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The Bryophyte Flora of Babadağ (Denizli/Turkey)

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Abstract

The bryophyte flora of Babadağ (Denizli), a floristically important mountain of Western Anatolia with a high number of endemic flowering plant taxa, was investigated between 2003 and 2006. After the identification of approximately 2500 bryophyte taxa collected from the research area, total 213 moss taxa belonging to 24 families and 78 genera, 24 liverwort taxa belonging to 17 families and 19 genera and one hornwort species are reported from the study area. Twenty-five moss taxa and one liverwort species are reported for the first time from C11 qrid-square in the system adopted by Henderson (1961).

Key words: Bryophyte, Babadag Flora, Bryogeography, West Anatolia, Turkey.

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Yarı kurak bölgelerde bozuk ekosistemlerin yeniden kazınılmasında uygun fidan, ağaç tipi ve dikim mevsiminin belirlenmesi

Özet

Bu çalışmada, çok sayıda endemik çiçekli bitki taksonu içeren Batı Anadolu' nun önemli bir dağı olan, Babadağ' ın (Denizli) bryofit florası 2003 – 2006 yılları arasında araştırılmıştır. Çalışma alanından toplanan yaklaşık 2500 bryofit taksonun teşhisi sonucunda, toplam 24 familya, 78 cins'e ait 213 karayosunu taksonu, 17 familya, 19 cins'e ait 24 ciğerotu taksonu ve sadece 1 boynuzlu ciğerotu türünün alanda yayılış gösterdiği belirlenmiştir. Teşhis edilen bryofitler içinde ciğerotlarından 1, karayosunlarından ise 25 takson Henderson (1961) kareleme sistemine göre C11 karesi için yeni kayıt olarak bulunmuştur.

Anahtar kelimeler: Bryofitler, Babadağ Flora, Bryocoğrafya, Batı Anadolu, Türkiye

1. Introduction

Studies on the bryophyte flora of Turkey focused on the Black Sea region, the western and southern part of the country. To date, nearly thirty of them have been deal with the bryoflora of the West Anatolia in Turkey, e.g., Walther (1967, 1970, 1975, 1979), Walther and Leblebici (1969), Leblebici (1974), Çetin (1988), Yayıntaş and Iwatsuki (1988), Gökler and Öztürk (1991), Gökler (1992,1993 a,b), Çetin (1993), Tonguç and Yayıntaş (1996), Kürschner and Parolly (1999), Yayıntaş and Tonguç (2001), Özenoğlu (2001), Gökler (2001), Özenoğlu and Gökler (2002), Erdağ (2002), Kürschner (2004) and Özenoğlu et al. (2007). In spite of these investigations, important parts of the area are still bryologically poorly known such as the Aydın Mountains, major parts of the Menteşe Mountains and most of the mountain ranges around Denizli province (florulas of these mountains are in preparation by the authors).

There is still an obvious need to conduct further field work in the western part of Turkey in order to contribute to the knowledge of the Mediterranean bryophyte diversity.

This study aims to provide such a mosaic stone in giving an annotated species inventory from a highly diverse area.

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1.1 The study area

The study area is located between 37° 54´ N latitude, 28° 41´ E longitude and 37° 37´ N latitude, 29° 12´ E longitude. Although main parts of the study area is located in Denizli province, the small northwesten part extends to province Aydın (Figure 1).

The main summits of Babadağ are Babadağ (2300 m), Sarıbıçak Tepe (2220 m), Evran Tepe (2100 m), Akdağ (2200m), Karababa Tepesi (2100 m), Göktepe (1850 m) and Ortaca Tepe (1750 m). Steep valleys, mostly cut into the North side of the mountain, increase the habitat and climatic diversity of the area.

Although there are many streams during winter and early spring, only Yeşildere Stream, İsrail Stream (Seyme), Dandalaz Stream and Altındere (Gebere Stream) are permanently flowing during the long and dry summer period. With the exception of Dandalaz Stream, all are situated in the northern parts of Babadağ.

Maquis dominates the deforested areas at lower altitudes. *Pinus brutia* Ten. forms well developed forests all around the study area mostly N, E and NW slopes of the mountain between 250 and 1000 (1200) m. From 1200 – 1400 m on, it is replaced by *P. nigra* subsp. *caramanica* (Loudon) Rehder. Higher up, Juniper forests and thorn cushion communities are seen as mixed formations between 1400 - 1600 m. After this zone pure thorn–cushion vegetation prevails.

The main annual precipitation in the area is around 500 mm/y (464 mm/y in Babadağ County and 658 mm/y in Tavas County), reflecting the typically long summer drought from May to October. During the mild winter most of the annual precipitation falls (MGM, 2005).

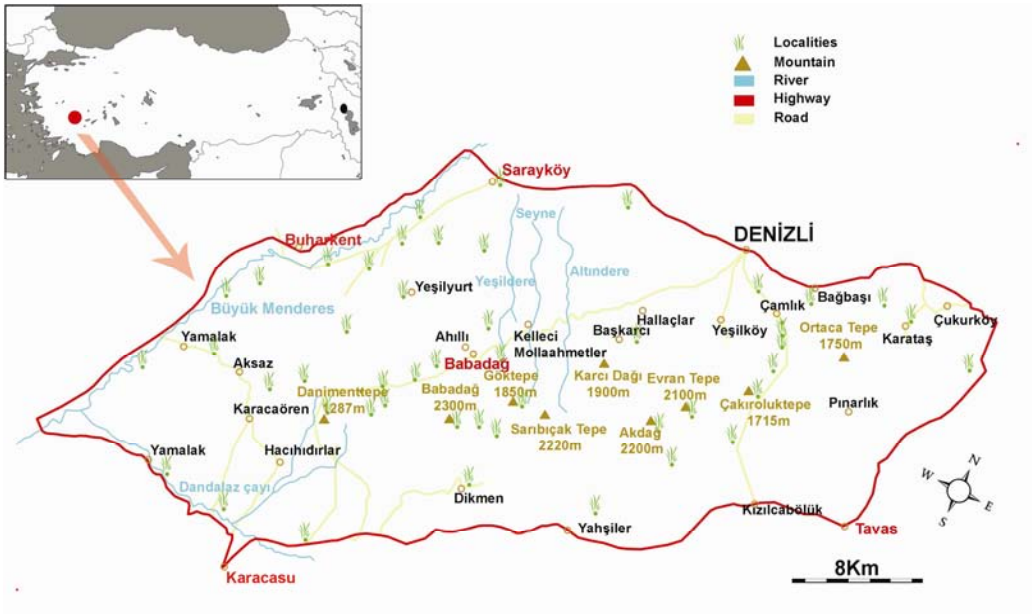

Figure 1. The map of study area

2. Materials and methods

The bryophyte flora of Babadağ (Denizli/Turkey), one of the important mountains of Western Turkey, has been investigated. Nearly 2500 bryophyte specimens were collected from 51 different localities in different seasons between 2003 and 2006 and identified with the relevant floras and monographs (Smith, 2004; Nyholm, 1981; Frahm and Frey, 1983; Crum and Anderson, 1981; Arnell, 1981; Paton, 1997; Zander, 1978, 1993; Heyn and Herrnstadt, 2004; Pedrotti, 2001; Nyholm, 1986; Cano et al. 1993; Cano et al. 2005; Greven, 1995; Muñoz, 1999; Hofmann, 1998; Jimenez et al., 2005 etc.).

Moss taxa are listed to generic level in adopting the taxonomy and nomenclature of the checklist of Hill et. al (2006), which in respects of higher taxonomical ranks is based on the system by Goffinet and Buck (2004). The treatment of hornworts and liverworts follows Grolle (1983). The recorded specific and subspecific taxa are listed alphabetically. For each taxon, only one collector number was given to avoid repetition in the floristic list but the same plants collected from different localities were indicated (loc. 1,2,3..). Asterisks indicate new records for square C11 (Henderson, 1961) (*) and records for bryoflora of Turkey (#). All specimens are deposited in AYDN (Herbarium of Adnan Menderes University, Aydın, Turkey).

Collection localities are presented in the following list with their coordinates (as far as available), altitudes and a brief site ecological note.
Collector and identifying author abbreviations used in the text and appendix are AERD. (Adnan ERDAĞ), MKIR. (Mesut KIRMACI), OZ. (Hatice ÖZENOĞLU)

2.1. List of Collection localities

1. **Başoluk –Yaylatepe (Babadağ),** N 37º 41´, E 28º 56´, Alt. 1600 m., *Pinus nigra* - *Juniperus* spp. mixed forest, 10 viii 2003.
2. **Akdağ summit**, N 37º 42´, E 028º 57´, Alt. 2100 m., pure thorn–cushion vegetation, 03 ix 2003.
3. **Gökbel (Babadağ) Mountain**, Alt. 1600 m., *Pinus nigra* forest, 03 ix 2003.
4. **Zeytin high plateu (upper part of Çamlık, Denizli),** Alt. 1300 m., *Pinus nigra* forest, 23 xi 2003.
5. **Çakıroluk Tepe (Denizli),** Alt. 1200 m., *Pinus nigra* forest, 23 xi 2003.
6. **Between Çamlık and Çakıroluk Tepe (Denizli),** N 37º 41´, E 29º 15´, Alt. 1200 m., near stream, *Platanus orientalis* L. dominates, 23 xi 2003.
7. **Upper part of Çamlık (Denizli),** N 37º 41´, E 29º 20´, Alt. 1100 m., steep valley, Maquis dominates, *Daphne* sp., *Pistacia* sp., *Juniperus sp*., 23 xi 2003.
8. **Köprü area (upper part of Çamlık, Denizli),** Alt. 1000 m., steep valley, *Juglans regia* L., 23 xi 2003.
9. **East of Babadağ summit,** N 37º 44´, E 29º 55´, Alt. 1850 m., *Pinus nigra* forest, 01 v 2004.
10. **Mollaahmetler village (Babadağ),** N 37º 46´, E 28º 56', Alt. 1400 m., *Pinus nigra* forest, 01 v 2004.
11. **Yeşilköy Valley, Şelale area (Denizli),** Alt. 600 m., according to high moisture, *Castenae sativa* Mill., *Styrax officinalis* L., *Arbutus unedo* L., *Ficus carica* L., *Juglans regia* L. and *Corylus avellana* L. constitute general vegetation, 04 vi 2004.
12. **Çakıroluk Tepe (Denizli),** N 37º 41´, E 29º 02´, Alt. 1600 m., *Juniperus* sp., *Pinus nigra* mixed forest, 04 vi 2004.
13. **Between Çamlık and Çakıroluk Tepe (Denizli),** N 37º 41´, E 29º 50´, Alt. 1250 m., *Pinus brutia* and *Pinus nigra* mixed forest, 04 vi 2004.
14. **Between Çamlık and Çakıroluk Tepe (10 km to Denizli),** N 37º 41´, E 29º 05´, Alt. 1000 m., *Pinus brutia* forest, 04 vi 2004.
15. **Between Çamlık and Çakıroluk Tepe (5 km to Denizli),** N 37º 42´, E 29º 04´, Alt. 800 m., *Pinus brutia* forest, 04 vi 2004.
16. **Between Yamalak Town and Aksaz village (Aydın),** Alt. 340 m., *Pinus brutia* forest and Maquis, 06 viii 2004.
17. **Between Aksaz village and Sarayköy (Aydın),** N 37º 51´, E 28º 44´, Alt. 900 m., *Pinus brutia* forest, 06 viii 2004.
18. **Kovanlı Mountain and Azılar Gediği (Aksaz / Aydın),** N 37º 51´, E 28º 43´, Alt. 990 m., *Quercus* spp. and *Pinus brutia* mixed forest, 06 viii 2004.
19. **Sarayköy - Yeşilyurt, Ketenlik Stream,** N 37º 50´, E 28º 45´, Alt. 850 m., along stream *Platanus orientalis* dominates, *Quercus coccifera* L., *Q. infectoria* ssp. *boisseri* (Reuter) O. Schwarz., *Cistus salvifolius* L. and *Styrax officinalis* are other plants, 07 viii 2004.
20. **Taşoluk (Babadağ),** N 37º 50´, E 28º 46´, Alt. 820 m., there are a lot of small streams, *Platanus orientalis* dominates, 07 viii 2004.
21. **Babadağ – Karacasu road; 30 km to Karacasu,** N 37º 50´, E 28º 47´, Alt. 800 m., *Pinus brutia* forest, 07 viii 2004.
22. **Taşdelen Tepe (Babadağ),** N 37º 48´, E 28º 46´, Alt. 1220 m., *Pinus nigra* forest, 07 viii 2004.
23. **Taşoluk Plateau (Babadağ),** N 37º 47´, E 28º 47´, Alt. 1340 m., *Pinus nigra* forest, 07 viii 2004.
24. **Dokuzçam area (Babadağ – Karacasu road; 17 km to Karacasu),** N 37º 48´, E 28º 45´, Alt. 1460 m., *Pinus nigra* forest, 07 viii 2004.
25. **Dikmen Village (Karacasu),** N 37º 43´, E 28º 49´, Alt. 1010 m., deforested area, destroyed maquis, 10 viii 2004.
26. **Dikmen Tepe (Karacasu),** N 37º 42´, E 028º 50´, Alt. 1400 m., *Quercus* spp. mixed forest, 10 viii 2004.
27. **Babadağ summit,** Alt. 2300 m., pure thorn–cushion vegetation, 10 viii 2004.
28. **Saçma Tepe (Karacasu),** Alt. 1800 m., *Pinus nigra*, *Juniperus excelsa* Bieb., *J. oxycedrus* L. and *J. foetidissima* Wild. mixed forest, 10 viii 2004.
29. **Dandalaz River (near Karacasu),** Alt. 450 m., along stream *Platanus orientalis* dominates, 11 viii 2004.
30. **Danişment-Göktepe (Babadağ),** N 37º 48´, E 028º 44´, Alt. 1250 m., *Pinus nigra* forest, 11 viii 2004.
31. **Taşdelen fountain,** N 37º 48´, E 028º 46´, Alt. 1350 m., *Pinus nigra* forest, 13 viii 2004.
32. **Taşoluk Plateau (Babadağ),** N 37º 47´, E 028º 47´, Alt.1200 m., *Pinus nigra* and *Pinus brutia* mixed forest, 13 viii 2004.
33. **Kızılcabölük – Evran Tepe,** N 37º 41´, E 029º 00´, Alt. 1550 m., *Pinus nigra* forest, 15 iv 2005.

34. **Between Yenice and Karacasu (Aydın),** N 37º 46´, E 028º 36´, Alt. 400 m., *Pinus brutia* forest and maquis (*Quercus coccifera, Cistus creticus* L., *Jasminium fruticans* L., *Cercis siliquastrum* L.), 21 v 2005.
35. **Denizli, Bağbaşı (Northwest of Babadağ),** N 37º 43´, E 029º 07´, Alt. 700 m., destroyed maquis, 07 vii 2005.
36. **Babadağ - Karataş forest office (Southeast of Babadağ),** N 37º 41´, E 029º 10´, Alt. 900 m., *Pinus brutia* forest, 08 vii 2005.
37. **East of Babadağ (Denizli-Tavas highway),** N 37º 42´, E 029º 12´, Alt. 720 m., *Pinus brutia* plantation, 08 vii 2005.
38. **Between Denizli-Aydın, Erenköy village (North of Babadağ),** N 37º 50´, E 029º 00´, Alt. 400 m., cultivated area, weak plant cover, 09 vii 2005.
39. **Between Denizli-Aydın, Hacı Eyüplü village (North of Babadağ),** N 37º 50´, E 029º 8´, Alt. 360 m., agriculture area, weak plant cover, 10 vii 2005.
40. **Denizli – Sarayköy (on Sarayköy - Babadağ highway),** N 37º 54´, E 028º 54´, Alt. 160 m., agriculture area, 10 vii 2005.
41. **Between Sarayköy and Babadağ (9 km to Babadağ),** N 37º 50´, E 028º 53´, Alt. 320 m., *Pinus brutia* forest, 12 vii 2005.
42. **Babadağ District, Kos Stream,** Alt. 1000 m., *Pinus brutia* forest, along stream *Platanus orientalis* dominated, 12 vii 2005.
43. **Between Babadağ and Sarayköy (10 km to Sarayköy),** N 37º 50´, E 028º 52´, Alt. 330 m., *Pinus brutia* forest and maquis, 12 vii 2005.
44. **Denizli-Aydın highway (50 km to Aydın),** N 37º 57´, E 028º 47´, Alt. 160 m., agriculture area, 12 vii 2005.
45. **Babadağ District, Darıyeri locality,** Alt. 1900 m., upper part of tree zone (Pure thorn–cushion vegetation), 20 iii 2006.
46. **Denizli – Babadağ – Karacasu highway, west of Babadağ, between Başaran and Yenice Village,** Alt. 200 m., agriculture area and *Olea europaea* L. Plantation, 23 iii 2006.
47. **Aydın, Aksaz Village,** N 37º 55´, E 028º 39´, Alt. 120 m., agriculture area, 30 iv 2006.
48. **Aydın, field of Gencelli Village,** Alt. 120 m., agricultural area, 30 iv 2006.
49. **Denizli – Babadağ cross road,** N 37º 54´, E 028º 56´, Alt 180 m., agriculture area, 30 iv 2006.
50. **Denizli, Çamlık,** Alt. 450 m., *Pinus brutia* forest, 30 iv 2006.
51. **Between Aydın and Buharkent,** N 37º 57´, E 028º 43´, Alt.140 m., agriculture area, 30 iv 2006.

3. Results and discussion

3.1 Floristic Inventory

ANTHOCEROTOPHYTA
ANTHOCEROTACEAE
Phaeoceros laevis (L.) Prosk.
Loc: 25, 51, on soil, 0-500 m, MKIR 2201
MARCHANTIOPHYTA SPHAEROCARPACEAE
Sphaerocarpos texanus Austin
Loc: 46,47,49,50,51, on soil, Alt. 0-500 m, MKIR 3733
TARGIONIACEAE
Targionia hypophylla L.
Loc: 8, on soil and soil-covered rock, Alt. 500-1500 m, MKIR 1555
AYTONIACEAE
Reboulia hemisphaerica (L.) Raddi
Loc: 8,9,11,19,27,28, on soil and rock, Alt. 0-2000 m, MKIR 2086
Preissia quadrata (Scop.) Nees
Loc: 9,35, on rocks and soil-covered rock, Alt. 500-2000 m, Det: ERD & MKIR, MKIR 1633
CONOCEPHALACEAE
Conocephalum conicum (L.) Dumort.
Loc: 9,11,19,23, on soil and soil-covered rock, Alt. 500-2000 m, MKIR 1631
LUNULARIACEAE
Lunularia cruciata (L.) Dumort. ex Lindb.
Loc: 25, on soil and rocks, Alt. 0-2000 m, MKIR 2234
MARCHANTIACEAE
Marchantia polymorpha L.
Loc: 19,23, on moist soil and rocks, Alt. 0 – 500 m, MKIR 2163
CORSINIACEAE
Corsinia coriandrina (Spreng.) Lindb.
Loc: 46, on soil and epiphytic, Alt. 0-1000 m, MKIR 3723
OXYMITRACEAE
Oxymitra incrassata (Brotero) Sérgio & Sim-Sim

Loc: 9, on soil, Alt. 1500-2000 m, MKIR 1673
RICCIACEAE
Riccia sorocarpa Bisch.
Loc: 46, on soil, Alt. 500, MKIR 3723 d
METZGERIACEAE
Metzgeria furcata (L.) Dumort.
Loc: 11, on rocks, Alt. 1000, MKIR 1733b
ANEURACEAE
Aneura pinguis (L.) Dumort.
Loc: 23, epilithic-on soil, Alt. 0-1000, MKIR 2162
PELLIACEAE
Pellia endiviifolia (Dicks.) Dumort.
Loc: 9,23,25, epilithic- on soil - soil-covered rock, Alt. between: 500-1500, MKIR 1638
Pellia epiphylla (L.) Corda
Loc: 19,30, epilithic - on soil - soil-covered rock, Alt. 500-1500, MKIR 2333
CODONIACEAE
Fossombronia husnotii Corb.
Loc: 46, on soil, Alt. 0-500, MKIR 3723a
Petalophyllum ralfsii (Wils.) Nees & Gottsche
Loc: 46, on soil - soil-covered rock, Alt. 0-500, MKIR 3723c
JUNGERMANNIACEAE
Jungermannia atrovirens Dumort.
Loc: 9, epilithic, Alt. 1500-2000, MKIR 1615b
Jungermannia gracillima Sm.
Loc: 9, epilithic, Alt. 1500-2000, MKIR 1609
CEPHALOZIELLACEAE
Cephaloziella divaricata (Sm.) Schiffn.
Loc: 10, epilithic, Alt. 0-1000, MKIR1709b
FRULLANIACEAE
Frullania dilatata (L.) Dumort.
Loc: 11, epiphytic, Alt. 500-1000, Det: ÖZ & MKIR, MKIR 1723b
PORELLACEAE
Porella cordaeana (Huebener) Moore
Loc: 8,25, epilithic - epiphytic - soil-covered rock, Alt. 1000-1500, MKIR 2205
* *Porella obtusata* (Taylor) Trevis.
Loc: 35, epilithic, Alt. 500-1000, MKIR 3198
Porella pinnata L.
Loc: 9, epilithic - epiphytic - soil-covered rock, Alt. 1500-2000, MKIR 1662
Porella platyphylla (L.) Pfeiff.
Loc:8,11,35, epilithic - epiphytic- on soil - soil-covered rock, Alt. 500-2000, MKIR 3195b

BRYOPHYTA
POLYTRICHACEAE
**Atrichum undulatum* (Hedw.) P. Beauv.
Loc: 45, on soil, Alt. *ca* : 1000-1500, MKIR 3682
Pogonatum urnigerum (Hedw.) P. Beauv.
Loc: 9, epilithic, Alt. 1500-2000, MKIR 1640b
Polytrichum piliferum Hedw.
Loc: 11, on soil, Alt. 500-1000, MKIR 1727
TIMMIACEAE
**Timmia megapolitana* Hedw.
Loc:28, epilithic, Alt. 1500-2000, MKIR 2310b
ENCALYPTACEAE
Encalypta rhaptocarpa Schwägr.
Loc: 28, epilithic, Alt. 500-2000, MKIR 2269
Encalypta streptocarpa Hedw.
Loc: 6,8,9,33, epilithic - soil-covered rock, Alt. 500-2000, MKIR 2394
Encalypta vulgaris var. *mutica* Brid.
Loc: 51,52, soil-covered rock, Alt. 0-500, MKIR 3808
Encalypta vulgaris Hedw. var. *vulgaris*
Loc: 1,2,9,13,15,16,17,19,28,33,35,36, epilithic - on soil - soil-covered rock, Alt. 0-2300, MKIR 3798
FUNARIACEAE
Entostodon convexus (Supruce) Brugués
Loc: 9, on soil, Alt. 0-500, MKIR 1676
Entostodon pulchellus (H. Philib.) Brugués
Loc: 9,46, on soil, Alt. 0-500, MKIR 1605b
Funaria hygrometrica Hedw.

Loc: 8,9,10,17,34,35,40,46,47,49,50, on soil - soil-covered rock, Alt. 0-2000, MKIR 3162
**Physcomitrium pyriforme* (Hedw.) Bruch & Schimp.
Loc: 51, on soil, Alt. 0-500, MKIR 3749
GRIMMIACEAE
Grimmia anodon Bruch & Schimp.
Loc: 9,28, epilithic, Alt. 1000-2000, MKIR 1677
Grimmia decipiens (Schultz) Lindb.
Loc: 8, epilithic, Alt. 1000-1500, MKIR 1774
Grimmia dissimulata E. Maier
Loc: 36, epilithic, Alt. 500-1500, MKIR 3213
Grimmia funalis (Schwägr.) Bruch & Schimp.
Loc: 16,19, epilithic, Alt. 0-1500 , MKIR 2084
Grimmia hartmanii Schimp.
Loc: 30, epilithic, Alt. 1000-1500, MKIR 2015
Grimmia laevigata (Brid.) Brid.
Loc: 3,4,9,11,13,18,21,22,26,36,37, epilithic, Alt. 500-2000, MKIR 1730
Grimmia lisae De Not.
Loc: 4,7,8,1,15,16,17,21,22,25,30,35, epilithic - soil-covered rock, Alt. 0-1500, MKIR 3199
Grimmia nutans Bruch
Loc: 25, epilithic Alt. 1000-1500, MKIR 2190
Grimmia orbicularis Bruch ex Wilson
Loc: 30,34,36,37,39, epilithic, Alt. 0-2000, MKIR 3577
Grimmia ovalis (Hedw.) Lindb.
Loc: 9,1,17,18,22, epilithic, Alt. 500-2000, MKIR 2370
Grimmia pulvinata (Hedw.) Sm.
Loc: 1,4,8,9,15,16,17,19,21,22,23,24,25,26,28,31,32,33,34,35,37,39,41,42, epilithic - epiphytic - on soil, Alt. 0-2000, MKIR 2380
Grimmia trichophylla Grev.
Loc: 6,7,11,15,16,17,19,21,23,25,30, epilithic - on soil - soil-covered rock, Alt. 0-1500, MKIR 2343
Schistidium apocarpum (Hedw.) Bruch & Schimp.
Loc: 1,9,19,35,36, epilithic, Alt. 500-2000, MKIR 3225
**Schistidium helveticum* (Schkuhr) Deguchi
Loc: 9, epilithic, Alt. 1500-2000,MKIR 1625
**Schistidium pruinosum* (Wilson ex Schimp.) G. Roth
Loc: 15, on soil, Alt. 1000-1500, MKIR 1784b
Schistidium rivulare (Brid.) Podp.
Loc: 7,9,25,28, epilithic - on soil - soil-covered rock, Alt. 500-2000, MKIR 2388
FISSIDENTACEAE
Fissidens adianthoides Hedw.
Loc: 8,9,11, on soil - soil-covered rock, Alt. 500-2000, MKIR 1684
Fissidens pusillus (Wilson) Milde
Loc: 25,29, epilithic, Alt. 1000-1500, MKIR 2221
**Fissidens rufulus* Bruch & Schimp.
Loc: 34, epilithic - on soil, Alt. 0-500, MKIR 2596
Fissidens taxifolius Hedw.
Loc: 8 epilithic, Alt. 1000-1500, MKIR 1562
DITRICHACEAE
Ceratodon conicus (Hampe) Lindb.
Loc: 9,43, soil-covered rock, Alt. 1500-2000, MKIR 2172
Ceratodon purpureus (Hedw.) Brid.
Loc: 9,16,23,24,25,28,36,40,43,44, epilithic - on soil - soil-covered rock, Alt. 0-1500, MKIR 2305
Cheilothela chloropus (Brid.) Broth.
Loc: 21,22,44, on soil - epilithic, Alt. 0-1000 , MKIR 2132
Distichium capillaceum (Hedw.) Bruch & Schimp. var. *capillaceum*
Loc: 1,6,8,9,15,28,30, epilithic - soil-covered rock, Alt. 500-2000, MKIR 3809
Distichium capillaceum (Hedw.) Bruch & Schimp. var. *compactum* (Huebener) Dalla Torre & Sarnth.
Loc: 1,9,28, epilithic - soil-covered rock, Alt. 1000-2000, MKIR 2289
Dicranoweisia cirrata (Hedw.) Lindb.
Loc: 1,11,17, epilithic - on soil - soil-covered rock, Alt. 500-1500, MKIR 3165
DICRANACEAE
Dicranella heteromalla (Hedw.) Schimp.
Loc:23, soil-covered rock, Alt. 1000-1500, MKIR 2164
Dicranella howei Renauld & Cardot
Loc: 20,35, on soil, Alt. 500-1500, MKIR 3171b
**Dicranella subulata* (Hedw.) Schimp.
Loc: 35, epilithic, Alt. 500-1000, MKIR 3203
Dicranella varia (Hedw.) Schimp.
Loc: 43, on soil - soil-covered rock, Alt. 1000-2000, MKIR 3667a

Dicranum scoparium Hedw.
Loc: 9, on soil, Alt. 1500-2000, MKIR 1619b
MKIR 2010
POTTIACEAE
Timmiella anomala (Bruch & Schimp.) Limpr.
Loc: 9,44, epilithic, Alt. 500-1000, MKIR 3678
Timmiella barbuloides (Brid.) Mönk.
Loc: 35, soil-covered rock, Alt. 500-1000, MKIR 3181
Eucladium verticillatum (With.) Bruch & Schimp.
Loc: 8,9,11,42, epilithic, Alt. 500-2000, MKIR 1736
Gymnostomum aeruginosum Sm.
Loc: 9,11,12, epilithic, Alt. 500-1500, MKIR 1725
Hymenostylium recurvirostrum (Hedw.) Dixon
Loc: 17,19,25, epilithic, Alt. 500-1500, MKIR 2232
Pleurochaete squarrosa (Brid.) Lindb.
Loc: 7,13,16,18,19,36,39,41, epilithic - on soil - soil-covered rock, Alt. 0-1500, MKIR 2064
Tortella fragilis (Hook. & Wilson) Limpr.
Loc: 11,25, epilithic, Alt. 500-1000, MKIR 1745b
Tortella inclinata (R. Hedw.) Limpr.
Loc: 28, epilithic, Alt. 500-2000, MKIR 1992
Tortella inflexa (Bruch) Broth.
Loc: 16, soil-covered rock, Alt. 0-1500, MKIR 2282b
Tortella tortuosa (Hedw.) Limpr.
Loc: 1,2,4,7,8,11,12,13,14,17,18,19,24,25,28,33,35,36,37, epilithic - soil-covered rock - on soil, Alt. 500-2300, MKIR 3211
Trichostomum brachydontium Bruch
Loc: 9,11, epilithic, Alt. 500-2000, MKIR 1626
Trichostomum crispulum Bruch
Loc: 7,8,9,11,16,35,42, epilithic - on soil - soil-covered rock, Alt. 0-2000, MKIR 1687
Weissia condensa (Voit) Lindb.
Loc: 5,19, soil-covered rock, Alt. 1500-2000, MKIR 3467
Weissia controversa Hedw.
Loc: 4,19,28, epilithic, Alt. 500-2000, MKIR 1494
**Acaulon muticum* (Hedw.) Müll. Hal.
Loc: 50, on soil, Alt. 0-500, MKIR 3745
Aloina aloides (Koch ex Schultz) Kindb.
Loc: 40,43,44,46,47, on soil, Alt. 0-1000, MKIR 3671
Aloina ambigua (Bruch & Schimp.) Limpr.
Loc: 40,44, on soil, Alt. 1000-1500, MKIR 3637
**Barbula bolleana* (Müll. Hal.) Broth.
Loc: 29, epilithic, Alt. 500-1500, MKIR 2328b
Barbula convoluta Hedw. var. *convoluta*
Loc: 9,11,15,17,19, soil-covered rock, Alt. 0-500, MKIR 1755
Barbula convoluta var. *sardoa* Schimp.
Loc: 7,17, epilithic, Alt. 1000-2000, MKIR 2026
Barbula unguiculata Hedw.
Loc: 9,12,16,17,19,28,36,38,46, epilithic - on soil - soil-covered rock, Alt. 0-2000, MKIR 2290
Bryoerythrophyllum recurvirostrum (Hedw.) P. C. Chen
Loc: 25, epilithic - soil-covered rock Alt. 500-2000, MKIR 2197c
Crossidium squamiferum (Viv.) Jur. var. *pottioideum* (De Not.) Mönk.
Loc: 1,34, epilithic, Alt. 0-500, MKIR 2616
Crossidium squamiferum (Viv.) Jur. var. *squamiferum*
Loc: 12,16,18,34,35,36,39,41,43,44, epilithic - on soil - soil-covered rock, Alt. 0-2000, MKIR 3576
Didymodon acutus (Brid.) K. Saito
Loc: 13,38,39, on soil, Alt. 500-1000, MKIR 3581
**Didymodon australasiae* (Hook. & Grev.) R. H. Zander
Loc: 35, soil-covered rock, Alt. 500-1000, MKIR 3182b
Didymodon fallax (Hedw.) R. H. Zander
Loc: 17, epilithic - epiphytic, Alt. 500-1500, MKIR 2164
Didymodon ferrugineus (Schimp. ex Besch.) M. O. Hill
Loc: 17, soil-covered rock, Alt. 500-1000, MKIR 2003
**Didymodon glaucus* Ryan
Loc: 36 on soil, Alt. 500-1000, MKIR 3220
Didymodon insulanus (De Not.) M. O. Hill
Loc: 9,13,17,19,25,30,39,42, epilithic - epiphytic, Alt. 500-1500 , MKIR 1774
Didymodon luridus Spreng.
Loc: 1,7,9,16,17,19,21,22,26,28,34,35,36,38,39,43, epilithic - on soil - soil-covered rock, Alt. 0-1500, MKIR 1524
Didymodon rigidulus Hedw.

Loc: 19,26, epilithic - soil-covered rock, Alt. 500-2000, MKIR 2317
Didymodon sinuosus (Mitt.) Delogne
Loc: 11,36,42, epilithic - on soil, Alt. 500-2300, MKIR 3219
Didymodon spadiceus (Mitt.) Limpr.
Loc: 25,34, epilithic - on soil, Alt. 0-1500, MKIR 2606
Didymodon tophaceus (Brid.) Lisa
Loc: 11,16,17,19,20,24,28,36, epilithic - epiphytic - on soil, Alt. 0-1500, MKIR 3214
Didymodon vinealis (Brid.) R. H. Zander
Loc: 1,9,16,17,19,21,25,38,43, epilithic - epiphytic - on soil - soil-covered rock, Alt. 0-2000, MKIR 3573
**Microbryum davallianum* (Sm.) R. H. Zander
Loc: 16, on soil, Alt. 0-500, MKIR 3727b
Microbryum floerkeanum (F. Weber & D. Mohr) Schimp.
Loc: 49, on soil, Alt. 0-500, MKIR 3732b
Microbryum starckeanum (Hedw.) R. H. Zander
Loc: 46,47, on soil, Alt. 0-500, MKIR 3734
Phascum cuspidatum Hedw. var. *cuspidatum*
Loc: 46,47,49,50, on soil, Alt. 0-500, MKIR 3746
Phascum cuspidatum Hedw. var. *piliferum* (Hedw.) Hook. & Taylor
Loc: 46,50, on soil, Alt. 0-1000, MKIR 3725
Pseudocrossidium hornschuchianum (Schultz) R. H. Zander
Loc: 16,23, epilithic - on soil, Alt. 0-2000, MKIR 1963
Pseudocrossidium revolutum (Brid.) R. H. Zander
Loc: 4,15,16,20,25, epilithic - on soil - soil-covered rock, Alt. 0-1500, MKIR 1792
**Pterygoneurum ovatum* (Hedw.) Dixon
Loc: 1,47, on soil, Alt. 0-2000, MKIR 3807
**Syntrichia calcicola* J. J. Amann
Loc: 2,4,21,25, epilithic, Alt. 1000-2300, MKIR 3816
**Syntrichia caninervis* Mitt. var. *caninervis*
Loc: 24,28, 52, epilithic, soil-covered rock, Alt. 1500-2000, MKIR 2279
* *Syntrichia caninervis* Mitt. var. *gypsophila* (J. J. Amann ex G. Roth) Ochyra
Loc: 33, epilithic, Alt. 500-2000, MKIR 2286
Syntrichia caninervis Mitt. var. *pseudodesertorum* (Vondr.) M.T.Gallego
Loc: 28 epilithic, Alt. 500-2000, MKIR 2279
Syntrichia handelii (Schiffn.) S. Agnew & Vondr.
Loc: 7,2,28, epilithic - Epiphytic, Alt. 1000-2000, MKIR 2296
Syntrichia montana Nees
Loc: 7,12,17,18,19,22,25,28,35,36,37,38, epilithic - epiphytic - soil-covered rock, Alt. 500-2000, MKIR 2144a
Syntrichia laevipila Brid.
Loc: 7,12, epiphytic, Alt. 0-1500, MKIR 1765
Syntrichia norvegica F. Weber
Loc: 28, soil-covered rock, Alt. 1500-2000, MKIR 2273c
Syntrichia papillosissima (Copp.) Loeske
Loc: 1,4,7,9,12,18,25,30, epilithic - on soil, Alt. 1000-2300, MKIR 1763
Syntrichia princeps (De Not.) Mitt.
Loc: 1,6,7,15,16,17,19,21,22,25,31,35, epiphytic - epilithic - on soil, Alt. 0-1500, MKIR 1540
Syntrichia ruralis (Hedw.) F. Weber & D. Mohr var. *ruraliformis* (Besch.) Delogne
Loc: 9,15, epilithic - on soil, Alt. 1000-2000, MKIR 1796
Syntrichia ruralis (Hedw.) F. Weber & D. Mohr
Loc: 1,2,4,8,9,12,22,28,33,36, epilithic - epiphytic - on soil, Alt. 500-2300, MKIR 2390
Syntrichia subpapillosissima (Bizot & R. B. Pierrot ex W. A. Kramer) M. T. Gallego & J. Guerra
Loc: 4,28,35,37, epilithic, Alt. 500-2000, MKIR 3201
Syntrichia virescens (De Not.) Ochyra
Loc: 3,4,9,28,35, epilithic - epiphytic, Alt. 0-2000, MKIR 1467
Tortula atrovirens (Sm.) Lindb.
Loc: 36,39,43, epilithic - on soil - soil-covered rock, Alt. 500-2000, MKIR 3221
Tortula brevissima Schiffn.
Loc: 44, epilithic, Alt. 500-1000, MKIR 3679
Tortula canescens Mont.
Loc: 44, on soil, Alt. 500-1000, MKIR 3740
Tortula hoppeana (Schultz.) Ochyra
Loc: 35,43, epilithic - soil-covered rock, Alt. 500-2000, MKIR 3174
Tortula inermis (Brid.) Mont.
Loc: 16,37, soil-covered rock, Alt. 0-1500, MKIR 3146
Tortula lanceolata R. H. Zander
Loc: 49, on soil, Alt. 0-500, MKIR 3740
Tortula muralis var. *aestiva* Brid. ex Hedw.
Loc: 28,32,34,42,44, epilithic, Alt. 500-2000, MKIR 2257

Tortula muralis Hedw. var *muralis*
Loc: 1,8,11,16,19,25,29, epilithic - on soil, Alt. 0-2000, MKIR 2324
Tortula truncata (Hedw.) Mitt.
Loc:6,46,50, on soil, Alt. 1000-1500, MKIR 1511
Tortula subulata Hedw.
Loc: 1,4,9,11,15,19,22,23,25,28,29,30,31,32,33,34,35,36,37,42, epilithic - epiphytic - on soil, Alt. 0-2000, MKIR 2335
Tortula vahliana (Schultz) Mont.
Loc: 6,40, on soil, Alt. 500-1500, MKIR 1514
ORTHOTRICH ACEAE
Orthotrichum affine Schrad. ex Brid.
Loc: 2,4,8,9,11,12,17,18,19,24,30,31,43, epiphytic, Alt. 500-2000, MKIR 3663
Orthotrichum anomalum Hedw.
Loc: 4,11,19, epilithic - epiphytic, Alt. 500-1500, MKIR 1708
Orthotrichum cupulatum Hoffm. ex Brid. var. *bistratosum* Schiffn.
Loc: 5, epilithic Alt. 500-1000, MKIR 2783
Orthotrichum cupulatum Hoffm. ex Brid. var. *cupulatum*
Loc: 1,17,19,22,25,30,33,35,36,37,38, epilithic - epiphytic - on soil, Alt. 500-2000, MKIR 2011
Orthotrichum diaphanum Schrad. ex Brid.
Loc: 2,3,5,16,17,19,25,34,36,40,43,50, epiphytic, Alt. 0-1500, MKIR 3632
Orthotrichum lyellii Hook. & Taylor
Loc: 1,18,26,50, epiphytic, Alt. 0-1500, MKIR 2236
Orthotrichum macrocephalum F. Lara, Garilleti & Mazimpaka
Loc: 3,5,18,21,34,50, epiphytic, Alt. 0-1500, MKIR 1462
Orthotrichum pallens Bruch ex Brid.
Loc: 8,19,30,31, epilithic - epiphytic, Alt. 500-2000, MKIR 2363b
Orthotrichum pumilum Sw. ex Anon.
Loc: 2,3,4,8,12,16,19,21,22,24,25,28,30,31,34,50, epiphytic, Alt. 0-1500, MKIR 2316
Orthotrichum rupestre subsp. *franzonianum* (De Not.) Mönk.
Loc: 30,31, epiphytic, Alt. 500-2000, MKIR 2379
Orthotrichum rupestre Schleich. ex Schwägr. subsp. *rupestre*
Loc: 1,4,7,8,9,11,17,18,19,22,26,28,30, epilithic - epiphytic, Alt. 500-2000, MKIR 2349
Orthotrichum rupestre subsp. *sturmii* (Hoppe & Hornsch.) Boulay
Loc: 33, epilithic, Alt. 1500-2000, MKIR 2385
**#Orthotrichum scanicum* Grönvall
Loc: 19,21, epiphytic, Alt. 500-1000, MKIR 2117d
Orthotrichum speciosum Nees
Loc: 2,4,7,12,17,18,19,21,26,29,30,33,36, epiphytic, Alt. 500-2000, MKIR 1455
Orthotrichum striatum Hedw.
Loc: 4,5,6,7,12,19,24,28,30, epiphytic, Alt. 500-2000, MKIR 2178
Orthotrichum tenellum Bruch ex Brid.
Loc: 19, epiphytic, Alt. 500-1000, MKIR 2068d
#Orthotrichum tortidontium F. Lara, Garilleti & Mazimpaka
Loc: 28 epiphytic, Alt. 1000-2000, MKIR 2315
Orthotrichum urnigerum Myrin
Loc: 21, epiphytic, Alt. 500-1000, MKIR 2115
**Ulota hutchinsiae* (Sm.) Hammar
Loc: 9,12, epiphytic, Alt. 1500-2000, MKIR 1771
Zygodon viridissimus (Dicks.) Brid.
Loc: 4, epiphytic, Alt. 500-1000, MKIR 1503
HEDWIGIACEAE
Hedwigia stellata Hedenäs
Loc: 10,11,12, epilithic, Alt. 500-1500, MKIR 1703a
BARTRAMIACEAE
Anacolia webbii (Mont.) Schimp.
Loc: 9,30, on soil - soil-covered rock, Alt. 500-1500, MKIR 2342
Bartramia pomiformis Hedw.
Loc: 23,31, on soil - soil-covered rock, Alt. 1000-1500, MKIR 2376
Bartramia stricta Brid.
Loc: 9,19,22,25,30,35,36, epilithic - on soil - soil-covered rock, Alt. 500-2000, MKIR 3226
Philonotis caespitosa Jur.
Loc: 23, epilithic - on soil, Alt. 1000-1500, MKIR 2166a
BRYACEAE
#Bryum algovicum Sendtn. ex Müll. Hal.
Loc: 34, on soil, Alt. 0-500, MKIR 2607
Bryum alpinum Huds. ex With.
Loc: 30, epilithic - on soil - soil-covered rock, Alt. 1000-1500, MKIR 2345
Bryum argenteum Hedw. var. *argenteum*

Loc: 1,16,22,28,31,35, epilithic - on soil, Alt. 500-2000, MKIR 2252
Bryum argenteum var. *lanatum* (P. Beauv.) Hampe
Loc: 11, epilithic - on soil, Alt. 1000-2000, MKIR 2336
Bryum caespiticium Hedw.
Loc: 1,7,28,30,31,33,38, epilithic - on soil - soil-covered rock, Alt. 0-2000, MKIR 1495
Bryum canariense Brid.
Loc: 7,17,18, on soil, Alt. 1000-1500, MKIR 2045
Bryum capillare Hedw.
Loc: 1,4,6,15,17,19,21,22,28,30,35, epilithic - epiphytic - on soil, Alt. 500-1500, MKIR 2137
Bryum dichotomum Hedw.
Loc: 35, epiphytic - on soil, Alt. 500-1000, MKIR 3160
Bryum elegans Nees
Loc: 11, epilithic, Alt. 1500-2000, MKIR 3312
Bryum gemmilucens R. Wilczek & Demaret
Loc: 49, on soil, Alt. 0-500, MKIR 3739
Bryum imbricatum (Schwägr.) Bruch & Schimp.
Loc: 4,9,18,19,22,24,28,30, epilithic - on soil, Alt. 1000-2000, MKIR 1617
Bryum mildeanum Jur.
Loc: 9, on soil, Alt. 1500-2000, MKIR 1607
**Bryum moravicum* Podp.
Loc: 8,11,18, epiphytic, Alt. 500-2000, MKIR 2258a
Bryum pseudotriquetrum (Hedw.) P. Gaertn. et al. var. *pseudotriquetrum*
Loc: 9,25,34, epilithic - on soil - soil-covered rock, Alt. 0-2000, MKIR 2188
Bryum pseudotriquetrum var. *bimum* (Schreb.) Lilj.
Loc: 19, on soil, Alt. 500-1000, MKIR 2081
Bryum torquescens Bruch & Schimp.
Loc: 8, on soil, Alt. 1000-1500, MKIR 1552
Epipterygium tozeri (Grev.) Lindb.
Loc: 34,40, epilithic - on soil, Alt. 0-1000, MKIR 2598
Pohlia cruda (Hedw.) Lindb.
Loc: 9,19,28,33, epilithic - on soil - soil-covered rock, Alt. 500-2000, MKIR 2396
Pohlia elongata Hedw.
Loc: 9,31, on soil, Alt. 500-2000, MKIR 1657
Pohlia melanodon (Brid.) A. J. Shaw
Loc: 19,42, on soil, Alt. 500-1000, MKIR 3651
Pohlia wahlenbergii (F. Weber & D. Mohr) A. L. Andrews var. *calcarea* (Warnst.) E. F. Warb.
Loc: 25, on soil, Alt. 1000-1500, MKIR 2216
Pohlia wahlenbergii (F. Weber & D. Mohr) A. L. Andrews *wahlenbergii*
Loc: 10,17,19,23,28,49, epilithic - on soil, Alt. 0-1500, MKIR 3743
PLAGIOMNIACEAE
**Plagiomnium elatum* (Bruch & Schimp.) T. J. Kop.
Loc: 42, on soil, Alt. 500-1000, MKIR 3654b
**Plagiomnium rostratum* (Schrad.) T. J. Kop.
Loc: 42, on soil, Alt. 500-1000, MKIR 3653a
Plagiomnium undulatum (Hedw.) T. J. Kop.
Loc: 9,19,23, epilithic - on soil, Alt. 500-2000, MKIR 2165a
AULACOMNIACEAE
Aulacomnium androgynum (Hedw.) Schwägr.
Loc: 19, on soil - soil-covered rock, Alt. 500-2000, MKIR 2075b
AMBLYSTEGIACEAE
Amblystegium serpens (Hedw.) Schimp.
Loc: 16,25,28, epilithic - on soil, Alt. 500-2000, MKIR 2249
Hygroamblystegium tenax (Hedw.) Jenn.
Loc: 9, epilithic, Alt. 1000-1500, MKIR 2354
Leptodictyum riparium (Hedw.) Warnst.
Loc: 7,36, epiphytic, Alt. 500-1500, MKIR 3236
Palustriella commutata (Hedw.) Ochyra
Loc: 9,11,19,25, epilithic - on soil, Alt. 500-2000, MKIR 1608
LESKEACEAE
Pseudoleskeella catenulata (Brid. ex Schrad.) Kindb.
Loc: 28, epiphytic, Alt. 0-500, MKIR 2284a
BRACHYTHECIACEAE
Scorpiurium circinatum (Bruch) M. Fleisch. & Loeske
Loc: 23, epilithic, Alt. 1000-1500, MKIR 2165b
Scorpiurium sendtneri (Schimp.) M. Fleisch.
Loc: 11,16,34, epilithic - epiphytic - soil-covered rock, Alt. 0-2000, MKIR 2599
Platyhypnidium riparioides (Hedw.) Dixon

Loc: 9,19,23,30, epilithic, Alt. 500-1500, MKIR 3662
Rhynchostegium megapolitanum (Blandow ex F. Weber & D. Mohr) Schimp.
Loc: 40, on soil, Alt. 500-1000, MKIR 3639
Rhynchostegium murale (Hedw.) Schimp.
Loc: 23, soil-covered rock, Alt. 1000-1500, MKIR 2174
Rhynchostegiella litorea (De Not.) Limpr.
Loc: 7, on soil, Alt. 500-1000, MKIR 1528c
Rhynchostegiella tenella (Dicks.) Limpr.
Loc: 2,4,7,8,20,33, epilithic - on soil, Alt. 500-2000, MKIR 2406
Rhynchostegiella teneriffae (Mont.) Dirkse & Bouman
Loc: 17, on soil, Alt. 500-1000, MKIR 2001
Cirriphyllum piliferum (Hedw.) Grout
Loc: 17,19, epilithic - on soil, Alt. 0-1000, MKIR 2000
Oxyrrhynchium schleicheri (R. Hedw.) Röll
Loc: 17,19,29, epilithic, Alt. 500-1500, MKIR 2328
Oxyrrhynchium hians (Hedw.) Loeske
Loc: 19,41, on soil, Alt. 0-1000, MKIR 3661
Oxyrrhynchium speciosum (Brid.) Warnst.
Loc: 29,40 on soil Alt. 0-1000, MKIR 3638
Kindbergia praelonga (Hedw.) Ochyra
Loc: 19, epilithic, Alt. 0-500, MKIR 1970
Sciuro-hypnum plumosum (Hedw.) Ignatov & Huttunen
Loc: 24, on soil, Alt. 500-1500, MKIR 2183
Sciuro-hypnum reflexum (Starke) Ignatov & Huttunen
Loc: 28 epilithic, Alt. 1500-2000, MKIR 2273b
Brachythecium glareosum (Bruch ex Spruce) Schimp.
Loc: 8, epilithic, Alt. 500-2000, MKIR 1548
**Brachythecium mildeanum* (Schimp.) Schimp.
Loc: 9, epilithic, Alt. 1500-2000, MKIR 1607
Brachythecium rivulare Schimp.
Loc: 20,42, epilithic - epiphytic - on soil, Alt. 0-1500, MKIR 2112
Brachythecium rutabulum (Hedw.) Schimp.
Loc: 19, on soil, Alt. 500-1000, MKIR 2078
Brachythecium salebrosum (Hoffm. ex F. Weber & D. Mohr) Schimp.
Loc: 17,18, epilithic, Alt. 500-1500, MKIR 2014
Scleropodium cespitans (Wilson ex Müll. Hal.) L. F. Koch
Loc: 21, on soil, Alt. 500-1000, MKIR 2118
Scleropodium touretii (Brid.) L. F. Koch
Loc: 23, epilithic, Alt. 500-1500, MKIR 2197
Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen
Loc: 9,20,23,29,30,42, epilithic - on soil, Alt. 500-2000, MKIR 3656
Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen
Loc: 1,6,12,15,17,21,28,33, epilithic - epiphytic - on soil - soil-covered rock, Alt. 500-2000, MKIR 2404
Homalothecium aureum (Spruce) H. Rob.
Loc: 9, on soil, Alt. 500-2000, MKIR 2033
Homalothecium lutescens (Hedw.) H. Rob.
Loc: 1,8, on soil, Alt. 1000-1500, MKIR 1554
Homalothecium philippeanum (Spruce) Schimp.
Loc: 28, epilithic, Alt. 1500-2000, MKIR 2280
Homalothecium sericeum (Hedw.) Schimp.
Loc: 1,4,7,9,10,12,16,17,21,22,25,28,30, epilithic - epiphytic - on soil - soil-covered rock, Alt. 500-2000, MKIR 3592
FABRONIACAE
Fabronia pusilla Raddi
Loc: 4,35,37, epilithic - epiphytic, Alt. 500-1000, MKIR 3194
HYPNACEAE
Calliergonella cuspidata (Hedw.) Loeske
Loc: 19, epilithic, Alt. 500-1000, MKIR 2105
Ctenidium molluscum (Hedw.) Mitt.
Loc: 8,9, epilithic - on soil, Alt. 1000-2000, MKIR 1569
**Hypnum andoi* A. J. E. Sm.
Loc: 19, on soil, Alt. 500-1000, MKIR 2080
Hypnum cupressiforme Hedw. *cupressiforme*
Loc: 8,11,17,28,35, epilithic - epiphytic - on soil, Alt. 500-1500, MKIR 2032
Hypnum cupressiforme var. *lacunosum* Brid.
Loc: 1, epilithic - epiphytic, Alt. 500-2000, MKIR 1664
Hypnum cupressiforme var. *resupinatum* (Taylor) Schimp.
Loc: 1,9, epilithic - epiphytic, Alt. 1000-1500, MKIR 1667b

**Hypnum revolutum* (Mitt.) Lindb.
Loc: 28, epilithic, Alt. 1000-2000, MKIR 2292
PTERGYNANDRACEAE
Habrodon perpusillus (De Not) Lindb.
Loc: 1,12, epiphytic, Alt. 500-1000, MKIR 1761
Ptergynandrum filiforme Hedw.
Loc: 1,9, epiphytic, Alt. 1000-2000, MKIR 1669a
LEUCODONTACEAE
Leucodon sciuroides (Hedw.) Schwägr.var.*sciuroides*
Loc: 1,4,17,20,22,25,28,30,36, epilithic - epiphytic - on soil, Alt. 500-1500, MKIR 2017
Leucodon sciuroides var. *morensis* (Schwägr.) De Not.
Loc: 38,22, epilithic, Alt. 500-1500, MKIR 2158
Antitrichia californica Sull.
Loc: 11,19,30, epilithic - epiphytic, Alt. 500-1500, MKIR 2361
Antitrichia curtipendula (Hedw.) Brid.
Loc: 9, epilithic - on soil, Alt. 1500-2000, MKIR 1695
Pterogonium gracile (Hedw.) Sm.
Loc: 4,8,9,11,18,24,35, epilithic, Alt. 500-2000, MKIR 1697
NECKERACEAE
Neckera menziesii Drumm.
Loc: 30, epilithic, Alt. 1000-1500, MKIR 2359
LEMBOPHYLLACEAE
Isothecium alopecuroides (Lam. ex Dubois) Isov.
Loc: 19, epilithic - epiphytic, Alt. 500-1500, MKIR 2067
**#Isothecium myosuroides* var. *brachythecioides* (Dixon) Braithw.
Loc: 8,19,23, epiphytic - on soil, Alt. 500-1500, MKIR 2096

3.2. General remarks:

As a result of the identification of approximately 2500 specimens, 213 moss species belonging to 24 families and 78 genera, 24 liverwort species belonging to 17 families and 19 genera and one hornwort species have been found in the area. Among these bryophytes, one liverwort and 25 moss taxa represent new records for the C11 square according to Henderson (1961) grid system. The *Porellaceae* (5 taxa belonging to 2 genera) is the richest family in species number among the hepatics. *Porella* L. is the genus with most species (4 taxa). *Pottiaceae* (70 taxa belonging to 20 genera), *Grimmiaceae* (16 taxa belonging to 2 genera), *Bryaceae* (22 taxa belonging to 3 genera), *Orthotrichaceae* (21 taxa belonging to 3 genera) and *Brachytheciaceae* (28 taxa belonging to 13 genera) are the species rich families and they constitute 71.6% of the flora (157 taxa) as an expected result due to climatic conditions. *Aulocomniaceae, Timmiaceae, Hedwigiaceae, Neckeraceae, Fabroniaceae* and *Thuidiaceae* are monotypically represented families in the area.

The study area can be considered an important reserve for the species of the genus *Orthotrichum*, because 18 of 29 Turkish taxa are growing here (Papp and Sabovljevic, 2003; Erdağ and Kürschner, 2002; Erdağ et al., 2004; Kürschner and Erdağ, 2005). In spite of attractive communities dominated by members of the genus in the area, there are no bryosociological studies in the mountain (as a deficiency of Turkish bryology that focused mainly on floristic studies in general).

In the recent years, rising demand of dried plants in flower markets has caused an extensive harvesting of bryophytes. In our study area, northern slopes have plentiful bryophyte mats suitable for bryophyte harvesting activities. Fortunately, we have no observation about this activity which is very common in the most of the remaining mountains in western Anatolia.

3.3 Taxonomical remarks:

Orthotrichum cupulatum Hoffm. ex Brid. var. *bistratosum* Schiffn. (Schiffner, 1913) and *Grimmia nutans* Bruch (Müller, 1829) were described from Turkey in the early 19th century. The latter (figure 2) was also collected from Meteora (Greece) and described as a new species (*G. meteorae*) by Townsend in 1989. Greven (1995) has compared two collections and found that *G. meteorae* is a synonym of *G. nutans*, a neglected taxon during 160 years. *G. nutans was* collected from Babadağ after 175 years of the first collection from İzmir,Turkey in 1829. It should be emphasized that *Orthotrichum cupulatum* var. *bistratosum* has been known only from its type locality (Schiffner, 1913) and from Spain (Guerra, 1985) (figure 3). This taxon was also collected from Babadağ and Honaz Mountain (Kırmacı and Erdağ, 2009) 91 years later. Additionally, more recently recorded taxa for Turkey such as *Orthotrichum tortidontium* F. Lara, Garilleti and Mazimpaka (Mazimpaka et al., 2000), *O. scanicum* (Erdağ et al., 2004), *Bryum algovicum* (Yayıntaş Tonguç, 2001) and *Isothecium myosuroides* var. *brachythecioides* (Dixon) Braithw. (Uyar and Çetin, 2004) were also collected from the study area.

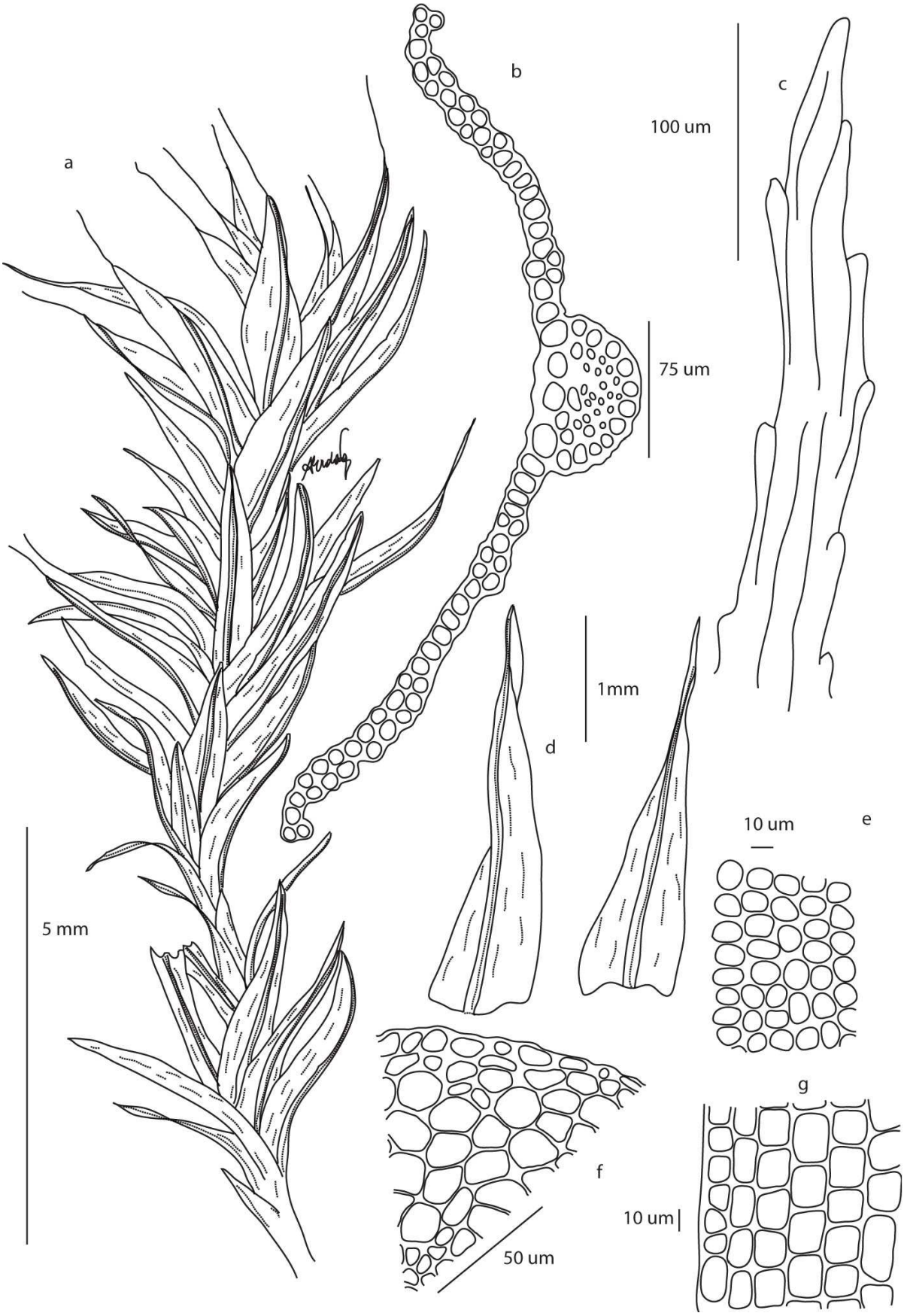

Figure 2

Grimmia nutans **a.** Habit (wet); **b.** Leaf cross section ; **c.** Hair point; **d.** Leaves; **e.** Mid – leaf cells; **f.** Cross section of stem; **g.** Basal leaf cells (Mkır 2190)

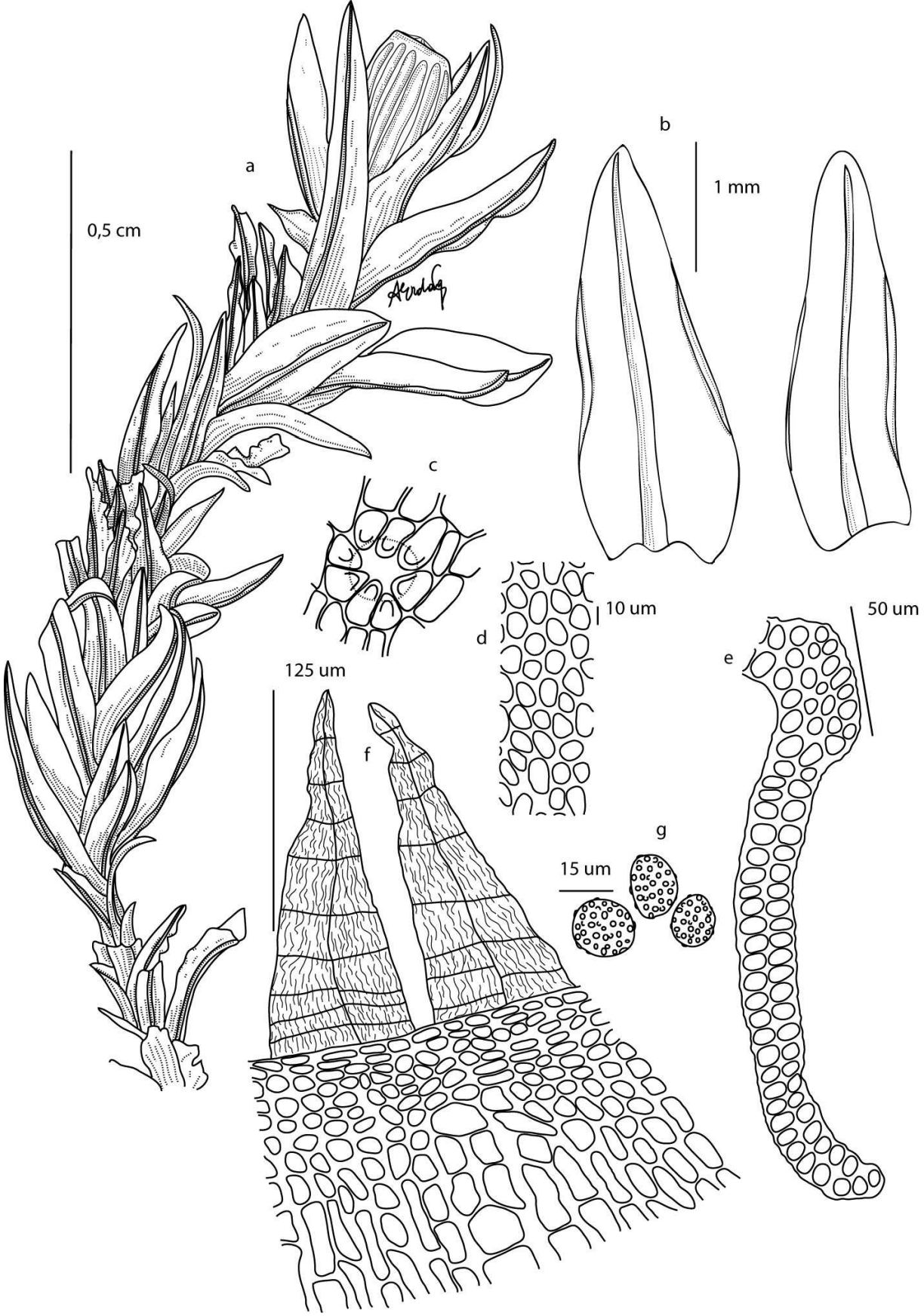

Figure 3: ***Orthotrichum cupulatum*** var. ***bistratosum*** **a.** Habit (wet); **b.** Leaves; **c.** Stoma; **d.** Mid – leaf cels; **e.** Leaf cross section; **f.** Peristome; **g.** Spores (Mkır 2783b)

Orthotrichum scanicum Gronvall was evaluated as a threatened species in the Red list of world bryophytes which was prepared by International Union for Conservation of Nature (IUCN) SSC Bryophyte specialist group. The population is suspected to have declined by at least 20% over the last 15 years (three generations), because host trees have been cut and air pollution has lowered the vitality of this species. It therefore meets the IUCN criteria for "vulnerable". Fortunately, it was recently found in some additional European countries and Turkey (Portugal, Vieira et al. 2004; Spain, Cano et al. 2004; Czech Republic, Kucera and Vana, 2003; Greece, Lara et al. 2003; Turkey, Erdağ et

al. 2004). Now, it can be regarded as a Mediterranean rather than a Nordic species and its threatened status becomes obsolete after these new findings.

Phascum cuspidatum Schreb. ex Hedw. var. *arcuatum* Herrnst. & Heyn has been only recorded from Israel in 1991 (figure 4). Its diagnostic character is the curved seta which is equal or longer than the capsule. This taxon morphologically resembles *P. cuspidatum* var. *piliferum* (Hedw.) Hook. & Taylor and *P. cuspidatum* var. *curvisetum* (Dicks.) Nees & Hornsch. However *P. cuspidatum* var. *piliferum* has straight seta and the latter has curved seta but seta is shorter than capsule. Similarly, *Didymodon validus* (=*D. acutus* var. *valida* or *D. acutus* f. *valida*) has been defined a distinct taxon in some floras (e.g., Kucera and Vana, 2003). The taxonomical status of these two taxa remains unclear and we did not include them in the list. Tortula *subulata* var. *graeffii* Warnst. and *T. subulata* var. *subinermis* (Bruch & Schimp.) Wilson were also evaluated as synonyms of *T. subulata* by Cano et. al. (2005). Indeed, it is not easy to distinguish these varieties using the diagnostic characters in all cases, because intermediate individuals cause identification problems, thus we also did not list these varieties separately. We followed the taxonomical approaches of Cano et al. (2005) for these taxa.

Figure 4: ***Phascum cuspidatum*** var. ***arcuatum*** **A.** Habit (dry) **B.** Habit (wet) (Mkır 3732)

The present study is a part of the on going research on the bryophyte flora of the Caria region of south-west Anatolia, which will be available in near future by the authors. In terms of species number of the flora (nearly ¼ of the total Turkish bryoflora), Babadag can be considered as one of the bryologically most important areas of the country especially for xerophytic bryophytes.

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References

Akman, Y.1990. İklim ve Biyoiklim. Palme Yayınları. Mühendislik serisi: 103.

Arnell, S.1981. Illustrated moss flora of Fennoscandia. 1. *Hepaticae*. Kungaelv: Swedish Nat Sci Res Coun.

Cano, M.J., Guerra, J., Ros, R.M. 1993. A revision of the moss genus *Crossidium* (*Pottiaceae*) with the description of the new genus *Microcrossidium*. Plant Systematics and Evolution 188: 213-235.

Cano, M.J., Jimenez, J.A., Gallego, M.T., Ros, R.M., Guerra, J. 2004. Bryophyte Check-list of Murcia Province (Southeastern Spain). Anales de Biologia 26: 117-155.

Cano, M.J., Werner, O., Guerra, J. 2005. A morphometric and molecular study in *Tortula subulata* complex (*Pottiaceae, Bryophyta*). Botanical Journal of the Linnean Society 149: 333 – 350.

Crum, H.A., Anderson, L.E. 1981. Mosses of eastern North America. Columbia Univ Press.

Çetin, B. 1988. Dilek Yarımadası Milli Parkı Karayosunları (Musci) :I. Doga TU Bot Derg 12,3: 207-213.

Çetin, B. 1993. An investigation of the Köyceğiz-Dalyan specially protected area as regards to bryophyte flora. Doga TU Bot Derg 17: 255-261

Erdağ, A. 2002. A contribution to the bryophyte flora of Western Turkey: the bryophyte flora of Madran Mountain and the Çine Valley (Aydın, Turkey). Turk J Bot 26: 31-42.

Erdağ, A., Kürschner, H. 2002. *Orthotrichum rivulare* Turn (Orthotrichaceae, Bryopsida) a hygrophytic species new to the bryophyte Flora of Turkey and Southwest-Asia with a key to the Turkish Specimens. Nova Hedwigia 74 (1-2): 251-256.

Erdağ, A., Kürschner, H., Parolly, G. 2004. *Orthotrichum leblebicii* sp. nov. (Orthotrichaceae, Bryopsida), and two further new epiphytic *Orthotrichum* records from southern Turkey. Nova Hedwigia 78 (3-4): 517-526.

Frahm, J.P., Frey, W. 1983. Moosflora. Stuttgart: Verlag Eugen Ulmer.

Goffinet, B., Buck, W.R. 2004. Molecular Systematics of Bryophytes (Goffinet, B., Hollowell, V., and Magill, R., eds.) Missouri Botanical Garden Press. St Louis 205–239.

Gökler, İ., Öztürk, M. 1991. Liverworts of Turkey and their position in South-West Asia. Candollea 46: 359-366.

Gökler, İ. 1992. Batı Anadolu ciğerotları üzerine bir araştırma. Doga TU Bot Derg 16: 1-8.

Gökler, İ. 1993a. Bazı Batı Anadolu ciğerotları üzerinde taksonomik ve ekolojik incelemeler. DEÜ Egit Bil Derg 2 (2): 79-85.

Gökler, İ. 1993b. Ege Bölgesi ciğerotları üzerinde taksonomik bir araştırma. DEÜ Egit Bil Derg 2 (6): 33-44.

Gökler, İ. 2001. Muğla İli ciğerotları, IV. ulusal ekoloji ve çevre kongresi. 5-8 Ekim 2001 Bodrum 299-306.

Greven, H.C. 1995. *Grimmia* Hedw. (*Grimmiaceae*, Musci) in Europe. Backhuys Publishers Leiden. The Netherlands

Grolle, R. 1983. Hepatics of Europe including the Azores, an annotated list of species, with synonyms from recent literature. Journal of Bryology 12: 403-459.

Guerra, J. 1985. Notas Breves. Anales Jardin Botanico de Madrid 42: 248.

Henderson, D.M. 1961. Contribution to the Bryophyte Flora of Turkey: IV. Not Roy Bot Garden Edinburgh 23: 263-278

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

Hill, M.O., Bell, N., Bruggeman-Nannenga, M.A., Brugués, M., Cano, M.J., Enroth, J., Flatberg, K.I., Frahm, J.P., Gallego, M.T., Garilleti, R., Guerra, J., Hedenäs, L., Holyoak, D.T., Hyvönen, J., Ignatov, M.S., Lara, F., Mazimpaka, V., Muñoz, J., Söderström, L. 2006. Bryological Monograph: An annotated checklist of the mosses of Europe and Macaronesia. Journal of Bryology 28: 198-267

Hofmann, H. 1998. A monograph of the genus *Homalothecium* (*Brachytheciaceae*, Musci). Lindbergia 23: 119–159

Jimenez, J.A., Rosa, M.R., Cano, M.J. Guerra, J. 2005. A new evaluation of the genus *Trichostomopsis* (*Pottiaceae*, *Bryophyta*). Botanical Journal of the Linnean Society 147: 117-127.

Juratzka, J., Milde, J. 1870. Beitrag zur Mossflora des Orientes. Kleinasien, das westliche Persien und den Caucasus umfassend. Verhandlungen der Zoologisch – botanischen Gesellschaft in Wien 20: 589 – 602.

Kırmacı, M., Erdağ, A. 2009. The Bryophyte Flora of Honaz Mountain (Denizli/Turkey). int. J. Bot., 5 (3): 226-235.

Kucera, J., Vana, J. 2003. Check- and red list of bryophytes of the Czech Republic. Preslia, Praha 75: 193–222.

Kürschner, H., Parolly, G. 1999. Syntaxonomy, synecology and life strategies of selected saxicolous bryophyte communities of West Anatolia and a first syntaxonomic conspectus for Turkey. Nova Hedwigia 68 (4); 365-391.

Kürschner, H. 2004. Life Strategies and adaptations in bryophytes from the Near and Middle East. Turk J Bot 28: 73-84.

Kürschner, H., Erdağ, A. 2005. Bryophytes of Turkey: An annotated reference list with synonyms from the recent literature and an Annotated List of Turkish Bryological Literature. Turk J Bot 29: 95-154

Kürschner, H., Parolly, G., Erdağ, A. 2006. A. Life forms and life strategies of epiphytic bryophytes in *Quercus vulcanica* forest of Turkey. Nova Hedwigia 82: 3-4

Kürschner, H., Parolly, G., Erdağ, A., Özkan, E. 2007. Synanthropic bryophyte communities new to Western Turkey – syntaxonomy, synecology and life syndromes. Nova Hedwigia 84: 459 – 478.

Lara, F., Blockeel, T.L., Gariletti, R., Mazimpaka, V. 2003. Some interesting *Orthotrichum* species from mainland Greece and Evvia. Journal of Bryology 25: 129 – 134.
Leblebici, E. 1974. Batı Anadolu Karayosunları (Bozdağ ve Yöreleri) Bitki 4: 563-575.
MGM. 2005. Devlet Meteoroloji İşleri Genel Müdürlüğü, Denizli meteroloji istasyonu iklimsel verileri, Arşiv.
Muñoz, J. 1999. A revision of *Grimmia* (Musci, *Grimmiaceae*) in the Americas. 1: Latin America. Ann Missouri Bot Gard 86: 118-191.
Müller, F.A. 1829. Erstes Verzeichnis sardinischer Laubmoose, wie auch derjenigen welche von meinem Freunde Herrn Fleischer bei Smyrna aufgefunden worden sind, nebst Beschreibungen und Abbildungen einiger neuer Arten. Flora 12: 385-396.
Mazimpaka, V., Lara, F., Garilleti, R. 2000. *Orthotrichum tortidontium* new for Turkey. Lindbergia 25: 15-16.
Nyholm, E. 1981. Illustrated Moss Flora of Fennoscandia. Swedish Natural Science-Research Council Fasc 1-5.
Nyholm, E. 1986. Illustrated Flora of Nordic Mosses. Swedish Natural Science-Research Council Fasc 1-4.
Özenoğlu, H. 2001. Güney Batı Anadolu Bölgesi (C11) Ciğerotları (*Hepaticae*) Florasının Araştırılması. Dokuz Eylül Üniversitesi Eğitim Bilimleri Enstitüsü.
Özenoğlu, H., Gökler, İ. 2002. Liverworts (*Marchantiopsida*) of the Dilek Peninsula National Park. Turk J Bot 26: 297-301.
Özenoğlu Kiremit, H., Sukatar, A., Gökler, İ. 2007. Studies on the Hornworts and Liverworts Flora of Antalya.Turk J Bot 31: 529-537.
Papp, B., Sabovljevic, M. 2003. Contributions to the bryoflora of Turkish Thrace. Studia Bot Hung 34: 43 - 54.
Paton, A.P. 1997. The Liverwort Flora of the British Isles. Harley Books.
Pedrotti, C.C. 2001. Flora Dei Muschi D'Italia. Medicina-Scienze.
Tonguç, Ö., Yayıntaş, A. 1996. Çal Dağı (Manisa) Karayosunları. Turk J Bot 20: 59-63.
Townsend, C.C. 1989. *Grimmia* (Musci): A variety new to the Lebanon and a new species from Greece. The Davis & Hedge Festschrift. Kit. Tan (ed.). Edinburgh University Press.
Schiffner, V. 1913. Bryophyta aus Mesopotamien Mesopotamien und Kurdistan, Syrien, Rhodos, Mytilini und Prinkipo. Gesammelt von Dr.Heinrich Frh. V. Handel-Mazetti. Wissenschaftliche Ergebnisse der Expedition nach Mesopotamien 1910. Ann Naturhist Mus Wien 27: 472-504.
Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. (Second Edition) Cambridge Univ. Press.
Uyar, G., Çetin, B. 2004. A new check-list of the mosses of Turkey. Journal of Bryology 26: 203-220.
Vieira, C., Seneca, A., Sergio, C. 2004. The bryoflora of Valongo. The refuge of common and rare species. Bol. Soc. Esp. Briol. 25: 1-15.
Walther, K. 1967. Beiträge zur Moosflora Westanatoliens I., Mitt. Staatsinst. Allg Bot Hamburg 12: 129-188.
Walther, K., Leblebici, E. 1969. Die Moosvegetation des Karagöl – Gebietes im Yamanlar Dağ nördlich İzmir. Monog of the Fac of Sci Ege Üniv 10: 1 – 48.
Walther, K. 1970. Beiträge zur Moosflora Westanatoliens II Mitt. Staatsinst. Allg Bot Hamburg Band 13: 167-180.
Walther, K. 1975. Zur Moosvegetation der Liquidambar-Wälder Südwest-Anatoliens. Phytocoenologia 2: 13-18.
Walther, K. 1979. Die Epiphytischen Moosgesellschaften des Nif Dag bei Izmir, Westanatolien. Doc Phytosociol 4: 943-950.
Yayıntaş, A., Iwatsuki, Z. 1988. Some mosses records from Western Turkey. Hikobia 10: 209-213.
Yayıntaş (Tonguç), Ö. 2001. Moss flora of Muğla and it's environment. Ot Sist Bot Derg 8 (1): 95 – 111.
Zander, R.H. 1978. New combinations in Didymodon (Musci) and key to the taxa in North America North of Mexico. Phytologia 41: 11-32.
Zander, R.H. 1993. Genera of the Pottiaceae: Mosses of harsh enviroments. Bullettin of the Buffalo Society of Naturel Sciences 32.

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