

LLAVEA CORDIFOLIA (PTERIDACEAE),
NEW FOR TEXAS AND THE UNITED STATES

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ABSTRACT

Llavea cordifolia (Pteridaceae) is reported as new to the Texas flora and to the flora of the United States.

RESUMEN

Llavea cordifolia (Pteridaceae) se cita como nueva para la flora de Texas y para la flora de los Estados Unidos.

Llavea is a morphologically distinctive, monotypic genus previously known to occur primarily in the mountains of Mexico from Coahuila, Nuevo León, and Tamaulipas south to Chiapas, but also in Guatemala and Costa Rica (Stolze 1981; Mickel & Beitel 1988; Lellinger 1989; Jaramillo et al. 2000; Mickel & Smith 2004). It has not previously been reported from Texas (e.g., Correll & Johnston 1970; Hatch et al. 1990; Jones et al. 1997; Yarborough & Powell 2002; Diggs et al. 2006) or from the United States (Windham 1993 [Flora North America]; Kartesz 1999; USDA Plants 2011).

The evolutionary relationships of the genus have been unclear—Copeland (1947) considered it to be derived from *Pellaea*, Pichi Sermolli (1963) placed it with *Cryptogramma* and *Onychium*, while Tryon and Tryon (1982) suggested there was a distant relationship to *Lygodium*. Family placement has ranged from Adiantaceae to Cryptogrammaceae (e.g., Smith et al. 2006), Llaveaceae, and Pteridaceae. Recent molecular research (e.g., Schuettpelz et al. 2007; Schuettpelz & Pryer 2007, 2008) has shown it to be in the Pteridaceae in a cryptogammoid clade consisting of three genera including *Cryptogramma* (6–11 species of North America, South America, Europe, and Asia) and *Coniogramme* (an Old World genus). This cryptogammoid clade is the most basal of the five clades comprising the Pteridaceae, making *Llavea* only distantly related to other members of that family. Schuettpelz et al. (2007) noted regarding this clade, “The morphology is highly variable in this group, and a clear morphological synapomorphy is lacking. Although all three genera display sterile-fertile leaf dimorphism, this character is widespread throughout the Pteridaceae.” *Llavea* has long been cultivated as an ornamental—Hooker (1860) pointed out that it was “one of the most beautiful, and, in a state of cultivation, rarest of ferns, native of Mexico, with a very peculiar habit.... No fern-collection suitable to a warm greenhouse should be without this charming plant.”

A collection from Presidio County, Texas is apparently the first documented occurrence of this species for both Texas and the United States.

Voucher specimen: **TEXAS. Presidio Co.:** moist limestone bluff, 1108 m (3635 ft), Big Bend Ranch State Park, ca. 11.1 km (6.9 mi) from the U.S.-Mexico border, 10 May 1992, R.J. O'Kennon & B.H. Warnock 10570 (BRIT).

While the Texas collection of this species was made in 1992, at that time it was thought to be an aberrant individual of an *Osmunda* species. The specimen remained in storage until late 2010 when its identity was realized. In Mexico, it occurs on rocky slopes of moist woods and cliffs (Mickel & Smith 2004). Tryon and Tryon (1982) noted, “*Llavea* grows in mesic canyons, or other rocky places in pine and oak woods, or in tropical forests. Sometimes it occurs on roadsides, on rock walls or in damp soil. It is principally, perhaps always, a calciophile.” It superficially somewhat resembles *Osmunda regalis*, ROYAL FERN, but is quite different in appearance from all other Texas species. The current status of the species in Texas is unknown. However,

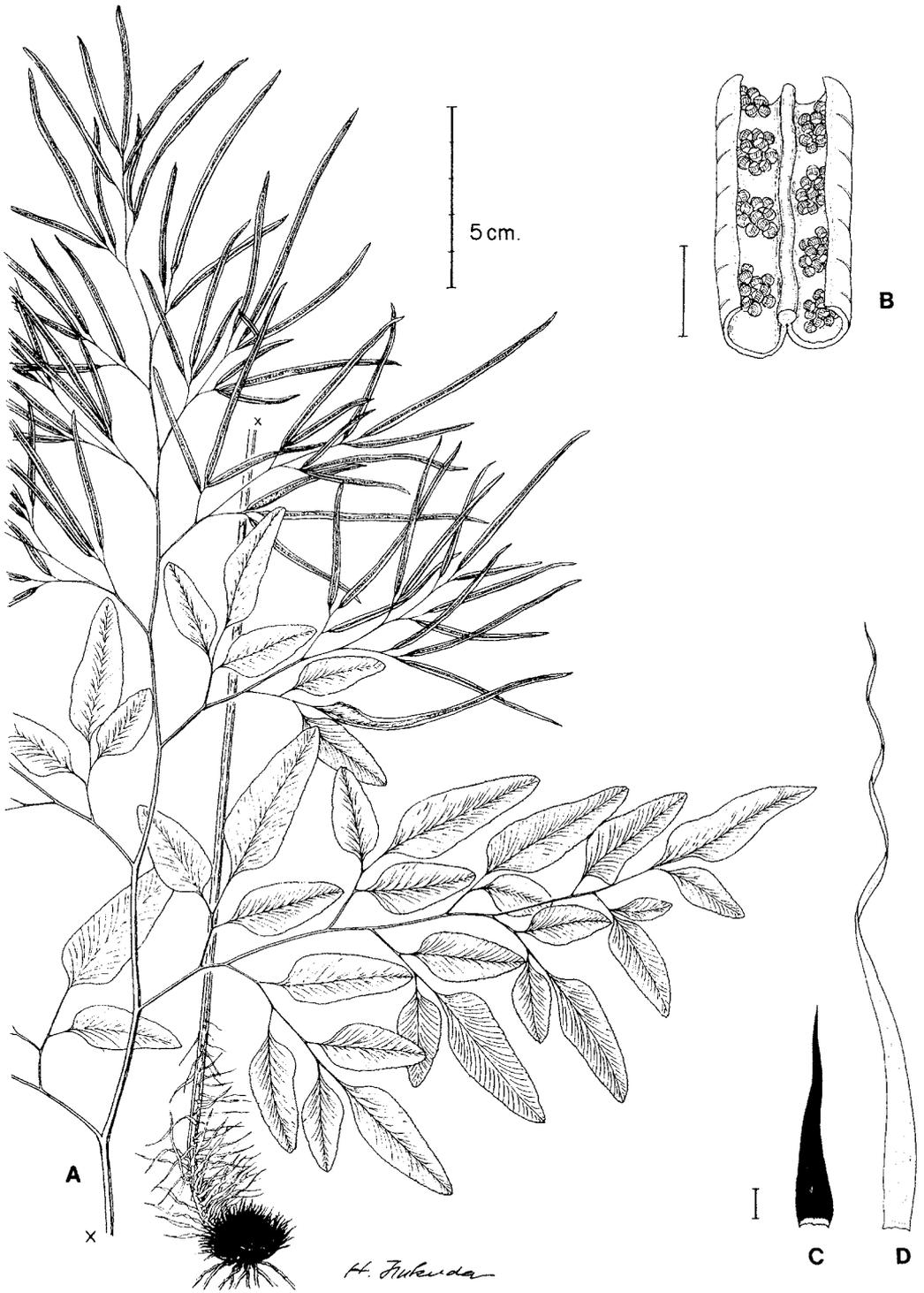


FIG. 1. Line drawing of *Llavea cordifolia* (reprinted with permission from Mickel & Smith 2004, fig. 174).



FIG. 2. Scan of Texas voucher specimen of *Llavea cordifolia* (O'Kennon & Warnock 10570, BRIT).

because it is known in this country from only a single station in Presidio County, we consider this species to be of conservation concern in both Texas and the United States.

Llavea cordifolia can be recognized by the following description (modified from Stolze 1981; Mickel & Beitel 1988; Pacheco 1995, and Mickel & Smith 2004) and from Figures 1 and 2.

Llavea cordifolia Lag., LLAVE'S FERN, CORDATE-LEAVED LLAVEA, HELECHO DE LA LLAVE. Plants terrestrial or on rocks; rhizomes typically horizontal or nearly so, compact, 2–2.5 cm diam., with scales linear-lanceolate, 0.6–1.4 cm long, entire, blackish; leaves clumped, 0.45–1.2(–1.47) m long, partially dimorphic (fertile leaves similar to sterile except with much narrower, longer sporangia-bearing pinnae limited to the terminal 1/3 of the blades); petioles ca. equal in length to blade, grooved, glabrous except for large (1–3 cm long), yellowish, linear-lanceolate scales near base; leaf blades broadly ovate, mostly 3-pinnate basally, 2-pinnate apically, subcoriaceous, glabrous, with ultimate segments distinctly stalked, with veins 1–2 forked, free, extending to segment margins, the ends prominent; sterile segments ovate-deltate, 2–3 cm long, 0.8–2.2 cm wide, grayish-green, marginally serrulate; fertile segments much narrower, linear, 2.5–8.5 cm long, 1–4(–5) mm wide, with inrolled margins partially covering sori; sori borne along the veins, so abundant as to often essentially cover the entire abaxial surface of the segments; indusium differentiated, with short glandular hairs on inside; $n = 29$ (Tryon & Tryon 1982; Mickel & Smith 2004). [*Allosorus karwinskii* Kunze, *Botryogramme karwinskii* (Kunze) Fée, *Ceratodactylis osmundoides* J. Sm.] The sole U.S. collection was sporulating on 10 May.

This species can be instantly distinguished from all other Pteridaceae and indeed all other ferns in the Trans-Pecos and Texas by the combination its large, striking, partially dimorphic leaves (fertile leaves similar to sterile except with much narrower, longer fertile pinnae limited to the terminal 1/3 of the blades) and the contrast between the blackish rhizome scales and the yellowish scales at the bases of the petioles.

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