

1-1-2007

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### Recommended Citation

KİREMİT, HATİCE ÖZENOĞLU; SUKATAR, ATAKAN; and GÖKLER, İSA (2007) "Studies on the Hornworts and Liverworts Flora of Antalya," *Turkish Journal of Botany*. Vol. 31: No. 6, Article 3. Available at: <https://journals.tubitak.gov.tr/botany/vol31/iss6/3>

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## Studies on the Hornworts and Liverworts Flora of Antalya\*

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Received: 07.12.2006

Accepted: 22.08.2007

**Abstract:** This study includes a list of hornwort and liverwort flora of Antalya province. It is composed of 2 species belonging to a family of the class *Anthocerotopsida* and 35 species belonging to 23 families of the class *Marchantiopsida* of the division *Bryophyta*. For the C12 grid square of Turkey, 14 liverworts are new records.

**Key Words:** Liverworts, hornworts, *Anthocerotopsida*, *Marchantiopsida*, Antalya

### Antalya İli Boynuzsu Otlar ve Ciğerotları Florası Üzerinde Çalışmalar

**Özet:** Bu çalışma, Antalya ilinde yayılış gösteren boynuzsu ot ve ciğerotu flora listesini kapsamaktadır. Çalışma, *Bryophyta* bölümüne bağlı *Anthocerotopsida* sınıfına ait 1 familyadan 2, *Marchantiopsida* sınıfına ait 23 familyadan 35 tür içermektedir. Bunlardan 14 tanesi C12 karesi için yeni kayıt özelliği taşımaktadır.

**Anahtar Sözcükler:** Ciğerotu, boynuzsu ot, *Anthocerotopsida*, *Marchantiopsida*, Antalya

### Introduction

Hornworts and liverworts are the members of classes *Anthocerotopsida* and *Marchantiopsida* (*Hepaticae*), respectively, of the division *Bryophyta*. According to the most recent references, nearly 10,000 species of liverworts and hornworts exist in the world. To date, only 163 species have been recorded in Turkey (Kürschner and Erdağ, 2005). However, this number does not reflect the real potential since Turkey possesses different climatic zones, diverse topographic features, and assorted vascular plants. It is known that most of the taxonomic studies in Turkey were related to vascular plants, meaning that cryptogrammic plants have been neglected because of the difficulty of research and insufficient references.

A part of the liverworts flora of Turkey was determined by previous studies (Gökler & Öztürk, 1991, 1996; Kürschner, 2001; Özenoğlu & Gökler, 2002;

Kürschner & Erdağ, 2005). However, the number of the species recorded by native researchers does not reflect the real potential of this country and the related references in this area are very limited (Crundwell & Nyholm, 1979; Çetin, 1989a, 1989b).

The study area is located between 36° 10.00' N – 37° 10.00' N and 30° 00.00' E – 30° 50.00' E in south-west Anatolia (Figure 1). The region has a Mediterranean climate with mild and rainy winters and hot and dry summers. The mean annual temperature varies between 18 and 20 °C on the coastal belt of the region. The mean January temperature varies between 10 and 5 °C. The mean July temperature is over 25 °C and the highest value reaches up to 45 °C (Atalay, 2002). The mean annual precipitation ranges from 600 to 1200 mm, half of which falls during the winter. Mediterranean vegetation can be divided into 2 main formations according to the ecological properties of the region.

\*This study was supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK), project number: TBAG – 2409 (104T019).

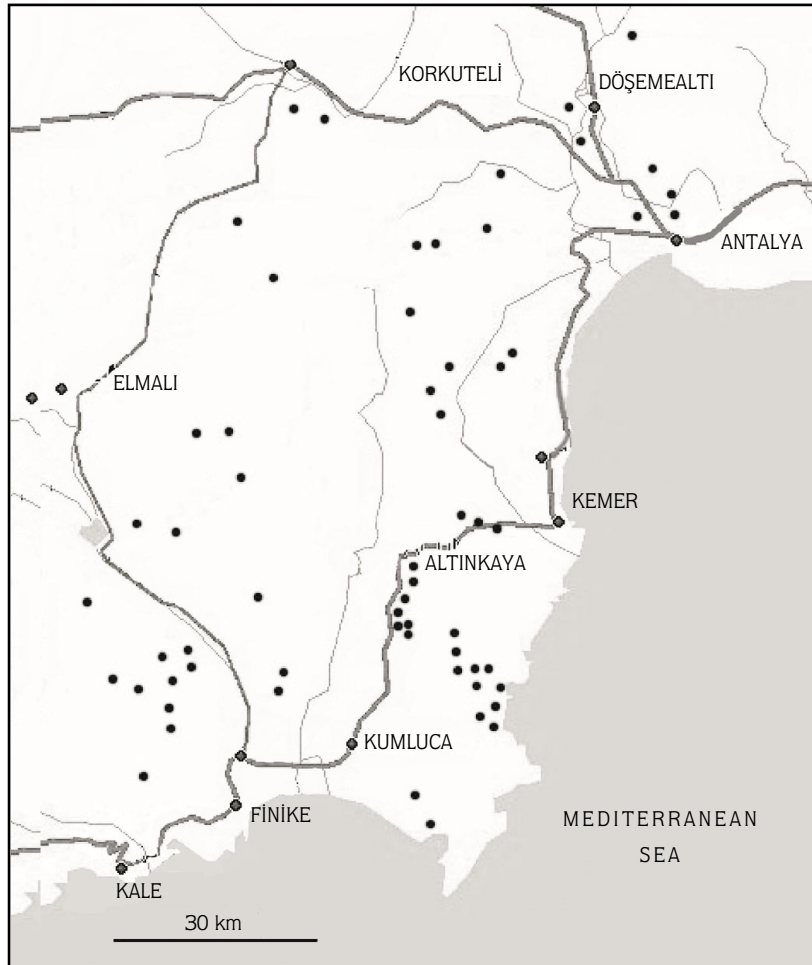


Figure. Geographic map of the study area. Locality coordinates are indicated by black dots.

Typical Mediterranean vegetation appears on the lower belt of the areas characterized by *Pinus brutia* Ten. and maquis vegetation, and the upper part region contains coniferous forests composed of *Pinus nigra* Arn., *Cedrus libani* A.Rich., and *Abies cilicica* (Ant. & Kotschy) Carr.). Maquis vegetation has developed as the result of the destruction of *Pinus brutia* forests. *Quercus coccifera* L., which is the prominent indicator maquis element of the Mediterranean climate, is found in all parts of the Mediterranean region (Atalay, 2002).

### Materials and Methods

The specimens of the study area were collected during excursions in 2002 and 2005. The liverworts and hornworts localities in the area were visited and different habitat types were investigated. The coordinates for each

taxon are determined by a Garmin e-trex Vista GPS. Black dots show the locality coordinates of liverworts and hornworts in the map (Figure). Many plants were collected from every locality in general.

Determinations were carried out using different previously reported lists and flora books (Gökler, 1986; Gökler & Öztürk, 1986, 1991, 1996; Smith, 1991; Frey & Kürschner, 1991; Paton, 1999; Kürschner, 2001) and some other relevant literature (Frey et al., 1991; Gökler, 1992, 1993a, 1993b; Gökler & Özenoğlu, 1999; Özenoğlu & Gökler, 2002; Kürshner & Erdağ, 2005). The plant list is shown in accordance with the system described by Grolle (1983). Distributions of the species in Turkey are given by the grid system of Henderson (1961). All the specimens were deposited in the herbarium of the Department of Biology, Buca Education

Faculty, Dokuz Eylül University. The new taxa for the grid square C12 are indicated with an asterisk (\*) in the floristic catalogue.

## Results and Conclusion

### BRYOPHYTA

### ANTHOCEROTOPSIDA

### ANTHOCERATALES

#### Anthocerotaceae

#### 1. *Anthoceros punctatus* L., 1753

- **Antalya;** Çıralı, Yanartaş (Chimera), on soil bank along the road, with *Oxymitra incrassata*, *Riccia ciliata*, *Fossombronia pusilla*, *Petalophyllum ralfsii*, *Southbya tophaceae*, and *Cephaloziella hampeana*. 28 m, 36° 25. 779' N 30° 27. 739' E, North, 16.11.2003. (C12/44-034).

Distribution in Turkey: A1, A4, B6, C11, C12

#### 2. *Phaeoceros laevis* (L.) Proskauer, 1951

- **Antalya;** Kemer, Olympos Archaic City Ruins, on soil, with *Riccia glauca*, *Fossombronia angulosa* and *Petalophyllum ralfsii*. 8 m, 36° 23. 705' N 30° 28. 322' E, 15.11.2003. (C12/32-029).

- **Antalya;** Kemer, Çıralı road, on soil bank along the road, with *Lunularia cruciata* and *Southbya tophaceae*. 65 m, 36° 25. 510' N 30° 26. 812' E, South-west, 20.03.2004. (C12/48-038, C12/52-041, C12/54-043).

Distribution in Turkey: A1, A4, B6, C11, C12

### MARCHANTIOPSIDA (HEPATICAE)

### MARCHANTIALES

#### Sphaerocarpaceae

#### \* 3. *Sphaerocarpos texanus* Austin, 1877

- **Antalya;** Kumluca-Altinyaka road, 7 km, on soil under shrubs, with *Lunularia cruciata* and *Southbya tophaceae*, 300 m, 36° 28. 001' N 30° 20. 012' E, 30.04.2004. (C12/66-055).

Distribution in Turkey: C11

### Targioniaceae

#### 4. *Targionia hypophylla* L., 1753

- **Antalya;** Kemer, Kesme Boğazi, canyon, on soil between rock cavities, 580 m, 36° 36. 875' N 30° 27. 477' E, South-east, 15.11.2003. (C12/12-023).

- **Antalya;** Altinyaka-Antalya road, 8-10 km from Antalya, under *Quercus coccifera* shrub, on soil, with *Fossombronia pusilla*, *Lunularia cruciata*, and *Reboulia hemisphaerica*. 541 m, 36° 28. 587' N 30° 20. 312' E, North-west, 15.11.2003. (C12/28-026).

- **Antalya;** Altinyaka, Büyükalan, Alakır Valley, Karaağaç, on wet rocks, epilithic, with *Reboulia hemisphaerica*, *Jungermannia atrovirens*, *Porella cordaeana*, and *Porella platyphylla*. 1140 m, 36° 41. 030' N 30° 19. 020' E, West, 30.04.2004. (C12/72-061).

- **Antalya;** Kemer, Olympos Archaic City Ruins, on rocks and soil, with *Lunularia cruciata* and *Reboulia hemisphaerica*. 8 m, 36° 23. 705' N 30° 28. 322' E, East, 01.05.2004. (C12/73-062).

- **Antalya;** Finike, Finike-Elmalı road, 2-3 km, on soil bank along the road and on stream banks, with *Lunularia cruciata*, *Fossombronia angulosa*, and *Fossombronia pusilla*. 33 m, 36° 24. 329' N 30° 08. 901' E, South-east, 28.11.2004. (C12/81-104, C12/82-105).

- **Antalya;** Finike-Korkuteli road, suitable wet and shady places along road, 1200 m, 36° 47. 992' N 30° 06. 340' E, 17.02.2005. (C12/88-135, C12/90-090, C12/91-146).

Distribution in Turkey: A1, A2, B6, B7, C11, C12, C13

### Aytoniaceae

5. *Plagiochasma rupestre* (J.R.Forst. & G.Forst.) Steph., 1898

- **Antalya;** Döşemealtı, Yağca Village, Karain Cave, entrance of the cave, on wet rock and soil, with *Lunularia cruciata* and *Riccia sorocarpa*. 376 m, 37° 04. 666' N 30° 34. 235' E, 29.04.2004. (C12/61-050).

Distribution in Turkey: A2, B6, B7, C11, C12

#### 6. *Reboulia hemisphaerica* (L.) Raddi, 1818

- **Antalya;** Kemer, Kesme Boğazi, on wet soil bank near stream, under *Pinus brutia* and *Mrytus communis* L.

shrubs. 125 m, 36° 36. 125' N 30° 28. 998' E, North-east, 15.11.2003. (C12/1-022, C12/7-023, C12/13-023, C12/14-023).

- **Antalya;** Antalya-Altinyaka road, Hisarçandır, on thin soil covered rocks. 855 m, 36° 46. 208' N 30° 28. 335' E, West, 16.11.2003. (C12/37-031).

- **Antalya;** Between Mavikent-Yardımlı Burnu, Gagai Archaic Ruins, on thin soil covered rocks along road, with *Lunularia cruciata* and *Fossombronia pusilla*. 33 m, 36° 16. 412' N 30° 22. 545' E, East, 20.03.2004. (C12/55-044).

- **Antalya;** Entrance of Düzlerçamı picnic area, on rocks along road, with *Southbya tophaceae*. 270 m, 36° 58. 572' N 30° 33. 764' E, East, 29.04.2004. (C12/63-052).

- **Antalya;** Kemer, Olympos Archaic City Ruins, on rock and soil, with *Targionia hypophylla* and *Lunularia cruciata*. 8 m, 36° 23. 705' N 30° 28. 322' E, East, 01.05.2004. (C12/73-062).

- **Antalya;** Finike-Korkuteli road, Gölova, in stream bed, on rocks, with *Lunularia cruciata*. 1200 m, 36° 48. 252' N 30° 02. 527' E, 17.02.2005. (C12/87-134, C12/89-136, C12/95-150).

Distribution in Turkey: A2, A4, B6, B7, B8, C11, C12, C13

\* **7. *Asterella gracilis*** (F.Weber) Underwood, 1895

- **Antalya;** Kemer, Çıralı road, 5-6 km, near stream bed along road, on thin soil covered rocks, with *Lunularia cruciata*, *Riccia sorocarpa*, *Leicolea turbinata*, and *Southbya tophaceae*. 42 m, 36° 25. 388' N 30° 27. 136' E, North-west, 20.03.2004. (C12/50-039).

Distribution in Turkey: A1

#### Conocephaleaceae

**8. *Conocephalum conicum*** (L.) Dumortier, 1822

- **Antalya;** Altinyaka, Pınargözü fish farm, in stream bed, on wet rocks, epilithic, with *Pellia endiviifolia* and *Porella platyphylla*. 1288 m, 36° 34. 150' N 30° 22. 100' E, 30.04.2004. (C12/69-058).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B8, C11, C12

#### Lunulariaceae

**9. *Lunularia cruciata*** (L.) Dumortier ex Lindb., 1868

- **Antalya;** Antalya-Altinyaka road, entrance of Hisarçandır, in stream bed, on roots of *Platanus orientalis* L. 782 m, 36° 46. 525' N 30° 28. 598' E, North, 16.11.2003. (C12/35-030).

- **Antalya;** Kemer, Kesme Boğazı, near stream bed, on soil bank and on thin soil covered rocks, with *Reboulia hemisphaerica*. 140 m, 36° 36. 064' N 30° 28. 922' E, North, 16.11.2003. (C12/13-023, C12/40-033).

- **Antalya;** Between Kemer and Çıralı, Ulupınar Village road, 2-3 km, on soil along road, with *Fossombronia pusilla* and *Petalophyllum ralfsii*. 250 m, 36° 27. 640' N 30° 26. 032' E, 20.03.2004. (C12/45-035, C12/46-036).

- **Antalya;** Kemer, Çıralı road, 5-6 km, on soil, with *Asterella gracilis*, *Riccia sorocarpa*, *Leicolea turbinata*, and *Southbya tophaceae*. 42 m, 36° 25. 388' N 30° 27. 136' E, North-west, 20.03.2004. (C12/47-037, C12/48-038, C12/49-039, C12/50-039).

- **Antalya;** Between Mavikent and Kumluca, in stream bed, on soil covered rocks, with *Phaeoceros laevis*. 130 m, 36° 17. 721' N 30° 21. 947' E, 20.03.2004. (C12/52-041, C12/53-042, C12/54-043, C12/55-044, C12/57-046).

- **Antalya;** Döşemealtı, Yağca Village, Karain Cave, entrance of cave, on wet rocks and soil, with *Plagiochasma rupestre* and *Riccia sorocarpa*. 376 m, 37° 04. 666' N 30° 34. 235' E, 29.04.2004. (C12/61-050).

- **Antalya;** Düzlerçamı, entrance of the Mecene Canyon, on soil banks and under rocks, with *Targionia hypophylla*. 270 m, 36° 58. 572' N 30° 33. 764' E, East, 29.04.2004. (C12/62-051, C12/64-053).

- **Antalya;** Finike, Finike-Elmalı road, 2-3 km, in grooved rocks along road, with *Targionia hypophylla*, *Fossombronia angulosa*, and *Fossombronia pusilla*. 33 m, 36° 24. 329' N 30° 08. 901' E, South-east, 28.11.2004. (C12/81-104, C12/82-105, C12/83-106, C12/93-148).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B9, C11, C12

#### Marchantiaceae

**10. *Marchantia polymorpha*** L., 1753

- **Antalya;** Finike, Arif Village, Oluklu Plateau road, 2-3 km, in a small stream bed, on soil, with *Pellia*

*endiviifolia* and *Fossombronia angulosa*. 581 m, 36° 29. 867' N 30° 04. 921' E, South, 27.11.2004. (C12/80-103).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B8, B9, C11, C12, C13, C15

#### Corsiniaceae

##### 11. *Corsinia coriandrina* (Spreng.) Lindb., 1877

- **Antalya**; Finike, Arif Village, Oluklu Plateau road, 5-6 km, in grooved rocks and on soil bank, with *Targionia hypophylla* and *Reboulia hemisphaerica*. 649 m, 36° 29. 762' N 30° 05. 711' E, South-west, 27.11.2004. (C12/79-102).

Distribution in Turkey: B6, C11, C12

#### Oxymitriaceae

##### 12. *Oxymitra incrassata* (Brotero) Sergio & Sim-Sim, 1989

- **Antalya**; Kemer, Olympos Archaic City Ruins, on soil under *Pinus brutia*, with *Riccia michelii*, *Fossombronia angulosa*, and *Petalophyllum ralfsii*. 45 m, 36° 23. 118' N 30° 27. 548' E, North, 15.11.2003. (C12/30-028).

- **Antalya**; Çıralı, Yanartaş (Chimera), on soil banks along road, 1-1.5 km, with *Riccia ciliata*, *Fossombronia angulosa*, and *Petalophyllum ralfsii*. 28 m, 36° 25. 779' N 30° 27. 739' E, North, 16.11.2003. (C12/44-034).

Distribution in Turkey: B6, C11, C12

#### Ricciaceae

##### \* 13. *Riccia ciliata* Hoffm., 1795

- **Antalya**; Çıralı, Yanartaş (Chimera), on soil banks along road, 1-1.5 km, with *Anthoceros punctatus*, *Oxymitra incrassata*, *Fossombronia angulosa*, *Fossombronia pusilla*, *Petalophyllum ralfsii*, *Southbya tophaceae*, and *Cephaloziella hampeana*. 28 m, 36° 25. 779' N 30° 27. 739' E, North, 16.11.2003. (C12/44-034).

Distribution in Turkey: B6, C11

##### \* 14. *Riccia glauca* L., 1753

- **Antalya**; Kemer, Olympos Archaic City Ruins, on soil, with *Phaeoceros laevis*, *Fossombronia angulosa*, and

*Petalophyllum ralfsii*. 8 m, 36° 23. 705' N 30° 28. 322' E, 15.11.2003. (C12/32-029).

- **Antalya**; Çıralı, 50-60 m from beach, on soil. 4 m, 36° 25. 342' N 30° 28. 979' E, 20.03.2004. (C12/51-040).

Distribution in Turkey: C11

##### 15. *Riccia michelii* Raddi, 1818

- **Antalya**; Kemer, Olympos Archaic City Ruins, on soil under *Pinus brutia*, with *Oxymitra incrassata*, *Fossombronia angulosa*, and *Petalophyllum ralfsii*. 45 m, 36° 23. 118' N 30° 27. 548' E, North, 15.11.2003. (C12/30-028).

Distribution in Turkey: C11, C12

##### 16. *Riccia sorocarpa* Bisch., 1835

- **Antalya**; Kemer, Çıralı road, 5-6 km, near stream bed, on soil along road, with *Asterella gracilis*, *Lunularia cruciata*, *Petalophyllum ralfsii*, *Leicolea turbinata*, and *Southbya tophaceae*. 42 m, 36° 25. 388' N 30° 27. 136' E, North-west, 20.03.2004. (C12/49-039, C12/50-039, C12/56-045).

- **Antalya**; Döşemealtı, Yağca Village, Karain Cave, entrance of the cave, on wet rocks and soil, with *Plagiochasma rupestre*, *Lunularia cruciata*, and *Fossombronia pusilla*. 376 m, 37° 04. 666' N 30° 34. 235' E, 29.04.2004. (C12/61-050).

Distribution in Turkey: B6, C11, C12

#### METZGERIALES

##### *Metzgeriaceae*

##### 17. *Metzgeria furcata* (L.) Dumortier, 1835

- **Antalya**; Kemer, Kuzdere Village, Kesme Boğazı, on rock near the stream, epilithic. 125 m, 36° 36. 125' N 30° 28. 998' E, North-east, 15.11.2003. (C12/4-022).

- **Antalya**; Kumluca-Altınyaka road, 10 km, on rocks and tree bark in the stream bed, with *Lunularia cruciata*, *Lophocolea bidentata*, and *Frullania tamarisci*. 500 m, 36° 29. 350' N 30° 19. 470' E, 30.04.2004. (C12/67-056).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B7, C11, C12, C13

## Pelliaceae

### 18. *Pellia endiviifolia* (Dicks.) Dumortier, 1835

- **Antalya;** Kumluca-Altinyaka road, 9 km from Altinyaka, on rocks near the road, epilithic. 1213 m, 36° 38. 286' N 30° 23. 640' E, North-west, 15.11.2003. (C12/25-024, C12/68-057).

- **Antalya;** Altinyaka-Antalya road, Hisarçandır, on wet rocks in stream bed, epilithic. 782 m, 36° 46. 525' N 30° 28. 598' E, South-east, 16.11.2003. (C12/29-027, C12/36-030).

- **Antalya;** Altinyaka, Pınargözü fish farm, on wet rocks in stream bed, epilithic, with *Conocephalum conicum* and *Porella platyphylla*. 1288 m, 36° 34. 150' N 30° 22. 100' E, 30.04.2004. (C12/69-058, C12/71-060).

- **Antalya;** Finike, Arif Village, Oluklu Plateau road, 2-3 km, on soil in stream bed, with *Marchantia polymorpha* and *Fossombronina angulosa*. 581 m, 36° 29. 867' N 30° 04. 921' E, South, 27.11.2004. (C12/80-103, C12/94-149).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B7, B9, C11, C12

## Codoniaceae

### \* 19. *Fossombronina angulosa* (Dicks.) Raddi, 1820

- **Antalya;** Kemer, Olympos Archaic City Ruins, on soil under *Pinus brutia*, with *Oxymitra incrassata*, *Ricia michelii*, and *Petalophyllum ralfsii*. 45 m, 36° 23. 118' N 30° 27. 548' E, North, 15.11.2003. (C12/30-028, C12/31-028, C12/32-029, C12/44-034).

- **Antalya;** Düzlerçamı, entrance of the Düzlerçamı picnic area, on small rocks, with *Lunularia cruciata*, *Fossombronina pusilla*, and *Southbya tophaceae*. 270 m, 36° 58. 572' N 30° 33. 764' E, East, 29.04.2004. (C12/64-053).

- **Antalya;** Finike, Arif Village, Oluklu Plateau road, 2-3 km, on soil in stream bed, with *Marchantia polymorpha* and *Pellia endiviifolia*. 581 m, 36° 29. 867' N 30° 04. 921' E, South, 27.11.2004. (C12/80-103, C12/81-104, C12/82-105, C12/93-148).

Distribution in Turkey: A2, A4, B6, C11

### 20. *Fossombronina pusilla* (L.) Nees, 1838

- **Antalya;** Altinyaka-Antalya road, 8-10 km from Antalya, on soil under *Quercus coccifera*, with *Targionia*

*hypophylla*, *Reboulia hemisphaerica*, *Lunularia cruciata*, *Pellia endiviifolia*, *Leicolea turbinata*, and *Southbya nigrella*. 541 m, 36° 28. 587' N 30° 20. 312' E, North-west, 15.11.2003. (C12/28-026).

- **Antalya;** Kemer, Kuzdere Village, Kesme Boğazi, on soil and rocks near stream, with *Southbya tophaceae*. 140 m, 36° 36. 064' N 30° 28. 922' E, West, 16.11.2003. (C12/14-023, C12/39-033).

- **Antalya;** Çıralı, Yanartaş (Chimera) road, 1-1.5 km, on soil banks near road, with *Anthoceros punctatus*, *Oxymitra incrassata*, *Riccia ciliata*, *Petalophyllum ralfsii*, *Southbya tophaceae*, and *Cephaloziella hampeana*. 28 m, 36° 25. 779' N 30° 27. 739' E, North, 16.11.2003. (C12/44-034, C12/46-036, C12/50-039).

- **Antalya;** Finike, Finike-Elmalı road, 2-3 km, on soil banks and rocks, with *Targionia hypophylla*, *Lunularia cruciata*, and *Fossombronina angulosa*. 33 m, 36° 24. 329' N 30° 08. 901' E, South-east, 28.11.2004. (C12/81-104, C12/95-150).

Distribution in Turkey: A1, A2, A3, A4, B6, C11, C12

### 21. *Petalophyllum ralfsii* (Wilson) Nees & Gottsche, 1844

- **Antalya;** Kemer, Olympos Archaic City Ruins road, 1-2 km, on soil under *Pinus brutia*, with *Oxymitra incrassata*, *Riccia michelii*, and *Fossombronina angulosa*. 45 m, 36° 23. 118' N 30° 27. 548' E, North, 15.11.2003. (C12/30-028, C12/32-029).

- **Antalya;** Between Kemer and Çıralı, Ulupınar Village, on soil near road, 2-3 km, with *Lunularia cruciata* and *Fossombronina pusilla*. 250 m, 36° 27. 640' N 30° 26. 032' E, 20.03.2004. (C12/44-034, C12/46-036, C12/49-039).

Distribution in Turkey: B6, C11, C12

## JUNGERMANNIALES

### Lophoziaceae

### 22. *Leicolea turbinata* (Raddi) H.Buch, 1937

- **Antalya;** Altinyaka-Antalya road, 8-10 km from Antalya, on soil under *Quercus coccifera* near road, with *Targionia hypophylla*, *Reboulia hemisphaerica*, *Lunularia cruciata*, *Fossombronina pusilla*, *Pellia endiviifolia*, and *Southbya nigrella*. 541 m, 36° 28. 587' N 30° 20. 312'

E, North-west, 15.11.2003. (C12/28-026, C12/29-027).

- **Antalya;** Kemer, Çıralı road, 5-6 km, on soil near stream, with *Asterella gracilis*, *Lunularia cruciata*, *Riccia sorocarpa*, and *Southbya tophaceae*. 42 m, 36° 25. 388' N 30° 27. 136' E, North-west, 20.03.2004. (C12/49-039, C12/50-039).

- **Antalya;** Saklıkent TÜBİTAK National Observatory road, Doyran Village, in stream bed, with *Fossombronia pusilla*. 68 m, 36° 53. 864' N 30° 31. 711' E, North, 27.11.2004. (C12/74-095).

Distribution in Turkey: B6, C11, C12

### Jungermanniaceae

#### 23. *Jungermannia atrovirens* Dumortier, 1831

- **Antalya;** Altinyaka, Büyükalan, Alakır Valley, Karaağaç, Şelale, on wet rocks near spring, epilithic, with *Targionia hypophylla*, *Reboulia hemisphaerica*, *Porella cordaeana*, and *Porella platyphylla*. 1140 m, 36° 41. 030' N 30° 19. 020' E, West, 30.04.2004. (C12/72-061).

Distribution in Turkey: A4, C11, C12

### Arnelliaceae

#### 24. *Southbya nigrella* (De Not.) Henriq., 1887

- **Antalya;** Kemer, Kesme Boğazi, on soil covered rocks in stream bed, epilithic. 580 m, 36° 36. 875' N 30° 27. 477' E, North-east, 15.11.2003. (C12/18-023).

- **Antalya;** Between Altinyaka and Antalya, 10 km from Antalya, on soil bank near road, with *Targionia hypophylla*, *Reboulia hemisphaerica*, *Lunularia cruciata*, *Pellia endiviifolia*, *Fossombronia pusilla*, and *Leicolea turbinata*. 544 m, 36° 27. 877' N 30° 20. 262' E, North-west, 15.11.2003. (C12/29-027).

- **Antalya;** Çıralı, Çıralı road, 3-4 km, on rocks near road. 195 m, 36° 29. 600' N 30° 19. 450' E, East, 30.04.2004. (C12/65-054).

- **Antalya;** Finike, Finike-Elmalı road, Yalnız Village, on soil banks in stream bed, with *Targionia hypophylla*, *Lunularia cruciata*, *Fossombronia angulosa*, and *Calypogeia fissa*. 273 m, 36° 28. 509' N 30° 06. 269' E, North-west, 28.11.2004. (C12/82-105).

Distribution in Turkey: B6, C11, C12

#### 25. *Southbya tophaceae* (Spruce) Spruce, 1849

- **Antalya;** Kemer, Çıralı road, 4-5 km, on soil banks near road, with *Phaeoceros laevis* and *Lunularia cruciata*. 65 m, 36° 25. 510' N 30° 26. 812' E, South-west, 20.03.2004. (C12/39-033, C12/44-034, C12/48-038, C12/50-039).

- **Antalya;** Düzlerçamı, Düzlerçamı picnic area, on rocks near road, with *Reboulia hemisphaerica*. 270 m, 36° 58. 572' N 30° 33. 764' E, East, 29.04.2004. (C12/63-052, C12/64-053).

- **Antalya;** Kumluca-Altinyaka road, 7 km, on soil near road, with *Sphaerocarpos texanus* and *Lunularia cruciata*. 300 m, 36° 28. 001' N 30° 20. 012' E, 30.04.2004. (C12/66-055).

Distribution in Turkey: B6, C11, C12

#### \* 26. *Gongylanthus ericetorum* (Raddi) Nees, 1836

- **Antalya;** Kemer, Çıralı road, 5-6 km, on soil bank near road. 56 m, 36° 25. 502' N 30° 26. 931' E, West, 20.03.2004. (C12/85-132).

Distribution in Turkey: C11

### Plagiochilaceae

#### \* 27. *Plagiochila porelloides* (Nees) Lindenb., 1840

- **Antalya;** Between Kemer and Çıralı, Ulupınar Village, Şelale, on rocks and soil banks near stream bed. 250 m, 36° 27. 440' N 30° 26. 032' E, 16.11.2003. (C12/45-035).

Distribution in Turkey: A1, A2, A3, A4, B6, B7, C11

### Geocalyceae

#### \* 28. *Lophocolea bidentata* (L.) Dumortier, 1835

- **Antalya;** Kumluca-Altinyaka road, 10 km, on rock and tree roots in stream bed, with *Lunularia cruciata*, *Metzgeria furcata*, and *Frullania tamarisci*. 500 m, 36° 29. 350' N 30° 19. 470' E, 30.04.2004. (C12/67-056).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B7

### Cephaloziellaceae

\* 29. *Cephaloziella hampeana* (Nees) Schiffner, 1903



- **Antalya**; Çıralı, Yanartaş (Chimera), on soil banks near road, 1-1.5 km, with *Anthoceros punctatus*, *Oxymitra incrassata*, *Riccia ciliata*, *Fossombronia pusilla*, *Petalophyllum ralfsii*, and *Southbya tophaceae*. 28 m, 36° 25. 779' N 30° 27. 739' E, North, 16.11.2003. (C12/44-034).

Distribution in Turkey: C11

#### Calypogeiaceae

\* **30. Calypogeia fissa** (L.) Raddi, 1818

- **Antalya**; Finike, Finike-Elmalı road, Yalnız Village, on soil bank near stream, with *Targionia hypophylla*, *Lunularia cruciata*, *Fossombronia angulosa*, and *Southbya nigrella*. 273 m, 36° 28. 509' N 30° 06. 269' E, North-west, 28.11.2004. (C12/82-105).

Distribution in Turkey: A1, A3, A4, B6

#### Radulaceae

\* **31. Radula complanata** (L.) Dumortier, 1831

- **Antalya**; Saklıkent TÜBİTAK National Observatory road, Doyran Village, on roots and bark of *Platanus orientalis* near Boyalı stream. 1193 m, 36° 53. 585' N 30° 22. 079' E, 27.11.2004. (C12/77-099).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, C11

#### Porellaceae

\* **32. Porella cordaeana** (Huebener) Moore, 1876

- **Antalya**; Kemer, Kesme Boğazı, on calcareous rock in stream bed, epilithic. 605 m and 580 m, 36° 36. 875' N 30° 27. 477' E, South-west and North, 15.11.2003. (C12/8-023, C12/10-023, C12/16-023, C12/19-023).

- **Antalya**; Altınyaka, Büyükalan Village, Alakır Stream Valley, Karaağaç, Şelale, on wet rocks, epilithic, with *Targionia hypophylla*, *Reboulia hemisphaerica*, *Jungermannia atrovirens*, and *Porella platyphylla*. 1140 m, 36° 41. 030' N 30° 19. 020' E, West, 30.04.2004. (C12/72-061).

Distribution in Turkey: A1, A2, A4, B6, B7, C11, C13

**33. Porella pinnata** L., 1753

- **Antalya**; Antalya-Altınyaka road, 9 km from Altınyaka, on rocks near road, epilithic. 1213 m, 36° 38. 286' N 30° 23. 640' E, North-west, (C12/24-024).

Distribution in Turkey: C12

**34. Porella platyphylla** (L.) Pfeiff., 1855

- **Antalya**; Kemer, Kesme Boğazı, on rocks in stream bed, epilithic. 605 m and 580 m, 36° 36. 875' N 30° 27. 477' E, North, 15.11.2003. (C12/8-023, C12/15-023, C12/16-023, C12/21-023).

- **Antalya**; Antalya-Altınyaka road, Hisarçandır, on bark of *Platanus orientalis* in stream bed, epiphytic. 782 m, 36° 46. 525' N 30° 28. 598' E, North, 16.11.2003. (C12/23-024, C12/34-030, C12/69-058).

- **Antalya**; Termessos National Park, on walls of the archaic city ruins. 853 m, 36° 59. 248' N 30° 28. 098' E, 21.03.2004. (C12/60-049).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, B7, C11, C12, C13

#### Frullaniaceae

**35. Frullania dilatata** (L.) Dumortier, 1835

- **Antalya**; Kemer, Kuzdere Village, Kesme Boğazı, on branches of *Myrtus communis*, *Laurus nobilis* L., *Cupressus sempervirens* L., *Arbutus andrachne* L., and *Pistacia terebintus* L. near stream bed, epiphytic. 125 m, 36° 36. 125' N 30° 28. 998' E, North-east, 15.11.2003. (C12/2, 3, 5, 6-022, C12/9, 17, 19, 20-023, C12/43-033).

Distribution in Turkey: A1, A2, A3, A4, A5, B6, C11, C12

\* **36. Frullania tamarisci** (L.) Dumortier, 1835

- **Antalya**; Kumluca-Altınyaka road, 10 km, on rocks and tree roots in stream bed, with *Lunularia cruciata*, *Metzgeria furcata* and *Lophocolea bidentata*. 500 m, 36° 29. 350' N 30° 19. 470' E, 30.04.2004. (C12/67-056).

Distribution in Turkey: A1, A2, A3, A4, B6, C13

#### Lejeuneaceae

\* **37. Lejeunea lamacerina** (Steph.) Schiffner, 1902

- **Antalya**; Saklıkent TÜBİTAK National Observatory road, Doyran Village, Turgut İni, on walls near road. 992 m, 36° 53. 962' N 30° 20. 768' E, 27.11.2004. (C12/75-096).

Distribution in Turkey: A1, A2, A3, A4, B6, C11

In the present investigation, 37 species belonging to the division *Bryophyta* were collected from Antalya, which is included in the C12 grid square of the Henderson system (1961). The results of the study show that 2 species belong to 1 family of *Anthocerotopsida* and 35 species belong to 23 families of *Marchantiopsida*. For grid square C12, 14 species (*Sphaerocarpos texanus*, *Asterella gracilis*, *Riccia ciliata*, *Riccia glauca*,

*Fossombronia angulosa*, *Gongylanthus ericetorum*, *Plagiochila porelloides*, *Lophocolea bidentata*, *Cephaloziella hampeana*, *Calypogeia fissa*, *Radula complanata*, *Porella cordaeana*, *Frullania tamarisci*, and *Lejeunea lamacerina*) are new records. As a result of our study, the number of species increased from 27 to 41 for square C12.

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