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## Research note

# Where has *Aristolochia tricaudata* (ARISTOLOCHIACEAE) gone? New record of a critically endangered species in Oaxaca, Mexico

## ¿A dónde ha ido *Aristolochia tricaudata* (ARISTOLOCHIACEAE)? Registro nuevo de una especie amenazada en Oaxaca, México

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**Abstract.** During fieldwork in San Juan Teponaxtla, Oaxaca, 3 individuals of *Aristolochia tricaudata* Lemaire, a very rare species threatened with extinction, were observed with flowers and fruits. Although this species is present in many botanical gardens, fruits have never been observed. Conservation actions are urgently required to protect this species in the wild.

**Key words:** *Aristolochia tricaudata*, Mexico, Oaxaca, Chiapas, critically endangered.

**Resumen.** Durante un recorrido de campo en San Juan Teponaxtla, Oaxaca, fueron observados tres individuos con flores y frutos de *Aristolochia tricaudata* Lemaire, una muy rara especie amenazada con la extinción. Aunque esta especie está presente en muchos jardines botánicos, los frutos nunca habían sido observados. Debido a lo restringido de su distribución, esta especie requiere de acciones de conservación urgentes para su protección en la naturaleza.

**Palabras clave:** *Aristolochia tricaudata*, México, Oaxaca, Chiapas, críticamente amenazada.

The family Aristolochiaceae is a member of the magnoliid order Piperales, which also includes Hydnoraceae, Lactoridaceae, Piperaceae, and Saururaceae (e.g. Nickrent et al., 2002, Wanke et al., 2007; APG III, 2009). Aristolochiaceae consists of approximately 600 species and is divided into 2 monophyletic subfamilies, Asaroideae and Aristolochioideae (e.g. Huber, 1993; Neinhuis et al., 2005). Subfamily Asaroideae contains 2 herbaceous genera, *Asarum* and *Saruma*, whereas the number of genera within subfamily Aristolochioideae is still under debate as the generic limits of *Aristolochia* itself are unclear (Wanke et al., 2006). The genus *Aristolochia* s.l. includes approximately 500 species, and growth forms within this genus vary from herbs, lianas, and shrubs to small trees. The species generally occur in warm, tropical, and subtropical areas with Mexico being a centre of diversity. According to Ortega-Ortiz and Ortega-Ortiz (1997) and Kelly (2000), there are approximately 65 species in Mexico.

The systematic knowledge of *Aristolochia* in Mexico is more or less restricted to 2 revisions based on herbarium specimens of hexandrous and pentandrous species, respectively (Pfeifer, 1966, 1970). Since then, some new species have been described and several floristic studies have been performed, e.g. for the Flora de Veracruz (Ortega-Ortiz et al. 1997) and for the Flora del Valle de Tehuacán-Cuicatlán (Kelly, 2000). However, comprehensive studies of the occurrence, distribution, and phylogenetic relationships of the Mexican species have not yet been carried out. Nevertheless, it is clear that many species are restricted to few localities.

One of these very rare species is *Aristolochia tricaudata* Lemaire, which was observed with flowers and fruits in May 2008 during fieldwork for the project “The Biodiversity and Ethnobiology of San Juan Teponaxtla, Oaxaca” developed by the Centro de Estudios Geográficos, Biológicos y Comunitarios, S.C. (Rivera Hernández et al., 2009). In one of the transects carried out in the field, 3 individuals were found in the transition between tropical rainforest and cloud forest, at 1 220 meters above sea level, growing together with *Terminalia* (Combretaceae),



**Figure 1.** *A. tricaudata*. a), Mr. Marino Contreras (local Cuicatec guide) with the shrub; b), flower; c), immature fruit, and d), dried opened fruit.

*Calatola* (Icaciniaceae), *Amphitecna* (Bignoniaceae), and *Clusia* (Clusiaceae). This locality was revisited in September 2009 and flowers and fruits were again observed (S. Isnard and S. Wagner, pers. comm.). While looking for other records of this species in herbaria, we found 3 more vouchers from Oaxaca and Chiapas, which report *A. tricaudata* from cloud forest and tropical rainforest, growing between 900 and 1 375 m altitude amongst other species together with *Coccoloba* (Polygonaceae) and *Quararibea* (Malvaceae).

*Aristolochia tricaudata* belongs to *Aristolochia* subgenus *Isotrema* (Wanke et al., 2006), and is most closely related to *A. arborea* and *A. salvadorensis* (Neinhuis et al., 2005; Ohi-Toma et al., 2006). It is a multi-stemmed, leaning shrub up to 3-4 m tall, built according to the Troll architectural model (Hallé, 2004) with conspicuous trimerous flowers with 3 fused sepals, each with a long pendent appendage (Fig. 1). In contrast with the observations of Pfeifer (1966), who only mentioned the flowers as ‘solitary in the leaf axils (?)’, they are both cauliflorous and developing in the leaf axils. The species is regularly cultivated in botanical gardens, but the plants have never been observed to set fruit. Hence, it is probable that the species has only once been introduced to Botanical Gardens, presumably from the type collection. However, studying the genotypic diversity of the botanical garden accessions might elucidate this mystery.

The Belgian botanist Auguste Boniface Ghiesbreght (1810-1893) collected the type specimen of *A. tricaudata* in Chiapas, without mentioning the precise locality. He sent living specimens to the famous nursery of Ambroise Verschaffelt in Gent, Belgium, from where the species was distributed to many European collections. In 1865, Charles Antoine Lemaire mentioned *A. tricaudata* with a provisional short description in the horticultural journal *L'illustration Horticole*, edited by him and owned by Verschaffelt (Lemaire, 1865). In 1867, he described the species in this same journal, accompanied by a splendid illustration which is reproduced here (Lemaire, 1867; Fig. 2). Pfeifer (1966) wrote a relatively short description of *A. tricaudata* based on 2 herbarium collections, the type and a specimen which could not be located. An emended description is provided below, including the fruit and seed characters that never have been described before.

***Aristolochia tricaudata*** Lem., *Illust. Hort.* 14: 121-123, t. 522, 1867. Type: MEXICO. Chiapas: without precise locality, *Ghiesbreght* 800 (K!). Synonym: *Isotrema tricaudatum* (Lem.) H. Huber, *Mitt. Bot. Staatssamml. München* 3: 551. 1960.

Shrub up to 3-4 m high; branches zigzag with slightly swollen nodes; leaves simple, alternate, petiole 1-2 cm long, tomentulose; lamina 10-23 cm long, 5-12 cm wide,



Figure 2. Illustration of *A. tricaudata* from Lemaire (1867).

ovate, obovate or lanceolate, base rounded to obtuse, apex acuminate (the type also has 2 leaves with bidentate apex), margin entire, adaxial side dark green, glabrous; abaxial side whitish green, tomentulose along the veins; venation pinnate and brochidodromous, pseudostipules absent; bracteoles absent, flowers dark red to reddish brown, mouth whitish, outer surface of the flower whitish to pinkish, solitary, pendent from the trunk or from leaf axils on the older portions of the branches, trimerous, zygomorphic, 8-16 cm long, 5-7 cm wide, perianth consisting of 3 fused sepals forming a strongly curved tube, appendages of each sepal 5-15 cm long, anthers 6, carpels 6, styles and stigmas fused into a three-lobed gynostemium with each lobe carrying 2 anthers; fruit an oblong 6-locular septicidal capsule, dehiscing by valves, when immature yellowish-greenish with reddish brown lines on the raised midvein of each component carpel, speckled reddish brown along this

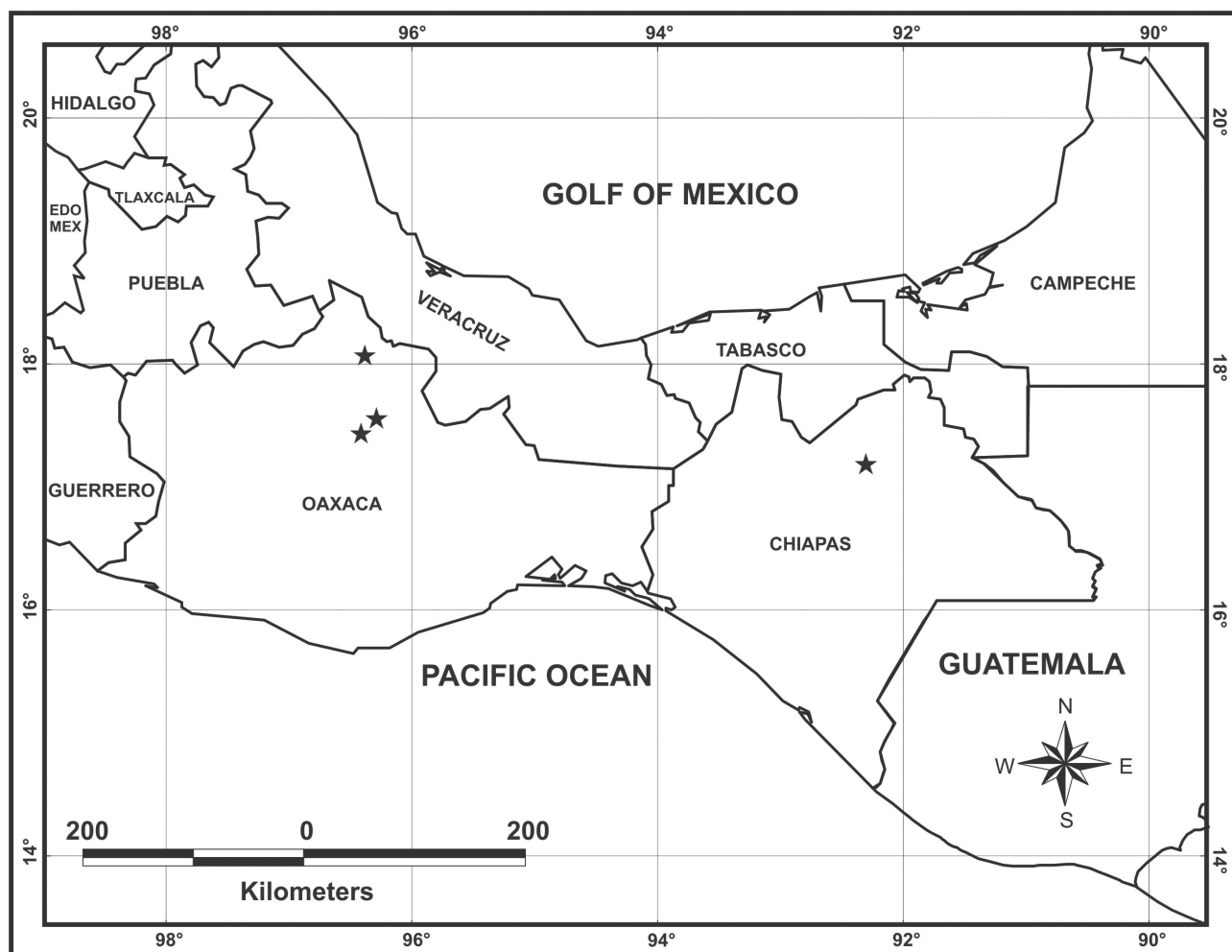


Figure 3. Distribution map of *A. tricaudata* (★) in Oaxaca and Chiapas.

midvein, sutures sunken, fruit when mature dark brown, 3-8 cm long, 1.8-2 cm wide, valves strongly recurved and separate from each other, pedicel not split as in many other *Aristolochia* species; seeds ovate with a pointed apex, flattened, dorsally slightly convex, ventrally slightly concave, dark reddish brown, up to 5 mm long and 3 mm wide, funiculus flattened against the seed, lignified, as long as the seed, 0.7-0.8 mm broad.

Additional specimens examined: OAXACA: Distrito Cuicatlán, Mpio. San Juan Tepeuxila, El Campamento, San Juan Teponaxtla, 1 220 m, 9 May 2008 (flowers), *J. Rivera-Hernández* 4288 (MEXU, CORU, GENT), 30 July 2008 (fruits), *J. Rivera-Hernández* 4379 (MEXU, CORU, GENT). Distrito Teotitlán, Mpio. San José Tenango, aproximadamente 400 m de San Martín Caballero, por la vereda a Tenango, 1 375 m, 21 January 2002 (fruit), *X. Munn E., D. García and F. Mendoza* 1824 (XAL, MEXU). Distrito Tuxtepec, Mpio. San Felipe Usila, Cerro Verde,

1 140 m, 25 May 1991, *J.I. Calzada and J. Múgica* 16975 (IEB, MEXU). CHIAPAS: Mpio. Tila, Colonia Kokijaz, 900 m, 25 July 1983, *A. Méndez Ton* (Alush Shilom Ton) 6400 (MEXU, XAL).

Sterile specimens of *A. tricaudata* resemble *A. arborea* but cannot be confused when flowers are present. *Aristolochia arborea* is cauliflorous with the flowers originating at the base of the trunk in racemose clusters and imitating the fruit body of mushrooms.

The vernacular name “guaco” or “flor de guaco” is given to most of the species of *Aristolochia* in Mexico. Before the observation of *A. tricaudata* in San Juan Teponaxtla, the inhabitants did not know this species, probably due to its scarce abundance. Since then, they have named it “i’ho dúvi”, which means “small tree” in Cuicatec, because the term “shrub” does not exist in this language.

The discovery of the population in Teponaxtla brings the total amount of recorded localities to 5: 3 in the north of

Oaxaca, 1 in the north of Chiapas, and finally the unknown type locality in Chiapas (Fig. 3). Only the collections from Oaxaca are relatively recent, and a visit of all localities is necessary to assess the size, viability, and specific threats for each population. The very small population of *A. tricaudata* in Teponaxtla is protected by the local community, which strictly forbids any collection of plants or parts of them. If not already the case, local inhabitants living near the other localities need to be informed about the status of this species.

The inclusion of *A. tricaudata* in the NOM-059-SEMARNAT-2010 list (SEMARNAT, 2010) of species protected by Mexican law, with the category of "En Peligro de Extinción" is urgent, and also its inclusion in the IUCN Red List (International Union for Conservation of Nature and Natural Resources) with the category of "Critically endangered" or "Endangered" is recommended.

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