ACTA
AMAZONICA | http://dx.doi.org/10.1590/1809-4392202203300

ORIGINAL ARTICLE

Taxonomic synopsis of *Caryomene* (Menispermaceae) in the Brazilian Amazon

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ABSTRACT

Caryomene comprises five species distributed in South America. For more than half a century, the genus has not received taxonomic treatment. However, many recent collections were carried out in Amazonia and new occurrences need to be inserted. The present study aimed to elaborate a synoptic treatment of the species collected in Amazonia and botanical specimens from 32 herbaria. The results pointed out the presence of five species in Amazonia, of which *C. grandifolia*, *C. foveolada, C. olivascens* and *C. prumnoides* are new occurrences. The states of Amazonas and Pará represent the two main distribution centers for the species. The fruit characters are the ones that best separate the species. An identification key, descriptions and illustrations of the species that occur in Amazonia are presented.

KEYWORDS: Anomospermeae, botany, Menispermoideae, Ranunculales, taxonomy

Sinopse taxonômica de *Caryomene* (Menispermaceae) na Amazônia brasileira

RESUMO

Caryomene possui cinco espécies distribuídas na América do Sul. Há mais de meio século que o gênero não recebe tratamento taxonômico. No entanto, muitas coletas recentes foram realizadas na Amazônia e novas ocorrências precisam ser inseridas. O presente estudo visou elaborar um tratamento sinóptico das espécies coletadas na Amazônia e amostras depositadas em 32 herbários. Os resultados evidenciaram a presença de cinco espécies na Amazônia, das quais *C. grandifolia*, *C. foveolada, C. olivascens* e *C. prumnoides* são novas ocorrências. Os estados do Amazonas e Pará representam os dois principais centros de distribuição dessas espécies. Os caracteres dos frutos são os que melhor separam as espécies. São apresentadas uma chave de identificação, descrições e ilustrações para as espécies da Amazônia.

PALAVRAS-CHAVE: Anomospermeae, botânica, Menispermoideae, Ranunculales, taxonomia

INTRODUCTION

The family Menispermaceae Jussieu comprises 72 genera and approximately 526 species, distributed mainly in the tropical regions of the world (Ortiz *et al.* 2016). In Brazil, it is represented by 15 genera, 108 species (29 endemic), six subspecies and seven varieties (BFG 2015).

In Menispermaceae, *Caryomene* Barneby & Krukoff (five species) is positioned within the tribe Anomospermeae Miers, and subfamily Menispermoideae Wang & Chen (Ortiz *et al.* 2016; Sousa 2016). The genus is easy to recognize due to the endocarp in the shape of an inverted "U," smooth or foveolate externally and the endosperm without an external tegumentary membrane (Barneby and Krukoff 1971; Sousa 2016). The representatives of *Caryomene* are distributed in South America, occurring in Bolivia, Brazil, Guyana, French Guiana, Suriname, Peru and Venezuela (Barneby 2001; MBG 2022). In Brazil, it is represented by five species (two endemic) distributed in the Amazonian phytogeographical domain, in the northern states of Amazonas, Pará and Rondônia, and the northeastern state of Maranhão (Sousa 2016; BFG 2015).

The morphological delimitation in this genus is very complex, which has resulted in confusing species with each other and with other genera (Sousa 2016). Some species treatments are incomplete, with only the description of staminate flowers or fruit, which makes it difficult to elucidate more precisely which characters are better suited for species separation (Sousa 2016).

The objective of this study was to produce an updated taxonomic treatment of *Caryomene* in the Brazilian Amazon, which better identifies the species and improves the knowledge about the genus in South America.

CITE AS: Sousa, J.S.; Gurgel, E.S.C. 2023. Taxonomic synopsis of *Caryomene* (Menispermaceae) in the Brazilian Amazon. *Acta Amazonica* 53: 232-238.

MATERIAL AND METHODS

The study was based on type material and additional specimens of *Caryomene* in Amazonia, mainly in the following herbaria: F, HERBAM, IAN, INPA, MG, NY, P, R, RB, UFRR, U and US (abbreviations based on Thiers 2022, continuously updated). We conducted field trips in all the Brazilian Amazonian states between January 2021 and October 2022 in order to collect fertile specimens, both in the rainy and dry seasons. Representative specimens were described and illustrated with the aid of a stereomicroscope (Leica EZ4D). The species descriptions are based on the material studied. Morphological terms follow Hickey (1973), Rizzini (1977), Jacques (2009), Ortiz *et al.* (2007), Wefferling *et al.* (2013), Ortiz *et al.* (2016) and Sousa (2016). Species identifications are based on the analysis of 15 types and identification keys. The following abbreviations were used: fl (flower), fr (fruit) and sn (without a number). Scanning electron microscopy (SEM) images were used to analyze and determine the types of indument and the surfaces of reproductive structures of representative specimens. The reproductive structures (flower and fruit) were cut into fragments or kept intact and were fixed, dehydrated, dried in a critical point, in an oven or under an incident light source and mounted on double-sided tape adhered to a metallic support of one cm in diameter (stub) (Bozzola and Russell 1992). After assembling the material, it was metallized with gold for two and a half minutes. The images were obtained through an electronic microscope LEO model 1450 VP at 10 KV of acceleration and recorded in digital mode, in "tiff" format.

RESULTS

Caryomene Barneby & Krukoff, Mem. New York Bot . Gard. 22(2): 52. 1971. Figure 1 (a-i)

Liana 2.5-5 cm diam., scandent; rhytidome striated or fissured. Leaves alternate, distichous or spiral, basifixed; venation basal actinodromous or venation mixed (basal-suprabasal actinodromous); primary veins 5, palmatinerved ou palmati-plinerved, convex on the abaxial surface. Petiole cylindrical or flat; basal pulvinus conspicuously swollen; apical pulvinus inconspicuous. Staminate flowers diclamid; sepals 6, biseriate; petals 6, smaller than the stamens, fleshy, involute, forming a pseudo disc around the stamen; stamens 6, free; anthers transversely dehiscent. Pistillate flowers absent. Drupes in pairs or solitary in the infructescence; epicarp coriaceous; mesocarp fleshy or slender; endocarp in the shape of an inverted "U," woody, smooth or foveolate externally; endosperm ruminate in the shape of an inverted "U," without an external tegumentary membrane; condyle linear, vertical to the longitudinal axis of the seed; embryo curved in the mid region.

Caryomene differs from the other Anomospermeae by the organization of the endocarp, which is smooth or foveolate on the outer surface and has a row of cavities circumscribed by lamelliform teeth. In addition to the reproductive character mentioned above, *Caryomene* is distinguished mainly by absence of an outer membrane involving the endosperm.

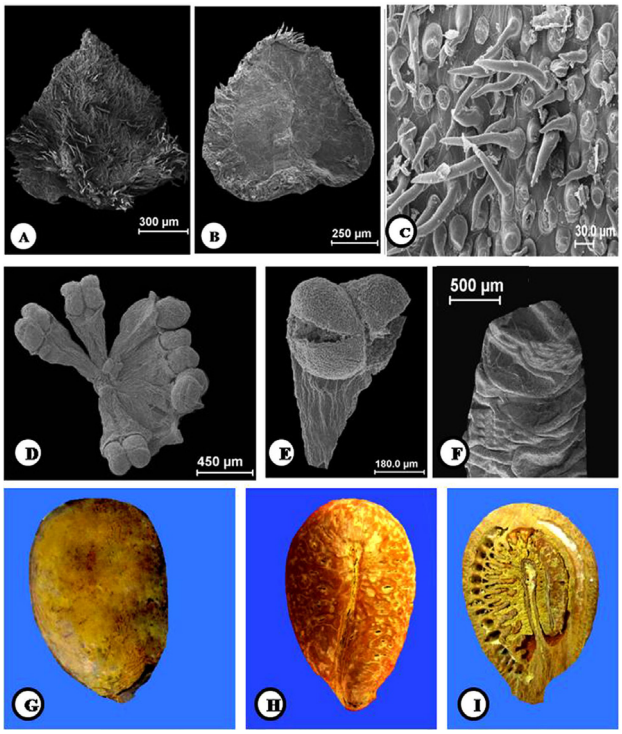

Figure 1. Scanning electron microscopy and morphological characterization of fruit of *Caryomene* Barneby & Krukoff. A – Outer surface of the sepal; B – Inner surface of the sepal; C – Sericeous indument of the sepal; D – Petals forming a pseudo disc around the stamens; E – Stamen; F – Ruminate endosperm; G – Drupe; H – Outer surface of the endocarp; I – Endocarp in longitudinal section showing the endosperm, embryo and the condyle. This figure is in color in the electronic version.

Type: *Caryomene prumnoides* Barneby & Krukoff

Caryomene grandifolia Barneby & Krukoff, Phytologia 41: 247, 1979. Type:—BRAZIL. Amazonas: Maués, 25 April 1974, fl., *D.B. Campbell et al. 22127* (holotype NY 320507!, isotype NY 320506!) Figure 2 (a-h)

Liana, 2.9–4 cm diam., scandent; rhytidome greenish, striated, glabrous. Petiole 8.1–19.1 × 0.1–0.2 cm, cylindrical, glabrous; basal pulvinus 0.6–1.5 cm long, turbinate or deltoid, canaliculated, glabrous. Leaves alternate, distichous; leaf blade 17.3–29.2 × 7.2–14.2 cm, oval, chartaceous, not bullate, adaxial surface glabrous, abaxial surface puberulent; apex attenuate or acute; base rounded or subtruncate; margin entire, repand, not revolute, not ciliate. Venation basal actinodromous, primary veins 5-palmatinerved, prominent on both surfaces; secondary veins diverging from the median region of the blade, prominent on both surfaces; tertiary veins reticulate, prominent on both surfaces. Staminate flowers with greenish perianth; sepals biseriate, 1–4 × 0.7–2.5 mm; external

sepals deltoid or oval, sparsely sericeous; internal sepals widely elliptic, deltoid or suborbicular, sericeous; petals 0.9–1 × 0.8–1.2 mm, fleshy, involute, flabeliform, glabrous; stamens 1–1.3 mm long, free, clavate, papillose, anthers transversely dehiscent. Pistillate flowers and fruit absent.

Examined specimens. BRAZIL. Amazonas: Bacia do rio Negro, comunidade de Macubeta, próxima ao rio Marié, floresta de terra firme, 26 Jan 1942, st., *R.L. Fróes 12477* (NY); Maués, póximo à fábrica do Guaraná, floresta de terra firme, 25 Apr 1974, fl., *D.B. Campbell et al. 22127* (NY). Pará: rio Xingu, próximo a tribo Asurini, floresta de terra firme, 15 Jun 1986, st., *W. Balée 2594* (NY).

Additional specimens examined. PERU. Loreto: Aguaytía, 03 Jul 1960, st., *M.E. Mathias* & *D. Taylor 5127* (NY); Aguaytía, Província de Coronel Portilho, próxima à fazenda Don Diogenes del Aguila,01 May 1970, st., *Vigo, J.S. 1970* (NY); Província de Coronel Portilho, padre Abad, 02 May 1970, st., *Vigo, J.S. 1970* (F).

Distribution: Suriname, Peru and Brazil (Krukoff 1979; Sousa 2016; MBG 2022). In Brazil, this species occurs in the state of Amazonas (Krukoff 1979; BFG 2015) and the present study found a new record for the state of Pará. *Caryomene grandifolia* was found only in terra firme forest, which corroborates an analysis made by Krukoff (1979). The species has found with staminate flowers in April.

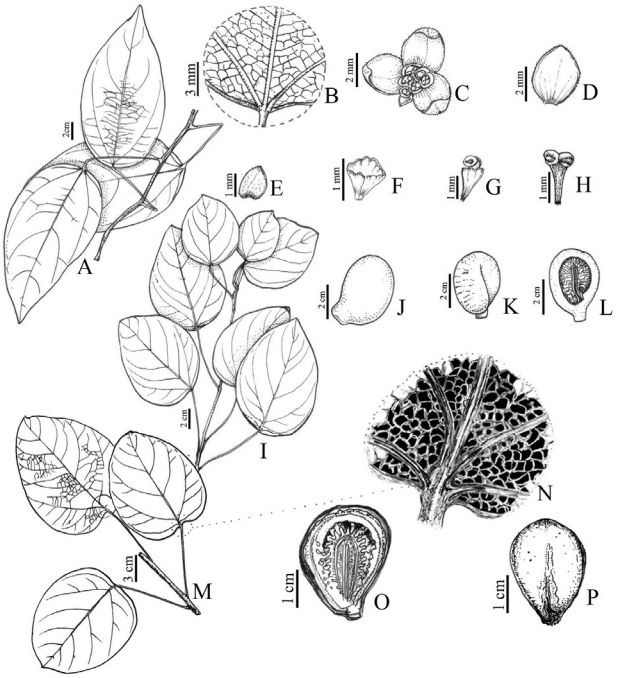

Figure 2. Species of *Caryomene* Barneby & Krukoff in the Brazilian Amazon. A–H *Caryomene grandifolia* Barneby & Krukoff. A – Branch; B – Leaf base in detail; C – Staminate flower; D – Inner sepal; E – Outer sepal; F – Petal; G – Petal surrounding the stamen; H – Stamen. I–L *Caryomene foveolata* Barneby & Krukoff. I – Branch; J – Drupe; K – Endocarp; L – Endocarp in longitudinal section. M–P *Caryomene prumnoides* Barneby & Krukoff. M – Branch; N – Leaf base in detail; O – Drupe in longitudinal section; P – Endocarp.

Caryomene foveolata Barneby & Krukoff, Mem. New York Bot. Gard. 22: 60, 1971. Type:—BRAZIL. Pará: Rio Tapajós, 25 September 1922, fr., *W.A. Ducke 18658* (holotype NY 320505!, isotype RB 18658!). Figure 2 (i-l)

Liana, 2.7–4.6 cm diam., scandent; rhytidome greenish, fissured, glabrous. Petiole 3.7–10.4 × 0.1–0.2 cm, cylindrical, glabrous; basal pulvinus 0.2–0.4 cm long, cylindrical or oval, not canaliculated, glabrous. Leaves alternate, distichous; leaf blade 6–15.5 × 4–9.8 cm, oval, chartaceous to subcoriaceous, not bullate, adaxial surface glabrous, abaxial surface glabrous to puberulent; apex acute or acuminate; base rounded or cuneate; margin entire, rectilinear, not revolute, not ciliate. Venation basal actinodromous, primary veins 5-palmatinerved, prominent on both surfaces; secondary veins diverging from the lower third of the blade, prominent on both surfaces; tertiary veins reticulate, prominent on both surfaces. Flowers absent. Drupes 4–5 × 3.2–4.1 cm, obovoid or suborbicular, yellow, smooth, glabrous; epicarp up to 1 mm thick, coriaceous, glabrous; mesocarp 3–5 mm thick, fleshy; endocarp woody, in the shape of an inverted "U," with one wall, foveolate externally, solid internally; endosperm in the shape of an inverted "U," without external tegumentary membrane, present only in the recesses of lamelliform teeth; condyle linear, vertical to the longitudinal axis of the seed; embryo curved in the mid region.

Examined specimens. BRAZIL. Amazonas: Maués, travessia do rio Maués, campinarana, 22 Jul 1983, fr., *J.L. Zarucchi et al. 3160* (MG, NY; RB). Maranhão: Monção, reserva dos índios Kaipós, florseta de terra firme, 17 May 1985, fr., *W.L. Balée 962* (MG, NY). Pará: Jacareacanga, próximo a usina hidrelétrica Teles Pires, floresta de terra firme, 19 Dec 2011, fr., *C.R.A. Soares et al. 494896* (HERBAM); rio Tapajós, floresta de terra firme, 25 Sep 1922, fr., *W.A. Ducke 18658* (NY). Mato Grosso: Aripuanã, floresta de terra firme, fr., *P. Roth 04* (INPA).

Distribution: Suriname and Brazil (Barneby and Krukoff 1971; MBG 2022). In Brazil, this species occurs in the states of Amazonas, Pará and Maranhão (Barneby and Krukoff 1971; BFG 2015; Sousa 2016). *Caryomene foveolata* is recorded here for the first time for Mato Grosso state. The species has found with fruit in May, July, September and December.

Caryomene prumnoides Barneby & Krukoff, Mem. New York Bot. Gard. 22: 55–56, 1971. Type:—BOLÍVIA. Pando: W. bank of Rio Madeira, 21 November 1968, fr., *G.T. Prance et al. 8750* (holotype NY 320509!, isotypes: F–1745253[digital image]!, INPA 25549!, MG 039576! NY 320510! P–00744923 [digital image]!, R 123670! U–0004402 [digital image]!, US–00103995 [digital image]!). Figure 2 (m-p)

Liana, 3–4.5 cm diam., scandent; rhytidome greenish, fissured, glabrous. Petiole 3.1–10.5 × 0.09–0.15 cm, flat, glabrous; basal pulvinus 0.4–1 cm long, deltoid, canaliculated, glabrous. Leaves alternate, spiral; leaf blade 8.2–17.1 × 6.1–13 cm, oval or cordiform, chartaceous, not bullate, adaxial surface glabrous, abaxial surface sparsely puberulent; apex acuminate; base cordate or subtruncate; margin entire, rectilinear, not revolute, not ciliate. Venation mixed (basal-suprabasal actinodromous), primary veins 5-palmati-plinerved, prominent on both surfaces; secondary veins diverging from the lower third of the blade, prominent on both surfaces; tertiary veins reticulate, prominent on both surfaces. Flowers absent. Drupes 3–5 × 2.5–4 cm, obovoid, greenish, smooth, glabrous; epicarp approximately 1 mm thick, coriaceous, glabrous; mesocarp 1–4 mm thick, fleshy; endocarp woody, in the shape of an inverted "U," double walled, smooth externally and composed of a row of interparietal cavities internally; endosperm in the shape of an inverted "U," without an external tegumentary membrane, present in the interparietal cavities and the recesses of lamellar teeth; condyle linear, vertical to the longitudinal axis of the seed; embryo curved in the mid region.

Examined specimens. BRAZIL. Amazonas: rio Solimões, s.d., *Martius s.n.* (MG). Rondônia: Presidente Médice, próximo ao Morro da Embratel, floresta de terra firme, 05 May 1987, fr., *C.A. Cid et al. 9040* (NY, UFRR). Mato Grosso: Novo Mundo, Parque Estadual Cristalino, 10 Feb 2008, fr., *D. Zappi et al. 1170* (HERBAM).

Additional specimens examined. BOLIVIA. Pando: W. bank of Rio Madeira, 10 Km above Abunã, forest on terra firme, 21 Nov 1968, fr., *G.T. Prance et al. 8750* (F, INPA, MG,NY, P, R, U, US).

Distribution: Bolivia and Brazil (Barneby and Krukoff 1971; MBG 2022). In Brazil, this species occurs in the states of Amazonas and Rondônia (Barneby and Krukoff 1971; BFG 2015; MBG 2022). Through the present study, a new occurrence was found in Mato Grosso state. *Caryomene prumnoides* was found only in terra firme forest, corroborating the data of BFG (2015). The species was found with fruit in May and November.

Caryomene glaucescens (Moldenke) Barneby & Krukoff, Mem. New York Bot. Gard. 22: 56, 1971. Figure 3 (a-f)

Anomospermum glaucescens Moldenke, Phytologia 3: 121, 1949. Type:—BRAZIL. Pará: basin of the Rio Tocantins, Jaurisinho, high forest high land, 14 September 1948, *R.L. Fróes 23446* (holotype NY 320490!, isotypes: IAN 42118!, NY 320513!).

Liana, 2.9–4.6 cm diam., scandent; rhytidome greenish, fissured, sparsely puberulent. Petiole 4.1–8.5 × 0.1–0.15 cm, cylindrical, puberulent; basal pulvinus 0.3–0.6 cm long, deltoid, not canaliculated, glabrous. Leaves alternate, spiral; leaf blade 8–15.1 × 4.5–9.1 cm, elliptic or oval, subcoriaceous, sometimes bullate, adaxial surface glabrous, abaxial surface puberulent; apex obtuse; base obtuse or rounded; margin entire, repand, not revolute, not ciliate. Venation basal actinodromous, primary veins 5-palmatinerved, impressed on adaxial surface and prominent on abaxial surface; secondary veins diverging from the lower third or of the median region of the blade, prominent on both surfaces; tertiary veins reticulate, imperceptible on adaxial surface and superficial on the abaxial surface. Flowers absent. Drupes 4.2–4.9 × 2.9–4.1 cm, subglobous, yellow, smooth, glabrous; epicarp

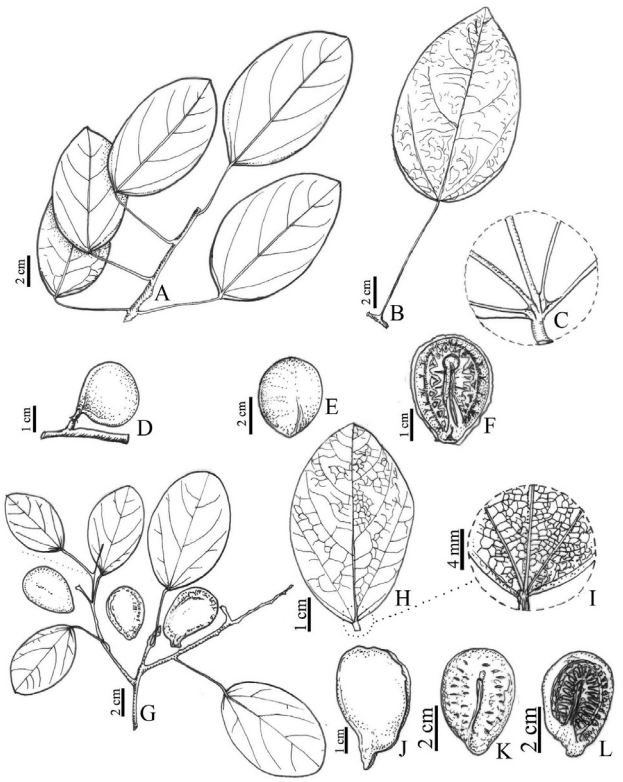

Figure 3. Species of *Caryomene* Barneby & Krukoff in the Brazilian Amazon. A–F *Caryomene glaucescens* (Moldenke) Barneby & Krukoff. A – Branch; B – Abaxial surface of the leaf; C – Leaf base in detail; D – Drupe; E – Endocarp; F – Drupe in longitudinal section. G–L *Caryomene olivascens* Barneby & Krukoff. G – Branch with drupes; H – Abaxial surface of the leaf; I – Leaf base in detail; J – Drupe; K – Endocarp; L – Endocarp in longitudinal section.

up to 1 mm thick, coriaceous, glabrous; mesocarp 2-4.5 mm thick, fleshy; endocarp woody, in the shape of an inverted "U," double walled, smooth externally and composed of a row of interparietal cavities internally; endosperm in the shape of an inverted "U," without an external tegumentary membrane, present in the interparietal cavities and the recesses of lamellar teeth; condyle capitate, vertical to the longitudinal axis of the seed; embryo curved in the mid region; absent cleft in the inner integument of the testa.

Examined specimens. BRAZIL. Pará: Jacundá, rodovia Transamazônica, floresta de terra firme, 15 Dec 1979, fr., *M.F.F. Silva et al. 376* (IAN, MG); margem do rio Tocantins, Jaurisinho, floresta de terra firme, 14 Sep 1948, fr., *R.L. Fróes 23446* (IAN, NY).

Additional specimens examined. FRENCH GUIANA. Caiena: região de Saül, 09 Feb 1981, fr., *A. Fournet 86* (NY).

Distribution: French Guiana and Brazil (Barneby and Krukoff 1971; MBG 2022). In Brazil, this species occurs only in the state of Pará (Barneby and Krukoff 1971; BFG 2015; Sousa 2016). It is peculiarly found in terra firme forest, as also reported by BFG (2015). The species was found with fruit in February, September and December.

Caryomene olivascens Barneby & Krukoff, Mem. New York Bot. Gard. 22: 57, 1971. Type:—BRAZIL. Pará: margem do rio Jari, mata de terra firme, 03 April 1969, fr., *N.T. Silva 1766* (holotype, NY 320508!, isotype IAN 133635!). Figure 3 (g-l)

Liana, 2.5–5 cm diam., scandent; rhytidome greenish, fissured, glabrous. Petiole 2.2–7.5 × 0.1–0.3 cm, flat, glabrous to sparsely pubescent; basal pulvinus 0.3–0.7 cm long, deltoid, canaliculated, glabrous. Leaves alternate, spiral; leaf blade 5.1–15.8 × 3.5–10.7 cm, elliptic, obovate or suborbicular, subcoriaceous, olive-brown on abaxial surface, not bullate, adaxial surface glabrous, abaxial surface strigose; apex obtuse, cuspidate or submarginate; base rounded or obtuse; margin entire, rectilinear, not revolute, not ciliate. Venation basal actinodromous, primary veins 5-palmatinerved or palmati-plinerved, impressed on the adaxial surface, prominent on the abaxial surface; secondary veins diverging from the lower third or of the median region of the blade, impressed on the adaxial surface and prominent on the abaxial surface; tertiary veins reticulate, imperceptible on adaxial surface and superficial on the abaxial surface. Flowers absent. Drupes 3.5–5.4 × 2.1–3.9 cm, obovoid, yellow, rugose, glabrous; epicarp up to 1 mm thick, coriaceous, glabrous; mesocarp almost 0 mm thick, slender; endocarp woody, in the form of an inverted "U," with one wall, foveolate externally, composed of a row of interparietal cavities internally; endosperm in the form of an inverted "U," without an external tegumentary membrane, present in the interparietal cavities and the recesses of lamellar teeth; condyle claviform, vertical to the longitudinal axis of the seed; embryo curved in the mid region.

Examined specimens. BRAZIL. Amapá: próximo a serra do Navio, floresta de terra firme, 04 Jan 1985, fr., *Rabelo, B.V. et al. 3180* (MG, NY 02239318). Pará: margem do rio Jari, floresta de terra firme, 03 Apr 1969, fr., *N.T. Silva 1766* (IAN, NY); região do rio Jarí, estrada entre São Miguel e Braço, floresta de terra firme, 07 May 1970, *N.T. Silva 3117* (IAN, NY); região do Jarí, Tinguelim, floresta de terra firme, 30 Sept 1970, fr., *N.T. Silva 3343* (IAN); rio Jarí, estrada entre Monte Dourado à Caracurú, floresta de terra firme, 11 Nov 1967, *E. Oliveira 3593* (IAN, NY).

Additional specimens examined. FRENCH GUIANA. Saül: nas proximidades de Bélizon, 28 Sep 1995, fr., *S.A. Mori et al. 24244* (NY, US); Layon Biche, 07 Feb 1990, fr., *S.A. Mori* & *C. Gracie s.n.* (NY, P).

Distribution: French Guiana, Venezuela and Brazil (Barneby and Krukoff 1971; MBG 2022). In Brazil, this species occurs in the state of Pará (Barneby and Krukoff 1971; BFG 2015) and the present study found a new record for the state of Amapá. *Caryomene olivascens* was found only in terra firme forest, which corroborates an analysis made by Sousa (2016) and BFG (2015). The species was found with fruit in February, April and September.

Identification key to the species of *Caryomene* in the Brazilian Amazon

1. Primary and tertiary veins prominent on adaxial surface

   2. Rhytidome striated; leaf blade 17.3–29.2 cm long; margin repand; secondary veins diverging from the median region of the blade ..... *C. grandifolia*

   2' Rhytidome fissured; leaf blade 6–17.1 cm long; margin rectilinear; secondary veins diverging from the lower third of the blade

      3. Basal pulvinus cylindrical or oval, not canaliculated; leaf base rounded or cuneate; venation basal actinodromous; primary veins palmatinerved; endocarp with one wall, foveolate externally, solid internally; endosperm present only in the recesses of lamelliform teeth ..... *C. foveolata*

      3' Basal pulvinus deltoid, canaliculated; leaf base cordate or subtruncate; venation mixed (basal-suprabasal actinodromous); primary veins palmati-plinerved; endocarp with double walled, smooth externally and composed of a row of interparietal cavities internally; endosperm present in the interparietal cavities and the recesses of lamellar teeth ..... *C. prumnoides*

1' Primary veins impressed and tertiary veins imperceptible on adaxial surface

   4. Petiole cylindrical; basal pulvinus not canaliculated; abaxial surface puberulent; margin repand; secondary veins prominent on adaxial surface; drupes subglobous; mesocarp

2–4.5 mm thick, fleshy; endocarp with double walled, smooth externally; condyle capitate ..... *C. glaucescens*

4' Petiole flat; basal pulvinus canaliculated; abaxial surface strigose; margin rectilinear; secondary veins impressed on the adaxial surface; drupes obovoid; mesocarp almost 0 mm thick, slender; endocarp with one wall, foveolate externally; condyle claviform ..... *C. olivascens*

DISCUSSION

According to Barneby and Krukoff (1971), *Caryomene* can be vegetatively distinguished from most Amazonian Menispermaceae by its hollow stem and by the presence of papillae inconspicuous in the midrib of the abaxial leaf surface. Sousa (2016) added that the species of the genus have petioles with wider pulvinus only at the base. In addition to the vegetative characters described for the genus in the present treatment, *Caryomene* can be distinguished by reproductive characters based on size and organization of the fruit: the drupes are large, endocarp thickly woody with thick-walled and horizontal dentiform plates and endosperm with no membrane lamellae (Barneby and Krukoff 1971; Sousa 2016).

The species of *Caryomene* are commonly confused with those of *Abuta* Aubl. and *Anomospermum* Miers, and, although these species are difficult to differentiate by their vegetative characters, they can easily be distinguished by their fruits. The drupes of *Caryomene* have a larger endocarp, with horizontal dentiform plates and endosperm without a membrane, since the lamellae have no exterior sac, while *Anomospermum* and *Abuta* have drupes with smaller endocarps, without horizontal dentiform plates and the endosperm composed of plates separated by membranous (Barneby and Krukoff 1971; Sousa 2016). According to the latter authors, the three genera have similar embryos, liner-vermiform, with appressed cotyledons and the endosperm folded, however the endosperm of *Caryomene* and *Abuta* forms an inverted "U", while *Anomospermum* has the endosperm curved in the shape of a "J". Although *Caryomene* and *Abuta* have endosperm with the same shape, they are easily differentiated, as *Caryomene* has petals and the endocarp is externally smooth or transversely foveolate and internally composed of lamelliform teeth, usually surrounded by interparietal cavities, while *Abuta* does not have petals and the endocarp it has three grooves on the outer surface of the testa, one dorsal and two laterals, and it is always smooth and entire inside. For the Amazon, this study registered the occurrence of five species with fruits fundamentally differing in their inner structure and vegetative characters that help separate the species.

Caryomene prumnoides was the first species of the genus discovered, although not the first described, chosen by Barneby and Krukoff (1971) to be the generic type of *Caryomene*, mainly due to the abundance of fruits. This species is well defined and easily distinguishable from other congeners by the cordiform leaf blade with a cordate or subtruncate base and exclusively by the endocarp composed of two walls and with the smooth outer surface.

Caryomene glaucescens is the only species of the genus that has a capitate condyle. According to Barneby and Krukoff (1971) this species has similarity in the leaf form with *C. olivascens*. However, in addition to this latter vegetative character, *C. glaucescens* is distinguished by presenting cylindrical petioles, puberulent abaxial surface, repand margin, prominent secondary veins on the adaxial surface, subglobous drupes, 2–4.5-mm thick, fleshy mesocarp and a double-walled, externally smooth endocarp, whereas *C. olivascens* has flat petioles, strigose abaxial surface, rectilinear margins, secondary veins impressed on the adaxial surface, obovoid drupes, with an almost 0-mm thick, mucilaginous mesocarp, endocarp with one wall, externally foveolate, and with claviform condyle. Barneby, when analyzing the material collected in Serra do Navio (Amapá state), suspected that it was a new species due to differences in the cavity of the endocarp, but this character is not enough to maintain it as an independent *taxon*, since morphological analysis revealed that it was *C. olivascens*, due to the similarity in diagnostic characters.

Of the five species of *Caryomene* analized, only *C. foveolata* and *C. grandifolia* have alternate leaves arranged on opposite sides (distichous). However, *C. foveolata* is easily distinguishing by presenting non canaliculated basal pulvinus, 6–15.5-cm long leaf blades, rectilinear leaf margins and secondary veins diverging from the lower third of the blade, while *C. grandifolia* is recognized by having canaliculated basal pulvinus, 17.3–29.2-cm long leaf blades, repand leaf margins and secondary veins diverging from the median region of the blade (Sousa 2016).

Among the species studied, *C. grandifolia* is easily identified by the large size of the leaf blade and striated rhytidome, as corroborated by Sousa (2016). *Caryomene glaucescens* and *C. olivascens* are endemic to Brazil. *Caryomene foveolata* is the most common in the Amazon.

CONCLUSIONS

The Amazon Rainforest is the main center of diversity for *Caryomene* species. *Caryomene foveolata* is the most common in the Brazilian Amazon. The states of Amazonas and Pará are the most species rich. There was an expansion in the geographic distribution of the genus with the inclusion of three new occurrences in the Brazilian Amazon: *C. grandifolia* in Pará, *C. olivascens* in Amapá, *C. foveolada* and *C. prumnoides* in Mato Grosso. Most species arecords occurred in terra firme forest . The leaf venation and fruit characters were the main features used to separate the species. A study of this scope will contribute to conservationist policies, use projects, management, recovery and environmental monitoring.

ACKNOWLEDGMENTS

The authors thank Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for a fellowship and Programa de Capacitação Institucional (PCI) of Museu Paraense Emílio Goeldi for the infrastructure to conduct this study.

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RECEIVED: 21/12/2022
ACCEPTED: 25/06/2023
ASSOCIATE EDITOR: Natalia Ivanauskas

DATA AVAILABILITY
The data that support the findings of this study were published in this article.