

NEW RECORDS OF BRYOPHYTES FROM A SALINE AREA OF GREECE

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This paper reports on a new (*Entosthodon hungaricus*) and an interesting species (*Bryum subapiculatum*) to Greece. They were collected in a saline area of central Macedonia. The occurrence of *Entosthodon hungaricus* in Greece in a salt affected area is not surprising. Its continental-Mediterranean distribution and preference to saline-alkali soil explain the presence of this species on the investigated area. *Bryum subapiculatum* is a member of the *Bryum erythrocarpum* complex. The other species of the complex can be found frequently on saline-alkali areas.

Key words: *Bryum subapiculatum*, *Entosthodon hungaricus*, Greece, new records of bryophytes, saline area

INTRODUCTION AND SITE DESCRIPTION

During a field trip in March 1999 a saline area was visited in North Greece. The area is the former "Vromolimnes" (Mavrouda and Lantza lakes). It is in Greece (central Macedonia, Prefecture of Thessaloniki), at an altitude of 340 m a.s.l. The lakes are situated in a deep hollow surrounded by Mt Vertiskos (1,103 m a.s.l. northwest), Mt Kerdylia (1,091 m a.s.l., northeast) and Mt Volvi (659 m a.s.l., southwest).

Earlier, several halophytic vegetation types were described by BABALONAS et al. (1980) from the area (*Suaedetum maritimae balkanicum* Micevski 1965, *Puccinellietum convolutae* Micevski 1965, *Hordeo-Trifolietum nigrescentis* Babalonas et al. 1980) and this was the first time, when this kind of vegetation type was examined in the continental-Mediterranean transition areas. This plant composition is considered a relict of a former rich coastal vegetation, when the sea invaded the basin from Strymon Gulf through a small, tectonic valley with SE–NW direction during the Pleistocene period as it is concluded in the paleogeographical study of the area (PSILOVIKOS et al. 1978). Then, in the Middle Pleistocene, the Vromolimnes basin became land due to the elevation of the nearby mountain ranges. At its lower part a lake was formed which was later divided into two smaller lakes. This is also verified by the salt content of the samples from the area of the former Lantza lake and by sea fossils found in the basin.

Nowadays, in consequence of the draining process finished in 1966 most of the area is used for agriculture and only some fragmented remnants of halophytic

vegetation can be recognised, despite that the chemical data of the lakes and the remaining water in the draining channels (SIMEONAKIS 1975) still indicate high average concentrations of Na^+ and Cl^- ions, fluctuating from 43.5–49.9 me/l Cl^- (max. 186.3 me/l) and 61.2–75.6 me/l Na^+ (max. 266.0 me/l).

The collection was made on the way from Mavrouda to Xiropotamos village on the northwestern bank of the former Lantza sea, in fragmented stands in a semi-cultivated area, where *Puccinellia convoluta* and *Agropyron mediterraneum* predominated. The place seemed to be ploughed earlier and perhaps abandoned. Around the 100 m $\times$ 200 m small stands cultivated fields were observed.

Geologically, the site belongs to the Serbo-Macedonian Mass of the "Hellenic Zones" which is part of the Dinaric branch of the Alpine system. It consists of crystalline-schists (MOUNTRAKIS 1985).

The climate of the area belongs to Mesotherm climates and more specifically to the Mediterranean climates with mild winters and dry, warm summers (mean temperature of the warmest month of the year is higher than 22 °C) (BALAFOUTIS 1977). The mean average temperature is between 15–16 °C. The annual precipitation ranges between 600–700 mm. The mean maximum of rain occurs during the end of spring, beginning of summer, and the mean minimum is in August.

EXACT RECORDS

Entosthodon hungaricus (Boros) Loeske and *Bryum subapiculatum* Hampe. Flora of Greece, North Greece, central Macedonia. In Vromolimnes basin surrounded by the mountains Vertiskos, Kerdylia and Volvi, between Mavrouda and Xiropotamos villages on the northwestern bank of former Lantza sea, on saline soil, on a semicultivated area predominated by *Puccinellia* and *Agropyron*. Alt.: 340 m a.s.l. Leg. et det.: Papp, B. Date: 24.03.1999.

DISTRIBUTION, ECOLOGY

Entosthodon hungaricus (Boros) Loeske is a continental-Mediterranean species. It was described by Ádám Boros from salt affected areas of Hungary in 1924. As some years later it was also collected in Ukraine (BOROS 1928), it was supposed that the species is a continental element (BOROS 1943, 1945). However later it was reported from Spain from salty areas (CASAS and BRUGUÉS 1978, GARCIA GOMEZ and FUERTES LASALA 1980, FUERTES LASALA and GARCIA GOMEZ 1981) and the Mediterranean character of the species also became clear. According to DÜLL (1984, 1985) it has records from eastern and central Europe as Austria,

Slovakia, Hungary, Romania, Yugoslavia, Ukraine, Southeast Russia, from the Mediterranean region of Europe as Spain and southwestern Asia. It was reported in 1996 from Germany as well (AHRENS 1996). It grows characteristically in saline-alkali areas, on the banks of alkali lakes, but sometimes occurs in calcareous sandy areas and on calcareous rocks of mountain ranges as well. The species is included in the Red Data Book of European Bryophytes (ECCB 1995) in the rare category.

Other bryophytes found in the Vromolimnes basin associated with *E. hungaricus* were as follows: *Barbula unguiculata* Hedw., *Bryum subapiculatum* Hampe, *Pottia davalliana* (Sm.) C. Jens., *Pottia truncata* (Hedw.) B. et S., *Pseudocrossidium hornschuchianum* (K. F. Schultz) Zander, *Didymodon tophaceus* (Brid.) Lisa, *Didymodon vinealis* (Brid.) Zander, *Phascum cuspidatum* Hedw., *Funaria hygrometrica* Hedw., *Bryum bicolor* Dicks.

Among the above-mentioned bryophytes there is a remarkable species; *Bryum subapiculatum* Hampe. It has only two previous records from Greece (BLOCKEEL et al. 2002) from the Ionian Islands and central Greece. The species is new to North Greece. It is regarded as an "oceanic" species by DÜLL (1984, 1985). It is a member of the *Bryum erythrocarpum* complex. The species of this complex have rhizoid gemmae. The reproductive propagulum production is very quick and intensive, which helps them to quickly occupy newly formed habitats. The other species of the complex can also be found frequently in saline-alkali areas. For example, *B. radiculosum* and *B. rubens* have been mentioned from the saline areas of the Strymon river delta at Touzla and Nea Kerdylia villages (PAPP et al. in press). *Bryum subapiculatum* is reported from almost all western European countries and from some countries of central Europe, e.g. Poland, Austria. It has records from Africa, America and New Zealand as well. It is a plant of arable fields, sides of footpath, cliffs and places kept bare by frequent disturbance. It is also found on sandy and peaty soils. It is a calcifuge species, but does not tolerate very acid conditions (CRUNDWELL and NYHOLM 1964).

CONCLUSION

The occurrence of these two species in Greece in salt affected habitats is not surprising. *Entosthodon hungaricus* was also found in Spain in salt affected areas (salt-marshes, saline areas around lagoons, salty lakes) (CASAS and BRUGUES 1978, GARCIA GOMEZ and FUERTES LASALA 1980, FUERTES LASALA and GARCIA GOMEZ 1981). Its continental-Mediterranean distribution and preference to saline-alkali soils explain the presence of this species on the investigated area. *Bryum subapiculatum* is a member of *Bryum erythrocarpum* complex. The other species of the complex can be found frequently on saline-alkali areas.

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