

Research note

New records of *Ipomoea chiquitensis* (Convolvulaceae) from the Brazilian northeast

Nuevo registro de Ipomoea chiquitensis (Convolvulaceae) para el noreste del Brasil

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Abstract

New records of *Ipomoea chiquitensis* J.R.I. Wood & R.W. Scotland were discovered for the states of Ceará, Piauí, and Rio Grande do Norte, in northeastern Brazil. The species was recently described from the Chaco region in Bolivia, and is reported herein to occur in “Caatinga” vegetation. We present a brief description, distribution map, potential distribution modeling, illustration, photographs, and a comparison with related species.

Keywords: First record; Brazilian flora; Caatinga; Endangered species

Resumen

Se descubrieron nuevos registros de *Ipomoea chiquitensis* J.R.I. Wood & R.W. Scotland para los estados del Ceará, Piauí y Rio Grande do Norte, en el noreste del Brasil. La especie fue descrita recientemente en la región del Chaco en Bolivia y ahora se encuentra aquí en la vegetación de la “Caatinga”. Se presenta una breve descripción, mapa de distribución, modelado de distribución potencial, ilustración, fotografías y una comparación con especies afines.

Palabras clave: Primer registro; Flora brasileña; Caatinga; Especies amenazadas

Convolvulaceae comprise 62 genera and nearly 1,900 species, mostly distributed in the tropics (Simões & Staples, 2017; Staples, 2017). In Brazil, more than 400 species are known in 24 genera (BFG, 2017). The family is represented mainly by climbing plants that grow in areas with a high incidence of sunlight, such as savannah vegetation and forest borders (Staples, 2012). The most diverse genus—in terms of number of species and morphological variation—is *Ipomoea* L., which includes more than 700 taxa (Staples, 2012). In Brazil, around 150 species are currently known, of which more than 1/3 are

endemic, and occur in different vegetation types (BFG, 2017). The genus is characterized morphologically by a single style with bilobed stigmas, pantoporate and echinate pollen grains, and by the fruit that is a dehiscent capsule (Simão-Bianchini, 1998), otherwise being extremely variable in habit, leaf shape, and corolla shape or color.

Ipomoea chiquitensis is a recently described species from Bolivia, and is considered endangered (Wood et al., 2015). During an ongoing project to improve the knowledge of Convolvulaceae from Brazil, we made field expeditions in the Brazilian northeast region between 2015

and 2016, when we collected a specimen that we came to conclude belonged to this species. It is the first record of *I. chiquitensis* for Brazil. More extensive study of herbarium collections revealed that this species is more frequent than initially thought in Brazil, only its specimens have been identified in herbaria as other species of *Ipomoea*.

In this work, we provide an extended and taxonomic treatment for *I. chiquitensis*, to include the newly reported Brazilian occurrences, and we re-assess its conservation status. We also provide a species distribution model to help identify potential areas of occurrence in the northeast of Brazil. Specimens were collected following the usual techniques for taxonomic studies proposed by Mori et al. (1985) and deposited in the herbaria PEUFR and HUVA. We also consulted the collections at EAC, HCDAL, HUVA, PEUFR, HST, IPA, HVASF, UFP, MOSS, UFRN, HUEFS, as well as on-line databases (INCT, 2009; Re flora, 2010). For accurate identification, specimens were compared against the protologue (Wood et al. 2015), and type specimen photographs (isotype K). The terminology used to describe the collected material is that proposed by Harris and Harris (2001), and Hickey (1974) for venation patterns. Distribution maps were constructed with the new records in addition to the ones previously cited in the literature, using the software DIVA-GIS (Fig. 1). The conservation status was reevaluated using GEOCAT (Bachman et al., 2011).

For modeling, we collected 23 environmental layers with spatial resolution of 1 km² (Table 1) and we selected predictors of environmental variables through principal component analysis (PCA). For that, we obtained the data of the 23 environmental variables in each pixel of the background (Caatinga), using the geographic information systems (GIS) software QGIS. For each PCA component we selected a predictor, one that maximized the percentage explained by the component (Table 2). The predictive variables selected by the PCA were: average temperature of the coldest quarter (bio11), annual precipitation (bio12), precipitation seasonality (bio15), and aridity index (ia). To compute the PCA we used the software R (R Core Team, 2016), Vegan package. We chose the environmental distance—DOMAIN algorithm (Carpenter et al., 1993) for the construction of our models. The models were computed in Open Modeller 1.1 software (Muñoz et al., 2011). We used the binomial test to evaluate the performance of independent models (Pearson et al., 2007). The binomial test was performed in BioEstat 5.0 software (Ayres et al., 2007).

Ipomoea chiquitensis J.R.I. Wood & R.W. Scotland.

Type. Bolivia, Santa Cruz, Velasco, 6 - 10 km N de San Rafael em el caminho a San Miguel, 16°43'55" S, 60°44'29" W, 420 m, 04/04/2011 (fl., fr.) J..R.I. Wood & D. Soto 27388 (holotype USZ; isotypes K!, LPB).

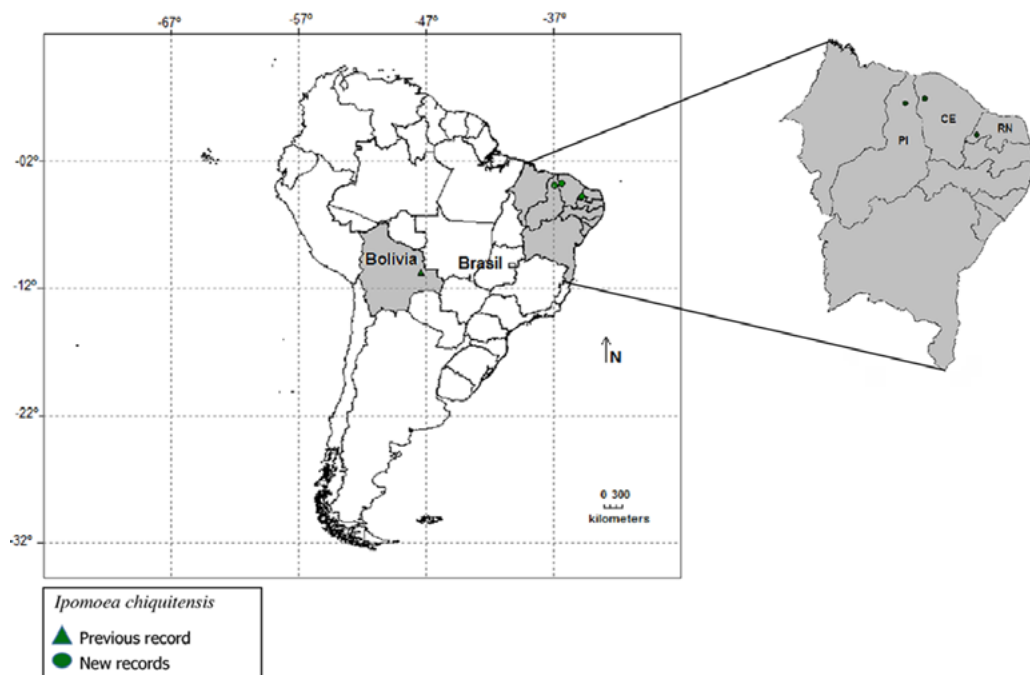


Figure 1. Distribution map of *Ipomoea chiquitensis*

Table 1

Nomenclature, abbreviation, download site, and source of the bioclimatic layers used in model computation.

Abbreviation	Variables	Site download	Reference
bio1	Annual mean temperature	Worldclim	Hijmans et al., 2005
bio2	Mean diurnal range (mean of monthly (max temp - min temp))	Worldclim	Hijmans et al., 2005
bio3	Isothermality (bio2/bio7) (100)	Worldclim	Hijmans et al., 2005
bio4	Temperature seasonality (standard deviation 100)	Worldclim	Hijmans et al., 2005
bio5	Max temperature of warmest month	Worldclim	Hijmans et al., 2005
bio6	Min temperature of coldest month	Worldclim	Hijmans et al., 2005
bio7	Temperature annual range (bio5-bio6)	Worldclim	Hijmans et al., 2005
bio8	Mean temperature of wettest quarter	Worldclim	Hijmans et al., 2005
bio9	Mean temperature of driest quarter	Worldclim	Hijmans et al., 2005
bio10	Mean temperature of warmest quarter	Worldclim	Hijmans et al., 2005
bio11	Mean temperature of coldest quarter	Worldclim	Hijmans et al., 2005
bio12	Annual precipitation	Worldclim	Hijmans et al., 2005
bio13	Precipitation of wettest month	Worldclim	Hijmans et al., 2005
bio14	Precipitation of driest month	Worldclim	Hijmans et al., 2005
bio15	Precipitation seasonality (coefficient of variation)	Worldclim	Hijmans et al., 2005
bio16	Precipitation of wettest quarter	Worldclim	Hijmans et al., 2005
bio17	Precipitation of driest quarter	Worldclim	Hijmans et al., 2005
bio18	Precipitation of warmest quarter	Worldclim	Hijmans et al., 2005
bio19	Precipitation of coldest quarter	Worldclim	Hijmans et al., 2005
pet	Evapotranspiration	CGIAR-CSI	Zomer et al., 2007, 2008
ai	Aridity Index	CGIAR-CSI	Zomer et al., 2007, 2008
alt	Altitude	AMBDATA	Valeriano, 2008
decliv	Declivity	AMBDATA	Valeriano, 2008

Description. Herbaceous vine, branches sparsely hirsute, internodes 2-15.5 cm long. Leaves simple, 1.8-6 × 3-6.5 cm, cordiform, the margin entire, the base cordate, the apex acuminate to cuspidate, mucronulate, blades discolorous, herbaceous, abaxial surface glabrous, adaxial surface sparsely hirsute; venation brochodromous, with 5-6 pairs of secondary veins and white dots along the veins on the abaxial surface. Petiole 2-5 cm long, hirsute. Inflorescence 1-floral, axillary, peduncle 3-6 mm long, hirsute; pedicel ca. 9 mm long, glabrescent, bracteole ca. 1 mm long, lanceolate, glabrous. Calyx with sepals subequal, the outer ones 5-6 × 2 mm, oval to lanceolate, margin entire, the base truncate, the apex acute to acuminate, glabrescent, the inner ones 4-5 × 2.5-3 mm, oval, margin hyaline, the base truncate, the apex acute, glabrous. Corolla 1.7-1.8 cm long, funnelliform, glabrous, pink to lilac. Stamens inserted; filaments 3.5-6 mm long, with short trichomes at the base anthers 1.2 mm long, the base sagittate, apex obtuse, white; Gynoecium inserted; ovary ca. 1 mm long, conical, glabrous, 2-loculate, 2 ovules per locule; style ca.

7 mm long; stigmatic lobes verrucate, papillose. Fruit ca. 9 mm long, ovoid, glabrous. Seeds not observed. (Figs. 2, 3).

Material examined. **Brazil.** Ceará: Graça, Sítio Santa Clara, 04°22'45" S, 38°00'36" W, fl., 08-V-2016, *F.F. Araújo 24* (HUVA 21151, EAC 3424, PEUFR 52969); Granja, Distrito de Santa Teresinha, Cachoeira de São Miguel, 03°21'33" S, 41°01'16" W), fl., fr., 03-VI-2016, *E.B. Souza 4140* (HUVA 20856). Piauí: Piripiri, 04°23'35".2 S, 041°51'21" W, fl., 12-VI-2016, *J.A.A.M. Lourenço 124* (PEUFR). Rio Grande do Norte: Portalegre, 6°11'50" S, 37°55'54.16" W, fl., 22.04.2016, *A.M. Marinho 256* (PEUFR).

Conservation status. Based on IUCN criteria, the species is classified as endangered (EN).

Note. Specimens of *Ipomoea chiquitensis* have been identified as *I. acanthocarpas* (Choisy) Aschers & Schweinf. due to the very short corolla. However, *I. chiquitensis* can be easily distinguished by its slender stems, herbaceous leaves, short peduncle, long pedicel, inflorescence reduced to one flower, and smooth sepals

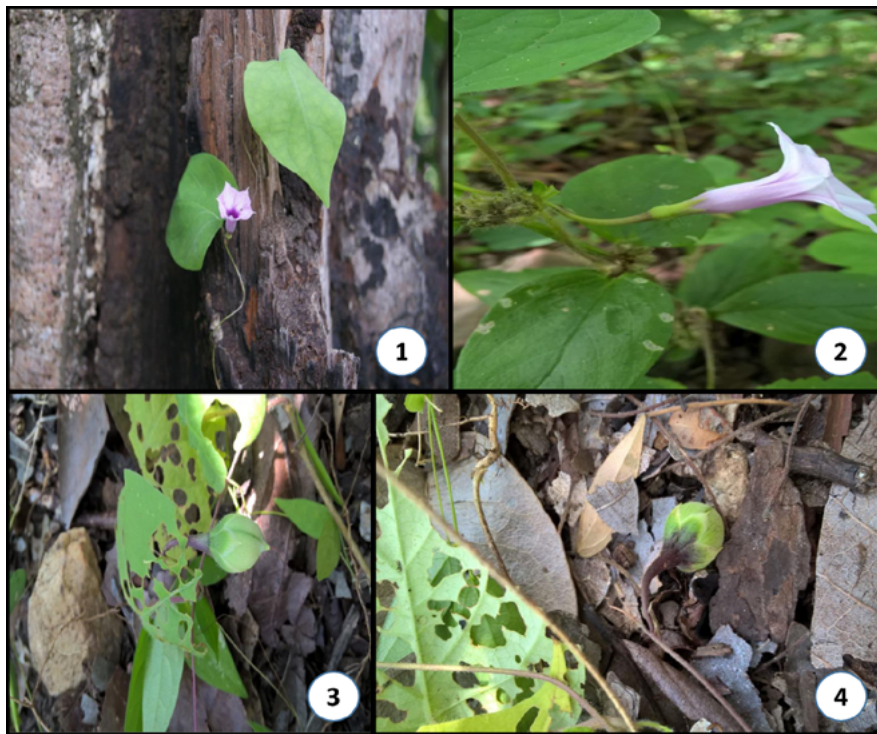


Figure 2. *Ipomoea chiquitensis*. 1) Slender stems; 2) corolla; 3) side view of fruit; 4) calyx persistent in fruit (F.F. Araújo 24). Photos by F.F. Araújo, except 1 by F.D.S. Santos.

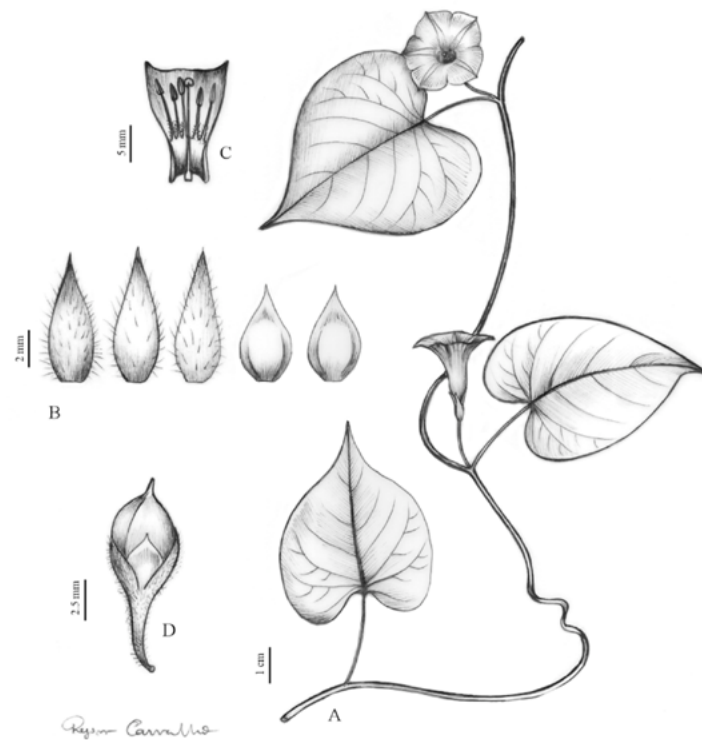


Figure 3. *Ipomoea chiquitensis*. A) Branch with leaves and a flower; B) sepals detail; C) corolla detail; D) fruit. Regina Carvalho picture based on F.F. Araújo 24.

(Table 3). *Ipomoea chiquitensis* occurs in Bolivia (Wood et al., 2015) and in the Brazilian northeast, where it grows in sandy soils, mostly disturbed areas, and in shaded sub-deciduous forest borders. This habitat is different from the type locality in Bolivia, where the species grows on islands of vegetation over rocky soils. This disjunct distribution between Caatinga and Chaco has been reported for other

species of Convolvulaceae (Buriel et al., 2014). Wood et al. (2015) categorized the species as critically endangered (CR). The new records from the Brazilian northeast change its status and here we categorize it as endangered (EN), according to the IUCN criteria.

The evaluation of the potential distribution of *Ipomoea chiquitensis* showed that it may occur in other areas of the northeast region of Brazil, because the results indicate the areas that are favorable to the occurrence of the taxon. The environmentally adequate area of the species from the model was 70594.97 km², equivalent to 8.53% of the background (Fig. 4). Overall, the discovery of the new records of *I. chiquitensis* come to support the already suggested relationship between the flora of Chaco and Caatinga (Buriel et al., 2014), and highlights the importance of improving investigations of the Convolvulaceae in savannah vegetation of the Brazilian northeast.

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Table 2
Eigenvalue of environmental layers for the 4 significant axes of PCA.

Variable	Eixo 1	Eixo 2	Eixo 3	Eixo 4
ai	0.0913	0.3626	0.3064	0.1169
alt	0.2177	0.1293	0.3108	0.1335
bio1	0.2898	0.0384	0.1468	0.0998
bio10	0.2777	0.029	0.1875	0.154
bio11	0.2996	0.0212	0.0682	0.0415
bio12	0.1496	0.283	0.3332	0.1924
bio13	0.2164	0.2046	0.2966	0.0476
bio14	0.1602	0.2966	0.1224	0.3079
bio15	0.21	0.1133	0.1575	0.3886
bio16	0.2102	0.2128	0.3219	0.0247
bio17	0.1583	0.2934	0.1268	0.3346
bio18	0.2061	0.0961	0.1149	0.1588
bio19	0.1205	0.3172	0.0773	0.1355
bio2	0.0508	0.3488	0.2846	0.2958
bio3	0.2093	0.1071	0.0976	0.1842
bio4	0.2327	0.0032	0.1929	0.2184
bio5	0.2651	0.1397	0.0378	0.2566
bio6	0.2619	0.1309	0.2456	0.074
bio7	0.0312	0.3235	0.2676	0.3838
bio8	0.2511	0.138	0.1922	0.0983
bio9	0.2816	0.0813	0.163	0.0401
decliv	0.0716	0.0864	0.1765	0.12
pet	0.2008	0.2784	0.1213	0.2802

Table 3
Morphological comparison between *Ipomoea chiquitensis* and *I. acanthocarpa* in the Brazilian northeast.

Morphological characters	<i>I. chiquitensis</i>	<i>I. acanthocarpa</i>
Stems	Slender	Thick
Peduncle	Short	Short
Pedicele	Long	Short
Inflorescence	1-flower	2-3 flowers
Sepals	Smooth	Rugose

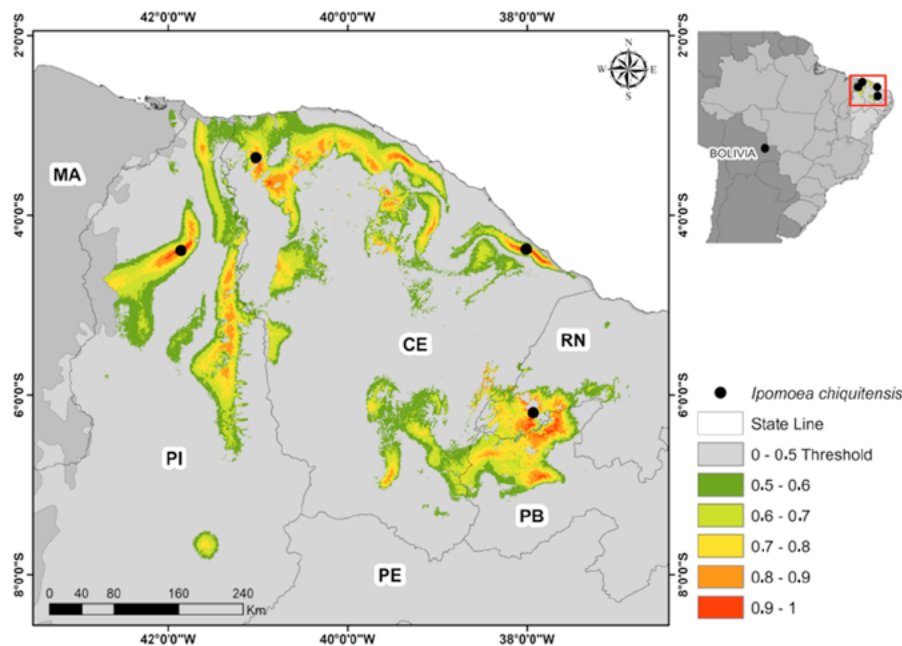


Figure 4. Potential distribution modeling of *Ipomoea chiquitensis*.

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