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Article in *Phytotaxa* · June 2016

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A new species of *Sloanea* (Elaeocarpaceae) subgenus *Quadrisepala* from Ecuadorian Amazonia

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Abstract

Sloanea multinervis, a new species collected in the terra firme forests of the Ecuadorean Amazon, is described and illustrated, and its morphological similarities with other species of *Sloanea* are discussed.

Key words: *Sloanea*, terra firme, Ecuador, Amazon

Introduction

The genus *Sloanea* Linnaeus (1753: 512) comprises approximately 150 species in the world and more than 80 species are found in the neotropics (Smith 1954, Smith 2001, Sampaio and Souza 2011, Sampaio 2009). The monophyly of the genus has been demonstrated in a previous molecular study but no intra-generic relationships have been evaluated (Crayn *et al.* 2006). *Sloanea* species are characterized by their arboreal habit; most of the species are canopy or subcanopy trees with large buttress. The petioles can be incrassate at one or both ends, flowers lack petals and the fruits are loculicidal capsules.

In this study we describe a new species of *Sloanea* from Ecuadorian Amazonia based on an intensive analysis of morphological characters from material collected in, and near, a 106 one-hectare plot network established in Ecuador and Peru (Figure 1). Type material from other *Sloanea* species deposited in Ecuadorian herbaria and images available in JSTOR were also studied and used to confirm that this taxon was distinct from any other nomenclatural types of *Sloanea* from the Neotropics.

The subgeneric placement of this new taxon is based on the classification developed by Smith (1954), which to our knowledge is the most comprehensive attempt to define a systematic classification of the genus. Smith (1954) used a series of reproductive and vegetative characters to divide *Sloanea* into two subgenera and four sections. *Sloanea* subgen. *Quadrisepala* Earle Sm. (Smith, 1954: 76) is mainly defined by the presence of four (rarely three or five) sepals that cover the stamens and ovary completely until anthesis, lateral or terminal panicles, lateral corymbs, corymbo-racemes, racemes or umbels and stipules that may fall or not before the leaf develops. *Sloanea* subgen. *Sloanea* (Smith, 1954: 32) is defined by a larger number of sepals (usually 4 to 9) that do not cover the reproductive parts of the flower in bud, lateral racemes and persistent stipules in the developing leaves. In addition on the basis of inflorescence patterns Smith (1954) defined the sections *Paniculi* Earle Sm. (Smith, 1954: 76) and *Corymbo-racemi* Earle Sm. (Smith, 1954: 86) within the subgenus *Quadrisepala* and sections *Sloanea* (Smith, 1954: 63) and *Brevispicae* Earle Sm. (Smith, 1954: 28) within the subgenus *Sloanea*.

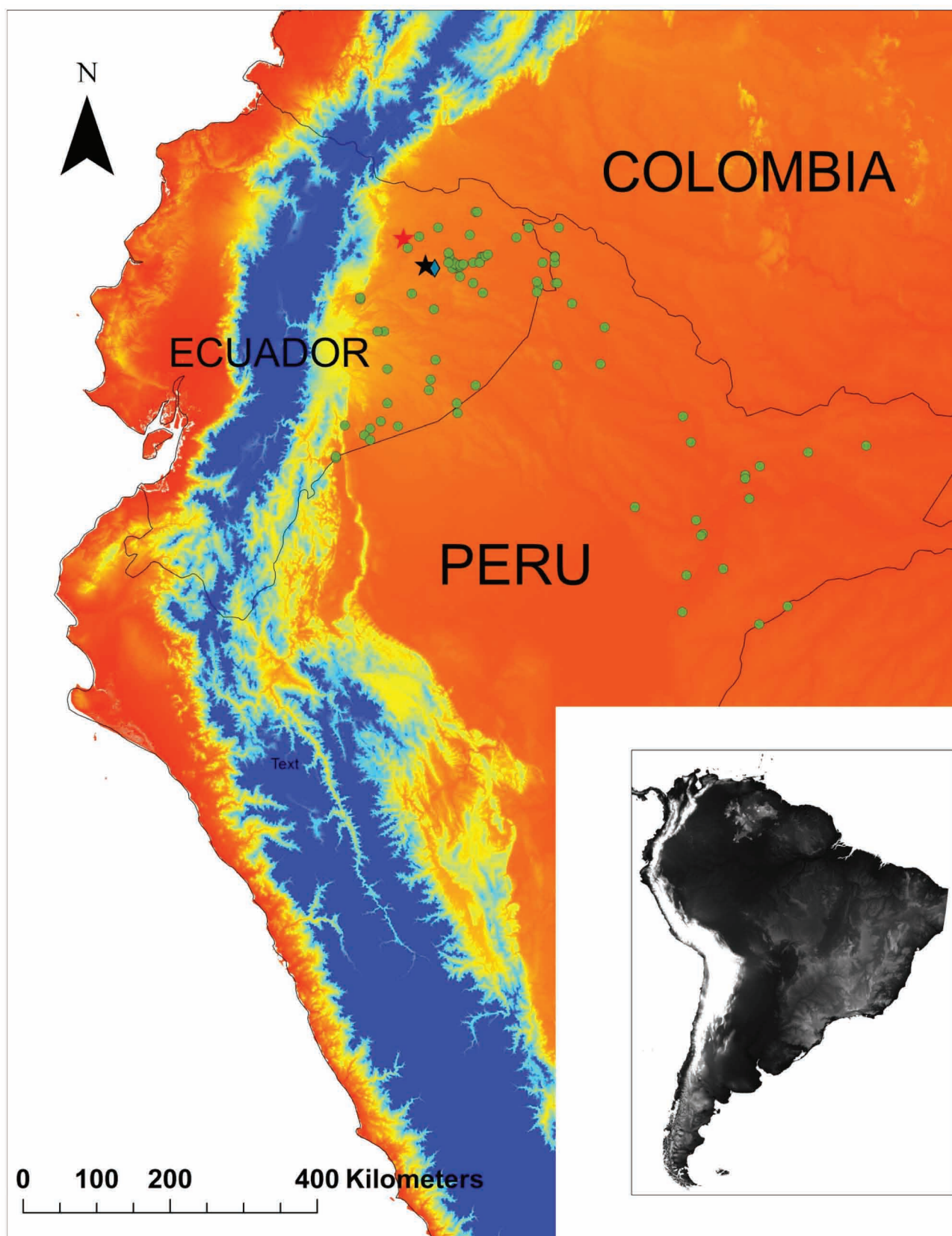


FIGURE 1. Map of the localities in which *Sloanea multinervis* J.E. Guevara, D. Fernández & W. Palacios, *sp. nov.* has been recorded. One hectare plots are represented by green dots. The red star represents one of the paratype localities, now an extinct population close to El Coca city. The type and an additional paratype locality are represented by a black star and a blue diamond respectively. These are the only known extant populations for this new species.

Taxonomic Treatment

Sloanea multinervis J.E. Guevara, D. Fernández & W. Palacios, *sp. nov.* (Fig. 2, 3)

Type:—ECUADOR: Provincia Orellana, Cantón Coca, parroquia Dayuma, vía al Pindo, sitio Santa Rosa, límite con Parque Nacional Yasuni, Centro IAMOE, Parcela Permanente 1. Bosque húmedo tropical, primario, sobre terreno con pendiente < 10%, 298323 E y 9926840 N, 330 msnm, October 2015, Walter Palacios, María Burbano y Reinaldo Suárez 17974 (Holotype: QCNE 239312!—Isotype: QCNE 239385!, QCA, MO).

Diagnosis:—*Sloanea multinervis* can be easily differentiated from the rest of species in the genus by the remarkably high number of secondary veins (25–31 pairs of veins), the persistent linear-lanceolate stipules in the branchlets and its racemose inflorescence.

Subcanopy trees up to 15–20 m tall and 40–50 cm width. Trunks with small buttresses, 50–70 cm tall. Branchlets ferruginous pubescent, quadrangular, striated and lenticellate, with conspicuous scars towards the tips when stipules have fallen. Leaves alternate or sub opposite, clustered to the tips of the branchlets; petioles 3.5–7.8 cm length, semi-terete shortly ferruginous puberulent at the base, thickened at the insertion with the blade; blades 20–40 × 9.3–20 cm, coriaceous oblong-elliptical, shortly-cordate at base, slightly acuminate at apex, floccose-puberulent along the mid-vein and sparsely across the blade, margins entire; venation brochidodromous, mid-rib grooved on the adaxial surface, floccose-puberulent, prominent on the abaxial surface, secondary veins pinnate, 25–31 pairs, prominent on the abaxial surface and slightly ascendant at a ca. 45 degree angle with the mid-vein, tertiary veins oblique to the secondary veins, numerous and very prominent on the abaxial surface; stipules lanceolate, 2–4 × 0.6–0.8 cm, very prominent and with entire margins, persistent and ferruginous puberulent, generally clustered toward the tips of the twigs. Inflorescence axillary, pendulous, bracteate, racemose, with peduncles 3.5–4 cm long, and rachis 8.5–17.5 cm long, densely pubescent, thickened, striated and quadrangular; pedicels 0.4–1.1 cm, stout, expanding at the apex, densely pubescent, finely striate and quadrangular, navicular bracts persistent at the base of the individual pedicels, 1–1.5 cm long. Flowers with 4 sepals, 9–12 × 4–9 mm, ovate-lanceolate, apex acuminate, margins entire, slightly involute, rose-pink on the outer surface, yellow-white at the base in the inner surface in early anthesis, pink in late anthesis, densely covered by minute pubescence on the outer surface, pubescent on the inner surface, ovate-lanceolate, apex acute, the sepals covering the reproductive organs until anthesis. Receptacle large, expanded and usually exceeding the length of the pedicel. Stamens 7–11 mm long, cream colored, numerous (over 100) the innermost reduced to staminodes, the filaments 1.5–3.5 mm long, minutely pubescent, the anthers 4–6 mm long, short linear-lanceolate, densely pubescent, the connective long extended as an acuminate glabrous awn, 1–1.5 mm long. Ovary 4–5 mm long, with six locules, 6-angled, ovate, densely pubescent, placentation axillary; style 6–8 mm long, densely puberulent at the base and glabrous at the apex, the apex entire, the receptacle expanded and densely puberulent. Fruits capsules 3–6.1 × 2.6–5.9 cm, rounded, opening by 5 rigid valves, externally covered by bristles 1.1–3.5 cm long, rigid; navicular bracts persistent at the base of the fruit.

Distribution and habitat:—*Sloanea multinervis* is a subcanopy tree only known from the El Pindo area, close to the buffer zone of Yasuni National Park in Ecuador. It is likely to occur also in the Colombian and Peruvian Amazon. It grows on clay soils on terra firme forests.

Phenology:—Flowering mainly from September to March; fruiting from June to July. A few individuals were observed with both flowers and fruits in September.

Ecology:—A large number of seedlings and saplings have been observed nearby adult trees. We observed ants of an unidentified taxon associated to this tree species. We did not observe any pollen transport and therefore we assume this plant-ant association could be an anti-herbivore defense mechanism instead of being related to nectar rewards or pollen transport.

Conservation Status:—This new species was first collected in 1989 by Edgar Gudiño (*E. Gudiño 144* MO, QCNE!) in a previously forested area surrounding the city of Coca. This area suffered pervasive clear-cutting produced by the expansion of oil palm plantation during the 90's which leads us to assume that this population has experienced a drastic reduction and likely local extirpation. Nowadays, only very small patches of forests remain intact. A second population of four mature individuals from which we collected the type specimen was found in, and near, a one-hectare plot we established in a private reserve close to Yasuni National Park. It is likely that other populations occur inside the park but at present only the type population is known. Only one of the four individual of *S. multinervis* was recorded in the 106 one-hectare plots we surveyed in the Ecuadorean and Peruvian Amazon. This sampling includes more than 53 000 individual trees with a diameter at breast height above 10 cm (Guevara *et al.* 2009, Pitman *et al.* 2001, Pitman *et al.* 2008, Pitman *et al.* 2014, ter Steege *et al.* 2013).



FIGURE 2. *Sloanea multinervis*: **A** Flowering branch, **B** Detail of leaves and stipules arrangement, **C** Fruit, **D** Flower. Photos credits: Walter Palacios.

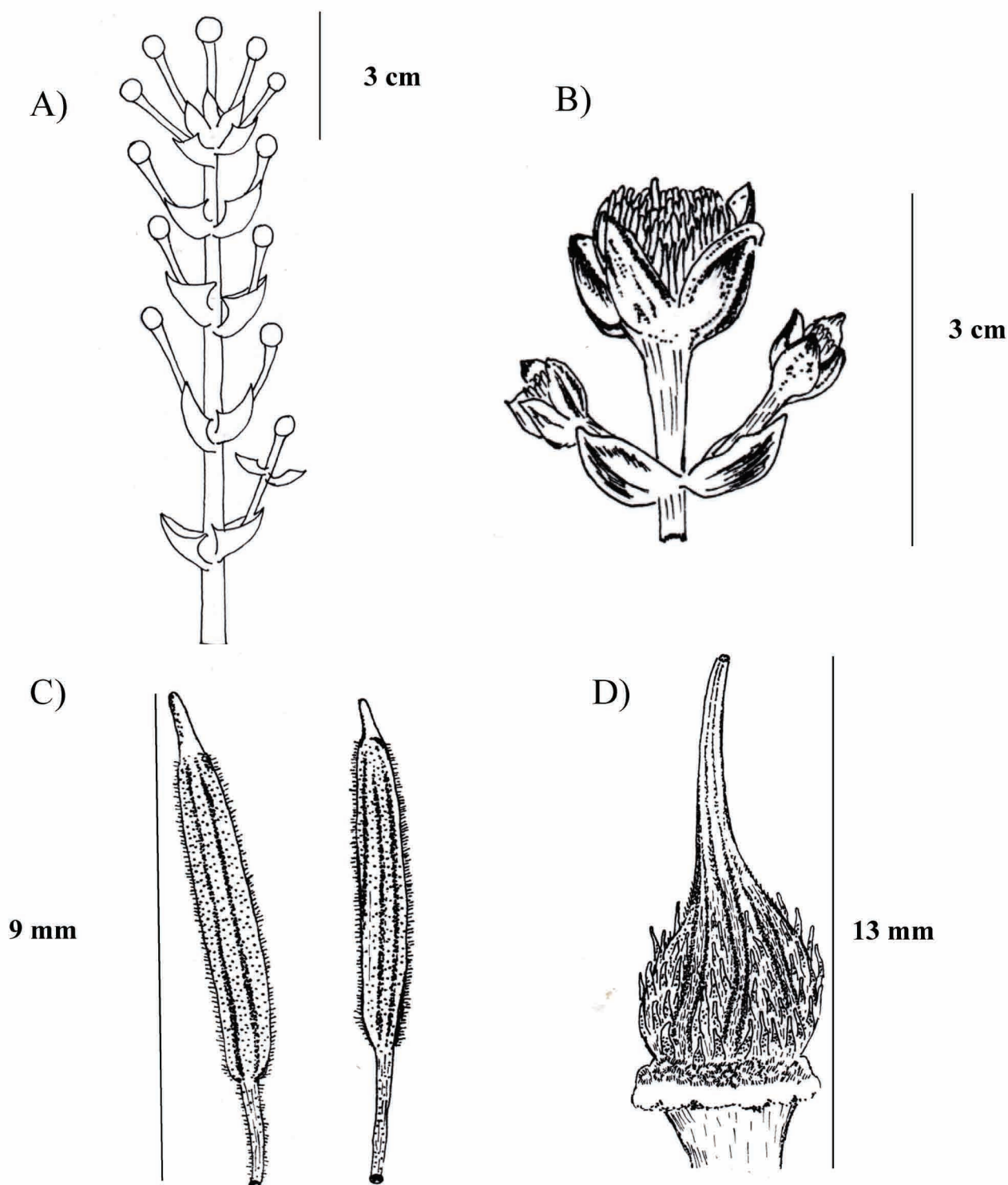


FIGURE 3. *Sloanea multinervis*. **A** Inflorescence; **B** Detail of the individual flower; **C** Detail of stamen; **D** Detail of ovary. (A–D from W. Palacios 17974). Illustration prepared by D. Fernández.

Based on abundance and frequency data and the number of hectares of remnant forest in northwestern Amazonia (Ecuador plus Loreto Department in Peru) we were able to estimate the population size for this new species. Because just one individual was found in our study area and also assuming *S. multinervis* has a homogeneous distribution in the 6,551,700 ha of remnant lowland Amazon forests in Ecuador and the 36,885,200 ha in the Loreto department in Peruvian Amazon we predict a population size of 603,000 adult trees for a great extent of northwestern Amazonia. Based on previous works (Pitman *et al.* 2008, Pitman *et al.* 2010, ter Steege *et al.* 2013) we consider this a fair estimate of the population size for this tree species and enough to consider it as a rare taxon (ter Steege *et al.* 2015). In addition, very little is known about

the ecology of this species and considering the population size, the number of records in herbaria, the probability of occurrence in other areas of the Amazon basin and the degree of fragmentation of one of the two known populations in Ecuador, we think the species may be classified as Near Threatened under the IUCN (2001) criteria.

Vernacular name:—Worani indigenous communities from the area of Yasuní national Park refer to this species as “dadaka”.

Etymology:—From the latin *multinervis* meaning having many nerves, referring to the many secondary veins present in the leaf blade.

Discussion:—Despite the fact that Smith (1954) considered the type of inflorescence as an important character for the delimitation of these four sections, Sampaio and Souza (2011) argued that there is a wide variation in the type of inflorescence to be considered diagnostic at the sectional level being a remarkably variable character for extra-Amazonian taxa. In this paper we consider the number of sepals and their aestivation as the only diagnostic characters for the assignation of the new taxon to subgenus level, in agreement with the sub-generic division proposed by Smith (1954). Meanwhile the persistence of stipules and the type of inflorescence are considered important species-level characters.

Sloanea multinervis may be placed in the subgenus *Quadrisepala*. The species has four sepals that cover entirely the reproductive organs of the flower. *S. multinervis* may be confused with *S. synandra* Benth (1858: 66) which is the taxon morphologically most similar. The two taxa share vegetative similarities such as large leaves with entire margins and sub-cordate base, prominent tertiary veins in the abaxial surface, arcuate secondary veins and glabrous leaf blades in the adaxial surface. Nonetheless, *S. multinervis* can be distinguished from *S. synandra* by the number of secondary veins (25–31 vs. 11–15) the presence of persistent lanceolate stipules clustered at the top of the branchlets vs. deciduous in *S. synandra* and the fruits (fruits with bristles in *S. multinervis* vs. fruits without bristles in *S. synandra*). Other remarkable differences are the racemose inflorescence in *S. multinervis*, vs. paniculate inflorescence in *S. synandra*, the 6-angled ovary in *S. multinervis* vs. 4-angled in *S. synandra*. Finally *Sloanea multinervis* is a sub-canopy tree with small buttress while *S. synandra* is an emergent tree with buttress of 1.5–5 m high.

Although Smith (1954) has emphasized that the number of secondary veins should not be considered a diagnostic character, *S. multinervis* has a remarkably high number of secondary veins, a character rarely found in other species of the group and from our point of view constituting a very distinctive character of this species. The presence of persistent linear-fascicular stipules, clustered to the tips of the branchlets is another important character to differentiate this species.

Paratypes:—ECUADOR: Orellana, Cantón Orellana, Sector Huashito, 20 km al norte de Coca, 3–21 Noviembre 1989, *E. Gudiño 144* (QCNE!, MO, QCA); Orellana, Parque Nacional Yasuní, Comunidad Tobeta a 170 km al sur del Coca, vía Puerto Pindo, 24 de Junio 2004, *D. Naranjo & B. Freire 795* (QCNE!, MO); Orellana, Cantón Coca, parroquia Dayuma, vía al Pindo, sitio Santa Rosa, límite con Parque Nacional Yasuní, Centro IAMOE, Parcela Permanente 1. Bosque húmedo tropical, primario, sobre terreno con pendiente < 10%, 298323 E y 9926840 N, 330 msnm, *W.A. Palacios, M. Burbano & R. Suárez 17846* (QCNE!), 17924 (QCNE!).

Acknowledgments

JEGA was supported by Garden Club of America award in Tropical Botany. We thank the staff at the herbaria AMAZ, QAP, QCA, and QCNE, for their support. Carmen Ulloa commented on an earlier version of the manuscript. We are grateful to Ecuador's Ministerio de Ambiente (MAE) and Ministerio del Ambiente del Peru (MINAM) for permission to carry out this research.

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