The Bryophyte Flora of Yenice Forests (Karabük, Turkey)

1Güray Uyar, 1Mevlüt Alataş, 1Muhammet Ören and 2Tamer Keçeli
1Department of Biology, Faculty of Sciences and Arts, Zonguldak Karaelmas University,
Zonguldak, Turkey
2Department of Biology, Faculty of Sciences and Arts, Kırıkkale University, Kırıkkale, Turkey

Abstract: This study presents a survey on bryophyte flora of Yenice Forests (Karabük, Turkey). One hundred seventy three bryophyte taxa (18 liverworts and 155 mosses) belonging to 47 families and 99 genera were recorded from the area. Among them, 10 taxa were defined as new records for the A2 grid-square in the grid system adopted by Henderson. In the floristic list, all taxa with their Turkey distributions, which are determined by reviewing the related all literature, are given. In addition, some aspects of their ecology are discussed.

Key words: Bryophyte flora, Yenice Forests, Turkey

INTRODUCTION

Turkey is one of the richest countries in terms of biodiversity in the temperate zone as situated on a crossroad between Europe and Asia, giving a unique geographic position to the country.

Although the investigations of Pteridophyta and Spermatophyta in Turkey have been thoroughly researched in 11 volumes, the studies on Bryophyta are still continuing. The studies on bryophytes of western Black Sea region can be divided into two periods in terms of their conductors and realization times. The first is from 1860 to 1979 and the second is from 1985 to date. The second period of studies was mostly performed by native bryologists. Although a few researchers have studied on the bryophyte flora in Western Black Sea region of Turkey, (Çetin and Yurdakulu, 1985, 1986, 1988; Keçeli and Çetin, 2000; Uyar and Çetin, 2001; Çetin et al., 2002; Abay and Çetin, 2003; Uyar, 2003; Keçeli and Çetin, 2006; Uyar and Çetin, 2006), no detailed study has yet been made on the Bryophyte flora of Yenice Forests (Karabük) which was chosen as the study area.

Our main aim in this study was to determine the bryophyte flora of the Yenice forests and to provide more data about Turkish bryophytes.

DESCRIPTION OF THE STUDY AREA

There are 9 forest hot spots of Turkey listed in the priority forest areas of Europe in terms of their richness in biodiversity and under serious threat that need to be protected. This list was prepared within the context of Gifts to the Earth by The World Wide Fund for Nature (WWF) International (1997). The 9 forest hot spots are as follows: Küre Mountains, Istanbul Forests, İbradı-Akselk Forests, Amanos Mountains, Karçal Mountains, Dağlı Peninsula-Bozburun, Firtana Valley, Babadag and Yenice Forests. Among them, Küre Mountains was declared a national park in 2000. In 2002, another hot spot, the Karçal Mountains, provided a legal status for protection. Yenice Forests have two Nature Reserves in the area but these areas do not cover the whole area for complete protection. Therefore, there is a need for enlarging these protection areas including all the intact forests.

Yenice Forests are situated in western Black Sea region of Anatolia (including Karabük province). The study area is surrounded in the north by Bartın, in the north-west by Zonguldak, in the south by Bolu, in the east by Karabük. The altitude of the study area varies between 175 and 1999 meters. The region lies approximately at the latitude between 41°11'N and 41°03', longitude 32°19'E and 32°28'E. According to Henderson (1961), it belongs to the A2 grid-square (Fig. 1).

The common bedrock types in the study area are dolomitic limestone, sandstone and clay stone which belong to Mesozoic age. The common soil types in the region are brown forest, redzina and in patches terra fusca soils, which are the richest soils in organic matter (Koy and Muðurlug, 1989).

The study area is under the effect of a less rainy cool of the Mediterranean type of climate and it has a Central Mediterranean precipitation regime (Akman, 1999). The annual rainfall average is 720.96 mm and the annual average temperature is 13.5°C. The rainfall
regime is SSWA (Spring, Summer, Winter and Autumn) (DMGM, 2005). Due to the topographical features of the region, there exist some differences between the east and west parts with respect to climatic conditions. In the study area, at higher altitudes and in north-west faced localities such as Keltepe and Çıldere oceanic climate influence can be seen, nevertheless east and south-east faced localities as Karabük province are characterized by the less rainy cool of Mediterranean climatic type. The ombro-thermic climate diagram (Fig. 2) for Yenice was drawn using Gaussem’s method (Akman, 1999). As seen on the ombro-thermic climatic diagram, an arid period was not observed in Yenice.

The study area is included in the Euxine province of the Euro-Siberian floristic region (Zohary, 1973). The general vegetation in the study area is made up of forest and pseudomacchie. Forest vegetation is the most common formation type in this area. Pseudomacchie vegetation was distributed in the lower parts of the area (the location of Incidere and Şimişdere mix into Filvos River). The forest vegetation consists of mainly the following taxa: Fagus orientalis Lipsky, Carpinus betulus L., Alnus glutinosa (L.) Gaertner., Quercus cerris L., Q. hartwissiana Steven, Q. macranthera

The region is very interesting in terms of its rich biodiversity, natural structure and climate. These conditions encouraged us to conduct a study on the bryophytes. The localities, which were surveyed, were chosen to cover as many different biotopes and ecosystems and as many microhabitats and specific niches as possible.

**MATERIALS AND METHODS**

The materials for this study were collected during periodic field trips between 2002 and 2005 in different seasons. Materials are deposited in the herbarium of UYAR (Zonguldak).


The ecological characteristics such as, acidity, water requirements and necessity of light and life forms of bryophytes in the study area have been assessed using Dierken (2001) and Magdevra (1982) and also, they are given in the floristic list for each taxon. In addition, the status of the taxa for Turkey was determined by reviewing the related literature (Uyar and Çetin, 2004; Kürschner and Erdog, 2005).

The new taxa for the A2 grid square are indicated with an asterisk (*). In the florist list for each taxon, the numbers of the sites where they have been found are given, followed by the description of the habitat occupied in the study area. Table 1 lists the sites sampled, all of which belong to the study region.

For each taxon, only one collector number was given to avoid repetition in the floristic list. Thus, the same taxa collected from different localities were represented with the first collector number, i.e., *Platyhypnidium riparioides* (Hedw.) Dixon was collected from localities 5, 9, 10, 17, 30 and 38 was identified by the collector number ALATAS 28.

<table>
<thead>
<tr>
<th>Site No.</th>
<th>Altitude in metres above sea level (m)</th>
<th>Localities and geographic coordinates</th>
<th>Trees and some tall shrubs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1460 m</td>
<td>Sorgun, 41° 03' N - 032° 28' E</td>
<td>PS, PN, AB</td>
</tr>
<tr>
<td>2</td>
<td>1525 m</td>
<td>Sorgun, 41° 03' N - 032° 27' E</td>
<td>PS</td>
</tr>
<tr>
<td>3</td>
<td>1275 m</td>
<td>Sorgun, 41° 02' N - 032° 26' E</td>
<td>CB, FO, FO, TE, AP, QM</td>
</tr>
<tr>
<td>4</td>
<td>980 m</td>
<td>Kahalı, 41° 02' N - 032° 28' E</td>
<td>CB, FO, FLEUM</td>
</tr>
<tr>
<td>5</td>
<td>825 m</td>
<td>Meyri, 41° 03' N - 032° 24' E</td>
<td>CB, FO, CB</td>
</tr>
<tr>
<td>6</td>
<td>670 m</td>
<td>Şekermeye, 41° 04' N - 032° 23' E</td>
<td>AP, FE, AG, PS</td>
</tr>
<tr>
<td>7</td>
<td>175 m</td>
<td>Şeker, 41° 11' N - 032° 22' E</td>
<td>CB, AP, BS</td>
</tr>
<tr>
<td>8</td>
<td>180 m</td>
<td>Şeker, 41° 11' N - 032° 20' E</td>
<td>PO, AG, JO</td>
</tr>
<tr>
<td>9</td>
<td>2200 m</td>
<td>Şeker, 41° 11' N - 032° 20' E</td>
<td>AG, BS, FC, SA, PL</td>
</tr>
<tr>
<td>10</td>
<td>287 m</td>
<td>Yozgat village, 41° 10' N - 032° 21' E</td>
<td>QB, FO, SAU</td>
</tr>
<tr>
<td>11</td>
<td>315 m</td>
<td>Yozgat village, 41° 10' N - 032° 21' E</td>
<td>SA, PO, AG, EA</td>
</tr>
<tr>
<td>12</td>
<td>436 m</td>
<td>Fırıncı kaltı, 41° 09' N - 032° 21' E</td>
<td>FO, CB, UG</td>
</tr>
<tr>
<td>13</td>
<td>496 m</td>
<td>Fırıncı kaltı, 41° 09' N - 032° 21' E</td>
<td>CB, FO, FE, CA</td>
</tr>
<tr>
<td>14</td>
<td>528 m</td>
<td>Fırıncı kaltı, 41° 08' N - 032° 21' E</td>
<td>CB, FO, AT</td>
</tr>
<tr>
<td>15</td>
<td>416 m</td>
<td>Fırıncı kaltı, 41° 08' N - 032° 21' E</td>
<td>CB, BS, FE</td>
</tr>
<tr>
<td>16</td>
<td>450 m</td>
<td>Fırıncı kaltı, 41° 07' N - 032° 21' E</td>
<td>FE, CB</td>
</tr>
<tr>
<td>17</td>
<td>340 m</td>
<td>Fırıncı kaltı, 41° 07' N - 032° 16' E</td>
<td>FO, PN, AP, CB, AG, SA, FT, PE, CA</td>
</tr>
<tr>
<td>18</td>
<td>624 m</td>
<td>Başakayak, 41° 02' N - 032° 15' E</td>
<td>FO, PT, CB, AG, PN, UF, AP</td>
</tr>
<tr>
<td>19</td>
<td>1055 m</td>
<td>Yayağı, 40° 59' N - 032° 19' E</td>
<td>FO, CB, PN, AB, SA, FE, QM</td>
</tr>
<tr>
<td>20</td>
<td>918 m</td>
<td>Boyabat k., 41° 00' N - 032° 15' E</td>
<td>CB, FO, PT, AB, SA, QM</td>
</tr>
<tr>
<td>21</td>
<td>592 m</td>
<td>Turba, 41° 04' N - 032° 15' E</td>
<td>QP, PN, FE, AP</td>
</tr>
<tr>
<td>22</td>
<td>1412 m</td>
<td>Çifteler, 41° 02' N - 032° 28' E</td>
<td>PS, AB, FO</td>
</tr>
<tr>
<td>23</td>
<td>1414 m</td>
<td>Çifteler, 41° 02' N - 032° 28' E</td>
<td>AB, FO</td>
</tr>
<tr>
<td>24</td>
<td>1429 m</td>
<td>Çifteler, 41° 02' N - 032° 29' E</td>
<td>PS, AB, FO</td>
</tr>
<tr>
<td>Site No.</td>
<td>Altitude in metres above sea level (m)</td>
<td>Localities and geographic coordinates</td>
<td>Trees and some tall shrubs</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------</td>
<td>--------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>25</td>
<td>1385 m</td>
<td>Sorgan, 41° 03’ N - 032° 28’ E</td>
<td>Meadow</td>
</tr>
<tr>
<td>26</td>
<td>1324 m</td>
<td>Karin, 41° 03’ N - 032° 28’ E</td>
<td>PS, FN</td>
</tr>
<tr>
<td>27</td>
<td>1124 m</td>
<td>Karina, 41° 04’ N - 032° 29’ E</td>
<td>FO, PN, QM, AH, TR</td>
</tr>
<tr>
<td>28</td>
<td>860 m</td>
<td>Sipahi, 41° 00’ N - 032° 30’ E</td>
<td>PN, QP</td>
</tr>
<tr>
<td>29</td>
<td>165 m</td>
<td>Kayabikh, 41° 13’ N - 032° 11’ E</td>
<td>FO, PO, CB, PN, AG, QP</td>
</tr>
<tr>
<td>30</td>
<td>300 m</td>
<td>Kala, 41° 12’ N - 032° 10’ E</td>
<td>FO, PO, AG, PF</td>
</tr>
<tr>
<td>31</td>
<td>205 m</td>
<td>Kala, 41° 12’ N - 032° 11’ E</td>
<td>PN, AA, AU, QP</td>
</tr>
<tr>
<td>32</td>
<td>261 m</td>
<td>Kala, 41° 13’ N - 032° 10’ E</td>
<td>SD, PN, QP, FO, CM</td>
</tr>
<tr>
<td>33</td>
<td>451 m</td>
<td>Kala, 41° 13’ N - 032° 09’ E</td>
<td>PQ, PN, FO, CB,</td>
</tr>
<tr>
<td>34</td>
<td>495 m</td>
<td>Çeşme, 41° 12’ N - 032° 09’ E</td>
<td>FO, CB, OC, CA</td>
</tr>
<tr>
<td>35</td>
<td>580 m</td>
<td>Malas, 41° 12’ N - 032° 09’ E</td>
<td>QP, FO, CB, OC, CA, TR</td>
</tr>
<tr>
<td>36</td>
<td>355 m</td>
<td>Kabaalak, 41° 15’ N - 032° 09’ E</td>
<td>FO, CB, AP, PN, TA</td>
</tr>
<tr>
<td>37</td>
<td>121 m</td>
<td>Kabaalak, 41° 15’ N - 032° 09’ E</td>
<td>TA, AP, AG, FO</td>
</tr>
<tr>
<td>38</td>
<td>1050 m</td>
<td>Keltpepe, 41° 06’ N - 032° 30’ E</td>
<td>PS, CA</td>
</tr>
<tr>
<td>39</td>
<td>1400 m</td>
<td>Keltpepe, 41° 06’ N - 032° 29’ E</td>
<td>AB, FO, CB</td>
</tr>
<tr>
<td>40</td>
<td>1350 m</td>
<td>Keltpepe, 41° 05’ N - 032° 29’ E</td>
<td>PS, AB, FO</td>
</tr>
<tr>
<td>41</td>
<td>1525 m</td>
<td>Keltpepe, 41° 04’ N - 032° 28’ E</td>
<td>PS, PN</td>
</tr>
<tr>
<td>42</td>
<td>1620 m</td>
<td>Keltpepe, 41° 05’ N - 032° 28’ E</td>
<td>Bare field</td>
</tr>
<tr>
<td>43</td>
<td>1780 m</td>
<td>Keltpepe, 41° 04’ N - 032° 27’ E</td>
<td>PS, AB</td>
</tr>
<tr>
<td>44</td>
<td>1840 m</td>
<td>Keltpepe, 41° 04’ N - 032° 27’ E</td>
<td>Bare field</td>
</tr>
<tr>
<td>45</td>
<td>1900 m</td>
<td>Keltpepe, 41° 05’ N - 032° 27’ E</td>
<td>JO</td>
</tr>
<tr>
<td>46</td>
<td>1950 m</td>
<td>Keltpepe, 41° 05’ N - 032° 27’ E</td>
<td>JO</td>
</tr>
<tr>
<td>47</td>
<td>1970 m</td>
<td>Keltpepe, 41° 04’ N - 032° 27’ E</td>
<td>AB</td>
</tr>
<tr>
<td>48</td>
<td>1720 m</td>
<td>Keltpepe, 41° 04’ N - 032° 27’ E</td>
<td>AB</td>
</tr>
<tr>
<td>49</td>
<td>1720 m</td>
<td>Keltpepe, 41° 04’ N - 032° 27’ E</td>
<td>AB</td>
</tr>
<tr>
<td>50</td>
<td>1540 m</td>
<td>Keltpepe, 41° 04’ N - 032° 26’ E</td>
<td>AB</td>
</tr>
<tr>
<td>51</td>
<td>1500 m</td>
<td>Keltpepe, 41° 04’ N - 032° 26’ E</td>
<td>PS</td>
</tr>
<tr>
<td>52</td>
<td>240 m</td>
<td>Keltpepe, 41° 11’ N - 032° 23’ E</td>
<td>Meadow</td>
</tr>
<tr>
<td>53</td>
<td>1200 m</td>
<td>Keltpepe, 41° 07’ N - 032° 23’ E</td>
<td>PN</td>
</tr>
<tr>
<td>54</td>
<td>1320 m</td>
<td>Keltpepe, 41° 07’ N - 032° 23’ E</td>
<td>PN</td>
</tr>
<tr>
<td>55</td>
<td>1450 m</td>
<td>Keltpepe, 41° 06’ N - 032° 24’ E</td>
<td>AB, PS</td>
</tr>
<tr>
<td>56</td>
<td>1500 m</td>
<td>Keltpepe, 41° 06’ N - 032° 24’ E</td>
<td>AB, PS</td>
</tr>
<tr>
<td>57</td>
<td>1560 m</td>
<td>Keltpepe, 41° 06’ N - 032° 25’ E</td>
<td>Bare field</td>
</tr>
<tr>
<td>58</td>
<td>1599 m</td>
<td>Keltpepe, 41° 05’ N - 032° 27’ E</td>
<td>Bare field</td>
</tr>
</tbody>
</table>

Floristic List

MARCHANTIOPSIDA

Conocephalaceae

*Conocephalum conicum* (L.) Dumort. - 3: on wet soil, 7: on rock, 9: stream bank, on soil and rocks TK3408.

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

Ecological features: Basiphyte, hygrophyte, sciophyte, mat.

Lunulariaceae

*Lunularia cruciata* (L.) Lindb. - 10: on soil, TK3431.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B9, C11, C12), Europe, Asia, Africa, C. and S. America, Australia, New Zealand.

Ecological features: Subneutrophyte, mesophyte, photophyte; mat.

Metzgeriaceae

*Metzgeria furcata* (L.) Dumort. - 5: on the bark of tree, 10: on the bark of tree, 11: on the bark of tree, associated with *Porella platyphylla*, 15: on the bark of tree, 18: on trees and on the bark of dead tree TK3415.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C12, C13), C. Europe, Asia, N. America, Faroe Islands, Japan.

Ecological features: Acidophyte, mesophyte, photophyte; mat.

Pelliaeeae

*Pellia endiviifolia* (Dicks.) Dumort. - 3: on wet soil, 8: on rock, 9: on rock, 13: on rock TK3404.

Distribution: Turkey (A1, A2, A3, A4, A6, B7, B9, C11, C12), C. Europe, N. America, Asia, N Africa.

Ecological features: Basiphyte, hygrophyte, photophyte; mat.
Jungermanniaceae
*Jungermannia atrovirens* Dumort. - 3: on soil, 3: stream bank, on rock, 8: on rock, TK3405.
Distribution: Turkey (A1, A4, C11, C12), Europe, Faroe Islands, N. America, Caucasus, Iceland, Japan, Greenland.
Ecological features: Basiphyte, hygrophyte, photophyte; short turf.

Plagiochilaceae
Distribution: Turkey (A1, A2, A3, A4, B6, B7, C11), Europe, Asia, N. Africa, N. America, Greenland.
Ecological features: Basiphyte, mesophyte, photophyte; tall turf.

Geocalycaceae
*Lophocolea bidentata* (L.) Dumort. - 9: stream bank, on rock, TK3427.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7) Europe, Asia, Africa, Australia, New Zealand, Faroe Islands.
Ecological features: Subneutrophyte, hygrophyte, photophyte; tall turf.

*Lophocolea heterophylla* (Schrad.) Dumort. 17: on the bark of dead tree, 20: on decayed log, TK3449.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7), Europe, Asia, N. Africa, America, Azores, Madeira, Canaries.
Ecological features: Subneutrophyte, mesophyte, sciophyte; mat.

*Chiloscyphus polyanthos* (L.) Corda - 16: stream bank, on rock, TK3446.
Distribution: Turkey (A1, A2, A4, A5, B6, C11), Europe, Asia, N. America, Faroe Islands, Iceland, Japan, Azores, Madeira, Tunisia.
Ecological features: Acidophyte, hygrophyte, sciophyte; mat.

Scapaniaceae
*Scapania verrucosa* Heeg - 9: near stream bank, on rock, TK3424.
Distribution: Turkey (A3, A4), Europe, Asia, Mexico.
Ecological features: Acidophyte, hygrophyte, photophyte; short turf.

Calypogeia
*Calypogea fissa* (L.) Rauch - 14: on rock, TK3441.
Distribution: Turkey (A1, A3, A4, B6), C. and N. Europe, Asia, Africa, N. America.
Ecological features: Acidophyte, hygrophyte, photophyte; mat.

Radulaceae
Distribution: Turkey (A1, A2, A3, A4, A5, B6, C11, C13), Africa, Asia, N. America, Japan, Azores, Madeira, Iceland, Greenland.
Ecological features: Subneutrophyte, hygrophyte, photophyte, mat.

Porellaceae
Distribution: Turkey (A2, A4, B6, C11), Europe, Asia, N. Africa, Faroe Islands, Iceland.
Ecological features: Basiphyte, xerophyte, sciophyte; mat.

*Porella platyphylla* (L.) Pfeiff. - 1: on the bark of tree, 2: on the bark of tree, 4: near the stream bank, on rock, 10: on the bark of tree, 11: on the bark of tree, together with *Metzgeria furcata*, 20: on rock, TK3401.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C12, C13), C. Europe, Asia, N. America, Greenland, Madeira.
Ecological features: Basiphyte, mesophyte, sciophyte, fan.

Fruillaniaceae
Ecological features: Acidophyte, mesophyte, sciophyte, weft.

*Fruillania dilatata* (L.) Dumort. - 1: on the bark of tree, 6: on the bark of tree, 10: on the bark of tree, 11: on the bark of tree, associated with *Radula complanata*, 12: on the bark of tree, TK3402.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, C11, C12, C13), Europe, Asia, N. Africa.
Ecological features: Acidophyte, xerophyte, photophyte, mat.

Lejeuneaceae
Distribution: Turkey (A1, A2, A3, A4, B6, B7, C11), Europe, Asia, N. America, Azores, Madeira, Canaries, Tenerife.
Ecological features: Subneutrophyte, mesophyte, sciophyte, mat.
Distribution: Turkey (A4), Europe, Asia, Faroe Islands, Madeira, Azores.
Ecological features: Subneutrophyte, hygrophyte, scioiphyte, mat.

**BRYOPSIDA**

**BRYOPSIDA**

**Polytrichaceae**
*Atrichum undulatum* (Hedw.) P. Beauv. - 17, 18, 22: on soil ALATAS 128.
Distribution: Turkey (A2, A3, A4, B6), Europe, Asia, N. America, N. Africa.
Ecological features: Acidophyte, mesophyte, scioiphyte, tall turf.

**Pogonatum aloides** (Hedw.) P. Beauv. - 19: on soil ALATAS 135, 56: ÖREN 201
Distribution: Turkey (A1, A2, A4), Europe, N. America.
Ecological features: Acidophyte, mesophyte, scioiphyte, short turf.

Distribution: Turkey (A1, A2, A3, A4, B6), Europe, Asia.
Ecological features: Acidophyte, mesophyte, scioiphyte, tall turf.

**Polytrichastrum formosum** (Hedw.) G. L. Sm. (Polytrichum formosum Hedw.) - 8: on rocks, 20: on soil ALATAS 119.
Distribution: Turkey (A1, A2, A4, A5), Europe, Iceland, Asia, N. America, S. Africa.
Ecological features: Acidophyte, mesophyte, scioiphyte, tall turf.

**Tetraphidaceae**
*Tetrathis pellucida* Hedw. - 18: on soil ALATAS 12.
Distribution: Turkey (A2, A4), Europe, Asia.
Ecological features: Acidophyte, mesophyte, scioiphyte, short turf.

**Buxbaumiaceae**
*Buxbaumia viridis* (DC.) Mouge. and Nestl. - 2: on stump, ALATAS 126.
Distribution: Turkey (A2), Europe, Asia, N. America.
Ecological features: Subneutrophyte, hygrophyte, scioiphyte, annual.

**Eucalyptaceae**
*Encalypta streptocarpa* Hedw. - 7, 50: on soil, 2, 18, 27 and 29: on rocks ALATAS 2; 54, 55: on soil, ÖREN 192.
Distribution: Turkey (A1, A2, A3, B6, B7, C12), Europe, N. America, N. W. Asia.
Ecological features: Subneutrophyte, xerophyte, scioiphyte, tall turf.

**Funariaceae**
*Funaria hygrometrica* Hedw. - 8, 24: on soil, 10: on rocks, ALATAS 59.
Distribution: Turkey (A1, A2, A4, B6, C11, C12, C13, C14), Cosmopolitan.
Ecological features: Subneutrophyte, mesophyte, photophyte, annual.

**Grimmiaceae**
Ecological features: Acidophyte, xerophyte, photophyte, cushion.

*Grimmia dissimulata* E. Maier - 55: on shaded rocks, ÖREN 219.
Distribution: Turkey (A2, A4), Europe.
Ecological features: Acidophyte, xerophyte, photophyte, short turf.

*Grimmia ovalis* (Hedw.) Lindb. - 2, 8, 10, 25: on rocks, ALATAS 101.
Distribution: Turkey (A1, A2, A3, A5, B6, B7, B8, C11, C12, C13), Europe, Asia, N. Africa, N. America, Madera, Canaries.
Ecological features: Subneutrophyte, xerophyte, photophyte, cushion.

*Grimmia pulvinata* (Hedw.) Sm. - 38: on soil, 2, 10, 17, 24 and 25: on rocks, ALATAS 23, 53: on rocks, ÖREN 204.
Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, B9, C11, C12, C13, C14), Cosmopolitan.
Ecological features: Basiphyte, xerophyte, photophyte, cushion.

*Grimmia trichophylla* Grev. - 33: on soil, ALATAS 15.
Distribution: Turkey (A1, A2, A3, A4, B6, B7, C11, C12, C13, C14), Cosmopolitan.
Ecological features: Subneutrophyte, xerophyte, photophyte, cushion.

*Racemium canescens* (Hedw.) Brid. - 29, 30: on rocks, ALATAS 133.
Distribution: Turkey (A1, A2, A4), Europe, America, N. and W. Asia, Japan.
Ecological features: Subneutrophyte, xerophyte, photophyte, tall turf.

*Schistidium apocarpum* (Hedw.) Bruch and Schimp. - 2, 24, 27, 38, 40, 51: on rocks ALATAS 16; 55: on soil, ÖREN 197.
Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, C11, C12, C13, C14), Europe, Asia.
Ecological features: Acidophyte, xerophyte, photophyte, tall turf.

*Schistidium atrofuscum* (Schimp.) Limpr. (S. apocarpum var. atrofuscum (Schimp.) C.E.O Jensen) - 53: on rocks, ÖREN 212.
Distribution: Turkey (A2, B6, B8, C11), Europe, N. America. 
Ecological features: Basiphyte, xerophyte, photophyte, cushion. 

_Schistidium conformum_ (Funck) Bruch and Schimp. (S. apocarpum var. conformum (Funck) H. Möller) - 29, 17: on rocks, ALATAS 142, 53, 55 and 56: on rocks, ÖREN 185. 
Distribution: Turkey (A2, A4, B6, B8, B9, C13, C14), N. Europe, Caucasus, China, N. America, Greenland. 
Ecological features: Subneutrophic, xerophyte, photophyte, cushion.

_Fissidentaceae_ 

_Fissidens viridulus_ (Sw. ex anon.) Wahlenb. (F. bambergeri Milde.) - 7: on rocks, ALATAS 100. 
Distribution: Turkey (A1, A2, B6, C11, C13), Europe, Asia, N. America, N. Africa. 
Ecological features: Subneutrophyte, mesophyte, sciophyte, short turf. 

_Fissidens bryoides_ Hedw. - 7: on soil, ALATAS 99. 
Distribution: Turkey (A1, A2, B6, C1), Europe, Asia. 
Ecological features: Subneutrophyte, hygrophyte, sciophyte, short turf. 

Distribution: Turkey (A1, A2, A4, B6), Asia, N. Africa, N. and C. America. 
Ecological features: Subneutrophyte, mesophyte, sciophyte, short turf. 

_Fissidens virularis_ (Spruce) Schimp. - 36: on wet rocks, ALATAS 123. 
Distribution: Turkey (A2, B6, C11), Europe, E. Asia, N. Africa, Australia. 
Ecological features: Subneutrophyte, hygrophyte, sciophyte, short turf. 

*Fissidens serrulatus* Brid. - 1: on rocks in stream, ALATAS 78. 
Distribution: Turkey (A1, A4), Europe, Africa. 
Ecological features: Subneutrophyte, hygrophyte, sciophyte, short turf. 

_Ditrichaceae_ 

_Ceratodon purpureus_ (Hedw.) Brid. - 19: on soil, ALATAS 118. 
Distribution: Turkey (A1, A2, A4, A5, B6, B7, B8, C14), N. Europe, Asia, Japan, N. America. 
Ecological features: Subneutrophyte, mesophyte, sciophyte, short turf. 

_Ecological features: Subneutrophyte, mesophyte, photophyte, short turf. 
_Ditrichum flexicaule_ (Schwägr.) Hampe - 53, 56: on soil, ÖREN 182. 
Distribution: Turkey (A2, A4, B7, B8, C12), Europe, Asia, N. America, Greenland. 
Ecological features: Subneutrophyte, xerophyte, photophyte, tall turf. 

_Ditrichum heteromallum_ (Hedw.) E. Britton - 5, 8: on soil ALATAS 113; 57: on stump, ÖREN 200. 
Distribution: Turkey (A1, A2) Europe, N. America. 
Ecological features: Acidophyte, hygrophyte, photophyte, short turf. 

_Ditrichum pallidum_ (Hedw.) Hampe - 39: on bark, ALATAS 38. 
Distribution: Turkey (A2), Europe, Asia, Africa. 
Ecological features: Acidophyte, mesophyte, sciophyte, short turf. 

* _Ditrichum subulatum_ Hampe - 6: on rocks, 23: on soil near stream bed, ALATAS 54. 
Distribution: Turkey (B6), Europe, Asia, Africa. 
Ecological features: Acidophyte, mesophyte, sciophyte, short turf. 

_Trichodon cylindricus_ (Hedw.) Schimp. (Ditrichum cylindricum (Hedw.) Grout) - 1, 10: on rocks, ALATAS 66. 
Distribution: Turkey (A2, B8), Europe, N. America, N. Asia, Japan, New Zealand. 
Ecological features: Subneutrophyte, mesophyte, sciophyte, short turf. 

_Dicranaceae_ 

_Dicranella heteromallla_ (Hedw.) Schimp. - 9: on calcareous rocks, ALATAS 116. 
Distribution: Turkey (A1, A2, A3, B6), Europe, N. America, N. Asia. 
Ecological features: Acidophyte, mesophyte, photophyte, tall turf. 

_Dicranella varia_ (Hedw.) Schimp. - 5: on wet soil on rocks ALATAS 95; 52: on rocks near stream bed, ÖREN 215. 
Distribution: Turkey (A1, A2, A3, A4, B6, C11, C12), Europe, Asia. 
Ecological features: Basiphyte, hygrophyte, photophyte, short turf. 

_Dicranum fusescens_ Sm. - 2: on rocks, ALATAS 106. 
Distribution: Turkey (A2, A4), Europe, Asia. 
Ecological features: Acidophyte, mesophyte, photophyte, tall turf. 

_Dicranum majus_ Sm. - 39, 50: on bark, 20: on soil, ALATAS 43. 
Distribution: Turkey (A1, A2, A3, A4, A5, C13), Europe, N. America, Iceland, Asia, Japan. 
Ecological features: Acidophyte, mesophyte, sciophyte, tall turf. 

135

Distribution: Turkey (A1, A2, A3, A4, A5, B6), Europe, America, New Zealand.

Ecological features: Acidophyte, mesophyte, photophyte, tall turf.

**Dicranum tauricum** Sajfegen - 2, 3 and 22: on bark ALATAS 114; 56: on bark, ÖREN 196.

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

Ecological features: Acidophyte, mesophyte, photophyte, tall turf.

**Leucobryaceae**

*Dicranodontium demidatum* (Brid.) E.Britton. - 2: on stump, ALATAS 94

Distribution: Turkey (A4), Europe, Asia.

Ecological features: Acidophyte, mesophyte, photophyte, tall turf.

**Pottiaceae**


Distribution: Turkey (A1, A2, A4, B6, C11, C12, C13), Europe, Asia, America, Africa.

Ecological features: Basiphyte, hygrophyte, sciphyte, cushion.

*Gyroweisia tenuis* (Schrad. ex Hedw.) Schimp. - 5: on wet rocks, ALATAS 109.

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

Ecological features: Basiphyte, hygrophyte, sciphyte, cushion.

**Pleurochaete squarrosa** (Brid.) Lindb. - 8: on soil, ALATAS 14.

Distribution: Turkey (A2, B6, C11, C13), Europe, Asia, Africa, N. America.

Ecological features: Basiphyte, xerophyte, photophyte, short turf.

**Weissia controversa** Hedw. - 38: on bark, 18: on rocks, 31: on soil, ALATAS 37.

Distribution: Turkey (A2, A4, B6, C11), Europe, N. and C. Amerika, India, New Zealand.

Ecological features: Subneuotrophyte, xerophyte, photophyte, short turf.

**Weissia controversa var. crispata** (Nees and Hornsch.) Nyholm - 21: on soil, ALATAS 120; 54: on rocks, ÖREN 216.

Distribution: Turkey (A2, A4, B6, C11), Europe, N. and C. Amerika, Asia, New Zealand.

Ecological features: Subneuotrophyte, xerophyte, photophyte, short turf.

**Barbula convoluta** Hedw. - 8: on soil, 17, 37: on rocks, ALATAS 82.

Distribution: Turkey (A1, A2, A3, A4, B6, C11, C12, C13), Europe, Asia.

Ecological features: Basiphyte, mesophyte, photophyte, short turf.

**Bryoerythrophyllum recurvirostrum** (Hedw.) P.C.Chen - 5: on rocks, ALATAS 88.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, B8, B9, C13, C15), Europe, Asia, N. and C. Africa, N. and C. America, Greenland.

Ecological features: Basiphyte, hygrophyte, sciphyte, cushion.

**Didymodon fallax** (Hedw.) R.H.Zander - 26: roadside on soil, ALATAS 48; 52: on rocks near stream bed, ÖREN 188.

Distribution: Turkey (A1, A2, A3, B6, B8, B10, C11, C13), Europe, Asia, N. America, N. Africa, Maderia.

Ecological features: Subneuotrophyte, mesophyte, photophyte, short turf.

**Didymodon forrigenius** (Schimp. ex Besch.) M.O.Hill - 6, 7: on wet soil, 10, 18: on rocks, ALATAS 61.

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

Ecological features: Basiphyte, hygrophyte, sciphyte, short turf.

**Didymodon nicholsonii** Culm. - 5: on rocks, ALATAS 108.

Distribution: Turkey (A2, A3), Europe.

Ecological features: Basiphyte, hygrophyte, photophyte, short turf.

**Didymodon tophaceous** (Brid.) Lisa - 52, 54: on rocks near water leakage, ÖREN 193.

Distribution: Turkey (A1, A2, A4, B6, C11, C12), Europe, Iceland, Asia, Africa, America, Canaries.

Ecological features: Basiphyte, hygrophyte, photophyte, short turf.

**Didymodon vinealis** (Brid.) R.H.Zander - 2, 5: on humid soil, 23: near stream bed on wet rocks, ALATAS105; 54: on rocks near water leakage, ÖREN 214.
Distribution: Turkey (A1, A2, A3, B6, B7, B8, B9, C11, C12, C13, C14) Europe, Iceland, Asia, N. Africa, America, Jamaica.

Ecological features: Subneutrophile, xerophyte, photophyte, short turf.


Distribution: Turkey (B6, C12, C13), Europe, N. America, N. Africa, Madeira, Canaries, Australia, New Zealand.

Ecological features: Subneutrophile, mesophyte, photophyte, short turf.

*Phascum cuspidatum* Hedw. - 56: on soil, ÖREN 180

Distribution: Turkey (A1, A2, B6, B7, C11), Europe, Asia, N. America, Madeira, Canaries.

Ecological features: Subneutrophile, mesophyte, photophyte, annual.

*Syntrichia norvegica* F.Weber - 19: on bark, ALATAS 127.

Distribution: Turkey (A1, A2, B9), Europe, N. Asia.

Ecological features: Acidophyte, mesophyte, photophyte, cushion.

*Syntrichia ruralis* (Hedw.) F.Weber and D.Mohr - 1, 5 and 43: on rocks, 2: on bark, ALATAS 9, 53, 56 and 58: on rocks, ÖREN 183.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, B9, B10, C11, C12, C13, C14, C15), Europe, Asia, Africa, Asia, N. America, Australia, Greenland.

Ecological features: Subneutrophile, mesophyte, photophyte, cushion.

*Tortula muralis* Hedw. - 10, 38: on rocks, 17, 5 and 10: on soil, ALATAS 17, 53: on rocks, ÖREN 218.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, B9, C12, C13, C14), Cosmopolitan.

Ecological features: Subneutrophile, mesophyte, photophyte, cushion.

*Tortula subulata* Hedw. (*Tortula subulata* Hedw. var. graeffii Warnst.) - 17, 39 and 50: on soil, 14: on rocks, 2: on bark, ALATAS 10: on soil, 53: on rocks, ÖREN 205.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, C11, C12, C13), Europe, N. America, Canaries, Madeira.

Ecological features: Subneutrophile, mesophyte, photophyte, short turf.

**Orthotrichaceae**

*Orthotrichum affine* Schrad. ex Brid. - 3, 14, 18, 19, 22: on bark, 2, 40: on rocks, ALATAS 36.

Distribution: Turkey (A1, A2, A3, B6, B8), C. Europe, N. America, N. W. Asia, N. Africa.

Ecological features: Subneutrophile, xerophyte, sciothophyte, cushion.

*Orthotrichum anomalum* Hedw. - 25: on soil and rocks ALATAS 43, 53: on rocks, ÖREN 186.

Distribution: Turkey (A1, A2, A3, A4, B6, B8, C11, C13), Asia, C. Europe, N. Africa, N. and C. America, Greenland.

*Orthotrichum cupulatum* Hoffm. ex Brid. - 26, 50: on rocks, ALATAS 19.

Distribution: Turkey (A1, A2, B6, B7, B8, B9, C11, C12, C13, C14, C15), Europe, Iceland, N. Asia, N. America, N. Africa, Australia, New Zealand.

Ecological features: Subneutrophile, xerophyte, photophyte, cushion.

*Orthotrichum diaphanum* Schrad. ex Brid. - 7, 37: on bark, 29: on rocks, ALATAS 64.

Distribution: Turkey (A1, A2, A3, A4, B6, B7), Europe, Asia, America, N. Africa, Madeira, Canaries.

Ecological features: Subneutrophile, xerophyte, photophyte, cushion.

*Orthotrichum lyelli* Hook. and Taylor - 1: on rocks, 22, 31: on bark, ALATAS 96.


Ecological features: Subneutrophile, mesophyte, photophyte, short turf.

*Orthotrichum rupestre* Schleich. ex Schwägr. - 38: on rocks ALATAS 32.


Ecological features: Acidophyte, xerophyte, photophyte, cushion.

*Orthotrichum speciosum* Nees - 53: on bark ÖREN 206.


Ecological features: Subneutrophile, mesophyte, photophyte, cushion.

*Uloa crispa* (Hedw.) Brid. - 18, 30, 36: on bark, 37: on rocks, ALATAS 137, 53, 56: on bark, ÖREN 181.

Distribution: Turkey (A2, A3, B6), Europe, N. and C. Asia, N. Africa, N. America, Madeira, Canary Island.

Ecological features: Subneutrophile, hygrophyte, photophyte, cushion.

**Hedwigiaceae**

*Hedwigia ciliata* (Hedw.) P. Beauv. - 33, 35: on rocks, ALATAS 131.

Distribution: Turkey (A1, A2, A4, A5, B6, B7, C11), Europe, N. Africa, Japan.

Ecological features: Acidophyte, xerophyte, photophyte, short turf.

**Bartramia**

*Bartramia portulacea* Hedw. - 20: on rocks, ALATAS 122.

Distribution: Turkey (A2, A4, B6), Europe, Asia.

Ecological features: Acidophyte, mesophyte, sciothophyte, short turf.
*Bartramia pomiformis* Hedw. - 11: on rocks, ALATAS 81.
Distribution: Turkey (A1, A4, A5, B6, C11, C14), Europe, Asia, N. America, New Zealand, Japan.
Ecological features: Acidophyte, mesophyte, sciophyte, cushion.

*Philonotis calcaria* (Bruch and Schimp.) Schimp. - 2: on wet soil, ALATAS 89.
Distribution: Turkey (A2, A4, B7, B9, C10, C11, C13), Europe, Asia, Africa.
Ecological features: Basiphyte, hygrophyte, photophyte, tall turf.

*Philonotis fontana* (Hedw.) Brid. - 10: on rocks near stream bed, ALATAS 52.
Distribution: Turkey (A2, A4, B6, B7, B8, B9, B10), Europe, Asia, N. Africa, America, Greenland.
Ecological features: Subneutrophyte, hygrophyte, photophyte, tall turf.

**Bryaceae**

*Bryum alpinum* Huds. ex With. - 29: on sandy soil, ALATAS 132.
Distribution: Turkey (A2, B6, B7, B8, C11), Europe, Asia, America, C. and S. Africa, Madeira, Canaries.
Ecological features: Subneutrophyte, mesophyte, photophyte, tall turf.

*Bryum argenteum* Hedw. - 8: on rocks, 29: on sandy soil, ALATAS 92.
Distribution: Turkey (A1, A2, A4, A5, B6, B8, B9, C13, C14), Cosmopolitan.
Ecological features: Subneutrophyte, mesophyte, photophyte, short turf.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, B8, B9, C11, C13, C15), Cosmopolitan.
Ecological features: Subneutrophyte, mesophyte, photophyte, short turf.

*Bryum capillare* Hedw. - 38: on bark, 2, 8, 22, 29, 50: on soil, 1, 10, 17, 29: on rocks, ALATAS 35; 53, 56: on soil, ÖREN 213.
Distribution: Turkey (A1, A2, A4, A5, B6, B7, B8, B9, C11, C12, C13), Cosmopolitan.
Ecological features: Subneutrophyte, mesophyte, photophyte, cushion.

*Bryum milleformum* tur. - 53: on soil, ÖREN 217
Distribution: Turkey (A1, A2, A4, C11, C13, C14), Europe, S. Asia, N. Africa.
Ecological features: Subneutrophyte, mesophyte, photophyte, short turf.

*Bryum pallens* Sw. ex anón. - 52: on calcareous rocks near stream bed, ÖREN 194.

Eco features: Subneutrophyte, hygrophyte, photophyte, short turf.

*Bryum radiculatum* Brid. - 29: on sandy soil, ALATAS 73.
Distribution: Turkey (A1, A2, B6, C11), Europe, Asia, N. Africa, Madeira, Canaries, Japan.
Ecological features: Basiphyte, xerophyte, photophyte, cushion.

*Bryum torquescens* Bruch and Schimp. - 6: on water reservoir, 11: on rocks, ALATAS 57.
Distribution: Turkey (A1, A2, B6, B8, C11, C12), Europe, Asia, Africa, America, Australia, New Zealand.
Ecological features: Basiphyte, mesophyte, photophyte, short turf.

*Rhodobryum roseum* (Hedw.) Limpr. - 11, 18: on rocks ALATAS 91.
Distribution: Turkey (A2, A4), Europe, Asia, N. America.
Ecological features: Subneutrophyte, hygrophyte, sciophyte, dendirid.

**Mielichhoferiaceae**

Distribution: Turkey (A2, A4, B6, B10), Europe, Asia, America, Australia, Greenland.
Ecological features: Acidophyte, hygrophyte, photophyte, tall turf.

*Pohlia wahlenbergii* var. *calcarea* (Warnst.) E.F.Warb. - 5, 6: on soil, 30: on wet rocks, ALATAS 60.
Distribution: Turkey (A2, A3, C11, C12), Europe, Asia, America.
Ecological features: Basiphyte, hygrophyte, photophyte, short turf.

**Mniaceae**

Ecological features: Acidophyte, hygrophyte, sciophyte, tall turf.

*Mnium marginatum* (Dicks.) P.Beauv. - 50: on bark, 18: on rocks, ALATAS 42.
Ecological features: Subneutrophyte, hygrophyte, sciophyte, fan.

*Mnium stellare* Hedw. - 6: on soil, 23, 34: on rocks, 29: on bark, ALATAS 112.
Distribution: Turkey (A1, A2, A4), Europe, C. Asia, Japan, N. America.
Ecological features: Basiphyte, hygrophyte, sciophyte, tall turf.
Cinclidiaceae
*Rhizoclonium punctatum* (Hedw.) T.J.Kop. - 5, 16, 19, 23: on wet soil, ALATAS 30.
Distribution: Turkey (A1, A2, A3, A4, B6), C. Europe, Asia, N. America.
Ecological features: Subneutral, hygrophyte, scizophyte, tall turf.

Plagiommniaceae
*Plagiomnium affine* (Blandow ex Funck) T.J.Kop. - 16: on bark, 7, 8: on wet rocks, ALATAS 50.
Distribution: Turkey (A1, A2, A4, B6, B8), Europe, Asia.
Ecological features: Subneutral, hygrophyte, scizophyte, tall turf.

*Plagiomnium elatum* (Bruch and Schimp.) T.J.Kop. - 5, 16, 18, 22, 40, 50: on soil, 7: on bark, 34: on wet rocks, ALATAS 45.
Distribution: Turkey (A2, A3, A4), Europe.
Ecological features: Subneutral, hygrophyte, scizophyte, tall turf.

*Plagiomnium undulatum* (Hedw.) T.J.Kop. - 5, 8, 11, 18: on wet rocks, 19, 22, on humid soil, ALATAS 77.
Distribution: Turkey (A1, A2, A3, A4, B6, C13), Asia, N. and W. Africa, N. Europe, Japan.
Ecological features: Subneutral, hygrophyte, scizophyte, tall turf.

Amblystegiaceae
*Amblystegium confervoides* (Brid.) Schimp. - 13: on rocks, ALATAS 102.
Distribution: Turkey (A1, A2), Europe, Africa.
Ecological features: Subneutral, mesophyte, scizophyte, tall.

*Amblystegium serpens* (Hedw.) Schimp. - 32: on rocks, 40: on bark and soil, ALATAS 70.
Distribution: Turkey (A1, A2, A4, B7, B8, C11), Europe, N. America, C. Asia.
Ecological features: Acidophyte, hygrophyte, scizophyte, weft.

*Campyliadelphus chrysophyllus* (Brid.) R.S.Chopra (*Campylium chrysophyllum* (Brid.) Lange) Lange - 23: on soil ALATAS 140.
Distribution: Turkey (A2), Europe, Asia.
Ecological features: Subneutral, mesophyte, scizophyte, weft.

*Cratoneuron filicinum* (Hedw.) Spruce - 6, 16 and 37: on rocks near stream bed, 2, 17 and 25: on humid soil near stream bed, ALATAS 53, 52, 56: on calcareous rocks, ÖREN 179.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, B8, B9, B10, C11, C13, C15), Europe, Asia, America, Africa, New Zealand.
Ecological features: Basiphyte, hygrophyte, photophyte, weft.

*Cratoneuron filicinum* (Hedw.) Spruce var. *atrovirens* (Brid.) Ochyra - 50: on bark, 2, 23: on soil, 18: on calcareous rocks, ALATAS 44.
Distribution: Turkey (A1, A2, A4, B6, B7, B10, C11, C12), Europe, Asia, N. America, N. Africa.
Ecological features: Basiphyte, hygrophyte, photophyte, weft.

Distribution: Turkey (A2, A4, A5), Europe, Asia, America.
Ecological features: Acidophyte, hygrophyte, photophyte, mat.

*Hygrohypnum turidum* (Hedw.) Jern. - 10, 30 and 36: on wet rocks, 5: on wet soil, ALATAS 111.
Distribution: Turkey (A2, A4, B6), Europe, Asia, Japan, N. America.
Ecological features: Basiphyte, hydrophyte, photophyte, weft.

*Palusiella commutata* (Hedw.) Ochyra - 44: on calcareous rocks, water leakage, ÖREN 184.
Distribution: Turkey (A2, B7, B9, B10, C11, C13, C15), N. Europe, Asia, N. Africa, Japan.
Ecological features: Basiphyte, amphiphyte, photophyte, weft.

Distribution: Turkey (A1, A2, A4, A5), Europe, Asia, America, Greenland.
Ecological features: Subneutral, mesophyte, photophyte, tall turf.

Calliergonaceae
*Warnstorfia exannulata* (Schimp.) Loeske - 2: on rocks, ALATAS 84.
Distribution: Turkey (A1, A2, B6), Europe, N. America, Asia, Japan, New Zealand, Greenland.
Ecological features: Acidophyte, hygrophyte, photophyte, tall turf.

Leskeaceae
*Pseudoleskea catenulata* (Brid. ex Schrad.) Kindb. - 1: on rocks ALATAS 86.
Distribution: Turkey (A2, A3), Europe, Asia.
Ecological features: Basiphyte, xerophyte, photophyte, tall.

Thuinaceae
*Abietinella abietina* (Hedw.) M.Fleisch. (*Thuinium abietinum* (Hedw.) Schimp.) - 1, 47: on rocks, 1, 18: on soil, ALATAS 22.
Distribution: Turkey (A1, A2, A3, A4, B9), Europe, Asia, N. America, Greenland.
Ecological features: Subneutral, xerophyte, photophyte, weft.
Abietinella abietina (Hedw.) M.Fleisch. var. hystrixosa (Mitt.) Sakurai (Thuidium abietinum (Hedw.) Schimp. var. hystrixosa (Mitt.) Loeske and Lande ex Loeske) - 53: on soil, ÖREN 187.

Distribution: Turkey (A2, A3, A4, B9), Europe, Asia.
Ecological features: Subnuterophyte, xerophyte, photoephyte, weft.

Thuidium tamariscinum (Hedw.) Schimp. - 7: on bark, 11, 18: on soil, ALATAS 90.

Distribution: Turkey (A2, A3, A4, C13), Europe, N. and C. America, Japan.
Ecological features: Subnuterophyte, mesophyte, scioiphyte, weft.

Brachytheciaceae

Ecological features: Subnuterophyte, mesophyte, scioiphyte, weft.

Scurfiarium circinatum (Brid.) M. Fleisch. and Loeske - 29: on rocks, ALATAS 68.

Distribution: Turkey (A1, A2, A3, B6, B7, C11, C12, C13), Europe, Asia, Africa.
Ecological features: Basiphyte, xerophyte, scioiphyte, tail.

Eurhynchium striatum (Hedw.) Schimp. - 5, 7 and 34: on rocks, 2, 6: on soil, ALATAS 56.

Distribution: Turkey (A1, A2, A4, B6), Europe, Asia, Iceland, Japan.
Ecological features: Subnuterophyte, hygrophyte, scioiphyte, weft.

Platynium riparioides (Hedw.) Dixon - 5, 10, 17, 30 and 38: on rocks near stream bed, 9: on calcareous rocks, ALATAS 28.

Distribution: Turkey (A1, A2, A4, B5, B6, B8, B9, C11), Europe, Asia, America.
Ecological features: Basiphyte, amphiiphyte, scioiphyte, tail.

Rhyynchostegium confertum (Dicks.) Schimp. - 8: on soil, 5, 7, 16: on rocks, ALATAS 103.

Distribution: Turkey (A1, A3, A4, B6, C11), Europe, Asia, N. Africa, Madeira, Canaries.
Ecological features: Subnuterophyte, hygrophyte, scioiphyte, weft.


Distribution: Turkey (A2, B6, C12), Europe, Asia, N. Africa.
Ecological features: Subnuterophyte, xerophyte, scioiphyte, weft.

Rhyynchostegium murale (Hedw.) Schimp. - 7: on rocks, 30: on wet rocks, ALATAS 69.

Distribution: Turkey (A2, B6), Europe, N. Africa, Asia, Japan.
Ecological features: Subnuterophyte, mesophyte, scioiphyte, tail.

Rhyynchostegiella teneriffae (Mont.) Dirkse and Bouman - 32: on rocks ALATAS 125.

Distribution: Turkey (A2), Europe, N. Asia, N. Africa, Madeira, Canaries.
Ecological features: Subnuterophyte, hygrophyte, scioiphyte, weft.


Distribution: Turkey (A1, A2, A4, B6, B7, C11), C. Europe, N. Africa, Japan.
Ecological features: Subnuterophyte, mesophyte, scioiphyte, weft.


Distribution: Turkey (A1, A2, A3, B6), Europe, N. Africa.
Ecological features: Subnuterophyte, xerophyte, scioiphyte, weft.

Oxyrrhynchium schleicheri (R.Hedw.) Roll (Eurhynchium schleicheri (R. Hedw.) Jur.) - 10: on rocks, 5: on humid soil, ALATAS 63.

Distribution: Turkey (A1, B6, C11), Europe, Asia, Africa.
Ecological features: Subnuterophyte, hygrophyte, scioiphyte, weft.

Oxyrrhynchium speciosum (Br.) Warnst. (Eurhynchium speciosum (Br.) Jur.) - 10, 16: on soil, ALATAS 62.

Distribution: Turkey (A2, B6), Europe, Madeira, Azores, Canaries.
Ecological features: Subnuterophyte, hygrophyte, scioiphyte, weft.


Distribution: Turkey (A1, A2, A3, B6, B8, C11, C12), Europe, N. America, N. Asia.
Ecological features: Subnuterophyte, hygrophyte, scioiphyte, weft.

Sciuro-hyphum starkei (Br.) Ignatov and Huttunen (Brachythecium starkei (Br.) Schimp.) - 10: on soil, 5: on humid soil, ALATAS 87.

Distribution: Turkey (A1, A2, A4, B6) Europe, Asia, N. America, Japan.
Ecological features: Subnuterophyte, hygrophyte, photoephyte, weft.
Brachythecium albicans (Hedw.) Schimp. - 24: on rocks, ALATAS 121.
Ecological features: Subneutrophyte, mesophyte, photoiphyte, wet.

Brachythecium glareosum (Bruch ex Spruce) Schimp. - 10: on rocks, ALATAS 115; 56: on soil, ÖREN 198.
Ecological features: Subneutrophyte, mesophyte, photoiphyte, weft.

Brachythecium millecamum (Schimp.) Schimp. - 36: on rocks, ALATAS 139.
Ecological features: Subneutrophyte, hygrophyte, photoiphyte, weft.

Brachythecium rutabulum (Hedw.) Schimp. - 6: on water reservoir, ALATAS 65.
Distribution: Turkey (A2, A1, A3, A4, B6), Europe, Asia, N. America, Australia.
Ecological features: Subneutrophyte, hygrophyte, photoiphyte, scioiphyte, weft.

Brachythecium salebrosum (Hoff. ex F. Weber and D. Mohr) Schimp. - 59: on bark, ALATAS 47.
Distribution: Turkey (A2, B6, C13), Europe, Asia, N. America.
Ecological features: Acidophyte, mesophyte, photoiphyte, weft.

Distribution: Turkey (A2, B6), Europe, N. America.
Ecological features: Subneutrophyte, mesophyte, photoiphyte, weft.

Eurhynchiastrum pulchellum (Hedw.) Ignatov and Huttunen (Eurhynchiastrum pulchellum (Hedw.) Jenn.) - 5, 7: on rocks, ALATAS 49.
Distribution: Turkey (A1, A2, A4, B6, B8, B10), Europe, Asia, N. America, Japan.
Ecological features: Subneutrophyte, mesophyte, photoiphyte, scioiphyte, weft.

Brachytheciastrum velutinum (Hedw.) Ignatov and Huttunen (Brachytheciastrum velutinum (Hedw.) Schimp.) - 5, 39 and 40: on bark, 7: on rocks, 10, 19: on soil, ALATAS 4; 54: on decaying stump, ÖREN 203.
Distribution: Turkey (A1, A2, B6, C12), Europe, Asia, N. America.

Ecological features: Subneutrophyte, mesophyte, photoiphyte, scioiphyte, weft.

Homalotheicum lutescens (Hedw.) H. Rob. - 39: on bark, 40: on soil, 1, 50 and 51: on rocks, ALATAS 7; 56: on tree, 55: on rocks, ÖREN 191.
Distribution: Turkey (A1, A2, A3, B6, B7, C11, C12, C13), Europe, C. Asia, N. America.
Ecological features: Subneutrophyte, mesophyte, photoiphyte, scioiphyte, weft.

Homalotheicum lutescens (Hedw.) H. Rob. var. fallax (H. Phil.) Hedenäs and L. Soderstr. - 18: on rocks, ALATAS 130.
Distribution: Turkey (A1, A2, A4, B7, B10, C13), Europe.
Ecological features: Subneutrophyte, mesophyte, photoiphyte, scioiphyte, weft.

Campylophyllum calcareum (Crundw. and Nyholm) Hedenas (Campylophyllum calcareum (Crundw. and Nyholm) - 2, 17: on rocks, ALATAS 74.
Distribution: Turkey (A2), Europe.
Ecological features: Basiphyte, xerophyte, photoiphyte, weft.

Ctenidium molluscum (Hedw.) Mitt. - 2, 5, 6, 23 and 29: on rocks ALATAS 75.
Distribution: Turkey (A2, A3, A4, B6), Europe, Asia, N. America.
Ecological features: Subneutrophyte, hygrophyte, scioiphyte, weft.

Hypnum callithrix (Hedw.) Brid. - 39: on bark, ALATAS 39.
Distribution: Turkey (A2, A4), Europe, Asia, N. America, Japan.
Ecological features: Subneutrophyte, hygrophyte, scioiphyte, weft.

Hypnum cupressiforme (Hedw.) - 7, 12, 22, 24, 39 and 40: on bark, 7: on rocks, 9: on soil ALATAS 8.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C13), Cosmopolitan.
Ecological features: Subneutrophyte, xerophyte, photoiphyte, weft.
Int. J. Bot., 3 (2): 129-146, 2007

_Hylocomiaceae_

*Hypnum cupressiforme* Hedw. var. _lacunosum_ Brid. (*Hypnum lacunosum* (Brid.) Hoffm. ex Brid.) - 3: on soil, 1: on rocks ALATAS 83.

Distribution: Turkey (A1, A2, B6), Europe, C. America.

Ecological features: Basiphyte, xerophyte, photophyte, weft.


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

Ecological features: Acidophyte, hygrophyte, photophyte, weft.

_Pylaista polyantha_ (Hedw.) Schimp. - 3, 6, 11, 12: on rocks, 13: on bark, ALATAS 110.

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

Ecological features: Acidophyte, mesophyte, scophyte, weft.

_Taxiphyllum wissigillii_ (Garov.) Wijk and Margad. - 55: on rocks, UYAR 847.

Distribution: Turkey (A1, A2, A4), Europe, Iceland, Caucasus.

Ecological features: Basiphyte, hygrophyte, scophyte, mat.

**Pterigynandraceae**

_Heterocladium heteropterum_ (Brid.) Schimp. - 1: on rocks, ALATAS 76.

Distribution: Turkey (A2, A3, C11), Europe.

Ecological features: Subneutrophyte, mesophyte, scophyte, weft.


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

Ecological features: Subneutrophyte, mesophyte, scophyte, tail.

_Hylocomiaceae_

_Rhytiadiplas triquetrus_ (Hedw.) Warnst. - 23: on soil ALATAS 93.

Distribution: Turkey (A2, A3, A4, A5, B6), Europe, Asia, N. America, Japan.

Ecological features: Subneutrophyte, hygrophyte, scophyte, tail.

*Plagiotheciaceae*

_Herzogia seligeri_ (Brid.) Z.Iwats. - 50: on soil, 19, 22 and 39: on bark, ALATAS 5, 57: on bark, ÖREN 199.

Distribution: Turkey (A2, A3), Europe, N. America, Japan.

Ecological features: Subneutrophyte, mesophyte, scophyte, tail.


Distribution: Turkey (A1), Europe, Asia, America, New Zealand.

Ecological features: Acidophyte, hygrophyte, scophyte, mat.

*Plagiothecium latebricola* Schimp. - 40: on bark, ALATAS 46.

Distribution: Turkey (A4), Europe, Asia.

Ecological features: Acidophyte, hygrophyte, scophyte, mat.

_Plagiothecium nemorale_ (Mitt.) A. Jaeger - 34: on soil, ALATAS 138.


Ecological features: Subneutrophyte, hygrophyte, scophyte, mat.

**Pylaisiadelphaceae**

_Platygyrium repens_ (Brid.) Schimp. - 17: on bark, 18: on rocks, ALATAS 141.

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

Ecological features: Acidophyte, mesophyte, photophyte, mat.

**Sematophyllaceae**

_Sematophyllum demissum_ (Wilson ex Hedw.) Mitt. - 6: on rocks, ALATAS 117.


Ecological features: Acidophyte, hygrophyte, scophyte, mat.

**Leucodontaceae**

_Antirrhichia curtippendula_ (Timm ex Hedw.) Brid. - 11, 13, 35: on rocks, 17, 22: on bark, ALATAS 51.

Distribution: Turkey (A2, A3, A4, B6), Europe, C. and S. Africa.

Ecological features: Subneutrophyte, mesophyte, scophyte, tail.

_Leucodon sciroides_ (Hedw.) Schwägr. - 2, 3, 17, 40: on bark, ALATAS 31.

Distribution: Turkey (A1, A2, A3, A4, A5, B6, C11, C12, C13), Europe, Asia, Iceland.

Ecological features: Acidophyte, xerophyte, photophyte, tail.

**Neckeraceae**

_Neckera bessleri_ (Lobarz.) Jur. (Homalia besseri Lobarz.) - 55: on shaded rocks, ÖREN 220.

Distribution: Turkey (A2, B6, C12), Europe, Caucasus.

Ecological features: Subneutrophyte, xerophyte, scophyte, fan.
Neckera complanata (Hedw.) Huebener - 4, 5, 7, 13, 36, 40: on bark, 29: on soil near stream bed, ALATAS 25.
Ecological features: Subneotrophy, mesophyte, sciophyte, fan.

Neckera crispa Hedw. - 6: on soil near stream bed, 18: on rocks, ALATAS 71; 55: on shaded rocks, ÖREN 222.
Distribution: Turkey (A2, A3, A4, B6, C13), Europe, Asia.
Ecological features: Subneotrophy, mesophyte, sciophyte, fan.

Thamnobryum alopecurum (Hedw.) Gagnelee - 7: on bark, 6, 4: on rocks, ALATAS 58.
Distribution: Turkey (A1, A2, A4, B6, C12), Europe, Asia, N. America, N. Africa.
Ecological features: Subneotrophy, hygrophyte, sciophyte, fan.

Lembophyllaceae
Distribution: Turkey (A1, A2, A4, B6, C13), Europe, N. W. Asia.
Ecological features: Subneotrophy, mesophyte, sciophyte, fan.
Isotrichum myosuroides Brid. - 55: on shaded rocks, ÖREN 221.
Distribution: Turkey (A2, A3, A4, B6), Europe, Asia, Iceland.
Ecological features: Subneotrophy, mesophyte, sciophyte, fan.

Anomodontaceae
Anomodon attenuatus (Hedw.) Huebener - 4: on rocks, 13, 14, 17: on bark, ALATAS 80.
Ecological features: Subneotrophy, mesophyte, sciophyte, tail.
Anomodon viticulosus (Hedw.) Hook. and Taylor - 2, 3, 8, 18, 34: on rocks, 5, 13, 27, 36: on bark, ALATAS 79; 55: on shaded rocks, ÖREN 223.
Distribution: Turkey (A2, A3, A4, B6, C13), Europe, C. Asia, N. America.
Ecological features: Subneotrophy, mesophyte, sciophyte, tail.

RESULTS AND DISCUSSION

In this study, a total of 173 taxa belonging to the Bryopsida (155 taxa), Marchantopsida (18 taxa) were determined. According to the grid system described by Henderson (1961), the number of new records in the study area in the A2 square is 10. These species are, Lejeunea patens, Fissidens serrulatus, Ditrichum subulatum, Dicranodontium denneatum, Gyroweisia venus, Microzyum starkeanum, Bartramia pomiformis, Bryum pallens, Plagiocladus denticulatum var. obusfolium and Plagiothecium latebricola. Moreover, Bruckmannia viridis has indicated as a vulnerable species in Red Data Book of European Bryophytes (ECOB, 1995).

The richness of families in terms of species in the research area is given in Table 2. As it can be seen in the Table 2, Bruchylethiaceae is the richest family in the species. Pottiaceae, Amblystegiaceae, Bryaceae, Orthotrichaceae, Grimmiaceae, Hygrotrichaceae, Dicranaceae

<table>
<thead>
<tr>
<th>Table 2: The distribution of the taxa according to the families</th>
</tr>
</thead>
<tbody>
<tr>
<td>Families</td>
</tr>
<tr>
<td>Bruchylethiaceae</td>
</tr>
<tr>
<td>Pottiaceae</td>
</tr>
<tr>
<td>Amblystegiaceae</td>
</tr>
<tr>
<td>Bryaceae</td>
</tr>
<tr>
<td>Grimmiaceae</td>
</tr>
<tr>
<td>Hygrotrichaceae</td>
</tr>
<tr>
<td>Orthotrichaceae</td>
</tr>
<tr>
<td>Dicranaceae</td>
</tr>
<tr>
<td>Ditrichaceae</td>
</tr>
<tr>
<td>Fissidensaceae</td>
</tr>
<tr>
<td>Bartramaceae</td>
</tr>
<tr>
<td>Plagiocladaceae</td>
</tr>
<tr>
<td>Polytrichaceae</td>
</tr>
<tr>
<td>Neckerae</td>
</tr>
<tr>
<td>Greycalyaceae</td>
</tr>
<tr>
<td>Muscaceae</td>
</tr>
<tr>
<td>Plagiochilaceae</td>
</tr>
<tr>
<td>Thuidiaceae</td>
</tr>
<tr>
<td>Anomodontaceae</td>
</tr>
<tr>
<td>Feltliniaceae</td>
</tr>
<tr>
<td>Lejeuneaceae</td>
</tr>
<tr>
<td>Lembophyllaceae</td>
</tr>
<tr>
<td>Leucobryaceae</td>
</tr>
<tr>
<td>Melichroaceae</td>
</tr>
<tr>
<td>Porellaceae</td>
</tr>
<tr>
<td>Ptiliogynaceae</td>
</tr>
<tr>
<td>Buchbucharaceae</td>
</tr>
<tr>
<td>Calliergonaceae</td>
</tr>
<tr>
<td>Calypogonaceae</td>
</tr>
<tr>
<td>Cinclidaceae</td>
</tr>
<tr>
<td>Conocephalaceae</td>
</tr>
<tr>
<td>Encalyptaceae</td>
</tr>
<tr>
<td>Funariaceae</td>
</tr>
<tr>
<td>Hedwigaceae</td>
</tr>
<tr>
<td>Hylocomiaceae</td>
</tr>
<tr>
<td>Juncaginaceae</td>
</tr>
<tr>
<td>Leucobryaceae</td>
</tr>
<tr>
<td>Lunulariaceae</td>
</tr>
<tr>
<td>Metzgeraceae</td>
</tr>
<tr>
<td>Pleuroziaceae</td>
</tr>
<tr>
<td>Plagiochilaceae</td>
</tr>
<tr>
<td>Ptiliaceae</td>
</tr>
<tr>
<td>Radulaaceae</td>
</tr>
<tr>
<td>Scapaniaceae</td>
</tr>
<tr>
<td>Serratophyllaceae</td>
</tr>
<tr>
<td>Tetraphidaceae</td>
</tr>
<tr>
<td>Total: 47</td>
</tr>
</tbody>
</table>
and Mniaceae are other foremost components of the flora. These 9 families make up 64.2% of the total taxa in the study area and other 29 families constitute 35.8% (Table 2).

As might be expected from climate in this area, mesophytes mosses (41.6%) are dominant in the investigated area. These are followed by hygrophytes (36.4%) and then xerophytes (22%), others (2.3%) occurred in the region (Fig. 3).

According to the light availability in bryophytes in this region, with a majority of votes are photophyte (53%). The rest of taxa are sciophyte (47%).

The first preference of the bryophyte flora of the studied region is Subneutrophile in sequence Acidophyte and Basiphyte (Fig. 4).

Predominant life form is short turf (21.4%) and then in sequence weft (19.7%), tall turf (17.3%), mat (15.0%), cushion (13.3%), tail (6.4%), fan (4.6%), annual (1.7%) and dendroid (1.2%) (Fig. 5).

As a result the bryophytes in the life forms such as weft, mat, tail and fan are pleurocarpous species (45.44%) and other bryophyte life forms as short turf and cushion and the majority portion of tall turf are acrocarpous species (54.56%). Since acrocarpous species have quilled leaves and grow in cushion form, they can endure longer periods of heat and dryness better than pleurocarpous species. As for pleurocarpous bryophytes generally cover rocks or other substrata in more humid habitats. However, Thuidium abietinum, Hypnum cupressiforme and Homalothecium lutescens are common in all kinds of habitats because of their high tolerance to desiccation during the long dry season between May and October. Therefore, it is not a surprise that Brachytheciaceae and Pottiaceae have great species richness in this area. As acrocarpous found to be 55% in this area may be explained by transitional zone in the

Fig. 3: Groups of bryophyte affinity for humidity

Fig. 4: Preferential acidity of bryophytes in the study area

Fig. 5: Life forms among bryophytes in the study area

south of the area. Also forests are almost widespread whole parts of the study area; the high rate of pleurocarpous found in these areas is meaningful. These values indicate that the investigated area is sometimes dry, especially in southern parts of the area but it is relatively humid in its other parts.

ACKNOWLEDGMENTS

We would like to thank forest engineer Ahmet Şükrü Elbir for his help during the field studies.

REFERENCES


W.W.F. International, 1997. 100 European Forests We Should Protect Now (Map). W.C.M.C.