A new species of *Ceratozamia* (Zamiaceae) from Tabasco and Chiapas, Mexico

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DESCRIPTION

**CERATÖZAMIA BECERRAE** PÉREZ-FARRERA, VOVIDES, & SCHUTZMAN SP. NOV. AFFINIS C. MIQUELIANA.

(Fig. 1)

**Diagnosis:** Plantae rupestrae, caule hypogaeo vel partimi epigaeo, globose, parvo, humili; foliis 2-5, descendentibus, petiolis et rachidibus linearibus; foliis 2-5 descending to decumbent, pinnate, olive-green upon emergence, forming an open crown, 55-178 cm long, 21.5-45 cm wide; petiole and rachis linear, terete with two parallel adaxial canals at leaflet articulations on rachis, unarmed or with few distantly spaced fine prickers, petiole 15.5-79 cm long, rachis 17-80 cm long; leaflets coriaceous, flat, 4-13 pairs, oblong to oblanceolate, subfalcate, asymmetrical towards acuminate apex, opposite to subopposite along apical portion of leaf, alternate to subalternate along mid and basal portion of leaf, margins subrevolute, entire, proximal margin more curved than the distal, giving the leaflet a subfalcate appearance, olive green on adaxial surface, light green on abaxial surface, articulation yellow to orange inserted at an oblique angle to the rachis, 17-30 cm long, 5.2-10 cm wide, 32-54 veins visible on adaxial surface, interven distance 0.17-0.24 cm, distance between leaflets 5.4-12.9 cm. **MICROSTROBILI** erect, conical, light to olive-green at emergence, light to olive-green at maturity, 11-13.5 cm long, 4-5.1 cm in diameter; peduncle heavily tomentose, 2-3 cm long, 1-1.5 cm in diameter; megasporophylls numerous, peltate, spirally inserted along cone axis, distal face hexagonal, biconcave, with olive-green tomentulum on lobulate portion near the horns, long axis 1.8-3.3 cm, short axis 0.6-1.4 cm, 3-4 crests near base of the horns. **SEEDS** ovate, sarcotesta white when immature turning creamy yellow at maturity, sclerotesta smooth, beige to light-beige with 7-10 visible rays radiating from the micropyle, 1.1-2.1 cm long, 1.1-1.4 cm in diameter. Chromosome number 2n = 16.

**Etymology:** We have assigned the specific epithet of this species in honour of Professor Marco E. Becerra, who collected this taxon for the first time. Professor Becerra (1870-1940) made important historical, linguistic, ethnological and archaeological contributions, as well as carrying out botanical (floristic) and faunistic research throughout his native State of Tabasco. His intellectual life is considered one of the most inquiring and fruitful in its history. He also explored northern Chiapas and made archaeological and botanical discoveries in the Sumidero canyon.

Figure 1. *Ceratozamia becerrae* sp. nov. A, habit of young male plant; B, leaf highlighting detail of articulation and leaflet veins; C, mature male strobilus; D & E, detail of microsporophyll, abaxial and adaxial surfaces, respectively; F, detail of microsporangia and associated reddish brown tomentum; G, mature female strobilus (vertical scars between sporophyll horns are caused by squirrels); H & I, detail of megasporophyll and ovules (one ovule aborted); J, seed; K, long section of seed showing embryo.

The habitat presents an irregular topography with slopes of up to 70% and cliff faces. The geology of this region comprises Eocene continental marine strata with Oligocene marine inclusions. Its limestone rock has eroded to form a karst topography (López-Mendoza, 1980; López-Hernández, 1994), and the soil is a shallow tropical rendzina. *Ceratozamia becerrae* grows within an altitudinal range of 400-600 m a.s.l.

**DISCUSSION**

*Ceratozamia becerrae* sp. nov. has affinity with *C. miqueliana* but differs in growth habit of the leaves, trunk and petioles. The leaf crown in *C. miqueliana* is erect with a heavily armed petiole, and the trunks become curved with age. The leaf crown in *C. becerrae* consists of fewer leaves (Fig. 2), which are descendent to decumbent and have a greater interleaflet distance when compared to those of *C. miqueliana* and *C. zoquorum* (Figs 3-5). The leaflet shapes in *C. miqueliana* and *C. zoquorum* are long oblongate but in *C. becerrae* they are comparatively wider; the articulation in both *C. zoquorum* and *C. becerrae* is similar in that the angle of insertion to the rachis is oblique, but not so in *C. miqueliana* (Fig. 6). The petioles are unarmed and

**KEY SEPARATING CERATOZAMIA BECERRAE FROM C. MIQUELIANA, C. ZOQUORUM AND C. EURYPHYLLIDIA**

1. Petioles unarmed or very few prickles. Leaflets coriaceous
   2. Leaf 42-75 cm wide, leaflets pruinose, often long oblongate, leaflets 3.2-6.5 cm wide, distance between leaflets 1.7-2.4 cm, .................................................................*C. zoquorum*
   2’. Leaf 21.5-45 cm wide, leaflets glossy, often oblong rarely oblongate, leaflets 5.2-9 cm wide, distance between leaflets 5.3-12.8 cm, .................................................................*C. becerrae*

1’. Petiole heavily armed with prickles. Leaflets papyraceous to moderately membraneaceous
   3. Leaflets not translucent, 4-6.5 cm wide, .................................................................*C. miqueliana*
   3’. Leaflets translucent 9-16 cm wide, .................................................................*C. euryphyllidia*

**Figure 2.** Habitat photos. A, habit of mature *Ceratozamia becerrae* sp. nov.; note descending to decumbent leaf with few leaflets. B, habit of *C. miqueliana*; note ascending leaves with many more leaflets in comparison.
rarely present prickles, which when present are light, whilst the trunks are globose to subglobose in *C. becerrae*. Although both species bear erect cones, they differ in size and colour: at emergence the megastrobili of *C. miqueliana* are olive-green, whilst those of *C. becerrae* are a light yellowish green (Fig. 7). Both species occur in similar vegetation types, inhabiting the herbaceous layers of tropical evergreen rain forests; however, *C. miqueliana* occurs on basaltic substrate in Veracruz, or on humus rich clay soils in Chiapas, while *C. becerrae* is found only on calcareous rocks forming karst topography. These rain forests form part of the Pleistocene floristic refuges south of the Mexican Trans-volcanic Mountain Range (González & Vovides, 2002) and both these cycad species, along with *C. zoquorum*, *Zamia cremnophila* and *Z. splendens*, appear to be endemic to the region, which has the highest precipitation in lowland Mexico. This region specifically comprises the ‘arc refuge’ area of Wendt (1987, 1993), which extends from northern Oaxaca, southern Veracruz and southern Tabasco to northern Chiapas c. 350 km long (east-west) and 75 km (north-south) at its widest. This area is rich in endemics and includes other Pleistocene refuges described by Toledo (1982). These refuge areas of southern México have been postulated as the probable centre of origin for the genus *Ceratozamia* (González & Vovides, 2002).

*Ceratozamia becerrae* is native to the mountains of northern Chiapas and the southern Sierras of Tabasco. Specific locality information has been omitted on purpose in order to discourage illegal commercial collecting of this critically endangered species. Owing to recent expanding agricultural activities and...
coffee plantations, as well as a forest fire during 1998 that affected severely one of its two known populations, we recommend its inclusion in IUCN Red List Category CRB2 (a-e) (IUCN (1994)).

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