

NOTES ON THE FLORA OF THE YUCATAN PENINSULA IV:
MARSILEA VESTITA HOOK. ET GREV. VAR. *VESTITA*
 (MARSILEACEAE), A NEW RECORD AND SOME COMMENTS
 ABOUT THE GENUS IN THE REGION

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Abstract: *Marsilea vestita* Hook. et Grev. var. *vestita* is reported for the first time from the Yucatan Peninsula Biotic Province. An overview of the family Marsileaceae in the region is presented. A key to the three species known for the area is provided, as well as habitat notes and a full description of the newly reported population of *M. vestita* var. *vestita*.

Key words: ferns, Marsileaceae, *Marsilea*, Mexico, Yucatan Peninsula Biotic Province.

Resumen: Se registra por primera vez a *Marsilea vestita* Hook. et Grev. var. *vestita* en la Provincia Biótica Península de Yucatán. Se hacen comentarios generales sobre la familia Marsileaceae y se incluye una clave para identificar las tres especies que crecen en la región, notas sobre su hábitat, y una descripción completa de esta nueva población de *M. vestita* var. *vestita*.

Palabras clave: helecho, Marsileaceae, *Marsilea*, México, Provincia Biótica Península de Yucatán.

Ferns are a group of ancient vascular plants. One of their centers of diversity is located in Mexico, where an estimated number of 1,024 taxa (Mickel and Smith, 2004) are known to occur. This high fern diversity is explained by a combination of climatic, geological, geomorphologic, and historical factors (Mickel and Beitel, 1988; Riba, 1993). Ferns are, however, poorly represented in the Yucatan Peninsula. Dealing only with the Mexican portions of the Yucatan Peninsula Biotic Province (thereupon MYP), Sosa *et al.* (1985) included 1,936 species of vascular plants, of which only 29 were ferns, whereas Durán *et al.* (2000) included 2,477 species and 41 ferns. These figures for ferns indicate that they scarcely account for 1.5–1.6% of the entire regional flora. The low fern diversity in the region is due to the overall dryness, geomorphologic homogeneity and low elevations (0-250 m) of the MYP, and the near absence of rivers due to a karst geomorphology (Carnevali *et al.*, 2003). Within the MYP, precipitation decreases

roughly from SE to NW, with a minimum near Progreso, Yucatán, (*ca.* 500 mm per year) and maxima near La Unión, Quintana Roo, close to the Belizean border (*ca.* 1,500 mm per year), as well as in Palizada and most of SW Campeche (up to 1,999 mm per year). The effective dry season in most of the MYP is from one to three months. All these factors combined explain the low fern diversity of the MYP (Orellana *et al.*, 1999).

The most recent floristic checklists for the MYP (Sosa *et al.*, 1985; Durán *et al.*, 2000; Arellano-Rodríguez *et al.*, 2003) do not include the fern family Marsileaceae. This family contains three genera, namely *Marsilea* L., *Pilularia* L., and *Regnellidium* Lindm. With 45 species, *Marsilea* L. is the largest genus (Johnson, 1986; Pérez-García *et al.*, 1999). There are recent monographic revisions of the genus *Marsilea* for the whole New World (Johnson, 1986), for Mesoamerica (Johnson 1995), and another one for Mexico (Pérez-García *et al.*, 1999). None

of these publications mentions any species of the family for the MYP. However, the family was recently recorded for the first time for the area (Ocaña and Lot, 1996; see below).

The following offers an account of the three species of the genus found in the Yucatan Peninsula Biotic Province (YPBP henceforth; includes the three states of the Mexican portion of the Peninsula, as well as northern Belize and the El Petén Department of Guatemala), including a key to their identification. Then, we discuss the identity of the new population herein reported and provide a full description of the plants and a brief account of their habitat.

Key for the species of the genus *Marsilea* in the YPBP:

1. Sporocarps borne from the rhizome; rhizome with roots only at the nodes, sometimes the 1(-2) roots at up to 1 cm away from the node; superior teeth of the sporocarp present, acute; sorus 14–22 per sporocarp.....
.....*Marsilea vestita* var. *vestita*
1. Sporocarps borne on the petiole; rhizome with roots in the nodes and internodes; superior teeth of the sporocarp absent; sorus 10–13 per sporocarp.
 2. Sporocarps 1–4 on proximal 1/4 of petiole; leaflets 11–20 mm wide, obdeltate to flabellate.....
..... *Marsilea deflexa*
 2. Sporocarps 3–25 on proximal 2/3 of petiole; leaflets 13–37, spatulate to flabellate.....
..... *Marsilea crotophora*

Marsilea crotophora D.M.Johnson, Syst.Bot.Monogr. 11:46. 1986.

DISTRIBUTION: Mexico (Guerrero, Veracruz, and Tabasco), Nicaragua, Venezuela, Brasil, Bolivia, and Paraguay (Pérez-García 1999, Johnson 1986).

MATERIAL EXAMINED: MEXICO: Tabasco en la desviación a Tamulte de las Sabanas, en el km 26, 18 enero 1995, A. Guadarrama *et al.* 95.1.2 (CICY).

DISCUSSION: This species was reported as occurring in the YPBP by Ocaña and Lot (1996). Their plants were found growing in flooded areas along the margins of the Palizada river delta in SW Campeche. There they grow in a community known as “popal”, which is dominated by species of *Thalia* L., *Pontederia* L., and *Sagittaria* L. (Ocaña and Lot, 1996). These authors identified their material as *Marsilea crotophora* D.M.Johnson, a species known from neighboring Tabasco State. Unfortunately, the specimens collected were sterile (A. Novelo, pers. comm.) and, despite an intensive search in relevant Mexican and international herbaria, the voucher specimens have not been found. Thus, the identity of the Palizada river population of *Marsilea* must remain tentative until more material is collected. However, *Marsilea crotophora* seems to be relatively common in the neighboring State of Tabasco, near Villahermosa, in the Pantanos de Centla area (*e.g.* Johnson,

1986; Pérez-García *et al.*, 1999). This region is adjacent with the delta system of the Palizada River, which drains into the Laguna de Términos.

Marsilea deflexa A.Braun, Monatsberg.Königl.Preuss. Akad.Wiss.Berlin 1863:421. 1864.

Zaluzianskia deflexa (A.Braun) Kuntze, Revis, Gen.Pl. 2:823. 1891.

DISTRIBUTION: Mexico (Jalisco, Nayarit, Oaxaca, Puebla, Veracruz), Guatemala, Honduras, Costa Rica, Colombia, Venezuela, Brazil, Peru, and Paraguay.

MATERIAL EXAMINED: None.

DISCUSSION: A second species of *Marsilea*, *M. deflexa* A.Braun, has been collected in the Peten Department of Guatemala at La Libertad (*C. Lundell* 2579, F, MICH, cited in Johnson, 1986). This locality, although outside Mexico, lies within the southern limits of the YPBP, as earlier defined by Lundell (1934) and Barrera (1962), and more recently by authors such as Carnevali *et al.* (2001; 2003, and references therein). Thus the species is included in this account. The species is easily distinguished by the large angular sporocarps with conspicuous lateral ribs (Johnson, 1986).

Marsilea vestita* var. *vestita Hook. et Grev., Icon.Filic. 2: pl. 159. 1830 [1829]. Figure 1a, b, c.

Here we offer a description of the Yucatan plants for comparison with other known populations. Aquatic or sub-aquatic ferns; main rhizome with roots only on the nodes or 1–2 roots less than 1 cm away from the node; internodes 1–3 cm long; nodes densely pilose; terrestrial leaves with erect or suberect petioles, these pilose to glabrescent; leaflets 0.5–2 cm long, 0.5–1.5 cm broad, rounded spatulate to broadly cuneate, asymmetric, the lateral margins slightly denticulate, somewhat concave, the leaflet blade flat, but held in a somewhat ascending fashion on live plants, sparsely to densely pilose on the underside, hydropoten absent; floating leaves not seen; fertile leaves produced at or slightly above soil level, with a single sporocarp borne at petiole base; peduncle erect to somewhat procumbent, sparsely pilose; sporocarps 2.4–5 mm long, 2–3 mm wide, ovate in lateral profile, often with conspicuous lateral ribs, densely covered with appressed black to dark brown hairs, eventually glabrescent; rafe 0.5–1.5 mm long; superior tooth acute, somewhat curved, 0.3–0.5 mm long. Sporangia of two types: megasporangia which a single megaspore and microsporangia which contain up to 64 microspores (only the last one was observed with various stages of development). For more details in the morphology of the sporangia see Schneider and Pryer (2002).

DISTRIBUTION: Widely distributed in the north of Mexico (Baja California, Baja California Sur, Coahuila, Nuevo León, San Luis Potosí, Sonora, Tamaulipas, and

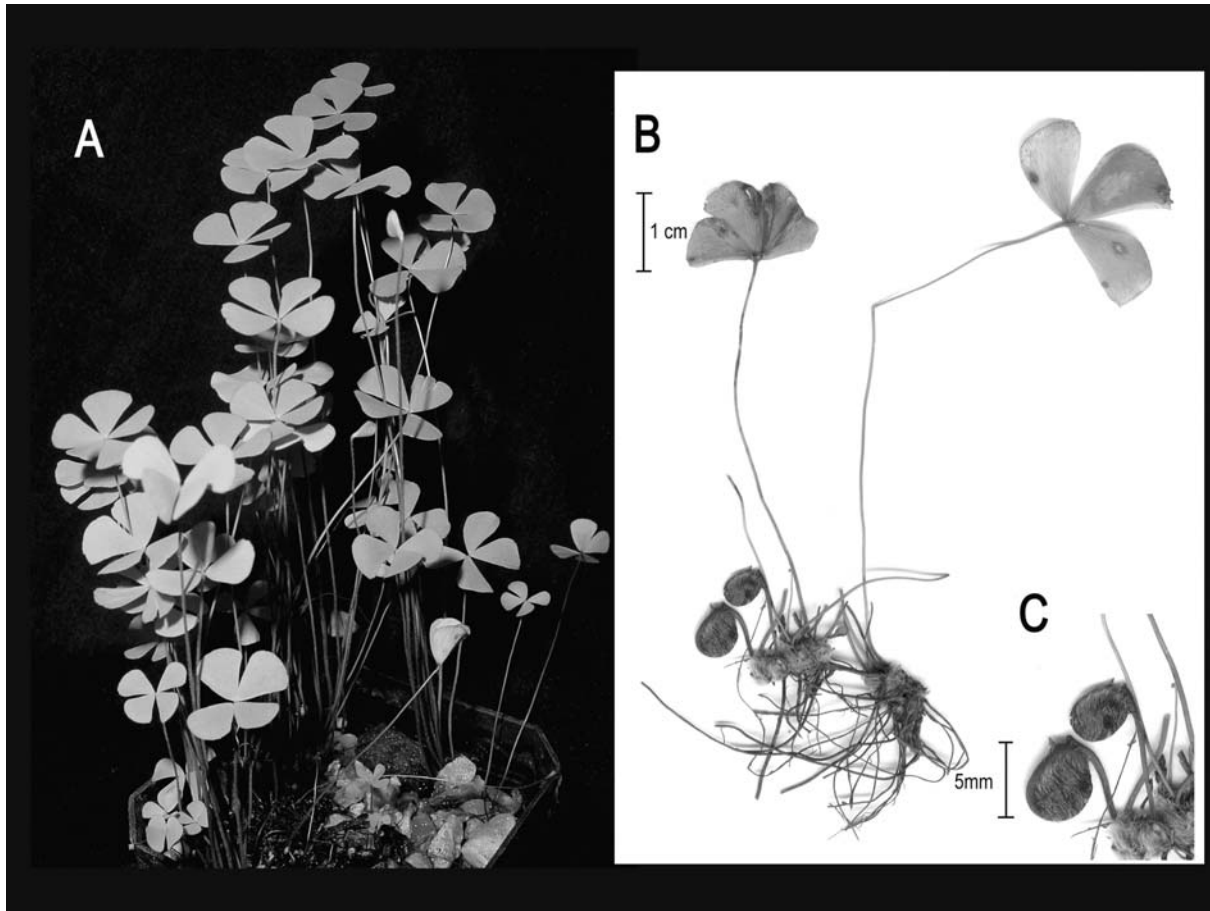


Figure 1. (a) Views of the general habit of *Marsilea vestita* Hook. et Grev. var. *vestita*. Note flat leaflets held in a somewhat upright position (Carnevali *et al.* 6740, CICY); (b) detail of the general habit of a fertile specimen including sporocarps and rhizomes of *Marsilea vestita* var. *vestita* (Carnevali *et al.* 6740, CICY); (c) detail of two sporangia of *Marsilea vestita* var. *vestita* with teeth. Note the sporocarp covered with adpressed hairs and the erect acute terminal tooth (Carnevali *et al.* 6740, CICY).

Zacatecas), Canada, the United States, and Peru (Pérez-García *et al.*, 1999; Johnson 1986). These Yucatan collections represent a notable disjunction in the known distribution of *Marsilea vestita* var. *vestita*. All previous Mexican records were collected at the NW states or the north central sections of the country (Johnson, 1986; Pérez-García *et al.*, 1999). However, since the species is also recorded from a strikingly disjunct station in northern Peru, it is likely that *Marsilea vestita* has actually been overlooked and is more widespread than the collecting record suggests.

MATERIAL EXAMINED: MEXICO: Yucatán, Municipio Dzemul, 2 km al S del entronque a las Ruinas de Xcambó, aprox. 21°18'00" N, 89°19'58" O. Selva baja caducifolia con cactáceas columnares sobre suelo negro pedregoso con muchas lajas expuestas, helecho rizomatoso, muy desecado pero con algunas hojas todavía verdes, creciendo a pleno sol en un lugar que estuvo inundado varios meses antes. Esporocarpos color pardo oscuro, densamente adpreso hirsutos; folíolos verde claro, pecíolos variables desde cuatro

hasta ca. 10 cm de largo; raíces sólo en los nudos. 7 marzo 2003, G. Carnevali, R. Duno and F. May-Pat 6740 (CICY, NY, MEXU, MO, UCAM, XAL, US, HUH); 3 km al S del entronque a las Ruinas de Xcambó, en la zona inundable, aprox. 21°18'00" N, 89°19'58" O, selva baja caducifolia con cactáceas columnares, "helecho de 4 cm de alto, esporocarpos pardo oscuro, hirsutos", 17 July 2003, L. Can-Itzá, F. May-Pat, and S. Hernández 61 (CICY).

HABITAT: The locality and ecological conditions under which this new population of *Marsilea vestita* var. *vestita* was collected are of interest. The plants were found in partial desiccated, shallow depressions filled with muddy, organic soils, where they grew along with members of the Cyperaceae, Alismataceae, Portulacaceae, Poaceae, Convolvulaceae, and other plants. These depressions occurred over a general pan of limestone slabs and outcrops which harbor a diverse, low height, dry-forest community. Dominant woody taxa here are members of the Fabaceae (*e.g.* *Prosopis juliflora* (Sw.) DC.),

Euphorbiaceae (*Croton* spp., *Jatropha gaumeri* Greenman) and some others (e.g. *Guaicum sanctum* L., *Bursera simaruba* (L.) Sarg., *Metopium brownei* Urb., *Gymnopodium floribundum* Rolfe). A most conspicuous element of this kind of association, called “*selva baja caducifolia con cactáceas candelabriformes*” (low caducifolious forest with candelabra-like cacti) is the abundance of columnar cacti, several of which are endemic [*Pterocereus gaumeri* (Britton et Rose) T.MacDoug. et Miranda, *Stenocereus laevigatus* (Salm-Dyck) Buxb., *Pachycereus* sp. nov.] and other succulents in the Cactaceae (e.g. *Mammillaria gaumeri* Orcutt), Agavaceae (*Agave angustifolia* Haw.), and Portulacaceae (*Talinum* spp., *Portulaca* spp.). Epiphytes are rare and not diverse, mainly succulent Orchidaceae (e.g. *Myrmecophila christinae* Carnevali et Gómez-Juárez) and Bromeliaceae (e.g. *Tillandsia paucifolia* Baker). During the dry season, some of the larger trees become leafless but many shrubs are sclerophyllous and evergreen. During the rainy season, a wealth of herbs and subshrubs, both geophytes (e.g. *Zephyranthes* sp.) and annuals to perennials (e.g. *Cienfuegosia yucatanensis* Millsp. and *Cuphea gaumeri* Koehne) create a showy flowering display. Ferns are virtually absent. This vegetation type is floristically very interesting since it harbors many of the endemic species of the YBPB and a high species diversity, as compared to the vegetation matrix it is embedded within (Carnevali et al., 2003).

Discussion

Our specimens are certainly referable to *Marsilea vestita* var. *vestita*. The only other species it could be confused with is *Marsilea mollis* Robinson et Fernald and both taxa are almost impossible to distinguish when sterile. However, when sporocarps are available, both taxa are readily diagnosable since the sporocarps of *M. vestita* feature an acute superior tooth, such as found in our material. The sporocarps of the Yucatecan plants also feature the adpressed hairs typical of *M. vestita*. As clearly discussed by Johnson (1986), the Yucatan plants display the asymmetrical, almost falcate leaflets, which are held flat and somewhat ascending, which are diagnostic of *M. vestita* when compared against *M. mollis*.

Interestingly, the collections of this species in our area were made in March 2003, about six months after Hurricane Isidore hit the Yucatan Peninsula. The hurricane caused a great amount of flooding and ecological disturbance in the Peninsula. Areas that remained wet or flooded for a few weeks after the end of the rainy season, continued flooded much longer in the aftermath of the hurricane. The larger extent of flooded areas and the longer persistence of the standing water could be an explanation to the appearance of this species in such a dry area of the YBPB. It must

be remembered that the longer period of flooding must have attracted larger and possibly more diverse flocks of water fowl which could have brought the sporocarps of these small ferns.

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