



Additional bryophyte records from Gümüşhane province in Turkey

Nevzat BATAN¹, Turan ÖZDEMİR², Mevlüt ALATAŞ³

1 Maçka Vocational School, Karadeniz Technical University, 61750, Trabzon, Turkey

2 Department of Biology, Faculty of Science, Karadeniz Technical University, 61080, Trabzon, Turkey

3 Zonguldak Science and Art Center, Biology Department, Zonguldak, 67100, Turkey

ABSTRACT: A result of bryological excursion in the Gümüşhane province in Turkey (North east Anatolia), a total of 189 bryophytes belonging to 92 genera (19 liverworts and 180 mosses). *Encalypta trachymitria* Ripart was found for the second time from Turkey. Furthermore, 14 taxa were recorded as new records for the Gümüşhane A4 grid-square.

KEY WORDS: Biodiversity, Bryophyte, Gümüşhane, Turkey.

Received: 24 November 2013

Revision accepted 04 August 2014

UDK 582.32

INTRODUCTION

In recent years there has been a considerable increase in the number of remarkable bryophyte records and bryofloristic papers for Turkey (BATAN & ÖZDEMİR 2012, 2013; CANLI & ÇETİN 2012; EZER & KARA 2012; KIRMACI *et al.* 2012; KIRMACI & AGCAGIL 2012; ÖREN *et al.* 2012; ÖZDEMİR *et al.* 2012; URSAVAŞ & ÇETİN 2012; BATAN *et al.* 2013a, 2013b; CAN *et al.* 2013; KIRMACI & KÜRSCHNER 2013; UYAR & ÖREN 2013; EZER *et al.* 2013), the bryophyte flora of many regions of Turkey are still poorly characterised or completely unknown. The total number of bryophyte species of Turkey has exceeded 970 according to UYAR & ÇETİN (2004); KÜRSCHNER & ERDAĞ (2005); KÜRSCHNER & FREY (2011) and with new records reported. Compared with European countries, not many bryofloristic studies have been conducted in Turkey. Therefore, the bryophyte flora of Turkey need more detailed investigation. The aim of the present study was to contribute significantly to the characterisation of bryophyte flora of Turkey.

Gümüşhane, located in the A4 square according to the HENDERSON (1961) grid system, is surrounded by Bayburt, Giresun, Trabzon and Erzincan and is located in the south of the East Black Sea Region. It is in the Kolşik Zone of

the Europe-Siberia phytogeographical area (Figure 1). The climate in Gümüşhane is characterized by quite hot dry summers with moderate precipitation, rainy autumns and springs, with cold, snowy winters generally marked with high precipitation. The mean annual temperature is 10°C, average humidity is 59%, and the mean annual rainfall is about 409.2 mm (AKMAN 1999).

Gümüşhane is a transitional area between the Black Sea and East Anatolia Regions, and this translation is reflected in its vegetation. Plant cover is steppe in plains less than 1600 m in Gümüşhane, especially Köse Mountain and Vauk Mountains. In uplands higher than 1600-1700 m, pure or mixed stands of *Picea* sp., *Pinus* sp., *Abies* sp., *Quercus* sp., *Populus* sp., *Juniperus* sp., *Fagus* sp. predominate in Gümüşhane (Köse Mountain and Vauk Mountains). Mixed forests composed of coniferous trees such as *Picea* sp., *Pinus sylvestris* L. and *Abies* sp. are within the 800-2000 m range of Harşit valley and South Zigana Mountain. In areas above 2000 m, there are forests composed of *Pinus sylvestris*, whereas the regions below 1500 m embody *P. orientalis*, *A. nordmanniana*, *Carpinus betulus* L., *Populus tremula* L., *Acer platanoides* L., *Ulmus minor* Miller. and *Fagus orientalis* Lipsky. mixed forests. *Alnus glutinosa* L. Gaertner, *Taxus baccata* L., and *Tilia*



Figure 1. Map of the study area.

rubra DC. are among other tree species. In addition, *Quercus* sp. and *Juniperus* sp. grow in damaged areas of the forest while *Rhododendron* sp. may emerge in the subalpine bushes (ANŞIN 1981).

MATERIALS AND METHODS

The bryophyte samples were collected in 23 localities between 19 May, 2009 and 12 October, 2012 in Gümüşhane province in Turkey. The samples were examined with a Carl Zeiss Stemi 2000-C stereomicroscope and Carl Zeiss Axio Imager A2 light microscope. Identifications were determined by consulting keys (LEWINSKY 1993; SMITH 1996, 2004; PATON 1999; CORTINI PEDROTTI 2001, 2006; GREVEN 2003; HEYN & HERRNSTADT 2004; FREY *et al.* 2006; GUERRA *et al.* 2006; KÜRSCHNER 2006, 2008; GUERRA & CROS 2007; KÜRSCHNER & FREY 2011).

For each taxon, localities and substrate were given to avoid repetition in the floristic list, but the same plants collected from different localities were indicated (Loc. 1, 2, 3, 4, 5, 6, etc.). Second time records for Turkish bryophyte flora are indicated with an asterisk (*), first time records for an A4 grid-square are indicated with 2 asterisks (**) and the taxon recorded from Gümüşhane for the first time is indicated with 3 asterisks (***), which is presented in

the bryofloristic list. The nomenclature follows GOFFINET & SHAW (2009) for liverworts and HILL *et al.* (2006) for mosses. Vouchers are deposited in the Biology Department, Faculty of Science, Karadeniz Technical University, Turkey (KTUB).

List of collection stations

1. Turkey, Gümüşhane province, Köse Mountain, Sungurbeyli 1, 40°19'40.90"N, 39°33'56.59"E, 1633 m, 19.05.2009.
2. Turkey, Gümüşhane province, Köse Mountain, Sungurbeyli 2, 40°19'20.66"N, 39°33'55.93"E, 1700 m, 19.05.2009.
3. Turkey, Gümüşhane province, Köse Mountain 1, 40°17'45.42"N, 39°33'19.02"E, 1851 m, 19.05.2009.
4. Turkey, Gümüşhane province, Köse Mountain 2, 40°18'00.74"N, 39°34'22.25"E, 1935 m, 19.05.2009.
5. Turkey, Gümüşhane province, Köse Mountain 3, 40°17'35.44"N, 39°35'09.24"E, 1894 m, 20.05.2009.
6. Turkey, Gümüşhane province, Köse Mountain 4, 40°17'22.85"N, 39°34'28.35"E, 1964 m, 20.05.2009.
7. Turkey, Gümüşhane province, Köse Mountain 5, 40°17'26.52"N, 39°35'42.72"E, 1872 m, 20.05.2009.
8. Turkey, Gümüşhane province, Köse Mountain 6,

- 40°16'55.44"N, 39°35'30.62"E, 1850 m, 20.05.2009.
9. Turkey, Gümüşhane province, Köse Mountain, Subaşı, 40°15'31.80"N, 39°36'55.71"E, 1834 m, 20.05.2009.
 10. Turkey, Gümüşhane province, Vauk Mountain, Güvercinlik 1, 40°22'12.60"N, 39°50'16.65"E, 1910 m, 26.05.2010.
 11. Turkey, Gümüşhane province, Vauk Mountain, Güvercinlik 2, 40°22'09.26"N, 39°49'20.60"E, 1922 m, 26.05.2010.
 12. Turkey, Gümüşhane province, Vauk Mountain, Güvercinlik 3, 40°22'18.02"N, 39°48'55.49"E, 1786 m, 26.05.2010.
 13. Turkey, Gümüşhane province, Vauk Mountain, Akçahisar 1, 40°22'48.51"N, 39°47'22.45"E, 1649 m, 26.05.2010.
 14. Turkey, Gümüşhane province, Vauk Mountain, Akçahisar 2, 40°23'06.67"N, 39°46'53.42"E, 1625 m, 26.05.2010.
 15. Turkey, Gümüşhane province, Vauk Mountain, Akçahisar 3, 40°23'03.06"N, 39°44'57.06"E, 1550 m, 26.05.2010.
 16. Turkey, Gümüşhane province, Vauk Mountain, Geçit, 40°23'03.19"N, 39°43'39.95"E, 1487 m, 27.05.2010.
 17. Turkey, Gümüşhane province, Vauk Mountain, Kale, 40°23'06.77"N, 39°41'46.97"E, 1407 m, 27.05.2010.
 18. Turkey, Gümüşhane province, Vauk Mountain, Gökdere, 40°22'36.01"N, 39°40'42.01"E, 1437 m, 27.05.2010.
 19. Turkey, Gümüşhane province, Torul district, Zigana Mountain 1, 40°36'41.01"N, 39°20'49.12"E, 1136 m, 12.10.2012.
 20. Turkey, Gümüşhane province, Torul district, Zigana Mountain 2, 40°39'14.66"N, 39°22'20.02"E, 1748 m, 03.06.2010.
 21. Turkey, Gümüşhane province, Torul district, Zigana Mountain 3, 40°39'24.82"N, 39°24'27.83"E, 1830 m, 03.06.2010.
 22. Turkey, Gümüşhane province, Kürtün district, Harşit Valley, Çıkrıküzü high plateau 1, 40°42'41.48"N, 38°57'38.31"E, 1765 m, 12.10.2012.
 23. Turkey, Gümüşhane province, Kürtün district, Harşit Valley, Çıkrıküzü high plateau 2, 40°43'08.42"N, 38°58'25.54"E, 1364 m, 12.10.2012.

RESULTS

The collected bryophytes were evaluated and a total of 180 moss taxa (belonging to 78 genera) and 19 liverwort taxa (belonging to 14 genera) were identified from Gümüşhane in Turkey. *Encalypta trachymitria* is also reported for the second time from Turkey.

Bryofloristic list

Liverworts (Marchantiophyta)

****Barbilophozia barbata* (Schmid. ex Schreb.) Loeske. –

Loc: 22, 23; on wet soil.

****Cephaloziella rubella* (Nees) Warnst. – Loc: 22, 23; on wet soil.

****Chiloscyphus polyanthos* (L.) Corda. – Loc: 23; on wet soil.

****Conocephalum conicum* (L.) Dumort. – Loc: 10, 22, 23; on wet soil.

****Diplophyllum albicans* (L.) Dumort. – Loc: 21, 22, 23; on wet soil.

****D. taxifolium* (Wahlenb.) Dumort. – Loc: 22, 23; on wet soil.

****Frullania dilatata* (L.) Dumort. – Loc: 21, 22, 23; on tree trunk and wet soil.

****F. tamarisci* (L.) Dumort. – Loc: 19, 20, 21, 22, 23; on wet soil and tree trunk.

****Marchantia polymorpha* L. – Loc: 22, 23; on wet soil.

****Metzgeria furcata* (L.) Dumort. – Loc: 13, 22, 23; on wet soil.

****Pellia endiviifolia* (Dicks.) Dumort. – Loc: 6, 13, 22, 23; on wet soil.

****P. epiphylla* (L.) Corda. – Loc: 6, 13, 22, 23; on wet soil.

****Porella platyphylla* (L.) Pfeiff. – Loc: 19, 20, 21, 22; on rock and tree trunk.

****Plagiochila asplenoides* (L. emed. Taylor) Dumort. – Loc: 22, 23; on wet soil.

****P. porelloides* (Torrey ex Nees) Lindenb. – Loc: 22, 23; on wet soil.

****Radula complanata* (L.) Dumort. – Loc: 19, 22, 23; on tree trunk.

****Scapania aspera* Bernet et M. Bernet – Loc: 22, 23; on wet soil.

****S. nemorea* (L.) Grolle – Loc: 22, 23; on wet soil.

****Southbya tophacea* (Spruce) Spruce – Loc: 21, 22, 23; on wet soil.

Mosses (Bryophyta)

Abietinella abietina (Hedw.) M.Fleisch. – Loc: 1, 2, 3, 4, 6, 8, 10, 12, 16, 17, 19, 20, 22; on rock and soil.

Anomodon attenuatus (Hedw.) Huebener – Loc: 19, 20, 21, 22, 23, 39, 40; on tree trunk and rock.

***A. tristis* (Ces.) Sull. & Lesq. – Loc: 22, 23; on tree trunk.

A. viticulosus (Hedw.) Hook. & Taylor – Loc: 19, 20, 21, 22, 23, 38; on tree trunk and rock.

****Antitrichia curtipendula* (Hedw.) Brid. – Loc: 20, 21, 22, 23; on tree trunk, tree root and rock.

****Amblystegium serpens* (Hedw.) Schimp. – Loc: 10, 11, 12, 13, 14; on wet soil and rock, near the stream.

Atrichum undulatum (Hedw.) P.Beauv. – Loc: 12, 13, 19, 20, 21, 22, 23; on wet soil.

****Aulacomnium palustre* (Hedw.) Schwägr. – Loc: 3, 5; on rotten log.

Barbula unguiculata Hedw. – Loc: 1, 2, 6, 7, 8, 19, 22; on soil.

Bartramia ithyphylla Brid. – Loc: 19, 20, 21, 22; on soil.

****B. pomiformis* Hedw. – Loc: 19, 20, 21, 22; on soil.

****B. stricta* Brid. – Loc: 19, 22; on wet soil.

- Brachythecium albicans* (Hedw.) Schimp. – Loc: 10, 11; on soil.
- B. glareosum* (Bruch ex Spruce) Schimp. – Loc: 3, 4, 11, 16, 17; on rock and soil.
- B. mildeanum* (Schimp.) Schimp. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20; on soil and rock.
- ****B. rivulare* Schimp. – Loc: 3, 4, 13, 14, 15; on wet rock and soil, near a stream.
- ****B. rutabulum* (Hedw.) Schimp. – Loc: 3, 4, 13, 14, 15, 19, 20, 23; on wet rock and soil, near a stream.
- ****B. salebrosum* (Hoffm. ex F.Weber & D.Mohr) Schimp. – Loc: 15, 16; on soil.
- ****Brachytheciastrum velutinum* (Hedw.) Ignatov & Huttunen – Loc: 10, 13, 14; on soil.
- Bryoerythrophyllum recurvirostrum* (Hedw.) P.C.Chen – Loc: 19, 21, 22, 23; on soil.
- ****Bryum archangelicum* Bruch & Schimp. – Loc: 3, 4, 5, 11, 12, 13, 19, 20, 22, 23; on soil and rock.
- ****B. caespitium* Hedw. – Loc: 13, 14, 15; on soil.
- B. capillare* Hedw. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 19, 20, 22, 23; on soil, tree root and rock.
- B. dichotomum* Hedw. – Loc: 3, 4, 10, 11, 13, 15, 22, 23; on soil and rock.
- ***B. klinggraeffii* Schimp. – Loc: 3, 4, 5; on wet soil.
- ****B. mildeanum* Jur. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 19, 20, 22, 23; on soil, tree root and rock.
- B. moravicum* Podp. – Loc: 3, 10, 11; on soil, tree root and rock.
- ****B. pallens* Sw. ex anon. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15; on soil and rock.
- B. pallescens* Schleich. ex Schwägr. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 20, 22, 23; on soil and rock.
- ****B. pseudotriquetrum* (Hedw.) P. Gaertn. et al. – Loc: 1, 2, 3, 17; on wet soil.
- ****B. rubens* Mitt. – Loc: 3, 4, 5, 6; on wet soil and rock.
- ****B. ruderale* Crundw. & Nyholm – Loc: 10, 11, 13, 14; on soil.
- ****B. torquescens* Bruch & Schimp. – Loc: 13, 14, 15, 16, 17; on soil.
- ****B. turbinatum* (Hedw.) Turner – Loc: 13, 14, 15; on wet soil.
- Calliergonella cuspidata* (Hedw.) Loesk – Loc: 11, 13, 15, 19, 23; on wet soil.
- ****C. lindbergii* (Mitt.) Hedenäs – Loc: 10, 11, 38, 39; on submerged soil.
- ****Campyliadelphus chrysophyllus* (Brid.) R.S. Chopra – Loc: 12, 19, 22, 39; on wet soil and rock, near a stream.
- ****Campylium protensum* (Brid.) Kindb. – Loc: 12, 13, 19, 23, 38, 39; on wet soil and rock, near a stream.
- ****Campylopus pilifer* Brid. – Loc: 22, 23; on wet soil.
- ****Ceratodon purpureus* (Hedw.) Brid. – Loc: 2, 16, 23; on soil.
- Climacium dendroides* (Hedw.) F.Weber & D.Mohr – Loc: 19, 20; on wet soil.
- ****Cratoneuron filicinum* (Hedw.) Spruce – Loc: 12, 13, 19, 20, 22, 23, 38, 39; on submerged soil and rock, near a stream.
- Ctenidium molluscum* (Hedw.) Mitt. – Loc: 14, 19, 20, 23; on wet soil and rock.
- ****Dichodontium palustre* (Dicks.) M.Stech – Loc: 19, 22, 23; on submerged soil and rock.
- ****D. pellucidum* (Hedw.) Schimp. – Loc: 22, 23; on submerged soil and rock.
- ****Dicranella heteromalla* (Hedw.) Schimp. – Loc: 13, 14, 15, 22, 23; on wet soil.
- ***D. subulata* (Hedw.) Schimp. – Loc: 19, 20, 21, 22, 23; on wet soil.
- ****Dicranoweisia cirrata* (Hedw.) Lindb. – Loc: 20, 22; on tree trunk.
- Dicranum flexicaule* Brid. – Loc: 22; on wet soil.
- D. majus* Sm. – Loc: 19, 20, 21, 22, 23; on wet soil.
- ****D. polysetum* Sw. – Loc: 19, 20, 21, 22, 23; on wet soil.
- D. scoparium* Hedw. – Loc: 19, 20, 21, 22, 23; on wet soil.
- ****Didymodon acutus* (Brid.) K.Saito – Loc: 3, 4, 5, 6, 15, 16, 17, 18; on soil.
- ****D. fallax* (Hedw.) R.H.Zander – Loc: 3, 4; on soil.
- ****D. luridus* Hornsch. – Loc: 7, 8, 14, 15; on soil.
- ***D. umbrosus* (Müll. Hal.) R.H.Zander – Loc: 20, 22, 23; on soil.
- ****Drepanocladus aduncus* (Hedw.) Warnst. – Loc: 10, 11, 14; on submerged soil.
- ***Encalypta ciliata* Hedw. – Loc: 1, 2, 3, 4, 5, 13, 15, 16, 17; on soil.
- ***E. rhaptocarpa* Schwägr. – Loc: 6, 7, 8, 13, 14, 18, 19, 20; on soil.
- ****E. streptocarpa* Hedw. – Loc: 6, 7, 8, 13, 14, 18, 19, 20, 22, 23; on soil.
- **E. trachymitria* Ripart – Loc: 22, 23; on soil.
- ****E. vulgaris* Hedw. – Loc: 1, 2, 3, 4, 5, 13, 15, 16, 17; on soil.
- ****Entosthodon attenuatus* (Dicks.) Bryhn – Loc: 4, 5, 22; on wet soil.
- Epipterygium tozeri* (Grev.) Lindb. – Loc: 11, 19, 20, 22, 23; on wet soil.
- ****Eurhynchium angustirete* (Broth.) T.J.Kop. – Loc: 19, 20, 21, 22, 23; on wet rock and soil and tree root.
- E. striatum* (Hedw.) Schimp. – Loc: 19, 20, 21, 22, 23; on wet rock and soil.
- ****Fontinalis antipyretica* Hedw. – Loc: 19, 22, 23; on submerged rock in a stream.
- ****Funaria hygrometrica* Hedw. – Loc: 1, 3, 4, 5, 11, 12, 13, 15, 16, 17, 18; on soil.
- ****Grimmia decipiens* (Schultz) Lindb. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17; on rock.
- ****G. donniana* Sm. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock.
- ****G. elatior* Bruch ex Bals. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock.
- ****G. elongata* Kaulf. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock.
- G. longirostris* Hook. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock.
- G. ovalis* (Hedw.) Lindb. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,

- 12, 13, 14, 15, 16, 17, 18; on rock.
G. pulvinata (Hedw.) Sm. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock.
 ****G. ramondii* (Lamarck & De Candolle) Margadant – Loc: 3, 4, 5, 11, 12, 13; on rock.
G. trichophylla Grev. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock.
 ****Hedwigia ciliata* (Hedw.) P.Beauv. – Loc: 1, 3, 12, 13, 14, 15, 17, 18, 19, 20; on rock.
Herzogiella seligeri (Brid.) Z.Iwats. – Loc: 19, 22, 23; on tree trunk.
 ***Homalothecium aureum* (Spruce) H.Rob. – Loc: 19, 22, 23; on tree trunk and rock.
H. lutescens (Hedw.) H.Rob. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23; on soil, rock, tree root and tree trunk.
H. philippeanum (Spruce) Schimp. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13; on soil, rock, tree root and tree trunk.
H. sericeum (Hedw.) Schimp. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23; on soil, rock, tree root and tree trunk.
 ****Hygroamblystegium humile* (P.Beauv.) Vanderp., Goffinet & Hedenäs – Loc: 3, 10, 11, 20, 22, 23; on submerged soil and rock, near a stream.
 ****H. tenax* (Hedw.) Jenn. – Loc: 3, 10, 11, 20, 22; on submerged soil and rock, near a stream.
 ****H. varium* (Hedw.) Mönk. – Loc: 3, 10, 11, 20, 22, 23; on submerged soil and rock, near a stream.
 ****Hygrohypnum luridum* (Schimp.) Broth. – Loc: 10, 11, 19, 20, 22, 23; on submerged rock, in a stream.
Hylocomium splendens (Hedw.) Schimp. – Loc: 19, 20, 21, 22, 23, 38, 39, 40; on soil.
 ****Hypnum andoi* A.J.E.Sm. – Loc: 13, 14; on tree root and tree trunk.
H. cupressiforme var. *cupressiforme* Hedw. – Loc: 4, 5, 8, 10, 12, 15, 16, 20; on soil, rock, tree root and tree trunk.
H. cupressiforme var. *lacunosum* Brid. – Loc: 1, 2, 4, 5, 8, 10, 12, 15, 16, 22; on soil, rock, tree root and tree trunk.
H. cupressiforme var. *resupinatum* (Taylor) Schimp. – Loc: 1, 2, 4, 5, 8, 10, 12, 15, 16, 18, 10, 22; on soil, rock, tree root and tree trunk.
 ***H. hamulosum* Schimp. – Loc: 22, 23; on wet soil, near a stream.
 ****H. imponens* Hedw. – Loc: 10, 12; on soil and rock.
 ****H. vaucheri* Lesq. – Loc: 11, 14, 16, 17; on soil and rock.
Isothecium alopecuroides (Lam. ex Dubois) Isov. – Loc: 19, 20, 21, 22, 23; on tree root and soil.
 ****Leptodictyum riparium* (Hedw.) Warnst. – Loc: 10; on wet rock, near a stream.
 ****Leucobryum glaucum* (Hedw.) Ångstr. – Loc: 19, 20, 21, 22, 23, 38, 39; on soil and rotten log.
Leucodon sciuroides (Hedw.) Schwägr. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23; on rock and tree trunk.
 ****Mnium lycopodioides* Schwägr. – Loc: 19, 20, 22, 23, 38, 39, 40; on wet soil and and rock.
 ****M. stellare* Hedw. – Loc: 19, 20, 22, 23, 38, 39, 40; on wet soil and and rock.
M. thomsonii Schimp. – Loc: 22, 23, 38, 39, 40; on wet soil.
 ****Neckera complanata* (Hedw.) Hueb. – Loc: 19, 20, 21, 22, 23; on tree trunk.
N. crispa Hedw. – Loc: 10, 13, 14, 15, 19, 20, 21, 22, 23; on tree trunk and rock.
 ***Orthotrichum acuminatum* H. Philib. – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk.
 ****O. anomalum* Hedw. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
 ****O. cupulatum* Hoffm. ex Brid. – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
O. diaphanum Schrad. ex Brid. – Loc: 3, 4, 11, 12, 13, 20, 21, 22, 23; on tree trunk.
 ****O. lyellii* Hook. & Taylor – Loc: 19, 20, 21, 22, 23; on tree trunk.
 ***O. pulchellum* Brunt. – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
 ****O. rivulare* Turner – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
O. rupestre Schleich. ex Schwägr. – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
 ****O. speciosum* Nees – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
 ***O. tenellum* Bruch ex Brid. – Loc: 3, 4, 5, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23; on tree trunk and rock.
 ****Palustriella decipens* (De Not.) Ochyra – Loc: 10, 11; on wet rock, near a stream.
 ****P. falcata* (Brid.) Hedenäs – Loc: 10, 11; on wet rock and soil, near a stream.
 ****Philonotis calcarea* (Bruch & Schimp.) Schimp. – Loc: 3, 4, 5, 6, 13, 14, 15, 23; on submerged soil.
 ****P. fontana* (Hedw.) Brid. – Loc: 3, 4, 5, 6, 10, 11, 12, 13; on submerged soil.
 ****P. seriata* Mitt. – Loc: 19, 22; on submerged soil.
P. tomentella Molendo – Loc: 19, 20, 22, 23; on submerged soil.
 ****Plagiomnium affine* (Blandow ex Funck) T.J.Kop. – Loc: 12, 13, 19, 20, 21, 22, 23, 39; on wet soil.
 ****P. medium* (Bruch & Schimp.) T.J.Kop. – Loc: 13, 15, 19, 20, 21, 22, 23, 38, 39; on wet soil.
 ****P. rostratum* (Schrad.) T.J.Kop. – Loc: 12, 19, 20, 21, 22, 23; on wet soil and and rock.
P. undulatum (Hedw.) T.J.Kop. – Loc: 12, 13, 15, 19, 20, 21, 22, 23, 39; on wet soil and and rock.
 ****Plasteurhynchium striatulum* (Spruce) M.Fleisch. – Loc: 19, 20, 21, 22, 23; on wet soil and rock.
Platyhypnidium riparioides (Hedw.) Dixon – Loc: 10, 19, 20, 22; on submerged rock.
 ****Pogonatum aloides* (Hedw.) P.Beauv. – Loc: 4, 5, 16, 17, 19, 22, 23; on soil.
Pohlia cruda (Hedw.) Lindb. – Loc: 10, 11, 13, 14, 15, 17; on soil, on tree root and rock.
 ****P. nutans* (Hedw.) Lindb. – Loc: 10, 11, 13, 14, 15; on

soil and on tree root.

Polytrichum commune Hedw. – Loc: 3, 4, 10, 11, 12, 22, 23; on soil.

****P. piliferum* Schreb. ex Hedw. – Loc: 1, 2, 5, 12, 14; on soil.

****P. strichum* Menzies. ex Brid – Loc: 1, 2, 5, 11, 14, 15, 17; on soil.

****Pseudoscleropodium purum* (Hedw.) M.Fleisch. – Loc: 20, 22, 23; on wet soil and rock.

****Pseudoleskeella nervosa* (Brid.) Nyholm – Loc: 19, 20, 22, 23; on rock, tree root and tree trunk.

****Pterigynandrum filiforme* Hedw. – Loc: 19, 20, 21, 22, 23; on tree trunk.

****Pterogonium gracile* (Hedw.) Sm. – Loc: 19, 20, 21; on tree root, soil and rock.

****Pylaisia polyantha* (Hedw.) Schimp. – Loc: 22, 23; on tree trunk.

Racomitrium ericoides (Brid.) Brid. – Loc: 11, 12, 13, 14, 15, 16, 17, 18; on rock.

R. elongatum Ehrh. ex Frisvoll – Loc: 11, 12, 13, 14, 15, 16, 17, 18; on rock.

****R. lanuginosum* (Hedw.) Brid. – Loc: 13, 14, 15; on rock.

Rhizomnium punctatum (Bruch & Schimp.) T.J.Kop. – Loc: 21, 22, 23 on wet soil and rock..

****Rhynchostegium confertum* (Dicks.) Schimp. – Loc: 22; on wet rock.

R. murale (Hedw.) Schimp. – Loc: 19, 20, 22; on wet rock.

Rhytidiadelphus triquetrus (Hedw.) Warnst. – Loc: 19, 20, 21, 22, 23, 38, 39, 40; on soil.

****Rhytidium rugosum* (Hedw.) Kindb. – Loc: 19, 20, 21; on soil and rock.

****Sanionia uncinata* (Hedw.) Loeske – Loc: 19, 20, 22, 23; on wet rock, soil, tree root and tree trunk.

Sciuro-hypnum populeum (Hedw.) Ignatov & Huttunen – Loc: 3, 4, 10, 11, 13; on rock and soil.

****Schistidium papillosum* Culm. – Loc: 19, 20, 22, 23; on wet rock.

****S. trichodon* (Brid.) Poelt – Loc: 19, 20, 22, 23; on wet rock.

***Syntrichia calcicola* J.J.Amann – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on soil.

****S. laevipila* Brid. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on rock and tree root.

****S. montana* Nees – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21; on rock, on soil and tree root.

****S. norvegica* F.Weber – Loc: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15; on rock, on soil and tree root

****S. princeps* (De Not.) Mitt. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21; on rock, on soil and tree root.

S. ruralis var. *ruralis* (Hedw.) F.Weber & D.Mohr – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21; on rock and on soil.

****S. ruralis* var. *ruraliformis* (Besch.) Delogne – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21;

on rock and on soil.

S. virescens (De Not.) Ochyra – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21; on rock, on soil and tree root.

****Timmia austriaca* Hedw. – Loc: 10, 11, 12, 13, 14, 15; on soil.

****T. bavarica* Hessel. – Loc: 10, 11, 12, 13, 14, 15; on soil.

****T. megapolitana* Hedw. – Loc: 12, 13; on soil.

***T. norvegica* J.E.Zetterst. – Loc: 11, 14, 15; on soil.

Thuidium delicatulum (Hedw.) Schimp. – Loc: 13, 14, 19, 20, 21, 22, 23, 38; on wet rock and soil.

****T. recognitum* (Hedw.) Lindb. – Loc: 13, 15, 19, 20, 21, 22, 23, 39; on wet rock and soil.

T. tamariscinum (Hedw.) Schimp. – Loc: 13, 14, 15, 19, 20, 21, 22, 23, 40; on wet rock and soil.

Tortella fragilis (Hook. & Wilson) Limpr. – Loc: 3, 4, 12, 13; on soil.

****T. humilis* (Hedw.) Jenn. – Loc: 14, 15, 19, 20, 21, 23; on wet rock and soil.

****T. inclinata* (Hedw.) Jenn. – Loc: 14, 19, 20; on soil.

****T. inflexa* (Bruch) Broth. – Loc: 5; on soil.

T. tortuosa (Hedw.) Limpr. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23; on rock and soil.

****Tortula canescens* Mont. – Loc: 1, 5, 10, 15, 16, 17, 19, 20, 21; on soil.

****T. muralis* Hedw. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23; on soil.

T. subulata Hedw. – Loc: 1, 2, 3, 7, 8, 9, 12, 13, 17, 18, 19; on soil.

***T. vahliana* (Schultz) Mont. – Loc: 1, 2, 4, 12, 15; on soil.

****Trichostomum crispulum* Bruch – Loc: 4, 5, 14, 19; on soil.

****Ulota crispa* (Hedw.) Brid. – Loc: 19, 20, 21, 22, 23; on tree trunk.

****Warnstorfia exannulata* (Schimp.) Loeske – Loc: 10; on submerged soil.

****Weissia brachycarpa* (Nees & Hornsch.) Jur. – Loc: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; on soil.

****W. condensa* (Voit) Lindb. – Loc: 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18; on soil.

****W. controversa* Hedw. – Loc: 3, 4, 5, 6, 7, 10, 11, 14, 15, 19; on soil.

***Zygodon rupestris* Schimp. ex Lorent – Loc: 19, 23; on tree trunk.

DISCUSSION

A total of 180 moss taxa (78 genera) and 19 liverwort taxa (14 genera) were reported from Gümüşhane province in north east Turkey. One hundred and forty bryophyte taxa were reported for the first time from Gümüşhane province while *Encalypta trachymitria* was also found for the second time in Turkey. Furthermore, 14 taxa are new records for square A4 in the grid system adopted by HENDERSON (1961).

The genera with the highest number of species for mosses in this study were *Bryum* (14 taxa), *Orthotrichum* (10 taxa), *Grimmia* (9 taxa), *Syntrichia* (8 taxa), *Brachythecium* (6 taxa) and *Hypnum* (6 taxa). *Diplophyllum* (2 taxa), *Frullania* (2 taxa), *Pellia* (2 taxa), *Porella* (2 taxa), *Plagiochila* (2 taxa) and *Scapania* (2 taxa) were the richest genera in terms of species number within the liverworts.

Bryophyte taxa were seen to grow mostly on soils (or wet soils), on rock and wet rock, on tree trunk, tree root and submerged soil and rock in the study area in Gümüşhane province. There are many epiphytic bryophytes, because of there are more in tree the research area [The second part of this sentence is unintelligible, so I have no idea what the text should be!]. As regards climatic conditions, most of the bryophytes prefer soil, wet soil and rock, submerged and trees near a stream or river, which is consistent with the climate and valleys in the study area. The most important habitats for bryophytes were soil, rock and tree.

The most common genera of bryophytes are *Tortella*, *Tortula*, *Grimmia*, *Syntrichia*, *Homalothecium*, *Bryum*, *Weissia*, *Thuidium* and *Orthotrichum*.

Weissia brachycarpa, *W. condensata*, *Tortula muralis*, *Tortula tortuosa*, *Syntrichia calcicola*, *S. laevipila*, *S. montana*, *S. princeps*, *S. ruralis*, *S. virescens*, *Orthotrichum acuminatum*, *O. anomalum*, *O. cupulatum*, *O. speciosum*, *O. cupulatum*, *O. tenellum*, *Homalothecium lutescens*, *H. sericeum*, *Grimmia decipiens*, *G. elatior*, *G. longirostris*, *G. ovalis*, *G. pulvinata*, *Bryum mildeanum*, *Thuidium delicatulum* are the most common taxa in the study area.

Until our study, 99 moss taxa had been reported from Gümüşhane (ÖZDEMİR & BATAN 2009; BATAN & ÖZDEMİR 2011; LARA *et al.* 2010). The present study comprised 199 taxa (180 mosses and 19 liverworts). Furthermore, this study provided the first records for liverworts from Gümüşhane. The new records from these studies have increased the total number of bryophyte species of Gümüşhane to 239 (19 liverworts and 220 mosses).

REFERENCES

- AKMAN Y. 1999. Climate and Bioclimate (The Methods of Bioclimate and Climate Types of Turkey). Kariyer Matbaacılık Ankara.
- ANŞIN R. 1981. Main vegetation types of the inner and coastal part of the East Black Sea region. *Journal of the Forestry Faculty of the Karadeniz Technical University* **4**: 14-25.
- BATAN N & ÖZDEMİR T. 2011. Some mosses records from Mersin (C12), Trabzon and Gümüşhane (A4). *SDU Faculty of Forestry Journal* **12**: 104-109.
- BATAN N & ÖZDEMİR T. 2012. *Bryoerytrophillum rubrum* (Pottiaceae) - a new moss record for Turkey. *Phytologia Balcanica* **18**: 117-120.
- BATAN N & ÖZDEMİR T. 2013. Contributions to the moss flora of the Caucasian part (Artvin Province) of Turkey. *Turk. J. Bot.* **37**: 375-388.
- BATAN N, ALATAŞ M & ÖZDEMİR T. 2013a. *Leptoscyphus cuneifolius* (Lophocoleaceae, Marchantiophyta) new to Southwest Asia. *Cryptogamie Bryol.* **34**: 373-377.
- BATAN N, ALATAŞ M & ÖZDEMİR T. 2013b. *Schistidium sordidum* new to Turkey and Southwest Asia. *Arch. Biol. Sci.* **65**: 1505-1509.
- CAN SM, KARA R & EZER T. 2013. Bryophyte flora of Melendiz Mountain in Turkey. *Turk. J. Bot.* **37**: 575-588.
- CANLI K & ÇETİN B. 2012. *Didymodon tomaculosus* (Blockeel) M.F.V. Corley, new to the moss flora of Turkey and Asia. *Bangladesh J. Botany* **41**: 177-179.
- CORTİNİ PEDROTTI C. 2001. Flora dei muschi d'Italia, Sphagnopsida, Andreaopsida, Bryopsida (I Parte). Antonio Delfino Editore Medicina-Scienze Roma.
- CORTİNİ PEDROTTI C. 2006. Flora dei muschi d'Italia, Bryopsida (II parte). Antonio Delfino Editore Medicina-Scienze Roma.
- EZER T & KARA R. 2012. New national and regional bryophyte records, 33. 15. *Pseudocalliergon turgescens* (T.Jensen) Loeske, Turkey. *J. Bryol.* **34**: 286.
- EZER T, KARA R & ALATAŞ M. 2013. *Scapania gracilis* Lindb. (Hepaticae, Scapaniaceae), new to bryophyte flora of Turkey. *Folia Cryptog. Estonica* **50**: 117-119.
- FREY W, FRAHM JP, FISCHER E & LOBIN W. 2006. The Liverworts, Mosses and Ferns of Europe. Gustav Fischer Verlag, Heidelberg.
- GOFFINET B & SHAW AJ. 2009. Bryophyte Biology. 2nd ed. Cambridge Univ. Press, Cambridge.
- GREVEN HC. 2003. Grimmias of the World. Leiden: Backhuys Publishers.
- GUERRA J & CROS M. 2007. Flora Briofítica Ibérica, Vol. 1, Murcia: Universidad de Murcia Sociedad Española de Briología.
- GUERRA J, CANO MJ & CROS RM. 2006. Flora Briofítica Ibérica, Vol. 3, Murcia: Universidad de Murcia Sociedad Española de Briología.
- HENDERSON DM. 1961. Contribution to bryophyte flora of Turkey IV. *Notes from the Royal Botanical Garden Edinburgh* **23**: 263-278.
- HEYN CC & HERRNSTADT I. 2004. The Bryophyte Flora of Israel and Adjacent Regions. Jerusalem: The Israel Academy of Sciences and Humanities.
- HILL MO, BELL N, BRUGGEMAN-NANNENGA MA, BRUGUES M, CANO MJ, ENROTH J, FLATBERG KI, FRAHM JP, GALLEGO MT, GARILLETI R, GUERRA J, HEDENAS L, HOLYOAK DT, HYVONEN J, IGNATOV MS, LARA F, MAZIMPAKA V, MUÑOZ J & SODERSTROM L. 2006. An annotated checklist of the mosses of Europe and Macaronesia. *J. Bryol.* **28**: 198-267.
- KIRMACI M & AGCAGIL E. 2012. New national and regional bryophyte records, 33. 2. *Crossidium aberrans* Holz. and E.B. Bartram, Turkey. *J. Bryol.* **34**: 281-282.
- KIRMACI M, KÜRSCHNER H & ERDAĞ A. 2012. New and noteworthy records to the bryophyte flora of Turkey and Southwest Asia. *Cryptogamie Bryol.* **33**: 267-270.
- KIRMACI 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.
- KÜRSCHNER H & ERDAĞ A. 2005. Bryophytes of Turkey: an annotated reference list of the species with synonyms from the recent literature and an annotated list of Turkish bryological literature. *Turk. J. Bot.* **29**: 95-154.
- KÜRSCHNER H. 2006. A key to pleurocarpous mosses (Bryophytina p.p.) of the Near and Middle East towards a bryophyte flora of the Near and Middle East 5. *Nova Hedwigia* **83**: 353-386.
- KÜRSCHNER H. 2008. A key to acrocarpous mosses (Bryophytina p.p.) of the Near and Middle East towards a bryophyte flora of the Near and Middle East 7. *Nova Hedwigia* **86**: 43-103.
- KÜRSCHNER H & FREY W. 2011. Liverworts, mosses and hornworts of Southwest Asia (*Marchantiophyta*, *Bryophyta*, *Anthocerotophyta*). *Nova Hedwigia* **139**: 1-240.
- LARA F, MAZIMPAKA V, MEDİNA R, CAPARROS R & GARILLETI R. 2010. Northeastern Turkey, an unnoticed but very important area for the *Orthotrichaceae* (Musci, Bryophyta). *Nova Hedwigia* **138**: 165-180.
- LEWINSKY J. 1993. A synopsis of the genus *Orthotrichum* Hedw. (Musci, *Orthotrichaceae*). *Bryobrothera* **2**: 1-59.
- ÖREN M, UYAR G & KEÇELİ T. 2012. The bryophyte flora of the western part of the Kure Mountains (Bartın, Kastamonu), Turkey. *Turk. J. Bot.* **36**: 538-557.
- ÖZDEMİR T & BATAN N. 2009. Contributions to the moss flora Gümüşhane (Kürtün, Torul districts), Turkey. *Pakistan Journal of Biological Sciences* **12**: 346-352.
- ÖZDEMİR T, BATAN N & UYAR G. 2012. New national and regional bryophyte records, 31. 8. *Conardia compacta* (Drumm. ex Müll.Hal.) H.Rob., Turkey. *J. Bryol.* **34**: 125-126.
- PATON J. 1999. The Liverworts Flora of the British Isles. Harley Books Oxon.
- SMITH AJE. 1996. The Liverworts of Britain and Ireland. Cambridge Univ. Press Cambridge.
- SMITH AJE. 2004. The Moss Flora of Britain and Ireland. Cambridge University Press Cambridge.
- URSAVAŞ S & ÇETİN B. 2012. *Seligeria donniana* (Sm.) Müll. Hal. (Seligeriaceae) a new record to the bryophyte flora of Turkey. *Biodicon* **5**: 70-72.
- UYAR G & ÇETİN B. 2004. A new check-list of the mosses of Turkey. *J. Bryol.* **26**: 203-220.
- UYAR G & ÖREN M. 2013. Three remarkable new moss records for South-West Asia from northern Turkey. *Turk. J. Bot.* **37**: 363-368.

Botonica SERBICA



REZIME

Dodatni podaci za briofloru provincije Gümüşhane (Turska)

Nevzat BATAN, Turan ÖZDEMİR, Mevlüt ALATAŞ

U ovom radu dati su podaci brioloških istraživanja provincije Gümüşhane u Turskoj (severoistočna Anadolija). Zabeleženo je ukupno 189 briofita svrstanih u 92 roda (19 jetrenjača i 180 mahovina). *Encalypta trachymitria* Ripart zabeležena je po drugi put u flori Turske. Četrnaest taksona navode se kao novi za Gümüşhane kvadrat A4.

Ključne reči: biodiverzitet, briofite, Gümüşhane, Turska.