

ON THE MOSS FLORA OF LAGONAKI HIGHLAND (ADYGEA REPUBLIC,  
THE WESTERN CAUCASUS)

К ФЛОРЕ МХОВ ЛАГОНАКСКОГО НАГОРЬЯ (РЕСПУБЛИКА АДЫГЕЯ,  
ЗАПАДНЫЙ КАВКАЗ)

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Abstract

Annotated list of 211 moss species of the isolated karst massif in westernmost high mountainous part of the Greater Caucasus Mountains is presented. 12 species are new for the Republic of Adygeya. The list includes some interesting records of species which are rare in the area, e.g., *Mielichhoferia mielichhoferiana*, *Plasteurhynchium striatulum*, *Pseudotaxiphyllum elegans*, *Seligeria trifaria*, *Barbula crocea*, *Tayloria lingulata*, *Grimmia teretinervis*, *Lescurea plicata*, *L. saviana*, *Plagiobryum demissum*, *Buxbaumia viridis*, *Pseudocalliergon trifarium*, *Sphagnum angustifolium*, and *S. balticum*. A brief characteristic of habitats is given in annotations.

Резюме

Представлен аннотированный список 211 видов мхов, произрастающих на изолированном карстовом массиве в самой западной высокогорной части Большого Кавказа. Новыми для Республики Адыгея являются 12 видов. Список включает редкие и интересные виды, а также находки редких на Кавказе видов, например, *Mielichhoferia mielichhoferiana*, *Plasteurhynchium striatulum*, *Pseudotaxiphyllum elegans*, *Seligeria trifaria*, *Barbula crocea*, *Tayloria lingulata*, *Grimmia teretinervis*, *Lescurea plicata*, *L. saviana*, *Plagiobryum demissum*, *Buxbaumia viridis*, *Pseudocalliergon trifarium*, *Sphagnum angustifolium*, *S. balticum*. Аннотации содержат краткую характеристику местообитаний.

Keywords: Western Caucasus, Republic of Adygea, Lagonaki Highland, mosses, flora.

INTRODUCTION

Lagonaki Highland is the westernmost high-mountainous part of the Greater Caucasus Mountains. This is an isolated formation situated between Belaya and Pshekh River, on the border of two great Caucasus regions: Colchis and Caucasus botanical provinces. Geopolitically, the largest part of this area lies in the Republic of Adygeya. The high-mountain part of the Lagonaki Highland is located within the borders of the Caucasian Reserve and the UNESCO World Natural Heritage Site. This is one of the centers of biodiversity development for species and forms in the Caucasus.

The first list of 12 moss species of this area was published by Shaposhnikov (1909). A few mosses were collected in 1935 by L.N.Vasilyeva, but her data remained unpublished. Some information regarding mosses of Lagonaki Highland is included in the publication of Akatova (2002). In the Herbarium of the Caucasian Reserve (CSR) there are a few specimens collected in this region by L.N.Vasilyeva (1935), A.P.Senicheva (1951), and V.V.Akatov (1981-82).

During 1995-2014, mosses were collected in Lagonaki Highland in the course of an inventory of the moss flora of the Caucasian Reserve by T.V.Akatova, and in 1999 by M.S. Ignatov. The present paper summarizes all these data.

STUDY AREA

The study area is about 17,000 hectares. It is located between 43°56' and 44°08' N, and 39°50' and 40°02' E, and ranges from 1500 to 2868 m elevation. Lagonaki Highland is a slightly broken surface with separate mountain massifs. The main peaks are Fisht (2868 m), Oshten (2804), and Pshekho-Su (2744 m) (Fig. 1). Northern part of this area is gently sloping, southern and eastern slopes are rocky and very steep. The mountain massifs are formed by calcareous rocks (limestone, dolomites, marls). Erosion and karst processes are widespread in the whole area.

CLIMATE AND VEGETATION

The climate of the upper mountain zones is cold alpine with a mean annual temperature of +3.5°C, mean temperature of January (coldest month) is -4.0–-6.0°C,

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Fig. 1. Map of the Lagonaki Highland.

mean temperature of August (the warmest month) is 12–14°C, annual precipitation ranges from 1780 mm (Armyanskiy camping) to 2765 mm (Cherkesskiy Pass) (Ivanchenko et al., 1982).

The study area occupies the upper part of forest belt, subalpine and alpine belts. Upper mountain coniferous and mixed coniferous broad-leaved forests (1500–1800 m) are formed by *Abies nordmanniana* (nomenclature of vascular plants follows Zernov, 2006) and *Fagus orientalis* with *Acer trautverreri*. Subalpine forest belt (1700–1900 m) – open birch and beech woodlands, pine, maple forests – are formed by *Betula litwinowii*, *Fagus orientalis*, *Pinus sylvestris* subsp. *hamata*, and *Acer trautverreri*. In the forest belt of the study area trunk bases are covered by *Isothecium alopecuroides*, *Pseudoleskeella nervosa*, *Pterigynandrum filiforme*, *Lescuraea mutabilis*, and *L. saviana*. On trunks of deciduous trees are common *Hypnum cupressiforme*, *Ulota crispa*, *Pterigynandrum filiforme*, *Pseudoleskeella nervosa*, *Orthotrichum pallens*, *O. striatum*, *O. stramineum*; frequent mosses on rotten logs include *Herzogiella seligeri*, *Tetraphis pellucida*, *Brachythecium rutabulum*, and *Sciuro-hypnum reflexum*. In the forest belt, some rare species were found: *Buxbaumia viridis* growing on rotten logs of *Abies* and *Andreaea alpestris* on rocks.

Upper parts of mounts above timberline are occupied by subalpine and alpine vegetation:

– subalpine meadows, dominants *Festuca woronowii*, *Calamagrostis arundinacea*, *Stachys macrantha*, *Anemone fasciculata*; **most common mosses** (under herbal cover) include *Abietinella abietina*, *Rhytidiadelphus triquetrus*, *Hylocomium splendens*, *Rhytidium rugosum*, *Pleurozium schreberi*, *Rhodobryum roseum*;  
– *Rhododendron caucasicum* and *Juniperus depressa* communities; **most common mosses**: *Hylocomium splendens*, *Rhytidiadelphus triquetrus*, *Entodon concinnus*, *Pleurozium schreberi*, *Hylocomiastrum pyrenaicum*, *Polytrichum formosum*.

– short-grass meadows and heaths (communities with significant participation of lichens) – *Festuca ovina*, *Carex huetiana*, *C. tristis*, *Alchemilla caucasica*, *Campanula tridentata*; **most common mosses**: *Rhytidium rugosum*, *Polytrichum commune*, *Hypnum cupressiforme*, *Dicranum spadiceum*, *Pleurozium schreberi*, *Entodon concinnus*;

– mats (snowbed communities) with *Taraxacum stevenii*, *Sibbaldia parviflora*, *Pedicularis nordmanniana*, *Nardus stricta*, *Corydalis conorhiza*; **most common mosses**: *Sanionia uncinata*, *Brachythecium salebrosusum*, *Polytrichastrum sexangulare*, *Syntrichia norvegica*, *Heterocladium dimorphum*, *Oncophorus virens*;

– sedge-*Sphagnum* bogs and boggy meadows with *Carex transcaucasica*, *C. rostrata*, *Menyanthes trifoliata*, *Eriophorum vaginatum*, *Parnassia palustris*; **most common mosses**: *Calliergonella lindbergii*, *Warnstorfia exannulata*, *Pseudocalliergon trifarium*, *Scorpidium cossonii*, *Drepanocladus aduncus*, *Aulacomnium palustre*, *Polytrichum longisetum*; **rare species**: *Amblyodon dealbatus*, *Fissidens adianthoides*, *Meesia triquetra*, *Tayloria lingulata*, *Dichodontium palustre*.

#### ANNOTATED LIST OF SPECIES

The list is based on material obtained during field work by T.V. Akatova (1995–2014) and M.S. Ignatov (1999), and on data of CSR. Names of taxa are arranged alphabetically, nomenclature follows Ignatov, Afonina, Ignatova et al. (2006) with some updates from recent literature. Annotations include a brief characteristic of habitats. Specimens are deposited in CSR and MHA.

*Abietinella abietina* – 1800–2500 m – on the ground of subalpine meadows (under herbal cover, often together with other bryophyte species), in herb-lichen communities of alpine short-grass lands, on soil in *Rhododendron caucasicum* stands, in stands of *Juniperus depressa*, on limestone rocks in the zone of the upper forest line; sporadically in the whole study area.  
*Amblyodon dealbatus* – 2000–2200 m – northern foot of Oshten Mountain, on side of streams and on hillocks in mire; Abadzesh Ridge, subalpine belt, on soil in boggy meadow; rare.

*Amblystegium serpens* – upper reaches of Armyanka River, 1803 m, south-eastern steep slope of mount Oshten, on the base of pine-tree trunk, on rotten logs.

*Andreaea alpestris* – on stone in beech forest near Cherkesskiy Pass (1800 m); only one collection (CSR, MHA).

*Anomodon rugelii* – upper reaches of Belaya River, 1600 m, on stone in the zone of the upper forest line; rare.

*A. viticulosus* – Kamennoe More Ridge, 1900 m, zone of the upper forest line, on limestone rocks; in high-mountain belts rare.

*Aulacomnium palustre* – 1950–2050 m, northern foot of Oshten Mountain, springy sedge-moss bog, on hillocks; sporadically.

*Barbula crocea* – Upper Armyanka River, 1870 m, on soil and rocks in the river-bed; in one place.

*Bartramia ithyphylla* – 1900–2300 m – on limestone rocks; on the side of hillocks on banks of small streams in boggy meadow; on bare soil along edge of trail in subalpine belt; on soil in *Juniperus depressa* stand, northern slope of mount Pshek-

- ho-Su, 2100 m, in cirque; Abadzesh-Murzikao Massif, 2300 m, on the ground of the hole in alpine belt; sporadic in the high-mountain zone.
- Blindia acuta* – on the bank of stream in beech forest near Cherkesskiy Pass, 1800 m; in one place.
- Brachytheciastrum velutinum* – 1600-1900(2500) m – growing on the ground, rotten wood, bases of tree trunks in coniferous, mixed coniferous – broad-leaved forests, birch and beech woodlands; above timberline – on soil in *Juniperus depressa* stand (2120 m), on stone in subalpine belt, on soil between rocks in rock field (2500 m); Oshten Mountain, alpine belt, on bare soil in lichen heath; widespread in the forest belt, rare in alpine and subalpine belts.
- Brachythecium cirrosum* – 1600-1900 m – Kamennoe More Ridge, on humus in chinks on limestone rocks; source of the Belaya River, on limestone outcrops.
- B. erythrorrhizon* – 1950-2500 m – on soil in alpine meadows, herb-lichen communities, *Geranium gymnocaulon*-associations, in *Rhododendron caucasicum* and *Juniperus depressa* stands; sporadically.
- B. glareosum* – Kamennoe More Ridge, on soil in moist crevices on wet cliff.
- B. mildeanum* – mount Guzeripl, ~1780 m, on rock near the stream, coll. L.N.Vasilyeva, VII.1935 (CSR); northern slope of mount Oshten, 2000-2100 m, on soil in waterlogged site, on banks of small streams and pools in boggy meadow; on peat banks in herb-sedge-*Sphagnum* bog.
- B. rivulare* – 1600-2500 m – on rocks in the river- and brook-bed, on moist soil, cliffs and rocks along the banks of streams and pools, on moist rocks near the snow patch; on soil in *Rhododendron caucasicum* stands; sometimes on soil along edge of trail; widespread in the whole area.
- B. rutabulum* – 1600-1850 m – on soil, rotten logs, rocks covered by soil, sometimes on trunk bases of deciduous trees in deciduous and mixed deciduous-*Abies* forests, in open birch and beech woodlands; common.
- B. salebrosum* – 1600-2200 m – on rotten logs, on trunk bases of deciduous trees, on soil in glades, *Rhododendron caucasicum* and *Juniperus depressa* stands, *Geranium gymnocaulon*-associations, snowbed communities; sporadically.
- Bryoerythrophyllum recurvirostrum* – source of the Kurdzhips River, 1844 m, on big rock; Kamennoe More Ridge, 1900 m, on limestone rocks in karst depression; Oshten Mountain, on rocky ground in stands with late snow cover, 2100 m; Abadzesh-Murzikao Massif, 2300 m, on the ground of the hole in alpine belt.
- Bryum amblyodon* – Kamennoe More Ridge, zone of the upper forest line, 1900 m, on limestone rocks, det. V.I. Zolotov (CSR, MHA).
- B. argenteum* – 1900-2500 m – in subalpine pasture on ground baring; on rocky soil of the open patches in *Nardus stricta* communities, alpine and subalpine meadows, lichen heaths; sometimes on cushion plants.
- B. bimum* – Oshten Mountain, 1600 m, on soil and rocks in rock fields; coll. Senicheva 14.VII.1951, det. V.I. Zolotov (CSR, MHA); only one collection.
- B. caespiticium* – 2000-2300 m – on bare soil in stands with late snow cover (alpine belt), in *Festuca woronowii* communities (subalpine belt); det. V.I. Zolotov.
- B. capillare* – 1700-2500 m – between boulders, on rocks covered by humus in rock field near timberline; on rocky soil in stand with late snow cover (alpine and subalpine belts); on limestone outcrops covered by humus; on bare soil in open *Rhododendron caucasicum* communities; sporadically.
- B. elegans* – 1600-2200 m – on rocks, boulders in rock-fields; on soil in snowbed communities in alpine belt.
- B. moravicum* – 1600-1800 m – occasionally on rocks, cliffs and soil in the forest zone; on trunk bases of deciduous trees in the zone of the upper forest line; on rotten wood (pine-tree) in *Pinus* forest; scattered.
- B. pseudotriquetrum* – 1700-2100 m – Instruktorskaya Shchel area (upper Armyanka River), on rocks and moist soil in the river-bed; northern foot of Oshten Mountain, sedge-moss bog, on waterlogged site; boggy meadows; springy mire.
- B. schleicheri* – 1800-2200 m – on rocks and moist soil in the river-bed, along stream banks, around pools and lakes, in springy mire, along the border of late snow patches; subalpine belt; frequently.
- B. turbinatum* – on boulder in subalpine meadow, source of the Armyanka River (Instruktorskaya Shchel area), 1850 m; det. V.I. Zolotov (CSR, MHA).
- B. weigelii* – eastern slope of Oshten Mountain, right tributary of the Armyanka River, 1850 m, in boggy meadow along the shore; only one collection (CSR, MHA).
- Buxbaumia viridis* – on rotten *Abies* logs and stubs in *Abies* and mixed deciduous-*Abies* forests: near Kamennoe More Ridge, 20.VII.1935, coll. L.N.Vasilyeva (CSR); upper of Belaya River near Fisht camping (1500 m), coll. M.S. Ignatov (MHA); upper Armyanka River Basin (1680 m) (CSR); valley of river Kurdzhips near Asishskiy Pass (1623 m) (CSR).
- Calliergonella lindbergii* – 1550-2100 m – on peat, waterlogged soil and in water in boggy meadows, herb-sedge-*Sphagnum* bogs and springy mire; on sandy river bank cliff; on moist soil along edge of trail; frequently in subalpine belt.
- Calliergon cordifolium* – Abadzesh-Murzikao mountain area, 2120, in stream-bed.
- C. giganteum* – in stagnant water of the swampy pool, Lagonaki Plateau, 1920 m; Armyanskiy Ridge, glade in open crook-stem birch forest, 1550 m, sedge-moss bog.
- Campyliadelphus chrysophyllus* – 2100-2300 m – Oshten Mountain, in snowbed communities in alpine belt; on bare soil in *Festuca woronowii* communities in subalpine belt.
- Campyllum protensum* – 1850-2600 m – on moist soil in waterlogged patches, springy mires, *Rhododendron caucasicum* stands, hole-like karst depressions, in snowbed communities, on morain near the glacier; sporadically in the zone of the upper forest line, subalpine and alpine belts.
- C. stellatum* – 1900-2300 m – in moist crevices on wet limestone cliffs, on rock ledges and niches, on rocks near the mouth of the cave, on separate boulders in snowbed communities; sporadically.
- Campylophyllum halleri* – 1600-2450 m – on limestone outcrops in karst depression, on boulder faces in rock fields; Oshten Mountain, Kamennoe More Ridge, Lagonaki Plateau; sporadically.
- Campylopus schimperi* – Armyanskiy Ridge, 2020 m, on soil in alpine meadows and lichen heaths.
- Ceratodon purpureus* – southern slope of Oshten Mountain, 1600 m, on stones; Lagonaki Plateau, 1900 m, on ground baring in subalpine pasture.
- Climacium dendroides* – mount Guzeripl, 1720 m, sedge-*Sphagnum* bog; Kamennoe More Ridge, 1900 m, on rocks in karst depression, on moist soil in deep crevices; northern foot of Oshten Mountain, 2170 m, on peat bank in ridge-pool complex, on moist soil in springy mire, boggy meadows; occasionally on soil in alpine meadows and lichen heaths.

- Cratoneuron filicinum* – 1500-2800 m – on rocks around pools and lakes, on rocks by a cascade, in karst depression on humus, on wet rocks and cliffs, on hillocks in brooks and pools, on moist soil in springy mire, boggy meadows; common in the whole area.
- Ctenidium molluscum* – 1600-2700 m – on moist limestone outcrops and rocks, in hole-like karst depression, among boulders in rock fields in cirques; common in the whole area.
- Dichodontium palustre* – northern foot of Oshten Mountain, 2100 m, on the side of hillocks in mire; rare.
- D. pellucidum* – 1850-2300 m – on the side of hillocks on banks of small streams and pools, in moist crevices on wet cliffs, in rock fissure in the river-bed (periodically submerged zone), on rocks along the shore; on moist soil in springy mire, in stand with late snow cover.
- Dicranella subulata* – northern slope of Oshten Mountain, 2100 m, in snowbed communities.
- Dicranodontium denudatum* – 1500-1700 m – on rotten logs and wood remnants in upper mountain forest; sporadically.
- Dicranum bonjeanii* – 1950-2500 m – on hillocks in sedge-moss bogs; on peat banks in ridge-pool bog complex; on soil in boggy meadows, in *Rhododendron caucasicum* stands, in snowbed communities, alpine meadows and lichen heaths.
- D. flexicaule* – Abadzesh-Murzikao mountain area, 1780 m, on soil in subalpine meadows.
- D. fuscescens* – slope of mount Oshten, about 1600 m, upper mountain *Abies* forest, on rotten *Abies* trunk; coll. L.N. Vasilyeva, 19.VII.1935 (CSR).
- D. montanum* – eastern slope of mount Oshten, 1680 m, on *Pinus* trunks.
- D. scoparium* – 1500-2550 m – on the ground in alpine low grasslands and lichen heaths, in *Rhododendron caucasicum* and *Juniperus depressa* stands in the subalpine belt and the zone of the upper forest line, in the forest belt on the ground, rotten wood, bases of tree trunks; widespread in the whole area.
- D. spadiceum* – 2000-2500 m – on the ground in alpine and subalpine meadows, lichen heath, snowbed communities, stands of *Juniperus depressa* and *Rhododendron caucasicum*; northern slope of Oshten Mountain, on humus among boulders in rock fields in cirque.
- D. tauricum* – source of the Armyanka River, 1600 m, upper mountain *Fagus-Abies* forest, on rotten woods.
- Didymodon fallax* – Kamennoye More Ridge, 1900 m, on limestone outcrops in open crook-stem birch forest.
- D. rigidulus* – 1600-1750 m – in crevices of limestone rocks in the zone of the upper forest line; rare.
- D. spadiceus* – Kamennoye More Ridge, 1900 m, on limestone outcrops in open crook-stem birch forest.
- Diphyscium foliosum* – source of the Belaya River, 1600 m, crook-stem beech forest, on bare soil on slope to the trail; Armyanskiy Ridge, 1950-2020 m, on landslide in upper mountain forest, on rocky soil in open alpine meadow.
- Distichium capillaceum* – 1900-2500 m – on limestone outcrops at the upper part forest belt, in alpine and subalpine belts; on the ground in alpine meadows, lichen heaths, snowbed communities; common in the whole area.
- D. inclinatum* – 2400-2500 m – Oshten Mountain, on limestone outcrops, on rocky soil in stand with late snow cover in alpine belt.
- Ditrichum flexicaule* – 1800-2500 m – on rocky soil in alpine meadows, lichen heaths; on limestone outcrops, between and under rocks in rock fields, on rocks in hole-like karst depression; widespread in the whole area.
- Drepanium recurvatum* – Kamennoye More Ridge, 1900 m, on rocks; coll. L.N. Vasilyeva, 17.VII.1935 (CSR).
- Drepanocladus aduncus* – bottom of the mount Guzeripl, 1700 m, in shallow small pools in subalpine belt, in herb-bogs in upper mountain *Abies* forest; northern slope of Oshten Mountain, 2000 m, sedge-moss bogs, in pools with *Carex rostrata*, in waterlogged patches (mixed with *Warnstorfia exannulata* and *Meesia triquetra*).
- D. polygamus* – northern slope of Oshten Mountain, 2000 m, on peat banks and hillocks in ridge-pool complex, in springy mire, boggy meadows.
- D. sendtneri* – Oshten Mountain, 1920 m, in brook.
- Encalypta alpina* – Kamennoye More Ridge, 1900 m, on limestone rocks in hole-like karst depression (subalpine belt).
- E. ciliata* – Oshten Mountain, 1900 m, on soil in *Pinus* forest near timberline; northern slope of mount Guzeripl, 1800 m, on soil in subalpine belt.
- E. rhaptocharpa* – Kamennoye More Ridge, 1900 m, on limestone outcrops in hole-like karst depression.
- E. spatulata* – Kamennoe More Ridge, 1900 m, subalpine belt, on limestone rocks covered by soil.
- E. streptocarpa* – sporadic in subalpine and alpine belts (1800-2600 m) on rocky soil, limestone rocks, big boulders; on moist limestone outcrops near mouth of a cave (mount Fisht, 1650 m); on the base of pine-tree trunk, on rotten pine-logs, 1800 m.
- E. vulgaris* – 1700-2600 m – Kamennoe More Ridge, subalpine belt, on limestone rocks covered by soil; southern slope of mount Fisht, on moist limestone outcrops near mouth of a cave; western slope of mount Fisht, on limestone cliffs.
- Entodon concinnus* – 1800-2500 m – on rocks, stones, on ground in alpine grasslands, lichen heaths, *Rhododendron caucasicum* stands (with *Pleurozium schreberi*, *Hylocomium splendens*, *Rhytidiadelphus triquetrus* and others); sporadic.
- Eurhynchiastrum pulchellum* – Kamennoe More Ridge, 1900 m, subalpine belt, on limestone rocks near mouth of a cave; Oshten Mountain, 2100 m, subalpine belt, on soil in *Rhododendron caucasicum* stand.
- Eurhynchium angustirete* – 1500-1800 m – in the forest belt on the ground, rotten wood, roots of the trees, common; Kamennoe More Ridge, 2000 m, in stand of *Juniperus depressa*.
- Fissidens adianthoides* – northern foot of Oshten Mountain, 2000 m, on hillocks and wet rocks in mire and boggy meadow.
- F. bryoides* – Oshten Mountain, 2373 m, alpine belt, on soil in snowbed communities; rare.
- F. dubius* – 1500-2400 m – on limestone rocks and cliffs in the alpine, subalpine and forest belts; on soil in subalpine *Festuca woronowii* communities.
- F. osmundoides* – Kamennoe More Ridge, 1900 m, in moist crevices on limestone outcrops in open birch woodlands, in deep karst depression; northern foot of Oshten Mountain, 2000-2100 m, on hillocks and peat banks in mire, on wet soil in boggy meadow; on soil in stand with late snow cover.
- F. taxifolius* – 1500-1800 m – on the ground in mixed deciduous-coniferous forests, in open crook-stem beech woodlands.
- Grimmia anodon* – Oshten Mountain, 2800 m, on rocks near the top.
- G. elatior* – southern slope of Oshten Mountain, 1750 m, on big boulders in rock fields in open crook-stem beech woodlands.
- G. elongata* – source of the Tsitse River, place between Mountain Fisht and Mountain Oshten (coll. Shaposhnikov, det. Mikutovich) (Shaposhnikov, 1909).

- G. teretinervis* – Kamennoe More Ridge, 1900 m, on limestone rocks.
- Gymnostomum aeruginosum* – 1950-2080 m – on limestone rocks, on bare soil in open *Rhododendron caucasicum* stands.
- Herzogiella seligeri* – 1500-1700 m – in the mountain forests on rotten logs, common; northern slope of Oshten Mountain, 2100 m, on soil in *Rhododendron caucasicum* stand.
- Heterocladium dimorphum* – northern slope of Oshten Mountain, 2420 m, on rocky soil in stand with late snow cover.
- Homalothecium philippeanum* – 1550-2200 m – on limestone rocks, cliffs and ground, frequent in the whole area.
- H. sericeum* – widespread in the whole area (to 2800 m): on limestone outcrops, on moist rocks near late snow patches, on boulders in rock fields; rare on rocky soil in snowbed communities.
- Hygrohypnella ochracea* – 1500-1700 m – in the stream-bed on rocks.
- Hygrohypnum luridum* – 1500-1700 m – in the stream-bed on rocks.
- Hylocomium pyrenaicum* – 2000-2300 m – Oshten Mountain, on rocky soil in stand with late snow cover; on bare soil in *Rhododendron caucasicum* stands; the upper reaches of the Armyanka River, on spots of bare peat on slope of small stream; eastern slope of the mount Pshenko-Su, on moraine in cirque.
- H. umbratum* – Oshten Mountain, on trunk of *Abies* in coniferous forest (about 1400 m); coll. L.N. Vasilyeva, 20.VII.1935 (CSR).
- Hylocomium splendens* – 1700-2500 m – on soil in subalpine and alpine meadows and lichen heaths, in *Rhododendron caucasicum* and *Juniperus depressa* stands (with *Pleurozium schreberi*, *Rhytidiadelphus triquetrus* and others).
- Hymenostylium recurvirostrum* – Kamennoe More Ridge, 1900-1920 m, on moist limestone rocks, in hole-like karst depression, on moist limestone outcrops near mouth of a cave.
- Hypnum cupressiforme* – widespread in the whole area, on bases and trunks of deciduous trees, on rotten trunks, logs and stumps, on soil, stones in forest belt; common on soil in alpine and subalpine meadows and lichen heaths, in *Rhododendron caucasicum* and *Juniperus depressa* stands.
- Isopterygiopsis pulchella* – 1900 (2400) m – Kamennoe More Ridge, subalpine belt, on rocks; mount Nagoy-Chuk, on rocky soil in alpine belt.
- Isothecium alopecuroides* – 1500-1700 m – on tree trunk bases, on rotten trunks and logs, stones in forests, common in the forest belt.
- Lescuraea incurvata* – 1600-2400 m – on limestone outcrops, between and under rocks in rock fields, in hole-like karst depression; on rocky soil in lichen heaths, *Rhododendron caucasicum* stands, in snowbed communities; only one collection on *Fagus* trunk base.
- L. mutabilis* – 1550-2100 m – *Fagus-Abies* forest, on *Fagus* trunk base, on rotten logs; on bases of *Betula* and *Fagus* in the zone of the upper forest line; on soil in *Rhododendron caucasicum* stands.
- L. plicata* – 1850-2500 m – on soil between boulders in rock field; on ground in *Rhododendron caucasicum* stands, snowbed communities; in moist depression between calcareous cliffs; scattered.
- L. radicata* – 1900-2400 m – on limestone outcrops; on rocky soil in snowbed communities.
- L. saviana* – 1850-1900 m – on bases of *Betula* and *Fagus* in the zone of the upper forest line; on stone in *Fagus-Acer* upper mountain forest; rare.
- L. saxicola* – subalpine and alpine belts (1600-2500 m): on limestone outcrops, on rocky soil in snowbed communities, on moraine near glacier.
- Leucobryum glaucum* – 1550-2300 m – valley of the Belaya River, on rocks and stones in *Fagus-Abies* forest; Armyanskiy Ridge, on rocky soil and stones in alpine lichen heaths.
- L. juniperoides* – upper of the Belaya River, on rotten wood, coll. M.S. Ignatov (MHA).
- Leucodon immersus* – 1550-1600 m – in the forest belt on trunks and trunk bases of deciduous trees; sporogonia rare.
- L. sciuroides* – on *Acer trautvetteri* trunk in forest near timberline, 1720 m.
- Meesia triquetra* – northern foot of Oshten Mountain, 2050 m, on waterlogged site in mire (communities with *Menyanthes trifoliata*); rare.
- M. uliginosa* – 1900-2500 m – northern foot of Oshten Mountain, on hillocks in sedge-*Sphagnum* bog and sedge-moss bog, on moist soil in boggy meadow; northern slope of Oshten Mountain, on humus among boulders in rock fields; Kamennoye More Ridge, on moist rocks; sporadic in subalpine belt.
- Mielichhoferia mielichhoferiana* – upper of the Belaya River near the Fisht camping (1500 m), on limestone rocks, coll. M.S. Ignatov (MHA).
- Mnium hornum* – Kamennoye More Ridge, about 1900 m, in the shade of cliffs, 17.VII.1935, coll. L.N. Vasilyeva (CSR).
- M. lycopodioides* – 1600-1700 m – on trunk bases of *Salix caprea*, on trunks of *Acer trautvetteri* in forest near timberline.
- M. marginatum* – 2300-2500 m – on soil in alpine meadows and lichen heaths; on limestone outcrops.
- M. spinosum* – 1500-1650 m, on soil and stones in upper mountain forest.
- M. stellare* – north-eastern slope of Oshten Mountain, 2050 m, stand with late snow cover; rare.
- M. thomsonii* – 1900-2300 m – on humus in crevices on limestone cliffs; on soil in stand with late snow cover, in *Rhododendron caucasicum* and *Juniperus depressa* stands; subalpine belt, frequently.
- Myurella julacea* – 2200-2600 m, scattered on soil in alpine and subalpine meadows and lichen heaths, on bare rocky soil, rocks and stones in alpine belt; source of the Kurdzhips River, 1844 m, on big rock in open crook-stem birch forest; mixed with other bryophytes.
- Neckera besseri* – Kamennoye More Ridge, subalpine belt, 1900 m, in crevices of rocks.
- N. complanata* – Kamennoye More Ridge, subalpine belt, 1900 m, limestone rocks, on humus.
- N. crispa* – Kamennoye More Ridge, subalpine belt, 1900 m, limestone rocks, on humus.
- Niphotrichum canescens* – on outcrops, stones, rocky soil in forest belt; on rocky soil in open *Rhododendron caucasicum*, *Festuca woronowii* and snowbed communities, in alpine meadows; on stone in subalpine belt; on bare soil on slope to the trail; sporadically in the whole area.
- Oncophorus virens* – 1600-2200 m, on moist ground along the banks of streams, around pools and lakes, in stand with late snow cover, mires, boggy meadows; on moist humus in cliffs crevices and hole-like karst depression; common at the upper part of forest belt, in subalpine belt.
- Orthothecium intricatum* – Kamennoye More Ridge, 1900-1950 m, on humus in cliffs crevices near the late snow patch in

- hole-like karst depression; southern slope of mount Oshten, on boulders in rock-fields, 1600 m; source of the Kurdzhips River, 1844 m, on big rock (on lichen).
- O. rufescens* – Kamennoye More Ridge, subalpine belt, 1900 m, on limestone rocks in karst depression; rare.
- Orthotrichum alpestre* – upper of the Armyanka River, Instruktorskaya Shchel area, 1855 m, on base of birch-tree trunk near timberline.
- O. anomalum* – 1700-2000 m – mount Guzeripl, on boulders in rock-fields; upper of the Armyanka River, on rocks, limestone outcrops; mount Oshten, south facing slope, on boulder in *Festuca woronowii* communities; hollow between mount Oshten and mount Abadzesh, on stone in subalpine meadow.
- O. cupulatum* – southern slope of the mount Fisht near Belorechenskiy Pass, on big rocks and rock outcrops (1700 m); Kamennoye More Ridge, on rock faces, in crevice of rock in open crook-stem birch forest (1900 m); mount Oshten, on rocks near the peak (2800 m).
- O. pallens* – 1500-1700 m – subalpine forest belt, on trunks (rare trunk bases) of *Fagus* and *Acer trautvetteri*.
- O. speciosum* – upper of the Armyanka River, 1803 m, southeastern and eastern steep slopes of mount Oshten, on the branches of the pine-tree; 1850 m, on base of pine-tree trunks.
- O. stramineum* – on trunks of deciduous trees at the upper forest border, western slope of mount Fisht, 1500 m.
- O. striatum* – 1500-1800 m – on trunks of *Salix caprea*, *Fagus*, *Acer*, *Pinus* in upper mountain forest belt, open crook-stem birch forests.
- Oxyrrhynchium hians* – 1500-1700 m – on spots of bare soil in mixed deciduous-coniferous upper mountain forest.
- Palustriella commutata* – 1700-2800 m – on ground and rocks in river-bed, moist crevices and hole-like karst depression, in boggy meadows, sedge-*Sphagnum* bogs, springy mire; common.
- P. decipiens* – 1800-2300 m – on stones along the banks of streams, around pools and in river-bed; in boggy meadow, springy mire (Kamennoye More Ridge, mount Oshten and Guzeripl).
- Paraleucobryum longifolium* – 1500-1650 m – on bases and trunks of *Betula* trees in open crook-stem birch forest.
- P. sauteri* – mount Fisht, hole-like karst depression near the top, 2800 m.
- Philonotis calcarea* – upper of the Armyanka River, among boulders in rock fields (about 1600 m), 14.VII.1951, coll. Senicheva, det. Akatova (CSR).
- P. fontana* – 1950-2300 m – frequently on moist soil in swampy patches, boggy meadows, springy mire, on hillocks on banks of small streams and pools.
- P. tomentella* – 1700-2300 m – upper of the Belaya River, beech forest near Cherkesskiy Pass, on waterlogged patches, coll. M.S. Ignatov (MHA); northern slope of the Oshten Mountain, in snowbed communities.
- Plagiobryum demissum* – mount Nagoy-Chuk, 2570 m, on rocky soil in alpine belt; Kamennoye More Ridge, 1920 m, on moist soil around late snow patch in hole-like karst depression.
- Plagiomnium ellipticum* – northern slope of the mount Abadzesh, 2100 m, subalpine meadow, on soil under herbal cover; northern foot of the Oshten Mountain, 2050 m, on hillocks and rocks in springy sedge-moss mire, boggy meadows, on peat bank among *Sphagnum* on banks of small streams in boggy meadow.
- P. medium* – on soil in mixed *Fagus-Abies* forest, 1650 m.
- Plagiopus oederianus* – Kamennoye More Ridge, 1900 m, on limestone outcrops in open crook-stem birch forest.
- Plagiothecium denticulatum* – 1500-1650 m – on bases of *Betula* tree trunks in open crook-stem birch forest.
- P. laetum* – upper of the Armyanka River, 1620 m, on rotten *Abies*-log; northern slope of Oshten Mountain, 2100 m, *Rhododendron caucasicum* communities, on soil and lower branches of *Rhododendron*.
- P. nemorale* – upper of the Armyanka River, 1720 m, mixed *Fagus-Abies* forest, on the base of *Fagus* tree.
- Plasteurhynchium striatulum* – western slope of the mount Fisht, source of the Pshekha River, 1520 m, on dry rocks; only one collection (CSR, MHA).
- Pleurozium schreberi* – common on soil in alpine and subalpine meadows and lichen heaths, *Rhododendron caucasicum* and *Juniperus depressa* stands; rare on hillocks and peat banks in ridge-pool complex, in boggy meadows (northern slope of Oshten Mountain); Kamennoye More Ridge, on rock.
- Pogonatum aloides* – 1500 m, on bare soil on slope to the trail.
- P. urnigerum* – Kamennoye More Ridge, 1900 m, subalpine meadows, on soil under *Juniperus depressa*.
- Pohlia cruda* – on limestone outcrops in open crook-stem birch forest, on side of hole-like karst depression near the late snow patch; between boulders, on rocks covered by humus in rock-fields; on bare soil in open *Rhododendron caucasicum* and *Juniperus depressa* stands, in snowbed communities, in *Festuca woronowii* communities.
- P. nutans* – upper of the Armyanka River, 1803 m, southeastern steep slope of mount Oshten, on rotten wood.
- P. wahlenbergii* – 1900-2300 m – on rocky soil in *Festuca woronowii* communities, in stand with late snow cover; in hole-like karst depression.
- Polytrichastrum alpinum* – northern slope of the Oshten Mountain, 2080 m, bare soil in open *Rhododendron caucasicum* communities; the upper of the Armyanka River, on slope of small stream, 2115 m.
- P. sexangulare* – 2000-2600 m – in stand with late snow cover and on soil around late snow patches in subalpine and alpine belt; in alpine sedge meadows.
- Polytrichum commune* – 1950-2500 m – on soil in *Festuca woronowii* communities, alpine meadows, lichen heaths, boggy meadows, on hillocks in grass-*Sphagnum* bogs.
- P. formosum* – 1500-2100 m – upper mountain beech-forest, on soil and roots of trees; in *Rhododendron caucasicum* stands above timberline.
- P. juniperinum* – 1900-2600 m – on bare rocky soil in alpine and subalpine meadows, lichen heaths, snowbed communities, *Rhododendron caucasicum* stands; frequently.
- P. longisetum* – northern foot of the Oshten Mountain, 2050 m, sedge-*Sphagnum* bog, on hillocks and peat banks in ridge-pool complex, in boggy meadows.
- P. piliferum* – 1900-2600 m – on rocks, on bare rocky soil in alpine and subalpine meadows, lichen heaths, snowbed communities; frequently.
- Pseudocalliergon trifarium* – northern foot of the Oshten Mountain, 2050 m, sedge-*Sphagnum* bog, in pool with *Menyanthes trifoliata*, in waterlogged patches.
- Pseudoleskeella catenulata* – on rocks, stones in rock-fields, rocky meadows, on rocky soil in snowbed communities; the zone of the upper forest line and high mountain area.
- P. nervosa* – 1500-1700 m – common in deciduous and mixed deciduous-*Abies* forests, in open birch and beech woodlands on rocks, trunk bases and trunks of deciduous trees (often

- with *Hypnum cupressiforme*, *Isothecium alopecuroides*, and *Pterigynandrum filiforme*); mount Nagoy-Chuk, on rocky soil in lichen heaths (2600 m).
- Pseudotaxiphyllum elegans* – source of the Belaya River, about 1550 m, coll. M.S. Ignatov (MHA).
- Pterigynandrum filiforme* — widespread in the forest belt on trunk bases, trunks, roots and in crowns of trees; sometimes on rotten wood.
- Rhizomnium pseudopunctatum* – upper of the Armyanka River, on spots of bare peat on slope of small stream, 2115 m.
- R. punctatum* – subalpine belt, 2100 m, in the river-bed on moist rocks; on the ground of the hole in alpine belt, 2300 m.
- Rhodobryum roseum* – southern slope of the mount Abadzesh, 2200 m, subalpine meadow, on soil under herbal cover; northern slope of the mount Pshehko-Su, 1980 m, under *Rhododendron caucasicum* on moraine in cirque.
- Rhynchostegium confertum* – mount Fisht, on moist rocks in karst depression near the peak, 2800 m.
- R. murale* – source of the Belaya River, 1550 m, on loamy slope along the shore.
- Rhytidiadelphus triquetrus* – 1600-2300 m – on rotten logs, soil, rocks and stones covered by soil in forest belt; above timberline frequently on soil in *Rhododendron caucasicum* and *Juniperus depressa* stands, subalpine meadows (with *Hylocomium splendens* and *Pleurozium schreberi*); rare on rock outcrops.
- Rhytidium rugosum* – 1800-2600 m – common on soil in alpine and subalpine meadows and lichen heaths, in *Rhododendron caucasicum* stands; rare on rocks covered by soil in subalpine and alpine belts.
- Saelania glaucescens* – on humus in crevices of cliffs, mount Pshekho-Su, 2000 m; Fisht-Oshtensky Pass, 2200 m; coll. M.S. Ignatov (MHA).
- Sanionia uncinata* – widespread on the ground, on rotten wood in coniferous and mixed deciduous-coniferous forests, open birch and beech woodlands; on the ground in alpine and subalpine meadows and lichen heaths, on rocky soil and stones in snowbed communities, in *Rhododendron caucasicum* and *Juniperus depressa* stands; on limestone outcrops, on moist soil in crevices of cliffs.
- Schistidium crassipilum* – Kamennoye More Ridge, 1930 m, on limestone rocks in hole-like karst depression; mount Abadzesh, 2100 m, on rocks and stones in subalpine belt; Guseripsskiy Pass, 1800 m, on rocks around pool; upper of the Armyanka River, 1803 m, south-eastern steep slope of the mount Oshten, Pine-forest, on limestone outcrops.
- S. elegantulum* – Kamennoye More Ridge, 1920 m, on limestone outcrops, in karst depressions.
- Sciuro-hypnum curtum* – mount Pshekho-Su, 1980 m, northern slope, in *Rhododendron caucasicum* stands; in one place.
- S. populeum* – on bases of *Fagus* trunks in the zone of the upper forest line.
- S. reflexum* – 1500-2600 m – on rotten *Abies* logs in coniferous forests; on *Salix caprea* trunks and on bases of *Betula litwinowii* in open crook-stem birch forest; on soil in *Rhododendron caucasicum* stands, snowbed communities in alpine and subalpine belts.
- S. starkei* – on stone near the pool, mount Guzeripl, about 1600 m, VII.1935, coll. L.N. Vasilyeva (CSR); northern slope of mount Oshten, 2100 m, on soil in *Rhododendron caucasicum* stands.
- Scorpidium cossonii* – northern foot of Oshten Mountain, 2050 m, sedge-*Sphagnum* bog, in pool with *Menyanthes trifoliata*, on waterlogged patches, on peat banks and hillocks in ridge-pool complex, in boggy meadows.
- Seligeria trifaria* – Kamennoye More Ridge, 1930 m, on the walls of deep hole-like karst depression; coll. M.S. Ignatov (MHA).
- Serpoleskea subtilis* – 1520 m, on trunk bases of *Betula litwinowii* and *Salix caprea* at the upper forest border.
- Sphagnum angustifolium* – Guseripsskiy Pass, slope of the mount Oshten, herb-sedge-*Sphagnum* bog in upper mountain *Abies* forest; Armyanskiy Ridge, 1800 m, sedge-*Sphagnum* bog.
- S. balticum* – Armyanskiy Ridge, 1800 m, sedge-*Sphagnum* bog, in pools, 21.VII.1935, coll. L.N. Vasilyeva (CSR).
- S. inundatum* – northern foot of the mount Oshten, 2050 m, on hillocks and peat banks in ridge-pool complex, at a boggy stand amongst meadow associations.
- S. subsecundum* – mount Guzeripl, 2000 m, sedge-*Sphagnum* bog around pool; northern foot of the mount Oshten, sedge-*Sphagnum* bog.
- Stereodon procerrimus* – 1800-2000 m – on limestone rocks, in karst depressions in the zone of the upper forest line, in subalpine belt.
- S. revolutus* – mount Oshten, northern slope, 2300 m, scree in cirque, on limestone rock fragments; 2400 m, on soil in lichen heath; Abadzesh-Murzikao Massif, 2300 m, on the ground of the hole in alpine belt.
- S. vaucheri* – 1850-2200 m, sporadically in subalpine belt on dry limestone outcrops and stones.
- Straminergon stramineum* – mount Guzeripl, 2000 m, sedge-*Sphagnum* bog.
- Syntrichia montana* – eastern slope of the mount Oshten, 1900 m, on soil under pine; source of the Armyanka River, 1803 m, southern slope, on stones.
- S. norvegica* – on boulders in rock fields, in moist crevices on wet cliffs, on rocks and ground near late snow patches and in hole-like karst depression; on rocks in stream bed; on soil in *Rhododendron caucasicum* and *Juniperus depressa* stands, in *Festuca wonowii* communities; on the base of trunk of *Acer trautvetteri* in the zone of the upper forest line.
- S. ruralis* – source of the Armyanka River, 1803 m, south-eastern steep slope of the mount Oshten, on the base of pine-tree trunk.
- S. sinensis* – mount Oshten, on limestone rocks; coll. L.N. Vasilyeva, 3.VII.1935 (CSR).
- Taxiphyllum wissgrillii* – source of the Belaya River, 2100 m, on soil and rocks; rare.
- Tayloria lingulata* – northern foot of the Oshten Mountain, 2050 m, sedge-*Sphagnum* bog, on hillocks among *Meesia uliginosa*; only one collection (CSR).
- Tetraphis pellucida* – scattered in upper mountain *Abies*, *Fagus-Abies* and *Pinus* forests on rotten logs and stumps.
- Thamnobryum alopecurum* – 1500-1650 m, on moist shade rocks, stones, soil under crown canopy in mixed deciduous-coniferous upper mountain forest; mount Guzeripl, near timberline, 1700 m, on stone among *Tortella tortuosa*.
- Thuidium assimile* – Armyanskiy Ridge, 1870 m, on soil in subalpine meadow.
- T. recognitum* – near the pool, mount Guzeripl, about 1600 m, coll. L.N. Vasilyeva (CSR).
- Timmia austriaca* – 1900-2000 m – on limestone rocks in hole-like karst depression; rare.
- T. bavarica* – Kamennoye More Ridge, 1900 m, on moist limestone rocks in hole-like karst depression; mount Oshten, 2100

- m, on limestone rocks in stand with late snow cover; mount Fisht, hole-like karst depression near the top, 2800 m; rare.
- Tortella tortuosa* – widespread in the whole area: on limestone outcrops, cliffs, rocks in rock fields, moraines, hole-like karst depression; on rocky soil in alpine meadows and stands with late snow cover; on bare soil in *Rhododendron caucasicum* and *Juniperus depressa* stands, in *Festuca woronowii* communities; on rocks in forest belt.
- Tortula hoppeana* – 1900-2300 m – Kamennoye More Ridge, on limestone outcrops in hole-like karst depression; mount Oshten, on soil in stand with late snow cover; in *Festuca woronowii* communities.
- T. subulata* – 1500-2200 m – on ground barings, rocky soil, on bare soil on slope to the trail in *Fagus-Abies* forest, at the upper part forest belt; southern slope of the Oshten Mountain, on boulders in rock-field; on open soil by the trail in subalpine belt.
- Trichostomum crispulum* – 1700-1950 m – on side of hole-like karst depression, on limestone rocks near the mouth of the cave, in crevices of cliffs; sporadic in subalpine and alpine belts.
- Ulota crispa* – on trunks and branches of deciduous trees in mixed coniferous – broad-leaved forests up to timberline, common.
- Warnstorfia exannulata* – Oshten Mountain, 1700 m, eastern slope, in pool among the sedge meadow; northern slope, 2050 m, mire with dominance *Menyanthes trifoliata*, in pool.
- W. fluitans* – Armyanskiy Pass, 2000 m, subalpine belt, sedge-*Sphagnum* bog.
- Weissia brachycarpa* – southern slope of the Oshten Mountain, territory between Guseripsskiy Pass and Armyanskiy Pass, 1650 m, on rocks; in one place, coll. M.S. Ignatov (MHA).

#### DISCUSSION

The list of mosses of the Lagonaki Highland includes 211 species. Among them, 12 species are new for the Republic of Adygeya: *Plasturhynchium striatulum*, *Bryum weigeli*, *Grimmia anodon*, *Orthotrichum alpestre*, *Campylopus schimperi*, *Paraleucobryum sauteri*, *Drepanocladus polygamus*, *D. sendtneri*, *Mnium lycopodioides*, *Meesia triquetra*, *Timmia austriaca*, and *Lescurea saviana*; 8 species are known only from a single locality in Lagonaki Highland in the Russian part of the

Caucasus: *Andreaea alpestris*, *Calliergon giganteum*, *Grimmia teretinervis*, *Plagiobryum demissum*, *Pseudocalliergon trifarium*, *Sphagnum angustifolium*, *S. balticum*, and *Tayloria lingulata*; 12 species are rare in the Russian part of the Caucasus: *Amblyodon dealbatus*, *Barbula crocea*, *Lescurea saviana*, *Leucobryum glaucum*, *L. juniperoideum*, *Meesia triquetra*, *Mielichhoferia mielichhoferiana*, *Plasturhynchium striatulum*, *Paraleucobryum sauteri*, *Mnium hornum*, *Seligeria trifaria*, and *Sphagnum inundatum*.

Among mosses collected in the Lagonaki Highland, four species are red-listed in Europe (R), one species is protected in Russia (RF), and four species are red-listed in the Republic of Adygeya (RA): *Buxbaumia viridis* (R, RF, RA), *Barbula crocea* (RA), *Grimmia teretinervis* (R, RA), *Lescurea plicata* (PA), *Mielichhoferia mielichhoferiana* (R), and *Syntrichia sinensis* (R).

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