



Original Paper

Diversity of Convolvulaceae from Meruoca Massif, Ceará, Brazil

Diego Santos^{1,3,7}, Marlene Feliciano Figueiredo^{2,4}, Maria Teresa Buril^{1,5} & Elnatan Bezerra de Souza^{2,6}

Abstract

We present the taxonomic treatment of Convolvulaceae for the Meruoca Massif, located in the Northwest region of the Ceará state, where there are remnants of Tropical Pluvial Sub-deciduous Forest (Dry Forest) and Tropical Pluvial-Nebular Rainforest (Wet Forest). The present study was based on the morphological analysis of specimens collected in the field and from the collections EAC, HUEFS, HUVA, PEUFR, and SPF. We recorded 24 species distributed in four genera: *Ipomoea* (18 species), *Jacquemontia* (three species), *Distimake* (two species), and *Camonea* (one species). We report the first records of *I. cearensis* for Atlantic Forest and *I. aristolochiifolia* to the state of Ceará. The taxonomic treatment includes identification key, morphological descriptions, geographic distribution, taxonomic and ecological comments, the period of flowering and fruiting, and photos and illustrations of the diagnostic characters.

Key words: biodiversity, semiarid, *Ipomoea*, flora, taxonomy.

Resumo

Apresentamos o tratamento taxonômico de Convolvulaceae para o maciço da Meruoca localizado na região noroeste do estado do Ceará, onde existem remanescentes de Floresta Tropical Pluvial Sub-decídua (Floresta Seca) e Floresta Tropical Plúvio-Nebular (Floresta Úmida). O presente estudo foi baseado em análise morfológica de espécimes de coletados em campo e a partir de coleções do EAC, HUEFS, HUVA, PEUFR, e SPF. Registramos 24 espécies distribuídas em quatro gêneros: *Ipomoea* (18 espécies), *Jacquemontia* (três espécies), *Distimake* (duas espécies), e *Camonea* (uma espécie). Reportamos o primeiro registro de *I. cearensis* para a Mata Atlântica e *I. aristolochiifolia* para o estado do Ceará. O tratamento taxonômico inclui chave de identificação, descrição morfológica, distribuição geográfica, comentários taxonômico e ecológico, período de floração e frutificação, fotos e ilustrações dos caracteres diagnósticos.

Palavras-chave: biodiversidade, semiárido, *Ipomoea*, flora, taxonomia.

Introduction

Convolvulaceae Juss. is represented by approximately 1,880 species and 59 genera, distributed predominantly in the tropics and has few representatives in subtropical and temperate zones (Staples 2012). In Brazil, about 420 species and 24 genera are known, most distributed in all regions and phytogeographic domains. In northeastern region, the family is represented by

18 genera and 226 species, while in Ceará state, 13 genera and 98 species have been recognized (BFG 2018). Among the domains, the Cerrado with 264 species (67 endemic) and Atlantic Forest with 152 (17 endemic) are the richest in number of species and endemism of Convolvulaceae. The species are frequent in open areas and forest edges (Bianchini & Pirani 1997; Souza & Lorenzi 2012). The family is characterized morphologically by

¹ Universidade Federal Rural de Pernambuco, Depto. Biologia, Prog. Pós-graduação em Botânica, Recife, PE, Brasil.

² Universidade Estadual Vale do Acaraú, Herbário Professor Francisco José de Abreu Matos, Sobral, CE, Brasil.

³ ORCID: <<https://orcid.org/0000-0002-0053-1333>>. ⁴ ORCID: <<https://orcid.org/0000-0001-9029-7618>>.

⁵ ORCID: <<https://orcid.org/0000-0001-9615-2057>>. ⁶ ORCID: <<https://orcid.org/0000-0002-5222-4378>>.

⁷ Author for correspondence: fdsantosbot@gmail.com

presenting leaves alternate, simple or compound; flowers actinomorphic, diclamids, dialisepals, gamopetal with mesopetal areas delimited by two ribs, ovary super, fruit usually capsule dehiscent or not. (Simão-Bianchini 1998).

Several floristic studies have been carried out in the last decades in the Northeast of Brazil: Bahia (França & Melo 2014; Junqueira & Simão-Bianchini 2006); Paraíba (Albuquerque *et al.* 2012; Buriel *et al.* 2013) and Pernambuco (Buriel & Alves 2011; Delgado-Junior *et al.* 2014). Although Falcão & Falcão (1984) conducted the family survey in Ceará, in which 26 species were recorded, their work provides brief descriptions and interspecific delimitation based on inconsistent characters, probably since few specimens were analyzed. Additionally, several new species have been described for the Brazilian flora, especially in the northeastern region (Wood *et al.* 2017a, b, c; Santos *et al.* 2019; Santos *et al.* 2020a, b, c).

It is noteworthy that over the years, these taxonomic studies of the family have focused on caatinga areas, making it necessary to carry out taxonomic studies to know the diversity of the family in areas of Atlantic Forest. Considering the relevance of Convolvulaceae in Brazil, especially in the Northeast region, and that its richness in the Ceará flora and the Atlantic Forest is still poorly known, we present the floristic treatment of Convolvulaceae in the Meruoca Massif.

Material and Methods

Study area

The Meruoca Massif is located in the Northwest region of Ceará (03°32'30"S, 40°27'18"W), covering the municipalities of Meruoca in the north, Alcântara in the west, Sobral in the south and a small part of Massapê to the east (Fig. 1). The Massif is inserted in the geological unit of the Meruoca-Rosario crystalline and granitic basement rocks dating from the upper, lower, and middle Precambrian (Castro 1989). Red-yellow and litholic podzolic soils predominate (Leite & Marques 1989). The altitude ranges from 200 to 1,000 m (Souza 1989) with average precipitation of 1,000 to 1,100 mm/year, reaching maximum values between March and April. (Bezerra *et al.* 1989). The vegetation is characterized by Tropical Pluvium Sub-deciduous Forest (Dry Forest), found in the low-lying slopes areas, and Tropical Pluvium-Nebular Rainforest (Wet Forest) restricted to the higher areas, forming the "rain forest enclaves in caatinga areas" (Figueiredo 1989).

Taxonomic study

This study was based on the analysis of botanical collections from EAC, HUEFS, HUVA, PEUFR, and SPF, as well as specimens collected from field trips conducted from September/2014 to April/2016. Flowers were packed in 70% alcohol for morphological study of the reproductive characters. Specimens were processed according to the usual taxonomic techniques (Mori *et al.* 1989). Specimens identification was based on specialized literature (Simão-Bianchini 1998; Wood *et al.* 2015), comparison with type collections available on online database (<<https://plants.jstor.org/>>), and comparison with material previously determined by experts. The binomials are in accordance with BFG (2018) and the acronyms of the collections are cited according to Thiers (continuously updated). Morphological concepts follow Harris & Harris (1994).

Genera and family were described based on the species from the study area. The specimens were deposited in the HUVA and duplicates were sent to the EAC and HUEFS. Habit type, habitat, flowering and fruiting periods, ecological preferences were obtained from specimen labels and field observations. Data on species diversity and geographical distribution agree with exsiccate labels, with literature (Robertson 1971; O'Donell 1941; Simões & Staples 2017; Wood *et al.* 2015, 2020) and specialized virtual databases (BFG 2018). The diagnostic characters were illustrated for each species. The study area map was prepared using the QGIS version 2.7 software, and figure captions were prepared in Corel Draw X7.

Results and Discussion

In this study we documented 24 species of Convolvulaceae in Meruoca Massif, distributed in four genera: *Ipomoea* L. (18 species), *Jacquemontia* Choisy (three species), *Distimake* Raf. (two species), and *Camonea* Raf. (one species). This diversity represents 24% of the total number of Convolvulaceae species in the state of the Ceará state. The characters used to the delimitation of these generic taxa were the leaf blade division, presence or absence of spinescent appendix in the leaf axile, trichome type, inflorescence type, anther conformation after anthesis and stigma morphology (Fig. 2). Species were recorded in different vegetation habitats, including edges of wet and dry forest, and cultivated and rocky outcrop areas. Among the recorded species, four are

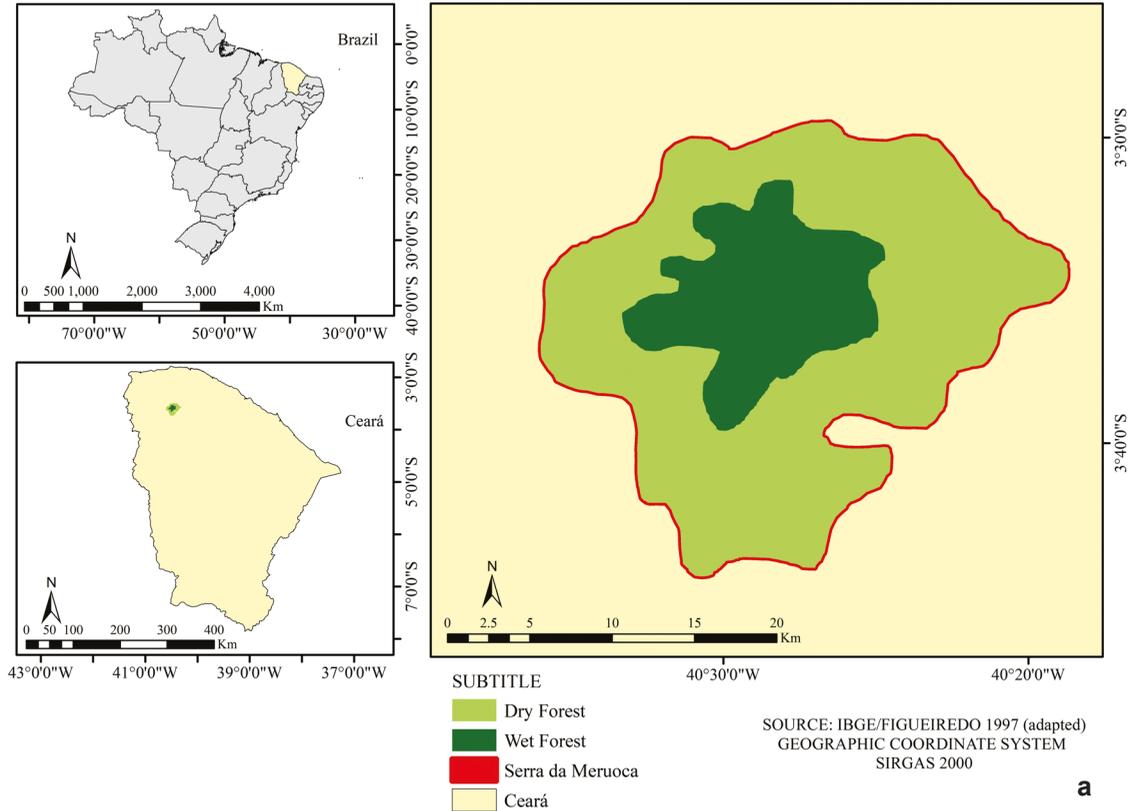


Figure 1 – Location of the study area (Meruoca Massif), Ceará, Brazil.

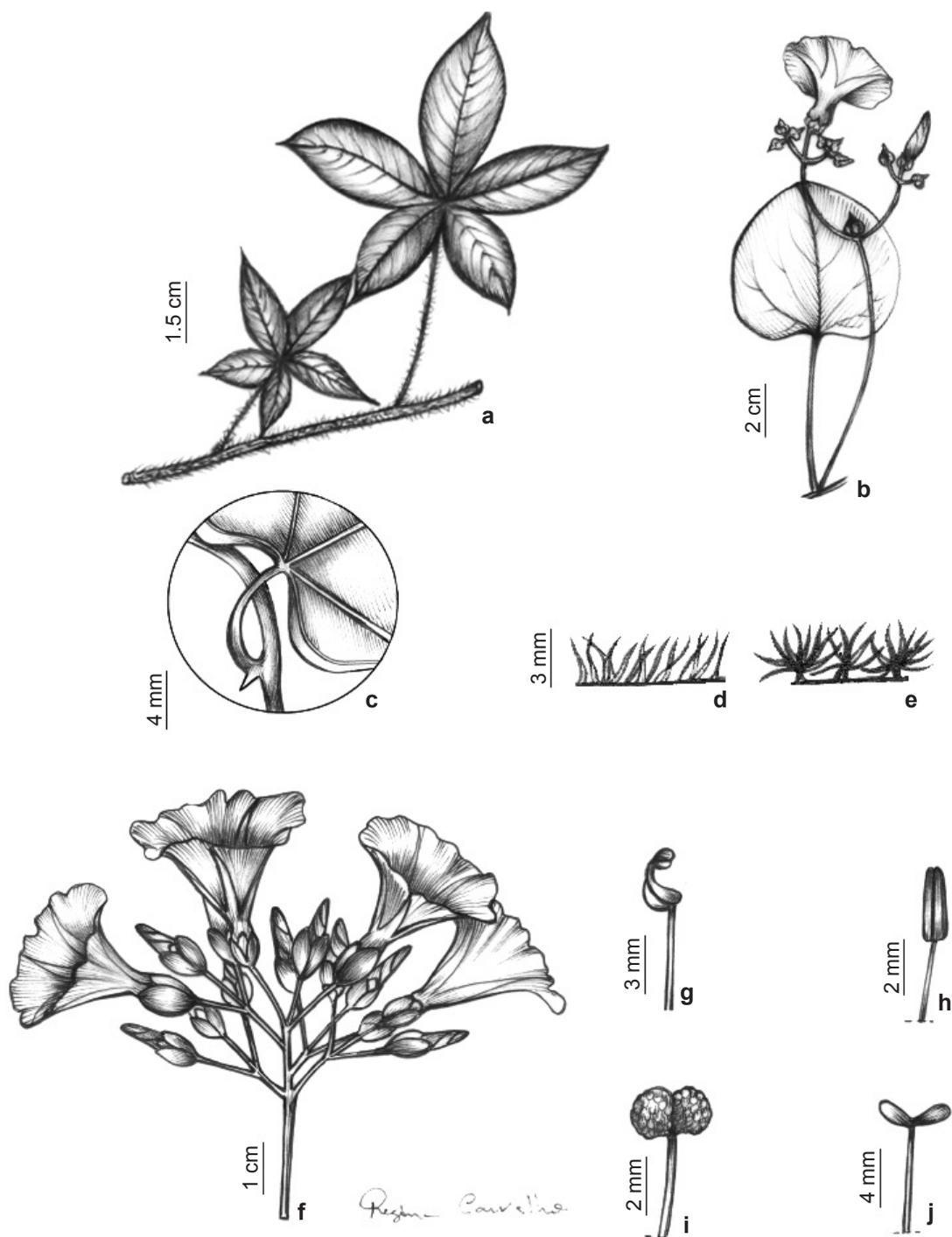


Figure 2 – a-j. Morphological characters used in the delimitation of Convolvulaceae genera in the study area – a. composite leaves of *Dystimake*; b. simple leaves of *Ipomoea*; c. appendix in the leaf armpit of *Camonea umbellata*; d. trichomes simple; e. trichomes stellate; f. flowers in umbella, *Camonea umbellata*; g. spiral anthers in *Dystimake*; h. straight anthers in *Ipomoea*; i. globose stigma in *Camonea*, *Ipomoea*, and *Dystimake*; j. ellipsoid stigmas in *Jacquemontia*.

endemic to Brazil - *I. subincana* (Choisy) Meisn., *I. cearensis* O'Donell, *I. vespertilia* D. Santos, G. C. Delgado-Junior & Buriel, *J. mucronifera* (Choisy) Hallier f. - and among these two are restricted to the northeastern Brazil (*I. cearensis* and *I. vespertilia*).

The first record of *I. cearensis* in Atlantic Forest vegetation was documented here, while *I. aristolochiifolia* G. Don was recorded for the first time in the state of Ceará. None of the species registered in the study area had their conservation status assessed. The diversity of species found in the Meruoca massif was greater than that found in other studies in the northeastern region, such as those of the Usina de São Jose, in Pernambuco state, and the Sete Cidades National Park, in Piauí state (Alencar *et al.* 2019), for which 12 and six species were documented, respectively. On the other hand, this diversity was similar to that of the micro-region of Cariri Paraibano (Buriel *et al.* 2013) and that of the micro-region of Alto Capibaribe, Pernambuco state (Nepomuceno *et al.* 2016), in which 24 and 20 species were registered, respectively. Our result was also similar to that found in the floristic/taxonomic treatment carried out in the Catimbau National Park (Delgado-Junior *et al.* 2014) that documented the occurrence of 30 species.

Taxonomic treatment

Convolvulaceae Juss., Gen. Pl. 132. 1789.

Vines or subshrub decumbent, stem with trichomes stellate or simple sericeous, pilose, hirsute, tomentose, pubescent to glabrescent, glabrous. Leaf simple or compound, pinnatisect, cordiform, reniform, ovate, 3-lobed, sagittate, rarely with heterophyllia, trichomes stellate or simple, deciduous or perennial when flowering; spinescent appendix present or absent in leaf axile. Flowers in dichasium or in monochasium axillary, peduncle passing or no through sinus of leaf base; bracteoles like-leaf or non. Calyx dialysepalous with sepals equal or unequal, lanceolate, ovate, suborbiculate, obovate to oblong, base rounded, truncate, apex obtuse, acute, acuminate, rounded or cuneate. Corolla gamopetalous, funnel shaped, hypocrateriform or tubular, pink, white, yellow, blue, red, beige, area mesopetalous sericeous, pubescent or glabrous. Five stamens, epipetal, anthers twisted or straight after anthesis; style 1, inserted, stigmas ellipsoid or biglobous. Capsule cuboid, ovoid, ellipsoid, globoid, obovoid, hirsute or glabrous, dehiscent or indehiscent. Seeds pubescent, incanous, velutinous, canescent, tomentose, vilose, plumose, glabrous to glabrescent.

Identification key for the Convolvulaceae genera occurring in the Meruoca Massif, Ceará

1. Stems and leaf with trichomes stellate; stigmas ellipsoid.....4. *Jacquemontia*
- 1'. Stems and leaf with trichomes simple or glabrous; stigmas biglobous.
 2. Spinescent appendix in the leaf axile.....1. *Camonea umbellata*
 - 2'. Spinescent appendix absent in leaf axile.
 3. Leaf simple; anthers straight after anthesis.....3. *Ipomoea*
 - 3'. Leaf compound; anthers twisted after anthesis.....2. *Distimake*

1. *Camonea* Raf., Fl. Tellur. 4: 81. 1838.

Camonea comprises five species, four of which are widely distributed in tropical Asia; and one widely distributed in the tropical zones of America and Africa (*C. umbellata* (L.) A.R. Simões & Staples) (Simões & Staples 2017).

1.1. *Camonea umbellata* (L.) A.R. Simões & Staples, Bot. J. Linn. Soc. 183(4): 583. 2017.

Fig. 3a

Vines, stem with trichomes pubescent to glabrescent (trichomes simples). Simple leaf 4.0–8.5 × 2.2–7.0 cm, cordiform, base cordate, apex acuminate, acute, obtuse or emarginated, margins entire, velutinous to glabrescent, discolorous,

venation actinodromous; petiole 1.0–8.0 cm long, pubescent to glabrescent, and spinescent appendix in the leaf axillary. Umbel with 3–20 flowers, peduncle 4.0–9.5 cm long, pubescent to glabrescent, non-passing through sinus of leaf base; pedicel 0.6–2.0 cm long, glabrous; bracteoles 0.1–0.3 × 0.1 cm, ovate to lanceolate, base truncate, apex acute to obtuse, glabrescent. Sepals 0.9–1.0 × 0.4–0.5 cm, elliptic, navicular, base truncate, apex obtuse, glabrous. Corolla 2.8–3.1 × 2.3–2.5 cm, funnel shaped, area mesopetalous villous to glabrescent, yellow. Anthers twisted after anthesis; stigmas biglobous. Capsule 0.7–0.8 cm long, globose, glabrous, dehiscent, apex concave. Seeds ca. 0.5 × 0.5 cm, velutinous.

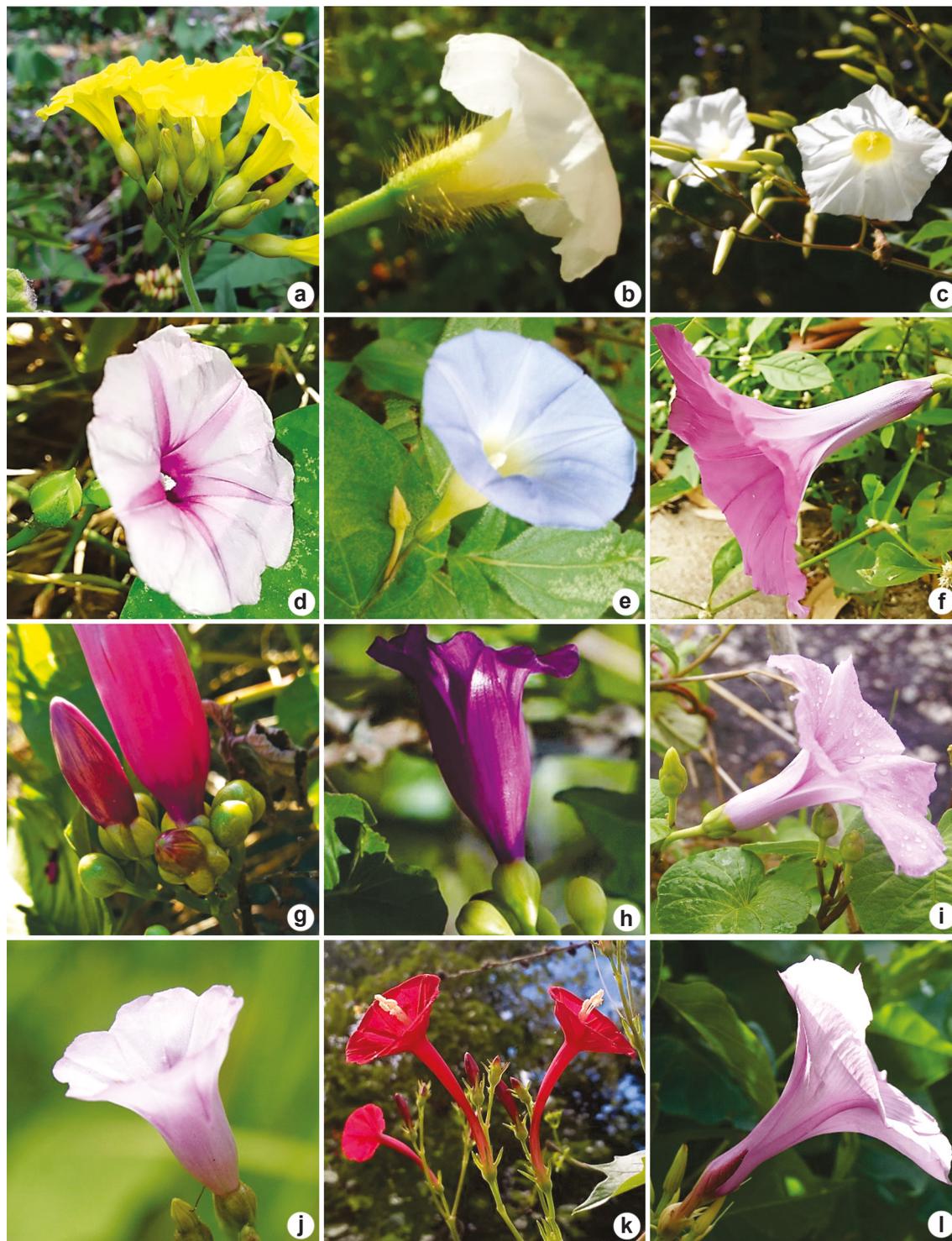


Figure 3 – a-l. Convolvulaceae species recorded in the study area – a. *Camonea umbellata*; b. *Distimake aegyptius*; c. *Distimake macrocalyx*; d. *Ipomoea acanthocarpa*; e. *Ipomoea aristolochiifolia*; f. *Ipomoea asarifolia*; g. *Ipomoea batatoides*; h. *Ipomoea bignonioides*; i. *Ipomoea cearensis*; j. *Ipomoea cynanchifolia*; k. *Ipomoea hederifolia*; l. *Ipomoea incarnata*.

Examined material: Meruoca, Sítio Santo Inácio, 6.V.2013, fl. and fr., *J.E.M. Nascimento 173* (HUVA); 31.III.2010, fl. and fr., *M.F. Mata 2060* (HUVA); Sítio Santo Elias, 21.V.2010, fl., *M.F. Mata 14463* (HUVA). Sobral, 1.V.1982, fl., *S. Silva 660* (HUVA).

In Brazil, the species occurs in Amazon, Cerrado, Atlantic Forest, and Pantanal domains and regions (BFG 2018). In the Massif, it was registered in anthropized areas associated with dry forest of the municipalities of Meruoca and Sobral. It was found with flowers and fruits in March and May. It is characterized by having spinescent appendix in the leaf axils, flowers in umbels and yellow corolla.

2. *Distimake* Raf., Fl. Tellur. 4: 82. 1838.

Vines, stem with trichomes, simple hirsute or glabrous, latex absent. Leaf compound, 5-leaflets blade, leaflets narrowly ovate, elliptic, hirsute or glabrous, base acute to cuspidate, apex acute to acuminate, margins entire, venation actinodromous; petiole 1–9.5 cm long, hirsute or glabrous, spinescent appendix absent in the leaf axile. Dichasium with 2–45 flowers; peduncle 3–11.5 cm long, hirsute or glabrous; pedicel 1.5–2

cm long, hirsute or glabrous; bracteoles ca. 0.2×0.1 cm, linear, narrowly triangular to lanceolate, base truncate, apex acute, glabrous or hirsute. Sepals unequal in dimensions, $0.7\text{--}2.0 \times 0.3\text{--}0.8$ cm, lanceolate, ovate, obovate, oblong, base rounded, truncate, apex obtuse, acute, acuminate, hirsute or glabrous, flat. Corolla $2.0\text{--}4.5 \times 2.5\text{--}3.0$ cm, funnel shaped, white, areas mesopetalous glabrous; anthers oblong, twisted after anthesis; ovary globose, bilocular, 2 ovule per locule, glabrous; stigma biglobose. Capsule ovoid, cuboid, glabrous, dehiscent. Seeds pubescent or incanus.

Distimake comprises 45 species with pantropical distribution (Simões & Staples 2017; Petrongari *et al.* 2018). In Brazil, 18 species are reported, with representatives in all regions and phytogeographic domains of the country (BFG 2018). In the Meruoca Massif, the genus is characterized by its leaf blade with trichomes simple or glabrous, anthers twisted after anthesis, stigma biglobous, and is represented by two species. The characters used in the separation of these species were the presence/absence of indument and capsule morphology.

Key for identification of *Distimake* species of the Meruoca Massif, Ceará

- | | |
|--|----------------------------------|
| 1. Stems and leaflets hirsute; capsule ovoid..... | 2.1. <i>Distimake aegyptius</i> |
| 1'. Stems and leaflets glabrous; capsule cuboid..... | 2.2. <i>Distimake macrocalyx</i> |

2.1. *Distimake aegyptius* (L.) A.R. Simões & Staples, Bot. J. Linn. Soc. 183(4): 573. 2017.

Fig. 3b

Stems hirsute. Leaf with leaflets $4.5\text{--}14.5 \times 3\text{--}12.5$ cm, base acute, apex acuminate, hirsute, discolorous; petiole 4–9.5 cm long, hirsute. Dichasium with 2–12 flowers; peduncle 5.5–10 cm long, hirsute; pedicel 1.5–2 cm long, hirsute; bracteoles, ca. 0.2×0.1 cm, linear, hirsute. Sepals outer $1\text{--}1.2 \times 0.3$ cm, ovate, oblong, lanceolate, base rounded, apex acuminate, hirsute; inner $0.7\text{--}0.8 \times 0.3$ cm, ovate, base rounded, apex acute, hirsute. Corolla $2\text{--}3.5 \times 2.5\text{--}2.7$ cm. Capsule ca. 1.4 cm long, ovoid. Seeds ca. 4×3.5 mm, pubescent.

Examined material: Meruoca, Sítio São Vicente, 6.V.2013, fl. and fr., *F.S. Camelo 17051* (HUVA); Santo Inácio, 12.V.2013, fl. and fr., *J.E.M. Nascimento 130* (HUVA). Sobral, subida da serra da Meruoca, 2.I.2010, fl. and fr., *M.O.M. Mesquita 42* (HUVA); Lagoa da Fazenda, 8.V.2001, fl., *M.W.M. Oliveira 11* (HUVA); 29.V.2000, fl., *F.E.T. Fernandes 07* (HUVA).

It occurs in Central America and South America (O'Donell 1941). In Brazil, it is widely distributed in all regions and states, except in the South region, being found in Amazon, Caatinga, Cerrado and Atlantic rainforest (BFG 2018). In the massif, it was registered in dry forest edges in the municipalities of Meruoca and Sobral. O'Donell (1941) also cited the species in degraded areas. It was registered with flowers and fruits in January and May. The species is morphologically similar to *D. macrocalyx* in that they share compound leaf, anthers twisted after anthesis and white corolla, differing from this one by presenting hirsute stem and leaf (*vs.* glabrous in *D. macrocalyx*), and ovoid capsule (*vs.* cuboid capsule).

2.2. *Distimake macrocalyx* (Ruiz & Pav.) A.R. Simões & Staples, Bot. J. Linn. Soc. 183(4): 574. 2017.

Fig. 3c

Stem glabrous. Leaf with leaflets $2.3\text{--}10 \times 1.0\text{--}4.0$ cm, base acute to cuspidate, apex

acuminate, glabrous, slightly discolorous; petiole 1.0–8.0 cm long, glabrous. Dichasium with 3–45 flowers; peduncle 3.0–11.5 cm long, glabrous; pedicel 0.8–2.2 cm long, glabrous; bracteoles ca. 0.2 × 0.1 cm, narrowly triangular to lanceolate, glabrous. Sepals outer 1.2–2 × 0.6–0.8 cm, ovate, base ovate, truncated, apex obtuse, glabrous; inner, 0.7–0.1 × 0.4 cm, ovate, base ovate to obovate, truncate, apex obtuse, glabrous. Corolla 4.0–4.5 × 2.5–3.0 cm. Capsule 0.5–0.6 cm, cuboid. Seeds 0.4–0.5 cm long, incanous.

Examined material: Meruoca, Sítio Santo Inácio, 5.V.2013, fl., *J.E.M. Nascimento 169* (HUVA); estrada para o Sítio das Almas, 2.X.2015, fl. and fr., *E.B. Souza 3724* (EAC, HUVA); Sítio Santo Inácio, 10.XI.2013, fl., *J.E.M. Nascimento 150* (HUVA); Sítio Santo Antônio, 8.VII.1997, fl., *A. Fernandes* (EAC 12098).

It is widely distributed in South America (O'Donell 1941). In Brazil, it occurs in all regions and phytogeographic domains (BFG 2018). In the study area, it was only registered in dry forest edges in the municipalities of Meruoca. It was collected with flowers in May, July, October and November; and fruit in October. This taxon is characterized by its glabrous stems and leaflets, and cuboid capsule. It is similar to *D. aegyptius* (see comments in *D. aegyptius*).

3. *Ipomoea* L., Sp. Pl. 1: 159. 1753.

Vines or subshrub decumbent; root tuberous or non; stem twisted or not, with trichomes simple, pilose, tomentose, pubescent, hirsute, glabrous, glabrescent, exfoliating or not, presence or absence of small warts, lenticels present or absent, prickle present or absent. Leaf simple, blade ovate, cordiform, sagittate, reniform, pinnatisect, 3-lobed, rarely with heterophyllia, base cordate or truncate, acuminate, cuneate, rounded, entire or lobed margin, pilose, sericeous, pubescent, glabrous to glabrescent, concolorous or discolorous, leuconeura perennial or deciduous in flowering; petiole canaliculate, hirsute, pilose, tomentose, glabrous, pubescent, glabrescent, spinescent appendix absent in the leaf axile. Dichasium,

cyme, monochasium or umbel; peduncle pubescent, tomentose, hirsute, pilose, glabrescent, glabrous, passing or non through sinus of leaf base; pedicel glabrous, tomentose, pubescent, pilose, hirsute; bracteole narrow-ovate, deltoid, obovate, oblong, narrow-triangular, narrow-elliptic, linear, lanceolate, naviculars, base truncate, attenuate, obtuse or cuneate, apex apiculate, acuminate, cuneate, acute, obtuse or rounded, glabrous, pubescent, sericeous, hirsute, pilose to glabrescent, sometime deciduous. Sepals equal or unequal lanceolate, oblong, ovate, elliptical, obovate, deltoid, suborbiculate or narrow-ovate, flat or convex, base obtuse, truncate or cuneate, apex obtuse, acute, cuneate, rounded, retuse, mucronate, asymmetric or emarginate, hirsute, pilose, pubescent or glabrous, smooth or with longitudinal ridges, rostrate, gibbous, verrucose, longitudinal striates present or absent. Corolla funnel shaped, hypocrateriform, tubular, area mesopetalous sericeous, pubescent, glabrous, greenish white, blue with white tube, red, white, pink, yellow, purple with tube white. Stamens with filament unequal, anthers straight after anthesis; stigma biglobose. Capsule conical, ellipsoid, globoid, ovoid, hirsute or glabrous, dehiscent or indehiscent, apiculate or not. Seeds canescent, pubescent, tomentose, velutinous, vilose, plumose, glabrous.

Ipomoea is represented by 600–700 species, with predominant distribution in the tropics (Wood *et al.* 2020). In Brazil, about 150 species are distributed in all phytogeographic regions and domains (BFG 2018). In the Meruoca Massif, the genus is represented by 18 species of which *I. subincana* and *I. vespertilia* are endemic to the Caatinga domain. This genus is characterized by having habit climbing or decumbent subshrubby, trichomes simple, stigma biglobous, anthers straight after anthesis. The main characters used to separate its species include habit type, leaf senescence during flowering, stem indument, presence or absence of prickle, leaf shape, sepal morphology and indument, corolla color and fruit dehiscence.

Key for identification of *Ipomoea* species in Meruoca Massif, Ceará

1. Leaf deciduous when flowering; corolla greenish white 3.18. *Ipomoea vespertilia*
- 1'. Leaf perennial when flowering; corolla red, pink, white, blue with fauce white or purple.
 2. Stems grabrous.
 3. Leaf blade pinnatisectal..... 3.13. *Ipomoea quamoclit*
 - 3'. Leaf blade cordiform, ovate, reniform, sagittate (rarely with heterophyllia, cordiform to 3-lobed).

4. Subshrub decumbent; leaf blade reniform3.3. *Ipomoea asarifolia*
- 4'. Vines; leaf blade cordiform, ovate, sagittate, 3-lobed.
5. Sepals rostrate, verrucose or with ridges longitudinal.
6. Outer sepals rostrate; corolla hypocrateriform.....3.8. *Ipomoea hederifolia*
- 6'. Outer sepals verrucose or with ridges longitudinal; corolla funnel shaped.
7. Outer sepals verrucose; capsule ovoid3.1. *Ipomoea acanthocarpa*
- 7'. Outer sepals with ridges longitudinal; capsule conical
..... 3.2. *Ipomoea aristolochiifolia*
- 5'. Sepals smooth.
8. Stems with lenticel; sepals with longitudinal striate3.9. *Ipomoea incarnata*
- 8'. Stems without lenticel; sepals without longitudinal striate.
9. Sepals flat; the inner have emarginate apex 3.6. *Ipomoea cearensis*
- 9'. Sepals convex; the inner have obtuse or rounded apex.
10. Flowers in dichasium; sepals elliptic 3.5. *Ipomoea bignonioides*
- 10'. Flowers in umbel; sepals orbiculate 3.4. *Ipomoea batatoides*
- 2'. Stems pilose, tomentose, hirsute, glabrescent.
11. Stems aculeate..... 3.12. *Ipomoea parasitica*
- 11'. Stems without prickle.
12. Stems tomentose to glabrescent.
13. Outer sepals oblong; capsule indeiscent3.15. *Ipomoea sericosepala*
- 13'. Outer sepals ovate, elliptic to deltoid; capsule dehiscent
14. Leaf blade sericeous to glabrescent; sepals gibbous
.....3.10. *Ipomoea megapotamica*
- 14'. Leaf blade tomentose to glabrescent; sepals smooth3.16. *Ipomoea subincana*
- 12'. Stems hirsute to glabrescent.
15. Outer sepals glabrous.
16. Leaf blade velutinous; outer sepals obovate 3.7. *Ipomoea cynanchifolia*
- 16'. Leaf blade pilose to glabrescent; outer sepals elliptic.....
.....3.14. *Ipomoea ramosissima*
- 15'. Outer sepals hirsute.
- 17'. Sepals with apex acute; corolla white; capsule hirsute 3.17. *Ipomoea triloba*
- 17'. Sepals with apex acuminate; corolla blue with white fauce; capsule glabrous.....
..... 3.11. *Ipomoea nil*

3.1. *Ipomoea acanthocarpa* (Choisy) Asch. & Schweinf., Beitr. Fl. Aethiop., 277. 1867.

Figs. 3d; 4a

Vines, root non-tuberous, stem glabrous, rough, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade 4–14 × 3–11.5 cm, cordiform to sagittate, base cordate, apex acute to acuminate, margin entire, sericeous to glabrescent, concolor, veins slender, perennial when flowering; petiole 3–17 cm long, glabrous. Monochasium with 2–3 flowering; peduncle 2–5 cm long, hirsute to glabrescent; pedicel 0.3–1.1 cm long, glabrous; bracteoles 1.5–2.0 × 1 mm, ovate to lanceolate, base truncate, apex acute, glabrous. Sepals equal, 0.6–1 × 0.4–0.6 cm, 2 outer ovate, flat, base truncate, apex acute, glabrous, verrucose, striate longitudinal absent; 3 inner ovate, base truncate,

apex acute, glabrous, smooth, striate longitudinal absent. Corolla 2.5–3 × 2.2–2.8 cm, funnel shaped, area mesopetal glabrous, pink with tube dark. Capsule 0.7–1 cm long, ovoid, glabrous, dehiscent, apiculate. Seeds 0.4–0.6 cm compr., plumose.

Material examined: Meruoca, Sítio Santo Inácio, 5.V.2013, fl., *E.M.J. Nascimento 146* (HUVA); 26.I.2014, fl., *E.M.J. Nascimento 11* (HUVA). Sobral, Lagoa Grande, Fazenda Experimental da UVA, 21.V.2010, fl. and fr., *M.O.M. Mesquita 31* (HUVA).

In Africa this species is widely distributed across the Sahel region from Senegal and Sierra Leone east to Sudan and Ethiopia. In South America, it occurs in the Guyana, Bolivia, Colombia, Ecuador, Venezuela, Peru and Brazil where it is especially common (Wood *et al.* 2015). In Brazil, it occurs in northeastern (Bahia, Ceará, Maranhão, Pernambuco, Rio Grande do Norte)

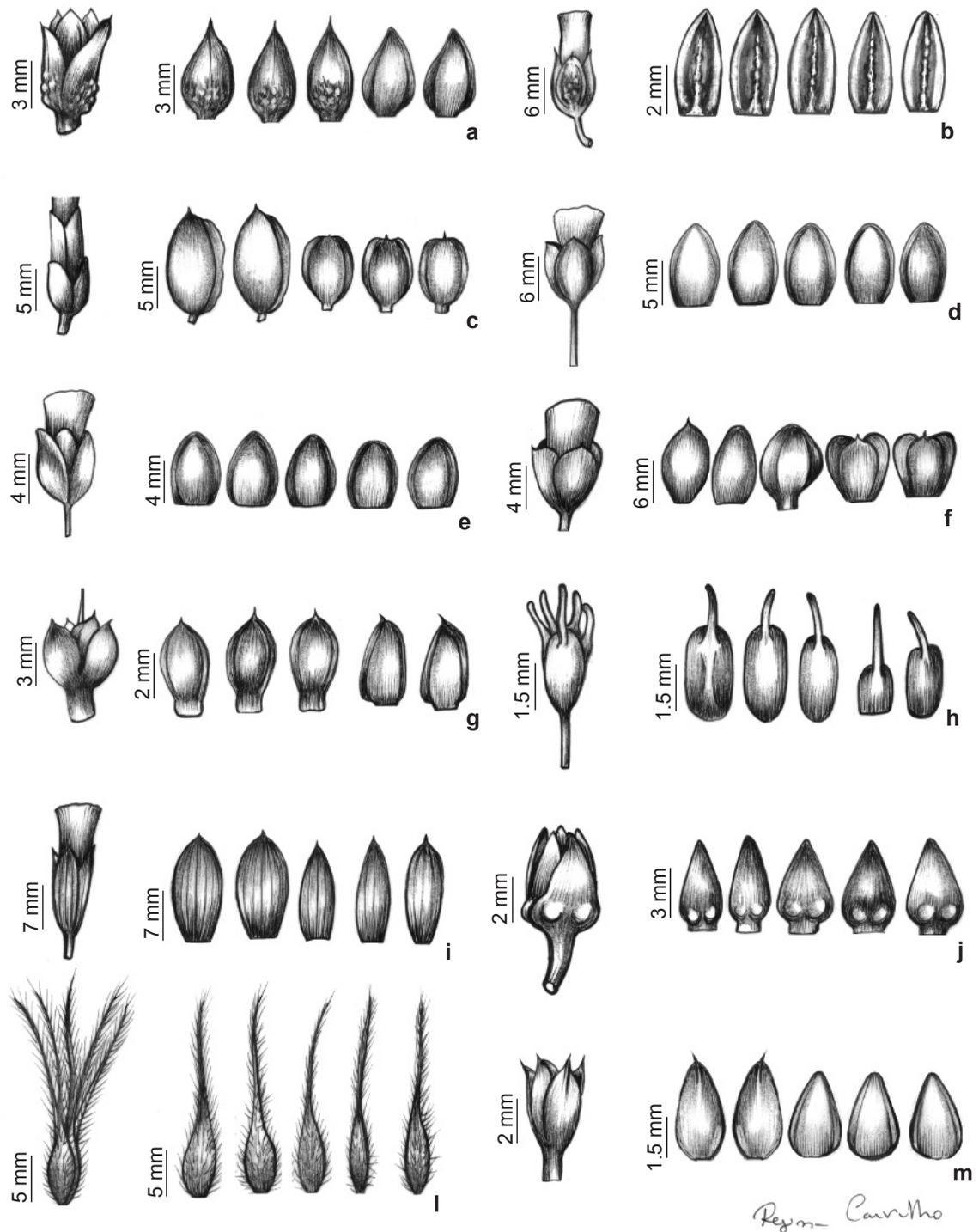


Figure 4 – a-m. Calyx and sepals morphology of the *Ipomoea* species recorded in the study area – a. *Ipomoea acanthocarpa*; b. *Ipomoea aristolochiifolia*; c. *Ipomoea asarifolia*; d. *Ipomoea batatoides*; e. *Ipomoea bignonioides*; f. *Ipomoea cearensis*; g. *Ipomoea cynanchifolia*; h. *Ipomoea hederifolia*; i. *Ipomoea incarnata*; j. *Ipomoea megapotamica*; l. *Ipomoea nil*; m. *Ipomoea parasitica*.

and north region (Pará), in the Amazon, Caatinga and Atlantic Forest (BFG 2018). In the Massif, this species lives in maize monoculture, and anthropized areas associated with sandy soil. It can be found with flowers and fruit between January and May. This species is characterized by monochasium flowers, outer sepals verrucose, glabrous and ovoid capsules; the inner sepals smooth, glabrous and ovoid capsules. It is easily confused with *I. aristolochiifolia* G. Don, differing from this by their outer sepals verrucose (vs. outer sepals with longitudinal ridges in *I. aristolochiifolia*) and ovoid capsule (conical).

3.2. *Ipomoea aristolochiifolia* G. Don Gen. Hist. 4: 277. 1838. Figs. 3e; 4b

Vines, root non-tuberous, stem glabrous, slender, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade 1.5–10 × 1–6 cm, cordiform, base cordate, apex acuminate or acute, margin entire, occasionally with small lobes, sericeous to glabrescent, concolorous, veins slender, perennial when flowering; petiole 0.3–6 cm long, glabrous. Cyme with 1–3 flowers; peduncle 1–4 cm long, glabrous, passing through sinus of leaf base; pedicel 0.7–1 cm long, glabrous; bracteoles ca. 1 mm long, oval, base truncate, apex acute, glabrous. Sepals unequal, 0.4–0.5 × 0.2 cm, 2 narrowly ovate outer, flat, base obtuse to truncate, apex obtuse to acute, glabrous, with ridges longitudinal, absent longitudinal striate, 3 ovate inner, flat, base truncate, apex acute, glabrous, smooth, absent longitudinal striate. Corolla 1.6–2.5 × 2–2.5 cm, funnel shaped, sericeous mesopetal area, blue with white tube. Capsule 0.7–0.8 cm long, conical, glabrous, dehiscent, apiculate. Seeds not observed. **Examined material:** Meruoca, Sítio Santa Cruz, Trilha do Delta, 22.VII.2015, fl. and fr., *E.B. Souza 3665* (HUVA).

It occurs in Mexico, Guatemala, Nicaragua, Costa Rica, Venezuela, Colombia, Ecuador, Peru, Bolivia, and Brazil (Wood *et al.* 2015). In Brazil, it is naturalized in the regions north (Pará), northeast (Alagoas, Bahia, Paraíba, Pernambuco), central west (Distrito Federal, Goiás, Mato Grosso do Sul), southeast (Minas Gerais, Rio de Janeiro, São Paulo), and south (Paraná, Santa Catarina), in the Amazon, Cerrado and Atlantic Forest domains (BFG 2018). In the Massif, only a small population was found in dry forest edges in municipality of Meruoca, influenced by pastures and real estate speculation. This collection represents its first record in the state of Ceara. It was found with

flowers and fruits in July. It is characterized by having its peduncle usually passing through sinus of leaf base, and outer sepals with longitudinal ridges; the inner sepals whitout longitudinal ridges. It is similar to *I. acanthocarpa* (see comments of this species).

3.3. *Ipomoea asarifolia* (Desr.) Roem. & Schult., Syst. Veg., ed. 15, 4: 251. 1819. Figs. 3f; 4c

Subshrub decumbent, root non-tuberous, stem glabrous, non-exfoliating, lenticel absent, prickles absent, latescent. Leaf blade 2–16 × 3–16.5 cm, reniform, base cordate, apex rounded, cuspidate, emargined, margin entire, glabrous, concolorous, veins slender, perennial when flowering; petiole 0.8–20 cm long, glabrous. Cyme with up to 15 flowers; peduncle 1–12 cm long, glabrous, non-passing through sinus of leaf base; pedicel 0.4–1 cm long, glabrous; bracteole 0.2–0.4 × 0.2–0.3 cm, ovate to deltoid, base truncate, apex apiculate, glabrous. Sepals unequal, 0.5–0.8 × 0.3–0.5 cm, 2 outer oblong to suborbiculate, flat, base truncate to cuneate, apex rounded, truncate, retuse, mucronate, glabrous, smooth, absent longitudinal veins; 3 inner 1.2–1.3 × 0.4–0.8 cm, narrow-obovate, flat, base truncate to cuneate, apex rounded, emarginate, glabrous, smooth, absent longitudinal veins. Corolla 6.0–8.0 × 5.5–7.0 cm, funnel shaped, glabrous mesopetal area, totally pink. Capsule ca. 1.0 cm long, ovoid, glabrous, dehiscent. Seeds 0.6 cm long, canescent.

Examined material: Sobral, subida da Serra da Meruoca, 22.III.2007, fl., *M.O.M. Mesquita 40* (HUVA).

Additional examined material: BRAZIL. CEARÁ: Graça, Santa Clara, 5.VI.2016, fl., *F.F. Araújo 40* (HUVA). Itaipipoca, Maciço de Uruburetama, Pico de Itacoatiara, 17.IV.2016, fl., *F.D.S. Santos 504* (HUVA). Sobral, 29.IV.2002, fl. and fr., *C.O. Souza 4132* (HUVA).

It occurs in the Jamaica, Guatemala, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Peru, Bolivia, Paraguay and Brazil (Wood *et al.* 2015). In Brazil, it occurs in the regions north (Acre, Amapá, Pará, Rondônia, Roraima), northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe), central west (Mato Grosso) and southeast (Rio de Janeiro), in the Amazon, Caatinga, and Atlantic Forest (BFG 2018). In the Massif, it was found on roadsides and in disturbed areas associated with sandy clay soil. In the study area, this species was found with flowers in March. In the study area it is the only species that having leaf blade reniform.

3.4. *Ipomoea batatoides* Choisy, Mém. Soc. Phys. Genève 8(1): 58-59 1837. Figs. 3g; 4d

Vines, root non-tuberous, stem glabrous, twisted, not exfoliating, lenticel absent, prickle absent, latescent. Leaf blade 4–9 × 4–8.5 cm, cordiform, base cordate, apex acute, margin entire, glabrous, concolorous, veins slender, perennial when flowering; petiole 2–5.5 cm compr., glabrous. Umbel with up to 20 flowers; peduncle 3–11.5 cm long, glabrous, non-passing through sinus of leaf base; pedicel 0.4–0.6 cm long, glabrous; bracteole ca. 1 × 2 cm, lanceolate, navicular, base truncate, apex acute, glabrous. Sepals equal in size 0.7–0.9 × 0.4–0.5 cm, the outer orbiculate, convex, base truncate to rounded, apex rounded, glabrous, smooth, absent longitudinal striate; the inner orbiculate, convex, base truncate to rounded, apex rounded, glabrous, smooth, absent longitudinal striate. Corolla 4.5–5.5 × 4.5–6.5 cm, funnel shaped, area mesopetal glabrous, totally pink. Capsule ca. 1 cm length, ovoid, glabrous, dehiscent. Seeds ca. 0.5 cm long, vilose with long trichome on its edges.

Examined material: Meruoca, Sítio Santo Inácio, 24.V.2015, fl. and fr., *F.D.S. Santos 337* (HUVA).

This species occurs in Mexico, Guatemala, Nicaragua, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Suriname, Peru, Brazil and Bolivia (Wood *et al.* 2015). In Brazil, it is registered in the north (Amazonas, Amapá, Pará, Rondônia, Tocantins), central west (Goiás, Mato Grosso do Sul, Mato Grosso) and northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe), in the Amazon, Atlantic Forest, Caatinga and Cerrado (BFG 2018). In the Massif, it was only recorded in an area of granitic outcrop on sandy soils associated to dry forest edges in the Meruoca municipality. It was collected with flowers and fruit in May. In the study area, it is characterized by the morphological combination of the cordiform leaf blade, flowers in umbel, and orbiculate, convex sepals. *Ipomoea batatoides* is close to *I. bignonioides* because they share convex sepals, differing by having orbicular sepals (vs. elliptical).

3.5. *Ipomoea bignonioides* Sims., Bot. Mag. 53: t. 2645, 1826. Figs. 3h; 4e

Vines, root non-tuberous, stem glabrous, non exfoliating, lenticel absent, prickle absent, latescent. Leaf blade 4–11 × 3–12 cm, cordiform to 3-lobed (heterophyllia), base truncate to cordate, apex acute to acuminate, margin entire or lobed,

glabrous, leuconeura, veins slender, perennial when flowering; petiole 2.5–9 cm long, glabrous. Dichasium with 3–8 flowers; peduncle 0.5–1.5 cm long, glabrous, non-passing through sinus of leaf base; pedicel 1–1.5 cm long, glabrous; deciduous bracteole. Sepals outer and inner are equal, 0.9–1 × 0.6–0.7 cm, elliptic, convex, base obtuse, apex obtuse, glabrous, smooth, absent longitudinal striate. Corolla 4–4.4 × 3–3.5 cm, funnel shaped, glabrous mesopetal area, purple with white tube. Capsule ca. 1 cm length, ovoid, glabrous, dehiscent. Seeds ca. 0.5 cm long, tomentose to glabrescent.

Examined material: Meruoca, Sítio Olho D'água das Pombas, 27.V.2013, fl., *M.F. Mata 2377* (HUVA).

Additional examined material: BRAZIL. CEARÁ: Graça, 10.IV.2015, fl. and fr., *E.B. Souza 3333* (HUVA).

It occurs in Guyana and in Brazil (Wood *et al.* 2015). In Brazil, it occur in the north (Pará) and northeastern (Ceará, Maranhão). Previously, this species was only cited in the Amazon domain (BFG 2018), but herein we registered it in the Caatinga domain, in the Ceará state. In the Massif, it was only found in the Meruoca municipality, in edges and interior of dry forest associated with sandy soils with litter. In the study area, this species was found collected with flowers in May. In the study area, it is characterized by its cordiform to 3-lobed leaf blade (heterophyllia), and convex, elliptic sepals. It is morphologically closer to *I. batatoides* (see comments in *I. batatoides*).

3.6. *Ipomoea cearensis* O'Donell., Lilloa 26: 363, t.4. 1953. Figs. 3i; 4f

Vines, root non-tuberous, stem glabrous, twisted, not exfoliating, lenticel absent, prickle absent, latescent. Leaf blade, 5–23 × 4–16.5 cm, cordiform, base cordate, apex acuminate to cuneate, margin entire, pilose, concolorous, veins slender; petiole 2.5–14 cm long, glabrous, perennial when flowering. Dichasium with 3–25 flowers; peduncle 4–23 cm long, glabrous, non-passing through sinus of leaf base; pedicel 0.3–1.5 cm long, glabrous; bracteoles 1–1.5 cm long, lanceolate, base attenuate, apex acute, pilose. Sepals unequal, 2 outer 0.6–0.8 × 0.4–0.7 mm, oblong to suborbiculate, flat, base truncate, apex rounded to obtuse, pilose to glabrescent, smooth, absent longitudinal striate; 1 intermediate, ca. 1.1 × 1 cm, base truncate, apex asymmetric, glabrous; 2 inner 0.8–1 × 1–1.2 cm, obovate, flat, base truncate, apex emarginate, occasionally lobed, glabrous, asymmetric, glabrous, smooth, absent longitudinal striate. Corolla ca. 7–7.5 × 8.5–9 cm,

funnel shaped, area mesopetalous glabrous, pink. Capsule 1–1.2 cm long, ovoid, glabrous, dehiscent. Seeds 0.7–0.8 cm long, plumose.

Examined material: Meruoca, Sítio Santo Inácio, 26.V.2013, fl., *J.E.M. Nascimento 124* (HUVA); Sítio São Vicente, 6.V.2013, fl., *K.V. Castro 17059* (HUVA); Sítio Santo Antônio dos Fernandes, 26.II.1981, fl., *A. Fernandes* (EAC 9761); 4.VII.2002, fr., *A.S.F. Castro 1208* (EAC). Sobral, subida da serra da Meruoca, 2.VI.2010, fl., *M.O.M. Mesquita 38* (HUVA).

It is endemic from northeastern Brazil region (Ceará) in the Caatinga (Wood *et al.* 2015). This species was previously mentioned in the Caatinga domain, but here we registered it in the Atlantic Forest domain. In Massif, it was found on granitic outcrop associated with wet forest in the municipalities of Sobral and Meruoca. It was found with flowers in May, and with fruit in July. In study area, it is characterized by twisted and pilose to glabrescent stem, cordiform leaf blade, pilose to glabrescent outer sepals, the outer have obtuse to rounded apex, while the inner have emarginate apex, or occasionally lobed.

3.7. *Ipomoea cynanchifolia* Meisn., *Fl. bras.* 7: 274. 1869. Figs. 3j; 4g

Vines, root non-tuberous, stem hirsute to glabrescent, slender, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade 2–7.5 × 1.5–5 cm, cordiform, base cordate, apex acuminate, margin entire, velutinous, discolorous, veins slender, perennial when flowering; petiole 1–7.5 cm long, hirsute. Dichasium with 3–8 flowers; peduncle 1.3–5.5 cm long, hirsute, non-passing through sinus of leaf base; pedicel 0.3–0.7 cm long, glabrous; bracteoles ca. 0.1 cm long, lanceolate, base truncate, apex acute, glabrous. Sepals unequal, ca. 0.4 × 0.2–0.4 cm, 2 outer obovate, flat, base truncate, apex rounded to obtuse, apiculate, glabrous, smooth, absent longitudinal striate; 3 inner elliptic, flat, base obtuse, apex acute, glabrous, smooth, absent longitudinal striate. Corolla 1.6–1.8 × 2–3 cm, funnel shaped, glabrous, area mesopetalous glabrous, pink with tube internally dark. Capsule 0.5–0.6 cm long, ovoid to ellipsoid, glabrous, dehiscent, apiculate. Seeds not observed.

Examined material: Meruoca, estrada para o Sítio Santo Inácio, 11.V.2015, fl. and fr., *F.D.S. Santos 322* (HUVA).

It occurs in Bolivia, Brazil and the Guyana (Wood *et al.* 2015). In Brazil, it is widely distributed in the north (Amazonas, Pará, Rondônia, Roraima),

northeast (Bahia, Maranhão), central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso) and southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), in the Amazon, Caatinga, Cerrado and Atlantic Forest (BFG 2018). In the study area, a small population of the species was found on sandy clay soil on the roadside. It was registered with flowers and fruits in May. This taxon is characterized by its cordiform leaf blade, glabrous and obovate outer sepals, and funnel shaped and pink corolla. It is similar to *I. ramosissima* (Poir.) Choisy due to hirsute to glabrescent stem, and glabrous sepals, differing from this by having outer sepals obovate (*vs.* elliptical in *I. ramosissima*).

3.8. *Ipomoea hederifolia* L., *Syst. Nat.*, ed. 10, 2: 925. 1759. Figs. 3k; 4h

Vines, root non-tuberous, stem glabrous, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade, 2.5–18 × 2.5–16 cm, cordiform to 3-lobed (rarely with heterophyllia), base cordate, apex acute to acuminate, margin entire or lobed, sparsely sericeous to glabrescent, concolor, veins slender, perennial when flowering; petiole 2.0–2.5 cm long, glabrous to glabrescent. Dichasium with up to 20 flowers; peduncle 2–16.5 cm long, glabrous to glabrescent, non-passing through sinus of leaf base; pedicel 0.1–0.8 mm long, glabrous; bracteoles ca. 0.2 mm long, ovate to oblong, base truncate, apex acute to apiculate, glabrous. Sepals equal, 2–3 × 2–2.5 mm, oblong to suborbiculate, flat, base truncate, apex rounded, truncate, retuse, glabrous, rostrate, absent longitudinal striate. Corolla 3–3.5 × 1.5–2 cm, hypocrateriform, area mesopetalous glabrous, red. Capsule 0.4–0.6 cm long, globose, glabrous, dehiscent, apiculate. Seeds ca. 0.5 mm long, velutinous to glabrescent.

Examined material: Meruoca, Santa Maria, trilha para a pedra do urubu-rei, 13.V.2016, fl., *E.B. Souza 4014* (HUEFS, HUVA); Sítio Olho D'água das Pombas, 23.V.2013, fl., *F.D.S. Santos 230* (HUVA); Sítio Santos Inácio, 30.VI.2013, fl. and fr., *J.E.M. Nascimento 143* (HUVA); subida do Maciço, Sobral, 11.V.2015, fl. and fr., *F.D.S. Santos 274* (HUVA).

This taxon occurs in the United States, Mexico, Jamaica, Honduras, Guatemala, Nicaragua, Dominican Republic, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Guianas, Peru, Bolivia, Paraguay and Brazil (Wood *et al.* 2015). In Brazil, it occurs in the north (Amazonas, Pará, Rondônia, Roraima, Tocantins), northeast (Alagoas, Bahia, Ceará,

Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe), central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), south (Paraná, Santa Catarina), in the Amazon, Caatinga, Cerrado and Atlantic Forest (BFG 2018). In Massif, the species was registered in dry forest borders in the municipalities of Meruoca and Sobral. It was registered with flowers and fruits in May and June. In the study area, it is characterized by leaf blade cordiform to 3-lobed, rostrate sepals, red and hypocrateriform corolla. It can be confused with *I. quamoclit* by share red and hypocrateriform corolla, differing from this by their pinnatisect leaf blade (*vs.* cordiform to 3-lobed leaf blade in *I. hederifolia*) and smooth sepals (*vs.* rostrate).

3.9. *Ipomoea incarnata* (Vahl) Choisy in DC., Prodr. 9: 360. 1845. Figs. 3l; 4i

Vines, root non-tuberous, stem glabrous, exfoliating, lenticellate, prickle absent, latescent. Leaf blade 2.5–14.5 × 1–10.5 cm, cordiform, sagittate, base cordate to hastate, apex acuminate, margin entire, glabrous, concolorous, veins slender, perennial when flowering; petiole 1–9.5 cm long, glabrous. Dichasium with 3–18 flowers; peduncle 1–16.5 cm long, glabrous, non-passing through sinus of leaf base; pedicel 1–2 cm long, glabrous; bracteoles 0.7–1.5 × 0.2–2.0 cm, narrow-ovate to narrow-elliptic, base truncate, apex acute to cuneate, glabrous, navicular. Sepals equal, 1.5–1.6 × 0.5–0.8 cm, narrowly ovate to lanceolate, flat, base truncate, apex acute, glabrous, smooth, with longitudinal striate. Corolla 6–8 × 6–7.5 cm, funnel shaped, area mesopetalous glabrous, pink. Capsule and seeds not observed.

Examined material: Meruoca, Sítio Santo Inácio, 23.I.2015, fl., *J.E.M. Nascimento 237* (HUVA); 11.V.2015, fl., *F.D.S. Santos 316* (HUVA); Santo Antônio dos Fernandes, 5.VII.2002, fl., *A.S.F. Castro 1216* (EAC).

This taxon occurs in the Colombia, Ecuador, Venezuela and Brazil (Wood *et al.* 2015). In Brazil, it is registered in the northeast (Bahia, Ceará, Pernambuco, Rio Grande do Norte, Sergipe) and southeast regions (Minas Gerais), in the Caatinga and Atlantic Forest (BFG 2018). In the study area, it was recorded in rupestrian vegetation and dry forest edges associated with sandy soil in the municipalities of Meruoca and Sobral. It was collected with flowers in January, May and July. This species can be distinguished from the other in

the area by having lenticellate and glabrous stems, and glabrous sepals with longitudinal striate.

3.10. *Ipomoea megapotamica* Choisy in DC., Prodr. 9: 375. 1845. Figs. 4j; 5a

Vines, root non-tuberous, stem tomentose to glabrescent, not exfoliating, lenticel absent, prickles absent, latescent. Leaf blade 2.5–16 × 2.5–15 cm, ovate to cordiform, base cordate, apex cuspidate, cuneate, mucronate, margin entire, densely sericeous to glabrescent, discolorous, veins slender on surface abaxial, perennifolia when flowering; petiole 1.5–23 cm long, pubescent to glabrescent. Dichasium with 3–45 flowers; peduncle 2.5–12 cm long, pubescent to glabrescent, non-passing through sinus of leaf base; pedicel 0.4–0.7 cm long, pubescent, glabrous; bracteoles 0.5–0.7 × 0.2–0.3 cm, narrow-ovate to lanceolate, base truncate, apex acute to acuminate, sericeous, navicular. Sepals equal in size 0.5–0.6 × 0.2 cm, the outer ovate to deltoid, flat, base truncate, apex acute, sericeous, gibbous, absent longitudinal striate; the inner ovate to deltoid, flat, base truncate, apex acute, sericeous, gibbous, absent longitudinal striate. Corolla 3.0–4.0 × 3.0–5.0 cm, funnel shaped, area mesopetalous sericeous, tube subgibbous, pink pale. Capsule 0.6–0.8 cm long, ovoid, glabrous, dehiscent, apiculate. Seeds 0.4–0.5 cm long, plumose.

Examined material: Meruoca, Sítio Santo Inácio, 5.V.2013, fl., *J.E.M. Nascimento 120* (HUVA); Sítio Santo Antônio dos Fernandes, 4.VII.2002, fr., *A.S.F. Castro 1210* (EAC).

It is distributed in the Bolivia and Brazil (Wood *et al.* 2015). In Brazil, it occurs in the north (Tocantins), northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe), central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Minas Gerais, São Paulo), and south (Rio Grande do Sul) in the Caatinga, Cerrado and Atlantic Forest domains (BFG 2018). In Massif, it was recorded in rocky vegetation associated with sandy soils in the municipality of Meruoca. It was found with flowers in May and fruits in July. This species is characterized by its stem tomentose to glabrescent, leaf blade ovate to cordiform, densely sericeous to glabrescent, and sepals ovate to deltoid, gibbous. It is similar to *I. subincana* because they share tomentose to glabrescent stem, differing from this one by having slender veins on the abaxial surface (*vs.* prominent veins in *I. subincana*) and gibbous sepals (*vs.* smooth).

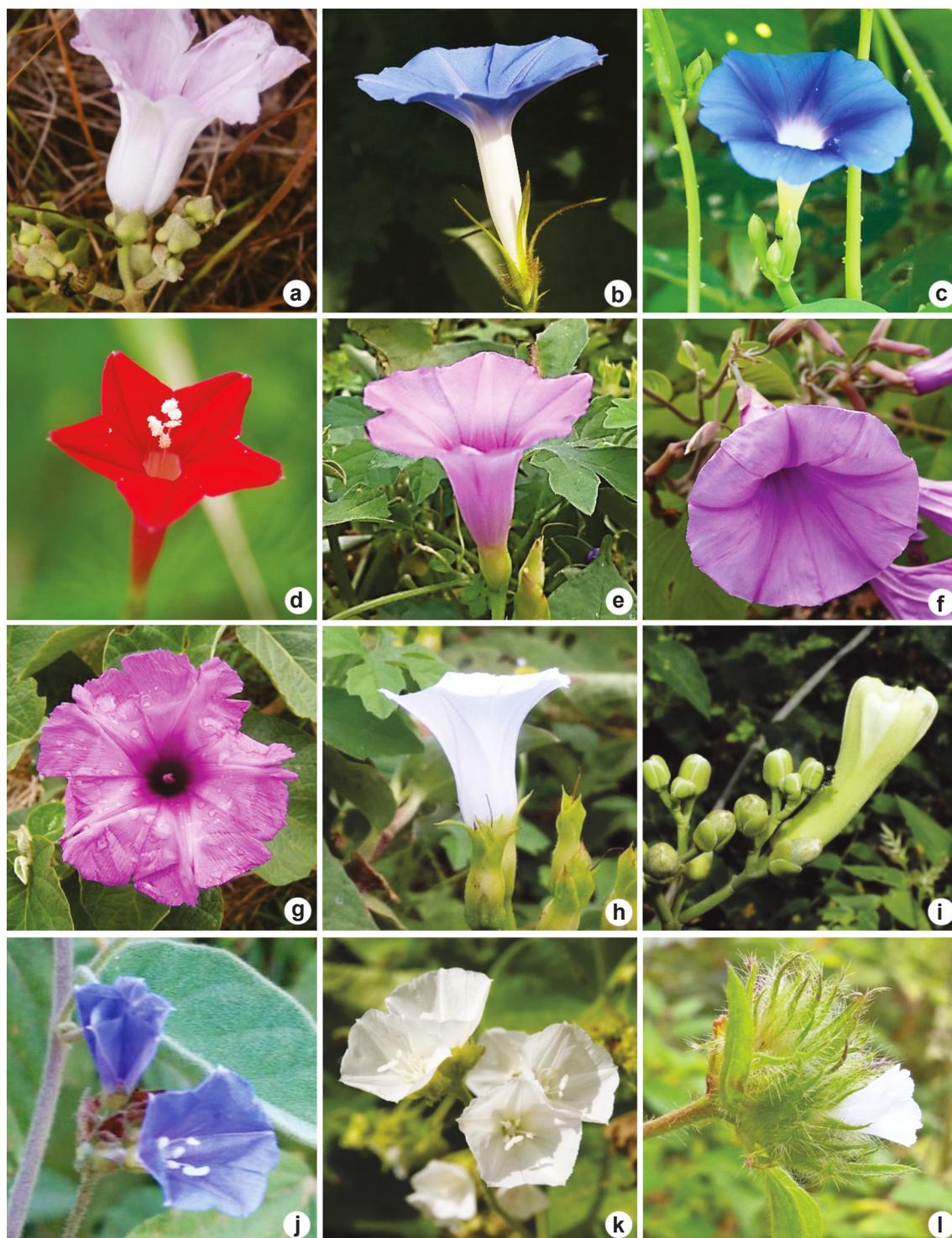


Figure 5 – a-l. Convolvulaceae species documented in study area – a. *Ipomoea megapotamica*; b. *Ipomoea nil*; c. *Ipomoea parasitica*; d. *Ipomoea quamoclit*; e. *Ipomoea ramosissima*; f. *Ipomoea sericosepala*; g. *Ipomoea subincana*; h. *Ipomoea triloba*; i. *Ipomoea vespertilia*; j. *Jacquemontia mucronifera*; k. *Jacquemontia pentanthos*; l. *Jacquemontia tamnifolia*.

3.11. *Ipomoea nil* (L.) Roth, Catal. Bot. 1: 36. 1797. Figs. 4l; 5b

Vines, root non-tuberous, stem hirsute to glabrescent, not exfoliating, lenticel absent, prickle absent, lenticel absent, latex absent. Leaf blade 4–22 × 3–29 cm, 3-lobed, base cordate, apex acuminate, margin lobed, sericeous, concolorous, veins slender, perennial when flowering; petiole 1.5–25 cm long, hirsute. Dichasium with 2–8 flowers; peduncle 2–21 cm long, hirsute; pedicel 0.5–1 cm long, hirsute, non-passing through sinus of leaf base; bracteole 0.5–1 cm long, linear to lanceolate, base truncate, apex acute, hirsute. Sepals equal, 1.5–3.5 × 0.3 cm, lanceolate, flat, base truncate, apex acuminate, hirsute, smooth, absent longitudinal striate. Corolla 5–6.5 × 3.5–6 cm, funnel shaped, area mesopetalous glabrous, blue with fauce white. Capsule 0.8–1 cm long, globose, glabrous, dehiscent. Seeds 0.5–0.6 cm long, canescent to glabrescent.

Examined material: Sobral, subida da serra da Meruoca, 2.VI.2010, fl., *M.O.M. Mesquita 31* (HUVA); 2.II.2010, fl., *J.E.M. Nascimento 80* (HUVA). Meruoca, Sítio Santo Antônio, 4.VII.2002, fr., *Castro, A.S.F. 1209* (EAC).

It occurs in the United States, Mexico, Haiti, Dominican Republic, Cuba, Bahamas, Guatemala, Nicaragua, Costa Rica, Panama, Colombia, Guianas, Ecuador, Brazil, Bolivia, Argentina (Wood *et al.* 2015). In Brazil, it is naturalized in the north (Acre, Amazonas, Pará, Rondônia, Tocantins), northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe), central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), (Paraná, Rio Grande do Sul, Santa Catarina), across all domains (BFG 2018). In the Massif, it occurs in wet forest on sandy soil associated with anthropized areas. It was found with flowers in February and June and fruits in July. It is morphologically related to *I. triloba* because they share outer sepals hirsute, differing from it by having sepal with acuminate apex, glabrous capsule (*vs.* sepals with acute apex, and hirsute capsule in *I. triloba*), and blue corolla with white fauce (*vs.* white).

3.12. *Ipomoea parasitica* (Kunth) G. Don, Gen. Hist. 4: 275. 1838. Figs. 4m; 5c

Vines, root non-tuberous, stem pilose, not exfoliating, lenticel absent, aculeate, latescent. Leaf blade 5.0–22 × 4.0–21 cm, cordiform, base cordate, apex acuminate to cuneate, margin entire,

pilose, concolorous, veins slender, perennial when flowering; petiole 3.0–25 cm long, pilose. Cyme with 3–10 flowers; peduncle 2.0–10 cm long, pilose to glabrescent, non-passing through sinus of leaf base; pedicel 0.3–1.4 cm long, pilose; bracteole 0.5–0.9 × 0.1 cm, narrow-triangular, base truncate, apex acuminate, pilose. Sepals equal, 0.6–0.7 × 0.4–0.5 cm, ovate, flat, base truncate, apex obtuse, pilose, smooth, absent longitudinal striate. Corolla 5.0–5.5 × 3.5–5.0 cm, funnel shaped, area mesopetalous sericeous, blue with tube white. Capsule 1.3–1.7 cm long, ovoid, glabrous, dehiscent, apiculate. Seeds 0.7–1.0 cm long, incanescenscent.

Material examined: Meruoca, Sítio Santa Cruz, 22.VII.2015, fl. and fr., *E.B.S. Souza 3662* (HUVA). Sobral, subida do maciço, 2.VI.2010, fl. and fr., *M.O.M. Mesquita et al. 45* (HUVA); 21.VIII.2009, fl. and fr., *M.F. Mata 2052* (HUVA); Sítio Santo Antônio dos Fernandes, 4.VII.2002, fr., *A.S.F. Castro 1206* (EAC).

It is distributed in Mexico, Nicaragua, Guatemala, Costa Rica, Venezuela and Brazil (Wood *et al.* 2015). In Brazil, it is registered in the northeast (Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Rio Grande do Norte, Sergipe), central west (Distrito Federal, Goiás) and southeast (Minas Gerais), in the Caatinga, Cerrado and Atlantic Forest domains (BFG 2018). In the Massif, it was collected in the municipalities of Meruoca and Sobral, associated with anthropized areas. It was found with flowers and fruits in May, June, July and August. This species differs easily from the others by aculeate and pilose stem, ovate sepals with obtuse apex, funnel shaped and blue corolla.

3.13. *Ipomoea quamoclit* L., Sp. Pl. 1: 159-160. 1753. Figs. 5d; 6a

Vines, root non-tuberous, stem glabrous, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade 3–6 × 2–4.5 cm, pinnatisect with lobes 0.5–2.5 cm long, linear, glabrous, concolorous, veins slender, perennial when flowering; petiole 0.5–3.5 cm long, glabrous. Cyme with 1–3 flowers; peduncle 1.5–9 cm long, glabrous, non-passing through sinus of leaf base; pedicel 0.5–1.5 cm long, glabrous; bracteoles ca. 1 mm long, oblong, base truncate, apex rounded, glabrous. Sepals unequal, 2 outer 4–5 × 2.5–3 mm, oblong, flat, base truncate, apex obtuse, rounded, apiculate, glabrous, smooth, absent longitudinal striate; 1 intermediate ca. 0.6 × 0.4 cm, apex asymmetric, occasionally emarginate, glabrous; 2 inner 0.6 × 0.4 cm, oblong, base truncate, apex obtuse, glabrous, smooth, absent

longitudinal striate. Corolla 2.5–3 × 1.3–1.5 cm, hypocrateriform, area mesopetal glabrous, red. Capsule 0.7–1 cm long, ovoid, glabrous, dehiscent, apiculate. Seeds 0.5–0.6 cm long, flocose.

Examined material: Meruoca, Sítio São Vicente, trilha do Anil, 6.V.2013, fl., *F.S. Camelo 1745* (HUVA).

Additional examined material: BRAZIL. CEARÁ: Sobral, Fazenda Crioula, 26.V.2001, fl. and fr., *T.A. Ribeiro 81* (HUVA).

It occurs in the United States, Mexico, Jamaica, Haiti, Dominican Republic, Venezuela, Colombia, Ecuador, Guianas, Bolivia, Brazil and Argentina (Wood *et al.* 2015). In Brazil, it is found in north (Acre, Amazonas, Pará, Rondônia, Tocantins), northeastern (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe), central west (Distrito

Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), (Paraná, Rio Grande do Sul, Santa Catarina), in all phytogeographical domains (BFG 2018). In Massif, it was only recorded in the municipality of Meruoca, in areas under anthropic influence in dry forest. In the study area, it was found with flowers in May. In the study area, it can be recognized by its pinnatisect leaf blade, hypocrateriform and red corolla.

3.14. *Ipomoea ramosissima* (Poir.) Choisy in DC., Prodr. 9: 377. 1845. Figs. 5e; 6b

Vines, root non-tuberous, stem hirsute, not exfoliating, lenticel absent, prickles absent, latex absent. Leaf blade 2–7 × 1.7–5 cm, cordiform to

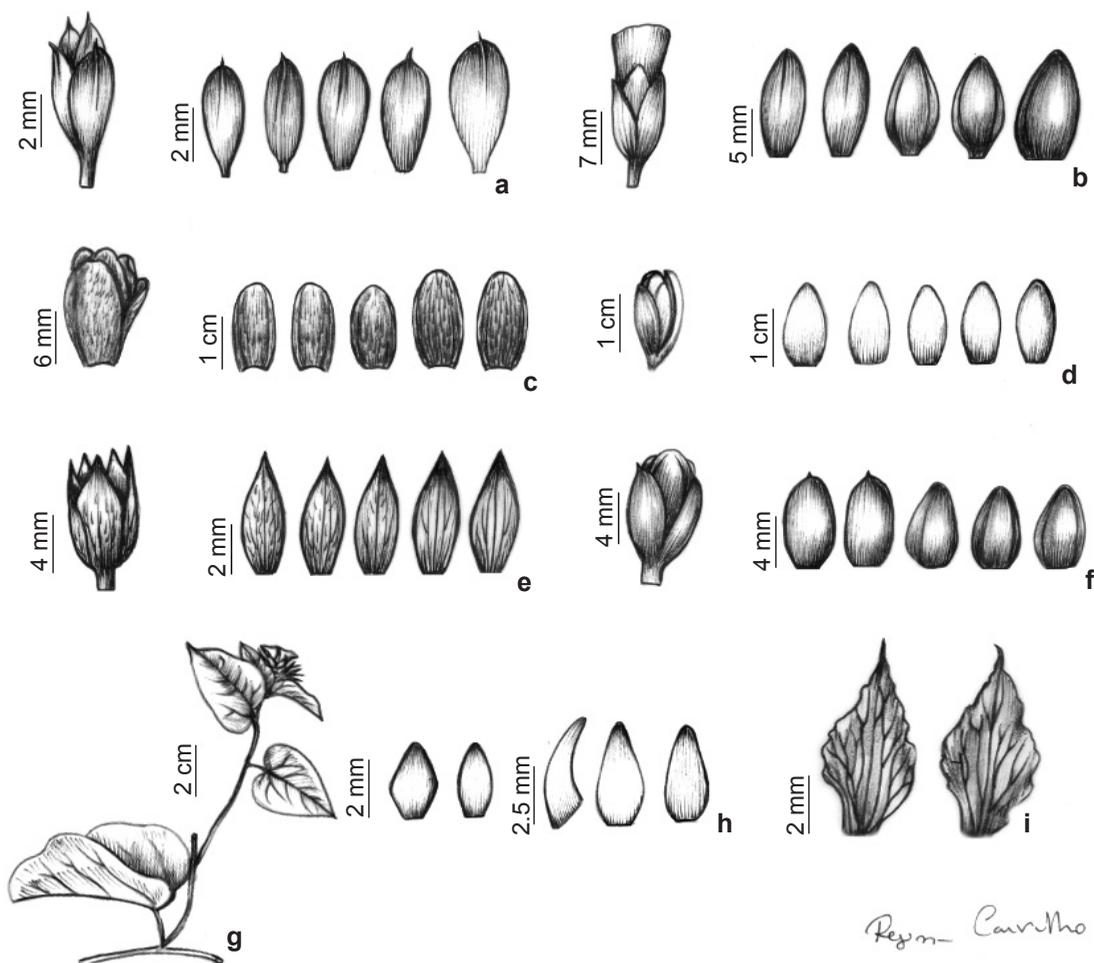


Figure 6 – a-i. Calyx and sepals morphology of the Convolvulaceae species recorded in the study area – a. *Ipomoea quamoclit*; b. *Ipomoea ramosissima*; c. *Ipomoea sericosepala*; d. *Ipomoea subincana*; e. *Ipomoea triloba*; f. *Ipomoea vespertilia*; g-h. *Jacquemontia mucronifera*; i. *Jacquemontia pentanthos*.

3-lobed, base cordate, apex acute to acuminate, margins entire or lobed, pilose to glabrescent, discolorous, veins slender, perennial when flowering; petiole 1–8 cm long, hirsute. Cyme with 3–8 flowers; peduncle 2–12 cm long, hirsute to glabrescent, non-passing through sinus of leaf base; pedicel 0.5–1 cm long, glabrous; bracteoles 0.1–0.4 mm long, lanceolate, base truncate, apex acute to acuminate, glabrous. Sepals unequal, 0.4–0.6 × 0.4 cm, 2 outer elliptic, flat, base obtuse, apex obtuse, glabrous, smooth, striate longitudinal absent; 3 inner, obovate, flat, base obtuse, apex truncate, emarginate, rounded, cuspidate, glabrous, smooth, striate longitudinal absent. Corolla 2–2.5 × 2–2.2 cm, funnel shaped, area mesopetalous glabrous, pink. Capsule 0.5–0.7 cm long, subglobose, glabrous, dehiscent, apiculate. Seeds 3.5–4 mm long, glabrous.

Material examined: Meruoca, estrada para Sítio Santo Inácio, F.D. Santos 502 (PEUFR); trilha do Delta, 2.VI.2010, fl., M.O.M. Mesquita et al. 44 (HUVA); Sítio Santo Inácio, 12.VI.2016, fl. and fr., J.E.M. Nascimento 78 (HUVA).

It is widely distributed in the Mexico, Nicaragua, Guatemala, Costa Rica, Panama, Venezuela, Colombia, Ecuador, Peru, Brazil, Bolivia and Argentina (Wood *et al.* 2015). In Brazil, it occurs in the north (Amazonas, Pará, Rondônia, Roraima, Tocantins) northeastern (Bahia, Ceará, Maranhão, Pernambuco, Sergipe), central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo), south (Paraná, Santa Catarina) regions, in all phytogeographic domains (BFG 2018). In the Massif, it was found in dry forest borders and cultivated areas in the municipality of Meruoca. It was collected with flowers and fruits in June. It can be recognized by the its hirsute stem, glabrous and unequal sepals, two outer elliptic and three inner obovate. In the study area, it may be confused with *I. cynanchifolia*, whose relationship was discussed in the comments of this species.

3.15. *Ipomoea sericosepala* J.R.I. Wood & Scotland, Kew Bull. 70(3)-3: 21. 2015.

Figs. 5f; 6c

Vines, root non-tuberous, stem tomentose, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade 4–13 × 4–13 cm, cordiform, base cordate, apex acute, obtuse, cuspidate, acuminate, margin entire, discolorous, margins entire, sericeous to glabrescent adaxial surface

with trichomes restricted main veins, densely sericeous abaxial surface, veins slender, perennial when flowering; petiole 3–10 cm long, tomentose. Dichasium with 3–10 flowers; peduncle 5–16 cm long, tomentose, non-passing through sinus of leaf base; pedicel 1.3–2 cm long, tomentose; bracteoles 0.3–1.2 cm long, lanceolate, base truncate, apex acute, sericeous. Sepals unequal, 1.2–1.5 × 0.6–0.9 cm, 2 outer oblong, flat, base obtuse, apex rounded, truncate, sericeous, smooth, absent longitudinal striate; 3 inner obovate to elliptic, flat, base obtuse, apex rounded to obtuse, sericeous, smooth, absent longitudinal striate. Corolla 5–5.5 × 4.5–5 cm, funnel shaped, area mesopetal sericeous, pink. Capsule 1.6–1.7 cm long, ellipsoid, sericeous to glabrescent with trichomes at the apex, indehiscent. Seeds 0.9–1 cm long, incanescens.

Examined material: Meruoca, Sítio Santo Inácio, 6.V.2013, fl. and fr., J.E.M. Nascimento 173 (HUVA); Santo Antônio dos Fernandes, 4.VII.2002, fr., A.S.F. Castro 1211 (EAC). Sobral, Serra do Rosário, 1.V.2009, fl., E.B. Souza 1706 (HUVA); 1.V.1982, fl., S. Silva 660 (HUVA); 2.VI.2010, fl., M.O.M. Mesquita et al. 39 (HUVA).

It is registered in the Brazil, Peru and Bolivia (Wood *et al.* 2015). In Brazil, it occurs in north (Amapá, Pará, Rondônia, Tocantins), northeastern (Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe) central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo) and south (Paraná) regions, in Amazonia, Caatinga, Cerrado, Atlantic Forest (BFG 2018). In the Massif, it was recorded in dry forest borders associated with sandy soil in municipalities of Sobral and Meruoca. It was found with flowers and fruits in May. In the study area, *I. sericosepala* is characterized by its leaf blade discolorous, densely sericeous abaxial surface, outer sepals oblong, and indiscent capsule. It is easily recognized in the study area for its indeiscent fruits.

3.16. *Ipomoea subincana* (Choisy) Meisn., in Mart., *Fl. bras.* 7: 259. 1869. Figs. 5g; 6d

Vines, root non-tuberous, stem tomentose to glabrescent, not exfoliating, lenticel absent, prickle absent, latescent. Leaf blade 2.0–17 × 3.0–16 cm, cordiform to ovate, base cordate, apex obtuse to acute, margins entire, tomentose to glabrescent on both surfaces, discolorous, prominent veins on the abaxial surface, perennial when flowering; petiole 2.5–15 cm long, pubescent. Cyme with 3–12

flowers; peduncle 1.0–8.5 cm long, pubescent, non-passing through sinus of leaf base; pedicel 0.3–1.0 cm long, pubescent; bracteole 1.5–2.0 × 0.7–1.0 cm, ovate to obovate, narrow-elliptical, base obtuse, cuneate, apex obtuse, rounded, pubescent, navicular. Sepals equal in size 1.0–1.6 × 0.7–1.0 cm, the outer elliptic to ovate, flat, base obtuse, apex obtuse, truncate, pubescent, smooth, flat, absent longitudinal striate; the inner elliptic to ovate, flat, base obtuse, apex obtuse, truncate, pubescent, smooth, flat, absent longitudinal striate. Corolla 6.0–8.0 × 7.0–8.0 cm, funnel shaped, area mesopetalous glabrous, pink. Capsule 1.3–1.5 cm long, globose, glabrous, dehiscent. Seeds 0.9–1 cm long, tomentose to glabrescent.

Examined material: Meruoca, Sítio Santo Inácio, 5.V.2014, fl. and fr., *F.D.S. Santos 57* (HUVA); 13.XI.2014, fl. and fr., *F.D.S. Santos 192* (HUVA); Sítio Santo Antônio, 25.II.1981, fl., *A. Fernandes* (EAC 9707).

Endemic species from Brazil (Wood *et al.* 2015), registered in the northeastern (Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe) and southeast regions (Minas Gerais) in the Caatinga and Cerrado domains (BFG 2018). In the Massif, *I. subincana* was recorded only on rocky outcrop associated to the wet forest in the municipality of Meruoca. It was collected with flowers and fruits in February, May and November. It can be recognized by the tomentose stem, prominent veins on the abaxial surface, smooth and pubescent sepals. In the study area, this taxon is morphologically related to *I. megapotamica* (see comments in this species).

3.17. *Ipomoea triloba* L., Sp. Pl. 1: 161. 1753.

Figs. 5h; 6e

Vines, root non-tuberous, stem hirsute to glabrescent, not exfoliating, lenticel absent, prickle absent, latex absent. Leaf blade 2.0–10.5 × 1.3–9.5 cm, cordiform, base cordate, apex acuminate to acute, margin entire, pilose to glabrescent, discolor, veins slender, perennial when flowering; petiole 2.0–12 cm, pilose to glabrescent. Cyme with 2–10 flowers; peduncle 0.9–10 cm long, pilose to glabrescent, non-passing through sinus of leaf base; pedicel 0.2–1 cm long, pilose; bracteoles 0.2–1.1 × 0.1 cm, narrowly triangular to lanceolate, base truncate, apex acuminate, pilose to glabrescent. Sepals equal, 0.8–0.9 × 0.4–0.5 cm, 2 outer elliptic to naviculars, base truncate, apex acute, hirsute, smooth, absent longitudinal striate; 3 inner elliptic to naviculars, base truncate, apex acute, glabrous,

smooth, absent longitudinal striate. Corolla 1.5–2.5 × 2.0–2.5 cm, funnel shaped, area mesopetal glabrous to glabrescent, white. Capsule ca. 0.6 cm long, globoid, hirsute, dehiscent, apiculate. Seeds 0.4–4.5 mm long, glabrous.

Examined material: Meruoca, Sítio Santa Cruz, trilha do Delta, 22.VII.2015, fl., *E.B. Souza 3673* (HUVA); Sítio Santo Inácio, 13.XI.2014, fl., *F.D.S. Santos 236* (HUVA); 10.XI.2013, fl., *J.E.M. Nascimento 150* (HUVA). Sobral, subida da serra da Meruoca, 2.VI.2010, fl. and fr., *M.O.M. Mesquita et al. 41* (HUVA).

It occurs in the United States, Mexico, Honduras, Guatemala, Ecuador, Brazil, and Argentina. In Brazil, it occurs in the north (Acre, Amazonas, Rondônia, Roraima, Tocantins), Northeastern (Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte), central west (Distrito Federal, Goiás, Mato Grosso do Sul, Mato Grosso), southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, São Paulo) and south (Paraná, Rio Grande do Sul, Santa Catarina), and all phytogeographic domains (BFG 2018). In Massif, it was registered in the municipalities of Meruoca and Sobral, in anthropized areas in dry forest. It was found with flowers in June, July and November; and with fruit in June. It is characterized by cordiform leaf blade, outer sepals elliptic to navicular, hirsute, white corolla, and globoid capsule. It is morphologically close to *I. nil* (see comments in *I. nil*).

3.18. *Ipomoea vespertilia* D. Santos, G.C. Delgado-Júnior & Buril, Brittonia, p. 1-6, v. 71. 2019.

Figs. 5i; 6f

Vines, root-tuberous, stem pubescent, not exfoliating, lenticel absent, prickle absent, latescent. Leaf deciduous when flowering. Dichasium with 3–30 flowers; peduncle 7–23 cm long, canescent to glabrescent, non-passing through sinus of leaf base; pedicel 0.5–0.8 cm long, incandescent; bracteoles 1–1.5 cm long, cymbiform, base cuneate, apex acute, sericeous to glabrescent, occasionally deciduous. Sepals equal, 0.6–0.7 × 0.5–0.7 cm, ovate to oblong, flat, base rounded to truncate, apex obtuse to rounded, pubescent, smooth, absent longitudinal striate. Corolla 2.3–3.5 × 1.5–2.3 cm, tubular, area mesopetal pubescent, greenish white. Capsule 0.9–1 cm long, ovoid, glabrous, dehiscent, apiculate. Seeds ca. 0.5 mm long, plumose.

Examined material: Sobral, subida da Serra da Meruoca, 21.VII.2016, fl. and fr., *F.D.S. Santos 506* (HUVA); 20.VI.2016, fl., *E.B. Souza 4296* (HUVA).

This species was recently described as endemic from northeastern Brazil (Ceará, Paraíba, Pernambuco and Rio Grande do Norte), where it occurs in the Caatinga domain (Santos *et al.* 2019). In the Massif, it was recorded in the municipality of Sobral on edges of dry forest. It was found with flowers and fruits between June and July. It is characterized by having leaf deciduous when flowering, long peduncle (7–23 cm long) and corolla greenish white. In Ceará, this taxon is morphologically close to *I. marcellia* Meisn. by share the same leaf indument. However, *I. vespertilia* differs from this by its tubular corolla, greenish white, and nocturnal anthesis (*vs.* funnel shaped corolla, beige and diurnal anthesis in *I. marcellia*).

4. *Jacquemontia* Choisy, Mém. Soc. Phys. Genève 6: 476. 1834.

Twining habit, stems with trichomes stellate. Leaf blade cordiform to ovate, base rounded to cordate, apex acute, acuminate, apiculate, discolorous or concolorous, trichomes stellate; petiole 0.5–6.8 cm long, trichomes stellate. Dichasium glomeruliform or umbelliform with 3–18 flowers; peduncle with trichomes stellate, non-passing through sinus of leaf base; pedicel

with trichomes stellate; bracteoles leaf-like or no, linear, narrowly or widely elliptic, base attenuate, apex acute, trichomes stellate. Sepals unequal, the outer, rhomboid to lanceolate, flat, base rounded, truncate to cuneate, apex acuminate to acute, trichomes stellate, margins sinuous or straight, scarious; intermediate falcate, asymmetric, base truncate, cuneate, rounded, apex acuminate, acute, margin straight, trichomes stellate; the inner ovate, flat, base rounded, obtuse, apex acuminate, margin straight, trichomes stellate restricted to middle region. Corolla funnel shaped, area mesopetal glabrous, white or blue; anthers oblong, straight after anthesis; ovary globose, bilocular, 2 ovule per locule, glabrous; style 1, inserted, stigmas ellipsoid. Capsule ovoid. Seeds smooth or rough.

Jacquemontia is represented by approximately 120 species, with predominantly neotropical distribution, and some representatives in the paleotropics (Robertson 1971). In Brazil, the genus is represented by 66 species distributed in all regions and phytogeographic domains (BFG 2018). In the Meruoca Massif, the genus is characterized by its twining habit, trichomes stellate and stigma ellipsoid, and is represented by three species. The characters used for species separation are inflorescence, bracteole and sepal morphology.

Key for identification of *Jacquemontia* species in the Meruoca Massif, Ceará

1. Bracteoles leaf-like; dichasium glomeruliform.....4.3. *Jacquemontia tamnifolia*
- 1'. Bracteoles unlike leaf; dichasium umbelliform.
 2. Bracteoles linear; outer sepals with margin straight4.1. *Jacquemontia mucronifera*
 - 2'. Bracteoles narrowly elliptical; outer sepals with margin sinuous...4.2. *Jacquemontia pentanthos*

4.1. *Jacquemontia mucronifera* (Choisy) Hallier f., Bot. Jahrb. Syst. 16: 543. 1893. Figs. 5j; 6g-h

Leaf blade 2–8 × 1.5–7 cm, cordiform to ovate, base cordate, apex acuminate, discolorous; petiole 0.5–4 cm long. Dichasium umbelliform with 3–18 flowers; peduncle 0.5–10.5 cm long; pedicel 0.1–0.3 cm long; bracteoles 0.3–1 cm long, linear, unlike leaf, base acute, apex acute. Sepals unequal, 5–7 × 2–3 mm long, 2 outer rhomboid to lanceolate, base cuneate, apex acute, margin straight, escarious; 1 intermediate 4–6 × 1.5 mm, falcate, asymmetric, base cuneate, apex acuminate, margin straight; 2 inner 2.5–4 × 1–2 mm, ovate, base obtuse, apex acuminate, margins straight, trichomes restricted in the middle region of the sepals. Corolla 0.7–0.9 × 1.2–1.5 cm, blue. Capsule not observed.

Examined material: Alcântara, Sítio Maracajá, 24.V.2016, fl., *A.C. Alcântara* (HUVA 3673); 29.IV.2016, fl., *A.C. Alcântara* 38 (HUVA).

This species is endemic to Brazil, registered in the northeastern (Alagoas, Bahia, Paraíba, Pernambuco, Rio Grande do Norte, Sergipe), southeast (Minas Gerais, Rio de Janeiro) and south (Paraná, Rio Grande do Sul, Santa Catarina) in the Cerrado and Atlantic Forest domains (BFG 2018). In Massif, it was found in the municipality of Alcântara in anthropized areas. It was found with flowers in April and May. In the study area, it is characterized by its linear bracteoles, and outer sepals with straight margin. It is morphologically close to *J. pentanthos* for sharing dichasium umbelliform, differing by presenting linear

bracteoles (*vs.* bracteoles narrowly elliptic in *I. pentanthos*) and outer sepals with straight margin (*vs.* sinuous).

4.2. *Jacquemontia pentanthos* (Jacq.) G. Don, Gen. Hist. 4: 283. 1838. Figs. 5k; 6i

Leaf blade 1–10 × 1–8 cm, ovate, base rounded to cordate, apex obtuse, acuminate, apiculate; petiole 0.5–6.8 cm long. Dichasium umbelliform with 10–17 flowers; peduncle 2–17 cm long; pedicel 0.1–0.3 cm long; bracteoles 0.5–1 × 0.1–0.2 cm, narrowly elliptical, unlike leaf, base attenuate, apex acute. Sepals equal, 0.6–0.7 × 0.4 cm, 2 outer, rhomboid, base rounded to truncate, apex acuminate, indument stellate, margin sinuous; 1 intermediate falcate, asymmetric, base truncate to rounded, apex acuminate; 2 inner 0.5–0.6 × 0.2 cm, narrowly ovate, flat, base rounded, apex acuminate, indument with trichomes stellate restricted middle region, margins sinuous. Corolla 1 × 1.2–2.2, white. Capsule ca. 0.5 cm long. Seeds ca. 2.5 mm long, smooth.

Examined material: Meruoca, subida da Serra, 20.VII.2015, fl., *F.D.S. Santos 323* (HUVA).

Additional examined material: BRAZIL. CEARÁ: Carnaubal, Planalto da Ibiapaba, 30.IV.2010, fl., *E.K.S. Brandão 14* (HUVA). Massapê, 20.VI.2014, fl. and fr., *M.C.P. Teixeira 27* (HUVA). Monsenhor Tabosa, 18.VI.2005, fl., *E.K.S. Brandão 14* (HUVA).

It occurs in Mexico, West Indies, Central America, and northern South America (Robertson 1971). In Brazil it is widely distributed in all regions in the Amazon, Caatinga and Cerrado domains (BFG 2018). In the study area, it occurs on roadsides over sandy soils in the municipality of Meruoca. It was registered with flowers in July

It is characterized by its bracteoles narrowly elliptical, and outer sepals with sinuous margin. Its morphological comparison with *J. mucronifera* was discussed in the comments of this species.

4.3. *Jacquemontia tamnifolia* (L.) Griseb., Fl. Brit. W.I. 474. 1862. Fig. 5l

Leaf blade 1.5–7 × 1.5–5.5 cm, cordiform to ovate, base cordate, apex acute to apiculate, concolorous; petiole 0.8–4 cm long. Dichasium glomeruliform with up to 15 flowers; peduncle 3–4.2 cm long; pedicel ca. 3 mm long; bracteoles 1.5–3 cm long, widely elliptic, like-leaf, base attenuate, apex acute. Sepals equal, 0.2 × 0.1 cm long, lanceolate, base rounded, apex acuminate, trichomes stellate, margin straight. Corolla 1–1.2 cm compr., white. Capsule ca. 4 mm long. Seeds ca. 3 mm long, rough.

Examined material: Meruoca, Sítio Santo Inácio, 11.V.2014, fl. and fr., *J.E.M. Nascimento 17* (HUVA). Sobral, Sítio São Miguel, 4.IX.2011, fl., *E.B. Souza 2249* (HUVA); Dto. de Jordão, 4.IX.2011, fl., *E.B. Souza 2289* (HUVA).

It is distributed throughout the Americas, Africa and Asia (Robertson 1971). In Brazil, it occurs in all regions and states with the exception of Goiás and grows in all the country's phytogeographic domains, often associated with anthropized areas (BFG 2018). In the Massif, it was found in cultivation areas associated with sandy soil in the municipalities of Sobral and Meruoca. It was registered with flowers in May and September; and with fruits in May. It is easily recognized by the bracteoles leaf-like, and dichasium glomeruliform.

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