

THE GENUS *GRIMMIA* HEDW. (GRIMMIACEAE, MUSCI) IN RUSSIA

РОД *GRIMMIA* HEDW. (GRIMMIACEAE, MUSCI) В РОССИИ

ELENA IGNATOVA & JESÚS MUÑOZ

ЕЛЕНА ИГНАТОВА, ИИСУС МУНЬОС

Abstract

The revision of *Grimmia* collections from the territory of Russia is presented. Thirty one species are recognized, while *G. decipiens* and *G. trichophylla* are excluded from the Russian bryoflora. Descriptions, illustrations, comparisons with similar species, studied specimens and maps of distribution in Russia are presented for each species.

Резюме

Проведена ревизия рода *Grimmia* для территории России, где выявлен 31 вид, а нахождение *G. decipiens* и *G. trichophylla* не подтверждается. Для всех видов даны описания, иллюстрации, сравнения со сходными видами, а также перечислены все изученные образцы. Распространение видов показано также на картах.

INTRODUCTION

The genus *Grimmia* is difficult for species identification, and thus its treatments by different authors lead sometimes to more or less incongruent results. About 250 species of the genus were accepted in "Index Muscorum", not counting *nominae nudaе* (Wijk & al., 1962, 1969), 123 species [69 of them as confirmed by recent revisions] – by Crosby & al. (1999), 71 – by Muñoz & Pando (2000), and 93 – by Greven (2003).

The genus got recently a lot of attention: it was revised for the territory of Japan (Deguchi, 1978), China (Cao & Vitt, 1986; Cao & al., 2003), Altai within Russia (Ignatov & Cao, 1994), North Europe (Nyholm, 1998), Europe (Greven, 1995; Maier & Geissler, 1995), Himalayas (Maier, 2002), South America (Muñoz, 1999), worldwide (Greven, 2003). Muñoz & Pando (2000) published results of their worldwide revision, including type citations, complete synonymy and distribution of each species up to the country level.

During these studies a lot of corrections were done for the territory of Russia, but the main amount of collections, especially from local herbaria remained under-studied. Thus the most recent existing revision of *Grimmia* for the whole area of Russia is the treatment of this genus in Savicz-Lyubitskaya & Smirnova (1970) handbook of acrocarpous mosses of the USSR.

This latter revision includes 27 species and 3 varieties which are treated here as species: *G. trichophylla* var. *tenuis* – *G. muehlenbeckii*, *G. tergestina* var. *poecilostoma* – *G. poecilostoma*, *G. hartmanii* var. *anomala* – *G. anomala*. In addition, these authors also included *G. orbicularis* under the name *G. pulvinata* var. *africana*. Three more species of *Grimmia* were reported by Savicz-Lyubitskaya & Smirnova (l. c.) as *Dryptodon* (*D. atratus*), *Hydrogrimmia* (*H. mollis*) and *Racomitrium* (*R. patens*). Thus these authors reported for USSR altogether 34 species of *Grimmia*, 29 of them from Russia.

Check-list of mosses of the former USSR (Ignatov & Afonina, 1992) includes 27 species for Russia (including *Hydrogrimmia*, *G. trichophylla* and *G. decipiens*, the two latter species based on erroneous data). Muñoz & Pando (2000) reported for Russia 30 species, adding *G. capillata*, *G. triformis* and *G. teretivervis*, as new for Russia, and raising the status of *G. poecilostoma* and *G. orbicularis* up to species level. Finally Ignatova & al. (2003) described one more Siberian species, *G. jacutica*.

The present revision is based on the study of herbarium collections from the main bryological herbaria where Russian material is well-represented: CSR, H, IRK, KPABG, KRS, LE, MHA, MW, PTZ, S, SASY, SVER, UUH, VLA.

¹ – Moscow State University, Biological Faculty, Moscow 119992 Russia – Россия 119992 Москва, Московский государственный университет, Биологический факультет.

² – Real Jardín Botánico, Plaza de Murillo 2, E-28014 Madrid, Spain

Grimmia Hedw., Sp. Musc. Frond.: 75.1801.

Type species: *Grimmia plagiopodia* Hedw. (lectotype, designated by Mårtensson, 1956: 156).

Plants medium-sized, more rarely small or robust, soft or rigid, in dense or loose, often easily separating tufts, patches or cushions, dark green, yellow green, brownish or blackish green, not or weakly to strongly hoary. Leaves ovate, ovate-lanceolate, lanceolate or linear-lanceolate, concave or keeled in distal part; margins entire, plane, incurved or recurved, often recurved on one side and plane on other side in proximal part of leaf; costa single, clearly or weakly delimited from laminal cells, \pm percurrent, semi-terete and ventrally canaliculate or flattened, rarely terete, in cross section semi-elliptic, semi-circular, round or reniform, sometimes irregularly angular, trapezoid, winged dorsally in distal part of leaf; lamina 1-2(-3)-stratose in distal 2/3, often more thick, rarely less thick at margins, usually unistratose at proximal 1/3 of leaf; upper and median laminal cells subquadrate, oblate to short rectangular, sometimes rounded-quadrate or irregular, with strong or moderately thickened, straight or sinuose walls, mostly smooth, rarely papillose or / and bulging, basal juxtacostal cells rectangular to linear, thick- or thin-walled, porose to nodulose or not porose, basal marginal cells usually shorter, pellucid, rarely quadrate or oblate, opaque, often with thin longitudinal and thick transverse walls, more rarely with uniformly thin longitudinal and transverse walls. Autoicous or dioicous. Androecia terminal, at shoot tips, or lateral, just below perichaetia. Setae short to long, straight, arcuate or sigmoid. Capsules immersed, emergent or exserted, symmetric or ventricose, ovoid or cylindrical, smooth, furrowed or ribbed. Operculae plane or conic, rostrate or mamillate, columellae not attached to opercula. Annulus of three main types (Fig. 1): 1) composed of (2-)3-4 rows of thick-walled, but transparent cells with narrow lumen, becoming larger to upper rows, separating in spirals (affinis-type, according to Deguchi, 1978); 2) composed of small, round, thick-walled but transparent cells with round lumen, separating in groups or by single cells (elongata-type, l.c.); 3) several rows of subquadrate or transverse rectangular thick-walled, not transparent cells at the orifice (Schistidium-type, l.c., called also simple and persistent or not differentiated). Peristome teeth

orange-red, erect to spreading when dry, lanceolate, entire or cleft, not perforate or perforate to cribose. Spores small, finely papillose. Calyptrae cucullate or mitrate. Gemmae in few species, multicellular, globular, with protuberant cells, developing on stalks or sessile, on leaf apices, on dorsal or ventral side of costa.

The generic concept used in the present paper is a traditional one. Recently Ochyra & al. (2003) suggested to split *Grimmia* into four genera, segregating also *Dryptodon* (= *Grimmia* sect. *Rhabdogrimmia*, species with curved setae and ribbed capsules), *Guembelia* (group of species with flat, poorly defined costae) and *Orthogrimmia* (small species with keeled lanceolate leaves), remaining in *Grimmia* species with ventricose capsules. Though the core species of these groups are contrasting, the position of some species remains unclear (and probably will be more clear after expanded analysis which involves molecular data). So we leave the systematic discussion for the future, and by the same reason arrange species in alphabetical order.

The number of species in the genus (in the present circumscription) is different in the publications of different authors, i. e.: 123 species [69 of them as confirmed by recent revisions] (Crosby & al., 1999), 71 species (Muñoz & Pando, 2000) or 93 species (Greven, 2003).

Species of *Grimmia* are mostly distributed in cold and mountain regions of the world, where rocks and especially acid rocks are widespread (though some species prefer calcareous rocks and sometimes grow on soil in cold environments). The name is in honour of J. F. C. Grimm, 1737-1821, a medical doctor and botanist from Gotha, Germany.

NB: The careful explanation of some taxonomically important morphological characters of *Grimmia* is given by Loeske (1913), Deguchi (1978), and Muñoz (1998).

NB: Helpful suggestions on the slide preparation, cross sectioning, etc. are given by Maier (2002).

NB: Beautiful colorful pictures of many species of *Grimmia* are given as a supplement to the world revision of *Grimmia* by Greven (2003).

NB: Leaf length given in keys and description do not include hair-point length.

NB: The study of leaf cross section is very important for the species identification; the sections should be made mostly at distal 2/3-3/4 of leaf, if otherwise not indicated.

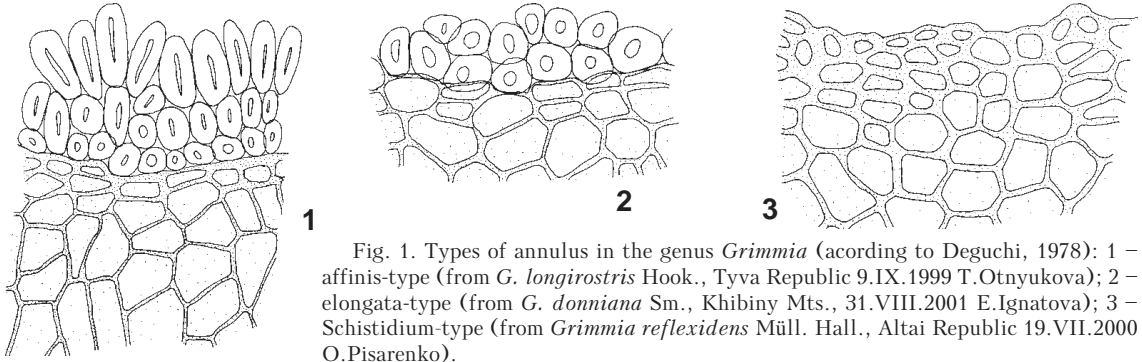


Fig. 1. Types of annulus in the genus *Grimmia* (according to Deguchi, 1978): 1 – affinis-type (from *G. longirostris* Hook., Tyva Republic 9.IX.1999 T.Otnyukova); 2 – elongata-type (from *G. donniana* Sm., Khibiny Mts., 31.VIII.2001 E.Ignatova); 3 – Schistidium-type (from *Grimmia reflexidens* Müll. Hall., Altai Republic 19.VII.2000 O.Pisarenko).

KEY FOR IDENTIFICATION
OF GRIMMIA IN RUSSIA

- 1. Leaves soft, broadly ovate; leaf cells 12-25 µm wide *G. mollis* (p. 146)
 - Leaves rigid, linear, ovate-lanceolate or ovate; leaf cells 6-12(-14) µm wide 2
- 2. Capsules immersed into perichaetial leaves, setae shorter than 1 mm 3
 - Capsules emergent to exerted (setae longer than 1 mm) or plants sterile 9
- 3. Plants robust, leaves (2.0-)2.5-4.0 mm long, from ovate base narrowed to long lanceolate acumen *G. pilifera* (p. 156)
 - Plants small to medium-sized, leaves 1.0-2.0(-2.5) mm long, ovate to lanceolate . . . 4
- 4. Leaves canaliculate, not keeled in distal part, bistratose in distal 2/3 of leaf, costa weakly differentiated, flattened, semi-elliptical in cross section 5
 - Leaves keeled in distal part, mostly unistratose or bistratose at margins in 1-5 cell rows, rarely mostly bistratose (*G. anodon*); costa differentiated, semi-circular in cross section 6
- 5. Capsules symmetric, setae erect, centrally attached; usually on calcareous substrates *G. tergestina* (p. 172)
 - Capsules asymmetric, ventricose, setae sigmoid, excentrically attached; mostly on acidic or neutral substrates *G. poecilostoma* (p. 161)
- 6. Capsules symmetric, setae erect, centrally attached 7
 - Capsules asymmetric, ventricose, setae sigmoid, excentrically attached 8
- 7. Leaf margins plane, basal marginal cells of stem leaves with uniformly thin longitudinal and transverse walls
 - *G. triformis* (p. 177)
 - Leaf margins recurved, basal marginal cells of stem leaves with thin longitudinal and thick transverse walls *G. capillata* (p. 113)
- 8. Peristome absent *G. anodon* (p. 107)
 - Peristome present *G. plagiopodia* (p. 161)
- 9(2). Basal marginal cells of stem leaves with uniformly thin longitudinal and transverse walls 10
 - Basal marginal cells of stem leaves with thin longitudinal and thick transverse walls 13
- 10. Leaf margins always plane, never recurved; opercula low conic, mamillate *G. donniana* (p. 115)
 - Leaf margins recurved in proximal part, at least on one side; opercula with short beak 11
- 11. Leaves long and narrow, linear-lanceolate, strongly flexuose to almost crisped when dry; basal paracostal cells with thick, porose to nodulose longitudinal walls and very thin transverse walls *G. incurva* (p. 131)
 - Leaves ovate-lanceolate or lanceolate, slightly flexuose when dry; basal paracostal cells with moderately thickened and slightly porose longitudinal walls . . . 12
- 12. Hyaline hair-points long (mostly longer than 0.3 mm); setae arcuate when moist *G. fuscolutea* (p. 124)
 - Leaves with very short hyaline hair-points (usually not longer than 0.3 mm) or muticous; [setae erect when moist] *G. elongata* (p. 120)
- 13(9). Leaf margins always plane, never recurved 14
 - Leaf margins recurved in proximal part, at least on one side 21

14. Upper laminal cells bulging 15
 – Upper laminal cells not bulging . . . 16
15. Leaves with deep longitudinal plicae; upper laminal cells with scattered papillae *G. caespiticia* (p. 111)
 – Leaves not or weakly plicate; upper laminal cells never papillose . . . *G. alpestris* (p. 105)
16. Costa terete, prominent both dorsally and ventrally, round in cross section *G. teretinervis* (p. 170)
 – Costa semi-terete, not prominent ventrally, not round in cross section 17
17. Leaves keeled in distal part; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells *G. montana* (p. 147)
 – Leaves canaliculate in distal part; costa weakly differentiated, slightly prominent dorsally or flattened, semi-elliptical in cross section, with (2-)3-6 ventral epidermal cells 18
18. Basal marginal cells of stem leaves oblate, opaque *G. laevigata* (p. 136)
 – Basal marginal cells of stem leaves quadrate or rectangular, not opaque 19
19. Leaves muticous, cucullate at apex *G. unicolor* (p. 179)
 – Leaves with hyaline hair-points . . . 20
20. Leaves from ovate base tapering into long and narrow lanceolate acumen; perichaetial leaves similar to stem leaves; [capsules exerted] *G. ovalis* (p. 154)
 – Leaves from ovate base tapering into short and rather wide acumen; perichaetial leaves differentiated, filmy at base or at proximal 2/3, with very thin-walled basal cells; [capsules immersed] *G. tergestina*, *G. poecilostoma* (pp. 172, 161) [these two species could not be differentiated certainly without sporophytes]
- 21(13). Gemmae present 22
 – Gemmae absent 25
22. Leaves strongly contorted to crisped; gemmae subsessile on dorsal side of costa at base of upper leaves . . . *G. torquata* (p. 175)
 – Leaves erect or slightly flexuose; gemmae at leaf apices or on branched stalks on ventral side of costa at leaf base . . 23
23. Gemmae on branched stalks on ventral side of costa at leaf base
 *G. muehlenbeckii* (p. 149)
 – Gemmae on leaf apices 24
24. Leaf lamina striolate, laminal cells with longitudinal cuticular ridges on both surfaces, looking like papillae in leaf cross section; gemmae yellowish . . . *G. anomala* (p. 111)
 – Leaf lamina smooth, without cuticular ridges; gemmae red-brown . . . *G. hartmanii* (p. 126)
- 25(21). Costa reniform in cross section, with 3-6 ventral epidermal cells 26
 – Costa semi-circular or angular in cross section, with 2 ventral epidermal cells 28
26. Leaves muticous, costa winged dorsally in distal part of leaf . . . *G. ramondii* (p. 165)
 – Leaves with hyaline hair-points, not winged 27
27. Plants in dense tufts or cushions; leaves mostly bistratose in distal 2/3; autoicus, sporophytes frequent, capsules ovoid-cylindric, smooth, setae erect and straight *G. longirostris* (p. 139)
 – Plants in loose tufts or patches; leaves unistratose, bistratose in one cell row at margins; dioicus, sporophytes very rare, capsules ovoid, ribbed, setae arcuate when moist *G. jacutica* (p. 132)
28. Plants robust, leaves 2.5-4.5 mm long. . 29
 – Plants not robust, leaves mostly to 2.0 (-2.5) mm long 30
29. Costa furrowed to winged on dorsal side in distal part of leaf, irregularly angled in cross section; upper laminal cells papillose, often also bulging; capsules ribbed, setae arcuate when moist . . . *G. elatior* (p. 117)
 – Costa smooth on dorsal side, semi-circular in cross section; upper laminal cells not papillose or bulging; [capsules immersed, smooth, setae short, erect] *G. pilifera* (p. 156)
30. Costa weakly winged on dorsal side in distal part of leaf, irregularly angled or trapezoid in cross section . . . *G. muehlenbeckii* (p. 149)
 – Costa semi-terete, not winged, semi-circular in cross section 31
31. Leaves lanceolate 32
 – Leaves ovate 33
32. Leaves widely keeled in distal part, usually spirally twisted when dry; upper and

- median laminal cells incrassate and sinuose; capsules furrowed, setae arcuate when moist *G. funalis* (p. 123)
- Leaves narrowly keeled in distal part (blades forming < 40° angle), not spirally twisted when dry; upper and median laminal cells moderately incrassate and slightly sinuose; capsules smooth, setae erect and straight when moist . . . *G. reflexidens* (p. 167)
33. Hyaline hair-points long, terete; capsules usually present, ribbed; setae arcuate when moist 34
- Hyaline hair-points short to long, in sterile plants sometimes absent, widened and flattened at base, usually decurrent; [capsules smooth, immersed] 35
34. Perigonia lateral, just below perichaetia; calyptrae mitrate; peristome teeth entire, not or slightly perforate . . . *G. pulvinata* (p. 162)
- Perigonia terminal; calyptrae cucullate; peristome teeth cribose
. *G. orbicularis* (p. 152)
35. Leaf lamina partially bistratose in distal part *G. anodon* (p. 107)
- Leaf lamina unistratose 36
36. Hyaline hair-points in upper and perichaetial leaves considerably widened and flattened at base, decurrent . . . *G. capillata* (p. 113)
- Hyaline hair-points in upper and perichaetial leaves slightly widened and flattened at base, not decurrent . . .
. *G. plagiopodia* (p. 161)

1. *Grimmia alpestris* (Schleich. ex Web. et Mohr) Schleich. Cat. Pl. Helv. ed. 2: 29. 1808.
– *Trichostomum pulvinatum* var. *alpestre* Schleich. ex Web. et Mohr, Bot. Taschenb. 110. 1807. Figs. 2, 3.

Plants in compact cushions, glaucous-green in upper part, blackish inside. Stems erect, 0.5–1.5 cm long, with central strand. Leaves appressed when dry, erect-spreading when moist, 1.0–1.8×0.4–0.5 mm, from oblong base gradually narrowing into lanceolate acumen, sharply keeled distally, slightly plicate; margins plane to incurved in distal part of leaf; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points to 1 mm long, almost smooth; lamina bistratose in upper 2/3 or mostly bistratose with unistratose strips, upper laminal cells isodiametric, 8–13µm, rounded-quadrate, with moderately thickened and not sinuose walls,

strongly bulging, basal juxtacostal cells short rectangular to quadrate, 10–35×8–20 µm, with evenly thickened walls, basal marginal cells similar in shape and size, with thin longitudinal and thick transverse walls. Dioicous, sporophytes not rare. Setae straight, 2–4 mm. Capsules exserted, ovoid-cylindric, 1.0–1.8 mm long, chestnut, smooth, fusiform. Exothecial cells thick-walled, stomata at urn base lacking. Operculum low conic, mamillate. Annulus of Schistidium-type. Peristome teeth entire or slightly cleft distally, brownish, concolorous with the urn. Spores 10–13 µm. Calyptrae cucullate.

SPECIMENS EXAMINED: **CAUCASUS:** North Ossetia, North Ossetian Reserve, 20.VII.1977, *L.I. Abramova* (MW); **Karachaevo-Cherkessia**, Teberda Reserve, Alibek Gorge, 2.VII.1995, #4/95, *Onipchenko* (MW); Alibek glacier, 27.VII.1955, *I. Patrobołova* (LE, MW); Chuchkhur Gorge, 9.VII.1998, #z-36, *A. Volkov & S. Zenyakin* (MW); Maljy Khutyj Gorge, 28.VIII.1999, #7/99, *Onipchenko* (MW); Azgek Gorge, 30.VII.1993, 8.VII.1994, 33/93, 17/94, *Onipchenko* (MW); Aksaut River, Kti-Teberda Gorge, 15.VIII.1979, #7/12, *E.E. Gogina* (MHA); **Krasnodar Territory**, Mzymta River basin, Achishkho Mt., 25.VI.1951, *Alper* (CSR); Mzymta River basin, Achishkho Mt., 14.VIII.2004, *T. Akatova* (CSR); **Adygeya**, Belaya River basin, Kut Mt., 17–19.VII.1996, *T. Akatova* (CSR, MHA); **URALS:** **Bashkortostan**, Burzyan Distr., Shulgan-Tash, 6.VI.2001, #03-32, *V. Zolotov* (MHA); **SIBERIA:** **Altai Republic**, Katun, 1.VIII.1915, *J. Grano* (H-Br); Tyuguryuk, 23.VI.1966 *L. Bardunov & L. Novak* (IRK); Kurkure Range, Kayakkatuyarykskij Creek, 1.VII.1991, #7/109, *Ignatov* (MHA); Kurkure Range, Altyntash Creek, 16.VI.1989, *N. Zolotukhin* (MHA); **FAR EAST:** **Kamchatka**, South-Kamchatian Reserve, Koshelevskij volcano, 21–29.VII.1990, *I. V. Czernyadjeva* (LE); Ushkovskij volcano slope, 23.VII.2003, *I. V. Czernyadjeva* (LE).

Distribution. This species is not rare in mountains of Central and Northern Europe and North America, Turkey and Transcaucasia, scattered in Middle Asia. In Russia *G. alpestris* is rather common in Caucasus, sporadically found in mountain areas of southern Siberia and Kamchatka, and only one locality in South Urals (Bashkortostan) is known. It grows usually in alpine belt, more rarely below tree-line, at 1800–3800 m alt., on neutral or basic rocks; the single collection from Bashkortostan was made at 500 m alt., on calcareous substrate.

Differentiation. *Grimmia alpestris* can be confused with *G. caespiticia* (see comments to this species) or *G. reflexidens*. It differs from the latter species mainly in sporophyte characters: capsules chestnut, fusiform (vs. stramineous, ovoid-cylindric in *G. reflexidens*), exothecial cells thick-walled (vs. thin-walled),

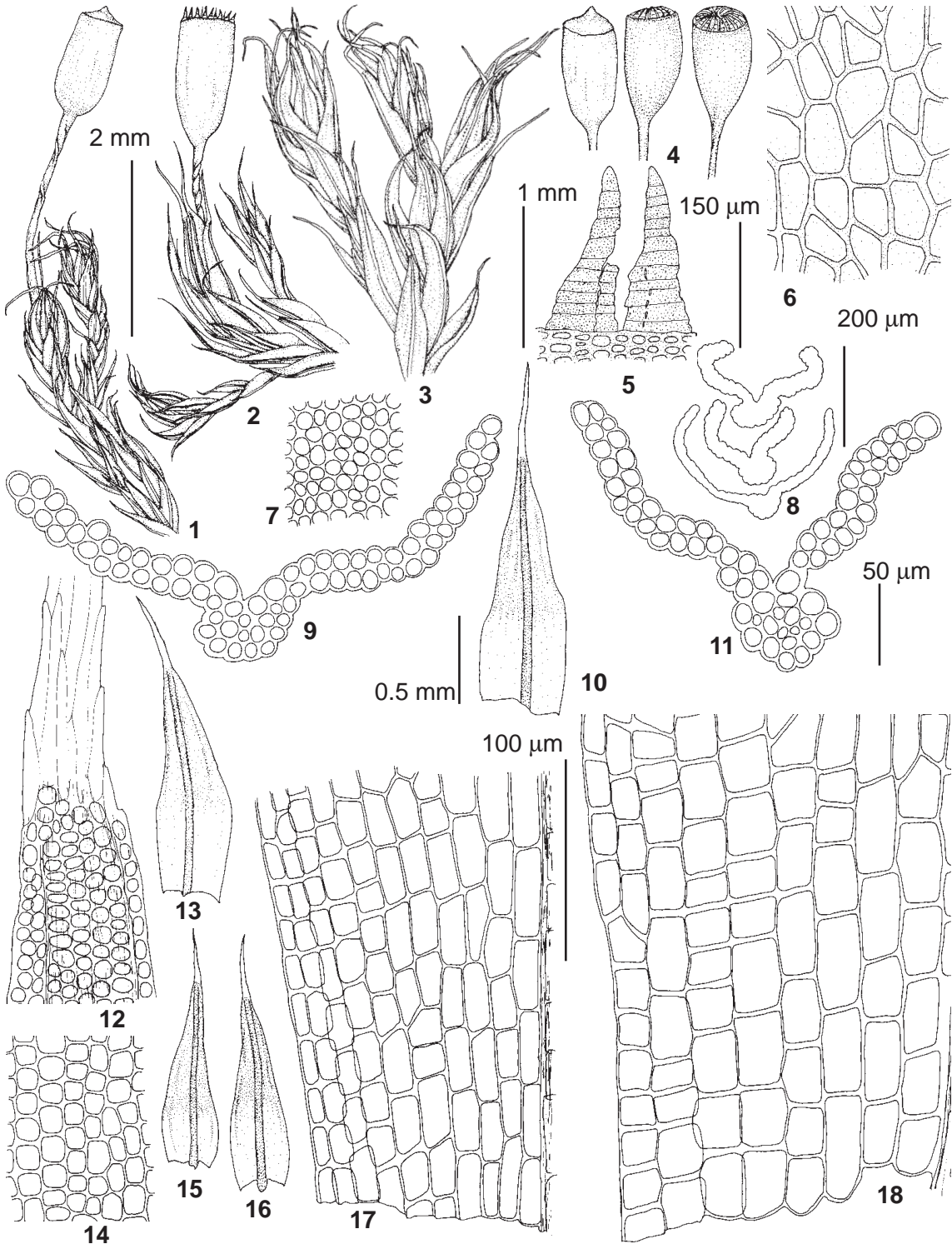


Fig. 2. *Grimmia alpestris* (Schleich. ex Web. et Mohr) Schleich. (from Bashkortostan, V. Zolotov, #03-32): 1-3 – habit; 4 – capsules; 5 – part of peristome; 6 – exothecium; 7 – upper leaf cells; 8-9, 11 – leaf transverse sections; 10, 13, 15-16 – leaves; 12 – base of hair-point and upper leaf cells; 14 – median leaf cells; 17-18 – basal leaf cells. Scale bars: 2 mm for 1-2, 4; 1 mm for 3; 0.5 mm for 10, 13, 15-16; 50 μm for 9, 11; 100 μm for 6-7, 12, 14, 17-18; 150 μm for 5; 200 μm for 8.



Fig. 3. Distribution of *Grimmia alpestris* (Schleich. ex Web. et Mohr) Schleich. (circles) and *Grimmia anomala* Hampe ex Schimp. (stars)

stomata absent (vs. present at urn base), peristome teeth brownish, concolorous with the urn (vs. orange, contrasting in color with the urn). Sterile specimens are sometimes difficult to identify because some forms of *G. reflexidens* are very close to *G. alpestris* in gametophyte characters sharing plane leaf margins, partially bistratose lamina and bulging upper laminal cells. However, such forms of *G. reflexidens* are very rare in Russian material, and this species can usually be recognized by narrowly recurved margin in middle part of leaf, at least on one side, mostly not or very slightly bulging cells and not glaucous plants.

2. ***Grimmia anodon*** B.S.G., Bryol. Europ. 3: 110. 236. 1845. Figs. 4, 5.

Plants in dense, low tufts, dark-green to bluish or brown, sometimes hoary. Stems erect, 0.5-1 cm long, usually with numerous thin sterile shoots with small muticous leaves. Leaves appressed when dry, erect-spreading when moist, upper and perichaetial leaves enlarged, 1.0-2.0×0.4-0.8 mm, oblong to ovate, concave, keeled distally, not plicate; margins plane in distal part of leaf, slightly recurved in proximal or middle part at one or both sides; costa clearly differentiated from laminal cells, narrow, widened distally, slightly prominent dorsally, semi-circular, with two ventral cells in cross section; hyaline hair-points short to absent in lower leaves or leaves of sterile shoots, long in upper and

perichaetial leaves, weakly denticulate to almost smooth, widened and flattened at base; lamina mostly unistratose, with bistratose margins, or partly bistratose in distal part of leaf; upper and median laminal cells rounded-quadrate to short rectangular, 10-20×8-12 μm, rather thin-walled and slightly sinuose, proximal juxtacostal cells rectangular, proximal marginal cells short rectangular, with thin longitudinal and thick transverse walls. Autoicous, androecia terminal, mostly with sporophytes. Setae short, to 0.5 mm, curved, excentrically attached to the capsule. Capsules immersed, asymmetric, ventricose, 0.7-1.0 mm long, rounded, smooth, with wide mouth when open. Annulus of elongata-type. Peristome absent. Operculum plane-convex, mamillate. Spores 8-10 μm. Calyptrae mitrate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Karelia**, Ruskeala, Korpikallio, 15.VII.1876, *V.F. Brotherus* (H); Sortavala, 13.VI.1930, *V. Kujala* (H); **Moscow Province**, Lyubertzy Distr., Dzerzhinskij, 6.VII.1987, *Ignatov* (MHA); **Samara Province**, Syzran' Distr., Usol'e village, 24.VI.1926, #1/33, *E. Schtukukenberg* (LE, MW); Syzran Distr., Zhiguli, 13.VII.1910, *I.A. Vereitinov* (LE); Syzran Distr., Zhiguli, Lysaya Gora, 15.VI.1910, *I.A. Vereitinov* (LE); Morkvashi village, Kamennaya Gora (Zhiguli), 4.VII.1925, #4/13, *E. Schtukukenberg* (LE, MW); **Volgograd Province**, Sredne-Akhtubinskij Distr., 22.VI.1993, #169, *S. Suragina* (MHA); Kletskij Distr., Kremenskaya, 7.VIII.1999, *Ignatov* (MHA); **Astrakhan Province**, mons Bogdo, 30.IV.1926, #15, *V.P. Savicz* (MW, MHA, LE); Bogdo, 5.V.1923, *L. Kazakevich* (LE, MW); Bolshoe Bogdo Mt., 24.V.1992, *V. Sagaljev*, 2-3.V.2002, 14.VII.2002, *S. Suragina* (MHA);

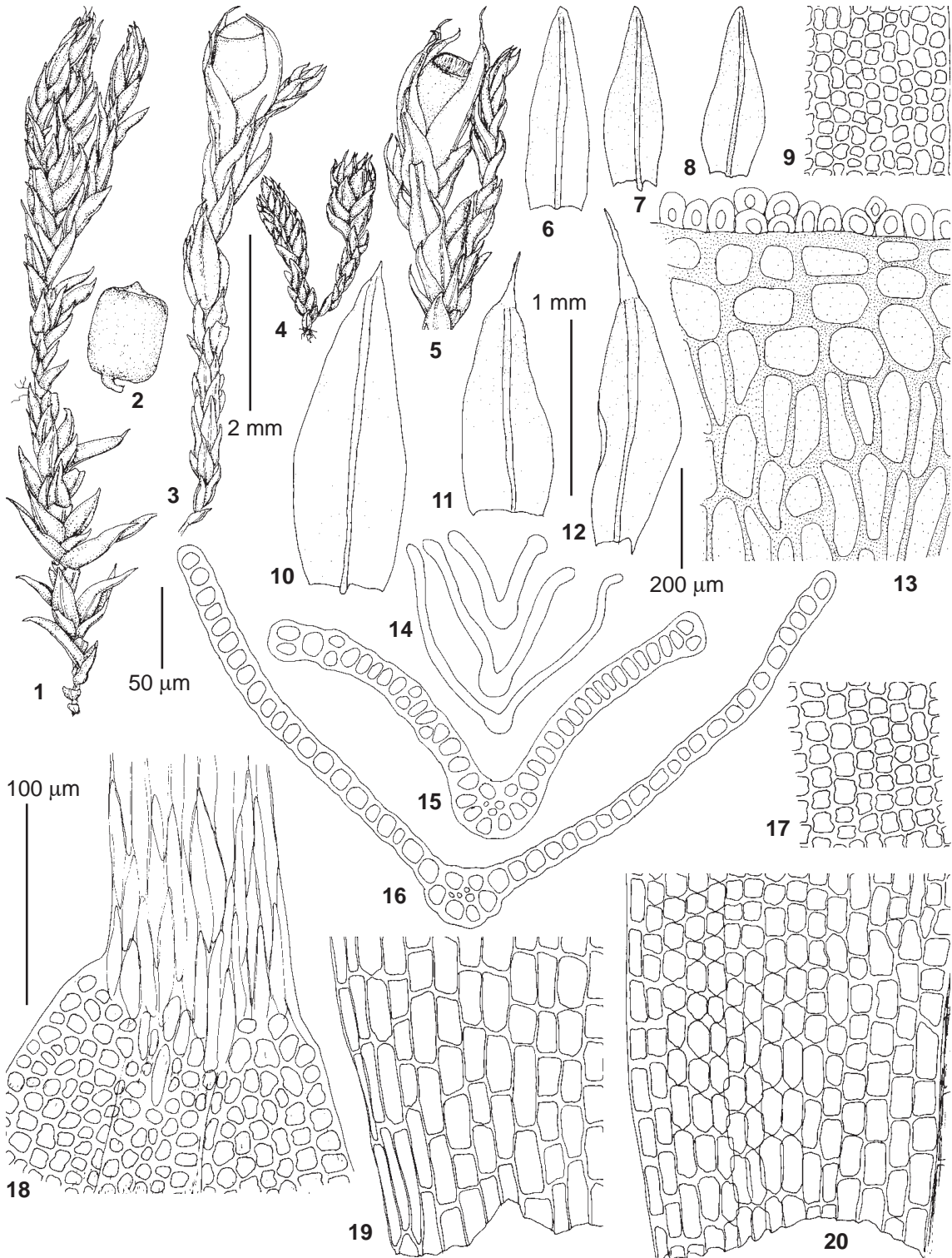


Fig. 4. *Grimmia anodon* B. S. G. (from Astrakhan Province, 9.V.1997, I.Zemlyanskaya): 1, 4 – habit (sterile shoots); 2 – capsule; 3, 5 – habit (fertile plants); 6-8 – leaves from sterile shoots; 9 – upper leaf cells; 10 – upper leaf; 11-12 – perichaetial leaves; 13 – exothecium; 14-16 – leaf transverse sections; 17 – median leaf cells; 18 – base of hair-point and upper leaf cells; 19-20 – basal leaf cells. Scale bars: 2 mm for 1-5; 1 mm for 6-8, 10-12; 50 μm for 15-16; 100 μm for 9, 13, 17-20; 200 μm for 14.



Fig. 5. Distribution of *Grimmia anodon* B.S.G. in Russia.

Kalmykiya, Manych Distr., Chalón-Khamur, Manych River valley, 17.IX.1924, #45, *L.Kazakevicz* (LE, MW); **CAUCASUS: Kabardino-Balkaria**, Chegem River Gorge, 5.08.1998, *Z.Kharzinov* (KBNG); Sukan River Gorge, 10.10.1999, *Z.Kharzinov* (KBNG); Baksan River Gorge near Adyl-Su Creek mouth, 27.07.2002, *Z.Kharzinov* (KBNG); **Krasnodar Territory**, Caucasian Reserve, Tryu-Yatyrgvarta Mts., 16.VII.1997, *T.Akatova* (CSR); **Adygeya**, Oshten Mt., 14.VIII.1992, *T.Akatova* (CSR, MHA); **URALS: Bashkortostan**, Shulgan-Tash Reserve, 2001, #02-49, *V.Zolotov* (MHA); **SIBERIA: Altai Republic**, Kosh-Agach, Tabozhok Creek, 29-30.VII.1992, 7.VIII.1992, #30/4, #30/5, 31/3, #30/14, *Ignatov* (MHA); Kosh-Agach, Kokorya Creek, 4.VIII.1992, #32/17, *Ignatov* (MHA); Tokpak Creek, 24.VII.1993, #36/359, *Ignatov* (MHA); Bogoyash Creek, 27.VII.1993, #36/340, *Ignatov* (MHA); Karakem River, 18-23.VI.1989, #0/480, #0/721, 0/722, *Ignatov* (MHA); Chulyshman River at Uandu Creek mouth, 2.VIII.1993, #36/301, *Ignatov* (MHA); Chulyshman River, Yazula, Bashtu Mt., 25.VI.1989, #0/725, *Ignatov* (MHA); Chulyshman River, Berekhtuyaryk, 26.VI.1989, #0/478, *Ignatov* (MHA); Shapshal Range, Tutuoyuk Creek, 15.VII.1990, *N.Zolotukhin* & *E.Koroleva* (MHA); Kayakkatuyarykskij Creek, 1.VII.1991, #7/113, *Ignatov* (MHA); Shapshal Range, Yakhansoru Lake, 28.VI.1990, *N.Zolotukhin* (MHA); Kayra Creek, 14.VII.1991, #13/50, *Ignatov* (MHA); **Krasnoyarsk Territory**, Taimyr, Ledyanaya Bay, 23 & 31.VII.2004, 12.VIII.2004, *V.Fedosov* (MW); Evenkiya, Bajkit Distr., Tanimakit River, 31.VIII.1989, *G.Lunina* (MHA); **Yakutia**, Khangalasskij Distr., Lenskie Stolby, 17.VIII.2000, #00-122, *Ignatov* (MHA); Verkhoyansk Distr., Orto-Sala River, Petrusha Lake, 25.VII.1989, *E.G.Nikolin* (SASY, MW); Srednekolymskij Distr., Kolyma River at Labuya settlement, 7.X.2002, *E.I.Ivanova* (SASY, MW); Indigirka River basin, Injali River, 19.VI.1976, #10, *O.M.Afonina* (LE); **FAR EAST: Chukotka**, Senyavin Strait, Yanrakynnot Settlement, 26.VII.1976, *O.M.Afonina* (LE); Utaveem River, 29.VII.1970, *B.A.Yurtzev* (LE); Chegitun' River, 9.VIII.1991, *O.M.Afonina* (LE); Palavaam

River, 20.VII.1989, *O.M.Afonina* (LE); Vrangél Island, Gusinaya River, 27.VII.1980, *O.M.Afonina* (LE).

Distribution. Rather widespread species throughout Europe except northernmost regions, in North Africa, Transcaucasian countries, Turkey, Middle East, Middle Asia, Iran, Pakistan, India, China, and Mongolia, North and South America. Known from lowland European Russia, from Moscow to Astrakhan Province and Kalmykiya, and from two localities in Karelia, rather common in dry areas of Altai Mts.; from other regions represented by scattered collections: Chukotka and Vrangél Island, Yakutia, Taimyr and Central part of Krasnoyarsk Territory, South Urals, and in Russian part of Caucasus found in few localities in Kabardino-Balkaria, Krasnodar Territory, and Adygea. Grows from sea level to 2500 m alt., in dry habitats, mostly calcareous.

Differentiation. Most collections of *G. anodon* have sporophytes and can be easily recognised by immersed ventricose capsules on curved setae, without peristome (*Schistidium flaccidum*, species also having immersed capsules and mostly lacking peristome differs by straight seta attached to the center of urn base). Sterile plants of *G. anodon* can be differentiated from other species by the combination of ovate, keeled, mostly muticous leaves (except only uppermost ones), unistratose

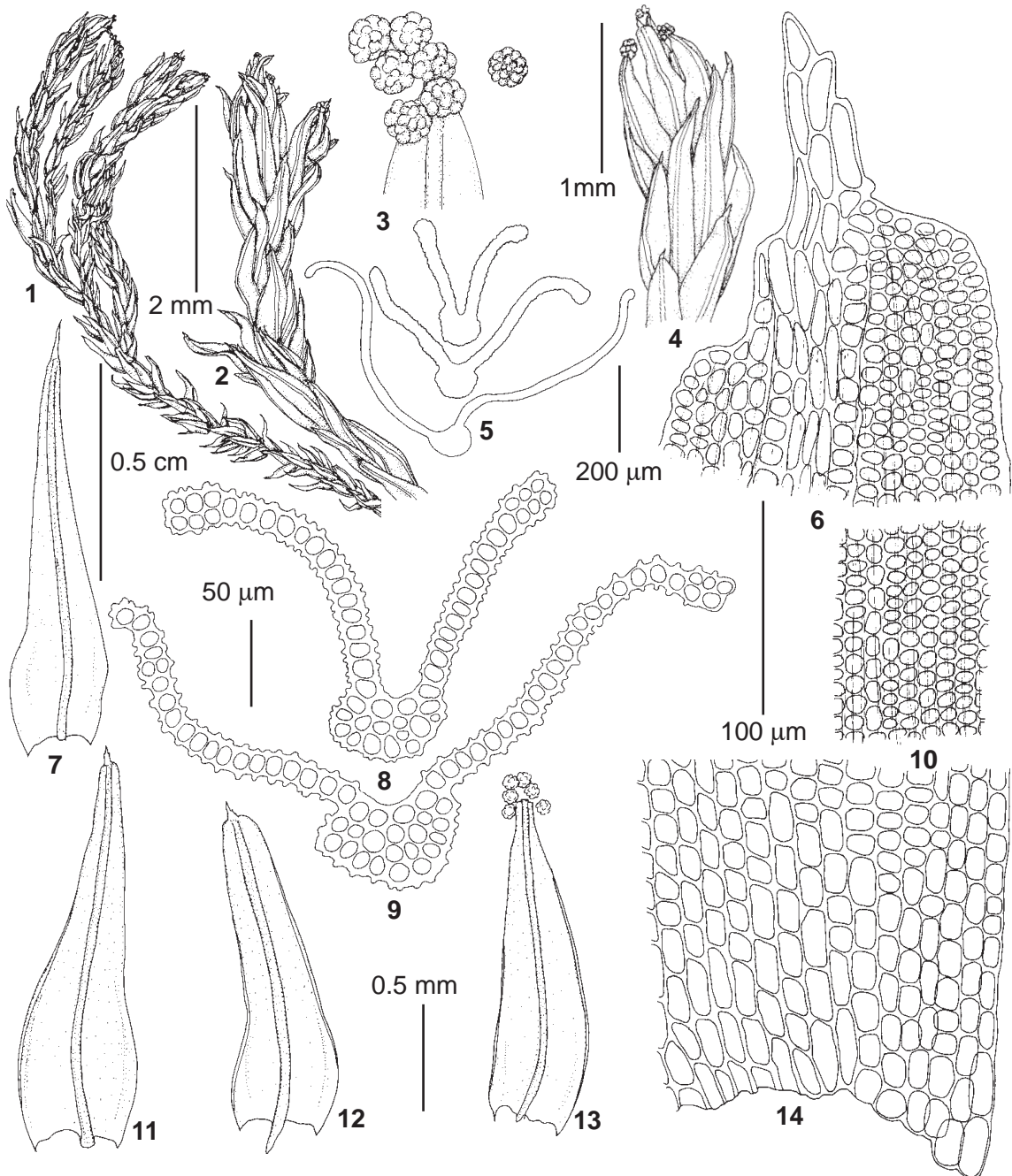


Fig. 6. *Grimmia anomala* Hampe ex Schimp. (1-2, 5, 8 – from Bashkortostan, V. Zolotov, #06-34; 3-4, 6-7, 9-14 – from Altai Republic, 15.VII.2000, O. Pisarenko): 1-2, 4 – habit; 3 – leaf tip bearing gemmae; 5, 8-9 – leaf transverse sections; 6 – hair-point and upper leaf cells; 7, 11-13 – leaves; 10 – median leaf cells; 14 – basal leaf cells. Scale bars: 0.5 cm for 1; 2 mm for 2; 1 mm for 4; 0.5 mm for 7, 11-13; 50 μ m for 8-9; 100 μ m for 6, 10, 14; 200 μ m for 3, 5.

lamina with bistratose strips or margins, and narrow costa. *Grimmia tergestina* and *G. poecilostoma* differ from *G. anodon* by concave leaves with plane margins, wide but weakly differentiated costa and lamina distally comple-

tely bistratose. *Grimmia plagiopodia*, species most similar by gametophyte characters to *G. anodon* can be recognised by always unistratose leaf lamina (vs. partly bistratose or with bistratose margins in 1-2 cell rows in *G. anodon*) and

densely denticulate hyaline hair-points (vs. weakly denticulate to almost smooth in *G. anodon*). Sterile plants of *G. capillata* can be recognized from *G. anodon* by always unistratose leaf lamina.

3. ***Grimmia anomala*** Hampe ex Schimp., Syn. Musc. Eur. ed. 2: 270. 1876. — *Grimmia hartmanii* var. *anomala* (Hampe ex Schimp.) Mönk., Laubm. Eur.: 369. 1927. Figs. 6, 3.

Plants in loose rigid patches, dark green above, brownish below. Stems prostrate to ascending, moderately branching, 1-2[-3] cm long, with well-developed central strand. Leaves erect, loosely appressed to imbricate, sharply keeled distally, 1.5-2.2×0.5-0.6 mm, from ovate base gradually tapering into wide or narrow acumen, acute or obtuse, rounded or truncate at apex, in upper leaves eroded due to gemmae formation; margins plane or weakly recurved in distal part of leaf, more strongly recurved on one or both sides below; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2-3(-4) ventral epidermal cells; hyaline hair-points very short, weakly denticulate; lamina unistratose, bistratose in 1-4 cell rows at margins; upper and median laminal cells rounded-quadrate to ovate, 7-8 μm, not or slightly sinuose, with longitudinal cuticular ridges on both surfaces, looking as papillae in leaf cross section and striolate in surface view; basal juxtacostal cells short rectangular, 8-10×15-25 μm, with moderately thickened, not porose walls, basal marginal cells with thin longitudinal and thick transverse walls. Gemmae numerous, multicellular, globose, 70-80(-100) μm in diameter, yellowish green or yellow, becoming brownish later, with protuberant surface cells, developing on eroded apices of normally developed upper leaves. Dioicous, sporophytes rare, not known from the territory of Russia. [Setae 3-5 mm, flexuose when dry, erect or curved when moist. Capsules exerted, ovoid, smooth, 1.5-2 mm long. Operculum conic, with rather long erect or oblique beak. Annulus of affinis-type. Peristome teeth orange-red, entire. Spores 14 μm. Calyptrae mitrate].

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Murmansk Province**, Laplandskij Reserve, Salnye tundry, VII.2004, B35/1a-04, B24/1-04, O.A.Belkina (KPABG); Khibiny Mts., Vudjavrchorr Mt., 6.VIII.2004, I.V.Blinova (KPABG); **Karelia**, Loimalajoki, VII.1876, V.F.Brotherus (H); **CAUCASUS:** **Karachaevo-Cherkessia**, Teberda Reserve, Teberda River upper course, Beik-Ala, VIII.1947, I.I.Tumadzhyanov (LE); **Krasnodar Territory**, Caucasian Reserve, Pseashho, 27.VIII.1909, I.Palamarchuk (LE); Shakhe River basin, Khuko Ridge, 20.VIII.1995, T.Akatova (CSR); Urushten River basin, Dzhuga Mt., 5.VIII.1988, T.Akatova (CSR); Mzymta River basin, Achishkho Mt., 14.VIII.2004, T.Akatova (CSR); **URALS:** **Bashkortostan**, Burzyan Distr., Shulgan-Tash, 6-9.VI.2001, #06-34, 06-36, 06-38, V.Zolotov (MHA); **SIBERIA:** **Altai**

Republic: Katunskij Reserve, Katunskij Range, Talmen'e Lake, 15.VII.2000, O.Pisarenko (MW); **Kemerovo Province**, Kuznetzkij Alatau Mts., Barkhatnyj Range, 16.VI.2000, Krasnaya River, 20.VI.2002, Chemodan Mt., Kedrovij Creek, 11.IX.2004, Pokatnyj Creek, 12.IX.2004, O.Pisarenko (NS).

Distribution. Mountain regions of Europe, from Scandinavia to Spain, North America (Canada and northern states of U.S.A.), Asia (Japan and India). Rare throughout its range. In Russia *G. anomala* was reported only from Caucasus until recently (records from Sakhalin Island were based on erroneously identified specimens, see the discussion under *G. hartmanii*); in 1990-2000 was also found in Altai Mts. and Kuznetzkij Alatau (O.Yu.Pisarenko), Bashkortostan (V.I.Zolotov), and Kola Peninsula (O.A.Belkina, I.V.Blinova). In the Caucasus it grows in the forest belt (beech, fir or pine forests) and just above tree-line (*Rhododendron* stands). In the Altai and Kuznetzkij Alatau Mts. it is found on boulders at high-grass subalpine meadows and on rock outcrops, in Bashkortostan in pine forests, and in Murmansk Province in birch forest, on open slope and on rock in a stream. It occurs both on acidic and basic rocks.

Differentiation. The main diagnostic characters of *Grimmia anomala* are the striolate lamina due to well-developed longitudinal cuticular ridges that resemble papillae when view in transverse section, and also the usually present yellowish multicellular gemmae at apices of upper leaves. The gemmae of *G. anomala* are similar to those of *G. hartmanii*, and the former species was sometimes treated as a variety of the latter; however, both species have stable differences discussed under *G. hartmanii*.

4. ***Grimmia caespiticia*** (Brid.) Jur., Laubm.-Fl. Oesterr.-Ung.: 172. 1882. — *Campylopus caespiticius* Brid., Muscol. Recent. Suppl. 4: 77. 1818 ["1819"]. Figs. 7, 8.

Plants in small, dense, fragile tufts, glaucous-green or dark green to blackish, not hoary. Stems erect, 0.5-1.5 cm long, with central strand. Leaves erect, with incurved tips, appressed when dry, erect-spreading when moist, 1.0-1.9×0.4-0.5 mm, from oblong base gradually tapering into lanceolate acumen, cucullate at apex, sharply keeled distally, with deep longitudinal plicae formed of several rows of more thick-walled narrow and longer cells; margins plane in proximal part, incurved in distal part; costa differentiated, strongly prominent dorsally, semi-circular or angular in cross section,

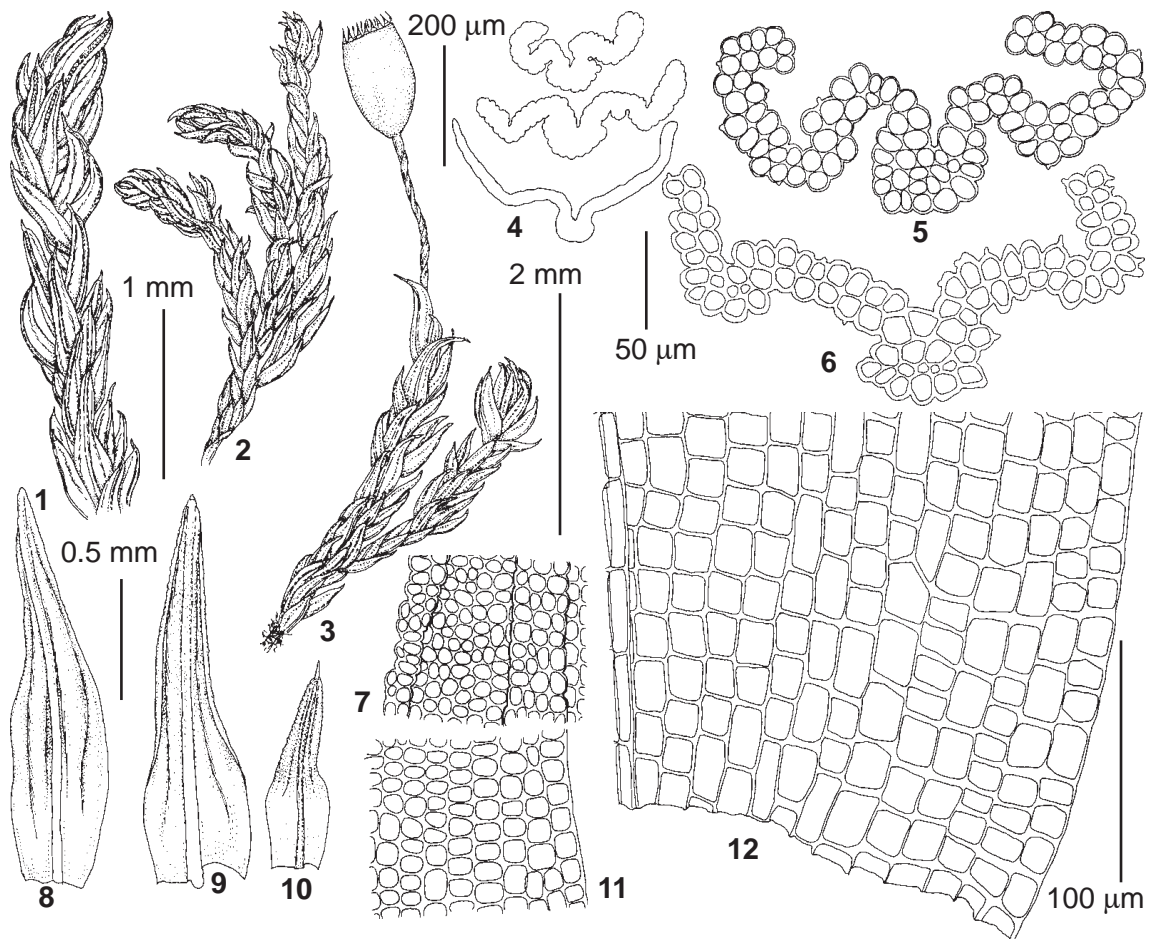


Fig. 7. *Grimmia caespiticia* (Brid.) Jur. (from Altai Republic, 11.VII.2000 O.Pisarenko): 1-3 – habit; 4-6 – leaf transverse sections; 7 – upper leaf cells; 8-10 – leaves; 11 – median leaf cells; 12 – basal leaf cells. Scale bars: 2 mm for 2-3; 1 mm for 1; 0.5 mm for 8-10; 50 µm for 5-6; 100 µm for 7, 10-12; 200 µm for 4.

with 2 ventral epidermal cells; hyaline hair-points usually short, to 0.5 mm long in upper leaves, almost smooth, mostly ca. 0.1 mm long or absent; lamina mostly bistratose in distal 2/3, partially 1- or 3-stratose, upper laminal cells isodiametric, 8-11 µm, rounded-quadrate, with evenly thickened walls, strongly bulging and with scattered papillae, median laminal cells short rectangular, 10-25×8-10 µm, walls not sinuose, basal juxtacostal cells short rectangular and quadrate, 10-35×10-15 µm, not porose or sinuose, basal marginal cells similar in shape and size, with thin longitudinal and thick transverse walls. Dioicous, sporophytes frequent. Androecia terminal. Setae 2-2.5 mm, straight. Capsules exserted, ovoid-cylindric, 1-1.5 mm long, smooth, chestnut. Exothecial cells thick-walled, stomata at urn base present. Operculum low conic, with short oblique beak or more rarely mamillate. Annulus of Schistidium-type. Peristome teeth entire or slightly cleft distally, chestnut, of the same color that the urn. Spores 10-14 µm. Calyptrae cucullate.

SPECIMENS EXAMINED: **CAUCASUS: Kabardino-Balkaria**, Elbrus Mt. surroundings, Adyl-Su River, Dzhankaut glacier, X.1994, #31, *I.Pospelov* (MW); **North Ossetia**, in alpe Zomorashch pr. Rex, ad fl.Terek, #22, *A.H. & V.F.Brotherus* (H-SOL); **Karachaev-Cherkessia**, Teberda Reserve, Alibek Gorge, 3.X.1989, *Onipchenko* (MHA); Mussa-Achitara Mt., 6.VIII.1986, *Ignatova* (MHA); Chuchkhur-Buulgen pass, 30.VII.1998, #z-39, *A.Volkov & S.Zenyakin* (MW); Northern Klukhor, 11.IX.1994, #200/94, *Onipchenko* (MW); Klukhorskoe Lake, 14.IX.1954, *I.Patrabolova* (LE); Gitche-Murudzhu, 9.IX.1994, #183/94, *Onipchenko* (MW); Ullu-Muridzhu, 8.VIII.1986, *Ignatova* (MW); M.Khati para, 19.VIII.1995, #113/95, *Onipchenko* (MW); Malaya Khati para Gorge, 3.VIII.1986, *Ignatova* (MHA); **Krasnodar Territory**, Uruschten River basin, Alous Mt., 12.VIII.1994, 17.VII.2002, *T.Akatova* (CSR, MHA); Dzhuga Mt., 5.VIII.1988, *T.Akatova* (CSR, MHA); Mzymta River basin, Aishkho Ridge, 5.VII.1951, *V.Alper* (CSR, MHA); **Adygeya**, Belaya River basin, Kut Mt., 21.VII.1996, *T.Akatova* (CSR); **SIBERIA: Altai Republic**, Katunskij Reserve, 11.VII.2000, *O.Pisarenko* (MW); **Krasnoyarsk Territory**, Western Sayan Mts., Karasu [Kara-Sug] River upper course, 6.VII.1968, *L.V.Bardunov* (IRK, MHA); **Khakassia**, Ordzhonikidzenskij Distr., Zolotogorskij settlement, 15.VII.1970, *A.Vasiljev* (IRK).



Fig. 8. Distribution of *Grimmia caespiticia* (Brid.) Jur. (circles) and *Grimmia capillata* De Not. (star) in Russia.

Distribution. *Grimmia caespiticia* is distributed in the mountains of Central and Southern Europe, Turkey, western coastal areas of North America; in Russia it is known from several localities in Caucasus and mountains of southern Siberia (Altai and Western Sayan Mts.). It grows above tree line, on exposed acidic and neutral rocks.

Grimmia caespiticia was erroneously reported from Urals and Arctic Siberia (Savicz-Lyubitzkaya, Smirnova, 1970), Russian European Arctic and Eastern Siberia (Ignatov & Afonina, 1992). Specimens cited by Ignatov & Cao (1994) from Altai Mts. belong to *Coscinodon cribrosus*, but *G. caespiticia* was collected in Altai later (O. Pisarenko, MW).

Differentiation. *Grimmia caespiticia* is similar to *G. alpestris* in gametophyte characters, sharing distally bistratose lamina, incurved margins, and strongly bulging laminal cells. However, the leaves of *G. alpestris* are less deeply plicate, lacking narrow thick-walled cells at the most deep part of the plicae, the upper laminal cells never have papillae, and the urn lacks stomata (the latter two characters are the most reliable for differentiation). Sterile specimens could be certainly recognized only by presence or absence of papillae of distal laminal cells. Sterile plants of *G. caespiticia* also can be confused with sterile *Coscinodon cribrosus*, another species with deeply

plicate leaves; but distal laminal cells of *Coscinodon cribrosus* are never bulging or papillose, and hyaline hair-points of upper and perichaetial leaves are much longer and flattened basally, whereas in *G. caespiticia* hair points are shorter than 0.5 mm and terete throughout.

5. *Grimmia capillata* De Not., Mem. Reale Accad. Sci. Torino 39: 248. 1836. — *Grimmia mesopotamica* Schiffn., Ann. K. K. Naturhist. Hofmus. 27: 488. 1913. Figs. 9, 8.

Plants in dense, easily separating tufts, dark-green above, brownish in lower part, not very hoary. Stems erect, to 1 cm long, with evenly arranged leaves. Leaves appressed to imbricate when dry, erect-spreading when moist, sometimes 3-ranked, 0.9-1.2×0.4-0.5 mm, ovate to ovate-lanceolate, concave, keeled in distal part, not plicate; margins plane to slightly recurved distally, recurved on both sides proximally; costa clearly differentiated, thin, widened in distal part of leaf, prominent dorsally, semi-circular in cross section, 2 cells wide ventrally, percurrent; hyaline hair-points short or absent in lower leaves and leaves of sterile shoots, rather long in perichaetial leaves; lamina unistratose throughout, upper and median cells rounded-quadrate to short rectangular, 7-22×9-13 μm, with not or slightly sinuose walls, basal juxtacostal cells elongate rectangular, basal marginal cells shorter, rectangular, with thin longitudinal and thick transverse walls. Autoicous, usually with sporophytes. Perichaetial leaves much longer than vegetative leaves, 2-2.5×0.4-0.5 mm, hyaline hair-points to 1 mm long, denticulate,

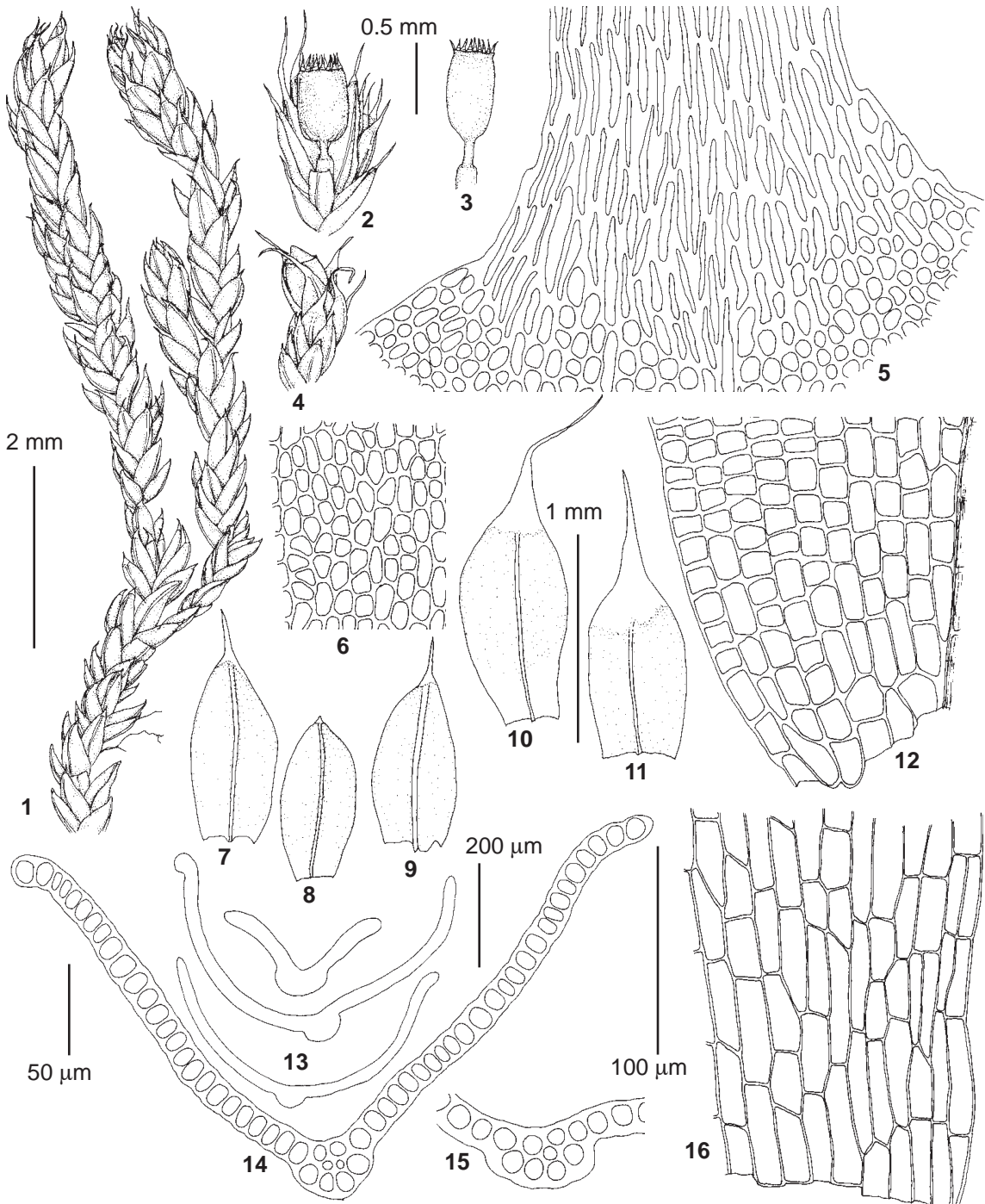
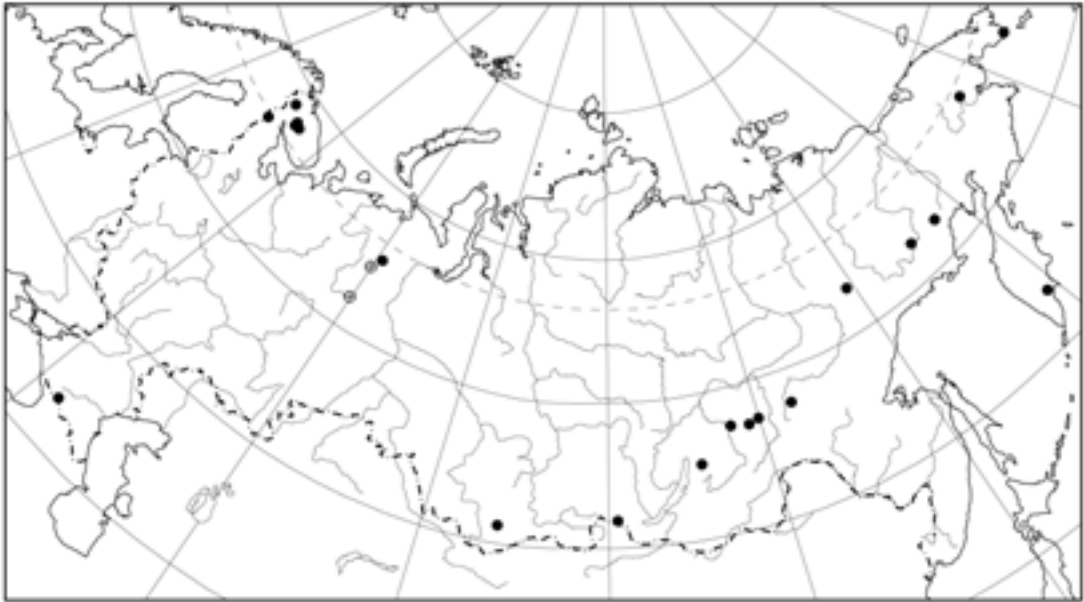


Fig. 9. *Grimmia capillata* De Not. (from Altai Republic, 23.VII.1966, L.V.Bardunov): 1 – habit; 2-4 – capsules; 5 – base of hair-point and upper leaf cells; 6 – median leaf cells; 7-9 – leaves; 10-11 – perichaetial leaves; 12 – basal cells of vegetative leaf; 13-15 – leaf transverse sections; 16 – basal cells of perichaetial leaf. Scale bars: 2 mm for 1; 1 mm for 2-4; 0.5 mm for 7-11; 50 μm for 14-15; 100 μm for 5, 6, 12, 16; 200 μm for 13.

widened and flattened at base, usually decurrent. Setae 0.3-0.5 mm, straight, centrally attached. Capsules immersed to emergent, ca. 1 mm long, symmetric, short cylindric, slightly sulcate. Oper-

culum low conic, mamillate. Annulus of elongata-type. Peristome present, peristome teeth perforated and cleft, densely and highly papillose. Spores 11-14 μm. Calyptrae mitrate.



SPECIMENS EXAMINED: **SIBERIA: Altai Republic**, Chagan-Uzun River, 23.VII.1966, *L.V. Bardunov* (IRK).

Distribution. *Grimmia capillata* is known from southern part of Europe and in North Africa, Middle East, Iraq, and Turkmenistan. In Russia it was found only once by *L.V. Bardunov* in south-eastern Altai Mts., in deserty steppe of Chuya River valley, on loamy soil among rock outcrops (this species was reported by *Bardunov* (1974) as *Schistidium plagiopodium* (Hedw.) *Loeske*).

Differentiation. *Grimmia capillata* is most close to *G. crinita* (species still not found in Russia) and is sometimes treated as its variety; the character differentiating *G. crinita* from *G. capillata* is sigmoid, excentrically attached setae (vs. straight, centrally attached in *G. capillata*). *Grimmia plagiopodia*, one more species with immersed peristomate capsules and unistratose leaf laminae differs from *G. capillata* in sigmoid setae, ventricose capsules and shorter and non-decurrent hair-points in perichaetial leaves.

6. *Grimmia donniana* Sm., *Engl. Bot.* 18: 1259. 1804. Figs. 10, 11.

Plants in dense tufts or cushions, yellowish green above, brownish or blackish below, usually very hoary. Stems erect, 1-1.5 cm long, with central strand. Leaves flexuose and loosely appressed when dry, erect and patent when moist, 1.3-2.1×0.3-0.6 mm, from oblong base gradually tapering into

lanceolate acumen, widely keeled distally, blades forming 35-100° angle in distal part of leaf, not plicate; margins plane, never recurved; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points usually 0.5-1.0 mm long, in lower leaves shorter, in upper and perichaetial leaves longer, up to 1.5-2.0 mm, terete, in perichaetial leaves slightly widened and flattened basally, slightly denticulate to almost smooth, flexuose when dry; lamina unistratose near costa, bistratose at margins and with bistratose strips in distal 2/3 of leaf, upper and median laminal cells short rectangular mixed with subquadrate, gradually elongated to the leaf base, 10-20×9-11 μm, with moderately thickened sinuose walls, not bulging, basal juxtacostal cells elongate rectangular, 30-70×9-12 μm, with moderately thickened, not or slightly porose walls, basal marginal cells similar in shape and size, pellucid, uniformly thin-walled. Autoicous, androecia axillary or terminal, sporophytes usually present. Perichaetial leaves moderately larger than vegetative leaves, to 2.5×0.8 mm, with longer hair-points. Setae 1.5-2.5[3.0] mm, pale yellowish, straight. Capsules emergent to exerted, ovoid, 1.0-1.2 mm long, stramineous, exothecial cells thin-walled, stomata at urn base present. Operculum low conic, mamillate. Annulus of elongata-type. Peristome teeth orange, contrasting in color with the urn, entire or weakly perforated distally. Spores 9-11 μm. Calyptrae mitrate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA: Murmansk Province**, Khibiny, 1981, *L. Volkova* (LE); Lapponia Imandrae, in monte Kivakkatunturi, 7.VIII.1883,

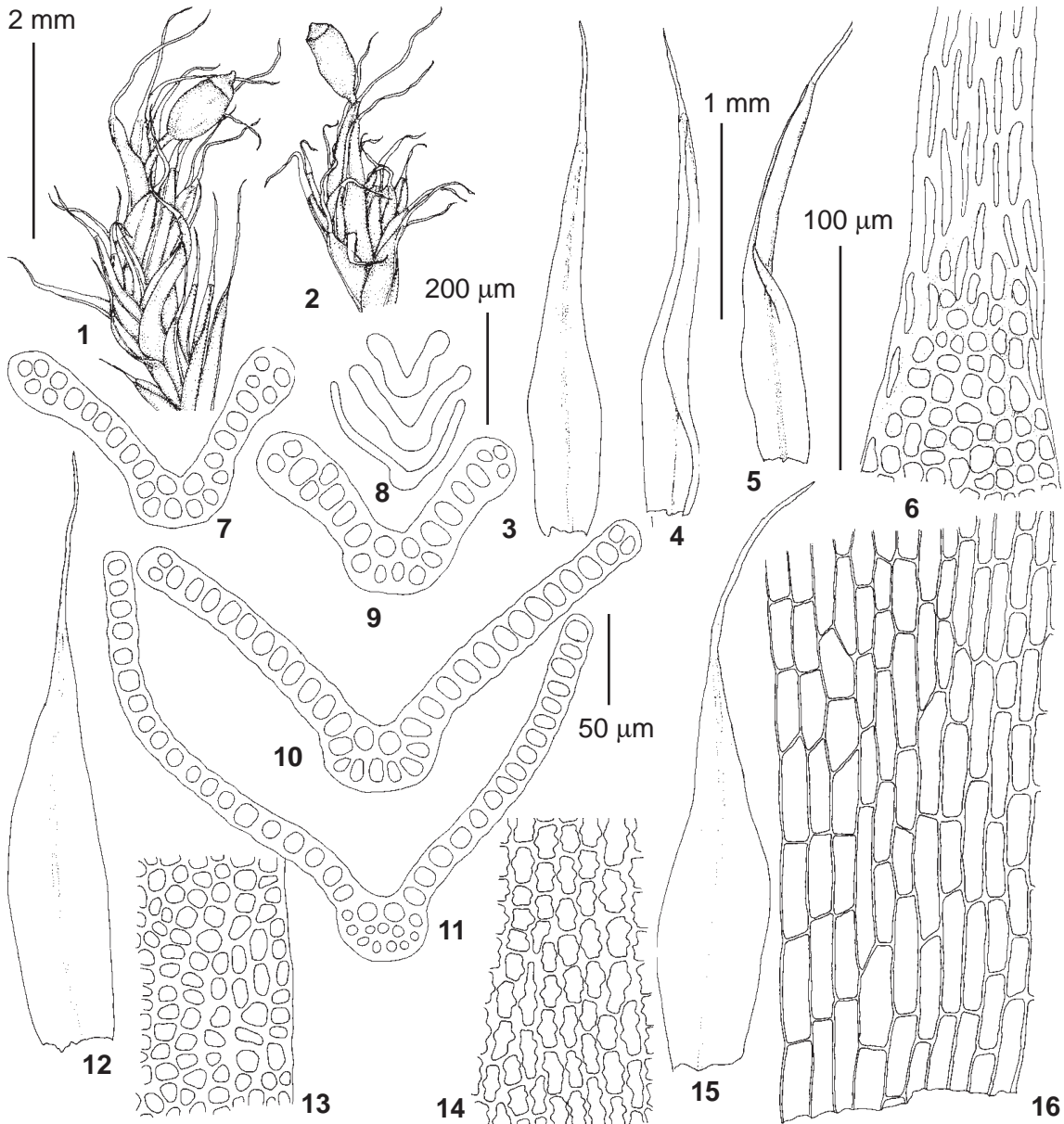


Fig. 11. *Grimmia donniana* Sm. (from Murmansk Province, 30.VIII.2001, E.Ignatova): 1-2 – habit; 3-5 – leaves; 6 – base of hair-point and upper leaf cells; 7-11 – leaf transverse sections; 12, 15 – perichatial leaves; 13 – upper leaf cells; 14 – median leaf cells; 16 – basal leaf cells. Scale bars: 2 mm for 1-2; 1 mm for 3-5, 12, 15; 50 µm for 7, 9-11; 100 µm for 6, 13-14, 16; 200 µm for 8.

#381, *V.F.Brotherus* (LE); Khibiny Mts., Kunjok River, Pereval'nye Lakes, 2.IX.2001, *Ignatova* (MW); Takhtartumchorr Mt., Molibdenovyy Cirque, 4.IX.2001, *Ignatova* (MW), 2.IX.1994, #123, 128, *A.Yu.Likhachev* (KPABG, MHA); Khibiny, Lovchorr, Botanikov Gorge, 5.VIII.1948, #1992a, *R.N.Shlyakov* (LE); Khibiny Mts., Ajkuajvenchjok Creek, 30.VIII.2001, *Ignatova* (MW); Lapponia Imandrae, in alpe Chibina, VII.1885, *V.F.Brotherus* (LE); Vudyavrchorr Mt., Botanicheskij Cirque, 31.VII.1998, *Ignatov* (MHA), 31.VIII.2001, *Ignatova* (MW); Khibiny Mts., Vudyavrchorr Mt., 26.VIII.2001, *Ignatova* (MW),

17.VII.1947, #44, #66, *R.N.Shlyakov* (LE), 17.IX.1946, #141, *V.B.Kuvaev* (MW); Khibiny Mts., between Bolshoj & Malyy Vudjavr Lakes, 6.IX.2001, *Ignatova* (MW); Khibiny, Kukisvumchorr, 16.VII.1948, #1809, *R.N.Shlyakov* (LE), 4-6.IX.2001, *Ignatova* (MW); Khibiny Mts., Petrelius Valley, 27.VIII.1932, #2/9, *A.Korovin* & *A.Fomina* (KPABG); Yukspor, 13.VII.1948, #1757, *R.N.Shlyakov* (LE); Yuksporlak pass, 30.VI.1948, #1608, *R.N.Shlyakov* (LE); Goltzovaya River, 29.VII.1988, #281, *T.Dudoreva* (KPABG); Lovozerskie Mts., Elmara-Jok Pass, 24.VIII.1982, #83/2, *O.Belkina* (KPABG); Karnasurt-Pyalkinchorr Pass,

30.VIII.1982, #127/5, *O.Belkina* & *A.Likhachev* (KPABG); Raslak Cirque, 26.VIII.1982, #109/3, *O.Belkina* & *A.Likhachev* (KPABG); Lavna-Tundra Mts., Lavnatundra Mt. 2.VII.1987, #101-2-87, *O.Belkina* (KPABG); Yumos Creek, 3.VIII.1987, #213-87, *O.Belkina* (KPABG); Karelia, Kivakatunturi [Paanajarvi], VIII.1883, *V.F.Brotherus* (H); **CAUCASUS: Kabardino-Balkaria**, Elbrus Peak, 28.VII.2004, *Ignatov & al.* (MHA); **URALS: Komi Republic**, Kozhviniskij Distr., Lemva River, 21.IV.1956, *I.D.Kil'dyshevskij* (LE); Nyadokota River, 21.IV.1956, *I.D.Kil'dyshevskij* (LE); **SIBERIA: Altai Republic**, Kurkure Range, Kurkure-bazhi Peak, 13.VII.1976, *N.Zolotukhin* (MHA); **Buryatia**, South Baikal area, Tunkinskaya valley, Mondy village, 20.VI.1986, *L.V.Bardunov* (MHA); Djerginskij Reserve, 12.VII.2002, #37, *D.Tubanova* (UUH); **Chita Province**, Udokan Range, 9.VIII.1987 & 27.VII.1989, V.R.Filin (MW); **Irkutsk Province**, Vitim Reserve, Oron Lake, Labaznyj Creek, 4.VIII.1984, *L.V.Bardunov* (IRK, MW); **Yakutia**, Neryungri Distr., Khatynga River basin, Urga Creek, 18.VIII.1995, *E.I.Ivanova* (SASY, MW); Neryungri Distr., Udokan Range, 7.VIII.2000, *L.V.Kuznetzova* (SASY, MW); Tomponskij Distr., Suntar-Khayata, 13.VII.2003, *Zolotov & Ivanova* (MHA); **FAR EAST: Chukotka**, Provideniya Bay, 3.VIII.2001, 23.VIII.2001, *O.M.Afonina* (LE); Pekulnej Mt. Range, Televeem-First Creek, 22.VII.1979, *O.M.Afonina* (LE); **Magadan Province**, Ten'kinkij Distr., Sibit-Tyaeliakh, on rocks, 13.VIII.1976, *L.Blagodatskikh* (LE); Omsukchan, 15.VI.1959, *S.Filatov* (LE); **Kamchatka**, Elizovo Distr., Koryakskij Volkano, 26.VII.1985, *Onipchenko* (MHA).

Distribution. *Grimmia donniana* is known in Europe from Iceland and Great Britain to France and Italy, also in the Georgian Caucasus, in Asia in China and Japan, in North and South America. In Russia it is rather common in Kola Peninsula, especially in the Khibiny Mts. (the most frequent species of the genus in that area). It is sporadically found in other regions of the country: in Chukotka, Kamchatka, Magadan Province, central and southern Yakutia, Transbaikalia, a few collections from Altai Mts., the northernmost Urals, and only one locality in the Caucasus, in Kabardino-Balkaria (nival belt of Elbrus Mt.). It usually grows above the tree-line, in the alpine and nival belts up to 3800 m alt., mostly on rather dry acidic or neutral rocks.

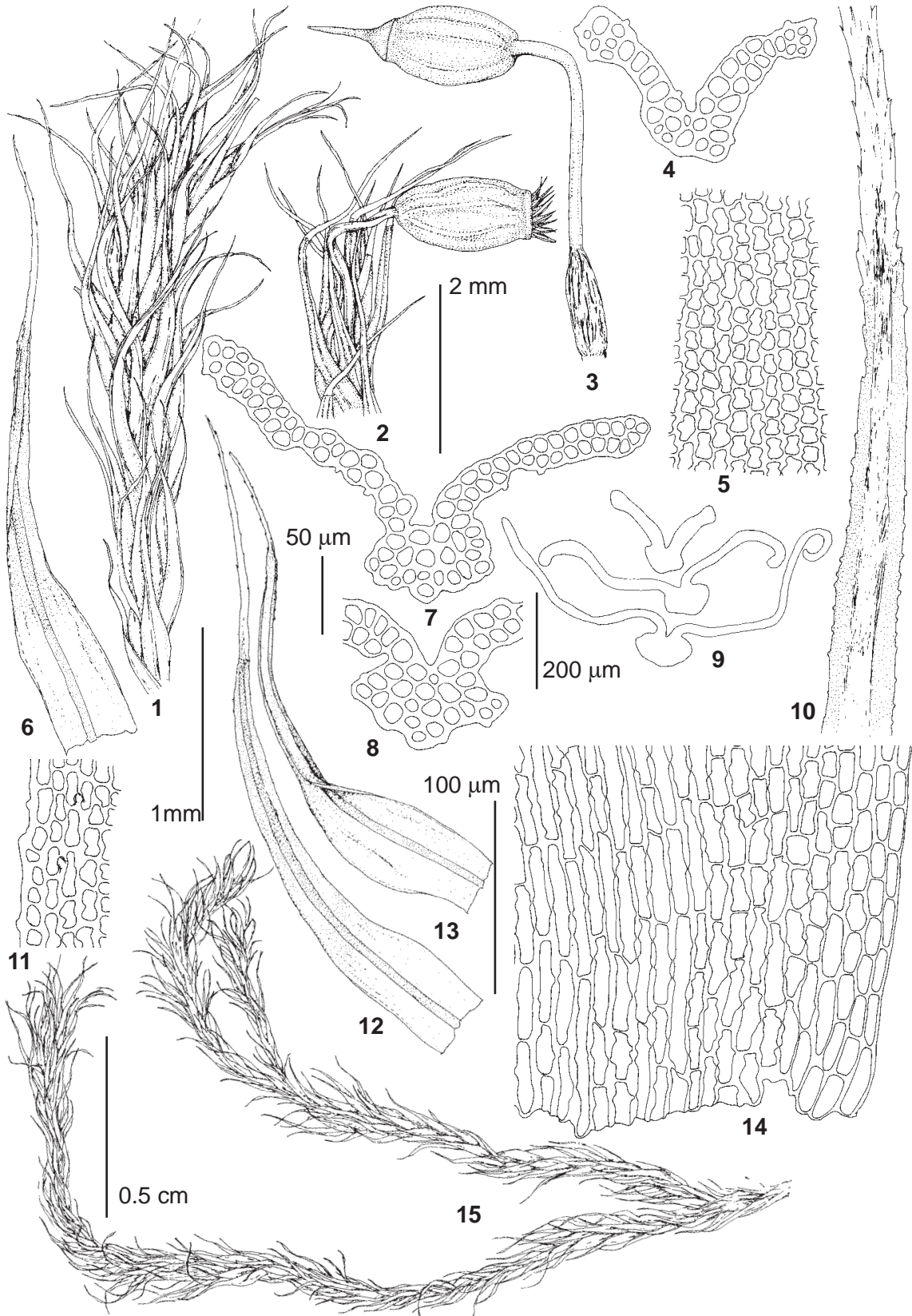
Differentiation. *Grimmia donniana* can usually be recognized by small greish hoary cushions (as exception, muticous phenotypes occur), with numerous capsules, mamillate opercula, narrow lanceolate, widely keeled leaves with always plane margins, and uniformly thin-walled basal marginal cells (in vegetative leaves). The latter character is rather rare in Russian *Gimmia* species, known also in *G. incurva*, *G. fuscolutea* and *G. elongata*, that are quite unlike in general appearance, and in

G. triformis. The differentiation of *G. donniana* from *G. reflexidens* and *G. triformis* is discussed under these species.

7. *Grimmia elatior* Bruch ex Bals.-Criv. et De Not., Mem. Reale Accad. Sci. Torino 40: 340. 1838. Figs. 12, 13.

Plants in large, loose, easily separating tufts or patches, dark green, yellowish green, or brownish green, moderately hoary. Stems erect or ascending, 2-7 cm long. Leaves erect or slightly flexuose, loosely appressed when dry, erect-spreading when moist, (2.5-)3-4(-5)×(0.5-)0.6-0.7(-0.9) mm, from oblong-ovate base gradually tapering into long acumen, longly acuminate, narrow at apical part, sharply keeled distally; margins plane to weakly recurved distally, more strongly recurved to revolute on one or both sides at proximal 1/2 of leaf; costa differentiated, strongly prominent dorsally, irregularly angled in cross section, 3-5-stratose, with 2 ventral epidermal cells; hyaline hair-points rather long in upper leaves, terete, moderately to weakly denticulate; lamina (1-)2-3-stratose in distal 2/3 of leaf, 3-5-stratose at margins; upper laminal cells rounded-quadrate to short rectangular, with moderately incrassate sinuose walls, 9-10 μm wide, opaque, with large low papillae, often moderately to strongly bulging; median laminal cells short rectangular, sinuose, basal juxtacostal cells elongate rectangular, with moderately incrassate, porose walls; basal marginal cells shorter, rectangular, pellucid, with transverse walls more thick than longitudinal walls. Dioicous, androecia terminal, sporophytes sporadic. Setae to 3 mm long, arcuate when moist. Capsules exerted, inclined to horizontal, ovoid, 0.7-2.0 mm long, ribbed. Operculum conic, with long erect beak. Annulus of affinis-type. Peristome teeth red, perforated and cleft. Spores 10-12 μm. Calyptrae mitrate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA: Murmansk Province**, Khibiny Mts., Vudjavrchorr Mt., Yuzhnoe Skvoznoe Gorge, 30.VIII.1947, #RS-1473-47, *R.N.Shlyakov* (KPABG); Vudjavrchorr Mt., 30.VIII.1947, #1475, *R.N.Shlyakov* (LE); Khibiny Mts., Yukspor Mt., 30.VIII.1948, #1938, *R.N.Shlyakov* (LE); Lapponia or., Kantalaks [Kandalaksha], VIII.1872, *V.F.Brotherus* (H); Salla, Kutsa, 1.VII.1939, *A.Auer* (H); **Karelia**, Soanlahti, Korpikallio, 1.VIII.1933, *M.J.Kotilainen* (H, LE); Soanlahti, Laaja, Vehkavaara, 14.XI.1936, *A.J.Huuskonen* (KPABG); Ruskeala, 23.VII.1936, *A.J.Huuskonen* (H); Suistamo, 20.V.1936, *A.J.Huuskonen* (H); Suisaari, 7.VII.1943, *M.J.Kotilainen* (H); Kurkijoki, 13.VI.1936, *V.Rasanen & T.M.Laurila* (H); Siikajarvi [Lahdenpohja], 11.VIII.1938, *A.Pankakoski* (H); Impilahti, Makisalo, 14.VII.1927, *A.E.Koskimies* (H); Pitkaranta Distr., Impilahti, 25-28.VI.1997, #754, 889, *S.Huttunen & H.Wahlberg* (H); Sortavala, 1.VII.1977, #1292, *S.Huttunen & H.Wahlberg* (H); **Leningrad Province**, Hogland, 23.VI.1867, *M.Brenner* (H); Pyhajarvi [near Priozersk], 30.VI.1904, *H.Lindberg* (H); **Pskov Province**, Porchov, 2.VIII.1917, *N.Malta* (H); **CAUCASUS: Dagestan**, Awarsk Distr., prope pag. Gimri, 24.V.1901, #12896, *Th.Alexeenko* (H-Br, LE); **North Ossetia**, North Ossetian



Reserve, VIII.1976, 19-21.VII.1977, 24-25.VII.1979, 27.VII.1980, *L.I.Abramova* (MW); pr. fl. Ardon, #245, *V.F.Brotherus* (H-SOL); **Kabardino-Balkaria**, Sovetskij Distr., Bezengi Gorge, 9.VIII.1988, #42, *Yu.L.Menitzkij & al.* (MHA); Elbrus area, Adyl-Su Creek, Dzhankuat glacier, X.1994, #50, *I.Pospelov* (MW); Adyl-Su Creek, 29.VII.2004, *Ignatov & al.* (MHA); Shkhelda Creek, 29.VII.2004, *Ignatov & al.* (MHA); Baksan River at Adyl-Su Creek mouth, 30.VII.2004, *Ignatov & al.* (MHA); Cherek Bezengijskij River near Dumala Creek mouth, 31.VII.2004, *Ignatov & al.* (MHA); **Karachaevo-Cherkessia**, Aksaut Gorge, 13.VIII.1979, #10/14, *E.E.Gogina* (MHA); Teberda Reserve, Semen-Bash Mt., 6.VII.1976, 17.VIII.1987, *Onipchenko* (MHA); Alibek Gorge, 16.VIII.1986, *Ignatova* (MHA); Kel'bashi Mt., 12.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE); Northern Klukhor Gorge, 11.IX.1994, #200/94, 3.IX.1998, #34/98 *Onipchenko* (MW); Klukhori, 1945, *I.Tumadzhano* (LE); Shumka Gorge, 18.VII.1994, #88/94, 31.VII.1996, #200/96, *Onipchenko* (MW), 14.VIII.1986, *Ignatova* (MHA); Shumka waterfall, 14.VIII.1986, *Ignatova* (MHA); Gitche-Murudzhu Gorge, 2.VIII.1998, #z-46, *A.Volkov & S.Zenyakin* (MW); Murudzhu Gorge, 30.VI.1998, #4/98, *Onipchenko* (MW); Ullu-Murudzhu Gorge, 7-9.VIII.1986, *Ignatova* (MHA), 13.IX.1955, *I.Patrabolova* (LE); Baduk Gorge, 15.VIII.1986, *Ignatova* (MHA), 17.VIII.1993, #61/93, #65/93, *Onipchenko* (MW); Baduk Lakes, 26.VII.1955, *V.V.Makarov* (MHA); Goraly-Kol Gorge, 12-13.VIII.1986, *Ignatova* (MHA); Nazly-Kol Gorge, 10-11.VIII.1986, *Ignatova* (MHA); Bolshaja Khati para-Khadzhibej Pass, 17.VII.1994, #83/94, *Onipchenko* (MW); Bolshaja Khati para Gorge, 16.VII.1994, #78/94, *Onipchenko* (MW); Teberda River, 1.VIII.1986, *Ignatova* (MHA); Mukhu Gorge, 12.VII.1982, *E.L.Vaulina* (MHA); Kyshkadzher Gorge, 10.VII.1994, #38/94, *Onipchenko* (MW); Azgek Gorge, 18.VIII.1955, *V.V.Skripchinskij* (MHA); Bolshaya Laba River upper course, 4.VIII.1946, #25, *Petrovicheva* (LE, MW); **Stavropol Territory**, Pyatigorsk, Beshtau Mt., 29.V.1891 (LE); **Krasnodar Territory**, Kuban' Distr., Uspenskaya st., Novopokrovsk forestry, 3.VII.1926, *E.Shiffers & L.Sokolova* (LE); Sochi Distr., Khosta, 18.VIII.1935, *L.N.Vasil'eva* (LE); Urushten River basin, Alous Mt., 13-14.VIII.1994, *T.Akatova* (CSR, MHA); Malaya Laba River basin, Tryu-Yatyrgvarta Mts., 16.VII.1997, *T.Akatova* (CSR, MHA); Malaya Laba River basin, Basskany Ridge, 22.VII.1998, *T.Akatova* (MHA); Armovka Mt., 19.VI.2000, *T.Akatova* (CSR, MHA); **Adygeya**, Belaya River basin, Oshten Mt., 30.VII.1997, *T.Akatova* (CSR); **URALS: Komi Republic**, Pechora Reseve, 25.VIII.1935, *A.Leontjev* (LE); **Perm Province**, Basegi Reserve, Southern Basegi, 9.VI.1992, #97, *A.Bezgodov* (MW); Basegi Reserve, Middle Basegi, 21.VI.1985, #328, *A.Bezgodov* (MW); Vishera Reserve, Kuryksar Range, 23.VI.1995, #321, 357, 346, *A.Bezgodov & A.Selivanov* (MW); Olkhovochnyj Range, 16.VII.1994, #481, *A.Bezgodov* (MW); Olkhovka Creek, 26.VI.1994, #140, *A.Bezgodov* (MW); **Sverdlovsk Province**, Konzhakovskij Kamen Mt., 10.VII.1953, #5, *P.L.Gorchakovskij* (LE, MW); **Bashkortostan**, Baimak Distr., Irendyk Range, Mukasovo, Gadelsha waterfall, 17.VI.1989, #54, *A.I.Solomeshch* (MHA); Beloretzk Distr., Bretyak, 12.IX.1990, #13/14, *Ignatova* (MHA); **Chelyabinsk Province**, Zlatoust Distr., Urenga Range, Golaya Mt., 9.VII.1990, #199b, *A.A.Muldashev* (MHA); **SIBERIA: Altai Republic**, between Bortuldag & Kair Creeks, 25.VII.1908, *P.Krylov* (H-Br, LE); Shebalino, 6.VII.1909, *P.Kursky* (H-Br); Amoss, 27.VI.1909, *P.Kursky* (H-Br); ad pag. Sentelekskaja, 4.VII.1913, *N.Kusnezov* (H-Br); Ridderzk, VIII.1919, *Vereshchagin* (H-Br); Ak-Turu River, 17.VII.1966, *L.V.Bardunov* (IRK); Ust-Nezi Village, 22.VII.1953, *V.Melnichuk* (MHA); Tabozhok Peak, 1.VIII.1992, #31/5 & 30.VII.1992, 31/16, *Ignatov* (MHA); Tabozhok Creek, 1-4.VIII.1992, #31/17, #32/8, #33/11, 21.VII.1993, #36/363, *Ignatov* (MHA); Katanda, 20.VI.1966, *L.V.Bardunov* (IRK); Ak-Turu, 18.VII.1966, *L.V.Bardunov* (IRK); Tyuguryuk, 23.VI.1966, *L.V.Bardunov* (IRK); Bogoyash Creek in upper course, 27.VII.1993, #36/331, 36/341, 36/98, *Ignatov* (MHA); Malyj Yaloman, 30.VII.1991, #25/2, *Ignatov* (MHA); Karakem River Basin, Kobiguayuk Creek, 14-15.VI.1989, #0/469, #0/948, #0/729, *Ignatov* (MHA); Ayulyuyuzuk Creek, 16.VI.1989, #0/468, *Ignatov* (MHA); Chiket-Aman pass, 28.VII.1966, *L.V.Bardunov* (IRK); Seminskij Pass, 15.VI.1972, #176, *N.Alyanskaya & al.* (MHA); Seminskij pass, 15.VI.1966, *L.V.Bardunov* (IRK); Kurkure Range, Kayakkatuyarykskij Creek, 6.VI.1991, #4/11, #8/331, #8/324, #3/200, #3/46, #3/13, #7/106, #7/97, #7/102, #7/42, #8/82, #8/169, #8/170, #8/48, 28.VII.1991, #6/25, *Ignatov* (MHA); Kayak Lake, 30.VI.1991, #7/187, *Ignatov* (MHA); Teletzkoe Lake, Artyshu Creek, 8.IX.1987, *N.I.Zolotukhin* (MHA); Chulcha River, Nepristupnyj waterfall, 10.VII.1991, #9/104, *Ignatov* (MHA); Chinairu Creek (Aedigan Tributary), 8.VII.1993, #34/102, #34/139, #34/201, *Ignatov & Ignatova* (MHA); Shebalino Distr., Tamanel Peak, 6.VI.1993, #34/185, *Ignatov & Ignatova* (MHA); Kurkure Range, Altyntash Creek, 7.VI.1982, *N.Zolotukhin* (MHA); Kaira Creek near Kaira-bazhi Peak, 14.VII.1991, #13/37, *Ignatov* (MHA); Kyga River basin, Bayas Lake, 2.VII.1989, #0/467, *Ignatov* (MHA); Shebalino Distr., Askat village, #1066A, *V.A.Manakyan* (IBA); Teletzkoe Lake, Karagaj Creek, 10.VIII.1988, *N.I.Zolotukhin* (MHA); Chemal, 14.VI.1966, *L.V.Bardunov* (IRK); Chemal, 5.VIII.1991, #29/6, *Ignatov & Ignatova* (MHA); Ust-Sema, #B-65184, *T.S.Elias & al.* (NY); Teletzkoe Lake, Yailyu, #21/33, 1.VI.1989, *Ignatov* (MW); Teletzkoe Lake, Yurga, Azhi cape, 24.VII.1991, *N.I.Zolotukhin* (MHA); Kamga River basin, Srednij Shaltan Creek, 6.VI.1989, #0/905, *Ignatov* (MHA); **Krasnoyarsk Territory**, Taimyr, Taimyr Lake, Ledyanaya Bay, 11-17.VII.2004 & 12.VIII.2004, #G2, G4, G6-9, G12-15, G18, G20, *V.Fedosov* (MW); Putorana Plateau, Agatskij Kamen Mt., 7.VII.1968, #22, *V.Kuvaev* (MW); Putorana Plateau, Kapchuk Lake, 25.VII.1982, #96, *I.V.Czernyadjeva* (LE); Baikit Distr., Central Siberian Reserve, Stolbovaya, 27.VI.1992, #46, *S.Shcherbina* (MW); Kochumdek River, 6.VIII.1991, *S.Shcherbina* (MW); NW part of East Sayan Range, «Stolby» State Reserve, 26.V.1996, *T.N.Otnyukova* (KRF, MW); Western Sayan Mts., Malyj On River, 5.VII.1968, *L.V.Bardunov* (IRK); Minussinsk, VIII.1880, *N.Martianoff* (H-Br); Montes Sajjanensis, in monte Borus, VIII.1888, *Argunioff* (H-Br); **Tyva Republic**, Todginskaya Valley, west extremity of Kadysh Lake, 30.VIII.1999, *T.N.Otnyukova* (KRF, MW); **Irkutsk Province**, Kamar-Daban Mt. Range, Murino, 27.VII.1957, *L.V.Bardunov* (IRK); Vitimskij Reserve, Amalyk Creek, 9.VIII.1984, *L.V.Bardunov* (IRK); Vitimskij Reserve, Vitim River at Amalyk Creek mouth,

Fig. 12. *Grimmia elatior* Bruch ex Bals.-Criv et De Not. (1, 4-15 – from Perm Province, A.Bezgodov, #140; 2-3 – from North Ossetia, VIII.1976, *L.I.Abramova*): 1, 15 – habit; 2-3 – capsules; 4, 7-9 – leaf transverse sections; 5 – median leaf cells; 6, 12-13 – leaves; 10 – base of hair-point and upper leaf lamina; 11 – upper leaf cells; 14 – basal leaf cells. Scale bars: 0.5 cm for 15; 2 mm for 1-3; 1 mm for 6, 12-13; 50 µm for 4, 7-8; 100 µm for 5, 11, 14; 200 µm for 9, 10.

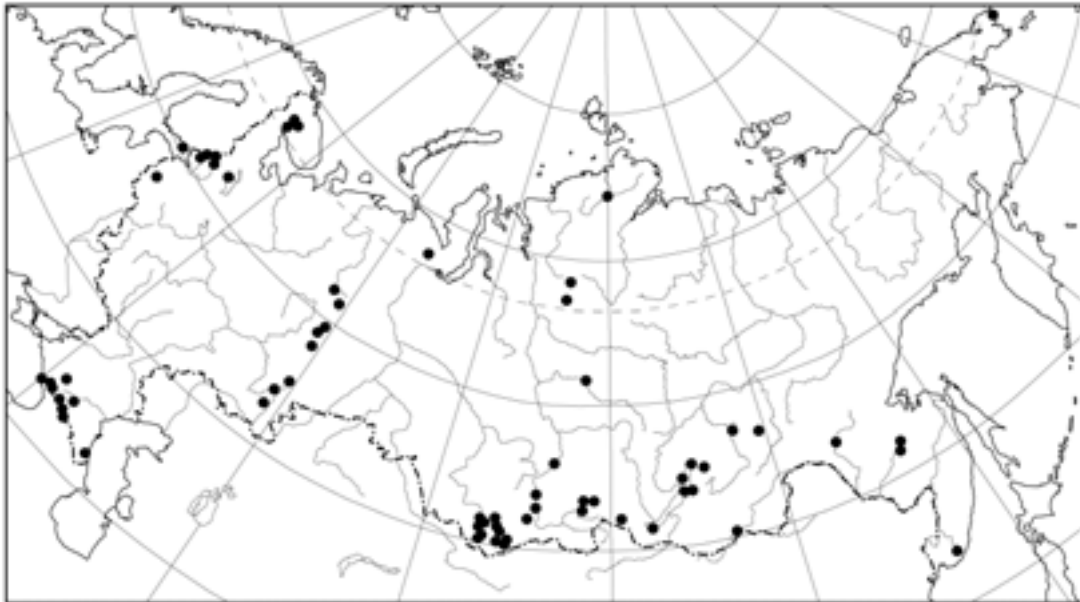


Fig. 13. Distribution of *Grimmia elatior* Bruch ex Bals.-Criv et De Not. in Russia

24.VI.1984, *L.V.Bardunov* (IRK); **Buryatia:** Eastern Sayan Mts., Kitoj River, 12.VIII.1960, *L.V.Bardunov* (IRK); Eastern Sayan Mts., Kadyr-Oruk pass, 19.VII.1961, *L.V.Bardunov* (IRK); Eastern Sayan Mts., Kara-Buren' River, 12.VII.1961, *L.V.Bardunov* (IRK); NE Baikal, Ushkanji islands, 27.VI.1956, *L.V.Bardunov* (IRK); NE Baikal, Bolshaya Cheremshanaya Creek middle course, 24.VII.1956, *L.V.Bardunov* (IRK); NW Baikal, Kovrizhka cape, 27.VIII.1957, *L.V.Bardunov* (IRK); NW Baikal, Bolsodej bay, 25.VIII.1967, *L.V.Bardunov* (IRK); NE Baikal, Turali cape, 26.VIII.1956, *L.V.Bardunov* (IRK); Dzherginskij Reserve, 22.VII.2000, #3, D.Tubanova (UUF); **Chita Province**, union of Ili Creek with Onon River, pr. Duldurga, *P.Michno* (LE); **FAR EAST: Khabarovsk Territory**, Verkhnebureinskij Distr., Tastakh Creek mouth, 7.VIII.1997, #97-1111, *Ignatov* (MHA); Bureinskij Reserve, Pravaya Bureya River, 27.VIII.1997, #97-1108, 97-1110, *Ignatov* (MHA); **Amurskaya Province**, Upper Zeya Plane, Zhurban village, 30.VI.1974, *S.K.Gambaryan* (MHA); **Primorskij Territory**, Chuguevka Distr., Oblachnaya Mt., 31.VII.1980, *V.Ya.Cherdantseva* (VLA); **Chukotka**, Lavrentij Bay, Krauze Cap, 29.VIII.1975, *O.M.Afonina* (LE).

Distribution. *Grimmia elatior* is widespread in Europe, Transcaucasia and Turkey, known from Central and Eastern Asia, North America, and also from Madagascar. In Russia it is more common in the Caucasus and Altai Mts., and not rare in South and Middle Urals, Kola Peninsula and Karelia. It is scattered in Taymyr, Putorana Plateau, Chukotka, Eastern Sayan Mts., Transbaikalia, Amurskaya Province and Khabarovsk Territory, and only one locality is known from the Primorskij Territory. It grows in a wide elevation range, from sea level to 3100 m alt., in the forest and alpine belts, mostly on siliceous rocks, either shaded or exposed.

Differentiation. *Grimmia elatior* is usually easy to recognize by its large size, leaves longer than 2.5 mm, lamina bistratose to 3-5-stratose at margins in the distal part of the leaf, upper laminal cells papillose, and costa strongly prominent, furrowed, and irregularly angled dorsally in cross section. The differentiation from *G. muehlenbeckii* and *G. jacutica* is discussed under these species.

9. *Grimmia elongata* Kaulf. in Sturm., *Deutschl. Fl. Abtheilung II, Cryptogamie* 4(13):24. 1812. Figs. 10, 14.

Plants in compact cushions, fragile, dark green or blackish green above, brownish or blackish below. Stems erect or ascending, 2-3 cm long, fasciculately branching, evenly foliated, with weak central strand. Leaves slightly flexuose or contorted, loosely appressed when dry, with appressed base and spreading acumen when moist, 1.2-1.6[2.0]×0.3-0.5 mm, lanceolate, sharply and narrowly keeled distally, blades forming <40° angle; margins plane in distal part of leaf, recurved on one or both sides in proximal part; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points absent to very short, not longer than 0.3 mm (usually less than 0.1 mm); lamina mostly unistratose at distal part, bistratose in 1-2 cell rows at margins; upper laminal cells oblate, subquadrate to short rectangular, 7-9 μm, thick-walled, moderately sinuose, with brownish cell walls, median laminal cells short rectangular, 10-18×8-10 μm, with strongly sinuose walls, basal

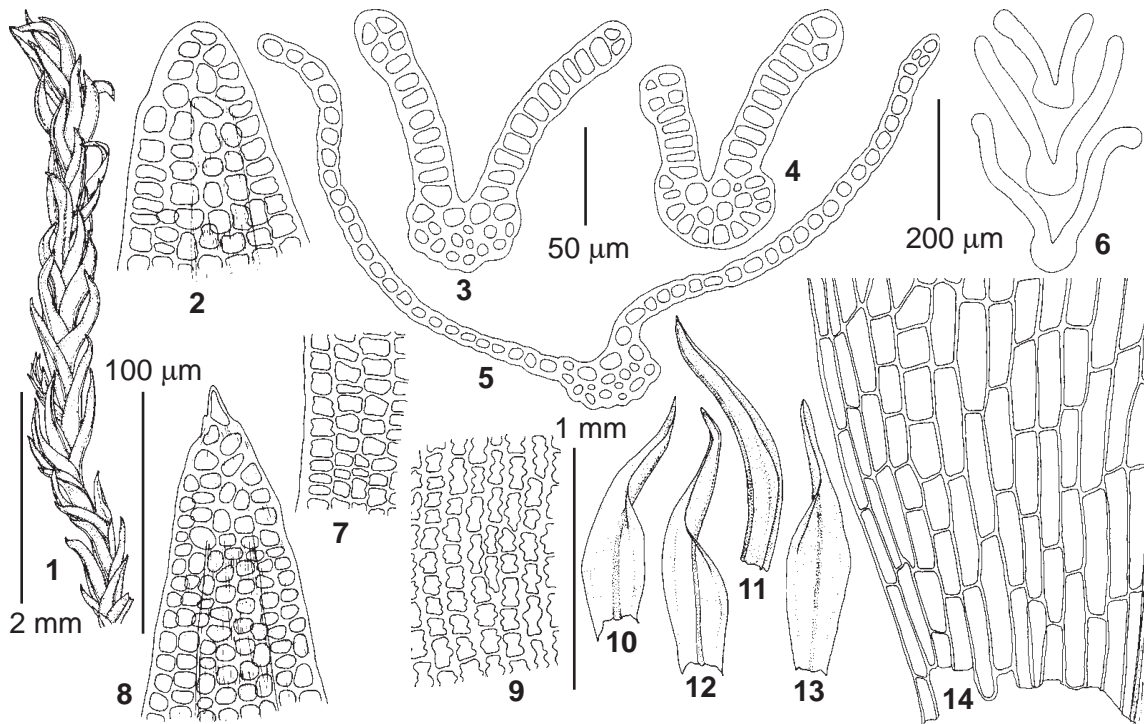


Fig. 14. *Grimmia elongata* Kaulf. (from Tyumen Province, V.B.Kuvaev, #508): 1 – habit; 2, 7-8 – upper leaf cells; 3-6 – leaf transverse sections; 9 – median leaf cells; 10-13 – leaves; 14 – basal leaf cells. Scale bars: 2 mm for 1; 1 mm for 10-13; 50 µm for 3-5; 100 µm for 2, 7-9, 14; 200 µm for 6.

juxtacostal cells elongate rectangular, 25-45×9-11 µm, with slightly thickened, not porose walls, basal marginal cells similar in shape and size or shorter, with uniformly thin walls. Dioicous, androecia terminal, sporophytes sporadic, but both specimens from Russia lacking capsules (one of them with androecia). [Perichaetial leaves similar to vegetative leaves, but with widened base. Setae 1.5-2.5 mm, yellowish, straight when wet. Capsules emergent to exerted, ovoid, 0.6-1.0 mm long, smooth; exothecial cells thin-walled, stomata at urn base present. Operculum conic, with short obtuse beak. Annulus of elongata-type. Peristome teeth entire. Spores 11-13 µm. Calyptrae mitrate, seldom cucullate].

SPECIMENS EXAMINED: SIBERIA: Tyumen Province, Beryezov Distr., Khulga River basin, #508, V.B.Kuvaev (LE, MW); Sosva, Porna-ja-Marja, 20.VII.1915, B.N.Gorodkov (H-Br, #1829009).

Distribution. *Grimmia elongata* is known in Europe from Scandinavia (but not found in Finland) and Great Britain to Spain and Italy, eastward to Romania and Poland, Africa (Lesotho and Uganda), Asia (India, China, and Japan), South and Central America; in Caucasus it was collected in Georgia. In Russia it is known only from two close localities, both in the eastern slope of Polar Urals. It grows at 500 m alt., above tree-line, on acidic rocks.

In the annotation to *Grimmia elongata* in Handbook of acrocarpous mosses of the USSR (Savicz-Lyubitzkaya, Smirnova, 1970) this species is characterized as rare montane plant in Carpatians, Urals, Siberia, and Middle Asia, and in the Check-list of mosses of the former USSR (Ignatov & Afonina, 1992) it is reported for European and Beringian Arctic, Caucasus, southern Siberia, and Far East. Most of these records are based on erroneously identified specimens (as seen from herbaria material). East Siberian records (Nyholm, 1998; Muñoz & Pando, 2000) are also based on wrongly identified specimen (in valle flum. Lena, Bulun, H.Nilsson-Ehle (H)), representing another genus, *Schistidium*.

Differentiation. Superficially *G. elongata* is most similar to alpine forms of *G. incurva* also growing in Urals; both species share uniformly thin-walled basal marginal cells, proximally recurved leaf margins, and very short hyaline hair-points. However, the leaves of *G. incurva* are longer, with length to width ratio 5-6:1 (3-4:1 in *G. elongata*), walls of distal laminal cells are not very sinuose and are not brownish-colored (as in *G. elongata*),

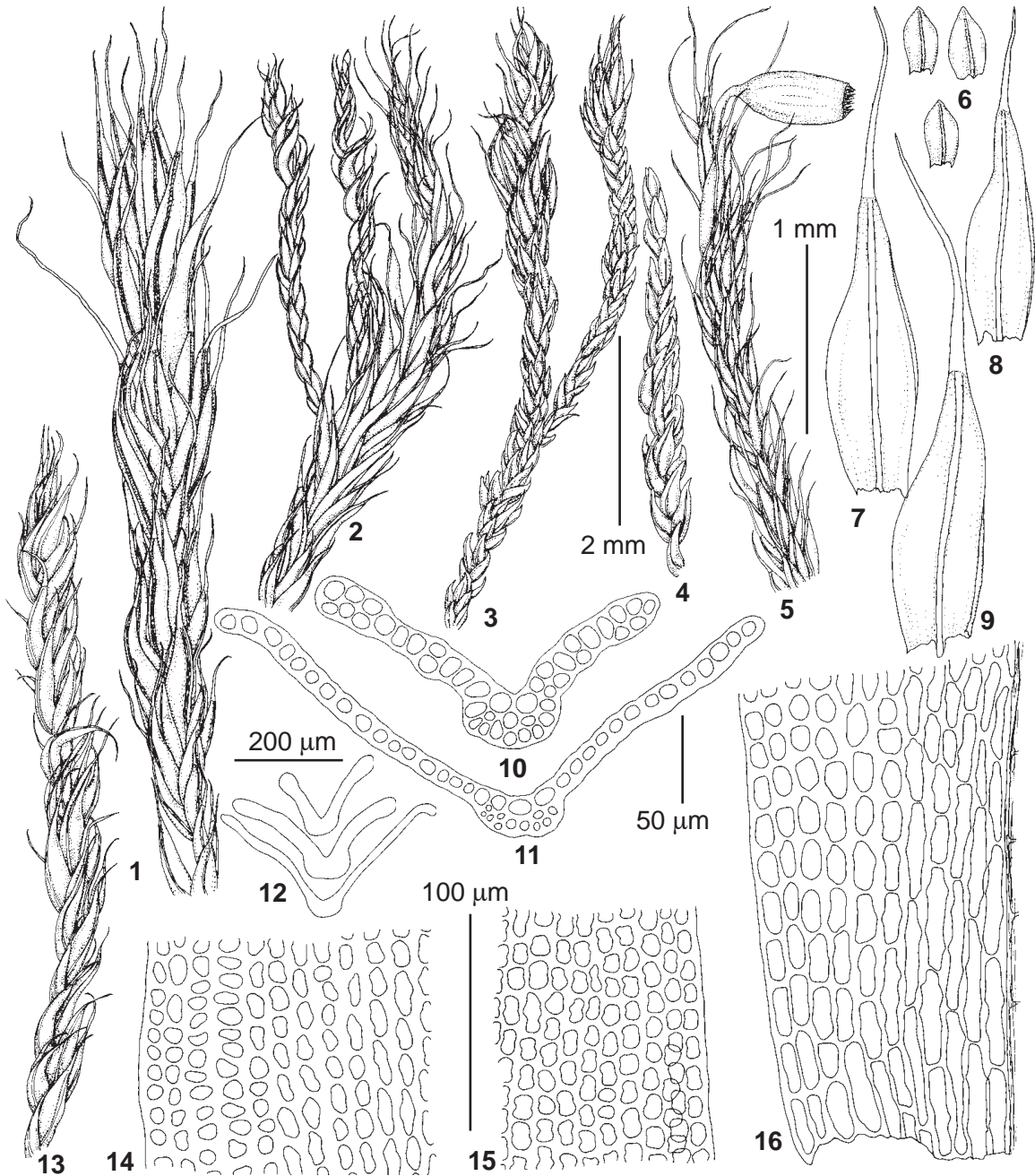


Fig. 15. *Grimmia funalis* (Schwaegr.) B.S.G. (1, 4, 15 - from Karachaevo-Cherkessia, V. Onipchenko, #15/97; 2 - from Krasnoyarsk Territory, 5.VII.1968, L.V. Bardunov; 3 - from Murmansk Province, R.N. Schlyakov, #2124; 5 - from Altai #0/908, Ignatov; 6-14, 16-18 - from Yekaterinburg Province, P.L. Gorchakovskij, #18); 1-5, 13 - habit (4 - small thread-like shoot); 6 - leaves from thread-like shoot; 7-9 - leaves; 10-12 - leaf transverse sections; 14 - upper leaf cells; 15 - median leaf cells; 16 - basal leaf cells. Scale bars: 2 mm for 1-5, 13; 1 mm for 6-9; 50 µm for 10-11; 100 µm for 14-16; 200 µm for 12.

basal juxtacostal cells are thick-walled, strongly porose (vs. thin-walled and eporose), and leaves distally are more widely keeled to flat due to broadened costa (vs. narrowly and sharply keeled in *G. elongata*). Brownish color, sharply and narrowly keeled leaves, uniformly

thin-walled basal marginal cells, and margins recurved proximally are characteristic also for *G. fuscolutea*, known in Russia by few collections from southern Siberia and a single one from Caucasus. This species differs from *G. elongata* by long hyaline hair-points, usually



Fig. 16. Distribution of *Grimmia funalis* (Schwaegr.) B.S.G. in Russia

longer than 0.3 mm (very short in *G. elongata*), setae curved when moist (straight in *G. elongata*), slightly furrowed capsules (smooth in *G. elongata*), and autoicous plants with androecia hidden just below perichaetia (dioicous plants and terminal androecia in *G. elongata*). One of Urals specimens of *G. elongata* was tentatively identified in herbarium as *G. donniana*, which is also similar to *G. elongata* in uniformly thin-walled basal marginal cells, but differs in yellowish color, long hyaline hair-points and hoary cushions, widely keeled leaves and margins always plane throughout.

9. *Grimmia funalis* (Schwaegr.) B. S. G., Bryol. Europ. 3: 119, tab. 247. 1845. — *Trichostomum funale* Schwaegr., Sp. Musc. Frond., Suppl. 1(1): 150, tab.37. 1811. — *Grimmia funalis* var. *calvescens* (Kindb.) H.Möller, Ark. Bot. 26A (2):65. 1934. — *Grimmia calvescens* Kindb., Christiania Vidensk.-Selsk. Forh. 1888(6): 19. 1888. Figs. 15, 16.

Plants in dense or loose, easily separating tufts, yellowish green or graish green. Stems erect, 2-3 cm long, thin thread-like shoots with small scaly leaves often present inside the tuft. Leaves spirally twisted when dry, (1.0-)1.5-2.0×(0.3-)0.4-0.6 mm, lanceolate, keeled distally; margins plane or slightly recurved on one side in middle part of leaf; costa differentiated, prominent dorsally, semi-circular in cross section, with 2(-3) ventral epidermal cells;

hyaline hair-points short or long, weakly denticulate or almost smooth; lamina partially bistratose in distal 2/3, unistratose at base; upper and median laminal cells 8-12 µm wide, isodiametric to short rectangular, with strongly thickened and moderately sinuose walls, cell areolation looking homogenous in distal 2/3 of lamina; basal juxtacostal cells elongate rectangular, porose, basal marginal cells shorter, with moderately thick longitudinal walls and strongly thick transverse walls. Dioicous, sporophytes very rare in the territory of Russia (known from southern Siberia). Setae 1.5-2 mm, arcuate when moist. Capsules emergent, ovoid, smooth or slightly furrowed. Operculum conic, shortly rostrate. Annulus of elongata-type. Peristome teeth orange, split distally, papillose. Spores 15-17 µm. Calyptrae mitrate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Murmansk Province**, ad. fl. Kurengi, 1861, *N.-I. Fellman* (H); Khibiny Mts., Koashva Mt., 21.VIII.1949, #1604, *R.N. Shlyakov* (KPABG); Lovchorr, Botanikov Gorge, 12.VIII.1928, #2124, 1992, *R.N. Schlyakov* (LE); Lovchorr, 5.VIII.1948, #1992b, *R.N. Schlyakov* (LE); Ajkuaajvenchjok Gorge, 16.IX.1989, *O.M. Afonina* (KPABG); Vudjavrchorr Mt., Yuzhnoe Skvozhnoe Gorge, 30.VIII.1947, #RS-1472-47, *R.N. Shlyakov* (KPABG); Yukspor Creek, 13.VII.1948, 21.VIII.1949, #1756, 2440, *R.N. Shlyakov* (KPABG); Kukisjok Creek, 29.VI.1990, *Ignatov* (MHA); **CAUCASUS:** **Kabardino-Balkaria**, Bezengi Gorge, 9.VIII.1988, #42, *Yu. Menitzkij & al.* (MHA); Cherek Bezengijskij River, Dumala Creek, 31.VII.2004, *Ignatov & al.*, (MHA); Elbrus Mt., VIII.1975, *T. Davydkina & E. Seman* (LE); Elbrus area, Adyl-Su Creek, Dzhanquat Glacier, X.1994, #31, #46, *I. Pospelov* (MW); **North Ossetia**, Lars, #126, *A.H. & V.F. Brotherus* (H-SOL); North Ossetian Reserve, 19.VII.1976, #20, *L.I. Abramova* (MW); **Karachaevo-**

Cherkessia, Kuban, in summo jugo alpino inter Do-Ut et Utschkulan, 3.IX.1890, *S.Sommier & E.Levier* (H); Teberda Reserve, Alibek Gorge, 4.VII.1995, #18/95, *Onipchenko* (MW); Northern Klukhor Gorge, 8.IX.1994, #178/94, *Onipchenko* (MW); Oriuchat Gorge, 4.IX.1994, #152/94, #165/94, *Onipchenko* (MW); Buulgen-Klukhor Pass, 29.VIII.1997, #15/97, *Onipchenko* (MW); Amanauz River left bank, 23.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE); Shumka Gorge, 31.VIII.1996, #199/96, 205/96, *Onipchenko* (MW); Murudzhu Gorge, 1.VII.1998, #7/98, 24.IX.2003, #24/03, *Onipchenko* (MW); Ullu-Murudzhu Gorge, 8.VIII.1986, *Ignatova* (MW); Goralykol Gorge, 21.VII.1994, #111/94, *Onipchenko* (MW); Bolshaya Khatipara, 17.VII.1994, #84/94, #85/9, *Onipchenko* (MW); Bolshaya Khatipara-Khadzhibej pass, 17.VII.1994, #85/94, *Onipchenko* (MW); Azgek Gorge, 17.VIII.1985, 30.VII.1993, #35/93, *Onipchenko* (MHA, MW); Khatipara Ridge, 29.VII.1993, #31/93, *Onipchenko* (MW); Malaya Khatipara Gorge, 6.VII.1994, #9/94, 27.VII.1994, 117/94, 5.VIII.1995, 15/95, *Onipchenko* (MW), 4.VIII.1986, *Ignatova* (MHA); Kyshkadzher Gorge, 10.VII.1994, #28/94, *Onipchenko* (MW); Bolshoy Zelenchuk River basin, Pshish Mt., 5.VIII.1990, *T.Akatova* (CSR); **Krasnodar Territory**, Caucasian Reserve, Abago Mt., 14.VII.1986, *T.Akatova* (CSR); Urushten River basin, Alous Mts., 13.VIII.1994, *T.Akatova* (CSR, MHA); Tryu-Yatrygvarta Mts., 20.VII.1997, *T.Akatova* (CSR, MHA); **Adygeya**, Belaya River basin, Abago Mt., 15.VII.1986, *T.Akatova* (CSR, MHA); **URALS: Sverdlovsk Province**, Serebryanskij Mt. Range, 12.VII.1953, #18, *P.L.Gorchakovskij* (LE, MW); Denezhkin Kamen Mt. Range, 26.VII.1996, *A.P.Djachenko* (SVER); **SIBERIA: Altai Republic**, inter fl. Bortuldag et Kair, 25.VII.1903, *P.Krylov* (H-Br); Bobyrgan, 16.VI.1903, *P.Krylov* (H-Br); Terekhta jugum, 3.VIII.1909, *P.Kursky* (H-Br); Ak-Turu, 18.VII.1966, *L.V.Bardunov* (IRK); Tabozhok Peak, 1.VIII.1992, #31/76, *Ignatov* (MHA); Kokkul Lake, 4.VIII.1992, #33/12, *Ignatov* (MHA); Malaya Kokorya Creek, 21.VI.1993, #36/344, *Ignatov* (MHA); Dvukhkarovaya Creek, 25.VII.1993, #36/179, *Ignatov* (MHA); Bogoyash Creek, 27.VI.1993, #36/135, 36/335, *Ignatov* (MHA); Karakem River, 18.VI.1989, #0/469, 0/470, 0/908, 0/909, 0/911, 0/912, 0/914, 0/915, 0/916, 0/297, *Ignatov* (MHA); Kayakkatuyarykskij Creek, 27-28.VI.1991, #3/112, 3/165, 3/52, 3/107, 3/33, 3/69, 6/18, *Ignatov* (MHA); Kayak Lake, 30.VI.1991, #7/182, 7/5, 7/7, 7/35, *Ignatov* (MHA); Kayra Creek near Kayra-bazhi Peak, 14.VI.1991, #13/30, 13/45, 13/38, *Ignatov* (MHA); between Kaira-bazhi Peak and Bardaky Lake, 14.VII.1991, #13/133, *Ignatov* (MHA); Kolyushta Mt., 30.VI.1989, #0/94, *Ignatov* (MHA); Bayas Creek, 2.VI.1989, #0/913, *Ignatov* (MHA); Karakol Lakes, 3.VIII.1991, #28/121, *Ignatov & Ignatova* (MHA); Katunskij Range, Ioldo River, 23.VII.2000, *O.Pisarenko* (MW); **Krasnoyarsk Territory**, Taimyr, Taimyr Lake, Ledyanaya Bay, 22.VII.2004, #G3, *V.Fedosov* (MW); Putorana Plateau, Agatskij Kamen Mt., 7.VII.1968, #1, 22, *V.Kuvaev* (MW); Putorana Plateau, Nyakshingda Lake, #82, 87, 412, *V.B.Kuvaev* (MW); Baikit Distr., Selnin Creek, 17.VII.1990, #240, *S.Shcherbina* (MW); Western Sayan Mts., Malyj On Creek, 5.VII.1968, *L.V.Bardunov* (IRK); Olenjya Rechka, 19.VI.1968, *Bardunov & Stezko* (IRK); **Buryatia**, Khamar-Daban Ridge, Baikalskij Reserve, Nemskij Klyuch Creek, 9.VIII.2001, *N.A.Konstantinova* (MW); **Irkutsk Province**, Vitim Reserve, Oron Lake, Kultuchnaya Creek, 28.VI.1984, *L.V.Bardunov* (IRK, MW); **Yakutia**,

Suntar Distr., Vilyuj River, 25.VII.1958, #53/1, *Kildyushevskij* (MW); Neryungri Distr., Udokan Range, 29.VII.2000, *L.V.Kuznetzova* (SASY, MW); Tomponskij Distr., Suntar-Khayata Range, Kyubyume Creek, 16.VI.1999, *E.I.Ivanova & K.K.Kriovshapkin* (SASY, MW); Tomponskij Distr., Suntar-Khayata Range, Krasnoe Lake, 10.VII.2003, *E.I.Ivanova & V.I.Zolotov* (SASY, MW); Kobyajskij Distr., Kitchan Settlement, 3.VII.2002, *E.I.Ivanova* (SASY, MW); Kobyajskij Distr., Lyampushka River, 15.VII.2002, *E.I.Ivanova* (SASY, MW); **FAR EAST: Khabarovsk Territory**, Bureinskij Reserve, Levaya Bureya-Kurajgagna, 8.VIII.1992, *B.Borisov* (MW); Medvezh'e Lake, 9-13.VIII.1997, #97-1099, #97-1094, *Ignatov* (MHA), #60196a, *Z.Iwatsuki* (MHA) & #97-234, *B.C.Tan* (FH); **Primorskij Territory**, Alekseevskij Range, Ol'khovaya Mt., 8.VIII.1986, *V.Barkalov* (VLA); **Kamchatka Province**, Shikotan Island, Gorobetz Bay, 30.VIII.1978, *V.Ya.Cherdantseva* (VLA); **Chukotka**, Velikaya River, Tavatvaam Creek, 29.VIII.1983, *O.M.Afonina* (LE, MW); Tanyurer River, Golubaya Creek, 14.VII.1981, *O.M. Afonina* (LE, MW).

Distribution. *Grimmia funalis* is widespread in mountain areas of the Holarctic, it is known from most European countries (including Great Britain and Iceland), Algeria, Madeira and Canarian Islands, Turkey, Middle Asia, Mongolia, China, North America and Greenland. In Russia *G. funalis* is not rare in Kola Peninsula, Caucasus, and Altai, scattered in Putorana Plateau, Western Sayan Mts., Buryatia, Yakutia, Khabarovsk and Primorskij Territory, and it was only found twice in the alpine belt of North Urals. Grows at all altitudes, but more frequently at 1900-3100 alt., on acidic and neutral rocks.

Differentiation. *Grimmia funalis* can be recognized by usually spirally twisted leaves (it is better seen on thread-like thin shoots with scaly leaves lacking hair-points which are often found in tufts) and homogenous cell areolation (cells uniform in size and shape, thick-walled, sinuose).

10. *Grimmia fuscolutea* Hook., Musci Exot. 1: 63. 1818. — *Grimmia apiculata* Hornsch., Flora 2(2): 442. 1819, nom. illeg. Figs. 17, 18.

Plants in dense tufts, yellowish green above, blackish brown below, sometimes brownish throughout. Stem ascending to erect, 1-2 cm long, fasciculately branched, densely foliated. Leaves slightly flexuose, loosely appressed when dry, appressed at base and with spreading acumens when wet, narrow lanceolate, 1.4-1.6(-2.0)×0.3-0.4(-0.5) mm, acuminate, sharply keeled distally, blades forming < 40° angle; margins plane in distal part of leaf, narrowly recurved to revolute on one or both sides below; costa differentiated, strongly

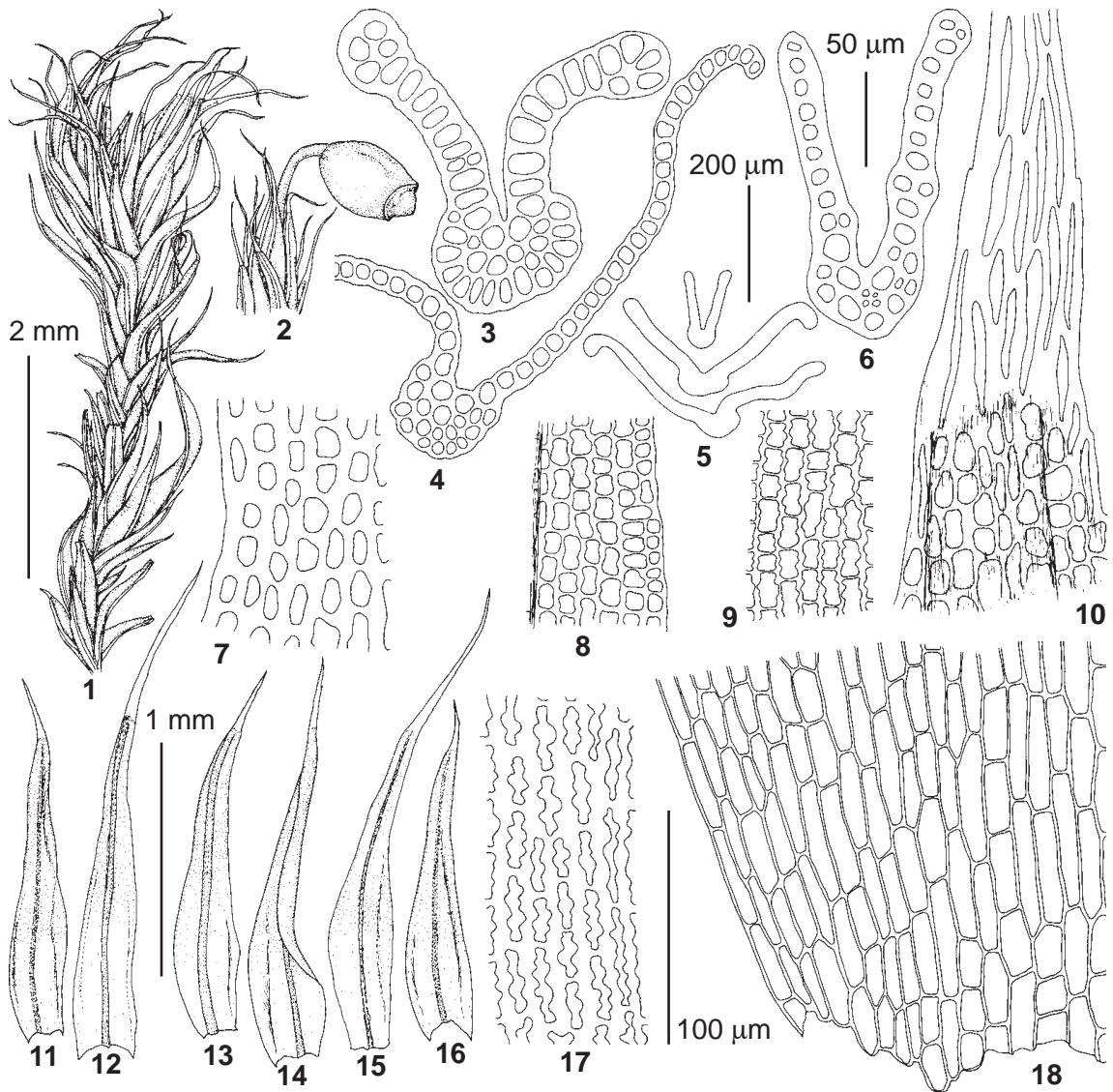


Fig. 17. *Grimmia fuscolutea* Hook. (1, 3-5, 8-16, 18 – from Altai Republic, M. Ignatov, #0/476; 2, 6-7, 17 – from Karachaevo-Cherkessia, V. Onipchenko, #95/94): 1 – habit; 2 – capsule; 3-6 – leaf transverse sections; 7-8 – upper leaf cells; 9, 17 – median leaf cells; 10 – base of hair-point and upper leaf cells; 11-16 – leaves; 18 – basal leaf cells. Scale bars: 2 mm for 1-2; 1 mm for 11-16; 50 µm for 3-4, 6; 100 µm for 7-10, 17-18; 200 µm for 5.

prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points 0.2-0.5(-0.8) mm long, terete, weakly denticulate; lamina mostly unistratose, bistratose in 1-2 cell rows at margins in distal part of leaf, sometimes also with narrow bistratose strips; upper and median laminal cells with moderately to strongly thickened walls, gradually elongating to the base, 10-20×9-15 µm to 25-35×10-12 µm, strongly sinuose, basal juxtacostal cells elongate rectangular, 30-70×12-16 µm, with thin to moderately thickened walls, not or slightly porose, basal marginal cells pellucid, with uniformly thin longitudinal and

transverse walls. Autoicous, androecia lateral, hidden just below perichaetia, sporophytes frequent (but only two of four Russian specimens have sporophytes, one from Altai Mts., and one from Caucasus). Setae 2-3 mm, arcuate when moist. Capsules emergent, 1 mm long, ovoid, slightly furrowed. Operculum conic, with short, thick, obtuse beak. Annulus of affinis-type. Peristome teeth entire. Spores 10-13 µm. Calyptrae mitrate.

SPECIMENS EXAMINED: **CAUCASUS:** Karachaevo-Cherkessia, Teberda Reserve, Khadzhibei Gorge, 25.VII.1995, #94/9, Onipchenko (MW); **SIBERIA:** Altai Republic, Karakem River Basin, Ayulyuyuzuk Creek,



Fig. 18. Distribution of *Grimmia fuscolutea* Hook. (triangles) and *G. hartmannii* Schimp. (circles) in Russia

16.VI.1989, #0/476, Ignatov (MHA); Kurkure Range, Kayak-katuyarykskij Creek, First Lake, 6.VI.1992, #7/152, Ignatov (MHA); **Buryatia**, Baikal area, Khamar-Daban Range, Pereemnaya River, 17.VIII.1989, S.Kazanovskij (MHA).

Distribution. *Grimmia fuscolutea* is known from scattered localities in Europe (Norway, mountains of Central Europe), it occurs in mountains of Africa and South America, Mexico, western North America, in Asia from India, Nepal, China, and Japan, also in Antarctic. In Russia it is known from few localities, in Baikal area, Altai Mts., and Caucasus. In Baikal surroundings it was collected in forest belt, on rocks at river bank, in Altai and Caucasus in alpine belt, at 2500-3350 m elevation, on granitic cliffs and on soil in spotty mountain tundra.

Grimmia fuscolutea was reported for Chukotka (Ignatov & Afonina, 1992; Afonina & Czernyadjeva, 1995) based on wrongly identified specimens, and later excluded from the list of mosses of Chukotka (Afonina, 2004).

Differentiation. *Grimmia fuscolutea* is very rare in Russia, only known from poor or sterile collections. Specimens with sporophytes are easy to recognize by slightly furrowed capsules, arcuate setae in wet condition, short and thick beak of operculum, recurved to revolute leaf margins and uniformly thin-walled basal marginal cells. The similar character combination is known in *G. incurva*, but in latter species leaves are linear and usually considerably longer (2.5-3.5 mm long vs.

1.2-2.0 mm long in *G. fuscolutea*), contorted to almost crisped when dry (vs. slightly flexuose in *G. fuscolutea*), and the upper and median laminal cells are less thick-walled and sinuose. Moreover, *G. incurva* is dioicous, while *G. fuscolutea* – autoicous, with the bud-like perigonia found just below perichaetia. Sterile plants of *G. fuscolutea* are superficially similar to *G. reflexidens*, a species with leaves also narrowly keeled above, but the basal marginal cells of *G. reflexidens* always have transverse walls much thicker than the longitudinal walls. This character differentiates *G. fuscolutea* also from *G. funalis*, similar in mostly unistratose lamina and thick, sinuose cell walls. Moreover, *G. funalis* is dioicous. Differences from *G. elongata* are discussed under the latter species.

11. ***Grimmia hartmannii*** Schimp., Syn. Musc. Eur.: 214. 1860. – *Grimmia brachydictyon* (Card.) Deguchi, J. Sci. Hiroshima Univ., Ser. B, Div. 2, Bot. 16: 173. 1979 '1978'. – *Racomitrium patens* var. *brachydictyon* Card., Bull. Herb. Boissier, ser. 2, 8: 333. 1908. Figs. 18-20.

Plants in loose patches, olive green or yellowish green above, brownish below. Stems prostrate to ascending, moderately branched, to 3-6 cm long, evenly foliated, central strand lacking, tips of shoots usually curved. Leaves flexuose or curved, loosely appressed when dry, patent to spreading when moist, 2.5-3.0×0.5-0.7 mm, from ovate base gradually tapering into long and narrow lanceolate acumen, keeled distally, widely canaliculate proximally; margins plane to weakly

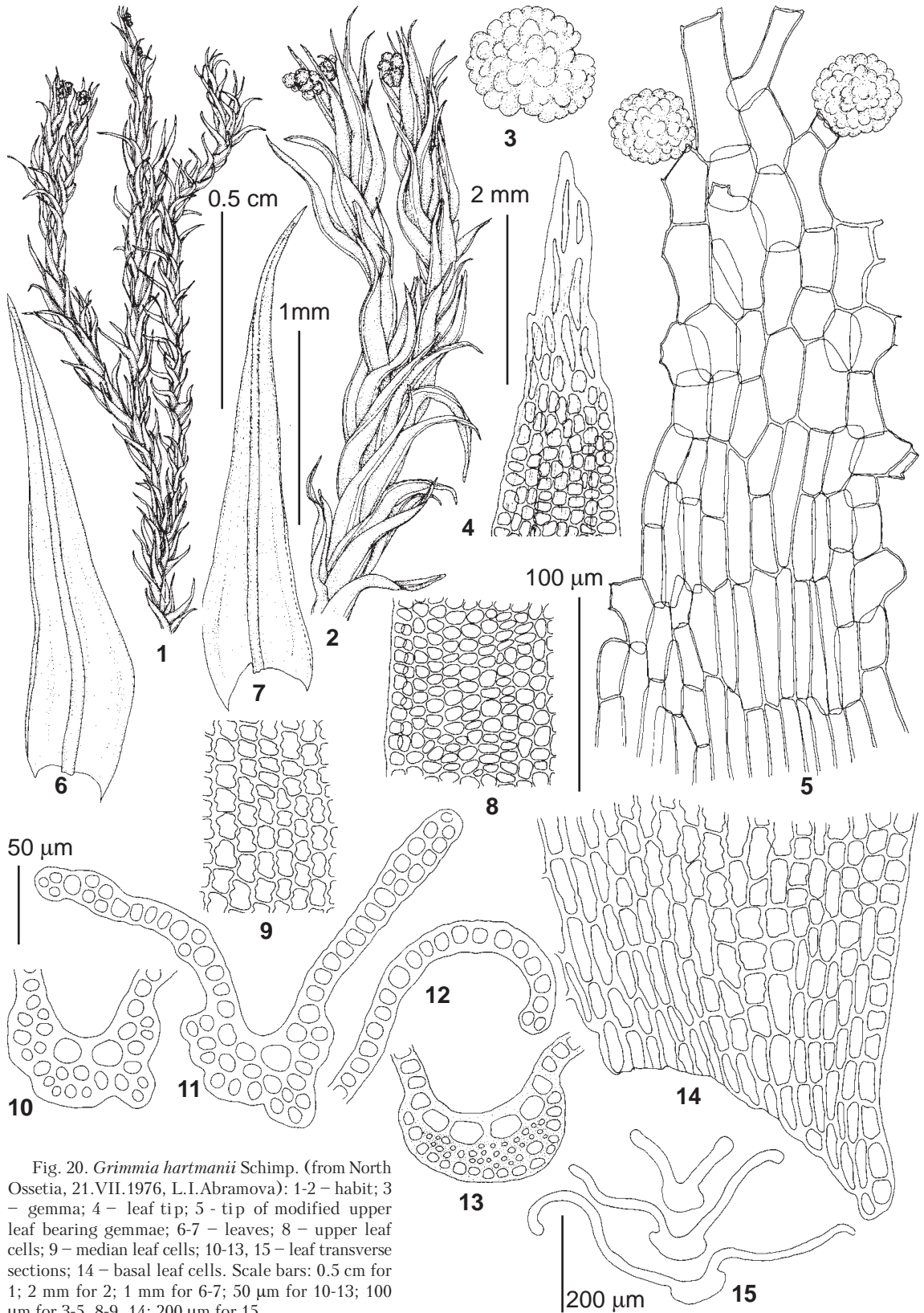


Fig. 20. *Grimmia hartmanii* Schimp. (from North Ossetia, 21.VII.1976, L.I.Abramova): 1-2 - habit; 3 - gemma; 4 - leaf tip; 5 - tip of modified upper leaf bearing gemmae; 6-7 - leaves; 8 - upper leaf cells; 9 - median leaf cells; 10-13, 15 - leaf transverse sections; 14 - basal leaf cells. Scale bars: 0.5 cm for 1; 2 mm for 2; 1 mm for 6-7; 50 μm for 10-13; 100 μm for 3-5, 8-9, 14; 200 μm for 15.

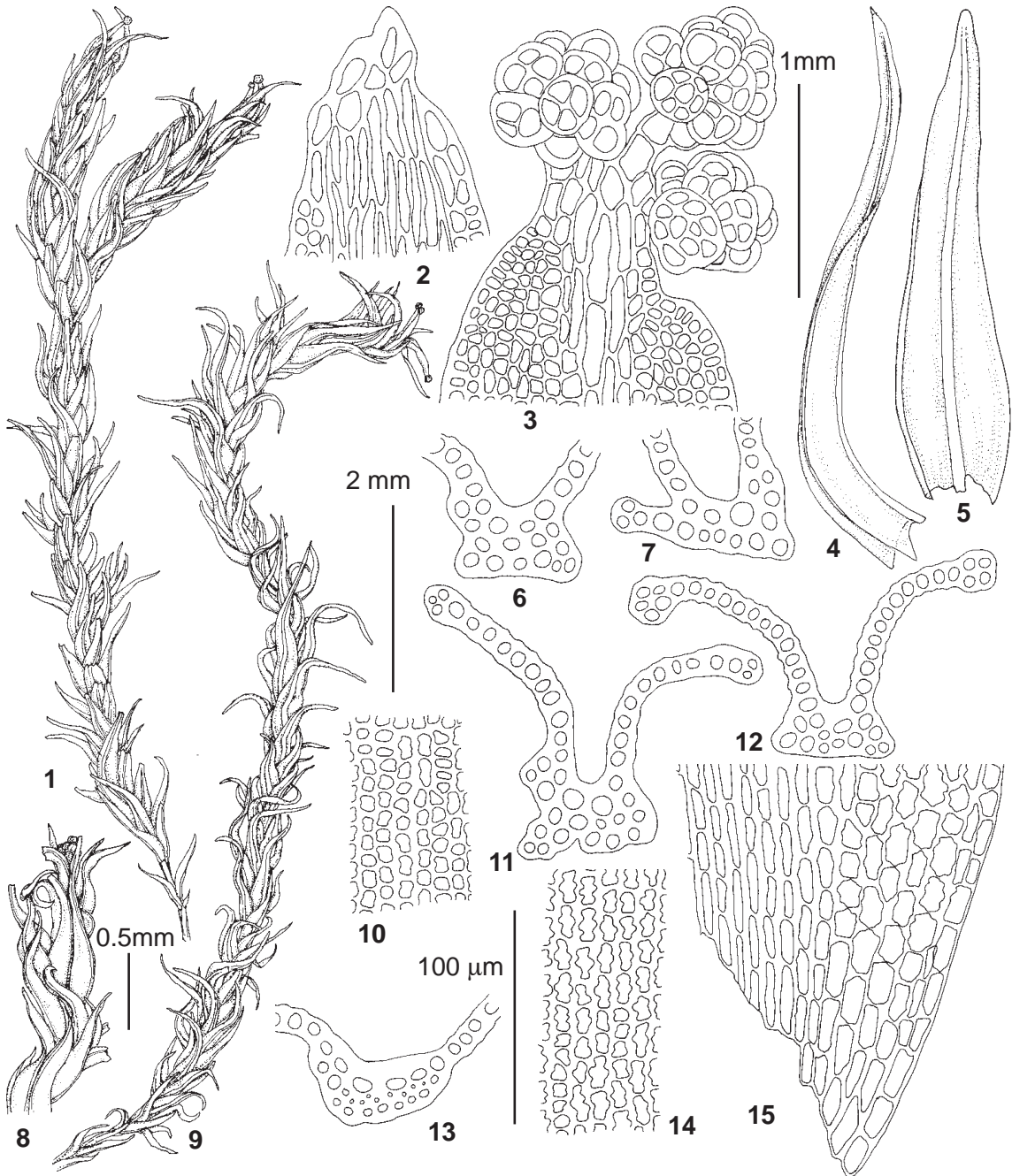


Fig. 20. *Grimmia hartmanii* Schimp. (1-7, 10-11, 13-15 - from Kamchatka, I. Czernyadjeva, #81; 8-9, 12 - from Sakhalin, 6.IX.1966, V. Ardeeva): 1, 8-9 - habit; 2 - leaf tip; 3 - leaf tip with gemmae; 4-5 - leaves; 6-7, 11-13 - leaf transverse sections; 10 - upper leaf cells; 14 - median leaf cells; 15 - basal leaf cells. Scale bars: 2 mm for 1, 9; 1 mm for 4-5; 0.5 mm for 8; 100 μ m for 2-3, 6-7, 10-15.

recurved at distal 1/3 of leaf, more strongly recurved to revolute below on one or both sides; costa differentiated, prominent dorsally, sometimes weakly winged in distal part of leaf, in cross section irregularly angled and asymmetric in distal part of leaf, reniform in proximal part, with differentiated dorsal and ventral

epidermis, ventral epidermal cells (2-3)-7; hyaline hair-points very short, usually 0.1-0.2 mm long; lamina unistratose, at margins bistratose for 1-6 cell rows and sometimes with bistratose strips; upper laminal cells isodiametric, 7-8 μ m, rounded-polygonal, with incrassate, not or slightly sinuose walls, median laminal cells

subquadrate to short rectangular, 11-15×7-10 µm, with moderately thickened sinuose walls, basal juxtacostal cells rectangular, 20-40×8-10 µm, thick-walled, porose, basal marginal cells shorter, with thin longitudinal and thick transverse walls. Gemmae frequently developed on tips of normally developed leaves or otherwise on more or less modified, short and hyaline leaves (and in this case appearing in between acumens of normal subterminal leaves), globose, multicellular, 100-200 µm in diameter, yellowish green or yellow when young, dark red or red-brown, more rarely orange when mature. Dioicous, sporophytes rare, not known from the territory of Russia. [Setae 3-4 mm, flexuose when dry, erect or curved when moist. Capsules exerted, ovoid, smooth, 1.5-2 mm long. Operculum conic, with rather long erect or oblique beak. Annulus of affinis-type. Peristome teeth orange or red, irregularly cleft, perforated. Spores 12-16 µm. Calyptrae mitrate].

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:**

Karelia, Kronoborg [Kurkijoki], 16.VIII.1874, *E. Juslin* (H, LE); Paelkjarvi [Pujkkola], 8.VII.1876, *V.F. Brotherus* (H); Lahdenpohja Distr., Kurkijoki, 31.VII.1999, #20-897, *Maksimov & Maksimova* (PTZ); **Leningrad Province**, Tuvisaari [Sovetskij], 11.IX.1895,? (H); Vii puri [Vyborg], V.1875, *E.Lang* (H); Hogland, 8.VIII.1868, *M. Brenner* (H); **CAUCASUS: Dagestan**, Karak, 29.VI.1925, *I. Bogdanovskaya-Gienef* (LE, MW); **Kabardino-Balkaria**, Elbrus Mt. S-facing slope, 1959, *Vladimirova* (LE, MW); **North Ossetia**, North Ossetian Reserve, 21-27.VII.1976, #2, 122, 153, 23.VII.1980, #79, 80, 83 *L.I. Abramova* (MW); **Karachaevo-Cherkessia**, Teberda Reserve, Alibek Gorge, 23.VIII.1955, *A.L. Abramova & I.I. Abramov* (LE); Malaya Khati para Gorge, 21.VIII.1955, #143, *A.L. Abramova & I.I. Abramov* (H, LE); Mukhu Gorge, 31.VII.1994, #142/94, *Onipchenko* (MW); **Krasnodar Territory**, Adler Distr., Krasnaya Polyana, 5.IX.1937, *A. Lazarenko* (LE), 22.VII.1948, *I.M. Raspopov* (LE); Aibga Mt., 1.VI.1951, *V. Alper* (CSR, MHA); Urushten River basin, Sinyaya Creek, 7.VIII.2000, *T. Akatova* (CSR); Alos Mt., 14.VIII.1994, *T. Akatova* (CSR, MHA); Malaya Laba River basin, Akhtsarkhva Mt., 16.VII.2001, *T. Akatova* (CSR); Mzymta River basin, Kogot Mt., 4.VIII.2000, *T. Akatova* (CSR, MHA); Achishkho Ridge, 16.VIII.1996, 14.VIII.2004, *T. Akatova* (CSR, MHA); Sochi Distr., Lazarevskoe, 30.VII.1927, *Ya. Vasiljev* (H); **Adygeya**, Belaya River, 6.VIII.1999, *T. Akatova* (CSR, MHA); Guzeri pl., 13.VI.1995, *T. Akatova* (CSR, MHA); Suvorovskij kordon, 15.VI.1995, *T. Akatova* (CSR, MHA); Belaya River at Imeretinka Creek mouth, 9.VIII.1999, *T. Akatova* (CSR, MHA); **URALS: Bashkortostan**, Shulgan-Tash, #42a, *O. Zhigunov* (UFA); **FAR EAST: Kamchatka Province**, Kihchik River, 10.VIII.2001, #81, *I. Czernyadjeva* (LE); **Sakhalin Province**, Sakhalin Island, Nevelsk surroundings, 27.IX.1964, *V. Ya. Cherdantseva* (VLA); Aniva Distr., Susunajskij Range, Majorskaya Mt., 6.IX.1966, *V. Ya. Cherdantseva* (VLA, IRK); Dolinskij Distr., 7.IX.1964, *V. Ya. Ardeeva* (IRK); Kuril Islands, Kunashir, Goryachij Plyazh, Vtoraya Rechka, 30.VII.1978, *V. Ya. Cherdantseva* (VLA).

Distribution. *Grimmia hartmanii* is common in mountain areas of Europe, from southern Scandi-

navia and Great Britain to Spain, also in Transcaucasia and Turkey, Japan, eastern North America. In Russia it is rather common in Caucasus, but very rare in north-western European Russia, South Urals, and Far East (Sakhalin and Kamchatka), from where it is known from few localities. It grows on acidic and neutral rocks, usually in the forest belt.

Differentiation. *Grimmia hartmanii* is usually easy to recognize by its red-brown, comparatively large globose gemmae formed in clusters at shoot tips. Another diagnostic character is the large size of the plants (3-6 cm long), the ascending and evenly foliated stems with curved shoot tips, the strong costa, reniform in cross section, widely canaliculate in middle part where it has 3-7 ventral epidermal cells. *Grimmia hartmanii* usually resembles *G. ramondii*, and their differences are discussed under the latter. Reniform costae are also characteristic of *G. longirostris*, but this species differs from *G. hartmanii* in smaller plant size (stems to 2-3 cm long), erect stems, and gemmae absence. *Grimmia anomala* has similar gemmae in size and position, and it is sometimes treated as a variety of *G. hartmanii*. *Grimmia anomala* differs mainly in having striolate lamina due to the well-developed longitudinal cuticular ridges, which look similar to papillae in leaf cross section (vs. laminal cells without cuticular ridges, smooth or with small thickenings above cell joint in transverse leaf section in *G. hartmanii*). Also *G. anomala* has smaller gemmae (70-80 µm vs. 100-200 µm in *G. hartmanii*), that are yellowish (vs. red-brown in *G. hartmanii*) and occur always on normally developed upper leaves, whereas in *G. hartmanii* gemmae often (though not always) found on modified, short and hyaline leaves and thus look subaxillary.

Several specimens from Sakhalin reported as *G. anomala* (Savicz-Lyubitskaya & Smirnova, 1970) belong to *G. hartmanii* because they lack longitudinal cuticular ridges.

Far East collections differ from Caucasus plants in smaller plant and leaf size (leaves 2.0-2.3 mm long vs. 2.5-3.0 mm in Caucasus specimens), more strongly flexuose dry leaves (contrary to mostly straight leaves of *G. anomala*), and smaller gemmae (ca. 100 µm vs. 100-200 µm in Caucasus plants), orange (vs. red-brown in Caucasus plants), forming both on tips of normal and small modified leaves (vs.

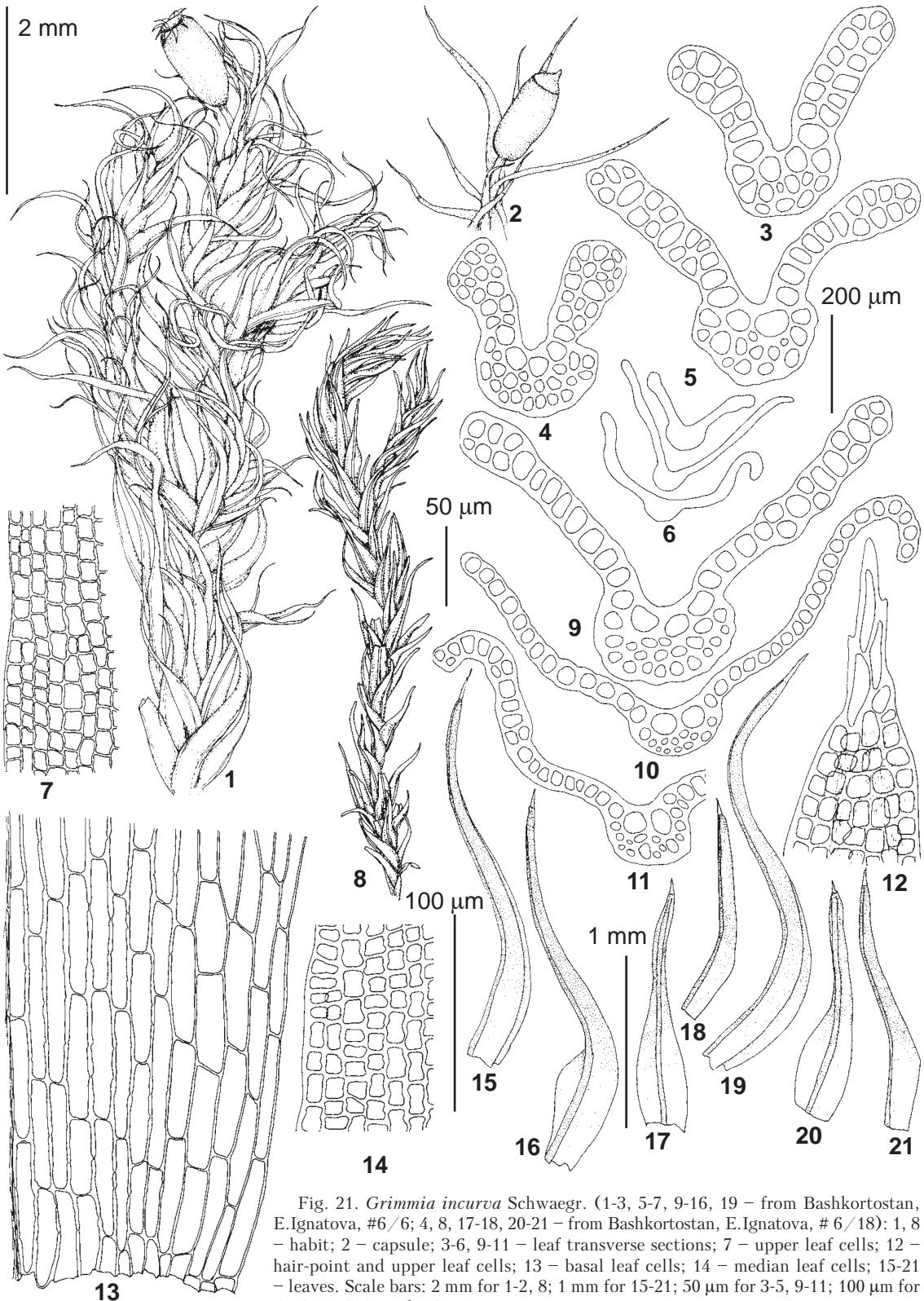


Fig. 21. *Grimmia incurva* Schwaegr. (1-3, 5-7, 9-16, 19 – from Bashkortostan, E. Ignatova, #6/6; 4, 8, 17-18, 20-21 – from Bashkortostan, E. Ignatova, # 6/18): 1, 8 – habit; 2 – capsule; 3-6, 9-11 – leaf transverse sections; 7 – upper leaf cells; 12 – hair-point and upper leaf cells; 13 – basal leaf cells; 14 – median leaf cells; 15-21 – leaves. Scale bars: 2 mm for 1-2, 8; 1 mm for 15-21; 50 μm for 3-5, 9-11; 100 μm for 7, 12-14; 200 μm for 6.

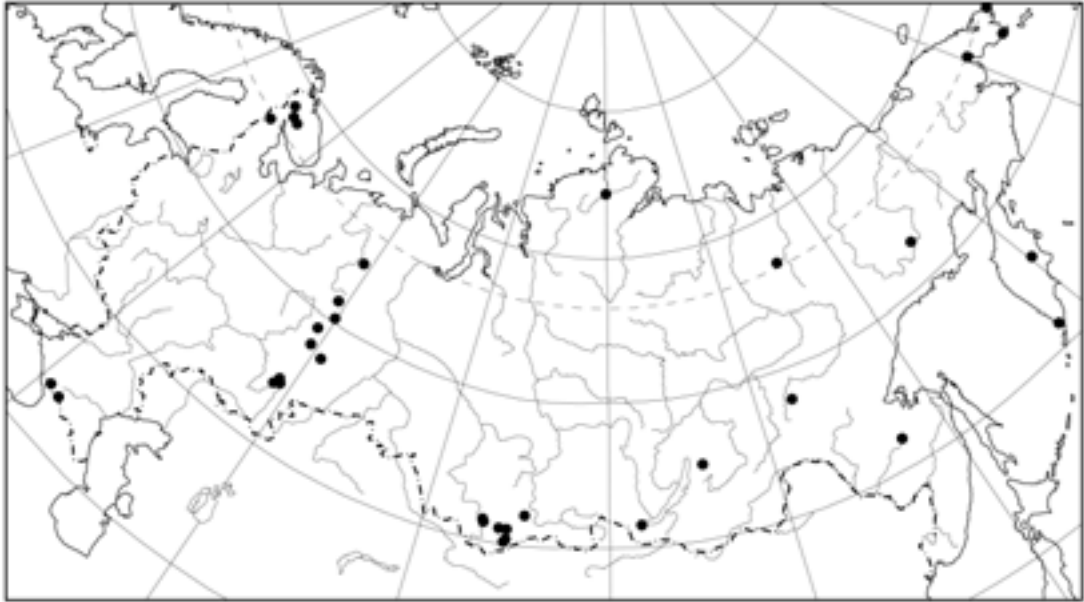


Fig. 22. Distribution of *Grimmia incurva* Schwaegr. in Russia.

usually on modified upper leaves in Caucasus plants). These Far East populations are very similar to Japanese collections of *G. brachydietyon*. The latter species was synonymized by Muñoz & Pando (2000) with *G. hartmanii*. Deguchi (1978) and Greven (2003), however, recognize *G. brachydietyon* as a separate species and point out the following differences from *G. hartmanii*: 1) smaller plant size, smaller leaves and gemmae; 2) costa winged on dorsal side in distal part of leaf; 3) hair-point very short or leaves mucicous. However, in *G. hartmanii* costa also has low wings on dorsal side, and hair-points are rather short.

12. *Grimmia incurva* Schwaegr., Sp. Musc. Suppl. 1(1): 90. 1811. Figs. 21, 22.

Plants in loose or dense rounded cushions, dark green or blackish-green. Stem erect, (1-)2-3 cm long. Leaves contorted to crisped when dry (in small forms flexuose, loosely appressed), (1-)2.5-3(-4) × (0.3-)0.4-0.6 mm, linear-lanceolate, sharply keeled distally; margins plane in distal part of leaf, recurved on one side below; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points short to absent; lamina mostly bistratose in distal 1/3, to 4-stratose at margins, in middle part of leaf bistratose in 4-6 cell rows at margins, unistratose near costa, in basal part of leaf unistratose; upper laminal cells subquadrate, 9-14 μm, with moderately thickened and slightly sinuose walls, median laminal cells with moderately to strongly sinuose walls, basal juxta-

costal cells elongate rectangular, with thick and porose longitudinal walls and thin transverse walls, basal marginal cells slightly shorter, pellucid, with uniformly thin longitudinal and transverse walls. Dioicous, sporophytes rare. Setae 2-3 mm, arcuate when moist. Capsules emergent, ovoid-cylindric, smooth. Operculum conic, with short beak. Annulus of affinistype. Peristome teeth orange, strongly perforated. Spores 10-12 μm. Calyptrae mitrate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Murmansk Province**, Kandalaksha Distr., Kuoloyarvi, Salatunturi Mt., 23.VII.1957, #378, *R. Shlyakov* (KPABG); Salla, Tuutsan, 21.VII.1938, *O. Lumiala* (H); Khibiny Mts., Rasvumchorr Plateau, 28.VIII.1948, #2240, 1172, *R. Shlyakov* (KPABG); Khibiny Mts., Kukisvumchorr Mt., 4.IX.2001, *Ignatova* (MW); Takhtarvumchorr Mt., Molibdenovoy Cirque, 2.IX.1994, #31a-94, *A. Likhachev* (KPABG); Khibiny Station, Medvezhij Log, 12.VIII.1949, #2386, *R. Shlyakov* (KPABG); Chil'tald Mts., Chil' Creek, 28.VI.1988, #29-288, 29-5-88, 135-1-88, 135-12-88, *O. Belkina* (KPABG); Chil'tald Mts., Malaya Konjya Mt., 26.VI.1988, #5-3-88, 5-6-88, 11-1-88, *O. Belkina* (KPABG); Lavna-tundra Mts., Peak 638 m, 24.VII.1987, #95-1-87, *O. Belkina* (KPABG); Lavnatundra Mt., 30.VII.1987, #145/2, 143/6, *O. Belkina* & *A. Likhachev*, 7.VIII.1987, #295-5-87, 109-87, 105-1-87, 105-3-87 *O. Belkina* (KPABG); **Karelia**, Loukhi Distr., Paanayarvii National Park, Kivakka Mt., 8.IV.2000, #24-226, *A. Maksimov* & *T. Maksimova* (MW); **CAUCASUS:** **Karachaevo-Cherkessia**, Teberda Reserve, Mussa-Achitara Mt., 6.VIII.1986, *Ignatova* (MHA); Oriuchat Gorge, 3.IX.1994, #161/94, *Onipchenko* (MW); Goralay-Kol Gorge, 13.VIII.1986, *Ignatova* (MHA); Malaya Khati para Gorge, 30.VIII.1983, 6.VII.1994, #9/94 & 16.V.2001, *Onipchenko* (MW), 4.VIII.1986, *Ignatova* (MHA); Kyshkadzher Gorge, 10.VII.1994, #37/94, *Onipchenko* (MW); **Adygeya**, Caucasian Reserve, Achishkho Mt., 16.VIII.1996, *T. Akatova* (CSR); **URALS:** **Komi Republic**, Sablya Mt., 9.VIII.1984,

A.P.Djachenko (SVER); **Perm Province**, Basegi Reserve, Southern Basegi, 9.VI.1994, #37, *Ignatov & Bezgodov* (MW); Srednij Basegi Mt., 7.VI.1992, #20, 191, *A.Bezgodov* (MW); 16.VI.1993, #191, *A.Bezgodov* (MW); Vishera Reserve, Tulymskij Kamen Range, 1.VII.1994, #317, *A.Bezgodov* (MW); Tulymskij Kamen Range, 12.VII.1994, #443, *A.Bezgodov* (MW); 21.VII.1994, #513, *A.Bezgodov* (MW); **Sverdlovsk Province**, Rezh Distr., Rezh river valley, Pershino environs, 23.VII.1996, *I.Goldberg* (SVER); Alapaevsk Distr., Rezh river valley, Katushka Creek, 23.VI.2000, *I.Goldberg* (SVER); Denezhkin Kamen Mt., 28.VII.1996, A.P.Djachenko (SVER); **Bashkortostan**, Beloretzk Distr., Yamantau Mt., 12.VII.1997, #48, *A.I.Solomeshch* (MW); Bolshoj Iremel Peak, 6.IX.1990, #6/18, 6/6, 6/9, 6/18, 6/15, 3/10, *Ignatova* (MW); South Ural' Reserve, B.Shelom Mt., 4.VII.1998, #33, *A.A.Muldashev* (MW); **SIBERIA: Altai Republic**, Kurajskij Range, N of Kosh-Agach, Tabozhok Peak, 1.VIII.1992, #31/8, 31/12, 31/13, 31/14, *Ignatov* (MHA); pass between Bashkaus & Pravyy Bogoyash Rivers, 26.VII.1993, #36/346, *Ignatov* (MHA); Bogoyash Creek upper course, 27.VII.1993, #36/99, *Ignatov* (MHA); pass between Kolbakaya and Saluru Creeks, 31.VII.1993, #36/71, *Ignatov* (MHA); Karakem River Basin, Ayulyuyuzuk Creek upper course, 16.VI.1989, #0/927, *Ignatov* (MHA); Karakem River Basin, Kobiguayuk Creek, 15-19.VI.1989, #0/471, 0/907, 0/906, 0/883, 0/361, 0/421, 0/187, 0/902, 0/930, *Ignatov* (MHA); between Ayulyuyuzuk & Kobiguayuk, 15.VI.1989, #0/901, 0/934, *Ignatov* (MHA); Shapshal Range, 22.VII.1935, #1108, *M.Khomutova* (MW); Shapshal Range, SE of Uzunkul' Lake, 23.VI.1990, *N.Zolotukhin* (MHA); Shapshal Range, Trekhlavaya Peak top, 19.VII.1990, *N.Zolotukhin* (MHA); Shapshal Range, Uzunoyuk Creek upper course, 9.VII.1990, *N.Zolotukhin* (MHA); Shapshal Range, Booshkon pass, 5.VII.1990, *N.Zolotukhin* (MHA); Kurkure Range, Kayakkatuyarykiskij Creek Basin, left branch, 28.VI.1991, #8/23, *Ignatov* (MHA); Kurkure Range, Kayakkatuyarykiskij Creek upper course, 30.VI.1991, #7/4, 7/168, 7/38, *Ignatov* (MHA); Kurkure Range, Kayakkatuyarykiskij Creek Basin, First Lake, 3.VII.1991, #7/152, 8/336, 3/139, *Ignatov* (MHA); Second Lake, 3.VII.1991, #3/182, 3/260, 3/72, 3/264, 3/270, 7/78, *Ignatov* (MHA); Kurkure Range, between Kayak & Kayakkatuyarykiskij Creeks, 4.VII.1991, #7/50, 7/56, 7/57, *Ignatov* (MHA); Kayakkatuyarykiskij Creek Basin, upper course, 30.VI.1991, #7/171, *Ignatov* (MHA); Tamanel Peak, 8.VII.1993, #34/87, 34/88, 28/111, *Ignatov & Ignatova* (MHA); Shebalino Distr., Karakol Lakes, 3.VIII.1991, *Ignatov & Ignatova* (MHA); **Krasnoyarsk Territory**, Taimyr, Taimyr Lake, Ledyanaya Bay, 28.VII.2004, #G19, *V.Fedosov* (MW); Western Sayan Mts., Ora-sug Creek upper course (Kantegir River tributary), 19.VII.1965, *S.Gudoshnikov & V.Timonin* (MHA, IRK); Western Sayan Mts., Sinyaya Creek (Golaya tributary), 21.VIII.1991, #2098-11, *V.B.Kuvaev* (MW); **Buryatia**, Khamar-Daban Mts., Slyudyanka River, 20.VII.1990, *S.Kazanovskij* (IRK, MW, MHA); Dzherginskij Reserve, 12.VII.2002, #12, D.Tubanova (UUH); **Yakutia**, Kobyajskij Distr., Kele River upper course, Kyunkyunyur Creek, 26.VII.1987, *E.G.Nikolin* (SASY); 30.VI.1987, *E.G.Nikolin* (SASY); Neryungri Distr., Khatynga River basin, Urga Creek, 18.VIII.1995, *E.I.Ivanova* (SASY, MW); **FAR EAST: Khabarovsk Territory**, Verkhnebureinskij Distr., Bureinskij Reserve, Lan-Balaganakh watershed, 22.VIII.1989, #89-M-230, *O.Grigorjeva* (MHA); **Chukotka**, Provideniya Bay, 23.VIII.2001, *O.M.Afonina* (LE); Bering

Strait, *C.Wright*, #78 (FH); Crux Bay, Aegvekinot Settlement, 20.VI.1969, #1, *O.M.Afonina* (LE); **Magadan Province**, Tenkinskij Distr., Sibit-Tyellakh village, 14.VII.1976, *L.S.Blagodatskich* (LE); **Kamchatka**, Koshelevskij volcano, VII.1990, *I.V.Czernyadjeva* (LE); Ushkovskij volcano slope, 14-19.VII.2003, *I.V.Czernyadjeva* (LE).

Distribution. *Grimmia incurva* is distributed in the Holarctic from the Arctic to southern Europe, Tibet, central China, Japan, but rare in North America (Crum & Anderson, 1981). In Russia it is not rare in Caucasus, Kola Peninsula, Middle and South Urals, Altai Mts., scattered in Western and Eastern Sayan Mts., Taimyr, Yakutia, Khabarovsk Territory, Magadan Province, Chukotka, and Kamchatka. It grows at a wide range of elevations (400-3400 m alt.), mostly in alpine belt, rarely below tree-line, on rocks, in rock crevices and niches, usually in shaded habitats, more rarely on exposed places.

Differentiation. *Grimmia incurva* is usually readily recognized by very long, liner-lanceolate, contorted to almost crisped leaves. Another helpful character – basal juxtacostal cells with thick and porose, nodulose longitudinal walls contrasting with very thin transverse walls (see illustrations in Ignatov & Cao, 1994), and also uniformly thin-walled basal marginal cells. In alpine belt, in severe conditions small forms with almost straight leaves and practically without hyaline hair-points are found; in such plants costa is very wide, filling most of subulate distal part of leaf, leaf tips are often fragile, and basal juxtacostal cells not nodulose. The differentiation from other species with uniformly thin-walled basal marginal cells, *G. fuscolutea* and *G. elongata*, is discussed under these species; *G. donniana* also has thin-walled basal marginal cells, but it differs in greish color of plants and usually numerous exerted capsules.

13. *Grimmia jacutica* Ignatova, Bedn.-Ochyra, Afonina et Muñoz, *Arctoa* 12: 5. 1D; 2-1, 2, 4, 6, 8, 10, 12-14; 3-3-11; 4-1-10. 2004. Figs. 23-25.

Plants in loose, easily separating tufts or patches, olive green or yellowish green above, brownish below. Stems ascending, (3-)4-5(-8) cm long, weakly branching, reddish, without central strand. Leaves often slightly secund, flexuose, loosely appressed when dry, usually with recurved leaf tips, erect-spreading when moist, 2.1-3.0x0.5-0.8 mm, from ovate base gradually tapering into long and narrow lanceolate acumen; margins recurved on one side in proximal 1/2-2/3 of leaf and plane or weakly and shortly recurved on other side; costa differentiated,

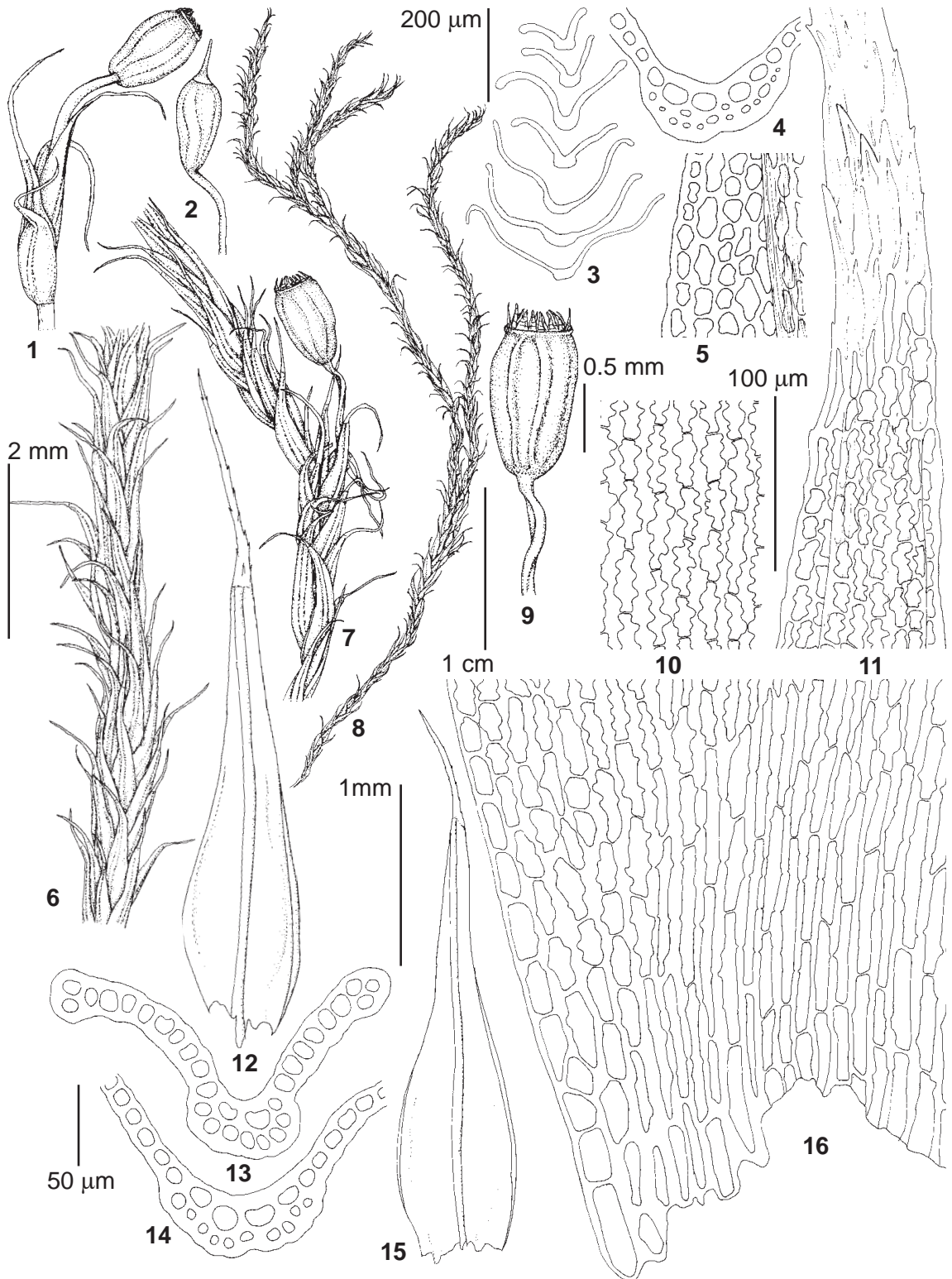


Fig.23. *Grimmia jacutica* Ignatova, Bedn.-Ochyra, Afonina & Muñoz (from holotype, Yakutia, 6.IX.1990, E.Akimova): 1-2, 7, 9 –capsules; 3-4, 13-14 – leaf transverse sections; 5 – upper leaf cells; 6, 8 – habit; 10 – median leaf cells; 11 – base of hair-point and upper leaf cells; 12, 15 – leaves; 16 – basal leaf cells. Scale bars: 1 cm for 8; 2 mm for 1-2, 6-7; 1 mm for 12, 15; 0.5 mm for 9; 50 μ m for 4, 13-14; 100 μ m for 5, 10-11, 16; 200 μ m for 3.

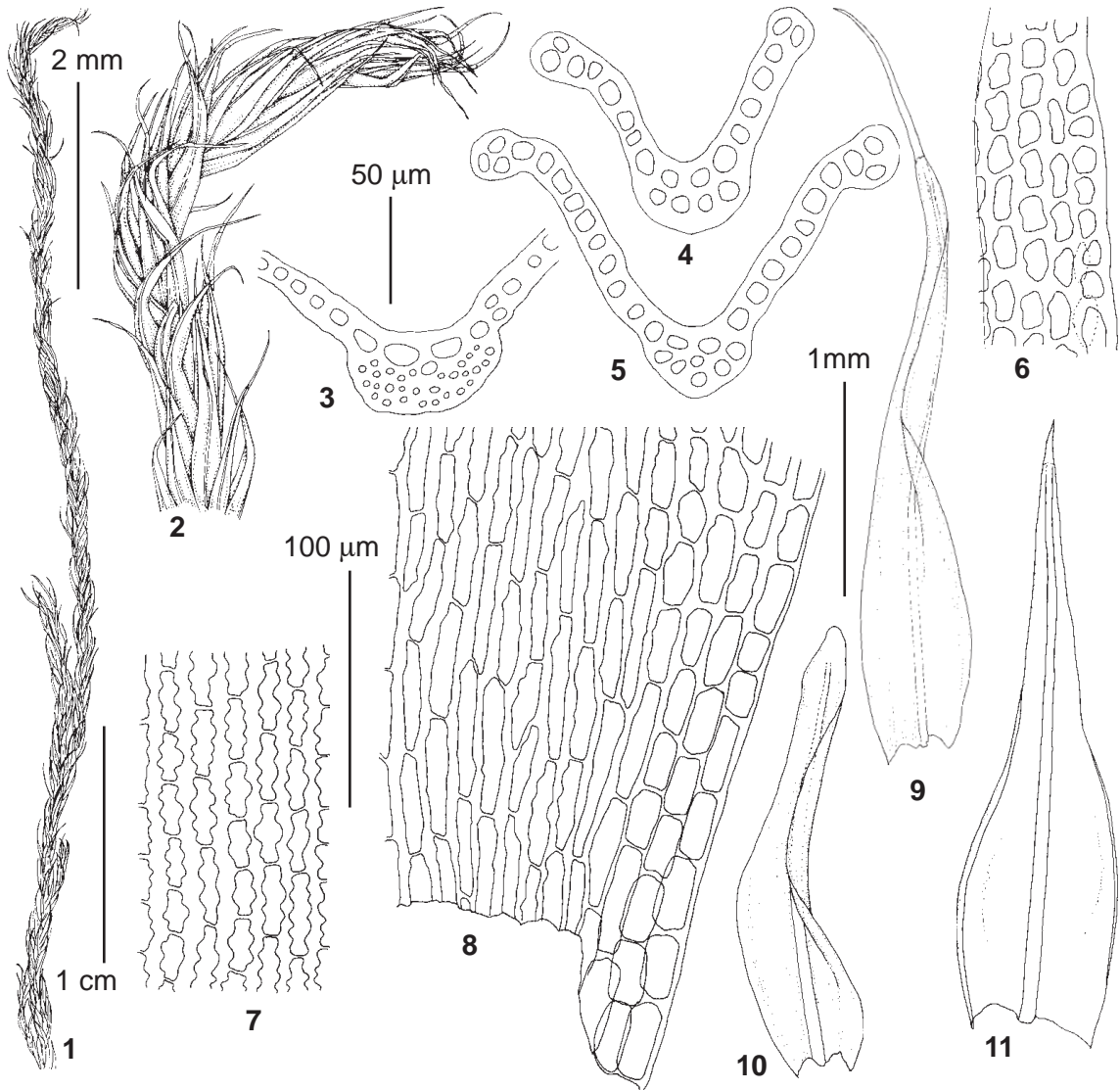


Fig.24. *Grimmia jacutica* Ignatova, Bedn.-Ochyra, Afonina & Muñoz (1-9 – from Chukotka, Yanrakynnot, 23.VII.1976, O.Afonina; 10 – from Yakutia, Tiksi, 21.VII.1979, V.R.Filin; 11 – from Amurskaya Province, 23.VII.1915, Prokhorov & Kuzeneva): 1-2 – habit; 3-5 – leaf transverse sections; 6 – upper leaf cells; 7 – median leaf cells; 8 – basal leaf cells; 9-11 – leaves. Scale bars: 1 cm for 1; 2 mm for 2; 1 mm for 9-11; 50 µm for 3-5; 100 µm for 6-8.

prominent dorsally, canaliculate ventrally, reniform in cross section, with 3-4(5) ventral epidermal cells, mostly bistratose, rarely 3(-4)-stratose; hyaline hair-points 0.1-1.2 mm long, mostly 0.5-0.7 mm long, terete distally, slightly widened and flattened at base, straight or weakly flexuose, often recurved when dry, slightly or moderately denticulate; lamina unistratose, bistratose in one cell row at margins; upper laminal cells short rectangular mixed with subquadrate, thick-walled, sinuose, 7-18×9-11 µm; median laminal cells elongate rectangular, 12-25(30)×(9)10-12 µm, with very strongly thickened and sinuose, pale longitudinal walls and very thin transverse walls; basal juxtacostal cells linear, 25-50(-90)×9-11 µm, strongly incrassate and porose,

basal marginal cells with thick and straight longitudinal and transverse walls. Dioicous. Male plants with smaller leaves, 2.0-2.3×0.5-0.7 mm, and shorter hyaline hair-points, 0.1-0.3(-0.5) mm long; perigonia numerous, terminal but becoming lateral after innovation growth. Sporophytes very rare (but perichaetia with not fertilized archegonia are frequent, terminal but becoming lateral after innovation growth). Perichaetial leaves similar to stem leaves, 2.2-2.7×0.5-0.7 mm, with longer hyaline hair-points, to 1.6 mm. Setae 1.8-2.0 mm long, arcuate when moist. Capsules exserted, ovoid, ca. 1.0×0.7 mm, ribbed; stomata at urn base. Annulus of affinis-type. Peristome teeth orange, finely papillose, entire, weakly perforated. Operculum

low conic, with long erect beak. Calyptrae not seen. Spores 13-18 μ m.

SPECIMENS EXAMINED: **SIBERIA: Krasnoyarsk Territory**, Taimyr, Taimyr Lake, Ledyanaya Bay, 22.VII.2004, #G5, G17, *V.Fedosov* (MW); Putorana Plateau, Kapchuk Lake, 3.VIII.1978, *Vilde* (LE); Putorana Plateau, Ayan Lake, 19.VII.1983, *I.Czernyadjeva* (LE); Evenkiya, Nizhnyaya Tunguska River, 20.VII.1932, *A.Rubin & I.Maskil'* (LE); Podkamennaya Tunguska River, 8.VIII.1994, #281, 282, *S.Sherbina* (MW); **Yakutia**, fl. Aldan, 1911, *Th.W. Sokolov* (H-Br); Aldanskij Distr., Nizhnij Nimnyr Village, 21.VII.1995, *E.Ivanova* (MHA); Aldanskij Distr., Uchur River, Chagda Village, 28.VII.1991, *E.Ivanova* (SASY, MW); Aldanskij Distr., Uchur River, Kurung-Khokhoe Aryt Island, 1.VIII.1991, *E.Ivanova* (SASY, MW); Aldanskij Distr., Uchur River near Sivalga River mouth, 23.VII.1991, *A.Protopopov* (SASY, MW); Aldanskij Distr., Ili River, 8.VII.1991, *E.Ivanova* (SASY, MW); Aldanskij Distr., Emeldjak Village, 6.IX.1991, *E.Tyrlgyna* (SASY, MW); Aldanskij Distr., Gynym River, 11.VII.1991, *A.Protopopov* (SASY, MW); Bulun Distr., Sokurdakh Mt., 2.VII.1960, *V.R.Filin* (MW); Bulun Distr., Tiksi, 21.VII.1979, *V.R.Filin* (MW); Kobyajskij Distr., Undyulyung River, 13.VI.1990, *A.Kazantsev* (SASY, MW); Kobyajskij Distr., Undyulyung River upper course, 12.VI.1990 & 14.VI.1990 *E.Nikolin* (SASY, MW); Kobyajskij Distr., Kele River at Kyunkyunyur Creek mouth, 29.VII.1987, *E.Nikolin* (SASY, MW); Kobyajskij Distr., Kyunkyunyur Peak, 30.VI.1987, *E.Nikolin* (SASY, MW); Kobyajskij Distr., Kele River at Kumkandra Creek mouth, 4.VIII.1987, *E.Nikolin* (SASY, MW); Kobyajskij Distr., Lyampushka River, 15.VII.2002, *E.I.Ivanova* (SASY, MW); Mirninskij Distr., Vilyuj River, 22.VII.1990, #1/6, *A.Isaev* (SASY, MW); Neryungri Distr., Tokinskij Stanovik, Utuk River, 24.VIII.1987, *K.Volotovskij* (SASY, MW); Neryungri Distr., Toko Lake, 10.VIII.1987, *K.Volotovskij* (SASY, MW); Suntarskij Distr., Chona River, Dyraj, 16.VII.1958, #8/2, 29/11 & 20/1, *V.Usanova* (SASY, MW); Suntarskij Distr., Vilyuj River at Lakhargaana Creek mouth, 12.VIII.1958, #101/7, *P.Kil'dyushevskij* (SASY, MW, LE, KRAM); Olyekminskij Distr., Choruoda River, 28.VII.1995, *K.K.Krivoshapkin* (MW); Tompo Distr., Tukuran River at Temirdaeeakh Creek mouth, 4-6.IX.1990, *E.Akimova* (SASY, MW); Tompo Distr., Tukuran River upper course, peak 1301 m, 3.IX.1990, *E.Akimova* (SASY, MW); Tompo Distr., Eastern Verkhoyan Mts., Eketchan River upper course, 23.VI.1956, #74/7, *L.Dobretzova* (SASY, MW); Tompo Distr., Eastern Verkhoyan Mts., Aemykchan River upper course, 13.VIII.1955, #89/3, *L.Dobretzova* (SASY, MW); Tompo Distr., Eastern Verkhoyan Mts., Barykchan River middle course, 29.V.1955, #24/11, *V.Ivanova* (SASY, MW); Tompo Distr., Verkhoyan Mts., Nulkasig River upper course, 27.VII.1956, #105/3, *V.Ivanova* (SASY, MW); Tompo Distr., Sette-Daban Range, 21.VI.1999, *E.I.Ivanova & K.K.Krivoshapkin* (SASY, MW); Tompo Distr., Suntar-Khayata Range, Kyurbyulyakh Creek, 17.VII.2003, *E.I.Ivanova & V.I.Zolotov* (SASY, MW); Tompo Distr., Suntar-Khayata Range, Nelyulyakh Creek, 14.VII.2003, *E.I.Ivanova & V.I.Zolotov* (SASY, MW); Ust-Maya Distr., Allakh-Yun, Tarbagannakh Creek, 25.VIII.2000, #00-350, *M.Ignatov* (MHA); Ust-Maya Distr., Allakh-Yun, Semenchi-Yuryakh Creek, 26.VIII.2000, #00-356, *M.Ignatov* (MHA); Ust-Maya Distr., Solnechnyj Village, 3.IX.2000, #00-355, *M.Ignatov* (MHA); Kobyajskij Distr., Undyulyung River

at Byrandja Creek mouth, 11.VII.1990, *E.Nikolin* (SASY, MW), 12.VII.1990, *E.Ivanova* (SASY, MW); Kobyajskij Distr., Sobolokh-Mayan River at Kuolanda Creek mouth, 26.VIII.1991, *B.Borisov & S.Kirillina* (SASY, MW); Kobyajskij Distr., Sobopol River, 2.VIII.1958, #70/8, *L.Dobretzova* (SASY, MW); **Buryatiya**, Khamney River upper course, 1912, #3730, *V.Smirmov* (LE); Baikal Lake, Bolshaya Cheremshanaya Creek, 23.VII.1956, *L.V.Bardunov* (IRK, MW); Eastern Sayan Mts., Mondy Village surroundings, 22.VIII.1960, *L.V.Bardunov* (IRK, MW); ad fontes fl. Chamkol, 1912, *V.Smirmov* (H-Br); distr. Troizkosavsk, prope fl. Chamneja, 1912, *V.Smirmov* (H-Br); Dzherginskij Reserve, 16.VII.2002, #19, *D.Tubanova* (UUH); **Chita Province**, Shilka River, Boty Creek upper course, 30.VIII.1963, *L.V.Bardunov* (IRK, MW); Naminga River, 1000 m, 31.VII.1989, *V.R.Filin* (MW); **FAR EAST: Amurskaya Province**, Zeya Nature State Reserve, 28.VIII.1979, #75, 2.V.1979, #358, 5.IX.1979, #128, *D.Petelin* (MW); 23.VIII.1980, #331, *L.I.Abramova* (MW), 22.VIII.1980, *N.Stezura* (LE); Bokongro Creek, 31.VII.1911, #186, *N.Prokhorov & O.Kuzeneva* (LE); fl. Zeja, Tukuringra, 21.VII.1910, 23.VII.1915, 1.IX.1915, *O.Kuzeneva* (H-Br); Seledzha Distr., Bryus Mt., 8.VIII.1976, *V.Ya.Cherdantseva* (VLA, MW); **Khabarovsk Territory**, Verkhnebureinskij Distr., Peak 1923 m, 3.VIII.1989, #89-M-52, 89-M-49, *B.Khasanov* (MHA); Lednikovjy Creek, 21.VIII.1987, *M.Galkina* (MHA); watershed of Lan & Balagankh Rivers, 24.VIII.1989, #89-M-224, *O.Grigorjeva* (MHA); Medvezh'e Lake, 10.VIII.1997, #97-195, 97-368, *B.Tan* (MHA); Medvezh'e Lake, 8-10.VIII.1997, #97-1107, 97-2002, 97-2006, 97-2013, *M.Ignatov* (MHA); Sovetskij Distr., Tumnin River, Aiga Mt., 15.IX.1945, *B.Kolesnikov* (LE); **Evreiskaya Autonomous Province**, Bastak Reserve, Bydyr Peak, 13.VIII.2000, *Rubzova* (VLA); **Primorskij Territory**, Oblachnaya Peak 1400-1855 m, 31.VII.1980, *V.Ya.Cherdantseva* (VLA); Sikhote-Alin Reserve, Zakharovky Creek, 11.VIII.1979, *I.A.Flyagina* (VLA); South Sikhote-Alin, Tskhamodynza Mt., 5.IX.1959, *V.M.Ponomarenko* (LE, MW); **Chukotka**, Yablou River, 9.VIII.1982, *O.M.Afonina* (LE, KRAM); Tanujrer River, Bezymjannoe Lake, 1.VIII.1978, 6-14.VII.1979, *O.M.Afonina* (KRAM, LE); Ilmyneiveem River, 1.VIII.1978, *O.M.Afonina* (KRAM, LE); Televeem-Pervaya River, 23.VII.1979, *O.M.Afonina* (KRAM, LE); Tanuyrer River, mouth of Kujviveemkej Creek, 10.VIII.1981 & 30.VIII.1981, *O.M.Afonina* (KRAM, LE); Anadyr River, Carvaljanskaya Creek, 23.VII.1982, *O.M.Afonina* (LE); Palajvaam River (Anadyr Ridge), 13 & 25.VII.1989, *O.M.Afonina* (KRAM, LE); Getlyanen River, 3.VIII.1976, *O.M.Afonina* (LE); Senyavin Strait, Arakamchechen Island, 11.VII.1976, *O.M.Afonina* (LE); Penkingei Bay, Peszovaya Creek mouth, 11.VII.1978, *Katenin* (LE); Senyavin Strait, vicinity of Yanrakynnot settlement, 20 & 23.VII.1976 *O.M.Afonina* (KRAM, LE).

Distribution. Recently described *Grimmia jacutica* is not rare in eastern Asian Russia, from Taimyr and Enissej River basin to Chukotka and Primorskij Territory, and also known from Alaska in North America. It is rather common in the montane areas of Yakutia. *Grimmia jacutica* occurs in a wide elevation range, from sea level to 1700 (-2100) m alt., in arctic tundrae and mountains, in the forest belt (larch, more rarely spruce forests)

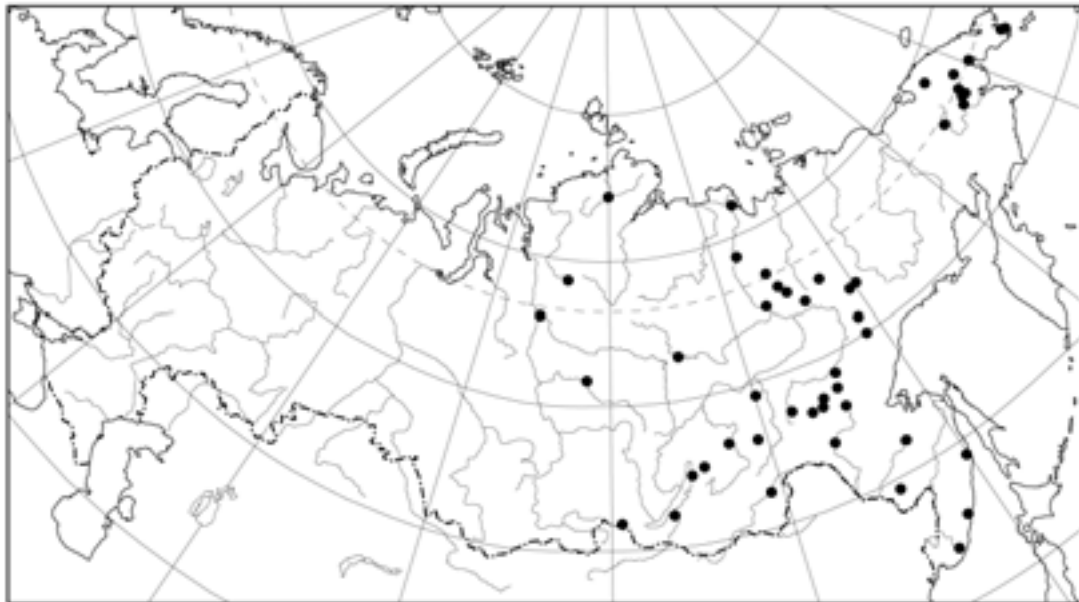


Fig. 25. Distribution of *Grimmia jacutica* Ignatova, Bedn.-Ochyra, Afonina & Muñoz in Russia

and in alpine tundra, mostly on rock-fields, on rocks and in crevices between them, usually in dry habitats; in arctic tundra also on soil.

Differentiation. Large plants and ribbed capsules on arcuate setae of *G. jacutica* resemble those of *G. elatior* (part of collections were placed in herbaria under the latter name), but it can be easily separated from the latter by weaker, mostly bistratose costa, reniform in cross section, with 3-5 ventral epidermal cells (vs. strong, 3-5-stratose, irregularly angular in cross section, with 2 ventral epidermal cells costa in *G. elatior*), unistratose leaf lamina, bistratose for only one cell row at margins (vs. mostly bistratose, 3-5-stratose at margins in *G. elatior*), upper laminal cells never papillose or bulging (vs. usually papillose and often bulging in *G. elatior*). Reniform costa is characteristic for *G. longirostris*, but this species differs in smaller plants, ca. 1-3 cm high, in dense cushions (vs. plants 4-5 cm high, in loose patches in *G. jacutica*), usually bistratose lamina in distal part of leaf (vs. always unistratose lamina, bistratose only in one cell row at margins in *G. jacutica*), hyaline hair-points terete (vs. widened and flattened at base in *G. jacutica*), and frequent sporophytes, cylindrical, smooth capsules on erect setae (vs. usually lacking sporophytes in *G. jacutica* and, if present, capsules ovoid, ribbed, on arcuate setae). The peculiar cell areolation of *G. jacutica*, composed of elongate rectangular cells

with pale, strongly incrassate and sinuose longitudinal walls and contrastingly very thin transverse walls resembles *Racomitrium* cell areolation. Furthermore, the apparently lateral perichaetia caused misidentification of many *Grimmia jacutica* collections, that were identified mostly as *Racomitrium sudeticum*. However, the sinuosity of the longitudinal walls in *Racomitrium* species is different, more regular, with smaller period of «sinusoid». *Racomitrium sudeticum* further differs from *G. jacutica* in lacking the large area of strongly incrassate, porose, not sinuose basal juxtacostal cells, and its often 3-stratose costa.

Several specimens from three coastal localities from extreme East of Chukotka and West of Alaska differ from other collections of *G. jacutica* in more robust plants with appressed leaves, straight hair-points and 3-4-stratose costa (Fig. 24). In other characters these specimens agree with *G. jacutica*. This species is not very variable, but in few populations the plants with very short or completely absent hyaline hair-points were found.

14. ***Grimmia laevigata*** (Brid.) Brid., Bryol. Univ. 1(1): 183. 1826. — *Campylopus laevigatus* Brid., Muscol. Recent. Suppl. 4: 76. 1818 [1819]. — *Grimmia campestris* Burchell ex Hook., Musci Exot. 2: 129. 1819. — *Grimmia leucophaea* Grev., Mem. Wern. Nat. Hist. Soc. 4: 87, pl. 6. 1822. Figs. 26, 27.

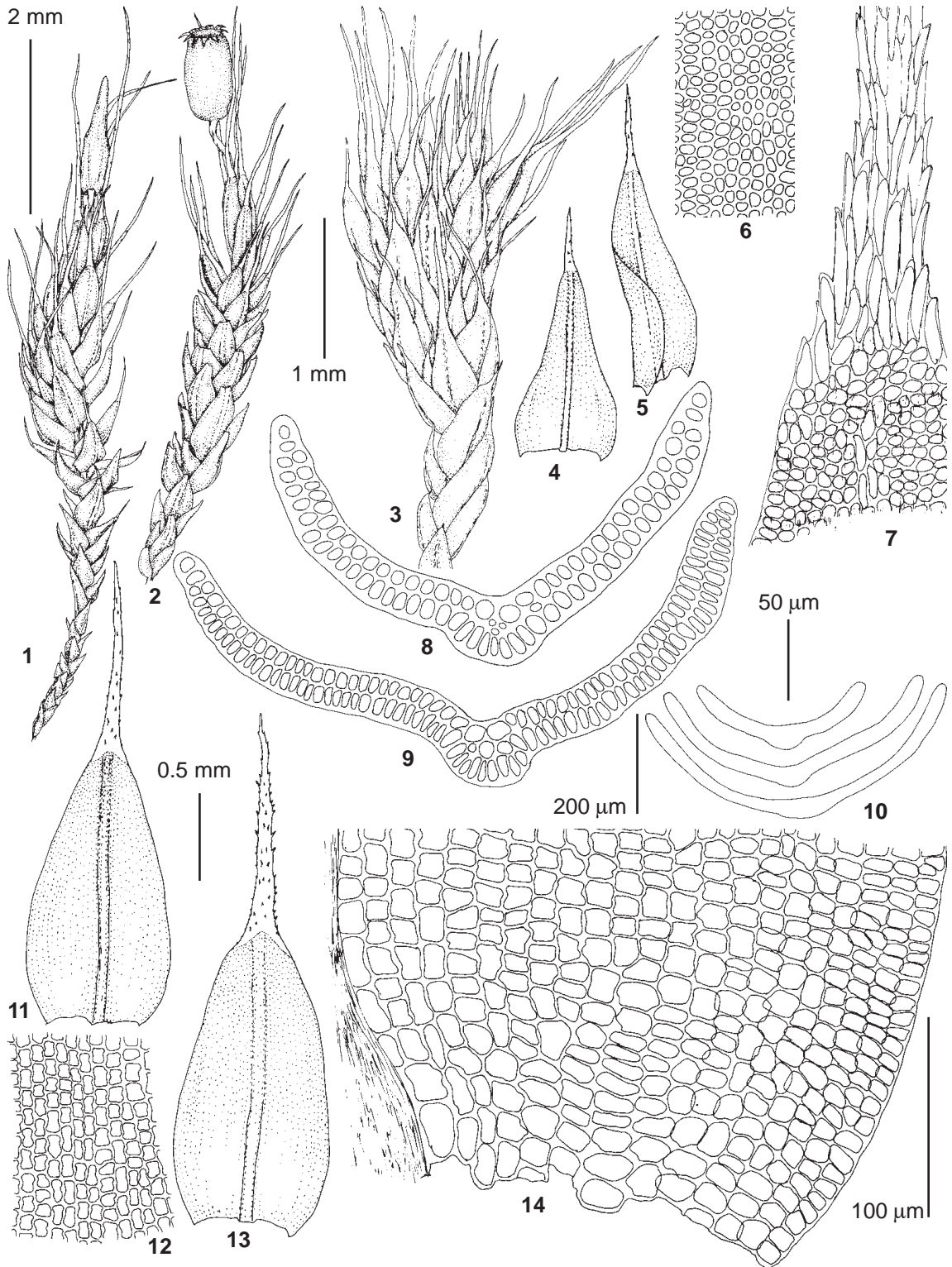


Fig. 26. *Grimmia laevigata* (Brid.) Brid. (1-2, 5, 11-13 - from Altai Republic, M.Ignatov, #35/11; 3-4, 6-10, 12, 14 - from Bashkortostan, E.Ignatova, #13/96): 1-3 - habit; 4-5 - lower leaves; 6 - upper leaf cells; 7 - base of hair-point and upper leaf cells; 8-10 - leaf transverse sections; 11, 13 - upper leaves; 12 - median leaf cells; 14 - basal leaf cells. Scale bars: 2 mm for 1-2; 1 mm for 3; 0.5 mm for 4-5, 11,13; 50 μm for 8-9; 100 μm for 6-7, 12, 14; 200 μm for 10.



Fig. 27. Distribution of *Grimmia laevigata* (Brid.) Brid. in Russia.

Plants in dense, easily separating tufts, dark green or blackish, usually very hoary. Stems erect, 1-2 cm long. Leaves gradually enlarged to the distal part of shoot, 1.5-2.0(-2.5)×0.5-0.7 mm, ovate-triangular, shortly acuminate to obtuse, widely concave, not plicate; margins plane; costa weakly differentiated distally, flat, semi-elliptic in cross section, (2-)4-6 cells wide ventrally, widened at leaf base; hyaline hair-points in upper and perichaetial leaves long (sometimes as long as lamina), terete distally, widened and flattened proximally, usually decurrent, sharply and densely denticulate; lamina bistratose in distal 2/3, with 1-2 marginal cell rows unistratose; upper cells isodiametric, 6-8µm, with moderately thickened walls, median cells short rectangular, slightly sinuose, basal juxtacostal cells short rectangular, slightly porose, basal marginal cells oblate mixed with quadrate. Dioicous, sporophytes very rare. Setae straight, 2-3 mm. Capsules emergent to exserted, oblong-cylindric, 0.7-1.0 mm long, smooth to wrinkled when dry. Operculum conic, rostrate. Annulus of affinis-type. Peristome teeth cleft distally, papillose. Spores 12-16µm. Calyptrae mitrate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Leningrad Province**, Vii pori [Vyborg], V.1875, *E.Lang* (H); **Orel Province**, Livny Distr., Navesnoe village, Kuzilinka, 28.VI.1999, *V.Zolotov* (MHA); **Lipetzkiy Province**, Stegalovka village, Svishnya Creek, «Kamennyj Les», 7.VI.1986, *N.N.Popova* (MHA); **Orenburg Province**, Belyaevskij Distr., Burlykskij, 20.V.1990, *N.Shevyreva & T.Konovalova* (MHA); **Volgograd Province**, Kletskij Distr., Kremenskaya, 7.VIII.1999, *Ignatov* (MHA); **Astrakhan' Province**, Bogdo, Krasnaya balka, 9.V.1997, *I.Zemlyanskaya* (MHA); Kalmykia, Calon-Khomur, 18.IX.1924, *K.Beguckow* (LE); **CAUCASUS:** **Dagestan**,

prope pagum Tanti, 19.VII.1898, *Th.Alexeenko* (LE); Distr. Samur, pr.p.Fija, 19.VIII.1900, #9256, *Th.Alexeenko* (LE); between Derbent & Khuchni, 22.VI.1961, *A.Bobrov* (LE, MW); Bujnask Distr., Kafyrkumukh Ridge, near Kafyrkuukh Rv. St., 28.IX.1956, *Ya.Prokhanov* (LE, MW); **Kabardino-Balkaria**, Sovetskij Distr., Bezengi Gorge, 6.VII.1988, #46, *N.Portenier* (MHA); Baksan River at Adyl-Su Creek mouth, 30.VII.2004, *Ignatov & al.* (MHA); Baksan River near Bylym, 30.VII.2004, *Ignatov & al.* (MHA); Baksan River near Lazhkuta, 30.VII.2004, *Ignatov & al.* (MHA); Cherek Bezengijskij River near Dumala Creek mouth, 1.VIII.2004, *Ignatov & al.* (MHA); **North Ossetia**, Lars ad fl. Terek, *V.F.Brotherus* (H-BR); Kobi ad fl. Terek, *A.H. & V.F.Brotherus* (LE); **Karachaevo-Cherkessia**, Teberda Reserve, Ullu-Murudzhu Gorge, 9.VIII.1986, *Ignatova* (MW); Dzhemagat Gorge, 10.VII.1994, #29/94, *Onipchenko* (MW); Mukhu Gorge, 17.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE, MW, MHA); M.Khati para Gorge, 2.VII.1994, #2/94, *Onipchenko* (MW); Malaya Khati para Gorge, 10.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE, MW); Malaya Khati para Mt., 22.VII.1977, *Onipchenko* (MW); Nizhnyaya Teberda, 3.VII.1994, #6/94, 7/94, 8/94, *Onipchenko* (MW); Kuban' River upper course, 21.VIII.1955, *V.V.Skripchinskij* (LE); **Krasnodar Territory**, Malaya Laba River basin, Sergiev Gaj Ridge, 26.VI.2003, *T.Akatova* (CSR, MHA); **URALS:** **Bashkortostan**, Khajbullinskij Distr., Shajntantau Range, Usergan, 19.VI.1991, #21, *A.Muldashev* (MHA); Uchaly Distr., Komsomol'skij, Irendyk Range, 4.IX.1990, *Ignatova* (MHA); Beloretzk Distr., Bretyak, 12.IX.1990, #13/24, 13/96, *Ignatova* (MHA); **Chelyabinsk Province**, Magnitnaya Mt., 21.VI.1929, *V.Korzhevin & I.Blumental* (LE); **SIBERIA:** **Altai Republic**, Chagan-Uzun, 23.VII.1996, *L.V.Bardunov* (MHA); Chuya River, #B-65166, *T.S.Elias & al.* (NY); Malyj Yaloman, 30.VII.1991, #25/145, *Ignatov & Ignatova* (MHA); Saratan, 4.VIII.1993, #36/349, *Ignatov* (MHA); Chulcha River, Nepristupnyj waterfall, 10.VII.1991, #9/163, *Ignatov* (MHA); Charysh River, 11.VII.1913, #1928, *N.I.Kuznezov* (LE); Ust-Sema,

29.VI.1991, #24/151, *Ignatov & Ignatova* (MHA); Teletzkoe Lake, Izvestkovaya Mt., 12.VI.1989, #0/945, *Ignatov* (MHA); Teletzkoe Lake, Kobykhta, 12.VI.1989, #0/462, *Ignatov* (MHA); Gorno-Altai, 18.VII.1993, #35/11, *Ignatov* (MHA); Gorno-Altai, 26.VII.1991, #23/13, 23/14, *Ignatov* (MHA); **Krasnoyarsk Territory**, Western Sayan Mts., Malaya Ury Creek, 1.VIII.1968, *L.V.Bardunov* (IRK); Minussinsk, 9.VII.1894, #84, *N.Martianov* (H-Br, LE); **Irkutsk Province**, lacus Baikal, supra pagum Bolshie Koty, *L.Pujmanova* (ALTA).

Distribution. *Grimmia laevigata* is known from xeric areas throughout the world, including Europe, Africa, Middle East, China, Mongolia, North and South America, Australia, New Zealand, Oceania. In Russia the species is rather common in xeric areas of the Caucasus; scattered localities are known from steppe and forest-steppe zones of European Russia and South Urals, it is sporadic in Altai Mts., and few collections were made in Western Sayan Mts. and Baikal Lake surroundings. It grows on exposed, dry, mostly non-calcareous rocks.

Differentiation. *Grimmia laevigata* is almost always found in Russia in sterile condition (plants with sporophytes were found only once in Altai Mts.). Gametophyte characters of *G. laevigata* are very similar to that of *G. tergestina* or *G. poecilostoma*, species also rarely forming sporophytes. The main diagnostic characters of *G. laevigata* are oblate and not translucent basal marginal cells (vs. short rectangular and quadrate, translucent basal marginal cells in *G. tergestina*, *G. poecilostoma*, and also *G. ovalis*). *Grimmia laevigata* differs from all these species in mostly triangular lower leaves, much more distinctly enlarged to the proximal part of shoot (lowermost leaves are scale-like, with very short hyaline hair-points), and usually longer and more dentate hyaline hair-points.

15. ***Grimmia longirostris*** Hook., Musci Exot. 1: 62. 1818. — *Grimmia affinis* Hoppe et Hornsch. in Hornsch., Flora 2: 85, 443. 1819. — *Grimmia ovata* auct. non Web. et Mohr. — *Grimmia cavifolia* Lindb. et Arnell, Kongl. Svenska Vetenskapsakad. Handl. 23(10): 103. 1890. Figs. 28, 29.

Plants in dense cushions or in dense to loose tufts, olive-green, yellowish-green or dark green to blackish, moderately hoary or sometimes very hoary. Stems erect, 1-3 cm long. Leaves loosely appressed and slightly flexuose when dry, 1.3-2.0(-2.5)×0.4-0.7 mm, from ovate base gradually tapering into lanceolate acumen, acuminate, obtusely keeled distally; margins plane in distal part of leaf, recurved at one side in

proximal and middle part and plane or shortly and narrowly recurved on the other side, more rarely recurved on both sides; costa weakly differentiated in distal 1/3, clearly differentiated from the middle part of leaf to the base, prominent dorsally, canaliculate ventrally, reniform in cross section, with (3-)4-6(-8) ventral epidermal cells; hyaline hair-points from short to rather long (very rarely absent), terete, straight to slightly flexuose, denticulate, not decurrent; lamina (1-)2(-3)-stratose in distal 1/3, unistratose with bistratose strips in middle part, unistratose at base; upper laminal cells isodiametric, 8-10 µm, with moderately thickened and slightly sinuose walls, median laminal cells short rectangular, with sinuose walls, basal juxtacostal cells elongate rectangular, with thickened, porose walls, becoming shorter to the margin, basal marginal cells rectangular, pellucid, with thin longitudinal and thick transverse walls (sometimes basal marginal cells or almost all basal cells are short rectangular to quadrate). Autoicous, androecia terminal, sporophytes frequent. Setae 2-4 mm, straight. Capsules exserted, ovoid-cylindric, 1.2-1.5(-2) mm long, smooth. Operculum low conic, with short to long obtuse beak, straight or oblique. Annulus of affinis-type. Peristome teeth orange, densely papillose, cleft or perforated distally. Spores 8-12 µm. Calyptrae cucullate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA: Murmansk Province**, Salla, 21.II.1937, *Vaarama* (H); Lapponia Murmanica, Varsina, VIII.1887, *V.F.Brotherus* (H); Kola, 17.VII.1867, *Fellman* (H); Petsamo Lappmark [Rybachij Peninsula], 15 & 19.VII.1937, *Hayren* (H); Khibiny Mts., Kuelpor, 5.IX.1948, #2305b, *Schlyakov* (LE); Lapponia Imandrae, ad lacum Umpjawr, 17.VII.1892, #607, *Kihlman* (LE); Kandalaksha Bay, Kem'-Ludskij Island, 12-15.VIII.1989, #102-7-89, 188-7-89, 188-2-89, *Belkina & Likhachev* (KPABG); Velikij Island, 20.VIII.1992, #69-4-92, 71-15-92, *Likhachev* (KPABG); Ryazhkov Island, 3-4.VIII.1988, #371/4, 391-12-88, *Shlyakov* (KPABG); Olenij Island, 26-30.VII.1988, #19/20, 239/2, 307/6, 307/12, 319/15, *Belkina & Likhachev* (KPABG); Ponoj, 29.VII.1972, #329, *Shlyakov* (KPABG); Kovdor, 13.VII.1977, #120, *Shljakov* (MHA); Pyukhyakuru Gorge, 5.VIII.1986, #27/27, *Belkina & Likhachev* (KPABG); Khibiny Mts., Lovchorr, Pirrotinovee Gorge, 9.VIII.1948, #207, *Schlyakov* (LE); Aikuaivumchorr, 23.VI.1948, #1520, *Schlyakov* (LE); Rasvumchorr Mt., 17.VIII.1977, #1171, *Shljakov* (KPABG); Kukisvumchorr, 25.VII.1947, #572, 4.VIII.1948, 1976, *Schlyakov* (LE); Kukisvumchorr, 4.IX.2001, *Ignatova* (MW); Vudjavrchorr, 17.VII.1947, #253, #RS-53-47, *Shlyakov* (LE); Yukuksporlak Pass, 30.VI.1948, #1608a, *Schlyakov* (LE); Chiltald Mts., Malaya Konjya Mt., 11.VII.1988, #207-6-88, *Belkina* (KPABG); Chil' Stream, 9.VII.1988, #171-5-88, *Belkina* (KPABG); Lavna-Tundra Mts., 10.VIII.1987, #333-7-87, 333-2-87, 333-12-87, *Belkina* (KPABG); **Karelia**, Petrosavodsk, 1863, *Simming* (LE); Suojarvi, 20.VI.1870, *Norrlin* (H); Ladoga Lake, 21.V.1890, *Birulya* (LE); Sandal Lake, 11.VII.1920, 15.VII.1920, 18.VIII.1920, *L.I.Savicz* (LE); Selgozerov, 1.VII.1921, *L.I.Savicz* (LE); Ruhajarvi, Seesjarvi, Vilsjarvi,

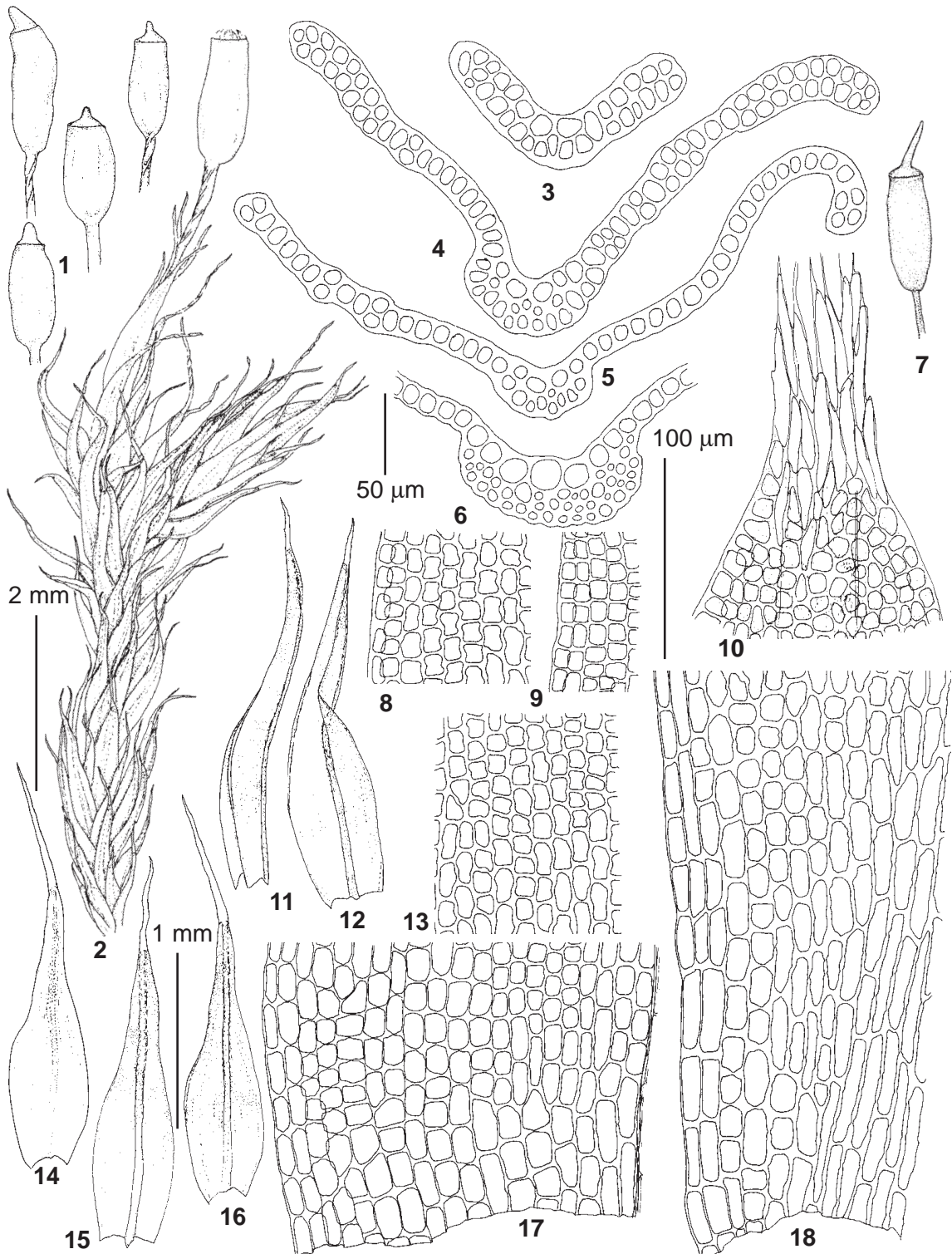


Fig. 28. *Grimmia longirostris* Hook. (1-2, 8 – from Perm Province, A. Bezkodov, # 144; 3-6, 9-16, 18 – from Perm Province, A. Bezkodov, #378; 7 – from Tuva Republic, 9.IX.1999, T. Otnyukova; 17 – from Ekaterinburg Province, 1.VII.1999, I. Goldberg): 1, 7 – capsules; 2 – habit; 3-6 – leaf transverse sections; 8-9 – upper leaf cells; 10 – base of hair-point and upper leaf cells; 11-12, 14-16 – leaves; 13 – median leaf cells; 17-18 – basal leaf cells. Scale bars: 2 mm for 1-2, 7; 1 mm for 11-12, 14-16; 50 µm for 3-6; 100 µm for 8-10, 13, 17-18.

- 11.II.1942, *Huuskonen* (H); Ontojarvi, 14.V.1942, *Huuskonen* (H); Tolvuya, 16.VII.1969, #079, *Volkova* (LE); White Sea, Sidorov Island, 13.VIII.1998, *Maksimov* (PTZ); Paanajarvi, 19.IV.1990 & 25.VI.2003, *Maksimov* (PTZ); Lendery, 10.VIII.2003, #L-03/52-48a, *Maksimov & Maksimova* (PTZ); Elmozero, 11.VIII.2000, #6-72, *Maksimov & Maksimova* (PTZ); Kindasovo, 24.V.1995, #207, *Maksimov & Maksimova* (PTZ); **Leningrad Province**, St. Andrae [=Kamennogorsk], 6.VI.1888, *Linden* (H); [Vyborg], in saxo horti Monrepos, 6.VIII.1851, *Nylander* (H); St.Iohannes [=Sovetskij], 11.IX.1895, *H.Lindberg* (H); Raisala [=Melnikovo], 20.VI.1888, *Linden* (H); **CAUCASUS: Kabardino-Balkaria**, Agashtan, Dorbunla-aly, 23.VII.1925, *E. & N.Bush* (LE, MW); Balkarskij Cherek gorge, 19.VII.1925, *E. & N.Bush* (LE); Bezengi Gorge, Mizhgiri glacier, 23.VII.1987, #1988A, *N. & E.Portenier*, 27.IX.1986 (MHA); **North Ossetia**, North Ossetian Reserve, 19.VII.1976, 21.07.1976, 31.VII.1976, 9.VII.1977, 24.VII.1977, 25.VII.1979, *L.I.Abramova* (MW); ad glacier Zei, #1897, *Tkheschelaschwili* (H-Br); fl.Ardon, 1881, *V.F.Brotherus* (H-Br); ad mare glaciale Zei, VIII.1881, *V.F.Brotherus* (H-Br); **Karachaev-Cherkessia**, Urup River basin, Chapal 2nd Range, 11.VIII.1945, *Shiffers* (LE); Ullukama Gorge (Kuban upper course), 8.VIII.1979, #3/5, *Gogina* (MHA); Uzunkol, 5.IX.1988, *Bochkin* (MHA); Teberda Reserve, Ullu-Murudzhu, 7-9.VIII.1986, *Ignatova* (MHA); Goral-y-Kol, 13.VIII.1986, *Ignatova* (MHA); Teberda River, 1.VIII.1986, *Ignatova* (MHA); M.Khati para Gorge, #10/94, 174/96, *Onipchenko* (MW); M.Khati para Gorge, 2-3.VIII.1986, *Ignatova* (MHA); Kyschkadzher Gorge, 10.VII.1994, 38/94, *Onipchenko* (MW); Azgek River, 17.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE, MW); Mukhu Gorge, 17-18.VIII.1955, *A.L.Abramova* (LE, MW); Shubaidai-Chat Gorge, 31.VII.1994, #139/94, *Onipchenko* (MW); 22.VII.195, *E.Z.Baisheva* (LE); Ishimbaj Distr., Uryuk River, 19.VI.2001, #13-192, *V.I.Zolotov* (MHA); **Krasnodar Territory**, Malaya Laba River basin, Armovka Mt., 21.VII.1997, *Akatova* (CSR); Tryu-Yatyr-gvarta Mts., 16.VII.1997, *Akatova* (CSR, MHA); **Adygeya**, Belaya River basin, Abago Mt., 15.VII.1986, 10-12.VII.1988, 15.VII.1986, *Akatova* (CSR, MHA); **URALS: Komi Republic**, Kozhinskij Distr., Nyadokota River, 21.IV.1956, *Kil'dyushevskij* (LE); ad mont. Jegenni Pai., 2.VIII.1905, *Pohle* (LE); **Pern Province**, Basegi Reserve, Yuzhnyj Baseg, First, 9.VI.1994, #788, *Ignatov & Bezgodov* (MW), 22.VI.1993, #255, *Bezgodov* (MW); Vishera Reserve, Kuryksar Range, 24.VI.1995, #338, *Bezgodov & Selivanov* (MW); Kuroksarskij Kamen, *P.Krylov* (LE); Vishera Reserve, Olkhovka Creek, 26.VI.1994, #131, 144, 120, 121, *Bezgodov* (MW); Vishera Reserve, Moiva River, 5.VII.1994, #378, 373, *Bezgodov* (MW); **Sverdlovsk Province**, Iset River, Beklemishevo, Revun rapids, 1.VII.1999, *Goldberg* (SVER); Sysert river, 6-10.VII.1997, 19.VIII.1998, *Goldberg* (SVER); Cherdantzevo Village, 27.VI.1997, *Goldberg* (LE); Dvurechensk, 18.VII.1995, *Goldberg* (SVER); Ekaterinburg, pr. riv. Kamenka, #14, *Navashin* (LE); Ekaterinburg Sity, Shartashskie kamennye palatki, 13.VI.1953, #33, *Gorchakovskij* (LE, MW), 3.X.1996, *Goldberg* (SVER, MW); Severka Rv. Station, 12.V.1953, #50, 65, *Gorchakovskij* (LE, MW); Chusovaya River, Sobachyi Rebra, 2.VII.1998, *Goldberg* (SVER); Pershino, 23.VII.1996, *Goldberg* (SVER); Rezh River, Samotsvety, 31.VII.1981, *Chernogorodova & Dyachenko* (SVER); Koptelovo Rv. Station, 24.VII.1982, *Dyachenko* (SVER); Denezhkin Kamen Mt., 26.VII.1996, *Dyachenko* (SVER); **Bashkortostan**, Uryuk River, 19.VI.2001, #13-222, *Zolotov* (MHA); Bashkirskij Reserve, Ural-tau, 19.IX.1946, 1.IX.1946, 23.VI.1948, #2896, #2055/c, 4690, 4694, *Selivanova-Gorodkova* (LE); South Kraka, 9-10.VII.1946, #110, #6210, *Selivanova-Gorodkova* (LE); Breyak, 12.IX.1990, #13/110, 13/37, 13/6, *Ignatova* (MHA); Tlyashevo, 21-22.VI.1997, #47, 217, *Solomeshch* (MW), 22.VI.1997, #44/67, 37, *Muldashev* (MW); Kara-Tash Mt., 8.VI.1990, #13, *Muldashev & Galeeva* (MHA); Bash-tau, Bolshoj Shatak Mt., 11.VIII.1946, 19.VII.1948, #1540/c, 5416, *Selivanova-Gorodkova* (LE); Murakaev, 18.VI.1997, #18, *Muldashev* (MW); Bulanusher Mt., 19.VI.1997, #26, *Solomeshch* (MW); Mashak Range, 11.VII.1997, #13, *Solomeshch* (MW); Kobeya Mt., 7.VII.1998, #27, #55, *Muldashev* (MW); Malyj Iremel Peak, 30.VIII.1990, #3/15, #3/14, *Ignatova* (MHA); Zuyakovo, 22.VII.1995, *Baisheva* (LE); **Chelyabinsk Province**, Satka Distr., B.Nurgush Mt., 16-20.VIII.1997, #73, #74, #40, *Kulikov & Balandin* (MW); Myass, Ilmenskij Reserve, 4.IX.1990, #4/2, #4/7, *Ignatova* (MHA); Miass surr., Chashkovskij Range, 29.VIII.1927, *Tyulina* (LE); Miass, Ilmen Mt., *Tyulina* (LE); **SIBERIA: Tyumen Province**, Berezovo Distr., Polja River, 30.VIII.1950, #81/16, *I.D.Kil'dyushevskij* (LE); Berezov Distr., Lyapin River basin, Sarakappyer Mt., 13.VIII.1950, #54/7, *Kildyushevskij* (LE); Sob River, #53, *Czernyadjeva* (LE); Berezov Distr., Khadyta-Shchuchya watershed, 23.VI.1909, #147, *Sukachev* (LE); Junto Lake, #8, *Czernyadjeva* (LE); **Altai Republic**, jug. Narymj, pr. p. Altajskaya, 22.VI.1899, *Ladygin* (H-Br); Bortyl'dag & Kair Rivers watershed, 25.VII.1903, *P.Krylov* (H-Br, LE); watershed of Soyen-Chadyr & Ak-Kem, 25.VII.1903, *P.Krylov* (H-Br, LE); between Shebalino & Topuchaya, Kumalyr River, 22.VI.1903, *P.Krylov* (H-Br, LE); Chibilik River, 24.VI.1903, *P.Krylov* (LE); fl. Aigulak, 3.VII.1903, *P.Krylov* (H-Br); Ak-Kem, 26.VII.1903, *P.Krylov* (H-Br); fl.Argut, 23.VII.1903, *P.Krylov* (H-Br); Ak-Turu River, 12.VII.1908, *Vereshchagin* (LE); 14.VI.1907, *Vereshchagin* (LE); Yustyd, 2.VII.1907, #632, *Vereshchagin* (LE); Tyekta, 1.VII.1908, #876, *Vereshchagin* (LE); Manzhherok, 22-25.VII.1908, *Tyumentzeva* (LE); Katon Karagai, Narymskij Range, 2-22.VII.1919, *Vereshchagin* (LE); Shebalino, 6.VII.1909, *P.Kurskij* (H-Br); Inya Glaciers, 16.VII.1913, #2357, *Kusnezov* (LE); Anujskij trakt, Svetlaya River, 22.VI.1911, *Nekrasova* (LE); Tschuja Alpen, 20.VIII.1915, *J.Grano* (H-Br); Sajlyugem Range, Sartemot River valley, 10.VIII.1926, #18, *Baranov* (H-Br, LE, MW); Sajlyugem Range, Boguty Lake, 30.VII.1926, #182, *Baranov* (LE); Kostakhtha River, 4.VII.1931, *B.Schischkin & al.* (LE); Kurkure River, 23.VII.1931, *B.Schischkin & al.* (LE); Chulyshman, 4.IX.1931, *B.Shishkin* (LE, MHA); Teletzkoe Lake, Kyrasai Creek, 7.IX.1931, *B.Schischkin* (LE); Shebalino surroundings, 15.V.1947, *Palamarchuk* (LE, MW); Ak-Turu, 18-19.VII.1966, *L.V.Bardunov* (IRK); Chuya River, 16.VII.1966, *L.V.Bardunov* (IRK); Chiket-Aman pass, 27.VII.1966, *L.V.Bardunov* (IRK); Kyga Creek, 20.IX.1977, *Barashkova & al.* (MHA); Kosh-Agach, Tabozhok Creek, 29.VII-7.VIII.1992, #30/8, 30/9, 30/43, *Ignatov* (MHA); Kokorya Creek, 2.VIII.1992, #32/5, *Ignatov* (MHA); Kosh-Agach, Tabozhok Peak, 30.VII-1.VIII.1992, #31/6, 31/7, 31/9, 31/11, 31/79, *Ignatov* (MHA); Tokpak Creek, 23.VII.1993, #36/275, *Ignatov* (MHA); Uzuntytygem Creek, 24.VII.1993, #36/350, *Ignatov* (MHA); Karakem River, 18.VI.1989, #0/477, *Ignatov* (MHA); Bogoyash

- Creek, 27.VII.1993, #36/330, *Ignatov* (MHA); 18.VI.1986, 17.VI.1989, *Zolotukhin* (MHA); Tura Creek, 2.VIII.1991, #28/1, *Ignatov & Ignatova* (MHA); Malyj Yaloman, 30-31.VII.1991, #21/8, 23/130, 25/8, 25/59, 25/71, 25/86, 25/129, *Ignatov & Ignatova* (MHA); Karakem Creek, 18-25.VI.1989, #0/732, #0/472, 0/931, 0/921, 0/922, 0/923, 0/928, *Ignatov* (MHA); Kobiguayuk - Ayulyuyuzuk watershed, 15.VI.1989, #0/924, *Ignatov* (MHA); Kobiguayuk Creek, 14-18.VI.1989, #0/728, 0/730, 0/463, *Ignatov* (MHA); Chulyshman River, Berekhtuyaryk, 26.VI.1989, #0/731, 0/473, 0/920, *Ignatov* (MHA); Chulyshman River, Chodro, 14.VI.1989, #0/935, *Ignatov* (MHA); Chulyshman River near Yazula, 25.VI.1989, 0/916, 0/925, *Ignatov* (MHA); Ulagan, 5.VIII.1993, #36/103, *Ignatov* (MHA); Shapshal Range, Tashkalykaya Mt., 14, 19.VII.1990, *N.Zolotukhin* (MHA); Yakhansoru Lake, 26.VI.1990, *N.Zolotukhin* (MHA); Shavla Creek, Oimok, 8.IX.1987, *N.Zolotukhin* (MHA); Uzunoyuk Creek, 9.VII.1990, *N.Zolotukhin* (MHA); Seminskij pass, 15.VI.1966, *L.V.Bardunov* (IRK); Kurkure Range, Kayakkatiyarykskij Creek, 28.VI-8.VII.1991, #3/14, 3/39, 3/67, 3/100, 3/102, 3/103, 3/111, 3/132, 3/141, 3/183, 3/247, 3/273, 3/275, 3/290, 4/27, 6/36, 7/32, 7/82, 7/128, 7/136, 8/18, 8/96, 8/147, 8/149, 8/153, 8/154, 8/178, 8/275, 8/284, 8/301, 8/307, 8/328, *Ignatov* (MHA); Buguzun Creek, 19.VIII.1993, *V.N.Pavlov* (MHA); Artyshtu Creek, 20.IX.1989, *N.Zolotukhin* (MHA); Aedigan, 7.VII.1993, #34/126, 34/168, *Ignatov & Ignatova* (MHA); Chulcha River, 11.VII.1991, #9/11, 9/30, 9/37, 9/48, 9/166, *Ignatov* (MHA); Katun River near Bijka creek mouth, 10.VII.1993, #34/219, *Ignatov & Ignatova* (MHA); Aedigan Creek, 8.VII.1993, #34/218, *Ignatov & Ignatova* (MHA); Tamanel Peak, 8.VII.1993, #34/190, *Ignatov & Ignatova* (MHA); Bardaky Lake, 14.VII.1991, #11/8, *Ignatov* (MHA); Syrjyaz, Arsoek Creek, 16.VIII.1986, *E.Koroлева* (MHA); Kayra-bazhi Peak, 14.VII.1991, #13/32, 13/61, 13/79, *Ignatov* (MHA); between Kayra-bazhi Peak & Bardaky Lake, 14.VII.1991, #13/96, 13/122, *Ignatov* (MHA); Kayra River, 17.VIII.1991, #15/36, *Ignatov* (MHA); Kuyakhtonary, Sykhoy Log, VIII.1973, *I.A.Palamarchuk* (MHA); Kolyushka Mt., 27.VII.1982, *Zolotukhin & Kosheleva* (MHA); Chemal, 5.VIII.1991, 7.VII.1993, #29/41, 34/12, *Ignatov & Ignatova* (MHA); Teletzkoe Lake, Chiri, 13.VI.1989, 19.VII.1991, #0/950, 17/43, 17/48, 17/54, 17/80, *Ignatov* (MHA); Chemal, 12.VI.1909, *V.I.Vereshchagin* (LE); Elekmonar Creek, 2.VIII.1991, #28/12, *Ignatov & Ignatova* (MHA); Tura Creek, 2.VIII.1991, #28/52, *Ignatov & Ignatova* (MHA); Izhon, 10.IX.1931, *B.Schischkin* (LE); Ust-Sema, #B-65190, *T.S.Elias & al.* (NY); Barangol, 14.VII.1966, *L.V.Bardunov* (IRK); Ust'-Sema, 28-29.VII.1991, #24/51, 24/61, 24/74, *Ignatov & Ignatova* (MHA); Teletzkoe Lake, Bele, 3.VII.1989, #0/926, *Ignatov* (MHA); Teletzkoe Lake, Kumzir, 24.VII.1991, #20/11, *Ignatov* (MHA); Teletzkoe Lake, Yailyu, 1.VI.1989, #0/918, 0/919, 0/929, 0/932, 22.VI.1991, 1/43, *Ignatov* (MHA); Teletzkoe lake, Yurga, 24.VII.1991, #1/13, *N.Zolotukhin* (MHA); Teletzkoe Lake, Kamga Creek, 5.VI.1989, #6/933, *Ignatov* (MHA); Kayra Creek, 11.IX.1987, *N.Zolotukhin* (MHA); **Kemerovo Province**, Novokuznetsk Distr., Lower Tera' River, Zayach'ya Mt., 29.VII.1971, *A.Vasiljev* (IRK); Tisulskij Distr., Kiya River, Makaraskij settlement, 5.IX.1971, *A.Vasiljev* (IRK); Tisul Distr., Apataga Mt., 9.IX.1971, *A.Vasiljev* (MHA); Tashtagol Distr., Pustag Mt., 20.IX.1970, *A.Vasiljev* (IRK); **Krasnoyarsk Territory**, Jenisei, Antziferova, 27.VI.1876, #236B, *H.W.Arnell* (H-SOL); Jenisei, Antziferova, *H.W.Arnell*, #273A (H-SOL); Jenisei, Dudinka, *H.W.Arnell*, #237B (H-SOL); Krasnojarsk, 11.VI.1876, *H.Arnell* (H-SOL), lectotype of *G.cavifolia*; H-Br, isotype of *G.cavifolia*; Minussinsk, V.1888, *N.Martianoff* (sub. *G.cavifolia*) (H-Br); Enissejsk Distr., Karabuly River, 3.IX.1908, #899, *J.V.Kuznezov* (H-Br, LE); Dudinka River, 20.VII.1914, #1150, *N.Kusnezov & W.Reverdatto* (LE); Turukhansk Distr., Bakhta River, Keteollo Lake, 11.VIII.1992, #85, *S.Szherbina* (MW); Podkamennaya Tunguska, Shumikha Creek, 10.VII.1994, #291, *S.Szherbina* (MW); Taimyr, Taimyr Lake, Ledyanaya Bay, 6-28.VII.2004, #G1, G8, G10, G16, G21, *V.Fedosev* (MW); Putorana Plateau, Bucharama Mt., 19.VII.1978, *R.Vilde* (LE); Putorana Plateau, Nyakshin Lake, 21.VII.1969, #47, *V.Kuvaev* (MW); Putorana Plateau, Beldunchana Lake, 26.VII.1971, 2.VIII.1971, 4.VIII.1971, *L.V.Bardunov* (IRK); Western Sayan Mts., Malyj On Creek upper course, 4.VII.1968, *L.V.Bardunov* (IRK); Western Sayan Mts., Borus Range, Berezozya River, 28.VII.1968, *S.Gudoshnikov* (IRK); Western Sayan Mts., Ury River, 30.VII.1968, *L.V.Bardunov* (IRK); Western Sayan Mts., Karasu [Karasug] Rive, 6.VII.1968, *L.V.Bardunov* (IRK); Western Sayan Mts., Olenjya Rechka, 19.VI.1968, *Bardunov & Stezko* (IRK); Western Sayan Mts., Alash River, 3.VII.1968, *L.Bardunov & A.Vasiljev* (IRK); Krasnojarsk City, Stolby, 26.V.1996, 31.VII.1997, 10.V.2001, 26.V.2001, Akademgorodok, 21.V.1995, *T.N.Otnyukova* (KRF, MW); **Khakassia**, Askizskij Distr., Malyj Zub Mt., Amzas River left tributary, 21.VIII.1970, *A.Vasiljev* (IRK); **Tyva Republic**, Todginskaya Valley, Azas River, 27.VIII.1997, *T.N.Otnyukova* (KRF, MW); Azas Lake basin, Ilgi-Chul Hut, 31.IX.1995, *T.N.Otnyukova* (KRF, MW); Toora-Khem, 17.VII.1995, *T.N.Otnyukova* (KRF, MW); Kadysh Lake, 30.VIII.1999, *T.N.Otnyukova* (KRF, MW); **Irkutsk Province**, [Zhigalovsk Distr.] ad.fl.Tytyra, 20.VI.1910, *N.Kusnezov* (H-Br); Kupa River, 2.VIII.1994, *S.Szherbina* (MW); Chunkskij Distr, Dagdyzherma River, Imen Creek, 17.VII.1957, *E.M.Zlobina* (IRK); Kazachinskoe, 25.VI.1976, *L.V.Bardunov & al.* (LE); Vitimskij Reserve, Oron Lake, Kultuchnaya River, 31.VII.1984, *L.V.Bardunov* (IRK); Vitimskij Reserve, Amalyk River, 29.VI.1984, *L.V.Bardunov* (IRK); NE Baikal, Bolshaya Rechka, 3.VII.1956, 11.IX.1956, *L.V.Bardunov* (IRK); **Buryatia**, Sayan, Khara-Daban, 12.VI.1902, #1829, *A.A.Elenkin* (H-Br, LE); Eastern Sayan Mts., Kitoj River, 11-13.VIII.1960, *L.V.Bardunov* (IRK); Eastern Sayan Mts., Belskij Range, Urik River, Alarskij Creek, 28.VII.1959, *L.V.Bardunov* (IRK); Tunka, prope pag. Arshan, 26.VI.1926, #33, *V.Smironov* (H-Br, IRK); Eastern Sayan, Tunkinskaya Depression, Arshan, 18.VII.1926, *V.Smironov* (MHA); Baikal, Bolshaya Cheremshanaya Creek, 25.VII.1956, *L.V.Bardunov* (IRK); Tunkinskij Distr., Sayan Mts., Oka River, 7.VIII.1902, #1797, *A.A.Elenkin* (LE); Baikal, Svyatoj Nos peninsula, 27.VI.1956, *L.V.Bardunov* (IRK); Baikal, Solontzovaya Creek, 12.VII.1956, *L.V.Bardunov* (IRK); Baikal, Bolshoj Cheremshanyj cape, 24.VIII.1955, *L.Malyshhev* (IRK); Baikal, Turali cape, 26.VIII.1956, *L.V.Bardunov* (IRK); Baikal, Tompuda Creek, 17.VIII.1956, *L.V.Bardunov* (IRK); Baikal, Aya bay, 29.VIII.1956, *L.V.Bardunov* (IRK); Bajkal, Bolshie Koty, *J.Vana* (NICH); Khamar-Daban Ridge, Baikalskij Reserve, Osinovskij Goletz Mt., 18.VIII.2001, *N.A.Konstantinova* (MW); Khamar-Daban Ridge, Baikalskij Reserve, Nemskij Klyuch Creek, 9.VIII.2001, *N.A.Konstantinova* (MW); Baikal Lake, Snezhnaya River, 20.VIII.1912, *V.Smironov* (H-Br, IRK); Eravinskije Lakes, 24.VII.1912, *M.Korotkij & al.* (LE); Dzherginskij Reserve, 14.VII.2002,



Fig. 29. Distribution of *Grimmia longirostris* Hook. in Russia

#13, *D.Tubanova* (UUH); **Chita Province**, Onon River basin, Adun-Chelon Mts., 27.VII.1911, *V.Smirnov* (MHA); Upper Shakhtama, 20-22.VIII.1963, *L.V.Bardunov* (IRK); Kyra Distr., VII.1965, *P.Shvodchikov* (LE, MW); Chita, 10.VI.1903, *Stukov* (LE); Nerchinsk Distr., Shaverna River, 19.VII.1909, #1193, *N.I.Kuznetsov* (LE); Shilka River, Boty Creek, 29-30.VIII.1963, *L.V.Bardunov* (IRK); Verkhneudinskij Distr., Yamarovskie springs, 16.VII.1903, *Stukov* (H-Br, LE); Verkhneudinskij Distr., Yamarovka, 23.VI.1919, #1609, *A.Zolotukhina* (H-Br, LE); Akshinskij Distr., Tsagan-Oluj, 12.X.1909, *G.Mikhno* (LE, MW); Yamarovka, 2.VII.1904, *G.Mikhno* (H-Br); Balej, 5.VIII.1963, *L.V.Bardunov* (IRK); Selenga Distr., 1900, *M.P.Mollesni* (LE, MW); Gazimur River, Batakan, 28.VIII.1963, *L.V.Bardunov* (IRK); between Shilka & Chernyj Uryum, 10.VII.1909, *N.Blagoveshzhenskij* & *G.Poplavskaya* (H-Br); **Yakutia**, Ytyh-Chaj ad fl. Lena, 5.VII.1901, *A.K.Kajander* (sub. *G.cavifolia*) (H-Br); Kii psaraj, 6.IX.1901, *A.K.Kajander* (H-Br); Kumachsur, 4.IX.1901, *A.K.Kajander* (H-Br); Ytyh-Chaj ad fl. Lena, *A.K.Cajander* (H-Br); Nikolsk, 3.VII.1910, *V.Sukachev* & *G.Poplavskaya* (H-Br); Bulun Distr., Chobogan River, 12.VII.1956, *I.Kil'dyushevskij* (LE); Aldan River, 1911, #1199, *F.V.Sokolov* (LE); Kalarskij Distr., Khodar Mt., 31.VIII.1932, *N.Savicz* (MHA); Khodar Mt. slope to Chara River, 31.VIII.1932, #557, *N.Savicz* (LE); Vilyui River, 12.VIII.1958, #101/8, *I.Kildyushevskij* (LE); Indigirka River, 28.VI-1.VII.1976, *O.M.Afonina* (LE, MW); Indigirka River, Ust-Nera, 13.VI.1976, *O.M.Afonina* (LE, MW); middle course of Indigirka River, In'yali Creek, 16-17.VI.1976, *O.M.Afonina* (LE); upper course of Indigirka River, Bolshaya Ercha River, 3-7.VIII.1974, *O.M.Afonina* (LE); middle course of Lena River, Nemkon, 5.VII.1999, *O.N.Khazieva* & al. (MHA); Zhiganskij Distr., Undyulyung River, Byrandja Creek, 12.VII.1990, *E.V.Ivanova* (SASY); Kobyajskij Distr., Undyulyung River upper course, 3-16.VI.1990, *E.V.Akimova* (SASY); Kobyajskij Distr., Bytantaj River upper course, 12.VI.1990, *E.G.Nikolin*

(SASY); Sobolokh-Mayan – Bytantaj watershed, 5-9.VIII.1991, *Baryshev E.V.* (SASY); Kobyajskij Distr., Kele River, Ugun Imta, 28.VI.1987, *E.G.Nikolin* (SASY); Verkhoyansk Range, Taudandya River, 23.VIII.1956, #145/27, *V.I.Ivanova* (LE); Aldan Distr., Chagda, Chyulbyu, 28.VII.1991, *E.Ivanova* (IRK); Aldanskij Distr., Ket-Kap Range, Right Berdyakit River, 20.VII.1989, *K.Volotovskij* (IRK); Aldanskij Distr., Gynym River, 24-26.VII.1991, *E.I.Ivanova* (SASY); Aldanskij Distr., Ili River, 8-10.VII.1991, *E.I.Ivanova* (LE); Khangalassky Distr., Lenskie Stolby, 17.VIII.2000, #00-117, *Ignatov* (MHA), 25.VIII.1999, *K.Krivoshapkin* (LE) & 15.VII.1999, *E.I.Ivanova* (SASY); Lenskij Distr., Nam, 22.IX.1953, #174/4, *V.B.Kuvaev* (SASY); Neryungri Distr., Chul'man, 5.VII.1993, *E.I.Ivanova* (LE); Neryungri Distr., B.Toko, Ivak Creek, 30.VII.1987, *K.Volotovskij* (LE); M.Toko Lake, 26.VII.1990, *K.Volotovskij* (LE); Olyekminsk Distr., Dzyagdachi River, 3.VII.1910, #141, 181, 188, *V.Sukachev* & *G.Poplavskaya* (LE); Olyekminskij Reserve, 6.IX.1996, *K.Krivoshapkin* (MW); Olekminsk Distr., Tokko River, 4.VII.1994, *E.I.Ivanova* (SASY); Biryk River, #060107, 060108, *K.Krivoshapkin* (LE, IBA); Olekminsk, #010602, 010404, *K.Krivoshapkin* (LE, IBA); Suntar-Khayata Range, 18.VI.1999, *E.Ivanova* & *K.Krivoshapkin* (MHA); Tompo Distr., 150 km of Khandyga-Oimyakon Hw, Siaegaeliaekh, 21.VI.1999, *E.I.Ivanova* (SASY); Tompo Distr., Khandyga-Oimyakon Hw, 17-18.VI.1999, *E.I.Ivanova* (SASY); Tompo Distr., Suntar-Khayata Range, Kyubyume Creek, 16.VI.1999, *E.I.Ivanova* & *K.K.Krivoshapkin* (SASY, MW); Verkhoyansk Range, Menkyule River, 28.V.1956, #152/60, *V.Ivanova* (LE); Verkhoyansk Range, Tompo River, 13.VII.1956, #66/12, *V.I.Ivanova* (LE); Tomponskij Distr., Tukuran River, Temirdekh Creek, 4-8.IX.1990, *E.V.Akimova* (SASY); Tuora-Tukulan Creek, 3.IX.1990, *E.Baryshev* (SASY); Suntar Distr., Vilyuj River 217 km downstr. Ulakhan-Vava mouth, 12.VIII.1958, #101/8, *I.Kildyushevskij* (SASY); Suntar Distr., Vilyui River 50 downstr. Ulkhan-Vava 25.VII.1958, #53/2, *I.Kildyushevskij* (LE);

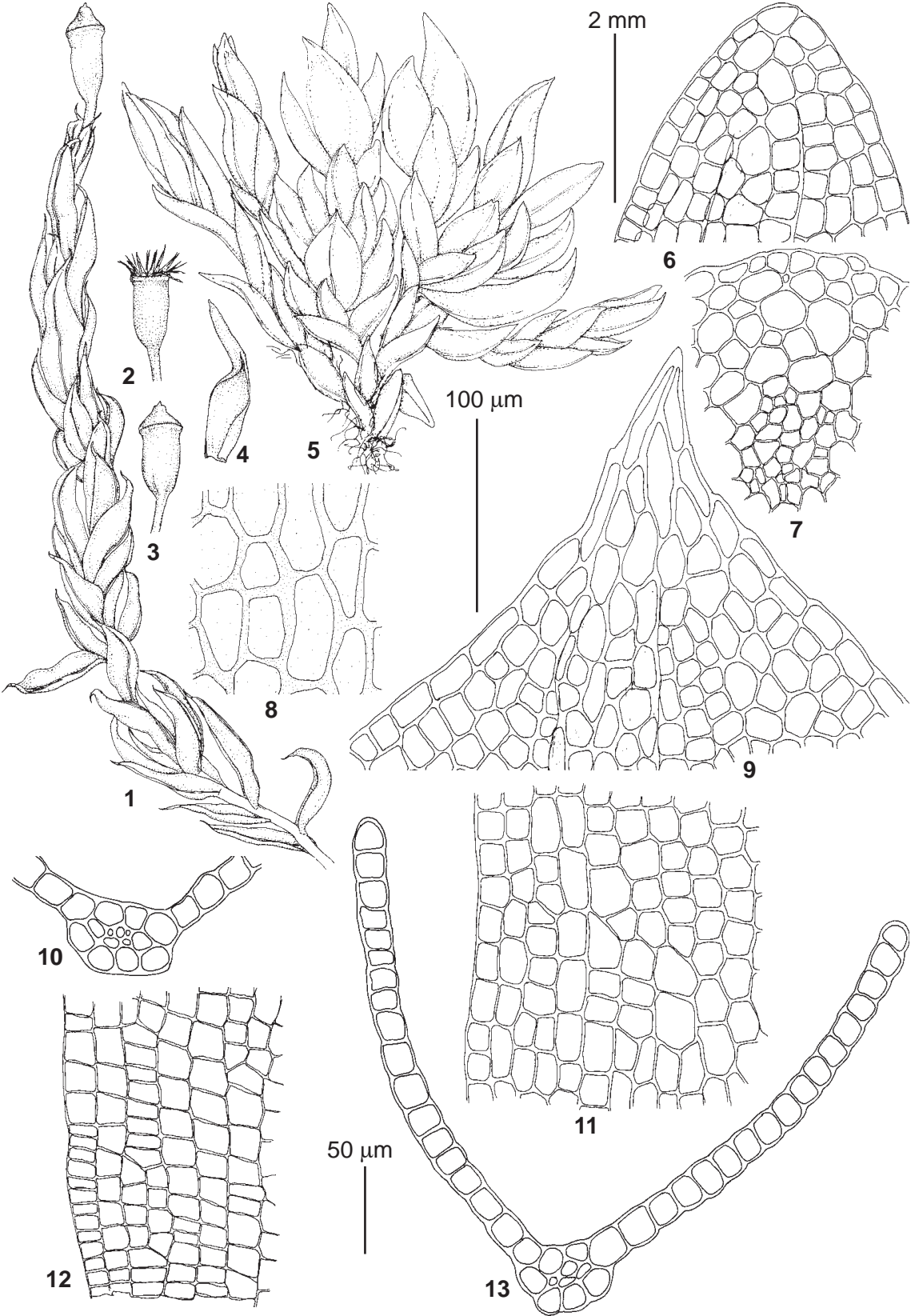
Ust-Maya Distr., Solnechnyj, Tom Creek, 2-3.IX.2000, #00-129, 00-135, 00-136, *Ignatov* (MHA); Ust-Maya Distr., Allakh-Yun, Selyakh Creek, 30.VIII.2000, #00-120, *Ignatov* (MHA); Ust-Maya Distr., Allakh-Yun, Tarbagannakh, 25.VIII.2000, #00-123, 00-945, *Ignatov* (MHA); Ust-Maya Distr., Yugorenok Creek, 6.IX.2000, 00-12, *Ignatov* (MHA); Ust-Maya Distr., Chabda Reserve, 5.IX.2001, *E.V.Sofronova* (SASY, MW); Aldan Distr., Uchur River, 1.VII.1991, *E.Ivanova* (LE, IRK); 25.VII.1989, *K.Volotovskij* (MHA, SASY); Kobyajskij Distr., Kitchan Settlement, 3.VII.2002, *E.I.Ivanova* (SASY, MW); Neryungri Distr., Udokan Range, 10.VIII.2001, *L.V.Kuznetzova* (SASY, MW); **FAREAST: Amurskaya Province**, Zeya Reserve, Teplyi Klyuch, 20.IX.1979, #254, *D.Petelin* (MHA), 8-11.VIII.1980, #19, 13, 19, 96, 109, 110, 111, 112, *L.I.Abramova* (MW), 12-13.VIII.1980, *N.Stezura* (IRK); Smirnovskij Klyuch, 9.VIII.1980, #39, *L.I.Abramova* (MW); Kamraj Creek, 5.IX.1979, *D.Petelin* (MW); B.Erakingra River, 23.IX.1979, #302, *D.Petelin* (MW); Beloborodovskij Klyuch, 12.VIII.1977, #1, *I.A.Gubanov* (MW); Zeya Reserve, Peak 1442 m, 22.VIII.1980, #213, 270, *L.I.Abramova* (MW); Upper Zeya plane, Zhurban settlement, 30.VI.1974, *S.K.Gambaryan* (IRK); Gilyuj River, 11.IX.1979, #140, *D.Petelin* (MW); Motovaya Creek, VIII.1979, #24, *D.Petelin* (MW); Zeya River basin, 2.VII.1908, *N.Prokhorov* & *O.Kuzeneva* (LE); Gilyuj River, 18.VII.1915, *N.Prokhorov* & *O.Kuzeneva* (LE); Bakharevaya & Starkovka, 11.VI.1910, *M.Korotkij* (H-Br, LE); **Khabarovsk Territory**, Komsomol'skij Reserve, VI.1985, *V.Ya.Cherdantseva* (VLA); Bureinskij Reserve, Bureya River, Umalta-Makit Creek, 28.VIII.1997, #97-110, *Ignatov* (MHA); Chapkhoz, 16.VIII.1989, #89-M-207, *O.Grigorjeva* (MHA); Pravaya Bureya River lower course, 27.VIII.1997, #97-1101, *Ignatov* (MHA); Kuraigagna Creek, 15.VIII.1997, #97-1106, *Ignatov* (MHA); Medvezhje Lake, 10.VIII.1997, #97-1102 & 12.VIII.1997, #97-1095, *Ignatov* (MHA); **Chukotka**, Anadyr River basin, Iljmynyjeem Creek, 27-28.VII.1978, 3.VIII.1978, 11.VIII.1982, *O.M.Afonina* (LE); Tamvatvaam Creek, 22.VIII.1983, *O.M.Afonina* (LE); Shakhterskij settlement, 27.VIII.1977, *O.M.Afonina* (LE); Achchen Lake, 7.VII.1970, 30.VII.1970, *O.M.Afonina* (LE); Yablon River upper course, 7-11.VIII.1982, *O.M.Afonina* (LE); Tanyurer River upper course, 5-9.VII.1979, *O.M.Afonina* (LE); Golubaya Creek, 14-16.VII.1981, *O.M.Afonina* (LE); Baranje Lake, 25.VII.1980, 31.VII.1980, 4.VIII.1980, *O.M.Afonina* (LE); Tanyurer River, Kujviveemkaj, 10.VIII.1981, *O.M.Afonina* (LE); Bering Strait, C.Wright, #77 (FH); Getlyan River, *O.M.Afonina* (LE); Malaya Vesnovannaya Creek, *O.M.Afonina* (LE); Ushkanji Gory, 11-14.VIII.1978, *O.M.Afonina* (LE); Lorino, 14.VIII.1962, *Gavrilyuk* (LE); Lavrentiya bay near Krauze cape, 18.VII.1973, *T.Belova* (LE), 29.VII.1975, 2.IX.1975, *O.M.Afonina* (LE); Pekulnej Mt. Range, South Pekulnejveem, 31.VII.1979, *O.M.Afonina* (LE); Televeem-First Creek, 18.VII.1979, 22.VII.1979, *O.M.Afonina* (LE); Karvalyanskaya Creek, Berezovye Mts., 19-27.VII.1982, *O.M.Afonina* (LE); Amguema River middle course, Aevgekinot-Iultin road, 20-25.VI.1969, *O.M.Afonina* (LE); Aevgekinot settlement surroundings, 20.VI.1969,

20.VI.1970, 19.VIII.1977, *O.M.Afonina* (LE); Kalenmyvaam River, 20.VII.1973, *A.Syтин* (LE); Iul'tin, 20.VII.1971, *Maksimova* (LE); Enmyvaam Creek, 30.VI.1980, 1.VII.1980, 9.VII.1980, *O.M.Afonina* (LE); Palyavaam River lower course, 12.VII.1979, 26.VII.1989, *O.M.Afonina* (LE); **Magadan Province**, Ten'kinskij Distr., Sibit-Tyeliakh Settlement, 23.VII.1976, *L.S.Blagodatskikh* (LE); **Kamchatka**, Verkhnekireunskie Springs, 27.VIII.2001, *O.Czernyagina* (LE); Ushkovskij volcano slope, 21.VII.2003, *I.Czernyadjeva* (LE); **Primorskij Territory**, Alekseevskij Range, Ol'khovaya Mt., 31.VII.1980, 21.IX.1993, 22.IX.1998, *V.Ya.Cherdantseva* (VLA); Sovetskij Distr., Murtto surroundings, *B.Kolesnikov* (LE); Kedrovaya Pad' Reserve, 14.VIII.1977, *V.Ya.Cherdantseva* (VLA); Sujoruna River, Kondratenkova village, VIII.1913, #90, *V.L.Komarov* (LE); Chuguevka Distr., Oblachnaya Mt., 31.VII.1980, 2.VIII.1980, *V.Ya.Cherdantseva* (VLA); Chuguevka Distr., Snezhnaya Mt., 31.VIII.1977, *L.V.Bardunov* & *V.Ya.Cherdantseva* (VLA); Dal'negorsk Distr., Rudnaya Pristan', 7.IX.1977, *L.V.Bardunov* & *V.Ya.Cherdantseva* (VLA); Sikhote-Alin'skij Reserve, Yasnaya River, 20.VI.1979, *V.Ya.Cherdantseva* (VLA); Sovetskij Distr., Tutto River, 6.VIII.1945, *B.Kolesnikov* (LE); Chernigovskij Distr., above Lunza settlement, 30.IX.1984, *A.Lazarenko* (LE); Partizansk Distr., Koj settlement surroundings, Mana Creek, 8.III.1971, *N.Komarov* (IRK).

Distribution. *Grimmia longirostris* is one of the most widespread species of the genus in Northern Hemisphere, growing also in Andes in South America, high mountains of New Guinea, Hymalaya, mountains of eastern Africa, Australia, and New Zealand. It is also the most widespread *Grimmia* species in Russia, common in all montane areas, from Chukotka, Taimyr, and Kola Peninsula to southern Far East, southern Siberia, and Caucasus, not rare in Urals, and absent in lowland European Russia and Western Siberia. Equally frequent in forest and alpine belts. Grows on acidic and neutral rocks, on sunny and shaded places.

Differentiation. Plants with sporophytes are readily recognized by numerous cylindrical exerted capsules, with smooth, stramineous urns, orange opercula contrasting in color with the urns, and short to long, but usually \pm obtuse beak. The species is very polymorphous, and its different forms were often confused, as seen from studied herbaria, with other species, mostly with *G. ovalis*, *G. montana*, and *G. reflexidens*. The differentiation from *G. ovalis* is discussed under the latter species. All records of *G. montana*

Fig.30. *Grimmia mollis* B. S. G. (1-4, 7-8 – from Yakutia, M.Ignatov, #00-152; 5-6, 9-13 – from Perm Province, A.Bezgodov, #321): 1, 5 – habit; 2-3–capsules; 4 – calyptra; 6, 9 – upper leaf cells; 7 – stem transverse section; 8 – exothecium; 10, 13 – leaf transverse sections; 11 – median leaf cells; 12 – basal leaf cells. Scale bars: 2 mm for 1-5; 50 μ m for 10, 13; 100 μ m for 6-9, 11-12.



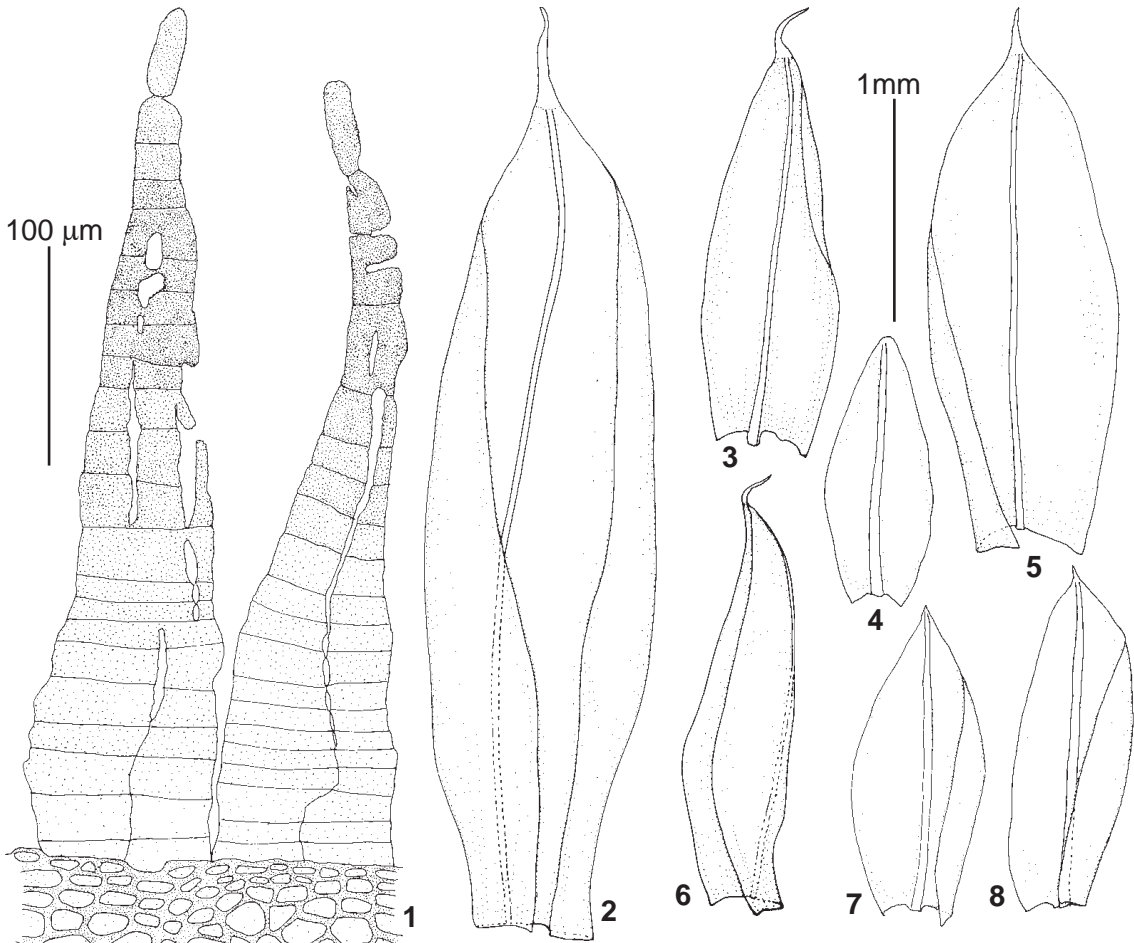


Fig. 31. *Grimmia mollis* B. S. G. (1-3, 5-6 – from Yakutia, M. Ignatov, #00-152; 4, 7-8 – from Perm Province, A. Bezgodov, #321): 1 – part of peristome; 2 – perichaetial leaf; 3-8 – stem leaves. Scale bars: 1 mm for 2-8; 100 µm for 1.

from Urals (and also from other regions of the country, except Caucasus and Karelia) were found to be small phenotypes of *G. longirostris* with quadrate basal marginal (and sometimes also juxtacostal) cells. However *G. longirostris* can be easily differentiated from *G. montana*, *G. reflexidens* and other species with keeled leaves by the shape of costa in transverse section: it is reniform, with 3-8 ventral epidermal cells in *G. longirostris* vs. semi-circular, with 2 ventral epidermal cells in *G. montana*, *G. reflexidens*, *G. pilifera*. Similar reniform costa is known in *Grimmia jacutica*, *G. hartmanii*, and *G. ramondii*; their differences from *G. longirostris* are discussed under these species.

16. *Grimmia mollis* B. S. G., Bryol. Europ. (fasc. 42) 3: 133. 1849. – *Hydrogrimmia mollis* (B. S. G.) Loeske, Stud. Morph. Syst. Laubm.: 108. 1910. Figs. 30-32.

Plants in soft, loose, easily separating tufts, bright to dark green or bluish green, not hoary. Stems erect, 1-3 cm long, with central strand. Leaves erect or loosely appressed when dry, erect-spreading when moist, ovate to broadly ovate, acute to obtuse, 1.4-2.5×0.5-0.9 mm, widely keeled to concave distally; margins plane throughout; costa differentiated, thin, slightly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points absent or short, ca. 0.1-0.3 mm long; lamina unistratose, rarely bistratose in 1-2 cell rows at margins in distal 2/3 of leaf; upper and median laminal cells subquadrate, 12-20 µm, with thin and not sinuose walls, basal juxtacostal cells short rectangular, 14-40×13-25 µm, with thin, not porose walls, basal marginal cells quadrate to oblate for several rows, with thin longitudinal and thick transverse walls. Dioicous, sporophytes rare. Setae straight, 2-3 mm. Capsules emergent to shortly exserted, ovate-cylindric, 1.5 mm long. Operculum conic, mamillate or with short beak. Annulus of Schistidium-type. Peristome teeth red,

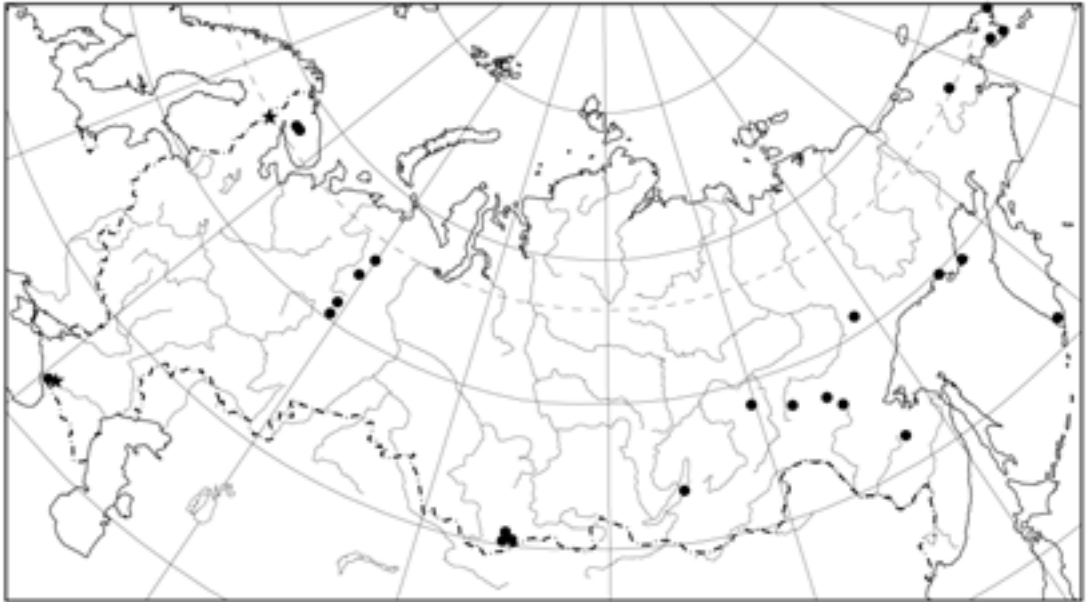


Fig. 32. Distribution of *Grimmia mollis* B. S. G. (circles) and *G. montana* B. S. G. (stars) in Russia.

perforated and cleft in distal part. Spores 10-13 μm . Calyptrae cucullate.

SPECIMENS EXAMINED: EUROPEAN RUSSIA: **Murmansk Province**, Khibiny Mts., 23.VII.1892, *Kihlman* (H); Lapponia Imandrae, [E of Lovozero], 2 & 29.VII.1892, *Kihlman* (H); Khibiny Mts., Yuksporlak pass, 8.VIII.1948, *R.N.Shlyakov* (KPABG), 3.VIII.1995, #8-95, *O.A.Belkina* (KPABG); Podjennaya River, 19.VIII.1948, *Shlyakov* (LE); Lovozerskie Mts., Karnasurt, #101-14-82, *O.Belkina* & *A.Likhacjev* (KPABG); Lovozerskie Mts., Parganyun, #20-12-84, *O.Belkina* & *A.Likhacjev* (KPABG); **CAUCASUS:** **Karachaevo-Cherkessia**, Teberda Reserve, Nazlykol Gorge, 10.VIII.1986, *Ignatova* (MHA); Nazlykol Gorge, 29.VIII.1995, #128/95, *Onipchenko* (MW); Ullu-Murudzhu Gorge, 10.VIII.1986, *Ignatova* (MHA); **URALS:** **Komi Republic:** Narodnaya Mt., 8.VII.1955, *Gorchakovskij* (LE); Telpos Range, 13.VIII.1907, *R.Pohle* (LE); **Perm Province**, Vishera Reserve, Tulym Range, 1.VII.1994, #321, 335, *Bezgodov* (MW); Vogulskij Kamen Mt., 23.VII.1958, *K.Igoshina* (LE); **SIBERIA:** **Altai Republic**, Shapshal Range, Uzunoyuk River, 9.VII.1990, *Zolotukhin* (MHA); Karakem River basin, Ayulyuyuzuk Creek, 16.VI.1989, #0/466, *Ignatov* (MHA); between Bashkaus & Pravjy Bogoyash Rivers, 26.VI.1983, #36/79, *Ignatov* (MHA); **Buryatia**, Baikal Lake, Svyatoj Nos Cape, 24-26.VII.1961, *V.Siplivinskij* & *L.Lagutskaya* (LE); **Yakutia**, Nerungri Distr., Toko, 23.VII.1987, *K.Volotyovskij* (SASY, LE); Pravaya Ungra River sources, 21.VIII.1989, *K.Volotovskij* (SASY, MHA, LE); Algama River, Karaelag Creek, 31.VII.2000, *E.Sofronova* (SASY); Olekminskij Distr., Torgo, 14.VII.1994, *E.I.Ivanova* (SASY); Ust-Maya Distr., Semenci-Yuryakh Creek, 26.VIII.2000, #00-961, *Ignatov* (MHA); Tarbagannakh Creek, 25.VIII.2000, #00-150, 00-152, 00-155 *Ignatov* (MHA); **FAR EAST:** **Khabarovsk Territory**, Bureinskij Reserve, Medvezhje Lake, 11.VIII.1997, #97-1089, 97-1090, *Ignatov* (MHA); **Chukotka**, Bering Strait, #73, *C.Wright* (FH); Chaplinskje hot springs, 12.VII.1969, *O.Afonina* (LE); Pepenveem River, 5.VIII.1970, *A.Galamin* (LE); Enmyuvaam River, 9.VII.1980,

O.Afonina (LE); **Magadan Province**, pr. Magadan, Marchekanskaya Sopka, 19.IX.1977, *O.M.Afonina* (LE), 19.VII.1978, *L.Blagodatskikh* (LE); Tenkinskij Distr., Gusakova pass, 19.VII.1972, *L.Blagodatskikh* (LE); Sibir-Tyellakh, 13.VII.1977, *V.Zvezdenko* (LE); Ol'skij Distr., P'yagin Peninsula, 11.VIII.1978, *L.Blagodatskikh* (LE); Luzhina Bay, 7.IX.1977, *L.Blagodatskikh* (LE); **Kamchatka**, South Kamchatian Protected Area, 24.VII.1990, *I.Czernjadjeva* (LE).

Distribution. *Grimmia mollis* is distributed sporadically in mountain areas of the Holarctic. In Russia, it is known from Kola Peninsula, Polar and Northern Urals, Caucasus, mountains of Siberia and Far East. It grows at wide elevation range, in forest and alpine belts, usually on moist rocks along streams and rivers.

Differentiation. *Grimmia mollis* differs from any other species of *Grimmia* by its soft, ovate-lanceolate to broadly ovate leaves, usually muticous, only upper leaves with short hyaline hair-points, plane margins, and large (12-25 μm vs. 6-12(-14) μm in other *Grimmia* species), thin-walled and esinuose subquadrate upper leaf cells.

17. ***Grimmia montana*** B. S. G., Bryol. Europ. (fasc. 25-28) 3: 128, tab. 250. 1845. Figs. 32, 33.

Plants in small cushions, dark green to blackish, not very hoary. Stems ascending or erect, fasciculate branching, 0.5-1.0 cm long, with central strand. Leaves loosely appressed and slightly flexuose when dry, erect-spreading when moist, 1.5-2.1×0.5-0.6 mm, from ovate base gradually tapering into lanceolate acumen, acuminate, keeled in distal

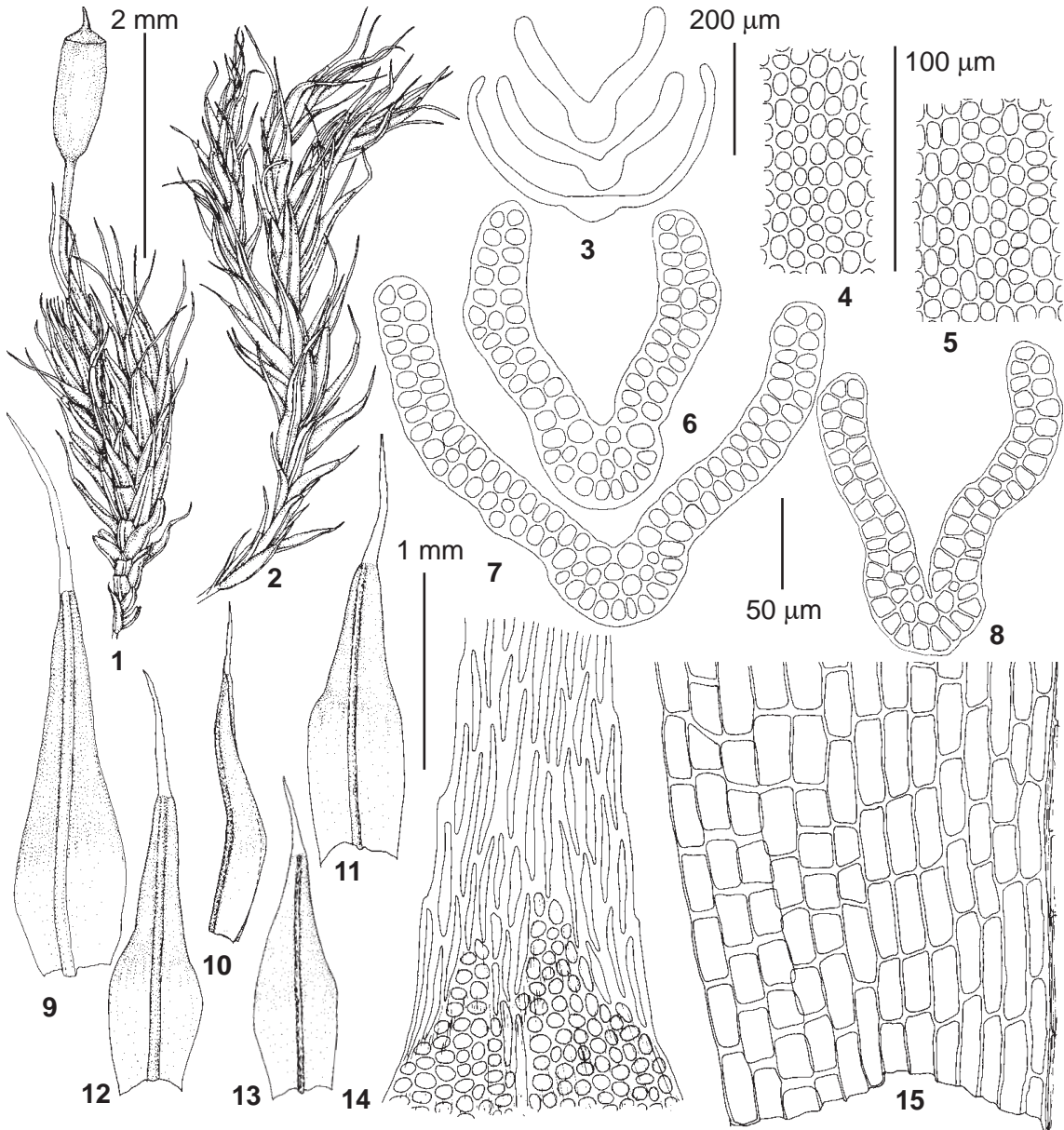


Fig.33. *Grimmia montana* B. S. G. (1, 8-9 – from Karelia, 27.VII.1937, A. V. Auer & al.; 2-7, 10-15 – from Karachaevo-Cherkessia, 16.V.2001, V. Onipchenko): 1, 2 – habit; 3, 6-8 – leaf transverse sections; 4 – upper leaf cells; 5 – median leaf cells; 9-13 – leaves; 14 – base of hair-point and upper leaf cells; 15 – basal leaf cells. Scale bars: 2 mm for 1, 2; 1 mm for 9-13; 200 µm for 3; 100 µm for 4-5, 14-15; 50 µm for 6-8; 1.

part; margins plane to incurved; costa differentiated, prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points 0.3-0.7[-1.5] mm long, terete, denticulate; lamina completely bistratose in distal 2/3, unistratose at base, not plicate, upper and median laminal cells isodiametric, 9-12 µm, rounded-quadrato to short rectangular, with moderately thickened, not sinuose walls, basal juxtacostal cells elongate rectangular, 20-50×10-14 µm, with thin, not porose walls, basal

marginal cells shorter, pellucid, with thin longitudinal and thick transverse walls. Dioicous, sporophytes not rare. Androecia terminal. Perichaetial leaves similar to vegetative leaves. Setae 2-4 mm, straight. Capsules exserted, 1-1.5 mm long, ovoid-cylindric, smooth, chestnut. Exothecial cells thin-walled, stomata lacking. Operculum low conic, with oblique beak. Annulus of Schistidium-type. Peristome teeth concolorous with the urn, perforate and cleft distally. Spores 10-14 µm. Calyptrae cucullate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** Karelia, Kuusamo, 27.VII.1937, A.V.Auer & al. (H), 28.VII.1937, O.V.Lumiala (H), 28.VII.1937, M.J.Kotilainen (H); **CAUCASUS:** Karachaevo-Cherkessia, Teberda Reserve, Malaya Khati para Gorge, 16.V.2001, V. Onipchenko (MW).

Distribution. *Grimmia montana* is known in Europe from Iceland, Great Britain, and Scandinavia to Spain and Portugal, eastward to Turkey, and also in Greenland, Canada, USA, and Mexico. Up to date it is found in Russia only from two localities. The collections of *G. montana* from Karelia are fertile. It was also collected recently in Teberda Nature Reserve, Karachaevo-Cherkessia (specimens lacking sporophytes, plants with archegonia). It grows on rock outcrops in forest belt in Karelia and on granite boulders among alpine lichen heath in alpine belt, 2800 m alt., in Caucasus. One more Caucasus locality of *G. montana* is known from Georgia, Kvarelskij District (coll. A.L. Abramova & I.I. Abramov, 25.VI.1964, LE).

Differentiation. *Grimmia montana* was often reported from the different regions of Russia, from Arctic to Caucasus and from Kola Peninsula to Far East, and was considered as rather common species (Bardunov, 1969; Melnichuk, 1970; Savicz-Lyubitzkaya, Smirnova, 1970; Ignatov & Afonina, 1992; Afonina & Chernyadjeva, 1995; Krivoshapkin & al., 2001). But as it can be seen from the herbarium material all these records represent other species, mostly *G. longirostris*, more rarely *G. teretinerwis* or *G. reflexidens*. Most commonly the forms of *G. longirostris* with subquadrate basal marginal (and sometimes also juxtacostal) cells were confused with *G. montana*; such forms are not rare in dry areas of Siberia (Yakutia, Tyva, etc.) and Urals (this character was used in keys of Russian handbooks as diagnostic character of *G. montana*). The shape of costa in cross section was usually ignored, which caused numerous misidentifications.

Grimmia montana is clearly differentiated from *G. longirostris* by costa semi-circular in cross section, with 2 ventral epidermal cells (vs. reniform in cross section, with 3-8 ventral epidermal cells in *G. longirostris*), margins always plane to incurved (vs. recurved at least at one side in middle part of leaf in *G. longirostris*). Also plants of *G. longirostris* are usually larger, yellowish-green, capsules with

stramineous urns contrasting in color with the orange opercula, whereas plants of *G. montana* are smaller, always dark green, and the opercula are of the same color as the urns, chestnut. *Grimmia montana* differs from *G. reflexidens* by leaves more widely keeled (vs. sharply and narrowly keeled with almost parallel blades near the costa in *G. reflexidens*), lamina completely bistratose distally (vs. only partly bistratose distally), leaf margins plane (vs. occasionally recurved, at least at one side), beaks long and oblique (vs. mamillate), urns and opercula of the same color (vs. orange opercula contrasting in color with stramineous urns in *G. reflexidens*); a good differentiating character is the absence of stomata at urn base in *G. montana* and their presence in *G. reflexidens*. *Grimmia teretinerwis*, another species sometimes confused with *G. montana* in Russian herbaria, was only recently reported for the first time for the territory of the country (Muñoz & Pando, 2000; Goldberg, 2002). The plants of this species are about the same size as those of *G. montana*, and are similar also in lamina being completely bistratose distally and margins plane throughout. However, *G. teretinerwis* can be easily separated of *G. montana* by the costa round in cross section and prominent both dorsally and ventrally (unique character in the genus), whereas in *G. montana* the costa is prominent only dorsally, and narrowly channeled ventrally.

18. *Grimmia muehlenbeckii* Schimp., Syn. Musc. Eur. 212. 1860. — *Grimmia trichophylla* var. *tenuis* (Wahlenb.) Wijk et Marg., Taxon 8: 106. 1959. — *Campylopus pulvinatus* var. *tenuis* Wahlenb., Fl. Suec. (ed. 2) 2: 748. 1826. Figs. 34, 35.

Plants in dense or loose tufts, dark green or blackish green. Stems ascending, 1-2 cm long. Leaves flexuose, loosely appressed when dry, patent to spreading when moist, lanceolate, acuminate, 1.5-2.5×0.4-0.6 mm, sharply keeled distally; margins plane in distal part of leaf, recurved on one or both sides below; costa differentiated, strongly prominent dorsally, winged, in cross section irregularly angled or trapezoid, with 2 ventral epidermal cells; hyaline hair-points short or rather long, sharply denticulate; lamina mostly unistratose, 2(-3-4)-stratose at margins in 1-6 cell rows and sometimes with bistratose strips in distal 1/2 of leaf; upper laminal cells isodiametric, 7-9µm, rounded-quadrate, with moderately thickened, not or slightly sinuose walls, median laminal cells

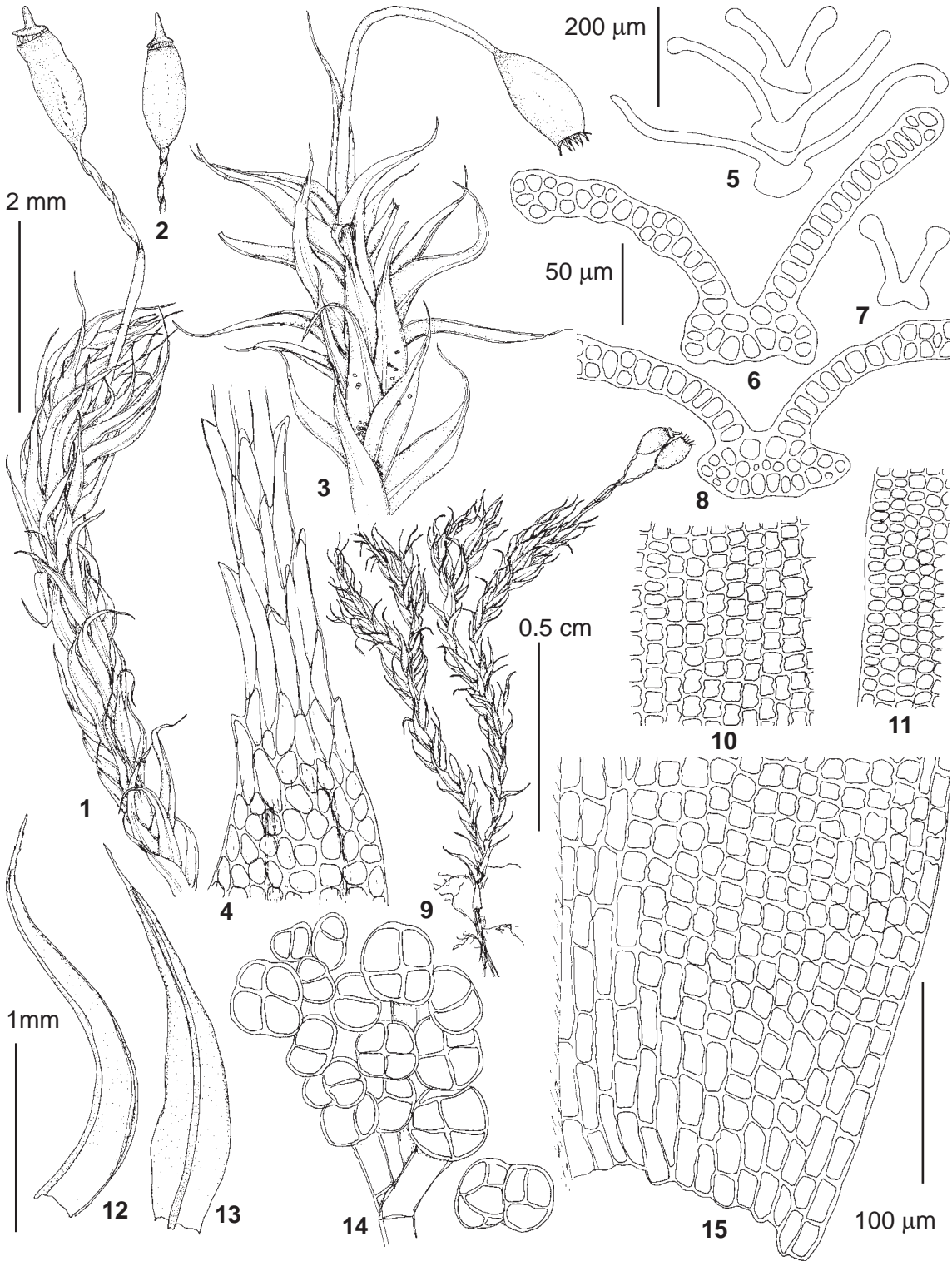


Fig. 34. *Grimmia muehlenbeckii* Schimp. (from Perm Province, M. Ignatov & A. Bezgodov, #244): 1, 3, 9 – habit; 2 – capsule; 4 – base of hair-point and upper leaf cells; 5-8 – leaf transverse sections; 10 – median leaf cells; 11 – upper leaf cells; 12-13 – leaves; 14 – gemmae; 15 – basal leaf cells. Scale bars: 0.5 cm for 9; 2 mm for 1-3; 1 mm for 12-13; 50 μm for 6, 8; 100 μm for 4, 10-11, 14-15; 200 μm for 5, 7.

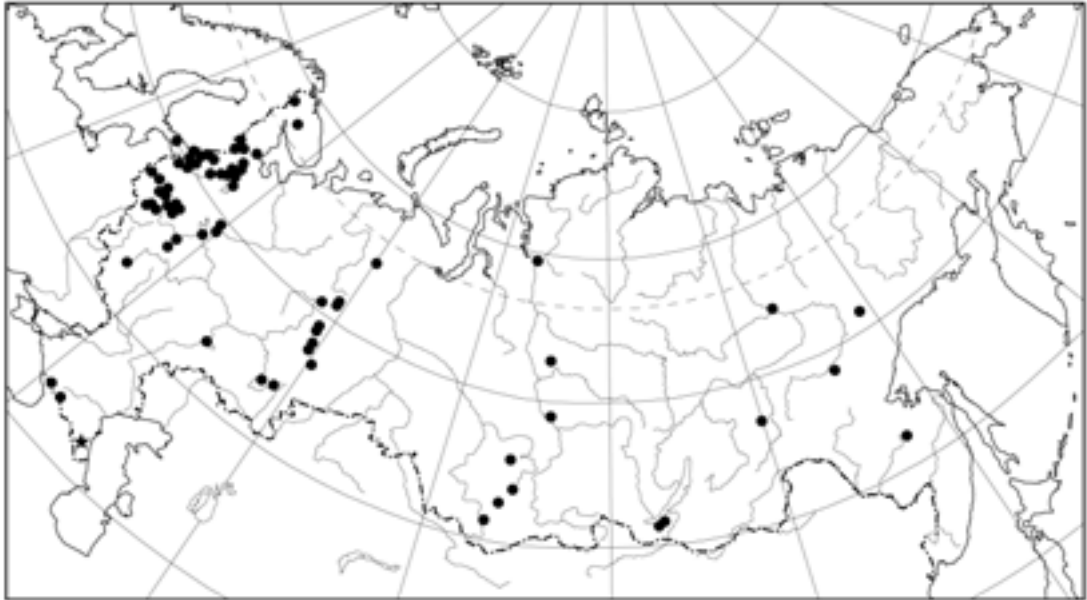


Fig. 35. Distribution of *Grimmia muehlenbeckii* Schimp. (circles) and *G. orbicularis* Bruch ex Wils. (star) in Russia.

thin-walled, moderately sinuose, basal juxtacostal cells rectangular, with moderately thickened, weakly porose walls, basal marginal cells short rectangular, pellucid, with thin longitudinal and thick transverse walls. Gemmae often present, developing on short branched stalks on ventral side of leaf base, rounded-ovoid, red-brown, 3-8-celled, often clustered, to 60 μm in diameter. Dioicous, androecia terminal, sporophytes not rare. Setae to 3 mm, arcuate when moist. Capsules exserted, ca. 1 mm long, ovoid, slightly furrowed when dry. Operculum low conic, with moderately long erect beak. Annulus of affinis-type. Peristome teeth red-brown, densely papillose, entire or weakly perforated. Spores 12-18 μm . Calyptrae mitrate.

SPECIMENS EXAMINED: EUROPEAN RUSSIA:
Murmansk Province, Khibiny Mts., Pirrotinove Gorge, 9.VIII.1948, #2070, 2073, *R.N.Shlyakov* (KPABG); Khibiny Mts., Yukspor, 30.VII.1948, #1947, Khibiny Mts., *R.N.Shlyakov* (KPABG); Vudjavrchorr Mt., 16.VIII.1948, #2136, *R.N.Shlyakov* (KPABG); 6.VIII.2004, *I.V.Blinova* (KPABG); Lavnatundra Mt., 25.VII.1977, #97/63, *O.Belkina* (KPABG); **Karelia**, Sandal Lake surroundings, 7-21.VI.1920, #116, 126, 207, 1299, *L.I.Savicz* (LE); Bygozero, 12.VII.1921, #002470, *A.I.Belyaeva* (LE); Segozero, 9-19.VI.1921, #3200, 3225, 3226, 3241, 3246, 3506, *L.I.Savicz* (LE); Hiisjarvi, Pallinvaara, IX.1934, *R.Tuomikoski* (H); Ruskeala, 21.VII.1935, *A.J.Huuskonen* (H); Suistamo, 3.XI.1935, *A.J.Huuskonen* (H); Suojarvi, 16.VIII.1939, *R.Tuomikoski* (H); Vieljarvi [Vedlozero], 30.VIII.1942, 7-12.IX.1942, 29.X.1942, 14.VII.1943, 3.IX.1943, 18.III.1944, *A.Railonsala* (H); Nestejarvi, 8.VII.1942, *A.J.Huuskonen* (H); Uksjarvi, «Peninsula digitiformis», 29.VI.1942, *M.J.Kotilainen* (LE); Zaonezhskij Distr., Tolvuya, 16.VII.1969, #080, *L.A.Volkova* (LE); Muezerskij Distr., Reboly, 14.VIII.1970, *L.Volkova*

(LE); Shuyskaya Chupa, 23.VII.1973, *L.Volkova* (LE); Kondopoga Distr., Sampo Mt., 23.VII.1973, *L.Volkova* (LE); Pudozhskij Distr., Vodla Settl., 30.VIII.1976, *L.Volkova* (LE); Onega Lake, Peschanoe Settl., 9.IX.1976, *L.Volkova* (LE); Vodlozero, 9-10.VII.1977, *L.Volkova* (LE); Belomorskij Distr., Shuezero Lake, Lekhta Settl., 30.VII.1977, *L.Volkova* (LE); Pudozhskij Distr., Onega Lake, Shal'skij Settl., 5.IX.1978, *L.Volkova* (LE); Olonetzkiy Distr., Obzhinskij lighthouse, 8.VIII.1984, *L.Volkova* (KPABG); Elmozero, 13.VIII.2001, #26-91, *Maksimov & Maksimova* (PTZ); Lendery, 8.VIII.2003, #L-03/40-59a, *Maksimov & Maksimova* (PTZ); **Leningrad Province**, Viborg [=Vyborg], VIII.1851, *W.Nylander* (H); Hogland, 18 & 20.VI.1867, *S.O.Lindberg*, 18.VI.1867, *M.Brenner* (H); St. Andrea [=Kamenogorsk], 6.VI.1888, *J.Linden* (H); Muola [=Pravdino], 22.X.1893, *H.Lindberg* (H); St. Iohannes [=Sovetskij], 3.V.1895, *B.Poppius* (H); Valkjarvi [Michurinskaya], 17.VI.1895, *H.Lindberg* (H); Raisala [Melnikovo], 19.VIII.1926, 4 & 6.VII.1928, *I.Hiitonen* (H); Luga Distr., Osmino, 1972, *G.Vjyunova* (KPABG); Priozersk Distr., Otradnoe, 2.VIII.1966, *I.I.Abramov* (LE); Volosovskij Distr., Shugovitsy, 14.V.1985, *Ignatov* (MHA); **Pskov Province**, Dno surr., Polonka River, Beloshka village, 23-28.V.1940, *I.I.Abramov* (LE, MW); **Novgorod Province**, Staraya Russa Distr., 10.VIII.1908, *P.Kurskij* (LE); Leokhnovo village, 19.IX.1905, *P.Kurskij* (LE); **Wologda Province**, Wologda surr., Domanovo, VII.1906, *A.A.Sniaetkow* (LE); Kubinskoe Lake, 4.IX.1891, *E.Zickendrath* (MW, LE); **Yaroslavl Province**, Rybinsk U., Koprinskaya Volost, 1924, *D.Meshczeryakov* (LE); **Tver Province**, Finyevo, 20.07.1999, *A.A.Notov* (MW); Nelidovo Distr., Fedorovskoe, 3.VIII.1994, *Ignatov* (MW); Toropetzkij Distr., Khvorost'evo, 18.07.1999, *A.A.Notov* (MW); Andreapol'Distr., between Khotilitzy & Spiridovo, 6.08.1998, *A.A.Notov* (MW); **Moscow Province**, Lyubertzij Distr., Lytkarino, 4.VII.1988, *Ignatov* (MHA); Moscow City, territory of University Botanical Garden,

22.IV.1988, *Ignatov* (MHA); Mytishzhi Distr., Stepan'kovo, 18.VI.1987, *Ignatov* (MHA); Dmitrov Distr., near Tourist Station, 26.VI.1987, *Ignatov* (MHA); Taldom Distr., Mel'dino, 3.VII.1986, 6.VI.1988, 18.VII.1996, *Ignatov* (MHA); **Orel Province**, Vysokoe, Kamennyj les, 21.IV.1990, *N.N.Popova* (MHA); **Samara Province**, Syzran Distr., Rachejskoe forestry, 18.VIII.1989, *A.Mordvinov* (IRK); **CAUCASUS: Karachaevo-Cherkessia**, Teberda Reserve, Ullu-Murudzhu Gorge, 8.VIII.1986, *Ignatova* (MHA); Baduk Lakes, 26.VII.1955, *V.V.Makarov* (MHA); **URALS: Sverdlovsk Province**, Sukhogorskij Kamen Mt. top, 15.VII.1959, *M.Storozheva* (LE); Sysert River, 10.VII.1995, *I.Goldberg* (SVER); Chusovaya river, 30.IV.1981, Soroka, *Dyachenko* (SVER); **Perm Province**, Basegi Reserve, Vilva River, 23.VI.1993, #279, *A.Bezgodov* (MW), 8.VI.1994, #162, 172, 181, 217, 244, *Ignatov & Bezgodov* (MW); Basegi Reserve, Southern Baseg, 9.VI.1994, #84, 791, *Ignatov & Bezgodov* (MW); 20.VI.1992, #388, *A.Bezgodov* (MW); Basegi Reserve, Northern Baseg, 17-19.VI.1993, #204, 228, 7.VII.1993, #428, 6.VI.1992, *A.Bezgodov* (MW), 5.VI.1994, #399, 455, *Ignatov & Bezgodov* (MW); Vishera Reserve, Bolshoj Kolchim River, Churochnaya Creek, 12.VIII.1995, #714, 722, *A.Bezgodov* (MW); Vishera Reserve, Shchugor River, 4.VIII.1995, *A.Bezgodov* (MW); Kuryksar Range (23.VI.1995), #321, 355, *A.Bezgodov & A.Selivanov* (MW); Tulym Range, 1.VII.1994, #333, *A.Bezgodov* (MW); Olkhovka River lower course, 26.VI.1994, #117, *A.Bezgodov* (MW); **Bashkortostan**, Beloretzk Distr., Zuyakovo, 22.VII.195, *E.Z.Baisheva* (LE); Ishimbaj Distr., Uryuk River, 19.VI.2001, #13-192, *V.I.Zolotov* (MHA); **SIBERIA: Tyumen Province**, Berezovo Distr., Polja River, 30.VIII.1950, #81/16, *I.D.Kil'dyushevskij* (LE); **Altai Republic**, Tura Kreek, 2.VIII.1991, #28/1, *Ignatov & Ignatova* (MHA); **Kemerovo Province**, Tisul Distr., Apataga Mt., 9.IX.1971, *A.Vasiljev* (MHA); Tashtagol Distr., Pustag Mt., 20.IX.1970, *A.Vasiljev* (IRK); **Krasnoyarsk Territory**, Jenisei, Antziferova, *H.W.Arnell*, #273A (H-SOL); Jenisei, Dudinka, *H.W.Arnell*, #237B (H-SOL); Turukhansk Distr., Bakhta River, Keteollo Lake, 11.VIII.1992, #85, *S.Shcherbina* (MW); **Khakassia**, Askizskij Distr., Malyj Zub Mt., Amzas River left tributary, 21.VIII.1970, *A.Vasiljev* (IRK); **Irkutsk Province**, NE Baikal, Bolshaya Rechka, 3.VII.1956, 11.IX.1956, *L.V.Bardunov* (IRK); **Buryatia**, Khamar-Daban Ridge, Baikalskij Reserve, Osinovskij Goletz Mt., 18.VIII.2001, *N.A.Konstantinova* (MW); **Yakutia**, Aldan Distr., Uchur River, 1.VII.1991, *E.Ivanova* (LE, IRK); 25.VII.1989, *K.Volotovskij* (MHA, SASY); Kobyajskij Distr., Kitchan Settlement, 3.VII.2002, *E.I.Ivanova* (SASY, MW); Neryungri Distr., Udokan Range, 10.VIII.2001, *L.V.Kuznetsova* (SASY, MW); **FAREAST: Khabarovsk Territory**, Bureinskij Reserve, Medvezh'e Lake, 10.VIII.1997, #97-1102, *Ignatov* (MHA).

Distribution. *Grimmi. muehlenbeckii* is known from most European countries, in Transcaucasia and Turkey, North America. In Russia it is very common in Karelia and not rare in the Kola Peninsula and the Urals. It is almost the only *Grimmia* species in lowland European Russia, especially in its northern part. It is sporadic in Caucasus and east of the Urals (mountain

chains of southern Siberia, Yakutia, and one collection from Khabarovsk Territory). *Grimmia muehlenbeckii* grows on granitic boulders, more rarely on sandstones and granitic walls of channels and rivers; in the mountains it usually occurs in forest belt.

Differentiation. *Grimmia muehlenbeckii* can be recognized by its medium-sized plants and trapezoid costa in cross section. Besides, it often has multicellular gemmae on branched stalks on ventral side of leaf base. Gemmae of similar shape and size are usually present in *G. torquata*, but they develop in the latter species on dorsal side of costa near leaf base, on shorter stalks (looking as sessile). *Grimmia torquata* further differs in having strongly crisped dry leaves (resembling *Tortella* in habit). Another two species producing gemmae are *G. anomala* and *G. hartmanii*, but their gemmae develop on leaf apices at distal part of shoots, and they are much larger plants. When gemmae are lacking, *G. muehlenbeckii* can be separated by its winged costa, irregularly angled and usually trapezoid in cross section. It is similar to the costa structure of *G. elatior*, but plants of the latter species are more robust, 2-7 cm long (vs. small plants, to 2 mm long), leaves usually >2.5 mm long (vs. 1.5-2.5 mm long), costa (2-)-3-5-stratose (vs. 2(-)-3-stratose), upper laminal cells usually papillose and often bulging (vs. never papillose or bulging in *G. muehlenbeckii*).

19. *Grimmia orbicularis* Bruch ex Wils., Engl. Bot. Suppl. 4: 2888. 1844. Figs. 35, 36.

Plants in dense cushions, yellowish green to dark green, very hoary. Stems erect, 1-4 cm long. Leaves gradually larger to the distal part of shoot, 1.3-2.0x0.6-0.8 mm, oblong-ovate, acute to obtuse, keeled; margins recurved on both sides at middle part of leaf; costa differentiated, prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points in upper and perichaetial leaves as long as lamina or longer, 1-2(-2.5) mm, weakly denticulate or almost smooth, in lower leaves short or absent; lamina unistratose throughout; upper laminal cells isodiametric, 10-12 μ m, rounded-quadrate, thick-walled, not sinuose, median laminal cells short rectangular, with moderately thickened, strongly sinuose walls, basal juxtacostal cells elongate rectangular, slightly porose, basal marginal cells short rectangular, with thin longitudinal and thick transverse walls. Autoicous, androecia terminal, sporophytes usually present. Setae 2-3 mm, arcuate when moist. Capsules exerted, horizontal or pendent,

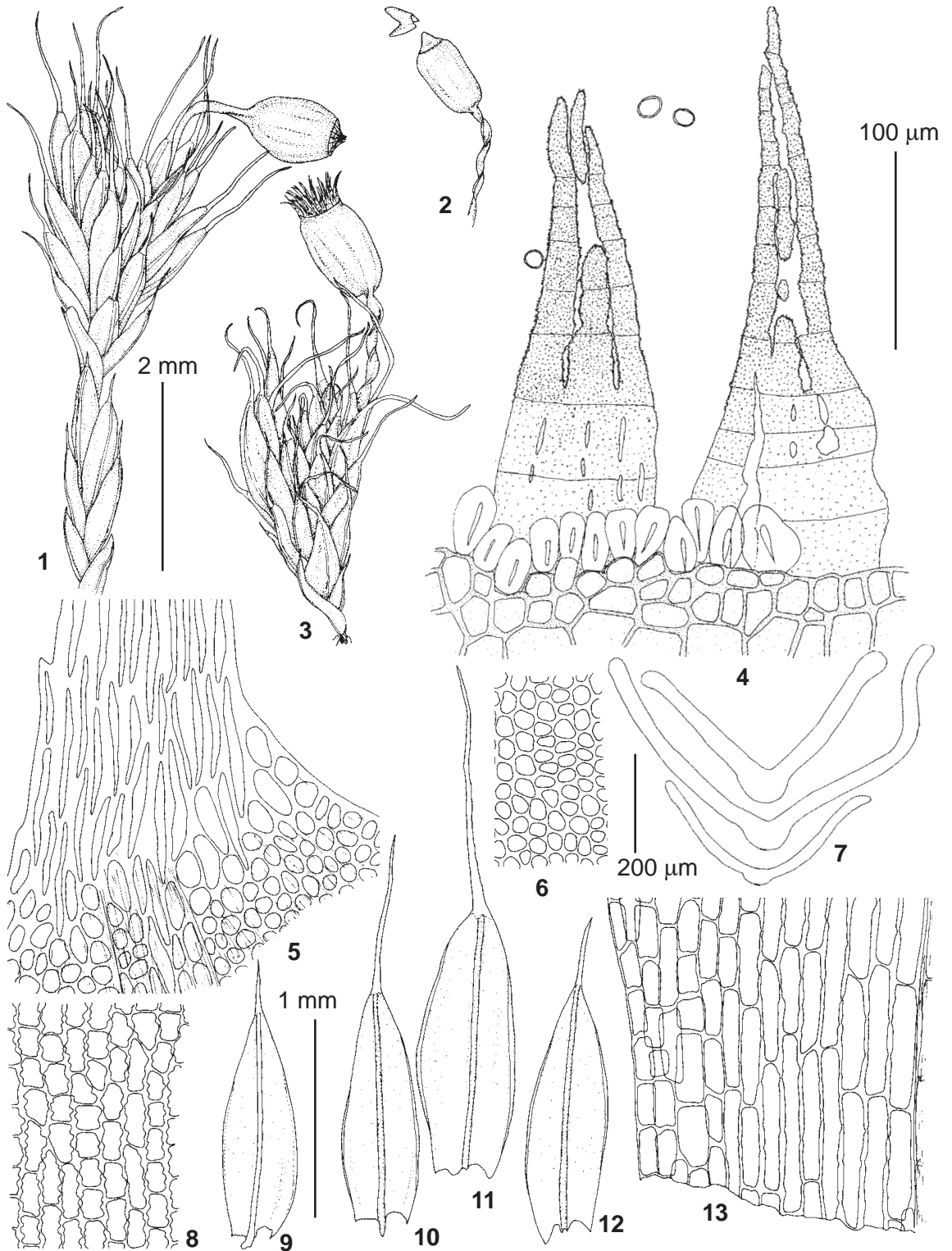


Fig. 36. *Grimmia orbicularis* Bruch ex Wils. (from Dagestan, 19.V.1988, V.Bochkin): 1, 3 – habit; 2 – capsule & calyptra; 4 – part of peristome; 5 – base of hair-point and upper leaf cells; 6 – upper leaf cells; 7 – leaf transverse sections; 8 – median leaf cells; 9-12 – leaves; 13 – basal leaf cells. Scale bars: 2 mm for 1-3; 1 mm for 9-12; 100 μm for 4-6, 8, 13; 200 μm for 7.

1-1.5 mm long, ovoid, ribbed. Operculum conic, with short beak. Annulus of affinis-type. Peristome teeth cribrose, irregularly cleft distally. Spores 10-14 μm . Calyptrae cucullate.

SPECIMENS EXAMINED: **CAUCASUS: Dagestan**, 10 km SE of Derbent, between Maraga & Rukel' villages, 19.V.1988, *V.D.Bochkin* (MHA); Derbent, 17.III.1902, #14211, *Th.Alexeenko* (LE).

Distribution. *Grimmia orbicularis* is widespread in xeric areas of central and southern Europe, northern Africa, Middle East, Transcaucasia, Turkey, Middle Asia and Pakistan. It is very rare in Russia, known only of 2 specimens from Dagestan. Savicz-Lyubitzkaya & Smirnova (1970) thought that *G. orbicularis* is a synonym of *G. pulvinata* var. *africana* (Hedw.) Wils., and they reported it under the latter name from the southern part of European Russia and Caucasus. According to Muñoz & Pando (2000), however, *G. pulvinata* var. *africana* is a synonym of *G. pulvinata*, not *G. orbicularis*.

Differentiation. In gametophyte characters *G. orbicularis* is very similar to *G. pulvinata*, differing in completely unistratose lamina (vs. bistratose at margins in *G. pulvinata*) and longer basal juxtacostal cells. But these species can be easily separated by androecia position (terminal in *G. orbicularis* vs. lateral, hidden just below perichaetia in *G. pulvinata*), peristome teeth perforation (cribrose and cleft in *G. orbicularis* vs. entire or slightly perforated in *G. pulvinata*), and calyptrae shape (cucullate in *G. orbicularis* vs. mitrate, rarely subcucullate in *G. pulvinata*). Usually it is enough to check androecia position for their differentiation: presence of bud-like perigonium just below perichaetium readily excludes *G. orbicularis*.

20. ***Grimmia ovalis*** (Hedw.) Lindb., Acta Soc. Sci. Fenn. 10: 75. 1871. — *Dicranum ovale* Hedw., Sp. Musc. Frond. 140. 1801. — *Grimmia commutata* Hueb., Muscol. Germ. 185. 1833. Figs. 37, 38.

Plants in loose tufts or patches, dark green or blackish-green, brownish in lower part, not very hoary. Stems erect or ascending, 1-4 cm long. Leaves erect to flexuose, loosely imbricate when dry, sigmoid in lateral view when wet, not considerably enlarged to the distal part of shoot, 2-3x0.5-0.7 mm, from ovate base gradually tapering into long lanceolate acumen, acuminate, concave, not plicate; margins plane; costa weakly differentiated in distal 2/3 of leaf, flattened, semi-elliptic in cross section, 4-6 cells wide ventrally; hyaline hair-points 0.5-1.5 mm long,

terete, slightly denticulate, not decurrent; lamina bistratose in distal 2/3, not translucent; upper cells isodiametric, 6-8 μm , rounded-quadrate, with evenly thickened to slightly sinuose walls, median cells quadrate and short rectangular, moderately sinuose, basal juxtacostal cells long rectangular, with moderately thickened, slightly porose walls, basal marginal cells short rectangular or sometimes quadrate, hyaline, with thin longitudinal and thick transverse walls. Dioicous, sporophytes rare (known from Russia only in two collections from Caucasus). Perichaetial leaves not differentiated. Setae straight, 3-4 mm. Capsules exserted, ovoid, 1-1.5 mm long, smooth, narrowed to the mouth. Operculum conic, with long oblique beaks. Annulus of affinis-type. Peristome teeth cleft distally, red-brown, papillose. Spores 8-10 μm . Calyptrae cucullate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA: Karelia:** Sortavala, 28.VII.1935 & 18.VI.1939, *A.Pankakoski* (H); **Leningrad Province**, Luzhskij Distr., Kopezerje, 13.VIII.1971, #166, *G.Vjunova* (LE); Luzhskij Distr., Golubkovo, 10.VIII.1971, #140b, *G.Vjunova* (LE); **Pskov Province**, Staryj Izborsk, 19.X.1996, *Ignatov & Zolotov* (MHA, MW); **Moscow Province**, Lyubertzjy Distr., Dzerzhinskij, 6.VII.1988, *Ignatov* (MHA); **Udmurtiya**, Izhevsk Sity, 27.VII.2000, *A.Sedych* (SVER); **Lipetz Province**, Svishnya Creek, 20.VIII.1994, *N.N.Popova* (MHA); **Rostov Province**, Krasnosulinskij Distr., Kundryuchjya River, 5.V.1993, #768, *L.Babenko* (MHA); **Volgograd Province**, Kletskij Distr., Kremenskaya, 7.VIII.1999, *Ignatov* (MHA); **CAUCASUS: Dagestan**, Levashi Distr., Udokkarskie gates, 11.VII.1961, *A.E.Bobrov* (LE, MW); **North Ossetia**, upper course of Tsej Riv., 25.VII.1979, *L.I.Abramova* (MW); North Ossetian Reserve, 31.VII.1976, 27.VII.1980, *L.I.Abramova* (MW); **Karachaevo-Cherkessia**, Teberda Reserve, Semen-Bash Mt., 6.VII.1976, *Onipchenko* (MHA); Teberda River valley, 1.VIII.1986, *Ignatova* (MHA); Malaya Khati para Gorge, 10.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE, MW); Mukhu Gorge, 17.VIII.1955, *A.L.Abramova & I.I.Abramov* (LE, MW); Bolshaya Laba River basin, Zaksen Mt., 22.VI.2003, *T.Akatova* (CSR, MHA); **Krasnodar Territory**, Mzymta River basin, Kogot Mt., 4.VIII.2000, *T.Akatova* (CSR, MHA); **Adygeya**, Belaya River basin, Tybga Mt., 6.VIII.1987, *T.Akatova* (CSR, MHA); **URALS: Sverdlovsk Province**, Alapaevsk Distr., Reps River, 23.VI.2000, *I.Goldberg* (SVER, MW); **Bashkortostan**, Burzyan Distr., Bainazarovo, 9.IX.1990, #10/9, *Ignatova* (MHA); Bashkirskij Reserve, Ural-tau, Gyr-tash, 24.VI.1948, #4688, *E.Selivanova-Gorodkova* (LE); Abzelilovskij Distr., Bulanusher Mt., 19.VI.1997, #38, *A.Solomeshch* (MW); **SIBERIA: Altai Republic**, Teletzkoe ozero, VII.1913, *J.Grano* (H-Br); Kosh-Agach, Tabozhok Peak, 30.VII.-1.VIII.1992, #31/80, 31/77, 31/78, *Ignatov* (MHA); Chulyshman River, Yazula, 26.VI.1989, #0/951, 0/917, *Ignatov* (MHA); Kayakkatuyarykskij Creek, 6.VII.1991, #8/279, *Ignatov* (MHA); left branch of Kaira Creek near Kaira-bazhi Peak, 14.VII.1991, #13/170, *Ignatov* (MHA); Chemal, 5.VIII.1991, #19/68, *Ignatov & Ignatova* (MHA); Teletzkoe Lake, Kishte waterfall, 9.VIII.1953, Mel'nichuk (MHA); Teletzkoe Lake, 30.III.1988, *I.Zolotukhina* (MHA); Yailyu, 24.VI.1993, #0/915, 149, *Ignatov* (MHA); **Krasnoyarsk Territory**, Malyi On Creek upper course, 4.VII.1968,

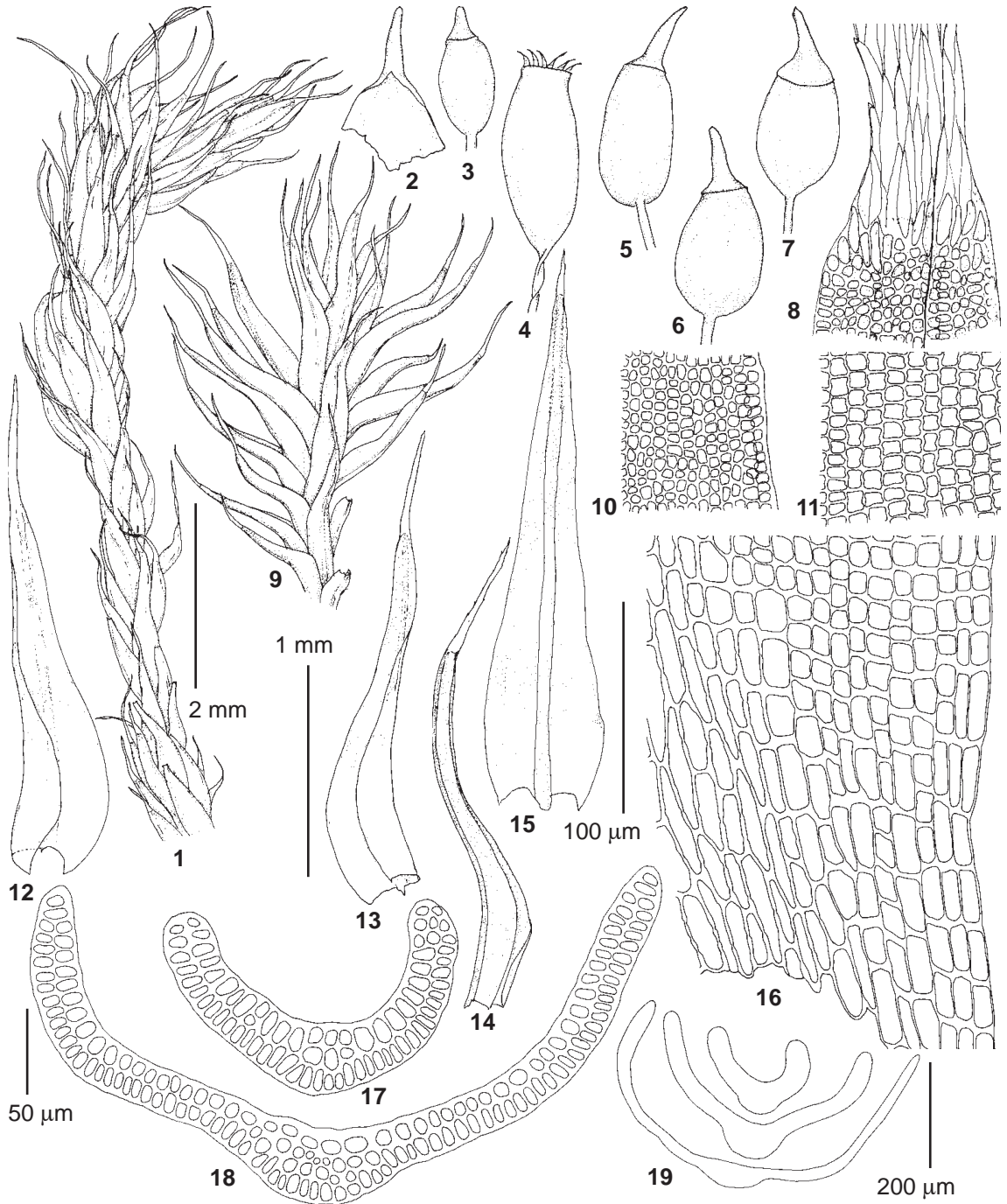


Fig. 37. *Grimmia ovalis* (Hedw.) Lindb. (1, 8-19 – from Bashkortostan, A.Solomeshch, #38; 2-7 – from Karachaevo-Cherkessia, 17.VIII.1955, A.L.Abramova & I.I.Abramov): 1, 9 – habit (dry & wet, respectively); 2 – calyptra; 3-7 – capsules; 8 – base of hair-point and upper leaf cells; 10 – upper leaf cells; 11 – median leaf cells; 12-15 – leaves; 16 – basal leaf cells; 17-18, 19 – leaf transverse sections. Scale bars: 2 mm for 1-7, 9; 1 mm for 12-15; 50 μm for 17-18; 100 μm for 8, 10-11, 16; 200 μm for 19.

L.V.Bardunov (IRK); Minussinsk, VIII.1880, *Martianoff* (H-Br); **Irkutsk Province**, 20.VI.1910, *N.I.Kuznetsov* (LE); Tutura River, 20.VI.1910, #553, *N.I.Kuznezov* (LE); **Chita Province**, Upper Shakhtama, 22.VIII.1963, *L.V.Bardunov*

(IRK); **FAR EAST: Amurskaya Province**, Zeya Reserve, Teplyj Creek, 10.VIII.1980, #56, *L.I.Abramova* (MW); **Primorskij Territory**, Khanka Lake, Orlovka village, 27.VI.1913, #17, *V.L.Komarov* (LE).

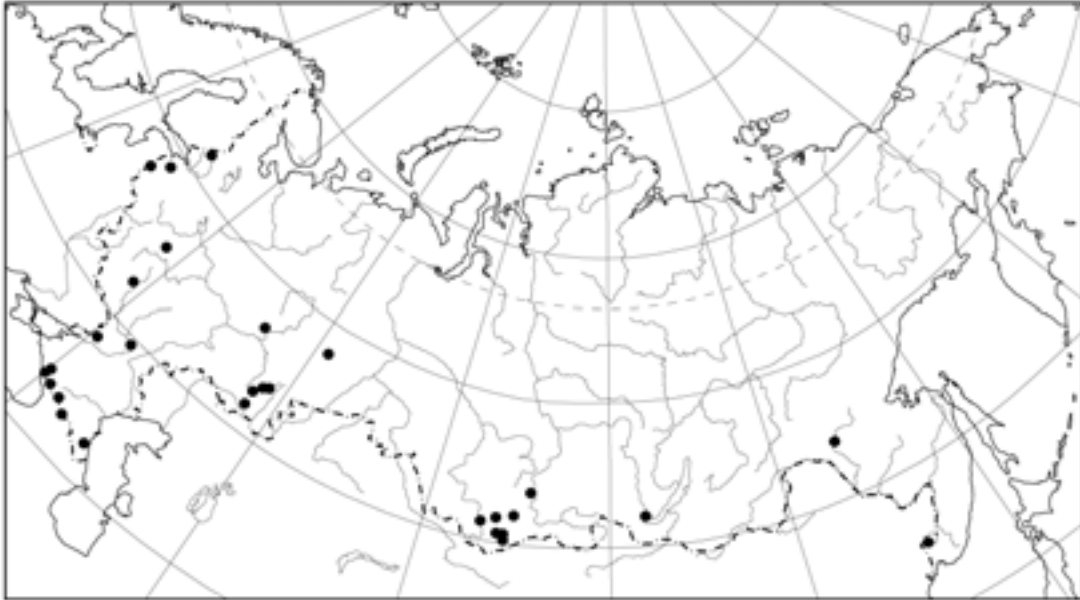


Fig. 38. Distribution of *Grimmia ovalis* (Hedw.) Lindb. in Russia

Distribution. *Grimmia ovalis* is rather widespread in Europe and xeric regions of Asia, known from North Africa, North and Central America. It was considered to be the most widespread species of the genus in Russia, but considerable number of specimens in herbaria labeled as *G. ovalis* represent *G. longirostris*, mostly because of long existing nomenclature confusion (see Sayre, 1951). *Grimmia ovalis* is distributed sporadically in Caucasus and southern Siberia (becoming more frequent in Middle Asia and Ukraine); several collections are known from Urals and central European Russia, mostly in forest-steppe and steppe zones, and also few records are from Leningrad, Pskov, and Moscow Provinces; very rare in Far East. It grows on dry, shaded or exposed substrates, on siliceous or, rarely, basic rocks (mostly on sandstones).

Differentiation. *Grimmia ovalis* differs from *G. longirostris* by concave, channeled, not keeled leaves with plane margins, flattened, weakly differentiated costa, slightly or not prominent dorsally (vs. keeled leaves with recurved on one side margins and costa prominent dorsally, reniform in cross section in *G. longirostris*). Sporophytes are very rare in Russian collections of *G. ovalis* whereas they

are often present in *G. longirostris* specimens; the shape and color of urns and opercula are also different in these species (capsules ovoid, opercula long-rostrate, concolorous with the urns in *G. ovalis* vs. capsules cylindrical, opercula usually with obtuse beaks, orange, contrasting in color with the urns in *G. longirostris*). Small plants of *G. ovalis* can be confused with *G. laevigata* or *G. tergestina* (see comments under these species).

21. ***Grimmia pilifera*** P. Beauv., Prodr. Aethelogam.: 58. 1805. Figs. 39, 40.

Plants medium-sized to robust, rigid, in loose, easily separating tufts, dark green to black green. Stems erect to ascending, (1-)2-3 cm long, without central strand. Leaves erect or slightly flexuose, loosely appressed when dry, with appressed base and spreading acumen when wet, becoming larger to the distal part of shoot, 2.0-3.0×0.6-0.8 mm, from ovate sheathing base quickly narrowed into long lanceolate acumen, keeled above, not plicate; margins plane in distal part of leaf, recurved on one or both sides at leaf base; costa differentiated from the lamina, strongly prominent distally, semi-circular in cross section, with 2(-3) ventral epidermal cells, 2-5(-6)-stratose; hyaline hair-points short in lower leaves, rather long in upper and perichaetial leaves, to 1.5 mm long, moderately denticulate; lamina unistratose with bistratose strips

Fig. 39. *Grimmia pilifera* P. Beauv. (from Primorskij Territory, 20.IX.1988, V.Ya.Cherdantseva): 1, 3 – capsules; 2, 6 – habit; 4 – upper leaf cells; 5 – stem transverse section; 7 – median leaf cells; 8-10, 12-13 – leaf transverse sections; 11 – basal leaf cells; 14-16 – leaves. Scale bars: 0.5 cm for 6; 2 mm for 1-3; 1 mm for 14-16; 50 µm for 8-10, 13; 100 µm for 4-5, 7, 11; 200 µm for 13.

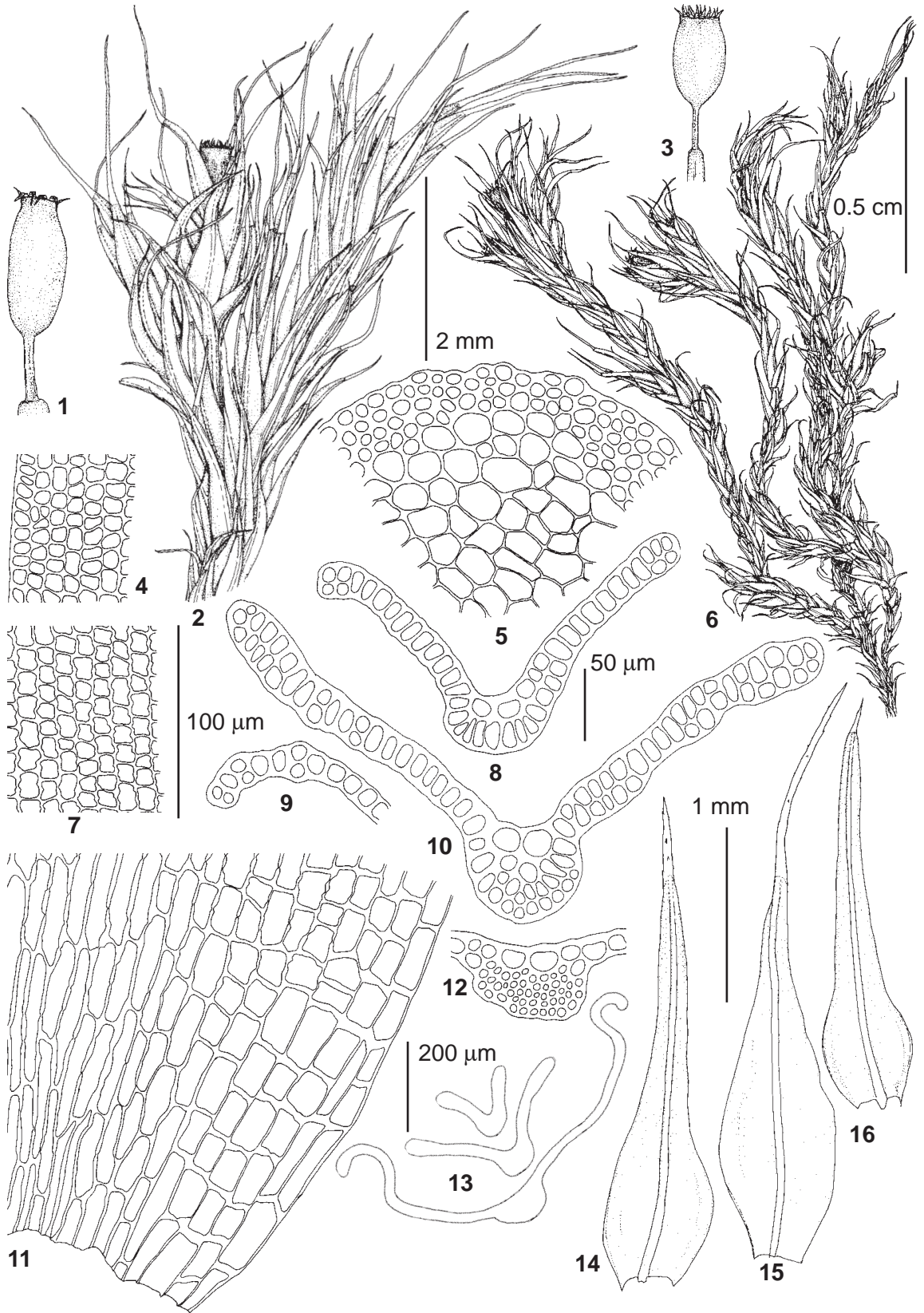




Fig. 40. Distribution of *Grimmia pilifera* P. Beauv. (circles) and *G. plagiopodia* Hedw. (triangles) in Russia

or mostly bistratose in distal 2/3 of leaf, to 3-4-stratose at margins, unistratose at base; upper leaf cells oblate to subquadrate and short rectangular, 6-8 μm wide, with moderately thickened and slightly sinuose walls, median laminal cells short rectangular, with moderately sinuose walls, basal juxtacostal cells linear, thick-walled, porose, basal marginal cells shorter, rectangular, pellucid, with thin longitudinal and thick transverse walls. Dioicous, androecia terminal, sporophytes not rare. Perichaetial leaves considerably longer than vegetative leaves, 3-4 \times 0.9-1.2 μm , with longer hyaline hair-points. Setae 0.3-0.4 mm, erect, straight. Capsules immersed, oblong-ovoid, 1.0-1.5 mm long, smooth. Operculum conic, with long straight beak. Annulus of affinis-type. Peristome teeth orange-brownish, entire or slightly cleft distally, densely papillose distally. Spores 12-15 μm . Calyptrae mitrate.

SPECIMENS EXAMINED: **SIBERIA: Altai Republic**, Chulyshman River, Dzhulukul' Lake, 1.VIII.1988, *N.Zolotukhin* (MHA); Katun River 2 km upstream Bijka Creek mouth, 10.VII.1993, #34/52, *Ignatov & Ignatova* (MHA); Chemal, 7.VII.1993, #34/215, 34/97, 34/217, *Ignatov & Ignatova* (MHA); Kuba River, 3.VI.1972, *V.Makarov* (MHA); **Buryatia**, Dzherginskij Reserve, 18.VII.2002, #27a, *D.Tubanova* (UUh); Barguzinskij Distr., Ina, 8.VII.1997, #524, *L.V.Krivobokov* (UUh); **Chita Province**, Onon River basin, Adun-Chelon Mts., 19 & 27.VII.1911, #9161, *V.Smirmov* (H-Br, LE); Nerch-Zavodskij Uezd, Kalginskaya Station, 18.VIII.1902, *Stukov* (IRK); distr. Nerchinsk, VIII.1902, *Stukov* (H-Br); inter fl. Shilka et Chernyj Uryum, 15.VI.1905, *N.Blagoveshzhenskij & G.Poplavskaya* (H-Br); **FAR EAST: Amurskaya Province**, Khinganskij Reserve, 16.IV.1992, *V.Ya.Cherdantseva* (VLA); Selemdzhinskij Distr., 25 km from Fevral'sk, Medvezhje, 28.VII.1976, *Zinovjev & Sleptzov* (VLA); Zeya Reserve, VIII.1980, *N.Stezura* (IRK); Upper Zeya plane, Zhurban, 30.VI.1974, *S.K.Gambaryan* (IRK); **Khabarovsk**

Territory, Bolshekhkhzirs'kij Reserve, Khkhzir Mt., 9-14.VIII.1981, *V.Ya.Cherdantseva* (VLA); Bureinskij Reserve, Lan & Balaganakh watershed, 22.VIII.1989, #89-M-269, *O.V.Grigorjeva* (MHA); Pravaya Bureya River right bank, 27.VIII.1997, #97-1109, *Ignatov* (MHA); **Chukotka**, Anadyr Distr., Pekulnej Mts., Televeem River, *O.M.Afonina* (LE); 115 km of Egvekinot-Iultin road, *O.M.Afonina* (LE); **Primorskiy Territory**, Nikolsk-Ussurijskij surr., Sujfun River, Krasnoyarskaya Mt., 26.VI.1927, *V.Transhel* (LE); Nikolsk, III.1905, *P.V.Siuzew* (H-Br, LE); Nikolsk Ussurijskij, 22.III.1905, *P.V.Siuzew* (LE); Sovetskij Distr., Tutto, Aleshkin Klyuch, 10.VIII.1945, #68, *Kolesnikov* (LE); Vityaz' Bay, 13.X.1978, *L.V.Bardunov* (VLA); Suchan River basin, #77, *V.L.Komarov* (LE); Vladivostok Distr., Muravjev Amurskij peninsula, *V.Transhel* (LE); Rejneke Island, 28.VIII.1977, *S.Gambaryan* (VLA); Rejneke island, 20.IX.1997, *K.V.Gorobetz* (VLA); Nikolsk-Ussurijskij surr., Sujfun River, Krasnoyarskaya Mt., 26.VI.1927, *V.Transhel* (LE); Nikolsk, III.1905, *P.V.Siuzew* (H-Br, LE); Nikolsk Ussurijskij, 22.III.1905, *P.V.Siuzew* (LE); Sovetskij Distr., Tutto, Aleshkin Klyuch, 10.VIII.1945, #68, *Kolesnikov* (LE); Vityaz' Bay, 13.X.1978, *L.V.Bardunov* (VLA); Suchan River basin, #77, *V.L.Komarov* (LE); Vladivostok Distr., Muravjev Amurskij peninsula, *V.Transhel* (LE); Rejneke Island, 28.VIII.1977, *S.Gambaryan* (VLA); Rejneke island, 20.IX.1997, *K.V.Gorobetz* (LE); Sudzuchinskij Reserve, Tumannaya Mt., 19.VII.1944, *Zhudova & Pokrovskaya* (LE); Lazovskij Reserve, Sokolovka, 21.IX.1988, *V.Ya.Cherdantseva* (VLA); Sudzuchinskij Reserve, Southern Sikhote-Alin Mts., 2.X.1946, #218, *P.Zhudova* (LE); Popov Island, 16.IX.1930, *A.S.Lazarenko* (LE); Lazovskij Reserve, Egerevka, 20.IX.1988, *V.Ya.Cherdantseva* (VLA); Lazo Distr., Chistovodnoe, 13.IX.1977, *L.V.Bardunov & V.Ya.Cherdantseva* (KPABG); Kedrovaya Pad' Reserve, 19.VIII.1977, *V.Ya.Cherdantseva* (VLA); Vladivostok, 28.III.1905, *P.V.Siuzew* (H-Br, LE); Shkotovo cape, 23.VIII.1930, *A.Lazarenko* (LE); Shkotovo Distr., Peishula village, 16.X.1950, #5675, *V.Voroshilov* (MHA); Vladivostok Distr., Okeanskaya village, 28.VII.1952, #6601,

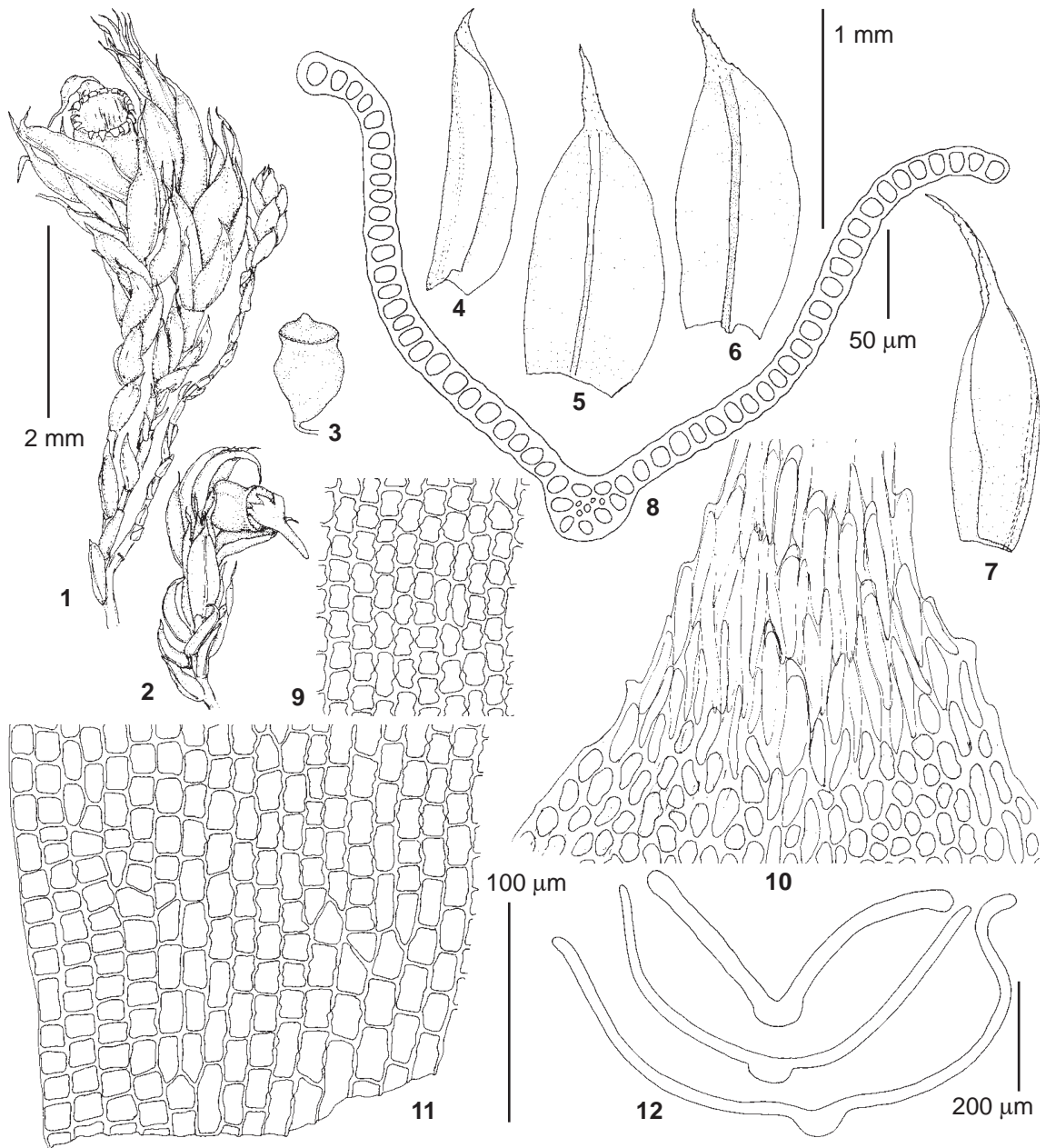


Fig. 41. *Grimmia plagiopodia* Hedw. (from Astrakhan Province, 9.V.1997, I.Zemlyanskaya): 1-2 – habit; 3 – capsule; 4-7 – leaves; 8, 12 – leaf transverse sections; 9 – median leaf cells; 10 – base of hair-point and upper leaf cells; 11 – basal leaf cells. Scale bars: 2 mm for 1-3; 1 mm for 4-7; 50 µm for 8; 100 µm for 9-11; 200 µm for 12.

V. Voroshilov (MHA); Lazovskij Reserve, Kamenka, 24.IX.1974, L. V. Bardunov & V. Ya. Cherdantseva (VLA); Sudzukhinskij Reserve, Zhudova & Pokrovskaya (LE); Ol'ga Distr., Shcherbakovka, 3.IX.1977, L. Bardunov & V. Cherdantseva (VLA); Ussurijskij Reserve, Peishula River, 2.VII.1974, V. Ya. Cherdantseva (VLA); Ussurijskij Reserve, Zmeinaya Mt., 16-20.VII.1974, S. Nesterova (VLA); Khasan Distr., Gakkelevskij Mt. Range, 1959, V. Ya. Ardeeva (LE); Oktyabr'skij Distr., Chernyatino, Razdol'naya Creek, V.1989, V. Ya. Cherdantseva (VLA); Faddeevka village, 3.X.1950,

#5495, V. Voroshilov (MHA); Anuchino Distr., Tikhorechnoe, 30.VI.1988, V. Ya. Cherdantseva (VLA); Khanka Distr., Kamen-Rybolov settl., 28.VI.1928, #343, D. P. Vorobjev (LE).

Distribution. *Grimmia pilifera* is distributed in North America from Canada to Mexico, and in temperate Asia (Japan, Korea, Mongolia). In Russia it is known only east of the Urals, mostly in the southern Far East (the most common

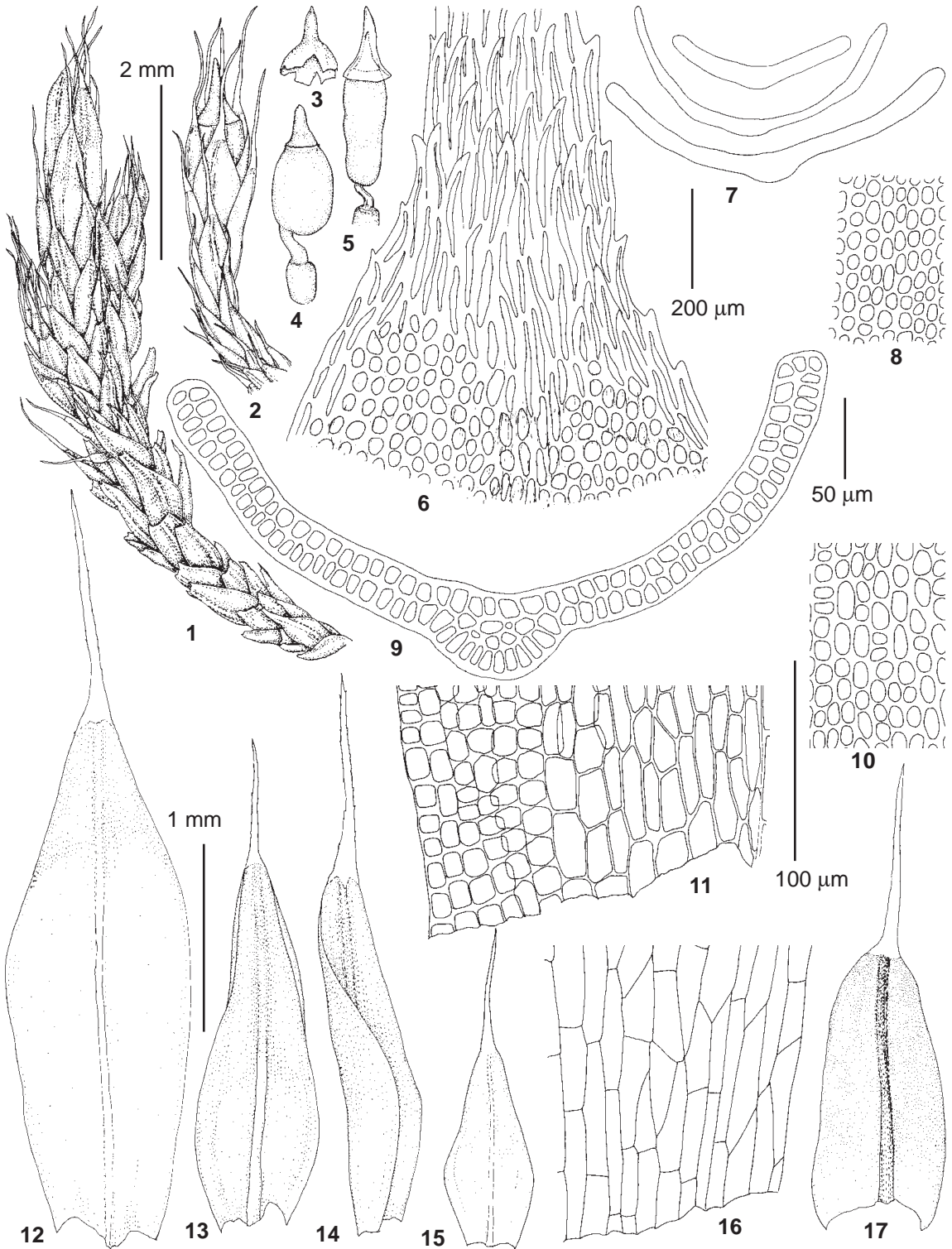


Fig. 42. *Grimmia poecilostoma* Card. et Seb. (1, 9, 12-14 – from Altai Republic, Ignatov, #33/1; 2-8, 10-11, 15-16 – from Yakutia, Ignatov, #00-128; 17 – from Kabardino-Balkaria, 30.VII.2004, Ignatov & al.): 1, 2 – habit; 3 – calyptra; 4-5 – capsules; 6 – base of hair-point and upper leaf cells; 7, 9 – leaf transverse sections; 8 – upper leaf cells; 10 – median leaf cells; 11 – basal cells of vegetative leaf; 12 – perichaetial leaf; 13-15, 17 – leaves; 16 – basal cells of perichaetial leaf. Scale bars: 2 mm for 1-5; 1 mm for 12-15, 17; 50 μm for 9; 100 μm for 6, 8, 10-11, 16; 200 μm for 7.

species of the genus in that area), extending northward to Chukotka and westward to Altai Mts. It was erroneously reported for European Russia (Muñoz & Pando, 2000). *Grimmia pilifera* grows usually in the forest belt at low altitudes (up to 1900 m alt. in Altai Mts.), on shaded rock outcrops or boulders, mostly acidic or neutral.

Differentiation. Plants with sporophytes can be easily recognized by comparatively large rigid plants, long perichaetial leaves with long hyaline hair-points, and immersed capsules on short erect setae. Sterile plants can be confused with *G. elatior* or with *G. longirostris*. *Grimmia elatior* is similar in leaf length, longer than 2.5 mm, and in the costa strongly prominent dorsally, but differs in distal laminal cells distinctly papillose and often also bulging (vs. smooth, not bulging cells in *G. pilifera*), costa furrowed dorsally and irregularly angular in cross section (vs. smooth dorsally, semi-circular in cross section in *G. pilifera*). Some phenotypes of *G. longirostris* from dry habitats have rigid plants with long hair-points and are very similar to sterile plants of *G. pilifera*, but can be easily differentiated by costa reniform in cross section with 4-6 ventral epidermal cells (vs. semi-circular in cross section with 2 ventral epidermal cells in *G. pilifera*) and central strand present (vs. absent in *G. pilifera*). Moreover, the leaves of *G. longirostris* are shorter, 1.3-2.0(-2.5) mm long (vs. 2.0-3.0 mm in *G. pilifera*), more gradually tapering into acumen (vs. abruptly tapered from the sheathing base in *G. pilifera*).

22. *Grimmia plagiopodia* Hedw., Sp. Musc. Frond. 78. 1801. Figs. 40, 41.

Plants in dense low tufts, dark green or brownish, slightly hoary. Stems erect, to 0.5 cm long. Leaves appressed when dry, erect-spreading when moist, upper and perichaetial leaves enlarged, 1.0-2.0×0.7-1 mm, widely ovate to oblong, concave, keeled in upper part, not plicate; margins plane in distal 1/3, recurved below at both sides; costa clearly differentiated from the laminal cells, thin, slightly widened in upper part, prominent dorsally, semi-circular in cross section, 2 cells wide ventrally; hyaline hair-points short to long in upper leaves, denticulate, broadened and flattened at base, in lower leaves absent; lamina unistratose throughout; cells in distal part of lamina rounded-quadrate, 8-12 μm, thin-walled, slightly sinuose, basal juxtacostal cells elongate, basal marginal cells shorter, rectangular, with thin longitudinal and thick transverse walls.

Autoicous, sporophytes usually present. Setae ca. 0.3 mm, curved, attached excentrically to the capsules. Capsules 1-1.5 mm long, immersed, asymmetric, ventricose, rounded, smooth, with wide mouth when open. Operculum plane to low convex, mamillate. Annulus of Schistidium-type. Peristome present, strongly cleft and perforate. Spores 11-13 μm. Calyptrae mitrate.

SPECIMENS EXAMINED: EUROPEAN RUSSIA: Astrakhan Province, ripae lac. Baskunczak prope montem Bogdo, 8.V.1926, #16, V.P. Savicz (LE, MHA); Bogdo-Baskunchak Reserve, 9.V.1997, I. Zemlyanskaya (MHA), 14.VII.2002, S. Suragina (MHA); **Orenburg Province**, Sorochinskij Distr., Golubovka, VII.1993, G.D. Musikhin (LE); **SIBERIA: Altai Republic**, Yustyd, 3.VII.1907, V.I. Vereshchagin (H-Br, LE).

Distribution. *Grimmia plagiopodia* is known from scattered localities in Europe, North Africa, Turkey, Caucasus, Middle Asia, North America. Only few collections from Russia are known: from Astrakhan and Orenburg Provinces, and also one old collection from Altai Mts. (one more specimen from this area reported by Bardunov (1974) as *Schistidium plagiopodium* (Hedw.) Loeske represents another species, *Grimmia capillata*). It grows mostly on sandstones, often with *G. anodon*.

Differentiation. Differences from most close species, *G. anodon* and *G. capillata*, are discussed under these species.

23. *Grimmia poecilostoma* Cardot et Sebillé, Rev. Bryol. 28: 118, tab. 5. 1901. — *Grimmia tergestina* var. *poecilostoma* (Cardot et Sebillé) Loeske, Laubm. Eur. Part I: 84. 1913. Figs. 42, 43.

Plants in dense or loose, easily separating tufts, dark-green, olive-green to blackish when wet, black above and brownish below when dry, hoary. Stems erect, 0.7-1.0 cm long. Leaves erect to appressed when dry, erect-spreading when moist, gradually enlarged to the distal part of fertile shoot, 1.5-1.8(-2.0)×0.5-0.7 mm, ovate to ovate-lanceolate, concave, not plicate; margins plane; costa weakly differentiated in distal part, semi-elliptical in cross section, 3-7 cells wide ventrally; hyaline hair-points of vegetative leaves 0.5-0.8 mm long, terete distally, flattened proximally, sometimes shortly decurrent, almost smooth to slightly denticulate; lamina bistratose in distal 2/3, unistratose basally, upper laminal cells isodiametric, 6-9 μm, thick-walled, median laminal cells short rectangular, 15-25×10-12 μm, thick-walled, not sinuose, basal juxtacostal cells long rectangular, to 70×12 μm, moderately thick-walled and slightly porose, basal marginal cells shorter, 20-40×12 μm, with thin longitudinal and



Fig. 43. Distribution of *Grimmia poecilostoma* Card. et Seb. in Russia: with (circles) and without (triangles) capsules.

thick transverse walls. Dioicous, sporophytes not rare. Androecia terminal. Perichaetial leaves 2.5-3.0×0.6–1.1 mm, hyaline hair-points 1.3-1.5 mm long, widened and flattened basally, decurrent; basal cells of outer perichaetial leaves very thin-walled, hyaline, inner perichaetial leaves mostly hyaline and filmy, except uppermost cells, convolute. Setae very short, sigmoid, excentrically attached. Capsules immersed, ovate, 0.7-1.0 mm long, ventricose. Operculum conic, rostrate. Annulus of affinis-type. Peristome teeth cribrate and cleft. Spores 9-12 µm. Calyptrae mitrate.

SPECIMENS EXAMINED: Specimens with sporophytes: **CAUCASUS:** Kabardino-Balkaria, Baksan River near Adyl-Su Creek mouth, 30.VII.2004, *M. Ignatov & al.* (MHA); Cherek-Bezengijskiy River at Dumala Creek mouth, 30.VII.2004, *Ignatov & al.* (MHA); **SIBERIA:** Altai Republic, Kosh-Agach, Tabozhok Peak, 2-8.VIII.1992, #32/7, 33/1, *Ignatov* (MHA); Malyj Yaloman, 4.VIII.2000, *Ignatov* (one of four specimens with immature asymmetric capsules) (MW); **Yakutia**, Ust-Maya Distr., Yugorenok, Shchel Creek, 8.IX.2000, #00-121, 00-127, 00-128, *Ignatov* (MHA); Khangalassky Distr., Lenskie Stolby, Labydjya River, 17.VIII.2000, *Ignatov* (MHA).

Specimens lacking sporophytes, referred tentatively to *G. poecilostoma* (basing on distributional pattern or growing on acidic and neutral substrates): **SIBERIA:** Altai Republic, Kosh-Agach, Tabozhok Peak, 4.VIII.1992, #33/2, *Ignatov* (MHA); Malyj Yaloman, 30-31.VII.1991, #25/26, 25/128, 25/160, *Ignatov & Ignatova* (MHA); Karakem River, 23.VI.1989, #0/952, *Ignatov* (MHA); Chermal, 7.VII.1993, #34/212, 34/213, *Ignatov & Ignatova* (MHA); Teletzkoe Lake, Derbogach, 4.VI.1989, #0/897, *Ignatov* (MHA); **Yakutia**, Ust-Maya Distr., Yugorenok, Shchel Creek, 8.IX.2000, #00-124, *Ignatov* (MHA); Indigirka River, 17.VI.1976, *O.M. Afonina* (LE).

Distribution. *Grimmia poecilostoma* is known from Central and Southern Europe, Mongolia, Middle Asia, Turkey, North America (to Mexico). In Russia it was collected in Caucasus, Altai, and Yakutia. Sporadically found with sporophytes (more frequently than *G. tergestina*); some collections were referred to this species tentatively.

Differentiation. The differences of *G. poecilostoma* from *G. tergestina*, *G. laevigata*, and *G. ovalis* are discussed under *G. tergestina*.

24. *Grimmia pulvinata* (Hedw.) Sm., Engl. Bot. 24: 1728. 1807. — *Fissidens pulvinatus* Hedw., Sp. Musc. Frond. 158. 1801. — *Grimmia pulvinata* var. *africana* (Hedw.) Wils., Bot. Antarct. Voy., Fl. Nov.-Zel. 2: 75. 1854. Figs. 44, 45.

Plants in dense small cushions, light green or dark green to black, very hoary. Stems erect, 1-4 cm long. Leaves 1.3-1.8×0.6-0.8 mm, ovate to oblong-ovate, acute to obtuse, widely keeled; margins recurved on both sides at middle part of leaf; costa differentiated, prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points in upper and perichaetial leaves as long as lamina or longer, to 2 mm, almost smooth or denticulate, lower leaves mucous; lamina unistratose, bistratose at margins in 1-2 cell rows at distal 2/3 of leaf; upper laminal and median cells isodiametric, 8-10 µm, subquadrate to short rectangular, moderately thick-walled, not or slightly sinuose, translucent, basal juxtacostal cells subquadrate to short rectangular,

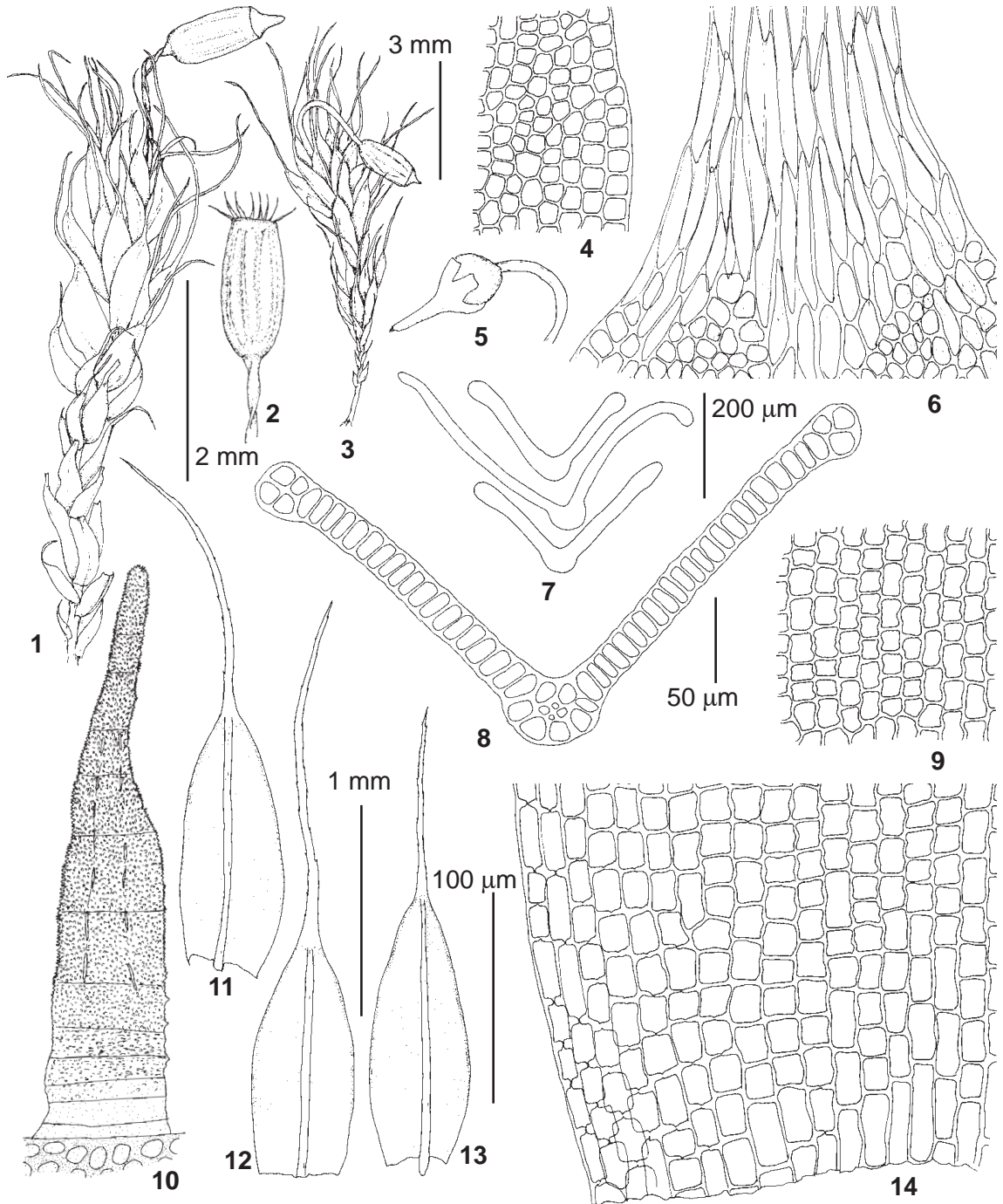


Fig. 44. *Grimmia pulvinata* (Hedw.) Sm. (from Voronezh Province, N.N. Popova, #4382): 1, 3 – habit; 2 – capsule; 4 – upper leaf cells; 5 – calyptra; 6 – base of hair-point and upper leaf cells; 7-8 – leaf transverse sections; 9 – median leaf cells; 10 – part of peristome; 11-13 – leaves; 14 – basal leaf cells. Scale bars: 3 mm for 3; 2 mm for 1-2; 1 mm for 11-13; 50 μm for 8, 10; 100 μm for 4, 6, 9, 14; 200 μm for 7.

basal marginal cells short rectangular, pellucid, with thin longitudinal and thick transverse walls. Autoicous, androecia lateral, just below perichaetia, sporophytes usually present. Setae 2-4 mm, arcuate when moist. Capsules exserted, horizontal or pendent,

1-1.5 mm long, ovoid, ribbed. Operculum conic, with short to long erect beak. Annulus of affinis-type. Peristome teeth entire or slightly perforated, densely papillose. Spores 8-13 μm. Calyptrae mitrate, sometimes almost cucullate.

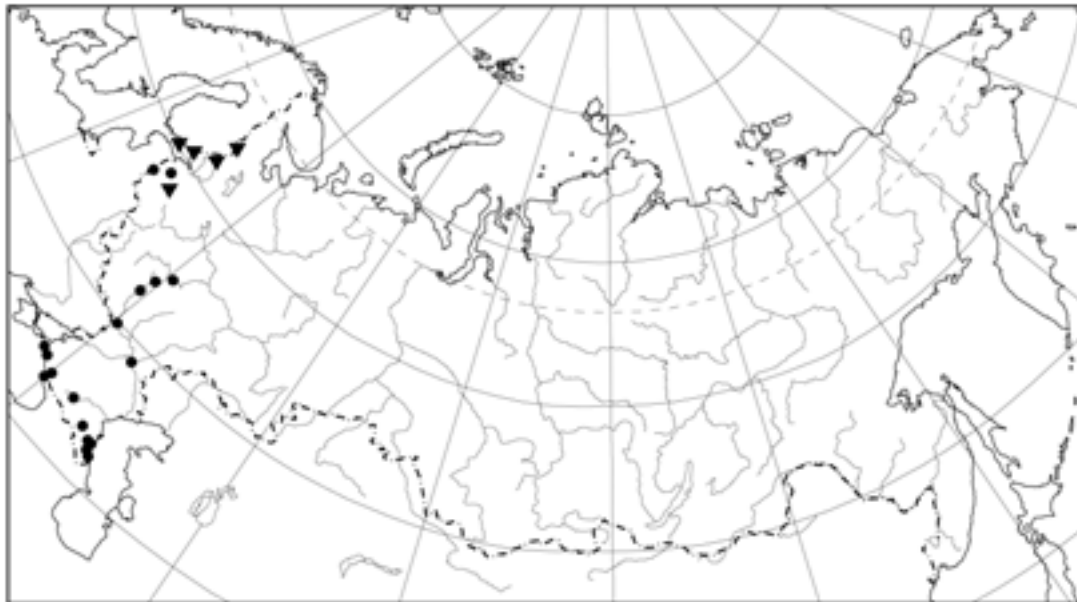


Fig. 45. Distribution of *Grimmia pulvinata* (Hedw.) Sm. (circles) and *G. ramondii* (Lam. et DC.) Margad. (triangles) in Russia.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:**
Leningrad Province, Luzhskij Distr., Ruchji, 18.VIII.1971, #185, *G. Vjunova* (LE); **Pskov Province**, Staryj Izborsk, 19.X.1996, *Ignatov & Zolotov* (MHA, MW); **Ryazan Province**, Miloslav District, Voeikovo, 21.VI.2001, *L. Volosnova* (MW); Spassk Distr., Okskij Reserve, 19.VII.2000, *L. Volosnova* (MW); **Voronezh Province**, Boguchary Distr., Leskovka, *N.N. Popova* (MHA); Verkhnemamonskij Distr., Derezovka, 16.VII.1983, #4382, *N.N. Popova* (LE); **Lipetz Province**, Apukhtino Distr., *N.N. Popova* (MHA); **Volgograd Province**, Volgograd City, 3.IV.1996, *Yu. Matveeva* (MHA); **CAUCASUS:**
Dagestan, Petrovsk, 26.V.1890, *W. Lipsky* (LE); SW of Petrovsk, Kakhulaj Spring, 12.VI.1925, #153, *A.K. Prokofieva* (LE); Temir-khan-Schura, 7.V.1891 *Th. Alexeenko* (LE); supra Derbent, ad p. Dshalgan, #117-65, *Th. Alexeenko* (LE); Derbent Distr., prope st. Rubas, 11.VIII.1892, *Th. Alexeenko* (LE); prope Derbent, 23.VIII.1899, #3807, *Th. Alexeenko* (LE); Derbent, V.1901, *Th. Alexeenko* (H-Br); Kaitag-Talassaron pr. Kajakont, 17.VII.1900, *Th. Alexeenko* (H-Br); Makhachkala Distr., Tarki-tau Mt. near Tarki village, 22.III.1953, 9.VIII.1953, #1, 1250, *Ya.I. Prokhanov* (LE, MW); Bujnask Distr., Kapchugaj Station, 3.VIII.1955, #471, *Ya.I. Prokhanov* (LE, MW); **Chechenia**, Groznyj, 5.V.1890, #273, *W. Lipsky* (LE); **Stavropol Territory**, Pyatigorsk, Mashuk Mt., 29.IX.1928, *E. Schteinberg* (LE, MW); **Krasnodar Territory**, Armavir Distr., Ergolyk, 4.VII.1926, #35/2331, *E. Schiffers* (LE, MW); Gelendzhik Distr., Arkhi-po-Osi povka, 6-9.VIII.1958, 1.X.1959, *A.L. Abramova & I.I. Abramov* (LE), 2.IX.1937, *A.S. Lazarenko* (LE); Novorossiisk Distr., 22.IV.1889, 10.IV.1891, *Anonymo* (LE); Anapa Distr., Malyj Utrish, VII.1996, *A. Tishkova* (MW), 21.VI.2000, *E. Kirichok* (MW); Malyj Utrish, 24-25.VIII.2004, *T. Akatova* (CSR, MHA); Bolshoj Utrish, 22.VIII.2004, *T. Akatova* (CSR, MHA); Khosta, 11.VIII.2000, *Ignatov & Ignatova* (MW); Aibga Mt.,

30.VI.1951, *V. Alper* (CSR, MHA); Kavkazskij Reserve, Mzymta River, 30.V.1951, *N.P. Ariskina* (LE); **Adygeya**, Belaya River basin, Zhelobnaya Creek, Inzhenernyj Ridge, 5.VIII.1997, *T. Akatova* (CSR, MHA).

Distribution. One of the most widespread species throughout the world, common in most European countries, Macaronesia, northern, eastern and southern Africa, North and South America, Australia and New Zealand. In Asia it is very common in its western areas, eastward to Middle Asia and Afganistan, but from Mongolia is known only from few localities, and unknown from China (all former reports of this taxon from China are in fact other species, mainly *G. longirostris*). In Russia, *G. pulvinata* is frequent in Caucasus, and grows there only at low altitudes, usually in coastal areas of Black and Caspian Seas. In Middle European Russia it is not rare in steppe zone and sporadic in forest zone (known from few localities in Leningrad, Pskov, and Ryazan Provinces). Grows on calcareous, more rarely acidic rocks, sometimes on concrete or other man-made substrates.

Differentiation. *Grimmia pulvinata* can be recognized by elliptic, keeled leaves, and unistratose translucent lamina. This species is a considerably larger than *G. anodon*, and both species usually bear sporophytes, which precludes confusion. The differences from its closest species, *G. orbicularis*, are discussed under that species.

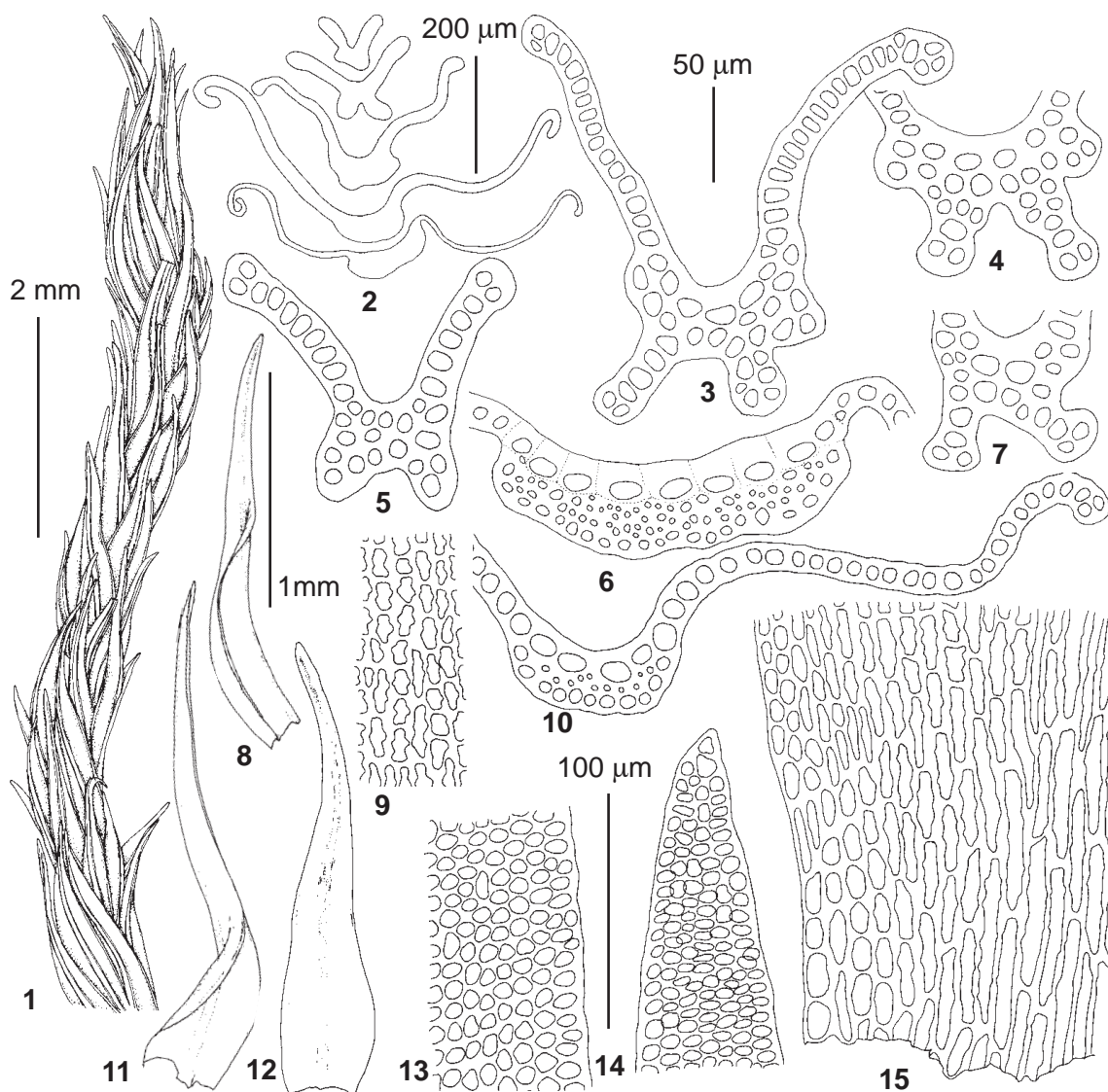


Fig. 46. *Grimmia ramondii* (Lam. et DC.) Margad. (1-2, 5, 8-15 – from Novgorod Province, V.1908, P.Kurskij; 3-4, 6-7 – from Leningrad Province, Hogland, 18.VI.1867, S.O.Lindberg): 1 – habit; 2-7, 10 – leaf transverse sections; 8, 11-12 – leaves; 9 – median leaf cells; 13-14 – upper leaf cells; 15 – basal leaf cells. Scale bars: 2 mm for 1; 1 mm for 8, 11-12; 50 µm for 3-7, 10; 100 µm for 9, 13-15; 200 µm for 2.

25. *Grimmia ramondii* (Lam. et DC.) Margad., *Lindbergia* 1: 128. 1972. – *Pterigynandrum ramondii* Lam. et DC., *Fl. Franc.*, ed. 3, 2: 462. 1805 [*ramondi*]. – *Bryum patens* Hedw., *Sp. Musc. Frond.*: 86. 1801. – *Dryptodon patens* (Hedw.) Brid., *Bryol. Univ.* 1(1): 192. 1826. – *Grimmia patens* (Hedw.) B. S. G., *Bryol. Europ.* 3: 120. 1845, nom. illeg. – *Racomitrium patens* (Hedw.) Hüb., *Muscol. Herm.*: 198. 1833. Figs. 45, 46.

Plants in large, loose, easily separating patches, dark green, brownish green to black. Stems ascending, without central strand, 2-6[-10] cm long, evenly foliated. Leaves erect to slightly curved, appressed

when dry, erect-spreading when moist, 2.0-2.6×0.4-0.6 mm, from ovate base gradually tapering into narrow lanceolate acumen, mucous and obtuse at apex, keeled distally, widely channeled proximally; margins plane to weakly recurved in distal 1/3 of leaf, more strongly recurved to revolute on both or, more rarely, on one side below; costa differentiated, prominent dorsally, winged in distal 2/3 of leaf, reniform and irregularly angled on dorsal side, with (2-)3-8 ventral epidermal cells; lamina unistratose, bistratose for one cell row at margins; upper laminal cells isodiametric, 7-9 µm, rounded or irregular in shape, oblate at leaf apex, thick-walled, median laminal cells rectangular, incrassate, moderately

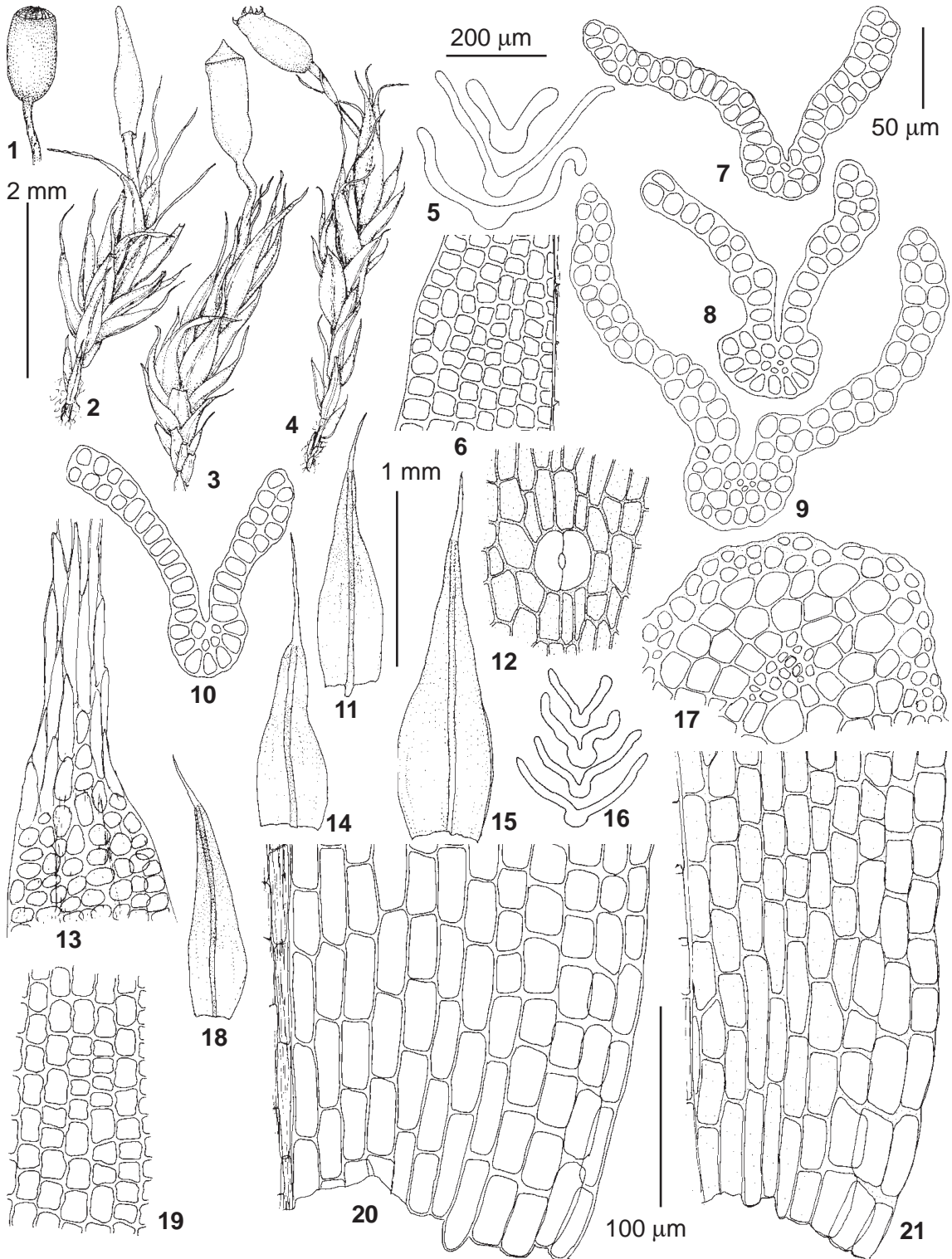


Fig. 47. *Grimmia reflexidens* Müll. Hal. (2-11, 13-14, 18-20 – from Perm Province, A. Bezdudov, #335; 1, 12, 15-17, 21 – from Altai, 23.VI.1966, L. Bardunov & L. Novak): 1 – capsule; 2-4 – habit; 5, 7-10, 16 – leaf transverse sections; 6 – upper leaf cells; 11, 14-15, 18 – leaves; 12 – cells of exothecium and stomatum; 13 – base of hair-point and upper leaf cells; 17 – stem transverse section; 19 – median leaf cells; 20-21 – basal leaf cells. Scale bars: 2 mm for 1-4; 1 mm for 11, 14-15, 18; 50 µm for 7-10; 100 µm for 6, 12-13, 17, 19-21; 200 µm for 5, 16.

sinuose, basal juxtacostal cells linear, thick-walled, slightly sinuose and porose, basal marginal cells short rectangular, pellucid, with thick longitudinal and transverse walls. Dioicous, sporophytes rare, not known from Russia. [Setae to 3-5 mm, arcuate when moist. Capsules exerted, pendent, ovoid, ribbed. Operculum conic, with long erect beak. Annulus of affinis-type. Peristome teeth red, strongly cleft. Spores 12-16 µm. Calyptrae mitrate].

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Karelia** Ladogensis, Impilahti, Pullinvuori, 23.VII.1935, *A.J.Huuskonen* (KPABG, ex H); Muezerskij Distr., Lendery, 8.VIII.2003, #L-02/40-1, *Maksimov & Maksimova* (PTZ); **Leningrad Province**, Hogland, 18.VI.1867, *S.O.Lindberg*, 18.VI.1867, *M.Brenner* (H); Vyborg, 18.VI.1908, *H.Buch* (H); **Novgorod Province**, Staraya Russa Distr., Vilenka village, V.1908, *P.Kurskij* (LE).

Distribution. Widespread in Europe, known also from Japan and western North America. Rare in Russia, where it has been found in few localities of Karelia, Novgorod and Leningrad Province.

Differentiation. *Grimmia ramondii* can be recognized by narrow lanceolate muticous leaves and costa winged dorsally in the distal part of the leaf. Leaves of *Grimmia unicolor* are also muticous, but plants of this species are smaller, leaf lamina is completely bistratose, and the costa is poorly differentiated, flattened and without wings. Another species resembling *G. ramondii* in plant size, foliation pattern, and costa structure is *G. hartmanii* (sometimes also having weakly winged costa), but it differs by dark red multicellular gemmae usually present on the tips of upper leaves, and the short hyaline hair-points present on non-gemmiferous leaves. Large plants, winged costa and muticous leaves differentiate *G. ramondii* from *G. longirostris* with poorly developed hair-points.

26. ***Grimmia reflexidens*** Müll. Hal., Syn. Musc. Frond. 1: 795. 1849. — *Grimmia sessitana* De Not., Atti Reale Univ. Genova 1: 704. 1869. Figs. 47, 48.

Plants in dense tufts or cushions, yellowish-, brownish- or blackish-green, rarely glaucous, moderately hoary. Stems erect, 0.5-2 cm long, with central strand. Leaves erect, appressed when dry, patent to spreading when moist, 1.0-1.8×0.3-0.5 mm, from oblong base gradually tapering into lanceolate acumen, sharply and narrowly keeled in distal part, blades forming <45° angle to almost parallel near the costa; margins plane to slightly recurved in distal part of leaf, usually narrowly recurved on one or rarely on both sides in middle and lower part of

leaf, sometimes plane throughout; costa differentiated, prominent dorsally, semi-circular in cross-section, with 2 ventral epidermal cells; hyaline hair-points short to long, to 1.5 mm, slightly denticulate; distal part of lamina unistratose near the costa, bistratose in 2-6cell rows at margins and with bistratose strips; upper laminal cells isodiametric, 8-12 µm, rounded-quadrate, with moderately thickened and slightly sinuose walls, not bulging or slightly bulging, median laminal cells short rectangular, with moderately sinuose walls, basal juxtacostal cells elongate rectangular, 20-55×8-10 µm, with moderately thickened, not or slightly porose walls, basal marginal cells in 3-5 cell rows shorter, pellucid, with thin longitudinal and thick transverse walls. Autoicous, androecia axillary or terminal, sporophytes usually present. Setae 1.5-3 mm, pale yellowish, straight. Capsules exerted, ovoid-cylindric, rounded at base, stramineous, 0.8-1.2 mm long, exothecial cells thin-walled, stomata at urn base present. Operculum low conic, mamillate. Annulus of Schistidium-type. Peristome teeth orange, contrasting in color with the urn. Spores 10-14 µm. Calyptrae cucullate.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Murmansk Province**, Khibiny Mts., Ajkuajvenchjok Creek, 30.VIII.2001, *Ignatova* (MW), 17.IX.1989, #25, *N.Konstantinova* (KPABG); Takhtarvumchorr Mt., Molibdenovij Cirque, 8.VIII.1994, #NK-3-95, *N.Konstantinova* (KPABG); Vudjavrchorr, 16.VIII.1948, #2135, *R.N.Shlyakov* (LE); Vudjavrchorr Mt., Botanicheskij Cirque, 31.VIII.2001, *Ignatova* (MW); Lovozerskie Mts., Chivruaj Gorge, 14.VII.1983, #12/2, *O.Belkina* (KPABG); Il'majok Gorge, 23.VIII.1982, #79/11, *O.Belkina* (KPABG); Rajyavr Lake, 27.VIII.1983, #87/1, *O.Belkina* & *A.Likhachev* (KPABG); **Karelia:** Kuusamo, Ruskeakallio, 5.VIII.1883, *V.F.Brotherus* (H); Paanajarvi, Krasnaya Skala, 19.VI.1990, *A.Maksimov* (PTZ); **CAUCASUS:** **Dagestan**, Kasi Kumukh, 10.VIII.1898, *Th.Alexeenko* (LE); ad Djulti Tschai, conf. Samuri, 21.VII.1860, *Ruprecht* (LE); **Kabardino-Balkaria**, Karasu, 30.VII.1927, *E. & N.Bush* (LE, MW); 26.VII.1980; Elbrus Mt., 1959, *Vladimirova* (LE, MW); Adyl-Su Gorge, X.1994, #11, *I.Pospelov* (MW); Elbrus Mt., 14.VI.1892, *Anonymous* (LE); **North Ossetia**, North Ossetian Reserve, 20-24.VII.1977, 26.VII.1980, *L.I.Abramova* (MW), 28.VII.1982, *A.Amirkhanov* (MW), 28.VIII.1988, *V.Bochkin* (MHA); ad mare glaciale Zei ad fontes fl. Ardon, *V.F.Brotherus* (H-BR); **Karachay-Cherkessia**, Teberda Reserve, Alibek Gorge, 3.X.1989, *Onipchenko* (MHA); Semen-Bashi Mt., 6.VII.1976, *Onipchenko* (MHA); Mussa-Achitara Mt., 6.VIII.1986, *Ignatova* (MHA); Klukhor pass, 11.VII.1982, *E.Vaulina* (MHA); Northern Klukhor, 12.IX.1994, #208/94, *Onipchenko* (MW); Amanauz River, 23.VIII.1955, *A.L.Abramova* & *I.I.Abramov* (LE, MW); Chuchkhur River, 15.VIII.1954, *I.Patrobolova* (LE, MW); Ullumurudzu Gorge, 8-10.VIII.1986, *Ignatova* (MHA); Ullumurudzu-Nazlykol pass, 10.VIII.1986, *Ignatova* (MHA); Malaya Khatipara Gorge, 14.VIII.1955, *A.L.Abramova* & *I.I.Abramov* (LE, MW), 31.VIII.1983, #35-83, *Onipchenko* (MHA), 3-4.VIII.1986, *Ignatova* (MHA); Kyskhkadzher Mt.,

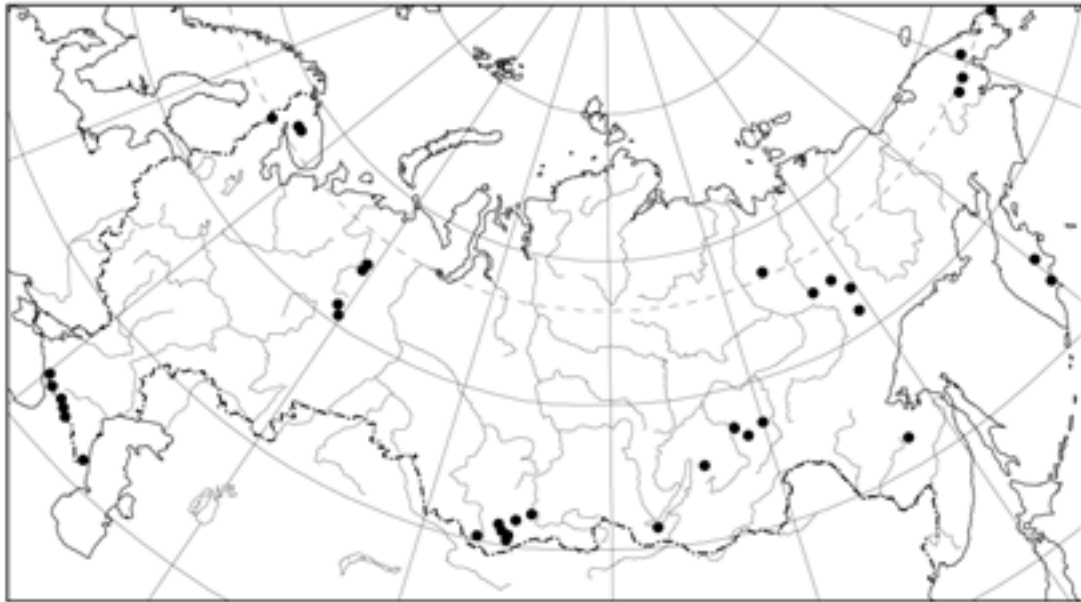


Fig. 48. Distribution of *Grimmia reflexidens* Müll. Hal. in Russia.

13.VIII.1986, *Onipchenko* (MHA); **Krasnodar Territory**, Malaya Laba River basin, Magisho Mt., *T. Akatova* (CSR); Urushten River basin, Mramornaya Mt., 8.VIII.2000, *T. Akatova* (CSR); Alous Mt., 13.VIII.1994, *T. Akatova* (CSR, MHA); **URALS: Komi**, Telpos Range, 13.VIII.1907, *R.R. Pohle* (LE); Sablya Mt., 9.VIII.1984, A.P. Djachenko (SVER); **Sverdlovsk Province**, Denezhkin Kamen, 27.VII.1996, A.P. Djachenko (SVER); **SIBERIA: Altai Republic**, fl. Taldyr, 18.VII.1903, *P. Krylov* (H-Br); Tyuguryuk, 23.VI.1966, *L.V. Bardunov* (IRK, MHA); Bashkaus River, Dvukharovaya Creek, 25.VII.1993, #36/351, *Ignatov* (MHA); Kobiguayuk Creek, 14-19.VI.1989, #0/186, 0/724, 0/939, 0/940, 0/943, *Ignatov* (MHA); Karakem River, 15-18.VI.1989, #0/478, 0/941, 0/944, *Ignatov* (MHA); Shapshal Range, Toshkalykaya Mt., 14.VII.1990, *N. Zolotukhin* (MHA); Shapshal Range, Trekhglavaya Peak, 19.VII.1990, *N. Zolotukhin* (MHA); Kayakktuyarykskij Creek, 28-30.VI.1991, #5/10, 6/15, 7/33, 4.VII.1991, 7/79, 7/80, 7/84, *Ignatov* (MHA); Kayakktuyarykskij Creek Basin, 3-8.VII.1991, #3/181, 3/274, 8/66, 8/67, *Ignatov* (MHA); Kurkure-bazhi Peak, 13.VIII.1976, *N. Zolotukhin* (MHA); Katuyaryk Creek, 5.VI.1994, 23.VI.1994, *E. Koroleva* (MHA); Kurkure Range, between Kayak & Kayakktuyarykskij Creeks, 4.VII.1991, #7/41, 7/49, 7/55, 7/66, *Ignatov* (MHA); Kolyushta Mt., 1.VII.1989, #0/477, *N. Zolotukhin*, 1.VII.1989, #0/477, *Ignatov* (MHA); **Yakutia**, Tompo Distr., Tukuran River upper course, Temirdekh Creek, 6.IX.1990, *E. V. Akimova* (SASY); Tuora-Tukuran Creek, 6.IX.1990, *S. N. Kirillina* (SASY); Tompo Distr., Uze-Sakh River, 21.IX.1956, #198/8, 10, *I. Kil' dyshevskij* (LE); Tompo Distr., Suntar-Khayata Range, At-Moole Creek, 22.VII.2003, *E. I. Ivanova & V. I. Zolotov* (SASY, MW); Zhiganskij Distr., Sobolokh-Mayan River, 23.VIII.1991, *S. Kirillina* (SASY); Kobyajskij Distr., Kele River, Njamnit Creek, 28.VI.1987, *E. G. Nikolin* (SASY); Neryungri Distr., Udokan Range, 1.VIII.2001, *L. V. Kuznetzova* (SASY, MW); Ust-Maya Distr., Semenchi-Yuryakh Creek, 26.VIII.2000, #00-133, 00-134, *Ignatov*

(MHA); Tarbagannakh Creek, 25.VIII.2000, #00-126, 00-132, *Ignatov* (MHA); **Krasnoyarsk Territory**, Western Sayan Mts., Kantegirskij Range, Karasu River, 6.VII.1968, *L. V. Bardunov* (IRK, MHA); **Tuva Republic**, Abakan-Ak-Dovurak Road, 6.VIII.2004, O. Grigorjeva (MW); **Irkutsk Province**, Vitim Reserve, Vitim River at Nizhnij Uryakh mouth, 10.VII.1984, *L. V. Bardunov* (IRK); **Buryatia**, Baikalskij Reserve, Osinovskij Goletz Mt., 18.VIII.2001, *N. A. Konstantinova* (MW); Dzherginskij Reserve, 12.VII.2002, #18, *D. Tubanova* (UUH); **Chita Province**, Kalar Distr., Udokan Range, Mertvoe Lake, 3.VIII.1987, *V. R. Filin* (MW); Nirungnakan village, 14.VIII.1987, *A. Kozhevnikova & V. Filin* (MW); Kalarskij Distr., Udokan Mt. range, 20.VII.1977, *T. Otnyukova* (IRK); **FAR EAST: Khabarovsk Territory**, Verkhnebureinkij Reserve, Medvezhje Lake, 9.VIII.1997, #97-1091, 97-1092, 97-1093, 97-1103, 97-1104, *Ignatov* (MHA); **Chukotka**, Bering Strait, *C. Wright*, #79 (FH); Anadyr Distr., Pekulnej Randge, 22.VII.1972, *O. M. Afonina* (LE); Tanyurer Riv., Golubaya Creek, 16.VII.1981, *O. M. Afonina* (LE); Lunnaya River, 15.VIII.1970, *O. M. Afonina* (LE); **Kamchatka Province**, Pushchino settlement, 16.IX.1975, *O. M. Afonina* (LE); Ushkovskij volcano slope, 16-23.VII.2003, *I. V. Czer-nyadjeva* (LE).

Taxonomic notes. *Grimmia reflexidens* is gametophytically a very variable species. Plants from dry habitats can have weakly to strongly developed leaf plications, like in *G. subsulcata* Limpr., described from such dry areas in Eastern Europe. The same plications are seen in the type of *G. reflexidens*, from Chile, taxon that was transferred to *Coscinodon* by Maier (2002) on the base of such strong plications. However, what would be the diagnostic character to transfer this species to *Coscinodon*, viz. the campanulate

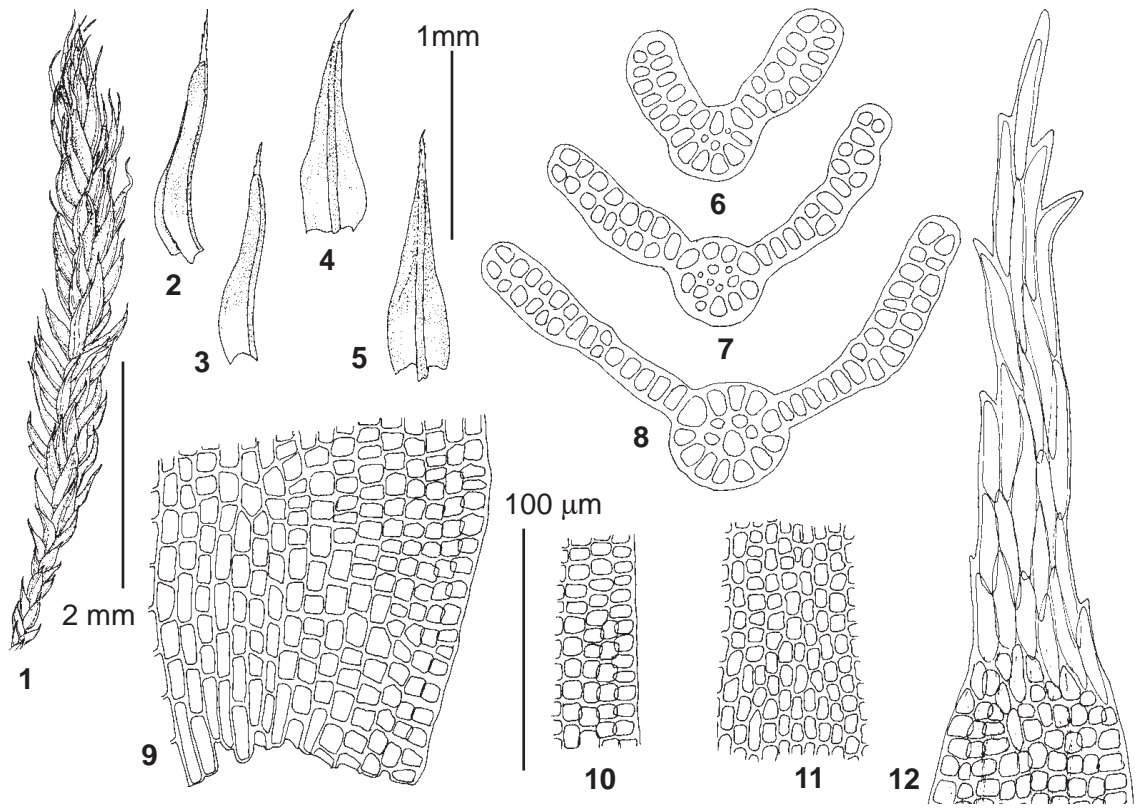


Fig. 49. *Grimmia teretinervis* Limpr. (from Perm Province, A. Bezdodov, #624): 1 – habit; 2-5 – leaves; 6-8 – leaf transverse sections; 9 – basal leaf cells; 10 – median leaf cells; 11 – upper leaf cells; 12 – base of hair-point and upper leaf cells. Scale bars: 2 mm for 1; 1 mm for 1-5; 100 µm for 6-12.

calyptra, is lacking on all the isotypes of *G. reflexidens* (BM, JE, NY, PC). Drawings by Maier, of outstanding quality, also show (Maier, 2002: fig. 23, Illustrations numbers 20f, 24, or 27) that the plications in the type of *G. reflexidens* (fig. 23 #24) are simply an exaggerated expression of what otherwise is common in specimens identified by her as *G. sessitana* (fig 23 #20f, 27), but that cannot be used to include this taxon into *Coscinodon*. Sporophytes in Pöppig s.n. (Pöppig s.n., BM), are also typical for *Grimmia*, with narrow teeth that, at least for the small part remaining, are not cribose, as usually seen in *Coscinodon*. Muñoz failed in annotating correctly the lectotype specimen deposited in BM. As Maier (2002) pointed out, there is one specimen annotated as «isotype» (identified in the database that Muñoz keeps of Grimmiaceae names as BM 2811M7, which corresponds to the BM loan number, 2811M, plus an internal unique identifier for this loan, 7 in this case) and other as «isolectotype» («BM 2811M36» coded as in the previous case). The

specimen that Muñoz intended to designate as lectotype is obviously «BM 2811M7», labelled «Herb. Hampe 1881. *Grimmia reflexidens* inter *Dryptodon consobrinus* Kze. Chile leg. Pöppig».

Distribution. *Grimmia reflexidens* is widely distributed throughout the world, common in mountain areas of Europe and Asia, North and South America, known from Africa, Australia, New Zealand and Antarctic. In Russia, *G. reflexidens* is not rare in the mountains of Siberia, common in Caucasus, scattered in Kola Peninsula, Polar and North Urals, and the Far East. It grows on exposed siliceous rocks in alpine belt.

Differentiation. *Grimmia reflexidens* can be confused with *G. alpestris* (see comments to the latter species), and also with *G. donniana* and *G. montana*. It differs from *G. donniana* in narrowly keeled leaves, with blades forming mostly 20-35° angle, as seen in leaf cross section (vs. more widely keeled leaves in *G. donniana*, with blades forming 35-100° angle in distal part of leaf), basal marginal cells with transverse

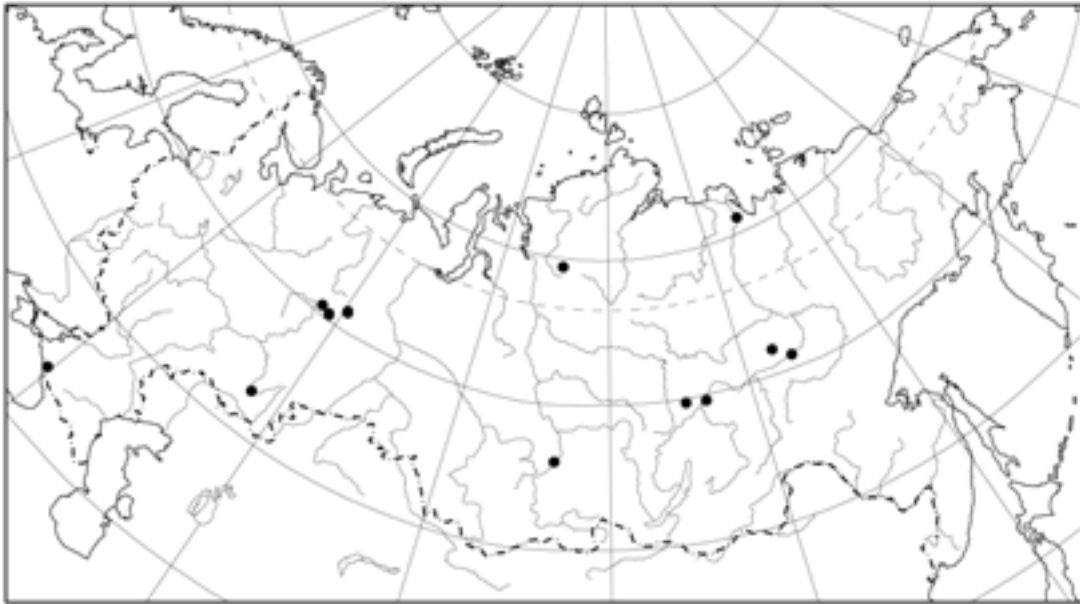


Fig. 50. Distribution of *Grimmia teretinervis* Limpr. in Russia.

walls more thick than longitudinal walls (vs. uniformly thin walls of basal marginal cells in *G. donniana*), and leaf margins mostly recurved on one or both sides in middle part of leaf (vs. margins plane throughout in *G. donniana*). The hyaline hair-points of *G. donniana* are usually long in the upper and perichaetial leaves, and cushions are usually very hoary, whereas in *G. reflexidens* the hyaline hair-points are short to moderately long, and the tufts are not very hoary. *Grimmia montana* differs from *G. reflexidens* in more widely keeled leaves, always plane margins and completely bistratose lamina in distal 1/2 of leaf.

27. *Grimmia teretinervis* Limpr., Jahresber. Schles. Ges. Vaterl. Cultur 61: 216. 1884. — *Schistidium teretinerve* Limpr., Jahresber. Schles. Ges. Vaterl. Cultur 61: 216. 1884, nom alt. Figs. 49, 50.

Plants small, in dense, easily separating tufts, dark green or brownish green, weakly hoary. Stems erect, 0.5-1 cm long, shoots thin. Leaves imbricate when dry, from ovate base gradually tapering into short narrowly acute acumen, 0.8-1.3×0.3-0.4 mm, sharply to widely keeled distally; margins plane throughout; costa differentiated, prominent both dorsally and ventrally, rounded in cross section, with (2)3-5 ventral epidermal cells; hyaline hair-points rather short, ca. 3 mm long, sharply denticulate; lamina bistratose or unistratose near costa and bistratose in 4-8 cell rows at margins in distal 2/3 of leaf; upper and

median laminal cells subquadrate to short rectangular, 6-8(-9) μm, with slightly thickened and not or weakly sinuose walls, basal juxtacostal cells short rectangular, with moderately thick, not porose walls, basal marginal cells quadrate for several rows, with thin longitudinal and thick transverse walls. Dioicous, sporophytes unknown.

SPECIMENS EXAMINED: **CAUCASUS:** *Adygeya*, Caucasian Reserve, Kamennoe More Ridge, 26.VI.1992, *T.Akatova* (CSR, MHA); **URALS:** **Perm Province**, Krasnovishersk Distr., B. Shchugor River, 4.VIII.1995, #24, *A.Bezgodov* (MW); Krasnovishersk Distr., Vyels surroundings, 17.VI.1995, #169, 170, *A.Bezgodov* (MW); **Sverdlovsk Province**, Ivdel Distr., Lozva River, 5.VIII.2000, *I.Goldberg* (SVER, MW); **Bashkortostan**, Shulgan-Tash Reserve, 2001, #02-25, 02-49, *V.Zolotova* (MHA); **SIBERIA:** **Krasnoyarsk Territory**, Putorana Plateau, Lama Lake, 16.VII.1984, #28, *I.Czernyadjeva* (LE, MW); Krasnoyarsk City, left bank of Yenisey River, 10.V.2001, *T.N.Otnyukova* (KRF, MW); prope Krasnojarsk, 1912, #1734, *Zhuravlev* (H, LE); **Yakutia**, Lenskij Distr., Peleduj River, 23.VIII.1953, #136/2, *V.Kuvaev* (SASY); Lenskij Distr., Peleduj River upper course, 1.IX.1953, #151/16, *M.Sukhikh & V.Kuvaev* (SASY); Lenskij Distr., Pilka River, 25.VII.1999, *E.I.Ivanova* (SASY, MW); Khangalassky Distr., Lenskie Stolby, 17.VIII.2000, #00-130, *Ignatov* (MHA); Khangalassky Distr., Sinyaya River, 7.VI.2000, *E.I.Ivanova* (SASY, MW); Lena River lower course, Chekurovka, 26.VII.1988, *V.R.Filin* (MW).

Distribution. *Grimmia teretinervis* is sporadically distributed in Northern and Central Europe, and North America. Only recently it was reported from the territory of Russia (Muñoz & Pando, 2000), and it is not

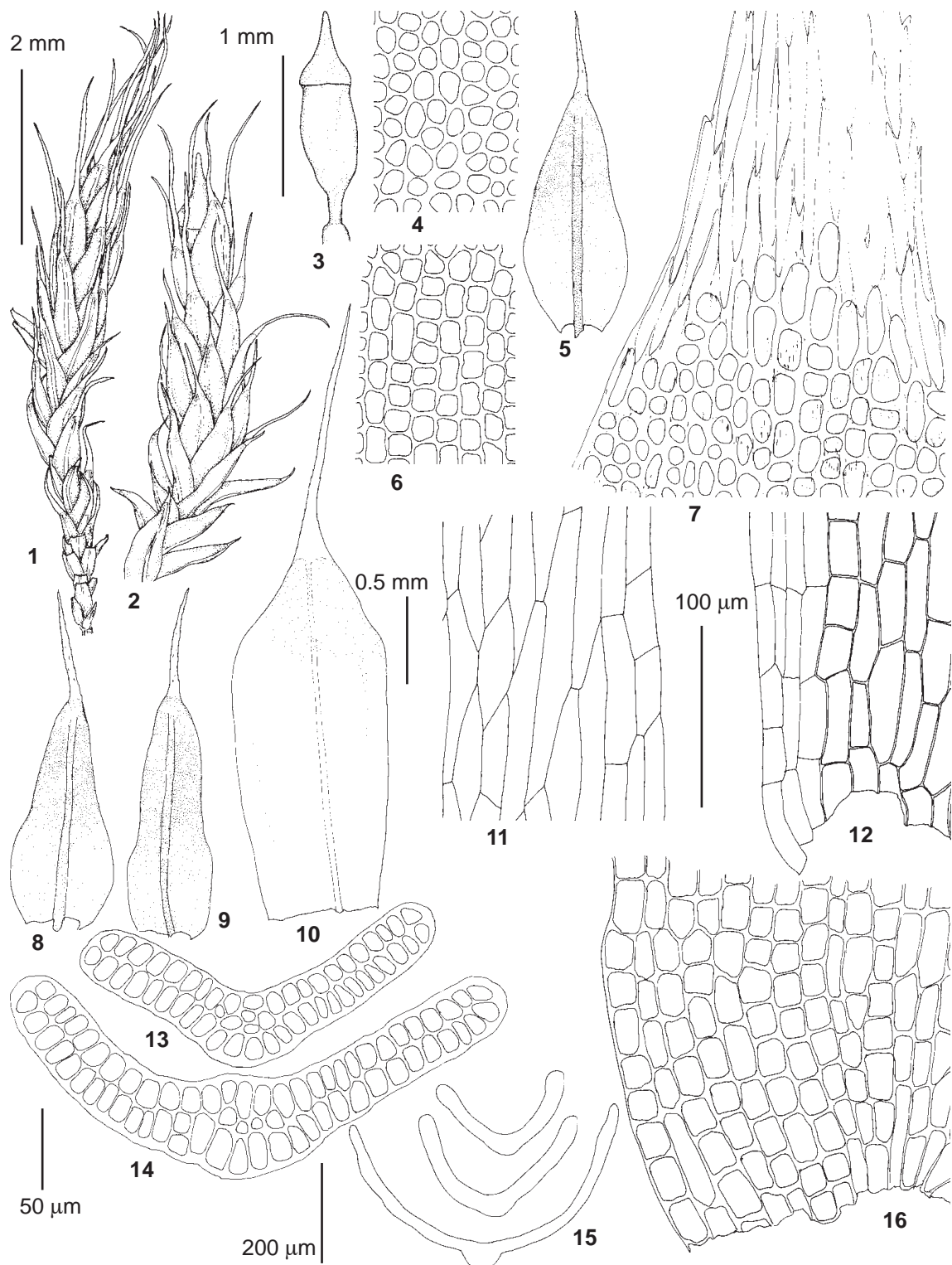


Fig. 51. *Grimmia tergestina* Tomm. ex B.S.G. (1, 4-16 -from Perm Province, A. Bezgodov, #624; 2-3 - from North Ossetia, 11.VIII.1979, Amirkhanov): 1, 2 - habit; 3 - capsule; 4 - upper leaf cells; 5, 8-9 - leaves; 6 - median leaf cells; 7 - base of hair-point and upper leaf cells; 10 - perichaetial leaf; 11 - median cells of perichaetial leaf; 12 - basal cells of perichaetial leaf; 13-15 - leaf transverse sections; 16 - basal cells of vegetative leaf. Scale bars: 2 mm for 1; 1 mm for 2-3; 0.5 mm for 5, 8-10; 50 μm for 13-14; 100 μm for 4, 6-7, 11-12, 16; 200 μm for 15.

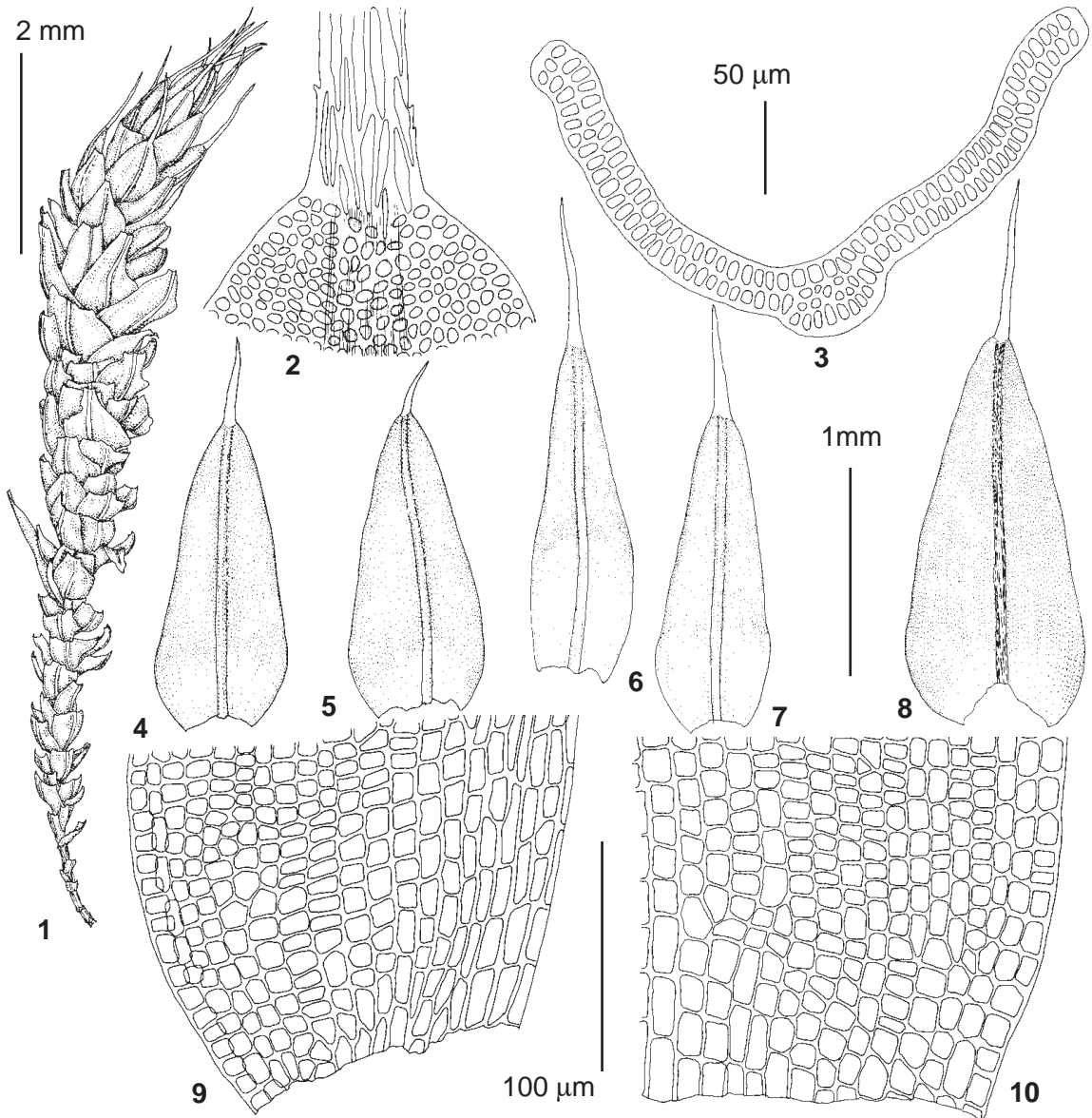


Fig. 52. *Grimmia tergestina* Tomm. ex B.S.G. (1-5, 9 – from lectotype of *G. crassifolia* Lindb. ex Broth., Ossetia, VII.1877, V.F.Brotherus; 6 – from Bashkortostan, V.Zolotov, #02-28; 7 – from Altai Republic, M.Ignatov, #30/15; 8 – from Kabardino-Balkaria, 30.VII.2004, Ignatov & al.; 10 – from North Ossetia, 11.VIII.1979, Amirkhanov): 1 – habit; 2 – base of hair-point and upper leaf cells; 3 – leaf transverse section; 4-8 – leaves; 9-10 – basal cells of vegetative leaves. Scale bars: 2 mm for 1; 1 mm for 4-8; 50 µm for 2-3; 100 µm for 9-10.

mentioned in any handbooks of mosses of USSR or Russia. The revision of herbarium material revealed its sporadic distribution in Siberia (several records from Putorana Plateau, Yakutia, and Krasnoyarsk surroundings), in Caucasus and Urals. It grows at low elevations, mostly on calcareous rocks.

Differentiation. *Grimmia teretineris* differs from any other species of *Grimmia* by its costa round in cross section, convex both dorsally

and ventrally. The species can be also recognized by imbricate leaves and very thin shoots. Limpricht (1884) described this species also under the alternative name *Schistidium teretineris*, and he later used this latter placement to treat the taxon. Plants with anteridia and archegonia are known, but sporophytes have never been found, and consequently, the precise generic placement of this species needs further studies.



Fig. 53. Distribution of *Grimmia tergestina* Tomm. ex B. S. G. in Russia: with (circles) and without (triangles) capsules.

Plants in dense tufts, dark green to blakish when wet, black above and brownish in lower part when dry, usually rather hoary. Stems erect, 0.5-2 cm long. Leaves erect to appressed when dry, erect to patent when moist, gradually enlarged to the distal part of fertile shoot, 1.4-2.0×0.5-0.7 mm, ovate to ovate-lanceolate, obtuse to shortly acuminate, concave, not plicate; margins plane; costa weakly differentiated in distal part of leaf, flattened, semi-elliptical in cross section, 4-6 cells wide ventrally; hyaline hair-points of vegetative leaves to 0.5-0.7 mm long, terete, weakly denticulate to almost smooth, not decurrent; lamina bistratose in distal 2/3 of leaf, unistratose in basal part, upper laminal cells rounded-quadrate, 9-12 μm, thick-walled, slightly sinuose, basal juxtacostal cells rectangular, basal marginal cells short rectangular, with thin longitudinal and thick transverse walls. Perichaetial leaves larger, 2.0-2.5×0.7-1.0 mm, with longer hyaline hair-points, to 1.5 mm, widened and flattened at base; basal marginal cells long rectangular, with very thin walls, forming filmy margin, in innermost perichaetial leaves widened and extending to proximal 2/3 of leaf. Dioicous, male and female plants in separate tufts, not mixed, often in different populations. Sporophytes rare (but archegonia usually present). Setae straight, centrally attached, to 0.3 mm. Capsules immersed, 0.5-0.8 mm long, ovate, symmetric. Operculum conic, rostrate. Annulus of affinis-type. Peristome present [capsules immature or very old in Russian material]. Spores 8-10 μm. Calyptrae mitrate.

SPECIMENS EXAMINED: Specimens with sporophytes: **CAUCASUS: Kabardino-Balkaria**, Baksan River near Bylym, 30.VII.2004, *Ignatov & al.* (MHA);

Karachaevo-Cherkessia, Verkhnyaya Teberda, 8.VII.1995, #46/95, *Onipchenko* (MW); **North Ossetia**, Unali village, 11.VIII.1979, *A.Amirkhanov* (MW); **SIBERIA: Altai Republic**, Chagan-Uzun, 23.VII.1966, *L.V.Bardunov* (IRK, MW); Yakutia, Indigirka River basin, Injali River, 16-20.VI.1976, *O.M.Afonina* (LE).

Specimens lacking sporophytes, tentatively referred to *G. tergestina* (according to the occurrence of fertile collections in the area or growing on calcareous substrate): **CAUCASUS: North Ossetia**, North-Ossetian Reserve, 25.VII.1977, *L.I.Abramova* (MW); Verkhnij Tsej, 31.VII.1980, *L.I.Abramova* (MW); Balta, 20.V.1881, *A.H. & V.F.Brotherus* (LE); in valle fl. Ardon, inter Alagir et Mizurtzy, 7.1877, *V.F.Brotherus* (H-Br #1829002, lectotype of *G. crassifolia*); pr. fl. Ardon, VII.1877, *A.H. & V.F.Brotherus* (H #3066219, 3066220); **Stavropol Territory**, Kislovodsk, Sinie Gory, 1915, *V.P. & L.I.Savicz* (LE); Kislovodsk, Krasnye kamni, 1915, *V.P.Savicz* (LE); **URALS: Perm Province**, Krasnovishersk Distr., Bolshoj Shchugor River, 4.VIII.1995, #624, *A.Bezgodov* (MW); **Bashkortostan**, Abzelilovo Distr., Tlyashevo, 22.VI.1997, #11, *A.Solomeshch* (MW); Burzyan Distr., Shulgan-Tash Reserve, 5.VI.2001, #02-50, *V.Zolotov* (MHA); **SIBERIA: Altai Republic**, Kosh-Agach, Tabozhok Creek, 29.VII.1992, #30/15, 30/16, 7.VIII.1992, 30/18, *Ignatov* (MHA); Malyy Yaloman Creek, 30-31.VII.1991, #25/42, 25/89, *Ignatov & Ignatova* (MHA); Malyy Yaloman, 4.VIII.2000, *Ignatov* (MHA); Shebalino Distr., Katun River 2 km upstr. Bijka Creek, 10.VII.1993, #34/120, *Ignatov & Ignatova* (MHA); Chermal, 8.VII.1948, #7/3, *T.F.Voszhenakova* (LE, MW); **Tyva**, Todginskaya Valley, Azas Lake basin, Ilgi-Chul Hut, 1.VIII.1995, *T.N.Otnyukova* (KRF, MW); Todzhinskaya Valley, Kadysh Lake, 30.VIII.1999, *T.N.Otnyukova* (KRF, MW); **Krasnoyarsk Territory**, Minussinsk Distr., opp. Krasnoyarsk, 12.VIII.1912, #1593, *Z.Glagoleva* (LE); Krasnoyarsk City, 4.V.2001, *T.N.Otnyukova* (KRF, MW); Minussinsk, V.1888, *N.Martianoff* (H-Br); **Khakassia**, Ordzhonikidze Distr., Kopjevo railway station, 30.VI.1970,

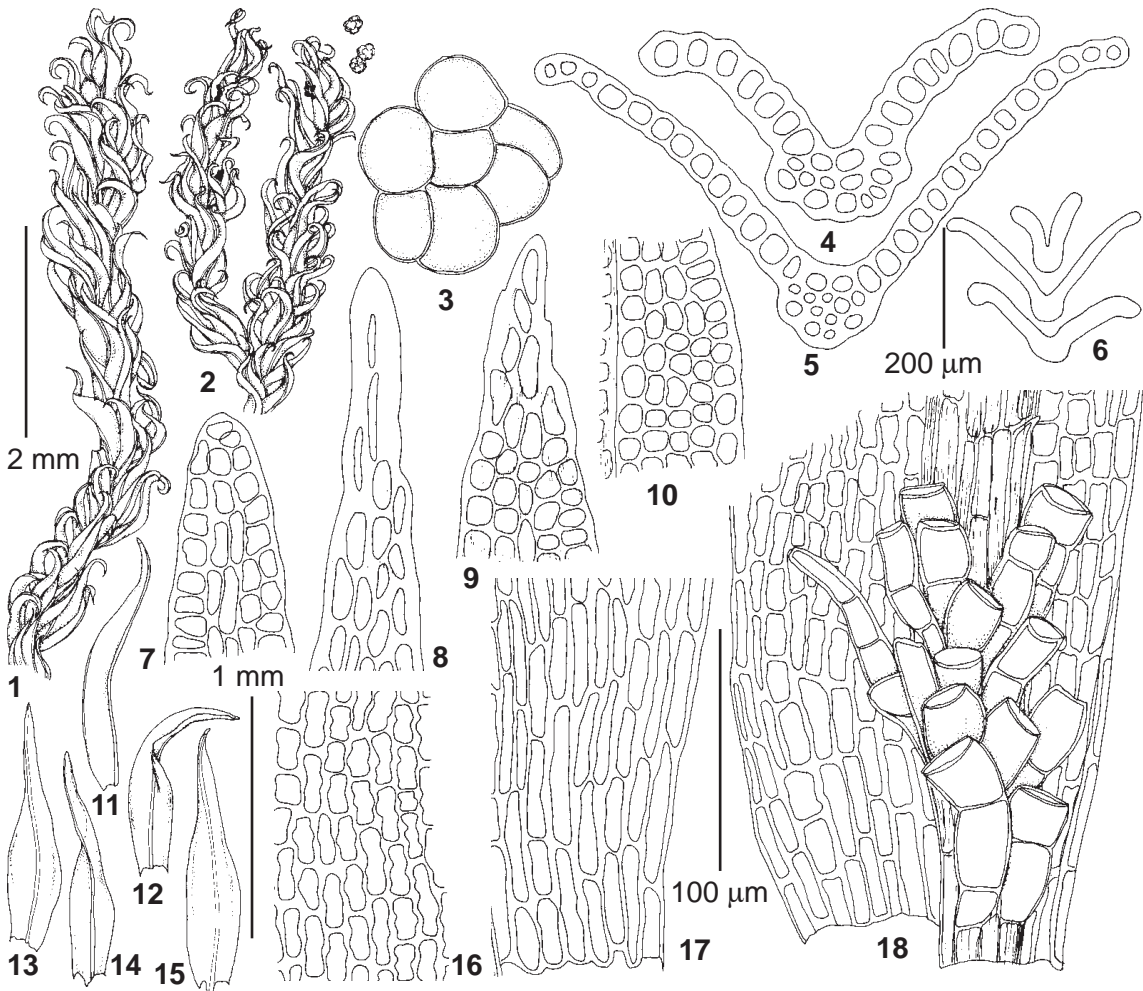


Fig. 54. *Grimmia torquata* Drumm. (1 – from Vrangell Island, O.M.Afonina, #35; 2-18 – from Yakutia, M.Ignatov, #00-11): 1-2 – habit; 3 – gemma; 4-6 – leaf transverse sections; 7-10 – upper leaf cells; 11-15 – leaves; 16 – median leaf cells; 17 – basal leaf cells; 18 – leaf base with gemmae stalks. Scale bars: 2 mm for 1-2; 1 mm for 11-15; 100 µm for 4-5, 7-10, 16-18; 200 µm for 6.

A. Vasiljev (IRK, MW); **Irkutsk Province**, Baikal Lake, Aya bay, 24.VI.1987, *L.V.Bardunov* (IRK, MW); **FAR EAST: Primorskij Territory**, Ol'ga Distr., Mokrushikha, 5.IX.1977, *A.Minakov* (VLA); Suchan River basin, Ekaterinovka, Zolotaya Gora, 4.IX.1913, #73, *V.L.Komarov* (LE).

Distribution. *Grimmia tergestina* is known in Europe, from southern Scandinavia to Spain, Central Asia, North and South America. Widespread in xeric areas (Altai, Tyva, Mongolia, Middle Asia), scattered in other places. In Russia collections with sporophytes are known only from Caucasus, Altai and Yakutia; we refer tentatively to this species some specimens without sporophytes from Urals, southern Siberia, and southern Far East.

Differentiation. Fertile plants of *Grimmia tergestina* are easily recognized by immersed

peristomate capsules on straight setae (concave leaves with plane margins, distally bistratose lamina, and semi-elliptical in cross section costa differentiate *G. tergestina* from *G. capillata*, another species with immersed capsules on straight setae). However sterile material of *G. tergestina* cannot be surely differentiated from *G. poecilostoma*, species identical in gametophyte characters. The latter species is sporadically found in Siberia and Caucasus, with many collections having sporophytes. Greven (1995) considers that *G. poecilostoma* grows exclusively on acidic or neutral substrates and always is found with sporophytes whereas *G. tergestina* is found only on calcareous rocks and rarely form capsules. The distributional

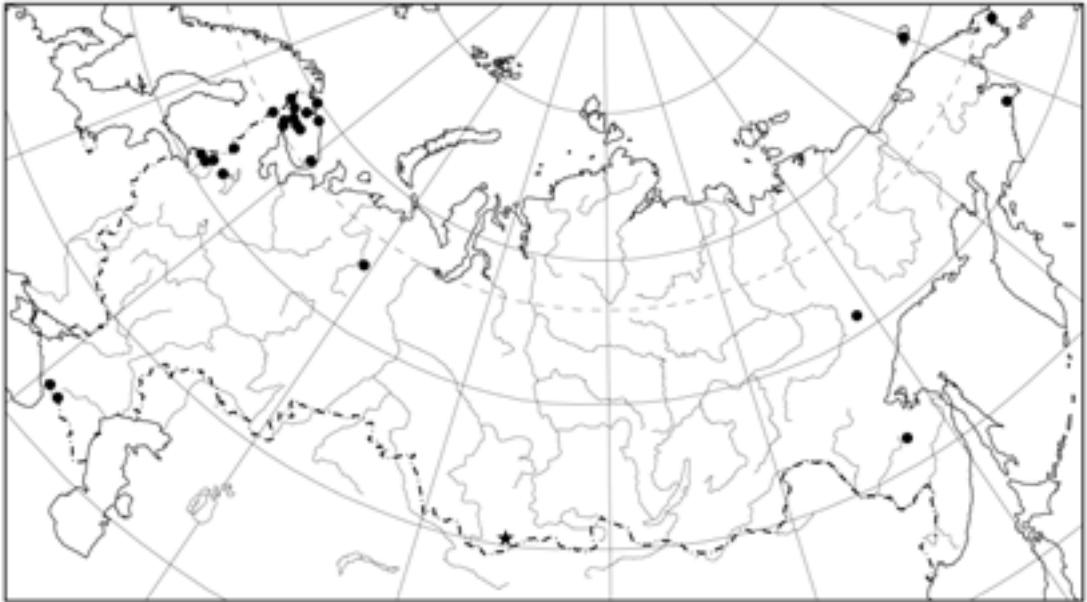


Fig. 55. Distribution of *Grimmia torquata* Drumm. (circles) and *G. triformis* Carestia et De Not. (star) in Russia.

pattern of both species generally agree with these statements, but we have seen some exclusions (see also Muñoz, 1999). We tentatively refer some sterile collections to either of the two species based on the occurrence in the area of other populations with sporophytes or the calcareous or siliceous nature of the substrate.

We also tentatively refer to *G. tergestina* the isolectotype of *G. crassifolia* (H-Br #1829002) and other specimens in H (#30663219, 3066220) identified as *G. crassifolia*. The latter species was synonymized by Muñoz (1999) with *G. poecilostoma*, and it is recognized by Greven (1995, 2003) as a separate species (he also mentions that this species has its main distribution in the steppes of Asiatic Russia). Greven (l.c.) points out the following characters differentiating *G. crassifolia* from *G. tergestina*: 1) leaves with incurved margins and concave leaf apices, loosely appressed when dry; 2) hyaline hair-points weak, not decurrent; 3) basal marginal cells subquadrate, lamina bistratose almost to the leaf base; 4) perichaetial leaves hardly differentiated. The straight setae, according to Greven (l.c.) separates *G. crassifolia* from *G. poecilostoma*. However, all specimens collected by Brotherus in Ossetia are sterile, which preclude their sure identification (fertile specimens of *G. tergestina* were collected later in close area of North Ossetia). We failed to separate in the

material in Russian herbaria the collections with the character combination suggested by Greven. All these characters (leaf shape and concavity, hyaline hair-point length and decurrency, cell areolation of basal lamina of vegetative leaves) are very variable in *G. tergestina*. Furthermore, all fertile specimens of *G. tergestina* from the territory of Russia have perichaetial leaves with filmy margins typical for this species.

Both *G. poecilostoma* and *G. tergestina* differ from *G. laevigata* by filmy margins of perichaetial leaves (and almost completely filmy innermost ones), and very slightly denticulate to almost smooth hyaline hair-points; the leaves of *G. laevigata* are usually triangular, whereas leaves of *G. tergestina* and *G. poecilostoma* are ovate-lanceolate, though this character is rather variable. In some cases it is difficult to differentiate sterile specimens of *G. tergestina* or *G. poecilostoma* from small plants of *G. ovalis*. But the latter species differs in longer leaves (2-3 mm, vs. 1.4-2.0(-2.5) mm in *G. tergestina* and *G. poecilostoma*) with long, gradually tapering acumen, not rounded at apex, and perichaetial leaves similar to vegetative ones, without filmy margin formed by thin-walled cells.

29. ***Grimmia torquata*** Drumm., Musci Scotici, Vol. 2, n° 28. 1825. Figs. 54, 55.

Plants in soft, dense tufts or cushions, yellowish green or olive green above, brownish or blackish

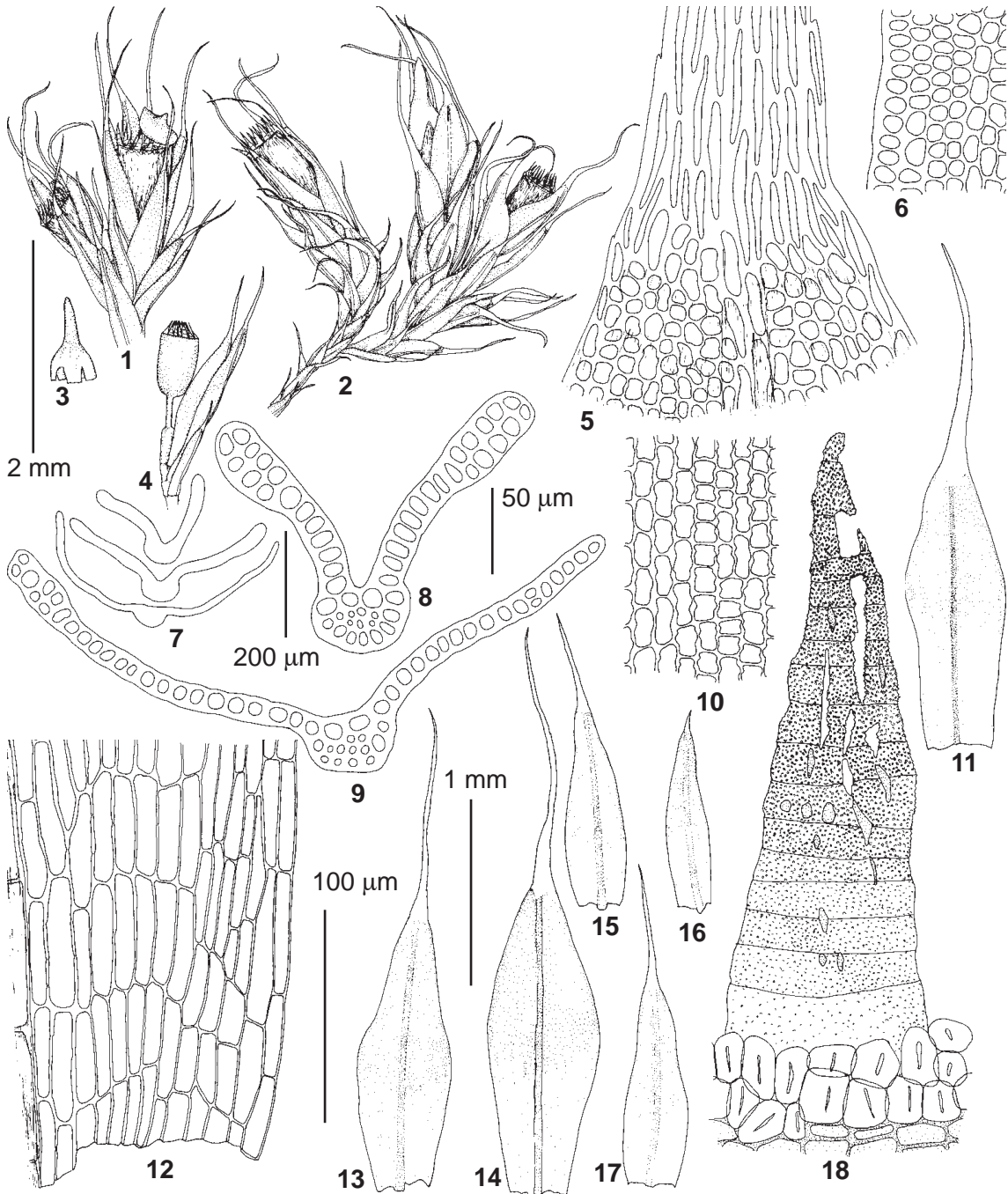


Fig. 56. *Grimmia triformis* Carestia et De Not. (from Altai Republic, M. Ignatov, #0/474): 1-2 - habit; 3 - calyptra; 4 - capsule; 5 - base of hair-point and upper leaf cells; 6 - upper leaf cells; 7-9 - leaf transverse sections; 10 - median leaf cells; 11, 13-17 - leaves; 12 - basal leaf cells; 18 - part of peristome. Scale bars: 2 mm for 1-4; 1 mm for 11, 13-17; 50 µm for 8-9; 100 µm for 5-6, 10, 12, 18; 200 µm for 7.

brown below. Stems erect, 2-5 cm long, fasciculately branching. Leaves strongly crisped and contorted when dry, slightly curved and loosely appressed when moist, occasionally 3-ranked, 0.9-1.6×0.2-0.4 mm, lanceolate, acuminate, keeled distally; margins

plane in distal part of leaf, slightly recurved below; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points very short, ca. 0.1-0.2 mm long, seldom longer, in lower leaves absent;

lamina unistratose throughout, often yellowish-colored; upper laminal cells isodiametric, 9-11 μm , thick-walled, subquadrate to short rectangular or oblate at margins, slightly sinuose, median laminal cells short rectangular, 15-25 \times 10-12 μm , gradually elongating to the leaf base, with thick, strongly sinuose walls, basal juxtacostal cells thick-walled, porose, basal marginal cells more pellucid, with thick longitudinal and transverse walls. Gemmae common, aggregated on dorsal leaf base, forming on short stalks at dorsal surface of costa, dark-red, multicellular, with protuberant cells, 40-60 μm in diameter. Dioicous, androecia terminal, sporophytes very rare, not known from the territory of Russia. [Setae arcuate when moist. Capsules exerted, small, ovoid, slightly furrowed. Operculum conic, with long erect beak. Annulus of elongata-type. Peristome teeth orange, short, cleft. Spores 9 μm . Calyptrae mitrate].

SPECIMENS EXAMINED: EUROPEAN RUSSIA:
Murmansk Province, Teriberka, VII.1872, *V.F. Brotherus* (H); Petsamo [Rybachij Peninsula], 7.VII.1932, *A.V. Auer* (H); Pyukhyakuru Gorge, 1-2.VII.1972, #58, 107, *R.N. Shlyakov* (KPABG), 4-8.VIII.1986, #26/14, 26/15, 26/19-2, 27/14, 27-15-86, 0/20, *O. Belkina & A. Likhachev* (KPABG); Kandalaksha Bay of White Sea, Ryazhkov Island, 4-5.VIII.1988, #391-58-88, 32, 405/2, 405/3, 405/3a, *O. Belkina & A. Likhachev* (KPABG); Kandalaksha Bay of White Sea, Olenij Island, 30.VII.1988, #323/50, *O. Belkina & A. Likhachev* (KPABG); Ponoj River, 29-30.VII.1972, #330, 354, *R.N. Shlyakov* (KPABG); Kandalakshskie Mts., Middle Luven'gskoe Lake, 8.VIII.1985, #88/5, *A. Likhachev* (KPABG); Kandalakshskie Mts., Okatjeva Mt. northern slope, 18.VIII.1985, #208/4, *A. Likhachev* (KPABG); 5-7 km E of Kandalaksha, White Sea Shore, 4.VIII.1998, *Ignatov* (MHA); Khibiny Mts., Jukspor Creek Gorge, 23.VIII.1948, #2191a, *R.N. Shlyakov* (KPABG); Khibiny Mts., Southern Canyon, 5.VIII.1998, *Ignatov* (MHA); Khibiny Mts., Yuzhnoe Gorge, 5.VIII.1998, #8-13-98, 10-2-98, *O. Belkina* (KPABG); Khibiny Mts., Kukisvumchorr Mt., 4.IX.2001, *Ignatova* (MW); Lovozerskie Mts., Kujvchorr Mt., 29.VIII.1982, #117/1, *O. Belkina & A. Likhachev* (KPABG); Lovozerskie Mts., Ninchurt Mt., 14.VII.1983, #13/14, 13/9, 21.VIII.1983, 48/3, 48/13, *O. Belkina & A. Likhachev* (KPABG); Chiltald Mts., Chil' Creek, 9.VII.1988, #171-27-88, *O. Belkina* (KPABG); Ionnnjugoajv Mts., Ionnlakk Mt., 23.VII.1989, #24/3, 24/1, *A. Likhachev* (KPABG); Chiltald Mts., Malaya Konja Mt., 11.VII.1988, #207-4-88, *O. Belkina* (KPABG); Lavna-tundra Mts., Lavnatundra Mt., 7.VIII.1987, #293-6-87, 295-9-87, 297-7-87, 297-9-87, 297-10-87, *O. Belkina* (KPABG); Tuloma & Kola Rivers lower course, 2.VIII.1952, *R.N. Shlyakov* (KPABG); Salla, Kutsa, 24.VII.1934, *R. Tuomikoski* (H); **Karelia**, Valaam, 30.VI.1914, *V. Pesola* (H); Koikari, 20.VI.1870, *J.P. Norrlin* (H); Muezerskij Distr., Lendery, 5.VIII.2003, #L-03/21-52a & 8.VIII.2003, #L-03/39-37a, *Maksimov & Maksimova* (PTZ); **Leningrad Province**, Leningrad Distr., Kurkijoki, 1874, *E. Juslin* (KPABG); **CAUCASUS: Kabardino-Balkaria**, Elbrus Mt. area, Adyl-Su River upper course, X.1994, #31, *I. Pospelov* (MW); **Karachaevo-Cherkessia**, Teberda Reserve, Oriuchat Gorge, 4.IX.1994, #151/94, *Onipchenko* (MW); Khadzhibej Gorge,

25.VII.1995, #94/95, *Onipchenko* (MW); Bolshaya Khati para Gorge, 16.VII.1994, #78/94, *Onipchenko* (MW); **URALS: Komi Republic**, Sablya Mt., 19.VIII.1983, *A.P. Dyachenko* (SVR); **SIBERIA: Yakutia**, Ust-Maya Distr., Allakh-Uyn, Semenchi-Yuryakh Creek, 26.VIII.2000, #00-11, *Ignatov* (MHA); Ust-Maya Distr., Allakh-Uyn, Semenchi-Yuryakh Creek, 26.VIII.2000, #00-115, *Ignatov* (MHA); Ust-Maya Distr., Allakh-Uyn, Tarbagannakh Creek, 25.VIII.2000, #00-119, 00-507, 00-508, *Ignatov* (MHA); **FAR EAST: Chukotka**, Lavrentiya Bay, *O.M. Afonina* (NY); Vrangl Island, Rodgers Bay, Nasha River, 27.VIII.1987, #35, *O.M. Afonina* (LE, MW, MHA, KPABG); **Magadan Province**, Koryakia, Pekulnejskoe Lake, *O.M. Afonina* (LE); **Khabarovsk Territory**, Verkhnebureinskij Distr., Bureinskij Reserve, Kerbi-Kuraigagna watershed, 15.VIII.1992, *B. Borisov* (MW).

Distribution. *Grimmia torquata* is spread throughout Europe, in the mountains or at sea level in northernmost countries, in Greenland, in the north or in mountains of North America. In Russia it is rather common in Kola Peninsula and Karelia, scattered in Chukotka, and recently found in south-eastern Yakutia and Khabarovsk Territory. In 1990 it was collected several times in Caucasus, Karachaevo-Cherkessia and Kabardino-Balkaria, an area from where it had not been reported before. In northern localities grows at low altitudes, on acidic cliffs or rock outcrops, often on vertical surfaces, sometimes dominating on soil in tundra communities (Vrangl Island). In more southern areas, like south-eastern Yakutia and Caucasus, it grows in the mountains above tree-line, in the alpine and subnival belts, on moist cliffs (the Yakutian collection is from cliffs near a waterfall).

Differentiation. The species can be easily recognized by comparatively short, strongly contorted and crisped leaves with very short hyaline hair-points, thick-walled and sinuose median laminal cells, and also because it has numerous dark red gemmae on dorsal surface of costa at leaf base in all collections. Another species with strongly crisped leaves is *Grimmia incurva*, but it differs in considerably longer, linear leaves, usually 2.5-3.0 mm long, always without gemmae. Spirally twisted leaves and similar thick-walled laminal cells are characteristic of *G. funalis*, but leaves of this species are not crisped, hyaline hair-points are usually long, and it lacks gemmae.

30. *Grimmia triformis* Carestia et De Not., Comment. Soc. Crittog. Ital. 2: 102.1866. — *Grimmia donniana* var. *triformis* (Carestia et De Not.) Loeske, Laubm. Eur. Part 1: 96. 1913. Figs. 55, 56.

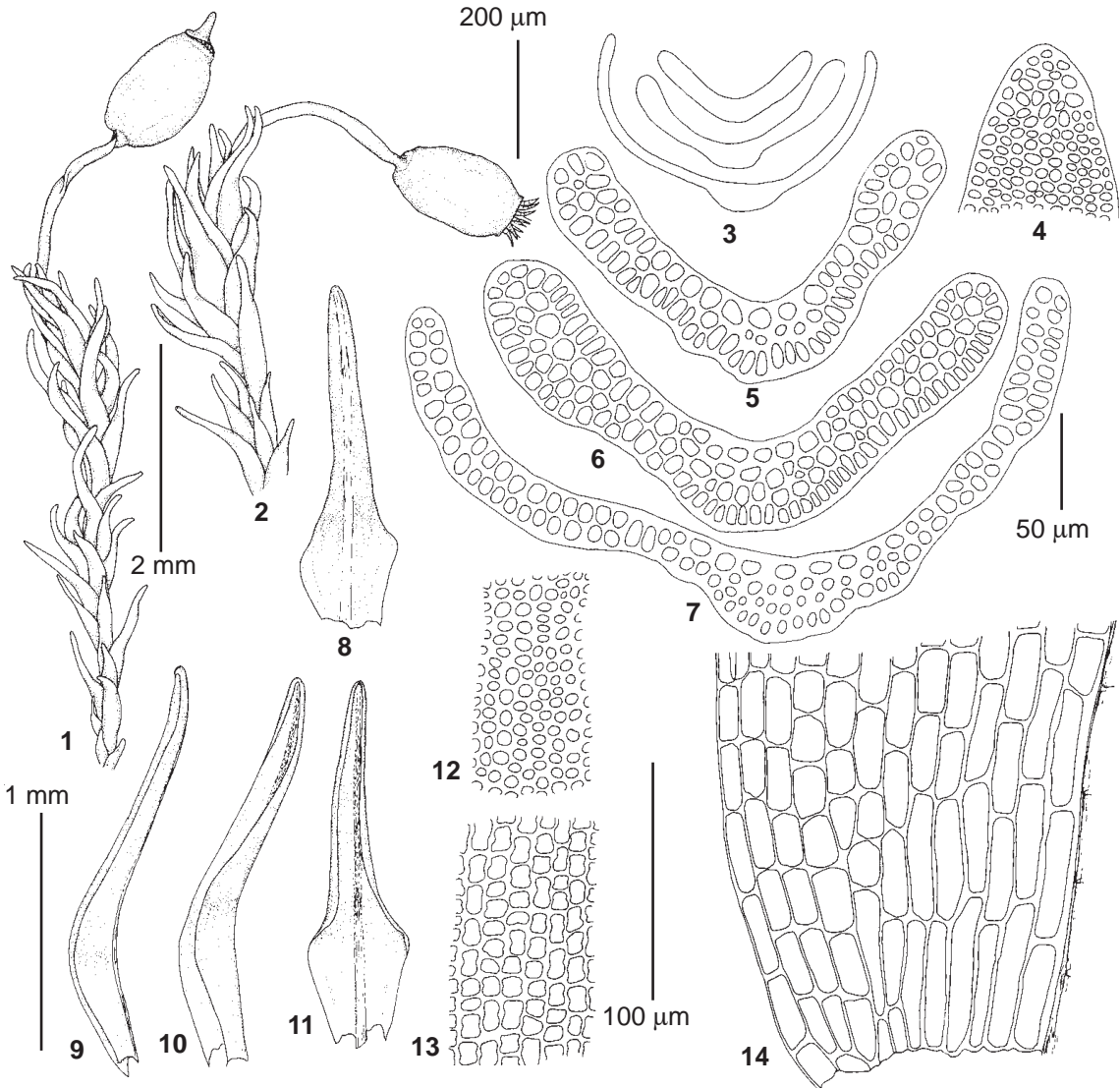


Fig. 57. *Grimmia unicolor* Hook. (from Altai Republic, M. Ignatov, #3/147): 1, 2 – habit; 3, 5–7 – leaf transverse sections; 4 – leaf tip; 8–11 – leaves; 12 – upper leaf cells; 13 – median leaf cells; 14 – basal leaf cells. Scale bars: 2 mm for 1–2; 1 mm for 8–11; 50 µm for 5–7; 100 µm for 4, 12–14; 200 µm for 3.

Plants in dense tufts, dark green, hoary. Stems erect, 0.5[–2] cm long, with weak central strand. Leaves flexuose, loosely appressed when dry, erect-spreading when moist, 1.0–1.6×0.3–0.5 mm, from oblong base gradually tapered into lanceolate acumen, widely keeled in distal part, not plicate; margins plane; costa differentiated, strongly prominent dorsally, semi-circular in cross section, with 2 ventral epidermal cells; hyaline hair-points 0.3–0.5(–1.3) mm long, denticulate, terete distally, flattened basally, flexuose; lamina unistratose near the costa, bistratose at margins and in strips in distal 2/3 of leaf, upper and median laminal cells not bulging, 11–14×10–11 µm, rounded-quadrate to short rectangular, with not or slightly sinuose walls, median laminal cells gradually

elongating to the leaf base, 12–20×10–12 µm, with moderately sinuose walls, basal juxtacostal cells elongate rectangular, 30–50×10–12 µm, with slightly thickened, not or very slightly porose walls, basal marginal cells uniformly thin-walled, to 70×10 µm. Autoicous, androecia terminal, sporophytes always present. Perichaetial leaves considerably larger than vegetative leaves, 1.7–2.0[3.1]×0.6–0.7[0.8] mm, with longer hyaline hair-points, 1.2–1.7[2.0] mm long, widened and flattened at base. Setae ca. 0.5[–1.0] mm, erect, straight. Capsules immersed, smooth, ovoid-cylindric, 0.8–1.0 mm long, smooth, stramineous, exothelial cells thick-walled, stomata at urn base present. Operculum low conic, mamillate. Annulus of elongata-type. Peristome teeth orange, contrasting



Fig. 58. Distribution of *Grimmia unicolor* Hook. in Russia.

in color with the urn, cribose throughout and irregularly cleft distally, densely papillose. Spores [8]9-11 μ m. Calyptrae mitrate.

SPECIMENS EXAMINED: **SIBERIA: Altai Republic**, Karakem River between Ayulyuyuzuk & Kobiguayuk Creeks, 20.VI.1989, #0/474, M.Ignatov (MHA).

Distribution. *Grimmia triformis* is a very rare species known from few localities in mountains of Central Europe. In Russia it is represented by single collection from Altai Mts., very far from its main area in Europe. It grows at 2050 m alt., at tree-line of *Pinus sibirica* forest, on siliceous rocks.

Differentiation. *Grimmia triformis* is very close to *G. donniana* and differs only in sporophytic characters (capsules are usually present in both species). In *G. triformis*, setae are very short, ca. 0.5 mm long and capsules are immersed (vs. setae 1.5-2.5 mm long and capsules exserted in *G. donniana*), and peristome teeth are wider, 70-100 μ m at base, cribose in *G. triformis* (vs. peristome teeth 50-70 μ m wide at base, almost entire in *G. donniana*). Altaian specimen of *G. triformis* was reported by Ignatov & Cao (1995) as *Coscinodon cribrosus*, another species with immersed capsules and strongly cribose peristome teeth. However, *Coscinodon cribrosus* is easily separated from *Grimmia triformis* by deeply plicate leaves (vs. not plicate in *G.*

triformis) and plicate, campanulate calyptrae, covering the capsules almost to the base (vs. small, mitrate, smooth calyptrae in *Grimmia triformis*).

31. ***Grimmia unicolor*** Hook. in Grev., Scott. Crypt. Fl. 3: 123. 1825. Figs. 57, 58.

Plants in loose or rather dense rigid patches, dark green or bluish-green. Stems erect or ascending, 1-3 cm long, fasciculately branched. Leaves appressed when dry, sigmoid in lateral view when wet, gradually enlarged to the distal part of shoot, 1.5-2.8 \times 0.6-0.7 mm, from short ovate base quickly narrowed into long lanceolate obtuse acumen, concave, cucullate at apex, not plicate; margins plane to incurved in proximal part of leaf; hyaline hair-points absent; costa weakly differentiated in distal 2/3, flattened or slightly prominent dorsally, semi-elliptical in cross section; lamina 2-3-stratose in distal 2/3, opaque, to 4-stratose at margins, upper laminal cells isodiametric, 6-7 μ m, rounded, thick-walled, median laminal cells ca. 9 μ m wide, quadrate to short rectangular, with moderately thickened sinuose walls, basal juxtacostal cells elongate rectangular, to 50 \times 10-12 μ m, with not porose or sinuose walls, basal marginal cells pellucid, short rectangular, to 35 \times 10-12 μ m, with thin longitudinal and thick transverse walls. Perichaetial leaves 2.5-3.0 \times 0.7-0.9 mm, with wider and longer basal part, formed by more thin-walled pellucid cells. Dioicous, sporadically with sporophytes. Setae 3-4 mm, straight when wet, often variously curved when dry. Capsules exserted, ovoid, strongly narrowed to the

mouth, 1-1.5 mm long, smooth. Operculum conic, long-rostrate. Annulus of affinis-type. Peristome teeth red-brown, finely papillose, entire or perforated distally. Spores 10-12 µm. Calyptrae mitrate, lobed at base.

SPECIMENS EXAMINED: **EUROPEAN RUSSIA:** **Karelia**, Ladoga, Puutsalo, 30.VI.1874, *S.O.Lindberg* (H); Sortavala, 14.VI.1934, *M.J.Kotilainen* (H); Impilachti, VII.1876, *V.F.Brotherus* & *H. Hjelt* (H), 20.VII.1914, *V.Pesola* (H), 15.VI.1916, *M.J.Kotilainen* (H), 12.VII.1926, *E.Kanervo* (H); Kronoborg [Kurkijoki], 1874, *E.Julin* (H); **CAUCASUS: North Ossetia**, North Ossetian Reserve, 25.VII.1977, *L.I.Abramova* (MW); ad mare glaciale Zei ad fl. Ardon, *A.H.* & *V.F. Brotherus* (H-SOL, H-Br); **Karachaev-Cherkessia**, Teberda Reserve, Baduk Gorge, 17.VIII.1993, #1/93, *Onipchenko* (MW); Ullu-Murudgu Gorge, 8.VIII.1986, *Ignatova* (MW); Bolshaya Khatipara-Khadzhej pass, 17.VII.1994, #80/94, *Onipchenko* (MW); Goral-Kol Gorge, 21.VII.1994, #104/94, 111/94, *Onipchenko* (MW); Azgek Gorge, 30.VII.1993, #32/93, *Onipchenko* (MW); **SIBERIA: Altai Republic**, Verkhne-multinskoe Lake, 5.VII.2000, *O.Pisarenko* (MW); Ak-Turu, 18.VII.1966, *L.V.Bardunov* (IRK, MW); between Kolbakaya & Saluru Creeks, 31.VII.1993, #36/347, *Ignatov* (MHA); Kobiguayuk Creek, 14.VI.1989, #0/464, *Ignatov* (MHA); Kayak Lake, 30.VI.1991, #7/11, *Ignatov* (MHA); Kayakkatuyarykskij Creek, 3-6.VII.1991, #111/94, 3/268, 27.VI.1991, 3/12, 3/32, 3/61, 3/84, 8/158, 8/163, *Ignatov* (MHA); left branch of Kaira Creek at Kaira-bazhi Peak, 14-17.VII.1991, #13/21, 13/41, 13/49, 13/162, *Ignatov* (MHA); Teletzkoe Lake, Chulyshman mouth, 5.VII.1966, *L.V.Bardunov* (IRK, MW); **Irkutsk Province**, Baikal Lake, Longatui River, 30.VIII.1921, #91, *V.Smirnov* (H-Br, MHA, IRK, MW); Murino, 30.VIII.1921 (H-Br); Vitimskij Reserve, Amalyk River, 9.VIII.1984, *L.V.Bardunov* (IRK, MW); **Buryatia**, Tunkinskij Range, 1934, #44, *V. Smirnov* (LE); **FAR EAST: Khabarovsk Territory**, Bureinskij Reserve, Medvezh'e Lake, 10.VIII.1997, #97-1096, *Ignatov* (MHA).

Distribution. *Grimmia unicolor* is sporadically distributed in Europe, from Scandinavia and Great Britain to Spain, known in Asia from India, China, Mongolia, Middle Asia, in Africa from Ethiopia, and from North America. In Russia it is known of old collections from Karelia, sporadically found in Caucasus, rather common in Altai Mts., extending eastward to Irkutsk Province and Khabarovsk Territory. *Grimmia unicolor* grows on siliceous rocks in the mountains, usually above tree-line, at 1700-3000 m alt., but in Baikal area it was collected in forest belt, on cliffs at lake shore and river banks.

Differentiation. *Grimmia unicolor* can be easily recognized by concave, channeled leaves with plane to incurved margins, obtuse, cucullate apex without hair-point, weakly differentiated flattened costa, and lamina often 3- to 4-stratose at margins.

TAXA EXCLUDED FROM BRYOFLORA OF
RUSSIA

Grimmia trichophylla Grev. Species most close to *G. muehlenbeckii*, differs from the latter in larger plant size, longer hyaline hair-points and gemmae subsessile, formed on short stalks on both sides of the lamina. *Grimmia trichophylla* was reported by Savicz-Ljubitskaya & Smirnova (1970) for European Russia, Polar Urals, Caucasus, and Eastern Siberia, and by Ignatov & Afonina (1992) also for Beringian Arctic. All specimens of this species in herbaria were erroneously identified (they belong mostly to *G. longirostris*, *G. reflexidens* or *G. muehlenbeckii*). *Grimmia trichophylla* is widespread in North and South America, known from Australia and New Zealand, Africa, Middle East and Turkey, common in Europe (but not found in Finland). Its occurrence in Russia is unlikely.

Grimmia decipiens (Schultz) Lindb. This species occurs in Europe and northern Africa, and known also from Turkey and Armenia. It is characterized by robust plants with ribbed capsules on arcuate setae, resembling habitually *G. trichophylla* and *G. elatior* (but can be readily separated from both these species in costa reniform in cross section, with 3-8 ventral epidermal cells). Savicz-Ljubitskaya & Smirnova (1970) reported this species for European Russia, Ignatov & Afonina (1992) – for North-West European Russia and Caucasus, Abramov & Volkova (1998) – for Priladozhskij District of Karelia. All these records were based on erroneously identified specimens. However, the species can be found in Caucasus.

SYNONYMS

- Dryptodon patens* (Hedw.) Brid. – *Grimmia ramondii*
Grimmia affinis Hoppe et Hornsch. – *G. longirostris*
Grimmia apiculata Hornsch. – *G. fuscolutea*
Grimmia brachydictyon (Card.) Deguchi – *G. hartmanii*
Grimmia calvescens Kindb. – *G. funalis*
Grimmia campestris Burchell ex Hook. – *G. laevigata*
Grimmia cavifolia Lindb. et Arnell – *G. longirostris*
Grimmia commutata Hueb. – *G. ovalis*
Grimmia crassifolia Lindb. ex Broth. – *G. tergestina*
Grimmia donniana var. *triformis* (Carestia et De Not.) Loeske – *G. triformis*

- Grimmia funalis* var. *calvescens* (Kindb.) H.Möller
– *G. funalis*
- Grimmia hartmanii* var. *anomala* (Hampe ex Schimp.) Mönk. – *G. anomala*
- Grimmia leucophaea* Grev. – *G. laevigata*
- Grimmia mesopotamica* Schiffn. – *G. capillata*
- Grimmia ovata* auct. non Web. et Mohr. – *G. longirostris*
- Grimmia patens* (Hedw.) B. S. G. – *G. ramondii*
- Grimmia pulvinata* var. *africana* (Hedw.) Wils. – *G. pulvinata*
- Grimmia sessitana* De Not. – *G. reflexidens*
- Grimmia tergestina* var. *poecilostoma* (Cardot et Sebillé) Loeske – *G. poecilostoma*
- Grimmia trichophylla* var. *tenuis* (Wahlenb.) Wijk et Marg. – *G. muehlenbeckii*
- Hydrogrimmia mollis* (Bruch et Schimp.) Loeske
– *Grimmia mollis*
- Racomitrium patens* (Hedw.) Hueb. – *Grimmia ramondii*

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