The Bryophyte Flora of Kümbet High Plateau (Dereli district, Turkey)

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Abstract

As a result of bryological researches in the Kümbet High Plateau of Giresun province (Turkey), a total of 289 bryophyte taxa belonging to 131 genera and 64 families, of which are 50 liverworts and 239 mosses, were determined from 40 different localities. Among them, Neckera pumila and Pseudephemerum nitidum new to A4 grid square and all bryophyte taxa are new for Kümbet high plateau. Collected localities and substrata are presented at bryofloristic list.

Key words: Biodiversity, Bryophyte, Flora, Kümbet, Turkey.

Kümbet Yaylası Briyofit Florası (Dereli, Türkiye)

Öz

Giresun ili Kümbet Yaylası'nda yapılan briyolojik araştırmalar sonucunda, 40 farklı lokaliteden 64 familyaya ve 131 cinse ait, 50 ciğerotu ve 239 yapraklı kara koşunun üstüne toplam 289 briyofit taksonu tespit edilmişdir. Neckera pumila ve Pseudephemerum nitidum A4 karesi için yenidir ve tüm briyofit taksonları Kümbet yaylası için yenidir. Toplanma lokaliteleri ve substratlar briyofloristik listede verilmiştir.

Anahtar kelimeler: Biyoçeşitlilik, Briyofit, Flora, Kümbet, Türkiye

1. Introduction

Kümbet Plateau, which is located within the borders of Dereli district of Giresun province and it is surrounded by Giresun to the north, Yağlıdere and Keşap to the east, Şebinkarahisar to the south, and Bulancak to the west (Fig. 1).

The Giresun Mountains (e.g. Kümbet High Plateau) belong to the East Black Sea Mountains and they are situated in the north east of Turkey. Kümbet High Plateau is located in the northern part of the Giresun Mountains. The Giresun Mountains are very high and near the Black Sea. From the summit of these mountains, a lot of streams and rivers flow through deep valleys into the Black Sea. Oceanic climate prevails in the northern part of the Giresun Mountains. The mild, damp oceanic climate with high and evenly distributed rainfall makes biodiversity very rich. Kümbet plateau, summers are warm and humid, and winters are cool, snowy, and damp (Anşin, 1981; Sesli et al., 2015; Erata et al., 2021).

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Research area is covered mixed forest and the dominant taxa in the main vegetation are *Alnus glutinosa* (L.) Gaertn., *Carpinus betulus* L., *C. orientalis* Mill., *Corylus avellana* Thunb., *Acer platanoides* L., *Tilia rubra* DC, *Ilex colchica* Pojk., *Daphne pontica* L., *Castanea sativa* Mill., *Fagus orientalis* Lipsky, *Picea orientalis* (L.) Peterm., *Pinus sylvestris* L., *Abies nordmanniana* (Stev.) Spach. subsp. *nordmanniana*, *Rhododendron luteum* Sweet, *R. ponticum* L. *Salix* sp., *Betula* sp. and various *Quercus* (Anşin, 1981; Sesli et al., 2015; Erata et al., 2021).

2. Materials and Methods
The bryophyte samples were collected by authors in 40 different localities (Table 1) between 08 July 2019 and 30 August 2020 from KünBet high plateau in Turkey (Fig. 1). The bryophyte samples were examined with stereomicroscope and light microscope. Identifications were determined by consulting various floras and keys (Crum and Anderson, 1981; Nyholm, 1986, 1989, 1993, 1998; Lewinsky, 1993; Blom, 1996; Smith, 2004; Paton, 1999; Pedrotti, 2001, 2006; Greven, 2003; Heyn and Herrnstadt, 2004; Frey et al., 2006; Guerra et al., 2006, 2010, 2014, 2018; Brugués et al., 2007; Kürschner and Frey, 2011).
Figure 2. Some ecosystem types from Kümbet high plateau

Table 1. The collection localities.

| No | Locality                                                                 | Altitude Sea Level (m) | Date       |
|----|--------------------------------------------------------------------------|------------------------|------------|
| 1  | Kümbet: Cimbirtlık Forest Management warehouse-1, 40°35'28"N/38°26'59"E | 1230-1260              | 08.07.2019 |
| 2  | Kümbet: Upper part of Cimbirtlık Forest Management warehouse, 40°35'08"N/38°26'43"E | 1270-1350              | 08.07.2019 |
| 3  | Kümbet: Upper part of Yüceköy, Southeastern hillside, 40°34'56"N/38°26'54"E | 1450-1420              | 08.07.2019 |
| 4  | Kümbet: Armutalan high plateau, 40°34'17"N/38°25'18"E                    | 1430                   | 09.07.2019 |
| 5  | Kümbet: Samayil high plateau, 40°35'41"N/38°24'59"E                      | 1800-1850              | 09.07.2019 |
| 6  | Kümbet: Between Kümbet center and Keşoğ high plateau, 40°35'41"N/38°24'59"E | 1780-1800              | 09.07.2019 |
| 7  | Kümbet: Ayaçılık Hill, 40°34'04"N/38°25'41"E                            | 1810-1850              | 09.07.2019 |
| 8  | Kümbet: Between Kümbet Kümbet center and Şıh high plateau, 2. Km, 40°33'20"N/38°28'28"E | 1720-1730              | 09.07.2019 |
| 9  | Kümbet: Başoba high plateau, 40°31'48"N/38°29'01"E                      | 2000-2050              | 10.07.2019 |
| 10 | Kümbet: Çeğerli high plateau, 40°33'35"N/38°29'20"E                     | 1927                   | 10.07.2019 |
| 11 | Kümbet: Koç Kayası Nature Park -1, 40°34'58"N/38°29'02"E                | 2110-2130              | 10.07.2019 |
| 12 | Kümbet: Koç Kayası Nature Park-2, 40°33'50"N/38°28'47"E                 | 1910-1950              | 10.07.2019 |
| 13 | Kümbet: Köyyeri high plateau, 40°31'28"N/38°26'29"E                     | 1620                   | 11.07.2019 |
| 14 | Kümbet: Homorlu high plateau, 40°32'49"N/38°26'14"E                     | 1600                   | 11.07.2019 |
| 15 | Kümbet: Elemeği high plateau, 40°31'59"N/38°25'39"E                     | 1910-1930              | 11.07.2019 |
3. Results and Discussion

3.1. Results

As a result of the study, 50 liverwort taxa (belonging to 21 families and 30 genera), 239 moss taxa (belonging to 43 families and 101 genera) and a total of 289 bryophyte taxa (belonging to 64 families and 131 genera) were determined.

For each taxa, their localities and substrate were given in the floristic list. Taxa for new Giresun province is indicated with (#) bryofloristic list. Also new for A4 square is indicated with (+) in the bryofloristic list.

**Bryofloristic list**

**Marchantiophyta**

**Anastrophyllaceae** L.Söderstr., De Roo & Hedl.

**Barbilophozia** Loeske

*Barbilophozia barbata* (Schmidl ex Schreb.) Loeske – Loc.: 11, 15, 25, 33; on rock, on soil.

*B. hatcheri* (A. Evans) Loeske – Loc.: 23; on rock.

#B. lycopodioides* (Wallr.) Loeske – Loc.: 19; on rock.

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Nomenclature of the species and synonym status were evaluated by reviewing Hodgetts et al. (2020). The status of bryophyte taxa was appraised by reviewing related literature for Giresun Province (Özdemir and Batan, 2017a; Erata et al., 2018). The status of bryophyte taxa was evaluated by reviewing related literature for the A4 square (Abay et al., 2016; Özdemir and Batan, 2017 a, b; Erata et al., 2018). Bryophyte samples are deposited in the private herbarium of Hüseyin ERATA at the Bayramiç vocational school, Çanakkale Onsekiz Mart University (Çanakkale), Turkey.
Jungermanniaceae

Gymnocoela (Dumort.) Dumort. Gymnocoela inflata (Huds.) Dumort. – Loc.: 12; on wet soil.

Sphenolobus (Lindb.) Berggr. Sphenolobus minutus (Schreb.) Berggr. (Syn: Anastrophylum minutum (Schreb.) Schust.) – Loc.: 11, 12; on soil.

Cephaloziellaceae

Cephaloziella divaricata (Dumort.) Dumort. – Loc.: 26, 33, 39; on soil, on wet soil.

Cephalozia bicuspidata (L.) Dumort. – Loc.: 12; on soil.

Anastrophyllum minutum (Lindb.) Lindb. – Loc.: 15, 16, 26, 28, 31, 33, 35, 39; on soil, on rock, on a dead tree trunk.

Lepidoziaceae

Lepidozia reptans (Lyell) Mitt. – Loc.: 3, 17, 26, 39; on wet soil, on rock, on a dead tree trunk.

Lepidozia (Dumort.) Dumort. Lepidozia reptans (L.) Dumort. – Loc.: 3, 6, 40; on a dead tree trunk.

Lepidoziaceae

Lophocoleaceae

Lophocolea bidentata (L.) Dumort. – Loc.: 15, 16, 26, 31, 33, 35; on wet soil, on rock, on a dead tree trunk.

L. minor Nees. – Loc.: 1, 7, 12, 16, 40; on soil, on a dead tree trunk.

Plagiochilaceae

Plagiochila (Dumort.) Dumort. Plagiochila asplenioides (L. emend. Taylor) Dumort. – Loc.: 1, 2, 3, 6, 8, 10, 12, 17, 18, 19, 20, 22, 24, 25, 26, 28, 31, 34, 35, 36, 40; on wet soil, on rock, on a dead tree trunk.

P. pinnata (Dumort.) Dumort. – Loc.: 1, 2, 3, 6, 8, 10, 12, 13, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 28, 31, 32, 33, 35, 36, 40; on soil, on rock, on a dead tree trunk.

P. pinnata (Dumort.) Dumort. – Loc.: 1, 2, 3, 6, 8, 10, 12, 13, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 28, 31, 32, 33, 35, 36, 40; on soil, on rock, on a dead tree trunk.
Polytrichum codaeana (Huebener) Moore – Loc.: 10, 31; on rock, on tree bark.
P. platyphylla (L.) Pfeiff. – Loc.: 2, 3, 37, 39; on rock, on tree bark.
Radulaceae Müll. Frib.
Radula Dumort.
Radula complanata (L.) Dumort. – Loc.: 1, 11, 19, 20, 29, 35, 36; on rock, on tree bark.
R. lindenbergiana Gottsche ex C. Hartm. – Loc.: 1, 6, 8, 10, 13, 15, 16, 22, 24, 29, 31, 33, 35.; on rock, on tree bark.

Aneuracea H. Klinggr.

Riccardia Gray
*Riccardia multifida* (L.) Gray – Loc.: 14; on wet soil.
*R. palmata* (Hedw.) Carruth. – Loc.: 8; on wet soil.

Metzgeriaceae H. Klinggr.

Metzgeria Raddi
Metzgeria conjugata Lindb. – Loc.: 8; on soil.

Pelliaceae H. Klinggr
Pellia Raddi
Apopellia endiviifolia (Dicks.) Nebel & D.Quandt. – Loc.: 4, 5, 18, 28; on wet soil.
Pellia epiphylla (L.) Corda – Loc.: 1, 3, 5, 6, 10, 12, 19, 22, 23, 31, 36; on wet soil.

Conocephalaceae Müll. Frib. Ex Grolle
Conocephalum Hill
Conocephalum conicum (L.) Dumort. – Loc.: 1, 2, 3, 6, 9, 17, 21, 28, 39, 40; on wet rock and on wet
Marchantiacae Lindl.
Marchantia L.
Marchantia polymorpha L. – Loc.: 6, 7, 10, 13, 16, 18, 19, 20, 29, 30, 31, 32, 35, 36, 37, 38; on wet soil.

Bryophyta
Sphagnaceae Dumort.
Sphagnum L.
*Sphagnum auriculatum* (Schimp.) Ångstr. – Loc.: 25, 26; on wet soil in bog.
*S. fallax* (H. Klinggr.) H. Klinggr. – Loc.: 26, 27; on wet soil in bog.
S. inundatum (Schimp.) M. Stech. – Loc.: 26; on wet soil in bog.
*S. platyphyllum* (Lindb. ex Braithw.) Warnst. – Loc.: 23, 25, 26; on wet soil in bog.
*S. squarrosum* (Crome – Loc.: 26; on wet soil in bog.
S. subsecundum (Schim. – Loc.: 26, 27; on wet soil in bog.
*S. teres* (Schimp.) Ángstr. – Loc.: 26; on wet soil in bog.

Polytrichaceae Schwag.

Atrichum P. Beauv.
*Atrichum tenellum* (Röhl) Bruch & Schimp. – Loc.: 4, 9; on soil.
A. undulatum (Hedw.) P. Beauv. – Loc.: 1, 2, 4, 5, 6, 7, 9, 13, 18, 21, 28, 29, 31, 35, 39, 40; on soil.

Pogonatum P. Beauv.
Pogonatum aloides (Hedw.) P. Beauv. – Loc.: 1, 7, 8, 10, 13, 16, 19, 20, 30, 31, 32, 35; on soil, on rock.
P. urnigerum (Hedw.) P. Beauv. – Loc.: 3, 4, 5, 9, 14, 17, 28; on soil, on rock.

Polytrichastrum Hedw.

Polytrichastrum alpinum (Hedw.) G.L.Sm. – Loc.: 2, 7; on soil.

Polytrichum Hedw.
Polytrichum commune Hedw. – Loc.: 1, 4, 8, 12, 13, 18, 26, 35; on soil.
P. formosum Hedw. – Loc.: 2, 3, 9, 12, 13, 14, 17, 19, 22, 26, 29, 32, 35, 36, 38, 39, 40; on soil, on rock.
P. juniperinum Hedw. – Loc.: 9, 10, 13, 15, 16, 23, 24, 29, 30, 31, 32, 33, 38; on soil, on rock.
P. piliferum Hedw. – Loc.: 9, 10, 11, 12, 13, 22, 24, 25, 31, 32; on soil, on rock.

Tetraphidaceae Schimp.
Tetraphis Hedw.
Tetraphis pellucida Hedw. – Loc.: 1, 3, 40; on a dead tree trunk.

Encalyptaceae Schimp.

Encalypta Dixon

Encalypta ciliata Hedw. – Loc.: 8, 14, 15, 33, 39; on rock.
E. streptocarpa Hedw. – Loc.: 16, 17; on rock.
E. vulgaris Hedw. – Loc.: 8, 14; on rock.

Funariaceae Schwag.

Funaria Hedw.

Funaria hygrometrica Hedw. – Loc.: 11, 18, 35; on soil.

Hymenolomataceae Ignatov & Fedosov

Hymenoloma Dusén

Hymenoloma compactum (Schwägr.) Ochyra – Loc.: 17; on rock.

H. crispalum (Hedw.) Ochyra. – Loc.: 11, 15, 22, 25, 33; on soil, on rock.

Flexitrichaceae Ignatow & Fedosov

Flexitrichum Ignatow & Fedosov

Flexitrichum flexicaule (Schwägr.) Ignatow & Fedosov (Syn: Ditrichum flexicaule (Schwägr.) Hampe) – Loc.: 11, 29, 30; on soil, on rock.

F. gracile (Mitt.) Ignatow & Fedosov (Syn: Ditrichum gracile (Mitt.) Kunz) – Loc.: 9, 14; on soil, on rock.

Leucobryaceae Schimp.

Dicranodontium Bruch & Schimp.

Dicranodontium denuudatum (Brid.) E. Britton. – Loc.: 1, 3, 28; on a dead tree trunk.

Aongstroemiaceae De Not.

Dichodontium Schimp.

Dichodontium pellucidum (Hedw.) Schimp. – Loc.: 1, 3, 4, 7, 11, 12, 25, 28, 39, 39; on soil

Diobelonella Ochyra.

Diobelonella palustris (Dicks.) Ochyra (Syn: Dichodontium palustre (Dicks.) M. Stech.) – Loc.: 5, 9, 22, 26; on soil.

Dicranellaceae M. Stech

Dicranella (Müll.Hal.) Schimp.

Dicranella heteromalla (Hedw.) Schimp. – Loc.: 1, 5, 7, 13, 32; on soil.

D. rufescens (Dicks.) Schimp. – Loc.: 26; on soil.

Fissidentaceae Schimp.

Fissidens Hedw.

Fissidens adiantoides Hedw. – Loc.: 8, 12, 22; on soil, on the rock cracks.
F. dubius P. Beav. – Loc.: 2, 9, 11, 25, 29; on wet soil, on the rock cracks.
#F. taxifolius Hedw. – Loc.: 1, 3, 5, 6, 9, 29, 31, 37; on soil, on the rock cracks.

**Dicranaceae** Schimp.

**Dicranum** Hedw.

*Dicranum bonjeanii* De Not. – Loc.: 1, 22; on soil.

*D. majus* Turner. – Loc.: 29; on soil.

*D. polysetum* Sw. ex anon. – Loc.: 34; on soil.

*D. scoparium* Hedw. – Loc.: 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15, 18, 19, 23, 25, 29, 32, 33, 34, 35, 36, 38, 39; on soil, on rock, on a dead tree trunk.

#D. *spadiceum* J.E.Zetterst. – Loc.: 11, 15, 24, 25, 26; on soil.

**Rhabdoweisiaceae** Limpr.

**Cynodontium** Bruch & Schimp.

*Cynodontium jenneri* (Schimp.) Stirr. – Loc.: 29; on rock.

**Dicranoweisiaceae** Milde.

*Dicranoweisia cirtata* (Hedw.) Lindb. – Loc.: 8, 12; on soil.

**Kiaeria** I. Hagen

*Kiaeria starkeri* (F. Weber & D. Mohr) I. Hagen – Loc.: 12; on soil.

**Ditrichaceae** Limpr.

**Ceratodon** Brid.

*Ceratodon purpureus* (Hedw.) Brid. – Loc.: 1, 2, 5, 6, 12, 13, 15, 16, 17, 21, 23, 29, 32, 38, 40; on soil; on rock.

**Pseudobepherum** (Lindb.) I.Hagen

#*Pseudobepherum nitidum* (Hedw.) Loeske – Loc.: 9; on wet soil.

**Pottiacae** Schimp.

*Anoectangium* Schwaegr.

*Anoectangium aevitum* (Hedw.) Mitt. – Loc.: 12, 16, 17, 38; on rock.

**Bryoerythrophyllum** P.C.Chen.

*Bryoerythrophyllum recurvirostrum* (Hedw.) P.C. Chen. – Loc.: 11, 14, 17, 25, 38; on rock.

**Chionoloma** Dixon

*Chionoloma teniostre* (Hook. & Taylor) M.Alonso, MJ.Cano & JAJiménez (Syn: *Oxystegus tenuirostris* (Hook. & Taylor) A.J.E.Sm.) – Loc.: 1, 4; on rock.

**Didymodon** Hedw.

*Didymodon ferrugineus* (Schimp. ex Besch.) M.O.Hill. – Loc.: 1, 2; on soil, on rock.

*D. luridus* Hornsch. – Loc.: 38; on rock.

*D. tophaceus* (Brid.) Lisa. – Loc.: 1; on rock.

*D. vinealis* (Brid.) R.H.Zander – Loc.: 1; on rock.

**Syntrichia** Brid.

*Syntrichia montana* Nees – Loc.: 14, 30, 39; on soil, on rock.

*S. norvegica* F.Weber – Loc.: 38; on rock.

*S. ruraliformis* (Besch.) Mans. (Syn: *S. ruralis* (Hedw.) F.Weber & D.Mohr var. *ruraliformis* (Besch.) Delogne) – Loc.: 16, 19, 20, 38; on soil, on rock.

*S. ruralis* (Hedw.) F.Weber & D.Mohr – Loc.: 2, 10, 11, 13, 15, 19, 23, 25, 30, 31, 32, 33, 36; on soil, on rock.

**Syntrichia virescens** (De Not.) Ochyra – Loc.: 17; on rock.

**Tortella** (Müll.Hal.) Limpr.

*Tortella fragilis* (Hook. & Wilson) Limpr. – Loc.: 7; on rock.

#T. humilis* (Hedw.) Jenn. – Loc.: 28; on rock.

#T. nitida* (Lindb.) Broth. – Loc.: 3, 6, 7, 11; on soil, on rock.

*T. tortuosa* (Hedw.) Limpr. – Loc.: 1, 2, 4, 8, 10, 11, 12, 15, 16, 17, 22, 25, 28, 30, 31, 33, 37, 38, 39; on soil, on rock.

**Tortula** Hedw.

*Tortula marginata* (Bruch & Schimp.) Spruce. – Loc.: 2, 6, 10, 18, 31, 35, 39, 40; on soil, on rock.

#T. mucronifolia* Schwägr. – Loc.: 15, 17; on rock.

*T. subulata* Hedw. – Loc.: 1, 4, 5, 7, 8, 11, 15, 25, 29, 30, 33, 38; on soil, on rock.

**Weissia** Hedw.

#*Weissia brachycarpa* (Nees & Hornsch.) Jur. – Loc.: 7; on soil.

*W. controversa* Hedw. – Loc.: 8, 11, 22, 25; on soil.

**Saellaniae** Ignatov & Fedosov

**Saellania** Lindb.

#*Saellania glaucescens* (Hedw.) Broth. – Loc.: 7, 11, 25; on rock.

**Grimmiaceae** Arn.

**Grimmia** Hedw.

#*Grimmia anomala* Hampe ex Schimp. – Loc.: 14; on rock.

*G. alpestris* (Weber & Mohr) Schleicher. – Loc.: 13, 15, 17, 22, 24, 30, 32, 33, 38; on rock.

*G. dissimulata* E.Maier. – Loc.: 10, 24, 31; on rock.

#*G. elatior* Bruch ex Bals.-Crv. & De Not. – Loc.: 11, 25, 30; on rock.

*G. elongata* Kaulf. – Loc.: 24; on rock.

#*G. funalis* (Schwaegr.) Bruch & Schimp. – Loc.: 4, 11, 17, 25, 30, 38; on rock.

*G. hartmannii* Schimp. – Loc.: 2, 8, 10, 11, 12, 15, 16, 22, 23, 24, 25, 30, 31, 33; on rock.

*G. longirostris* Hook. – Loc.: 11, 15, 25; on rock.

*G. montana* Bruch & Schimp. – Loc.: 9, 38; on rock.

*G. muehlenbeckii* Schimp. – Loc.: 38; on rock.

*G. ovalis* (Hedw.) Lindb. – Loc.: 13, 32; on rock.

*G. pulvinata* (Hedw.) Sm. – Loc.: 14; on rock.

**Racomitrium** Brid.

*Racomitrium aciculare* (Hedw.) Brid. – Loc.: 8; on rock.

*R. affine* (F. Weber & D. Mohr) Lindb. – Loc.: 13, 32; on rock.

*R. aquaticum* (Brid. ex Schrad.) Brid. – Loc.: 12; on rock.

*R. canescens* (Hedw.) Brid. – Loc.: 11, 13, 15, 19, 20, 25, 32, 33, 36; on rock.

*R. elongatum* Ehrh. ex Frisvoll – Loc.: 9, 16, 19, 23, 29, 36, 40; on rock.

*R. ericoides* Brid. – Loc.: 2, 10, 16, 22, 24, 29, 31, 34; on rock.
R. sudeticum (Funck) Bruch & Schimp. – Loc.: 4, 19, 20, 36; on rock.
Schistidium Bruch & Schimp.
Schistidium apocarposum (Hedw.) Bruch & Schimp. – Loc.: 2, 8, 19, 20, 28, 36; on rock.
S. confertum (Funck) Bruch & Schimp. – Loc.: 2, 10, 11, 17, 25, 31, 30, 38; on rock.
S. crassipilum H.H.Blom – Loc.: 2, 19; on rock.
#S. dupretii (Thér.) W.A.Weber – Loc.: 10, 31, 39; on rock.
S. elegantulum H.H.Blom – Loc.: 13, 17, 32; on rock.
S. flavicium H.H.Blom – Loc.: 11, 39; on rock.
#S. helveticum (Schkuhr) Deguchi – Loc.: 9; on rock.
S. papillosum Culm. – Loc.: 2, 4, 11, 14, 15, 16, 17, 25, 33; on rock.
S. platyphylloides (Mitt.) H.Perss. – Loc.: 14; on rock.
S. rivulare (Brid.) Podp. – Loc.: 11, 15, 19, 33; on rock.
S. trichodon (Brid.) Poelt – Loc.: 2, 9; on rock.
Hedwigia ciliata (Hedw.) P. Beauv.
Hedwiga ciliata (Hedw.) P. Beauv. var. ciliata – Loc.: 11, 13, 14, 15, 17, 25, 30, 32, 33; on rock.
H. emodica Hampe ex Müll.Hal. (Syn: H. ciliata var. leucophaea) Bruch & Schimp. – Loc.: 11, 23, 25, 38; on rock.
Bartramia halleriana Hedw.
Bartramia halleriana Hedw. – Loc.: 1, 8, 11, 14, 16, 19, 20, 25, 36, 39; on wet rock, on the rock cracks.
#B. isothyphilla Brid. – Loc.: 11, 12, 14, 15, 19, 20, 25, 30, 33, 36, 38, 39; on rock, on the rock cracks.
B. pomiformis Hedw – Loc.: 12; on the rock cracks.
Philonotis Brid.
Philonotis caespitosa Jurs. – Loc.: 9, 13, 32; near stream, on wet soil.
P. calcarea (Bruch & Schimp.) Schimp. – Loc.: 9, 10, 13, 29, 31, 32; near stream, on wet soil, on wet rock.
P. fontana (Hedw.) Brid. – Loc.: 1, 5, 9, 13, 18, 19, 20, 22, 23, 28, 30, 32, 35, 36, 38; near stream, on wet soil, on wet rock.
P. seriata Mitt. – Loc.: 9, 22; near stream, on wet soil.
P. tomentella Molendo – Loc.: 10, 31; near stream, on wet soil, on wet rock.
Bryaceae Schwagr.
Bryum Hedw.
Bryum argenteum Hedw. – Loc.: 13, 14, 16, 38; on soil.
B. dichotomum Hedw. – Loc.: 11, 31; on soil.
B. gemmiparum De Not. – Loc.: 13; on soil.
B. schleicheri DC. – Loc.: 5, 9, 19, 20, 26, 30, 36; near stream, on wet soil.
Imbribyrum N.Pedersen
Imbribyrum alpinum (Huds. ex With.) N. Pedersen – Loc.: 2, 7, 13, 16, 17, 32; on wet soil.
Ptychostomum Hornsch.
Ptychostomum capillare (Hedw.) Holyoak & N. Pedersen. – Loc.: 22, 35; on soil.
P. creberrimum (Taylor) J.R. Spence & H.P. Ramsay (Syn: Bryum creberrimum Taylor) – Loc.: 2, 9, 11, 12, 17; on soil.
P. donium (Grev.) Holyoak & N. Pedersen. – Loc.: 18, 35; on soil.
P. elegans (Nees) D.Bell & Holyoak – Loc.: 1, 7, 19, 20, 21, 23, 36, 40; on soil.
P. imbricatum (Müll. Hal.) Holyoak & N. Pedersen. – Loc.: 6, 13, 17, 19, 24, 30, 31, 32, 36; on soil.
P. moravicum (Podp.) Ros & Mazimpaka. – Loc.: 1, 2, 6, 7, 8, 12, 16, 19, 20, 34, 38, 39; on soil, on tree brak.
P. pellens (Sw.) J.R. Spence – Loc.: 7, 9; on soil.
P. pallescens (Schleich. ex Schwägr.) J.R. Spence – Loc.: 29, 38; on soil.
P. pseudotriquetrum var. bimum (Schreb.) Holyoak & N. Pedersen. – Loc.: 11, 19, 25, 30, 38, 39; near stream, on wet soil.
P. pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay var. pseudotriquetrum – Loc.: 5, 8, 9, 10, 11, 12, 18, 19, 20, 22, 23, 25, 28, 29, 30, 31, 35, 36, 39, 39; near stream, on wet soil.
P. torquescens (Bruch & Schimp.) Ros & Mazimpaka – Loc.: 7; on soil.
Rhodobryum (Schimp.) Limpr.
Rhodobryum onteranise (Kindb.) Kindb. – Loc.: 12; on soil.
Mniaceae Schwagr.
Mniium Hedw.
Mniium hornum Hedw. – Loc.: 8; on wet soil.
M. lycopodioides Schwägr. – Loc.: 38.
M. spinosum (Voit) Schwägr. – Loc.: 4, 5, 6, 7, 8, 12, 13, 15, 16, 18, 19, 20, 21, 24, 29, 32, 33, 34, 35, 36, 39, 40; on wet soil, on a dead tree trunk.
M. spinulosum Bruch & Schimp. – Loc.: 16; on wet soil.
M. stellare Hedw. – Loc.: 14; on wet soil.
M. thomsonii Schimp. – Loc.: 1, 3, 35, 39; on wet soil.
Plagiomnium T.J.Kop.
Plagiomnium affine (Bladow ex Funck) T.J.Kop. – Loc.: 1, 7, 8, 13, 16, 29, 32; on soil, on wet soil.
P. cuspidatum (Hedw.) T.J.Kop. – Loc.: 1, 2; on soil.
P. elatum (Bruch & Schimp.) T.J. Kop. – Loc.: 13, 14, 18, 30, 32, 35; on soil.
P. ellipticum (Brud.) T.J.Kop. – Loc.: 10, 14, 16, 17, 31, 38, 39; on wet soil.
P. medium (Bruch & Schimp.) T.J.Kop. – Loc.: 6, 10, 18, 21, 29, 30, 31, 35, 38, 39, 40; on soil.
P. undulatum (Hedw.) T.J.Kop. – Loc.: 1, 4, 7, 8, 12, 13, 18, 19, 20, 21, 28, 29, 30, 32, 35, 36, 39, 40; on soil, on rock.
Pohlia Hedw.
Pohlia cruda (Hedw.) Lindb. – Loc.: 3, 9, 12, 14, 15, 16, 38, 39; on soil.
P. melanodon (Brid.) A.J. Shaw – Loc.: 16, 39; on wet soil.
P. nutans (Hedw.) Lindb. – Loc.: 12, 38; on wet soil.
P. wahlenbergii (F.Weber & D.Mohr) A.L. Andrews. – Loc.: 1, 8, 12, 16; on wet soil.
Rzihozonium (Broth.) T.J.Kop.
Rzihozonium magnifolium (Horik.) T.J. Kop. – Loc.: 2, 3, 10, 22, 29, 31, 35; on wet soil.
Abietinella abietina (Bruch & Schimp.) Müll.Hal. – Loc.: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 22, 24, 26, 29, 30, 31, 35, 36, 37, 39, 40; on wet soil, on wet rock.

**Campylyphyllopsis** W.R. Buck
#Campylyphyllopsis calcarea (Crundw. Ve Nyholm)

Ochryra (Syn: Campylyphyllum alcarea (Mitt.) Hedenäs.) – Loc.: 12, 22, 24; on wet soil.

**Cratevneuron** (Sull.) Spruce
Cratevneuron filicinum (Hedw.) Spruce. – Loc.: 1, 2, 4, 5, 10, 11, 17, 19, 20, 28, 29, 30, 31, 36; on wet soil, on wet rock.

**Drepanium** (Schimp.) C.E.O. Jensen
Drepanium fastigiatum (Hampe) C.E.O. Jensen (Syn: Hypnum recurvatum (Lindb. & Arnell) Kindb. – Loc.: 29; on rock.

**Hygroamblystegium** Loeske
#Hygroamblystegium flaviatile (Hedw.) Loeske – Loc.: 19, 20; near stream, on wet soil.

**Hygrohypnum** Lindb.
Hygrohypnum luridum (Hedw.) Jenn. – Loc.: 2; near stream, on wet soil.

**Palustriella** Ochryra
Palustriella falcatula (Brud.) Hedenäs. – Loc.: 1, 12, 22, 24, 28, 29, 30; on wet soil.

**Platyhypnum** Loeske
Platyhypnum duriusculum (De Not.) Ochryra (Syn: Hygrohypnum duriusculum (De Not.) D.W. Jamieson) – Loc.: 11, 38; near stream, on wet soil.

**Pseudoamblystegium** Vanderp. & Hedenäs
Pseudoamblystegium subtile (Hedw.) Vanderp. & Hedenäs – Loc.: 3; on tree bark.

**Scorpidiaceae** Ignatov & Ignatova

**Sanionia** Loeske
Sanionia uncinata (Hedw.) Loeske. – Loc.: 1, 2, 3, 5, 6, 7, 8, 9, 10, 12, 14, 18, 19, 21, 22, 24, 26, 29, 31, 35, 36, 37, 40; on soil, on a dead tree trunk.

**Calliergonaceae** Vanderp., Hedenäs, CJCox & AJShaw

**Warnstorfia** Loeske
#Warnstorfia fluviatilis (Hedw.) Loeske – Loc.: 23; near stream, on wet soil.

**Pseudoleskeaceae** Schimp.

**Lescuriae** Schimp.
Lescuriae incurvata (Hedw.) E. Lawton. – Loc.: 15, 19, 20, 22, 24, 30, 33, 38; on rock.

**L. mutabilis** (Brud.) Lindb. ex I. Hagen. – Loc.: 10, 12, 24, 31; on tree bark.

#L. plicata (Schleich. ex F. Weber & D. Mohr) Broth. – Loc.: 15, 33; on soil.

**Pseudoleskeellaceae** Ignatov & Ignatova

**Pseudoleskeellaceae** Ignatov & Ignatova

**Pseudoleskeellaceae** Ignatov & Ignatova

**Thuidiaceae** Schimp.

**Abietinella** Müll.Hal.
Abietinella abietina (Hedw.) M.Fleisch. var. abietina – Loc.: 8, 14, 17, 23, 30, 31, 36; on soil, on rock.
A. abietina (Hedw.) M.Fleisch. var. hystricosa (Mitt.)
Sakurai. – Loc.: 15, 16, 19, 20, 22, 26, 33, 38; on soil,
on rock.
Thuidium Schimp.
Thuidium assimile (Mitt.) A.Jaeger. – Loc.: 1, 2, 6, 10,
15, 16, 22, 26, 31, 33, 37, 39; on soil, on rock, on a dead
tree trunk.
T. delicatulum (Hedw.) Schimp. – Loc.: 9; on soil.
T. recognitum (Hedw.) Lindb. – Loc.: 19, 23; on soil.
T. tamariscinum (Hedw.) Schimp. – Loc.: 1, 2, 7, 12,
21, 28, 29, 31, 35, 40; on soil, on rock, on a dead tree
trunk.

Brachythecium Schimp.
Brachythecium albinums (Hedw.) Schimp. – Loc.: 5, 6,
12, 13, 14, 19, 20, 32, 34, 36; on soil.
B. campestre (Müll.Hal.) Schimp. – Loc.: 1; on soil.
B. cirrosum (Schwägr.) Schimp. – Loc.: 35; on soil
B. glareosum (Bruch ex Spruce) Schimp. – Loc.: 2; on
soil.
B. laetum (Hedw.) Schimp. – Loc.: 1; on soil.
B. mildeanum (Schimp.) Schimp. Ex Milde – Loc.: 2;
on soil.
B. rivulare (Hedw.) Schimp. – Loc.: 1, 7, 10,
12, 16, 18, 19, 20, 21, 22, 24, 26, 28, 29, 30, 31, 32, 33,
35, 36, 37, 38, 39; near stream, on wet soil.
B. rutabulum (Hedw.) Schimp. – Loc.: 1, 9; near
stream, on wet soil.
B. salebrosum (Hoffm. ex F. Weber & D. Mohr)
Schimp. – Loc.: 2, 3; on soil.
Cirriphyllum Grout
Cirriphyllum crassinervium (Taylor) Loeske &
M.Fleisch. – Loc.: 1; 2; on soil, on rock.
C. piliferum (Hedw.) Grout – Loc.: 12; on soil.
Eurhynchastrum Ignatov & Huttunen
Eurhynchastrum pulchellum (Hedw.) Ignatov &
Huttunen. – Loc.: 15, 38; on soil.
Eurhynchastrum Schimp.
Eurhynchastrum angustirete (Broth.) T.J.Kop. – Loc.: 1,
2, 3, 6, 7, 8, 16, 18, 19, 20, 21, 28, 29, 35, 36, 40; on
soil.
E. striatum (Hedw.) Schimp. – Loc.: 6, 39; on soil.
Homalothecium Schimp.
Homalothecium lutescens (Hedw.) H.Rob. – Loc.: 15,
38; on soil, on rock, on a dead tree trunk.
H. philippceanum (Spruce) Schimp. – Loc.: 14, 30, 38;
on soil, on rock.
H. sericeum (Hedw.) Schimp. – Loc.: 14, 17; on soil,
on rock.
Kindbergia Ochyra
Kindbergia praerolong (Hedw.) Ochyra – Loc.: 2, 39;
on soil.
Oxyrrhynchium (Schimp.) Warnst.
Oxyrrhynchium hiuns (Hedw.) Loeske. – Loc.: 1, 3, 8;
on soil, on rock.

O. speciosum (Brid.) Warnst. – Loc.: 12; on soil.
Plasteurhynanchium M.Fleisch. ex Broth.
Plasteurhynanchium striatulum (Spruce) M. Fleisch. –
Loc.: 10, 29, 31; on soil.
Pseudoscleropodium (Limpr.) M.Fleisch.
Pseudoscleropodium purum (Hedw.) M.Fleisch. –
Loc.: 11, 12; on soil.
Rhyneostegium Schimp.
Rhyneostegium riparioides (Hedw.) Cardo – Loc.: 2;
on wet rock.
R. megapolitanum (Blandow ex F.Weber & D.Mohr)
Schimp. – Loc.: 1; on soil.
Siciro-hypnum Hampe
Siciro-hypnum florotianum (Sendtn.) Ignatov &
Huttunen – Loc.: 2; on soil.
S. populeum (Hedw.) Ignatov & Huttunen – Loc.: 17;
on rock.

Hypnaceae Schimp.
Hypnum Hedw.
Hypnum andoi A.J.E.Sm. – Loc.: 1, 2, 16, 17, 28, 34,
39; on rock, on tree bark.
H. bambergeri Schimp. – Loc.: 1, 4, 5, 14, 31, 34; on
rock.
H. callichroum Brid. – Loc.: 8; on rock.
H. cupressiforme var. cupressiforme Hedw. – Loc.: 1,
2, 4, 5, 6, 7, 8, 13, 15, 16, 17, 18, 19, 20, 23, 28, 29, 32,
33, 35, 36, 39; on rock, on tree bark, on a dead
tree trunk.
H. cupressiforme var. filiforme Brid. – Loc.: 1, 3, 5, 6,
7, 12, 16, 18, 29, 34; on soil, on tree bark.
H. cupressiforme var. lacunosum Brid. – Loc.: 1, 7, 10,
13, 14, 15, 23, 31, 32, 38; on soil, on rock.
H. hamulosum Schimp. – Loc.: 5, 11, 14, 16, 29; on
soil.
H. jatlandicum Holmen & E.Warncke. – Loc.: 6, 16; on
soil, on a dead tree trunk.
H. resupinatum Taylor (Syn: Hypnum resupinatum
var. resupinatum) (Taylor) Schimp. – Loc.: 1, 2, 4, 6, 8,
11, 15, 16, 25, 28, 29, 33, 34, 39; on soil, on tree bark.
Pylaisiadelphaceae Grout & W.R.Buck
Platygyrium Schimp.
Platygyrium repens (Brid.) Schimp. – Loc.: 19, 20; on
rock, on soil.
Pylaisiaceae Schimp.
Buckia D.Rios, M.T.Gallego & J.Guerra
Buckia vaucheri (Lesq.) D.Rios, M.T.Gallego &
J.Guerra (Syn: Hypnum vaucheri Lesq.) – Loc.: 8; on
soil.
Calliergonella Loeske
Calliergonella cuspidata (Hedw.) Loeske. – Loc.: 1, 2,
9, 10, 12, 13, 16, 19, 20, 22, 23, 29, 30, 31, 32, 36, 39;
near stream, on wet soil.
C. lindbergii (Mitt.) Hedenäs. – Loc.: 1, 19, 35; on
wet soil.
Homomallium (Schimp.) Loeske
#Homomallium incurvatum (Schrad. ex Brid.) Loeske
– Loc.:10, 12, 19, 20, 31; on rock.
Pylaisia Schimp.
Pylaisia polyantha (Hedw.) Schimp. – Loc.: 1, 19, 20;
on tree bark.
3.2. Discussion

Families with the highest number of species in the study area are the Polytrichaceae (7), Lophocoleaceae (5), Pylaisiadelphaceae (4), and Bartramiaceae (3). The other common genera are Bryoachne (5 members) and Amblystegia (4 members). The species diversity among the genera reflected by the percentage of species growing across the study area second species growing across the study area. The other common genera are Bryoachne (5 members) and Amblystegia (4 members). The species diversity among the genera reflected by the percentage of species growing across the study area. Second species growing across the study area.
Neckera punila, Pseudosphemeron nitidum new record for A4 square, 52 taxa new for Giresun Province and all taxa new for Kumbet high plateau (Dereli district) (Özdemir and Batan, 2017b; Erata et al., 2018).

Barbilophozia lycopodioides, B. sudetica, Lophozia ventricosa, Tritomaria exsecta, Trilophozia quinquedentata, Scapania aequiloba, Solenostoma hylalinum Blepharostoma trichophyllum, Lepidozia reptans, Riccardia multifida, R. palmata, Sphagnum fallax, S. platyphyllum, S. squarrosum, S. teres, Atrichum tenellum, Polytrichastrum alpinum, Encalypta ciliata, Flexitrichum flexicaule, F. gracile, Dicranea rufescens, Fissidens taxifolius, Dicranum spadiceum, Tortella humilis T. nitida, Tortula mucronifolia, Weissia brachycarpa, Saelania glaucescens, Grimmia anomala, G. elatior, G. fanalis, Schistidium dupretii, S. helveticum, Bartramia tymblyphylly, Ptychostomum pallescens, P. turbinatum, Pohlia melanodon, Nyholmiella obtusifolia, Orthotrichum alpestre, O. anomalum, O. tenellum, Pulvigeria lyellii, Herzogiiella seligeri, Plagiothecium latebrolicola, Campylophyllopsis calcarea, Hygroamblystegium flaviale, Warnstorfiella fluitans, Lescurea plicata, Brachyphyteium cirrosus, Hypnum hamulosum and Homomallium incurvaturn are new to Giresun Province (Özdemir and Batan, 2017b; Erata et al., 2018).

These are the some studies carried out in Giresun province (Handel-Mazzetti, 1909; Ünal, 1973; Özdemir and Baydar, 1997; Özdemir, 1999; Özdemir, 2001a, b; Özdemir and Koz, 2005, 2006, 2007; Özdemir and Batan, 2008; Özdemir, 2008; Kırmacı and Kürschner, 2013; Erata et al., 2018). As a results of these studies, in a total 367 bryophyte taxa have been reported in Giresun province. The first bryofloristic studies in the Dereli district of Giresun province was carried out by Özdemir and Koz (2007). In this study, mosses of the area were investigated and 91 taxa were determined in this study.

The present study 52 new bryophyte (40 mosses and 12 liverworts) taxa adds to the bryophyte flora of Giresun province. This study has the highest number of species that has been done in Giresun province so far. Finally, the number of bryophyte taxa of Giresun province reached 419 with the present paper.

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