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MONOGRAPH

Lycopodiidae for the "Flora Critica d'Italia": material and methods

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ABSTRACT Procedures are presented that were followed during the preparation of the first pteridophyte family treatments for the "Flora Critica d'Italia": Lycopodiaceae, Isoetaceae, Selaginellaceae. The work was mainly based on the study of literature and herbarium specimens. In some cases SEM observation of spores has proved useful. Data collected from herbarium specimens and other verified sources were loaded into a database, from which a distribution map was prepared for each taxon. Several preliminary papers have been published, and for each family a taxonomic conspectus, with type designations, maps and an identification key, has been prepared. The treatment of these three families for the "Flora Critica d'Italia" (in Italian) is about to be published or (Isoetaceae) has already been published.

KEY WORDS Italy; flora; vascular plants; pteridophytes; lycopodiophytes; herbarium; SEM; taxonomy.

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INTRODUCTION

The need for an up-to-date "Flora Critica d'Italia" has long been recognized. About 10 years ago the Società Botanica Italiana (Italian Botanical Society) endorsed the project and prepared a model (Pignotti, 2006). The project, after the establishment of the Fondazione per la Flora Italiana (Foundation for the Italian Flora), has now entered its active phase of implementation: a few months ago the first preliminary results have been published (Cecchi & Selvi, 2014; Troia & Greuter, 2014). Procedures are presented that were followed during the preparation of the first pteridophyte family treatments for the "Flora Critica d'Italia": Lycopodiaceae, Isoetaceae, Selaginellaceae.

According to recent literature, these three families (known as lycopodiophytes or "lycophytes") constitute the Lycopodiidae, the first of the five major subclasses of pteridophytes recognized by Christenhusz et al. (2011) and Christenhusz & Chase (2014) (Fig. 1).

MATERIAL AND METHODS

The treatment is mainly based on the study of literature and herbarium specimens. It encompasses all Lycopodiidae taxa that grow spontaneously in the National territory, either native or naturalized.

We studied all Italian and selected foreign Lycopodiidae specimens kept in the Herbarium Centrale Italicum (FI) and Herbarium Mediterraneum Panormitanum (PAL, including PAL-Gr); several specimens, notably original material for

relevant names, were supplied by the Herbarium of the Botanischer Garten und Botanisches Museum Berlin-Dahlem (B). Each specimen has been documented photographically. In addition, we examined high-resolution digital images, available online or provided on request, from the following herbaria: APP, BOLO, CAT, GDOR, MFU, MRSN, MSNM, PAD, RO, ROV, SIENA, TO, TR, and K, LINN, P, PH, UPS (abbreviations according to Thiers, 2014), and had the presence of selected specimens verified by colleagues in others (e.g. MI). Specimens conserved in the private collections of Bonafede (Bologna, Italy), Selvi (Florence, Italy), Tondi (Rome, Italy) have also been studied.

For mapping the distribution, reports based on photographs have been considered only when species identification was not in doubt; in particular, data from popular websites such as Acta Plantarum (www.actaplantarum.org) have been taken into consideration. However, literature reports not supported by herbarium vouchers have been discarded for mapping purposes; comments have been added for those of special historical or phytogeographical interest.

Data (both original data and metadata) were loaded into a specific spreadsheet. Data fields included not only the scientific name and geographical parameters but also biological aspects, so as to enable future searches on, for example, phenology or altitudinal range. All specimens with sufficient locality data have been georeferenced and plotted on a base map of Italy (Cecchi & Selvi, 2014).

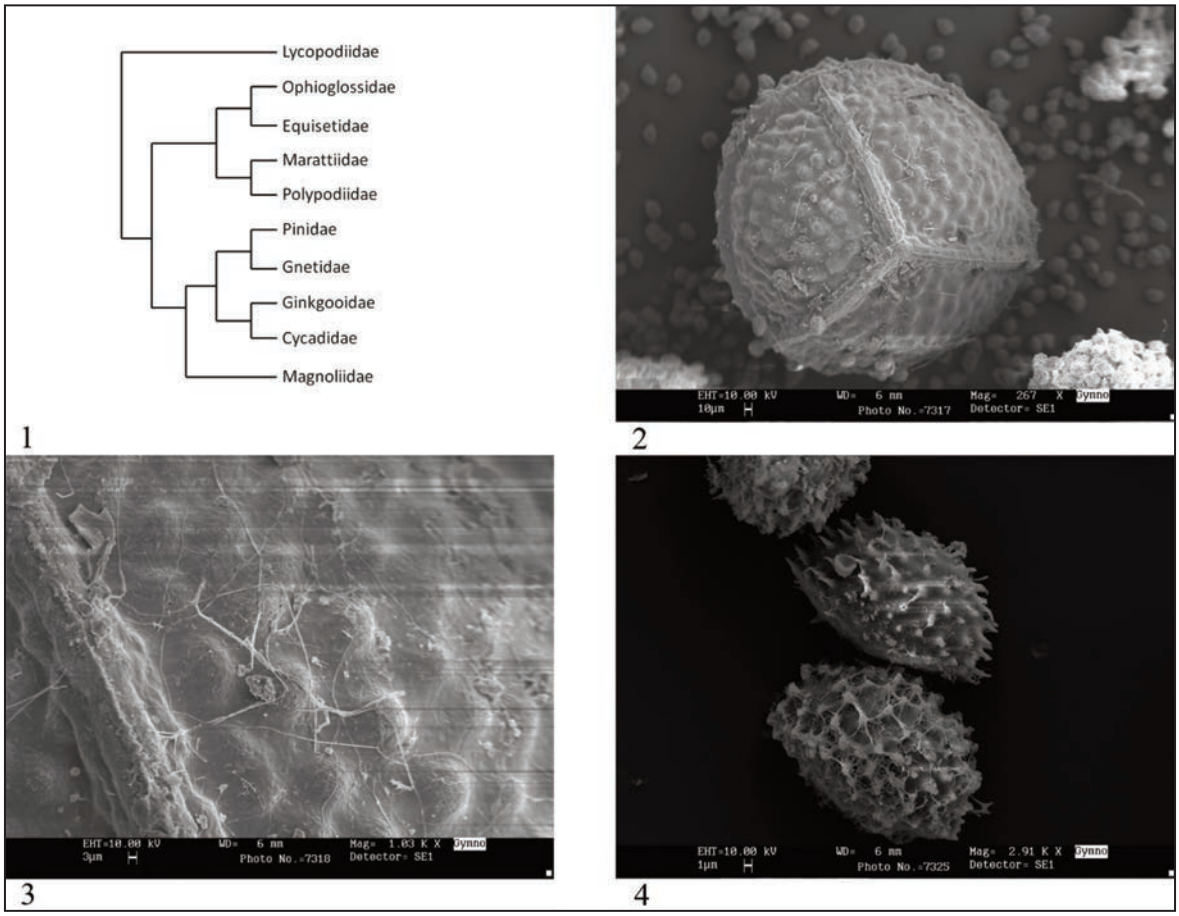

Figure 1. The main subclasses of living vascular plants, cladogram based on Schuettpelz & Pryer (2008), Pryer et al. (2009), and Grewe et al. (2013); clade names according to Christenhusz et al. (2011) and Christenhusz & Chase (2014) for pteridophytes, Chase & Reveal (2009) for spermatophytes. Figures 2–4. Example of SEM images prepared for the "Flora Critica d'Italia": *Isoetes gymnocarpa* (Gennari) A. Braun, megaspores and microspores from the type specimen in TO (see Troia & Greuter, 2014). Figure 2: megaspore in proximal view. Figure 3: detail of Fig. 2. Figure 4: microspores.

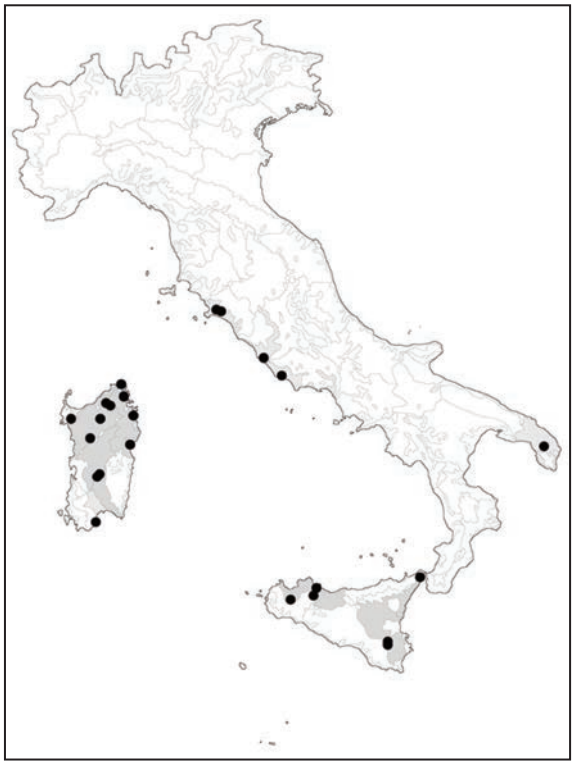

Figure 5. Example of a distribution map prepared for the Flora Critica d'Italia: *Isoetes longissima* Bory.

Currently, a map is used that shows physiographical rather than administrative territorial units, following the model proposed by Cecchi & Selvi (2014). In a first phase, only a selection of specimens have been mapped: 1 to 3 preferably recent specimens for each territorial units, so as to avoid excessive crowding of the dots; territorial units in which the species in question is present were shaded.

For some critical taxa, particularly in the genus *Isoetes*, scanning electron micrographs were produced to illustrate and document megaspore and microspore features (Figs. 2–4).

RESULTS AND CONCLUSIONS

With regard to Isoetaceae, a synthetic paper with a taxonomic conspectus, type designations and an identification key has been published in the journal Plant Biosystems (Troia & Greuter, 2014), and similar papers for Lycopodiaceae and Selaginellaceae, including distribution maps (Fig. 5), are ready for publication. Preliminary results were presented by Troia et al. (2012, 2014b) and Troia & Greuter (2013), as well as a paper with a SEM study of spores of the *Isoetes longissima* group (Troia et al. 2014a).

The treatment (in Italian) for the Flora Critica d'Italia of these three families, following guidelines prepared by the Editorial Committee, has just been published (Isoetaceae: Troia & Greuter, 2015) or is about to be published (Lycopodiaceae and Selaginellaceae: Troia & Greuter, in prep.).

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