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Bryophyte Checklist of Giresun, North East Turkey

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Abstract

A check-list of the bryophytes of Giresun province is provided in this study. A total of 252 taxa have been recorded including of 235 taxa (consisting 105 genera) of mosses and 17 taxa (consisting 15 genera) of liverworts. The moss genera including the largest number of taxa are *Grimmia* (11), *Didymodon* (9), *Ptychostomum* (8), *Brachythecium* (6), *Bryum* (6), *Dicranum* (6), *Schistidium* (6), *Sphagnum* (6), *Syntrichia* (6), *Orthotrichum* (6), *Mnium* (5), *Plagiomnium* (5), *Racomitrium* (5) *and Tortella* (5). Besides, *Lophocolea* (2) and *Pellia* (2) are the richest in species number in liverworts. The checklist is given in alphabetical order.

Key Words: Bryophytes, Checklist, Giresun, Turkey

Giresun İli Briyofit Kontrol Listesi, Kuzeydoğu Türkiye

Öz

Bu çalışmada Giresun ili briyofit listesi oluşturulmuştur. Liste, 235 karayosunu taksonu (105 cinse ait) ve 17 ciğerotu taksonu (15 cinse ait) olmak üzere toplam 252 takson içermektedir. En fazla takson içeren yapraklı karayosunu cinsleri, *Grimmia* (11), *Didymodon* (9), *Ptychostomum* (8), *Brachythecium* (6), *Bryum* (6), *Dicranum* (6), *Schistidium* (6), *Sphagnum* (6), *Syntrichia* (6), *Orthotrichum* (6), *Mnium* (5), *Plagiomnium* (5), *Racomitrium* (5) ve *Tortella* (5) dır. Bunun yanında *Lophocolea* (2) ve *Pellia* (2) ise en fazla takson sayısına sahip ciğerotu cinsleridir. Liste alfabetik sıraya göre verilmiştir.

Anahtar Kelimeler: Briyofitler, Kontrol listesi, Giresun, Türkiye

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1. Introduction

Bryofloristic studies have been initiated by foreign researchers (Tchihatcheff, 1860; Juratzka and Milde, 1870; Wettstein, 1889; Barbey, 1890; Schiffner, 1896, 1897; Fritsch, 1900; Schiffner, 1903, 1908; Penther and Zederbauer, 1905; Bornmüller, 1908, 1909; Czeczott, 1939; Henderson and Muirhead, 1955; Henderson, 1957, 1958, 1961a, b, 1964, 1969; Jovet-Ast, 1957; Walther, 1967, 1970; Henderson and Prentice 1969) in Turkey. After a long time, in the 1980s, local bryologists started to work on bryophyte diversity. In 1986, a list of recent liverworts and mosses (143 taxa) was compiled by Gökler, 1986; Çetin,1988a, 1988b to compile liverworts studies made up to that date. After that, the studies that have been increasing rapidly continued. Uyar and Çetin have published the current checklist of mosses of Turkey (Uyar and Çetin, 2004). Then, Kürschner and Erdağ (2005) published an explanatory reference list for the Turkish Bryophytes, along with synonyms of the species according to the latest literature (Kürschner and Erdağ, 2005). Therefore, Özenoğlu Kiremit and Keçeli (2009) listed the liverworts and hornworts of Turkey. The latest information about Turkish mosses was cited within the study of Ros et al (2013). There are some local checklists based on Turkish Bryophytes (Abay et al., 2009, 2010; Şahin et al., 2009 a,b, Ursavaş and Abay, 2009; Özdemir, 2009; Ursavaş et al., 2010; Keçeli et al., 2011 and Abay et al 2016). The first records of bryophytes from Giresun province was given by Handel-Mazzetti (1909). After that date, the main works began in the 1990s. These are the important studies carried out in Giresun province (Handel-Mazzetti, 1909; Ünal, 1973; Özdemir and Baydar, 1997; Özdemir, 1999; Özdemir, 2001 a,b; Özdemir and Koz, 2005; Özdemir and Koz, 2006; Özdemir and Koz, 2007; Özdemir and Batan, 2008; Özdemir, 2008; Kırmacı and Kürschner, 2013).

The number of species lists for individual provinces is limited (Abay, 2014). However, data of regional level are the most important for biodiversity studies and conservation (Abay, 2016). Thus, in this paper we compile all data on bryophyte taxa occurring in Giresun province, aiming to fill one the gaps in our knowledge of Bryophytes.

Giresun province, which is located in the Eastern Black Sea Region of Turkey, lies between 37° 50' and 39° 12' eastern longitudes and 40° 07' and 41° 08' northern latitudes. Trabzon and Gümüşhane in the east of the province, Ordu in the west, Sivas and Erzincan in the south, and Sivas in the southwest, and the north is surrounded by the Black Sea. The Black Sea coast is warm and rainy. According to the average of long-term observations, the annual average temperature in the city center is 14,2 °C. The coldest month (February) the average temperature is 6,9 °C. The warmest month is August and the average is 22,3 °C. The most precipitation is in October and November, and the lowest in May and June. Monthly value at maximum rainfall exceeds 140 mm per month, while minimum rainfall does not fall below 60 mm per month. The average number of rainy days is 184. Natural vegetation varies depending on climatic characteristics and elevation. There are differences between the two parts of the province in the distribution of the natural plant cover as it is in the climate conditions. The slopes behind the coastal plains in the northern part of the province are covered with hazelnut gardens up to 800 m. Towards higher, forests of *Alnus glutinosa* Lam, *Castanea sativa* Mill., *Carpinus betulus* Mill., *Quercus pontica* C. Koch and *Fagus orientalis* Lipsky, and after 1600 meters *Abies nordmanniana* (Stev.) Spach, *Picea orientalis* (L.) Link. and *Pinus sylvestris* L. are found. The forest cover ends at 2000 meters. Higher areas are covered with alpine meadows., Mostly arid forests and steppe plants are predominant in Çoruh-Kelkit Valley located in the south of the Giresun Mountains. 25 % of the province's arable land consists of agriculture, 34% forest and shrubland, 18% meadow and pasture, and 25 % non-agricultural land (Giresun Çevre Durum Raporu, 2015).

1.2. New records

Two species of mosses were reported as new records for Turkey; *Tortella inflexa* (Bruch) Broth. (in 2001) and *Rhytidiadelphus loreus* (Hedw.) Warnst. (in 2008) by Özdemir (2001, 2008) after Handel-Mazzetti (1909). Also, *Sphagnum capillifolium* (Ehrh.) Hedw., *Sphagnum centrale* C.E.O. Jensen (in 26 August 2011) and *Sphagnum compactum* Lam. & DC. (in 17 July 2012) were found as a second time from Turkey by Kırmacı and

Kürschner (2013) after Turkish square system gave by Henderson (1961).

2. Materials And Methods

This checklist was been created by bringing together the taxonomic studies, carried out in Giresun province from 1909 to the present. These studies are Handel-Mazzetti, 1909; Ünal, 1973; Özdemir and Baydar, 1997; Özdemir, 1999; Özdemir, 2001 a,b; Özdemir and Koz, 2005; Özdemir and Koz, 2006; Özdemir and Koz, 2007; Özdemir and Batan, 2008; Özdemir, 2008; Kırmacı and Kürschner, 2013). on bryophytes in Giresun province between 1907 and 2017. The valid names and synonyms of the taxa were based on Ros et al., (2007 2013 for mosses and liverworts. It also benefited from publications such as; (Uyar and Çetin, 2004; Kürschner and Erdağ, 2005; Özenoğlu Kiremit and Keçeli, 2009) However, for valid names of some taxa, Hodgetts (2015) was used. On the other hand, In present studies, first records **(*)** and second records **(**)** for Turkey from the province of Giresun are shown. And the localities of these taxa are presented in the annotations.

3. Results

Bryophytes are represented in the checklist by 120 genera, and 252 taxa of infrageneric level (245 species, 7 varieties), that equals 25.81 % of the total moss flora of Turkey. The checklist includes 17 taxa of liverworts and 235 mosses. The largest number of liverwort species was found in the genera Lophocolea (2) and *Pellia* (2) and other liverwort genera contain one taxon. *Grimmia* with 11 taxa is the richest genus in the mosses. Some other rich genera are *Didymodon* (9), *Ptychostomum* (8), *Brachythecium* (6), *Bryum* (6), *Dicranum* (6), *Schistidium* (6), *Sphagnum* (6), *Syntrichia* (6), *Orthotrichum* (6), *Mnium* (5), *Plagiomnium* (5), *Racomitrium* (5), and *Tortella* (5)..Two species, *Rhytidiadelphus loreus* and *Tortella inflexa*, were recorded first time and three species of *Sphagnum* genus (*Sphagnum capillifolium*, *Sphagnum centrale* and *Sphagnum compactum*) also second time for bryophyte Flora of Turkey. Explanations about these taxa are given in the Annotations.

3.1. *Alphabetical List of Bryophytes*

HEPATICOPHYTA (LIVERWORTS)

Bazzania trilobata (L.) Gray
Calypogeia muelleriana (Schiffn.) Müll. Frib.
Conocephalum conicum (L.) Dumort.
Fossombronia pusilla (L.) Nees
Frullania tamarisci (L.) Dumort.
Lejeunea cavifolia (Ehrh.) Lindb.
Lophocolea bidentata (L.) Dumort.
L. heterophylla (Schrad.) Dumort.
Lunularia cruciata (L.) Lindb.
Marchantia polymorpha L.
Metzgeria furcata (L.) Dumort.
Pellia endiviifolia (Dicks.) Dumort.
P. epiphylla (L.) Corda
Plagiochila porelloides (Torrey *ex* Nees) Lindenb.
Porella platyphylla (L.) Pfeiff.
Reboulia hemisphaerica (L.) Raddi
Scapania undulata (L.) Dumort.

BRYOPHYTA (MOSSES)

Abietinella abietina (Hedw.) M. Fleisch.
Alleniella complanata (Hedw.) S. Olsson, Enroth & D. Quandt
Amblystegium serpens (Hedw.) Schimp.
Andreaea pygmaea Cardot.
Anoectangium aestivum (Hedw.) Mitt.
Anomobryum concinnatum (Spruce) Lindb.
Anomodon attenuatus (Hedw.) Huebener
A. viticulosus (Hedw.) Hook. & Taylor
Atrichum undulatum (Hedw.) P. Beauv.
Barbula convoluta Hedw.
B. unguiculata Hedw.
Bartramia pomiformis Hedw.
Brachythecium albicans (Hedw.) Schimp.
B. glareosum (Bruch *ex* Spruce) Schimp.
B. mildeanum (Schimp.) Schimp. *ex* Milde
B. rivulare Schimp.
B. rutabulum (Hedw.) Schimp.
B. salebrosum (Hoffm. ex F. Weber & D. Mohr) Schimp.
Bryoerythrophyllum recurvirostrum (Hedw.) P.C. Chen
Bryum argenteum Hedw.
B. creberrinum Tayl.
B. dichotomum Hedw.
B. elegans Nees
B. gemmiparum De Not.
B. radiculosum Brid.
Calliergonella cuspidata (Hedw.) Loeske
C. lindbergii (Mitt.) Hedenäs
Campylium protensum (Brid.) Kindb.
Campylopus atrovirens De Not.
C. fragilis (Brid.) Bruch & Schimp.
C. pilifer Brid.
Cirriphyllum crassinervium (Taylor) Loeske & M. Fleisch.
C. piliferum (Hedw.) Grout

Climacium dendroides (Hedwig) Weber & D. Mohr
Cratoneuron filicinum (Hedw.) Spruce
Ctenidium molluscum (Hedw.) Mitt. D. Mohr:
Dichodontium flavescens (Dicks. ex With.) Lindb.
Dicranella heteromalla (Hedw.) Schimp.
D. varia (Hedw.) Schimp.
Dicranum fuscescens Sm.
D. majus Turner
D. montanum Hedw.
D. scoparium Hedw.
D. tauricum Sapjegin
Didymodon acutus (Brid.) K. Saito
D. asperifolius (Mitt.) H.A. Crum, Steere & L.E. Anderson
D. fallax (Hedw.) R.H. Zander
D. ferrugineus (Schimp. *ex* Besch.) M. O. Hill
D. luridus Hornsch.
D. rigidulus Hedw.
D. spadiceus (Mitt.) Limpr.
D.tophaceus (Brid.) Lisa
D. vinealis (Brid.) R.H. Zander
Diphyscium foliosum (Hedw.) D. Mohr
Distichum inclinatum (Hedw.) Bruch. & Schimp.
Ditrichum heteromallum (Hedw.) E. Britton
Drepanocladus aduncus (Hedw.) Warnst.
Encalypta alpina Sm.
E. contorta Hoppe ex Lindb.
E. streptocarpa Hedw.
E. vulgaris Hedw.
Epipterygium tozeri (Grev.) Lindb.
Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen
Eurhynchium striatum (Hedw.) Schimp.
Exsertotheca crispa (Hedw.) S. Olsson, Enroth & D. Quandt
Fissidens adianthoides Hedw.
F. dubius P. Beauv.
Fontinalis antipyretica Hedw.
F. hypnoides C. Hartm.
Funaria hygrometrica Hedw.
Grimmia alpestris (F. Weber & D. Mohr) Schleich.
G. decipiens (Schultz) Lindb.
G. donniana Sm. *ex* Spruce
G. elongata Kaulf.
G. hartmannii Schimp.
G. laevigata (Brid.) Brid.
G. ovalis (Hedw.) Lindb.
G. pulvinata (Hedw.) Sm.
G. pulvinata var. *longipila* Schimp.
G. tergestina Tomm. *ex* Bruch & Schimp.
G. trichophylla Grev.
Gymnostomum aeruginosum Sm.
G. calcareum Nees & Hornsch.
Habrodon perpusillus (De Not.) Lindb.
Hedwigia ciliata (Hedw.) P. Beauv.
Homalia trichomanoides (Hedw.) Schimp.
Homalothecium lutescens (Hedw.) H. Rob.
H. philippeanum (Spruce) Schimp.
H. sericeum (Hedw.) Schimp.
Hookeria lucens (Hedw.) Sm.
Hygroamblystegium tenax (Hedw.) Jenn.
H.varium (Hedw.) Mönk.
Hygrohypnum palustre var. *subsphaericarpon* (Schleich. ex Brid.) Loeske
H. smithii (Sw.) Broth.
Hylocomiastrum pyrenaicum (Spruce) M. Fleisch.
Hylocomium splendens (Hedw.) Schimp.
Hyocomium armoricum (Brid.) Wijk & Margad.
Hypnum cupressiforme var. *cupressiforme* Hedw.
H. cupressiforme var. *lacunosum* Brid.
H. cupressiforme var. *resupinatum* (Taylor) Schimp.
H. revolutum (Mitt.) Lindb.
Imbribryum alpinum (Huds. *ex* With.) N. Pedersen
I. mildeanum (Jur.) J.R. Spence
Isothecium alopecuroides (Lam. *ex* Dubois) Isov.
I. myosuroides Brid.
Kindbergia praelonga (Hedw.) Ochyra
Leptodictyum riparium (Hedw.) Warnst.
Lescuraea incurvata (Hedw.) E. Lawton
L. mutabilis (Brid.) Lindb. ex I. Hagen
Leucobryum albidum (P. Beauv.) Lindb.
L. glaucum (Hedw.) Ångstr.
Leucodon immersus Lindb.
L. sciuroides (Hedw.) Schwägr.
Loeskeobryum brevirostre (Brid.) M. Fleisch.
Merceya acutiuscula (Lindb. ex Broth.) Broth.
Microbryum curvicollum (Hedw.) R.H. Zander
Mnium hornum Hedw.
M.marginatum (Dicks. *ex* With.) P. Beauv.
M. orthorrhynchium auct.
M. spinosum (Voit) Schwägr.
M. stellare Hedw.
Nogopterium gracile (Hedw.) Crosby & W.R. Buck
Orthothecium strictum Lorentz L.E. Anderson
O. affine Schrad. *ex* Brid.
O. diaphanum Brid.
O. lyellii Hook & Taylor
O. rupestre Schleich. *ex* Schwägr.
O. stramineum Hornsch. ex Brid.

O. striatum Hedw.
Oxyrrhynchium hians (Hedw.) Loeske
O. speciosum (Brid.) Warnst.
Oxystegus tenuirostris (Hook. & Taylor) A.J.E. Sm.
Palustriella commutata (Hedw.) Ochyra
P. decipiens (De Not.) Ochyra
Paraleptodontium recurvifolium (Taylor) D.G. Long
Paraleucobryum longifolium (Ehrh. *ex* Hedw.) Loeske
P. sauteri (Bruch & Schimp.) Loeske
Philonotis calcarea (Bruch & Schimp.) Schimp.
P. capillaris Lindb.
P. fontana (Hedw.) Brid.
P. seriata Mitt.
P. tomentella Molendo
Plagiomnium affine (Blandow *ex* Funck) T.J. Kop.
P. cuspidatum (Hedw.) T.J. Kop.
P. elatum (Bruch & Schimp.) T.J. Kop.
P. ellipticum (Brid.) T.J. Kop.
P. undulatum (Hedw.) T.J. Kop.
Plagiothecium cavifolium (Brid.) Z. Iwats.
P. denticulatum (Hedw.) Schimp.
P. succulentum (Wilson) Lindb.
P. undulatum (Hedw.) Schimp.
Plasteurhynchium striatulum (Spruce) M. Fleisch.
Platygyrium repens (Brid.) Schimp.
Pleurozium schreberi (Willd. ex Brid.) Mitt.
Pogonatum aloides (Hedw.) P. Beauv.
P. nanum (Hedw.) Beauv.
P. urnigerum (Hedw.) P. Beauv.
Pohlia elongata Hedw.
P. ludwigii (Spreng. ex Schwägr.) Broth.
Polytrichum commune Hedw.
P. formosum Hedw.
P. juniperinum Hedw.
P. longisetum Sw. ex Brid.
Pseudoleskeella nervosa (Brid.) Nyholm
Pseudoscleropodium purum (Hedw.) M. Fleisch.
Ptilium crista-castrensis (Hedw.) De Not.
Ptychostomum archangelicum (Bruch & Schimp.) J.R. Spence
P. boreale (F. Weber & D. Mohr) Ochyra & Bednarek-Ochyra
P. capillare (Hedw.) Holyoak & N. Pedersen
P. moravicum (Podp.) Ros & Mazimpaka
P. pallens (Sw.) J.R. Spence
P. pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay
P. pseudotriquetrum var. *bimum* (Schreb.) Holyoak & N. Pedersen
P. torquescens (Bruch & Schimp.) Ros & Mazimpaka
Racomitrium aquaticum (Brid. ex Schrad.) Brid.
R. canescens (Hedw.) Brid.
R. ellipticum (Turner) Bruch & Schimp.
R. heterostichum (Hedw.) Brid.
R. lanuginosum (Hedw.) Brid.
Rhizomnium punctatum (Hedw.) T.J. Kop.
Rhodobryum roseum (Hedw.) Limpr.
Rhynchostegiella tenella (Dicks.) Limpr.
Rhynchostegium confertum (Dicks.) Schimp.
R. murale (Hedw.) Schimp.
R. riparioides (Hedw.) Cardot.
R. rotundifolium (Scop. ex Brid.) Schimp.
Rhytidiadelphus loreus (Hedw.) Warnst. **[1]** (*)
R. squarrosus (Hedw.) Warnst.
R. triquetrus (Hedw.) Warnst.
Sanionia uncinata (Hedw.) Loeske
Schistidium apocarpum (Hedw.) Bruch & Schimp.
S. confertum (Funck) Bruch & Schimp.
S. flaccidum (De Not.) Ochyra
S. platyphyllum (Mitt.) H. Perss.
S. rivulare (Brid.) Podp
S. trichodon (Brid.) Poelt
Sciuro-hypnum plumosum (Hedw.) Ignatov & Huttunen
S. populeum (Hedw.) Ignatov & Huttunen
S. reflexum (Starke) Ignatov & Huttunen
Scleropodium tourettii (Brid.) L.F. Koch
Scorpidium revolvens (Sw. *ex* anon.) Rubers
Scorpiurium circinatum (Bruch) M. Fleisch. & Loeske
Seligeria pusilla (Hedw.) Bruch & Schimp.
S. recurvata (Hedw.) Bruch & Schimp.
Sematophyllum demissum (Wilson) Mitt.
Sphagnum auriculatum Schimp
S. capillifolium (Ehrh.) Hedw. [2] (**)
S. centrale C.E.O. Jensen [3] (*)
S. compactum Lam. & DC. [4] (**)
S. girgensohnii Russow
S. warnstorfii Russow
Stereodon arcuatus Lindb.
Syntrichia montana Nees
S. norvegica F. Weber
S. princeps (De Not.) Mitt.
S. ruralis (Hedw.) F. Weber & D. Mohr
S. ruralis var. *ruraliformis* (Besch.) Delogne
S. virescens (De Not.) Ochyra
Tetradontium brownianum (Dicks.) Schwägr.
Thamnobryum alopecurum (Hedw.) Gangulee
Thuidium delicatulum (Hedw.) Schimp.

T. tamariscinum (Hedw.) Schimp.
Tomentypnum nitens (Hedw.) Loeske
Tortella fragilis (Hook. & Wilson) Limpr.
T. inclinata (R. Hedw.) Limpr.
T. inflexa (Bruch) Broth. [5] (*)
T. squarrosa (Brid.) Limpr.
T. tortuosa (Hedw.) Limpr.
Tortula caucasica Broth
T. hoppeana (Schultz) Ochyra
T. muralis Hedw.
T. subulata Hedw.
Trichostomum crispulum Bruch
Ulota crispa (Hedw.) Brid.

4. Annotations

[1] This species was recorded by Özdemir in 2006 from Giresun province of Turkey, Dereli district, Kümbet High Plateau, 40° 32' 30" N, 38° 28' 45" E, 950 m, on soil in *Picea orientalis* forest, 08.08.2006 (Özdemir, 2008).

[2] This species was recorded firt time by Handel-Mazzetti in 1909 in Giresun province: Ezeli district, Kizil Ali High Plateau, 1300 m, under *Rhododendren*, July 1907 (Handel-Mazzetti, 1909). After a long time, the taxa was recorded second time in Giresun province: Tirebolu district, Yeşilpınar village, 40°54'39.8"N; 38°53'49.5"E, 300 m, on acidic wet soil bank, 26 August 2011 (Kırmacı and Kürschner, 2013).

[3] This species was first time recorded from Turkey by Abay et al. (2009) in Rize province: Çamlıhemşin district, Kaçkar mountains, Kavron plateau, 40°53'0.1"N; 41°07'52.6"E, 2300 m, subalpine meadow with peat (Abay et al., 2009). Then, second time recorded from Turkey in Giresun province, Tirebolu district, Yeşilpınar village, 40°54'39.8"N; 38°53'49.5"E, 300 m, on acidic wet soil bank, 26 August 2011(Kırmacı and Kürschner, 2013).

[4] The taxa was recorded firt time from Turkey by Handel-Mazzetti in Giresun province, Ezeli district, Kizil Ali High plateau, 1300 m, under *Rhododendren* sp., July 1907 (Handel-Mazzetti, 1909). After 1909, This species was found second time by Abay et al. In 2009 from Rize province, Çamlihemşin district, Kaçkar Mountains, upwards from Kavron plateau, 40°53'0.1"N; 41°07'52.6"E, 2300 m, subalpine meadow with peat (Abay et al., 2009), Then, third time recorded in Trabzon province, Soğanlı Mountains, south of Sürmene and Köprübaşı district, Ağaçbaşı High Plateau, 40°41'48.8"N; 40°05'01.6"E, 1980 m, peat bog, 17 July 2012 by Kırmacı and Kürschner (Kırmacı and Kürschner, 2013).

[5] The taxa was recorded as a new record for moss flora of Turkey by Özdemir in 2000 from Giresun province, north of Giresun castle, small, bright gren patches on soil covered rocks in an open habitat, 150 m, 05.04.2000 (Özdemir, 2001).

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