The Moss Flora of İğneada Floodplain Forests National Park (Demirköy, Kırklareli) Turkey

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Abstract

In this study, the moss flora of İğneada Floodplain Forest National Park (Kırklareli-Demirköy) in Turkey were investigated between the years of 2015-2016. As a result of examination of six hundred thirty moss samples, which collected from İğneada Floodplain Forest National Park, were examined 24 families, 55 genera, 102 taxa species or subspecies. In terms of taxa number, the richest six families are; Pottiaceae (20), Brachytheciaceae (14), Polytrichaceae (9), Orthotrichaceae (8), Hypnaceae (6), Bryaceae (6). Atrichum crispum (James) Sull., and Bryum gemmiferum (R. Wilczek & Demaret.) (in press), marked with a black diamond (♦) sign are new records for the Turkish bryophyte flora. According to Henderson (1961) grid square system, 17 moss taxa marked with an asterisk (*) sing are new records for A1 square. While acrocarpous taxa (70) represent 68 % of the whole flora, the ratio of pleurocarpous ones (32) is 32 %.

Key words: Atrichum crispum, Bryum gemmiferum, new record, Kırklareli-Demirköy, national park, moss, flora, Turkey

İğneada Longoz Ormanları Milli Parkı (Demirköy, Kırklareli) Karayosunu Florası

Öz

Bu çalışmada, 2015-2016 yılları arasında İğneada Longoz Ormanları, Milliparkında (Kırklareli-Demirköy) alanın karayosunu florası araştırılmıştır. İğneada Longoz Ormanları Milli Parkından toplanan 630 karayosunu örnek nin incelenmesi sonucu; 24 familyaya ait, 55 cins, 102 takson türü veya alttakson seviyesinde belirlenmiştir. Teşhis edilen bu taksonlardan en zengin altı ailenin sırasıyla şu şekildedir: Pottiaceae (20), Brachytheciaceae (14), Polytrichaceae (9), Orthotrichaceae (8), Hypnaceae (6), Bryaceae (6). Bu taksonlardan baklava dilimi (♦) şeklinde işaretlenen Atrichum crispum (James) Sull., ve Bryum gemmiferum (R. Wilczek & Demaret.) (basımda), Türkiye Briyofit florası için yeni kayıttır. 17 takson ise Henderson (1961) kareleme sistemine göre A1 karesi için yeni kayıttır. Akrokarptakson sayısı tüm florananın (69) %68’i, pleurokarp takson sayısı ise (33) tüm florananın %32’ni oluşturmaktadır.

Anahtar kelimeler: Atrichum crispum, Bryum gemmiferum, yeni kayıt, Kırklareli-Demirköy, milli park, karayosunu, flora, Türkiye

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1. Introduction
Comprising floodplain forests have a large coverage on the planet. Roughly, 3% of the globe's land area is calculated to be wetlands, 60% of which is covered by floodplain forests that host a very high variety of plant species, including trees, shrubs, and many endangered plant species and provide habitats for a wide range of fauna. Therefore, they are very significant for worldwide biodiversity (Kavgaci et al., 2007). Various endangered plant species find convenient habitats for themselves in floodplain forest ecosystems. However, the acreage of these matchless areas reduce and ends up with great losses in the flora (Kavgaci et al., 2007).

Dispersion of lakes, bog, floodplain forests and river-bank forests are more limited than the other types of vegetation, for example; alpine forests, bush and grass. Even so, the environmental, biologic, ecological and economic importance of wetlands and floodplain forests have been realized, newly, and improper use of these areas for ages have made them more indefensible (Jackson, 1990). Wenger et al., (1990) accentuate the significance and primacy of the studies to characterize the useful structures and plant diversity of this forest owing to diminish in the area for the floodplain forest ecosystem in Europe. Furthermore, wooded wetlands as a forest stock are the prominent ingredient to define the bryophyte biodiversity (Schuck et al., 1994; Kavgaci et al., 2007). Even though İğneada National Park is a significant area in terms of ecosystem variation, no bryofloristic studies have been conducted in this area until now (Yaltırık and Efe, 1988; Kavgaci et al., 2007; URL1).

The first bryophyte research in Turkey was achieved by foreigner researcher in the 1800s (Uyar and Çetin, 2004; Kürschner and Erdağ, 2005). Later on, investigator from Turkey subscribe to the literature on bryophytes. In these studies, more than 49 new moss species have been described from Turkey in the last four years. Bryofloristical data of Turkey is still in its infancy since major areas, often only in accessible regions, has not been visited by bryologists yet (Uyar and Ören, 2013). These studies should be continued to explore new bryophyte records to develop more sweeping knowledge on the bryophyte flora of Turkey (Kara et al., 2017). The state of bryophytes data in Turkey has been reviewed by a few authors (Uyar and Çetin, 2004; Kürschner and Erdağ, 2005; Ros et al., 2013; Erdağ and Kürschner, 2017; Batan et al., 2018).

1.1 Study area
Respecting the ecosystem diversity, İğneada National Park and Acarlar floodplain forest are very substantial in Turkey (Figure 1). There is a vast variety of vegetation types including floodplain forest, open areas, grassland, dune areas, forest with Quercus petraea (Matt.) Liebl., Q. cerris L., Carpinus betulus L., C. orientalis Mill., Acer campestre L., Alnus orientalis Decne A. glutinosa (L.) Gaertn., Salix alba L., Castanea sativa Mill., Acer pseudo-platanus L., Sambucus nigra L., Hedera helix L., Populus tremula L., Cornus sanguinea L., C. mass L., Erica arborea L., Ruscus aculeatus L., Tilia tomentosa Moench, Fraxinus Ornus L., F. angustifolia Vahl., Pinus nigra subsp. pallasiana (Lamb.) Holmboe, P. pinea L., lakes, swamps, scrub communities, and marine dunes.

İğneada Floodplain Forests, National Park that covers an area of 3.115 hectares. It is located in the Black Sea seaside in the northwest part of Turkey, close to the public boundary of Bulgaria (41° 54' 33" – 41° 46' 25" N, 27° 55' 19" – 28° 00' 53" E). İğneada is regarded as one of the 122 significant plant areas of Turkey (Özhatay et al., 2003).
2. Materials and Methods
This study was conducted in an important floodplain forest of Turkey between 2015 and 2016. During the bryological survey held in the region of Kırklareli and Sakarya specimens were collected by S. Ursavaş and Z. İşın. A total of 632 specimens from 59 sampling points were collected and kept in the personal Herbarium of Serhat Ursavas at Çankırı Karatekin University, Faculty of Forestry. Other copies of *Atrichum crispum* are available in the collections of Richard H. Zander and *Bryum gemmiferum* is available in the collection of David T. Holyoak to whom a sample was sent for confirmation.

The moss samples were examined with Leica EZ4 HD stereomicroscop and Olympus BX50 light microscope. Identifications were determined by consulting various key (Lawton 1971; Crum, 1973; Crum and Anderson, 1981; Smith, 1980, 2004; Watson, 1981; Pedrotti, 2001, 2006; Heyn and Herrnstadt, 2004; Greven, 2003; Lüth, 2006a, 2006b, 2006c, 2007, 2008, 2009, 2010).

According to Henderson (1961) grid square, Iğneada Longoz Forests, National Park are located in A1 square. The bryophyte studies carried out in A1 grid square so far are as follows: The first study;

![Figure 1. The location of the research area (▲) according to the grid system of Turkey (Henderson, 1961), and locality of new records (♦).](image-url)
3. Findings

3.1. Abbreviations:

• First record for Turkish bryophyte flora

* New record for A1 grid square

** New record for Kirkarelı

Loc: Locality number

I: Collection number for Zeki IŞİN

U: Collection number for Serhat URSAVAŞ

**: New record for Kırklareli

*: New record for Zeki IŞİN

3.2. List of collection sites

1) Hamam lake, N41°49'22.65", E27°58'6.42", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus orientalis, Crataegus monogyna, 5 m, 03.11.2015.

2) Hamam lake, N41°49'25.88", E27°58'11.41", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus orientalis, Crataegus monogyna, 18 m, 13.11.2015.

3) Hamam lake, N41°49'16.39", E27°57'58.65", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Ulmus minor, Alnus glutinosa, Acer campestre, 12 m, 13.11.2015.

4) Hamam lake, N41°49'15.47", E27°57'44.20", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Ulmus minor, 25 m, 03.11.2015.

5) Hamam lake, N41°49'18.13", E27°57'13.42", Quercus hartwissiana, Carpinus orientalis, 25 m, 03.11.2015.

6) Hamam lake, N41°49'40.97", E27°57'23.82", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Acer campestre, Sorbus torminalis, 28 m, 03.11.2015.

7) Hamam lake, N41°50'14.25", E27°57'37.15", Quercus frainetto, Fraxinus angustifolia, 79, 04.11.2015.

8) Hamam lake, N41°50'15.33", E27°56'57.06", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia, Sorbus torminalis, 58 m, 04.11.2015.

9) Hamam lake, N41°50'18.47", E27°56'14.13", Quercus frainetto, Fraxinus angustifolia, Cornus mass, Acer pseudoplatanus, Sorbus torminalis, 77 m, 04.11.2015.

10) Hamam lake, N41°50'49.93", E27°57'51.82", Quercus frainetto, Fagus orientalis, Carpinus orientalis, C. betulus, 29 m, 04.11.2015.

11) Hamam lake, N41°51'19.58", E27°57'57.68", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus betulius, Fraxinus angustifolia, 70 m, 04.11.2015.

12) Eriklı village, N41°54'36.01", E27°56'38.60", Fagus orientalis, Carpinus orientalis, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 12 m, 05.11.2015.

13) Eriklı village, N41°54'31.31", E27°56'54.03", Fagus orientalis, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 46 m, 05.11.2015.

14) Eriklı village, N41°54'20.08", E27°57'26.94", Fagus orientalis, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 21 m, 05.11.2015.

15) Eriklı village, N41°54'7.62", E27°57'51.93", Fagus orientalis, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus betulius, 05.11.2015.

16) Eriklı village, N41°53'52.17", E27°58'16.08", Fagus orientalis, Corylus avellana, Carpinus betulius, Tilia tomentosa, 21 m, 05.11.2015.

17) Eriklı village, N41°53'47.05", E27°58'46.86", Fagus orientalis, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus betulius, 1 m, 05.11.2015.

18) Eriklı village, N41°53'48.23", E27°59'15.05", Carpinus betulius, Cornus mass, Crataegus monogyna, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 10 m, 05.11.2015.

19) Eriklı village, N41°53'37.72", E27°59'27.25", Fraxinus angustifolia, grassland, reeds, 8 m, 05.11.2015.

20) Eriklı village, N41°53'29.38", E27°59'99.90", Fraxinus angustifolia, grassland, reeds, Juniperus oxycedrus, 9 m, 05.11.2015.

21) Mert lake, N41°51'33.19", E27°57'31.34", Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia, Acer campestre, Acer pseudoplatanus, 24 m, 06.11.2015.

22) Mert lake, N41°51'46.52", E27°57'11.59", Carpinus betulius, Acer campestre, Cornus mass, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 37 m, 06.11.2016.

23) Fountain, N41°51'56.77", E27°56'55.56", Fagus orientalis, Carpinus betulius, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 27 m, 06.11.2015.

24) Fountain, N41°51'58.82"K, E27°56'35.21", Fagus orientalis, Carpinus betulius, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 28 m, 06.11.2015.

25) Fountain, N41°51'57.19", E27°56'4.08", Fagus orientalis, Carpinus betulius, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 12 m, 06.11.2015.

26) Fountain, N41°52'11.04", E27°56'7.19", Fagus orientalis, Carpinus betulius, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, 65 m, 06.11.2015.

27) Fountain, N41°52'17.27", E27°56'22.38", Corylus avellana, Carpinus betulius, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia, 3 m., 06.11.2015.
28) Erikli lake, N41°52'44.80", E27°56'34.75", Carpinus betulus, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia, 3 m., 06.11.2015.
29) Erikli lake, N41°53'17.86", E27°59'48.16", Coriaria myrtifolia, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia, 1 m., 06.11.2015.
30) Bulanık stream, N41°499.95", E27°57'48.93", Fraxinus angustifolia, Cornus mass, 11 m., 07.11.2015.
31) Bulanık stream, N41°49'6.60", E27°58'29.32", Acer pseudoplatanus, Carpinus betulus, Quercus hartwissiana, Q. frainetto, Q. petraea, Fraxinus angustifolia, 13 m., 07.11.2015.
32) Bulanık stream, N41°49'17.56", E41°49'17.56", Fraxinus angustifolia, Cornus mass, Acer pseudoplatanus, 25 m., 07.11.2015.
33) Bulanık stream, N41°49'35.2", E41°49'35.2", Fraxinus angustifolia, Acer campestre, Hedera helix, Sambucus nigra, 34 m., 07.11.2015.
34) Bulanık stream, N41°48'50.30", E27°58'51.18", Acer pseudoplatanus, Carpinus betulus, Fagus sylvatica, Quercus hartwissiana, Q. frainetto, Q. robur, 27 m., 07.11.2015.
35) Bulanık stream, N41°48'32.54", E27°58'30.30", Populus tremula, P. nigra, Fraxinus angustifolia, 34 m., 07.11.2015.
36) Bulanık stream, N41°48'35.16", E41°48'35.16", Carpinus betulus, Populus nigra, Fraxinus angustifolia, 41 m., 07.11.2015
37) Bulanık stream, N41°48'47.21", E27°56'51.72", Carpinus betulus, Fraxinus angustifolia, Junglans regia, Acer pseudoplatanus, 27 m., 07.11.2015.
38) Plantation, N41°48'57.84", E41°48'57.84", Acer pseudoplatanus, Carpinus betulus, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, Fraxinus angustifolia, Populus tremula, 25 m., 07.11.2015.
39) Plantation, N41°47'42.38", E28° 04'67", Acer pseudoplatanus, Carpinus betulus, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, Fraxinus angustifolia, Populus tremula, 24 m., 07.11.2015.
40) Plantation, N41°46'37.23", E28° 05'741", Carpinus betulus, Pinus nigra subsp. pallasiana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, 8 m., 07.11.2015.
41) Erikli lake, N41°53'17.28", E27°59'2.68", Carpinus betulus, Pinus nigra subsp. pallasiana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, Fraxinus angustifolia, 18 m., 07.11.2016
42) Erikli lake, N41°53'27.91", E41°53'27.91", Carpinus betulus, Pinus nigra subsp. pallasiana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, Populus tremula, 18 m., 07.11.2016.
43) Erikli lake, N41°53'36.26", E27°58'49.26", Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus aculeatus, 12 m., 07.05.2016.
44) Erikli lake, N41°53'42.31", E27°58'36.03", Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus aculeatus, 18 m., 07.05.2016.
45) Erikli lake, N41°53'39.46", E28° 01'10.11", Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus aculeatus, Quercus petrea, Q. robur, 18 m., 07.05.2016.
46) Erikli lake, N41°53'49.69", E41°53'49.69", Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus aculeatus, Quercus petrea, Q. robur, Sorbus torminalis, Hedera helix, 21 m., 07.05.2016.
47) Erikli lake, N41°53'40.90", E27°59'53.82", Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus aculeatus, Quercus petrea, Q. robur, Hedera helix, 30 m., 07.05.2016.
48) Erikli lake, N41°53'46.25", E27°59'42.27", Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus aculeatus, Quercus petrea, Q. robur, Hedera helix, 30 m., 07.05.2016.
49) Mert lake, N41°52'4.92", E27°58'41.88", reeds, beach, 1 m., 08.05.2016.
50) Mert lake, N41°51'43.03", E27°58'39.33", beach, Fraxinus angustifolia, Alnus glutinosa, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, 1 m., 08.05.2016.
51) Mert lake, N41°51'12.94", E27°58'35.45", Ulmus minor, Fraxinus angustifolia, 1 m., 08.05.2016.
52) Mert lake, N41°50'53.04", E27°58'34.62", Carpinus betulus, Fraxinus angustifolia, Tilia tomentosa, Ulmus glabra, Ruscus aculeatus, Acer campestre, 1 m., 08.05.2016.
53) Mert lake, N41°50'43.54", E27°58'30.53", Quercus hartwissiana, Ruscus aculeatus, Smilax excelsa, 7 m., 08.05.2016.
54) Mert lake, N41°50'25.6", E27°58'25.6", Quercus hartwissiana, Ruscus aculeatus, Smilax excelsa, 22 m., 08.05.2016.
55) Mert lake, N41°50'9.14", E27°58'41.59", Tilia tomentosa, Ruscus aculeatus, Quercus frainetto, 15 m., 08.05.2016.
56) Hamam lake, N41°49'46.95", E27°58'46.97", Sorbus torminalis, Cornus mass, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, 14 m., 08.05.2016.
57) Hamam lake, N41°49'25.70", E27°58'51.80", Fraxinus angustifolia, Sorbus torminalis, Cornus mass, Quercus hartwissiana, Q. frainetto, Q. robust, Q. petrea, 16 m., 08.05.2016.
58) Hamam lake, N41°49'7.38", E27°58'46.97", Fraxinus angustifolia, Sorbus torminalis, Cornus mass, Quercus hartwissiana, Q. frainetto, Q.robur, Q. petrea, 3 m., 08.05.2016.
59) Saka lake, N41°49'2.76", E27°59'5.15", Carpinus betulus, Acer campestre, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petrea, 1 m., 08.05.2016.

3.3. Plant list
The bryopluristic list Nomenclature of the species follows Ros et al., (2013), Plášek et al., (2015) and Lara et al., (2016).

**BRYOPHYTA** Schimp.
**POLYTRICHACEAE** Schwagr.
Atrichum angustatum (Brid.) Bruch & Schimp.
Loc: 10, on soil, U2318; Loc: 10, on soil, I19; Loc: 11, on soil, U2319; Loc: 11, on soil, I19; Loc: 12, on soil, I19.
♦ Atrichum crispum (James) Sull.
Loc: 30, on dune soil, U2320; Loc: 30, on soil, U2321.
*Atrichum tenellum* (Röhl.) Bruch & Schimp.
Loc: 42, on soil, U2429; Loc: 42, on soil, I91; Loc: 43, on soil, I92.
Atrichum undulatum (Hedw.) P. Beauv.
Loc: 9, on soil, U2317; Loc: 8, on soil, I93; Loc: 9, on bark, I94.
♦ Pogonatum aloides (Hedw.) P. Beauv.
Loc: 5, 6, 37, 47, 48, on soil, U2312; U2313; U2324; U2315; I18; I95; I96; I97; I98.
Pogonatum nanum (Hedw.) Beauv.
Loc: 7, 8, on soil, U2316; I99; I100.
♦ Pogonatum formosum Hedw.
Loc: 4, 41, 46, 47, U2322; U2431; I86; U2430; I101; I102; I103.
Pogonatum juniperinum Hedw.
Loc: 36, 40, 41, U2323; 2325; 2326; I21; I104; I105; 106; Loc: 38, on rock, U2324, I20.
Pogonatum piliferum Hedw.
Loc: 47, on soil, U2327; I107.
**FUNARIACEAE** Schwagr.
**Physcomitrium pyriforme** (Hedw.) Hampe
Loc: 30, 31, on soil, U2276; I108; I109.
*Entosthodon fascicularis* (Hedw.) Müll. Hal.
Loc: 54, 55, on soil, U2267; I110; I111.
Funaria hygrometrica Hedw.
Loc: 49, 54, 55, on soil, U2264; U2266; I107; I114; I115.
**GRIMMIACEAE** Arn.
**Grimmia dissimulata** E. Maier
Loc: 39, 40, U2343; I116; I117.
**Grimmia pulvinata** (Hedw.) Sm.
Loc: 29, on rock, U2339; Loc: 29, 30, 41, on concrete, U2346; I88; I118.
**Grimmia trichophylla** Grev.
Loc: 29, 52, on rock, I116; U2341; Loc: 29; on concrete, U2340; I119; Loc: 29, 52, on log, U2342; I120.
**Schistidium apocarpos** (Hedw.) Bruch & Schimp.
Loc: 29, on rock, U2344; I121; Loc: 29, 41, 42, on log, U2345; I122; I123.
**FISSIDENTACEAE** Schimp.
*Fissidens crassipes* Wilson ex Bruch & Schimp.
Loc: 52, 53, on soil, U2248; I127; I128.
**Fissidens rivularis** (Spruce) Schimp.
Loc: 37, on soil, U2243; I12; Loc: 19, 20, on rock, U2244; I129; I130.
**Fissidens taxifolius** Hedw.
Loc: 1, 12, 36, 41, 42, 52, 54, 56, on soil, U2238; U2239; U2240; U2241; U2242; U2245; U2246; U2247; I3; I4; I131; I132; I133; I134; Loc: 54, on log, I135.
**DITRICHACEAE** Limpr.
Pleuridium acuminatum Lindb.
Loc: 48, 49, on soil, U2260; I136; I137.
Pleuridium subulatum (Hedw.) Rabenh.
Loc: 45, 46, 48, on soil, U2258; 2259; I137; I135; I138.
**DICRANACEAE** Schimp.
*Dicranella subulata* (Hedw.) Schimp.
Loc: 22, 46, 47, on soil, U2256; 2257; I64; I139; I140.
Dicranum scoparium Hedw.
Loc: 14, 47, on soil, U2256; I142; Loc: 14, on decayed log, U2255; I141.
POTTIACEAE Schimp.
Barbula convoluta Hedw.
Loc: 10, 11, on soil, U2299; I143; I144.
Barbula unguiculata Hedw.
Loc: 57, on soil, U2302; Loc: 51, 52, 57, on dune, U2303; I145; I146; I147.
**Dichelytra mucronata** (Brid.) Broth.
Loc: 41, 42, on tree root, U2409; I148; I149.
Didymodon vinealis (Brid.) R.H. Zander
Loc: 37, 38, on rock, U2298; I150; I151.
**Ephemerum minutissimum** Lindb.
Loc: 7, 8, on dune soil, U2347; I152.
**Syntrichia laevipila** Brid.
Loc: 58, on soil, I66; Loc: 58, 59, on tree root, U2277; I153.
**Syntrichia calcicola** J.J. Amann

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Loc: 29, on rock, U2280; I154; Loc: 29, 28, on dune soil, U2281; I155; I142.

*Syntrichia latifolia* (Bruch ex Hartm.) Huebener.
Loc: 19, 20, on soil, U2279; I156; I157.

*Syntrichia ruralis* (Hedw.) F. Weber & D. Mohr.
Loc: 49, on dune soil, U2290; I158.

*Tortella squarrosa* (Brld.) Limpr. (Syn: Pleurochroaeta squarrosa) (Brld.) Lindb.
Loc: 8, on soil, U2287; I1159; I161; Loc: 29, 39, on rock, U2288; U2289; I45; I160; Loc: 50, on dune soil, U2205; I49.

*Tortula brevissima* Schiffner.
Loc: 50, on tree root, U2307; I162.

*Tortula marginata* (Bruch & Schimp.)Spruce
Loc: 42, on soil, U2291; Loc: 42, 50, on tree root, I163; I164.

*Tortula muralis* Hedw.
Loc: 20, 29, 51, on concrete, U2282; U2284; U2286; U2283; I43; I166; Loc: 55, on rock, I148; Loc: on tree root, I165.

*Tortula subulata* Hedw.
Loc: 42, 43, on tree root, U2278; I167; I168.

*Tortula truncata* (Hedw.) Müll.
Loc: 58, 59, on soil, U2297; I169; I170.

*Trichostomum brachydontium* Bruch.
Loc: 37, 45, 55, 56, on soil, U2291; U2290; U2306; I50; I171; I172; Loc: 37, on rock, U2292; I171.

*Weissia brachycarpa* (Nees & Hornsch.) Jur.
Loc: 5, 45, 46, 53, 54, on soil, U2301; U2292; U2293; I67; I174; I175; Loc: 7, on tree root, U2296; I173.

*Weissia condens*a (Voit) Lindb.
Loc: 7, 8, on tree root, U2295; I175; I176

*Weissia controversa* var. *controversa* Hedw.
Loc: 54, 55, on soil, U2300; I177; I178.

*Weissia controversa* var. *crispata* (Nees & Hornsch.) Nyholm.
Loc: 48, 49, on rock, U2294; I179; I180.

*BRYACEAE* Schwägr.

* Bryum dichotomum* Hedw. (Syn: Bryum bicolor Dicks.)
Loc: 20, 21, on soil, U2335; I181; I182.

*Bryum gemmifera* R. Wileczek & Demaret.
Loc: 30, on dune soil, U2069.

*Imbribryum alpinum* (Huds. ex With.) N. Pedersen (Syn: Bryum alpinum Huds. ex With.)
Loc: 51, 52, on sand, U2337; I185; I186.

*Psychotomum capillare* (Hedw.) Holyoak & N. Pedersen (Syn: Bryum capillare Hedw.)
Loc: 41, on soil, U2336; I15; Loc: 29, 30, 49, on sandy soil, U2329; U2330; I70; I188; I189; I190.

*Psychotomum imbricatulum* (Müll. Hal.) Holyoak & N. Pedersen (Syn: Bryum caespiticium Hedw.)
Loc: 49, 51, on sandy soil, U2332; U2333; I22; I85; Loc: 28, 29, on concrete, U2331; I191; I192.

* Psychotomum creberrimum* (Taylor) J.R.Spence & H.P.Ramsay
Loc: 33, on soil, U2966; Loc: 33, 34, on concrete, I193; I194.

*MNIAEAE* Schwägr.

*Epiphierygium tozeri* (Grev.) Lindb.
Loc: 31, 32, 33, on sandy soil, U2337; U2338; I17; I195; I196.

*Plagiomnium affine* (Blandow ex Funck) T.J. Kop.
Loc: 4, 5, 56, 68, on tree root, U2271; U2272; I197; I198; Loc: 56, on soil, I68.

*Plagiomnium ellipicticum* (Brid.) T.J. Kop.
Loc: 7, 15, 46, 47, on soil, U2268; U2269; U2270; I24; I47; I46; I200; I201.

*Plagiomnium undulatum* (Hedw.) T.J. Kop.
Loc: 12, 43, 44, 45, on soil, U2273; U2275; U2274; I23; I202; I203; I204.

*BARTHAMIACEAE* Schwägr.

*Bartramia halleriana* Hedw.
Loc: 47, 48, on soil, U2372; I205; I206.

**Bartramia pomiformis** Hedw.
Loc: 9, 10, on soil, U2369; I207; I208.

**Philonotis arnellii** Husn.
Loc: 30, 34; 35; U2370; U2371; U2372; I209; I210.

*ORTHOTRICHEACEAE* Arn.

* Lewinskaia acuminata* (H.Philib.) F.Lara, Garilleti & Goffinet
Loc: 50, 51, on soil, I211; I212; Loc: 51, on tree root, U2401.

*Lewinskaia affinis* (Schrad. ex Brid.) F.Lara, Garilleti & Goffinet (Syn: Orthotrichum affinis Schrad. ex Brid).
Loc: 2, 11, 12, 29, 41, 45, 50, 56, on tree root, U2386; U2385; U2384; U2387; U2403; U2404; I35; I36; I73; I74; U2405; I213; I214; Loc: 29, 45, on rock, U2388; U2406; I37.

*Orthotrichum diaphanum* Schrad. ex Brid.
Loc: 49, 50, on tree bark, U2400; I215; I216.

*Pulvigeria lyellii* (Hook. & Taylor) Pläšek, Sawicki & Ochyra (Syn: Orthotrichum lyellii Hook. & Taylor).
Loc: 8, 13, 57, 58, on tree bark, U2393; U2394; U2402; I112; I113; I183; I184.

*Orthotrichum patens* Bruch ex Brid.
Loc: 13, 31, 42, 43, 59, U2397; U2398; U2407; U2399; I39; I217; I218; I219; I220.

*Orthotrichum pumilum* Sw. ex anon.
Loc: 16, 17, on tree bark, U2395; I221; I22.

**Leewinskaia speciosa** (Nees) F.Lara, Garilleti & Goffinet (Syn: Orthotrichum speciosum Nees).
Loc: 5, 6, on tree bark, U2396; I223; I224.

*Orthotrichum stramineum* Hornsch. ex Brid.
Loc: 19, 32, 33, on tree bark, U2391; U2392; I40; I225; I226.

*Leewinskaia striata* (Hedw.) F.Lara, Garilleti & Goffinet (Syn: Orthotrichum striatum Hedw.).
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Loc: 5, 17, 54, 55, on tree bark, U2390; U2389; U2408; I38; I227; I228; I229.

**FONTINALACEAE** Schimp.
*Fontinalis antipyretica* Hedw.
Loc: 42, 45, 51, 52, 53, on soil in-stream, U2374; U2375; U2373; U2376; I76; I230; I231; I232; I233.

**AMBLYSTEGIACEAE** G. Roth.
*Amblystegium serpens* (Hedw.) Schimp.
Loc: 41, on decayed log, U2252; I234; Loc: 41, 42, on concrete, U2254; I236; I237; Loc: 45, on soil, U2253.

**Drepanocladus aduncus** (Hedw.) Warnst.
Loc: 28, 29, on wet soil, U2251; I238; I239.

**LESKEACEAE** Schimp.
*Leskea polycarpa* Hedw.
Loc: on log, U2377; U2378; U2175; I77; I243; I244; I245; Loc: 58, on soil, I78.

**Pseudoleskeella catenulata** (Brid. ex Schrad.) Kindb.
Loc: 3, 42, 43, on tree bark, U2367; U2366; I6; I246; I247.

**PSEUDOLESKEACEAE** Schimp.
*Lescuraea patens* Lindb. (Syn: *Leskea patens* Hornsch.)
Loc: 14, on decayed log, U2368; I248; I249.

**BRACHYTHECIACEAE** G. Roth.
*Brachytheciumstrum velutinum* (Hedw.) Ignatov & Huttunen (Hedw.) Schimp.
Loc: 5, 6, on soil, U2208; I250; I251; Loc: 12, on decayed log, U2209; I56.

**Brachythecium campestre** (Müll. Hal.) Schimp.
Loc: 50, 51, on tree bark, U2234; I251; I252.

**Brachythecium mildeanum** (Schimp.) ex Milde
Loc: 40, 41, on soil, U2217; I253; I254.

**Brachythecium rivulare** Schimp.
Loc: 52, on soil, U2233; I79; Loc: on decayed log, U2211; I255; I256.

**Brachythecium rutabulum** (Hedw.) Schimp.
Loc: 13, 14, on decayed log, U2210; I257; I258.

**Homalothecium lutescens** (Hedw.) H.Rob
Loc: 45, 46, on soil, U2194; I259; I260.

**Homalothecium sericeum** (Hedw.) Schimp.
Loc: 11, 12, 15, 17, 20, 32, 50, on tree root, U2195; U2196; U2197; U2198; U2199; U2200; U2235; I51; I52; I53; I54; I80; Loc: 11, 17, on soil, I261; I262.

**Kindbergia praelonga** (Hedw.) Ochyra (Syn: *Eurhynchium praelongum* (Hedw.) Schimp.)
Loc: 16, 31, on decayed log, U2214; U2219; Loc: 12, 13, 14, 16, 52, U2212; U2213; U2226; I58; I83; I62; I65; I66; I265; I266; I267; I268; Loc: 6, 31, 50, on soil, I57; I84; I263.

**Oxyrrhynchium hians** (Hedw.) Loeske (Syn: *Eurhynchium hians* (Hedw.) Sande Lac.)
Loc: 38, on rock, U2220; I81; Loc: 49, 54, on soil, U2230; U2231; I59; I270.

**Pseudocorydendron purum** (Hedw.) M. Fleisch.
Loc: 40, 41, 45, 53, on soil, U2204; U2205; U2218; I271; I272; I273; I274.

**Rhynchostegium riparioides** (Hedw.) Cardot (Syn: *Platyhypnidium riparioides* (Hedw.) Dixon)
Loc: 16, 17, on soil, U2250; I275; I276.

**Scleropodium cespitans** (Wilson ex Müll. Hal.) L.F. Koch
Loc: 1, 11, 17, on soil, U2201; U2202; U2203; I55; I277; I278.

**Scleropodium touretii** (Brid.) L.F. Koch
Loc: 36, 56, on soil, U2206; U2207; I279; I280.

**HYPNACEAE** Schimp.
*Herzogiella seligeri* (Brid.) Z. Iwats.
Loc: 7, 9, 10, on decayed log, U2383; U2384; I34; I281.

*Homomallium incurvatum* (Schrad. ex Brid.) Loeske
Loc: 10, on tree bark, U2427; I282.

**Hypnum cupressiforme** var. **cupressiforme** Hedw.
Loc: 27, on rock, U2425; Loc: 8, 40, 56, 57, on soil, U2421; U2418; I283; I284; Loc: 7, 8, 10, 12, 41, 42, on decayed log, U2419; U2419; U2417; U2420; I27; I28; I29; I31; I32; I33.

**Hypnum cupressiforme** var. **lacunosum** Brid.
Loc: 50, 51, on log, U2422; I285; Loc: 51, on soil, I286.

**Hypnum cupressiforme** var. **resupinatum** (Taylor) Schimp.
Loc: 16, 17, on tree bark, U2423; U2424; I287; I288.

**Hypnum cupressiforme** var. **subjulaceum** Molendo
Loc: 29, on rock, U2426, I289.

**PYLAISIADELPHACEAE** Goffinet & Buck, Monogr. Syst
**Platygyrium repens** (Brid.) Schimp.
Loc: 10, 11, on tree bark, U2428; I290; I291.

**PLAGIOTHeciACEAE** (Broth.) M. Fleischer
*Plagiothecium succulentum* (Wilson) Lindb.
Loc: 42, 43, on soil, U2380; I293; I294.

**CRYPHAECACEAE** Schimp.
**Cryphaea heteromalla** (Hedw.) D. Mohr
Loc: 33, 34, 35, 52, on tree bark, U2063; U2064; U2064; I5; I295; I296; I297.

**LEUCODONTACEAE** Schimp.
*Leucodon sciuroides* (Hedw.) Schwägr.
Loc: 35, 53, 58, on log, U2308; U2311; U2309; I69; I298; I299.

**Nogopterium gracile** (Hedw.) Crosby & W.R. Buck (Syn: *Pterogonium gracile* (Hedw.) Sm., *Pterigynandrum gracile* Hedw.)
Loc: 39, on rock, U2310; I300.
NECKERACEAE Schimp.  
Alleniella complanata (Hedw.) S. Olsson, Enroth & D. Quandt (Syn: Neckera complanata (Hedw.) Huebener)  
Loc: 12, 14, 15, 16, 26, 33, 41, 43, 51, 52, on tree bark, U2353; U2351; U2349; U2348; U2350; U2352; U2448; U2354; U2355; U2356; I8; I9; I10; I11; I17; I301; I302; I303.

*Homalia trichomanoides* (Hedw.) Brid.  
Loc: 1, 12, 13, 25, 26, 52, 57, on tree bark, U2359; U2358; U2360; U2361; U2357; U2362; I12; I13; I14; I17; I300; I304; I305; I242.

**LEMBOPHYLLACEAE** Broth.  
Isothecium alopecuroides (Lam. ex Dubois) Isov.  
Loc: 10, 15, 37, 47, on tree bark, U2223; U2224; U2222; U2221; I62; I63; I306; I307; I240.

**ANOMODONTACEAE** Kindb.  
*Anomodon attenuatus* (Hedw.) Huebener  
Loc: 12, 13, 42, 43, on tree bark, U2411; U2410; U2429; I26; I301; I302; I303; I240.

Anomodon viticulosus (Hedw.) Hook. & Taylor  
Loc: 12, 13, 35, 41, on tree bark, U2413; U2414; U2412; U2440; I25; I308; I142; I131.

4. Results and Discussion  
There were two new records from İğneada Floodplain Forests, National Park. Atrichum crispum (James) Sull., and Bryum gemmiferum R. Wilczek & Demaret were collected from the study area and given as new records of Bryum gemmiferum and Atrichum crispum for Turkey (Ursavaş and İşin, in press).

We determined 102 taxa (species, subspecies and varieties) belonging to 24 families and 54 genera within Bryophyta. Furthermore, according to the Henderson (1961) grid system, 18 of these taxa are new records for the A1 grid system, which is the richest family in terms of a number of taxa, respectively, are; Pottiaceae (20), Brachytheciaceae (14), Polytrichaceae (9), Orthotrichaceae (8), Hyphonaceae (6), Bryaceae (5). The richest genus in terms of a number of taxa, respectively, are; Orthotrichum (11), Tortula (5), Syntrichia (4), Weisia (4), Brachythecium (4), Atrichum (4), Hyphnum (4), Fissidens (4). The reason for the wide variety of Orthotrichum species in the field is epiphytic species (Orthotrichaceae) becoming dominant in the area since the area is covered with water in a long period of the year.
Table 1. Family level distributions of taxa in the research area

| Family No | Family        | The number of genus | Genus               | The number of taxa |
|-----------|---------------|---------------------|--------------------|-------------------|
| 1         | Pottiaceae    | 9                   | Tortula            | 5                 |
|           |               |                     | Syntrichia         | 4                 |
|           |               |                     | Weissia            | 4                 |
|           |               |                     | Barbula            | 2                 |
|           |               |                     | Didymodon          | 1                 |
|           |               |                     | Ephedra           | 1                 |
|           |               |                     | Trichostomum      | 1                 |
|           |               |                     | Tortella           | 1                 |
| 2         | Brachytheciaceae| 8                  | Brachythecium      | 4                 |
|           |               |                     | Homalothecium     | 2                 |
|           |               |                     | Oxyrrhyhchium      | 2                 |
|           |               |                     | Scleropodium      | 2                 |
|           |               |                     | Kindbergia        | 1                 |
|           |               |                     | Pseudoscleropodium| 1                 |
|           |               |                     | Brachytheciastrum  | 1                 |
|           |               |                     | Rynchosostegium   | 1                 |
| 3         | Orthotrichaceae| 3                  | Orthotrichum      | 11                |
|           |               |                     | Lewinskya         |                   |
|           |               |                     | Pulvigera         |                   |
| 4         | Polytrichaceae| 3                   | Atrichum          | 4                 |
|           |               |                     | Polytrichum       | 3                 |
|           |               |                     | Pogonatum         | 2                 |
| 5         | Bryaceae      | 3                   | Physcomitrium     | 1                 |
|           |               |                     | Bryum             | 2                 |
|           |               |                     | Imbrhibryum       | 1                 |
| 6         | Hypnaceae     | 3                   | Hypnum            | 4                 |
|           |               |                     | Herzogiella       | 1                 |
|           |               |                     | Homomallium       | 1                 |
| 7         | Fissidentaceae| 1                   | Fissidens         | 4                 |
| 8         | Funariaceae   | 3                   | Entosthodon       | 1                 |
|           |               |                     | Physcomitrium     | 1                 |
|           |               |                     | Funaria           | 1                 |
| 9         | Grimmiiaceae  | 2                   | Grimmia           | 3                 |
|           |               |                     | Schistidium       | 1                 |
| 10        | Mniaceae      | 2                   | Plagiomnium       | 3                 |
|           |               |                     | Epipaptergium     | 1                 |
| 11        | Bartramiae    | 2                   | Bartramia         | 2                 |
|           |               |                     | Philenotis        | 1                 |
| 12        | Anomodontaceae| 1                   | Anomodon          | 2                 |
| 13        | Amblystegiaceae| 2                  | Amblystegium      | 1                 |
|           |               |                     | Drepanoscladus    | 1                 |
| 14        | Dicranaceae   | 2                   | Dicranella        | 1                 |
|           |               |                     | Dicranum          | 1                 |
| 15        | Ditrichaceae  | 1                   | Physidium         | 2                 |
| 16        | Leskeaceae    | 2                   | Leskea            | 1                 |
|           |               |                     | Pseudoleskeela    | 1                 |
| 17        | Leucodontaceae| 2                   | Leucodon          | 1                 |
|           |               |                     | Nogeopterium      | 1                 |
| 18        | Neckerae      | 2                   | Alleeniella       | 1                 |
|           |               |                     | Homalia           | 1                 |
| 19        | Plagiotheciaceae| 1                  | Plagiothecium    | 1                 |
| 20        | Cryphaeaceae  | 1                   | Cryphaea          | 1                 |
| 21        | Fontinalaceae | 1                   | Fontinalis        | 1                 |
| 22        | Lembophyllaceae| 1                  | Lembophyllresden  | 1                 |
| 23        | Pylaisiadelphiaceae| 1              | Pylaisiadelphiaceae| 1 |
| 24        | Pseudoleskeaceae| 1                  | Lescuraeae       | 1                 |
| Total     | 57            | Total              | 102               |

This study compared with the studies that are closest to the research area. The comparison of the studies according to the families is given in Table 2 and the genus level is given in Table 3.
### Table 2. Compared with the families in some bryophyte flora studies in A1 square.

| Bryophyte Studies | The Moss Flora of Iğneada Floodplain Forests National Park (2018) | Contribution to The Bryophyte Flora of European (2008) | Contribution to The Bryophyte Flora of Turkish Thrace (2003) | The moss flora of Istanbul (Kırklareli) mountains in Turkey (1996) | New moss records from Thrace for A1 (1994) |
|-------------------|---------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------|
| Families          | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % |
| Pottiaceae        | 20 19 | 33 26.2 | 46 36.8 | 18 19.6 | 12 22.2 | 1         |
| Brachytheciaceae  | 14 13.3 | 19 15.1 | 18 14.4 | 18 19.6 | 10 18.5 | 1         |
| Orthotrichaceae   | 9 8.6 | 10 7.9 | 8 5.4 | 2 3.7 | 1         |
| Polytrichaceae    | 9 8.6 | 4 3.2 | 1 0.8 | 5 5.4 | 3 5.6 | 1         |
| Bryaceae          | 6 5.7 | 14 11.1 | 11 8.8 | 7 7.6 | 2 3.7 | 1         |
| Hypnaceae         | 6 5.7 | 3 2.4 | 4 3.2 | 6 6.5 | 2 3.7 | 1         |
| Fissidentaceae    | 4 3.9 | 7 5.6 | 0 0 | 2 2.2 | 2 3.7 | 1         |
| Funariaceae       | 4 3.9 | 1 0.8 | 1 0.8 | 1 1.1 | 0 0.0 | 1         |
| Grimmiaeae        | 4 3.9 | 5 4.0 | 4 3.2 | 4 4.3 | 0 0.0 | 1         |
| Mniaceae          | 4 3.9 | 4 3.2 | 1 0.8 | 6 6.5 | 3 5.6 | 1         |
| Bartramiaee       | 3 2.9 | 2 1.6 | 1 0.8 | 0 0 | 0 0.0 | 1         |
| Anomodontaceae    | 2 1.9 | 1 0.8 | 0 0 | 0 0 | 0 0.0 | 1         |
| Amblystegiaceae   | 2 1.9 | 5 4.0 | 4 3.2 | 4 4.3 | 3 5.6 | 1         |
| Dicranaceae       | 2 1.9 | 2 1.6 | 4 3.2 | 2 2.2 | 2 3.7 | 1         |
| Ditrichaceae      | 2 1.9 | 5 4.0 | 5 4 | 0 0 | 2 3.7 | 1         |
| Leskeaceae        | 2 1.9 | 0 0 | 0 0 | 2 2.2 | 4 7.1 | 1         |
| Leucodontaceae    | 2 1.9 | 2 1.6 | 1 0.8 | 2 2.2 | 1 1.0 | 1         |
| Neckeraeae        | 2 1.9 | 3 2.4 | 0 0 | 1 1.1 | 0 0.0 | 1         |
| Plagiotheciaceae  | 2 1.9 | 2 1.6 | 0 0 | 5 5.4 | 2 3.7 | 1         |
| Cylindrotheciaceae| 1 0.9 | 0 0 | 0 0 | 0 0 | 0 0.0 | 1         |
| Fontinalaceae     | 1 0.9 | 2 1.6 | 0 0 | 0 0 | 0 0.0 | 1         |
| Leucobryaceae     | 1 0.9 | 0 0 | 0 0 | 0 0 | 0 0.0 | 1         |
| Lembophyllaceae   | 1 0.9 | 1 0.8 | 1 0.8 | 0 0 | 0 0.0 | 1         |
| Plaisiadelphaceae | 1 0.9 | 0 0 | 0 0 | 0 0 | 0 0.0 | 1         |
| Pseudoleskeaceae  | 1 0.9 | 0 0 | 0 0 | 0 0 | 0 0.0 | 1         |

### Table 3. Compared with the genus in some bryophyte flora studies in A1 square

| Bryophyte Studies | The Moss Flora of Iğneada Floodplain Forests National Park (2018) | Contribution to The Bryophyte Flora of European (2008) | Contribution to The Bryophyte Flora of Turkish Thrace (2003) | The moss flora of Istanbul (Kırklareli) mountains in Turkey (1996) | New moss records from Thrace for A1 (1994) |
|-------------------|---------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------|
| Families          | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % | The number of taxa % |
| Orthotrichum      | 9 8.6 | 9 7.1 | 9 7.2 | 5 5.4 | 2 3.7 | 1         |
| Tortula           | 5 4.8 | 5 4.0 | 15 12 | 6 6.5 | 6 11.1 | 1         |
| Atrichum          | 4 3.8 | 2 1.6 | 0 0 | 2 2.2 | 1 1.0 | 1         |
| Fissidens         | 4 3.8 | 7 5.6 | 10 8 | 2 2.2 | 2 3.7 | 1         |
| Brachythecium     | 4 3.8 | 3 2.4 | 3 2.4 | 4 4.3 | 2 3.7 | 1         |
| Hypnum            | 4 3.8 | 2 1.6 | 2 1.6 | 4 4.3 | 0 0.0 | 1         |
| Syntricha         | 4 3.8 | 5 4.0 | 0 0 | 0 0 | 0 0.0 | 1         |
| Weissia           | 4 3.8 | 3 2.4 | 4 3.2 | 1 1.1 | 1 1.0 | 1         |
| Grimmia           | 3 2.9 | 2 1.6 | 3 2.4 | 3 3.3 | 0 0.0 | 1         |
| Polytrichum       | 3 2.9 | 2 1.6 | 1 0.8 | 1 1.1 | 0 0.0 | 1         |
| Pycnostomum       | 3 2.9 | 0 0 | 0 0 | 0 0 | 0 0.0 | 1         |
| Plagiomnium       | 3 2.9 | 1 0.8 | 0 0 | 4 4.3 | 0 0.0 | 1         |
| Entosthodon       | 2 1.9 | 0 0 | 0 0 | 0 0 | 0 0.0 | 1         |
| Barbula           | 2 1.9 | 1 0.8 | 2 1.6 | 4 4.3 | 1 1.9 | 1         |
| Pleuridium        | 2 1.9 | 2 1.6 | 1 0.8 | 0 0 | 0 0.0 | 1         |
| Pogonatum         | 2 1.9 | 0 0 | 0 0 | 2 2.2 | 2 3.7 | 1         |
| Bryum             | 2 1.9 | 14 11.1 | 11 8.8 | 5 5.4 | 1 1.9 | 1         |
The distinction key for the *Atrichum* species encountered in the research area is as follows.

1- Lamella 4-7 in number, cells in middle leaf 12-18 μm wide, μm………………………………… A. angustatum
Lamella 1-5 in number, cells in middle leaf 20-50 μm wide, …………………………………… 2

2- Plants to 7 cm, leaves strongly undulate, lingulate to narrowly lanceolate, cells in middle leaf 30-50 μm wide, lamella 1-6 in number………………………………… A. undulatum
Plants to 2 cm, leaves not ore only slightly undulate, ovate to lanceolate, cells in middle leaf 20-30 μm wide, lamella 1-6 in number………………………………… 3

3- Plant to 0.6 cm, lamella 1-2 in number and 1-3 cells high, cells in middle leaf 24-50 μm wide………………………………… A. crispum

Plant to 1.5 cm, lamella 2-4 (5) in number and 5-6 (9) cells high in middle leaf 20-30 μm wide………………………………… A. tenellum

*Atrichum crispum* (James) Sull., (Figure 2)

Locality information: Turkey (Kırklareli): Demirköy, Igneada Floodplain Forest National Park, Hamam Lake around, on sandy, moist soil, ca. 10 m a.s.l., 41°49'9.9"N, 27°57'48.9"E, 07.11.2015, Ursavaş 2084, det. S. Ursavaş, conf. R. Zander.

Ecological information: *Atrichum crispum* usually located in the Atlantic coastal plain and exalted altitudes in the mountains. The latitudes of localities of *Atrichum crispum* are the same both in Turkey and Atlantic coast. But we found this species at low altitudes in Turkey.
**Bryum** Hedw.

The distinction key to the some bulbiliferous species of the *Bryum* complex in Turkey is as follows.

1. Nerve in upper leaves longly excurrent, to 2/3 length of lamina, bulbils solitary in leaf axil, 480-640 µm long. ..................... *B. dunense*

   Nerve not or only shortly excurrent or if strongly excurrent then bulbils many per axil, bulbils 50-480 µm long. ..............................2

2. Bulbils 20-30 per axil, 110-170 µm long, with distinct leaf primordia, orange or reddish in color. .......................... *B. gemmiferum*

   Bulbils not more than 5 per axil, 100-480 µm long, with or without distinct leaf primordia. .............................................3

3. Bulbils yellowish, leaf primordia rudimentary or indistinguishable. ................. *B. gemminlucens*

   Bulbils green, very rarely yellowish green, leaf primordia ¼-1/2 total length of bulbils. ........................................... *B. dichotomum*

**Bryum gemmiferum** R. Wilczek & Demaret (Figure 3)

**Locality information:** Turkey (Kırklareli): Demirköy, Iğneada Floodplain Forest National Park, Hamam Lake district, on sandy, moist soil, ca 10 m a.s.l., 41°49'9.94"N, 27°57'48.92"E, 07.11.2015, Ursavaş 2069, det. S. Ursavaş, conf. D. Holyak.

**Ecological information:** Although *Bryum gemmiferum* is recorded in various countries from Europa, until now it has not been recorded in Turkey. Difficult identification of *Bryum* species and misdiagnosis of the species with *B. dichotomum* might be the reasons of this situation. Another reason can be that this taxa can be accepted as a European originated species (Hill et al., 1992; Lockhart et al., 2012).

![Figure 3. Photo of *Bryum gemmiferum* (original)](image)

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