

## *Chigua*, A New Genus in the Zamiaceae with Comments on Its Biogeographic Significance

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### Abstract

STEVENSON, D. W. (New York Botanical Garden, Bronx, New York 10458, USA). *Chigua*, a new genus in the Zamiaceae with comments on its biogeographic significance. *Memoirs of the New York Botanical Garden* 57: 169–172. 1990.—*Chigua* a new genus in the Zamiaceae from Colombia is described and illustrated. This genus differs from all other cycad genera in having a prominent midrib with longitudinally dichotomous branched lateral veins in its pinnae and hexagonal sporophylls with raised mounds on the peltate face at the angles. Two species are described and illustrated: *C. restrepoi* sp. nov. and *C. bernalii* sp. nov. which differ from each other chiefly in leaflet width, length, and shape. The main biogeographic significance lies in this genus being the only endemic genus in the Cycadales for South America.

Key words: *Chigua*; Zamiaceae; South American endemic.

### Introduction

In 1918, Francis Pennell collected a single specimen of a cycad tentatively assigned to *Zamia*. This specimen, which consists of part of an unbranched subterranean caudex and a single leaf, is unusual in that the leaflets have a prominent midrib with lateral veins running longitudinally and branching dichotomously. Because this was a unicate, Sergio Sabato and I thought that perhaps the specimen represented a teratism as we had never seen any other cycad specimens with this leaflet character. Knut Norstog and I recently travelled to Colombia in search of more material that would conform to Pennell's collection. Fortunately, the trip proved successful and more material was collected (along with strobili) that was the same as that collected by Pennell and, moreover, some 50 km distant a second collection was made of plants with quite differently

shaped leaflets that were also more numerous per leaf, narrower, and longer. It was also clear that this material represented a new genus in that both the leaflets and the sporophylls were quite unlike those known for any of the currently known cycad genera.

The genera of cycads are easily separable on leaf, leaflet, and sporophyll characters. Thus, for example, *Dioon* Lindl. has leaflets that are laterally decurrent on the rachis and has flat sporophylls with the megasporophylls having two stalked ovules, whereas, in contrast, *Ceratozamia* Brongn. has articulated leaflets and peltate sporophylls with two horns and sessile ovules. A comparison of any other genera would reveal just as significant differences. Because the cycad genera are so distinct from one another in both reproductive and vegetative characters, any new genus should also be unique in these characters. Below is a description of such a new genus and

its two species along with a comparison of it to other genera that have some similarity in general in leaflet characters.

**Chigua D.** Stevenson, gen. nov.

Foliola subopposita vel alternata, con medio nervis praedita, laterale longitudinale e dichotomi; sporophyllus ♀ peltatus, hexagonus, ad quemqua angulum umbunatus; sporophyllus ♂ peltatus, hexagonus, planus.

Leaflets subopposite to alternate, prominent midvein present, lateral veins longitudinal and dichotomously branched; megasporangiate strobili with hexagonal peltate sporophylls; megasporophylls with a conspicuous bump at each angle of the hexagon; microsporangiate strobili with hexagonal peltate sporophylls.

Type Species: *Chigua restrepoi* D. Stevenson.

The genus name is derived from the Spanish transliteration of an Indian common name for cycads in Central and South America.

**Chigua restrepoi** D. Stevenson. Type<sup>1</sup>. COLUMBIA. Primary rain forest, elev. 150 m, 14 Mar 1987, D. Stevenson 693 (holotype: HUA, isotypes: FTG, NY). Fig. 1A-H.

Truncus hypogaeus, humilis, elipsoidus, 15 cm diam., 40 cm longus; cataphyllus lanata, triangularis, stipulis; folia pauca, 2–3, glabra; petiolus subteres teres, 60–80 cm longus, validus spinus armatus; rachis semiteres, 60–100 cm longus, in dimidio inferiore pucis spinis armata, supra inermis; foliola inferiore alternata, medio subopposita, supra opposita, 20–30 juga, lanceolata, 3–5 cm lata, 15–25 cm longa, basi cuneata, apicem caudata, margine dentata; strobilus ♂ cylindricus, vel 5 cm longus, 2 cm latus, ferrugineo-tomentosus; microsporophylla peltata, hexagona, plana; strobilus ♀ cylindricus, vel 15 cm longus, 5 cm latus, ferrugineo-tomentosus; megasporophylla peltata, hexagona, ad quemqua angula umbunata, ovulo duo; semina ovidea, rubra.

*Stem* hypogeous, ellipsoid, 15 cm diam., 40 cm long; *cataphylls* pubescent, triangular, 3–5 cm

long, 1–2 cm wide, stipulate; *leaves* 2–3, glabrous, stipulate; *petiole* subterete, 60–80 cm long, armed with prickles; *rachis* semiterete, 60–100 cm long, armed with prickles below, smooth above; *leaflets* alternate below, subopposite in middle, opposite above, 20–30 on each side, lanceolate, 3–5 cm wide, 15–25 cm long, papyraceous, sessile, cuneate at base, caudate at apex, margins with well defined teeth; *microsporangiate strobilus* cylindrical, 5 cm long, 2 cm diam., covered with reddish-brown tomentum; *peduncle* glabrous, 10 cm long, 1 cm diam.; *microsporophylls* peltate, sterile peltate tip flat; *megasporangiate strobilus* cylindrical, 15 cm long, 5 cm diam., covered with reddish-brown tomentum; *peduncle* glabrous, 30 cm long, 1.5 cm diam.; *megasporophylls* peltate with a narrow basal stalk, hexagonal with a conspicuous bump at each angle of the hexagon; *seeds* ovoid, red at maturity.

**Paratypes.** COLUMBIA. Primary rainforest, 120 m, 24 Jul 1986, R. Bernal, G. Galeano & D. Restrepo 1138 (COL, FTG); 28 Sep 1986, I. Turner 3 (FTG); 90–120 m, 5–6 Mar 1918, F. Pennell 4608 (NY).

This species is named in honor of the late Padre Sergio Restrepo, an excellent local botanist who located the species.

**Chigua bernalii** D. Stevenson. Type. COLUMBIA. Primary rain forest, 150 m, 27 Jul 1986, R. Bernal, G. Galeano & D. Restrepo 1189 (holotype: COL; isotype: FTG). Fig. 1I.

Truncus hypogaeus, humilis, ellipsoidus, 10 cm diam., 30 cm longus; cataphyllus lanata, triangularis, stipulis; folia pauca, 2–3, glabra, stipulis; petiolus subteres teres, 1–1.4 m longus, validus spinus armatus; rachis semiteres, 60–160 cm longus, in dimidio inferiore pucis spinis armata, supra inermis; foliola inferiore alternata, medio subopposita, supra opposita, 30–55 juga, lineara vel linear-lanceolata, 1–1.5 cm lata, 30–35 cm longa, basi cuneata, apicem longa caudata, margine dentata e undulata.

*Stem* hypogeous, ellipsoid, 10 cm diam., 30 cm long; *cataphylls* pubescent, triangular, 3–5 cm long, 1–2 cm wide, stipulate; *leaves* 2–3, glabrous, stipulate; *petiole* subterete, 1–1.4 m long, armed with prickles; *rachis* semiterete, 60–160 cm long, armed with prickles below, smooth above; *leaflets* alternate below, subopposite in middle, opposite above, 30–55 on each side, lin-

<sup>1</sup> As in previous papers, I have purposely omitted precise locality data in an attempt to prevent eradication by commercial collectors. Only a very few plants of this genus have been seen in the wild, and I am convinced that commercial collectors would, either intentionally or unintentionally, cause its extinction.

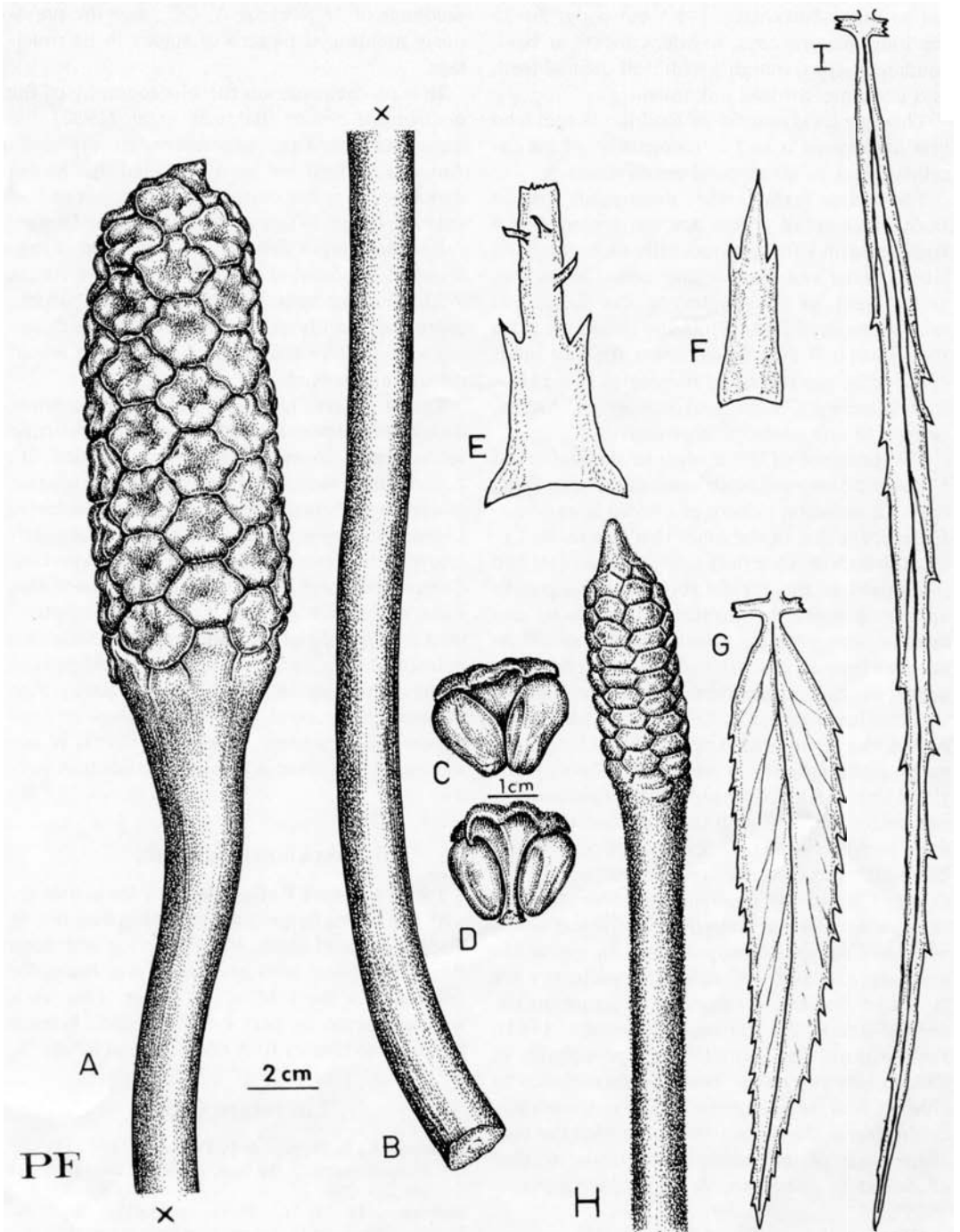


Fig. 1. *Chigua*. A-H. *Chigua restrepoi*. A. Megasporangiate strobilus. B. Peduncle. C. Abaxial view of megsporophyll. D. Adaxial view of megasporophyll. E. Leaf base with stipules. F. Cataphyll. G. Leaflet. H. Microsporangiate strobilus. I. Leaflet of *C. bernallii*. (A-D and H by Priscilla Fawcett, E-G and I by D.W.S.)

ear to linear-lanceolate, 1–1.5 cm wide, 30–35 cm long, papyraceous, sessile, cuneate at base, caudate at apex, margins with well defined teeth and undulate. Strobili unknown.

This species is named for Rodrigo Bernal who first discovered it and in recognition of his excellent work in neotropical cycad research.

The major features that distinguish *Chigua* from other cycad genera are the presence of a leaflet midrib with longitudinally dichotomizing lateral veins and the peculiar raised areas that are present at the angles of the hexagonal megasporophyll face. While the raised areas on the sporophyll face is unknown for any other cycad taxa, the midrib is present in two paleotropical genera, *Cycas* L. and *Stangeria* T. Moore, but not in any neotropical genera.

The presence of the midrib in the leaflets of *Cycas* and *Stangeria* needs some discussion. First, the total venation pattern of *Chigua* is quite different from that in the other two genera. In *Cycas*, the midrib is the only vein in the leaflets and it is raised on the abaxial surface with a groove appearing above the midrib on the adaxial surface. In *Stangeria*, the midrib appears raised on both surfaces as in *Chigua*, but the lateral veins depart at a right angle and then dichotomize near the margins, whereas in *Chigua* the lateral veins depart at a quite acute angle and run longitudinally, dichotomizing nearer their points of origin. The leaflets of *Stangeria* are very similar to and easily confused with those of marattiaceous ferns such as *Danaea*. *Chigua*, on the other hand, bears little or no resemblance to *Danaea*. In addition, *Chigua* has small stipules near the apex of its cataphylls and laterally near the leaf bases, whereas *Cycas* has no stipules and *Stangeria* has no cataphylls and the stipules of its leaves are large and fused into a hooded structure on the adaxial side of the leaf base (Stevenson, 1981). Furthermore, the strobili and sporophylls of *Chigua*, where known, bear no resemblance to either *Cycas* or *Stangeria* and it is chemically distinct from the latter two genera with the mucilage sugar pattern being more similar to that of *Zamia* L. (Stevenson & Siniscalco Gigliano, 1989).

*Chigua* is being placed in the Zamiaceae on the bases of the near-vertical orthostichies of its sporophylls and their peltate hexagonal morphology, the presence of the small stipules, which also occur in *Ceratozamia* and *Zamia*, and the

seedlings of *Microcycas* A. DC., and the previously mentioned pattern of sugars in its mucilage.

In a recent paper on the biogeography of the neotropical cycads, Balduzzi et al. (1982) discussed the lack of a cycad genus endemic to South America. Indeed, we have predicted that an endemic genus either existed and is extinct or had yet to be found. When we first studied the Pennell collection, Sergio Sabato and I realized it represented a potential candidate for that status. Without more material, however, and which, more importantly, possessed distinctively different reproductive characters, the question would remain unresolved.

Cycad genera, in general, show an endemic distributional pattern, with three genera endemic to Australia: *Bowenia* Hooker ex Hooker fil., *Lepidozamia* Regel, and *Macrozamia* Miq.; two endemic to Southern Africa: *Encephalartos* Lehm. and *Stangeria*; one endemic to Cuba: *Microcycas*; and two to Northern Central America: *Ceratozamia* and *Dioon*. The exceptions to this pattern of endemism are *Cycas*, which is distributed widely around the Indian Ocean Basin and in tropical Asia, and *Zamia* which is widespread in the neotropics. What is significant here is that the other pantropical, southern hemisphere continents have endemic genera, so that it is not surprising that there is also one for South America.

### Acknowledgments

I wish to thank Rupert Barneby for assistance with the Latin, Sergio Sabato for his stimulating discussions and ideas, Knut Norstog and John Popenoe for field assistance, and Jorge Brand for assistance in the field in Colombia. This work was supported in part by a National Science Foundation Grants BSR 8607049 and 8796279.

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