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CONTRIBUTIONS TO THE BRYOPHYTE FLORA OF EASTERN TURKEY

B. PAPP

Department of Botany, Hungarian Natural History Museum
H–1476 Budapest, Pf. 222, Hungary; pappbea@bot.nhmus.hu

Documentation of a bryologically quite unexplored area in eastern Turkey revealed 68 taxa (3 hepatics and 65 mosses) of which 5 species are reported for the first time in the A5 grid square of Turkey, 9 species in the B9, and 45 taxa in the B10 grid square.

Key words: Bryophytes, eastern Turkey, new records

INTRODUCTION

The first summaries of the bryophyte flora of Turkey were published by HENDERSON (1961) and HENDERSON and PRENTICE (1969). In these papers 15 distributional grid squares were established for Turkey, which roughly coincide with the major floristic districts of the country. This grid system is highly accepted by Turkish botanists and is actively used in their recent publications. Also containing an account on the Turkish bryoflora, a comprehensive work about the bryophytes of southwestern Asia was published by FREY and KÜRSCHNER (1991). More recent checklists for Turkey are published by UYAR and ÇETIN (2004) and KÜRSCHNER and ERDAĞ (2005).

Due to the increasing interest in bryophyte research in the last 10 years in Turkey several other papers were published by Turkish bryologists. The bryological investigations are mainly concentrated on the northern, western, and southwestern part of Turkey, while large areas in the eastern part remained quite unexplored (TOWNSEND 2005).

Eastern Turkey (a continuation of East Anatolia) is a mountainous area of upland character, with elevations of the plateau reaching 1,700 m. Many of the high mountains of this region are of limestone or dolomite, but some of the landmark high mountains are of Quaternary volcanic origin (Mt Ararat, 5,165 m, Mt Süphan, 4,434 m).

The highlands of eastern Turkey are largely covered by snow from November to March or April; the highest peaks, above 3,000 m, have permanent snow. On the plateau the mean yearly temperature is 8 °C, the coldest month is January with mean value of –4 °C and the warmest ones are July and August with 21 °C on average. Mean yearly precipitation is 312 mm with the most rainy month May (56 mm on average) (http://qwikcast.weatherbase.com).

Most of eastern Turkey is covered by steppe or at higher altitude mountain cushion vegetation dominated by *Astragalus* and *Acantholimon* species, locally with patches of park-like open forests composed mainly by junipers and deciduous oaks. This woody vegetation has seriously been affected by long-time human disturbance (DAVIS 1965).

MATERIALS AND METHODS

Collections were made in July 2001 by the author, and in May and August-September of 2006 by Krisztina Lakatos (Budapest), mainly from exposed volcanic and limestone rocks, at waterfalls and stream banks. The specimens are deposited in the Hungarian Natural History Museum, Budapest (BP). Nomenclature of the species follows GROLLE and LONG (2000) for hepatics and HILL *et al.* (2006) for mosses.

Site details

1. Turkey, archaeological site of Ani, Oçakli village at Kars town, volcanic bedrock, 1,450 m, 40° 30' 30.75" N, 43° 34' 23.56" E, leg. Papp, B., 23.07.2001.
2. Turkey, around Ishak paşa saray at Dogubayazit town, volcanic and limestone bedrock, 1,760–2,120 m, 39° 31' 37.57" N, 44° 07' 10.60" E, leg. Papp, B., 24.07.2001.
3. Turkey, Muradiye waterfall near Van lake, 1,730 m, 39° 01' 24.02" N, 43° 44' 52.15" E, leg. Papp, B., 25.07.2001.

4a. Turkey, above the camping opposite Akdamar island at Van lake near Van town, volcanic bedrock, 1,680 m, 38° 18' 20.84" N, 43° 3' 22.39" E, leg. Papp, B., 26.07.2001.

4b. Turkey, above the camping opposite Akdamar island at Van lake near Van town, volcanic bedrock, 1,680 m, 38° 18' 20.84" N, 43° 3' 22.39" E, leg. Lakatos, K., 05.2006.

5. Turkey, Akdamar island in Van lake near Van town, limestone bedrock, 1,650 m, 38° 20' 28.41" N, 43° 2' 13.64" E, leg. Papp, B., 26.07.2001.

6. Turkey, behind Urartu, castle on rock, volcanic bedrock, 1,900 m, 39° 31' 33.77" N, 44° 7' 51.09" E, leg. Lakatos, K., 05.2006.
7. Turkey, Van Kale at Van town, volcanic bedrock, 1,700 m, 38° 30' 7.23" N, 43° 20' 18.89" E, leg. Lakatos, K., 05.2006.
8. Turkey, Ice cave at Halaç village, 23 km east of Dogubayazit town towards the Iranian border, volcanic and limestone bedrock, 1,500 m, 39° 29' 53.45" N, 44° 19' 26.06" E, leg. Lakatos, K., 02.09.2006.
9. Turkey, Serkani spring, Bahçesaray, 2,200 m, 38° 6' 45.65" N, 42° 41' 10.84" E, leg. Lakatos, K., 27.08.2006.
10. Turkey, Mt Süphan, eastern slope, volcanic bedrock, 3,850 m, 38° 55' 28.99" N, 42° 49' 01.73" E, leg. Lakatos, K., 04.09.2006.

11a. Turkey, Mt Ararat, Yeşil kamp, Eliköy, volcanic bedrock, 2,950 m, 39° 40' 32.64" N, 44° 15' 54.68" E, leg. Lakatos, K., 23.08.2006.

11b. Turkey, Mt Ararat, Yeşil kamp, Eliköy, mainly volcanic bedrock, 2,800–3,300 m, 39° 40' 32.64" N, 44° 15' 54.68" E, leg. Lakatos, K., 26.08.2006.

12. Turkey, Mt Ararat, above Kum kamp, volcanic bedrock, 3,800 m, 39° 41' 02.43" N, 44° 16' 48.71" E, leg. Lakatos, K., 24.08.2006.
13. Turkey, foot of Mt Little Ararat, behind Yayginyurt village, volcanic and limestone bedrock, 1,470 m, 39° 31' 17.44" N, 44° 17' 11.50" E, leg. Lakatos, K., 02.09.2006.
14. Turkey, archaeological site of Arsameia on Mt Nemrut at Adiyaman, limestone bedrock in *Quercetum*, 700 m, 37° 57' 17.53" N, 38° 35' 22.41" E, leg. Papp, B., 29.07.2001.

The locality No. 1 is situated in the A5 grid square of Turkey according to HENDERSON (1961) and HENDERSON and PRENTICE (1969), while localities Nos 2–13 are placed into the B10, and the site No. 14 is located in the B9 grid square.

RESULTS

Altogether 68 taxa (3 hepatics and 65 mosses) are reported from the eastern part of Turkey.

A5 grid square of Turkey

Seven moss species are reported from the locality No. 1, which belongs to the A5 grid square of Turkey (HENDERSON 1961, HENDERSON and PRENTICE 1969). All specimens were collected from exposed volcanic rocks, as listed:

Grimmia plagiopodia Hedw.
Hypnum cupressiforme Hedw.
Orthotrichum anomalum Hedw.
Syntrichia ruralis (Hedw.) F. Weber et D. Mohr
Syntrichia virescens (De Not.) Ochyra
Tortula muralis Hedw. var. ***muralis***
Tortula hoppeana (Schultz) Ochyra

Hypnum cupressiforme was reported from A5 grid by HENDERSON (1961). *Grimmia plagiopodia* was recorded by TOWNSEND (2005) from the same place (Ani at Kars) of A5 grid, together with *Grimmia laevigata*, *Tortula muralis* var. *aestiva*, *Hypnum vaucheri*. The other five species are reported for the first time in the A5 grid of Turkey (HENDERSON and PRENTICE 1969).

B9 grid square of Turkey

14 species (2 hepatics and 12 mosses) are reported from locality No. 14, which is situated in the B9 grid square. All specimens were collected from exposed limestone rocks, as listed:

Hepaticae

Cephaloziella baumgartneri Schiffn.
Southbya nigrella (De Not.) Henriq.

Musci

Anoectangium handelii Schiffn. (det. J. Kučera)
Crossidium squamiferum (Viv.) Jur.
Didymodon umbrosus (Müll. Hal.) R. H. Zander (det. J. Kučera)
Didymodon vinealis (Brid.) R. H. Zander (det. J. Kučera)
Encalypta vulgaris Hedw. (det. W. Schröder)
Entosthodon pulchellus (H. Philib.) Brugués (det. H. Kürschner)
Grimmia anodon Bruch et Schimp. (det. W. Schröder)
Grimmia orbicularis Bruch ex Wilson (det. W. Schröder)
Grimmia tergestina Tomm. ex Bruch et Schimp. (det. W. Schröder)
Rhynchostegiella tenella (Dicks.) Limpr.
Schistidium helveticum (Schkuhr) Deguchi (det. W. Schröder)
Tortula inermis (Brid.) Mont. (det. J. Kučera)

Crossidium squamiferum, *Encalypta vulgaris* and the three species of *Grimmia* were already reported from the B9 grid square, the other 9 species were collected for the first time in this square (HENDERSON and PRENTICE 1969).

Anoectangium handelii is a very interesting record. It was described by SCHIFFNER (1913) from the C14 grid square of Turkey (HENDERSON 1961). Although our specimen has no axillary gemmae, the morphology, anatomy and ecology fit to the concept of *A. handelii* (J. Kučera, *pers. comm.*). It contains a few sporophytes, which is rarely observed in this plant.

B10 grid square of Turkey

Altogether 58 species (one hepatic and 57 mosses) are recorded in the B10 grid square. Following the species name, the numbers of the localities and the substrates are given.

Hepaticae

Pellia endiviifolia (Dicks.) Dumort. – 9: rocks at the spring

Musci

Brachytheciastrum velutinum (Hedw.) Schimp. – 5: soil among limestone rocks
Brachythecium rutabulum (Hedw.) Schimp. – 9: rocks at the spring
Bryoerythrophyllum recurvirostrum (Hedw.) P. C. Chen – 2: exposed limestone rocks
Bryum alpinum Huds. ex With. – 9: rocks at the spring
Bryum argenteum Hedw. – 2: soil among exposed limestone rocks
Bryum caespiticium Hedw. – 2, 5: soil among exposed limestone rocks
Bryum capillare Hedw. *s. l.* – 5: soil among exposed limestone rocks
Bryum moravicum Podp. – 9: on tree bark
Bryum pallens Sw. ex anon. – 3: soil among rocks at the stream
Bryum pseudotriquetrum (Hedw.) P. Gaertn. *et al.* – 9: rocks at the spring
Ceratodon conicus (Hampe) Lindb. – 2: soil among exposed limestone rocks
Ceratodon purpureus (Hedw.) Brid. – 2: soil among exposed limestone rocks
Cratoneuron filicinum (Hedw.) Spruce – 9: rocks at the spring
Didymodon vinealis (Brid.) R. H. Zander – 5: soil among exposed limestone rocks
Distichium capillaceum (Hedw.) Bruch et Schimp. – 10: on limestone rocks
Encalypta rhaptocarpa Schwägr. – 2: soil among exposed limestone rocks (rev. H. Kürschner); 4a, 8: soil among exposed schistose rocks; 5: exposed limestone rocks

Entosthodon attenuatus (Dicks.) Bryhn – 2, 5: exposed limestone rocks
Eurhynchiastrum pulchellum (Hedw.) Ignatov et Huttunen – 12: soil among exposed volcanic rocks
Grimmia alpestris (F. Weber et D. Mohr) Schleich. – 4a: exposed schistose rocks; 11a: exposed volcanic rocks (conf. E. Maier)
Grimmia anodon Bruch et Schimp. – 2, 5, 6, 7, 8, 11b, 13: exposed limestone rocks (conf./det. E. Maier, W. Schröder)
Grimmia laevigata (Brid.) Brid. – 4a, 4b: exposed schistose rocks; 8, 9, 13: exposed volcanic rocks
Grimmia ovalis (Hedw.) Lindb. – 4a, 4b: exposed schistose rocks; 8, 9, 11b: exposed volcanic rocks (conf. E. Maier)
Grimmia plagiopodia Hedw. – 2: exposed volcanic rocks (conf. E. Maier)
Grimmia pulvinata (Hedw.) Sm. – 5: exposed limestone rocks
Grimmia reflexidens Müll. Hal. – 11b: exposed volcanic rocks (rev. E. Maier)
Grimmia tergestina Tomm. ex Bruch et Schimp. – 11b: exposed limestone rocks (conf. E. Maier)
Habrodon perpusillus (De Not.) Lindb. – 2: exposed limestone rocks
Homalothecium philippeanum (Spruce) Schimp. – 5: exposed limestone rocks
Homalothecium sericeum (Hedw.) Schimp. – 8: exposed volcanic rocks
Hypnum revolutum (Mitt.) Lindb. – 2: exposed limestone rocks
Hypnum vaucheri Lesq. – 6, 8: exposed limestone rocks (det. H. Kürschner)
Orthotrichum cupulatum Hoffm. ex Brid. – 4b: exposed schistose rocks; 5: exposed limestone rocks
Orthotrichum rupestre Schleich. ex Schwägr. – 8: exposed volcanic rocks
Orthotrichum urnigerum Myrin – 8: exposed volcanic rocks
Oxyrrhynchium hians (Hedw.) Loeske – 12: volcanic rock crevices
Palustriella falcata (Brid.) Hedenäs – 9: rocks at a spring
Phascum cuspidatum Hedw. var. ***piliferum*** (Hedw.) Hook. et Taylor– 5: soil among exposed limestone rocks
Pohlia cruda (Hedw.) Lindb. – 12: soil among exposed volcanic rocks
Pohlia melanodon (Brid.) A. J. Shaw – 2: soil among limestone rocks
Pseudoleskeella catenulata (Brid. ex Schrad.) Kindb. – 8: exposed volcanic rocks
Schistidium flaccidum (De Not.) Ochyra – 4a: exposed schistose rocks
Schistidium helveticum (Schkuhr) Deguchi – 2: exposed limestone rocks (conf. Schröder)
Syntrichia caninervis Mitt. var. ***caninervis*** – 2: soil among exposed limestone rocks (conf. J. Kučera)
Syntrichia caninervis Mitt. var. ***gypsophyla*** (J. J. Amann ex G. Roth) Ochyra – 2: soil among exposed limestone rocks (conf. J. Kučera)
Syntrichia princeps (De Not.) Mitt. – 5: exposed limestone rocks
Syntrichia ruralis (Hedw.) F. Weber et D. Mohr – 11b, 12: exposed volcanic rocks; 2, 5: exposed limestone rocks; 4a: exposed schistose rocks
Syntrichia virescens (De Not.) Ochyra – 4b: exposed schistose rocks

Timmia austriaca Hedw. – 8: exposed limestone rocks
Tortula grandiretis Broth. – 2: soil among exposed limestone rocks (det. H. Kürschner and J. Kučera)
Tortula hoppeana (Schultz) Ochyra – 12: soil among exposed volcanic rocks (conf. J. Kučera)
Tortula inermis (Brid.) Mont. – 5: exposed limestone rocks
Tortula lanceola R. H. Zander – 12: exposed volcanic rocks
Tortula muralis Hedw. – 5: exposed limestone rocks
Tortula obtusifolia (Schwägr.) Mathieu – 2: soil among exposed limestone rocks (det. J. Kučera)
Tortula subulata Hedw. var. ***subulata*** – 5: soil among exposed limestone rocks
Tortula subulata Hedw. var. ***graeffii*** Warnst. – 2: exposed limestone rocks (det. J. Kučera)

Except of 13 species, namely *Brachytheciastrum velutinum*, *Bryum caespiticium*, *Cratoneuron filicinum*, *Distichium capillaceum*, *Eurhynchiastrum pulchellum*, *Grimmia anodon*, *Grimmia laevigata*, *Grimmia ovalis*, *Homalothecium sericeum*, *Hypnum revolutum*, *Palustriella falcata*, *Pohlia melanodon*, *Syntrichia ruralis*, all other 45 species are recorded for the first time in the B10 grid square of Turkey (HENDERSON and PRENTICE 1969).

Tortula grandiretis is a highly interesting record, although this species is already known from Turkey; Eğirdir area, Isparta Province (CRUNDWELL *et al.* 1978). The new locality is a range extension towards Central Asia. It was recently reported from Iraq (KÜRSCHNER and FREY 2006).

Tortula obtusifolia is commonly confused with forms of *T. muralis*, but it was reported earlier from the A4 and C13 grid squares of Turkey (HENDERSON 1961).

* * *

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