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# The Moss Flora (Musci) of the Sündiken Mountains

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**Abstract:** In this study carried out in the Sündiken Mountains, 83 taxa were identified by the authors. These belong to 21 families and 42 genera of bryophytes. Of these, 64 taxa are new for the B7 grid-square adopted by Henderson.

**Key Words:** Bryophytes, moss, flora, Sündiken Mountains

## Sündiken Dağlarının Karayosunu (Musci) Florası

**Özet:** Bu çalışmada, araştırma alanı olan Sündiken Dağlarından toplanan karayosunu örnekleri değerlendirilerek 21 familya ya ait 42 cins ve bunlara bağlı 83 takson tanımlanmıştır. Bunlardan 64 tanesi Henderson tarafından benimsenen kareleme sistemine göre B7 karesi için yenidir.

**Anahtar Sözcükler:** Bryophyta, karayosunu, flora, Sündiken Dağları.

## Introduction

The study area, the Sündiken Mountains, is located in the B7 grid square according to the system adopted by Henderson & Prentice (1969) (Figure 1). No detailed study into the moss flora in this area, that is, our study area, has been conducted to date. The Sündiken Mountains are situated between the east latitudes of 29°58'-32° 04' and the north latitudes of 39° 06'-40° 09' in relation to the north-west of Central Anatolia (Figure 2). The Sündiken Mountains possess a transitional feature in terms of their locations and climatic conditions in relation to their location between the west of the Marmara region and Northern Anatolia. The vegetation of this region is represented by 4 different common types of vegetation, namely *Pinus brutia* Ten., *P. nigra* Arn. subsp. *pallasiana* (Lamb.) Holmboe, *P. sylvestris* L. and *Quercus cerris* L. var. *cerris* (Ekim & Akman, 1990).

Due to the topographical features of the region, there exist some differences between the east-west and the north-south parts with respect to climatic conditions. On the one hand, the region is influenced by the oceanic climate of Northern Anatolia. On the other hand, it is influenced by the semi-arid and extremely cold climate of

the Mediterranean. These, accordingly, have an impact upon the vegetation occurring in this region. The region has an Eastern Mediterranean precipitation range (Ekim & Akman, 1990). By and large, the length of the Sündiken Mountains located within the boundaries of the city of Eskişehir is approximately 50 and 60 km, while its width varies between 20 and 25 km. The mountain range stretches in an east-west direction.

It is hoped that this study will contribute to the knowledge of moss flora in Turkey and could be useful as a guide for future research.

## Materials and Methods

The materials for this study were collected during periodic field trips between 2000 and 2002 in different seasons.

The identification of the samples was carried out using various books on moss flora (Smith, 1980; Nyholm, 1981; Watson, 1981; Greven, 1995). In addition, the status of the species for the study area and for Turkey was determined by reviewing the related literature (Çetin, 1988a; Uyar & Çetin, 2004; Kürschner & Erdağ,

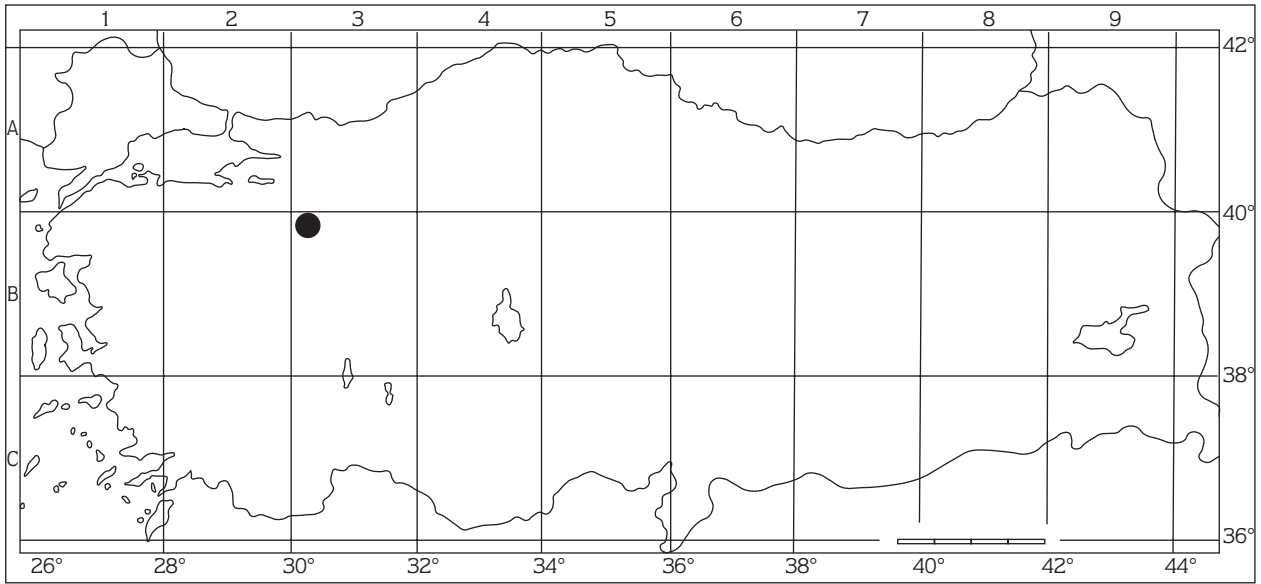


Figure 1. The grid system which is adopted by Henderson & Prentice for Turkey (1:10,000,000)

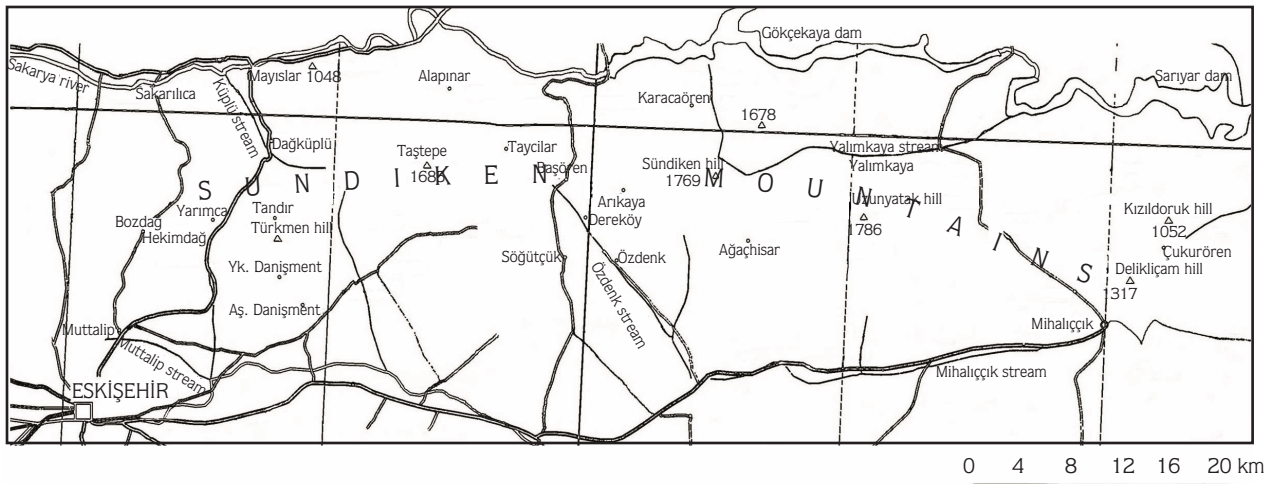


Figure 2. Map of the study area (1:350,000)

2005). The list of species is arranged according to the system described by Corley et al. (1981). In addition, collection dates, collector number, altitude and habitat are mentioned. Taxa new for the B7 grid square were determined by reviewing the related literature (Henderson & Prentice, 1969; Yücel & Tokur, 1989; Yücel & Magil, 1997). New records for the B7 grid square are marked with an asterisk.

The specimens were deposited within the herbarium of the University of Osmangazi, Faculty of Science and Arts, Department of Biology.

#### Floristic List

#### BRYOPSIDA

#### Polytrichaceae

#### *Atrichum* P.Beauv.

- \*1. *A. undulatum* (Hedw.) P.Beauv.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on soil, 26 August 2000, Savaroğlu 583.

Distribution: Turkey (A2, A3, A4, B6), Europe, Asia, Algeria, N. America.

**Polytrichum** Hedw.

2. *P. juniperinum* Hedw.

B7 Eskişehir: Sündiken Mountains, near Çatacık, *Pinus nigra* subsp. *pallasiana* forest, alt. 1650 m, on soil, 29 April 2001, Savaroğlu 701, 576.

Distribution: Sub-cosmopolitan and widespread in temperate regions of both hemispheres.

\*3. *P. strictum* Menzies ex Brid.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on soil, 26 August 2000, Savaroğlu 593.

Distribution: Turkey (A1, A2), Europe, Iceland, Caucasus, Asia, N. America, Greenland, Antarctica.

**Dicranaceae**

**Dicranum** Hedw.

4. *D. scoparium* Hedw.

B7 Eskişehir: Sündiken Mountains, near Arıkaya, *Pinus nigra* subsp. *pallasiana*- *Quercus cerris* var. *cerris* forest, alt. 1180 m, on soil, 23 July 2000, Savaroğlu 469, 600, 656.

Distribution: Sub-cosmopolitan.

5. *D. tauricum* Sapjegin

B7 Eskişehir: Sündiken Mountains, Ağaçhisar, *Pinus nigra* subsp. *pallasiana* forest, alt. 1580 m, on tree trunk, 26 August 2000, Savaroğlu 554.

Distribution: Turkey (A2, A3, B6, B7), Europe, N. America, Greenland.

**Dicranoweisia** Lindb. ex Milde

\*6. *D. cirrata* (Hedw.) Lindb. ex Milde

B7 Eskişehir: Sündiken Mountains, near Çatacık, *Pinus nigra* subsp. *pallasiana* forest, alt. 1560 m, on soil, 29 April 2001, Savaroğlu 698, 661.

Distribution: Turkey (A1, A2, A3, B6, C11, C12), Europe, Caucasus, Himalayas, Mongolia, Algeria, Canary Islands, Hawaii, N. America, Tasmania.

**Dicranella** (Mull.Hal.) Schimp.

\*7. *D. varia* (Hedw.) Schimp.

B7 Eskişehir: Sündiken Mountains, near Yalınkaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1460 m, on rock, 28 March 2001, Savaroğlu 650.

Distribution: Turkey (A1, A2, A3, A4, B6, C11, C12), Europe, Kashmir, China, Siberia, N. Africa, N. America, Cuba, Jamaica, Haiti.

**Ditrichaceae**

**Ditrichum** Hampe.

\*8. *D. heteromallum* (Hedw.) E.Britton

B7 Eskişehir: Sündiken Mountains, near Karakütük, *Pinus nigra* subsp. *pallasiana* forest, alt. 1538 m, on tree trunk, 15 October 2000, Savaroğlu 601, 594.

Distribution: Turkey (A1, A2, A3, A4), Europe, Iceland, N. America.

\*9. *D. subulatum* Hampe

B7 Eskişehir: Sündiken Mountains, near Yalınkaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1440 m, on soil, 28 March 2001, Savaroğlu 655.

Distribution: Turkey (B6, B8), Europe, Mediterranean region, Madeira, Tenerife.

**Encalyptaceae**

**Encalypta** Hedw.

\*10. *E. rhaptocarpa* Schwägr.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on tree trunk, 10 May 2000, Savaroğlu 22.

Distribution: Turkey (A1, A2, C11), Europe, Caucasus, Asia, N. America, N. Africa, Greenland, Hawaii.

11. *E. streptocarpa* Hedw.

B7 Eskişehir: Sündiken Mountains, Sakarılıca, *Pinus nigra* subsp. *pallasiana* forest, alt. 620 m, on rock, 10 May 2000, Savaroğlu 148.

Distribution: Turkey (A1, A2, A3, B6, B7, C12), Europe, Caucasus, N. America.

\*12. *E. vulgaris* Hedw.

B7 Eskişehir: Sündiken Mountains, Sakarılıca, *Pinus nigra* subsp. *pallasiana* forest, alt. 560 m, on rock, 10 May 2000, Savaroğlu 24, 147.

Distribution: Cosmopolitan.

**Pottiaceae**

**Syntrichia** Brid.

\*13. *S. mucronifolia* (Schwägr.) Brid.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on rock, 10 May 2000, Savaroğlu 38b.

Distribution: Turkey (B6, C11), Europe, Caucasus, N. Asia, China, N. America, Greenland.

**14. *S. princeps* (De Not.) Mitt.**

B7 Eskişehir: Sündiken Mountains, near Yalımkaaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1340 m, on rock, 28 March 2001, Savaroğlu 642.

Distribution: Turkey (A1, A2, B6, B7, C11, C12, C13, C14), Europe, Asia, N. and S. America, New Zealand.

**15. *S. ruralis* (Hedw.) F.Weber & D.Mohr.**

B7 Eskişehir: Sündiken Mountains, Bozdağ, *Quercus cerris* var. *cerris* forest, alt. 1240 m, on tree trunk, 10 May 2000, Savaroğlu 78, 566.

Distribution: Cosmopolitan.

**\*16. *S. subulata* (Hedw.) F.Weber & D.Mohr var. *subulata***

B7 Eskişehir: Sündiken Mountains, near Çatacak, *Pinus nigra* subsp. *pallasiana* forest, alt. 1650 m, on soil, 29 April 2001, Savaroğlu 597, 692.

Distribution: Cosmopolitan.

**\*17. *S. subulata* (Hedw.) F.Weber & D.Mohr var. *angustata* (Schimp.) J.J.Amann**

B7 Eskişehir: Sündiken Mountains, near Yalımkaaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1510 m, on soil, 28 March 2001, Savaroğlu 455, 609, 658.

Distribution: Turkey (A1, A2, B6, B8, C11), Europe, Asia, N. America, N. Africa.

**\*18. *S. subulata* (Hedw.) F.Weber & D.Mohr var. *graeffii* Warnst.**

B7 Eskişehir: Sündiken Mountains, Bozdağ, *Quercus cerris* var. *cerris* forest, alt. 1240 m, on soil, 10 May 2000, Savaroğlu 71, 454, 629, 696.

Distribution: Turkey (A2, C11), W. and N. Britain.

*Tortula* Hedw.

**\*19. *T. muralis* Hedw.**

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on rock, 10 May 2000, Savaroğlu 38a.

Distribution: Cosmopolitan.

*Pottia* Ehrh. ex Furnr.

**\*20. *P. commutata* Limpr.**

B7 Eskişehir: Sündiken Mountains, Bozdağ, *Quercus cerris* var. *cerris-Q. pubescens* forest, alt. 1240 m, on soil, 10 May 2000, Savaroğlu 51a.

Distribution: Turkey (B6), Europe, Mediterranean.

*Trichostomum* Bruch

**\*21. *T. branchyodontium* Bruch.**

B7 Eskişehir: Sündiken Mountains, Bozdağ, *Quercus cerris* var. *cerris-Q. pubescens* forest, alt. 1240 m, on soil, 10 May 2000, Savaroğlu 51b.

Distribution: Turkey (A1, A4, B7, C11, C12, C13), Europe, Caucasus, Syria, China, Japan, N. and S. Africa, New Zealand.

*Tortella* (Lindb.) Limpr.

**\*22. *T. tortuosa* (Hedw.) Limpr.**

B7 Eskişehir: Sündiken Mountains, Alapınar, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1240 m, on rock, 17 June 2000, Savaroğlu 406.

Distribution: Cosmopolitan.

*Cinclidotus* P.Beauv.

**\*23. *C. fontinaloides* (Hedw.) P.Beauv.**

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, near water, on rock, 26 August 2000, Savaroğlu 591.

Distribution: Turkey (C11), Europe, Asia, Caucasus, Tibet, Algeria, Morocco, Tunisia.

Grimmiaceae

*Schistidium* Bruch & Schimp.

**24. *S. apocarpum* (Hedw.) Bruch & Schimp.**

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on rock, 26 August 2000, Savaroğlu 578.

Distribution: Cosmopolitan.

**\*25. *S. confertum* (Funk) Bruch & Schimp.**

B7 Eskişehir: Sündiken Mountains, near Yalımkaaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1340 m, on rock, 28 March 2001, Savaroğlu 644.

Distribution: Turkey (A1, A2, A4, B6, B8, B9, C13, C14), Europe, Caucasus, N. and C. Asia, Japan, Ethiopia, N. America.

*Grimmia* Hedw.

**\*26. *G. decipiens* (Schultz) Lindb.**

B7 Eskişehir: Sündiken Mountains, Tandır, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1400 m, on rock, 11 June 2000, Savaroğlu 278.

Distribution: Turkey (A1, A2, A4, B6, C11, C13), Europe, Algeria, Tenerife, N. America.

**\*27. G. longirostris** Hook.

B7 Eskişehir: Sündiken Mountains, Alapınar, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1260 m, on rock, 17 June 2000, Savaroğlu 385a.

Distribution: Turkey (A1, A2), Europe, Asia, Africa, N. America.

**\*28. G. ovalis** (Hedw.) Lindb.

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1200 m, on rock, 23 July 2000, Savaroğlu 446, 385.

Distribution: Cosmopolitan.

**29. G. pulvinata** (Hedw.) Sm.

B7 Eskişehir: Sündiken Mountains, Söğütçük, alt. 1140 m, on rock, 17 June 2000, Savaroğlu 428, 452.

Distribution: Cosmopolitan.

**\*30. G. trichophylla** Grev.

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, on rock, 15 October 2000, Savaroğlu 358, 617.

Distribution: Cosmopolitan.

**\*31. G. dissimulata** E.Maier

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1200 m, on rock, 23 July 2000, Savaroğlu 443.

Distribution: Turkey (A2), N. Britain, Portugal.

**Funariaceae**

**Funaria** Hedw.

**32. F. hygrometrica** Hedw.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on oak trunk (= *Quercus* sp.), 10 May 2000, Savaroğlu 7.

Distribution: Cosmopolitan.

**Bryaceae**

**Pohlia** Hedw.

**\*33. P. melanodon** (Brid.) J.Shaw

B7 Eskişehir: Sündiken Mountains, near Yalım kaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1460 m, near water, on soil, 28 March 2001, Savaroğlu 646.

Distribution: Turkey (B6), Europe, Asia, Japan, N. Africa, Algeria, Egypt, Azores, N. America.

**Bryum** Hedw.

**\*34. B. alpinum** Huds. ex With var. *viride* Husn.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on wet soil, 10 May 2000, Savaroğlu 11.

Distribution: Turkey (A1, A2), Europe, Asia, C. and S. Africa, Canary Islands, America.

**\*35. B. bornholmense** Wink. & R.Ruthe

B7 Eskişehir: Sündiken Mountains, Sakarılıca, *Pinus nigra* subsp. *pallasiana* forest, alt. 420 m, on soil, 31 May 2000, Savaroğlu 184.

Distribution: Turkey (A2), C. Europe, N. America.

**\*36. B. caespiticium** Hedw.

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1230 m, on rock, 23 July 2000, Savaroğlu 479, 695.

Distribution: Cosmopolitan.

**37. B. capillare** Hedw.

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, on rock, 15 October 2000, Savaroğlu 610.

Distribution: Cosmopolitan.

**\*38. B. creberrimum** Taylor

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on soil, 26 August 2000, Savaroğlu 581.

Distribution: Turkey (A2, A4, B6, B8, B9, C11, C13), Europe, N. Asia, N. America, Australia, New Zealand.

**\*39. B. imbricatum** (Schwägr.) Bruch & Schimp.

B7 Eskişehir: Sündiken Mountains, near Yukarı Danişment, alt. 1270 m, on wet soil, 11 June 2000, Savaroğlu 345.

Distribution: Turkey (A2, A4), Europe, Asia, N. Africa, N. America, Australia, Antarctica.

**\*40. B. mildeanum** Jur.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, near water, on soil, 10 May 2000, Savaroğlu 9.

Distribution: Turkey (A1, A2, C11, C13, C14), Europe, Asia, N. Africa.



**\*41. B. schleicheri** DC.

B7 Eskişehir: Sündiken Mountains, Taşlıburun forest store, *Pinus nigra* subsp. *pallasiana* forest, alt. 1510 m, near water, on soil, 10 June 2001, Savaroğlu 709.

Distribution: Turkey (A4, B8, C13), Europe, Iran, Syria, Asia, N. Africa.

**\*42. B. subelegans** Kindb.

B7 Eskişehir: Sündiken Mountains, Bozdağ, *Quercus cerris* var. *cerris* forest, alt. 1240 m, on soil, 10 May 2000, Savaroğlu 77.

Distribution: Turkey (A1, A2), Europe, N. America.

**\*43. B. intermedium** (Brid.) Blandow

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, near water, on rock, 10 May 2000, Savaroğlu 25.

Distribution: Turkey (C11, C12), Europe, Asia, N. Africa, N. America, Greenland, Australia.

**Mniaceae**

**Mnium** Hedw.

**\*44. M. stellare** Hedw.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, near water, on wet soil, 26 August 2000, Savaroğlu 577.

Distribution: Turkey (A1, A2, A4), Europe, Turkey, Asia, N. America.

**\*45. M. thomsonii** Schimp.

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, near water, on wet soil, 15 October 2000, Savaroğlu 607.

Distribution: Turkey (B6), Europe, Faroes, Caucasus, C. Asia, Siberia, China, N. America, Greenland.

**Rhizomnium** T.Kop.

**\*46. R. punctatum** (Hedw.) T.Kop.

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, near water, 15 October 2000, Savaroğlu 605.

Distribution: Turkey (A1, A2, A3, A4, B8), Europe, Asia, N. America, Greenland.

**Plagiomnium** T.Kop.

**\*47. P. undulatum** (Hedw.) T.Kop.

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, near water, 15 October 2000, Savaroğlu 618.

Distribution: Turkey (A1, A2, A3, A4, B6, C11, C13), Europe, Asia, N.W. Africa.

**Aulacomniaceae**

**Aulacomnium** Schwägr.

**\*48. A. androgynum** (Hedw.) Schwägr.

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana*-*Quercus cerris* var. *cerris* forest, alt. 1240 m, on tree roots, 23 July 2000, Savaroğlu 482.

Distribution: Turkey (A1, A2, B6, B8), Europe, Japan, N. America.

**Bartramiaceae**

**Philonotis** Brid.

**49. P. calcarea** (Bruch & Schimp.) Schimp.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, forest road, Code. 309, *Pinus sylvestris* forest, alt. 1430 m, on rock in stream, 11 August 2000, Savaroğlu 523.

Distribution: Turkey (A1, A2, A3, A4, B7, B10, C13), Europe, Faroes, Asia, Algeria, N. America.

**\*50. P. rigida** Brid.

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana*-*Quercus cerris* var. *cerris* forest, alt. 1380 m, near water, 23 July 2000, Savaroğlu 490.

Distribution: Turkey (A4, B5), Belgium, Switzerland, Portugal, Italy, Sicily, Caucasus, Algeria.

**\*51. P. seriata** Mitt.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, forest road, Code. 309, *Pinus sylvestris* forest, alt. 1430 m, on rock in stream, 11 August 2000, Savaroğlu 542.

Distribution: Turkey (A1, A2, A4, B6), Europe, Faroes, Caucasus, Iran, Siberia, N. Africa, Greenland.

**Orthotrichaceae****Orthotrichum Hedw.**\*52. *O. affine* Schrad. ex Brid.

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1200 m, on tree trunk, 23 July 2000, Savaroğlu 448a, 457, 569.

Turkey (A1, A2, A3, A4, B6), Europe, Asia, N. Africa, N. America.

53. *O. lyellii* Hook. & Taylor

B7 Eskişehir: Sündiken Mountains, Arıkaya, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1200 m, on rock, 23 July 2000, Savaroğlu 444, 453.

Distribution: Turkey (A2, A4, B7, C11), Europe, Italy, Caucasus, Algeria, Morocco, N. and S. America, Mexico.

54. *O. rupestre* Schleich. ex Schwägr.

B7 Eskişehir: Sündiken Mountains, Alapınar, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1260 m, on rock, 17 June 2000, Savaroğlu 382, 451, 462, 564.

Distribution: Cosmopolitan.

\*55. *O. speciosum* Nees

B7 Eskişehir: Sündiken Mountains, Bozdağ, *Quercus cerris* var. *cerris-Q. pubescens* forest, alt. 1240 m, on tree trunk, 10 May 2000, Savaroğlu 63, 354, 448b, 460.

Distribution: Turkey (A1, A2, C11), Europe, N. Africa, N. and C. Asia, N. America, Greenland.

**Ulota D.Mohr.**\*56. *U. hutchinsiae* (Sm.) Hammar

B7 Eskişehir: Sündiken Mountains, near Çatacık, Kömürce-Kapaklı road, *Pinus nigra* subsp. *pallasiana* forest, alt. 1650 m, on rock, 29 April 2001, Savaroğlu 691.

Distribution: Turkey (B6), Europe, Japan, N. America.

**Fontinalaceae****Fontinalis Hedw.**\*57. *F. antipyretica* Hedw.

B7 Eskişehir: Sündiken Mountains, Çatacık roadside, *Pinus nigra* subsp. *pallasiana* forest, alt. 1340 m, on rock in stream, 7 July 2001, Savaroğlu 764.

Distribution: Cosmopolitan.

**Leucodontaceae****Leucodon Schwägr.**\*58. *L. immersus* Lindb.

B7 Eskişehir: Sündiken Mountains, near Arıkaya, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1180 m, on rock, 23 July 2000, Savaroğlu 462a.

Distribution: Turkey (A2, A3), Europe, Asia.

\*59. *L. sciuroides* (Hedw.) Schwägr.

B7 Eskişehir: Sündiken Mountains, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris-Juniperus excelsa* forest, alt. 1340 m, on rock, 26 August 2000, Savaroğlu 431, 562b.

Distribution: Cosmopolitan.

**Antitrichia Brid.**\*60. *A. curtispindula* (Hedw.) Brid.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on soil, 26 August 2000, Savaroğlu 585.

Distribution: Turkey (A2, A3, A4, B6, C11), Europe, Caucasus, C. and S. Africa, N. America, Greenland.

**Neckeraceae****Neckera Hedw.**\*61. *N. pumila* Hedw.

B7 Eskişehir: Sündiken Mountains, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris-Juniperus excelsa* forest, alt. 1340 m, on rock, 26 August 2000, Savaroğlu 567.

Distribution: Turkey (A2), C. Europe, Madeira, Canaries.

**Thamniaceae****Thamnobryum Nieuwl.**\*62. *T. alopecurum* (Hedw.) Nieuwl. ex Gangulee

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on rock, 26 August 2000, Savaroğlu 592.

Distribution: Turkey (A2, A3, A4, C11), Europe, Faroes, Asia, N. Africa, N. America.



### Amblystegiaceae

#### Cratoneuron (Sull.) Spruce

63. *C. filicinum* (Hedw.) Spruce var. *atrovirens* (Brid.) Ochyra

B7 Eskişehir: Sündiken Mountains, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris-Juniperus excelsa* forest, alt. 1340 m, on wet soil, 26 August 2000, Savaroğlu 571.

Distribution: Turkey (A1, A2, A4, B6, B7, B10, C11, C12), Europe, Asia, N. America, N. Africa.

#### Palustriella Ochyra

64. *P. commutata* (Hedw.) Ochyra

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on rock in stream, 26 August 2000, Savaroğlu 573.

Distribution: Turkey (A2, A3, B7, B8, B9, C13, C15), Europe, C. Asia, N. America, N. Africa.

#### Leptodictyum (Schimp.) Warnst.

65. *L. riparium* (Hedw.) Warnst.

B7 Eskişehir: Sündiken Mountains, Başören, *Pinus nigra* subsp. *pallasiana* forest, alt. 1070 m, on rock, 17 June 2000, Savaroğlu 411

Distribution: Turkey (A2, B6, B7), Cosmopolitan.

### Brachytheciaceae

#### Isothecium Brid.

\*66. *I. alopecuroides* (Dubois) Isov.

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on rock, 26 August 2000, Savaroğlu 589.

Distribution: Turkey (A1, A2, A3, A4, B6, C11, C13), Europe, Caucasus, Canaries, Azores.

#### Homalothecium Schimp.

67. *H. sericeum* (Hedw.) Schimp.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on rock, 10 May 2000, Savaroğlu 29, 34, 562a.

Distribution: Cosmopolitan.

#### Brachythecium Schimp.

\*68. *B. erythrorrhizon* Schimp.

B7 Eskişehir: Sündiken Mountains, near Yalınkaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1400 m, on tree trunk, 28 March 2001, Savaroğlu 660.

Distribution: Turkey (A1, A2, A4), Europe, Asia, N. America.

\*69. *B. plumosum* (Hedw.) Schimp.

B7 Eskişehir: Sündiken Mountains, Yukarı Danişment, alt. 1370 m, on oak trunk (= *Quercus* sp.), 11 June 2000, Savaroğlu 332.

Distribution: Cosmopolitan.

70. *B. populeum* (Hedw.) Schimp.

B7 Eskişehir: Sündiken Mountains, Yukarı Danişment, alt. 1370 m, on rock, 11 June 2000, Savaroğlu 335.

Distribution: Turkey (A1, A2, A4, B6, B7), cosmopolitan

\*71. *B. velutinum* (Hedw.) Schimp. var. *velutinum*

B7 Eskişehir: Sündiken Mountains, Yarımca, *Quercus cerris* var. *cerris* forest, alt. 1280 m, on tree trunk, 11 June 2000, Savaroğlu 357.

Distribution: Turkey (A1, A2, A3, B6, C12), Europe, Asia, N. America.

\*72. *B. velutinum* (Hedw.) Schimp. var. *salicinum* (Schimp.) Mönk.

B7 Eskişehir: Sündiken Mountains, Hekimdağ, alt. 1240 m, on oak trunk (= *Quercus* sp.), 10 May 2000, Savaroğlu 20, 478.

Distribution: Turkey (A1, A2, A3, B6, C12), Europe, Asia, N. Africa.

\*73. *B. velutinum* (Hedw.) Schimp. var. *validum* C.Jens.

B7 Eskişehir: Sündiken Mountains, near Yukarı Danişment, alt. 1270 m, on pine trunk (= *Pinus* sp.), 11 June 2000, Savaroğlu 75, 347.

Distribution: Turkey (A2), Europe, Asia, Japan, N. America.

#### Scleropodium Schimp.

\*74. *S. tourettii* (Brid.) L.F.Koch

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on rock, 26 August 2000, Savaroğlu 575.

Distribution: Turkey (C11), Denmark, Belgium, Luxemburg, France, Germany, N. America.

**Platyhypnidium** M.Fleisch.

**\*75. *P. riparioides*** (Hedw.) Dixon

B7 Eskişehir: Sündiken Mountains, north sides, near Karakütük, monument forest, *Pinus sylvestris* forest, alt. 1420 m, on rock in stream, 26 August 2000, Savaroğlu 582.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B8, B9, C11, C12), Europe, Asia, N. Africa, N. and C. America.

**Eurhynchium** Schimp.

**\*76. *E. hians*** (Hedw.) Sande Lac.

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, near stream, on soil, 15 October 2000, Savaroğlu 613.

Distribution: Turkey (A1, A2, A3, B6, C11, C13), Europe, Caucasus, Asia, Japan, Algeria, N. America.

**Entodontaceae**

**Entodon** Mull.Hal.

**\*77. *E. concinnus*** (De Not.) Paris

B7 Eskişehir: Sündiken Mountains, north sides, Karakütük, *Pinus sylvestris* forest, alt. 1516 m, near water, on soil, 15 October 2000, Savaroğlu 608.

Distribution: Turkey (C11), Europe, Iceland, Caucasus, Iran, Asia, N. America.

**Plagiotheciaceae**

**Taxiphyllum** M.Fleisch.

**\*78. *T. wissgrillii*** (Garov.) Wijk & Margad.

B7 Eskişehir: Sündiken Mountains, Tandır, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 1420 m, on tree root and base, 11 June 2000, Savaroğlu 304.

Distribution: Turkey (A2), Europe, Iceland, Caucasus.

**Hypnaceae**

**Hypnum** Hedw.

**79. *H. cupressiforme*** Hedw. var. *cupressiforme*

B7 Eskişehir: Sündiken Mountains, Ağaçhisar, *Pinus nigra* subsp. *pallasiana* forest, alt. 1580 m, on tree trunk, 26 August 2000, Savaroğlu 555.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C13), cosmopolitan.

**\*80. *H. cupressiforme*** Hedw. var. *lacunosum* Brid.

B7 Eskişehir: Sündiken Mountains, Bozdağ-Sakarılıca roadside, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 560 m, on soil, 10 May 2000, Savaroğlu 139.

Distribution: Turkey (A1, A2, A3, A4, B6, C12), Europe, N. America.

**\*81. *H. cupressiforme*** Hedw. var. *resupinatum* (Taylor) Schimp.

B7 Eskişehir: Sündiken Mountains, Yukarı Danişment, alt. 1370 m, on soil, 11 June 2000, Savaroğlu 339.

Distribution: Turkey (A1, A2, A4, C11), Europe.

**\*82. *H. imponens*** Hedw.

B7 Eskişehir: Sündiken Mountains, near Yalınkaya, *Pinus nigra* subsp. *pallasiana* forest, alt. 1400 m, on rock, 28 March 2001, Savaroğlu 659.

Distribution: Turkey (A2, A3), Europe, C. Asia, Switzerland, Iceland, Japan, N. America.

**\*83. *H. jutlandicum*** Holmen & E.Warncke

B7 Eskişehir: Sündiken Mountains, Sakarılıca roadside, *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, alt. 560 m, on tree trunk, 10 May 2000, Savaroğlu 110.

Distribution: Turkey (A2), C. Europe, Algeria, N. America.

## Results and Discussion

In this study, 83 taxa belonging to 42 genera and 21 families were identified from 814 moss specimens collected from the Sündiken Mountains between 2000 and 2002.

According to Henderson's grid system, the number of new records in the study area in the B7 square is 64. Species such as *Ditrichum subulatum*, *Pottia commutata*, *Pohlia melanodon*, *Bryum intermedium*, *Mnium thomsonii*, *Philonotis rigida* and *Entodon concinnus* are some of the rarest found in this country and these localities are mentioned for the first time.

In Table 1, the families Pottiaceae, Bryaceae, Brachytheciaceae, Grimmiaceae, Orthotrichaceae and Hypnaceae make up 60.8% of the total taxa in the study area, and the other 15 families constitute 39.2%.

Table 1. The distributions of the taxa according to the families.

Bryopsida Families	Number of taxa	Percentage of taxa according to the total number of taxa
<i>Pottiaceae</i>	11	13.1
<i>Bryaceae</i>	11	13.1
<i>Brachytheciaceae</i>	11	13.1
<i>Grimmiaceae</i>	8	9.52
<i>Orthotrichaceae</i>	5	5.95
<i>Hypnaceae</i>	5	5.95
<i>Dicranaceae</i>	4	4.76
<i>Mniaceae</i>	4	4.76
<i>Polytrichaceae</i>	3	3.57
<i>Encalyptaceae</i>	3	3.57
<i>Bartramiaceae</i>	3	3.57
<i>Leucodontaceae</i>	3	3.57
<i>Amblystegiaceae</i>	3	3.57
<i>Ditrichaceae</i>	2	2.38
<i>Funariaceae</i>	1	1.19
<i>Aulacomniaceae</i>	1	1.19
<i>Fontinalaceae</i>	1	1.19
<i>Neckeraceae</i>	1	1.19
<i>Thamniaceae</i>	1	1.19
<i>Entodontaceae</i>	1	1.19
<i>Plagiotheciaceae</i>	1	1.19

Based on the observations made during the field trips, acrocarpous mosses are capable of surviving during arid periods despite exposure to the graining effects of constant sunlight and the wind in arid habitats. On the other hand, pleurocarpous mosses were observed to be dominant in the habitats where water is abundant and the air is relatively humid. In consideration of the whole study area, 12 of the families belong to acrocarpous and 9 belong to pleurocarpous mosses. As to the taxa they included, 67.46% (56 taxa) of the taxa occurring in the Sündiken Mountains belong to acrocarpous mosses, whilst 32.53% (27 taxa) belong to pleurocarpous mosses. The fact that the region has a semi-arid characteristic seems to account for such a distribution of acrocarpous and pleurocarpous mosses.

Due to the altitude features of the study area, there are some climatic differences between the directions of east-west and north-south. On the one hand, the area is exposed to the oceanic climate of Northern Anatolia. On the other hand, it is exposed to the semi-arid and very

cold Mediterranean climate of Central Anatolia. This feature seems to have an effect upon the vegetation occurring in these areas. The best vegetation occurs in Çatacık-Karakütük environs, where the forest is the densest. Therefore, mosses densely occur in this specific area. Because the western part of the study area is less rugged than its eastern part, the parts cleared of plants or trees have been harnessed as agricultural areas. Therefore, there is a spare distribution of mosses here.

In Table 2, a comparison between studies carried out in the Black Sea (Çetin & Yurdakulol, 1985, 1988; Çetin & Uyar, 1997) and the Mediterranean (Çetin, 1989) shows that the proportion of acrocarpous mosses in the Mediterranean is higher than that in the Black Sea region. In particular, the number of taxa of Pottiaceae family members is higher than the number of taxa of Brachytheciaceae family members in the study areas, due to the reduced forest in the study areas because of excessive construction. Consequently, pleurocarpous taxa decreased since these taxa need much more humidity than acrocarpous taxa such as Pottiaceae family members, which can endure long periods of heat and dryness.

In the north parts of the study area (1300-1700 m) covered by *Pinus sylvestris* forest, there occur *Polytrichum strictum*, *P. juniperinum*, *Atrichum undulatum*, *Bryum creberrimum*, *Antitrichia curtispindula*, *Dicranoweisia cirrata*, *Dicranum scoparium*, *Syntrichia subulata* var. *subulata*, *S. subulata* var. *angustata*, *S. subulata* var. *graeffii*, *Mnium stellare*, *M. thomsonii* and *Rhizomnium punctatum* on the acidic soil; *Schistidium apocarpum*, *Grimmia trichophylla*, *Bryum capillare*, *B. caespiticium*, *Thamnobryum alopecurum*, *Isothecium myurum*, *Scleropodium tourettii*, *Ulota hutchinsiae* and *Cinclidotus fontinaloides* on rocks; *Ditrichum heteromallum* on tree trunks; *Bryum schleicheri* var. *latifolium*, *Mnium thomsonii*, *Rhizomnium punctatum*, *Plagiomnium undulatum*, *Philonotis seriata*, *P. calcarea*, *Palustriella commutata*, *Rhynchostegium riparioides*, *Eurhynchium hians* and *Entodon concinnus* in wetlands and near water in places; and *Fontinalis antipyretica* in water.

Likewise, in the north parts of the study area (1100-1300 m) covered by *Pinus nigra* subsp. *pallasiana-Quercus cerris* var. *cerris* forest, there occur *Tortella tortuosa*, *Grimmia affinis*, *G. ovalis* and *Orthotrichum rupestre* on rocks.

Table 2. The comparison of the taxa distribution according to the families.

Families	Sündiken Mountains		Bolu Gerede-Aktaş		Yedigöller National Park		Antalya and Its Environs		Sinop and Its Environs	
	The number of taxa	%	The number of taxa	%	The number of taxa	%	The number of taxa	%	The number of taxa	%
<i>Pottiaceae</i>	11	13.1	16	12	12	13.6	32	35.5	12	10.7
<i>Bryaceae</i>	11	13.1	17	12.6	2	2.2	4	4.4	6	5.3
<i>Brachytheciaceae</i>	11	13.1	19	15	15	17.4	14	15.5	23	20.5
<i>Grimmiaceae</i>	8	9.5	8	6	3	3.4	6	6.6	3	2.6
<i>Orthotrichaceae</i>	5	6	5	3.8	2	2.2	8	8.9	5	4.5
<i>Hypnaceae</i>	5	6	11	8	8	9.9	3	3.3	10	8.9

In the west parts of northern regions of the area (400-700 m) covered by *Pinus nigra* subsp. *pallasiana* forest, there occur *Bryum bornholmense* and *Hypnum cupressiforme* var. *lacunosum* on the soil, *Encalypta streptocarpa* and *E. vulgaris* on rocks, and *Hypnum jutlandicum* on tree trunks and roots.

In the south parts of the area (1000-1600 m) covered by the *Pinus nigra* subsp. *pallasiana*-*Quercus cerris* var. *cerris*-*Juniperus excelsa* forest, there occur *Dicranum scoparium*, *Ditrichum subulatum*, *Dicranoweisia cirrata*, *Syntrichia subulata* var. *angustata* and *Pohlia melanodon* on the soil; *Grimmia pulvinata*, *G. ovalis*, *G. trichophylla*, *G. dissimulata*, *Bryum caespiticium*, *Amblystegium riparium*, *Orthotrichum lyellii*, *O. rupestre*, *Leucodon immersus*, *L. sciuroides*, *Homalothecium sericeum*, *Dicranella varia*, *Syntrichia subulata* var. *graeffii*, *S. princeps*, *S. ruralis*, *Schistidium confertum*, *Hypnum imponens* and *Neckera pumila* on rocks; *Aulacomnium androgynum*, *Orthotrichum affine*, *O. speciosum*, *Dicranum tauricum*, *Brachythecium erythrorrhizon*, *B. velutinum* var. *salicinum* and *Hypnum cupressiforme* var. *cupressiforme* on tree trunks and roots; and *Philonotis rigida* and *Cratoneuron filicinum* var. *atrovirens* near water.

Leaf cells of *Grimmia dissimulata* are incrassate and all cell walls are sinuose. They most often occur over acidic rocks in the form of fuzzy dark coloured tufts. With this feature of theirs, they differ *G. trichophylla*. They were recorded in Turkey for the second time (Uyar & Çetin, 2000).

In the west part of the region (1200-1500 m) covered by *Quercus cerris* var. *cerris*-*Q. pubescens* forest, there occur *Hypnum cupressiforme* var. *resupinatum*, *Pottia commutata*, *Trichostomum branchyodontium*, *Bryum subelegans*, *B. alpinum* var. *viride* and *B. mildeanum* on soil; *Grimmia decipiens*, *Brachythecium populeum*, *Tortula muralis*, *Syntrichia mucronifolia*, *Homalothecium sericeum* and *Encalypta vulgaris* on rocks; *Taxiphyllum wissgrillii*, *Brachythecium velutinum* var. *velutinum*, *B. velutinum* var. *validum*, *B. velutinum* var. *salicinum*, *B. plumosum*, *Encalypta rhytocarpa*, *Syntrichia ruralis*, *S. subulata* var. *graeffii*, *Funaria hygrometrica*, *Orthotrichum speciosum* and *Homalothecium sericeum* on tree trunks and roots; and *Bryum inclinatum*, *B. alpinum* var. *viride* and *B. intermedium* in wetlands and near water in places.

*Bryum alpinum* var. *viride* have green leaves with wide, long and thin walled cells. Border cells do not differ from the other cells. Their leaf tips are denticulate. With this feature of theirs, they differ from *B. alpinum*.

*Brachythecium velutinum* var. *validum* have larger leaves and the surface of the seta is papillose with slightly papillose spores. With this feature of theirs, they differ from other varieties of *B. velutinum*. They were recorded in Turkey for the second time (Uyar & Çetin, 2001b).

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