Contrubition to the bryophyte flora of the İkizdere district (Rize, Turkey)

Nevzat Batan[1], Vagif Atamov[2], Savaş Ekşi[2] & Hüseyin Erata[3]

[1] Karadeniz Technical University, Maçka Vocational School, 61750, Trabzon, Turkey, e-mail: nevzatbatan@gmail.com (corresponding author)

[2] Recep Tayyip Erdoğan University, Faculty of Science and Art, Biology Department, 53100, Rize, Turkey

[3] Karadeniz Technical University, Department of Biology, Faculty of Science, 61080, Trabzon, Turkey

Received: June 27, 2017 ▷ Accepted: November 21, 2017

Abstract. As a result of bryological outing in the İkizdere district (Rize Province) in Turkey, a total of 175 bryophtes belonging to 104 genera (13 liverworts and 91 mosses) were determined from 17 different localities. Of these, 17 taxa belong to liverworts and 158 taxa belong to mosses. Among them, *Drepanocladus sordidus* and *Hypnum recurvatum* are reported for the second time from Turkey.

Key words: Biodiversity, bryophytes, İkizdere, Rize, Turkey

Introduction

Rize Province is located in the Euro-Siberian floristic region. It is surrounded by the Black Sea in the north, Artvin in the east, Erzurum in the south, and Trabzon in the west.

So far many bryofloristic studies have been conducted in the Rize Province (between 1955 and 2014). As a result of this, 410 bryophytes belonging to 172 genera (46 liverworts and hornworts, and 126 mosses) and 75 families were determined from different localities of Rize. Of these, 83 taxa are liverworts and hornworts, and 327 taxa are mosses (Abay & al. 2016). Rize is one of the highly varied areas for bryophytes in Turkey. It could be said that the number of bryophyte taxa increases with further investigations in the less studied areas of the Rize Province.

The total number of bryophte species in the Rize Province has reached 448 after this study. The study makes a notable contribution to the knowledge of bryopyte flora of İkizdere district (Rize Province), Black Sea Region and Turkey.

Material and methods

The bryophte samples were collected in 17 different localities between 2nd May 2013 and 19th Sebtember, 2013 from İkizdere (Rize) in Turkey (Fig. 1). The samples were examined with Carl Zeiss Stemi 2000-C stereomicroscope and Carl Zeiss Axio İmager A2 light microscope. Identifications were determined by consulting various keys (Nyholm 1986, 1989, 1993, 1998; Lewinsky 1993a, 1993b; Blom 1996; Smith 1996, 2004; Paton 1999; Pedrotti 2001, 2006; Greven 2003; Hedenäs & Bisang 2004; Heyn & Herrnstadt 2004; Frey & al. 2006; Guerra & al. 2006; Guerra & Cros 2007; Kürschner & Frey 2011).

For each taxa, 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, … etc.). The taxon recorded from Turkey for the second time is indicated with (*) in the bryofloristic list. Also, the taxon recorded from Rize Province for the first time is indicated with (#) in the bryofloristic list. Nomenclature of the species follows Ros & al. (2007) for liverworts and Ros & al. (2013), Plášek & al. (2015) and Lara & al. (2016) for mosses. The status of bryophyte taxa was evaluated by reviewing related literature for the Rize Province (Abay & al. 2016).

Bryophyte samples are deposited at the Biology Department, Faculty of Science, Karadeniz Technical University, Turkey (KTUB).

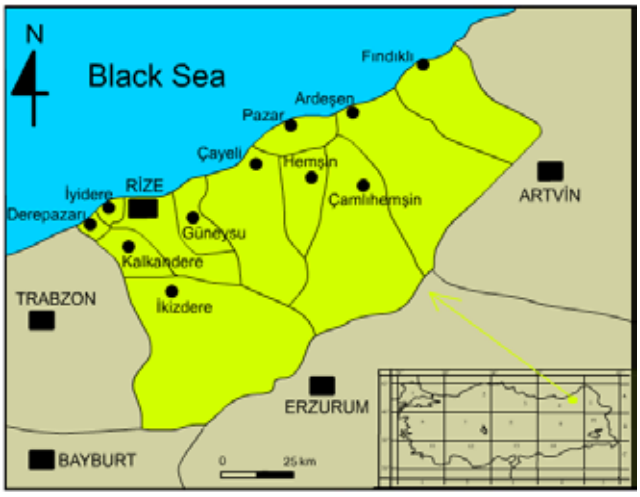

Fig. 1. Map of the study area (İkizdere-Rize in Turkey).

The Eastern Black Sea Mountain Range belongs to Northern Anatolia (including Rize Province) of Turkey. The eastern part of the Range is high and lies close to the Black Sea. On the northern side of the mountains, the streams and rivers had cut deep gorges to flow down to the sea.

Because of the moist climate, this region supports the largest areas of closed forests in Turkey. İkizdere district has a typical oceanic climate. Drought season is lacking and annual precipitation amounts to 2300 mm. The mean annual temperature is 18.5 °C, the coldest month is January with 6 °C, and the warmest one is July with 24 °C (Anşin 1981; Akman 1999; Papp 2004).

The northern slopes of the Eastern Black Sea Mountain Range are covered with mixed forests. Dominating vegetation comprises *Rhododendron ponticum* L., *R. luteum* Sweet., *Alnus glutinosa* (L.) Gaertn., *Buxus sempervirens* L., *Corylus avellana* L., *Ilex colchica* Pojk., *Daphne pontica* L., *Fagus orientalis* Lipsky, *Picea orientalis* (L.) Link., *Laurus nobilis* L., *Castanea sativa* Mill., *Carpinus betulus* L., and *Tilia rubra* DC, *Salix* sp. (Anşin 1981; Papp 2004).

List of collection stations

1. Turkey, Rize Province, İkizdere district, Demirkapı village; 40°46'02"N-40°36'03"E; 1200 m; 02.05.2013.
2. Turkey, Rize Province, İkizdere district, Tulumpınar village; 40°42'45"N-40°37'06"E; 1150 m; 02.05.2013.
3. Turkey, Rize Province, İkizdere district, Çamlık village-1; 40°42'37"N-40°38'21"E; 1372 m; 03.05.2013.
4. Turkey, Rize Province, İkizdere district, Çamlık village; 40°42'00"N-40°40'00"E; 1600 m; 04.05.2013.
5. Turkey, Rize Province, İkizdere district, Sivrikaya village-1; 40°40'28"N-40°42'49"E; 1900 m; 05.05.2013.
6. Turkey, Rize Province, İkizdere district, Sivrikaya village-2; 40°40'13"N-40°43' 04"E; 2083 m; 05.05.2013.
7. Turkey, Rize Province, İkizdere district, Ovit Mountain-1; 40°39'12"N-40°43'51"E; 2316 m; 04.05.2013.
8. Turkey, Rize Province, İkizdere district, Dereköy village; 40°42'42"N-40°36'52"E; 1200 m; 25.07.2013.
9. Turkey, Rize Province, İkizdere district, Yerelma village; 40°42'06"N-40°35'54"E; 150 m; 25.07.2013.
10. Turkey, Rize Province, İkizdere district, Tulumpınar village-2; 40°42'37"N-40°37'47"E; 1400 m; 26.07.2013.
11. Turkey, Rize Province, İkizdere district, Ovit Mountain-2; 40°37'06"N-40°46'46"E; 2735 m; 27.07.2013.
12. Turkey, Rize Province, İkizdere district, Rüzgârlı; 40°45'11"N-40°33'19"E; 700 m; 16.09.2013.
13. Turkey, Rize Province, İkizdere district, near the Ridos Hotel; 40°47'08"N-40°36'42"E; 890 m; 17.09.2013.
14. Turkey, Rize Province, İkizdere district, Hostaval Waterfall; 40°46'04"N-40°38'57"E; 1150 m; 17.09.2013.
15. Turkey, Rize Province, İkizdere district, Cimil Başköy village; 40°43'56"N-40°47'15"E; 2040 m; 18.09.2013.

16. Turkey, Rize Province, İkizdere district, Cimil Ortaköy village; 40°44'07"N 40°45'42"E; 2010 m; 18.09.2013.
17. Turkey, Rize Province, İkizdere district, Cimil Aşağıköy village; 40°44'25"N-40°43'42"E; 1980 m; 18.09.2013.

Results

The collected bryophytes were evaluated and 175 taxa (species, subspecies and varieties) belonging to 104 genera were determined.

Bryofloristic list

Liverworts (Marchantiophyta)

Conocephalum conicum (L.) Dumort. – 1: on soil.
Diplophyllum albicans (L.) Dumort. – 10: on soil.
Frullania tamarisci (L.) Dumort.– 3: on rotten tree.
Jubula hutchinsiae spp. *javanica* (Steph.) Verd. – 14: on wet rock.
 # Jungermannia gracillima Sm. – 6: on wet soil.
 # Jungermannia hyalina Lyell – 7: on wet rock.
Lejeunea cavifolia (Ehrh.) Lindb. Emend. Buch. – 10: on trunk of tree.
Lunularia cruciata (L.) Dumortier ex Lindb. – 2: on wet soil.
Metzgeria conjugata Lindb. – 10: on rock.
M.furcata (L.) Dumort. – 10: on trunk of tree.
 # Nardia compressa (Hook.) Gray – 6: on wet rock.
Pellia epiphylla (L.) Corda – 14: on wet soil.
Plagiochila asplenioides (L. emed. Taylor) Dumort. – 10: on soil.
P. porelloides (Torrey ex Nees) Lindb. – 15: on rock.
Porella platyphylla (L.) Pfeiff. – 2: on trunk of tree.
Radula complanata (L.) Dumort. – 7: on trunk of tree.
R. lindbergiana Gottsche ex C. Hartm. – 6: on trunk of tree.

Mosses (Bryophyta)

Abietinella abietina (Hedw.) M.Fleisch. var. *Abietina* – 7: on soil.
A. abietina var. *hystricosa* (Mitt.) Sakurai – 7; on soil.
 # Alleniella besseri (Lobarz.) S. Olsson, Enroth & D. Quandt – 5: on trunk tree.
Alleniella complanata (Hedw.) S. Olsson, Enroth & D. Quandt – 9: on trunk tree.
Amblystegium serpens (Hedw.) Schimp. – 8: on wet soil.
Anomodon attenuatus (Hedw.) Huebener – 5: on rock.
A.viticulosus (Hedw.) Hook. & Taylor – 1: on wet soil.
A. rugelii (Müll. Hal.) Keissl. – 1: on rock.
Atrichum angustatum (Brid.) Bruch & Schimp. – 5: on rock.
A. undulatum (Hedw.) P. Beauv. – 8: on soil.
Aulacamnium palustre (Hedw.) Schwägr. – 14: on wet soil.
Barbula convoluta Hedw. – 11: on soil.
B. unguiculata Hedw. – 5: on soil.
Bartramia halleriana Hedw. – 2: on wet soil.
B. pomiformis Hedw. – 13: on rock.
Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen – 9: on rock.
Brachythecium albicans (Hedw.) Schimp. – 17: on rock.
 # B. capillaceum (F.Weber & D.Mohr) Giacom. – 15: on rock.
B. rivulare Schimp. – 6: on wet soil.
B. rutabulum (Hedw.) Schimp. – 7: on rock.
B. salebrosum (Hoffm. ex F. Weber & D. Mohr) Schimp. – 6: on rock.
 # Bryoerythrophyllum ferruginascens (Stirt.) Giacom. – 7: on rock.
 # Bryum intermedium (Brid.) Blandow – 6: on rock.
B. schleicheri DC. – 12: on soil.
 # B. turbinatum (Hedw.) Turner – 3: on soil.
 # Calliergonella cuspidata (Hedw.) Loeske – 10: on soil.
C. lindbergii (Mitt.) Hedenäs – 8: on wet soil.
 # Campyliadelphus chrysophyllus (Brid.) R.S.Chopra – 13: on wet rock.
Campylium protensum (Brid.) Kindb. – 7: on soil.
Ceratodon purpureus (Hedw.) Brid. – 8: on soil.
 # Cirriphyllum crassinervum (Taylor) Loeske & M.Fleisch. – 14: on soil.
 # C. piliferum (Hedw.) Grout – 12: on soil.
Climacium dendroides (Hedw.) F. Weber & D. Mohr. – 5: on wet soil.
Cratoneuron filicinum (Hedw.) Spruce – 6: on wet rock.
Ctenidium molluscum (Hedw.) Mitt. – 15: on rotten tree.
Dicranella heteromalla (Hedw.) Schimp. – 9: on soil.
 # D. howei Renauld & Cardot – 12: on wet soil.
Dicranoweisia cirrata (Hedw.) Lindb. – 1: on soil.

D. crispula (Hedw.) Milde – 13: on wet soil.
Dicranum bonjeanii De Not. – 3: on soil.
D. majus Turner – 12: on rock.
D. polysetum Sw. – 7: on soil.
D. scoparium Hedw. – 16: on soil.
Didymodon acutus (Brid.) K. Saito – 14: on soil.
D. insulanus (De Not.) M.O. Hill – 10: on soil.
D. rigidulus Hedw. – 15: on soil.
D. vinealis (Brid.) R.H.Zander – 6: on soil.
Drepanocladus aduncus (Hedw.) Warnst. – 2: on soil.
* *D. sordidus* (Müll.Hal.) Hedenäs – 14: on wet soil.
# *Encalypta ciliata* Hedw. – 7: on rock.
E. streptocarpa Hedw. – 13: on soil.
Entodon concinnus (De Not.) Paris – 3: on wet soil.
E. schleicheri (Schimp.) Demet – 8: on wet soil.
Epipterygium tozeri (Grev.) Lindb. – 1: on wet soil.
Eucladium verticillatum (With.) Brunch & Schimp. – 4: on rock.
Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen – 12: on soil.
Eurhynchium angustirete (Broth.) T.J.Kop. – 1: on soil.
E. striatum (Hedw.) Schimp. – 9: on soil.
Exsertotheca crispa (Hedw.) S. Olsson, Enroth & D. Quandt – 3: on rock.
Fissidens adianthoides Hedw. – 5: on soil.
F. bryoides Hedw. – 5: on soil.
F. dubius P. Beauv. – 4: on soil.
F. taxifolius Hedw. – 9: on soil.
Fontinalis antipyretica Hedw. – 14: on wet rock.
Funaria hygrometrica Hedw. – 4: on wet soil.
Grimmia decipiens (Schultz) Lindb. – 11: on soil.
G. elongata Kaulf. – 6: on rock.
Gymnostomum aeruginosum Sm. – 10: on wet soil.
Habrodon perpusillus (De Not.) Lindb. – 9: on trunk of tree.
Hedwigia ciliata (Hedw.) P. Beauv. var. *Ciliata* – 10: on wet soil.
H. ciliata var. *leucophaea* Bruch & Schimp – 7: on wet soil.
Herzogiella seligeri (Brid.) Z.Iwats. – 10: on rotten tree.
Homalothecium aureum (Spruce) H. Rob. – 5: on soil.
H. lutescens (Hedw.) H. Rob. – 10: on rock.
H. sericeum (Hedw.) Schimp. – 3: on soil.
Hookeria lucens (Hedw.) Sm. – 4: on soil.
Hygrohypnum eugyrium (Schimp.) Broth. – 10: on wet soil.
H. luridum (Hedw.) Jenn. – 8: on wet rock.
Hylocomium splendens (Hedw.) Schimp. – 3: on soil.
Hymenoloma crispulum (Hedw.) Ochyra – 13: on wet soil.
Hypnum andoi A.J.E. Sm. – 13: on soil.
H. cupressiforme var. *cupressiforme* Hedw. – 16: on rock.
H. cupressiforme var. *lacunosum* Brid. – 4: on trunk of tree.
H. cupressiforme var. *resupinatum* (Taylor) Schimp. – 4: on trunk of tree.
H. jutlandicum Holmen & E.Warncke – 6: on soil.
* *H. recurvatum* (Lindb. & Arnell) Kindb. – 8: on rock.
# *H. vaucheri* Lesq. – 1: on soil.
Isothecium alopecuroides (Lam. ex Dubois) Isov. – 16: on soil.
I. myosuroides Brid. – 2: on soil.
Kindbergia praelonga (Hedw.) Ochyra – 3: on soil.
Leptodictyum riparium (Hedw.) Warnst. – 12: on wet soil.
Lescuraea saxicola (Schimp.) Milde – 1: on rock.
Leucobryum glaucum (Hedw.) Angstr. – 14: on soil.
L. juniperoideum (Brid.) Müll. Hal. – 17: on wet soil.
Leucodon sciuroides (Hedw.) Schwägr. – 4: on trunk of tree.
Mnium hornum Hedw. – 17: on wet rock.
M. lycopodioides Schwagr. – 1: on wet rock.
M. marginatum (Dicks.) P. Beauv. – 7: on wet soil.
M. stellare Hedw. – 6: on wet rock.
Oncophorus virens (Hedw.) Brid. – 6: on soil.
Orthotrichum affine Schrad. ex Brid. – 7: on trunk of tree.
O. anomalum Hedw. – 9: on rock.
O. pumilum Sw. ex anon. – 12: on trunk of tree.
O. rupestre Schleich. ex Schwägr. – 6: on rock.
Oxyrrhynchium hians (Hedw.) Loeske – 4: on soil.
O. schleicheri (R. Hedw.) Röll – 9: on soil.
Palamocladium euchloron (Müll.Hal.) Wijk & Margad. – 14: on rock.
Palustriella commutata (Hedw.) Ochyra – 14: on wet rock.
Philonotis caespitosa Jur. – 6: on wet soil.
P. calcarea (Bruch & Schimp.) Schimp. – 5: on wet soil.
P. capillaris Lindb. – 14: on wet rock.
P. fontana (Hedw.) Brid. – 13: on wet soil.
Plagiomnium elatum (Bruch & Schimp.) T.J.Kop. – 1: on wet soil.

P. ellipticum (Brid.) T.J.Kop. – 2: on wet soil.
P. rostratum (Schrad.) T.J.Kop. – 17: on soil.
P. undulatum (Hedw.) T.J.Kop. – 12: on soil.
Plagiothecium cavifolium (Brid.) Z. Iwats. – 15: on soil.
 # P. latebricola Schimp. – 8: on soil.
P. succulentum (Wilson) Lindb. – 3: on soil.
Pleurozium schreberi (Willd. ex Brid.) Mitt. – 8: on soil.
 # Pogonatum nanum (Hedw.) P. Beauv. – 3: on soil.
P. urnigerum (Hedw.) P. Beauv. – 17: on soil.
 # Pohlia melanodon (Brid.) A.J. Shaw – 4: on soil.
P. nutans (Hedw.) Lindb. – 6: on soil.
P. wahlenbergii (F. Weber & D. Mohr) A.L. Andrews – 4: on soil.
 # Polytrichastrum longisetum (Hedw.) G.L. Sm. – 15: on soil.
Polytrichum commune Hedw. – 8: on rock.
P. piliferum Hedw. – 4: on soil.
Pseudoamblystegium subtile (Hedw.) Vanderp. & Hedenäs – 15: on soil.
Pseudoleskea nervosa (Brid.) Nyholm – 12: on soil.
Pseudoscleropodium purum (Hedw.) M.Fleisch. – 8: on rock.
Pterigynandrum filiforme Hedw. – 7: on rock.
Ptychostomum capillare (Hedw.) Holyoak & N. Pedersen – 14: on rock.
P. moravicum (Podp.) Ros & Mazimpaka – 6: on soil.
P. pallens (Sw.) J.R. Spence – 11: on soil.
P. pallens (Sw.) J.R. Spence – 11: on soil.
P. pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay – 11: on wet soil.
 # Pylaisia polyantha (Hedw.) Schimp. – 10: on trunk of tree.
Racomitrium aquaticum (Brid. ex Schrad.) Brid. – 5: on wet soil.
R. canescens (Hedw.) Brid. – 11: on soil.
R. heterostichum (Hedw.) Brid. – 4: on rock.
Rhizomnium punctatum (Hedw.) T.J.Kop. – 10: on rock.
Rhodobryum roseum (Hedw.) Limpr. – 10: on soil.
Rhynchostegiella tenella (Dicks.) Limpr. – 10: on wet soil.
Rhynchostegium confertum (Dicks.) Schimp. – 4: on rock.
R. murale (Hedw.) Schimp. – 13: on wet rock.
R. riparioides (Hedw.) Cardot – 8: on wet rock.
Rhytidiadelphus triquetrus (Hedw.) Warnst – 5: on soil.
Rhytidium rugosum (Ehrh. ex Hedw.) Kindb. – 4: on soil.
Sanionia uncinata (Hedw.) Loeske – 8: on soil.
Schistidium apocarpum (Hedw.) Bruch & Schimp. – 2: on rock.
S.confertum (Funck) Bruch & Schimp. – 7: on rock.
 # S. papillosum Culm. – 15: on rock.
S. trichodon (Brid.) Poelt – 7: on rock.
Sciuro-hypnum populeum (Hedw.) Ignatov & Huttunen – 3: on soil.
 # Syntrichia montana Nees – 6: on rock.
Tetraphis pellucida Hedw. – 10: on rotten tree.
Thamnobryum alopecurum (Hedw.) Gangulee – 10: on rock.
 # Thuidium assimile (Mitt.) A. Jaeger – 5: on soil.
T. delicatulum (Hedw.) Schimp. – 2: on wet soil.
 # T. recognitum (Hedw.) Lindb. – 2: on soil.
 # T. tamariscinum (Hedw.) Schimp. – 12: on rock.
Timmia austriaca Hedw. – 8: on soil.
 # Tortella fragilis (Hook. & Wilson) Limpr. – 6: on soil.
 # T. humilis (Hedw.) Jenn. – 13: on rock.
T. inflexa (Bruch) Broth. – 7: on rock.
T. tortuosa (Hedw.) Limpr. – 5: on rock.
Tortula hoppeana (Schultz) Ochyra – 6: on rock.
Ulota crispa (Hedw.) Brid. – 3: on trunk of tree.
 # Weissia brachycarpa (Nees & Hornsch.) Jur. – 8: on soil.

Discussion

In the course of the study, we have found 175 taxa (species, subspecies and varieties) belonging to 104 genera. Moreover, *Drepanocladus sordidus* and *Hypnum recurvatum* were recorded for the second time in Turkey.

D. sordidus was reported from the Czech Republic, Finland, Germany, Iceland, the Netherlands, Poland, Russia, Svalbard, Sweden, and Switzerland in Europe, China (Yunnan), Russia, Turkey and Greenland, Canada (Alberta, British Columbia, Nova Scotia) and U.S.A. (Alaska, California, Indiana, Iowa, New Jersey, New York, Washington, Wisconsin) in North America, and Bolivia, Colombia, Ecuador, Guatemala, Jamaica, and Mexico in South and Central America (Hedenäs 1998)

According to Hedenäs (1998), *D. sordidus* grows in submerged habitats on fens (in Europe). In the

study area in Turkey, the habitat features of *D. sordidus* were similar (it was collected in a submerged and marsh area).

D. sordidus has been so far known only from herbarium records, without locality information in the bryophytes checklists of Turkey. Its locality and habitat data from Turkey are given for the first time in this paper.

H. recurvatum is rather widely distributed in the Northern Hemisphere: in addition to the montane and boreal regions of Europe (Pyrenees, Alpes, Jura, Carpathians, Fennoscandia, European part of the former Russia, Ural and Caucasus), Bulgaria, Spain, France, Greece, Italy, Montenegro, Macedonia, Serbia, Slovenia, it is known from Turkey, Siberia and Mongolia in Asia, and from North America and Greenland (Kučera 2003; Ros & al.2013).

According to Kučera (2003), *H. recurvatum* grows on base, usually calcareous rocks in upland regions, mostly in montane and subalpine belts, but occasionally encroaches on the alpine zone. The ecological features of *H. recurvatum* are similar (it is collected in montane and subalpine belts) in the study area, Turkey.

H. recurvatum has been so far known only from herbarium records, without locality information in the bryophytes checklists of Turkey. Its locality and habitats data from Turkey are given for the first time in this paper.

In the research area, the most common genera of mosses were: *Hypnum* (7), *Brachythecium* (5), *Dicranum* (4), *Didymodon* (4), *Fissidens* (4), *Homalothecium* (4), *Mnium* (4), *Philonotis* (4), *Ptychostomum* (4), *Schistidium* (4), *Thuidium* (4), *Tortella* (4), *Anomodon* (3), *Bryum* (3), *Orthotrichum* (3), *Racomitrium* (3), *Rhynchostegium* (3); and the most common genera of Liverworts were *Jungermannia* (2), *Metzgeria* (2), *Plagiochila* (2), and *Radula* (2). Furthermore, genus *Hypnum* showed the greatest diversity among these genera (represented by seven taxa). The second most common genus was *Brachythecium* (represented by five taxa).

As a result, 38 bryophyte taxa (*Drepanocladus sordidus, Hypnum recurvatum Alleniella besseri*, *Brachythecium capillaceum*, *Bryoerythrophyllum ferruginascens*, *Bryum intermedium*, *Bryum turbinatum*, *Calliergonella cuspidata*, *Campyliadelphus chrysophyllus*, *Cirriphyllum crassinervum*, *Cirriphyllum piliferum*, *Dicranella howei*, *Didymodon acutus*, *Encalypta ciliata*, *Entodon concinnus*, *Entodon schleicheri*, *Epipterygium tozeri*, *Fissidens bryoides*, *Herzogiella seligeri*, *Homalothecium aureum*, *Hypnum jutlandicum*, *Hypnum vaucheri*, *Plagiothecium latebricola*, *Pogonatum nanum*, *Pohlia melanodon*, *Polytrichastrum longisetum*, *Pylaisia polyantha*, *Schistidium papillosum*, *Syntrichia montana*, *Thuidium assimile*, *Thuidium recognitum*, *Thuidium tamariscinum*, *Tortella fragilis*, *Tortella humilis*, *Weissia brachycarpa*, *Jungermannia gracillima*, *Jungermannia hyalina,* and *Nardia compressa*) were new to the Rize Province. Also, *Herzogiella* was a first-time record as genus from the Rize Province.

Acknowledgement. This study was supported financially by the Recep Tayyip Erdoğan University Research Fund (RTEU-BAP 2013.102.03.6 coded project).

References

Abay, G., Batan, N. & Özdemir, T. 2016. Bryophyte checklist of Rize, Northeast Turkey. – Arctoa, **25**: 386-392.

Akman, Y. 1999. Climate and Bioclimate. The Methods of Bioclimate and Climate Types of Turkey. Kariyer Matbaacılık, Ankara (in Turkish).

Anşin, R. 1981. Main vegetation types of the inner and coastal parts of the eastern Black Sea region. – J. Foresty Fac. Karadeniz Tech. Univ. **1**: 14-25.

Blom, H.H. 1996. A revision of the *Schistidium apocarpum* complex in Norway and Sweden, ISBN: 3-443-62021-3, Bryophytorum Bibliotheca*, Band*, 333 pp.

Frey, W., Frahm, J.P., Fischer, E. & Lobin, W. 2006. The Liwerworts, Mosses and Ferns of Europe. English edition revised and edited by T.L. Blockeel. Harley Books, Colchester, 512pp.

Greven, H.C. 2003. Grimmias of the World. Leiden: Backhuys Publishers.

Guerra, J., Cano, M.J. & Cros, R.M. 2006. Flora Briofitica Ibérica, vol. 3, Murcia: Universidad de Murcia Sociedad Española de Briología.

Guerra, J. & Cros, M. 2007. Flora Briofítica Ibérica, vol. 1, Murcia: Universidad de Murcia Sociedad Española de Briología.

Hedenäs, L. 1998. An overview of the *Drepanocladus sendtneri* complex. – J. Bryol., **20**: 83-102.

Hedenäs, L. & Bisang, I. 2004. Key to European *Dicranum* species. – Herzogia, **17**: 179-197.

Heyn, C.C. & Herrnstadt, I. 2004. The Bryophyte Flora of Israel and Adjacent Regions. Jerusalem. The Israel Academy of Sciences and Humanities.

Kucera, J., Hradílek, Z., Buryová, B. & Hájek, P. 2003. *Hypnum sauteri* and *Lescuraea patens* – two additions to the moss flora of the Czech Republic. – Preslia, **75**: 255-262.

Kürschner, H. & Frey, W. 2011. Liverworts, Mosses and Hornworts of Southwest Asia (*Marchantiophyta, Bryophyta, Anthocerotophyta*). – Nova Hedwigia, **139**: 1-240.

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**: 361-382.

Lewinsky, J. 1993a. A synopsis of the genus *Orthotrichum* Hedw. (Musci, *Orthotrichaceae*). – Bryobrothera, **2**: 1-59.

Lewinsky, J. 1993b. Notes on some species of *Orthotrichum* Hedw. (Musci) from Europe, the Caucasus and North Africa. – Bryobrothera, **2**: 71-76.

Nyholm, E. 1986. Illustrated Flora of Nordic Mosses, fasc. 1. *Fissidentaceae – Seligeriaceae.* The Nordic Bryological Society, 1-72.

Nyholm, E. 1989. Illustrated Flora of Nordic Mosses, fasc. 2. *Pottiaceae – Splachnaceae – Schistostegaceae*. The Nordic Bryological Society, 75-141.

Nyholm, E. 1993. Illustrated Flora of Nordic Mosses, fasc. 3. *Bryaceae – Rhodobryaceae – Mniaceae – Cinclidiaceae – Plagiomniaceae.* The Nordic Bryological Society, 145-244.

Nyholm, E. 1998. Illustrated Flora of Nordic Mosses, fasc. 4. *Aulacomniaceae – Meesiaceae – Catocopiaceae – Bartramiaceae – Timmiaceae – Encalyptaceae – Grimmiaceae – Ptychomitriaceae – Hedwigiaceae – Orthotrichaceae*. The Nordic Bryological Society, 145-244.

Papp, B. 2004. Contributions to the bryoflora of the Pontic Mountains, North Anatolia, Turkey. – Stud. Bot. Hung., **35**: 81-89.

Paton, J.A. 1999. The Liverwort Flora of the British Isles. ISBN: 0-946589-60-7, Harley Books, Colchester.

Pedrotti, C.C. 2001. Flora dei muschi d'Italia, *Sphagnopsida, Andreaopsida, Bryopsida*, (I part). Roma: Antonia Delfi no Editore medicina-scienze.

Pedrotti, C.C. 2006. Flora dei muschi d'Italia, *Bryopsida*, (II part). Roma: Antonia Delfi no Editore medicina-scienze.

Plášek, V., Sawicki, J. Ochyra, R. Szczecińska, M. & Kulik, T. 2015. New taxonomical arrangement of the traditionally conceived genera *Orthotrichum* and *Ulota* (*Orthotrichaceae, Bryophyta*). – Act. Musei Sil., Sci. Nat. **64**: 169-174.

Ros, R.M., Mazimpaka, V., Abou-Salama, U., Aleffi, M., Blockeel, T.L., Brugues, M., Cano, M.J., Cros, R.M., Dia, M.G., Dirkse, G.M., El Saadawi, W., Erdağ, A., Ganeva, A., Gonzalez-Mancebo, J.M., Herrnstadt, I., Khalil, K., Kürschner, H., Lanfranco, E., Losada-Lima, A., Refai, M.S., Rodriguez-Nunez, S., Sabovljeviç, M., Sergio, C., Shabbara, H., Simsim, M. & Soderstrom, L. 2007. Hepatics and Anthocerotes of the Mediterranean, an annotated checklist. – Cryptog. Bryol., **28** (4): 351-437.

Ros, R.M., Mazımpaka, V., Abou-Salama, U., Aleffi, M., Blockeel, T.L., Brugues, M., Cros, R.M., Dia, M.G., Dirkse, G.M., Draper, I., Elsaadawi, W., Erdag, A., Ganeva, A., Gabriel, R., Gonzalezmancebo, J.M., Granger, C., Herrnstadt, 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. Cambridge Univ. Press, Cambridge.

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. 2nd ed., Cambridge Univ. Press, Cambridge.