



The bryophyte flora of Sinop Peninsula (Turkey)

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Abstract

This study presents knowledge about bryophytes of Sinop peninsula which one of the Key Biodiversity Areas (KBA). Research materials were collected from 60 different sites between September 2014-June 2016. As a result of the evaluation of 614 samples 25 species of 17 genera belonging to 17 families from Marchantiophyta (Liverworts), 130 species of 74 genera belonging to 28 families from Bryophyta (mosses), 2 species of 2 genera belonging to 2 families from Anthocerotophyta (Hornworts). In total, 157 specific and infraspecific taxa belonging to 47 families and 93 genera were identified. Among these, 95 taxa are new to Sinop province and 26 taxa are new to A3 square according to Henderson (1961) grid system.

Key words: Bryophyte, flora, Sinop Peninsula, Sinop, Turkey

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Sinop Yarımadası briyofit florası

Özet

Bu çalışma Önemli Doğa Alanları (ÖDA)'ndan biri olan Sinop Yarımadası'nın briyofitleri hakkında bilgi sunmaktadır. Araştırma materyali Eylül 2014-Haziran 2016 tarihleri arasında 60 farklı notadan toplanmıştır. 614 örneğin değerlendirilmesi sonucunda Marchantiophyta'dan (Ciğerotları) 17 familya ve 17 cinse ait 25, Bryophyta'dan (Karayosunları) 28 familya ve 74 cinse ait 130, Anthocerotophyta'dan (Boynuzotları) 2 familya ve 2 cinse ait 2 tür tespit edilmiştir. Toplamda 47 familya ve 93 cinse ait, tür ve tür altı düzeyde 157 takson tespit edilmiştir. Bunlar arasından 95 tanesi Sinop ili için, 26 tanesi ise Henderson (1961) kareleme sistemine göre A3 karesi için yenidir.

Anahtar kelimeler: Briyofit, flora, Sinop Yarımadası, Sinop, Türkiye

1. Introduction

Turkey is located at a junction of three phytogeographical regions; Euro-Siberian, Irano-Turanian and Mediterranean. There are very different ecosystem types, climates and elevations sea level to 5137 m. These factors increase the biodiversity of the country (Küçük and Ertürk, 2013; Özdemir and Batan, 2016). Sinop peninsula is located A3 square in Henderson (1961) grid system (Fig. 1) and situated Euro-Siberian phytogeographic region. Mediterranean climate is dominant in the area. The mean annual temperature 14.2 °C and total annual precipitation 683.3 mm (Akman, 1999).

Although elevation sea level to 210 m, Sinop peninsula has different ecosystem types such as wetlands, floodplain forests, meadows, deciduous forest, pine forest, maquis, sand dunes, coastal cliffs, agricultural areas. Main woody plants are *Pinus pinaster* Aiton, *Fraxinus angustifolia* Vahl., *Fagus orientalis* Lipsky, *Castanea sativa* Mill., *Carpinus betulus* L., *C. orientalis* Mill., *Populus tremula* L., *Quercus* L. sp., *Corylus avellana* L., *Cornus sanguinea* L., *Salix caprea* L., *Rhododendron luteum* Sweet, *Crataegus monogyna* Mill., *Phillyrea latifolia* L., *Erica arborea* L., *Laurus nobilis* L., *Arbutus unedo* L.. Some plants distributed to the peninsula are endemic and listed in red list of Turkey; *Isatis arenaria* Azn. (EN), *Crocus speciosus* Bieb. ssp. *xantholainos* Mathew (EN), *Convolvulus persicus* L. (EN), *Verbascum degenii* Hal. (CR), *Convolvulus persicus* L. (VU) ve *Psuedanum obtusifolium* Sm. (VU) (Eken et al., 2006).

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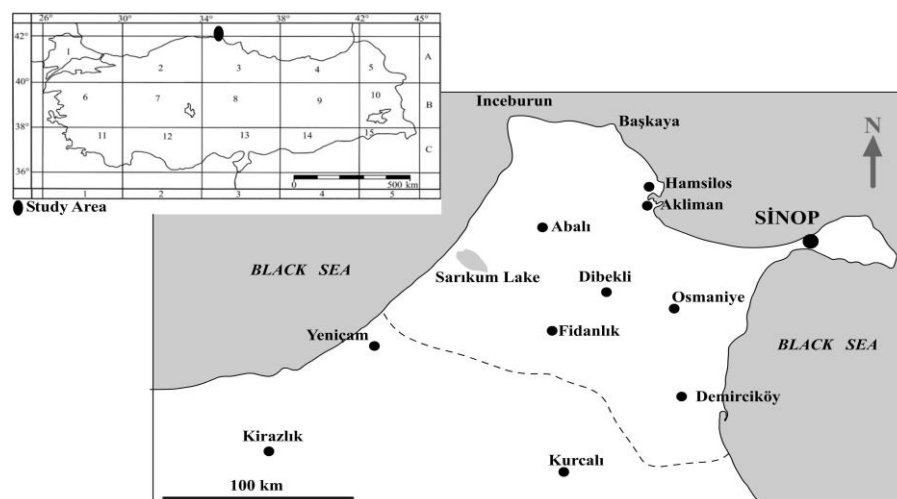


Figure 1. The map of the study area and Henderson grid system.

In parallel with gained to indigenous researchers, bryofloristical studies on the Turkey have been rapidly increased in the recent years (Ören et al., 2012; Uyar and Ören, 2013; Abay and Keçeli; Canlı and Çetin, 2014; Özdemir and Batan, 2014, 2016; Ursavaş and Çetin, 2014; Batan et al., 2015, 2016; Ezer et al., 2015; Ören et al., 2015a,b; Alataş and Batan, 2016a, b). However, the bryofloristical knowledge about the country is inadequate and there are many areas that not visited by bryologists. Sinop peninsula is one of them and no detailed study made on this area (Çetin and Uyar, 1997; Çetin, 1998; Özenoğlu Kiremit et al., 2016). With this study, we aimed to reveal the bryophyte flora of Sinop peninsula which which one of the Key Biodiversity Areas (KBA) and contribute to the bryodiversity of Turkey.

2. Materials and methods

Four field trips were organised to the area, between September 2014 to June 2016. Bryophyte materials were collected from the 60 different localities. Specimens were identified mainly by using related literature (Lewinsky, 1993; Smith, 1996; 2004; Paton, 1999; Cortini Pedrotti, 2001; 2006; Greven, 2003; Frey et al., 2006; Casas et al., 2006; 2009; Lara et al., 2009; Kürschner and Frey, 2011)

2.1 Collected localities

1. Sinop Peninsula, Bozburun, 42° 04' 10.7"N 35° 00' 06.3"E, 50 m, pine and deciduous forest, 11.10.15.
2. Sinop Peninsula, İnceburun, 42° 05' 41.5"N, 34° 56' 48.2"E, deciduous trees and maquis, 40 m, 11.10.15.
3. Sinop Peninsula, 42° 02' 12.1"N 35° 10' 27.6"E, 155 m, garrigue, 12.10.15.
4. Sinop Peninsula, 42° 01' 12.3"N 35° 12' 18.4"E, garrigue, 210 m, 12.10.15.
5. Sinop Peninsula, 42° 01' 40.3"N 35° 10' 32.7"E, 110 m, garrigue 12.10.15
6. Sinop Peninsula, City forest, 42° 00' 22.9"N, 35° 04' 06.3"E, 25 m, pine forest, 12.10.15.
7. Sinop Peninsula, Dibekli, 42° 01' 36.0"N 35° 02' 19.6"E, 0 m, floodplain forest, 12.10.15
8. Sinop Peninsula, Abalı, 42° 01' 04.1"N 34° 58' 46.1"E, 15 m, deciduous forest, 12.10.15.
9. Sinop Peninsula, Sarıkum, 42° 01' 31.5"N 34° 55' 36.7"E, 31 m, maquis, 12.10.15.
10. Sinop Peninsula, Sarıkum, 41° 19' 21.6"N 35° 41' 16.7"E, 63 m, deciduous forest, 12.10.15.
11. Sinop Peninsula, Abalı, 42° 02' 12.9"N 34° 58' 39.1"E, 60 m, deciduous forest, 12.10.15.
12. Sinop Peninsula, Abalı, 42° 03' 16.3"N 34° 56' 14.3"E, 35 m, deciduous forest, 12.10.15.
13. Sinop peninsula, 42° 03' 51.4"N 34° 58' 07.7"E, 90 m, mixed forest, 12.10.15.
14. Sinop Peninsula, İnceburun, 42° 02' 26.7"N 35° 01' 41.3"E, 2 m, mixed forest, 26.03.16.
15. Sinop Peninsula, İnceburun, 42° 02' 15.7"N 35° 01' 01.5"E, 0 m, wetland, 26.03.16.
16. Sinop Peninsula, Abalı, 42° 02' 13.5"N 34° 58' 40.9"E, 30 m, deciduous forest, 26.03.16.
17. Sinop Peninsula, Saraycık, 42° 02' 24.6"N 34° 57' 18.2"E, 50 m, mixed forest and maquis, 26.03.16.
18. Sinop Peninsula, Saraycık, 42° 04' 49.08"N 34° 56' 50.6"E, 15 m, maquis, 27.03.16.
19. Sinop Peninsula, İnceburun, 42° 03' 57.4"N 34° 59' 02.1"E, 50 m, maquis, 27.03.16.
20. Sinop Peninsula, İnceburun, 42° 03' 43.8"N 34° 58' 12.1"E, 120 m, deciduous forest, 27.03.2016.
21. Sinop Peninsula, Abalı, 42° 01' 45.7"N 34° 59' 00.0"E, 15 m, deciduous forest, 28.03.2016.
22. Sinop Peninsula, Dibekli, Yağcı, 42° 00' 32.0"N 34° 59' 46.0"E, 63 m, mixed forest 28.03.16.
23. Sinop Peninsula, Fidanlık, 41° 58' 40.5"N 34° 58' 36.4"E, 100 m, deciduous forest, 28.03.16.
24. Sinop Peninsula, İncirpınarı around, 41° 58' 49.8"N 34° 53' 33.9"E, 110 m, deciduous forest, 28.03.16.
25. Sinop Peninsula, Osmaniyeye, 41° 59' 18.7"N 35° 02' 58.6"E, 120 m, pine forest, 28.03.16.

26. Sinop Peninsula, Demirci, 41° 56' 53.1"N 35° 04' 00.6"E, 55 m, mixed forest, 29.03.16.
27. Sinop Peninsula, Hamsilos, 42° 03' 36.3"N 35° 02' 42.6"E, 8 m, deciduous forest and maquis, 29.03.16.
28. Sinop Peninsula, Hamsilos, 42° 03' 37.6"N 35° 02' 21.8"E, 10 m, deciduous forest and maquis, 29.03.16.
29. Sinop Peninsula, Çal around, 42° 04' 32"N 35° 00' 0.4"E, 48 m, pine plantation area, 25.06.16.
30. Sinop Peninsula, İnceburun road, 42° 04' 24"N 34° 59' 0.8"E, 69 m, hornbeam and oak forest, 25.06.16.
31. Sinop Peninsula, Abalı, Soğucak, 42° 02' 50"N 35° 00' 23"E, 51 m, oak forest, 25.06.16.
32. Sinop Peninsula, Fidanlık, 42° 59' 32"N 34° 59' 34"E, 101 m, deciduous forest, 25.06.16.
33. Sinop Peninsula, Dibekli, 41° 59' 58"N 35° 00' 49"E, 96 m, deciduous forest, 25.06.16.
34. Sinop Peninsula, Ordu, Toyluk, 41° 58' 13"N 35° 05' 33"E, 64 m, deciduous forest, 26.06.16.
35. Sinop Peninsula, Demirci, 41° 55' 33"N 35° 03' 39"E, 14 m, hornbeam and oak forest, 26.06.16.
36. Sinop Peninsula, Uzun Yol, 41° 55' 11"N 35° 02' 21"E, 102 m, deciduous forest, 26.06.16.
37. Sinop Peninsula, Akliman recreation area, 42° 3'2.13"N 35° 2'31.80"E, 9 m, deciduous forest, 29.09.14.
38. Sinop Peninsula, Akliman, 42° 3'20.75" N 35° 2'27.30"E, 4 m, pine plantation, dune and river side, 29.09.14.
39. Sinop Peninsula, Hamsilos, 42° 3'34.79"N 35° 2'58.32"E, 10 m, maquis and coastal cliff, 29.09.14.
40. Sinop Peninsula, Hamsilos, 42° 3'46.08"N 35° 2'16.06"E, 20 m, woodland, 26.09.14.
41. Sinop Peninsula, Bozburun, Toykümesi, 42° 4'40.22"N 35° 1'47.16"E, 40 m, maquis, 27.09.14.
42. Sinop Peninsula, Bozburun, Hacı Ali Kışlası, 42° 5'8.75"N 35° 1'4.59"E, 45 m, pine plantation, 26.09.14.
43. Sinop Peninsula, Abalı, 42° 3'27.92"N 35° 1'37.59"E, 40 m, pine plantation, 28.09.14.
44. Sinop Peninsula, Abalı, Soğucak, 42° 3'50.68"N 35° 0'46.10"E, 40 m, deciduous forest, 28.09.14.
45. Sinop Peninsula, Abalı, Soğucak, 42° 4'4.82"N 34°59'40.84"E, pine plantation, 70 m, 28.09.14.
46. Sinop Peninsula, Çal, 42° 4'42.89"N 35° 0'14.20"E, 40 m, pine plantation, 27.09.14.
47. Sinop Peninsula, Çataldere, 42° 5'20.36"N 35° 0'14.55"E, 45 m, pine plantation and maquis, 27.09.14.
48. Sinop Peninsula, Tepecik Kışlası, 42° 4'46.06"N 34°59'20.68"E, pine plantation and maquis, 27.09.14.
49. Sinop Peninsula, Yalancıgerne, 42° 5'35.01"N 34°58'28.10"E, 5 m, maquis and coastal cliffs, 27.09.14.
50. Sinop peninsula, 42° 5'51.08"N 34°56'52.22"E, 40 m, pine plantation, 27.09.14.
51. Sinop Peninsula, İnceburun, 42° 4'57.42"N 34°56'57.89"E, 20 m, maquis, 27.09.14.
52. Sinop Peninsula, İnceburun, Kurtkuyusu, 42° 5'14.45"N 34°58'26.85"E, 15 m, maquis and coastal cliffs, 28.09.14.
53. Sinop peninsula, 42° 4'39.56"N 34°58'15.55"E, 80 m, pine plantation and deciduous forest, 27.09.14.
54. Sinop Peninsula, Sarıkum, 42° 1'16.00"N 34°54'32.15"E, 5 m, lake side and dunes, 30.09.14.
55. Sinop Peninsula, Aksaz, Ayancık road, 42° 1'53.68"N 35° 2'4.60"E, 15 m, deciduous forest, 26.09.14.
56. Sinop Peninsula, Sarıkum, 42° 0'32.60"N 34°56'35.06"E, 25 m, deciduous forest, 30.09.14.
57. Sinop Peninsula, Sarıkum, 42° 1'47.37"N 34°55'13.80"E, 55 m, deciduous forest, 30.09.14.
58. Sinop Peninsula, Sarıkum, 42° 0'28.97"N 34°53'40.41"E, 30 m, pine plantation and deciduous forest, 30.09.14.
59. Sinop Peninsula, Topdağ, 42° 5'9.93"N 34°59'6.71"E, 45 m, maguis, 30.09.14.
60. Sinop Peninsula, Kurtkuyusu aorund, 42° 4'37.31"N 34°57'2.41"E, deciduous forest and maquis, 20 m, 28.09.14.

3. Results

Bryophyte list was arranged according to the Goffinet and Shaw (2009) system and accepted names were controlled by using recent checklist (Ros et al., 2013; Hodgetts, 2015). Status of the taxa were checked for A3 grid square and Turkey using by related literatures (Uyar & Çetin, 1997, 2004; Çetin, 1998; Kürschner & Erdağ, 2005; Kürschner & Frey, 2011; Ros et al., 2013; Canlı and Çetin, 2014; Özdemir and Batan, 2016; Özenoğlu Kiremit et al., 2016).

In floristic list, one collector number was given for each taxon to avoid repetition, even collected more than one sites. New records were indicated one asterisk for Sinop province (*) and 2 asterisks for A3 grid (**). Specimens were deposited in Bülent Ecevit University, Bryophyte Herbarium (ZNG).

MACHANTIOPHYTA

Lunulariaceae H.Klinggr.

**Lunularia cruciata* (L.) Dumort. ex Lindb. – Loc.: 9, 12, on soil Burçin 243.

Marchantiaceae (Bisch.) Lindl.

Marchantia polymorpha L. – Loc.: 45, wet on soil, TK 7526.

Aytoniaceae Cavers

**Reboulia hemisphaerica* (L.) Raddi – Loc.: 2, 40, on soil, Burçin 25.

Corsiaceae Engl.

***Corsinia coriandrina* (Spreng.) Lindb. – Loc.: 12, on soil, Burçin 237.

Ricciaceae Rchb.

***Riccia crozalsii* Levier – Loc.: 2, 12, on soil, Burçin 04.

***Riccia nigrella* DC – Loc.: 39, on soil, TK 7514.

***Riccia subbifurca* Warnst. ex Croz. – Loc.: 6, 39, on soil, Burçin 195.

Fossombroniaceae Hazsl.

***Fossombronia angulosa* (Dicks.) Raddi – Loc.: 1, 12, 22, on soil, Burçin 276.
1, 12, 22. istasyon toprak üzeri Burçin 194, 276, 405.

***Fossombronia foveolata* Lindb. – Loc.: 6, on soil, Burçin 189.

Fossombronia pusilla (L.) Dumort. – Loc.: 39, 47, 50, 52, on soil, TK 7536.

Metzgeriaceae H.Klinggr.

Metzgeria furcata (L.) Corda – Loc.: 2, 7, 17, 36, 38, 55, 56, 58, 60, on log and trees, Burçin 356.

Porellaceae Cavers nom. conserv.

Porella platyphylla (L.) Pfeiff. – Loc.: 9, 12, 21, 36, 37, 56, on rocks, soil and tree, Burçin 66.

Radulaceae Müll.Frib.

Radula complanata (L.) Dumort. – Loc.: 1, 7, 14, 24, 29, 35, 37, 38, 44, 48, 56, 58, 60, on soil and trees, Burçin 258.

Frullaniaceae Lorch

Frullania dilatata (L.) Dumort. – Loc.: 1, 4, 7, 9, 23, 24, 31, 37, 38, 44, 48, 56, 58, 60, on rocks and trees, Burçin 343.

Frullania tamarisci (L.) Dumort. – Loc.: 2, 4, 12, 16, 31, 40, 52, 56, on rocks, soil and trees, TK 7516.

Lejeuneaceae Cavers

Lejeunea cavifolia (Ehrh.) Lindb. – Loc.: 2, 12, 13, 35, 37, 38, 40, 49, 57, on soil and trees, Burçin 284.

Lophocoleaceae Vanden Berghen

Lophocolea bidentata (L.) Dumort. – Loc.: 13, 38, 40, on soil, Burçin 247.

**Lophocolea heterophylla* (Schrad.) Dumort. – Loc.: 2, 5, 9, 10, 11, 12, 35, 36, 37, 38, 40, 51, 52, 54, 60, on soil and trees, Burçin 148.

Cephaloziaceae Mig.

***Cephalozia bicuspidata* (L.) Dumort. – Loc.: 16, 20, 49, on soil, Burçin 235.

Cephaloziellaceae Douin

***Cephaloziella divaricata* (Sm.) Warnst. – Loc.: 50, on soil, TK 7533.

***Cephaloziella turneri* (Hook.) Müll.Frib. – Loc.: 36, on soil, Burçin 398.

Scapaniaceae Mig.

**Scapania nemorea* (L.) Grolle – Loc.: 16, 35 on soil, Burçin 390.

Southbyaceae Váňa, Crand.-Stotl., Stotler et D.G.Long

**Southbya tophacea* (Spruce) Spruce – Loc.: 18, on soil, Burçin 404.

Calypogeiaceae Arnell

***Calypogeia arguta* Nees et Mont. – Loc.: 29, on soil, Burçin 388.

**Calypogeia fissa* (L.) Raddi – Loc.: 1, 2, 13, 16, 20, 35, 57, on soil, Burçin 107.

ANTHOCEROTOPHYTA

Notothyladaceae (Milde) Müll. Frib. ex Prosk.

**Phaeoceros laevis* (L.) Prosk. – Loc.: 26, on soil, Burçin 22.

Phymatocerotaceae R.J.Duff, J.C.Villarreal, Cargill et Renzaglia

***Phymatoceros bulbiculosus* (Brot.) Stotler, W.T.Doyle et Crand.-Stotl. – Loc.: 12, on soil, Burçin 218.

BRYOPHYTA

Sphagnaceae Dumort.

- **Sphagnum auriculatum* Schimp. – Loc.: 14, 19, Burçin 245.
14, 19. istasyon su basar Burçin 238, 223; 230; 231; 233; 239; 245

Polytrichaceae Schwägr.

- **Atrichum angustatum* (Brid.) Bruch & Schimp. – Loc.: 8, 11, 16, on soil, Burçin 28.
***Atrichum tenellum* (Röhl.) Bruch & Schimp. – Loc.: 47, on soil, Ursavaş 2639.
Atrichum undulatum (Hedw.) P. Beauv. – Loc.: 1, 8, 14, 20, 30, 32, 38, on soil, Burçin 153.
**Pogonatum aloides* (Hedw.) P. Beauv. – Loc.: 16, on soil, Burçin 220.
**Pogonatum nanum* (Schreb. ex Hedw.) P. Beauv. – Loc.: 12, Burçin 205.
Polytrichum formosum Hedw. – Loc.: 1, 8, 14, 16, 23, 31, 43, 58, on soil, Burçin 19.

Funariaceae Schwägr.

- ***Entosthodon fascicularis* (Hedw.) Müll. Hal. – Loc.: 29, 45, on soil, Burçin 370.
**Physcomitrium pyriforme* (Hedw.) Bruch & Schimp. – Loc.: 55, on soil, Ursavaş 2672.
***Entosthodon obtusus* (Hedw.) Lindb. – Loc.: 1, 18, 29, on soil, Burçin 397.
**Funaria hygrometrica* Hedw. – Loc.: 1, 30, 40, on soil, Burçin 90.

Grimmiaceae Arn.

- **Grimmia laevigata* (Brid.) Brid. – Loc.: 4, on rocks, Burçin 40.
**Grimmia lisae* De Not. – Loc.: 4, on soil covered rocks, Burçin 175.
Grimmia pulvinata (Hedw.) Sm. – Loc.: 2, 4, 12, 18, 36, 42, Burçin 135.
***Schistidium brunnescens* subsp. *griseum* (Nees & Hornsch.) H.H. Blom – Loc.: on concrete wall, Burçin 402.
**Schistidium crassipilum* H.H. Blom. – Loc.: 8, on concrete wall, Burçin 129.

Fissidentaceae Schimp.

- ***Fissidens bryoides* Hedw. – Loc.: 1, on soil, Burçin 123.
**Fissidens dubius* P. Beauv. – Loc.: 12, on rock crevices, Burçin 211.
***Fissidens incurvus* Starke ex Röhl. – Loc.: 38, 57, on soil, Ursavaş 2576.
Fissidens taxifolius Hedw. – Loc.: 2, 6, 10, 12, 13, 14, 16, 22, 25, 26, 35, 37, 39, 41, 47, 53, 55, on soil, Burçin 306.
**Fissidens viridulus* (Sw. ex anon.) Wahlenb. – Loc.: 1, 6, 9, 23, 35, on soil, Burçin 351.

Ditrichaceae Limpr.

- Ceratodon purpureus* (Hedw.) Brid. – Loc.: 8, on soil, Burçin 50.
***Ditrichum pallidum* (Hedw.) Hampe. – Loc.: 8, 16, 19, 31, on soil, Burçin 326.
***Pleuroidium acuminatum* Lindb. – Loc.: 1, 2, 29, 30, on soil, Burçin 197.
***Pleuroidium subulatum* (Hedw.) Rabenh. – Loc.: 1, 8, 35, on soil, Burçin 122.

Dicranaceae Schimp.

- Dicranella howei* Renaud & Cardot. – Loc.: 3, 6, 12, 14, on soil, Burçin 151.
Dicranum scoparium Hedw. – Loc.: 1, 12, 21, 38, 43, 54, on soil, Burçin 291.

Leucobryaceae Schimp.

- **Campylopus subulatus* Schimp. ex Milde – Loc.: 48, on soil, Ursavaş 2641.
***Campylopus introflexus* (Hedw.) Brid. – Loc.: 59, Ursavaş 2700.
**Dicranodontium uncinatum* (Harv.) A. Jaeger – Loc.: 56, on soil, Ursavaş 2686.
**Leucobryum juniperoideum* (Brid.) Müll. Hal. – Loc.: 16, on soil, Burçin 246.

Pottiaceae Schimp.

- ***Anoetangium aestivum* (Hedw.) Mitt. – Loc.: 38, on soil, Ursavaş 2587.
Barbula unguiculata Hedw. – Loc.: 2, 9, 12, 30, 35, 54, on soil, Burçin 401.
**Bryoerythrophyllum recurvirostrum* (Hedw.) P.C. Chen – Loc.: 41, 42, 51, on rock crevices, Ursavaş 2608.
**Didymodon insulanus* (De Not.) M.O. Hill – Loc.: 7, on soil, Burçin 108.
***Ephemerum minutissimum* Lindb. – Loc.: 6, on soil, Burçin 6.
Gymnostomum calcareum Nees & Hornsch. – Loc.: 3, on limestone, Burçin 164.
**Pseudocrossidium revolutum* (Brid.) R.H. Zander. – Loc.: 25, on soil, Burçin 310.
**Syntrichia montana* Nees. – Loc.: 2, on ocks, Burçin 62.
**Syntrichia ruralis* (Hedw.) F. Weber & D. Mohr. – Loc.: 9, 54, on soil and sandy soil, Burçin 75.

- **Syntrichia ruralis* (Hedw.) F. Weber & D. Mohr var. *ruraliformis* (Besch.) Delogne. – Loc.: 25, on rocks, Burçin 283.
 **Tortella flavovirens* (Bruch) Broth. – Loc.: 49, on soil, Ursavaş 2645
 **Tortella inclinata* var. *densa* (Lorentz & Molendo) Limpr. – Loc.: 39, on sandy soil, Ursavaş 2596.
 **Tortella squarrosa* (Brid.) Limpr. (Syn: *Pleurochaete squarrosa* (Brid.) Lindb.). – Loc.: 5, 9, 25, 37, 39, 42, 54, on soil and soil covered rocks, Burçin 285.
Tortella tortuosa (Schrad. ex Hedw.) Limpr. – Loc.: 54, on soil, Ursavaş 2661.
 **Tortula muralis* Hedw. – Loc.: 5, 6, 34, 56, on rocks, Burçin 182.
 **Tortula subulata* Hedw. – Loc.: 57, on soil, Ursavaş 2694.
 **Trichostomum brachydontium* Bruch – Loc.: 1, 2, 4, 12, 14, 16, 18, 47, on soil, Burçin 307.
Trichostomum crispulum Bruch. – Loc.: 2, on soil, Burçin 203.
 **Weissia brachycarpa* (Nees & Hornsch.) Jur. – Loc.: 16, 40, on soil, Burçin 394.
 **Weissia condensata* (Voit) Lindb. – Loc.: 10, 39, 54, on soil, Burçin 98.
 **Weissia controversa* Hedw. var. *controversa* – Loc.: 2, 8, 13, 16, 30, 53, on soil, Burçin 120.
 **Weissia controversa* Hedw. var. *crispata* (Nees & Hornsch.) Nyholm – Loc.: 37, on soil, Ursavaş 2561.
 **Weissia longifolia* Mitt. – Loc.: 3, 41, on soil, Burçin 188.

Bryaceae Schwägr.

- **Bryum subapiculatum* Hampe – Loc.: 1, on sandy soil, Burçin 209.
 **Imbriobryum alpinum* (Huds. ex With.) N. Pedersen. – Loc.: 3, 12, 19, on rocks and soil, Burçin 268.
Ptychostomum capillare (Hedw.) Holyoak & N. Pedersen. – Loc.: 12, 14, on tree bark, Burçin 395.
 **Ptychostomum moravicum* (Podp.) Ros & Mazimpaka. – Loc.: 36, on tree bark, Burçin 392.
 **Ptychostomum imbricatulum* (Müll. Hal.) Holyoak & N. Pedersen. – Loc.: 1, 19, 33, 37, Burçin 403.
Ptychostomum pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay. – Loc.: 1, 2, 3, 4, 14, 22, 38, on wet soil, Burçin 304.

Mniaceae Schwägr.

- **Mnium stellare* Hedw. – Loc.: 32, on decaying log, Burçin 349.
Plagiomnium affine (Blandow ex Funck) T.J. Kop. – Loc.: 2, 4, 6, 12, 26, 35, 37, 38, 39, 40, on damp soil, Burçin 139.
Plagiomnium elatum (Bruch & Schimp.) T.J. Kop. – Loc.: 55, on damp soil, Ursavaş 2673.
Plagiomnium undulatum (Hedw.) T.J. Kop. – Loc.: 8, 12, 37, 48, on damp soil, Burçin 255.
Rhizomnium punctatum (Hedw.) T.J. Kop. – Loc.: 36, on wet soil, Burçin 380.

Bartramiaceae Schwägr.

- **Philonotis capillaris* Lindb. – Loc.: 8, 12, 13, 35, 36, on wet soil, Burçin 365.
 **Philonotis seriata* Mitt. – Loc.: 22, on wet soil, Burçin 217.

Orthotrichaceae Arn.

- **Orthotrichum affine* Schrad. ex Brid. – Loc.: 1, 7, 8, 9, 11, 12, 31, 35, 40, 44, 45, on tree bark, Burçin 100.
 **Orthotrichum anomalum* Hedw. – Loc.: 5, on rocks, Burçin 81.
Orthotrichum diaphanum Brid. – Loc.: 7, 21, on tree bark, Burçin 282.
 **Orthotrichum lyellii* Hook. & Taylor. – Loc.: 9, 17, 36, 58, on tree bark, Burçin 340.
Orthotrichum pumilum Sw. ex anon. – Loc.: 11, on tree bark, Burçin 208.
 **Orthotrichum speciosum* Nees – Loc.: 44, on tree bark, Ursavaş 2626.
 ***Orthotrichum stramineum* Hornsch. ex Brid. – Loc.: 3, 38, on tree bark, Burçin 200.
 **Orthotrichum striatum* Hedw. – Loc.: 31, 33, on tree bark, Burçin 367.
 **Ulota crispa* (Hedw.) Brid. – Loc.: 44, on tree bark, Ursavaş 2623.
 ***Zygodon forsteri* (Dicks.) Mitt. – Loc.: 9, on tree bark, Burçin 102.

Fontinalaceae Schimp.

- **Fontinalis antipyretica* Hedw. – Loc.: 7, on submerged tree base and roots in floodplains, Burçin 18.
 **Fontinalis hypnoides* C.Hartm. – Loc.: 7, on submerged tree roots in floodplains, Burçin 34.

Amblystegiaceae G. Roth.

- Amblystegium serpens* (Hedw.) Schimp. – Loc.: 7, on roots, Burçin 103.
 **Drepanocladus aduncus* (Hedw.) Warn. – Loc.: 3, 11, 32, 60, on submerged soil and tree roots, Burçin 371.
 **Leptodictyum riparium* (Hedw.) Warnst. – Loc.: 37, on submerged tree roots, Ursavaş 2555.

Leskeaceae Schimp.

- Pseudoleskeella catenulata* (Brid. ex Schrad.) Kindb. – Loc.: 37, 39, 56, on rocks, Ursavaş 2680.

Thuidiaceae Schimp.

**Thuidium tamariscinum* (Hedw.) Schimp. – Loc.: 11, 13, 17, 35, on soil, Burçin 342.

Thuidium delicatulum (Hedw.) Schimp. – Loc.: 40, on soil, Ursavaş 2601.

Brachytheciaceae G. Roth.

Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen. var. *velutinum* – Loc.: 35, 37, 40, 56, 57, on soil and tree bark, Burçin 350.

Brachytheciastrum velutinum var. *salicinum* (Schimp.) Ochyra & Parnowicz. – Loc.: 14, on tree bark, Burçin 308.

Brachythecium glareosum (Bruch ex Spruce) Schimp. – Loc.: 36, on soil, Burçin 378.

Brachythecium mildeanum (Schimp.) Schimp. – Loc.: 54, on soil, Ursavaş 2657.

Brachythecium rivulare Schimp. – Loc.: 15, 38, on wet soil in floodplains, Burçin 214.

Brachythecium rutabulum (Hedw.) Schimp. – Loc.: 2, 3, 7, 31, on soil and decaying log, Burçin 105.

Cirriphyllum crassinervium (Taylor) Loeske & M. Fleisch. – Loc.: 54, on rocks, Ursavaş 2658.

Eurhynchium striatum (Hedw.) Schimp. – Loc.: 1, 35, on soil, Burçin 22.

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen – Loc.: 38, on soil, Ursavaş 2574.

**Homalothecium sericeum* (Hedw.) Schimp. – Loc.: 2, 3, 7, 17, 34, 37, on tree bark and rocks, Burçin 70.

Homalothecium lutescens (Hedw.) H. Rob. – Loc.: 55, on soil, Ursavaş 2667.

Kindbergia praelonga (Hedw.) Ochyra. – Loc.: 1, 2, 4, 7, 12, 16, 18, 25, 36, 37, 38, 54, 55, 56, on soil, tree trunks and logs, Burçin 216.

Microeurhynchium pumilum (Wilson) Ignatov & Vanderp. – Loc.: 2, 6, 12, 36, 40, on soil Burçin 111.

Oxyrrhynchium hians (Hedw.) Loeske. – Loc.: 3, 23, 41, 54, 56, on soil and rocks, Burçin 363.

**Oxyrrhynchium schleicheri* (R.Hedw.) Röll. – Loc.: 2, 11, 38, 51, on soil, Burçin 150.

**Oxyrrhynchium speciosum* (Brid.) Warnst. – Loc.: 7, 12, on soil, Burçin 130.

Palamocladium euchloron (Bruch ex Müll. Hal.) Wijk & Margad. – Loc.: 7, on tree trunks, Burçin 77.

Pseudoscleropodium purum (Hedw.) M. Fleisch. – Loc.: 1, 10, 18, 22, 26, 36, 37, 38, 41, 43, 47, 50, 59, on soil, Burçin 01.

Rhynchostegiella tenella (Dicks.) Limpr. – Loc.: 7, on on base of trees, Burçin 169.

**Rhynchostegium confertum* (Dicks.) Schimp. – Loc.: 12, 24, on soil, Burçin 297.

Rhynchostegium riparioides (Hedw.) Cardot – Loc.: 51, on wet rocks, Ursavaş 2648.

**Scleropodium touretii* (Brid.) L.F. Koch. – Loc.: 2, 5, 8, 9, 19, 25, 56, on soil, Burçin 96.

***Scleropodium cespitosum* (Müll. Hal.) L.F. Koch – Loc.: 39, on soil, Ursavaş 2599.

**Scorpiurium circinatum* (Bruch) M. Fleisch. & Loeske. – Loc.: 3, 4, 5, on soil and rocks, Burçin 174.

Hypnaceae Schimp.

Calliergonella cuspidata (Hedw.) Loeske. – Loc.: 7, 12, 38, on wet soil, Burçin 72.

Hypnum andoi A.J.E. Sm. – Loc.: 1, on tree trunks, Burçin 21.

Hypnum cupressiforme Hedw. var. *cupressiforme* – Loc.: 12, 21, 24, 29, 37, 38, 39, 40, 44, 49, 54, 55, 60, on soil, rocks, tree trunks and logs, Burçin 270.

Hypnum cupressiforme Hedw. var. *lacunosum* Brid. – Loc.: 1, 4, 8, 10, 31, 39, 45, 48, on rocks, soil and tree bases, Burçin 144.

**Hypnum cupressiforme* Hedw. var. *resupinatum* (Taylor) Schimp. – Loc.: 1, 7, 14, 44, 57, on tree trunks Burçin 91.

**Hypnum jutlandicum* Holmen & E. Warncke. – Loc.: 1, 5, on soil, Burçin 87.

**Platygyrium repens* (Brid.) Schimp. – Loc.: 38, on tree bark, Ursavaş 2583.

Pterigynandraceae Schimp.

Heterocladium heteropterum (Brid.) Schimp. – Loc.: 56, on rocks, Ursavaş 2678.

Pterigynandrum filiforme Hedw. – Loc.: 8, 35, 56, on tree trunks, Burçin 92, 376.

Hylocomiaceae M. Fleisch.

Ctenidium molluscum (Hedw.) Mitt. – Loc.: 12, on soil, Burçin 280.

Plagiotheciaceae (Broth.) M. Fleisch.

**Plagiothecium cavifolium* (Brid.) Z. Iwats. – Loc.: 32, on tree bases, Burçin 377.

Cryphaeaceae Schimp.

**Cryphaea heteromalla* (Hedw.) D. Mohr. – Loc.: 7, 38, 44, on tree trunks, Burçin 185.

Leucodontaceae Schimp.

Leucodon immersus Lindb. – Loc.: 8, 9, on tree trunks, Burçin 67.

Leucodon sciuroides (Hedw.) Schwägr. – Loc.: 10, 17, 21, 35, 45, 56, 60, on tree trunks, Burçin 253.

Neckeraceae Schimp.

**Alleniella besseri* (Lobarz.) S. Olsson, Enroth & D. Quandt – Loc.: 56, on rocks, Ursavaş 2676.

Alleniella complanata (Hedw.) S. Olsson, Enroth & D. Quandt. – Loc.: 7, 14, 35, 37, 38, 55, 56, 58, on tree trunks, Burçin 101.

Thamnobryum alopecurum (Hedw.) Nieuwl. ex Gangulee – Loc.: 55, on rocks, Ursavaş 2669.

Leptodontaceae Schimp.

**Leptodon smithii* (Hedw.) F. Weber & D. Mohr. – Loc.: 9, 56, on tree trunks, Burçin 93.

Lembophyllaceae Broth.

Isothecium alopecuroides (Lam. ex Dubois) Isov. – Loc.: 16, 31, 44, 56, on soil and tree bases, Burçin 324.

Anomodontaceae Kindb.

Anomodon attenuatus (Hedw.) Huebener – Loc.: 55, 56, 58, on tree trunks, Ursavaş 2698.

Anomodon viticulosus (Hedw.) Hook. & Taylor. – Loc.: 7, 17, 55, on tree trunks and rocks, Burçin 85.

4. Conclusions and discussion

As a result of the evaluation of 614 bryophyte samples, 157 specific and infraspecific taxa belonging to 47 families and 93 genera were identified. 25 species of 17 genera belonging to 17 families from Marchantiophyta (Liverworts), 130 species of 74 genera belonging to 28 families from Bryophyta (mosses), 2 species of 2 genera belonging to 2 families from Anthocerotophyta (Hornworts). Among these, 95 taxa are new to Sinop province (*) and 26 taxa are new to A3 square (**) according to Henderson (1961) grid system.

The families with the highest number of taxa were Ricciaceae (3), Fossombroniaceae (3), Lophocoleaceae (2), Cephaloziellaceae (2) and Calypogeiaceae (2) for liverworts; Brachytheciaceae (24), Pottiaceae (23), Orthotrichaceae (10), Hypnaceae (7), Bryaceae (6), Polytrichaceae (6), Grimmiaceae (5), Fissidentaceae (5) and Mniaceae (5) for mosses. The moss families that have the most taxa are Brachytheciaceae and Pottiaceae in this study, such as the other bryofloristic studies in the Mediterranean areas (Ören and Keçeli, 2014). The richness genera were *Riccia* (3), *Fossombronia* (3), *Lophocolea* (2), *Cephaloziella* (2) and *Calypogeia* (2) for liverworts; *Orthotrichum* (8), *Fissidens* (5), *Hypnum* (5) and *Weissia* (5) for mosses.

Some remarkable species for Turkish bryophytes were found from the area. *Phymatoceros bulbiculosus* (Brot.) Stotler were reported only Mesogis (Kestane) Mountain, 900 m, İzmir-Tire, B6 grid square by Bormüller (1908) (Özenoğlu Kiremit and Keçeli, 2009). With this study, it has been re-collected from road side slope on soil in deciduous forest Aklıman region over a hundred years. This species is characterised by a single chloroplast per cell without pyrenoids, linear to lingulate and tuberous thalli. Spores are yellowish as *Phaeoceros*, but external face generally smooth (Stotler et al., 2005).

Fossombronia foveolata has been reported from Turkey without collected locality data (Özenoğlu Kiremit and Keçeli 2009). With this study, it is firstly recorded with detailed locality information. The species *F. foveolata* is distinguished other related species by spore size and morphology.

Zygodon forsteri was firstly recorded from Babadağ (Fethiye, Muğla) by Erdağ and Kırmacı (2010). It has been secondly reported with this study from Turkey. This species is distinguished other Turkish *Zygodon* species by autoceous gametophyte and smooth leaf cells (Smith, 2004).

Entosthodon obtusus previously reported Aydın and Artvin was frequently found on wet soil at temporarily ponds environs, marshy ground area (Kürschner et al., 2007; Batan & Özdemir, 2013). Its distinctive characters are reduced or absent peristome, convex lid, bordered leaf margin (Smith, 2004).

Common species are *Frullania dilatata*, *F. tamarisci*, *Radula complanata*, *H. cupressiforme* var. *cupressiforme*, *H. cupressiforme* var. *resupinatum*, *Orthotrichum affine*, *O. lyellii*, *Homalothecium sericeum*, *Pterigynandrum filiforme*, *Leucodon sciuroides*, *L. immersus* and *Alleniella complanata* as epiphytic, *Tortula muralis*, *Grimmia pulvinata*, *Frullania tamarisci*, *Porella platyphylla* as epilithic, *Barbula unguiculata*, *Totella squarrosa*, *Funaria hygrometrica*, *Pleuroidium acuminatum*, *P. subulatum*, *Trichostomum brachydontium* as epigeic in the area.

23 bryophytes (8 liverworts and 15 mosses) were reported to Hamsilos around, within boundaries of study area (Çetin and Uyar, 1997; Çetin, 1999). Unfortunately, *Marchantia paleacea* Bertol., *Isothecium myosuroides* Brid. and

Orthotrichum urnigerum Myrin of them could not be recorded in this study. However, 137 taxa were added to the bryodiversity of the area. At the end of the study, the bryophyte taxa number were reached up to 160 for the Sinop Peninsula and 227 for Sinop Province..

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References

- Abay, G., Keceli T. (2014). *Sphagnum molle* (Sphagnaceae, Bryophyta) in Turkey and SW Asia. *Cryptogamie Bryologie*, 35, 105-112.
- Akman, Y. (1999). İklim ve Biyoiklim (Biyoiklim Metodları ve Türkiye İklimleri). Ankara: Kariyer Matbaacılık.
- Alataş, M., Batan, N. (2016a). The moss flora of Yeşilyurt and Battalgazi (Malatya/Turkey) district. *Anatolian Bryology*, 2(1-2), 47-55.
- Alataş, M., Batan, N. (2016b). The moss flora of Arapgir (Malatya/Turkey) district. *Biological Diversity and Conservation*, 9(2), 102-107.
- Batan, N., Özdemir, T. (2013). Contributions to the moss flora of the Caucasian part (Artvin province) of Turkey. *Turkish Journal of Botany*, 37, 375-388.
- Batan, N., Özdemir, T., Alataş, M. (2015). Additional bryophyte records from Gümüşhane province in Turkey. *Botanica Serbica*, 39, 63-70.
- Batan, N., Jia, Y., Özdemir, T., Alataş, M. (2016). *Brotherella* and *Encalypta* species new to Turkey and Southwest Asia. *Plant Biosystems*, 150, 436-441.
- Bornmüller, J. (1908). *Florula Lydiae*, *Mittelungen des Thüringischen Botanischen Vereins*, 24, 1-140.
- Canlı, K., Çetin, B. (2014). The moss flora of Akdağ Mountain (Amasya, Turkey). *The Scientific World Journal*, <http://dx.doi.org/10.1155/2014/860379>.
- Casas, C., Brugués, M., Cros, R. M., Sérgio, C., Infante, M. (2009). *Handbook of Liverworts and Hornworts of the Iberian Peninsula and the Balearic Islands*. Barcelona: Institut d'Estudis Catalans.
- Cortini Pedrotti, C. (2001). *Flora dei muschi d'Italia, Sphagnopsida, Andreaopsida, Bryopsida (I parte)*. Roma: Antonio Delfino Editore Medicina-Scienze.
- Cortini Pedrotti, C. (2006). *Flora dei muschi d'Italia, Bryopsida (II parte)*. Roma: Antonio Delfino Editore Medicina-Scienze.
- Çetin, B., Uyar, G. (1997). The moss flora of Sinop and its environs (Ayancık, Boyabat and Gerze). *Turkish Journal of Botany*, 21, 231-244.
- Çetin, B. (1999). The liverworts (Hepaticae) of Sinop and its environs (Ayancık, Boyabat and Gerze). *Turkish Journal of Botany*, 23, 113-116.
- Eken, G., Bozdoğan, M., İsfendiyoğlu, S., Kılıç, D. T., Lise, Y. (2006). Türkiye'nin önemli doğa alanları. Ankara: Doğa Derneği.
- Erdağ, A., Kırmacı, M. (2010). *Zygodon forsteri* (Orthotrichaceae, Bryophyta), a new record to the bryophyte flora of Turkey and SW Asia. *Nova Hedwigia*, 138, 181-186.
- Ezer, T., Kara, R., Seyli, T., Ertek A. (2015). The bryophyte flora of Aladağlar National Park (Turkey). *Folia Cryptogamica Estonica*, 52, 7-20.
- Frey, W., Frahm, J. P., Fischer, E., Lobin, W. (2006). *The liverworts, mosses and ferns of Europe (english edition revised and edited by T.L. Blockeel)*. Colchester: Harley Books.
- Greven, H. C. (2003). *Grimmias of the World*. Leiden: Backhuys Publishers.
- Hodgetts, N. G. (2015). Checklist and country status of European bryophytes – towards a new red list for Europe. Ireland: Irish Wildlife Manuals, No. 84. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- Küçük, M., Ertürk, E. (2013). Biodiversity and protected areas in Turkey. *Sains Malaysiana*, 42(10), 1455-1460.
- Kürschner, H., Erdağ, A. (2005). Bryophytes of Turkey: an annotated reference list of the species with synonyms from the recent literature and an annotated list of Turkish bryological literature. *Turkish Journal of Botany*, 29, 95-154.
- Kürschner, H., Parolly, G., Erdağ, A., Eren, Ö. (2007). Synanthropic bryophyte communities new to western Turkey - syntaxonomy, synecology and life syndromes. *Nova Hedwigia*, 84, 459-478.
- Kürschner, H., Frey, W. (2011). Liverworts, mosses and hornworts of Southwest Asia (Marchantiophyta, Anthocerotophyta, Bryophyta). *Nova Hedwigia*, 139, 1-240.
- Lara, F., Garilleti, R., Medina, R., Mazimpaka, V. (2009). A new key to genus *Orthotrichum* Hedw. in Europe and the Mediterranean region. *Cryptogamie Bryologie*, 30(1), 129-142.
- Lewinsky, J. (1993). A synopsis of the genus *Orthotrichum* Hedw. (Musci, Orthotrichaceae). *Bryobrothera*, 2, 1-59.

- Ören, M., Uyar, G., Keçeli, T. (2012). The bryophyte flora of the western part of the Küre Mountains (Bartın, Kastamonu), Turkey. *Turkish Journal of Botany*, 36: 538-557.
- Ören, M. and Keçeli, T. (2014). The moss flora of Ihlara Valley (Aksaray/Turkey). *Biological Diversity and Conservation*, 7(1), 88-93.
- Ören, M., Sari, B., Ursavaş, S. (2015a). *Syntrichia minor* (Pottiaceae) and *Cephaloziella integerrima* (Cephaloziellaceae) new to bryophyte flora of Turkey. *Archives of Biological Sciences*, 67(2), 367-372.
- Ören, M., Bozkaya, S., Özçelik, A. D., Hazer, Y., Uyar, G. (2015b). Zonguldak ili briyofit florasına katkılar. *Anatolian Bryology*, 1(1), 34-41.
- Özdemir, T., Batan, N. (2014). New and noteworthy moss records for Turkey and Southwest Asia. *Teloepa*, 17, 35-42
- Özdemir, T., Batan, N. (2016). The bryophyte flora of Ordu province (Turkey). *Arctoa*, 25, 144-159.
- Özenoğlu Kiremit, H., Keçeli T. (2009). An Annotated Check-List of the Hepaticae and Anthocerotae of Turkey. *Cryptogamie, Bryologie*, 30(3), 343-356.
- Özenoğlu Kiremit, H., Kırmacı, M., Kiremit, F. (2016). New findings of *Riccia* Species (Marchantiophyta) in Turkey and Southwest Asia. *Cryptogamie Bryologie*, 37(1), 19-25.
- Paton, J. (1999). The liverworts flora of the British Isles. Colchester: Harley Books.
- Ros, R. M., Mazimpaka, V., Abau-Salama, U., Aleffi, M., Blockeel, T., Brugués, M., Cros, R. M., Dia M. G., Dirkse G. M., Draber, I., El-Saadawi, W., Erdağ, A., Ganeva, A., Gabriel, R., González-Mancebo, J. M., Granger, C., Herrstadt, I., Hugonnot, V., Khalil, K., Kürschner, H., Losada-Lima, A., Luis, L., Mifsud, S., Privitera, M., Puglisi, M., Sabovljevic, M., Sérgio, C., Shabbara, H. M., Sim-Sim, M., Sotiaux, A., Tacchi, R., Vanderpoorten, A., Werner, O. (2013). Mosses of the Mediterranean, an annotated checklist. *Cryptogamie Bryologie*, 34(2), 99-283.
- Smith, A. J. E. (1996). The liverworts of Britain and Ireland. Cambridge: Cambridge University Press.
- Smith, A. J. E. (2004). The moss flora of Britain and Ireland. Cambridge: Cambridge University Press.
- Stotler, R. E., Doyle, W. T., Crandall Stotler, B. J. (2005). *Phymatoceros* Stotler, W. T. Doyle & Crand.-Stotl., Gen. Nov. (Anthocerotophyta). *Phytologia*, 87(2), 114-117.
- Ursavaş, S., Çetin, B. (2014). *Cinclidotus asumaniae* Ursavaş & Çetin (Bryopsida, Pottiaceae), sp. nov., a new species to the hygrophytic moss flora of Southern Turkey. *Nova Hedwigia*, 98, 467-472.
- Uyar, G., Çetin, B. (2004). A new checklist of the mosses of the Turkey. *Journal of Bryology*, 26, 203-220
- Uyar, G., Ören, M. (2013). Three remarkable new moss records for South-West Asia from northern Turkey. *Turkish Journal of Botany*, 37, 363-368.

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