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The *Isoetes longissima* complex (Isoetaceae) in Italy: observations on the morphology of spores and leaves, and taxonomic implications

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Abstract

The morphological variability of the *Isoetes longissima* complex in Italy has been analyzed, on the basis of selected herbarium specimens. Observations were made on spore ornamentation and size, number of leaves per plant and maximum leaf length, velum extension and alae width in the basal portion of leaves. The first count of chromosome number on plants from Italy is also made. On the basis of our observations, the five taxa here considered are attributed to two taxa, treated at the species level as follows: *I. longissima* (incl. *I. velata* and *I. velata* [unranked] *sicula*), and *I. tiguliana* (incl. *I. dubia*). Italian distribution of these species is also given.

Key words: flora, Italy, lycophytes, *Lycopodiidae,* morphology, plant taxonomy.

Introduction

During the preparation of the Isoetaceae treatment for the "Flora Critica d'Italia" (Cecchi & Selvi 2014; Troia & Greuter 2014), we had to face the taxonomy of *Isoetes velata* A.Braun in Bory de Saint-Vincent & Durieu de Maisonneuve (1849: fig. 1) and its complex of subspecific taxa.

In a recent parallel paper, partially based on some results here presented, Troia & Greuter (2014) revised the nomenclature of this species, showing that the name currently used (*Isoetes velata*) has to be replaced by the earlier name *Isoetes longissima* Bory de Saint-Vincent (1846: 1165), so that here we refer to this group as "*Isoetes longissima* complex".

Isoetes longissima (= *I. velata*) is an amphibious species, typical of Mediterranean temporary ponds (Bagella *et al.* 2010; Ernandes & Marchiori 2013), distributed in the western part of the Mediterranean region and in the adjacent Atlantic area (Quézel 1998; Christenhusz & Raab-Straube 2013). The vicariant species *I. olympica* A.Braun in Milde (1867: 285) occurs in the Eastern Mediterranean, with rare populations in Turkey and Syria-Lebanon (Bolin *et al.* 2008, 2011).

Owing to its very variable morphology, several subspecies of *I. longissima* have been described, most of them awaiting a revision to assess their taxonomic value. Some of them, in fact, revealed to be different species (e.g. *I. fluitans* M.I.Romero in Romero *et al.* 2004: 233), but many others are still of uncertain value (cf. Greuter *et al.* 1984, who marked them with a meaningful question mark).

According to the literature preceding the already mentioned work of Troia & Greuter 2014 (i.e. Greuter *et al.* 1984, Ferrarini *et al.* 1986, Jermy & Akeroyd 1993, Conti *et al.* 2005), three taxa of this complex were reported for Italy: *Isoetes velata* A.Braun subsp. *velata* (hereafter *I. velata* in the text and figures), *I. velata* subsp. *tegulensis* Battandier & Trabut (1905: 407) [= *I. tiguliana* Gennari (1861a: 42)] (hereafter *I. tiguliana*), and *I. velata* subsp. *dubia* (Gennari 1861b: 104) Battandier & Trabut (1905: 407) [= *I. dubia* Gennari] (hereafter *I. dubia*). The controversial taxonomic status and Italian distribution of these taxa, according to main recent literature, are shown in Table 1.

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Microspore variability deserves more observations as well. In the case of *I. dubia*, the presence of irregular microspores and megaspores (Fig. 2) suggests that the specimen we examined could be a hybrid.

On the basis of our observations, the *Isoetes longissima* complex in Italy is represented by two different taxa, here treated at the species level as follows:

1) *Isoetes longissima* Bory (incl. *I. velata* and *I. velata* [unranked] *sicula*). In the opinion of several authors (e.g. Braun in Bory de Saint-Vincent and Durieu de Maisonneuve 1849; Pfeiffer 1922; Romero *et al.* 2004), *I. longissima* and *I. velata* are two names for the same species, the former being the correct one (Troia & Greuter 2014). We think there is no evidence to distinguish the two taxa at the subspecific level. Pichi Sermolli (in Ferrarini *et al.* 1986) considered the two names as two different species, but just because he considered the Spanish populations of "*I. longissima*" (now recognized a different species as "*I. fluitans*", mentioned above). *I. velata* [unranked] *sicula* also is here attributed to the same taxon. In Italy, *I. longissima* occurs in Tuscany, Latium, Sicily, Sardinia (Conti *et al.* 2005) and Apulia (Ernandes *et al.* 2010). The chromosome count here reported (2n = 22), confirming the previous count from the opposite side of the distribution area (Prada 1979), is the first report for this species for Sicily and Italy as a whole.

2) *Isoetes tiguliana* Gennari (incl. *I. dubia*, as already proposed by Ferrarini *et al.* 1986). We prefer to treat it at the species level, since it is morphologically different from *I. longissima* and co-occurs with it in the same region. The species in Italy occurs only in Sardinia. Northern African populations attributed to *I. velata* subsp. *tegulensis* and *I. velata* subsp. *dubia* (Maire 1952) need to be verified.

The present study improved the knowledge of the morphology of *Isoetes longissima* complex, ascertaining diagnostic characters to separate taxa and better defining their distribution in Italy. Further studies on the ecology, chorology, cytology of *I. tiguliana,* and in general on the status of the *I. longissima* complex in the Mediterranean area, are needed.

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