 15 μm long, in basal leaf corners isodiametric, 10-14 μm; lower and middle leaf cells prorate on abaxial side due to projections of lower cell ends, cells in upper third nearly smooth. Apparently dioicous. Perichaetia rather frequent; perichaetial leaves up to 0.4 mm long, 0.17 mm wide, non-plicate, distinctly reddish-brown, ovate-lanceolate, gradually narrowed into acumen, serrate. Cells in middle of the lamina large and elongate, up to 50×10 μm, near margins smaller, 30×7 μm, in basal leaf corner - subisodiametric. Perigonia and sporophytes not known.

*Differentiation:* The placement of *Myurel-*

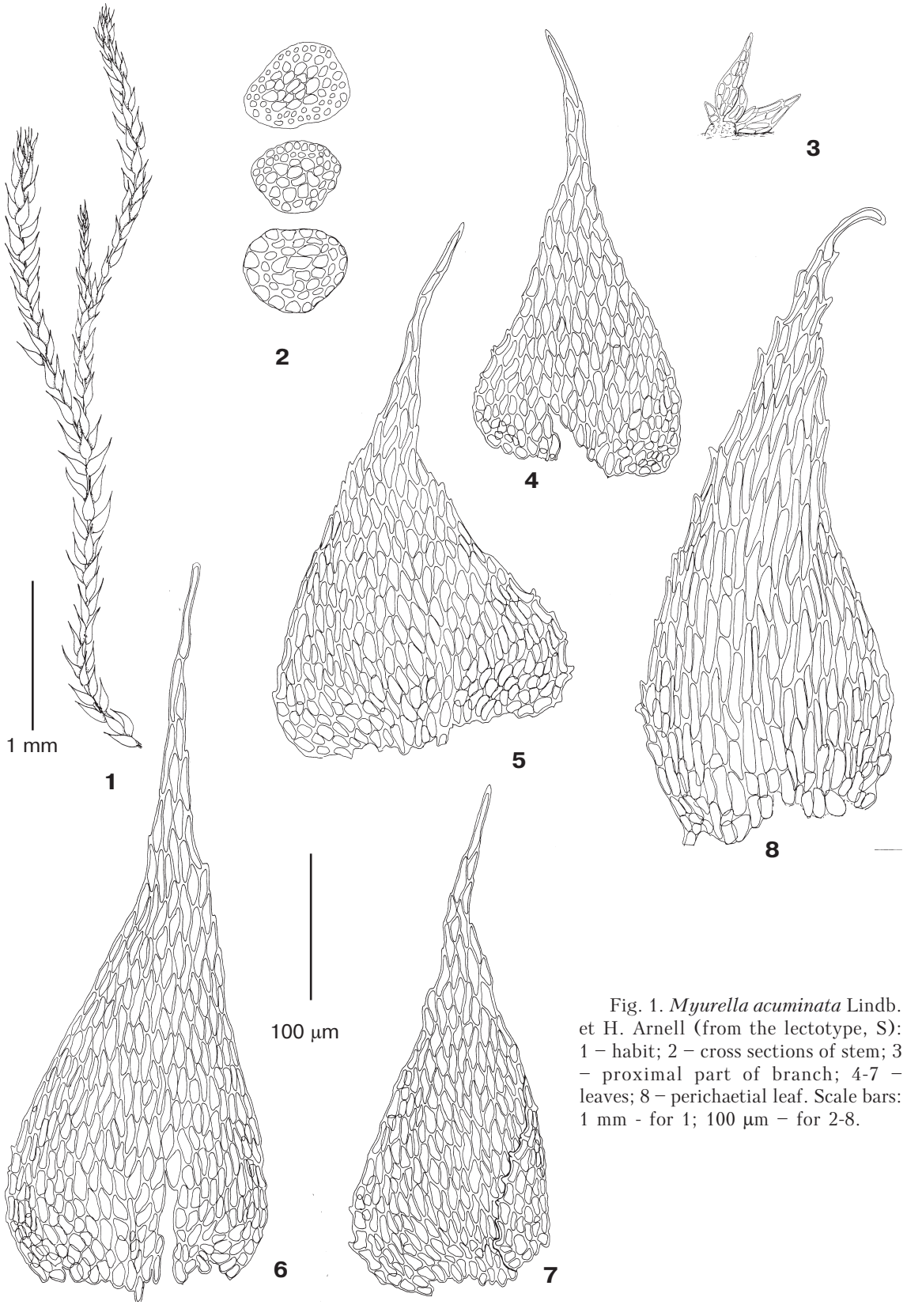



Fig. 1. *Myurella acuminata* Lindb. et H. Arnell (from the lectotype, S): 1 – habit; 2 – cross sections of stem; 3 – proximal part of branch; 4-7 – leaves; 8 – perichaetial leaf. Scale bars: 1 mm - for 1; 100 μm – for 2-8.

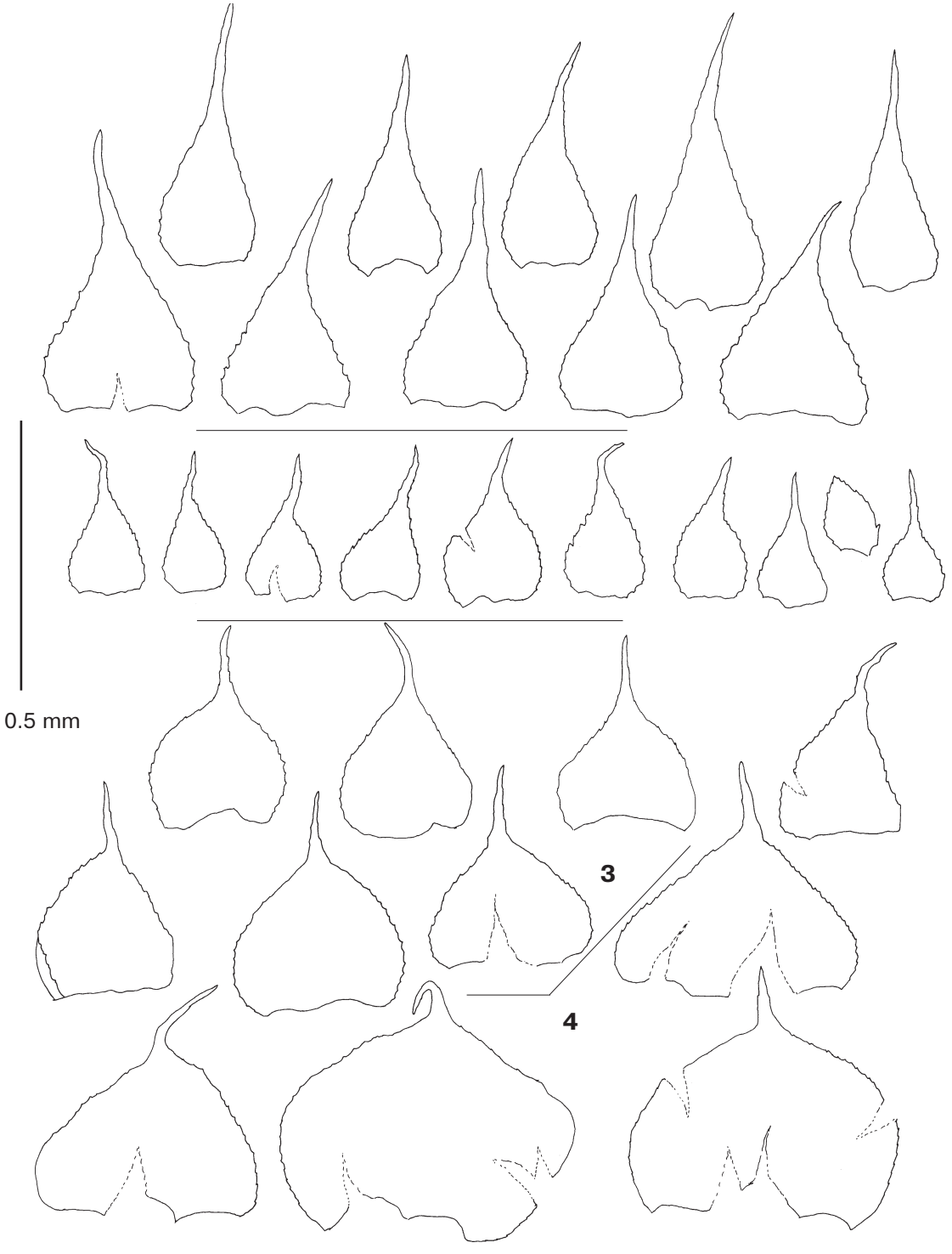



Fig. 2. Leaf outlines of stem leaves of: 1 – *Myurella acuminata* Lindb. et Arn. (from lectotype, S), and 2-4 – *Myurella tenerrima* (Brid.) Lindb. (from Putorana Plateau, Czernyadjeva #105, LE). 1 – stem leaves: 2 – leaves from stoloniform shoot; 3 – from non-densely leaved stem portion; 4 – from normally leaved stem. Scale bar 0.5 mm for all.

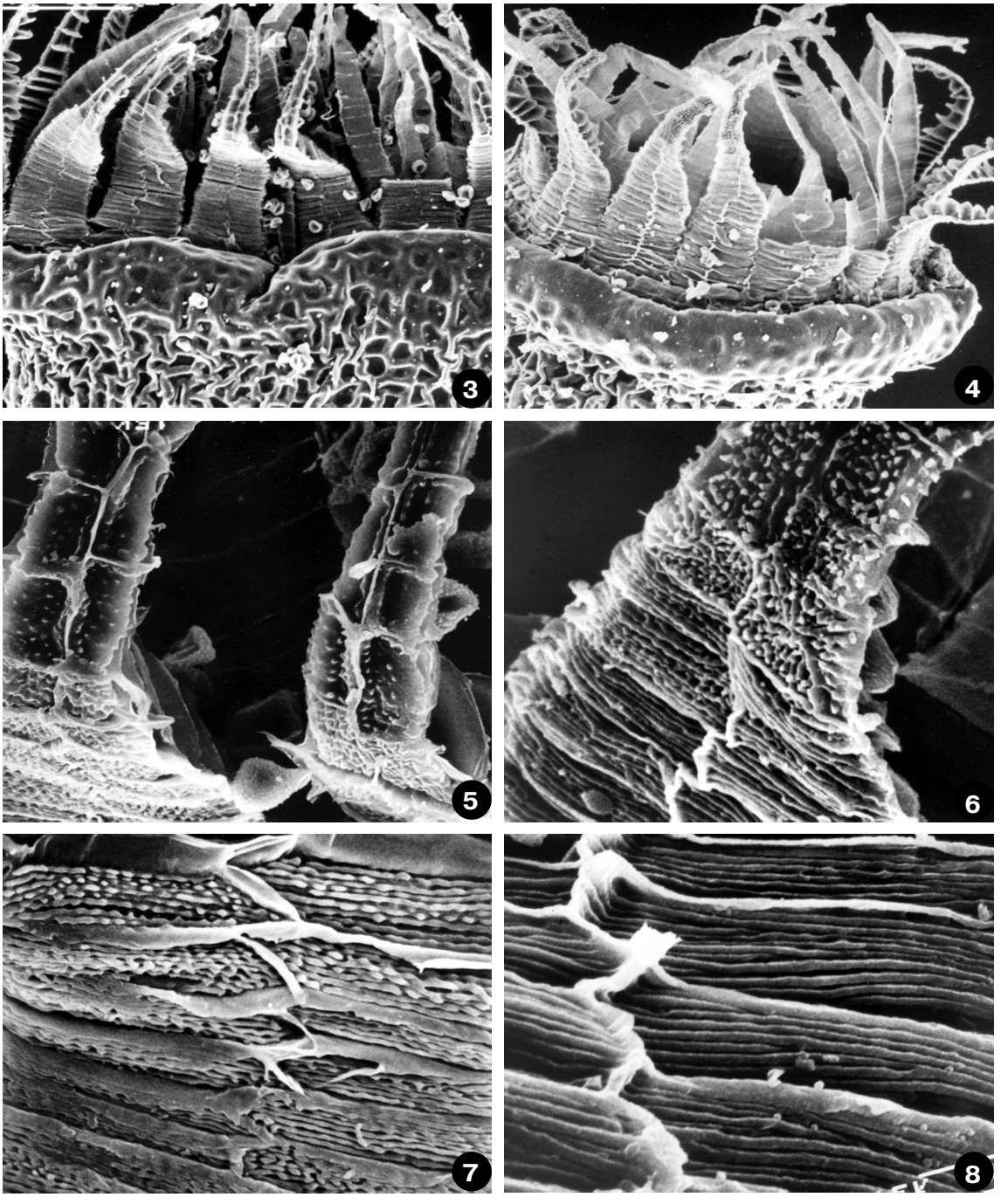
*la acuminata* in HIMOP-complex is supported by the following characters: (1) axillary papillose purplish rhizoids; (2) acute angle between branch and stem; (3) lack of pseudoparaphylliae (in HIMOP-complex present only in *Orthothecium*). *M. acuminata* obviously relates to the other *Myurella*-species in further peculiarities: (1) plants are very fragile in all parts; (2) stem and branches of *M. acuminata* resemble the small-leaved shoots of *M. tenerrima* and *M. sibirica* in size and leaf density; (3) leaves are similar to those of small-leaved shoots of *M. tenerrima* and *M. sibirica*, in shape and concavity and also in areolation of lamina and its basal portion; (4) lamina cells are prorate on abaxial side; (5) "compound" teeth on proximal leaf margin are very characteristic for *M. acuminata*; this is a rare feature in pleurocarps, also known in *Podperaea* (Hypnaceae) and *Bardunovia* (see below), and, less regularly, in all other species of *Myurella* (better represented on leaves of stoloniform shoots) and *Platydictya jungermannioides*; (6) small nonplicate and colored perichaetial leaves (as in other *Myurella*-species and *Orthothecium*).

*Myurella acuminata* is close to *M. tenerrima* and *M. sibirica*, and superficially is similar to small-leaved stoloniform shoots of these species. Stoloniform shoots are usually very rare among the mass of normal-sized shoots in *M. tenerrima*, but in Northern Siberia some collections of *M. tenerrima* have many thin shoots. The comparison of such form with *M. acuminata* is presented in Fig. 2. For this picture we selected a specimen from Putorana Plateau which is composed mostly of this shoots and therefore superficially is the most similar to *M. acuminata*. As it is seen from Fig. 2. the leaves of the latter species though are similar to some few leaves of *M. tenerrima*, but in general comprise quite a different variational pattern. In *M. tenerrima* normal leaves on well-developed shoots are broadly ovate, often wider than their lenght without acumen. Leaves of stoloniform shoots of *M. tenerrima* are similar to the stem leaves of *M. acuminata* in shape, but are about twice shorter. The leaves of *M. acuminata* are rather uniform in its fairly extensive collections. Except the leaf shape the the differences of *M. acuminata* from *M. tenerrima* includes: (1) longer middle lamina cells 20-25×8-10 μm vs. 10-15×8-10 μm; (2) longer apical cell, 45-80 μm vs. 15-30 μm; (3) leaves form by their basal parts an angle of 70-90° with the stem, but in upper parts spreading at 10-40°; in *M. tenerrima* smaller ovate-lanceolate leaves spread in their upper parts at angle more the 45°.

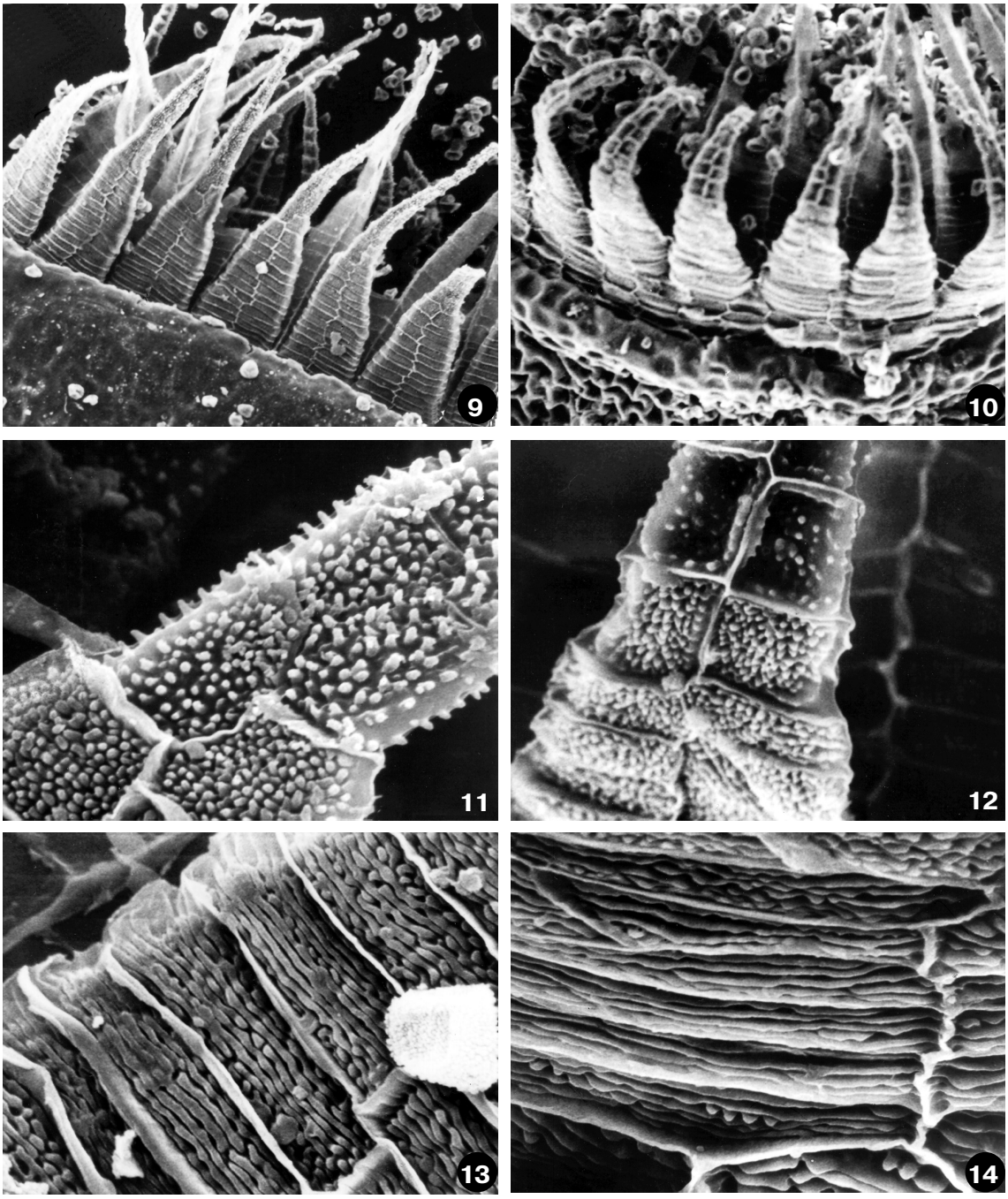
*Myurella acuminata* is the only species of the genus having golden-brown coloration of nearly the whole plant, while *M. julacea* is grayish-bluish and *M. sibirica,* and *M. tenerrima* are bright green. The color of *M. acuminata* is the same as of perichaetial leaves of other *Myurella* species.

Also, *M. acuminata* has no central strand in the stem. There is no central strand also in thin branches of *M. tenerrima* and *M. sibirica*, but it is constantly present in normal stems of these species. The central strand in the stem is absent among the other members of the HIMOP-complex only in *Platydictya*. *Platydictya* has also sometimes "compound" teeth at the proximal leaf margin and is a very small delicate fragile plant. Features differentiating *Platydictya* from *Myurella* include: (1) uncolored perichaetial leaves; (2) practically smooth lamina cells. *M. acuminata* has in some respects an intermediate position between *Myurella* and *Platydictya*, and three most important characters for their delimitation used before (presence/ absence of central strand; strongly concave/ ± plane leaves; distinctly papillose/ nearly smooth cells) no longer work. Therefore, the inclusion of *Platydictya jungermannioides* (and maybe *Platydictya* as a whole) in *Myurella*, an earlier described genus, seems not impossible. However, we retain this problems up to more complete study of the other taxa, treated now in *Platydictya*.

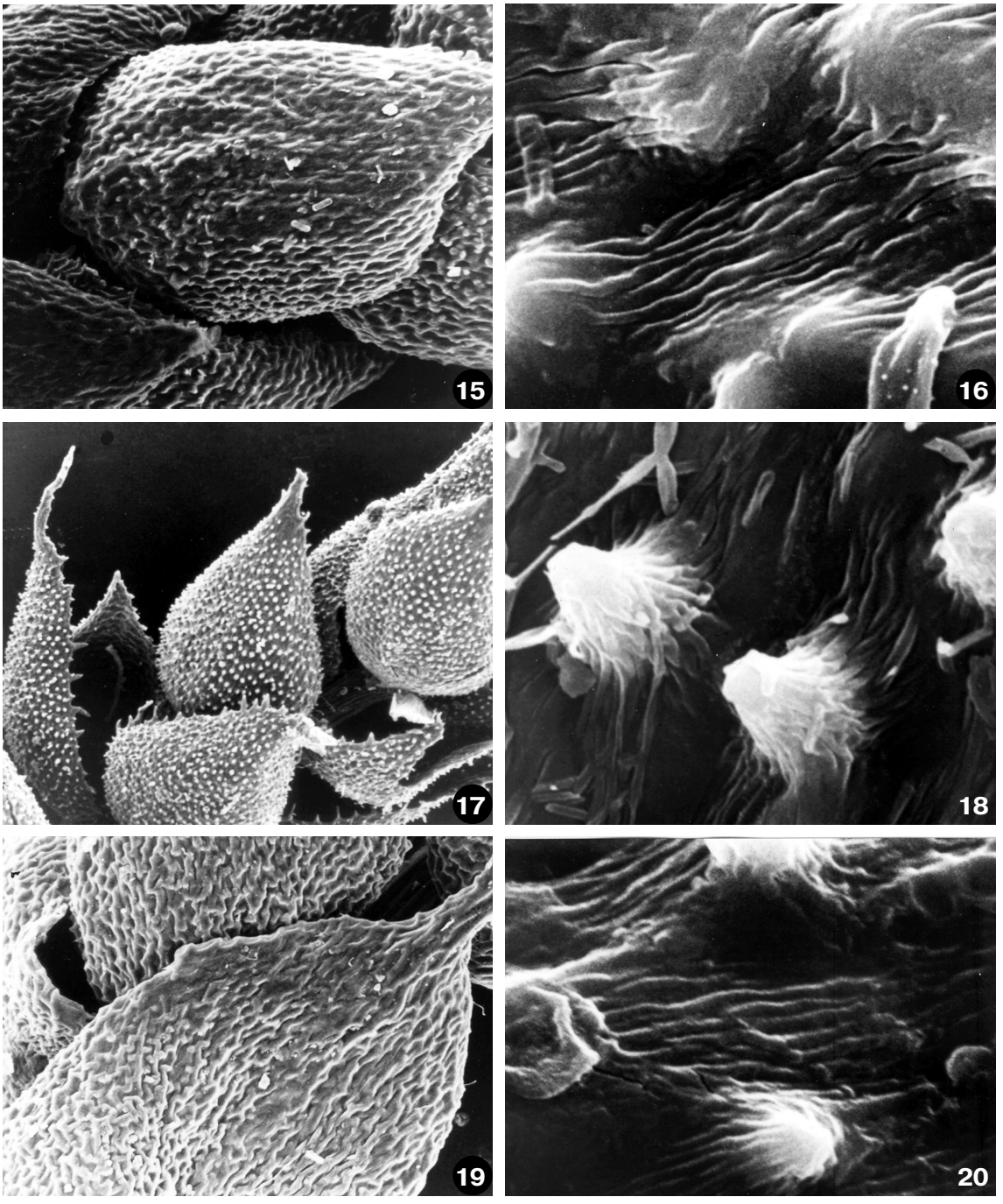
The comparison of the peristomes of *Platydictya jungermannioides* and 3 species of *Myurella* known with sporophyte also support their relationship (Figs.3-14). Exostome teeth of all species have narrow border and a very distinct constriction at about a half of their length. The upper part has a tendency to became weakly papillose and in the lower part papillae have a tendency to join forming transversal cristae. In very weakly papillose upper parts of teeth and moderately striolate their lower parts *Platydictya jungermannioides* is



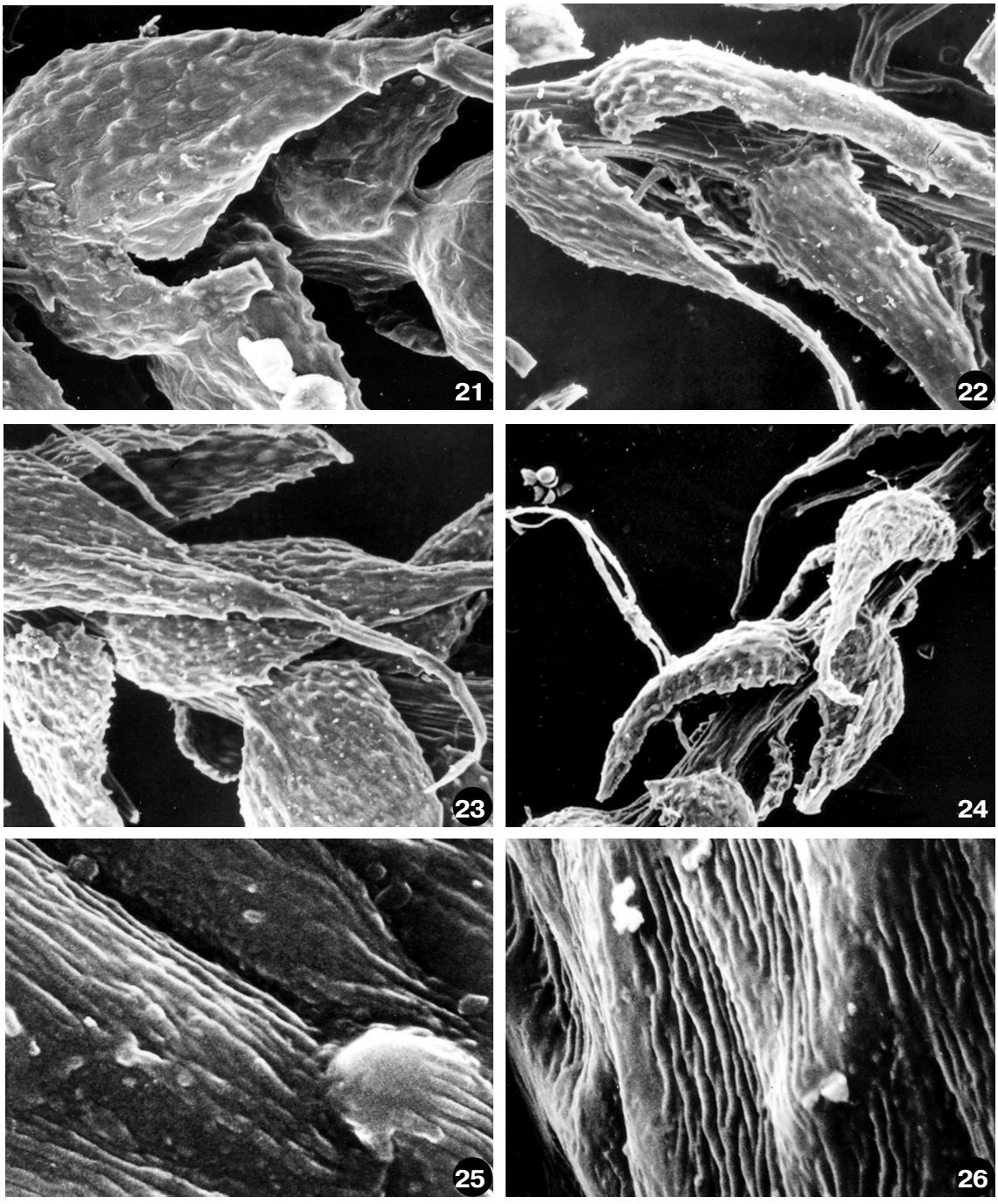

Figs. 3-8. SEM photos of peristomes of: 3,5,7 – *Myurella tenerrima* (Brid.) Lindb. (from Norvegia, Dovre, coll. Hornemann 1837, LE) and 4,6,8 – *M. sibirica* (C. Muell.) Reim. (from Russia, Eastern Sayan Mts., Urik River, coll. Bardunov 10.VIII.1959, MHA). 3, 4 – peristomes; 5, 6 – transitional zone; 7, 8 – lower parts of teeth. Magnifications: 3 – 315×; 4 – 315×; 5 – 1800×; 6 – 2450×; 7 – 2150×; 8 – 4000×.




Figs. 9-14. SEM photos of peristomes of: 9, 11, 13 – *Myurella julacea* (Schwaegr.) Schimp. in B. S. G. (from Norvegia, Gudbransdal, Svatsum, coll. Bryhn, July 1880, LE) and 10, 12, 14 – *Platydictya jungermannioides* (Brid.) Crum (from Russia, Archangelsk Province, Pinega State Reserve, coll. Ignatov, 31.VII.1988, MHA). 9, 10 – peristomes; 11, 12 – transitional zone; 13, 14 – lower parts of teeth. Magnifications: 9 – 350×; 10 – 400×; 11 – 3200×; 12 – 2300×; 13 – 3400×; 14 – 3400×.




Figs. 15-20. SEM photos of shoots and leaves of: 15, 16 – *M. julacea* (Schwaegr.) Schimp. in B. S. G. (from Russia, Altai, coll. Ignatov 0/1048, MHA); 17, 18 – *M. sibirica* (C. Muell.) Reim. (from Altai, coll. Ignatov 15/14, MHA); 19, 20 – *M. tenerrima* (Brid.) Lindb. (19 - from Altai, coll. Ignatov, 0/1133, MHA; 20 — from North Siberia, Putorana Plateau, coll. Czernyadjeva #105, LE). 15, 17, 19 – shoots; 16, 18, 20 — leaf surface. Magnifications: 15 – 500×; 16 – 1100×; 17 – 190×; 18 – 6750×; 19 – 450×; 20 – 9000×.




Figs. 21-26. SEM photos of shoots and leaves of 21, 23, 25 – *Myurella acuminata* Lindb. et H. Arnell (from lectotype, S): 22, 24, 26 – *Bardunovia baicalensis* Ignatov et Ochyra, gen. et spec. nova (from holotype, MHA): 21-24 – shoot portions; 25-26 – leaf surface in the leaf middle. Magnifications: 21 – 630×; 22 – 500×; 23 – 400×; 24 – 400×; 25 – 10000×; 26 – 8500×.

more close to *Myurella tenerrima*. Moderately striolate lower parts of teeth, where cristae are wawed and intermixed with papillae, are observed also in *M. julacea,* while in *M. sibirica* papillae are fused in solid cristae nearly up to transitional zone. The papillosity of the upper part of teeth is rather dense only in *M. julacea*. The observation of peristomes of *Myurella* are rather preliminary, since due to sporophyte rarity only single specimens were available for study for *M. sibirica* and *M. tenerrima,* and two - for *M. julacea.*

*Distribution and ecology: Myurella acuminata* is known from two mentioned localities (judging from the labels – about 20' of latitude, or ca. 40 km, one apart another), where it grows on calcareous rocks, in pure cushions, or with *M. julacea*. In the protologue *M. tenerrima* is also mentioned as an associated species, but we didn't find it in specimens in S and H.

**Bardunovia baicalensis** gen. et spec. nov. (combined generic and specific diagnoses)
Figs. 22,24,26-29

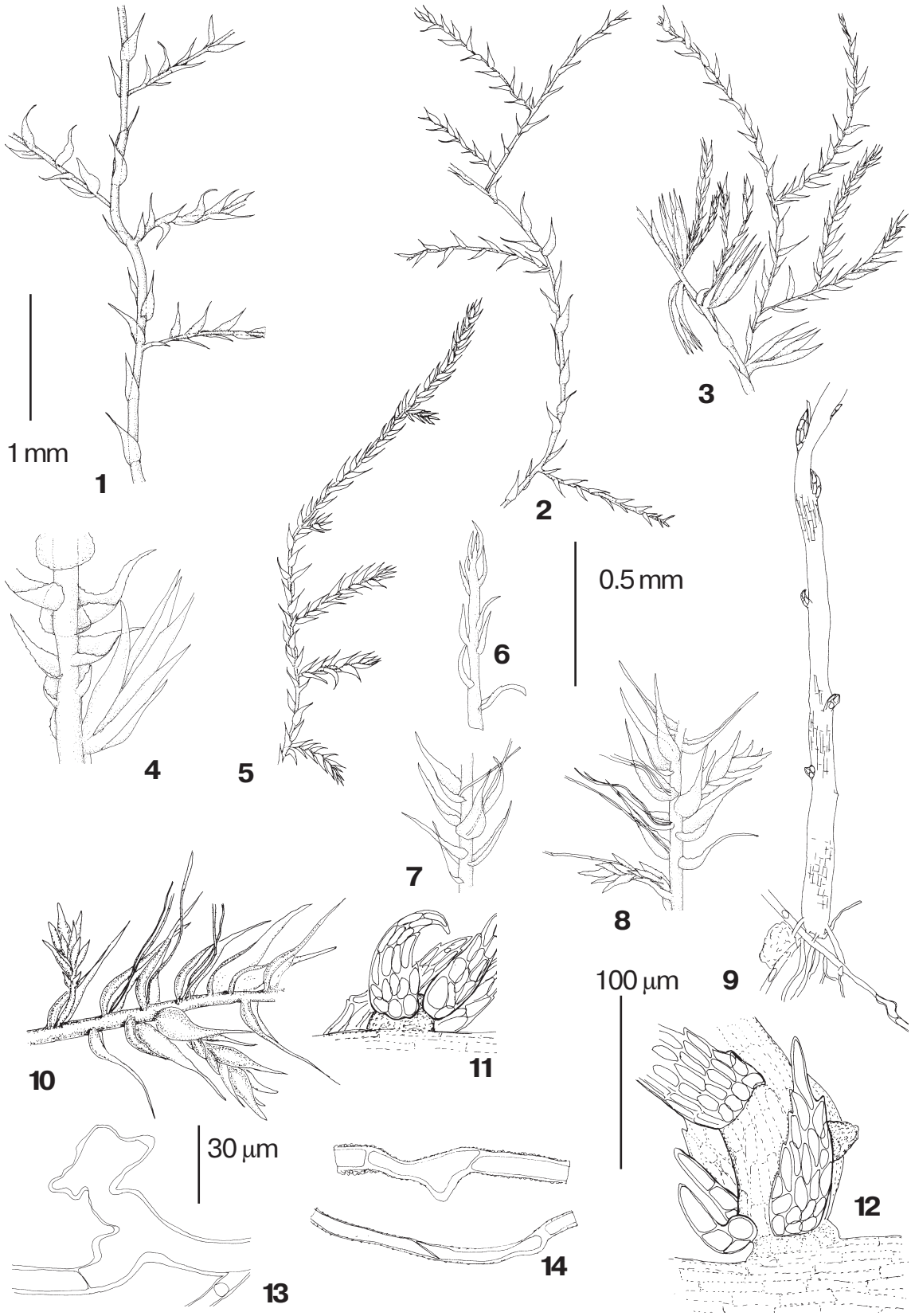
*Plantae pusillae, inferne viridae, supernae luteofuscae, valde fragiles, caulibus prostratis, pinnato ramosis, fasciculo centrali nullo, rhizoidis axillaribus purpureis granulosisque, gemmis axillaribus 2-3-cellularibus, pseudoparaphyllis nullis; rami fasciculato ramosis. Folia caulina et romosa valde varia. Folia caulina remota, delicata, accumbentis, ovato, longa acuminata, costata, reti elongato. Folia ramosa coferta, dense spiraliter imbricata, ovato-lanceolata, longe acuminata, marginibus serratis, basi dentibus bicellularibus, costa nulla, reti laxiusculo rhombeo- vel rhombeo-elliptico, fere laevi in parte superiore, papillosove in parte basali. Flores versimilariter dioici. Perichaetia numerosa; folia perichaetialia ovato-lanceolata, rubro-fusci, serrata, attenuata, cellulis medianis elongatis, angularibus subisodiametricis. Caetera ignota.*

*Typus: Russia, Provincia Irkutsk, Zvezdnyj, Laricetum, ad truncos putridos. 1.VII.1983 L. V. Bardunov (MHA, isotypi IRK, KRAM, S).*

Plant in lax soft mats, green in the youngest parts and brownish-green below, very fragile. Stems rather regularly pinnately branched, central strand well-developed, outer cell layer not differentiated. Most rhizoids purplish, granulose, axillary, often have nodulose thickenings; some (older?) rhizoids reddish-brown, granulose to smooth; sometimes rhizoids arise from "callose masses" which are scattered on axes, leaves or rhizoids. Pseudoparaphyllia absent. Branches considerably different from the stem, irregularly fasciculately 2-3 times branched, bearing sometimes 2-3-celled gemmae in leaf axils. Stem leaves remote, very delicate, often crumpling, mostly appressed to the stem, ovate-lanceolate, rather abruptly narrowed into a long and slender acumen, up to 0.7 mm long, 0.2 mm wide, margin serrulate to entire above, ± entire below, often wavy, almost plane. Costa short and double to single and reaching 3/4 of leaf length, formed of 2-4 rows of narrow cells, bistratose to unistratose. Lamina cells thin-walled throughout, upper cells elongate - 25-40×7-8 μm, in the middle lamina longer, 30-43×6-8 μm, towards the base shorter and wider, ca. 25×10 μm, in basal leaf angles - isodiametric, 10-18 μm; smooth. Leaves of ultimate branches rather densely set, ± rigid, erect and concave in lower part, basal part forms an angle of 50-70° with the stem, upper part - 10-30°, ± plane above, ovate-lanceolate, longly acuminate, up to 0.3 mm long, 0.1 mm wide, margin serrate to entire above, with "compound" teeth below. Costa absent. Lamina cells in the apex elongate - 30-50×7-8 μm, in the middle lamina elongate, 30-40×7-8 μm, towards the base shorter, ca. 15×10 μm, in basal leaf angles - isodiametric, ca. 8-10 μm, with slightly prorate lower cell ends in basal third, smooth above. Leaves of primary and secondary branches having transitional shape and size. Apparently dioicous. Perichaetia rather numerous, perichaetial leaves up to 0.45 mm long, 0.13 mm wide, non-plicate, distinctly reddish-brown, ovate-lanceolate, gradually narrowed into acumen, serrulate. Cells in middle lamina large and elongate, up to 60×15 μm, near margins smaller, 40×8-10 μm, in basal leaf corner short rectangular.

Type: Russia, Irkutsk Province, western part of Baikal-Amur Railway, Zvezdnyj (east of Ust-Kut and Kazachinskij), on rotten wood in *Larix* forest. 1.VII.1983 L. V. Bardunov (MHA, isotypes IRK, KRAM, S). The locality is about 56° 45'N–106° 30'E.

Fig. 27. *Bardunovia baicalensis* Ignatov et Ochyra, gen. et spec. nova (from holotype): 1, 2 – cntv portions; 3 – primary branch with perichaetia and secondary branches; 4 – primary branch with perichetium; 5 – secondary branch; 6, 7, 8 – secondary branch portions; 9 – the base of a shoot, originated from the secondary protonema; 10 – primary branch portion; 11, 12 – proximal parts of branches; 13, 14 – rhizoids. Scale bars: 1 mm – for 1-3, 5; 0.5 mm – for 4, 6-10; 100 μm – for 10-14.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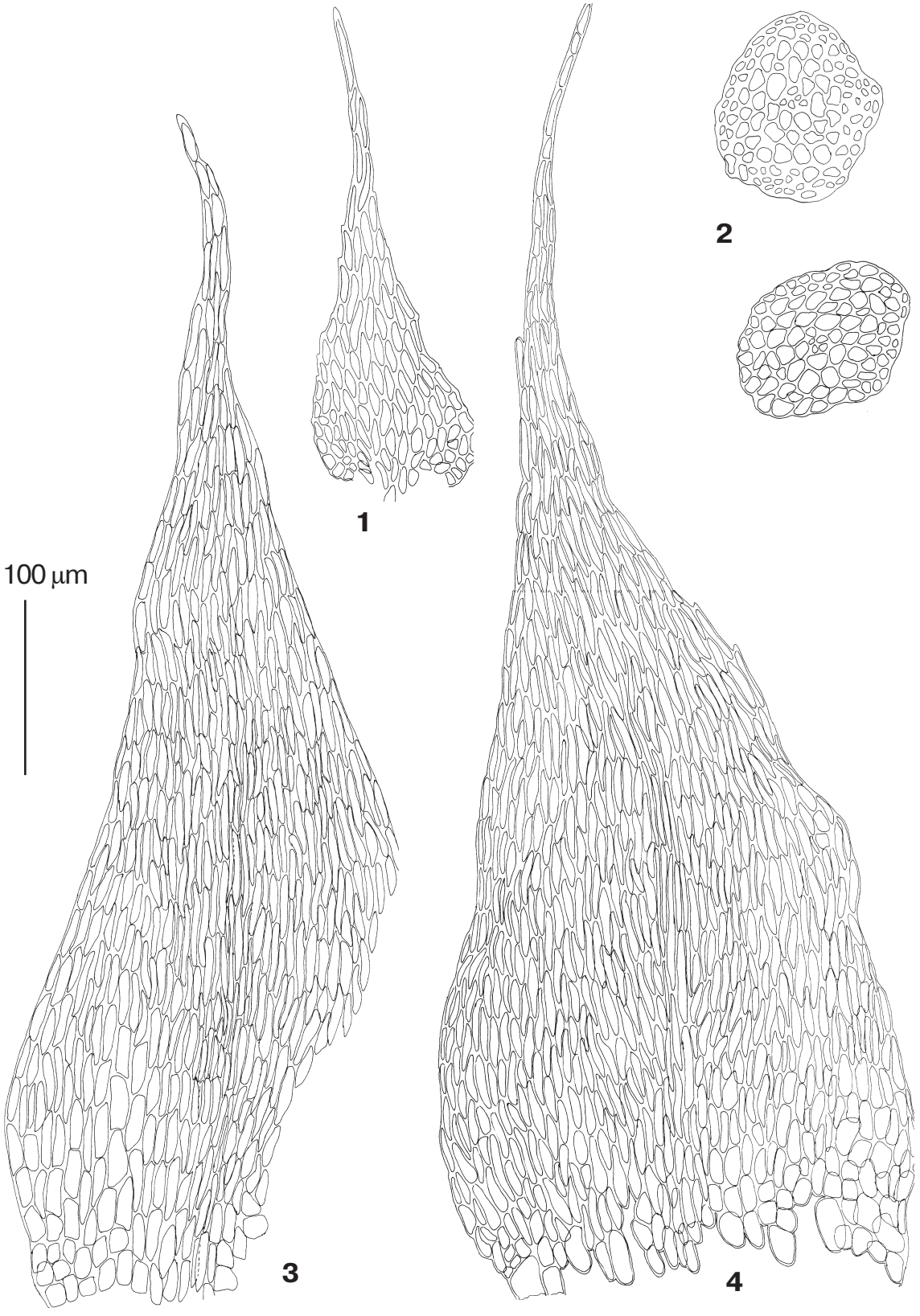
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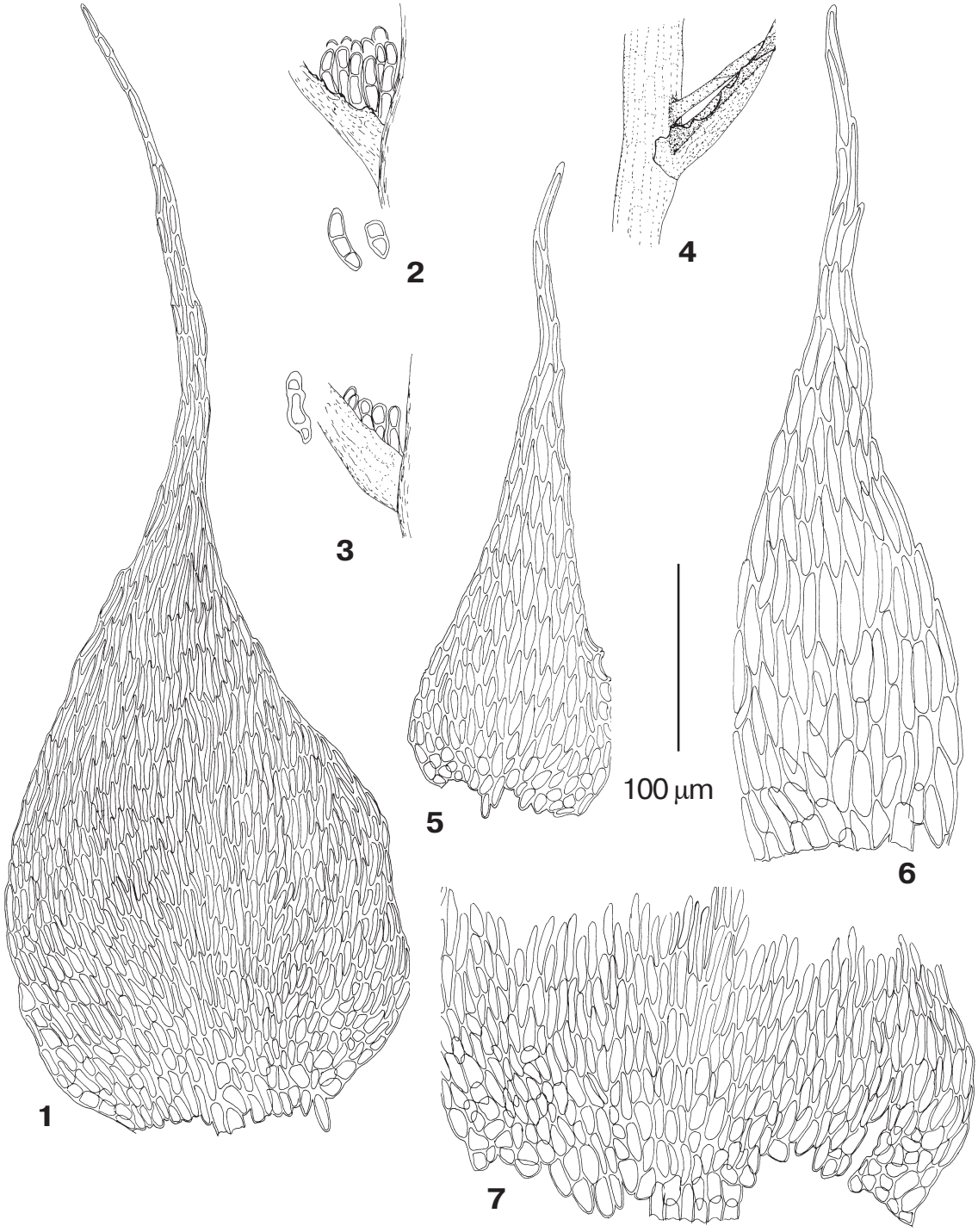


Fig.29.*Bardunovia baicalensis* Ignatov et Ochyra,gen.et spec.nova (from holotype): 1 – primary branch leaf; 2, 3 – leaf axils with axillary gemmae; 4 – leaf axil with axillary rhizoids; 5 – secondary branch leaf; 6 – perichaetial leaf; 7 – base of primary branch leaf. Scale bar 100 μm – for all.

Fig.28.*Bardunovia baicalensis* Ignatov et Ochyra,gen.et spec.nova (from holotype): 1 – secondary branch leaf; 2 – stem cross sectionss; 3, 4 – stem leaves. Scale bar 100 μm – for all.

The generic name refers to Leonid V. Bardunov, the investigator of Siberian bryophyte flora and the collector of this moss. The specific epithet refers to Baikal Lake area, where the moss occurs.

The relation of *Bardunovia* to HIMOP-complex is supported by: (1) small pleurocarpous plants with mostly ecostate leaves; (2) axillar papillose purplish rhizoids; (3) fragile stem with easily detached branches; (4) lack of pseudoparaphyllia (in HIMOP-complex present only in *Orthothecium*); (5) presence of 2-3-celled axillary gemmae (known in *Platydictya, Isopterygiopsis, Myurella, Orthothecium). Bardunovia* is especially similar to *Myurella*-species in the following characters: (1) branch leaves concave at base and in this area cells are prorate at abaxial side; (2) "compound" teeth at proximal leaf margin; 3) smooth and colored perichaetial leaves (as in *Myurella*-species and *Orthothecium*). The general similarity between *M. acuminata* and branches of *Bardunovia* in the leaf arrangement, leaf sizes and shape is considerable.

The main peculiarities of *Bardunovia* compared with all other genera of Hypnales (Hypnobryales) includes the enormous differences between stem and branch leaves, as well as the branching pattern of stem and branches. No species of this order has such different costate stem leaves and ecostate branch leaves. The very variable costa is known in e. g. *Campylium protensum* and *C. polygamum* (Amblystegiaceae), but in these species costate/ ecostate leaves are intermixed along one axis.

In some respect *Bardunovia* is similar to *Heterocladium dimorphum*. In the latter species stem leaves often appressed to the stem in their basal portion, but branch leaves are julaceous and their basal parts deviate from branches at nearly right angle. Stem leaves of *Bardunovia* and *H. dimorphum* have similar shape, and branch leaves of both species are also much alike. However in *Heterocladium dimorphum* costa is always distinct and present in both stem and branch leaves, rhizoids are clustered below the leaf insertion, branching is regularly pinnate and aslo lamina cells are much differentiated from elongate in paracostal area to isodiametric at the margins.

*Bardunovia* differs from the other members of the HIMOP-complex by unusual branching patter of the stem, where primary branches deviate at ± right angle. The branching of the branches is more similar to that of the HIMOP-complex, being fasciculate and with branches mostly forming an acute angle with the previous axes. These peculiarities do not allow to classify *Bardunovia* in any known genus, so we describe it as a new monotypic genus. Its most close relatives seems to be probably *Myurella* and *Platydictya*, species of the HIMOP-complex, here referred to Plagiotheciaceae.

*Distribution and ecology: Bardunovia baicalensis* is known only from a single type collection. Its occurrence on rotten wood is interestingly paralell to *Orthodontopsis bardunovii* Igantov et Tan, another genus endemic of South Siberia, which also is an obligate epixylic species in the boreal forest of the similar type (Ignatov & Tan, 1991).

The position of *Myurella acuminata* and *Bardunovia baicalensis* in the HIMOP-complex fills some gaps between taxa of very different appearances. *Myurella* was previously treated as distinct because of lack or transitional form between its ± isodiametric lamina cells and mostly very long and narrow cells of *Herzogiella, Isopterygiopsis* and *Orthothecium.* Also the leaf shape of *Myurella* and these three genera is distinct. However the series *Myurella spp. - Myurella acuminata – Bardunovia - Platydictya jungermannioides - Isopterygiopsis alpicola -Isopterygiopsis pulchella* - other narrow-celled species comprise a rather gradual transition between the extremes.

The relation of the HIMOP-compex to *Plagiothecium* is less obvious. Typically *Plagiothecium* has brownish smooth rhizoids, but young rhizoids are purplish and granular-papillose (Hedenaes, 1987).

In wide-celled *Plagiothecium* species rhizoids are arranged on abaxial leaf base and never originate "below the leaf insertion", though sometimes described as such. The careful detaching of leaves in practically all cases retains no rhizoids on stem. On short proximal portion of branch where rhizoids are especially numerous many of them are originated, of course, on stem, but this fact seems should not affect the gereral interpretation

of rhizoids of wide-celled *Plagiothecium* as non-cauline, absent below the leaf insertion.

The absence of pseudoparaphyllia and the presence of axillary gemmae are the other similarities between the *Plagiothecium* and HIMOP-complex.

To sum up, at present, Plagiotheciaceae is probably the best place for the *Bardunovia* and the whole HIMOP-complex.

AKNOWLEDGEMENTS

We are much indebted to Leonid V. Bardunov for the making at our disposal his collection described here as a new genus, to Lars Hedenaes and Timo Koponen for arranging the visits of the first author to S and H to study the type material; to Olga M. Afonina for the loan of collections from LE; to Elena A. Ignatova for the help with the SEM; to Hedenaes and Bardunov for their comments on the manuscript and to Alan Harrington and Hedenaes for corrections of English.

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