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Liverworts (Hepaticae) of Değirmenboğazı, Karakabaağaç, Başdeğirmendere Villages and Their Environs (Manyas, Balıkesir)

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ABSTRACT

The 36 liverwort specimens collected from Değirmenboğazı, Karakabaağaç, Başdeğirmendere villages and their environs, which were chosen as the research area, were evaluated. Totally 11 species belonging to 9 genera and 9 families were identified. Information concerning distributions, ecological properties and the importance of forest practices of species were given in the paper.

Key Words: Liverwort flora, Manyas, Balıkesir, Turkey

Değirmenboğazı Köyü ve Çevresinin (Manyas, Balıkesir) Ciğerotları (Hepaticae)

ÖZET

Araştırma alanı olarak seçilen Değirmenboğazı, Karakabaağaç, Başdeğirmendere köyleri ve çevresinden toplanan 36 ciğerotu örneği değerlendirilmiştir. 9 familyaya ve 9 cinse ait 11 tür belirlenmiştir. Bu makalede türlerin yayılışları, ekolojik özellikleri ve ormancılık uygulamalarındaki önemleri ile ilgili bilgiler verilmiştir.

Anahtar Kelimeler: Ciğerotu florası, Manyas, Balıkesir, Türkiye

1. INTRODUCTION

Hitherto, no detailed study has yet been conducted on the liverworts flora of the study area. Hovewer, the moss flora (Musci) of the aforementioned area was published by Abay and Ursavaş (1). Consequently, we have decided to carry out the liverwort flora of the district.

The investigated area belongs to B6 grid square according to the system adopted by Henderson (2). The research area is surrounded by Pırnallık to the north, Alanbaşı Hill (462 m) to the south, Manyas Dam Lake, Yayla Hill (355 m) and Yağlıpınar Hill (335 m) to the west, Kavaklı Cemetery to the east and Manyasderbendi Hill (436 m) to the south-east (Figure 1).

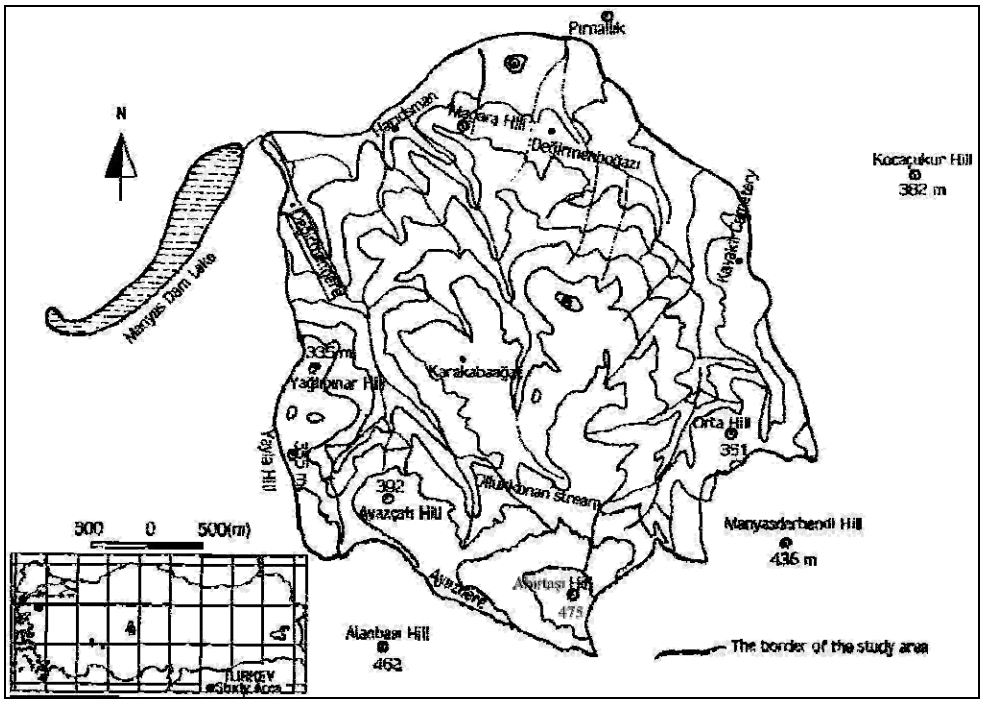

Figure 1. A map of the study area and the grid system adopted by Henderson for Turkey (1).

The study area is located in Southern Marmara Region and belongs to the Euro-Siberian floristic region. However, the existence of elements of Mediterranean origin as well in this area makes its floristic structure interesting. Woody taxa that are widespread in the area are connected with frequently seen tree and bush types. The forest vegetation consists of mainly some following taxa: *Carpinus betulus* L., *C. orientalis* Mill., *Fagus orientalis* Lipsky, *Alnus glutinosa* (L.) Gaertn., *Tilia tomentosa* Moench, *Acer campestre* L., *Quercus cerris* L., *Q. coccifera* L., *Myrtus communis* L., *Corylus avellana* L., *Populus nigra* L., *Ulmus glabra* Huds., *Arbutus*

andrachne L., *Ceratonia siliqua* L. Indeed, the Mediterranean type along the Marmara coasts, the Mediterranean and the Black Sea elements on southern Marmara coasts, damp forests on hillsides that are facing the northern parts of the mountains, and dry forests (*Quercus* spp.) on parts that are facing south are available (3).

The investigated area is under the effect of a less rainy variant of the Mediterranean type of climate and it has a Central Mediterranean precipitation regime (4).

2. MATERIALS AND METHODS

The materials of the study include 36 moss specimens collected during periodic field trips to the research area between dates on 16 May and 19 July 2004. The liverwort specimens were identified according to some floristic books (5-7). The plants list enumeration the nomenclature follows Grolle & Long (8). Author names of the plants were written according to Brummit & Powell (9). Distributions of species were given according to some references (10-14). Information concerning phytogeographical and ecological properties of species was given according to Mägdefrau (15) and Dierβen (16). Manyas and B6 grid square are not indicated in the localities for taxa to avoid repetition. In addition, collecting dates, vegetation, altitudes and coordinates were mentioned for the studied localities in Table 1, locality numbers, collector name, collector numbers and habitats were given for the specimens in the floristic list.

The liverwort specimens were deposited in the private collection of ABAY, Forest Botany Laboratory, Çankırı Faculty of Forestry, Ankara University.

Table 1. A list of the stations

Locality no	Collecting date	Latitude-longitude	Locality	Altitude (m)	Dominant plants of vegetation of the area
1	16.05.2004	N 39° 57' 899" E 27° 49' 687"	B6: in the vicinity of Karakabaağaç village	396	*Fagus orientalis, Carpinus orientalis*, *Corylus avellana, Quercus infectoria*
2	20.06.2004	N 39° 59' 755" E 27° 49' 817"	B6: Başdeğirmendere village	65	*Ulmus glabra, Juglans regia, Salix alba, Platanus orientalis*
3	20.06.2004	N 39° 58' 590" E 27° 48' 632"	B6: Karakabaağaç village, Değirmendere stream	186	*Fagus orientalis, Carpinus orientalis*, *Hedera helix*
4	20.06.2004	N 39° 58' 579" E 27° 48' 660"	B6: Sandallık Hill, on stream bed	309	*Fagus orientalis, Quercus infectoria, Carpinus betulus*
5	20.06.2004	N 39° 57' 373" E 27° 49' 498"	B6: Ayazdere Stream banks	420	*Fagus orientalis, Carpinus betulus, Quercus infectoria, Hedera helix*
6	20.06.2004	N 39° 57' 366" E 27° 49' 500"	B6: in the vicinity of Ayazdere Stream	453	*Fagus orientalis, Carpinus betulus, Quercus infectoria*
7	14.07.2004	N 39° 59' 846" E 27° 49' 586"	B6: Başdeğirmendere, around of trout farm, gipsy rocks	60	*Corylus avellana, Ulmus glabra, Platanus orientalis, Juglans regia*
8	14.07.2004	N 39° 59' 850" E 27° 49' 642"	B6: Başdeğirmendere, around of trout farm	62	*Alnus glutinosa, Platanus orientalis, Sambucus nigra, Ruscus aculeatus*
9	14.07.2004	N 39° 59' 740" E 27° 49' 469"	B6: northwest of Değirmenboğazı village, Mağara Hill slopes	75	*Carpinus orientalis*, *Styrax officinalis, Quercus cerris, Q. infectoria, Ruscus aculeatus*
10	14.07.2004	N 39° 59' 841" E 27° 49' 673"	B6: Başdeğirmendere, in the vicinity of trout farm	76	*Platanus orientalis, Styrax officinalis, Alnus glutinosa, Salix alba*
11	14.07.2004	N 39° 59' 723" E 27° 49' 449"	B6: northwest of Değirmenboğazı village, around of Mağara Hill	77	*Quercus infectoria, Carpinus orientalis*, *C. betulus, Ruscus aculeatus*
12	14.07.2004	N 39° 59' 772" E 27° 49' 517"	B6: Başdeğirmendere, around of trout farm	78	*Carpinus orientalis*, *Styrax officinalis, Quercus cerris, Q. infectoria, Ruscus aculeatus*
13	14.07.2004	N 39° 59' 740" E 27° 49' 612"	B6: in the vicinity of Başdeğirmendere	78	*Platanus orientalis, Styrax officinalis, Myrtus communis, Hedera helix*
14	14.07.2004	N 39° 59' 751" E 27° 49' 659"	B6: Başdeğirmendere, in the vicinity of trout farm	78	*Platanus orientalis, Styrax officinalis, Alnus glutinosa, Acer campestre, Cornus mas*
15	15.07.2004	N 39° 59' 956" E 27° 50' 300"	B6: Değirmenboğazı village, around of Suçıktı Stream	75	*Corylus avellana, Acer campestre, Carpinus orientalis*, *Styrax officinalis*

3. FLORISTIC LIST

PEL: Phytogeographical characterization; Ecological amplitude; Life form.
TK....: Tamer Keçeli & specimen number.

MARCHANTIOPSIDA (HEPATICAE)

Conocephalaceae Müll.Frib. ex Grolle
1. Conocephalum conicum (L.) Dumort. – 20: on soil, TK3600; 8: on wet rock, TK3630.
PEL: Mediterranean - arctic - circumpolar; basiphyt, hygrophyt, sciophyt; thalloid.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B8, C11, C12), Central and North Europe, North Russia, North Africa, Iceland, Siberia, Central, East and West Asia, Transcaucasus, India, China, Japan, Himalayas, Macaronesia, North America.

Lunulariaceae H.Klinggr.
2. Lunularia cruciata (L.) Lindb. – 7: on rock, TK3633.
PEL: Austral - tropical - boreal; subneutrophyt, mesophyt, photophyt; thalloid.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B9, C11, C12), Europe, Fennoscandia, Southwest Russia, Caucasus, Cyprus, Iran, Ethiopia, North, Central, East and South Africa, Macaronesia, North, Central and South America, Juan Fernandez, Australia, New Zealand.

Metzgeriaceae H. Klinggr.
3. Metzgeria furcata (L.) Dumort. – 3: on rock, TK3634; 6: on the bark of *Fagus orientalis*, TK3623; 9: on the bark of *Carpinus orientalis*, TK3605; 12: on the bark of *Carpinus orientalis*, TK3617, 19: on rock, TK3625¸17: on the bark of *Fagus orientalis*, TK3626.
PEL: Tropical - montane - alpine; acidophyt, mesophyt, photophyt; thalloid.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C12, C13), Central Europe, Faroes, Caucasus, Himalayas, Shensi, Japan, Korea, Tunisia, Ethiopia, Cameron, South Africa, Macaronesia, North America, West Indies, Chine, Southwest Asia Islands.

Pelliaceae H. Klinggr.
4. Pellia endiviifolia (Dicks.) Dumort. – 2: on rock, TK3632; 7: on rock, TK3615; 8: on wet soil, TK3631; 10: on soil, TK3621; 13: on rock, TK3620; 20: on soil, TK3601; 20: on rock near stream bank, TK3602.
PEL: Boreosubtropical - circumpolar; basiphyt, hygrophyt, photophyt; thalloid.

Distribution: Turkey (A1, A2, A3, A4, B6, B7, B9, C11, C12), Central Europe, Iceland, Caucasus, Japan, Korea, China, KamchaTKa, India, Morocco, Tunisia, Algeria, Madeira, western North America.

Geocalycaceae H. Klinggr.
5. Lophocolea heterophylla (Schrad.) Dumort. – 9: on soil, TK3611; 11: on soil, TK3614.
PEL: Boreosubtropical - montane - arctic - circumpolar; subneutrophyt, mesophyt, sciophyt; mats.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7), Europe, Russia, Siberia, Japan, Transcaucasus, West and East Asia, China, Mongolia, Himalayas, India, North Africa, Azores, Madeira, Canaries, North and South America.

Radulaceae (Dumort.) Müll.Frib.
6. Radula complanata (L.) Dumort. – 11: on the bark of *Carpinus orientalis*, TK3624; 12: on the bark of *Quercus infectoria*, TK3628; 14: on the bark of *Alnus glutinosa*, TK3603; 15: on rock, TK3608.
PEL: Boreosubtropical - montane - subarctic - circumpolar; subneutrophyt, hygrophyt, photophyt; mats.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, C11, C13), Europe, North and South Africa, Siberia, East and North Russia, Central, West and East Asia, Transcaucasus, East China, Mongolia, Sakhalin, Japan, Azores, Madeira, Tenerife, Iceland, Southwest and Northwest Pacific, North America, Mesoamerica, Greenland.

Porellaceae Cavers
7. Porella arboris-vitae (With.) Grolle – 4: on rock, TK3616.
PEL: Mediterranean - boreal; basiphyt, xerophyt, sciophyt; mats.
Distribution: Turkey (A2, A4, B6, C11), Central Europe, Fennoscandia, Faroes, Iceland, West and East Asia, Caucasus, China, North Africa, Macaronesia.
8. Porella cordaeana (Huebener) Moore – 19: on soil, TK3612.
PEL: Mediterranean - montane - boreal - disjunct - circumpolar; subneutrophyt, hygrophyt, sciophyt; mats.
Distribution: Turkey (A1, A2, A4, B6, B7, C11, C13), Europe, Fennoscandia, North Russia, Faroes, Iceland, Central and West Asia, Lebanon, China, Caucasus, North Africa, Madeira, Northwest America.
9. Porella platyphylla (L.) Pfeiff. – 5: on the bark of *Fagus orientalis*, TK3604; 6: on the bark of *Carpinus betulus*, TK3622.

PEL: Boreosubtropical - boreal - circumpolar; basiphyt, mesophyt, sciophyt; fans.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, B7, C11, C12, C13), Central Europe, North and Central Asia, Siberia, East Russia, Transcaucasus, West and East Asia, China, Mongolia, India, Madeira, North America, Greenland.

Frullaniaceae Lorch
10. Frullania dilatata (L.) Dumort. – 1: on the bark of *Fagus orientalis*, TK3606; 12: on the bark of *Carpinus orientalis*, TK3619; 14: on the bark of *Alnus glutinosa*, TK3627, 18: on the bark of *Fagus orientalis*, TK3607.
PEL: Boreosubtropical - montane - boreal; acidophyt, xerophyt, photophyt; comb form.
Distribution: Turkey (A1, A2, A3, A4, A5, B6, C11, C12, C13), Central Europe, Sweden, South Finland, North and East Russia, Central, East and West Asia, Transcaucasus, China, Mongolia, Cyprus, Iran, Siberia, Shensi, North Africa, Macaronesia.

Lejeuneaceae Casares-Gil
11. Lejeunea cavifolia (Ehrh.) Lindb. – 9: on soil, TK3610; 14: on soil, TK3618; 14: on the bark of *Alnus glutinosa*, TK3635; 15: on rock, TK3609; 16: on rock, TK3629.
PEL: Boreosubtropical- boreal- arctic- circumpolar; subneutrophyt, mesophyt, sciophyt; fans.
Distribution: Turkey (A1, A2, A3, A4, B6, B7, C11), Europe, Fennoscandia, North and East Russia, Faroes, Iceland, West and East Asia, Caucasus, Siberia, China, India, Tunisia, Algeria, Azores, Madeira, Canaries, Tenerife, North America.

4. RESULT AND DISCUSSION

In this study, 11 species belonging to 9 genera and 9 families were determined from liverwort specimens collected in Değirmenboğazı, Karakabaağaç and Başdeğirmendere villages and their environs in 2004. The study area stands between 56 and 475 m altitudes. If compared in terms of the surface measurement, these 36 liverwort specimens which were determined between these elevations are a considerable number.

Varieties of liverworts seen in the area may depend on the features below. The study area being close to the intersection point of the Marmara and Aegean regions. The area varies in terms of main rock kinds (granite, gneiss, mica-schist, limestone etc.). The area being rich in underground waters and the presence of running

streams in the area. The Manyas Dam, located close to the study area, creating a microclimate effect around itself. Because of the small variations among the elevations in the area, the humidity being able to move towards the inner zones. In the study area, the availability of both woody taxa (like *Quercus coccifera*) that represents a Mediterranean origin arid climate, and the Euxine elements such as *Fagus orientalis*, *Acer campestre*, *Alnus glutinosa*, *Carpinus betulus*, *C. orientalis*, indicate that various vegetation types are dominant in the area. The richest family is *Porellaceae* (one genus, 3 species) in the research area. The other 8 families have individually one genus and one species in the study area. The families which contain xerophytic taxa in the area are as follows: *Porellaceae* and *Frullaniaceae*. The aforementioned families contain taxa which can endure long periods of heat and dryness. We can understand that the Mediterranean climate is efficient owing to the Mediterranean elements, such as *Myrtus communis*, *Sytrax officinalis*, *Arbutus andrachne*, and *Ceratonia siliqua*, spreading in the study area. Thus, the presence of two xerophytic species (*Porella arboris-vitae* and *Frullania dilatata*) is the result of Mediterranean climate effects in the area.

The ecological characteristics of the samples collected from the research area are considered, comprising their preferred substrate, humidity have been assessed using Dierßen (16) and Mägdefrau (15) for life forms.

The predominant life form is mats (64 % which are the main and lateral shoots of which lie close to the substrate and are attached to it by rhizoids. The others are fans (27 %) and tails (9 %) (Figure 2).

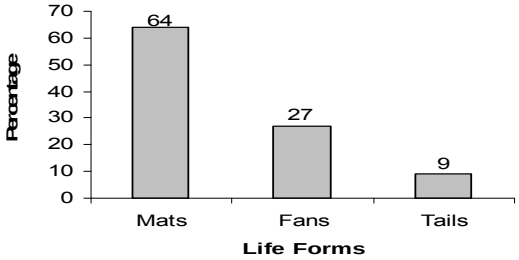

Figure 2. Life strategy among liverworts in the study area

A substrat analysis of the elements was performed. Accordingly, the percentage of epilithic taxa according to the total number of taxa is 46 %. Within the liverworts the epiphytic and humicolous are equally represented at 27 % (Figure 3).

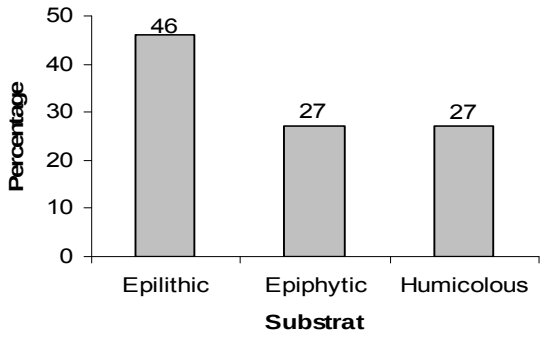

Figure 3. Preferential substrat of liverworts in the study area

In terms of need for water, mesophytes come first with 46 % of total taxa, hygrophytes are in second place with 36 %, and finally xerophytes with 18 % (Figure 4). It is an expected result for a less rainy variant of the Mediterranean type of climate.

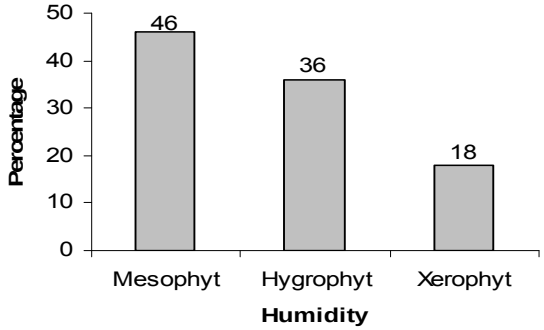

Figure 4. Groups of liverwort affinity for humidity preferential in the study area

It can be said the following topics when is looked for answering to the question that what is the important of bryophytes in practices of forestry and conservation of biodiversity?

Söderström (17) reflects that there are three important questions to be addressed in species conservation work: 1) what to conserve (which species), 2) where to

conserve them, and 3) how to conserve them. The third question is often dealt with and there are a number of suggestions how to do it, some more general and others more specific to the taxon to be conserved. What to conserve is a question to be answered by taxonomists (what taxa exist?), geneticists (what is the genetic variation among the taxa, including the evolutionary potential?) and floristic investigations (where does the taxon occur?). Conservationists use this information to make a synthesis, also adding political aspects.

Vanderpoorten et al. (18) expresses bryophytes have been used for indicating forest stands important for conservation (19,20). However, very little has been published about how land managers could manage woodland effectively for lower plants (21). As stressed by Hallingback (22), each person has its own experience in conservation, and most of the information in this field is speculative and must be properly tested. There is thus a need for collecting data on forest bryophyte species diversity, richness and ecology for supporting suggestions which could be included in the forest management plans in order to manage them positively for lower plants.

According to Vanderpoorten et al. (18) the following topics should be discussed in the studies related to practices of forestry: 1) to provide a basis of reference on the current state of the diversity and richness of the bryoflora in a forest, 2) to provide an accurate picture of how bryophytes are distributed in a forest and how the flora evolves in time, 3) to identify which habitats are important for bryophyte conservation, and 4) to discuss to what extent it is possible to reconcile bryophyte conservation with logging and recreation by suggesting reasonable management practices.

However, no particular conservation measure has been taken so far to protect bryophytes in Turkey due to lack of knowledge.

As a consequence, conservation measures and targeted management practices included in the forest management plan should focus on the high-diversity zones to allow the survival of the most interesting bryophyte assemblages.

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