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A SMALL COLLECTION OF HEPATICS FROM ADJARA, GEORGIA

НЕБОЛЬШАЯ КОЛЛЕКЦИЯ ПЕЧЕНОЧНИКОВ ИЗ АДЖАРИИ, ГРУЗИЯ

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Abstract

A study of a small hepatics collection gathered in 2013 in Adjara (Colchis forest zone in Georgia) revealed 47 species of liverworts and 3 of hornworts. The compiled checklist provides data for each species on the presence of generative structures and vegetative propagules, altitudinal range of distribution, habitat, and the list of accompanying taxa. Seven species (*Chiloscyphus fragilis*, *Cololejeunea calcarea*, *Frullania jackii*, *Jubula hutchinsiae* ssp. *caucasica*, *Liochlaena subulata*, *Metzgeria temperata*, *Plectocolea infusca*) are new for Georgia. *Plectocolea infusca* var. *memiadzei* Bakalin var. nov. is described basing on materials from Mtirala National Park and is characterized, in comparison with var. *infusca,* by more numerous and smaller grayish oil-bodies, not filling the cell lumen, a lower perigynium and specific distribution pattern. The morphological description and illustrations of the new taxon are provided.

Резюме

В результате изучения небольшой коллекции печеночников, собранной в 2013 году в Аджарии (зона колхидских лесов Грузии), выявлено 47 видов печеночников и 3 антоцерота. Каждый вид аннотирован сведениями о наличии в собранных образцах вегетативных пропагул, органов полового размножения, высотном диапазоне распространения, экологических условиях произрастания и перечнем сопутствующих видов. Семь видов (*Chiloscyphus fragilis*, *Cololejeunea calcarea*, *Frullania jackii*, *Jubula hutchinsiae* ssp. *caucasica*, *Liochlaena subulata*, *Metzgeria temperata*, *Plectocolea infusca*) приведены впервые для Грузии. *Plectocolea infusca* var. *memiadzei* Bakalin var. nov. описана на основе образца из национального парка Мтирала и характеризуется более многочисленными и мелкими сероватыми масляными тельцами, не заполняющими просвет клетки, более низким перигинием и особенностями географического распространения. Приводятся морфологическое описание и иллюстрации нового таксона.

KEYWORDS: Georgia, Adjara, *Hepaticae*, flora, *Plectocolea*.

The study of hepatic flora of Georgia started in the middle of the XIX century (Chikovani, 1978). The main book which summarized all the data on distribution of hepatics was the check-list "Flora of spore-bearing plants" (Chikovani, 1986). Unfortunately, the book was the last one in a series of miscellaneous bryological publications in the country. The next paper appeared almost 20 years later (Chikovani & Svanidze, 2004) and represented a shortened version of the aforementioned "Flora…".

Despite Georgia is a relatively small country covering 69700 km^2, the diversity in orography and climatic aspects is noticeably high which has resulted in the occurrence, to our knowledge, of about 4200 vascular plant species and over 800 bryophyte species (Chikovani & Svanidze, 2004). Various provinces of Georgia strikingly differ in thoroughness of study. The most comprehensive information on hepatic composition is available for the Republic of Adjara and to the certain extent for Svaneti and Mtiuleti, with only a few records for other administrative subunits. Despite a considerable number of currently known taxa of hepatics (174, including 3 hornworts and 171 liverworts), we believe that after careful flora exploration in several provinces of the country, the number of species will exceed 200.

Our field work was carried out for four days in the middle of May, 2013 and covered two localities; a brief information about them is in Table 1. Both localities are situated within the Colchis temperate-subtropical rain forest zone in south Adjara, the region characterized by mild subtropical climate of Mediterranean type, relatively high precipitation, numerous acidic rock outcrops, and dense stream network.

During the field work, over 300 hepatic specimens were collected, all of them are kept in VBGI. For one more week afterwards, most specimens were studied for oil-bodies features, when the plants were still in a living

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Table 1. General data on visited areas.

Feature	Mtirala National Park	Chvanistskali River Canyon
altitude range, m	200-1500	600-2250
altitude range of collection sites, m	400-1300	650, 2220
Plant communities studied	polydominant broad-leaved forest of 'Colchis type', *Carpinus* monodominant forest	polydominant broad-leaved forest of 'Colchis type', alpine grassland
mean annual precipitation, mm	4500	2500
Latitude / longitude	41°38-41'N 41°51-53'E	41°41-45'N 42°10-12'E

state. Despite the limited time we have found 50 species of hepatics (47 liverworts and 3 hornworts), 7 of them are newly recorded for Georgia. One variety is described as new for science. To take account of these new finds for the Georgian hepatic flora on the whole, as well as of additional localities for some taxa rare in the country, we provide our collection list below. Taxa new for Georgia are marked with asterisk. The nomenclature mostly follows the one accepted in the "Checklist of liverworts of Russia" (Konstantinova *et al.*, 2009). Each species is annotated by: (1) presence of generative structures and vegetative propagules (if present) in the following abbreviations: ant. – antheridia, arch. – archegonia, per. – perianths (including pseudoperianths of metzgerioid hepatics), spor. – sporangia, gemm. – gemmae; (2) altitudinal range of the species collection; (3) habitat; (4) associated species (if present); (5) herbarium numbers of selected specimens examined.

Anthoceros caucasicus Steph. spor. – 350-400 – Moist clayish road ruts in broadleaved forests. – In pure mats. – G-11-45-13, G-12-36-13.

A. punctatus L. spor. – 350 – Moist clayish road ruts in broadleaved forests. – In pure mats. – G-11-40-13.

Barbilophozia hatcheri (Evans) Loeske gemm. – 2220 – Cliff crevices in alpine grassland belt. – In pure mats or with *Plagiochila porelloides*. – G-17-4-13.

Bazzania trilobata (L.) S. Gray – 400 – Cliffs and decaying wood in part shade in broadleaved forests. – In pure mats. – G-12-52-13.

Blasia pusilla L. – 400 – Moist clayish road rut in broadleaved forest. Only one collection. – In pure mats. – G-12-41-13.

Blepharostoma trichophyllum (L.) Dumort. var. *trichophyllum* per. – 2220 – Rocks and stones in open places or under *Rhododendron caucasicum* branches, in alpine grassland belt. – In pure mats or with *Lophozia excisa* and *Radula lindenbergiana*. – G-17-19-13.

Calypogeia arguta Nees et Mont. gemm. – 350 – Sandy to clayish road ruts in broadleaved forests. – In pure mats. – G-11-44-13.

C. fissa (L.) Raddi – 350-400 – Clayish to sandy road ruts, base of trees, cliffs and stones along streams, from mesic to moist conditions, in part shade, in broadleaf forests. – In pure mats or with *Conocephalum conicum*, *Diplophyllum albicans*, *Pellia neesiana*, *Plagiochila porelloides*. – G-11-43-13, G-12-55-13.

Cephalozia catenulata (Huebener) Lindb. – 400 – Bark near tree bases or decaying wood, in part shade, in broadleaved forests. – In pure mats, but more frequently with *Cephalozia lacinulata* and *Nowellia curvifolia*. – G-12-75-13

C. lacinulata Jack ex Spruce arch., per. – 400 – Decaying wood in part shade in broadleaved forest. In pure mats or with *Cephalozia catenulata*. – G-12-61-13.

Cephaloziella divaricata (Sm.) Schiffn. ant. – 350 – Dry stone in the stream valley in open place surrounded by broadleaved forest. Only one collection. – In pure mats. – G-11-62-13.

**Chiloscyphus fragilis* (A.Roth) Schiffn. – 350-400 – Cliffs and rocks along streams and in spray zone near waterfall, rarely on moist decaying wood near stream, in partial shade to open places in broadleaved forests. – In pure mats or with *Jubula hutchinsiae* ssp. *caucasica*. – G-11-10-13, G-12-13-13.

**Cololejeunea calcarea* (Libert.) Schiffn. per., ant. – Mesic to moist cliffs near stream, in partial shade in broadleaved forests. – In pure mats or with *Frullania jackii*, *Lophocolea bidentata*, *Plagiochila porelloides*. – 400-650 – G-12-44-13, G-15-10-13.

Conocephalum conicum (L.) Und. ant., spor. juv. – 350-400 – Moist cliffs near streams and in the spray zone of waterfalls, moist clayish roadsides, mostly in part shade, in broadleaved forests. – In pure mats or with *Calypogeia fissa*, *Diplophyllum albicans*, *Pellia neesiana*, *Plagiochila porelloides*, *Scapania verrucosa*. – G-11-27-13, G-12-38-13.

Diplophyllum albicans (L.) Dumort. ant., gemm. – 340-400 – Moist cliffs (including those near streams) and clayish roadside, in partial shade, in broadleaved forests. – In pure mats or with *Calypogeia fissa*, *Jubula hutchinsiae* ssp. *caucasica*, *Marsupella emarginata*, *Pellia neesiana*, *Plagiochila porelloides*, *Scapania nemorea*, *S. verrucosa*. – G-11-37-13, G-12-49-13.

Frullania dilatata (L.) Dumort. ant., arch., per., spor. – 400-1300 – Tree bark in broadleaved lowland forest and *Carpinus* forest, in part shade to open places. – In pure mats. – G-12-83-13, G-13-13-13, G-14-5-13.

**F. jackii* Gotsche – 650 – Wet cliffs near stream in part shade in broadleaved forest. Only one collection. – In pure mats. – G-15-4-13.

F. tamarisci (L.) Dumort. ant., arch., per., spor. – 350-400 – Bark of trees, cliffs and dry stones in open places in broadleaved forests. – In pure mats. – G-11-56-13, G-12-32-13.

Jamesoniella autumnalis (DC) Steph. – 400 – Cliffs in open places surrounded by broadleaved forests. – In pure mats

or with *Plagiochila porelloides* and *Scapania nemorea*. – G-12-31-13.

**Jubula hutchinsiae* (Hook.) Dumort. ssp. *caucasica* Konst. et Vilnet ant., per., spor. – 350-650 – Wet cliffs (mostly near streams), rarely moist decaying wood, in part shade, in broadleaved forests. – In pure mats or with *Chiloscyphus fragilis*, *Diplophyllum albicans*, *Metzgeria furcata*, *Plagiochila porelloides*, *Scapania undulata*. – G-11-5-13, G-12-46-13, G-15-13a-13. – Comment: this is rather formal record of the subspecies for the country. As it was shown by Konstantinova & Vilnet (2011) all of Caucasian records previously named as *Jubula hutchinsiae* ssp. *hutchinsiae* really belong to ssp. *caucasica* described in aforementioned paper.

Jungermannia atrovirens Dumort. per. – 400 – Stones and cliffs along stream in broadleaved forest. Only one collection. – In pure mats. – G-12-15a-13.

Lejeunea cavifolia (Ehrh) Lindb. – 350-650 – Wet to moist cliffs near streams, tree branches and tree trunks, in part shade, in broadleaved forests. – In pure mats or with *Chiloscyphus polyanthos* and *Radula lindenbergiana*. – G-11-18-13, G-12-7-13, G-15-13-13.

**Liochlaena subulata* (Evans) Schljakov ant., arch., gemm. – 350-410 – Cliffs near stream, tree bark, decaying wood, in moist condition, in partial shade, in broadleaved forests. – In pure mats or with *Plagiochila porelloides*, *Riccardia palmata*, *Scapania nemorea*. – G-11-14-13, G-12-92-13, G-14-1-13.

Lophocolea bidentata (L.) Dumort. – 400-650 – Base of tree trunks, decaying wood, wet cliffs near streams in broadleaved forests. – In pure mats or with *Cololejeunea calcarea*, *Frullania jackii*, *Nowellia curvifolia*, *Plagiochila porelloides*, *Radula lindenbergiana*. – G-12-64-13, G-15-10-13.

L. heterophylla (Schrad.) Dumort. ant., per., spor. – 400-1300 – Decaying wood and tree trunk bases in lowland broadleaved forests and *Carpinus* forest belt. – In pure mats. – G-12-72-13, G-13-8-13.

Lophozia excisa (Dicks.) Dumort. per., ant. – 2220 – Rocks in open place and stones under *Rhododendron caucasicum* branches in alpine grassland belt. – In pure mats or with *Blepharostoma trichophyllum* var. *trichophyllum*, *Radula lindenbergiana*, *Sphenolobus minutus*. – G-17-26-13.

Lunularia cruciata (L.) Lindb. gemm. – 350-650 – Wet cliffs or soil along streams in broadleaved forests. – In pure mats. – G-11-31-13, G-14-7-13, G-15-9a-13.

Marchantia latifolia Gray ant., gemm. – 350-400 – Cliffs near stream and clayish stream banks in open places surrounded by broadleaved forests. – In pure mats. – G-11-39-13, G-12-2-13.

Marsupella emarginata (Ehrh.) Dumort. ant., per., spor. – 400 – Stones and cliffs along streams (rarely aside of stream) in broadleaved forests. – In pure mats or with *Diplophyllum albicans*. – G-12-47-13.

M. funckii (F.Web. et Mohr) Dumort. arch. – 1300-2220 – Dry sandy road cuts in open place, steep clayish slope to stream, mesic cliff in part shade, in *Carpinus* forest and alpine grasslands belts. – In pure mats. – G-13-3-13, G-17-2-13.

Metzgeria conjugata Lindb. ant., arch., spor. juv. – 350-650 – Cliffs along streams, decaying wood and tree branches in part shade, in broadleaved forest. – In pure mats. – G-11-16-13, G-12-5-13, G-15-16-13.

M. furcata (L.) Dumort. – 350-400 – Tree bark and moist cliffs, in part shade, in broadleaved forests. – In pure mats or with *Jubula hutchinsiae* ssp. *caucasica* and *Porella platyphylla*. – G-11-79-13, G-12-82-13.

**M. temperata* Kuwah. gemm. – 400 – Tree branch in part shade in broadleaved forest. Only one collection. – In pure mat. – G-12-9-13.

Nowellia curvifolia (Dicks.) Mitt. per. – 400-1300 – Decaying wood in part shade in broadleaved forest. – In pure mats or with *Cephalozia catenulata*, *Lophocolea bidentata*, *Plagiochila porelloides*. – G-12-61-13, G-13-63-13.

Pellia neesiana (Gott.) Limpr. – 350-400 – Cliffs and stones along streams and in waterfall spray zone, in part shade, in broadleaved forests. – In pure mats or with *Calypogeia fissa*, *Conocephalum conicum*, *Diplophyllum albicans*, *Plagiochila porelloides*, *Riccardia multifida*. – G-11-12-13, G-12-24-13.

Phaeoceros laevis Prosk. ssp. *laevis* spor. – 400-410 – Shaded cliffs and moist clayish roadside in broadleaved forests. – In pure mats. – G-12-37-13, G-14-2-13.

Plagiochila porelloides (Torrey ex Nees) Lindenb. ant., per., spor. – 350-650 – Tree bark, decaying wood, moist to wet cliffs along or aside of streams, cliffs in waterfall spray zone in open to part shade conditions, occurring from broadleaved forests in lowlands to alpine grassland belt. – In pure mats or with *Barbilophozia hatcheri*, *Calypogeia fissa*, *Cololejeunea calcarea*, *Conocephalum conicum*, *Diplophyllum albicans*, *Frullania jackii*, *Jubula hutchinsiae* ssp. *caucasica*, *Liochlaena subulata*, *Lophocolea bidentata*, *Nowellia curvifolia*, *Pellia neesiana*, *Radula lindenbergiana*, *Scapania nemorea*. – G-11-6-13, G-12-4-13, G-15-10-13.

Plectocolea hyalina (Lyell) Mitt. – 350-400 – Stones and cliffs along streams in broadleaved forest. – In pure mats. – G-11-23-13, G-12-15-13.

**P. infusca* Mitt. var. *memiadzei* Bakalin [see below]

Porella platyphylla (L.) Pfeiff. – 400 – tree bark in broadleaved forests. – In pure mats or with *Radula lindenbergiana* and *Metzgeria furcata*. – G-12-85-13.

Radula complanata (L.) Dumort. gemm. – 410 – Tree bark in broadleaved forest. – G-14-4-13.

R. lindenbergiana Gottsche ex Hartm. ant., arch., per., spor., gemm. – 350-2220 – Tree trunks, rocks and cliffs in open to partly shaded places (commonly along streams), in broadleaved forests to alpine grassland belt. – In pure mats or with *Blepharostoma trichophyllum* var. *trichophyllum*, *Cololejeunea calcarea*, *Frullania jackii*, *Lejeunea cavifolia*, *Lophocolea bidentata*, *Lophozia excisa*, *Plagiochila porelloides*, *Porella platyphylla*. – G-11-32-13, G-12-81-13, G-14-6-13, G-15-15-13, G-17-27-13.

Reboulia hemisphaerica (L.) Raddi spor. – 650 – Moist cliffs near streams in broadleaved forests. – G-15-1-13.

Riccardia multifida (L.) Gray – 400 – Stones and cliffs along stream in broadleaved forest. Only one collection. – With *Pellia neesiana*. – G-12-18-13.

R. palmata (Hedw.) Carruth. ant., arch. – 350-400 – Decay-

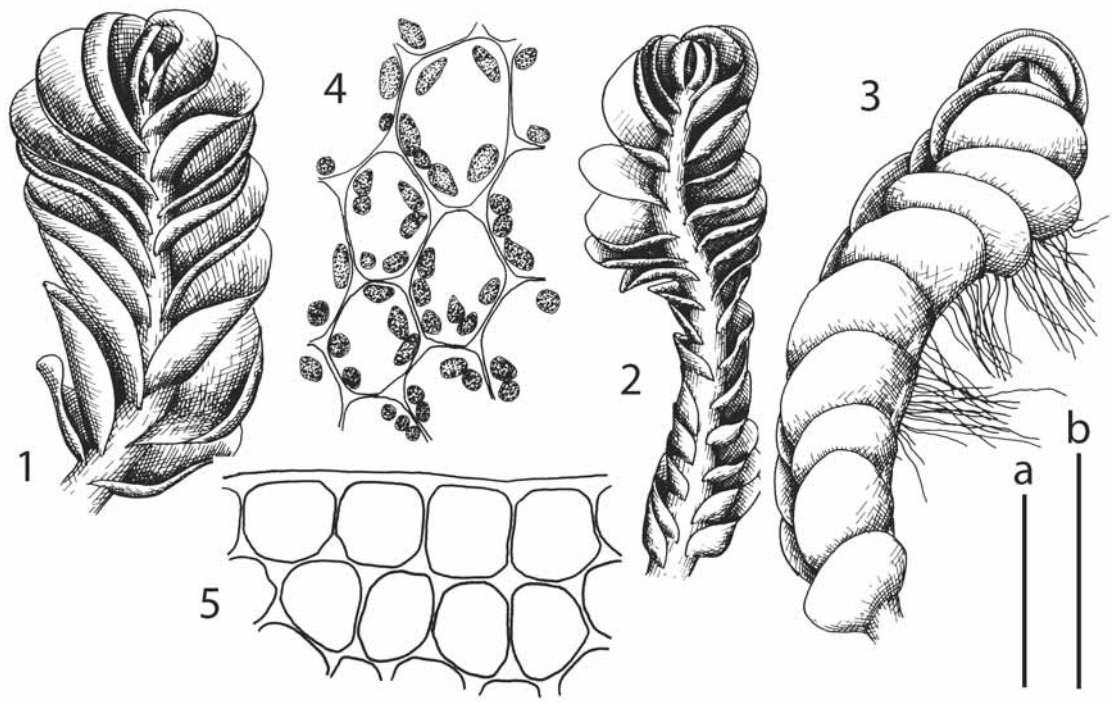

Fig. 1. *Plectocolea infusca* Mitt. var. *memiadzei*. 1 – habit, dorsal view; 2 – male branch, dorsal view; 3 – sterile branch, lateral view; 4 – midleaf cells with oil-bodies; 5 – leaf margin cells. Scales: a – 50 μm, for 4, 5; b – 2 mm, for 1-3. All from holotype (VBGI).

ing wood in part shade in broadleaved forest. – In pure mats or with *Liochlaena subulata*. – G-11-50-13, G-12-60-13.

Scapania nemorea (L.) Grolle per., spor., gemm. – 350-410 – Decaying wood, tree branches and tree trunk bases, moist to wet cliffs along or aside of streams, wet shaded road ruts in broadleaved forests. – In pure mats or with *Diplophyllum albicans*, *Jamesoniella autumnalis*, *Liochlaena subulata*, *Plagiochila porelloides*. – G-11-48-13, G-12-59-13, G-14-3-13.

S. undulata (L.) Dumort. ant. – 350-400 – Stones and cliffs along streams in part shade in broadleaved forests. – In pure mats or with *Jubula hutchinsiae* ssp. *caucasica* Konst. et Vilnet – G-11-26-13, G-12-12-13.

S. verrucosa Heeg gemm. – 350 – Moist cliffs near streams and in spray zone of waterfalls, in part shade, in broadleaved forests. – In pure mats or with *Conocephalum conicum*, *Diplophyllum albicans*, *Plagiochila porelloides*. – G-11-13-13.

Solenostoma caucasica (Váňa) Konst. ant., per. – 400-1300 – Moist clayish roadside in broadleaved forests. – G-12-33-13, G-13-5-13.

Sphenolobus minutus (Schreb.) Berggr. – 350-2220 – Dry stones in open places or under branches of *Rhododendron caucascum*, in broadleaved forests to alpine grassland belt. – In pure mats or with *Lophozia excisa* and *Plagiochila porelloides*. – G-11-64-13, G-17-10-13.

Plectocolea infusca var. ***memiadzei*** Bakalin var. nov. [named in honor of the famous Georgian botanist, Dr. Vaja Mevludovich Memiadze]

Plants prostrate to ascending 1.5-2.1 mm wide and 7-15 mm long, yellowish green to green and brownish green, closely adnate to the substratum by rhizoids. Stem 240-270 μm in diameter, brownish to greenish brown, slightly more deeply colored in ventral side, sparsely branched as subfloral innovations or laterally intercalary. Rhizoids dense, erect to obliquely spreading, purplish brownish to grayish brown. Leaves contiguous to subimbricate, with more deeply colored apices, widely obliquely ovate, 1.25-1.4×1.25-1.4 mm (1:1), loosely sheathing the stem near base, concave-canaliculate, widely ovate when flattened. Midleaf cells subisodiametric, with colorless to slightly brownish walls, (25)-37.5-48×(-25)40-48 μm, with moderate in size convex trigones, cuticle smooth; oil bodies 6-10 per midleaf cell, grayish brownish, sometimes filling cell lumen, granulate, spherical, 6.5-9 μm in diameter to shortly fusiform, 6-8×10-13 μm; cells along leaf margin (20-)30-45 μm, thin-walled, with thickened external wall, trigones moderate to large, convex, walls brownish, cuticle smooth; cells in basal part of the leaf similar to those in midleaf or slightly narrower, with obscurely finely striolate cuticle. Dioicous. Androecia intercalary, in 4-6 pairs of bracts, spicate, bracts strongly inflate in lower 1/3-2/3 of its length or cupped, sometimes with narrowly recurved margin in upper part, rounded when flattened, smaller than sterile leaves. Perianth conical, pluriplicate, gradually narrowed to slightly turbinate mouth, hidden within bracts or exerted for 1/5 of its length. Female bracts wider than sterile leaves, undulate and sometimes loosely crispate along margin. Perigynium ca. 1/5-1/3 of perianth length. Sporophyte unknown.

Holotype. Georgia. Adjara, Mtirala National Park Upper course of Chakvistavi River, ca. 4 km upstream of

Table 2. Comparison of *Plectocolea infusca* var. *memiadzei* Bakalin with some related taxa.

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Feature	*Plectocolea infusca* var. *memiadzei*	*Plectocolea infusca* Mitt. var. *infusca*	*Plectocolea kurilensis* (Bakalin) Bakalin & Vilnet	*Plectocolea hyalina* (Lyell) Mitt.
Shoot width, mm	1.5-2.1	~1.5-2.0	~2.0-3.0	~0.8-2.5
Leaf size, mm	1.25-1.4×1.25-1.4	0.8-1.0×0.8-1.0	0.8-1.25×-0.8-1.35	0.7-1.3×0.7-1.2
Oil-body color, quantity per cell and size	grayish-brownish, 6-10 per midleaf cell, only sometimes filling cell lumen, granulate, spherical, 6.5-9 μm in diameter to shortly fusiform, 6-8×10-13 μm	brownish, 2-8 per cell, nearly filling cell lumen, granulate, 6-10×6-14 μm	grayish, 2-4 per cell, granulate, spherical, 8-11 μm in diameter	grayish, 2-6, spherical,5-9 μm in diameter to oblong, 5-9×6-14 μm
Antical leaf margin recurvation	Absent	Absent	Present	Absent
General color	Bright	Bright	Bright	Pale
Larger leaves emargination	absent	rarely present	rarely present	commonly present
Perigynium / Perianth height rate	1/5-1/3	(1/4-)1/3-3/3	1/4–4/4	1/2-2/3
Distribution	Temperate Adjaria	Boreal to Subtropical East Asia	Temperate East Asia	Boreal circumpolar with a few penetrations southward to Boreal vegetation belts in mountains

Chakvistavi Village, the buffer zone of the park (41°40'30.1"N 41°52'58.1"E), 400 m alt. Leg. Vadim A. Bakalin 12 May 2013. G-12-39-13 (VBGI).

Other specimens examined (paratypes): Georgia. Adjara, Batumi Botanical Garden. leg. 24.IV.1971. N. Chikovani (TBI, duplicate in VBGI); Kintrishi River canyon, 500 m alt., forest, on soil. 26.VIII.1976. N. Chikovani (TBI, duplicate in VBGI).

The taxon prefers moist rocks and cliffs along streams and wet clayish roadsides. Thus the ecology of the new variety is rather similar to var. *infusca* in Temperate Eastern Asia. Dissimilarly to the new taxon, var. *infusca* frequently occupies habitats in open places. Probably in the course of the further studies var. *memiadzei* will be found in that habitat too. The associates of this taxon are poorly known. Due to data in hand, it is commonly forming pure mats, with rare admixture of *Calypogeia fissa* (L.) Raddi. The altitudinal range of the new taxon is rather restricted by wet Temperate broadleaf polydominant Colchis forest belt.

Morphological variability and relationships of the new taxon are poorly understood. By general appearance it resembles *Plectocolea infusca* Mitt. (in its narrow sense, cf. Bakalin & Vilnet, 2012) and *P. kurilensis* (Bakalin) Bakalin et Vilnet, both known from Eastern Asia. The differentiating features in the group *P. infusca – kurilensis*, as well as *P. hyalina* (Lyell) Mitt., for which the new taxon may be mistaken in the Caucasus are put in Table 2. We also noticed that no perianths with produced sporangia were found in our specimens, that looks as blocking fertilization process, despite the mass presence of androecia and archegonia. The similar situation has been described recently for *Mesoptychia polymorpha* Stotler, Crand.-Stotl. *et* Bakalin (Crandall-Stotler *et al*., 2013).

Plectocolea infusca var. *memiadzei* may be treated as a recently derived taxon which appeared due to isolation of the humid Temperate area in the Caucasus from those in Eastern Asia (currently divided by Boreal or xeric communities in Central Asia). The pair var. *infusca* – var. *memiadzei* resembles in distributional aspect some pairs of morphologically similar species with disjunction "Europe" – "East Asia", such as *Cololejeunea calcarea* (Libert.) Schiffn. – *Cololejeunea ornata* A.W. Evans, *Frullania jackii* Gotsche – *F. davurica* Hampe, *F. tamarisci* (L.) Dumort. – *F. appendiculata* Steph., *etc*.

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