

Ephemerum serratum (Hedw.) Hampe in the Canton of Geneva?

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The Ephemeraceae consists of tiny, annual plants that grow up to 3 mm in height from persistent protonema. The persistent protonema that is so typical of the members of this family has a very specific growth pattern (see Duckett *et al.* 1993; Pressel *et al.* 2005). The Ephemeraceae are also characterised by their small size, mostly lanceolate leaves that have narrowly hexagonal, lax cells and their globose, immersed capsules that mostly lack an operculum, termed cleistocarpous (see Bryan & Anderson 1957; Smith 2004; Bryan 2007).

Ephemerum serratum (Hedw.) Hampe, distributed predominantly in Europe and North America, is mostly found growing on damp soil along woodland paths, in arable fields or at the edges of reservoirs (see Smith 2004; Bryan 2007; Holyoak 2010). It is recognisable in the field as patches of protonema that are dotted with tiny plants (with lanceolate to ovate-lanceolate leaves that are variously dentate to sharply serrate along the upper leaf margins) and yellow-orange (brown when mature), globose capsules, when fertile. This minute moss species is characterized by its lanceolate to ovate-lanceolate, irregularly serrate leaves that mostly lack costae (if costae are present then they appear faintly in the upper leaves), and its cleistocarpous, globose, immersed capsules that contain large, papillose spores (40-70 µm long). An excellent illustration of *E. serratum* is available in Pursell & Allen (1996). Some generalized distinguishing features of the *Ephemerum* species currently recognised in Switzerland (*E. cohaerens* (Hedw.) Hampe, *E. minutissimum* Lindb., *E. recurvifolium* (Dicks.) Boulay and *E. serratum*: Schnyder *et al.* 2004) are given in Table 1.

One of these species, *Ephemerum minutissimum*, alternatively known as *Ephemerum serratum* var. *minutissimum* (Lindb.) Grout, is treated as a synonym of *E. serratum* by some authors (see Bryan 2007) or, following Risse (1996), as a separate entity: based principally on slight differences in plant size, the degree of papillosity of the spores, spore size and the presence or absence of a hyaline membrane (also see Holyoak, 2010). As currently defined, these two entities (*E. serratum* and *E. minutissimum*) can be distinguished most conclusively based on characteristics of their spores (see Table 1 and Risse (1996)), so correct determination requires the observation of spores from mature capsules. Unfortunately, however, illustrations of the spores (coarse versus finely papillose) are not provided in Risse (1996) or Holyoak (2010) thus a certain amount of interpretation is needed concerning this character and its states. Spores of both entities are illustrated in the recent Swedish Bryophyte Flora (Hallingbäck *et al.* 2008) where they are treated at the varietal level. In addition, there appears to be some confusion over which species has a hyaline membrane, Risse (1996) states that it is *E. serratum* whereas Smith (2004) and Holyoak (2010) state that it is *E. minutissimum*.

Ephemerum serratum is classed as vulnerable (VU) within Switzerland (Schnyder *et al.* 2004). Recent records show that it has been found on the Plateau and is known from two collections in Bern and one in Zürich and two from Geneva (see NISM 2011). This species was first mentioned in the literature from the Canton of Geneva ("Bois de la Bâtie") and Vaud ("près Mies") by Amman (1884). A little later Guinet (1888) added the localities of "Aïre" and "Bois des Frères" for this taxon within the Canton of Geneva, see all historical localities for this taxon in Burgisser & Price (2005).

An examination of the holdings for this species in G revealed 17 pre-1900 collections named *E. serratum* from the canton from the communes of Aire-la-Ville (4), Satigny (1), Vandœuvres (2), Versoix (9), Veryier (1) and one marked "Genf" that cannot be localised. Several of the G specimens from the "Bois de la Bâtie," Versoix, were re-determined as *Ephemerum minutissimum* by N. Schnyder in 2002, whereas the others were treated as *E. serratum* (due to the age of the material it is difficult to observe spore features in these specimens). Because of the difficulty in determining correctly the old herbarium material, all G herbarium specimens originally named *E. serratum* are currently treated under *E. minutissimum* in the NISM atlas (NISM 2011). This will be changed to *E. serratum* aggr. in the future to reflect the difficulties encountered (Schnyder *pers. comm.*). The G herbarium specimens were mostly collected before or at around the same time as Lindberg described his *E. minutissimum* from material in North America (Lindberg 1874), which may explain why it was not adopted until later in local floristic works.

The first recent records of specimens determined as *E. serratum* from Geneva occurred in 2003 where it was found in Bois des Frères (*Shani s.n.* G), Commune of Vernier, and in the Bois de la Bâtie (see records below), Commune of Versoix. The latter locality likely corresponds to the "Bois de la Bâtie" cited by Amman (1884). See discussion in Burgisser & Price (2005) on the locality "Bois de la Bâtie" in and around Geneva. Field excursions in the Bois de Versoix, Geneva, revealed that there are several populations of *Ephemerum* present within the forest (for each a small amount was taken for determination purposes). The first population found was in the area called "Bois de la Bâtie" and several others were located within the area named "Combes Chapuis." Within the Bois de Versoix, as a whole, this species is found growing on compacted soil along paths in the woodlands.

Specimens: Bois de la Bâtie, near La Bâtie, Versoix. In woodland of Bois de la Bâtie and along edge of La Versoix, 18 August 2003, Price & Clark 3038, 3073 (G); Collex-Bossey, Bois de la Bâtie (humid part), 22 August 2003, Maier II / 4 (G); Combes Chapuis, 10 December 2003, Price *et al.*, 3279 (G).

All recent records of *E. serratum* from the Canton of Geneva, including those previously sent to NISM, were found to be *E. minutissimum* (based on their possession of finely papillose spores). The populations of this species in Geneva in the Bois de Versoix, recorded in 2003 appear to be stable as they were still present in the same areas in 2010. This species appears to be both relatively frequent and relatively widespread within the Bois de Versoix forest.

Tab. 1. The main morphological differences between the four *Ephemerum* species recorded for Switzerland. Characters adapted from Bryan (2007), Smith (2004), Holyoak (2010) and from personal observations. It should be noted that there is some confusion over the presence of a hyaline membrane around the spores in *E. serratum* and *E. minutissimum*. Risse (1996) states that this structure is present in *E. serratum* but absent in *E. minutissimum* whereas Smith (2004) and Holyoak (2010) consider that it is present only in *E. minutissimum*.

	Leaves	Nerve	Margin	Capsule	Spores
<i>E. cohaerens</i>	erecto-patent, sometimes recurved above, broadly lanceolate to oblong-lanceolate	strong in upper leaf, weak in lower leaf, sometimes lacking in lower leaf	serrate	globose with conical apiculus, stomata scattered over surface	coarsely papillose, hyaline membrane lacking
<i>E. minutissimum</i>	erecto-patent, narrow-lanceolate	absent	coarsely and irregularly serrate	globose with conical apiculus, stomata at base only	finely papillose, often surrounded by hyaline membrane
<i>E. recurvifolium</i>	erecto-patent, recurved above, narrow-lanceolate	present, excurrent	serrulate, sometimes with 1-2 course teeth at apex	globose with oblique apiculus, stomata at base only	more or less smooth, hyaline membrane lacking
<i>E. serratum</i>	erecto-patent, often twisted at apex, narrowly lanceolate, lanceolate to ovate-lanceolate	absent, or if present weakly so in upper leaf	coarsely and irregularly serrate, often with spines	globose with conical apiculus, stomata at base only	coarsely papillose, hyaline membrane lacking

A population survey of *Ephemerum* across the canton of Geneva will be carried out in 2012-2013 with the aim of assessing the population density and distribution of species of this genus. A taxonomic study of *Ephemerum* within the canton will also be necessary to clarify the status and presence of species across the different localities. At present, based on the current concept of the separation of *E. serratum* and *E. minutissimum* using spore characteristics, it appears that *E. serratum* is a doubtful record within the Canton of Geneva. However, the original material of *E. serratum* has, to the best of my knowledge, not been typified, thus the characteristics of the spores in the type have not been established. An evaluation of spore papillosity and the hyaline membrane in *E. serratum* and *E. minutissimum* that includes illustrations of the character states concerned would be desirable.

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