

## ***Isoetes mourabaptistae*, a New Species from Southern Brazil**

JOVANI B. PEREIRA

Universidade Federal do Paraná, Depto. de Botânica, C.P. 19031, 81531-980, Curitiba, PR, Brazil,  
e-mail: giovanibio@gmail.com

PAULO G. WINDISCH

Universidade Federal do Rio Grande do Sul, Depto. de Botânica, C.P. 43433, 91501-970, Porto Alegre, RS, Brazil, e-mail: pteridos@gmail.com

MARIA L. LORSCHETTER

Universidade Federal do Rio Grande do Sul, Instituto de Biociências, Depto. de Botânica, C.P. 9500, 91540-000, Porto Alegre, RS, Brazil, e-mail: mlorsch@uol.com.br

PAULO H. LABIAK\*

Universidade Federal do Paraná, Depto. de Botânica, C.P. 19031, 81531-980, Curitiba, PR, Brazil,  
e-mail: plabiak@ufpr.br

**ABSTRACT.**—*Isoetes mourabaptistae*, a new species from southern Brazil, is described, illustrated, and compared to the most similar species. This new species is apparently restricted to southern Brazil, and is characterized by cristate to irregularly reticulate megaspores and microechinate microspores. It is an aquatic plant, occurring among submersed rocks along rivers, at about 900–1100 m in elevation.

**KEY WORDS.**—Isoetaceae, taxonomy, lycophytes, diversity, aquatic plants

The genus *Isoetes* L. comprises approximately 350 species (Hickey *et al.*, 2003), most of them occurring as aquatic plants in lakes and streams, but also as terrestrials on permanent or seasonally wet soils. The genus is widely distributed around the world, but many of its species tend to have very narrow distributions (Hickey, 1986; Hickey *et al.*, 2003; Small and Hickey, 2001; Luebke and Budke, 2003; Choi *et al.*, 2008).

Hickey (1990) considered South America to be a center of both morphological and taxonomic diversity for *Isoetes*. However, this is still one of the less known regions, and published estimates of the diversity of *Isoetes* in South America vary considerably. Two of the most important contributions to South American *Isoetes*, provided by Fucks-Eckert (1982) and Hickey (1985), suggest, respectively, between 75 and 47 species for this region. Undoubtedly much work is still needed to assess the actual diversity in South America. In Brazil particularly, *Isoetes* is one of the less known groups of lycophytes, and most of the species are represented by a very limited number of collections. Prado and Sylvestre (2010) recorded 14 species for Brazil (12 endemics), most of them

---

\* Corresponding author



distributed along the coastal mountains of the southeastern and southern regions.

A study on the spore morphology of ferns and lycophytes of Rio Grande do Sul (Lorscheitter *et al.*, 2009), and additional fieldwork conducted by the authors, has identified the presence of a new species of *Isoetes* that we describe herein.

***Isoetes mourabaptistae*** J. B. S. Pereira, P. G. Windisch, M. L. Lorscheitter, and Labiak, *sp. nov.* TYPE.—BRAZIL. Rio Grande do Sul, São Francisco de Paula, Rio Tainhas, 1 Oct. 2005, P. G. Windisch 10056 (Holotype: PACA 107431). **Figs. 1 A–B; 2 A–D; 3 A–D.**

Plantae parvae, minus quam 15 cm altae. Cormus erectus, bilobatus. Radices synchronae, dichotome divisae, conspicue succulentae. Folia chartacea, 10–35, ascendunt, 6–11 cm longa. Alae castaneae, apice vulgo truncatae, 20–25% per foliae longitudinem ascendentes. Subula olivacea, ascendens, apice attenuata. Squamae absentes. Labium absens. Ligula deltato-lanceolata. Velum incompletum. Sporangium basale ellipticum, hyalinum. Megasporeae albae, triletae, 558–736  $\mu\text{m}$  diametro, hemisphaero distali reticulato vel cristato, hemisphaerio proximali reticulato. Microsporeae monoletae, microechinatae, 24–31  $\mu\text{m}$  longae, 13–22  $\mu\text{m}$  latae.

Plants submerged, growing among rocks in streams, less than 15 cm tall. Corm erect, bilobed, 3–10 mm wide. Roots synchronous, dichotomous. Microphylls 10–35, ascending, linear, chartaceous, 6–11 cm long, 4–6 mm wide at the base and 1–2.5 mm wide in the medial portion, base of the microphylls alate, the alae 1.4–2.3 cm long, 0.5–0.8 mm wide (above the sporangium), extending 20–25% the length of the microphyll, castaneous, apices often truncate. Subula olive green, ascending, semiterete, the apex attenuate. Scales absent. Labium absent. Ligule deltate-lanceolate, membranaceous, 2.2–2.5 mm long and 1.4–1.8 mm wide. Velum incomplete, covering 50–75% of the sporangium width, and 25–50% of the sporangium length. Sporangium basal, elliptic, hyaline, 3.1–3.4 mm long, 1.9–2.4 mm wide. Megaspores whitish, trilete, globose in equatorial view, globose to subtriangular in proximal view, 558–736 ( $\bar{x}$  = 669)  $\mu\text{m}$  wide, irregularly reticulate to densely cristate distally, irregularly reticulate proximally. Microspores gray, monolete, elliptic, 30–38 ( $\bar{x}$  = 34)  $\mu\text{m}$  long, 23–28 ( $\bar{x}$  = 25)  $\mu\text{m}$  wide, perispore microechinate.

ADDITIONAL SPECIMENS EXAMINED.—BRAZIL. Rio Grande do Sul: São José dos Ausentes, Silveira, 09 Dez. 1994, R. Bueno 4471 (ICN).

ETYMOLOGY.—The specific epithet honors Dr. Luis Rios de Moura Baptista, botanist from the Federal University in Porto Alegre, Rio Grande do Sul.

DISTRIBUTION AND ECOLOGY.—*Isoetes mourabaptistae* is known from only two collections: one from São Francisco de Paula, and the other from São José dos Ausentes, both in the northeastern part of Rio Grande do Sul. It was found



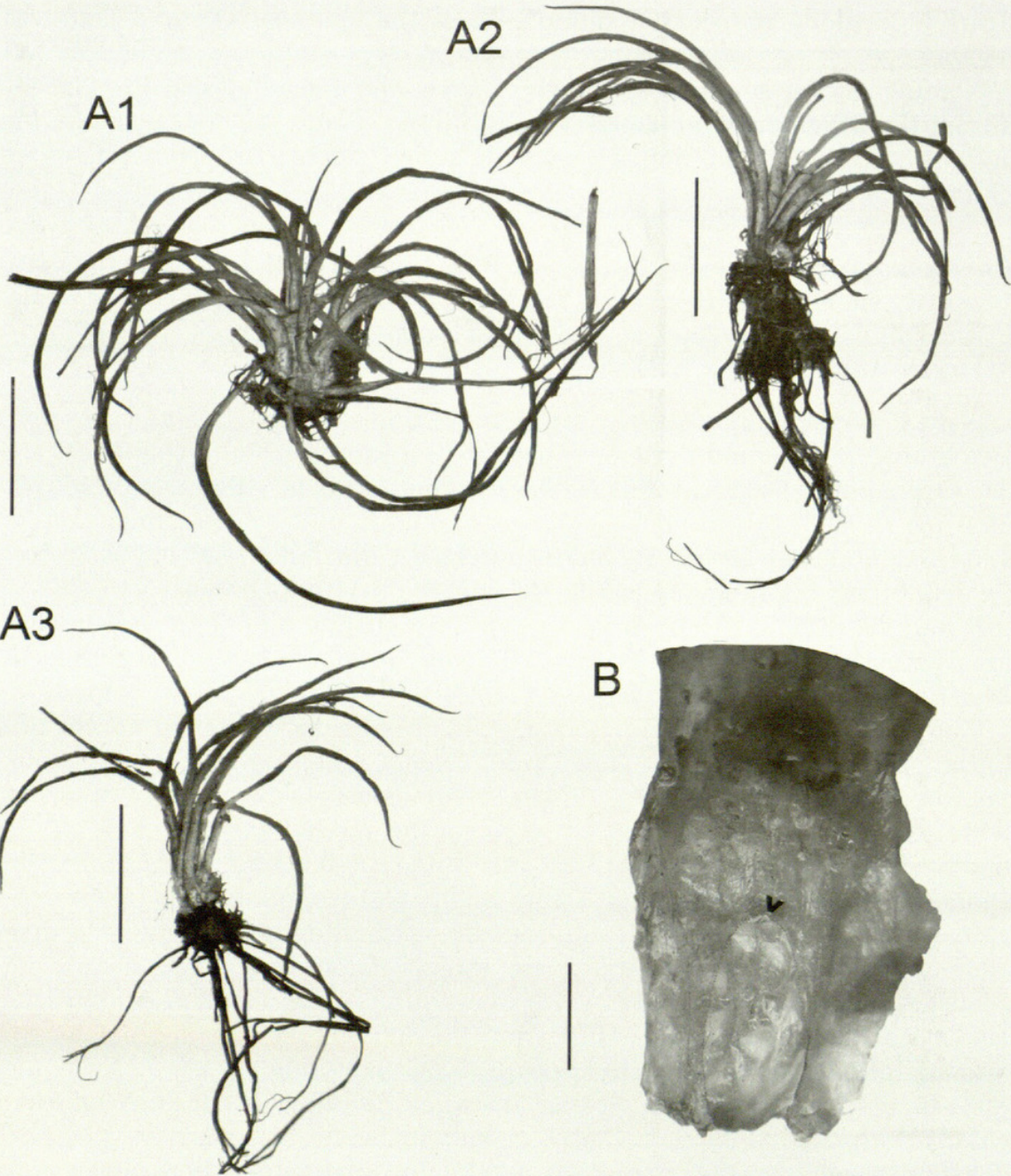


FIG. 1. A–B. **A.** Habit of *Isoetes mourabaptistae*. **B.** Velum (the arrow indicates the edge of the velum with the fenestra below). Scale bars: A = 2 cm and B = 1 mm. (All from the Holotype, *P. G. Windisch 10056*, PACA).

growing submerged, on rocks in shallow, clear waters, at altitudes of about 900–1100 m.

TAXONOMIC NOTES.—According to Hickey *et al.* (2009), in the southern part of South America there is a group of species with reticulate megaspores that is very complex taxonomically. This group includes species such as *I. brasiliensis* H. P. Fuchs, *I. ekmanii* U. Weber, *I. fuscomarginata* H. P. Fuchs,



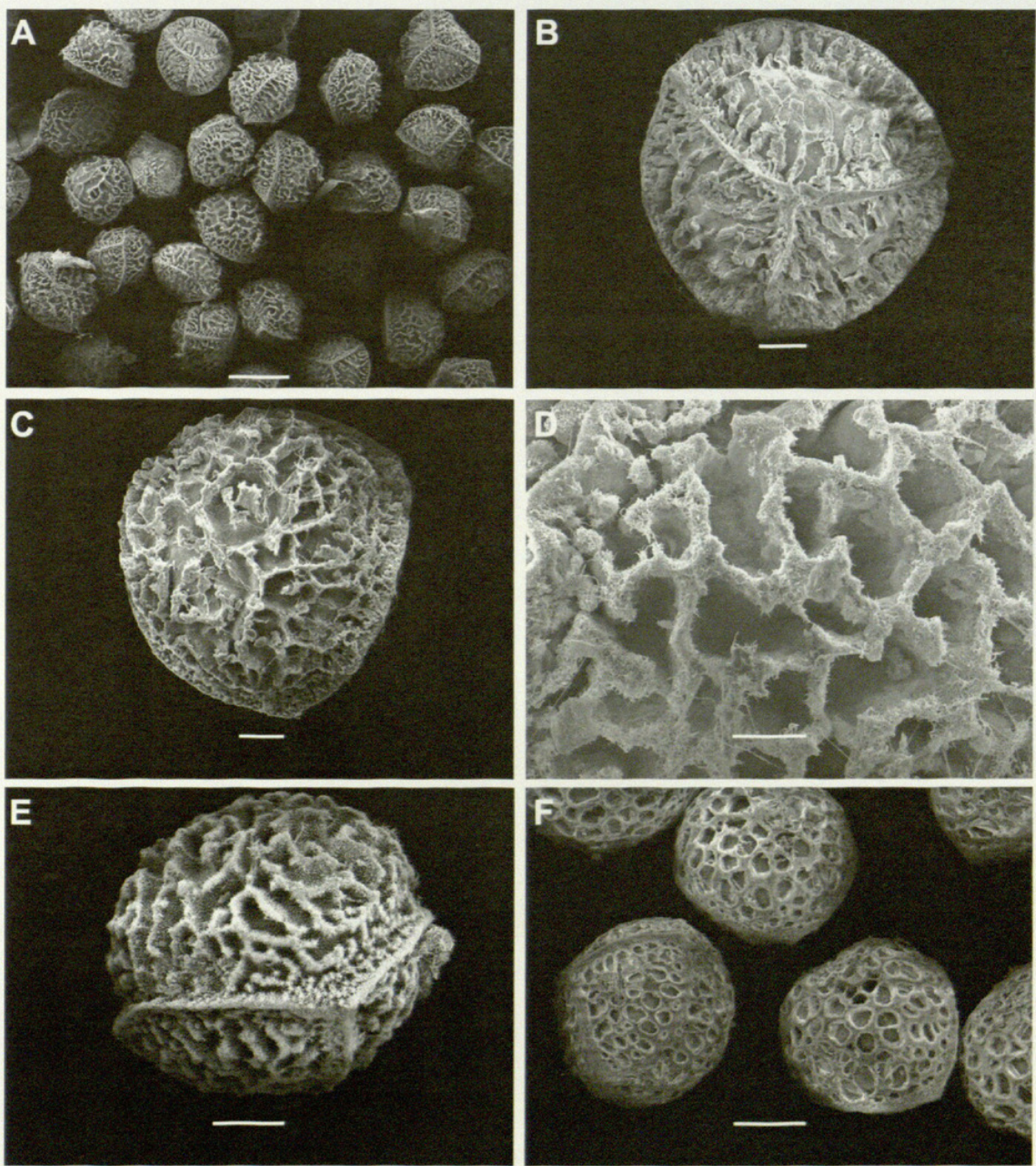


FIG. 2. A–F. SEM images of the megaspores of *Isoetes mourabaptistae*, *I. sehnemii*, and *I. spannagelii*. A–D. *Isoetes mourabaptistae* (Windisch 10056, PACA). A. Overview of the megaspores. B. Proximal view. C. Distal view. D. Detail of the megaspores in distal view. E. *I. sehnemii* (Sehnem 17094, PACA), megaspore in equatorial view. F. *I. spannagelii* (Pereira et al. 626, UPCB), megaspores in different positions. Scale bars: A = 500  $\mu\text{m}$ ; B, C, and E = 100  $\mu\text{m}$ ; D = 50  $\mu\text{m}$  and F = 200  $\mu\text{m}$ .

*I. martii* A. Br., *I. organensis* U. Weber, *I. ramboi* Herter, *I. smithii* H. P. Fuchs, *I. sehnemii* H. P. Fuchs, and *I. spannagelii* H. P. Fuchs. Because *Isoetes mourabaptistae* has megaspores that are irregularly reticulate, we believe that it may belong to this group. It can be distinguished from most of those species, however, by its larger megaspores (558–736  $\mu\text{m}$  in diameter), and by its



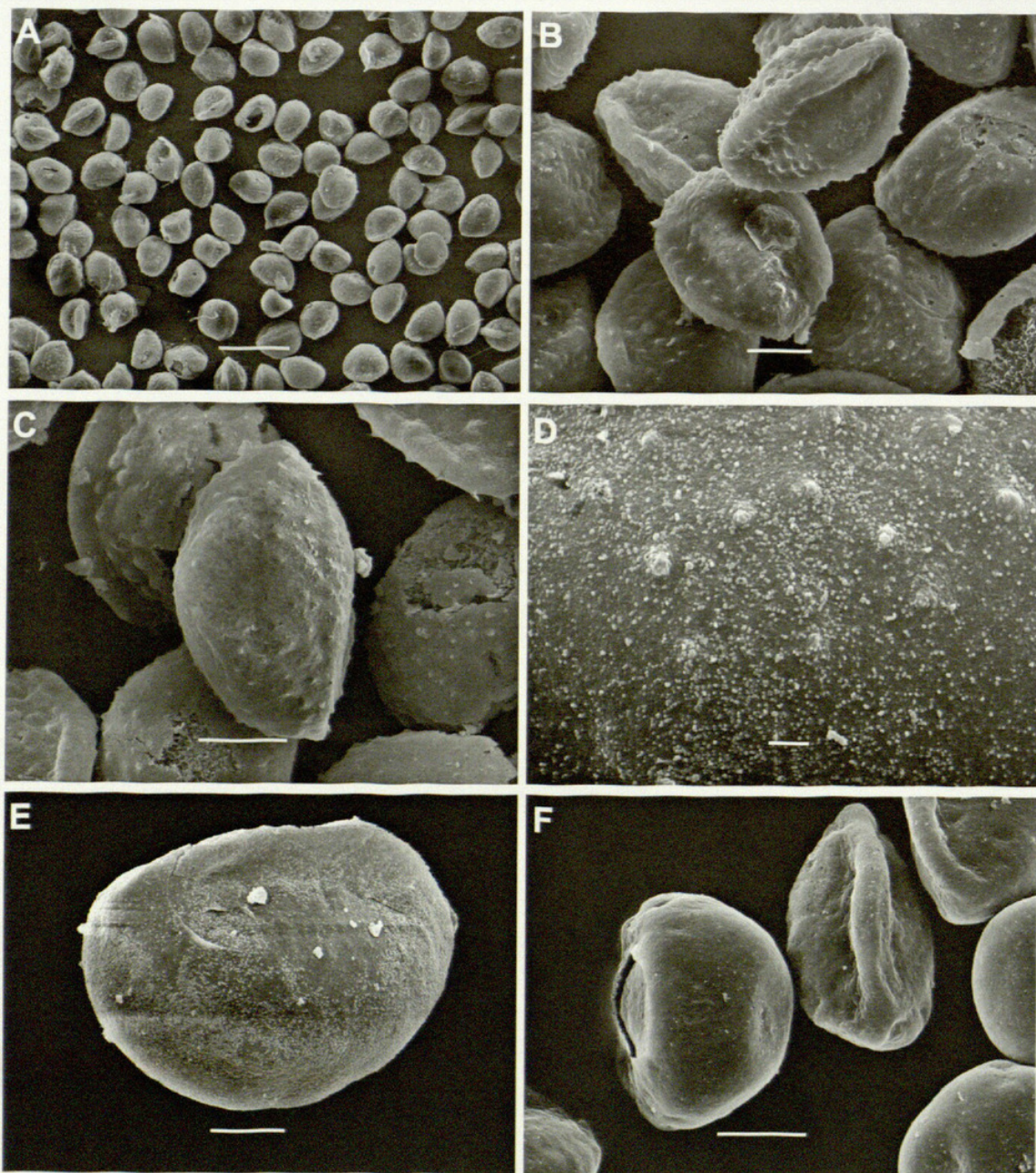


FIG. 3. A–F. SEM of the microspores of *Isoetes mourabaptistae*, *I. sehnemii* and *I. spannagelii*. A–D. *Isoetes mourabaptistae* (Windisch 10056, PACA). A–B. Overview of the microspores. C. Distal view of a microspore. D. Detail of the outer coating showing the microechinate surface. E. *I. sehnemii* (Sehnem 17094, PACA), equatorial view. F. *I. spannagelii* (Pereira et al. 626, UPCB), overview of the microspores. Scale bars: A = 50  $\mu\text{m}$ ; B, C and F = 10  $\mu\text{m}$ ; D = 1  $\mu\text{m}$  and E = 5  $\mu\text{m}$ .

microechinate microspores. In contrast, the megaspores of most of the species from southern Brazil are usually less than 400  $\mu\text{m}$  in diameter, and the microspores always have smooth outer coatings.

In the size of the microphylls (up to 11 cm long) and habit (Fig. 1 A), *Isoetes mourabaptistae* resembles *I. sehnemii* H. P. Fuchs and *I. spannagelii* H. P. Fuchs. However, the megaspores of *I. sehnemii* are much smaller (332–480



(–554)  $\mu\text{m}$  diam.) and the microspores are smooth (Figs. 2E and 3E). In *I. spannagelii* the megaspores are 406–562(–603)  $\mu\text{m}$  in diameter and distinctly and consistently reticulate. The microspores are also smooth (Figs. 2F and 3F).

Hans Peter Fucks-Eckert labeled a collection made by Luis Rios Moura-Baptista as '*Isoetes batistae*' (*Moura-Baptista* 7719, PACA), and also cited this name on pages 237 and 256 of his work published in 1982 (Fucks-Eckert, 1982). However, Fucks-Eckert never validly published this new name (therefore a *nomen nudum*). The specimen at the PACA Herbarium is very depauperate, with only fragments of the microphylls. Even though it was collected in the same river, and likely represents the species described here, we cannot be sure about its identity given the absence of the characters that distinguish this species from its congeners.

**CONSERVATION STATUS.**—*Isoetes mourabaptistae* is currently known from only two collections, from two different rivers in southern Brazil. This suggests that it is locally rare and has a narrow distribution, therefore deserving special attention relative to its conservation status. However, based on our current knowledge of its population size and geographic distribution, and according to IUCN Red List Criteria (IUCN, 2001), it is assessed here as Data Deficient (DD).

#### ACKNOWLEDGEMENTS

We thank the “Centro de Microscopia Eletrônica da UFPR” and Priscila Izabel Tremarin for their help with the SEM images. We also thank Dr. Thelma Veiga Ludwig and Dr. William Rodrigues for their valuable help in this work. This study is part of Jovani Souza's Master Dissertation, which was made possible through a fellowship from CAPES. Paulo Labiak, Paulo Windisch, and M. Luisa Lorscheitter are Research Grant recipients from the Brazilian Research Council (CNPq).

#### LITERATURE CITED

- CHOI, H.-K., J. JUNG and C. KIM. 2008. Two new species of *Isoetes* (Isoetaceae) from Jeju Island, South Korea. *J. Pl. Biol.* 51:354–358.
- FUCHS-ECKERT, H. P. 1982. Zur heutigen Kenntnis von Vorkommen und Verbreitung der südamerikanischen *Isoetes*-Arten. *Proc. Koninkl. Neder. Akad. Wetensch. Ser. C.* 85:205–260.
- FUCHS-ECKERT, H. P. 1986. Isoetáceas. Pp. 3–43, in R. Reitz, ed. *Flora Ilustrada Catarinense*. Itajaí, Santa Catarina, Brasil.
- HICKEY, R. J. 1985. Revisionary studies of Neotropical *Isoetes* Ph.D. Dissertation, The University of Connecticut, Storrs, CT.
- HICKEY, R. J. 1986. The early evolutionary and morphological diversity of *Isoetes*, with description of two new Neotropical species. *Syst. Bot.* 11:309–321.
- HICKEY, R. J. 1990. Studies of Neotropical *Isoetes* L. I. *Euphyllum*, a new Subgenus. *Ann. Missouri Bot. Gard.* 77:239–245.
- HICKEY, R. J., W. C. TAYLOR and N. T. LUEBKE, N. T. 1989. The species concept in Pteridophyta with special reference to *Isoetes*. *Amer. Fern. J.* 79:78–89.
- HICKEY, R. J., C. C. MACLUF and W. C. TAYLOR. 2003. A re-evaluation of *Isoetes savatieri* Franchet in Argentina and Chile. *Amer. Fern. J.* 93:126–136.
- HICKEY, R. J., C. C. MACLUF and M. LINK-PÉREZ. *Isoetes maxima*, a new species from Brazil. *Amer. Fern. J.* 99:194–199.
- LORSCHETTER, M. L., A. R. ASHRAF, P. G. WINDISCH and V. MOSBRUGGER. 2009. Pteridophyte spores of Rio Grande do Sul flora, Brazil, Part VI. *Palaeontographica* 281:1–96.



- LUEBKE, N. T. and J. M. BUDKE. 2003. *Isoetes tennesseensis* (Isoetaceae), an octoploid quillwort from Tennessee. Amer. Fern. J. 93:184–190.
- PRADO, J. and L. S. SYLVESTRE. 2010. Isoetaceae in Lista de Espécies da Flora do Brasil. Jardim Botânico do Rio de Janeiro. (<http://floradobrasil.jbrj.gov.br/2010/fb091270>).
- SMALL, R. L. and R. J. HICKEY. 2001. Systematics of the Northern Andean *Isoetes karstenii* Complex. Amer. Fern. J. 91:41–69.
- TAYLOR, W. C. and R. J. HICKEY. 1992. Habitat, evolution, and speciation in *Isoetes*. Ann. Missouri Bot. Gard. 79:613–622.



Pereira, Jovani B et al. 2012. "Isoetes mourabaptistae, a New Species from Southern Brazil." *American fern journal* 102, 174–180.

<https://doi.org/10.1640/0002-8444-102.2.174>.

**View This Item Online:** <https://www.biodiversitylibrary.org/item/182335>

**DOI:** <https://doi.org/10.1640/0002-8444-102.2.174>

**Permalink:** <https://www.biodiversitylibrary.org/partpdf/231034>

#### **Holding Institution**

Missouri Botanical Garden, Peter H. Raven Library

#### **Sponsored by**

Missouri Botanical Garden

#### **Copyright & Reuse**

Copyright Status: Permission to digitize granted by rights holder

Rights Holder: American Fern Society

License: <http://creativecommons.org/licenses/by-nc-sa/4.0/>

Rights: <https://www.biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.