



Original Paper

Ochnaceae on São Luís Island, Maranhão, Brazil

Mayara Dias Caldas^{1,3,5}, Karena Mendes Pimenta² & Lucas Cardoso Marinho^{1,4}

Abstract

The family Ochnaceae belongs to Malpighiales and has about 550 species included in 34 genera, with pantropical distribution. For Brazil, 207 species are reported, 16 have been recorded in Maranhão state. On São Luís Island, a well sampled area in the state, there were records of two genera, *Ouratea* and *Sauvagesia*, and three species: *O. fieldingiana*, *O. hexasperma*, and *S. erecta*. To confirm the occurrence of these species and provide new data about the family in Maranhão, this study aimed to provide a complete taxonomic treatment of the Ochnaceae on São Luís Island, since the region still lacks taxonomic treatments of specific taxa. Field expeditions were carried out to collect plants, and specimens at MAR and SLUI, and on virtual herbaria, were analyzed. As a result, six species were identified, including five in *Ouratea* and one in *Sauvagesia* namely: *O. cassinifolia*, *O. castaneifolia*, *O. cearensis*, *O. hexasperma* and *O. racemiformis*, and *S. erecta*. Specimens that had been identified as *O. fieldingiana* were redetermined as *O. castaneifolia*. *Ouratea cassinifolia*, *O. cearensis*, and *O. racemiformis* are new records for the island.

Key words: Malpighiales, new occurrences, *Ouratea*, *Sauvagesia*, taxonomic treatment.

Resumo

Ochnaceae pertence à ordem Malpighiales e possui cerca de 550 espécies incluídas em 34 gêneros, com distribuição pantropical. Para o Brasil, são reportadas 207 espécies, 16 são registradas no Maranhão. Para a Ilha de São Luís, a área mais bem amostrada do estado, os registros apontam a ocorrência de dois gêneros, *Ouratea* e *Sauvagesia*, e de três espécies, *O. fieldingiana*, *O. hexasperma*, e *S. erecta*. Visando confirmar a ocorrência destas espécies e levantar novos dados sobre a família no Maranhão, este trabalho teve como objetivo fornecer um tratamento taxonômico das Ochnaceae da Ilha de São Luís, visto que a região ainda é carente de tratamentos taxonômicos mais aprofundados em táxons específicos. Para atingir este objetivo, foram realizadas expedições de coleta e análise das coleções dos herbários MAR e SLUI, além dos espécimes disponíveis em herbários virtuais. Como resultados, foram identificadas seis espécies, incluindo cinco em *Ouratea* e uma em *Sauvagesia*, a saber: *O. cassinifolia*, *O. castaneifolia*, *O. cearensis*, *O. hexasperma*, *O. racemiformis* e *S. erecta*. Os espécimes que vinham sendo identificados como *O. fieldingiana* foram reconhecidos como *O. castaneifolia*, além disso *O. cassinifolia*, *O. cearensis* e *O. racemiformis* são novos registros para a ilha.

Palavras-chave: Malpighiales, novas ocorrências, *Ouratea*, *Sauvagesia*, tratamento taxonômico.

Introduction

The family Ochnaceae De Candolle (1811a: 209) was initially included in the order Malpighiales due to having dentate leaves and stipules (Cronquist 1988; Judd *et al.* 2009; Chacon 2011). Subsequently, molecular analyses

confirmed this phylogenetic position (Xi *et al.* 2012). The family has a pantropical distribution and comprises around 550 species distributed in 34 genera (Schneider *et al.* 2021). In Brazil, Ochnaceae occur in all regions and there are 207 species and 13 genera (Flora e Funga do Brasil

¹ Universidade Federal do Maranhão, Centro de Ciências Biológicas e da Saúde, Depto. Biologia, Bacanga, São Luís, MA, Brazil.

² Museu Paraense Emílio Goeldi, Depto. Botânica, Belém, PA, Brazil. ORCID: <<https://orcid.org/0009-0004-9424-5013>>.

³ ORCID: <<https://orcid.org/0000-0003-3058-4142>>.

⁴ ORCID: <<https://orcid.org/0000-0003-1263-3414>>.

⁵ Author for correspondence: mayara.caldas@discente.ufma.br

2022, continuously updated). The Northeast Region is the third richest in species (58 spp.); the North (107 spp.) and Southeast (75 spp.) regions are the richer, respectively (Flora e Funga do Brasil 2022, continuously updated). In Maranhão, there are records of 16 species distributed in two genera: *Ouratea* Aublet (1775: 397), the largest genus in the family (Schneider *et al.* 2021); and *Sauvagesia* Linnaeus (1753: 203).

Ochnaceae comprise shrubs, subshrubs, trees, and more rarely herbs. They have paired, perennial or deciduous stipules and simple, alternate leaves that usually have serrate or partially serrate margins. The flowers are hermaphroditic, actinomorphic or zygomorphic, dichlamydeous, dialypetalous and dialysepalous, and have articulate pedicels, anthers with poricidal or longitudinal dehiscence, staminodes present or absent, a superior ovary, and a syncarpous gynoeceum (Amaral *et al.* 2014). The leaf structure of Ochnaceae is very characteristic, making the family relatively easy to identify in the field (Marinho *et al.* 2018). Some characters are essential to recognize species, especially for *Ouratea*. In this genus, the leaves are usually serrate, and the leaf blade shape is highly variable but always simple, with a coriaceous or chartaceous texture. Most of the species have evident veins, the midvein is sulcate or prominent, and the venation is eucamptodromous with parallel intersecondary veins between the secondary veins that are visible or not visible on both surfaces and frequently inconspicuous (Silva 2015). *Sauvagesia* can be characterized by its highly variable habit, from annual or perennial herbs to shrubs and subshrubs; opposite leaves with serrated or long ciliated margins. The flowers, axillary or in congested terminal inflorescences, are extremely fragile to the touch, ranging from white to magenta. The fruits are capsular and protected by the calyx and persistent corona (Zappi 2018).

Although identifying *Ouratea* is easy using leaf morphology, the species of *Ouratea* are difficult to identify, and most of the specimens of the genus deposited in collections are undetermined. Maranhão has an ecotone region between the Cerrado and Amazonia, which are the two domains with the greatest diversity of Ochnaceae, and there are no taxonomic treatments of the family for the state. We believe a taxonomic treatment of the family in the region is very relevant. Thus, the objective of this work is to provide a taxonomic treatment of the Ochnaceae on São Luís Island.

Material and Methods

São Luís Island, also called Grande Island, Maranhão Island and Upaon-Açu, is around 831.7 km² and includes the municipalities of Paço do Lumiar, Raposa, São José de Ribamar and the capital of the state, São Luís (Bandeira 2017). It is in the extreme northern part of the state (02°35'11"S, 44°13'32"W) and occupies the center of the Golfão Maranhense archipelago (Muniz *et al.* 1994). The island is one of the most collected areas of the state according to data on *speciesLink* (<<http://www.splink.org.br/>>).

This work is based on field observations and a study of new collections and specimens deposited in herbaria. The fieldwork was conducted between December 2019 and November 2022, in four municipalities on São Luís Island, with the goal of collecting material for herbaria and data and images of species in the field. In some protected areas on the island, collecting was more frequent, such as Sítio do Rangedor State Park and the Itapiracó Environmental Protected Area; collecting was permitted under license number A16-2021 of the process 2105140013, which was issued by SEMA (acronym in Portuguese for the *Secretaria de Estado do Meio Ambiente e Recursos Naturais*). Other localities sampled were the dunes of São Marcos Beach, Sítio Santa Eulália, and Sítio do Físico. All the specimens collected were processed according to the techniques described by Mori *et al.* (1989) and deposited in the MAR herbarium at the Federal University of Maranhão, São Luís campus.

The herbaria on São Luís Island were consulted: MAR, at the Federal University of Maranhão; and SLUI, at the State University of Maranhão. Additionally, data from specimens available on virtual herbaria were consulted using the Herbário Virtual Re flora (<<http://re flora.jbrj.gov.br/>>) and *speciesLink* (<<http://www.splink.org.br/>>). Further, the herbaria at New York (NY, <<http://sweetgum.nybg.org/science/vh/>>) and Washington (US, <<http://collections.nmnh.si.edu/search/botany/>>) in the United States of America, which have numerous specimens from Maranhão, were consulted virtually.

The species were identified through a comparative analysis of type material and identification keys in Zappi (2018), Silva (2015), and on Flora e Funga do Brasil 2022 (continuously updated). The morphological descriptions are based on fresh and dry specimens, and the terminology follows the illustrated dictionary by Gonçalves & Lorenzi (2011).

Results and Discussion

We identified two genera, *Ouratea* and *Sauvagesia*, and six species of Ochnaceae on São Luis Island: *O. cassinifolia* (De Candolle 1811b: 421) Engler (1876: 319), *O. castaneifolia* (De Candolle 1811b: 417) Engler (1876: 309), *O. cearensis* (Tieghem 1902: 235) Sastre & Offroy (2016: 86), *O. hexasperma* (A. Saint-Hilaire 1825: 61) Baillon (1873: 366), *O. racemiformis* Ule (1915: 335), and *S. erecta* Linnaeus (1753: 203). Records previously determined as *O. fieldingiana* Engler (1876: 309) on the island were identified during this work as *O. castaneifolia*. Although *O. cassinifolia*, *O. cearensis* and *O. racemiformis* were deposited in collections, they had not been identified and are new records for the island. All six species described were collected during fieldwork in different locations on the island, including *O. cassinifolia* that was represented by only two unidentified specimens in the MAR herbarium. *Ouratea hexasperma* is widely distributed on the island and was present in most of the collection localities. On the other hand, the rarest species were *O. cassinifolia*, which was found only once in the field, and *S. erecta*, which was mostly found in flooded or wet areas.

Taxonomic treatment

1. Ochnaceae DC., *Nouv. Bull. Sci. Soc. Philom.* Paris, sér 2(2): 209. 1811b.

Ochnaceae are herbs, shrubs, subshrubs, or trees with alternate, simple leaves that are petiolate or sessile and have entire or fimbriate, persistent or caducous stipules. Leaf blades are coriaceous or semicoriaceous with serrate, partially serrate, or entire margins; not have glands, trichomes, or secretory structures; secondary venation eucamptodromous. Flowers are solitary or in paniculate or racemose inflorescences, which are terminal or lateral, with persistent or caducous bracts and bracteoles. Flowers are hermaphroditic, dichlamydeous, pedicellate, actinomorphic or zygomorphic, and vary in color. Androecium can have staminodes and the stamens vary from 5 to 10 to numerous, are sessile or subsessile, and have rugose or smooth anthers with poricidal or longitudinal dehiscence. Gynoecium is syncarpous, and a gynophore is present or absent. Carpels 3–8, ovary superior, 1-style, and each locule has one to numerous ovules. Fruits are capsules or schizocarps with succulent mericarps.

The family is distributed throughout the tropics of the world and comprises around 550 species and 34 genera (Schneider *et al.* 2021). In Brazil, Ochnaceae are found in all regions and the family is represented by 207 species and 13 genera. In Maranhão, there are records of two genera, *Ouratea* and *Sauvagesia*, and 16 species, which are most common in areas with poor soils, such as coastal restingas and sandy areas of the Cerrado and Amazônia.

Taxonomic key to the Ochnaceae species on São Luis Island, Maranhão, Brazil

1. Herb; leaves sessile, stipules fimbriate; flowers solitary; stamens 5, staminodes present; fruits capsules 1.6. *Sauvagesia erecta*
- 1'. Shrubs or treelets; leaves petiolate, stipules entire; flowers arranged in inflorescences; stamens 10, staminodes absent; fruits schizocarps.
 2. Leaves with an entire to repand margin; inflorescence racemose; flower white..... 1.1. *Ouratea cassinifolia*
 - 2'. Leaves with an entirely or partially serrate margin; inflorescence paniculate or thyrsoid; flowers yellow.
 3. Leaves with an entirely serrate margin; bracts and bracteoles greater than 10..... 1.2. *Ouratea castaneifolia*
 - 3'. Leaves with a serrate margin on distal half; bracts and bracteoles less than 3.
 4. Inflorescence thyrsoid; pedicel of central flower red; ovary 5–6-carpelar..... 1.4. *Ouratea hexasperma*
 - 4'. Inflorescence paniculate; pedicels yellowish green; ovary 5-carpelar.
 5. Shrub; canopy paucifoliate; leaves with decurrent base; central branch of inflorescence red, up to 12 cm long; bracts narrowly triangular; sepals patent 1.3. *Ouratea cearensis*
 - 5'. Tree; canopy with numerous leaves; leaves with rounded base; central branch of inflorescence green, curved upward, up to 19 cm long; bracts cymbiform; sepals adpressed to the flower 1.5. *Ouratea racemiformis*

1.1. *Ouratea cassinifolia* (DC.) Engl., *Fl. bras.* 12(2): 319. 1876. Fig. 1a-c

Shrub, up to 2 m tall, canopy paucifoliolate, irregular. Stipules early caducous. Leaves petiolate; petiole 0.8–12 mm long, thicker in the basal portion, slightly rugous; leaf blades 5.6–10.5 × 2.5–5 cm, subcoriaceous, oblong, base decurrent, apex obtuse, margin entire to repand, adaxial surface dark green, abaxial surface light green *in vivo*, discolor; secondary veins in 8–10 pairs, forming 50°–60° angle with the midvein. Inflorescence a terminal raceme, lax, central axis 4.6–6 cm long, pendulous; bracts and bracteoles early caducous; pedicel 1–2 cm long, white to reddish; flower buds 5–6 × 2–3 mm, ovoid, apex cuneate, white; sepals 5, 5–6 × 2–3 mm, oblong, white, base rounded, apex cuneate; petals 5, 5–8 × 3–4.5 mm, slightly unguiculate, white, reflexed to the sepals, base slightly attenuate, apex rounded; stamens 10, 3–4 mm long, anthers sessile, yellow, poricidal, slightly rugous; gynoecium 4–6 × 1–2 mm, ovary 5-carpellate, 1–1.5 × 1–2 mm, white, styles 3–5 mm long, white, stigma inconspicuous. Fruits 5.5–8 × 4–6 mm, carpophore subglobose, 2.2–3 × 2–4 mm, light green, mericarps up to 5, usually with 3 aborted, 3.3–5 × 2.4–4 mm, ellipsoid, light green when immature. Seeds not seen.

Specimens examined: São Luís, Ponta do Guaxinim, 3.XI.1986, fr., *M.C.F.V. Santos 400* (MAR); Alumar, 13.XI.1995, fl. and fr., *K.B. Ferreira et al. 17* (MAR); Sítio do Físico, 02°34'23"S, 44°16'56"W, 3.IX.2022, fl., *L.C. Marinho et al. 1833* (MAR).

Additional specimens examined: BRAZIL. MARANHÃO: Icatú, área de campinarana próximo à lagoa, 02°49'03.5"S, 43°55'11"W, 63 m alt., 16.VII.2022, fl., *L.C. Marinho et al. 1813* (MAR).

This species has been recorded with flowers in July, September, and December and with fruits in November and December.

Ouratea cassinifolia is the most distinct species of *Ouratea* on the island. It can be easily recognized by the non-serrate leaf margin (Fig. 1a), inflorescence that is a raceme, and white flowers (Fig. 1b). Photographs of *O. cassinifolia* from other localities generally show smaller, oval leaves that are often grouped at the end of branches. However, the specimen *Marinho 1833* has considerably larger leaves that are oblong and spaced out along the branch.

Ouratea cassinifolia is endemic to Brazil and occurs in the North and Northeast regions, only in the states of Pará and Maranhão (Flora e Funga do Brasil 2022, continuously updated). This

is a new record for São Luís Island; there are only three specimens, which are all from shady areas far from the coast.

1.2. *Ouratea castaneifolia* (DC.) Engl., *Fl. bras.* 12(2): 309. 1876. Fig. 1d-e

Shrub, up to 2.5 m tall, canopy with numerous leaves, irregular. Stipules caducous. Leaves petiolate; petiole ca. 1 cm long, slightly rugous; leaf blades 4.7–23 × 1.6–8 cm, coriaceous, oblong, base rounded, apex acuminate, margin entirely serrate, adaxial surface light green, glossy, abaxial surface light green *in vivo*, discolor; secondary veins in 8–10 pairs, forming 60°–70° angle with the midvein. Inflorescence a terminal panicle, congested, central axis 4–10 cm long, lateral axis 1–6 cm long; bracts ≥ 10, 5–9 × 2.5–3.5 mm, narrowly triangular, striated longitudinally, reddish-brown *in vivo*, erect, apex acute; bracteoles ≥ 10, 2–3 × 1–2 mm, lanceolate, striated longitudinally, reddish-brown *in vivo*, apex acute; pedicel 1–9 mm long, green; flower buds 4–5.5 × 2.5–5 mm, ovoid, yellowish-green *in vivo*, apex acute; sepals 5, 4–6 × 1.5–3 mm, ovate, yellowish green, adpressed to the petal, base rounded, apex acute to cuneate; petals 5, 6–8 × 5–8 mm, slightly unguiculate, yellow, base slightly attenuate, apex rounded; stamens 10, 4–5 mm long, anthers sessile, yellow, poricidal, rugous; gynoecium 4–6 × 1–2 mm, ovary 5-carpellate, 1–1.5 × 1–1.5 mm, yellow, styles 3–6 mm long, yellow, stigma inconspicuous. Fruits 18–20 × 7–8 mm, carpophore subglobose, 6.5–9 × 7–11 mm, brown *in sicco*, mericarps up to 5, usually with 3 aborted, 11–13 × 7–8 mm, ellipsoid, brown *in sicco*. Seeds not seen.

Specimens examined: São Luís, II-III.1939, fr., *R.L. Fróes 11570* (NY); Mata da CAEMA, 4.X.1988, fl., *J. Ferreira et al.* (MAR 3031); Alumar, 13.XI.1995, fl., *K.B. Ferreira et al.* (MAR 5314); Parque Estadual do Bacanga, 02°37'16,53"S, 44°17'04,36"W, 24.I.2013, fr., *M.S. Rodrigues 582* (SLUI); 03°23'35,40"S, 44°19'22,61"W, 20.III.2013, fr., *M.S. Rodrigues 588* (SLUI); Bacanga, campus da Universidade Federal do Maranhão (UFMA), 02°32'20,7"S, 44°16'58,4"W, 22.I.2018, fr., *J.S. Anjos 569* (MAR); Parque Estadual do Sítio do Rangedor, vegetação ao lado da ciclovia, 02°29'55"S, 44°15'54"W, 1.IX.2022, fl., *L.C. Marinho et al. 1826* (MAR); 7.IX.2022, fl., *M.D. Caldas et al. 14* (MAR).

Ouratea castaneifolia has been recorded with flowers and flower buds between September and November and with fruits between January and March.



Figure 1 – a-g. Species of *Ouratea* on São Luís Island, Maranhão – a-c. *O. cassinifolia* – a. branch with leaves (adaxial view) and flowers, detail showing the abaxial surface and margin of a leaf; b. detail of an inflorescence; c. immature fruits; d-e. *O. castaneifolia* – d. branch with flowers, detail of a flower (frontal view); e. leaves (adaxial view); f-g. *O. cearensis* – f. branch with flower buds and flowers, detail of a flower (frontal view); g. leaf (adaxial view). Photos: a-b. André Scatigna; c-g. Lucas Marinho.

This species is easily recognized in the field by the leaves with strongly serrate margins (Fig. 1e), woody stems, and robust flowers compared to the other *Ouratea* species on the island, in addition to having numerous bracts and bracteoles. While analyzing the herbarium material and works previously conducted on island, we verified that specimens of *O. castaneifolia* have frequently been identified as *O. fieldingiana* or *Ouratea nitida* (Swartz 1788: 67) Engler (1876: 310). The latter is the most similar to *O. castaneifolia* but does have records from Maranhão (Flora e Funga do Brasil 2022, continuously updated). *Ouratea castaneifolia* can be differentiated from *O. fieldingiana* by its leaves, which have a completely serrate margin, and paniculate inflorescence, while in *O. fieldingiana* only 2/3 of the leaf margin is serrate and the inflorescence is pseudoracemose (Flora e Funga do Brasil 2022, continuously updated). *Ouratea nitida* differs by the partially serrate, elliptic leaves and less than 10 bracts, while *O. castaneifolia* has oblong leaves with a completely serrate margin and greater than 10 bracts.

Ouratea castaneifolia has been recorded in four of the five regions in Brazil (North, Northeast, Central-West, and Southeast). In the Northeast region, this species occurs in the states of Bahia, Ceará, Maranhão, and Piauí (Flora e Funga do Brasil 2022, continuously updated). On São Luís Island, this species was recorded in vegetation typical of the Cerrado and some transition areas. Previously, it had not been cited in any work about the island; however, the Rosa Mochel Herbarium (SLUI) already had two specimens and NY already had one specimen.

1.3. *Ouratea cearensis* (Tiegh.) Sastre & Offroy, Adansonia 38(1): 86. 2016. Fig. 1f-g

Shrub, up to 2 m tall, canopy paucifoliolate, irregular. Stipules 1–2 per node, 1–2 × 1 mm, smooth to slightly striated longitudinally, triangular, apex acute. Leaves petiolate; petiole 2–6 mm long, thicker in the basal portion, slightly rugous; leaf blades 2.3–13.6 × 1.1–5.8 cm, coriaceous, elliptic, base decurrent, green *in vivo*, slightly discolor, apex acuminate, margin slightly serrate on the distal half; secondary veins in 8–11 pairs, forming 60°–70° angle with the midvein. Inflorescence a terminal or lateral panicle, congested, central axis 3.5–12 cm long, lateral axis 0.9–5.5 cm long, erect; bracts 2, 6–7 × 1–1.5 mm, narrowly triangular, striated longitudinally, brown *in vivo*, apex acute; bracteoles numerous, 1–1.5 × 0.5 mm, narrowly triangular,

striated longitudinally, brown *in vivo*, apex acute; pedicel 2–9 mm long, green; flower buds 2–5 × 1–3.5 mm, ovoid, yellowish-green *in vivo*, apex acute; sepals 5, 3.5–6 × 2–3 mm, ovate, yellowish green, patent, base rounded, apex cuneate; petals 5, 3.5–6.5 × 2.5–6 mm, slightly unguiculate, yellow, base attenuate, apex rounded; stamens 10, 2.5–5 mm long, anthers sessile, yellow, poricidal, slightly rugous; gynoecium 3–5 × 1–2 mm, ovary 5-carpellate, 1 × 1–2 mm, yellowish green, styles 2–4 mm long, yellow, stigma inconspicuous. Fruits 5–10 × 5–12 mm, carpophore subglobose, 1.5–3.2 × 3–6 mm, brown *in sicco*, mericarps up to 5, usually with 3 or 4 aborted, 2.5–7.5 × 2–5 mm, ellipsoid, brown *in sicco*. Seeds not seen.

Specimens examined: São José de Ribamar, Praia de Panaquatira, 02°28'23"S, 44°03'13,8"W, 23.I.2014, fr., *J.P. Lima 105* (MAR). São Luís, II-III.1939, fr., *R.L. Fróes 11567* (NY); campus da Universidade Estadual do Maranhão (UEMA), 26.XI.1991, fl., *J. Azevedo 04* (SLUI); Parque Estadual do Sítio do Rangedor, 27.XI.2010, fl., *S.M. Santos* (MAR 5452); Bacanga, Campus da Universidade Federal do Maranhão (UFMA), 02°33'06,8"S, 44°17'21,6"W, 4.IX.2018, fl., *J.J.F. Sousa 109* (MAR); 02°32'20,7"S, 44°16'58,4"W, 29.I.2019, fr., *J.S. Anjos 450* (MAR); Sítio Santa Eulália, 02°30'38"S, 44°16'37"W, 8.X.2019, fl. and fr., *E.C.G. Silva* (MAR 12224); Área de Proteção Ambiental do Itapiracó, área de floresta estacional semidecidual, 9.XII.2019, fl., *L.C. Marinho et al. 1554* (MAR). São Luís, Sítio do Físico, 20.XI.2021, fl., *M.D. Caldas et al. 09* (MAR); 20.XI.2021, fl., *M.D. Caldas et al. 10* (MAR); Parque Estadual do Sítio do Rangedor, 7.IX.2022, fl., *M.D. Caldas et al. 12* (MAR); dunas da praia de São Marcos, 7.IX.2022, fl., *M.D. Caldas et al. 16* (MAR).

This species has been recorded with flowers and flower buds from September to December and with fruits in January and October.

Ouratea cearensis is easily confused with *O. racemiformis*; however, some characters differ between the species. For example, in *O. cearensis* the central inflorescence axis is reddish and shorter, with lateral axes approximately the same size as the central axis. The sepals are patent, and the flower buds are slightly smaller compared to those of *O. racemiformis*.

Ouratea cearensis is endemic to Brazil and occurs the North and Northeast region in the States of Bahia, Ceará, Maranhão, Paraíba, Piauí (Flora e Funga do Brasil 2022, continuously updated), and Pará. On São Luís Island, this was the only species collected in an area of restinga and, like *O. castaneifolia*, it has been misidentified as *O. fieldingiana*. Unlike the other species, the specimens of *O. cearensis* often had galls.

1.4. *Ouratea hexasperma* (A. St.-Hil.) Baill., Hist. Pl 4: 366. 1873. Fig. 2

Shrub, up to 1 m tall, canopy paucifoliolate, irregular. Stipules present, 1–2 per node, 9–10 × 3 mm, coriaceous, striated longitudinally, triangular, apex acute. Leaves petiolate; petiole ca. 5 mm long, slightly rugous; leaf blades 4.6–7.1 × 2.6–3.9 cm, coriaceous, ovate, base rounded, light green *in vivo*, slightly discolor, apex acuminate, margin slightly serrate on the distal half; secondary veins in 9–12 pairs, forming 60°–70° angle with the midvein. Inflorescence terminal or subterminal, thyrsoid, congested, central axis 11.5–14.5 cm long, lateral axis 3–10 cm long; bracts 1, 2–4.5 × 1–2.5 mm, lanceolate, striated longitudinally, greenish-yellow *in vivo*, erect, apex acute; bracteoles 2, 3–4 × 1.5–2.5 mm, lanceolate, striated longitudinally, greenish-yellow *in vivo*, apex acute; pedicel 4–9 mm long, green on the lateral flower, reddish on the central flower of dichasium; flower buds 4–7 × 3–4.5 mm, ovoid, yellowish-green *in vivo*, apex acute; sepals 5, 4.5–6.5 × 2–3 mm, lanceolate to ovate, yellowish green, adpressed to the petals, base rounded, apex acute, persistent; petals 5, 6–8.6 × 5–6.5 mm, unguiculate, yellow, base attenuate, apex rounded; stamens 10, 4.5–5.5 mm long, anthers sessile, yellow, poricidal, slightly rugous; gynoeceum 6–8 × 1–2 mm, ovary 5–6-carpellate, 1–2 × 1–2 mm, yellow, styles 4–7 mm long, yellow, stigma inconspicuous. Fruits 4–11 × 5–11 mm, carpophore subglobose, 2–3.5 × 3–5 mm, red *in vivo*, mericarps up to 5(–6), usually with 3 aborted, 2–8.5 × 2–5 mm, ellipsoid, green to metallic blue *in vivo*. Seeds 3.5–5.5 mm long.

Specimens examined: Raposa, restinga da Ilha de Curupu, 02°24′09″S, 44°01′19″W, 1.XI.2014, fl., *M.A. Machado* 96 (MAR); 1.XI.2014, fl., *M.A. Machado* 130 (MAR); 6.III.2015, fl., *M.A. Machado* (MAR 013067). São José de Ribamar, Praia de Ponta Verde, 14.XI.1986, fl., *C.C. Marques* 03 (MAR); Praia de Panaquatira, 02°28′23″S, 44°03′13,8″W, 29.III.2014, fl., *G.P. Lima* 205 (MAR). São Luís, Sítio Santa Eulália, 02°30′38″S, 44°16′37″W, 8.X.2018, fl., *E.C.G. Silva* (MAR 012222); Parque Estadual do Sítio do Rangedor, vegetação ao lado da ciclovia, 02°29′55″S, 44°15′54″W, 11.IX.2021, fl. and fr., *M.D. Caldas et al.* 06 (MAR); 11.IX.2021, fl., *M.D. Caldas et al.* 07 (MAR); 1.IX.2022, fl., *L.C. Marinho et al.* 1825 (MAR); 7.IX.2022, fl., *M.D. Caldas et al.* 13 (MAR); 7.IX.2022, fl., *M.D. Caldas et al.* 15 (MAR); 15.XI.2022, fr., *M.D. Caldas et al.* 17 (MAR); 15.XI.2022, fl., *M.D. Caldas et al.* 18 (MAR); 15.XI.2022, fr., *M.D. Caldas et al.* 19 (MAR).

This species has been recorded with buds, flowers, and fruits from September to November.

The rest of the year, the inflorescences are sterile, and the sepals are dry but persistent on the inflorescence. During fieldwork, we observed birds, *Tyrannus savana* Daudin, 1802, eating the mature fruits (Fig. 2d).

Ouratea hexasperma is easily recognized in the field by the congested inflorescences that look like “brooms” when senescent due to the persistent sepals. Although it is characterized by the presence of 6 carpels, few specimens have this character state. Observations in the field provided information about the colors of live *O. hexasperma*: the mericarps can be metallic blue (Fig. 2e), which is a little unusual; and the inflorescence dichasia (Fig. 2c), which are here called thyrsoid, have central flowers with a red pedicel.

This species is typical of Cerrado and has been recorded in all regions of Brazil except the South (Flora e Funga do Brasil 2022, continuously updated). On São Luís Island, this species has been recorded on Panaquatira Beach (Lima *et al.* 2018) and in Sítio do Rangedor State Park (Almeida Jr. *et al.* 2021) and Sítio Santa Eulália (Silva *et al.* 2022). It was the most common species encountered during the fieldwork.

1.5. *Ouratea racemiformis* Ule, Notizbl. Bot. Gart. Berlin-Dahlem 6: 335. 1915. Fig. 3a-c

Tree, up to 2.5 m tall, canopy with numerous leaves, globose. Stipules present, 2–3 per node, 0.5–1.5 × 0.3–0.7 mm, smooth, slightly striated longitudinally, triangular, apex acute. Leaves petiolate; petiole 4–10 mm long, rugous; leaf blades 3.5–12.5 × 1.9–5.2 cm, subcoriaceous, oblong, base rounded, apex acuminate, margin slightly serrate on the distal third, discolor, adaxial surface dark green, abaxial surface light green *in vivo*; secondary veins in 9–11 pairs, forming 50°–60° angle with the midvein. Inflorescence a terminal panicle, congested, central axis 4.6–19 cm long, lateral axis 0.3–3.5 cm long, pendulous with an upward curve; bracts 2, 4–6 × 1–3 mm, cymbiform, slightly striated longitudinally, brown *in vivo*, apex acute; bracteoles 2, 2.5–5 × 1–2 mm, narrowly triangular, slightly striated longitudinally, yellowish-green, apex acute; pedicel 0.1–1.1 cm long, green; flower buds 3–7 × 1.5–4.5 mm, ovoid, yellowish-green *in vivo*, apex acute; sepals 5, 3.2–7.5 × 1.1–3.5 mm, ovate, yellowish-green, adpressed to the petals, base rounded, apex acute; petals 5, 3–9 × 2.1–7 mm, unguiculate, yellow, base attenuate, apex rounded; stamens 10, 1–6.2 mm long, anthers sessile, yellow, poricidal, rugous;

gynoecium 0.5–7 × 0.3–1.5 mm, ovary 5-carpellate, 0.2–1.2 × 0.2–1.2 mm, yellow, styles 0.3–5.8 mm long, yellow, stigma inconspicuous. Fruits 3–12 × 2–13 mm, carpophore subglobose, 1.5–4 × 0.7–7.5 mm, green *in vivo*, mericarps up to 5, usually with 3 aborted, 1.2–9 × 1.3–5.5 mm, ellipsoid, green *in vivo*. Seeds 1.5–6.5 mm long.

Specimens examined: São José de Ribamar, Praia de Panaquatira, 02°28'23"S, 44°03'13.8W, 9.XI.2013, fl., *G.P. Lima 14* (MAR); 16.XI.2014, fl., *G.P. Lima 502* (MAR). São Luís, Calhau 02°30'S, 44°15'W, 30.X.1982, fl., *I. & G. Gottsberger 21* (MAR); 30.X.1982, fr., *I. & G. Gottsberger 22* (MAR); Reserva Botânica Rosa Mochel,

25.XI.1987, fl., *A. Fernandes 01* (SLUI); campus da Universidade Estadual do Maranhão (UEMA), 28.I.1992, fl. and fr., *J. Azevedo 18* (SLUI); Alumar, 29.XI.1994, fr., *N. Figueiredo 08* (MAR); Parque Estadual do Sítio do Rangedor, 30.X.2010, fl., *S.M. Santos* (MAR 5454); Parque Estadual do Bacanga, 02°35'41,15"S, 44°16'14,18"W, 1.XI.2012, fl., *M.S. Rodrigues 554* (SLUI); 02°35'41,09"S, 44°16'13,94"W, 1.XI.2012, fl., *M.S. Rodrigues 555* (SLUI); Av. Litorânea, dunas da Praia de São Marcos, 02°29'7"S, 44°15'59"W, 21.XI.2015, fl., *A.N.F. Silva 702* (MAR); Área de Proteção Ambiental do Itapiracó, área de floresta estacional semidecidual, 9.XII.2019, fl., *L.C. Marinho et al. 1549* (MAR); 9.XII.2019, fl., *L.C. Marinho et al.*



Figure 2 – a-e. *Ouratea hexasperma* – a. habit; b. detail of an inflorescence; c. detail of dichasial arrangement showing the red pedicel of the central flower; d. individual of *Tyrannus savana* consuming the fruits of *O. hexasperma*; e. fruit with metallic blue mericarps. Photos: Lucas Marinho.

1560 (MAR); Parque Estadual do Sítio do Rangedor, 11.IX.2021, fl., M.D. Caldas et al. 08 (MAR).

Ouratea racemiformis has been recorded with flowers from September to January and with fruits in October, November, and January.

When alive, *Ouratea racemiformis* is easily confused with *O. cearensis*. Some of the main characters that can differentiate them are the inflorescence of *O. racemiformis* has a longer central axis, short lateral axes, and is always curved upward (see Fig. 3a-b). Among the species described, the double, cymbiform bracts are exclusive to this species (Fig. 3b).

In Brazil, it occurs in the North and Northeast regions, its distribution is restricted to the states of

Amazonas, Amapá, Pará, and Maranhão (Flora e Funga do Brasil 2022, continuously updated). For São Luís Island, this species had been collected for years but it was never correctly identified. Thus, we report *Ouratea racemiformis* for the first time for the area.

1.6. *Sauvagesia erecta* L., Sp. Pl. 1: 203. 1753.

Fig. 3d-e

Herb, up to 40 cm tall, paucifoliolate. Stipules present, numerous, 4–8.5 mm long, striated, margin fimbriate, apex fimbriate. Leaves sessile; leaf blades 5.3×2.2 – 7.2 mm, membranaceous, oblanceolate, green *in vivo*, slightly discolor, base attenuate, apex acute, margin serrate; secondary



Figure 3 – a-e. Ochnaceae on São Luís Island – a-c. *Ouratea racemiformis* – a-b. branches with flowers, detail of a flower (frontal view) in b; c. immature fruits; d-e. *Sauvagesia erecta* – d. habit, detail of a flower (lateral-frontal view); e. habit with flowers. Photos: a-d. Lucas Marinho; e. Mayara Caldas.

veins in 8–10 pairs, forming 20°–30° angle with the midvein. Solitary flowers, terminal or axillary; bracts foliaceous; bracteoles absent; pedicel 2–11 mm long, pale pink; flower buds 6–7 × 2–5 mm, ovoid, green *in vivo*, apex acute; sepals 5, 6–7 × 1.2–2.2 mm, lanceolate, green, patent, base rounded and fimbriate on the margin, apex acute and fimbriate on the margin; petals 5, 4–5.5 × 2.5–4 mm, unguiculate, white, base attenuate, apex cuneate; staminodes present, numerous, 0.5–1.5 mm long, pinkish to purple *in vivo*; stamens 5, 1–2 mm long, anthers 1–1.8 mm long, subsessile, yellow, rimose, smooth; gynoecium 1.1–2.5 × 0.5–1 mm, ovary 3-carpellate, 0.5–1 × 0.5–1 mm, brown *in sicco*, styles 1.5–3 mm long, white, stigma inconspicuous. Fruits capsules septicidal, 5–6 × 2–3.5 mm, ovoid, sepals, stamens and staminodes persistent. Seeds numerous, 0.5–0.7 × 0.1–0.5 mm, ovoid to globose, rugous to porous. **Specimens examined:** São José de Ribamar, Sítio Aguahy, 02°38'47,85"S, 44°09'05,76"W, 28.VIII.2012, fl. and fr., *F.C.V. Serra 80* (MAR); Área de Proteção Ambiental do Itapiracó, acesso pela Av. Joaquim Mochel, 19.VI.2021, fl., *L.C. Marinho et al. 1706* (MAR). São Luís, Sítio Santa Eulália, 11.II.2022, fl. and fr., *M.D. Caldas et al. 11* (MAR).

This species has been collected with flowers in February, June, and August and with fruits in February and August.

Sauvagesia erecta is the only species of *Sauvagesia* that occurs on the island. It can be recognized in the field by the herbaceous habit, white flowers with five stamens (Fig. 3d-e), and stipules and sepals with a fimbriate margin. Its fruit is a capsule with numerous seeds. It has solitary flowers instead of inflorescences. The flowers have staminodes and only 5 stamens, which is half the number of stamens of all the other species described here.

Sauvagesia erecta is widely distributed and has been collected in every Brazilian state (Flora e Funga do Brasil 2022, continuously updated). It occurs in various domains and vegetations. On São Luís Island, *S. erecta* has been recorded by Cabral Freire & Monteiro (1993) and Serra *et al.* (2016), and it is frequently associated with swampy areas.

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Data availability statement

In accordance with Open Science communication practices, the authors inform that all data are available within the manuscript.

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