

CONTRIBUTION TO THE BRYOPHYTE FLORA OF TURKISH THRACE

B. PAPP¹ and M. SABOVLJEVIĆ²

¹*Department of Botany, Hungarian Natural History Museum
H-1476 Budapest, Pf. 222, Hungary; E-mail: pappbea@bot.nhmus.hu*

²*Department of Plant Ecology, Institute of Botany and Botanical Garden, Faculty of Biology,
University of Belgrade, Takovska 43, YU-11000 Belgrade, Serbia–Montenegro
E-mail: marko@bfbot.bg.ac.yu*

A total of 142 bryophyte taxa (17 liverworts and 125 mosses) was collected during a field trip led to Turkish Thrace in May of 2000. Seven species *i.e.* *Bryum rubens*, *Didymodon sicculus*, *Fissidens polyphyllus*, *Fissidens serrulatus*, *Orthotrichum microcarpum*, *Seligeria paucifolia*, *Schistidium singarense* are new records for Turkey. Most of the species collected are taxa of the temperate zone of Europe. A relatively high proportion (37%) of the species has subatlantic, sub-Mediterranean distribution; several Mediterranean elements (20 species mainly liverworts) and a few boreal, subboreal species (11 species) contribute to the diversity of the flora according to the collected material.

Key words: bryophytes, Thrace, Turkey

INTRODUCTION

For nearly three centuries the flora and vegetation of Turkey have been investigated not only by botanists but also by various travellers, geographers, geologists, archaeologists, ethnologists etc. However, bryological study takes only a very small amount of that effort. Lately, in the past few decades, some bryological researches have been conducted by WALTHER and LEBLEBICI (1969), WALTHER (1975, 1979), GÖLKER *et al.* (1984), YAYINTAŞ and IWATSUKI (1988), ÇETIN (1991), GÖLKER and ÖZTÜRK (1991, 1996), YAYINTAŞ (1993, 1994), YAYINTAŞ and TONGUÇ (1993, 1994), TOWNSEND (1997), MÜLLER (1998) and KUČERA (1998). Checklists of Turkish liverworts (GÖLKER *et al.* 1986 and ÇETIN 1988*a*) and mosses (ÇETIN 1988*b*) are also available. A comprehensive work about the bryophyte flora of southwestern Asia was published by FREY and KÜRSCHNER (1991). Some interesting data concerning the bryology and the bryophytes in South Eastern Europe can be found in SABOVLJEVIĆ *et al.* (2001).

Notwithstanding these efforts (and of many others), certain areas of Turkey remain bryologically under-explored. One of these is Turkish Thrace (the European part of Turkey) (Fig. 1). Apart from GÖLKER and ÖZTÜRK (1996) there are no data on the bryophytes of Turkish Thrace.

MATERIALS AND METHODS

Collections were made in May of 2000 by Beáta Papp (BP) and Marko Sabovljević (BEOU). Materials are deposited in those two herbaria. Most of the important montane areas were visited and different habitat types were investigated.

In our enumeration the nomenclature for the mosses follows CORLEY *et al.* (1981), CORLEY and CRUNDWELL (1991), and for the liverworts follows SCHUMACKER and VÁŇA (2000). Exceptions are the subspecies and varieties and some *Tortula* and *Hypnum* species, where we based our identifications and nomenclature on the works of KRAMER (1980), SMITH (1991, 1993, 1997), FREY *et al.* (1995), BLOM (1996) and CORTINI PEDROTTI (2001).

To establish the European distribution types in the floristical evaluation, we followed DÜLL (1983, 1984, 1985, 1992).

THE INVESTIGATED AREA

Turkey has a peculiar situation as it belongs to the southeastern European countries, the Balkan countries and to southwestern Asian countries at the same time. Turkish Thrace is part of Europe and the Balkan Peninsula in its southeasternmost part. It is a region between Greece and Bulgaria, edged by the Aegean, Marmara and Black Seas.

The European part of Turkey covers 9,250 square miles. Turkish Thrace is topographically, climatically and biologically heterogeneous. The region bordered by the Black Sea (Istranca or Yıldız dağları) is composed mainly of schist and represents a low continuation of the northern mountain range of Anatolia. The central part is occupied by undulating plains drained by the Ergene River. On the northwestern side of the Marmara Sea (which divides Europe from Asia) there is a low sandstone range, the Işıklar dağları or Tekir dağları which continues southwards into Gelibolu (Gallipoli) peninsula (DAVIS 1965).

The climate of Turkish Thrace is typical Mediterranean near the southern coast. Mild, wet winters and long, hot, dry summers are characteristic. Drought period is usually from May to September. There is a clear difference from west to east of Thrace. The climate is more humid and cooler going towards the Black Sea coast or to the north of the area.

Turkey is a meeting point of three phytogeographical regions: Euro-Siberian, Mediterranean and Irano-Turanian. In the European part of Turkey (Turkish Thrace) the Euro-Siberian region is present in a narrow strip along the Black Sea coast. The relatively humid climate is shown by the predominantly mesophytic vegetation. There is, however, an interrupted chain of Mediterranean enclaves (mainly consisting of sclerophyll scrub), that also extends along the Black Sea

coast. This belt is very narrow and occurs intermittently from sea level to 200 or 300 m, particularly on thin soil and southern exposures.

Apparently, the Istanca area, the Yıldız dağları belong to the Euxine province of the Euro-Siberian region. Due to the destruction of the native vegetation there is a lack of information making it very difficult to see which phytogeographical areas most of the rest of Turkish Thrace could be referred. For example, many of the typical Euxine elements are absent from the wooded areas of Işklar dağı (Tekir dağları). It seems that this area rather belongs to the Balkan province of the Euro-Siberian region and is floristically a continuation of Greek Thrace. However, the plains of the central part are largely cultivated and have a steppe like aspect. This is certainly not Irano-Turanian, but represents an extension of the Sarmatian province which is well developed in the Danube valley (DAVIS 1965). Irano-Turanian elements are scarcely present in European Turkey. In Turkish Thrace, the Mediterranean region is surprisingly small, being confined to the southern part, which belongs to East-Mediterranean province. In many places maquis has been degraded and replaced by phrygana.

SITE DETAILS

Location of the collecting sites can be seen on Figure 1.

1. Kuru dağı, at Keşan city, 20 km south of Keşan crossroad to Sazlıdere village; planted *Pinetum* and *Quercetum*, 300–400 m a. s. l., 10.05.2000.

2. Between Korüköy and Gelibolu villages, 10 km before Gelibolu; seashore covered by saline vegetation, 1–2 m a. s. l., 10.05.2000.

3. Sarköy village at the Marmara Sea coast; *Platanus orientalis* tree, 50 m, 10.05.2000.

4. Işklar dağı, 17 km north of Sarköy village; *Quercetum* along the road to Malkara, 400 m a. s. l., 11.05.2000.

5. Işklar dağı, 30 km north of Sarköy village, 5 km after Bulgur köyü village; maquis, 500 m a. s. l., 11.05.2000.

6. Işklar dağı, 30 km north of Sarköy village, 7 km after Bulgur köyü village; *Quercetum*, 550 m a. s. l., 11.05.2000.

7. Işklar dağı, 3 km east of Gaziköy village along the road at the seashore to Tekirdağ city; stream valley with *Platanus orientalis* forest and maquis, 10–300 m a. s. l., 12.05.2000.

8. Yıldız dağları, valley south of Kyyköy village; limestone rocks near the sea, 20 m a. s. l., 13.05.2000.

9. Yıldız dağları, north of Kyyköy village; rocks at the seashore and heathland, 50 m a. s. l., 13.05.2000.

10. Black Sea coast at Terkos lake, near Istanbul; sand dunes at the seashore, 20 m a. s. l., 16.05.2000.

11. Karamandere village, near Istanbul; *Quercetum* coppice forest on acidic soil (clay, sand and gravel), 16.05.2000.

12. Pinarca village, near Istanbul; *Quercetum* coppice on limestone, 16.05.2000.

13. Inceđiz cave, Çatalca village, near Istanbul; limestone rocks at a spring and at a stream, 16.05.2000.

14. Park of the Rectorate of Istanbul University, Istanbul, 16.05.2000.

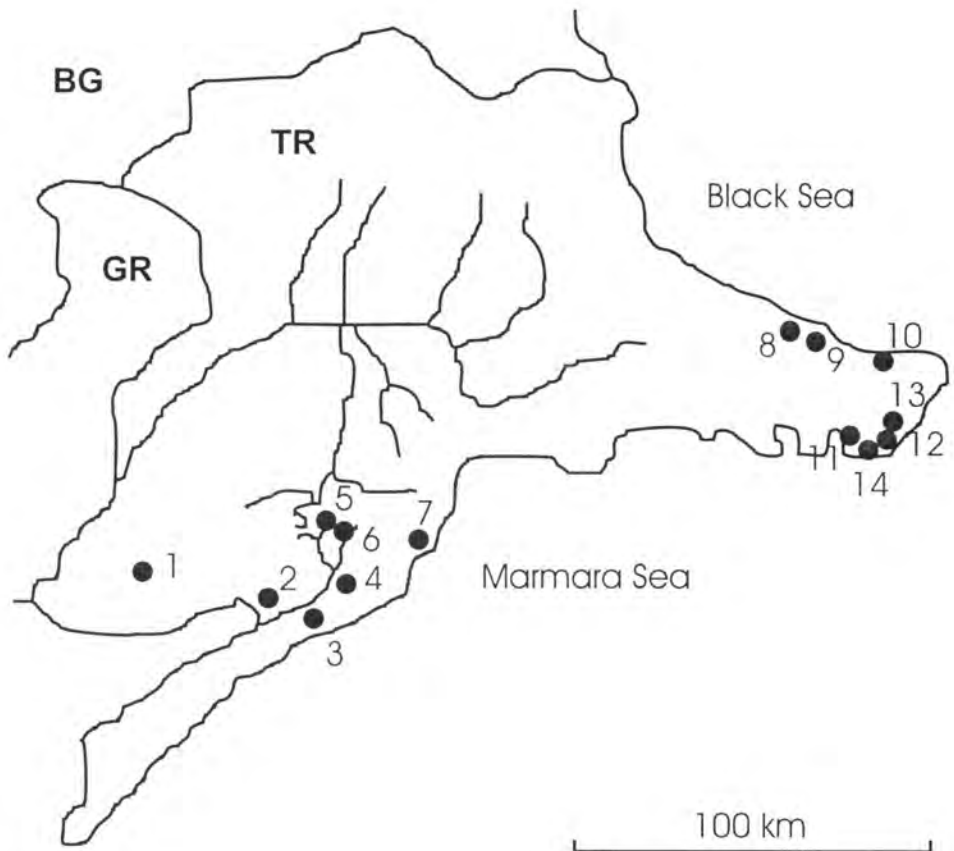


Fig. 1. Location of the collecting sites. BG = Bulgaria, GR = Greece, TR = Turkey (Thrace). For the numbers of localities see the locality list in the text.

RESULTS

A total of 142 bryophyte taxa (17 liverworts and 125 mosses) was collected during our fieldtrip. A list of the species is given below.

Hepaticae

- Calypogeia fissa* (L.) Raddi – 9: soil in heathland
Cephalozia bicuspidata (L.) Dum. var. *bicuspidata* – 9: soil in heathland
Cephalozia baumgartneri Schiffn. – 9: on soil
Cephalozia stellulifera (Taylor ex Spruce) Schiffn. – 1: on sandstone rocks, 5: on schistose soil, 9: soil in heathland
Cephalozia turneri (Hook.) K. Müll. – 9: soil in heathland
Fossombronia angulosa (Dicks.) Raddi – 1: on sandstone rocks
Fossombronia pusilla (L.) Nees var. *maritima* Paton – 7: on schistose soil
Frullania dilatata (L.) Dum. – 1, 4, 6, 9: on the bark of *Quercus*, 1: the bark of *Sorbus*, 7: on the bark of *Platanus orientalis*, 9: on the bark of *Phyllirea*
Jungermannia atrovirens Dum. – 13: on limestone rocks along a stream
Lejeunea cavifolia (Ehrh.) Lindb. – 7: on schistose soil and on the bark of *Quercus*
Lophozia turbinata (Raddi) Steph. – 1, 13: limestone rocks along a stream
Metzgeria furcata (L.) Dum. – 7: on the bark of *Platanus orientalis*
Pellia endiviifolia (Dicks.) Dum. – 7: on limestone rocks along a stream
Radula complanata (L.) Dum. – 1, 4, 9: on the bark of *Quercus*, 7: on schistose soil and on the bark of *Carpinus orientalis*, 9: on the bark of *Phyllirea*
Riccia crozalsii Levier – 1: on sandstone rocks
Riccia nigrella DC. – 5: on schistose soil
Scapania irrigua (Nees) Nees – 9: soil in heathland

Musci

- Acaulon triquetrum* (Spruce) C. Müll. – 9: on soil
Amblystegium riparium (Hedw.) B., S. et G. – 13: on limestone rocks along a stream
Barbula convoluta Hedw. – 4: on schistose soil
Barbula unguiculata Hedw. – 1: on sandstone rocks, 6: on schistose soil, 7: on limestone rocks along a stream, 9, 12: on limestone rocks
Bartramia ithyphylla Brid. – 7: on schistose soil
Brachythecium rutabulum (Hedw.) B., S. et G. – 1: limestone rocks along a stream
Brachythecium olympicum Jur. – 8: on soil
Brachythecium velutinum (Hedw.) B., S. et G. – 1: on sandstone rocks, 4, 6: on schistose soil, 7: on limestone rocks along a stream, 9: on tree bark
Bryoerythrophyllum recurvirostre (Hedw.) Chen. – 4: on soil
Bryum alpinum With. – 6: on schistose soil
Bryum bicolor Dicks. – 5: on schistose soil, 8: on limestone rocks, 9: soil in heathland

- Bryum bornholmense* Winkelm. et Ruthe – 9: soil in heathland
Bryum caespiticium Hedw. – 2: on salty soil; 9: on limestone rocks
Bryum canariense Brid. – 9: soil in heathland
Bryum capillare Hedw. – 4: on schistose soil, on the bark of *Quercus*, 6: on schistose soil
Bryum pallens Sw. – 13: on limestone rocks along a stream
Bryum rubens Mitt. – 7: on schistose soil, 9: on limestone rocks
Bryum ruderales Crundw. et Nyh. – 4: on schistose soil, 10: on sand dunes
Bryum subelegans Kindb. – 6: on schistose soil
Bryum torquescens B. et S. – 1: on sandstone rocks, 7: on schistose soil, 9: soil in heathland
Ceratodon purpureus (Hedw.) Brid. – 5, 6: on schistose soil, 9: soil in heathland
Cheilothela chloropus (Brid.) Lindb. – 5: on schistose soil
Cratoneuron filicinum (Hedw.) Spruce – 7: on limestone rocks along a stream
Dicranella howei Ren. et Card. – 7, 11: on schistose soil, 7: on limestone rocks along a stream,
 8: on limestone rocks
Dicranella varia (Hedw.) Schimp. – 9: on soil
Dicranoweisia cirrata (Hedw.) Lindb. ex Milde – 1: on the bark of *Pinus* and *Sorbus*
Dicranum majus Sm. – 9: soil in heathland
Dicranum scoparium Hedw. – 7: on schistose soil, 9: soil in heathland
Didymodon acutus (Brid.) K. Saito – 9: on soil
Didymodon insulanus (De Not.) M. Hill – 1: on limestone rocks along a stream
Didymodon fallax (Hedw.) Zander – 1: on sandstone rocks, 7: on schistose soil and limestone
 rocks along a stream, 8, 12: on limestone rocks
Didymodon luridus Hornsch. – 1: on sandstone rocks, 4: on schistose soil, 7, 13: on limestone
 rocks along a stream
Didymodon rigidulus Hedw. – 4, 11: on schistose soil, 6: on the bark of *Quercus*
Didymodon sicculus Cano *et al.* – 2: on salty soil, 9: on limestone rocks
Didymodon tophaceus (Brid.) Lisa – 1, 7: limestone rocks along a stream, 5: near a spring, 8:
 on limestone rocks
Didymodon vinealis (Brid.) Zander – 4: on schistose soil, 9: soil in heathland
Ditrichum flexicaule (Schwaegr.) Hampe – 9: soil in heathland
Ditrichum sp. – 5: on schistose soil
Encalypta vulgaris Hedw. – 4: on schistose soil
Eucadium verticillatum (Brid.) B., S. et G. – 1, 7, 13: on limestone rocks along a stream
Eurhynchium hians (Hedw.) Sande Lac. – 9, 13: on limestone rocks along a stream
Eurhynchium praelongum (Hedw.) B., S. et G. var. *stokesii* (Turn.) Dix. – 9: soil in heathland
Eurhynchium pumilum (Wils.) Schimp. – 1: on sandstone rocks, 9: on limestone rocks along a
 stream
Fissidens bryoides Hedw. – 7: on schistose soil
Fissidens dubius P. Beauv. – 1: limestone rocks along a stream
Fissidens incurvus Starke ex Röhl. – 5: on schistose soil
Fissidens limbatus Sull. – 1: on sandstone rocks
Fissidens polyphyllus Wils. ex B., S. et G. – 9: on soil
Fissidens pusillus (Wils.) Milde – 13: on limestone rocks along a stream
Fissidens rufulus B., S. et G. – 13: on limestone rocks along a stream
Fissidens serrulatus Brid. – 7: on soil
Fissidens taxifolius Hedw. – 1: on sandstone rocks, 5, 7: on schistose soil, 9: limestone rocks
 along a stream
Fissidens viridulus (Sw.) Wahlenb. – 7: on schistose soil

- Funaria hygrometrica* Hedw. – 4: on schistose soil, 9: soil in heathland, 10: on sand dunes
Grimmia orbicularis Bruch ex Wils. – 1, 4, 5, 7, 8: on rocks
Grimmia pulvinata (Hedw.) Sm. – 1: on sandstone rocks, 7: on schistose soil and on limestone rocks along a stream
Grimmia trichophylla Grev. – 1: on rocks
Gymnostomum aeruginosum Sm. – 8: on limestone rocks
Gymnostomum calcareum Nees et Hornsch. – 13: on limestone rocks along a stream, 14: limestone rocks in the park
Gyroweisia tenuis (Hedw.) Schimp. – 8: on limestone rocks
Homalothecium aureum (Spruce) Robins. – 5: on schistose soil
Homalothecium lutescens (Hedw.) Robins. – 4, 7: on schistose soil, 9: soil in heathland
Homalothecium sericeum (Hedw.) B., S. et G. – 1: on sandstone rocks, 4, 6: on the bark of *Quercus*, 7: on the bark of *Platanus orientalis*, 9: on the bark of *Acer*
Hygrohypnum luridum (Hedw.) Jenn. – 1: limestone rocks along a stream
Hypnum cupressiforme Hedw. – 9: on the bark of *Phyllirea*, 11: on schistose soil
Hypnum lacunosum (Brid.) Hoffm. – 5, 7: on schistose soil, 9: soil in heathland
Isothecium alopecuroides (Dubois) Isov. – 7: on the bark of *Carpinus orientalis*, 9: on the bark of *Acer*
Leptobarbula berica (De Not.) Schimp. – 1: on sandstone rocks
Leucodon sciuroides (Hedw.) Schwaegr. – 6: on the bark of *Quercus*
Orthotrichum affine Brid. – 1, 4: on the bark of *Quercus*, 1: on the bark of *Sorbus*, 7: on the bark of *Platanus orientalis*, 9: on the bark of *Carpinus orientalis*
Orthotrichum anomalum Hedw. – 1, 7: on limestone rocks along a stream
Orthotrichum cupulatum Brid. – 7: on rocks
Orthotrichum diaphanum Brid. – 3, 7: on the bark of *Platanus orientalis*, 9: on the bark of *Fraxinus* and *Carpinus orientalis*
Orthotrichum lyellii Hook. et Tayl. – 1: on the bark of *Sorbus*, 6: on the bark of *Quercus*, 7: on the bark of *Platanus orientalis*
Orthotrichum microcarpum De Not. – 7: on the bark of *Platanus orientalis*
Orthotrichum pallens Bruch ex Brid. – 7: on the bark of *Platanus orientalis*
Orthotrichum pumilum Sw. – 7: on the bark of *Platanus orientalis*
Orthotrichum striatum Hedw. – 7: on the bark of *Platanus orientalis*
Palustriella commutata (Hedw.) Ochyra – 7: on limestone rocks along a stream
Phascum cuspidatum Hedw. var. *cuspidatum* – 2: on salty soil, 9: on limestone rocks
Phascum cuspidatum Hedw. var. *piliferum* (Hedw.) Hook. et Tayl. – 9: on limestone rocks
Pleuridium acuminatum Lindb. – 4, 11: on schistose soil
Pleurochaete squarrosa (Brid.) Lindb. – 5, 6, 7: on schistose soil, 8, 12: on limestone rocks, 9: soil in heathland
Pohlia melanodon (Brid.) Shaw – 7, 13: on limestone rocks along a stream, 8: on limestone rocks
Polytrichum juniperinum Hedw. – 9: soil in heathland, 11: on schistose soil
Pottia intermedia (Turn.) Fűrnr. – 2: on salty soil
Pottia truncata (Hedw.) B. et S. – 11: on schistose soil
Pseudocrossidium hornschuchianum (K. F. Schultz) Zander – 9: on soil
Pseudocrossidium revolutum (Brid.) Zander – 3: on soil
Pylaisia polyantha (Hedw.) Schimp. – 9: on tree bark
Rhynchostegiella curviseta (Brid.) Limpr. – 9, 13: on limestone rocks along a stream
Rhynchostegiella tenella (Dicks.) Limpr. – 1: on sandstone rocks, 9: on limestone rocks

- Rhynchostegiella tenella* (Dicks.) Limpr. var. *litorea* (De Not.) Rich. et Wallace – 1: on limestone rocks along a stream
- Rhynchostegium confertum* (Dicks.) B., S. et G. – 7: on bark of *Platanus orientalis* and on limestone rocks along a stream
- Rhynchostegium megapolitanum* (Web. et Mohr) B., S. et G. – 7: on schistose soil, 9: on limestone rocks and soil in heathland
- Rhynchostegium riparioides* (Hedw.) Card. – 1, 13: limestone rocks along a stream
- Schistidium singarense* (Schiffn.) Laz. – 1: on sandstone rocks, 5: on schistose soil
- Scleropodium purum* (Hedw.) Limpr. – 7: on schistose soil, 9: soil in heathland
- Scleropodium touretii* (Brid.) L. Koch – 1: limestone rocks along a stream, 6, 7, 11: on schistose soil, 7: on the bark of tree
- Scorpiurium circinatum* (Brid.) Fleisch. et Loeske – 1: on sandstone rocks, 8, 9: on limestone rocks, 13: on limestone rocks along a stream
- Seligeria paucifolia* (Dicks.) Carruth. – 1: on sandstone rocks
- Taxiphyllum wissgrillii* (Garov.) Wijk et Marg. – 9: on soil
- Tortella flavovirens* (Bruch) Broth. – 9: on soil in heathland, 10: on sand dunes
- Tortella humilis* (Hedw.) Jenn. – 5: on soil in maquis
- Tortella nitida* (Lindb.) Broth. – 1: on sandstone rocks
- Tortula calcicolens* Kramer – 9: on limestone rocks
- Tortula inermis* (Brid.) Mont. – 5, 7: on schistose soil
- Tortula intermedia* (Brid.) De Not. – 4: on rocky soil
- Tortula marginata* (B. et S.) Spruce – 9: on limestone rocks
- Tortula muralis* Hedw. – 1: on sandstone rocks, 3: on the bark of *Platanus orientalis*, 4: on schistose soil, 7: on limestone rocks along a stream, 9: on limestone rocks
- Tortula princeps* De Not. – 7, 8: fissure limestone rocks
- Tortula ruraliformis* (Besch.) Grout – 5: on schistose soil
- Tortula ruralis* (Hedw.) Gaertn., Meyer et Scherb. subsp. *hirsuta* (Vent.) W. Kramer – 5: on schistose soil
- Tortula ruralis* (Hedw.) Gaertn., Meyer et Scherb. ssp. *hirsuta* (Vent.) W. Kramer var. *submamillosa* – 7: on schistose soil, 9: on soil in heathland, 10: on sand dunes
- Tortula solmsii* (Schimp.) Limpr. – 9: on soil
- Tortula subulata* Hedw. var. *subulata* – 4, 6, 7: on schistose soil
- Tortula subulata* Hedw. var. *angustata* (Schimp.) Limpr. – 4, 6: on schistose soil
- Tortula subulata* Hedw. var. *subinermis* (Brid.) Wils. – 9: on soil in heathland
- Trichostomum brachydontium* Bruch – 1: on sandstone rocks, 5, 7, 11: on schistose soil, 9: on soil in heathland and on limestone rocks along a stream
- Trichostomum crispulum* Bruch – 7: on schistose soil, 9: on soil in heathland
- Weissia brachycarpa* (Nees et Hornsch.) Jur. – 1: on sandstone rocks, 4, 11: on schistose soil, 9: on soil in heathland
- Weissia condensa* (Voit) Lindb. – 9: on soil in heathland
- Weissia controversa* Hedw. – 7: on schistose soil
- Weissia longifolia* Mitt. – 4: on schistose soil
- Zygodon viridissimus* (Dicks.) Brid. subsp. *rupestris* (Schimp. ex Lacoste) Kindb. – 7: on the bark of *Quercus*

Seven species *i.e.* *Bryum rubens*, *Didymodon sicculus*, *Fissidens polyphyllus*, *Fissidens serrulatus*, *Orthotrichum microcarpum*, *Seligeria paucifolia*, *Schisti-*

dium singarense seem to be new records for Turkey based on ÇETIN (1988b) and FREY and KÜRSCHNER (1991).

Bryum rubens Mitt. is a species of the temperate zone of Europe (DÜLL 1985). It is a member of the *Bryum erythrocarpum* complex, a plant of arable fields, roadsides, earthy banks, bare soil among tussocks and other temporary habitats. It occurs on soils from slightly acid to highly basic (CRUNDWELL and NYHOLM 1964). Resulting from the solution of taxonomic problems regarding this group many new records of the members of the complex were published from the Balkan region as well. *Bryum rubens* and *B. ruderale* were reported as new species for Yugoslavia (Serbia and Montenegro) by PAPP and SABOVLJEVIĆ (2001). The occurrence of the species in Turkey is not a surprise.

Didymodon sicculus Cano et al. is a newly described species from southeastern Spain (CANO et al. 1996). It lives on saline and gypsiferous soil. It is similar to *D. luridus* Spreng. The identification of our specimens was confirmed by Juan Antonio Jiménez Fernández. He has mentioned that he had also collected the species in Turkey. In this case our records are not new to the whole of Turkey, but they are valuable, too. The species was recorded from Greece (BLOCKEEL et al. 2002) and Italy (ALEFFI et al. 2003). It was supposed that it occurs on saline-alkali areas of other sub-Mediterranean, Mediterranean countries, as well.

Seligeria paucifolia (Dicks.) Carruth. is an atlantic species in Europe. It has records from western Europe (Belgium, France, Great Britain, Ireland) and from Italy (DÜLL 1985). It lives on shaded limestone in Britain and frequent and sometimes locally common in South and East England. In the other countries it is rare. It is included in the list of the species of Conservation Concern in Sussex. The species was reported as new to Yugoslavia (Serbia and Montenegro) by PAPP and SABOVLJEVIĆ (2001).

Orthotrichum microcarpum De Not. is a species of the temperate zone of Europe. It has been recorded from the sub-Mediterranean, Mediterranean region (Italy and former Yugoslavia), from northern Europe (Norway, Sweden), from Central Europe (Germany, Switzerland, Poland) as well. It was reported from the Caucasus (DÜLL 1985) and from Iran (FREY and KÜRSCHNER 1991).

Fissidens polyphyllus Wilson ex B., S. et G. is an atlantic, sub-Mediterranean species. It is recorded along the Atlantic coast of Europe (Great Britain, Ireland, Portugal, Spain, France), but it was found in Italy, too (DÜLL 1984). It is a quite robust plant growing in the lower altitudes in humid and shaded places in the Mediterranean region. It is not too common and can easily be confused with *F. taxifolius* subsp. *pallidicaulis*, but differs in the venation and leaf cells.

Fissidens serrulatus Brid. is also an atlantic, sub-Mediterranean species. Besides the Atlantic coast of Europe (as Great Britain, Ireland, France, Spain, Portu-

gal) it is reported from the east Mediterranean, too e.g. Italy, Greece, former Yugoslavia (DÜLL 1984). It seems to be a frequent species within the Mediterranean region growing on basic rock fissures, soils in shadow, in woods and by rivulets. It can be confused with robust forms of *F. adianthoides*, from which it differs with its longer leaves, smaller and mamilliose leaf cells.

Schistidium singarense (Schiffn.) Laz. is a member of the *S. apocarpum* complex. It grows mainly on basic rocks in a wide altitudinal range. This species seems to be a quite common species of the genus in the Mediterranean region as in Spain, Italy, Montenegro (CORTINI PEDROTTI 2001, SABOVLJEVIĆ, 2001 and CASAS 2000), along with another closely related species from the *S. apocarpum* complex, *S. crassipilum* Blom.

BRYOFLORISTICAL NOTES

In accordance with the phytogeographical situation of Turkish Thrace most (40%) of the species collected are taxa of the temperate zone of Europe. Most of these are circumpolar elements, but a few of them have Euro-Asiatic distribution as *Frullania dilatata*, *Isothecium alopecuroides*, *Scleropodium purum*. A high proportion of the species has subatlantic, sub-Mediterranean distribution (37%). Among liverworts, 7 species from the total 17 are of Mediterranean elements e.g. *Calypogeia fissa*, *Cephaloziella baumgartnerii*, *C. turneri*, *Fossombronina angulosa*, *Lophozia turbinata*, *Riccia crozalsii*, *R. nigrella*. Several characteristic mosses of the Mediterranean region were also collected, including *Cheilothela chloropus*, *Dicranella howei*, *Fissidens limbatus*, *Homalothecium aureum*, *Rhynchostegiella tenella* var. *litorea*, *Scorpiurium circinatum*, *Tortella nitida*, *Tortula ruralis* subsp. *hirsuta*. A few rarer Mediterranean species e.g. *Tortula marginta*, *T. solmsii* could also be highlighted. Some boreal, subboreal elements (11 species) contribute to the diversity of the flora according to the collected material e.g. *Scapania irrigua*, *Bartramia ithyphylla*, *Bryum pallens*, *Dicranum majus*, *D. scoparium*, *Ditrichum flexicaule*, *Gymnostomum aeruginosum*, *Hygrohypnum luridum*, *Orthotrichum pallens*, *Pylaisiella polyantha*, *Tortula subulata*.

* * *

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REFERENCES

- ALEFFI, M., SABOVLJEVIĆ, M. and TACCHI, R. (2003): *Didymodon sicculus* M. J. Cano, Ros, García-Zamora & J. Guerra (Pottiaceae, Musci), new to Italy. – *Cryptogamie, Bryologie* **24**(1): 49–51.
- BLOCKEEL, T. L., ROS, R. M., SABOVLJEVIĆ, M., CANO, M. J., GALLEGU, T. and MUÑOZ, J. (2002): New and interesting bryophyte records for Greece. – *Cryptogamie, Bryologie* **23**(2): 149–155.
- BLOM, H. (1996): A revision of the *Schistidium apocarpum* complex in Norway and Sweden. – *Bryophytorum Bibliotheca* **49**: 5–333.
- CANO, M. J., ROS, R. M., GARCÍA-ZAMORA, P. and GUERRA, J. (1996): *Didymodon sicculus* sp. nov. (Bryopsida, Pottiaceae) from the Iberian Peninsula. – *The Bryologist* **99**(4): 401–406.
- CASAS, C. (2000): El género *Schistidium* Bruch et Schimp. en España. – *Boletín de la Sociedad Española de Briología* **16**: 1–9.
- ÇETIN, B. (1988a): Check list of liverworts and hornworts of Turkey. – *Lindbergia* **14**(1): 12–14.
- ÇETIN, B. (1988b): Check list of the mosses of Turkey. – *Lindbergia* **14**(1): 15–23.
- ÇETIN, B. (1991): *Hygrohypnum duriusculum* (De Not.) Jamieson: a new record for the moss flora of Turkey. – *Lindbergia* **17**: 3–4.
- CORLEY, M. F. V. and CRUNDWELL, A. C. (1991): Additions and amendments to the mosses of Europe. – *Journal of Bryology* **16**: 337–356.
- CORLEY, M. F. V., CRUNDWELL, A. C., DÜLL, R., HILL, M. O. and SMITH, A. J. E. (1981): Mosses of Europe and the Azores; an annotated list of species, with synonyms from the recent literature. – *Journal of Bryology* **11**: 609–689.
- CORTINI PEDROTTI, C. (2001): *Flora dei muschi d'Italia*. I parte. – Antonio Delfino Editore, Milano, Roma, 817 pp.
- CRUNDWELL, A. C. and NYHOLM, E. (1964): The European species of the *Bryum erythrocarpum* complex. – *Journal of Bryology* **4**: 597–637.
- DAVIS, P. H. (ed) (1965): *Flora of Turkey I. Introduction*. – Cunnungham and Sons Limited, Alva, pp. 1–28.
- DÜLL, R. (1983): Distribution of the European and Macaronesian liverworts (Hepaticophytina). – *Bryologische Beiträge* **2**: 1–115.
- DÜLL, R. (1984): Distribution of the European and Macaronesian mosses (Bryophytina) I. – *Bryologische Beiträge* **4**: 1–109.
- DÜLL, R. (1985): Distribution of the European and Macaronesian mosses (Bryophytina) II. – *Bryologische Beiträge* **5**: 110–232.
- DÜLL, R. (1992): Distribution of the European and Macaronesian mosses (Bryophytina). Annotations and Progress. – *Bryologische Beiträge* **8/9**: 1–223.
- FREY, W. and KÜRSCHNER, H. (1991): Conspectus *Bryophytorum Orientalum et Arabicorum*. An annotated catalogue of the bryophytes of Southwest Asia. – *Bryophytorum Bibliotheca* **39**: 1–181.
- FREY, W., FRAHM, J. P., FISCHER, E. and LOBIN, W. (1995): *Die Moos- und Farnpflanzen Europas*. – Gustav Fischer Verlag, Stuttgart, Jena, New York, 426 pp.
- GÖLKER, I. and ÖZTÜRK, M. (1991): Liverworts of Turkey and their position of Southwest Asia. – *Candollea* **46**: 359–366.
- GÖLKER, I. and ÖZTÜRK, M. (1996): Liverworts of Turkish Thrace. – *Bocconea* **5**: 319–323.
- GÖLKER, I., INOUE, H. and ÖZTÜRK, M. (1984): A new record for Turkey, *Pellia neesiana* (Gott.) Limpr. – *Ege University Faculty Science Journal B* **7**(1): 85–89.

- GÖLKER, I., ÖZTÜRK, M. and KESERCIOĞLU, T. (1986): Checklist of liverworts (Hepaticae) recorded from Turkey. – *Ege University Faculty Science Journal B* **8**: 1–10.
- KRAMER, W. (1980): *Tortula* Hedw. sect. *Rurales* De Not. (Pottiaceae, Musci) in der östlichen Holarktis. – *Bryophytora Bibliotheca* **21**: 5–165.
- KUČERA, J. (1998): *Gymnostomum lanceolatum* Cano, Ros & Guerra (Pottiaceae, Musci) also in Turkey and Croatia. – *Journal of Bryology* **20**: 515–516.
- MÜLLER, F. (1998): Four new bryophytes to Turkey: *Bazzania flaccida* (Dum.) Grolle, *Leiocolea bantriensis* (Hook.) Joegr., *Brachythecium geheebii* Milde and *Plagiothecium laetum* B.S.G. – *Journal of Bryology* **20**: 516–518.
- PAPP, B. and SABOVLJEVIĆ, M. (2001): Contribution to the knowledge of the bryoflora of the region of Petnica (W Serbia, Yugoslavia). – *Studia bot. hung.* **32**: 107–120.
- SABOVLJEVIĆ, M. (2001): *Donnée sur la présence et la chorologie des taxons du genre Schistidium Bruch. et W. Schimper (Grimmiaceae) dans la République Fédérale de Yougoslavie (Serbie et Monténégro)*. – Book of Abstracts, X OPTIMA meeting, Palermo, Italy, p. 227.
- SABOVLJEVIĆ, M., GANEVA, A., TSAKIRI, E. and ŞTEFNUŢ, S. (2001): Bryology and bryophyte protection in south-eastern Europe. – *Biological Conservation* **101**: 73–84.
- SCHUMACKER, R. and VÁŇA, J. (2000): *Identification keys to the liverworts and hornworts of Europe and Macaronesia (Distribution and Status)*. – Documents de la Station scientifique des Hautes-Fagnes, no 31, 160 pp.
- SMITH, A. J. E. (1991): *The liverworts of Britain and Ireland*. – Cambridge University Press, 362 pp.
- SMITH, A. J. E. (1993): *The moss flora of Britain and Ireland*. – Cambridge University Press, 705 pp.
- SMITH, A. J. E. (1997): The Hypnum cupressiforme complex in the British Isles. – *Journal of Bryology* **19**: 751–774.
- TOWSEND, C. C. (1997): Two mosses new to Turkey. – *Journal of Bryology* **19**: 641.
- WALTHER, K. (1975): Zur Moosvegetation der Liquidambar-Walder Südwest-Anatoliens. – *Phytocoenologia* **2**: 13–18.
- WALTHER, K. (1979): Die epiphytischen Moosgesellschaften des Nif-Dag bei Izmir, Westanatolien. – *Documents Phytosociologique, Nouv. sér.* **4**: 943–950.
- WALTHER, K. and LEBLEBICI, E. (1969): Die Moosvegetation des Karagöl Gebietes im Yamanlar Dag nordlich Izmir. – *Monographs of the Faculty of Science, Ege University* **10**: 1–48.
- YAYINTAŞ, A. (1993): New moss record for Turkey, *Plagiothecium curvifolium* Schleiph. ex Limpr. (Plagiotheciaceae). – *Ege University Faculty Science Journal B* **15**: 21–23.
- YAYINTAŞ, A. (1994): A new moss record for Turkey, *Plagiothecium denticulatum* (Hedw.) B., S et G. var. *obtusifolium* (Turn.) Moore (Plagiotheciaceae). – *Ege University Faculty Science Journal B* **16**: 19–21.
- YAYINTAŞ, A. and IWATSUKI, Z. (1988): Some moss records from western Turkey. – *Hikobia* **10**: 209–213.
- YAYINTAŞ, A. and TONGUÇ, Ö. (1993): *Platydictya confervoides* (Brid.) Crum, a new moss record for Turkey. – *Ege University Faculty Science Journal B* **15**: 17–20.
- YAYINTAŞ, A. and TONGUÇ, Ö. (1994): A new moss record for Turkey, *Plagiothecium succulentum* (Wils.) Lindb. (Plagiotheciaceae). – *Turkish Journal of Botany* **18**: 517–518.

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