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## The Bryophyte Flora of Demirkapı Plateau Glacial Lakes (Çaykara, Trabzon) and Its Surroundings

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### Abstract

In this study, the moss flora of Demirkapı Plateau Glacial Lakes and its surroundings in the Çaykara region of Trabzon were investigated. Bryofloristic study was conducted at 24 different localities during various vegetation periods between 2024 and 2025, and a total of 1060 bryophyte specimens were collected. As a result of the identification of bryophyte specimens 291 bryophyte taxa (244 taxa mosses, 46 taxa liverworts, and 1 taxon hornworts) were identified from the study area. Among the results, *Lophozia silvicola*, *Andreaea alpestris*, *Andreaea mutabilis*, *Niphotrichum canescens* subsp. *latifolium* and *Sphagnum russowii* were recorded for the second time in the bryophyte flora of Türkiye. Furthermore, 43 bryophyte taxa are new for Trabzon Province and 119 bryophyte taxa are new for Çaykara District. Distribution and habitat information is provided for each identified bryophyte taxon.

**Keywords:** Bryophyte, Çaykara, Glacial lakes, Trabzon, Türkiye

### Demirkapı Yaylası (Çaykara, Trabzon) Buzul Gölleri ve Çevresi Briyofit Florası

#### Öz

Bu çalışmada, Trabzon'un Çaykara bölgesindeki Demirkapı Yaylası Buzul Gölleri ve çevresi araştırılmıştır. Çalışma, 2024-2025 yılları arasında 24 farklı istasyondan vejetasyon farklı periyotlarında arazi çalışması yapılmış ve toplam 1060 briyofit örneği toplanmıştır. Yapılan teşhisler sonucunda çalışma sahasından 291 (244 takson yapraklı karayosunu, 46 takson ciğerotları ve 1 takson boynuzsu ot) briyofit taksonu tespit edilmiştir. Elde edilen sonuçlar arasında *Lophozia silvicola*, *Andreaea alpestris*, *Andreaea mutabilis*, *Niphotrichum canescens* subsp. *latifolium* ve *Sphagnum russowii* Türkiye briyofit florası için ikinci kez kaydedilmiştir. Ayrıca, 43 briyofit taksonu Trabzon ili için ve 119 briyofit takson Çaykara ilçesi için yenidir. Teşhis edilen her bir briyofit taksonu için dağılım ve habitat bilgisi verilmiştir.

**Anahtar kelimeler:** Briyofit, Çaykara, Buzul Göller, Trabzon, Türkiye

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## 1. Introduction

Demirkapı Plateau, determined as the research area, is located on the southwestern slopes of the Haldizen Mountains within the borders of the Çaykara district of Trabzon (Figure 1). The Demirkapı Plateau is located approximately 15 km south of the Uzungöl Nature Park. These mountains constitute the second highest topographic structure

after the Kaçkar Mountains, which represent the characteristic high-altitude mountain range of the Eastern Black Sea Region. Haldizen mountains are surrounded by the Uzungöl Basin to the north, the high plateaus of Bayburt to the south, the Çaykara Plain and İkizdere Valley to the west, and the mountainous areas of Gümüşhane to the east (URL-1).

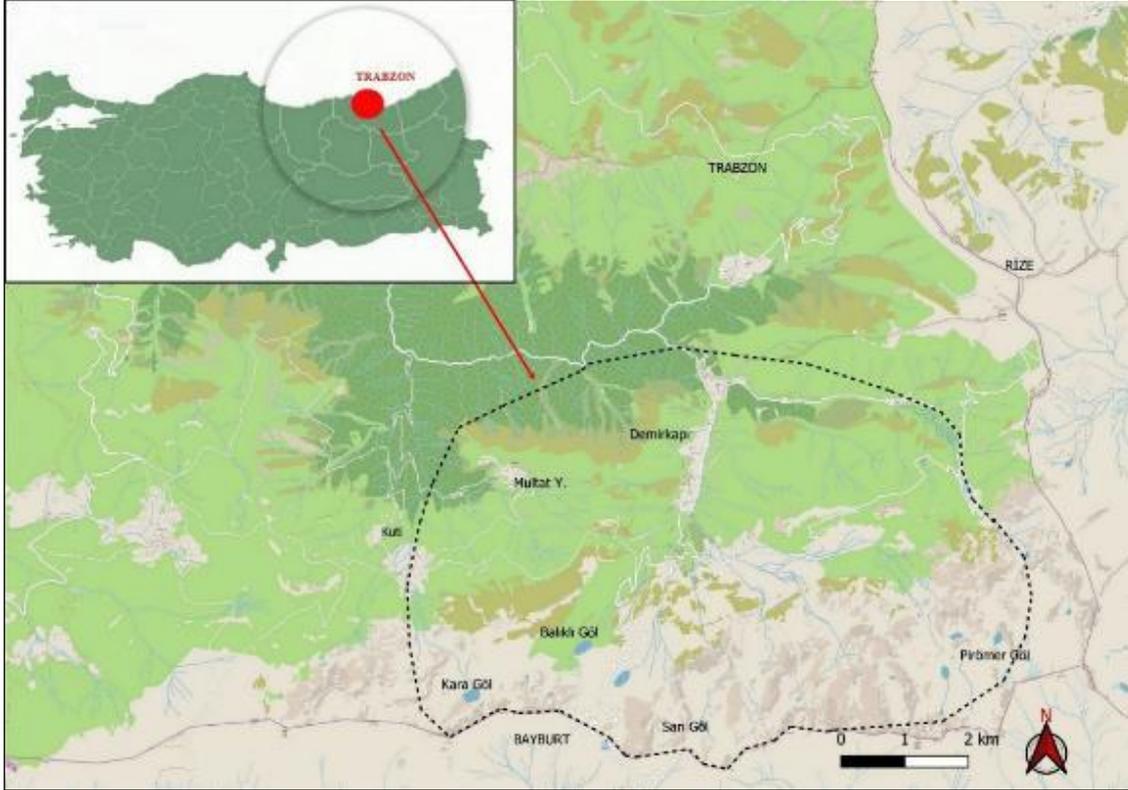


Figure 1. The study area.

In the Demirkapı Plateau, broadleaf and mixed forests dominate, in harmony with the humid climate of the Black Sea. *Fagus orientalis* L. is found around the Haldizen Stream on the Demirkapı Plateau, whereas beech trees form mixed forests further up. Due to the effect of altitude, *Picea orientalis* (L.) Link. began to appear densely. After the upper limit of the *P. orientalis* forests, *Betula pubescens* Ehrh. trees begin in the forest upper zone, which represents the transition from the spruce forests to the alpine (treeless) zone. Around 1800-2000 meters, the tree line forms and the subalpine zone begins; dwarf shrubs and herbaceous plants predominate in this zone. The alpine zone dominates at 2000 m and above. Above the forest line, dense shrubs of *Rhododendron caucasicum* Pall. are common, along with meadows. Steep cliffs and high-altitude lakes are found at the summits. This zone is dominated by short-growing herbaceous plants that are adapted to

harsh climatic conditions. Alpine meadows and forest-top vegetation generally predominate around the plateau (İnkaya, 2019).

The Haldizen Mountains contain numerous glacial lakes formed by the melting of glaciers at higher elevations. In addition to, lakes such as Aygır Lake, Balıklı Lake, Karagöl Lake, and Sarı Lake, this area contains numerous glacial lakes of various sizes, ranging from 100 to 1900 m. These lakes are generally located at altitudes of 2500 m and above, and high-mountain ecosystems encompassing subalpine and alpine zones have developed around them. Vegetation in these ecosystems is sparse and dominated by species resistant to cold climate conditions; herbaceous and dwarf plants, such as *Vaccinium* spp., dwarf shrubs, and alpine pastures, form the main components. (İnkaya, 2019).

The average annual rainfall in the research area is 1104 mm, and the average annual temperature is 7.07 °C. (Mbm, 2025).

## 2. Materials and Methods

The bryophytes samples were collected in 24 different localities between 05 July 2024 and 28 June 2025 from Demirkapı Plateau and its surroundings in Çaykara from Türkiye (Table 1). The collected bryophyte specimens were identified by consulting various floras and keys (Nyholm, 1986, 1989, 1993, 1998; Paton, 1999; Smith, 1996, 2004; Cortini-Pedrotti 2001, 2006; Guerra et al., 2006; Frey et al., 2006; Brugués et al., 2007; Casas et al., 2009; Brugués and Guerra, 2015; Lüth, 2019; Kürschner and Frey, 2020). Hodgetts et al. (2020) was followed in the creation of the plant list and for the nomenclatural changes and synonyms of bryophytes. The status of bryophyte taxa for

Trabzon Province was evaluated by reviewing the relevant literature (Batan and Özdemir, 2013; Özdemir and Batan, 2017; Erata et al., 2018, 2020a, 2020b, 2022; Kırmacı et al., 2019; Yıldırım et al., 2025). The localities and substrates from which each taxon was collected are provided in the floristic list. Taxa recorded for the second time for Turkey are indicated with (+), taxa new to Trabzon province are indicated with (\*), and taxa new to Çaykara district are indicated with (#). In the floristic list, the families to which the taxa belong, along with their valid Latin names and authors, are listed in alphabetical order. Additionally, the collection location, habitat, altitude, coordinates, and collection date for each taxon are also given.

Bryophyte samples are deposited in the private herbarium at the Karadeniz Technical University, Trabzon, Türkiye.

Table 1. Localities of bryophyte samples collected

No	Locality	Coordinates	Altitude (m)	Date
1	Çaykara, Demirkapı village Aygır lake, Uzungöl	(37T) 4487448 N/ 0617789 E	2728	5.07.2024
2	Çaykara, Demirözü Köyü, Balıklı lake	(37T) 4487930 N/ 0617556 E	2570	5.07.2024
3	Çaykara, on the Multat Plateau road, stream	(37T) 4490404 N/ 0614214 E	1835	20.07.2024
4	Çaykara, On the Multat Plateau Road, 4 (Alpine Meadow, Streamside)	(37T) 4489395 N / 0613957 E	2170	20.07.2024
5	Çaykara, Balıklı göl and its surroundings	(37T) 4487563 N / 0616981 E	2590	20.07.2024
6	Çaykara, Balıklı göl Snow Cover, Snow Peak	(37T)4469726 N / 0629403 E	2886	20.07.2024
7	Çaykara, Between Multat and Haldizen 1	(37T) 4489706 N / 0617508 E	2651	21.07.2024
8	Çaykara, Between Multat and Haldizen 2	(37T) 4489347 N / 0617350 E	2700	21.07.2024
9	Çaykara, Multat Yaylası on the Karagöl road 1	(37T) 4487894 N / 0614829 E	2458	21.07.2024
10	Çaykara, Karagöl	(37T)4487450 N / 0615273 E	2800	22.07.2024
11	Çaykara, Multat Plateau Village	(37T) 4489000 N / 0615200 E	2306	22.07.2024
12	Çaykara, Multat Plateau 1 (Alpine Meadow)	(37T) 4489250 N / 0615400 E	2230	22.07.2024
13	Çaykara, Multat Plateau 1-2	(37T) 4488482 N / 0614556 E	2281	22.07.2024
14	Çaykara, Demirkapı Neighborhood Entrance Küksen Area	(37T) 4490156 N / 0618487 E	2208	25.08.2024
15	Çaykara, Demirkapı Neighborhood, Lake Surroundings, Above Aygır Lake 1	(37T) 4487162 N / 0617550 E	2752	25.08.2024
16	Çaykara, Multat Plateau 3-4	(37T)4490199 N / 0616343 E	2253	11.06.2025
17	Çaykara, Karagöl 1	(37T) 4487150 N / 0615701 E	2857	11.06.2025
18	Çaykara, Between Karagöl and Balıklı Lake, Kaz Lake,	(37T) 4487328 N / 0616281 E	2700	11.06.2025
19	Çaykara, Demirkapı Exit Rocky Area	(37T) 4489056 N / 0619004 E	2300	11.06.2025
20	Çaykara, on the Sarıçiçek Lake Road, Small Lake	(37T) 4487002 N / 0618500 E	2725	26.05.2025
21	Çaykara, Above Aygır Lake, Bayburt Border	(37T) 4486173 N / 0617796 E	3018	26.05.2025
22	Çaykara, On the road to Sarıçiçek Lake, Below Küçük Lake	(37T) 4474420 N / 0629498 E	2784	26.05.2025
23	Çaykara, Büyük Plateau 1	(37T) 4489025 N /0620481 E	2393	27.06.2025
24	Çaykara, Multat Plateau Kırklar road	(37T) 4489672 N / 0612120 E	2546	28.06.2025

### 3. Results and Discussion

As a result of the evaluation of bryophyte samples collected from the study area, a total of 291 bryophyte taxa were identified, including 244 moss taxa (97 genera and 46 families), 46 liverwort taxa (29 genera and 21 families) and 1 hornwort taxon (1 genus and 1 family).

#### 3.1. Bryofloristic list

##### Anthocerotophyta

##### Anthocerotaceae Dumort.

##### *Anthoceros* L.

#*Anthoceros punctatus* L.

Loc.: 1; on wet soil.

##### Marchantiophyta

##### Adelanthaceae Grolle

##### *Syzygiella* Spruce

\**Syzygiella autumnalis* (DC.) K.Feldberg, Váňa, Hentschel&Heinrichs,

Loc.: 1; on soil.

##### Anastrophyllaceae L.Söderstr., De Roo & Hedd.

##### *Barbilophozia* Loeske.

*Barbilophozia barbata* (Schmidel ex Schreb.) Loeske

Loc.: 4, 10, 12, 15, 19; on soil, on wet soil

*Barbilophozia hatcheri* (A.Evans) Loeske

Loc.: 8, 9, 12, 13, 16, 19; on wet soil, on soil

\**Barbilophozia lycopodioides* Wallr.) Loeske

Loc.: 12, 13; on wet soil.

#*Barbilophozia sudetica* (Nees ex Huebener)

L.Söderstr., De Roo&Hedd.

Loc.: 12, 13; on soil, on rock.

##### *Sphenolobus* (Lindb.) Berggr.

*Sphenolobus minutus* (Schreb. ex D. Crantz) Berggr

Loc.: 1, 10; on wet soil, on soil, on rock

##### Cephaloziaceae Mig.

##### *Cephalozia* (Dumort.) Dumort.

*Cephalozia bicuspidata* (L.) Dumort.

Loc.: 1, 2; on wet soil

*Fuscocephaloziopsis* Fulford

[*Pleurocladula*Grolle]

\**Fuscocephaloziopsis lunulifolia* (Dumort.)

Váňa&L.Söderstr.,

Loc.: 1; on soil

\**Fuscocephaloziopsis pleniceps* (Austin)

Váňa&L.Söderstr

Loc.: 9; on wet soil

##### Cephaloziellaceae Douin

*Cephaloziella* (Spruce) Schiffn. [Dichiton Mont.

\**Cephaloziella baumgartneri* Schiffn

Loc.: 22; on soil.

*C. divaricata* (Sm.) Schiffn.

Loc.: 1, 2; on wet soil, on soil, on rock.

##### Lophoziaceae Cavers

##### *Lophozia* (Dumort.) Dumort.

*Lophozia longiflora* (Nees) Schiffn

Loc.: 1, 12, 13; On a dead tree trunk, on soil

+*Lophozia silvicola* H.Buch,

Loc.: 1; On wet soil

*L. ventricosa* (Dicks.) Dumort

Loc.: 6, 12, 13 on soil

*Trilophozia* (R.M.Schust.) Bakalin

*Trilophozia quinquedentata* (Huds.) Bakalin,

Loc.: 10, 16; on wet soil

##### Scapaniaceae Mig

##### *Diplophyllum* (Dumort.) Dumort.

#*Diplophyllum taxifolium*(Wahlenb.) Dumort.

Loc.: 2, 6, 8, 10, 12, 13, 15, 16; on soil,

*Scapania* (Dumort.) Dumort.

#*Scapania compacta* (Roth) Dumort.

Loc.: 1, On wet soil

*S. irrigua* (Nees) Nees

Loc.: 1, 2, 10, 12, 13; On wet soil

\**S. suliginosa* (Lindenb.) Dumort.

Loc.: 1; on soil

#*S. subalpina* (Nees ex Lindenb.) Dumort

Loc.: 1, 2, 10; On wet soil

*S. undulata* (L.) Dumort

Loc.: 1, 10; On wet soil,

##### Gymnomitriaceae H.Klinggr

*Gymnomitrium* Corda [Apomarsupella R.M.Schust.]

*Gymnomitrium obtusum* Lindb

Loc.: 6; on soil

##### *Marsupella* Dumort.

*Marsupella funckii* (F.Weber&D.Mohr) Dumort

Loc.: 12, 13; On rock, on wet rock, on soil, on wet soil.

##### *Nardia* Gray.

*Nardia scalaris* Gray

Loc.: 6; on soil,

##### *Liochlaena* Nees

*Liochlaena lanceolata* Nees [*Jungermannia lanceolata* auct. non L., *Jungermannia leiantha* Grolle, *Jungermannia subulata* var. *leiantha* (Grolle) Damsh.]

Loc.: 1; on soil

##### Jungermanniaceae Rchb.

##### *Jungermannia* L.

\**Jungermannia eucordifolia* Schljakov

Loc.: 1; on soil

##### Solenostomataceae Stotler&Crand.-Stotl.

*Solenostoma* Mitt. [Plectocolea (Mitt.) Mitt.

#*Solenostoma gracillimum* (Sm.) R.M.Schust

Loc.: 1, 2; on soil,

*S. hyalinum* (Lydell)Mitt

Loc.: 1, 2, 10; on wet soil

*S. sphaerocarpum* (Hook.) Steph.

Loc.: 1, 2, 22; on wet soil,

##### Blepharostomataceae W.Frey&M.Stech

*Blepharostoma* (Dumort.) Dumort.

*Blepharostoma trichophyllum* (L.) Dumort

Loc.: 1; on wet soil

##### Lophocoleaceae Vanden Berghen

##### *Chiloscyphus* Corda.

*Chiloscyphus pallescens* (Ehrh.) Dumort

Loc.: 4, 11, 19; on soil  
*C. polyanthos* (L.) Corda  
 Loc.: 1, 7, 8, 10, 16; on wet soil, on soil  
**Plagiochilaceae** Müll. Frib.  
*Pedinophyllum* Lindb. ex Nordst.  
*Pedinophyllum interruptum* (Nees) Kaal.  
 Loc.: 1, 6, 12, 13; on soil,  
**Plagiochila** (Dumort.) Dumort.  
*Plagiochila asplenioides* (L.) Dumort.  
 Loc.: 3, 10, 22; on soil,  
*P. porelloides* (Torr. ex Nees) Lindenb.  
 Loc.: 1, 3, 4, 5, 7, 8, 9, 10, 12, 13, 16, 19, 22; on soil, on wet soil  
**Frullaniaceae** Lorch  
*Frullania* Raddi.  
*Frullania tamarisci* (L.) Dumort  
 Loc.: 3, 5; on rock.  
**Lejeuneaceae** Cavers  
*Lejeunea* Lib.  
*Lejeunea cavifolia* (Ehrh.) Lindb  
 Loc.: 3; on tree bark..  
**Porellaceae** Cavers  
*Porella* L.  
*Porella platyphylla* (L.) Pfeiff.  
 Loc.: 2, 21; on rock  
**Radulaceae** Müll. Frib  
*Radula* Dumort.  
*Radula complanata* (L.) Dumort.  
 Loc.: 4, 5, 7, 8, 10, 11, 16, 19; on rock, on soil, on wet soil  
*R. lindenbergiana* Gottsche ex C.Hartm  
 Loc.: 4, 9, 15; on soil  
**Metzgeriaceae** H.Klinggr  
*Metzgeria* Raddi [Apometzgeria Kuwah]  
*Metzgeria furcata* (L.) Corda  
 Loc.: 1, 2, 7, 10; on rock  
**Pelliaceae** H.Klinggr.  
*Apopellia* (Grolle) Nebel & D.Quandt  
*Apopellia endiviifolia* (Dicks.) Nebel & D.Quandt  
 Loc.: 1; on soil  
**Pellia** Raddi.  
*Pellia epiphylla* (L.) Corda  
 Loc.: 4; on soil  
*P. neesiana* (Gottsche) Limpr.  
 Loc.: 1, 2, 10; on wet soil.  
**Conocephalaceae** Müll. Frib. ex Grolle  
**Conocephalum** Hill.  
*Conocephalum conicum* (L.) Dumort.  
 Loc.: 4, 9, 19, 21; on soil, on wet soil  
**Marchantiaceae** Lindl.  
*Marchantia* L.  
*Marchantia polymorpha* L.  
 Loc.: 19; on soil  
**Bryophyta**  
**Sphagnaceae** Dumort.  
**Sphagnum** L.  
 #*Sphagnum medium* Limpr.,  
 Loc.: 5; submerged

#*S. squarrosum* Crome  
 Loc.: 5; submerged  
 #*S. teres* (Schimp.) Ångstr  
 Loc.: 5, 6; submerged  
*S. capillifolium* (Ehrh.) Hedw.,  
 Loc.: 23; submerged  
 #*S. fuscum* (Schimp.) H.Klinggr.  
 Loc.: 5; submerged  
 #*S. quinquefarium* (Lindb. in Braithw.) Warnst.,  
 Loc.: 23; submerged  
 #*S. rubellum* Wilson,  
 Loc.: 23; submerged  
 +*S. russowii* Warnst.,  
 Loc.: 2, 5; On wet soil  
**Andreaeaceae** Dumort.  
**Andreaea** Hedw.  
 +*Andreaea alpestris* (Thed.) Schimp.,  
 Loc.: 6, 8, 9, 12, 13, 15, 16, 23; on rock  
 +*A. mutabilis* Hook.f. & Wilson  
 Loc.: 8, 9, 12, 13, 16, 17, 19; on rock  
 # *A. rupestris* Hedw.  
 Loc.: 17, 19, 22; on rock  
**Polytrichaceae** Schwägr.  
**Atrichum** P.Beauv  
*Atrichum undulatum* (Hedw.) P.Beauv  
 Loc.: 3; on soil.  
**Pogonatum** P.Beauv.  
 \**Pogonatum aloides* (Hedw.) P.Beauv.  
 Loc.: 3; on soil  
 \**P. dentatum* (Menzies ex Brid.) Brid.  
 Loc.: 3, 22; on rock.  
*P. urnigerum* (Hedw.) P.Beauv.  
 Loc.: 6, 9, 12, 13, 15, 19, 24; on soil  
**Polytrichastrum** G.L. Sm.  
*Polytrichastrum alpinum* (Hedw.) G.L. Sm.  
 Loc.: 1, 3, 5, 6, 7, 9, 10, 11, 12, 13, 15, 17, 18, 19,  
 20, 22, 24; on soil, on wet soil, on rock.  
 \**P. sexangulare* (Brid.) G.L.Sm.  
 Loc.: 20; on soil  
**Polytrichum** Hedw.  
*Polytrichum formosum* Hedw  
 Loc.: 5, 9, 17; on soil  
 #*P. juniperinum* Hedw.  
 Loc.: 1, 4, 8, 12, 13, 15, 16, 19, 21, 22; on wet soil,  
 on soil  
 #*P. piliferum* Hedw.  
 Loc.: 1, 4, 6, 8, 12, 13, 15, 16, 17, 22, 23, 24; on soil,  
 on rock  
 #*P. strictum* Menzies ex Brid.  
 Loc.: 5, 15, 23; on wet soil.  
**Encalyptaceae** Schimp  
**Encalypta** Hedw.  
 #*Encalypta ciliata* Hedw  
 Loc.: 7; on soil  
 \**E. microstoma* Bals.-Criv. & De Not  
 Loc.: 7, 14; on wet rock, on rock.  
**Distichiaceae** Schimp  
**Distichium** Bruch & Schimp.

- Distichium capillaceum* (Hedw.) Bruch & Schimp  
Loc.: 1, 5, 6, 9, 10, 17, 18, 20, 22; on wet soil, on soil, on rock
- Hymenolomataceae** Ignatov&Fedosov  
**Hymenoloma** Dusén.  
#*Hymenoloma compactum* (Schleich ex Schwägr) Ochyra  
Loc.: 1; on soil  
#*H. crispulum* (Hedw.) Ochyra  
Loc.:1,2, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16, 18, 19, 19, 20, 24; on rock, on soil
- Flexitrichaceae** Ignatov&Fedosov  
**Flexitrichum** Ignatov & Fedosov  
\**Flexitrichum flexicaule* (Schwägr.) Ignatov & Fedosov  
Loc.: 9; on soil  
#*F. gracile* (Mitt.) Ignatov&Fedosov  
Loc.: 9; on rock
- Leucobryaceae** Schimp  
**Leucobryum** Hampe.  
#*Leucobryum glaucum* (Hedw.) Ångstr  
Loc.: 3, 14, 19; on soil
- Amphidiaceae** M.Stech  
**Amphidium** Schimp.  
#*Amphidium mougeotii* (Schimp.) Schimp  
Loc.:1; on rock
- Aongstroemiaceae** De Not.  
**Dichodontium** Schimp.  
*Dichodontium pellucidum* (Hedw.) Schimp  
Loc.: 3, 11, 19; on wet soil, on rock
- Diobelonella** Ochyra.  
#*Diobelonella palustris* (Dicks.) Ochyra  
[Synonymous: *Dichodontium palustre* (Dicks.) M.Stech]  
Loc.: 1; on wet soil
- Dicranellaceae** M.Stech  
**Dicranella** (Müll. Hal.) Schimp.  
*Dicranella heteromalla* (Hedw.) Schimp  
Loc.: 10, 12, 13, 18; on soil,  
#*D. howei* Renauld & Cardot  
Loc.:1; on soil
- Fissidentaceae** Schimp.  
**Fissidens** Hedw.  
*Fissidens adianthoides* Hedw.  
Loc.: 3; on rock  
*F. dubius* P.Beauv.  
Loc.: 3; on rock
- Dicranaceae** Schimp.  
**Dicranum** Hedw.  
#*Dicranum bonjeanii* De Not  
Loc.: 1, 6, 11, 12, 13, 15, 21, 22, 23; on soil,  
#*D. flexicaule* Brid  
Loc.: 5, 19, 23; on soil,  
\**D. leioneuron* Kindb.  
Loc.: 5; on soil  
#*D. majus* Sm.  
Loc.: 18, 20; on soil  
#*D. polysetum* Sw. ex anon
- Loc.:1, 5, 10, 20; on soil  
**D. scoparium** Hedw  
Loc.:1, 5, 6, 9, 11, 12, 13, 15, 18, 19, 20, 23; on soil  
# *D. spadiceum* J.E. Zetterst  
Loc.: 1, 5, 6, 9, 12, 13, 18, 19, 22; on soil
- Paraleucobryum** (Limpr.) Loeske.  
#*Paraleucobryum enerve* (Thed.)Loeske  
Loc.: 22; on soil  
\**P. sauteri* (Bruch & Schimp.) Loeske  
Loc.: 4; on soil
- Rhabdoweisiaceae** Limpr  
**Dicranoweisia** Milde  
*Dicranoweisia cirrata* (Hedw.) Lindb.  
Loc.:1, 6; on wet soil,  
**Oncophorus** (Brid.) Brid.  
#*Oncophorus virens* (Hedw.) Brid.  
Loc.: 6, 9, 21; on soil
- Ditrichaceae** Limpr  
**Ceratodon** Brid.  
*Ceratodon purpureus* (Hedw.) Brid  
Loc.: 22; on soil, on rock
- Pottiaceae** Schimp  
**Syntrichia** Brid.  
\**Syntrichia minor* (Bizot) M. T. Gallego, J.Guerra, M.J. Cano, Ros&Sánchez-Moya  
Loc.: 19; on rock  
\**S. norvegica* F.Weber  
Loc.: 12, 13, 14,19, 20, 22; on rock,  
\**S. papillosissima* (Copp.) Loeske,  
Loc.: 7; on rock  
#*S. ruraliformis* (Besch.) Mans.  
Loc.: 7, 10, 12, 13, 14, 15, 19; on rock  
*S. ruralis* (Hedw.) F.Weber & D.Mohr  
Loc.: 12, 13, 14, 19; on rock  
\**S. virescens* (De Not.) Ochyra  
Loc.: 14; on rock
- Tortula** Hedw.  
\**Tortula hoppeana* (Schultz) Ochyra  
Loc.: 6, 9, 17; on soil  
#*T. marginata* (Bruch & Schimp.) Spruce  
Loc.: 19; on soil  
\**T. mucronifolia* Schwägr.  
Loc.: 14; on soil  
\**T. Schimper* M. J.Cano, O.Werner & J.Guerra  
Loc.: 17; on rock
- Anoetangium** Schwägr.  
*Anoetangium aestivum* (Hedw.) Mitt.  
Loc.: 12, 13; on soil
- Chionoloma** Dixon.  
*Chionoloma tenuirostre* (Hook&Taylor) M.Alonso, M. J. Cano & J.A.Jiménez [Synonymous: *Oxystegus tenuirostris* (Hook. & Taylor) A.J.E.Sm.]  
Loc.: 4, 11, 12, 13; on soil
- Tortella** (Müll. Hal.) Limpr.  
#*Tortella fasciculata* (Culm.) Culm  
Loc.: 1, 3, 5, 17, 18; on soil  
*T. tortuosa* (Hedw.) Limpr

- Loc.: 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 23, 24; on soil, on rock  
**Trichostomum** Bruch.  
*#Trichostomum crispulum* Bruch  
 Loc.: 5; on rock  
**Saelaniaceae** Ignatov & Fedosov  
**Saelania** Lindb.  
*#Saelania glaucescens* (Hedw.) Broth  
 Loc.: 5, 10, 15, 18, 19, 22, 23, 24; on rock, on soil  
**Grimmiaceae** Arn.  
**Racomitrium** Brid.  
*#Racomitrium aciculare* (Hedw.) Brid  
 Loc.: 11; on rock, on soil  
*R. affine* (F.Weber&D.Mohr) Lindb  
 Loc.: 1, 4, 10, 11, 14, 15, 19, 20; on soil, on rock  
*R. aquaticum* (Brid. ex Schrad.) Brid  
 Loc.: 15; on rock  
*R. canescens* subsp. *canescens* (Hedw.) Brid  
 Loc.: 1, 2, 4, 6, 7, 8, 10, 11, 12, 13, 16, 17, 18, 23, 24; on rock  
 +*R. canescens* subsp. *latifolium* (C.E.O.Jensen) Frisvoll [*Niphotrichum canescens* subsp. *latifolium* (Frisvoll) Bedn.-Ochyra & Ochyra]  
 Loc.: 1; on rock  
*R. ericoides* (Brid.) Brid.  
 Loc.: 1, 4, 11; on rock  
*#R. macounii* subsp. *alpinum* (E.Lawton) Frisvoll  
 Loc.: 1, 10, 12, 13, 15, 23; on rock  
*#R. macounii* subsp. *macounii* Kindb.  
 Loc.: 5, 6, 12, 13, 15; on soil, on rock  
*#Racomitrium obtusum* (Brid.) Brid.,  
 Loc.: 19; on rock  
*#R. sudeticum* (Funck) Bruch & Schimp  
 Loc.: 1, 4, 6, 12, 13, 15, 19; on rock  
**Grimmia** Hedw.  
*Grimmia alpestris* (F.Weber&D.Mohr) Schleich  
 Loc.: 1, 6, 7, 9, 15, 20; on rock  
*Grimmia anodon* Bruch & Schimp.,  
 Loc.: 14; On rock  
 \**G. anomala* Hampe ex Schimp  
 Loc.: 1, 15; on rock  
 \**G. caespiticia* (Brid.) Jur.  
 Loc.: 6, 12, 13, 15; on rock  
*#G. donniana* Sm.  
 Loc.: 9; on rock  
*#G. elatior* Bruch ex Bals.-Criv. & De Not  
 Loc.: 12, 13, 18; on rock  
*#G. funalis* (Schwägr.) Bruch & Schimp  
 Loc.: 5, 7, 9, 12, 13, 15, 19, 20, 24; on rock  
*#G. hartmanii* Schimp  
 Loc.: 4, 9, 12, 13, 15; on rock  
*#G. longirostris* Hook  
 Loc.: 5, 12, 13, 14, 23; on rock  
*G. ovalis* (Hedw.) Lindb.,  
 Loc.: 14, 19; on rock  
 \**G. unicolor* Hook  
 Loc.: 6; on rock  
**Schistidium** Bruch & Schimp.  
*#Schistidium agassizii* Sull. & Lesq.  
 Loc.: 9; on rock  
*S. apocarpum* (Hedw.) Bruch & Schimp  
 Loc.: 9; on rock, on wet soil  
*#S. boreale* Poelt  
 Loc.: 3, 7, 10; on rock  
*S. confertum* (Funck) Bruch & Schimp.  
 Loc.: 9, 10; on rock  
*S. papillosum* Culm.  
 Loc.: 9, 11, 19; on rock  
*S. rivulare* (Brid.) Podp  
 Loc.: 4; on rock  
**Hedwigiaceae** Schimp  
**Hedwigia** P.Beauv.  
*#Hedwigia emodica* Hampe ex Müll. Hal.  
 Loc.: 7, 9, 12, 13, 14; on rock  
 \**H. stellata* Hedenäs  
 Loc.: 12, 13; on rock  
*#Hedwigia ciliata* (Hedw.) P.Beauv.,  
 Loc.: 5, 19; on rock  
**Bartramiaceae** Schwägr  
**Bartramia** Hedw.  
*#Bartramia halleriana* Hedw.  
 Loc.: 3, 11, 15, 18; on rock, on soil  
*#B. ithyphylla* Brid  
 Loc.: 7, 9, 10, 11, 12, 13, 15, 18, 20, 22, 23, 24; on soil  
**Philonotis** Brid.  
*Philonotis caespitosa* Jur  
 Loc.: 14, 19, 21, 22; on wet soil  
*#P. calcarea* (Bruch & Schimp.) Schimp  
 Loc.: 2, 4; on wet soil  
*P. fontana* (Hedw.) Brid  
 Loc.: 1, 5, 9, 15, 23; on wet soil, on soil  
*#P. marchica* (Hedw.) Brid.  
 Loc.: 2, 15; on wet soil  
*#P. seriata* Mitt.  
 Loc.: 1, 4, 5, 6, 7, 11, 19, 23; on rock, on soil, on wet soil  
**Bryaceae** Schwägr  
**Bryum** Hedw.  
*Bryum argenteum* Hedw  
 Loc.: 19; on soil  
 \**Bryum canariense* Brid.,  
 Loc.: 4; on soil  
*B. dichotomum* Hedw  
 Loc.: 1, 7; on soil,  
**Imbribryum** Pedersen.  
*#Imbribryum alpinum* (Huds. ex With.) N.Pedersen  
 Loc.: 9; on soil  
*I. mildeanum* (Jur.) J.R.Spence  
 Loc.: 6, 15; on soil  
 \**I. muehlenbeckii* (Bruch & Schimp.) N.Pedersen  
 Loc.: 5; on rock  
**Ptychostomum** Hornsch.  
 \**Ptychostomum arcticum* (R.Br.) J.R.Spence ex Holyoak & N.Pedersen,  
 Loc.: 1; on wet soil

- \* *Ptychostomum compactum* Hornsch.,  
Loc.: 5, 14, 17, 18; on wet rock, on soil  
# *P. creberrimum* (Taylor) J.R.Spence & H.P.Ramsay  
Loc.: 1, 4; on rock  
# *Ptychostomum donianum* (Grev.) Holyoak & N.Pedersen,  
Loc.: 1, 3, 5, 7, 10, 11, 15, 19, 23; on wet soil, on rock, on soil  
*P. elegans* (Nees) D.Bell & Holyoak  
Loc.: 4, 12, 13, 20; on soil, on rock  
*P. imbricatulum* (Müll. Hal.) Holyoak & N.Pedersen  
Loc.: 14, 22; on soil  
# *P. inclinatum* (Sw. ex Brid.) J.R.Spence  
Loc.: 4, 6, 7, 9, 15, 17, 19; on soil  
\**P. intermedium* (Brid.) J.R.Spence  
Loc.: 17; on rock  
*P. moravicum* (Podp.) Ros & Mazimpaka  
Loc.: 3, 4, 9, 12, 13, 14, 15, 23; on tree bark, on soil  
*P. pallens* (Sw. ex anon.) J.R.Spence  
Loc.: 1, 5, 22; on wet soil  
# *P. pallescens* (Schleich. ex Schwägr.) J.R.Spence  
Loc.: 1, 2, 7, 10, 14, 15, 23; on soil, on rock  
*P. pseudotriquetrum* (Hedw.) J.R.Spence & H.P.Ramsay ex Holyoak & N.Pedersen var. *bimum* (Schreb.) Holyoak & N.Pedersen  
Loc.: 1, 15; on soil  
*P. pseudotriquetrum* (Hedw.) J. R. Spence & H. P. Ramsay ex Holyoak & N.Pedersen var. *pseudotriquetrum*  
Loc.: 1, 4, 5, 9, 10, 12, 13, 15; on wet soil, on soil  
# *P. rubens* (Mitt.) Holyoak & N. Pedersen  
Loc.: 9; on soil  
# *P. schleicheri* (DC.) J.R.Spence ex D. Bell & Holyoak  
Loc.: 1, 2, 4, 5, 6, 8, 11, 12, 13, 16, 19, 23; on wet soil, on soil, on rock  
# *P. torquescens* (Bruch & Schimp.) Ros & Mazimpaka  
Loc.: 3; on soil,  
# *P. turbinatum* (Hedw.) J.R.Spence  
Loc.: 6, 9; on soil  
\**P. weigeli* (Biehler) J.R.Spence  
Loc.: 1, 5, 19, 22, 23; on wet soil  
**Rhodobryum** (Schimp.) Limpr.  
*Rhodobryum ontariense* (Kindb.) Kindb  
Loc.: 8, 11, 12, 13, 16, 19, 24; on soil, on rock  
# *R. roseum* (Hedw.) Limpr  
Loc.: 8, 16; on soil  
**Mniaceae** Schwägr  
**Pohlia** Hedw.  
*P. cruda* (Hedw.) Lindb  
Loc.: 3, 6, 7, 9, 10, 11, 12, 13, 17, 19, 20, 21, 22; on rock, on soil  
# *P. lescuriana* (Sull.) Ochi  
Loc.: 12, 13; on soil  
# *P. nutans* (Hedw.) Lindb  
Loc.: 22, 23; on soil  
**Mnium** Hedw.  
# *Mnium hornum* Hedw.  
Loc.: 6, 11; on rock, on soil  
# *M. lycopodioides* Schwägr  
Loc.: 3, 5, 9, 11, 18, 20, 22; on rock, on soil  
# *M. marginatum* (Dicks.) P.Beauv  
Loc.: 10, 18, 21; on soil  
*M. spinosum* (Voit) Schwägr  
Loc.: 10, 19; on soil, on rock  
# *M. spinulosum* Bruch & Schimp  
Loc.: 3, 7, 9, 10, 11, 12, 13, 19, 22; on wet soil, on soil  
# *M. thomsonii* Schimp.  
Loc.: 3, 5, 9, 22; on rock, on soil  
**Plagiomnium** T.J.Kop.  
*Plagiomnium affine* (Blandow ex Funck) T.J.Kop.  
Loc.: 3; on soil,  
*P. cuspidatum* (Hedw.) T.J.Kop.  
Loc.: 17, 22; on soil  
*P. elatum* (Bruch & Schimp.) T.J.Kop.  
Loc.: 4; on soil  
# *P. ellipticum* (Brid.) T.J.Kop.  
Loc.: 1, 3, 19, 22; on wet soil  
*P. medium* (Bruch & Schimp.) T.J.Kop.  
Loc.: 3, 11, 19; on soil,  
*P. rostratum* (Schrad.) T.J.Kop.  
Loc.: 1, 3, 14, 17, 24; on wet soil, on soil  
*P. undulatum* (Hedw.) T.J.Kop.  
Loc.: 1, 3, 22; on soil  
**Rhizomnium** (Broth.) T.J.Kop.  
# *Rhizomnium magnifolium* Horik.) T.J.Kop.  
Loc.: 9, 10, 12, 13, 19; on wet soil  
# *R. pseudopunctatum* (Bruch & Schimp.) T.J.Kop.  
Loc.: 21, 23; on soil  
*R. punctatum* (Hedw.) T.J.Kop  
Loc.: 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 19, 24; on soil, on wet soil  
**Orthotrichaceae** Arn  
**Lewinskya** F. Lara, Garilleti & Goffinet.  
\**Lewinskya laevigata* (J.E.Zetterst.) F.Lara, Garilleti & Goffinet  
Loc.: 14; on rock  
# *L. rupestris* (Schleich. ex Schwägr.) F.Lara, Garilleti & Goffinet  
Loc.: 9, 14, 19, 20; on rock,  
**Orthotrichum** Hedw.  
\**Orthotrichum alpestre* Bruch & Schimp  
Loc.: 3; On rock  
\**O. bistratosum* (Schiffn.) Guerra  
Loc.: 19; on tree bark  
# *O. pallens* Bruch ex Brid  
Loc.: 19; on tree bark  
\**O. patens* Bruch ex Brid  
Loc.: 3; on tree bark  
**Zygodon** Hook. & Taylor.  
# *Zygodon rupestris* Schimp. ex Lorentz  
Loc.: 3; on tree bark

**Aulacomniaceae** Schimp**Aulacomnium** Schwägr.# *Aulacomnium palustre* (Hedw.) Schwägr

Loc.: 1, 2, 5, 9, 18, 21, 22; on rock, on soil

**Fontinalaceae** Schimp.**Fontinalis** Hedw.# *Fontinalis antipyretica* Hedw.

Loc.: 23; submerged

\* *Fontinalis squamosa* Hedw.,

Loc.: 14; submerged

**Plagiotheciaceae** M.Fleisch**Plagiothecium** Bruch & Schimp.*Plagiothecium cavifolium* (Brid.) Z.Iwats

Loc.: 10; on soil

# *P. laetum* Schimp.

Loc.: 22; on soil

# *P. nemorale* (Mitt.) A.Jaeger;

Loc.: 3; on tree bark

# *P. platyphyllum* Mönk.,

Loc.: 8, 16; on soil

# *P. succulentum* (Wilson) Lindb

Loc.: 1, 10, 12, 13; on soil

**Pterigynandraceae** Schimp**Pterigynandrum** Hedw.*Pterigynandrum filiforme* Hedw

Loc.: 3, 4, 5, 7, 9, 11, 12, 13, 14, 20, 23; on tree

bark, on rock, on soil

**Climaciaceae** Kindb**Climacium** F. Weber & D.Mohr.*Climacium dendroides* (Hedw.) F.Weber & D.Mohr

Loc.: 1, 2, 5, 11, 12, 13, 15, 22, 23; on wet soil,

submerged

**Amblystegiaceae** G.Roth**Cratoneuron** (Sull.) Spruce.# *Cratoneuron filicinum* (Hedw.) Spruce

Loc.: 4, 9, 12, 13, 19; on rock

**Palustriella** Ochyra.# *Palustriella commutata* (Hedw.) Ochyra

Loc.: 4, 14; near stream, on wet soil

# *P. decipiens* (De Not.) OchyraLoc.: 1, 2, 5, 9, 10, 11, 19, 21; on wet soil, on soil,  
on wet rock# *P. falcata* (Brid.) HedenäsLoc.: 1, 5, 9, 12, 13, 18, 23; on rock, ıslak on rock,  
on wet soil**Campyliadelphus** (Kindb.) R.S.Chopra.# *Campyliadelphus elodes* (Lindb.) Kanda

Loc.: 19, 24; on wet soil

**Campylium** (Kindb.) R.S.Chopra*Campylium protensum* (Brid.) KindbLoc.: 1, 2, 5, 10, 11, 12, 13, 19, 23, 24; on wet soil,  
on rock# *C. stellatum* (Hedw.) Lange & C.E.O. Jensen

Loc.: 1, 2, 9, 12, 13, 23; on wet soil, on rock

**Campylophyllopsis** W.R. Buck.# *Campylophyllopsis calcarea* (Crundw. &Nyholm) Ochyra [Synonymous: *Campylophyllum*  
*calcareum* (Crundw. & Nyholm) Hedenäs]

Loc.: 3; on tree bark.

**Drepanocladus** (Müll.Hal.) G.Roth# *Drepanocladus aduncus* (Hedw.) Warnst

Loc.: 5; on wet soil

# *D. polygamus* (Schimp.) Hedenäs

Loc.: 1; submerged

**Hygroamblystegium** Loeske.# *Hygroamblystegium tenax* (Hedw.) Jenn

Loc.: 14; submerged

**Hygrohypnum** Lindb.# *Hygrohypnum luridum* (Hedw.) Jenn

Loc.: 3; submerged, on wet rock

89. *Platyhypnum* Loeske.# *Platyhypnum duriusculum* (De Not.) OchyraLoc.: 5, 7, 9, 10, 15, 22, submerged, on wet rock, on  
wet soil# *P. molle* (Dicks. ex Hedw.) Loeske

Loc.: 1, 4; submerged

**Scorpidiaceae** Ignatov & Ignatova**Hygrohypnella** Ignatov & Ignatova# *Hygrohypnella ochracea* (Turner ex Wilson)

Ignatov &amp; Ignatova

Loc.: 1; on wet soil

**Sanionia** Loeske.*Sanionia uncinata* (Hedw.) Loeske

Loc.: 1, 3, 6, 8, 9, 10, 12, 13, 15, 16, 19, 20, 21, 22;

on wet soil, on rock, on soil

**Pseudoleskeaceae** Schimp**Lescuraea** Bruch & Schimp.# *Lescuraea incurvata* (Hedw.) E.Lawton

Loc.: 1, 4, 5, 8, 10, 12, 13, 15, 16, 19, 22; on rock

*L. mutabilis* (Brid.) Lindb. exl. Hagen

Loc.: 4, 6, 10, 15, 17; on rock

# *L. patens* Lindb

Loc.: 1, 3, 9, 15, 20, 24; On rock, on wet soil

\* *L. plicata* (Schleich. Ex F.Weber & D.Mohr)  
Broth.

Loc.: 12, 13; on rock, on soil

*L. radicata* (Mitt.) Mönk

Loc.: 1, 4, 6, 15, 20, 22, 23; on rock

\* *L. saviiana* (De Not.) E.Lawton

Loc.: 10, 11, 12, 13, 15, 24; on rock

# *L. saxicola* (Schimp.) Molendo

Loc.: 10, 11, 15, 18, 20, 22, 23, 24; on rock

**Pseudoleskeellaceae** Ignatov & Ignatova**Pseudoleskeella** Kindb.*Pseudoleskeella nervosa* (Brid.) Nyholm

Loc.: 19; on tree bark

**Thuidiaceae** Schimp**Abietinella** Müll. Hal.*Abietinella abietina* (Hedw.) M.Fleisch.

Loc.: 7; on rock.

*A. abietina* (Hedw.) M.Fleisch var. *hystricosa*

(Mitt.) Sakurai

Loc.: 4, 9; on soil, on rock

**Thuidium** Bruch & Schimp.*Thuidium asimile* (Mitt.) A.Jaeger

Loc.: 3, 7, 11; on soil, On rock

- T. delicatulum* (Hedw.) Schimp.  
Loc.: 19; on rock
- Brachytheciaceae** Schimp
- Eurhynchium** Bruch & Schimp.  
*Eurhynchium angustirete* (Broth.) T.J.Kop  
Loc.: 3, 22; on rock  
*E. striatum* (Hedw.) Schimp  
Loc.: 10, 22; on soil
- Pseudoscleropodium** (Limpr.) M.Fleisch.  
*Pseudoscleropodium purum* (Hedw.) M.Fleisch.  
Loc.: 12, 13; on soil
- Rhynchostegium** Bruch & Schimp.  
#*Rhynchostegium alopecuroides* (Brid.) A.J.E.Sm.,  
Loc.: 1, 3, 7, 9; on wet soil, on rock, on soil
- Rhynchostegiella** (Schimp.) Limpr.  
#*Rhynchostegiella litorea* (De Not.) Limpr.,  
Loc.: 20; on soil
- Brachytheciastrum** Ignatov & Huttunen.  
#*Brachytheciastrum collinum* (Schleich. ex Müll.Hal.) Ignatov & Huttunen  
Loc.: 14, 15; on rock, on soil  
# *B. velutinum* (Hedw.) Ignatov & Huttunen  
Loc.: 3; 15, 17; on rock
- Brachythecium** Schimp.  
*Brachythecium albicans* (Hedw.) Schimp  
Loc.: 12, 13; on soil  
\**B. erythrorrhizon* Schimp  
Loc.: 22; on soil  
#*B. geheebii* Milde  
Loc.: 3, 12, 13; on soil  
# *B. glareosum* (Bruch ex Spruce) Schimp  
Loc.: 1, 3, 4, 7, 12, 13, 19, 22, 23; on wet soil, on soil  
*B. rivulare* Schimp  
Loc.: 1, 3, 5, 8, 9, 11, 12, 13, 14, 15, 16, 19, 23; on wet soil, on soil  
*B. rutabulum* (Hedw.) Schimp  
Loc.: 2, 3, 10, 14, 15, 19, 23, 24; On wet soil, on rock, on soil, on wet rock  
\**Brachythecium turgidum* (Hartm.) Kindb.,  
Loc.: 1, 8, 16, 21; on wet soil, on soil
- Eurhynchiastrum** Ignatov & Huttunen.  
*Eurhynchiastrum pulchellum* (Hedw.) Ignatov & Huttunen  
Loc.: 8, 15, 16, 17, 24; on soil
- Homalothecium** Schimp.  
*Homalothecium lutescens* (Hedw.) H. Rob  
Loc.: 3, 7, 8, 11, 16; on rock  
*H. sericeum* (Hedw.) Schimp  
Loc.: 14; on rock
- Sciuro-hypnum** (Hampe) Hampe.  
\**Sciuro-hypnum latifolium* (Kindb.) Ignatov & Huttunen  
Loc.: 22; on rock  
*S. populeum* (Hedw.) Ignatov & Huttunen  
Loc.: 10; on rock  
#*S. reflexum* (Starke) Ignatov & Huttunen  
Loc.: 19, 20; on rock
- #*S. starkei* (Brid.) Ignatov & Huttunen  
Loc.: 19; on rock
- Hypnaceae** Schimp
- Hypnum** Hedw.  
*Hypnum andoi* A. J. E. Sm  
Loc.: 3; on tree bark  
*H. cupressiforme* Hedw var. *cupressiforme*  
Loc.: 3, 9; on rock  
*H. cupressiforme* Hedw. var. *lacunosum* Brid.  
Loc.: 11, 14, 23; on rock  
#*H. cupressiforme* Hedw. var. *subjulaceum* Molendo  
Loc.: 19; on rock  
#*H. jutlandicum* Holmen & E.Warncke  
Loc.: 8, 10, 11, 14, 16, 19, 20, 22; on soil, on rock  
*H. resupinatum* Taylor  
Loc.: 7, 9, 12, 13; on rock
- Jocheniaceae** Jan Kučera & Ignatov
- Jochenia** Hedenäs, Schlesak & D.Quandt.  
\**Jochenia pallescens* (Hedw.) Hedenäs, Schlesak & D.Quandt [Synonymous: *Hypnum pallescens* (Hedw.) P. Beauv.]  
Loc.: 19; on soil
- Pylaisiaceae** Schimp.
- Buckia** D.Rios, M.T. Gallego & J.Guerra.  
# *Buckia vaucheri* (Lesq.) D.Rios, M.T. Gallego & J.Guerra [Synonymous: *Hypnum vaucheri* Lesq.]  
Loc.: 19; on rock
- Calliergonella** Loeske.  
*Calliergonella cuspidata* (Hedw.) Loeske  
Loc.: 14; on wet soil, submerged, near stream  
*C. lindbergii* (Mitt.) Hedenäs  
Loc.: 1; on wet soil
- Pseudohygrohypnum** Kanda  
#*Pseudohygrohypnum eugyrium* (Schimp.) Kanda [Synonymous: *Hygrohypnum eugyrium* (Schimp.) Broth.]  
Loc.: 3; on rock, submerged
- Pylaisia** Schimp.  
# *Pylaisia polyantha* (Hedw.) Schimp.  
Loc.: 4; on rock,
- Roaldia** P.E.A.S.Câmara & Carv.-Silva.  
*Roaldia revoluta* (Mitt.) P. E. A S.Câmara & M. Carvalho-Silva [Synonymous: *Hypnum revolutum* (Mitt.) Lindb.]  
Loc.: 17, 18, 22; on soil
- Hylocomiaceae** M.Fleisch
- Hylocomiadelphus** Ochyra & Stebel.  
*Hylocomiadelphus triquetrus* (Hedw.) Ochyra & Stebel  
Loc.: 3, 5, 8, 9, 10, 11, 12, 13, 15, 16, 19, 24; on soil, on rock
- Hylocomiastrum** Broth  
*Hylocomiastrum pyrenaicum* (Spruce) M.Fleisch. ex Broth.,  
Loc.: 3, 5, 8, 9, 10, 11, 16; on rock
- Hylocomium** Bruch & Schimp.  
*Hylocomium splendens* (Hedw.) Schimp

Loc.: 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 19, 24; on rock, on soil

**Pleurozium** Mitt.

*Pleurozium schreberi* (Willd. ex Brid.) Mitt

Loc.: 12, 13; on soil,

**Rhytidiadelphus** (Limpr.) Warnst.

*Rhytidiadelphus squarrosus* (Hedw.) Warnst.

Loc.: 19; on rock

**Rhytidiaceae** Broth.

**Rhytidium** (Sull.) Kindb.

*Rhytidium rugosum* (Hedw.) Kindb.

Loc.: 3, 5, 6, 7, 9, 10, 11, 12, 13, 19; on rock

**Entodontaceae** Kindb.

**Entodon** Müll. Hal.

*Entodon concinnus* (De Not.) Paris

Loc.: 4, 9; on soil

**Leucodontaceae** Schimp

**Leucodon** Schwägr.

# *Leucodon immersus* Lindb

Loc.: 3, 7, 14; on rock

*L. sciuroides* (Hedw.) Schwägr.

Loc.: 3, 14; on tree bark, on soil

**Neckeraceae** Schimp

*Alleniella* S.Olsson, Enroth & D.Quandt.

*Alleniella complanata* (Hedw.) S.Olsson, Enroth &

D.Quandt

Loc.: 3; on tree bark

*Exsertotheca* S. Olsson, Enroth & D.Quandt.

*Exsertotheca crispa* (Hedw.) S.Olsson, Enroth & D.Quandt

Loc.: 3, 4; on soil, on rock

**Neckera** Hedw.

\**Neckera pumila* Hedw.

Loc.: 3; on tree bark

**Thamnobryum** Nieuwl.

# *Thamnobryum alopecurum* (Hedw.) Gangulee.

Loc.: 3; on tree bark

# *Thamnobryum neckeroides* (Hook.) E.Lawton,

Loc.: 19; on tree bark

**Heterocladaceae** Ignatov & Fedosov

**Heterocladia** Ignatov & Fedosov.

# *Heterocladia dimorpha* (Brid.) Ignatov & Fedosov [Synonymous: *Heterocladium dimorphum* (Brid.) Schimp.]

Loc.: 15, 17, 18, 20, 23, 24; on rock, on soil

**Lembophyllaceae** Broth.

**Isothecium** Brid.

*Isothecium alopecuroides* (Lam. ex Dubois) Isov

Loc.: 3, 9, 10, 11, 12, 13, 23; on rock, on tree bark, on soil

# *Isothecium interludens* Stirt.,

Loc.: 3; on rock

**Myuriaceae** M.Fleisch

**Ctenidium** (Schimp.) Mitt.

*Ctenidium molluscum* (Hedw.) Mitt

Loc.: 3, 11; on rock, on soil

**Anomodontaceae** Kindb

*Anomodon* Hook. & Taylor.

*Anomodon rugelii* (Müll.Hal.) Keissl

Loc.: 19; on tree bark

The liverwort families with the highest taxon numbers are Scapaniaceae with 6 taxa (13.04 %), Anastrophyllaceae with 5 taxa (10.87 %), and Gymnomitriaceae with 4 taxa (8.7 %). The liverwort families with the lowest taxon numbers are Jungermanniaceae, Blepharostomataceae, Conocephalaceae, Frullaniaceae, Lejeuneaceae, Marchantiaceae, Metzgeriaceae, Adelanthaceae, and Porellaceae, respectively, with a percentage of 2.17%.

The moss families with the highest taxon numbers are Grimmiaceae with 27 taxa (11.07%), Bryaceae with 26 taxa (10.66%), and Brachytheciaceae with 21 taxa (8.61%). The moss families with the lowest taxon numbers are Leucobryaceae, Myuriaceae, Amphidiaceae, Anomodontaceae, Aulacomniaceae, Climaciaceae, Distichiaceae, Ditrichaceae, Entodontaceae, Heterocladaceae, Jocheniaceae, Pseudoleskeellaceae, Pterigynandraceae, Rhytidiaceae, Saelaniaceae with a percentage of 0.41%.

Hornwort is represented by 1 family and 1 taxon.

The most common liverwort genera are *Scapania* (5), *Barbilophozia* (4), *Lophozia* (3), and *Solenostoma* (3). Other liverwort genera have two or fewer taxa.

The most common moss genera are *Ptychostomum* (17), *Grimmia* (11), *Racomitrium* (10), *Sphagnum* (8), *Dicranum* (7), *Plagiomnium* (7), *Brachythecium* (7), *Lescurea* (7), *Hypnum* (6), *Mnium* (6), *Syntrichia* (6), *Plagiothecium* (5), and *Philonotis* (5). Other moss genera have four or fewer taxa.

The most common liverworts taxa are *Barbilophozia barbata*, *B. hatcheri*, *Lophozia longiflora*, *L. ventricosa*, *Diplophyllum taxifolium*, *Scapania irrigua*, *Solenostoma hyalinum*, *S. sphaerocarpum*, *Chiloscyphus pallescens*, *C. polyanthos*, *Pedinophyllum interruptum*, *Plagiochila asplenioides*, *P. porelloides*, *Radula complanata*, *R. lindenberiana*, *Metzgeria furcata*, *Conocephalum conicum*.

The most common moss taxa are *Andreaea alpestris*, *A. mutabilis*, *Pogonatum urnigerum*, *Polytrichastrum alpinum*, *Polytrichum juniperinum*, *P. piliferum*, *Distichium capillaceum*, *Hymenoloma crispulum*, *Dicranum bonjeanii*, *D. scoparium*, *D. spadiceum*, *Syntrichia norvegica*, *S. ruraliformis*, *S. ruralis*, *Tortella tortuosa*, *Saelania glaucescens*, *Racomitrium affine*, *R. canescens*

subsp. *canescens*, *R. macounii* subsp. *alpinum*, *R. macounii* subsp. *macounii*, *R. sudeticum*, *Grimmia alpestris*, *G. funalis*, *G. hartmanii*, *Bartramia ithyphylla*, *Philonotis seriata*, *Ptychostomum donianum*, *P. inclinatum*, *P. moravicum*, *P. pallescens*, *P. pseudotriquetrum* var. *pseudotriquetrum*, *P. schleicheri*, *Rhodobryum ontariense*, *Pohlia cruda*, *Mnium lycopodioides*, *M. spinulosum*, *Rhizomnium punctatum*, *Aulacomnium palustre*, *Pterigynandrum filiforme*, *Climacium dendroides*, *Campylium protensum*, *Sanionia uncinata*, *Lescurea incurvata*, *L. radicata*, *L. saxicola*, *Brachythecium rivulare*, *B. rutabulum*, *Hypnum jutlandicum*, *Hylocomiadelphus triquetrus*, *Hylocomiastrum pyrenaicum*, *Hylocomium splendens*, *Rhytidium rugosum*, *Heterocladiella dimorpha*, *Isothecium alopecuroides*.

When station data are examined, liverworts such as *Plagiochila porelloides*, *Plagiochila asplenoides*, *Diplophyllum taxifolium*, *Conocephalum conicum*, *Radula complanata*, *Chiloscyphus polyanthos*, *Metzgeria furcata*, *Barbilophozia barbata*, *Solenostoma hyalinum*, *Solenostoma sphaerocarpum*, *Pedinophyllum interruptum*, and *Scapania undulata* are commonly found on soil and on wet soil, whereas mosses such as *Brachythecium rutabulum*, *Rhizomnium punctatum*, *Brachythecium rivulare*, *Philonotis seriata*, *Philonotis fontana*, *Climacium dendroides*, *Campylium protensum*, *Ptychostomum pseudotriquetrum* var. *pseudotriquetrum*, *Palustriella falcata*, *Palustriella decipiens*, and *Palustriella commutata* are generally concentrated on wet or moist soil and are commonly found in aquatic and streamside vegetation types. Submerged; *Sphagnum capillifolium*, *Fontinalis antipyretica*, *Fontinalis squamosa*, *Hygrohypnum luridum*, *Platyhypnum duriusculum*, *P. molle*; while on rock substrates, species such as *Grimmia funalis*, *Racomitrium canescens*, *Schistidium papillosum*, *Syntrichia ruraliformis*, *Lescurea incurvata*, *L. saxicola*, *Mnium lycopodioides*, *Rhytidium rugosum*, *Pohlia cruda*, *Bartramia ithyphylla*, *Tortella tortuosa*, *Saelania glaucescens*, *Andreaea alpestris*, and *Andreaea mutabilis* were predominantly identified. *Distichium capillaceum*, *Dicranum scoparium*, *Polytrichastrum alpinum*, *Polytrichastrum juniperinum*, *Hymenoloma crispulum*, *Sanionia uncinata*, *Hylocomium splendens*, *Hylocomiadelphus triquetrus*, *Ptychostomum donianum*, *Brachythecium glareosum*, and *Hypnum jutlandicum*, were observed on soil.

When the habitat distributions of 291 bryophyte specimens identified in the study area were examined, it was observed that the majority of the

species were found on rocks (121 taxa, 41.58%), followed by habitats on soil (85 taxa, 29.21%) and wet soil (44 taxa, 15.12%). submerged and tree trunk areas were identified as relatively less preferred microhabitats, with (17 taxa 5.84%) each, whereas the lowest proportion was found in habitats on wet rocks (7 taxa, 2.41%).

## Declarations

### Authors' contributions

Idea/Concept: ZGK, HE, NB. Conceptualization and design: ZGK, HE, NB. Auditing/ Consulting: ZGK, HE, NB. Resources: ZGK, HE, NB. Materials: ZGK, HE, NB. Data Collection & Processing: ZGK, HE, NB. Analysis & Interpretation: ZGK, HE, NB. Literature Review: ZGK, HE, NB. Writing: ZGK, HE, NB. Critical Review: ZGK, HE, NB.

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## Conflict of interest

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

## Ethics approval and consent to participate

The authors declare that ethical approval was not required for this study.

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