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Myxomycetes from Trabzon and Giresun Provinces (Turkey)

İljal OCAK, İsmet HASENEKOĞLU

Atatürk University, Kazım Karabekir Faculty of Education, Department of Biology Education, 25240 Erzurum - TURKEY

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Abstract: This study serves as a checklist of the myxomycetes of Trabzon and Giresun provinces, Turkey. Sixty-one myxomycete were identified, 20 of which were collected in the field and 41 grown in moist chamber culture. In addition, we report all taxa new for Giresun and Trabzon, including the following 15 taxa new to Turkey: *Licea biforis* Morgan, *Cribraria intricata* Schrad., *C. macrocarpa* Schrad., *Lycogala exiguum* Morgan, *Arcyria globosa* Schw., *A. nigella* Emoto, *A. magna* Rex, *Trichia erecta* Rex, *Dianema corticatum* A.Lister, *Craterium concinnum* Rex, *Didymium anellus* Morgan, *Comatricha acanthodes* Alexop., *C. pulchella* (C.Bab.) Rost., *C. tenerrima* (M.A.Curt.) G.Lister and *Lamproderma scintillans* (Berk. & Br.) Morgan. The number of myxomycete species reported from Turkey now stands at 140.

Key Words: myxomycetes, flora, new records, Turkey

Trabzon ve Giresun İlleri Myxomyceteleri

Özet: Bu çalışma Trabzon ve Giresun illerinin myxomycetelerinin bir listesini sunmaktadır. Toplam 61 myxomycetes tanımlanmıştır. Bunlardan 20 tanesi doğal olarak toplanırken, 41 tanesi nemli oda kültüründe yetiştirilmiştir. Bu türlerin hepsi Trabzon ve Giresun için ilk kez kaydedilmiştir ve *Licea biforis* Morgan, *Cribraria intricata* Schrad., *C. macrocarpa* Schrad., *Lycogala exiguum* Morgan, *Arcyria globosa* Schw., *A. nigella* Emoto, *A. magna* Rex, *Trichia erecta* Rex, *Dianema corticatum* A. Lister, *Craterium concinnum* Rex, *Didymium anellus* Morgan, *Comatricha acanthodes* Alexop., *C. pulchella* (C.Bab.) Rost., *C. tenerrima* (M.A.Curt.) G.Lister ve *Lamproderma scintillans* (Berk. & Br.) Morgan. S. Türkiye için yeni kayıtlardır. Bu çalışma ile Türkiye'den rapor edilen myxomycete sayısı 140 olmaktadır.

Anahtar Sözcükler: myxomycetes, yeni kayıtlar, Türkiye

Introduction

The aim of this article is to investigate the myxomycete flora of Giresun and Trabzon provinces (east Black Sea region, Turkey). The references indicate that the myxomycetes of Giresun and Trabzon provinces have not been investigated before. Furthermore, the myxomycetes of Turkey are poorly known. The first extensive studies in Turkey were carried out by Finnish scientists (Harkönen & Uotila, 1983; Harkönen, 1987). A major checklist of the myxomycetes of the Mediterranean region including Turkish records has been published (Lado, 1994), but so far only 140 species have been reported in Turkey (Ergül & Dülger, 2000, 2002a, 2002b; Ocak & Hasenekoğlu, 2003a, 2003b).

Myxomycetes are a small and relatively homogeneous group of eukaryotic organisms. Approximately 900

species have been identified (Lado et al., 1999). The name given to the group is derived from the Greek words myxa (slime) and mykets (fungi) and was first used by the German botanist Heinrich Link in 1833. De Bary considered the true slime moulds to have protozoan affinities, a view shared by a number of other biologists including Bessey (1950), Kudo (1954), Olive (1970) and Alexopoulos et al. (1996). On the other hand, Alexopoulos (1973) and Martin & Alexopoulos (1969) have followed Link's original interpretation and classified the group within the fungi.

The myxomycetes are considered to represent a taxonomic class, with 3 subclasses. The first subclass is *Ceratiomyxomycetidae*. It is very small and consists of just 1 order (the *Ceratiomyxales*) containing the single genus *Ceratiomyxa*. The second subclass is the

Myxogastromycetidae, which consists of 4 orders and includes most of the 900 species of myxomycetes. These 4 orders are the *Echinosteliales*, *Liceales*, *Physarales* and *Trichiales*. The third subclass (the *Stemonitomycetidae*) contains the single order *Stemonitales*, which consists of nearly 200 species (Martin & Alexopoulos, 1969; Martin et al., 1983; Stephenson & Stempen, 2000).

Description of the research area

Trabzon and Giresun provinces are on the mountains on the Black Sea coastline, the length of which is 400 km. Both provinces have a mild sea climate and abundant and regular rainfall. In Trabzon the annual rainfall is 830.8 mm and average temperature is 14.5 °C. In both provinces it is rainy 12 months of the year. Forests start at sea level and go up to 2400 m. On the lower parts broad-leaf deciduous trees are seen but in upper lands forests composed of conifers such as *Picea orientalis* (L.) Link, *Abies nordmanniana* (Stev) Spach. and *Pinus sylvestris* L. exist. The main sites selected for the collection of myxomycetes were Erikbeli, Haçka (Düzköy) and other surrounding plateaux, and Lişer (Maçka) plateau in Trabzon province and Kümbet plateau and Kulakkaya (Yavuz Kemal) plateau in Giresun province. The samples were collected from roadside and steppe areas.

Figure Shows the research area and localities from where samples were collected.

Methods

Between 1999 and 2000, 528 samples were collected from 45 locations during 8 trips to Giresun and Trabzon and they were then examined in the laboratory. Fifty-seven were myxomycetes collected in the field and directly examined. The remaining 471 samples consisted of substrates used for moist chamber culture.

The fruit bodies of myxomycetes were collected in the field. In addition, dead wood, bark of living trees, decaying leaves, pieces of fallen twig, plant debris, and decaying conifer needles and cones were sampled (Lakhanpal & Mukerji, 1981). Due to the lack of information on myxomycetes from the research area random samples were taken.

Field-collected specimens were dried in Petri dishes in the laboratory. Other substrates were put in the moist chamber culture so that myxomycetes could develop. All substrates were studied, but particular attention was given to wood, bark of living and dead trees and leaf litter (Martin et al., 1983; Stephenson & Stempen, 2000).

Moist chamber cultures were prepared by using Petri dishes (9 cm) fitted with filter paper. Sufficient sterile distilled water was added to moisten the contents thoroughly.

The samples were examined every 72 h using a dissecting microscope and a component microscope. The

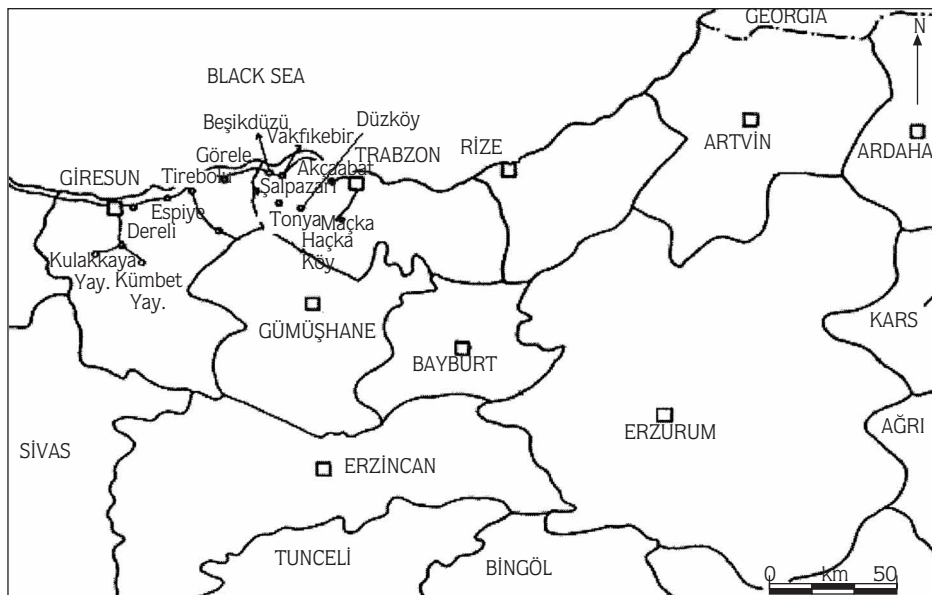


Figure. The research area and localities from where samples were collected.

morphological characters examined included fruiting bodies (plasmodiocarps, sporangia, aethalia, etc.) shape, size and colour, spore size and ornamentation, capillitium colour and branching, lime crystal size and morphology, stalk colour and proportion. Identifications were based on Martin & Alexopoulos (1969), Farr (1981), Lakhanpal & Mukerji (1981) and Stephenson & Stempen (2000).

Results

Sixty-one species belonging to 24 genera of *Myxomycetes* from both the field and moist chamber culture were identified. Twenty of these were obtained as field collections. While 12 of them were obtained only as field collections, 8 appeared in both the natural habitat and moist chamber culture. The other 41 species developed in moist chamber culture only.

Ceratiomyxales

Ceratiomyxaceae

Ceratiomyxa fruticulosa (Mull.) Macbr., 1899.

Syn: *Byssus fruticulosa* Müll., 1777.

Trabzon, Erikbeli plateau, apex, on wood of *Picea orientalis*, alt 1800 m, 10.07.1999, Ocak 46; Erikbeli plateau, Kartağaç, on wood of *Picea orientalis*, alt. 1500 m, 10.07.1999, Ocak 56; Erikbeli plateau, Sazlık, on wood of *Picea orientalis*, alt. 1750 m, 24.08.2000, Ocak 374; Trabzon, Şalpazarı, Ken plateau (hill), on wood of *Picea orientalis*, alt. 1600 m, 10.07.1999, Ocak 58 (field collection); Trabzon, Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 147; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt 1000 m, 26.08.2000, Ocak 496, 500; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1500 m, 27.08.1999, Ocak 223 (field collection); Giresun, Kümbet plateau, apex, on wood of *Picea orientalis*, alt. 1600 m, 25.08.2000, Ocak 431, 435.

Liceales

Liceaceae

Licea biforis Morgan, 1893.

Syn: *Licea sinuosa* Nann.-Brem., 1965.

Trabzon, Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 169 and on bark of *Picea orientalis*, Ocak 172-1; Trabzon, Erikbeli plateau, apex, on wood of *Picea orientalis*, alt. 1750 m,

24.08.2000, Ocak 377-1; Giresun, Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 260.

Licea kleistobolus Martin, 1942.

Syn: *Kleistobolus pusillus* C.Lippert, 1894.

Trabzon, Düzköy, Büyük Uskobel, on wood of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 123-2; Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1500 m, 24.08.2000, Ocak 394-2; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 223-1, 227-2; Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 250-4.

Licea minima Fr., 1829.

Syn: *Phelonites minima* (Fries) Fries, 1849.

Trabzon, Erikbeli plateau, Sazlık, on bark of *Picea orientalis*, alt. 1750 m, 24.08.2000, Ocak 361-1; Erikbeli plateau, Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1500 m, 24.08.2000, Ocak 391-1, 394-3; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 509, 510; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 225-4, 227.

Licea operculata (Wingate) Martin, 1942.

Trabzon, Düzköy, Haçka plateau, on bark of *Picea orientalis*, alt. 1780 m, 26.08.1999 Ocak 100-1, 101, 104; Trabzon, Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 142, 137, 172-2; Trabzon, Erikbeli plateau, apex, on bark of *Picea orientalis*, alt. 1750 m, 10.07.1999, Ocak 49-1; Erikbeli plateau, Gümüşhane Kürtün district side, on bark of *Picea orientalis*, alt. 1500 m, 24.08.2000, Ocak 394-4; Trabzon, Maçka-Torul road, 20 km from Maçka, alt. 1100 m, on wood of *Picea orientalis*, 28.08.1999, Ocak 282; Giresun, Kümbet plateau, on bark of *Picea orientalis*, alt. 1600 m, 07.07.1999, Ocak 7; Giresun, Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 260-1, 262-3.

Licea pusilla Schrad., 1797.

Syn: *Tubulina pusilla* (Shard.) Poir., 1808.

Trabzon, Düzköy, Hanzarcık, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 180-1.

Licea parasitica (Zukal) Martin, 1942.

Syn: *Cyllichnium operculatum* Wallr., 1833.

Giresun, Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 448-1.

Cribrariaceae

Cribraria argillacea (Pers.) Pers., 1794.

Syn: *Stemonitis argillacea* Pers. in J.F.Gmel., 1791.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 71.

Cribraria intricata Schrad., 1797.

Syn: *Trichia intricata* (Schrader) Poir in Lam, 1808.

Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1600 m, 24.08.2000, Ocak 392; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 500-1; Giresun, Kulakkaya plateau, Keseyol, on wood of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 236.

Cribraria macrocarpa Schrad., 1797.

Syn: *Trichia macrocarpa* Schrader, 1808.

Giresun, Kulakkaya plateau, Yaylak, on coniferous litter, alt. 1500 m, 27.08.1999, Ocak 231.

Cribraria microcarpa (Schrad.) Pers., 1801.

Syn: *Dictydium microcarpum* Schrad., 1797.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 70, 72; Trabzon Şalpazarı, Ken plateau (hill), on wood of *Picea orientalis*, alt. 1600 m, 10.07.1999, Ocak 58-2.

Dictydium cancellatum (Batsch) Macbr., 1899.

Syn: *Mucor cancellatus* Batsch, 1789.

Trabzon, Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 143, 147-1, 155, 168; Düzköy, Hanzarcık, on bark of *Picea orientalis*, alt. 1850, 26.08.1999, Ocak 178; Düzköy, Büyük Ova plateau, Zimba brook, on bark of *Fagus orientalis* Lipsky, alt. 1800 m, 26.08.1999, Ocak 214; Düzköy, Büyük Ova plateau, Zimba brook, on coniferous litter, alt. 1800 m, 26.08.1999, Ocak 222; Trabzon, Erikbeli plateau, Sazlık, on wood of *Picea orientalis*, alt. 1750 m, 24.08.2000, Ocak 367, 373; Erikbeli plateau,

Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1600 m, 24.08.2000, Ocak 394; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt.1000 m, 10.07.1999, Ocak 67 (field collection) and 26.08.2000, Ocak 479-1 (field collection); Giresun, Kümbet plateau, apex, north side, on bark of *Picea orientalis* (field collection), alt. 1610 m, 25.08.2000, Ocak 439, 440 and 441 (field collection); Kümbet plateau-Dereli road, on bark of *Picea orientalis*, alt. 1500 m, Ocak 404 (field collection), 414; Kümbet plateau-Dereli road, 8 km, on wood of *Picea orientalis*, alt. 1300 m, 25.08.2000, Ocak 455, 458; Kümbet plateau, on bark of *Picea orientalis*, alt. 1500 m, Ocak 430, 432-1; Giresun, Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1200 m, 27.08.1999, Ocak 262-1.

Reticulariaceae

Tubifera ferruginosa (Batsch.) J.F.Gmel., 1791.

Syn: *Stemonitis ferruginosa* Batsch., 1786.

Giresun, Kulakkaya plateau, Keseyol, on wood of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 236-3 (field collection).

Lycogala epidendrum (L.) Fr., 1829.

Syn: *Lycoperdon epidendrum* L., 1753.

Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on bark of *Picea orientalis*, alt. 1600 m, 24.08.2000, Ocak 379 (field collection); Erikbeli plateau, Kartağaç, on wood of *Picea orientalis*, alt. 1500 m, 10.07.1999, Ocak 52 (field collection); Trabzon Şalpazarı, Ken plateau (hill), on wood of *Picea orientalis*, alt. 1600 m, 10.07.1999, Ocak 59-1 (field collection); Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 64 (field collection), 71-1 (field collection) and 26.08.2000, Ocak 502-1 (field collection); Giresun, Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, Ocak 449 (field collection); Giresun, Kümbet plateau-Dereli road, on wood of *Picea orientalis*, alt. 1000 m, 25.08.2000, Ocak 463 (field collection).

Lycogala exiguum Morgan, 1893.

Syn: *Lycogala miniatum* var. *tesellatum* G.Lister in Penzing, 1898.

Trabzon, Maçka, Altındere Valley National Park,

Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 503 (field collection).

Echinosteliales

Echinosteliaceae

Echinostelium minutum de Bary, 1874.

Trabzon, Düzköy, Büyük Uskobel, on wood of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 116-2 and on coniferous litter, Ocak 119, 127-1; Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 171-1 and on coniferous litter, Ocak 136-2, 158-3; Trabzon, Maçka, Lişer plateau, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 191; Trabzon, Erikbeli plateau, apex, on bark of *Picea orientalis*, alt. 1800 m, 24.08.2000, Ocak 49; Erikbeli plateau, Sazlık, on wood of *Picea orientalis*, alt. 1750 m, 24.08.2000, Ocak 361; Giresun, Kümbet plateau, on bark of *Picea orientalis*, alt. 1600 m, 25.08.2000, Ocak 422, 430-1; Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 448; Kümbet plateau, apex, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 407; Giresun, Kulakkaya plateau, Keseyol, on coniferous litter and on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 243.

Clastodermataceae

Clastoderma debaryanum Blytt, 1880.

Syn: *Orthotricha microcephala* Wingate 1886.

Trabzon, Erikbeli plateau, apex, on wood of *Picea orientalis*, alt. 1800 m, 24.08.2000, Ocak 377.

Trichiales

Trichiaceae

Trichia botrytis (J.F.Gmel) Pers., 1794.

Syn: *Stemonitis botrytis* J.F.Gmel., 1791.

Trabzon, Düzköy, Hanzarcık, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 182-1; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 228.

Trichia decipiens (Pers) Macbr., 1899.

Syn: *Arcyria decipiens* Pers., 1795.

Trabzon, Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 172-3; Düzköy, Büyük Ova plateau, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 204-1; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on

bark of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 509-2; Trabzon, Maçka-Torul road, 20 km from Maçka, alt. 1100 m, on coniferous litter, 26.08.2000, Ocak 522.

Trichia erecta Rex, 1890.

Trabzon, Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 172-4.

Trichia favoginea (Batsch.) Pers., 1794.

Syn: *Lycoperdon favoginea* Batsch, 1786.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on bark of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 501-1 (field collection), 506 (field collection), 507 (field collection); Giresun, Kümbet plateau-Dereli road, 8 km, on bark of *Picea orientalis*, alt. 1300 m, 25.08.2000, Ocak 461 (field collection); Kümbet plateau, apex north side, on bark of *Picea orientalis*, alt. 1610 m, Ocak 451 (field collection).

Arcyria cinerea (Bull.) Pers., 1801.

Syn: *Trichia cinerea* Bull., 1797.

Trabzon, Düzköy, Kayabaşı, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 136, 148; Düzköy, Büyük Ova, on bark of *Picea orientalis*, alt.1850 m, 26.08.1999, Ocak 204; Büyük Uskobel, on litter of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 116; Trabzon, Şalpazarı, Simenli, alt. 1500 m, on bark of *Picea orientalis*, 10.07.1999, Ocak 63; Trabzon-Akçaabat coast road, roadside, on tree log, alt. at sea level, 07.08.1999, Ocak 268; Giresun, Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 438 (field collection); Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 227.

Arcyria denudata (L.) Wettst., 1886.

Syn: *Clathrus denudatus* L., 1753.

Giresun, Kümbet plateau, on bark of *Picea orientalis*, alt. 1600 m, 25.08.200, Ocak 465 (field collection).

Arcyria globosa Schw., 1829.

Syn: *Lachnobolus globosus* (Schwein.) Rostaf., 1875.

Trabzon, Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 138; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1500 m, 27.08.1999, Ocak 225; Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1200 m, 27.08.1999, Ocak 262.

Arcyria incarnata (Pers.) Pers., 1796.

Syn: *Stemonitis incarnata* (Pers.) J.F.Gmel., 1791.

Trabzon, Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 154 (field collection); Düzköy, Büyük Uskobel, on wood of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 131; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 65 (field collection) and 26.08.2000, Ocak 502 (field collection).

Arcyria insignis Kalchbr. & Cook, 1882.

Trabzon-Giresun road, 55 km from Giresun, roadside, bark of *Morus* L. sp., alt. 2-3 m, 07.07.1999, Ocak 33.

Arcyria magna Rex, 1893.

Giresun, Kümbet plateau, apex, on wood of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 432.

Arcyria nigella Emoto, 1928.

Trabzon, Erikbeli plateau, apex, on bark of *Picea orientalis*, alt. 1800 m, 24.08.2000, Ocak 375; Erikbeli plateau, Gümüşhane Kürtün district side, alt. 1500 m, 24.08.2000, Ocak 391; Trabzon, Düzköy, Kayabaşı plateau, on coniferous litter, alt. 1750 m, 26.08.1999, Ocak 158.

Arcyria nutans (Bull.) Grev., 1824.

Syn: *Trichia nutans* Bull., 1791.

Trabzon, Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 166, 170; Düzköy, Büyük Uskobel, on bark of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 113; Düzköy, Hanzarcık, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 182; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 68 (field collection) and 26.08.2000, Ocak 479 (field collection); Giresun, Kulakkaya plateau, Yaylak, on coniferous litter, alt. 1500 m, 27.08.1999, Ocak 225-1; Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1200 m, 27.08.1999, Ocak 250.

Arcyria pomiformis (Leers) Rostaf., 1875.

Syn: *Mucor pomiformis* Leers, 1775.

Trabzon, Şalpazarı, Ken plateau, on wood of *Picea orientalis*, alt. 1600 m, 10.07.1999, Ocak 59; Trabzon,

Düzköy, Haçka plateau, on bark of *Picea orientalis*, alt. 1780 m, 26.08.1999 Ocak 87; Düzköy, Haçka plateau, picnic field, on wood of *Picea orientalis*, alt. 1780 m, 26.08.1999, Ocak 100 and on bark of *Picea orientalis*, Ocak 106; Düzköy, Büyük Uskobel, on coniferous litter, alt. 1700 m, 26.08.1999, Ocak 118, 127 and on bark of *Picea orientalis*, Ocak 122; Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 172, on wood of *Picea orientalis*, Ocak 133, 140, 170-1 and on litter of *Picea orientalis*, 158-1,159; Düzköy, Hanzarcık, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 184; Düzköy, Büyük Ova plateau, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 206; Trabzon, Maçka-Torul road, 20 km from Maçka, alt. 1100 m, on wood of *Picea orientalis*, 28.08.1999, Ocak 277 (field collection); Giresun, Old Trabzon road (Armelit road), on bark of *Robinia pseudoacacia* L., 07.07.1999, Ocak 20; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1500 m, 27.08.1999, Ocak 225-2; Kulakkaya plateau, Keseyol, on coniferous litter, alt. 1300 m, 27.08.1999, Ocak 235 and on bark of *Picea orientalis*, Ocak 245; Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1200 m, 27.08.1999, Ocak 250-1.

Arcyria versicolor Phill., 1877.

Trabzon, Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 135, 173; Giresun, Kulakkaya plateau, Alçakbel, on wood of *Picea orientalis*, alt. 1200 m, 27.08.1999, Ocak 250-2.

Perichaena chrysosperma (Currey) A.Lister, 1894.

Syn: *Ophiotheca chrysosperma* Currey, 1854.

Giresun, Dereli road, Küçük Ahmet village, on bark of *Juglans regia* L., alt. 150 m, 25.08.2000, Ocak 474.

Perichaena corticalis (Batsch) Rostaf., 1875.

Syn: *Lycoperdon corticle* Batsch, 1783.

Trabzon, Maçka-Torul road, 20 km from Maçka, alt. 1100 m, on bark of *Picea orientalis*, 28.08.1999, Ocak 280; Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on bark of *Ulmus* L. sp. alt. 1000 m, 24.08.2000, Ocak 396-1.

Dianemaceae

Dianema corticatum A.Lister, 1894.

Trabzon, Düzköy, Büyük Uskobel, on wood of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 123.

Physarales**Physaraceae****Physarum cinereum** (Batsch) Pers., 1794.Syn: *Lycoperdon cinereum* Batsch, 1783.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 510-1 and on coniferous litter, Ocak 518.

Physarum nutans Pers., 1795.Syn: *Sphaerocarpus albus* Bull., 1791.

Trabzon, Düzköy, Haçka plateau, picnic field, on wood of *Picea orientalis*, alt. 1780 m, 26.08.1999, Ocak 99; Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 151,166-2; Düzköy, Hanzarcık, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 175, 176, 178-1; Trabzon, Maçka, Lişer plateau, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 193; Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1700 m, 24.08.2000, Ocak 390; Trabzon Şalpazarı, Ken plateau, on wood of *Picea orientalis*, alt. 1600 m, 10.07.1999, Ocak 59-2; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on bark of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 480, 509-1, 505 (field collection) and 10.07.1999, Ocak 68-1 (field collection); Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 223-2 (field collection); Kulakkaya plateau, Keseyol, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 235-2, 236-1 and 237 (field collection); Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 247, 254.

Physarum viride (Bull.) Pers., 1795.Syn: *Sphaerocarpus aurantius* Bull., 1791.

Trabzon, Düzköy, Hanzarcık, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 183; Düzköy, Büyük Ova plateau, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 205; Giresun, Dereli road, Konacık village, on bark of *Juglans* sp., alt. 250 m, 25.08.2000, Ocak 474-1; Giresun, Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 446 (field collection), 447-1; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 234.

Badhamia foliicola A.Lister, 1897.Syn: *Badhamia alpina*

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on bark of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 65-1.

Badhamia panicea (Fr.) Rostaf., 1873.Syn: *Physarum paniceum* Fr., 1829.

Trabzon, Düzköy, Gürgenlik, on bark of *Fagus orientalis*, alt. 1100 m, 26.08.1999, Ocak 79.

Craterium concinnum Rex, 1893.

Trabzon, Erikbeli plateau, apex, on bark of *Picea orientalis*, alt. 1800 m, 10.07.1999, Ocak 47.

Fuligo septica (L.) Wiggers., 1780.Syn: *Mucor septicus* L., 1763.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 501 (field collection); Giresun, Kümbet plateau, apex, on bark of *Picea orientalis*, alt. 1600 m, 25.08.2000, Ocak 415 (field collection); Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 450 (field collection).

Leocarpus fragilis (Dicks.) Rostaf., 1874.Syn: *Lycoperdon fragile* Dicks., 1785.

Giresun, Kulakkaya plateau, Keseyol, on mixed litter, alt. 1300 m, 27.08.1999, Ocak 235-1 (field collection).

Didymiaceae**Didymium anellus** Morgan, 1894.Syn: *Didymium effusum* var. *tenue* A.Lister, 1897.

Trabzon, Düzköy, Büyük Uskobel, on bark of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 115.

Didymium nigripes (Link) Fr., 1829.Syn: *Physarum nigripes* Link, 1809.

Kulakkaya plateau, Alçakbel, on deciduous litter, alt. 1200 m, 27.08.1999, Ocak 257 (field collection).

Didymium quitense (Pat.) Torrend, 1908.

Syn: *Chondrioderma quitense* Pat. in Pat & Lagerh., 1895.

Trabzon, Düzköy, Büyük Uskobel, on coniferous litter, alt. 1700 m, 26.08.1999, Ocak 116-1; Düzköy,

Kayabaşı plateau, on coniferous litter, alt. 1750 m, 26.08.1999, Ocak 158-2.

Didymium squamulosum (Alb. & Schw.) Fr. 1818.

Syn: *Diderma squamulosum* Alb. & Schw., 1805.

Giresun, Dereli, Çamlıköy village, on deciduous litter, alt. 200 m, 25.08.2000, Ocak 473; Giresun, about 25 km along Kürtün Tirebolu road, on deciduous litter, alt. 950 m, 24.08.2000, Ocak 400.

Diderma hemisphaericum (Bull.) Horman, 1829.

Syn: *Reticularia hemisphaeria* Bull., 1791.

Trabzon-Giresun coast road, beginning of Beşikdüzü district road, on deciduous litter, alt. 3-4 m, at sea level, 25.08.2000, Ocak 478.

Stemonitales

Stemonitaceae

Stemonitis axifera (Bull.) Macbr., 1889.

Trabzon, Erikbeli plateau, Kartağaç, on wood of *Picea orientalis*, alt. 1500 m, 10.07.1999, Ocak 55 (field collection); Erikbeli plateau, Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1500 m, 24.08.2000, Ocak 379-1 (field collection); Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 502-3 (field collection) and 10.07.1999, Ocak 68-2 (field collection); Giresun, Kümbet plateau, apex, north side, on wood of *Picea orientalis*, alt. 1610 m, Ocak 438-1 (field collection).

Stemonitis fusca Roth., 1787.

Syn: *Trichia nuda* With., 1792.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 68-3 (field collection); Giresun, Kümbet plateau-Dereli road, 8 km, on wood of *Picea orientalis*, alt. 1300 m, 25.08.2000, Ocak 466 (field collection), 467 (field collection); Kümbet plateau, apex, north side, on wood of *Picea orientalis*, alt. 1610 m, Ocak 450-1 (field collection).

Stemonitis herbatica Peck, 1873.

Giresun, Kulakkaya plateau, Keseyol, on wood of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 236-2 (field collection).

Stemonitis hyperopta Meylan, 1918.

Syn: *Comatricha typhina* var. *heterospora* Rex., 1893.

Trabzon, Erikbeli plateau, apex, on bark of *Picea orientalis*, alt. 1780 m, 10.07.1999, Ocak 49-2; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 70-1; Giresun, Kümbet plateau, apex, north side, on wood of *Picea orientalis*, alt. 1610 m, Ocak 441-1.

Stemonitis smithii Macbr., 1893.

Syn: *Stemonitis microspora* A.Lister in Morgan, 1894.

Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 10.07.1999, Ocak 64-1 (field collection) and 26.08.2000, Ocak 498.

Comatricha acanthodes Alexop., 1958.

Trabzon, Erikbeli plateau, Sazlık, on bark of *Picea orientalis*, alt. 1750 m, 24.08.2000, Ocak 359.

Comatricha elegans (Racib.) G.Lister, 1909.

Syn: *Rostafinskia elegans* Racib., 1884.

Trabzon, Düzköy, Büyük Uskobel, on bark of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 125.

Comatricha lurida A.Lister, 1894.

Syn: *Paradiacheopsis lurida* (A.Lister) Hertel, 1956.

Trabzon, Düzköy, Kayabaşı plateau, on coniferous litter, alt. 1750 m, 26.08.1999, Ocak 136-1 and on bark of *Picea orientalis*, Ocak 157, 173-1; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on bark of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 483, 497; Giresun, Old Trabzon road (Armelit road), on bark of deciduous stump, 07.07.1999, Ocak 19; Giresun, Kümbet plateau, apex, on bark of *Picea orientalis*, alt. 1600 m, 25.08.2000, Ocak 8.

Comatricha nigra (Pers.) Schroet., 1885.

Syn: *Stemonitis nigra* Pers. J.F.Gmel., 1791.

Trabzon, Düzköy, Kayabaşı plateau, on wood of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 157-1, 171, 173-2; Düzköy, Haçka plateau, picnic field, on bark of *Picea orientalis*, alt. 1780 m, 26.08.1999, Ocak 82, 90; Trabzon, Maçka, Lişer plateau, on bark of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 199; Giresun, Kulakkaya plateau, Yaylak, on bark of *Picea orientalis*, alt. 1500 m, 27.08.1999, Ocak 225-3, 226, 227-1.

Comatricha pulchella (C.Bab.) Rost., 1876.

Syn: *Stemonitis pulchella* C.Bab., 1839.

Giresun, Kulakkaya plateau, Alçakbel, on wood of *Picea orientalis*, alt. 1200 m, 27.08.1999, Ocak 250-3.

Comatricha tenerrima (C.Bab.) Rost., 1919.

Syn: *Stemonitis ternerrima* M.A.Curt., 1848.

Trabzon, Düzköy, Hanzarcık, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 184-1.

Lamproderma scintillans (Berk. & Br.) Morgan, 1894.

Syn: *Stemonitis scintillans* Berk. & Br., 1876.

Trabzon, Düzköy, Büyük Ova plateau, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 209

Macbrideola cornea (G.Lister & Cran) Alexop., 1967.

Syn: *Comatricha cornea* G.Lister & Cran in Lister, 1917.

Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on bark of *Ulmus campestris*, alt. 1000 m, 24.08.2000, Ocak 396.

Enerthenema papillatum (Pers.) Rostaf., 1876.

Syn: *Stemonitis papillatum* Pers., 1794.

Trabzon, Düzköy, Kayabaşı plateau, on bark of *Picea orientalis*, alt. 1750 m, 26.08.1999, Ocak 173-3, on coniferous litter, Ocak 136-3 and on wood of *Picea orientalis*, Ocak 166-1; Düzköy, Büyük Uskobel, on wood of *Picea orientalis*, alt. 1700 m, 26.08.1999, Ocak 123-1; Düzköy, Hanzarcık, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 180; Düzköy, Büyük Ova plateau, on wood of *Picea orientalis*, alt. 1850 m, 26.08.1999, Ocak 211; Trabzon, Erikbeli plateau, Gümüşhane Kürtün district side, on wood of *Picea orientalis*, alt. 1500 m, 24.08.2000, Ocak 394-1; Trabzon, Maçka, Altındere Valley National Park, Meryemana Forest, on wood of *Picea orientalis*, alt. 1000 m, 26.08.2000, Ocak 495; Trabzon, Maçka-Torul road, 20 km from Maçka, on bark of *Picea orientalis*, alt. 1100 m, 28.08.1999, Ocak 273; Giresun, Kümbet plateau, apex, north side, on bark of *Picea orientalis*, alt. 1610 m, 25.08.2000, Ocak 447; Kümbet plateau, apex, on bark of *Picea orientalis*, alt. 1600 m, 25.08.2000, Ocak 418; Giresun, Kulakkaya plateau, Alçakbel, on bark of *Picea orientalis*, alt. 1300 m, 27.08.1999, Ocak 262-2.

Discussion

Sixty-one species belonging to 17 genera of myxomycetes were identified in this investigation. Fifteen of the 61 species are new records for Turkey: *Licea biforis*, *Cribraria intricata*, *C. macrocarpa*, *Lycogala exiguum*, *Arcyria globosa*, *A. nigella*, *A. magna*, *Trichia erecta*, *Dianema corticatum*, *Craterium concinnum*, *Didymium anellus*, *Comatricha acanthodes*, *C. pulchella*, *C. tenerrima* and *Lamproderma scintillans* (Berk. (Ergül & Dülger, 2000, 2002a, 2002b; Ocak & Hasenekoğlu, 2003a, 2003b). As studies on myxomycetes are very limited in Turkey, new records can likely be found in future research.

In the study area, a very rich myxomycete flora was observed. In Trabzon and Giresun provinces, where the climatic conditions are suitable for myxomycetes, a very dense flora in both species composition and frequency of myxomycetes was found. The densest myxomycete flora was found in the high plateaux and especially in *Picea orientalis* (L.) Link. forests in the provinces.

Twenty myxomycetes were collected in the field. As seen in several reports in the literature, naturally growing myxomycete fructifications are more common in the samples collected in rainy August and September. In fact, as pointed out in many studies, the frequency of myxomycetes from natural habitats is affected by climatic conditions, rainfall and temperature. For example, more myxomycetes are obtained when collecting is performed in moist and warm seasons (Lazo, 1966; Farr, 1981; Stephenson, 1988; Harkönen & Ukkola, 2000).

Dictydium cancellatum, *Echinostelium minutum* and *Arcyria pomiformis* are the most common species in our investigation but some species are only from certain substrates. While *Dictydium cancellatum* and *Arcyria pomiformis* were obtained both from field collection and in moist chamber culture, *Echinostelium minutum* was obtained only by moist chamber culture.

The species seen only on 1 substrate and 1 sample are *Licea parasitica*, *L. pusilla*, *Cribraria argillacea*, *C. macrocarpa*, *Tubifera ferruginosa*, *Lycogala exiguum*, *Clastoderma debaryanum*, *Arcyria denudata*, *A. magna*, *Dianema corticatum*, *Didymium anellus*, *Stemonitis herbatica*, *Comatricha tenerrima*, *C. pulchella* and *Lamproderma scintillans* (on spruce stump), *A. insignis* (on bark of living mulberry), *Trichia erecta* and *Comatricha acanthodes* (on bark of living spruce),

Perichaena chrysosperma (on bark of living walnut), *Leocarpus fragilis* Rostaf. (on litter twig), *Diderma hemisphaericum* and *Didymium nigripes* (on litter of broad-leaves), *Comatricha elegans* (on bark litter) and *Macbrideola cornea* (on bark of living elm).

Arcyria incarnata, *A. nigella*, *Badhamia foliicola*, *B. panicea*, *Clastoderma debaryanum*, *Comatricha acanthodes*, *C. elegans*, *C. tenerrima*, *Craterium concinnum*, *Cribraria argillacea*, *C. microcarpa*, *Diderma hemisphaericum*, *Didymium anellus*, *D. quitense*, *Dianema corticatum*, *Lamproderma scintillans*, *Licea pusilla*, *Lycogala exiguum*, *Macbrideola cornea*, *Physarum cinereum*, *Stemonitis smithii*, *Trichia decipiens* and *T. erecta* were found only in Trabzon province.

Arcyria denudata, *A. insignis*, *A. magna*, *Comatricha pulchella*, *Cribraria macrocarpa*, *Didymium nigripes*, *D. squamulosum*, *Leocarpus fragilis*, *Licea parasitica*, *Perichaena chrysosperma*, *Stemonitis herbatica* and *Tubifera ferruginosa* were seen only in Giresun. These taxa are new records for both provinces. However, climatic conditions and vegetation are similar in the 2 provinces. Thus, the ecological requirement positions and demands of these taxa may be the same.

As these provinces have suitable climatic conditions and abundant vegetation for myxomycetes, a rich myxomycete species composition is found, especially the on bark and decaying wood of *Picea orientalis*.

Most of the myxomycetes were found on spruce (*Picea orientalis*) stumps. The species, with no exception, which grow and form fructifications in the field were collected from spruce stumps. However, in the literature it is reported that many species are collected from both gymnosperm and angiosperm substrates (Stephenson, 1988).

Substrates on which myxomycetes found are diverse and it is observed that myxomycetes grow especially on the bark of spruce stumps and living spruce, pines, poplars, and willows. Besides these, fructifications of myxomycetes were found on the bark of common alders, elms, beeches, acacias, fallen leaves, cones, pieces of branches, and humus masses. This is a natural case and is also seen in the literature (Harkönen & Uotila, 1983; Harkönen 1987; Stephenson, 1988; Harkönen & Ukkola, 2000).

Species such as *Dictydium cancellatum*, *Echinostelium*

minutum and *Arcyria pomiformis* grow on almost every substrate. In addition, some rare species are also found on certain substrates. For example, *Perichaena chrysosperma* was cultured on the bark of living walnut, *Macbrideola cornea* on the bark of living elm, and *Arcyria insignis* on the bark of living mulberry. It is observed that the species of *Didymium* commonly grow on leaf litter. Although such a species-substrate association is regarded as a reflection of ecological and physiological characters, these species are also observed on other substrates (Stephenson & Stempfen, 2000). This indicates that these species have a very special substrate-selecting characteristic and that the species which usually prefer bark are corticolous.

The genera *Echinostelium* de Bary, *Licea* Schrad. and *Macbrideola* H.C.Gilbert prefer the bark of living trees and are commonly known as corticolous species. Species such as *Comatricha nigra*, *Enerthenema papillatum* and *Perichaena chrysosperma* may be found on rotten wood but afterwards develop on bark in moist chamber culture.

In our study, it was observed that these species prefer the bark in the moist chamber culture. Surface conditions, pH, the water-retention capacity and nutrient contents are factors that influence the preference for bark. Furthermore, the development of myxomycetes is more affected on conifer bark, which is more acidic than broad-leaved tree bark. In addition, it is observed that the number of myxomycetes increases as epiphytic lichens and mosses on the bark surface trap spores (Stephenson & Stempfen, 2000). Likewise, our study shows that more fructification in both number and species grow on barks, especially that with lichens and mosses collected in Trabzon and Giresun.

Stephenson & Stempfen (2000) reported those the species *Lamproderma scintillans*, *Physarum cinereum*, *Stemonitis herbatica*, *Cribraria microcarpa* and *Arcyria cinerea* prefer leaf litter of both conifers and broad-leaved trees. However, in our research, while *Arcyria cinerea* was found on leaf litter, other collections were found on wood and bark. The species of *Didymium* Schrad. prefer especially the leaf litter of broad-leaved trees (Harkönen & Ukkola, 2000).

While *Arcyria* Wiggers species are reported to grow only on the remnants of conifer trees (Stephenson & Stempfen, 2000), 4 of the 10 *Arcyria* species in our study grow both on leaf litter and other substrates. However, the other 6 species were seen on wood and barks only.

All of the species identified in our study are similar to species known elsewhere in the world. The present data extend our knowledge on the flora of myxomycetes in Turkey.

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