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## Contributions to the Moss Flora of Artvin Region (Hatila Valley National Park-Turkey)

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**Abstract:** Field studies were organized for exploring the moss flora of Hatila Valley National Park of Artvin (Turkey) during spring-summer period in 2005-2006. The taxonomic survey yielded eighty-five moss taxa (comprises of seventy-nine species, six varieties) belonging to 44 genera of 16 families in Hatila Valley National Park of Artvin, Turkey. *Bryum rubens* Milt., *Dicranodontium uncinatum* (Harv.) A. Jaeger., *Eurhynchium hians* var. *rigidum* (Boul.) Düll., *Hypnum jutlandicum* Holmen and Warncke, *Rhynchostegiella jacquinii* (Garov.) Limpr. and *Pseudocrossidium hornsuschianum* (Schultz) R. H. Z ander are new records for A4 grid square (40°-42' N, 38°-42' E) determined. All taxa were found for the first time in Artvin. For every each taxon, the habitat pattern and distribution data are presented.

**Key words:** Hatila Valley National Park, moss, flora, Artvin

### INTRODUCTION

The studies on mosses in Turkey are not extensive as in many other countries, thus the moss flora of Turkey is still largely unknown. But in recent years there has been a substantial increase in the number of moss papers referring to the moss flora of Turkey (Abay and Cetin, 2003a, b; Erdag, 2003; Erdag *et al.*, 2003; Everest and Ellis, 2003; Papp and Sabovljevic, 2003; Uyar, 2003; Papp, 2004; Uyar and Cetin, 2004; Kürschner, 2004; Kürschner and Erdag, 2005; Abay, 2006; Abay *et al.*, 2007; Ozdemir, 2008; Ozdemir and Koz, 2008).

The study area is very interesting in respect to its natural structure, which encouraged us to conduct a study of the Bryophyta (Musci). No *musci* records have been made in Artvin so far while two papers about liverworts were performed (Gokler and Ozturk, 1989). This province still remains unexplored in respect to Musci. The present study adds further information to our knowledge of the moss flora of this district and of Turkey.

### MATERIALS AND METHODS

Field studies were organized for exploring the moss flora of Hatila Valley National Park of Artvin (Turkey) during spring-summer period in 2005-2006. The moss samples were collected from two localities on 17 August 2005 and 07 August 2006 in Artvin Hatila Valley National Park. The bryophyte specimens were incised by knife or spatula from their habitats. After cleaning, the specimens were preserved in plastic bags, each plastic bag has been labelled a providing the information about the habitat of

the area, such as the location of the collection, the name of the predominating plant in the surrounding vegetation, the medium where the sample was originally found (stone, branch of a tree, streambed, rotten root, etc.). The bryophyte specimens were dried in shadowy and ventilated room conditions in the laboratory. They have been identified by reference books (Watson, 1981; Frey *et al.*, 1995; Cortini-Pedrotti, 2001; Smith, 2004; Jimenez, 2006).

The statuses of taxa for Turkey were determined by reviewing the related literature (Cetin, 1988; Frey and Kürschner, 1991; Keçeli and Cetin, 2000; Uyar and Cetin, 2004; Papp, 2004; Kürschner and Erdag, 2005).

The information about the taxa new to A4 square grid (Ozdemir, 1994; Baydar and Ozdemir, 1996; Ozdemir and Cetin, 2000; Ozdemir, 2001a, b; Abay, 2005; Koz and Ozdemir, 2005; Ozdemir and Koz, 2006; Ozdemir and Koz, 2008). Vouchers are deposited in the herbarium of Karadeniz Technical University, Faculty of Science and Arts, Department of Biology.

### DESCRIPTION OF THE STUDY AREA

Artvin is located in eastern part of Black Sea region of Turkey. In the east, it is bounded by Georgia and Ardahan, Rize in the west, Erzurum in the South and Black Sea in the north. Artvin has a mountainous area, thus there exists hardly any plain in the area. On the other h and high plateaux and rivers are present.

Hatila Valley National Park is 10 km distance to Artvin. It consists of one of the main branches of Çoruh

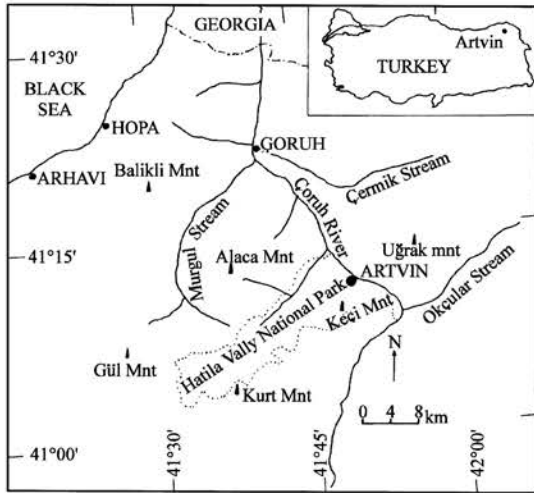


Fig. 1: Map of the study Area (Hetila Valler National park, active)

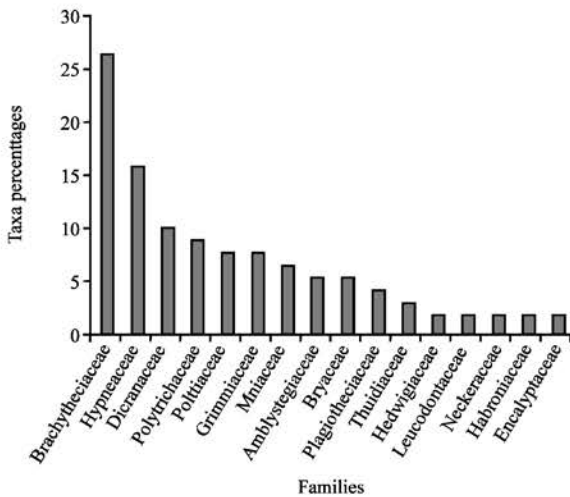


Fig. 2: The distribution of taxa according to families

River running into the border of the city centre and many other neighboring rivers.

The valley is surrounded by Gül Mnt (3131 m), Kurt Mnt (3224 m), Alaca Mnt (2844 m), Keçi Mnt (2047 m). It is situated at lat 41° 03'- 41° 13' 30" N and long 41°31'-41°48' E. The altitude of the area is between 1200-3200 m (Fig. 1).

In the middle part of the valley canyons and mountains passes were formed as a result of physical disintegration and mass movements, and carving of slopes by neighboring rivers and erosions as well. The abundant and mass vegetation in the middle and upper parts of the valley include numerous plant types. The distinctive feature of these plants is that they reflect the characteristics of Mediterranean climatic conditions.

Table 1: Distribution and percentages of taxa on the plant families

NF	Families	NT	(%)
1	<i>Brachytheciaceae</i>	22	25.88
2	<i>Hypneaceae</i>	13	15.29
3	<i>Dicranaceae</i>	7	8.23
4	<i>Polytrichaceae</i>	7	8.23
5	<i>Grimmiaceae</i>	6	7.05
6	<i>Pottiaceae</i>	5	5.88
7	<i>Mniaceae</i>	5	5.88
8	<i>Amblystegiaceae</i>	4	4.70
9	<i>Bryaceae</i>	4	4.70
10	<i>Plagiotheciaceae</i>	3	3.52
11	<i>Thuidiaceae</i>	2	2.35
12	<i>Hedwigiaceae</i>	1	1.17
13	<i>Leucodontaceae</i>	1	1.17
14	<i>Neckeraceae</i>	1	1.17
15	<i>Habroniaceae</i>	1	1.17
16	<i>Encalyptaceae</i>	1	1.17
Total	All families	85	100.00

NF: Number of Family, NT: Number of Taxa

Table 2: The distribution of taxa in habitats

NH	Habitats	NT	(%)
I	On rocks	55	64.71
II	On wet rocks	1	1.18
III	On soil	13	15.29
IV	On wet soil	1	1.18
V	On fresh tree body	13	15.29
VI	On died tree body	2	2.35
Total		85	100.00

NH: Number of Habitat, NT: Number of Taxa

The vegetation has a relic feature hereabouts. There are some plant species with endemic characteristics in the area as well.

Five different types of plant vegetation occur in the area considering the spreaded of tree and bushes, factors of both elevation and climate. These are semi-arid pseudo-maki forests (200-600 m): *Pinus pinea* L., semi-humid oak, scotch pine forests (600-900 m): *Quercus petraea* (Mat.) Lieb. and *Ostrya carpinifolia* Scop., semi-humid *Picea-Fagus* forests (900-1300 m): *Quercus petraea* (Mat.) Lieb., *Carpinus orientalis* Mill., *Carpinus betulus* L., *Pinus sylvestris* L., *Ostrya carpinifolia* Scop, *Abies nordmanniana* (Stev.) Spach. *Tilia rubra* DC. subsp. *caucasica*, *Acer cappadocicum* Gled., *Arbutus andrachne* L., *Juniperus oxycedrus* L., *Buxus sempervirens* L., humid *Picea-Fagus* forests (1300-1700 m): *Picea orientalis* (L.) Link., *Abies nordmanniana* (Stev.) Spach.) and *Fagus orientalis* Lipsky. Much humid, *Picea-Fagus-Pinus-Betula* forests (1700-2200 m.): *Abies nordmanniana* (Stev.) Spach, *Picea orientalis* (L.) Link., *Pinus sylvestris* L., (Anşin, 1981; Eminagaoglu and Anşin, 2003).

The annual average rainfall is 661,03 mm while the average temperature is 12,3 °C (Meteoroloji Bülteni, 1995). The climate type of the area is semi-humid and the main vegetation type is humid forest (Anşin, 1981). The rainfall regime of the study area is winter-spring-autumn-summer (Central Mediterranean) of Mediterranean

Table 3: A comparison the study area with the other National Parks in Turkey

National Parks in Turkey	Hatila Valley NP		Ilgaz mnt NP		Yedigöller NP		Soðuksu NP		Dilekyarimadasi NP		Uludağ NP	
References	Present study		Abay and Cetin (2003b)		Cetin and Yurdakulol (1988)		Uyar and Cetin (2001)		Cetin (1989)		Cetin (1999)	
Families	NT	(%)	NT	(%)	NT	(%)	NT	(%)	NT	(%)	NT	(%)
<i>Brachytheciaceae</i>	22	25.88	15	13.76	15	17.04	20	17.2	6	20.68	10	11.8
<i>Hypnaceae</i>	13	15.29	9	8.26	8	9.09	3	2.6	3	10.35	2	2.4
<i>Dicranaceae</i>	7	8.23	8	7.34	3	3.40	6	5.2	0	0.00	4	4.7
<i>Polytrichaceae</i>	7	8.23	3	2.75	5	5.70	2	1.8	0	0.00	8	9.5
<i>Grimmiaceae</i>	6	7.05	7	6.42	3	3.40	13	11.2	4	13.78	11	12.9
<i>Pottiaceae</i>	5	5.88	15	13.76	12	13.70	19	16.4	5	17.25	10	11.8
<i>Mniaceae</i>	5	5.88	5	4.60	5	5.70	7	6.0	1	3.45	4	4.7
<i>Amblystegiaceae</i>	4	4.70	9	8.26	8	9.09	1	0.9	0	0.00	4	4.7
<i>Bryaceae</i>	4	4.70	8	7.34	2	2.20	14	12.1	3	10.35	8	9.5
<i>Plagiotheciaceae</i>	3	3.52	2	1.83	4	4.54	1	0.9	0	0.00	0	0.0
Other six families	8	8.20	28	25.68	23	26.14	30	25.7	7	24.14	23	28.0
ND. of total taxa	85	100.00	109	100.00	88	100.00	116	100.0	29	100.00	84	100.0

NP: National Park, NT: Number of Taxa

Table 4: A comparison the study area with the other studies in Turkey

Some other studies in Turkey	Hatila valley NP		Trabzon province		Bulancağ (Giresun)		Samsun province		Bozcaada (Çanakkale)		Sündiken mnt. (Eskişehir)		Antalya province	
References	Present study		Ozdemir and Cetin (1999)		Koz and Ozdemir (2005)		Gönülol and Akarsu (1994)		Yayintas <i>et al.</i> (1994)		Savaroglu and Tokur (2006)		Cetin (1988)	
Families	NT	(%)	NT	(%)	NT	(%)	NT	(%)	NT	(%)	NT	(%)	NT	(%)
<i>Brachytheciaceae</i>	22	25.88	22	18.03	12	20.33	14	27.06	7	19.45	11	13.10	14	15
<i>Hypnaceae</i>	13	15.29	11	9.00	12	20.33	2	3.84	3	8.33	5	5.95	3	3
<i>Dicranaceae</i>	7	8.23	9	7.38	3	5.08	3	5.70	0	0.00	11	13.10	4	4
<i>Polytrichaceae</i>	7	8.23	8	6.55	4	6.77	3	5.70	0	0.00	4	4.76	0	0
<i>Grimmiaceae</i>	6	7.05	8	6.55	5	8.47	4	7.60	3	8.33	3	3.57	6	6
<i>Pottiaceae</i>	5	5.88	13	10.65	7	11.86	7	13.65	11	30.55	8	9.52	32	35
<i>Mniaceae</i>	5	5.88	7	5.73	3	5.08	1	1.92	0	0.00	4	4.76	0	0
<i>Amblystegiaceae</i>	4	4.70	6	4.90	3	5.08	2	3.84	1	2.77	0	0.00	3	3
<i>Bryaceae</i>	4	4.70	6	4.90	4	6.77	6	11.40	4	11.12	11	13.10	4	4
<i>Plagiotheciaceae</i>	3	3.52	6	4.90	1	1.69	2	3.84	0	0.00	3	3.57	0	0
Other six families	8	8.20	26	21.41	5	8.54	8	15.45	7	19.45	23	28.57	27	30
No. of Total Taxa	85	100.00	122	100.00	59	100.00	52	100.00	36	100.00	83	100.00	93	100

NP: National Park, NT: Number of Taxa

origin. The region is in line with the rainfall-heat formula ( $Q = 89.4$ ) and a low precipitation/cold bioclimate type is seen predominantly.

### SITES DETAILS

Turkey, Artvin, Hatila Valley National Park, Up Hatila Valley, 41° 30' N, 41° 31' E, 2100 m, (*Picea orientalis* (L.) Link.), *Abies nordmanniana* (Stev.) Spach., *Fagus orientalis* Lipsky., *Alnus glutinosa* Gearth. subsp. *barbata* Yalt.) 17.08.2005.

Turkey, Artvin, Hatila Valley National Park, Below Hatila Valley, 41° 13' 30" N, 41° 48' E, 1300 m, (*Quercus petraea* (Mat.) Lieb., *Picea orientalis* (L.) Link, *Quercus petraea* (Mat.) Lieb., *Fagus orientalis* Lipsky., *Pinus sylvestris* L., *Abies nordmanniana* (Stev.) Spach., *Ostrya carpinifolia* Scop., *Acer cappadocicum* Gled., *Carpinus betulus* L., *Alnus glutinosa* Gearth. subsp. *Barbata* Yalt., *Castanea sativa* Mill., *Rhododendron ponticum* L., *Tilia rubra* DC. subsp. *Lauracerasus officinale* Roem., *Ulmus glabra* Hudz., *Sambucus nigra* L., *Vaccinium*

*arctostaphylos* L. *Rubus plathyphyllos* C.Koch., *Populus tremula* L. and *Rhododendron luteum* Sweet.) 07.08.2006.

### RESULTS AND CONCLUSION

The taxonomic survey yielded 85 taxa (*Bryopsida*) belonging to 44 genera of 16 families in the region of Artvin Hatila Valley National Park, Artvin (Turkey).

The families seen in Table 1 with high taxa numbers are *Brachytheciaceae* (22), *Hypnaceae* (13), *Dicranaceae* (7), *Polytrichaceae* (7), *Pottiaceae* (5), *Grimmiaceae* (6), *Mniaceae* (5), *Amblystegiaceae* (4), *Bryaceae* (4) and *Thuidiaceae* (2). Ninety percent of all moss taxa are included in these families (Table 1).

In the mosses of the Hatila Valley National Park (Artvin), the families with the highest number of species are *Brachytheciaceae* (22), *Hypnaceae* (13) and *Dicranaceae* (10) respectively (Table 1 and Fig. 2). The most common genera are *Brachythecium* and *Hypnum*, with six species each, followed by *Eurhynchium* with five species.

All taxa are new to Artvin. *Bryum rubens* Milt., *Dicranodontium uncinatum* (Harv.) A. Jaeger., *Eurhynchium hians* var. *rigidum* (Baul.) Ther., *Hypnum jutl andicum* Holmen and Warncke, *Pseudocrossidium hornschurchianum* (Schultz.) R. H. Z ander and *Rhynchostegiella jacquinii* (Garov.) Limpr., are new to A4 square depending on the square grid system adopted by Henderson (1961). In the following record the species name is followed by the number of location and substrata. An asteriks (\*) indicate designates the new recorded to A4 grid square in Turkey.

This research is compared with both previous studies conducted in the national parks in Turkey (Table 3) and previous studies carried out in Black Sea, Central Anatolia, Aegean and Mediterranean Regions (Table 4).

It was defined that the families with plurocarpic features are more common than the acrocarpic ones as a result of comparing with both the samples in the study area and also the previous studies in the Black Sea region of Turkey. This is because the fact that the region has a rainy climate and vast forest lands. Although Black Sea region of Turkey is very adaptable for the development of bryophyte and with its convenient ground and climatic conditions, the numbers of taxa are not rich as to be expected. It means that in the Black Sea region the numbers of the species are low but they are very common in respect to bryophyte, these results from both the similar area and climate characteristics.

Mediterranean climate prevailing in the study area helps more acrocarpic taxa to grow than those in the previous studies in the Black Sea region of Turkey. Consequently, *Dicranaceae*, *Polytrichaceae* and *Pottiaceae* families are the most common families with acrocarpic taxa in the area. Habitats patterns of the species in the investigation area are shown in Table 2.

#### List of Taxa

*Amblystegium humule* (P. Beauv.) Crundw., 2, on rock, near the road and stream, bottom of forest, Batan 1.

*Amblystegium varium* (Hedw.) Lindb., 1, 2, on rock, near the road and stream, bottom of forest, Batan 2.

*Barbula unguiculata* Hedw., 1, on rock, near the road, Batan 3.

*Brachythecium albicans* (Hedw.) Schimp., 2, on rock, near the stream and road, bottom of forest, Batan 4.

*Brachythecium glaerosum* (Spruce) Br. Eur., 2, on tree, near the road, bottom of forest, Batan 5.

*Brachythecium mildeanum* (Schimp.) Schimp., 2, on rock, near the road, bottom of forest, Batan 6.

*Brachythecium rivulare* Schimp., 2, on soil, near the road, bottom of forest, Batan 85.

*Brachythecium salebrosum* (F. Web and D. Mohr) Schimp., 2, on rock, near the road, bottom of forest, Batan 7.

*Brachythecium populeum* (Hedw.) Schimp., 2, on tree, near the road, bottom of forest, Batan 8.

*Bryum capillare* Hedw. 2, on rock and soil, Batan 9.

*Bryum mildeanum* (Schimp) Schimp., 1, on rock, near the road, Batan 10.

*Bryum pallanscens* Schleich. ex Schwaegr, 1, on rock, near the road, bottom of forest, Batan 11.

\**Bryum rubens* Milt., 2, on rock, bottom of forest, Batan 12.

*Campylopus fragilis* (Brid.) Bruch and Schimp., 2, on rock, near the road, bottom of forest, Batan 13.

*Ctenidium molluscum* (Hedw.) Mitt., 1,2, on rock, near the road, bottom of forest, Batan 14.

*Ctenidium molluscum* var. *condensatum* (Schimp) E. Britton., 1, 2, on rock, near the road, bottom of forest, Batan 15.

*Dicranella heteromalla* (Hedw.) Schimp., 2, on tree, near the road, bottom of forest, Batan 16.

*Dicranum majus* Turner., 2, on tree root, near the road and stream, bottom of forest, Batan 17.

*Dicranum scoparium* Hedw., 2, on rock, near the road, bottom of forest, Batan 18.

*Dicranum polysetum* Sw., 2, on soil, bottom of forest, Batan 19.

\**Dicranodontium uncinatum* (Harv.) A. Jaeger., 1, 2, on soil, near the road, in woods, Batan 20.

*Dicranodontium denudatum* (Brid.) E. Britton., 2, on rock, near the road, bottom of forest, Batan 21.

*Didymodon tophaceus* (Brid.) Lisa, 1, on soil, in wood, Batan 82.

*Didymodon rigidulus* Hedw., 2, on rock, near the road, bottom of forest, Batan 83.

*Encalypta streptocarpa* Hedw., 2, on rock, near the road, bottom of forest, Batan 84.

*Eurhynchium striatum* (Schreb. ex Hedw.) Schimp., 2, on rock, near the stream and road, bottom of forest, Batan 22.

*Eurhynchium striatulum* (Spruce) Schimp., 1, 2, on rock, bottom of forest, Batan 23.

\**Eurhynchium hians* var. *rigidum* (Baul.) Ther. 2, on tree, near the road and stream, bottom of forest, Batan 24.

*Eurhynchium pulchellum* (Hedw.) Jenn., 2, on soil, near the road, bottom of forest, Batan 25.

*Eurhynchium pulchellum* (Hedw.) Jenn. var. *pulchellum*, 2, on soil, near the road, bottom of forest, Batan 26.

*Grimmia hartmanii* Schimp., 2, on rock, near the road, under forest, Batan 27.

*Grimmia donniana* var. *donniana* Sm., 2, on rock, near the road, bottom of forest, Batan 28.

- Habrodon perpusillus* (De Not.) Lindb., 1, on rock, near the road, bottom of forest, Batan 29.
- Hedwigia ciliata* (Hedw.) P. Beauv., 2, on rock, near the stream and road, bottom of forest, Batan 30.
- Homolothecium lutescens* (Hedw.) H. Robins., 2, on rock, near the road, bottom of forest, Batan 31.
- Homolothecium sericeum* (Hedw.) Schimp., 1, 2, on rock, near the stream and road, bottom of forest, Batan 32.
- Hylocomium brevistore* (Brid.) Br. Eur., 2, on rock, near the stream and road, bottom of forest, Batan 33.
- Hylocomium splendens* (Hedw.) Schimp., 2, on rock, near the road, bottom of forest, Batan 34.
- Hypnum cupressiforme* Hedw., 1, 2, on rock, under forest, Batan 35.
- Hypnum cupressiforme* var. *cupressiforme* Hedw., 1, 2, on rock, near the road, bottom of forest, Batan 36.
- Hypnum cupressiforme* var. *lacunosum* (Brid.) G. F. Hoffman ex Brid., 1, 2, on rock, near the road, bottom of forest, Batan 37.
- Hypnum cupressiforme* var. *resupinatum* Taylor., 2, on tree root, near the road, bottom of forest, Batan 38.
- \**Hypnum jutl andicum* Holmen and Warncke, 2, on rock, near the road, bottom of forest, Batan 39.
- Hypnum revolutum* (Mitt.) Lindb., 2, on rock, under forest, Batan 40.
- Isothecium alopecuroides* (Dubois) Isoviita., 2, on rock, near the stream and road, bottom of forest, Batan 41.
- Leptodictyum riparium* (Hedw.) Warnst., 2, on rock, near the road, bottom of forest, Batan 81.
- Leucobryum glaucum* (Hedw.) Angstr., on soil, under forest, Batan 42.
- Leucodon sciuroides* (Hedw.) Schwaegr., 2, on tree, near the road, bottom of forest, Batan 43.
- Mnium hornum* Hedw., 2, on rock, near the road, under forest, Batan 44.
- Neckera crispa* Hedw., 2, on rock, near the stream and road, bottom of forest, Batan 45.
- Oxyrrhynchium hians* (Hedw.) Lac., 2, on soil, near the road, bottom of forest, Batan 46.
- Oxyrrhynchium speciosum* (Brid.) Warnst., 2, on soil, near the stream and road, bottom of forest, Batan 47.
- Plagiomnium elatum* (Bl and.) T. Kop., 2, on tree, near the stream and road, bottom of forest, Batan 48.
- Plagiomnium medium* (B.S.G.) T. Kop., 2, on rock, near the stream and road, bottom of forest, Batan 49.
- Plagiomnium undulatum* (Hedw.) Kop., 2, on rock, near the stream and road, bottom of forest, Batan 50.
- Plagiothecium cavifolium* (Brid.) Z. Iwats., 1, on tree body, bottom of forest, Batan 51.
- Plagiothecium nemorale* (Mitt.) A. Jaeger., 2, on soil, bottom of forest, Batan 52.
- Plagiothecium succulentum* (Wilson) Lindb., 2, on tree body, bottom of forest, Batan 53.
- Pleurozium schreberi* (Wild. ex Brid.) Mitt., 2, on rock, near the stream and road, bottom of forest, Batan 54.
- Pogonatum aloides* (Hedw.) P. Beauv., 1, 2, on soil, near the road, under forest, Batan 55.
- Pogonatum urnigerum* (Hedw.) P. Beauv., 1, 2, on rock, near the road, bottom of forest, Batan 56.
- Polytrichastrum formosum* (Hedw.) G.L. Sm., 1, 2, on soil, near the road, bottom of forest, Batan 57.
- Polytrichastrum longisetum* (Sw. ex Brid.) G.L. Sm., 1, 2, on rock, near the road, bottom of forest, Batan 58.
- Polytrichum commune* Hedw., 1, 2, on soil, near the road, bottom of forest, Batan 59.
- Polytrichum juniperinum* Hedw., 1, on rock, near the stream and road, bottom of forest, Batan 60.
- Polytrichum pliferum* Hedw., 2, on soil, under forest, Batan 61.
- Pseudoschleropodium purum* (Hedw.) M. M. Fleisch., 2, on rock, near the road, bottom of forest, Batan 62.
- Pseudocalliergon trifarium* (F. Web. and D. Mohr.) Loeske., 2, on tree, near the road, bottom of forest, Batan 63.
- \**Pseudocrossidium hornschruchianum* (Schultz) R. H. Zander, 2, on rock, bottom of forest, Batan 64.
- Racomitrium canescens* (Hedw.) Brid., 2, on rock, near the road, bottom of forest, Batan 65.
- Racomitrium heterostichum* (Hedw.) Brid., 2, on soil, bottom of forest, Batan 66.
- Platyhypnidium riparioides* (Hedw.) Dixon, 2, on tree, near the road, bottom of forest, Batan 67.
- Rhynchostegium murale* (Hedw.) Schimp., 2, on tree, near the stream, bottom of forest, Batan 68.
- \**Rhynchostegiella jacquinii* (Garov.) Limpr., 2, on rock, near the stream, bottom of forest, Batan 69.
- Rhynchostegiella tenella* (Dicks.) Limpr., 2, on rock, near the road, bottom of forest, Batan 70.
- Rhytidiadelphus squarrosus* (Hedw.) Warnst., 2, on rock, near the road, bottom of forest, Batan 71.
- Rhytidiadelphus triquetrus* (Hedw.) Warnst., 2, on rock, near the road, bottom of forest, Batan 72.
- Sanionia uncinata* (Hedw.) Loeske., 2, on rock, near the road, under forest, Batan 73.
- Schistidium apocarpum* (Hedw.) Bruch and Schimp., 2, on rock, near the road, bottom of forest, Batan 74.
- Schistidium trichodon* (Brid.) Poelt., 2, on rock, near the road, bottom of forest, Batan 75.
- Tortella fragilis* (Hook. f. and Wils.) Limpr., 2, on rock, near the road, bottom of forest, Batan 76.
- Tortella tortouosa* (Hedw.) Limpr., 1, 2, on tree, bottom of forest, Batan 77.
- Tortula subulata* Hedw., 1, 2, on rock, near the road, bottom of forest, Batan 78.
- Thuidium recognitum* (Hedw.) Lindb., 2, on wet soil, near the stream, bottom of forest, Batan 79.

*Thuidium tamariscinum* (Hedw.) Schimp., 2, on rock, near the stream, bottom of forest, Batan 80.

## REFERENCES

- Abay, G. and B. Çetin, 2003a. New national and regional bryophyte records, 7: *Plagiothecium lateum* Bruch, Schimp. and Gümbel. J. Bryol., 25: 141-144.
- Abay, G. and B. Çetin, 2003b. The moss flora (Musci) of Ilgaz Mountain National Park. Turk. J. Bot., 27: 321-332.
- Abay, G., 2006. The moss flora (Musci) of Kiyicik Village (Findikli/Rize). The Herb J. Systematic Bot. Series A, A: 37-49.
- Abay, G., G. Uyar, B. Cetin and T. Keceli, 2006. The moss flora of the communities of *Buxus sempervirens* L. in Firtina valley (çamlihemin, rize) Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi. Seri A, 2: 38-51.
- Abay, G., G. Uyar, B. Çetin and T. Keçeli, 2007. *Bucklandiella microcarpa* (Hedw.) Bednarek-Ochyra and Ochyra (Grimmiaceae, Bryopsida), new to the moss flora of Turkey and South-West Asia. Crypt. Bryol., 28: 145-148.
- Anşin, R., 1981. Main vegetation types in and coastal parts of west Black Sea Region. J. For. Fac. KTU., 4: 14-25.
- Çetin, B. and E. Yurdakulol, 1985. Gerede-aktaş (Bolu) ormanlarının karayosunları (Musci) florasi. Turk. J. Bot., Ser. A2, 9: 29-38.
- Çetin, B. and E. Yurdakulol, 1988. Yedigöller Milli Parkinin Karayosunu Florası. Turk. J. Bot., 12: 128-146.
- Çetin, B., 1988a. Antalya Çevresi (Köprülü Kanyon ve Güllük Dağı (Termosses) Milli Parkları ve Kurşunlu Belalesi) Karayosunları (Musci). Turk. J. Bot., 13: 89-96.
- Çetin, B., 1988b. Checklist of the Mosses of Turkey. Lindbergia, 14: 15-23.
- Çetin, B., 1989. Dilek yarımadası milli parki karayosunları (Musci). Turk. J. Bot., 2: 207-214.
- Çetin, B., 1993. An investigation of the köyceğiz-dalyan specially protected area as regards to bryophyte flora. Turk. J. Bot., 17: 255-261.
- Çetin, B. and G. Uyar, 1997. The moss flora of sinop and its environs (Ayancik, Boyabat, Gerze). Turk. J. Bot., 21: 231-244.
- Çetin, B., 1999. The moss flora of the Uludağ National Park (Bursa/Turkey). Turk. J. Bot., 23: 187-193.
- Cortini-Pedrotti, C., 2001. Flora Dei Muschi D'Italia. 1st Edn., Antonio Delfino Editore, Medicina-Scienze, Roma, Italia, ISSN: 88-7287-250-2, pp: 817.
- Eminagaoğlu, Ö. and R. Anşin, 2003. The flora of Hatila Valley National Park and its close environs (Artvin). Turk. J. Bot., 27: 1-27.
- Erdag, A., 2003. *Syntrichia papillosa* (Wilson) Jur. (Pottiaceae, Bryopsida), an epiphytic species new to the bryophyte flora of Turkey. Crypt. Bryol., 24: 167-171.
- Erdag, A., M. Kirmaci and H. Kürschner, 2003. The *Hedwigia ciliata* (Hedw.) Ehrh. Ex P. Beauv. Complex in Turkey, with a new record, *H. hiliata* var. *leucophacea* Bruch and Schimp (Hedwigiaceae, Bryopsida). Turk. J. Bot., 27: 349-365.
- Everest, A. and L. Ellis, 2003. A contribution to the moss flora of the Taurus Mountains, Southern Turkey. Crypt. Bryol., 24: 33-42.
- Frey, K. and H. Kürschner, 1991. *Conspectus bryophytorum orientalum, et arabicorum*, an annotated catalogue of the bryophytes of Southwest Asia. Bryophytorum Bibliotheca, 39: 1-181.
- Frey, W., J.P. Frahm, E. Fischer and W. Lohm, 1995. Die Moss-und Farnpflanzen Europas, Gustav Fischer Verlag. 1st Edn., Stutgard, Jena, New York, pp: 426.
- Gökler, İ. and M. Öztürk, 1989. An investigation on the Liverworts (Hepaticae) of Black Sea region. Turk. J. Bot., 13: 242-248.
- Gönülol, A. and G. Akarsu, 1994. Samsun il merkezi ve çevresi Karayosunu (Musci) Florasi. Turk. J. Bot., 18: 193-200.
- Handel-Mazetti, H.M., 1909. Ergebnisse einer botanische Reise in des Pontische Randgerbrige in Sandschac Trapezunt. Ann. K. K. Naturhist. Hofmus. Wien, 23: 124-212.
- Henderson, D.N., 1955. Contributions to the bryophyte flora of Turkey I. Notes Royal Bot. Gard. Edinburg, 22: 29-43.
- Henderson, D.N., 1957. Contributions to the bryophyte flora of Turkey II. Notes Royal Bot. Gard. Edinburg, 22: 289-193.
- Henderson, D.N., 1958. Contributions to the bryophyte flora of Turkey III. Notes Royal Bot. Gard., Edinburg, 22: 611-620.
- Henderson, D.N., 1961. Contributions to the bryophyte flora of Turkey IV. Notes Royal Bot. Gard., Edinburg, 23: 263-278.
- Henderson, D.N., 1963. Contributions to the bryophyte flora of Turkey VI. Notes Royal Bot. Gard., Edinburg, 25: 279-291.
- Henderson, D.N., 1966. Contributions to the bryophyte flora of Turkey VIII. Notes Royal Bot. Gard., Edinburg., 29: 235-262.
- Jimenez, J.A., 2006. Taxonomic revision of the genus *Didymodon* Hedw. (Pottiaceae, Bryophyta) in Europe, North Africa and Southwest and Central Asia. J. Hattori Bot. Lab., 100: 211-292.
- Keceli, T. and B. Cetin, 2000. The moss flora of Cankiri-Eldivan mountain. Turk. J. Bot., 24: 249-258.

- Koz, B. and T. Özdemir, 2005. The moss flora (Musci) of Bulancak (Giresun-Turkey) district. *Herb J. Syst. Bot.*, 12: 107-116.
- Kürschner, H., 2004. Life strategies and adaptations in bryophytes from the near and Middle East. *Turk. J. Bot.*, 28: 73-84.
- Kürschner, H. and A. Erdağ, 2005. 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.
- Özdemir, T., 1994. Sürmene (Trabzon) Yöresi Karayosunu (Musci) Florasi. *Turk. J. Bot.*, 18: 331-335.
- Özdemir, T. and S. Baydar, 1996. Altindere Vadisi Milli Parki Karayosunlari (Musci). *Turk. J. Bot.*, 20: 53-57.
- Özdemir, T. and S. Baydar, 1997. Some taxa of the bryophyte spreaded in Tirebolu (Giresun) District. *Turk. J. Bot.*, 21: 335-339.
- Özdemir, T., 1999. Some taxa of bryophyta spreaded in Eynesil District (Giresun-Turkey). *Energy Edu. Sci. Technol.*, 4: 30-41.
- Özdemir, T. and B. Çetin, 1999. The moss flora of Trabzon and its environs. *Turk. J. Bot.*, 23: 391-404.
- Özdemir, T., 2000. Checklist of the mosses of A4 square of Turkey. *Energy Edu. Sci. Technol.*, 4: 60-79.
- Özdemir, T., 2001a. The bryophyta flora of Giresun province centre and near Vicinity. *Turk. J. Bot.*, 25: 275-283.
- Özdemir, T., 2001b. A new record for the moss flora of Turkey, *Tortella inflexa* (Bruch) Brot. *Turk. J. Bot.*, 25: 365-366.
- Özdemir, T. and B. Koz, 2006. The moss flora (Musci) of Keşap (Giresun) district. *The Herb J. Syst. Bot.*, 13: 175-182.
- Özdemir, T., 2008. *Rhyntidiadelphus loreus* (Hedw.) Warnst. (Hylocomiaceae, Bryopsida), new to the Moss Flora of Turkey and South-West Asia. *Crypt. Bryol.*, 29: 207-208.
- Özdemir, T. and B. Koz, 2008. Contributions to the moss flora of Dereli, Giresun district (Turkey). *Acta Bot. Hung.*, 50: 171-180.
- Papp, B. and M. Sabovljevic, 2003. Contribution to the bryophyte flora of Turkish Trace. *Studia Bot. Hung.*, 34: 43-54.
- Papp, B., 2004. Contributions to the bryoflora of the pontic Mnt, North Anatolia, Turkey. *Studia Bot. Hung.*, 35: 81-89.
- Sabovljevic, M., A. Ganeva, E. Tsakiri and I. Sorin, 2001. Bryology and bryophyte protection in South-Eastern Europe. *Biol. Conserv.*, 101: 73-84.
- Sabovljevic, M., T. Cvetic and V. Stenevanovic, 2004. Bryophyte red list of Serbia and Montenegro. *Biodiversity and Conservat.*, 13: 1781-1790.
- Savaroğlu, F. and S. Tokur, 2006. The moss flora (Musci) of the Sündiken Mountains. *Turk. J. Bot.*, 30: 137-148.
- Scotnicki, M.L., P.M. Selkirk, P. Broady, K.D. Adam and J.A. Ninham, 2001. Dispersal of the moss *Campylopus pyriformis* on geothermal ground near the submits of Mount Erebus and Mount Melbourne, Victoria Land, Antarctica. *Antarctic Sci.*, 13: 280-285.
- Smith, A.J.E., 2004. *The Moss Flora of Britain and Ireland*. 1st Edn., Cambridge Univ. Pres, London, pp: 1012.
- Uyar, G. and B. Çetin, 2001. The moss flora of Ankara-Kizilcahamam Soğuksu National Park. *Turk. J. Bot.*, 25: 261-273.
- Uyar, G., 2003. Two new varieties of *Ctenidium molluscum* (Hedw.) Mitt. (Hypnaceae, Musci), for the moss flora of Turkey. *Turk. J. Bot.*, 27: 227-229.
- Uyar, G. and B. Çetin, 2004. A new check-list of the mosses of Turkey. *J. Bryol.*, 26: 203-220.
- Watson, E.V., 1981. *British Mosses and Liverworts*. 1st Edn., Cambridge Univ. Press, London, pp: 519.
- Yayintas, A., V. Aysel, H. Güner and O. Tonguc, 1994. Bozcaadanin Karayosunu Florasi, *Turk. J. Bot.*, 18: 29-32.