

Contributions to the bryophyte flora of Şalpaazarı and Tonya districts (Trabzon, Turkey)

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Abstract. As a result of the examination of the bryophyte samples collected from the Şalpaazarı and Tonya districts (Trabzon) in Turkey, a total of 195 bryophyte taxa belonging to 105 genera (22 liverworts and 83 mosses) were identified from 16 localities. Of these taxa, 32 are liverworts and 163 mosses. *Aloina ambigua* (Bruch & Schimp.) Limpr. and *Drepanocladus polygamus* (Schimp.) Hedenäs are new to the A4 grid square.

Key Words: Biodiversity, bryophyte, flora, Şalpaazarı, Tonya, Turkey

Introduction

Turkey has three main floristic regions: Euro-Siberian, Mediterranean and Irano-Turanian. In the Black Sea region (e.g Trabzon Province), the bryophytes have been studied extensively (Gökler 1998, Özdemir & Çetin 1999, Papp 2004, Townsend 2005, Özdemir 2009, Lara & al. 2010, Batan & Özdemir 2011, 2013, Batan & al. 2013, Kırmacı & Kürschner 2013, Kırmacı & al. 2013, Erata & al. 2017, Erata 2018, Erata & Batan 2019). However, Şalpaazarı and Tonya districts have not yet been subject of such studies in the Eastern Black Sea Region. The aim of this paper is to contribute information to the bryophyte flora of Şalpaazarı and Tonya districts (Trabzon) in Turkey.

Şalpaazarı and Tonya, which are located westwards of the Trabzon Province, are two neighbouring districts. The research area is located in the Eastern Black Sea Region of the Euro-Siberian floristic region (Akman 1999). The area borders on Düzköy and Maçka districts

(Trabzon) in the east, Çanakçı district (Giresun) in the west, Beşikdüzü and Vakfikebir districts (Trabzon) in the north, and Kürtün district (Gümüşhane) in the south (Fig. 1).

The study area has oceanic rainfall regime, without a dry season. The coldest month is February and the mean minimum temperature then amounts to 0.9°C. The hottest month is July and the mean maximum temperature is 17.2°C. While the mean annual precipitation is 1010.8 mm, the heaviest rainfalls occur in October and November, and the lowest in March and April (Akman 1999, TSMS 2017).

Material and methods

The bryophyte specimens were collected by the authors in 2018, in Şalpaazarı and Tonya districts. These specimens were identified by consulting various floras and keys (Crum & Anderson, 1981, Ireland 1982,

Nyholm 1986, 1989, 1993, 1998, Lewinsky 1993, Blom 1996, Smith 1996, 2004, Paton 1999, Pedrotti 2001, 2006, Grevén 2003, Frey & al. 2006, Guerra & al. 2006, Brugués & al. 2007, Kürschner & Frey 2011, Guerra & al. 2014, 2018, Brugués & Guerra 2015). Their belonging to Turkey was assessed by reviewing the related literature (Özenoglu-Kiremit & Keçeli 2009, Kürschner & Frey 2011, Ros & al. 2013).

In the floristic list, localities and substrate were given for each taxon. In the bryofloristic list, the taxa new to Şalpazarı district were indicated with (#), for Tonya with (##) and for both districts with (###). The taxon new for Trabzon was indicated with (+) and for A4 square with (*). The taxa have been arranged in alphabetical order and nomenclature of the species follows Söderström & al. (2016) for liverworts and Ros & al. (2013), Plášek & al. (2015), Lara & al. (2016), and Hodgetts & al. (2019) for mosses. The status of bryophyte taxa was evaluated by reviewing literature relating to the A4 square (Abay & al. 2016, Özdemir & Batan 2017a, b, Erata & al. 2018) and to the Trabzon Province (Özdemir & Batan 2017, Erata & al. 2018). The bryophyte samples were deposited in the private herbarium of ERATA at Bayramiç Vocational School, Çanakkale Onsekiz Mart University (Çanakkale), Turkey.

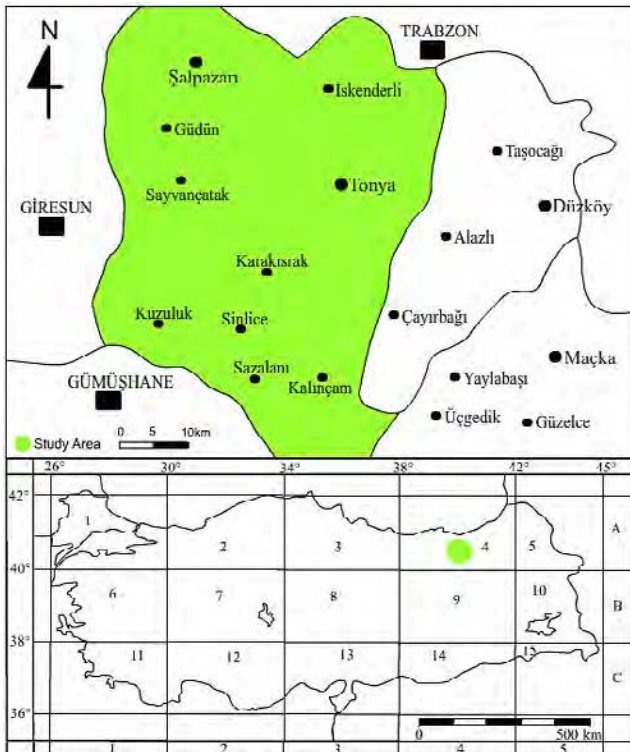


Fig. 1. Map of the study area and its surroundings.

Results and discussion

List of collection stations

1. Turkey: Trabzon Province, Şalpazarı district, Karakırsak High Plateau-1, 40°48'88.8"N, 39°14'53.7"E; 1733 m; 03.08.2018.
2. Turkey: Trabzon Province, Şalpazarı district, the road entering the Karakırsak High Plateau, 40°47'29.8"N, 39°14'18.8"E; 1750 m; 03.08.2018.
3. Turkey: Trabzon Province, Şalpazarı district, Karakırsak High Plateau-2, 40°48'69.4"N, 39°15'02.2"E; 1780–1833 m; 03.08.2018.
4. Turkey: Trabzon Province, Şalpazarı district, the road-2 entering the Karakırsak High Plateau, Teacher's Water locality, Karaçoban, 40°50'67.3"N, 39°14'87.6"E; 1515 m; 03.08.2018.
5. Turkey: Trabzon Province, Şalpazarı district, Karaçoban, 40°52'05.6"N, 39°14'27.3"E; 1384 m; 03.08.2018.
6. Turkey: Trabzon Province, Tonya district, between Çayırıcı and Kalınçam villages, Fol stream, 40°49'39"N, 39°18'57"E; 950 m; 11.05.2018.
7. Turkey: Trabzon Province, Tonya district, at the exit from Kalınçam village, Erikbeli road-1, 40°46'37"N, 39°15'35"E; 1110 m; 11.05.2018.
8. Turkey: Trabzon Province, Tonya district, at the entrance to the Erikbeli, between Kalınçam and Erikbeli, 40°44'37"N, 39°12'58"E; 1560–1580 m; 11.05.2018.
9. Turkey: Trabzon Province, Tonya district, at the exit from Tonya, Kalınçam road-1, 40°58'16"N, 39°38'23"E; 1852 m; 11.05.2018.
10. Turkey: Trabzon Province, Şalpazarı district, in the upper part of Sinlice village-1, 40°48'10"N, 39°13'39"E; 1420–1460 m; 12.05.2018.
11. Turkey: Trabzon Province, Şalpazarı district, in the upper part of Sinlice village-2, 40°47'22"N, 39°13'45"E; 1560–1600 m; 12.05.2018.
12. Turkey: Trabzon Province, Tonya district, Sazalanı High Plateau, 40°44'22"N, 39°12'31"E; 1710 m; 12.05.2018.
13. Turkey: Trabzon Province, Tonya district, Çamanlı High Plateau-1, 40°44'53.9"N, 39°18'66.8"E; 1700–1760 m; 02.08.2018.
14. Turkey: Trabzon Province, Tonya district, between Çamanlı and Gıranıyurt High Plateau, 40°44'57.5"N, 39°18'75.4"E; 1832–1880 m; 02.08.2018.

15. Turkey: Trabzon Province, Tonya district, Giranyurt High Plateau-1, 40°44'84.0"N, 39°19'34.2"E; 2169–2120 m; 02.08.2018.

16. Turkey: Trabzon Province, Tonya district, Giranyurt High Plateau-2, 40°44'43.2"N, 39°19'03.7"E; 1889–1830 m; 02.08.2018.

Bryofloristic list

Taxon	Localities	Habitat
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Liverworts (Marchantiophyta)

## <i>Apopellia endiviifolia</i> (Dicks.) Nebel & D.Quandt	14	on wet soil
## <i>Barbilophozia barbata</i> (Schmidel ex Schreb.) Loeske	16	on rock
## <i>Barbilophozia hatcheri</i> (A. Evans) Loeske.	3, 13	on rock
<i>Bazzania tricrenata</i> (Wahlenb) Lindb.	10	on tree body
### <i>Blepharostoma trichophyllum</i> (L.) Dumort.	1, 8, 10, 11, 12	on wet soil, on wet rock
<i>Calypogeia fissa</i> (L.) Raddi	10, 11	on wet soil
<i>Cephalozia bicuspidata</i> (L.) Dumort.	10, 11	on wet soil
## <i>Chiloscyphus polyanthos</i> (L.) Corda.	13	on wet soil
## <i>Conocephalum conicum</i> (L.) Dumort	3, 9, 13, 14	on wet rock
## <i>Diplophyllum albicans</i> (L.) Dumort.	1, 3, 6, 10, 11	on dead tree trunk
## <i>Frullania dilatata</i> (L.) Dumort.	1, 3, 9	on tree trunk
## <i>Frullania tamarisci</i> (L.) Dumort.	4, 9	on tree trunk, on rock
## <i>Jungermannia atrovirens</i> Dumort.	14	on soil
## <i>Jungermannia sphaerocarpa</i> Hook.	2, 14	on wet soil
<i>Lophozia longidens</i> (Lindb.) Macoun.	10	on wet rock
## <i>Lophozia ventricosa</i> (Dicks.) Dumort.	16	on wet rock
## <i>Marchantia polymorpha</i> L.	10	on wet soil
## <i>Metzgeria furcata</i> (L.) Dumort.	8, 9	on tree trunk
## <i>Pedinophyllum interruptum</i> (Nees) Kaal.	6, 8, 9	on wet soil
## <i>Pellia epiphylla</i> (L.) Corda.	2, 3, 8, 9, 11, 14	on wet soil
## <i>Plagiochila asplenoides</i> (L. emend. Taylor) Dumort.	6, 9, 10, 11, 12, 13, 14	on soil, on rock, on dead tree trunk
## <i>Plagiochila porelloides</i> (Torrey ex Nees) Lindenb	3, 7, 9, 11, 12, 16	on soil, on rock
## <i>Porella cordaeana</i> (Huebener) Moore.	8	on rock
<i>Ptilidium pulcherrimum</i> (Weber) Vain.	10	on wet rock
## <i>Radula complanata</i> (L.) Dumort.	3, 9	on rock
## <i>Radula lindenbergiana</i> Gottsche ex C. Hartm.	8, 9, 13	on rock
<i>Riccardia multifida</i> (L.) Gray	10, 11	on wet rock
+ <i>Scapania aspera</i> M.Bernet et Bernet.	10	on wet soil
## <i>Scapania irrigua</i> (Ness) Ness.	8, 11	on wet soil
## <i>Scapania nemorea</i> (L.) Grolle	14, 16	on wet soil
## <i>Scapania undulata</i> (L.) Dumort.	6	on wet soil
+ <i>Tritomaria exsecta</i> (Schmidel ex. Schrad.) Loeske.	3, 10, 11	on dead tree trunk

Taxon	Localities	Habitat
Mosses (Bryophyta)		
## <i>Abietinella abietina</i> (Hedw.) M.Fleisch. var. <i>abietina</i>	16	on soil
## <i>Abietinella abietina</i> var. <i>hystriosa</i> (Mitt.) Sakurai.	1, 14, 16	on soil
## <i>Alleniella complanata</i> (Hedw.) S.Olsson, Enroth & D.Quandt	7, 9	on rock, on tree trunk
* <i>Aloina ambigua</i> (Bruch & Schimp.) Limpr.	7	on wet soil
## <i>Amblystegium serpens</i> (Hedw.) Schimp.	9	on wet soil
## <i>Anoetangium aestivum</i> (Hedw.) Mitt.	1, 13, 14	on wet soil
## <i>Anomodon attenuatus</i> (Hedw.) Huebener	7, 9	on soil, on rock
## <i>Anomodon rugelii</i> (Müll. Hal.) Keissl.	9	on soil, on rock
## <i>Atrichum undulatum</i> (Hedw.) P. Beauv.	6, 8, 9, 10, 11	on wet soil
## <i>Barbula unguiculata</i> Hedw.	7, 8, 9	on soil
## <i>Bartramia halleriana</i> Hedw.	4, 6	on wet rock
## <i>Bartramia ithyphylla</i> Brid.	13	on wet soil
## <i>Brachytheciastrum velutinum</i> (Hedw.) Ignatov & Huttunen	7, 8, 9, 10	on dead tree trunk
## <i>Brachythecium albicans</i> (Hedw.) Schimp.	12, 13	on soil
## <i>Brachythecium mildeanum</i> (Schimp.) Schimp. Ex Milde	9	on wet soil
## <i>Brachythecium rivulare</i> Schimp.	1, 7, 8, 9, 11, 13, 14, 16	on wet soil, near stream
## <i>Brachythecium rutabulum</i> (Hedw.) Schimp.	6, 9	on wet soil, near stream
## <i>Brachythecium salebrosum</i> (Hoffm. ex F. Weber & D. Mohr) Schimp.	9	on wet soil
## <i>Bryum argenteum</i> Hedw.	4, 13	on soil
## <i>Bryum dichotomum</i> Hedw.	9	on soil
## <i>Calliergonella cuspidata</i> (Hedw.) Loeske	1, 3, 4, 7, 9, 13, 15	on wet soil, near stream
## <i>Calliergonella lindbergii</i> (Mitt.) Hedenäs	6	on wet soil
## <i>Campylium protensum</i> (Brid.) Kindb.	14, 15, 16	on wet soil
## <i>Campylopus brevipilus</i> Bruch & Schimp.	15	on soil
## <i>Campylopus flexuosus</i> (Hedw.) Brid.	6	on wet soil
<i>Campylopus pyriformis</i> (Schultz) Brid.	1, 10, 11	on soil
## <i>Campylophyllum calcareum</i> (Mitt.) Hedenäs	16	on wet soil
## <i>Cratoneuron filicinum</i> (Hedw.) Spruce.	1, 8, 9, 14, 16	on wet soil, on wet rock
## <i>Ceratodon purpureus</i> (Hedw.) Brid.	3, 4, 7	on soil, on rock
## <i>Cirriphyllum crassinervium</i> (Taylor) Loeske & M. Fleisch.	9	on soil
## <i>Climacium dendroides</i> (Hedw.) F. Weber & D. Mohr.	3, 13, 16	on wet soil
## <i>Ctenidium molluscum</i> (Hedw.) Mitt.	3, 6, 7, 8, 9, 10, 11, 13, 15, 16	on soil, on rock
+ <i>Cynodontium fallax</i> Limpr.	1	on rock
## <i>Cynodontium polycarpon</i> (Hedw.) Schimp.	8	on rock
## <i>Dichodontium palustre</i> (Dicks.) M. Stech.	1, 10, 13	on soil
## <i>Dichodontium pellucidum</i> (Hedw.) Schimp.	11, 16	on soil
<i>Dicranodontium denudatum</i> (Brid.) E.Britton.	11	on dead tree trunk
## <i>Dicranella heteromalla</i> (Hedw.) Schimp.	2, 7, 8, 10, 11, 13	on soil
## <i>Dicranum scoparium</i> Hedw.	1, 2, 3, 4, 6, 8, 10, 11, 12, 13	on rock,
## <i>Dicranum spadiceum</i> J.E.Zetterst.	14	on soil
## <i>Didymodon ferrugineus</i> (Schimp. ex Besch.) M.O.Hill.	6, 15	on soil
## <i>Didymodon rigidulus</i> Hedw.	9	on rock
## <i>Didymodon vinealis</i> (Brid.) R.H. Zander	7, 9	on rock

Taxon	Localities	Habitat
# <i>Distichium capillaceum</i> (Hedw.) Bruch & Schimp.	10	on soil
* <i>Drepanocladus polygamus</i> (Schimp.) Hedenäs	10	submerged
## <i>Entodon concinnus</i> (De Not.) Paris	2, 3, 6, 9, 14	on soil, on rock
### <i>Eurhynchiastrium pulchellum</i> (Hedw.) Ignatov & Huttunen	2, 8, 10, 11, 12	on soil
## <i>Eurhynchium angustirete</i> (Broth.) T.J.Kop.	1, 6, 8, 9, 10, 11, 12	on soil
## <i>Fissidens adianthoides</i> Hedw.	6	on wet soil
## <i>Fissidens dubius</i> P. Beauv.	8, 9, 11	on wet soil
## <i>Fissidens taxifolius</i> Hedw.	1, 8	on wet soil
<i>Funaria hygrometrica</i> Hedw.	10	on soil
## <i>Grimmia anodon</i> Bruch & Schimp.	9, 13, 14, 15	on rock
## <i>Grimmia dissimulata</i> E. Maier	9	on rock
## <i>Grimmia donniana</i> Sm.	13, 14	on rock
<i>Grimmia elongata</i> Kaulf.	3	on rock
## <i>Grimmia funalis</i> (Schwägr.) Bruch & Schimp.	14, 15	on rock
## <i>Grimmia hartmannii</i> Schimp.	3, 9, 14	on rock
## <i>Grimmia montana</i> Bruch & Schimp.	9, 14	on rock
## <i>Grimmia muehlenbeckii</i> Schimp.	9	on rock
## <i>Grimmia ovalis</i> (Hedw.) Lindb.	3, 13	on rock
## <i>Grimmia pulvinata</i> (Hedw.) Sm.	15	on rock
## <i>Hedwigia ciliata</i> (Hedw.) P. Beauv. var. <i>ciliata</i>	16	on rock
## <i>Hedwigia ciliata</i> var. <i>leucophaea</i> Bruch & Schimp.	13	on rock
<i>Homomallium incurvatum</i> (Schrader ex Brid.) Loeske	10, 11	on wet rock
<i>Hookeria acutifolia</i> W. J. Hooker & Greville	10	on wet soil
# <i>Hookeria lucens</i> (Hedw.) Sm.	11	on wet soil
## <i>Hylocomium splendens</i> (Hedw.) Schimp.	1, 2, 3, 12, 13, 15	on soil
<i>Hygroamblystegium tenax</i> (Hedw.) Jenn.	1	on wet soil
## <i>Hymenoloma crispulum</i> (Hedw.) Ochyra	14, 16	on soil
## <i>Hypnum andoi</i> A. J. E. Sm.	7, 9, 13	on rock, on tree trunk
## <i>Hypnum cupressiforme</i> var. <i>cupressiforme</i> Hedw.	1, 3, 6, 7, 8, 9, 12, 13, 15, 16	on soil, on rock
## <i>Hypnum cupressiforme</i> var. <i>filiforme</i> Brid.	6, 9	on tree trunk
## <i>Hypnum cupressiforme</i> var. <i>lacunosum</i> Brid.	3, 6, 9	on soil, on rock
## <i>Hypnum cupressiforme</i> var. <i>resupinatum</i> (Taylor) Schimp.	3, 6, 7, 15	on soil, on tree trunk
## <i>Hypnum hamulosum</i> Schimp.	9, 12	on soil
## <i>Hypnum jutlandicum</i> Holmen & E. Warncke	7, 13	on soil
## <i>Hypnum recurvatum</i> (Lindb. & Arnell) Kindb.	7	on rock
## <i>Hypnum revolutum</i> (Mitt.) Lindb.	1, 6, 9	on rock
## <i>Imbribryum alpinum</i> (Huds. ex With.) N. Pedersen	13, 15	on soil
## <i>Isothecium alopecuroides</i> (Lam. ex Dubois) Isov.	1, 3, 4, 6, 7, 8, 9, 11, 12	on soil, on tree trunk
<i>Kiaeria starkei</i> (F. Weber & D. Mohr) I. Hagen.	11	on soil
## <i>Lescurea mutabilis</i> (Brid.) Lindb. ex I. Hagen	3, 8, 12	on tree trunk
## <i>Leucobryum glaucum</i> (Hedw.) Ångstr.	6	on dead tree trunk
## <i>Leucodon sciuroides</i> (Hedw.) Schwägr.	7, 8, 13	on rock, on tree trunk
## <i>Lewinskya rupestris</i> (Schleich. Ex Schwägr.) F. Lara, Garilleti & Goffinet	7, 14	on rock
## <i>Lewinskya speciosa</i> (Nees) F. Lara, Garilleti & Goffinet .	7	on tree body
# <i>Mnium hornum</i> Hedw.	10	on wet soil

Taxon	Localities	Habitat
### <i>Mnium marginatum</i> (Dicks.) P.Beauv.	11, 14	on soil
## <i>Mnium spinosum</i> (Voit) Schwägr.	1, 3, 13	on soil
## <i>Mnium thomsonii</i> Schimp.	15	on soil
## <i>Oxyrrhynchium hians</i> (Hedw.) Loeske	1, 4, 7, 9	on soil, on rock
# <i>Oxystegus tenuirostris</i> (Hook. & Taylor) A.J.E. Sm.	1, 4	on soil, on rock
## <i>Palamocladium euchloron</i> (Müll.Hal.) Wijk & Margad.	9	on rock
## <i>Palustriella falcata</i> (Brid.) Hedenäs	13, 14, 15	on wet soil
## <i>Philonotis fontana</i> (Hedw.) Brid.	13, 14	on wet soil, near stream
## <i>Plagiomnium affine</i> (Blandow ex Funck) T.J.Kop.	6, 9, 11	on wet soil
## <i>Plagiomnium cuspidatum</i> (Hedw.) T.J.Kop.	8, 9	on soil, on rock
## <i>Plagiomnium elatum</i> (Bruch & Schimp.) T.J. Kop.	1, 6, 8, 14	on wet soil
## <i>Plagiomnium ellipticum</i> (Brid.) T.J.Kop.	9, 11, 13, 16	on wet soil
## <i>Plagiomnium rostratum</i> (Schrad.) T.J.Kop.	6, 9, 13, 15	on wet soil
## <i>Plagiomnium undulatum</i> (Hedw.) T.J.Kop.	1, 6, 9, 12, 16	on soil, on rock
## <i>Plagiothecium laetum</i> Schimp.	12, 15	on wet soil
## <i>Plagiothecium nemorale</i> (Mitt.) A.Jaeger	3, 6, 8, 9, 13	on wet soil
<i>Plagiothecium succulentum</i> (Wilson) Lindb.	1, 10	on wet soil
# <i>Plagiothecium undulatum</i> (Hedw.) Schimp.	1, 10, 11	on wet soil
## <i>Pleurozium schreberi</i> (Brid.) Mitt.	1, 3, 4, 12, 15	on soil
<i>Pohlia cruda</i> (Hedw.) Lindb	1, 4, 10	on wet soil
<i>Pohlia wahlenbergii</i> (F.Weber & D.Mohr) A.L.Andrews	10, 11	on wet soil
<i>Pogonatum aloides</i> (Hedw.) P. Beauv.	2	on soil
## <i>Pogonatum urnigerum</i> (Hedw.) P.Beauv .	7, 13	on soil
## <i>Polytrichum commune</i> Hedw.	1, 2, 4, 6, 7, 8, 10, 12, 16	on soil
<i>Polytrichum juniperinum</i> Hedw.	4	on soil
## <i>Polytrichum piliferum</i> Hedw.	13	on soil
## <i>Pseudoscleropodium purum</i> (Hedw.) M.Fleisch.	1, 6	on soil, on rock
## <i>Pseudoleskeella nervosa</i> (Brid.) Nyholm	1, 13, 14	on tree trunk
## <i>Ptychostomum capillare</i> (Hedw.) Holyoak & N. Pedersen	9	on wet soil
# <i>Ptychostomum creberrimum</i> (Taylor) J.R. Spence & H.P. Ramsay	10	on wet soil
## <i>Ptychostomum moravicum</i> (Podp.) Ros & Mazimpaka	1, 7, 8, 9, 12	on soil, on tree trunk
# <i>Ptychostomum pallescens</i> (Schleich. ex Schwägr.) J.R. Spence	11	on soil
<i>Ptychostomum pallens</i> (Sw.) J.R. Spence	10, 11	on soil
## <i>Ptychostomum pseudotriquetrum</i> (Hedw.) J. R. Spence & H.P. Ramsay var. <i>pseudotriquetrum</i>	1, 2, 8, 9, 11, 13, 14, 16	on wet soil, near stream
## <i>Pterigynandrum filiforme</i> Hedw.	1, 3, 6, 14	on rock, on tree trunk
<i>Racomitrium affine</i> (F. Weber & D. Mohr) Lindb	3	on rock
## <i>Racomitrium ericoides</i> (Brid.)	1, 2, 3, 4, 9, 13, 14, 16	on rock
## <i>Racomitrium heterostichum</i> (Hedw.) Brid.	4, 13	on rock
## <i>Racomitrium lanuginosum</i> (Hedw.) Brid.	15	on rock
## <i>Racomitrium macounii</i> Kindb.	4, 6	on rock
## <i>Rhizomnium magnifolium</i> (Horik.) T.J.Kop.	8, 9, 10, 11, 13	on wet soil
## <i>Rhizomnium punctatum</i> (Bruch & Schimp.) T.J.Kop.	6, 8, 10, 11, 13, 14, 15, 16	on wet soil
<i>Rhynchostegiella tenella</i> (Dicks.) Limpr.	4	on soil
## <i>Rhynchostegium megapolitanum</i> (Blandow ex F.Weber & D.Mohr) Schimp.	6, 8, 9	on wet soil
## <i>Rhytidiadelphus squarrosus</i> (Hedw.) Warnst.	2, 6	on soil

Taxon	Localities	Habitat
## <i>Rhytidiadelphus subpinnatus</i> (Lindb.) T.J. Kop.	6	on soil
## <i>Rhytidiadelphus triquetrus</i> (Hedw.) Warnst.	4, 12, 13	on soil
## <i>Rhytidium rugosum</i> (Ehrh. ex Hedw.) Kindb.	14, 15, 16	on soil
+ <i>Saelania glaucescens</i> (Hedw.) Broth.	4	on rock
## <i>Sanionia uncinata</i> (Hedw.) Loeske	1, 7, 8, 12	on dead tree trunk
## <i>Schistidium apocarpum</i> (Hedw.) Bruch & Schimp.	1, 3, 4, 8, 9, 11, 13	on rock
## <i>Schistidium confertum</i> (Funck) Bruch & Schimp.	7	on rock
## <i>Schistidium crassipilum</i> H.H.Blom	4,7	on rock
## <i>Schistidium papillosum</i> Culm.	1, 6, 9	on rock
## <i>Schistidium platyphyllum</i> (Hedw.) Roehl.	13	on rock
## <i>Schistidium trichodon</i> (Brid.) Poelt.	9	on rock
## <i>Sciuro-hypnum flotowianum</i> (Sendtn.) Ignatov & Huttunen	7, 9	on soil
## <i>Sciuro-hypnum plumosum</i> (Hedw.) Ignatov & Huttunen	9	on soil
## <i>Sciuro-hypnum populeum</i> (Hedw.) Ignatov & Huttunen	6, 9, 12, 13	on soil
### <i>Sphagnum centrale</i> C.E.O. Jensen	5	near stream
### <i>Sphagnum subsecundum</i> Nees	5	near stream
+ <i>Sphagnum squarrosum</i> Crome	2	near stream
## <i>Syntrichia ruralis</i> (Hedw.) F. Weber & D. Mohr	16	on soil
## <i>Taxiphyllum wissgrillii</i> (Garov.) Wijk & Margad.	9	on rock
## <i>Tetraphis pellucida</i> Hedw.	9, 10, 11	on dead tree trunk
## <i>Thuidium assimile</i> (Mitt.) A.Jaeger.	6, 7, 8, 9, 10, 13, 15	on wet soil
## <i>Thuidium delicatulum</i> (Hedw.) Schimp.	3, 8, 9	on wet soil
## <i>Thuidium recognitum</i> (Hedw.) Lindb.	6, 9	on wet soil
## <i>Thuidium tamariscinum</i> (Hedw.) Schimp.	1, 4, 8, 9, 10, 11, 13, 16	on wet soil
## <i>Tortella tortuosa</i> (Hedw.) Limpr.	4, 7, 8, 9, 11, 13, 14, 15, 16	on soil, on rock
## <i>Tortula marginata</i> (Bruch & Schimp.) Spruce.	1, 7, 8, 9	on soil, on rock
## <i>Tortula muralis</i> Hedw.	9	on soil
## <i>Ulotia crispa</i> (Hedw.) Brid.	1, 3, 6, 7, 8, 9	on tree trunk
+ <i>Weissia brachycarpa</i> (Nees & Hornsch.) Jur.	9	on soil
## <i>Weissia controversa</i> Hedw.	9, 13	on soil

As a result of the study, 32 liverwort taxa (belonging to 18 families and 22 genera), 163 moss taxa (belonging to 32 families and 83 genera) and a total of 195 bryophyte taxa (belonging to 50 families and 105 genera) were determined.

Aloina ambigua, so far known only from Central and Southwest Turkey, is particularly interesting among the collected taxa. It is reported for the first for the northeast of Turkey.

The most common genera of liverworts in the study area are: *Scapania* (4), *Pellia* (2), *Jungermannia* (2), *Barbilophozia* (2), *Lophozia* (2), *Plagiochila* (2), *Frullania* (2), and *Radula* (2) in the study area. The most common genera of mosses are *Grimmia* (10), *Hypnum* (9), *Plagiomnium* (6), *Schistidium* (6), *Ptychostomum*

(6), *Brachythecium* (5), *Racomitrium* (5), *Mnium* (4), *Plagiothecium* (4), *Thuidium* (4), *Sphagnum* (3), *Polytrichum* (3), *Campylopus* (3), *Didymodon* (3), *Sciuro-hypnum* (3) and *Rhytidiadelphus* (3).

Twelve bryophyte taxa are new records for the Şalpaazarı district and 158 bryophyte taxa are new records for the Tonya district. Furthermore, six bryophyte taxa (*Scapania aspera*, *Tritomaria exsecta*, *Sphagnum squarrosum*, *Cynodontium fallax*, *Saelania glaucescens*, *Weissia brachycarpa*) identified in this study are new records for the Trabzon Province. Also, *A. ambigua* and *D. polygamus* are new records for the square A4 under the Henderson (1961) grid system.

Blepharostoma trichophyllum, *Conocephalum conicum*, *Diplophyllum albicans*, *Pellia epiphylla*,

Plagiochila asplenoides and *Plagiochila porelloides* are the most common species found in the study area for Marchantiophyta (Liverworts).

Atrichum undulatum, *Brachythecium rivulare*, *Calliergonella lindbergii*, *Cratoneuron filicinum*, *Ctenidium molluscum*, *Dicranella heteromalla*, *Dicranum scoparium*, *Entodon concinnus*, *Eurhynchiastrum pulchellum*, *Eurhynchium angustirete*, *Grimmia anodon*, *Hylocomium splendens*, *Hypnum cupressiforme* var. *cupressiforme*, *Isothecium alopecuroides*, *Plagiomnium undulatum*, *Plagiothecium nemorale*, *Pleurozium schreberi*, *Polytrichum commune*, *Ptychostomum moravicum*, *Ptychostomum pseudotriquetrum* var. *pseudotriquetrum*, *Racomitrium ericoides*, *Rhizomnium magnifolium*, *Rhizomnium punctatum*, *Schistidium apocarpum*, *Thuidium assimile*, *Thuidium tamariscinum*, *Tortella tortuosa* and *Ulota crispa* were the most common species found in the study area for Bryophyta (Mosses).

Although the research area and its surroundings are under the influence of the Black Sea climate, this effect has been weakened by the distance from the coast, and a transitional climate type between the continental climate and the Black Sea climate prevails. This has led to emergence of different types of vegetation by creating exceptionally favorable growth conditions for plants.

The research area is mostly dominated by alpine, subalpine and forest vegetation. Thus, the bryophytes were mostly observed on soil, rock and tree trunks. Bryophyte taxa were seen to grow mostly on soil, rocks and tree trunks in the study area. The most important habitats for them are soil.

References

- Abay, G. 2017. A preliminary list of subalpine and alpine bryophytes of Rize, North-East Turkey. – *Anatolian Bryology*, 3(2): 75-80.
- Akman, Y. 1999. Climate and Bioclimate. The Methods of Bioclimate and Climate Types of Turkey. Kariyer Press, Ankara, 350 pp.
- Baydar, S & Özdemir, T. 1996. Altindere Valley National Park Mosses (Altindere Valley National Park) (Musci). – *Turk. J. Bot.*, 20: 53-57
- Batan, N. & Özdemir, T. 2011. Some of the moss (musci) records from Mersin (C12), Trabzon and Gümüşhane (A4). – *SDÜ Orman Fakültesi Dergisi*, 12 (2): 104-109.
- Batan, N. & Özdemir, T. 2013. Bryoflora of Dernekpaşarı district of Trabzon Province. – *Biodicon*, 6: 45-49.
- Batan, N., Alataş & Özdemir, T. 2013. *Leptoscyphus cuneifolius* (Lophocoleaceae, Marchantiophyta) new to Southwest Asia. – *Cryptog. Bryol.*, 34: 373-377.
- Blom, H.H. 1996. A Revision of the *Schistidium apocarpum* complex in Norway and Sweden. *Bryophyt. Biblioth.*, 333 pp.
- Brugués, M., Cros, R.M. & Guerra, J. 2007. Flora Briofítica Ibérica, vol. 1, Universidad de Murcia, Sociedad Española de Briyologia Murcia. Murcia, 169 pp.
- Brugués, M. & Guerra, J. 2015. Flora Briofítica Ibérica, vol. 2, Universidad de Murcia, Sociedad Española de Briyologia Murcia, Murcia, 355 pp.
- Crum, A.H. & Anderson E.L. 1981. Mosses of Eastern North America. Columbia Univ. Press. Newyork, 663 pp.
- Erata, H., Özen, Ö., Batan, N. & Özdemir, T. 2017. The bryophyte flora of Kanuni Campus in Karadeniz Technical Universtiy. – *Anatolian Bryology*, 3(1): 9-18.
- Erata, H., Batan, N. & Özdemir, T. 2018. The bryophyte flora of Sis Mountain (Giresun-Trabzon, Turkey). – *Anatolian Bryology*, 4(1): 46-64.
- Erata, H. & Batan, N. 2019. New and remarkable bryophyte records from Turkey and Southwest Asia. – *Pl. Biosyst.* DOI: 10.1080/11263504.2019.1635219.
- Frey, W., Frahm, J.P., Fischer, E. & Lobin W. 2006. The Liverworts, Mosses and Ferns of Europe. Essex. Harley Books, England, 512 pp.
- Gökler, İ. 1998. Liverworts (*Marchantiopsida*) of the Altindere Valley National Park. – *Turkish J. Bot.*, 22: 409-412.
- Greven, H.C. 2003. *Grimmias* of the World, Backhuys Publishers, ISBN: 90-5782-127-3. Leiden, 159 pp.
- Guerra, J., Cano, M.J. & Cros R.M. 2006. Flora Briofítica Ibérica, vol. 3, Universidad de Murcia, Sociedad Española de Briyologia Murcia. Murcia, 305 pp.
- Guerra, J., Cano, M.J. & Brugués M. 2014. Flora Briofítica Ibérica, vol. 5, Universidad de Murcia, ISBN: 84-616-8434-2, Sociedad Española de Briyologia Murcia, Murcia, 260 pp.
- Guerra, J., Cano, M.J. & Brugués M. 2018. Flora Briofítica Ibérica, vol. 6, Universidad de Murcia, Sociedad Española de Briyologia Murcia, Murcia, 463 pp.
- Hodgetts N., Cáliz M., Englefield E., Fettes N., García Criado M., Patin L., Nieto A., Bergamini A., Bisang I., Baisheva E., Campisi P., Cogoni A., Hallingbäck T., Konstantinova N., Lockhart N., Sabovljevic M., Schnyder N., Schröck C., Sérgio C., Sim Sim M., Vrba J., Ferreira C.C., Afonina O., Blockeel T., Blom H., Caspari S., Gabriel R., Garcia C., Garilleti R., González Mancebo J., Goldberg I., Hedenäs L., Holyoak D., Hugonnot V., Huttunen S., Ignatov M., Ignatova E., Infante M., Juutinen R., Kiebacher T., Köckinger H., Kučera J., Lönnell N., Lüth M., Martins A., Maslovsky O., Papp B., Porley R., Rothero G., Söderström L., Ştefănuţ S., Syrjänen K., Untereiner A., Vána J., Vanderpoorten A., Vellak K., Aleffi M., Bates J., Bell N., Brugués M., Cronberg N., Denyer J., Duckett J., During H.J., Enroth J., Fedosov V., Flatberg K.-I., Ganeva A., Gorski P., Gunnarsson U., Hassel K., Hespanhol H., Hill M., Hodd R., Hylander K., Ingerpuu N., Laaka-Lindberg S., Lara F., Mazimpaka V., Mežaka A., Müller F., Orgaz J.D., Patiño J., Pilkington S., Puche F., Ros R.M., Rumsey F., Segarra-Moragues J.G., Seneca A., Stebel A., Virtanen R., Weibull H., Wilbraham J., Żarnowiec J. 2019. A Miniature

- World in Decline: European Red List of Mosses, Liverworts and Hornworts. Brussels: 88 p.
- Ireland, R.** 1982. Moss Flora of Maritime Provinces. National Museum of Natural Sciences, Publication in Botany No: 13, Ottova, 735 pp.
- Kırmacı, M. & Kürschner, H.** 2013. The genus *Sphagnum* L. in Turkey – with *S. contortum*, *S. fallax*, *S. magellanicum* and *S. rubellum* new to Turkey and Southwest Asia. – *Nova Hedwigia*, **96**: 383-397.
- Kırmacı, M., Karakaya, M. Ç., Karakaya, N. & Kürschner, H.** 2013. Three new records to the bryophyte flora of Turkey. – *Biodicon*, **6**(3): 52-56.
- Kürschner, H. & Frey W.** 2011. Liverworts, mosses and hornworts of Southwest Asia (*Marchantiophyta*, *Bryophyta*, *Anthocerotophyta*). – *Nova Hedwigia*, **139**:1-240.
- Lara, F., Mazimpaka, V., Medina, R., Caparros, R. & Garilleti, R.** 2010. The northeastern Turkey, an unnoticed but very important area for the *Orthotrichaceae* (*Musci*, *Bryophyta*). – *Nova Hedwigia*, **138**: 165-180.
- Lara, F., Garilleti, R., Goffinet, B., Draper, I., Medina, R., Vigalondo, B. & Mazimpaka V.** 2016. *Lewinskya*, a new genus to accommodate the phaneroporous and monoicous taxa of *Orthotrichum* (*Bryophyta*, *Orthotrichaceae*). – *Cryptog. Bryol.*, **37**(4): 361-382.
- Lewinsky, J.** 1993. A synopsis of the genus *Orthotrichum* Hedw. (*Musci*, *Orthotrichaceae*). – *Bryobrothera*, **2**: 1-59.
- Nyholm, E.** 1986. Illustrated Flora of Nordic Mosses, Fasc. 1.5 *Fissidentaceae-Seligeriaceae*. The Nordic Bryological Society, Lund, 1-88 pp.
- Nyholm, E.** 1989. Illustrated Flora of Nordic Mosses, Fasc. 2. *Pottiaceae-Splachnaceae-Schistostegaceae*, The Nordic Bryological Society, Lund, 89-189 pp.
- Nyholm, E.** 1993. Illustrated Flora of Nordic Mosses, Fasc. 3. *Bryaceae-Rhodobryaceae Mniaceae-Cinclidiaceae-Plagiomniaceae*. The Nordic Bryological Society, Lund, 190-288 pp.
- Nyholm, E.** 1998. Illustrated Flora of Nordic Mosses, Fasc. 4. *Aulacomniaceae-Meesiaceae-Catocopiaceae-Bartramiaceae-Timmiaceae-Encalyptaceae-Grimmiaceae-Ptychomitriaceae-Hedwigiaceae-Orthotrichaceae*. The Nordic Bryological Society, Lund, 289-408 pp.
- Özdemir, T. & Çetin B.** 1999. The moss flora of Trabzon and environs. – *Turkish J. Bot.*, **23**: 391-404.
- Özdemir, T.** 2009. A revised check-list of the bryophytes of A4 square of Turkey. -*International J. Bot.*, **5**: 1-35.
- Özdemir, T. & Batan, N.** 2017a. The bryophyte checklist of Trabzon Province of Turkey. – *Arctoa*, **26**: 58-67.
- Özdemir, T. & Batan, N.** 2017b. Bryophyte Checklist of Giresun, Northeast Turkey. – *Anatolian Bryology*, **3**(1): 1-8.
- Özenoğlu-Kiremit, H. & Keçeli, T.** 2009. An annotated check-list of the *Hepaticae* and *Anthocerotae* of Turkey. – *Cryptog. Bryol.*, **30**(3): 343-356.
- Papp, B.** 2004. Contributions to the bryoflora of the Pontic Mountains, North Anatolia, Turkey. – *Stud. Bot. Hung.*, **35**: 81-89.
- Paton, J.** 1999. The Liverworts Flora of the British Isles, Harley Books. England, 626 pp.
- Pedrotti, C.C.** 2001. Flora dei muschi d'Italia (*Sphagnopsida*, *Andreaeopsida*, *Bryopsida* (I parte). Antonio delfino Editore medicina-scienze. Roma, 817 pp.
- Pedrotti, C.C.** 2006. Flora dei muschi d'Italia. *Bryopsida* (II parte). 818- 1234 pp. Antonia Delfi no Editore medicina-scienze, Roma.
- Plášek, V., J. Sawicki, R. Ochyra, M. Szczecińska & T. Kulik** 2015. New taxonomical arrangement of the traditionally conceived genera *Orthotrichum* and *Ulotia* (*Orthotrichaceae*, *Bryophyta*). – *Act. Musei Sil., Sci. Nat.* **64**: 169-174.
- Ros, R.M., Mazimpaka, V., Abou-Salama, U., Aleffi, M., Blockeel, T.L., Bruges, M., Cros, R.M., Dia, M.G., Dirkse, G.M., Draper, I., Elsaadawi, W., Erdag, A., Ganeva, A., Gabriel, R., Gonzalezmanabe, J.M., Granger, C., Herrstadt, I., Hugonnot, V., Khalil, K., Kürschner, H., Losada-Lima, A., Luis, L., Mifsud, S., Privitera, M., Puglisi, M., Sabovljević, M., Sergio, C., Shabbara, H.M., Sim-Sim, M., Sotiaux, A., Tacchi, R., Vanderpoorten, A. & Werner, O.** 2013. Mosses of the Mediterranean, an annotated checklist, – *Cryptog. Bryol.*, **34**: 99-283.
- Smith, A.J.E.** 1996. The Liverworts of Britain and Ireland, ISBN: 0-521-42473-9, Cambridge Univ. Press. Cambridge, 384 pp.
- Smith, A.J.E.** 2004. The Moss Flora of Britain and Ireland. Second Edition, ISBN: 0-52181640-8, Cambridge Univ. Press. Cambridge, 1012 pp.
- Söderstrom L, Hagborg A, Von Konrat M, Bartholomew-Began S, Bell D, Briscoe L, Brown E, Cargill D.C, Costa D.P, Crandall-Stotler B.J, Cooper E.D, Dauphin G, Enge J.J, Feldberg K, Glenny D, Gradstein S.R, He X, Heinrichs J, Hentschel J, Ilkiu-Borges A.L, Katagiri T, Konstantinova Na, Larrain J, Long Dg, Nebel M, Pocs T, Puche F, Reiner-Drehwald E, Renner M.A, Sass-Gyarmati A, Schafer-Verwimp A, Moragues J.S, Stotler R.E, Sukkharak P, Thiers B.M, Uribe J, Vaña J, Villarreal J.C, Wigginton M, Zhang L & Zhu R.** 2016. World checklist of hornworts and liverworts. – *PhytoKeys*, **59**: 1-828.
- Townsend, C.C.** 2005. Mosses from the Caucasian region and eastern Turkey. – *J. Bryol.*, **27**: 143-152
- TSMS – Turkish State Meteorological Service.** 2017. 11th region service (Trabzon, Turkey).

