

***Riccia lamellosa* Raddi (Marchantiophyta), a new record for Azerbaijan**

Gerald PAROLLY^{a*}, Tural QASIMOV^b & Harald KÜRSCHNER^c

^a*Freie Universität Berlin, Zentraleinrichtung Botanischer Garten
und Botanisches Museum (BGBM) Berlin, Königin-Luise-Str. 6-8, D-14195 Berlin,
Germany*

^b*Institute of Botany, Azerbaijan National Academy of Sciences,
40 Badamdar Highway, Baku AZ1004, Azerbaijan*

^c*Freie Universität Berlin, Institut für Biologie, Systematische Botanik
und Pflanzengeographie, Altensteinstr. 6, 14195 Berlin, Germany*

Abstract – The short-lived thallose liverwort *Riccia lamellosa* (Ricciaceae) is first recorded for Azerbaijan, hence bridging the distribution gap between the Russian Caucasus, Iran and Iraq. Its site conditions in the semi-desert landscape of Qobustan south of Baku are reported and illustrated. An updated list of *Riccia* species of the Caucasus ecoregion is provided.

Caucasus ecoregion / circum-amphitropical distribution / liverworts / Qobustan / Ricciaceae / semi-desert

INTRODUCTION

The Qobustan area with its petroglyphs and mud volcanoes ranks among the top tourist destinations in Azerbaijan. The Qobustan Petroglyph Reserve, a UNESCO World Heritage Site set on Böyükdağ in a stunning semi-desert landscape (Figs 1-2) overlooking the Caspian Sea, is especially famous and attracts thousands of visitors every year. Although the Upper Palaeolithic to Neolithic petroglyphs, the oldest dating back some 15,000 years ago, are the main attraction (Rüstəmov, 2006), a visit to Qobustan also pays off for nature lovers due to the area's rich and specialized semi-desert fauna and flora (see, in summary, Məmmədov *et al.*, 2012; Yusifov *et al.*, 2007).

However, as so often in Azerbaijan, the knowledge of the bryoflora, and of hepatics in particular, is still inadequate (Qasimov *et al.*, 2016). In this respect, it was no wonder that the first author discovered a *Riccia* species (Ricciaceae) in November 2009 in the beaten path of tourists, which turned out to be a new record for the country. In 2014, *R. lamellosa* Raddi was recollected (Fig. 3) and its site ecology studied in some detail.

* Corresponding author: g.parolly@bgbm.org



Figs 1-2. Landscape of the sampling locality: The Qobustan Petroglyph Reserve SW of Baki on the Abşeron Peninsula, Azerbaijan; **1.** open dwarf-shrub vegetation dominated by *Artemisia fragrans* (transition between semi-desert to steppe vegetation), spring aspect (April 2015); **2.** the area in summer (July 2010) (all photographs by G. Parolly). The arrows indicate typical microsites of *Riccia lamellosa*.



Fig. 3. Fresh sample of *Riccia lamellosa*. (photograph by G. Parolly).

Study area

The Qobustan area is situated 65 km SW of Baki at an elevation of approximately 40-150 (-300) m (Məmmədov *et al.*, 2012). Although not physically located on the Abşeron Peninsula proper, it is generally included in the Abşeron İqtisadi-Coğrafi bölgəsi, representing one of ten of Azerbaijan's economic-geographical regions (Məmmədov *et al.*, 2012; Yusifov *et al.*, 2007). The climate is dry subtropical with 2200-2400 hours of sunshine and an annual precipitation between ca. 200 and 400 mm (Məmmədov *et al.*, 2012). The petroglyphs are inscribed in soft limestone (Rüstəmov, 2006), weathering down to greyish steppe soil (Məmmədov *et al.*, 2012).

The vascular plant flora of the Abşeron Peninsula comprises more than 800 species (Məmmədov *et al.*, 2012). The vegetation of the Qobustan Petroglyph Reserve proper consists of a mixture of dry scrubland and more open slopes and flats supporting a steppe and semi-desert vegetation and a scattering of very few trees. Locally *Artemisia fragrans* dwarf-scrubland prevails (Fig. 1-2). Important woody species include *Capparis spinosa* s. l., *Celtis glabrata*, *Chrysojasmium fruticans*, *Cotoneaster integerrima*, *C. racemiflora*, *C. saxatilis*, *Ephedra procera*, *Lonicera iberica*, *Lycium* spp., *Juniperus* spp., *Prunus microcarpa*, *Punica granatum*, *Reaumuria alternifolia*, *Rhamnus pallasii*, *Rhus coriaria* and *Rosa iberica*. The herbaceous spring flora highlights are, among many others, *Adonis bienertii*, *Allium rubellum*, *Anacamptis collina*, *A. papilionacea* subsp. *schirwanica*, *Ferula persica*, *Iris acutiflora*, *I. reticulata*, *Orchis simia*, *Stipa* spp. and *Zosima absinthifolia* (Məmmədov *et al.*, 2012 and pers. obs.).

RESULTS AND DISCUSSION

New Locality – Azerbaijan: Abşeron Yarımadası, Qobustan area, Qobustan Petroglyph Reserve NW Qobustan village, Böyükdağ, 40°06'33.8" N / 049°22'42" E, 140-170 m, barren rocky hill-crag with scattered *Artemisia* steppe vegetation, in open clayey flats among vascular plant vegetation, 3.11.2009, T. Borsch, V. Farzaliyev & G. Parolly 09-33 (B, BAK, herb. H. Kürschner). – *Ibid.*, 100-120 m, barren rocky hill-crag with scattered *Artemisia* semi-desert/steppe vegetation, on clayey soil, sandstone, 15.4.2015, G. Parolly 14320 & T. Qasimov 106 (B, BAK).

***Riccia lamellosa* new for Azerbaijan.** – The discovery of *Riccia lamellosa* as an addition to the bryoflora of Azerbaijan and the southern Caucasus comes to no big surprise. The species is widespread especially in the Mediterranean Region, although locally rare and certainly often overlooked due to its short and ephemeral life cycle, which allows it only to be observed within a short period during the rainy season. The taxon “has an almost perfect circum-amphitropical range, occurring disjunctively throughout Mediterranean and subtropical regions of the world” (Gradstein, 2017, see also for a global distribution map included therein), with additional records from tropical high-mountain Africa and South America. It occurs in Southwest Asia, the Mid-Atlantic Islands, North America, on Kamchatka and in southern Australia (Bischler & Jovet-Ast, 2004; Dierßen, 2001; Gradstein, 2017; Jovet-Ast, 1986; Kürschner & Frey, 2011). In Southwest Asia and on a more regional scale, the range of *R. lamellosa* includes Iran, Israel, Jordan, Lebanon, Saudi Arabia, Syria and Turkey well as the Russian Caucasus (Konstantinova & Bakalin, 2009; Kürschner & Frey, 2011). The nearest station of *R. lamellosa* to the Qobustan locality is in Dagestan in the northern Caucasus (Konstantinova & Bakalin, 2009) so that the new record bridges the gap between the Russian Caucasus and the occurrences in Iran and Iraq (Akhani & Kürschner, 2004; Kürschner & Frey, 2011).

The genus *Riccia* in the Caucasus ecoregion. – The checklist of hornworts and liverworts of the former USSR (Konstantinova *et al.*, 1992) mentions seven *Riccia* species from Soviet Caucasasia, viz. *R. bifurca* Hoffm., *R. intumescens* (Bisch.) Underw. [as *R. canescens* Steph.]; for the taxonomy and nomenclature of the *R. intumescens* complex, we follow the wide species concept as outlined by Sauer (2006), and largely adopted in Central Europe], *R. ciliifera* Link *ex* Lindenb., *R. gougetiana* Durieu & Mont., *R. lamellosa*, *R. michelii* Raddi and *R. sorocarpa* Bisch. This account did not consider *R. subbifurca* Warnst. as an eighth taxon, reported for Georgia without locality data by Jovet-Ast (1986).

Presently, eleven *Riccia* taxa are known to occur for this area: Three taxa (*R. bifurca*, *R. cavernosa* Hoffm. and *R. fluitans* L.) are recorded from Armenia (Manakyan, 1995), seven (*R. bifurca*, *R. intumescens* [as *R. ciliata* var. *intumescens* Bisch.], *R. ciliifera*, *R. fluitans*, *R. frostii* Austin, *R. sorocarpa*, *R. subbifurca*) from Georgia (Jovet-Ast, 1986; Bakalin *et al.*, 2016) and three (*R. bifurca*, *R. lamellosa*, *R. sorocarpa*) from the Russian Caucasus (Konstantinova & Bakalin, 2009; including Krasnodar and Stavropol territories, Republics of Adygea, Kabardino-Balkaria, Alania [North Ossetia], Dagestan, Ingushetia, Chechnya and Karachaevo-Cherkessia). Although Baryakina (2010) reported two species from Azerbaijan (*R. ciliata* Hoffm., *R. sorocarpa*), both records are doubtful and there is presently to all appearances no verified record for any *Riccia* species from Azerbaijan kept at BAK.

Outside the former Soviet territories, sections of Iran and Turkey form part of the wider Caucasus ecoregion (for a delimitation, see, e.g., Zazanashvili *et al.*,

2012). Of the 13 *Riccia* species reported from Iran, only *R. fluitans* occurs in the Caucasus ecoregion (i. e. in the Gilan province; Akhani & Kürschner, 2004). Northeastern Anatolia harbours three species (*R. bifurca*, *R. crozalsii* Lev., *R. glauca* L. (Erdağ & Kürschner, 2017), adding to a total of accepted 13 *Riccia* taxa for the wider Caucasus ecoregion.

Identifying *Riccia lamellosa*. – Since all these species already are keyed out in European and Southwest Asian bryophyte floras, quick reference can be made to Frey *et al.* (2006), Kürschner (2001) and Kürschner & Frey (2011).

Among all Caucasian *Riccia* species, *R. lamellosa* is readily told apart by the combination of the following characters: (a) a pale greyish green to bluish, non-spongy thallus (over sporangia) sometimes partly covered with chalk; (b) thallus without cilia or papillae; (c) pure white ventral scales conspicuously projecting beyond thallus margins; (d) thallus margins sublamellate; (e) lobes rounded to obtuse, ca. 20 × 2-3 mm; (f) epidermis cells bistratose and soon collapsing; (g) monoicous; and (h) fairly large (85-120 µm) and indistinctly winged spores with often erulose crenulations (Heyn & Herrnstadt, 2004; Jovet-Ast, 1986; Kürschner & Frey, 2011).

Site ecology. – *Riccia lamellosa* was found growing in open clayey flats between the vascular plant vegetation among rocks of the rather barren rocky hill-crags of the Qobustan Petroglyph Reserve. At most places, it is restricted to a small band next to gently inclined rocks within the reaches of the rain water running off (Figs 1-2). During the wet season, *R. lamellosa* forms part of a 10-25 cm low turf-like vegetation composed by mainly annual species under a scatter of small shrubs and among tufts of *Artemisia fragrans*. The vegetation of the area suffers from locally considerable grazing pressure. As a moderately photophytic, meso- to xerophytic and nitrophytic plant (Dierßen, 2001), *R. lamellosa* is sometimes also recorded in the light shade under shrubs. Phytosociologically, it is a typical member of the *Psoretea decipiens* Matt. *ex* Follm. (syn.: *Barbuletea unguiculatae* Mohan 1978) vegetation class, which comprises the terrestrial cryptogamic vegetation of dry areas, including a wide range of ephemeral bryophytes communities (Dierßen, 2001). It is a key species of the drought-adapted *Ricciatum atromarginato-lamellosae* Ros & Guerra 1987 association (*Mannion androgynae* alliance Ros & Guerra 1987), typical of the xerophytic scrubland dominating the semi-deserts of southern Spain and North Africa (Ros & Guerra, 1987; Dierßen, 2001).

In Qobustan, *Riccia lamellosa* is associated with *Bryum argenteum* Hedw., *Crossidium crassinerve* (De Not.) Jur. and *Syntrichia ruralis* (Hedw.) F. Weber & D. Mohr, while *Encalypta ciliata* Hedw., *Grimmia pulvinata* (Hedw.) Sm. and an as yet unnamed *Syntrichia* sp. cover the rock faces.

CONCLUDING REMARKS

Riccia lamellosa represents the first validated generic record for Azerbaijan and provides glimpses on a hitherto overlooked diversity worth more detailed study in the future. It underlines that especially the dry habitats with their large number of short-lived mosses and liverworts are still drastically underrecorded (see also Qasimov *et al.*, 2016). Records of further *Riccia* species are obviously just a question of an intensified fieldwork.

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