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Sporophyte records of the moss *Dicranum tauricum* Sapjegin in the Czech Republic.

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Abstract: Sporophytes were for the first time recorded in three populations of *Dicranum tauricum* in the Czech Republic. Until now, such records were extremely scarce in Central Europe. Two populations observed concurrently at nearby localities were found in markedly different phenophases, whereas two populations observed at different localities in spring and autumn seemed to develop synchronously. The sporophytes are illustrated with conventional and SEM photography.

Key words: *Dicranum tauricum*, sporophyte, phenology, Central Europe

Introduction

The moss *Dicranum tauricum* Sapjegin occurs in most European countries and the western part of North America (e.g. Ignatov & Ignatova 2003; Ireland 2007); some sources (e.g. Smith 2006) mention an interesting disjunction on Kerguelen Island in southern Hemisphere. In the 19th century and the first half of the 20th century, it was reported relatively rarely (under the illegitimate name *Dicranum strictum* Schleich. ex D. Mohr or *Orthodicranum strictum* Broth.). It started to increase in abundance in the mid of 20th century, probably as a consequence of acid deposition, to which the species is believed to be relatively resistant (Blockeel 2014). Since 1970, its spreading was noted and documented from many, but mainly western and northern European countries (Hegewald 1972; Düll & Meinunger 1989; Enroth 1989; Greven 1992; Söderström 1992; Erzberger 1999). The increase of abundance in Central-East Europe, such as in Poland, the Czech Republic, Hungary or Ukraine has only been reported in last two decades (Fojcik 1998; Plášek 2001; Stebel & Plášek 2001; Stebel *et al*. 2012; Szűcs *et al*. 2013).

The moss was for the first time collected in the Czech Republic in 1975 by Z. Pilous (Plášek 2001) and only 17 records were known by 1997 (Franklová 1997). However, Plášek (2001) reported already 52 Czech localities in the subsequent treatment; the sharp increase was nevertheless mostly attributable to the increased interest in the species and focused search in suitable habitats. The last summarization of Czech records accounts for 120 localities (Stebel *et al*. 2012) and the real number is obviously still much higher. According to the latter treatment, *Dicranum tauricum* seems to be rather evenly widespread throughout the Czech Republic, although it avoids cool uplands areas.

Similarly to the situation in other regions, *Dicranum tauricum* is primarily an epiphyte growing on bark of mostly deciduous trees. Quite often, it is also recorded from decaying wood, particularly in lowland deciduous forests and sparse records exist from siliceous rocks. The obvious tolerance to acid deposition and pollution (Farmer *et al*. 1992; Söderström 1992; Frahm, 1998; Hedenäs & Bisang, 2004; Price & Lang 2011; Blockeel 2014) allows its growth along public roads or inside larger settlements.

Dicranum tauricum is reported to produce sporophytes regularly only in its North American part of the distribution area (Stebel *et al*. 2012), although Blockeel (2014) noted a frequent sporophyte production in northern Greece. Elsewhere in Europe, the species seems to rely on vegetative propagation by means of fragile leaf tips or less commonly reported leaf

and protonematal gemmae (Price & Lang 2011; Stebel *et al*. 2012). As of 2012, there were no reports of sporophytes in the Czech Republic (cf. Stebel *et al*. 2012) but recently, we have discovered sporulating populations of *D. tauricum* as well.

Sporophytes of *Dicranum tauricum* in the Czech Republic

The first author noted sporophytes in a population of *Dicranum tauricum* growing in the Český ráj Protected Landscape Area in North Bohemia in September 2015. Upon an inquiry, the second author realized that he observed another sporulating population nearby during the same bryofloristic foray. Having revised his collections, he found another specimen with sporophytes collected three years earlier on another locality of North Bohemia. The collection details for the three records are listed here (Fig. 1).

1. North Bohemia, Český ráj Protected Landscape Area, Hruboskalsko Nature Reserve: 800 m S of Pelešany village, 200 m SE of Valdštejn castle, along touristic path towards Sedmihorky village, mixed forest, on the sandstone stone, WGS-84: 50.56141 N, 15.16946 E, 370 m a.s.l., 19. IX. 2015 leg. Zuzana Skoupá & Lucie Fialová, det. Vítězslav Plášek (OSTR # B1248).
2. North Bohemia, Český ráj Protected Landscape Area, Hruboskalsko Nature Reserve: Karlovice village, Podháj, along the tourist path from Podháj lodge towards Kapelník rock formation, near Kořenského pramen spring, on bark of *Fraxinus* sp., WGS-84: 50.55198 N, 15.18091 E, 310 m a.s.l., 17. IX. 2015 leg. Jan Kučera (CBFS #18597).
3. North Bohemia, České středohoří Protected Landscape Area, Verneřice town, Loučky: Bobří soutěska valley, ca. 500 m ESE of the entrance rocks, WGS-84: 50.65574 N, 14.34962 E, 420 m a.s.l., on half-shaded decaying log, 29. IV. 2012 leg. Jan Kučera (CBFS #15067).

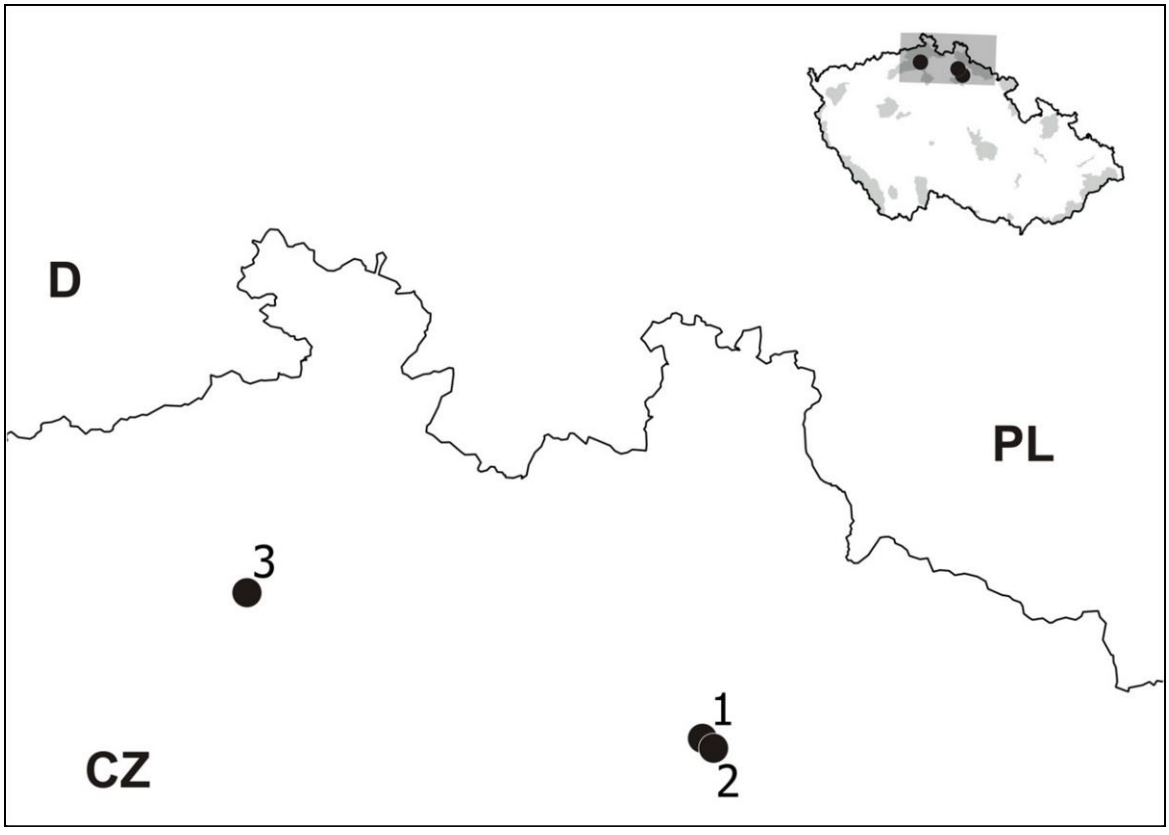

Fig 1: Localities of *Dicranum tauricum* with sporophytes in the Czech Republic.

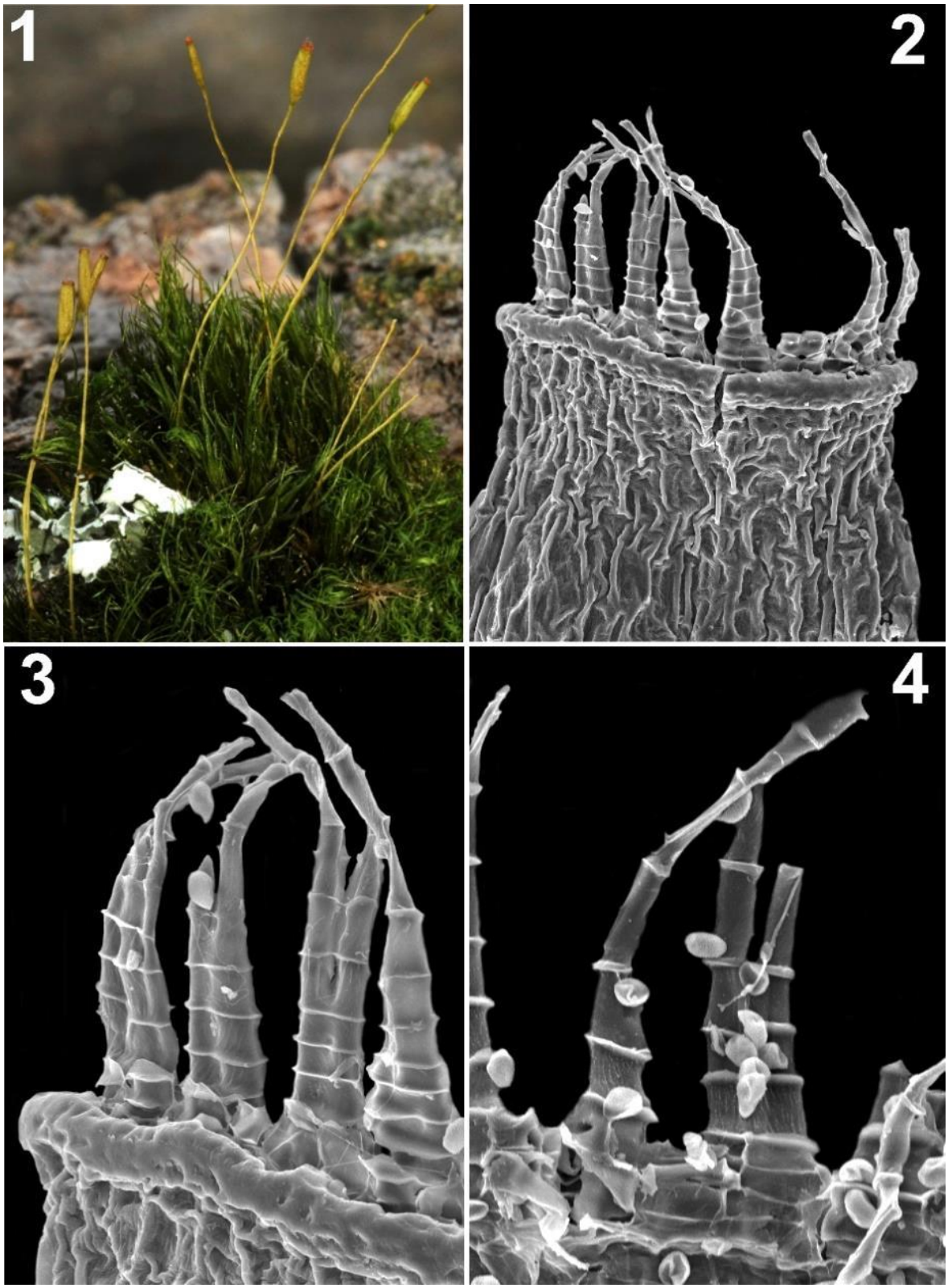

Fig 2: *Dicranum tauricum* with sporophytes from locality 1. **1** – Habitus of plants, **2** – SEM view of the capsule mouth with peristome, **3** – SEM detail of the outer side of peristome, **4** – SEM detail of the inner side of peristome. Photos by Zuzana Skoupá and Vítězslav Plášek.

Whereas the population of sporulating *Dicranum tauricum* at locality 1 was recorded with well developed sporophytes shortly after deoperculation (Fig. 2–1), the populations at localities 2 and 3 bore both old disintegrating capsules and young setas covered with calyptrae, where capsules were not yet swollen. The setas in recorded population were yellow, 10–17 mm long, capsules are straight or very slightly asymmetrically curved, nearly cylindrical or narrowly ellipsoidal, with urn 1.8–2.2 mm long and 0.4–0.5 mm wide and the straight lid 1.0–1.1 mm long. The exothecium consists of somewhat irregularly rectangular, moderately thick-walled cells ca. 15–30 μm wide, becoming smaller and rounded quadrate towards the mouth. Stomata present at the base of the urn. The peristome (Fig. 2–2) consists of 16 narrowly lanceolate, orange- to reddish-brown, later light brown teeth, divided to ca. 2/3–3/4 of length, ca. 200–250 μm long, with prominent articulation of cross-walls. Outer surface of teeth (Fig. 2–3) is nearly smooth with just a few oblique striae in the lower part, the inner surface (Fig. 2–4) is smooth above and obliquely papillosely striate below.

Discussion

Stebel *et al.* (2012) discussed the interesting differences in recorded sporophyte production between North America, where the species is known to sporulate regularly (Ireland 2007), and Europe. Only sporadic production of sporophytes was recorded in Central and Western Europe until now, e.g., Kuc (1959) reported the rare production of sporophytes from Poland and Meinunger & Schröder (2007) listed several records from Germany. Nevertheless, the species was observed more commonly with sporophytes in northern Greece (Blockeel 2014), and probably the sporophyte records will increase with increasing records of occurrence.

An interesting phenomenon that has not yet been reported seems to be the concurrent existence of different phenophases, observed in September 2015 at two nearby localities (1, 2) in Český ráj region. On the other hand, the same phenophase was observed in specimens collected at different North Bohemian localities (2, 3) in April and September. This difference cannot be explained by different site conditions, as these were comparable, with similar altitudes. It can be concluded that the life cycle of *Dicranum tauricum* is not closely correlated with the seasons in the temperate zone, and can start whenever site conditions allow the establishment and further development.

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