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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 örneğinin incelenmesi sonucu; 24 familyaya ait, 55 cins, 102 takson tür veya alttür seviyesinde belirlenmiştir. Teşhis edilen bu taksonlardan en zengin altı familya 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. Akrokarp takson sayısı tüm floranın (69) %68'ini, pleurokarp takson sayısı ise (33) tüm floranınn %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 acuelatus* 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 (41º 54' 33" – 41º 46' 25" N, 27º 55' 19" – 28º 00' 53" E). İğneada is regarded as one of the 122 significant plant areas of Turkey (Özhatay et al., 2003).

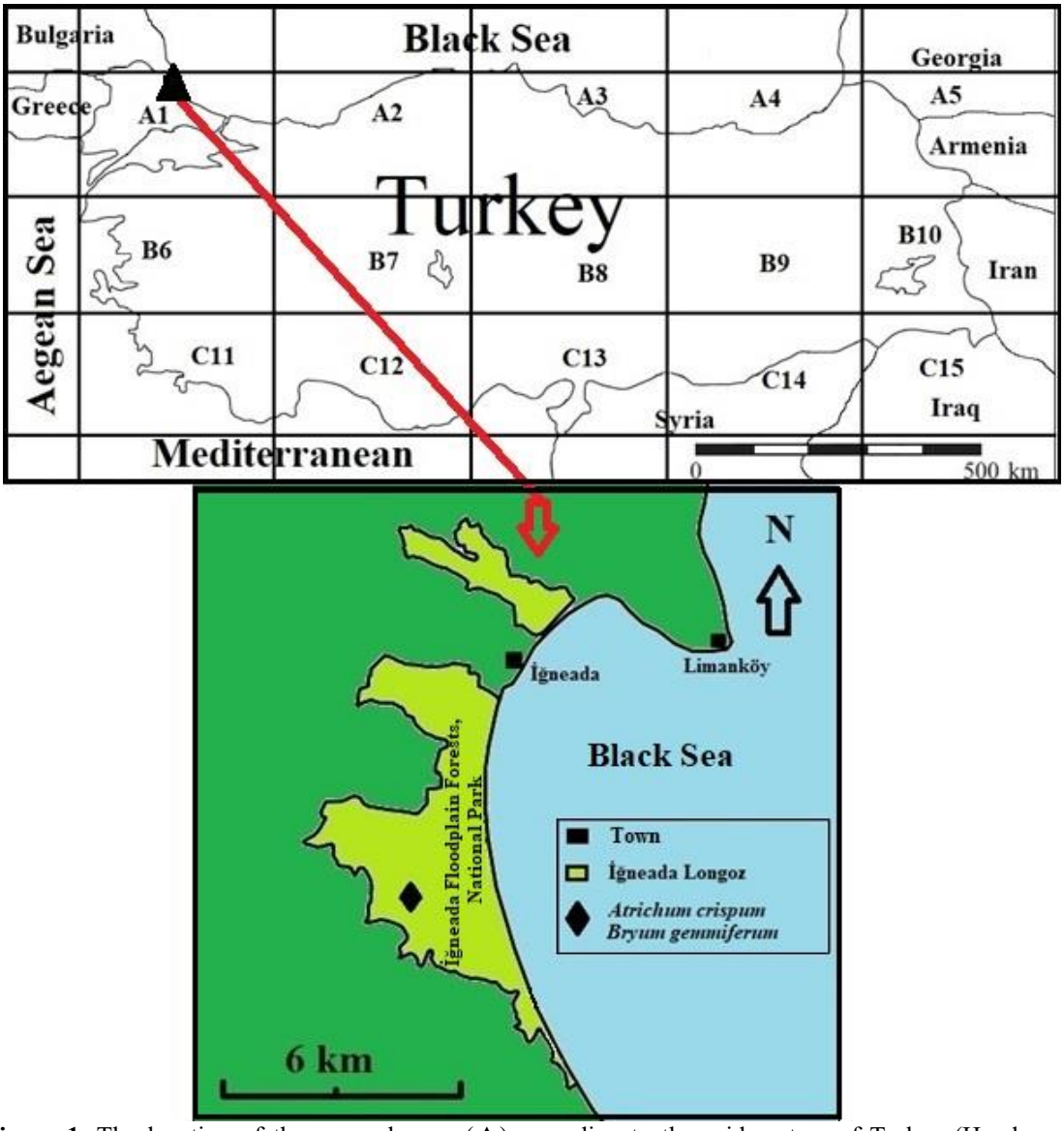

Figure 1. The location of the research area (▲) according to the grid system of Turkey (Henderson, 1961), and locality of new records (♦).

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. Işın. 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, İğneada 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;

3. Findings

3.1. Abbreviations:

♦: First record for Turkish bryophyte flora
*: New record for A1 grid square
**: New record for Kırklareli
U: Collection number for Serhat URSAVAŞ
I: Collection number for Zeki IŞIN
Loc: Locality number

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 betulus, Fraxinus angustifolia*, 70 m, 04.11.2015.
12) Erikli 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) Erikli 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) Erikli 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) Erikli village, N41°54'7.62", E27°57'51.93" *Fagus orientalis, Corylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus betulus*, 05.11.2015.
16) Erikli village, N41°53'52.17", E27°58'16.08", *Fagus orientalis, Corylus avellana, Carpinus betulus, Tilia tomentosa*, 21 m, 05.11.2015.
17) Erikli village, N41°53'47.05", E27°58'46.86", *Fagus orientalis, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Carpinus betulus*, 1 m, 05.11.2015.
18) Erikli village, N41°53'48.23", E27°59'15.05", *Carpinus betulus, Cornus mass, Crategus monogyna, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea*, 10 m. 05.11.2015.
19) Erikli village, N41°53'37.72", E27°59'27.25", *Fraxinus angustifolia*, grassland, reeds, 8 m, 05.11.2015.
20) Erikli village, N41°53'29.38", E27°59'9.90" *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 betulus, 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 betulus, 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 betulus, 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 betulus, 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 betulus, 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", *Coruylus avellana, Carpinus betulus, 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", *Coruylus avellana, 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", *Coruylus avellana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia,* 1 m., 06.11.2015.
30) Bulanık stream, N41°49'9.95", 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", *Faxinus angustifolia, Cornus mass, Acer pseudoplatanus,* 25 m., 07.11.2015.
33) Bulanık stream, N41°49'3.52", E41°49'3.52", *Faxinus angustifolia, Acer campestre, Hedera helix, Sambucus nigra,* 34 m., 07.11.2015.
34) Bulanık stream, N41°48'50.30", E27°58'51.18", Acer pseudopalatans, Carpinus betulus, Faxinus angustifolia, *Quercus hartwissiana, Q. frainetto, Q. robur,* 27 m., 07.11.2015.
35) Bulanık stream, N41°48'32.54", E27°58'8.30", *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° 0'4.67", *Acer pseudoplatanus, Carpinus betulus, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea, Fraxinus angustifolia, Populus tremula,* 24 m., 07.11.2015.
40) Plantation, N41°46'37.23", E28° 0'57.41", *Carpinus betulus, Pinus nigra* subsp. *pallasiana, Quercus hartwissiana, Q. frainetto, Q. robur, Q. petraea,* 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. petraea, Populus tremula,* 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, Coruylus avellana, Ruscus acuelatus,* 12 m., 07.05.2016.
44) Erikli lake, N41°53'42.31", E27°58'36.03", *Carpinus betulus, Fraxinus angustifolia, Coruylus avellana, Ruscus acuelatus,* 18 m., 07.05.2016.
45) Erikli lake, N41°53'39.46", E28° 0'10.11", *Carpinus betulus, Fraxinus angustifolia, Coruylus avellana, Ruscus acuelatus, Quercus petrea, Q. robur,* 18 m., 07.05.2016.
46) Erikli lake, N41°53'49.69", E41°53'49.69", *Carpinus betulus, Fraxinus angustifolia, Coruylus avellana, Ruscus acuelatus, 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 acuelatus, Quercus petrea, Q. robur, Hedera helix,* 21 m., 07.05.2016.
48) Erikli lake, N41°53'46.25", E27°59'42.27", *Carpinus betulus, Fraxinus angustifolia, Cornus mass, Ruscus acuelatus, 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 minör, 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 acuelatus, Acer campestre,* 1 m., 08.05.2016.
53) Mert lake, N41°50'43.54", E27°58'30.53", *Quercus hartwissiana, Ruscus acuelatus, Smilax excelsa,* 7 m., 08.05.2016.
54) Mert lake, N41°50'25.67", E41°50'25.67", *Quercus hartwissiana, Ruscus acuelatus, Smilax excelsa,* 22 m., 08.05.2016.
55) Mert lake, N41°50'9.14", E27°58'41.59", *Tilia tomentosa, Ruscus acuelatus, 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. robur, Q. petrea,* 16 m., 08.05.2016.
58) Hamam lake, N41°49'7.38", E41°49'7.38", *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 bryoploristic list Nomenclature of the species follows Ros et al., (2013), Plášek et al., (2015) and Lara et al., (2016).

BRYOPHYTA Schimp.

POLYTRICHACEAE Schwägr.

Atrichum angustatum (Brid.) Bruch & Schimp.
Loc: 10, on soil, U2318; Loc: 10, on soil, I19; Loc: 11, on soil, U2319; Loc: 11, on soil, I89; Loc: 12, on soil, I90.

♦ ***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.

Polytrichum formosum Hedw.
Loc: 4, 41, 46, 47, U2322; U2431; I86; U2430; I101; I102; I103.

Polytrichum juniperinum Hedw.
Loc: 36, 40, 41, U2323; 2325; 2326; I21; I104; I105; 106; Loc: 38, on rock, U2324, I20.

Polytrichum piliferum Hedw.
Loc: 47, on soil, U2327; I107.

FUNARIACEAE Schwägr.

*****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; I87; 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, I16; U2341; Loc: 29; on concrete, U2340; I119; Loc: 29, 52, on log, U2342; I120.

Schistidium apocarpum (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; I1; 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.

*****Dialytrichia 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

Loc: 29, on rock, U2280; I154; Loc: 29, 28, on dune soil, U2281; I155; I42.
***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 (Brid.) Limpr. (Syn: *Pleurochaete squarrosa* (Brid.) Lindb.)
Loc: 8, on soil, U2287; I159; 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, 52, on concrete, U2282; U2284; U2286; U2283; I43; I166; Loc: 55, on rock, I48; 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; I46; 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; I47; I174; I175; Loc: 7, on tree root, U2296; I173;
Weissia condensa (Voit) Lindb.
Loc: 7, 8, on tree root, U2295; ı175; 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 gemmiferum*** R. Wilczek & 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.
Ptychostomum 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.
Ptychostomum 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.
***** ***Ptychostomum creberrimum*** (Taylor) J.R.Spence & H.P.Ramsay
Loc: 33, on soil, U2966; Loc: 33, 34, on concrete, I193; I194.
MNIACEAE Schwägr.
Epipterygium 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 ellipticum (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.
BARTRAMIACEAE Schwägr.
***Bartramia halleriana** Hedw.
Loc: 47, 48, on soil, U2372; I205; I206.
****Bartramia pomiformis** Hedw.
Loc: 9, 10, on soil, U 2369; I207; I208.
****Philonotis arnellii** Husn.
Loc: 30, 34; 35; U 2370; U2371; I7; I209; I210.
ORTHOTRICHACEAE Arn.
***** ***Lewinskya acuminata*** (H.Philib.) F.Lara, Garilleti & Goffinet
Loc: 50, 51, on soil, I211; I212; Loc: 51, on tree root, U2401.
Lewinskya affinis (Schrad. ex Brid.) F.Lara, Garilleti & Goffinet (Syn: *Orthotrichum affine* 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.
Pulvigera lyellii (Hook. & Taylor) Plášek, Sawicki & Ochyra (Syn: *Orthotrichum lyellii* Hook. & Taylor).
Loc: 8, 13, 57, 58, on tree bark, U2393;U 2394; 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.
****Lewinskya 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.
Lewinskya striata (Hedw.) F.Lara,Garilleti & Goffinet (Syn: *Orthotrichum striatum* Hedw.).

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; U2379; 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.

Brachytheciastrum 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.) Schimp. ex Milde

Loc: 40, 41, on soil, U2217; I253; I254.

Brachytecium 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; I265; I264; I265; 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; UU2231; I59; I270.

Pseudoscleropodium 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; U2382; 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.

CRYPHAEACEAE 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; I71; I301; I302; I303.
****Homalia trichomanoides*** (Hedw.) Brid.
Loc: 1, 12, 13, 25, 26, 42, 52, 57, on tree bark, U2359; U2358; U2360; U2363; U2361; U2357; U2362; I12; I13; I14; I72; 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; I309; I310; I65.
Anomodon viticulosus (Hedw.) Hook. & Taylor
Loc: 12, 13, 35, 41, on tree bark, U2413; U2414; U2412; U2440; I25; I308; I242; I311.

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 Işın, 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 square: *Anomodon attenuatus* (Hedw.) Huebener *Atrichum tenellum* (Röhl.) Bruch & Schimp., *Bartramia halleriana* Hedw., *Dicranella subulata* (Hedw.) Schimp., *Entosthodon fascicularis* (Hedw.) Müll. Hal., *Fissidens crassipes* Wilson ex Bruch & Schimp., *Homalia trichomanoides* (Hedw.) Schimp., *Homomallium incurvatum* (Schrad. ex Brid.) Loeske, *Hypnum cupressiforme* var. *subjulaceum* Molendo, *Pseudoleskeella catenulata* (Brid. ex Schard.) Kindb., *Ptychostomum creberrimum* (Taylor) J.R.Spence & H.P.Ramsay, *P. imbricatulum* (Müll. Hal.) Holyoak & N.Pedersen, *Syntrichia latifolia* (Bruch ex Hartm.) Huebener, *Tortula brevissima* Schiffn., *Lewinskya acuminata* (H.Philib.) F.Lara, Garilleti & Goffinet., *O. patens* Bruch & Brid., *Lescuraea patens* Lindb., *Herzogiella seligeri* (Brid.) Z.Iwats., (Çetin and Uyar, 1997; Çetin, 1999; Uyar and Çetin, 2006; Keçeli and Çetin, 2006; Ören et al., 2010, 2012; Keçeli et al. 2012; Ros et al. 2013).

Bryophyte studies in Kırklareli were examined and 34 taxa from these studies are new records for the Kırklareli: *Atrichum crispum* (James) Sull., *A. tenellum* (Röhl.) Bruch & Schimp., *Physcomitrium pyriforme* (Hedw.) Hampe., *Entosthodon fascicularis* (Hedw.) Müll. Hal., *Grimmia dissimulata* E. Maier, *Fissidens crassipes* Wilson ex Bruch & Schimp., *Dicranella subulata* (Hedw.) Schimp., *Dialytrichia mucronata* (Brid.) Broth., *Ephemerum minutissimum* Lindb., *Syntrichia laevipila* Brid., *S. calcicola* J.J. Amann, *S. latifolia* (Bruch ex Hartm.) Huebener., *Tortula brevissima* Schiffner, *Bryum gemmiferum* R. Wilczek & Demaret, *Ptychostomum creberrimum* (Taylor) J.R.Spence & H.P.Ramsay, *Bartramia halleriana* Hedw., *B. pomiformis* Hedw., *Philonotis arnellii* Husn., *Lewinskya acuminata* (H.Philib.) F.Lara, Garilleti & Goffinet, *L. speciosa* (Nees) F.Lara, Garilleti & Goffinet, *Orthotrichum patens* Bruch *ex* Brid., *Drepanocladus aduncus* (Hedw.) Warnst., *Pseudoleskeella catenulata* (Brid. ex Schrad.) Kindb., *Lescuraea patens* Lindb., *Brachythecium campestre* (Müll. Hal.) Schimp., *B. rivulare* Schimp., *Scleropodium cespitans* (Wilson *ex* Müll. Hal.) L.F. Koch, *Herzogiella seligeri* (Brid.) Z. Iwats., *Homomallium incurvatum* (Schrad. ex Brid.) Loeske, *Hypnum cupressiforme* var. *subjulaceum* Molendo, *Platygyrium repens* (Brid.) Schimp., *Cryphaea heteromalla* (Hedw.) D. Mohr., *Homalia trichomanoides* (Hedw.) Brid., *Anomodon attenuatus* (Hedw.) Huebener (Yayıntaş and Tonguç, 1994; Yayıntaş et al., 1996; Papp and Sabovljevic, 2003; Natcheva et al., 2008).

According to Table 1. the richest families in terms of a number of taxa, respectively, are; Pottiaceae (20), Brachytheciaceae (14), Polytrichaceae (9), Orthotrichaceae (8), Hypnaceae (6), Bryaceae (5). The richest genus in terms of a number of taxa, respectively, are; *Orthotrichum* (11), *Tortula* (5), *Syntrichia* (4), *Weissia* (4), *Brachythecium* (4), *Atrichum* (4), *Hypnum* (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
			Dialytrichia	1
			Didymodon	1
			Ephemerum	1
			Trichostomum	1
			Tortella	1
2	**Brachytheciaceae**	8	*Brachythecium*	4
			Homalothecium	2
			Oxyrrhynchium	2
			Scleropodium	2
			Kindbergia	1
			Pseudoscleropodium	1
			Brachytheciastrum	1
			Rhynchostegium	1
3	**Orthotrichaceae**	3	*Orthotrichum* *Lewinskya* *Pulvigera*	11
4	**Polytrichaceae**	3	*Atrichum*	4
			Polytrichum	3
			Pogonatum	2
5	**Bryaceae**	3	*Ptychostomum*	3
			Bryum	2
			Imbribryum	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	**Grimmiaceae**	2	*Grimmia*	3
			Schistidium	1
10	**Mniaceae**	2	*Plagiomnium*	3
			Epipterygium	1
11	**Bartramiaceae**	2	*Bartramia*	2
			Philonotis	1
12	**Anomodontaceae**	1	*Anomodon*	2
13	**Amblystegiaceae**	2	*Amblystegium*	1
			Drepanocladus	1
14	**Dicranaceae**	2	*Dicranella*	1
			Dicranum	1
15	**Ditrichaceae**	1	*Pleuridium*	2
16	**Leskeaceae**	2	*Leskea*	1
			Pseudoleskeella	1
17	**Leucodontaceae**	2	*Leucodon*	1
			Nogopterium	1
18	**Neckeraceae**	2	*Alleniella*	1
			Homalia	1
19	**Plagiotheciaceae**	1	*Plagiothecium*	1
20	**Cryphaeaceae**	1	*Cryphaea*	1
21	**Fontinalaceae**	1	*Fontinalis*	1
22	**Lembophyllaceae**	1	*Isothecium*	1
23	**Pylaisiadelphaceae**	1	*Platygyrium*	1
24	**Pseudoleskeaceae**	1	*Lescuraea*	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 İğneada 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 Istıranca (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	%
Pottiaceae	20	19	33	26.2	46	36.8	18	19.6	12	22.2
Brachytheciaceae	14	13.3	19	15.1	18	14.4	18	19.6	10	18.5
Orthotrichaceae	9	8.6	10	7.9	10	8	5	5.4	2	3.7
Polytrichaceae	9	8.6	4	3.2	1	0.8	5	5.4	3	5.6
Bryaceae	6	5.7	14	11.1	11	8.8	7	7.6	2	3.7
Hypnaceae	6	5.7	3	2.4	4	3.2	6	6.5	2	3.7
Fissidentaceae	4	3.9	7	5.6	0	0	2	2.2	2	3.7
Funariaceae	4	3.9	1	0.8	1	0.8	1	1.1	0	0.0
Grimmiaceae	4	3.9	5	4.0	4	3.2	4	4.3	0	0.0
Mniaceae	4	3.9	4	3.2	1	0.8	6	6.5	3	5.6
Bartramiaceae	3	2.9	2	1.6	1	0.8	0	0.0	0	0.0
Anomodontaceae	2	1.9	1	0.8	0	0	0	0.0	0	0.0
Amblystegiaceae	2	1.9	5	4.0	4	3.2	4	4.3	3	5.6
Dicranaceae	2	1.9	2	1.6	4	3.2	2	2.2	2	3.7
Ditrichaceae	2	1.9	5	4.0	5	4	0	0.0	2	3.7
Leskeaceae	2	1.9	0	0.0	0	0	2	2.2	4	7.4
Leucodontaceae	2	1.9	2	1.6	1	0.8	2	2.2	1	1.9
Neckeraceae	2	1.9	3	2.4	0	0	1	1.1	0	0.0
Plagiotheciaceae	2	1.9	2	1.6	0	0	5	5.4	2	3.7
Cryphaeaceae	1	0.9	0	0.0	0	0	0	0.0	0	0.0
Fontinalaceae	1	0.9	2	1.6	0	0	0	0.0	0	0.0
Leucobryaceae	1	0.9	0	0.0	0	0	0	0.0	0	0.0
Lembophyllaceae	1	0.9	1	0.8	1	0.8	0	0.0	0	0.0
Plaisiadelphaceae	1	0.9	0	0.0	0	0	0	0.0	0	0.0
Pseudoleskeaceae	1	0.9	0	0.0	0	0	0	0.0	0	0.0

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

Bryophyte Studies	The Moss Flora of İğneada 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 Istıranca (Kırklareli) mountains in Turkey (1996)		New moss records from Thrace for A1 (1994)	
Genus	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
Tortula	5	4.8	5	4.0	15	12	6	6.5	6	11.1
Atrichum	4	3.8	2	1.6	0	0	2	2.2	1	1.9
Fissidens	4	3.8	7	5.6	10	8	2	2.2	2	3.7
Brachythecium	4	3.8	3	2.4	3	2.4	4	4.3	2	3.7
Hypnum	4	3.8	2	1.6	2	1.6	4	4.3	0	0.0
Syntrichia	4	3.8	5	4.0	0	0	0	0.0	0	0.0
Weissia	4	3.8	3	2.4	4	3.2	1	1.1	1	1.9
Grimmia	3	2.9	2	1.6	3	2.4	3	3.3	0	0.0
Polytrichum	3	2.9	2	1.6	1	0.8	1	1.1	0	0.0
Ptychostomum	3	2.9	0	0.0	0	0	0	0.0	0	0.0
Plagiomnium	3	2.9	1	0.8	0	0	4	4.3	0	0.0
Entosthodon	2	1.9	0	0.0	0	0	0	0.0	0	0.0
Barbula	2	1.9	1	0.8	2	1.6	4	4.3	1	1.9
Pleuridium	2	1.9	2	1.6	1	0.8	0	0.0	0	0.0
Pogonatum	2	1.9	0	0.0	0	0	2	2.2	2	3.7
Bryum	2	1.9	14	11.1	11	8.8	5	5.4	1	1.9

Bartramia	2	1.9	0	0.0	1	0.8	0	0.0	0	0.0
Homalothecium	2	1.9	4	3.2	3	2.4	1	1.1	1	1.9
Oxyrrhynchium	2	1.9	1	0.8	0	0	0	0.0	0	0.0
Anomodon	2	1.9	1	0.8	0	0	1	1.1	0	0.0
Plagiothecium	2	1.9	2	1.6	0	0	5	5.4	0	0.0
Scleropodium	2	1.9	1	0.8	3	2.4	0	0.0	0	0.0
Dicranella	1	1.0	1	0.8	2	1.6	2	2.2	1	1.9
Fontinalis	1	1.0	1	0.8	0	0	0	0.0	0	0.0
Amblystegium	1	1.0	1	0.8	1	0.8	1	1.1	2	3.7
Campylopus	1	1.0	0	0.0	0	0	0	0.0	0	0.0
Leskea	1	1.0	0	0.0	0	0	1	1.1	2	3.7
Platygyrium	1	1.0	0	0.0	0	0	0	0.0	1	1.9
Leucodon	1	1.0	0	0.0	0	0	1	1.1	0	0.0

Atrichum P. Beauv.

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……**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 cells 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°49'9.94"N, 27°57'48.92"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.

Figure 2. Photo of the natural environment of *Atrichum crispum* (original)

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. gemmilucens***
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, Igneada 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).

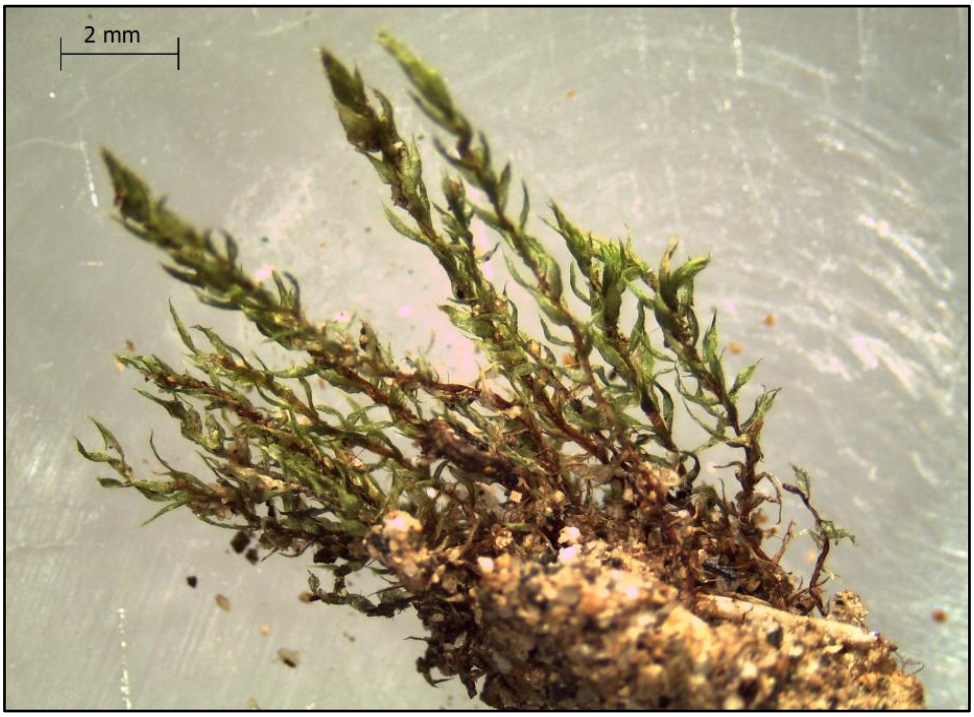

Figure 3. Photo of *Bryum gemmiferum* (original)

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