



Rediscovery of *Arrabidaea chica* (Bignoniaceae) and *Entada polystachya* var. *polyphylla* (Fabaceae) in Puerto Rico

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Abstract

In this contribution the rediscovery of the lianas *Arrabidaea chica* (Bignoniaceae) and *Entada polystachya* var. *polyphylla* (Fabaceae-Mimosoideae) in Puerto Rico is reported. These species were first collected during the 1880s and subsequently considered extirpated. Their current status in Puerto Rico is discussed, and recommendations for their conservation are offered.

Introduction

During the decade of 1880, the German botanist Paul Ernst Emil Sintenis and the Puerto Rican naturalist Agustín Stahl collected several plant species and made significant contributions to the knowledge of the flora of Puerto Rico (Urban 1903–1911, Stahl 1883–1888). During their explorations throughout the island, Sintenis and Stahl collected several species new to science and new records for Puerto Rico, some of which are still known only from their collections (Acevedo-Rodríguez 2007, 2013). Examples of these are *Arrabidaea chica* (Bonpl. in Humboldt & Bonpland 1807: 107, pl. 31) Verlot (1868: 154) (Bignoniaceae) and *Entada polystachya* (Linnaeus 1753: 520) Candolle (1825: 425) var. *polyphylla* (Bentham 1840: 133) Barneby (1996: 175) [synonym: *Entadopsis polyphylla* (Benth.) Britton (in Britton & Rose 1928: 191)] (Fabaceae-Mimosoideae), both collected in 1885 and 1886. *Arrabidaea chica* was collected by both botanists in Bayamón, while *E. polystachya* var. *polyphylla* was collected in Fajardo by Sintenis and between Manatí and Vega Baja by Stahl. Until recently, the two taxa have never been recollected in Puerto Rico and were considered as extirpated (Acevedo-Rodríguez 2005). During recent botanical explorations in Puerto Rico, I have recollected both species, which are reported here.

Arrabidaea chica

Arrabidaea chica is a liana that can reach about 15 m in length with fragrant violet flowers produced in terminal panicles, and linear or narrowly-elliptical dehiscent capsules that produce many winged seeds (Acevedo-Rodríguez 2005). This species is widely distributed in the continental Neotropics and is only documented in the Antilles from St. John, U.S. Virgin Islands (Acevedo-Rodríguez 1996) and Puerto Rico (Liogier & Martorell 2000, Acevedo-Rodríguez 2005). In Puerto Rico, *A. chica* is known from three collections made by Sintenis and Stahl at unspecified localities in the municipality of Bayamón in northern Puerto Rico (Urban 1903–1911, Fig. 1). Sintenis made a single collection of a fruiting individual of *A. chica* on 20 March 1885 on a limestone hill (Sintenis 1096, BM!, G!, GH!, K!, L!, W!), while the other two specimens were collected by Stahl from forests and thickets (Stahl 79 & 541). He considered these collections a new species and described them as *Adenocalymna portoricensis* Stahl (1888: 186), which was latter placed

in synonymy with *A. chica* (Urban 1903–1911, Acevedo-Rodríguez 2007). One of Stahl's specimens was flowering on July 1886 (*Stahl 541*, L!), while the other (*Stahl 79*) has not yet been located. The specimens at B are no longer extant (Dr. Robert Vogt, pers. comm.). I have searched extant duplicates in over 25 herbaria in 11 countries, but the search has been unsuccessful. Apart from these three early collections, *A. chica* has not been recorded from Puerto Rico and it was thought that it was most likely extirpated (Liogier & Martorell 2000, Acevedo-Rodríguez 2005).

In February 2007, during a botanical exploration of the “Monte de Santa Ana” limestone hills in Bayamón (18°24' N 66°08' W; 90 m a.s.l.; Fig. 1), a single individual of *A. chica* was found near the top of a limestone hill (*Caraballo 1456* and *1480*, UPR!). This individual was about 10 m long, sterile, shedding leaves, and growing on an exposed cliff scrambling over rocks and trees. The same plant was found fruiting in May 2009 (*Caraballo 2855*, UPR!). Further explorations to locate more individuals of the species on this and other limestone hills of the area have been fruitless. The vegetation at the site where *A. chica* was found is secondary and dominated by lianas, vines, and herbs. The surrounding vegetation is dominated by a developed limestone forest dominated by native trees such as *Bursera simaruba* (L.) Sarg. (Burseraceae), *Guarea guidonia* (L.) Sleumer (Meliaceae), and *Sideroxylon portoricense* Urb. (Sapotaceae).

Besides *Arrabidaea chica*, the “Monte de Santa Ana” limestone hills are home to over thirty endangered, rare or remarkable species of the karstic region of northern Puerto Rico (Table 1). Some of these are very rare and only known from one or a few individuals in the limestone hills of northeastern Puerto Rico. These include the trees *Manilkara pleeana* (Pierre) Cronq. (Sapotaceae), *Oxandra laurifolia* (Sw.) A.Rich. (Annonaceae) and *Coccothrinax barbadensis* (Lodd. ex Mart.) Becc. (Arecaceae), the endemic shrub *Malpighia fucata* Ker Gawl. (Malpighiaceae) and the vines *Jacquemontia verticillata* (L.) Urb. (Convolvulaceae) and *Canavalia nitida* (Cav.) Piper (Fabaceae-Faboideae). In contrast, some rare and endangered species maintain numerous populations in this area, such as the trees *Erythrina eggersii* Krukoff & Moldenke (Fabaceae-Faboideae) and *Ottoschulzia rhodoxylon* (Urb.) Urb. (Icacinaceae). Interestingly, a nearby limestone hill holds a large population of the endangered plant *Buxus vahlii* Baill. (Buxaceae), suggesting that not all limestone hills in this area share the same composition of rare species. These hills have served as a shelter for the native flora because their rugged topography made them unsuitable for agricultural purposes and as such they were not completely deforested during the intense agricultural period of the 18th and 19th centuries. The conservation of these limestone hills is crucial for the survival of many native species of plants and animals, particularly in highly populated and fragmented landscapes such as the metropolitan area of San Juan. At present, the limestone hill where *A. chica* was found is legally protected by the National Park Company of the Government of Puerto Rico as part of the Julio Enrique Monagas National Park. In addition, *A. chica* is listed as a critical element of the flora of Puerto Rico by the Department of Natural and Environmental Resources of The Commonwealth of Puerto Rico (DNER 2008). Besides the legal protection, the successful conservation of *A. chica* in Puerto Rico is dependent on the specific preservation and propagation of the known individual. The main current threats to its survival are wild fires and vegetation clearance, particularly on the cliffs where rock climbing is practiced. Although vegetative propagation (through branch cuttings using a rooting hormone) has been successful, propagation by seeds has failed. The conservation of *A. chica* also has medical relevance, as the species has anti-inflammatory and wound-healing properties, among other benefits (*e.g.*, Jorge *et al.* 2008).

Entada polystachya* var. *polyphylla

Entada polystachya var. *polyphylla* is a liana that can grow to 10 m long with flowers arranged in a terminal raceme of cylindrical spikes bearing white stamens, and produces flat pods that separate into one-seeded segments (Acevedo-Rodríguez 2005). This taxon is present in South America (Amazonian Brazil, Ecuador, Peru, southwest Venezuela and the Guianas) and Puerto Rico (Barneby 1996). In Puerto Rico, *E. polystachya* var. *polyphylla* is known from two collections made by Sintenis and Stahl (Urban 1903–1911). Sintenis collected a flowering individual on 5 February 1885 at the base of a hill named “Monte de Mula” next to a river in

the municipality of Fajardo in northeastern Puerto Rico (*Sintenis 1240*, B!, BM!, GH!, L!, LD!, S!, US!, W!) (Fig. 1). On October of the next year, Stahl collected a flowering individual in a sandy area between the municipalities of Manatí and Vega Baja in northern Puerto Rico (*Stahl 590*, B!; Fig. 1). As no more specimens of *E. polystachya* var. *polyphylla* were collected again, it was considered extremely rare or extirpated (Acevedo-Rodríguez 2005, Axelrod 2011).

In July 2009, a solitary individual of *E. polystachya* var. *polyphylla* was found near Road PR-191 in the municipality of Naguabo in the eastern region of Puerto Rico (*Caraballo 2921*, UPR!) (18°15' N 65°47' W; 345 m a.s.l.; Fig. 1). This locality is about 16 km southwest from the town of Fajardo, and although the exact position of the historical collection made by Sintenis is uncertain, both the historical and the current locality are in eastern Puerto Rico (Fig. 1). The individual of *E. polystachya* var. *polyphylla* was about 9 m long, flowering, and growing over other trees in a sunny area with large rocks. The surrounding vegetation was disturbed and included grasses, invasive vines, and some persisting cultivated plants. Other uncommon native vines found at the site were *Dioclea reflexa* Hook. f. (Fabaceae-Faboideae) and *Mucuna urens* (L.) DC. (Fabaceae-Faboideae).

Like *A. chica*, *E. polystachya* var. *polyphylla* is listed as a critical element of the flora of Puerto Rico by the Department of Natural and Environmental Resources of The Commonwealth of Puerto Rico (DNER 2008). Nevertheless, the only known individual of the species in Puerto Rico is on a private property and threatened by deforestation and wild fires. In addition, it should be noted that, although the flowers observed seems healthy, after flowering the inflorescence spikes became swollen and no fruits were observed (*Caraballo 2921*, UPR!). Further research is necessary to determine the cause of this deformity and the fertility of the individual. The successful conservation of *E. polystachya* var. *polyphylla* in Puerto Rico depends on the protection and propagation of the mentioned plant.



FIGURE 1. Map of the island of Puerto Rico showing the localities where the lianas *Arrabidaea chica* (circle) and *Entada polystachya* var. *polyphylla* (triangle) were rediscovered. The historical localities where *E. polystachya* var. *polyphylla* was collected during the 19th Century includes the municipality of Fajardo (rhombus) and the area between the municipalities of Manatí and Vega Baja (square). All the historical records of *A. chica* are from unspecified localities within the municipality of Bayamón.

Conclusions

There are numerous taxa in the Caribbean known only from few collections made during the 19th and early 20th centuries. Fortunately, some of them have been recently rediscovered during botanical explorations (Judd *et al.* 2011). Such is the case with the vine *Anechites nerium* (Aubl.) Urb. (Apocynaceae), which was reported to Puerto Rico by Stahl in 1888 in the municipality of Vega Baja (*Stahl 870*, US!) and rediscovered in the municipalities of Arecibo and Quebradillas in 2001 and 2004 respectively (all localities in northern Puerto Rico). Even though the flora of Puerto Rico is one of the best documented in the Caribbean region (Torres-Santana *et al.* 2010), new species and populations of rare and endangered plants are still being found (Axelrod 2011).

The Caribbean islands comprise 2.3% of the world's flora, and are considered as a Biodiversity Hotspot (Myers et al. 2000). The combination of high biodiversity with high deforestation rates, climate change, and invasive species emphasizes the need for conservation. This should go hand in hand with further botanical exploration of the Antilles, because species long thought to be extirpated or extinct may still be around in very small numbers, and may be in need of local protection and conservation.

TABLE 1. Scientific name, botanical family, estimated abundance (number of individuals observed in the field), and status of the endangered, rare, or remarkable plant species present at the “Monte de Santa Ana” limestone hills (Bayamón) in the karstic region of northern Puerto Rico. The legend for Status is as follow: N = Native; E = Endemic; C = Common; O = Occasional; R = Rare. Voucher specimens for all these species are deposited in the UPR Herbarium.

Scientific name	Botanical family	Abundance	Status
<i>Aegiphila martinicensis</i> Jacq.	Lamiaceae	6–25	N; O
<i>Aiphanes minima</i> (Gaertn.) Burret	Arecaceae	6–25	N; O
<i>Arrabidaea chica</i> (Bonpl.) Verl.	Bignoniaceae	1–5	N; R
<i>Canavalia nitida</i> (Cav.) Piper	Fabaceae-Faboideae	1–5	N; O
<i>Cassipourea guianensis</i> Aublet	Rhizophoraceae	1–5	N; C
<i>Chione venosa</i> (Sw.) Urb. var. <i>venosa</i>	Rubiaceae	6–25	N; O
<i>Coccoloba pyrifolia</i> Desf.	Polygonaceae	1–5	E; C
<i>Coccothrinax barbadensis</i> (Lodd. ex Mart.) Becc.	Arecaceae	1–5	N; C
<i>Cydista aequinoctialis</i> (L.) Miers	Bignoniaceae	1–5	N; O
<i>Drypetes ilicifolia</i> Krug & Urb.	Putranjivaceae	1–5	N; R
<i>Epidendrum ciliare</i> L.	Orchidaceae	6–25	N; C
<i>Erythrina eggertii</i> Krukoff & Moldenke	Fabaceae-Faboideae	6–25	N; R
<i>Exothea paniculata</i> (Juss.) Radlk.	Sapindaceae	50+	N; O
<i>Guarea glabra</i> Vahl	Meliaceae	1–5	N; C
<i>Heliconia caribaea</i> Lam.	Musaceae	1–5	N; C
<i>Hernandia sonora</i> L.	Hernandiaceae	6–25	N; O
<i>Hohenbergia antillana</i> Mez	Bromeliaceae	1–5	N; O
<i>Hyperbaena domingensis</i> (DC.) Benth.	Menispermaceae	26–50	N; O
<i>Hyperbaena laurifolia</i> (Poir.) Urb.	Menispermaceae	26–50	N; O
<i>Jacquemontia verticillata</i> (L.) Urb.	Convolvulaceae	1–5	N; R
<i>Licaria triandra</i> (Sw.) Kosterm.	Lauraceae	50+	N; O
<i>Lucya tetrandra</i> (L.) K. Schum.	Rubiaceae	1–5	N; R
<i>Malpighia fucata</i> Ker Gawl.	Malpighiaceae	1–5	E; O
<i>Manilkara pleeana</i> (Pierre) Cronq.	Sapotaceae	1–5	E; O
<i>Maytenus elongata</i> (Urb.) Britton	Celastraceae	1–5	E; R
<i>Ottoschulzia rhodoxylon</i> (Urb.) Urb.	Icacinaceae	26–50	N; O
<i>Oxandra laurifolia</i> (Sw.) A. Rich.	Annonaceae	1–5	N; O
<i>Passiflora multiflora</i> L.	Passifloraceae	50+	N; C
<i>Philodendron giganteum</i> Schott	Araceae	6–25	N; C
<i>Pisonia</i> sp.	Nyctaginaceae	6–25	E; O
<i>Pristimera caribaea</i> (Urb.) A. C. Smith	Celastraceae	50+	N; C
<i>Pseudolmedia spuria</i> (Sw.) Griseb.	Moraceae	6–25	N; O
<i>Stenostomum sintenisii</i> (Urb.) Britton & Wilson	Rubiaceae	1–5	E; R
<i>Tournefortia filiflora</i> Griseb.	Boraginaceae	50+	N; O
<i>Zamia erosa</i> O.F. Cook & G.N. Collins	Zamiaceae	50+	N; C

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