

***Riccia perennis* Steph. (Ricciaceae, Hepaticae) new to South-West Asia**

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Résumé – L'hépatique thalloïde *Riccia perennis* Steph. est mentionnée pour la première fois en Turquie. Cette acquisition porte le nombre d'espèces de ce genre connu dans le pays à vingt-deux. L'espèce a été collectée dans le Parc Naturel du Bafa Lake. *Riccia perennis* est brièvement décrit et illustré. L'écologie et la distribution de cette espèce sont passées en revue.

Hépatiques / *Riccia perennis* / Turquie / Nouveau report

Abstract – The thalloid liverwort *Riccia perennis* Steph. is reported for the first time from Turkey bringing the total number of *Riccia* taxon known from Turkey to twenty two. The species was collected from Bafa Lake Natural Park in western part of Turkey. The species is briefly described and illustrated. The ecology and distribution of the species are reviewed.

Liverworts / *Riccia perennis* / Turkey / New Record

INTRODUCTION

The *Riccia* genus comprises about 200 species, with a worldwide distribution up to the Arctic and Antarctic, but is more frequent in areas with Mediterranean-type climates (Jovet-Ast, 1986). About 40 species are widely distributed in Europe and SW Asia (Heyn & Herrstadt, 2004). Several species are Mediterranean endemics, such as *Riccia bicarinata* Lindb., *R. melitensis* C. Massal., *R. perennis* Steph., *R. sommierii* Levier (Jovet-Ast, 1986; Heyn & Herrstadt, 2004), although for *R. perennis*, a report outside the Mediterranean basin has been given by Düll (1983) and Söderström *et al.* (2002) from Ukraine. A great number of taxa are, in spite of the numerous works of Jovet-Ast, still poorly known both from the taxonomic and distributional points of view. The genus is in urgent need of a modern revision that would benefit from molecular methods.

The *Ricciaceae* is one of the richest families among the Turkish Liverwort Flora. The genus *Riccia* L. accounts for the great majority of taxa, with 21 taxa reported

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up to now (Gökler & Öztürk, 1991; Kürschner & Erdağ, 2005; Ros *et al.*, 2007, Özenoğlu Kiremit & Keçeli, 2009). *Ricciocarpos* Corda is the only other genus of the family, having only one aquatic species collected in Turkey, from Sakarya (Seçmen *et al.*, 1989). This latter genus is recorded from Northwest, West and South Anatolia areas with Mediterranean-type climates (Walther, 1967, 1970; Crundwell & Nyholm, 1979; Gökler, 1992; Gökler & Aysel, 1998; Gökler *et al.*, 2000; Özenoğlu & Gökler, 2002; Özenoğlu Kiremit, 2007; Özenoğlu Kiremit *et al.*, 2007).

Of the species recorded so far 14 belongs to the subgenus *Riccia*: *R. bicarinata*, *R. bifurca*, *R. ciliata*, *R. ciliifera*, *R. crozalsii*, *R. glauca*, *R. gougetiana*, *R. lamellosa*, *R. macrocarpa*, *R. michelii*, *R. nigrella*, *R. papillosa*, *R. sorocarpa* and *R. trabutiana*. The other five species belong to the subgenus *Ricciella* (*Riccia canaliculata*, *R. crystallina*, *R. fluitans*, *R. frostii* and *R. rhenana*).

In the course of a bryological survey of the Bafa Lake Natural Park, the first author had the opportunity to find a locality of a species not formerly recorded in any part of the country, *R. perennis*.

GEOGRAPHIC CONTEXT

In Turkey, the Bafa Lake Natural Park forms the borders of Söke District of Aydın and Muğla Provinces in Aegean Region. The Bafa Lake stands at the southeast border of Great Menderes Delta. The lake, which used to be part of Aegean Sea, had turned to be a lake as result of geomorphologic development of Great Menderes Delta. The region is under typical Mediterranean climatic influences that are characterized by mild and rainy winters, warm and dry summers. The mean annual temperature varies between 14-20°C in the region. The mean January temperature varies between 5 and 10°C. The mean July temperature is over 25°C, the highest value may attain 40°C. The mean annual precipitation is about 592 mm. The relative humidity is over 60% during the summer period in the region. Climatic soil type is the reddish Mediterranean soil. Climatic vegetation of the region is red pine (*Pinus brutia* Ten.) forests. Maquis vegetation has developed as the result of the destruction of *Pinus brutia* forests. Olive and olive oil are mostly produced in the region. In this area olive tree (*Olea europaea* L.) gardens are seen as an olive-tree forest. Also species of willow (*Salix*), bulrush (*Typha*) and tamarisk (*Tamarix*) appear especially in southwest region of lake (Atalay, 2002).

RESULTS

Description of Turkish material of *Riccia perennis* Steph.

Riccia perennis plants form crowded mats, with a characteristic light green to yellow tinge (Fig. 1). Thalli 2-3 furcate, ultimate branches 1.7-2.5 (2.7) mm wide, inflated, narrowed to apex; dorsal surface appearing areolate and bullose towards apex with distinct pores, parchment-like when dry. Thallus sections 600-800 µm high and 3-4 times as wide, chlorenchyma with one, two or three layers of air-chambers layer; parenchyma dense, often with small cells (Fig. 2).

R. perennis can be distinguished from other *Ricciella* sub-genus members by the size (very robust), colour (yellowish tinge), lobes width (more than 1,7 mm

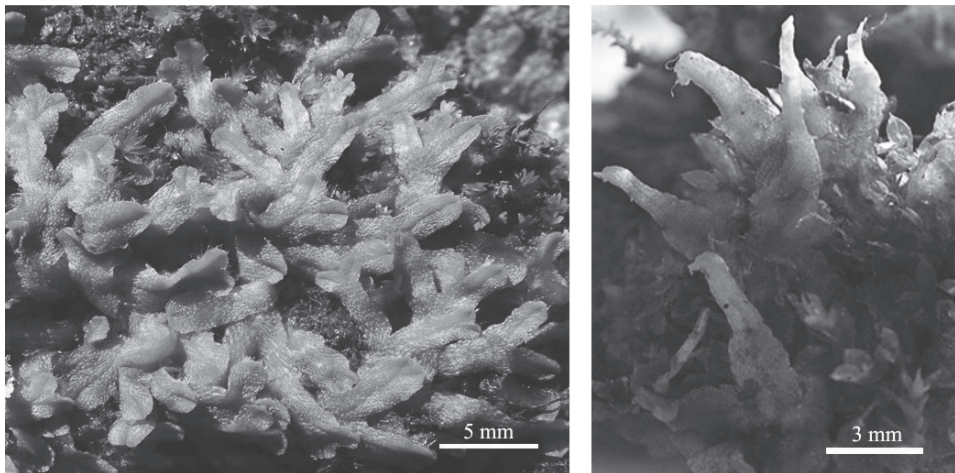


Fig. 1. General view of *R. perennis*. Photo by H. Özenoğlu Kiremit.

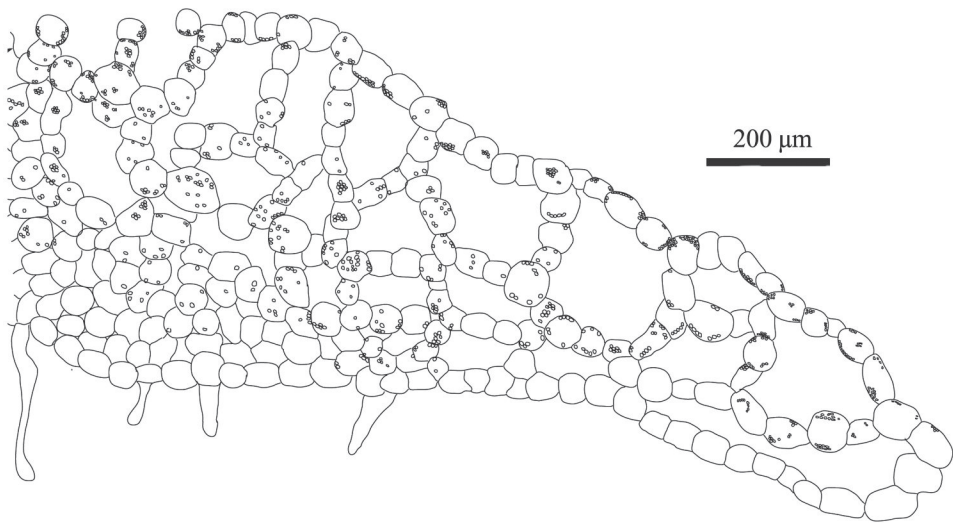


Fig. 2. Transverse section of thallus with one-three layers of air-chambers layer. Drawn by H. Özenoğlu Kiremit.

wide) and tubers on ventral face of the thallus. No other species of section *Ricciella* in Turkey has a thallus more than 1.5 mm wide so that determination is almost immediate even in the field.

Specimens studied: Turkey, Muğla, Milas, Kapikiri Village (Heraklea Antique City), Bafa Lake Natural Park, in grassland, in a small streambed, on wet soil, 75 m altitude; 37° 30. 222' N 27° 31. 936' E, 21.02.2009; *Özenoğlu C11/246*, leg. Özenoğlu Kiremit (the personal herbarium stored in Adnan Menderes University). The locality belongs to the grid square C 11 according to the system adopted by Henderson (1961).

Distribution

A compilation of data from Trabut (1942), Bischler & Jovet-Ast (1971-1972 & 1973), Hébrard (1993), Casas *et al.* (1997) Bischler (2004), Hugonnot & Offerhaus (2009) and Ros *et al.* (2007) allows the mapping of distribution of *R. perennis*.

R. perennis is recorded from Corsica (CO), Algeria (DZ), Spain (ES), Greece (GR), Italy (IT), Morocco (MA), Portugal (PT), Sardinia (SA), Tunisia (TN) and France (FR) in the Mediterranean Region (Fig. 3).

Ecology

R. perennis has been found in a quite open olive tree (*Olea europaea* L.) plantation. The species grow in grassland, in small streambed, and on wet soil that most probably endures severe drought during hot months. *R. perennis* thalli grow also in places that are exposed to direct sun radiation and only imperfectly protected by surrounding vegetation. Associated liverworts include *Corsinia coriandrina* (Spreng.) Lindb., *Lunularia cruciata* (L.) Lindb., *Gongylanthus ericetorum* (Raddi) Nees and *Phaeoceros laevis* (L.) Prosk.

DISCUSSION

The discovery of *R. perennis* is a significant extension range to the eastern border of its known range. Possibly due to an artefact effect caused by the lack of systematic floristic exploration, easternmost localities of *R. perennis* in Greece and Turkey appear rather isolated compared with the bulk of localities of Portugal, Spain, Sardinia and Northern Africa. This distribution pattern may change in the near future.

The species was until now considered as a western Mediterranean endemic. The locality in Ukraine (Düll, 1983; Söderström *et al.*, 2002), which appeared somewhat dubious (Jovet-Ast, 1986), should be re-evaluated (if the specimen can be traced) in the light of the discovery of the species in Turkey. Taking into consideration the new locality provided in the present work, the species must be considered as a Mediterranean and Southwestern Asiatic element.

Riccia perennis has been discovered recently in France (Hugonnot & Offerhaus, 2009) even though it was considered doubtful by Söderström *et al.* (2007). In Ros *et al.* (2007), the species is also quoted as doubtful in Italy and Algeria, although it is explicitly mentioned in Jovet-Ast (1970) from both countries and from the later by Bischler (2004).

From the works of Jovet-Ast & Bischler (1971, 1976), Bischler & Jovet-Ast, (1971-1972, 1973), Jovet-Ast (1986), Bischler (2004) *R. perennis* is a strict acidophilic species that thrives from sea level until 1200 m a.s.l. The amount of precipitation seems to be a crucial factor. Total amount must not fall down under 400 mm/year. From the major six types of vegetations described in Jovet-Ast & Bischler (1970), the species stands as a typical inhabitant of temporary wet substrates in the first step of vegetation colonization. Most important types of habitats are maquis, grasslands, small rivulets, ponds or reservoir and peat bog. Hence, the data provided in Jovet-Ast' publications conforms fairly well to the ecological data provided here.

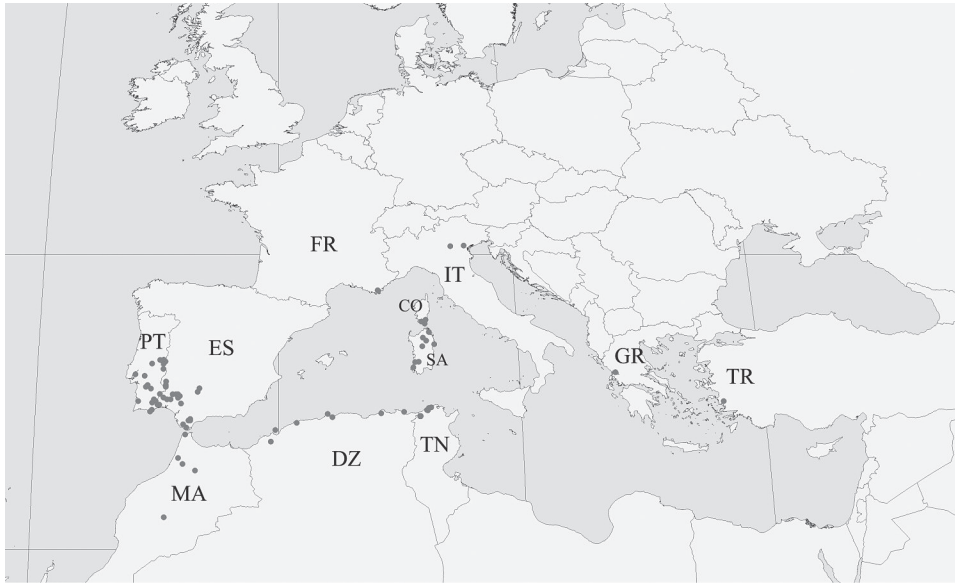


Fig. 3. Distribution of *Riccia perennis* Steph. in the Mediterranean Region.

Jovet-Ast (1970) provided a description of the stalked terminal tubercles and emphasized their importance in the biology and life history strategy of the species. The material collected in Turkey was notably devoid of spores but the typical tubercles were present. More studies are needed *in situ* to determine whether *R. perennis* rely solely on vegetative reproduction, or if spores have been missed. From a general point of view, vegetative reproduction is perhaps underestimated in the genus *Riccia* (Jovet-Ast, 1991) where sporal investment is largely predominant.

R. perennis is mentioned in the Red Data Book of European Bryophytes with the status “rare” (Schumacker & Martiny, 1995). In Turkey, it should be added to the Red Data List owing to its rarity and its distributional and ecological interest.

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