

FLORA DA RESERVA DUCKE, AMAZONAS, BRASIL: ANNONACEAE

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with bark descriptions by Leo Junikka³

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Trees or **shrubs**, very rarely **lianas**. Bark very tough and fibrous and torn off in long strips. **Leaves** alternate, entire, mostly distichous. **Flowers** axillary or non-axillary, rarely terminal, mostly bracteate, single or in rhipidiate inflorescences, articulation of pedicels mostly basal, except for *Guatteria* where it is suprabasal. Sepals 3, free or variously connate. Petals mostly in two 3-merous whorls, mostly free. Stamens many, connective often with a shield-like apical prolongation. Staminodes rarely present. Carpels mostly many, with 1 to many, basal or

parietal ovules. **Fruit** mostly apocarpous, consisting of free, generally stipitate carpels (monocarps), indehiscent, rarely dehiscent, sometimes syncarpous (among others *Annona*). **Seeds** often large, with ruminant endosperm, sometimes arillate.

In the Neotropics the family is represented by *ca.* 40 genera and *ca.* 900 species; the centres of distribution are the Amazon region and the Guianas. There occur 16 genera and 60 species in Reserva Ducke, with one further genus, *Onychopetalum* to be expected.

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The family is easily recognized by its often rather large, 3-merous flowers, its shield-like apical prolongation of the connective (protecting the stamens against predators), and by seeds with a ruminant endosperm. The last

character occurs also in the closely related family of Myristicaceae.

Most representatives of this family are pollinated by large or small beetles (Gottsberger 1970; Webber 1996).

Key to the genera of Annonaceae in Reserva Ducke

1. Leaves spirally arranged; flowers 4-merous; indument composed of stellate hairs 14. *Tetrameranthus*
- 1'. Leaves in 2 rows (distichous); flowers 3-merous; indument composed of various hair types (simple, stellate, or scale-like hairs) or lacking.
 2. Indument composed of stellate or scale-like hairs; fruit pseudosyncarpous and carpels strongly coherent, but only partly connate, the lower carpels sterile and forming a basal collar 6. *Duguetia*
 - 2'. Indument composed of simple hairs or lacking (rarely stellate hairs in *Annona*); fruit either apocarpous or syncarpous, but not as above.
 3. Flowers and fruit axillary, sometimes cauliflorous (rarely leaf-opposed as in *Anaxagorea brevipes*); fruit composed of many, free, 1-several-seeded monocarps
 4. Midrib of leaves raised on the upper side.
 5. Marginal leaf vein present 12. *Pseudoxandra*
 - 5'. Marginal leaf vein absent.
 6. Flower buds ellipsoid to broadly ellipsoid; outer petals with an apical, incurved appendage; monocarps subsessile. *Onychopetalum*
 - 6'. Flower buds generally globose, never ellipsoid; outer petals without an apical appendage; monocarps stipitate to subsessile.
 7. Leaves asymmetrical; stipes of monocarps 0–2 mm long; monocarps 1–4 3. *Bocageopsis*
 - 7'. Leaves symmetrical; stipes of monocarps 5–30 mm long; monocarps 10–100 15. *Unonopsis*
 - 4'. Midrib of leaves impressed on the upper side.
 8. Petals thick and fleshy; monocarps club-shaped, explosively dehiscent 1. *Anaxagorea*
 - 8'. Petals generally much thinner; monocarps never club-shaped, indehiscent or not explosively dehiscent.
 9. Monocarps dehiscent; seeds arillate; petals unequal 16. *Xylopia*
 - 9'. Monocarps indehiscent; seeds without an aril; petals mostly equal.
 10. Monocarps subsessile, woody, 3–8-seeded; petals narrowly oblong-elliptic 5. *Diclinanona*
 - 10'. Monocarp mostly distinctly stipitate, not woody, 1-seeded; petals mostly 1–3 times as long as wide.
 11. Pedicels with basal articulation; flowers male or bisexual 7. *Ephedranthus*
 - 11'. Pedicels with supra-basal articulation; flowers bisexual.
 12. Petals imbricate 9. *Guatteria*
 - 12'. Petals valvate 10. *Guatterriopsis*
 - 3'. Flowers and fruits terminal, leaf-opposed, or supra-axillary, rarely cauliflorous; fruit apocarpous or syncarpous.

- 13. Bracts absent; inner petals boat-shaped; monocarps dehiscent; seeds arillate 4. *Cymbopetalum*
- 13'. Bracts present; inner petals not boat-shaped; monocarps indehiscent; seeds without an aril.
- 14. Outer petals winged and flowers propellor-like; fruit syncarpous 13. *Rollinia*
- 14'. Outer petals not winged and flowers not propellor-like; fruit syncarpous or apocarpous
- 15. Staminodes present between stamens and petals; fruit syncarpous, with a basal, woody collar; leaves with a marginal vein 8. *Fusaea*
- 15'. Staminodes absent; fruit apocarpous or syncarpous, but then without a basal, woody collar; leaves without a marginal vein.
- 16. Fruit apocarpous, composed of many stipitate monocarps; petals thin, mostly with ciliate margin; secondary veins almost perpendicular to the midrib 11. *Malmea*
- 16'. Fruit syncarpous; petals mostly thick, margins not ciliate; secondary veins never perpendicular to the midrib 2. *Annona*

1. *Anaxagorea*

Anaxagorea A. St.-Hil., Bull. Sci. Soc. Philom. Paris 1825: 91. 1825.

Trees or **shrubs**. Indument of vegetative and floral parts consisting of brownish, microscopic, simple to stellate hairs. **Leaves** distichous, midrib impressed to flat on the upper side. Inflorescence 1-several-flowered, axillary, often cauliflorous, pedicels with 2 bracts. **Flowers** yellow to cream, 3-merous, medium-sized. Sepals 3, valvate. Petals 6,

free, subequal, valvate, inner side keeled. Staminodes present between stamens and carpels, 3–6 mm long. Carpels many, with 2 basal ovules. **Fruit** apocarpous, consisting of 5–20, explosively dehiscent, club-shaped monocarps; base of monocarps gradually narrowed into a stipe-like part, apex a globose structure, containing the seeds. **Seeds** 2, shiny black, semiglobose, not arillate.

Genus of 25 species occurring all over tropical America, and 4 species in Asia.

Key to the species of *Anaxagorea* in Reserva Ducke

- 1. Young twigs and petioles glabrous; sepals persistent 1. *A. brevipes*
- 1'. Young twigs and petioles densely covered with brown, erect hairs; sepals soon falling off
- 2. Leaves without a marginal vein, 8–20 × 2–6 cm; flower buds globose, obtuse; sepals 3–4 mm long 2. *A. manausensis*
- 2'. Leaves with a marginal vein, 10–36 × 3–12 cm; flower buds ovoid, acute; sepals 5–11 mm long 3. *A. phaeocarpa*

1.1 *Anaxagorea brevipes* Benth., Hooker’s J. Bot. Kew Gard. Misc. 5: 8. 1853.

Tree or **shrub**, up to 10 m tall, 8–15 cm in diam. Young twigs and petioles glabrous. **Leaf** petioles 3–13 mm long. Lamina elliptic to obovate, 8–27 × 3–10 cm, chartaceous, glabrous above, subglabrous below, base acute to rounded, apex acuminate, secondary veins 7–15 on either side of midrib, flat to slightly impressed above. **Inflorescences** in foliate zone, axillary or terminal, or cauliflorous, 1–2-flowered. Pedicels 3–11 mm long, 1.5–4 mm in diam. Flower buds ovoid to globose, obtuse. Indument of floral parts: outer side of sepals

and outer petals densely covered with brownish, erect hairs. Flowers yellow to cream, with fragrance of soursop. Sepals free, ovate to broadly ovate, 6.5–12 mm long, patent, persistent. Petals subequal, ovate to narrowly ovate, 11–17 mm long, 4–7.5 mm wide. **Monocarps** yellow (with red apex) or dark red, 20–36 mm long, subglabrous, beak 0.5–2.5 mm long. **Seeds** 11–16 mm long.

Amazonian Colombia, Venezuela, Ecuador, Peru, and Brazil (Amazonas), and in Guyana and Suriname.

In non-inundated forest, on sandy or clayey soil.

Flowering from August to November, fruiting in March and November.

25.XI.1957 (fr) *Chagas, J. INPA s/n* (INPA5697); 12.X.1995 (fl) *Miralha, J. M. S. et al. 310* (INPAKU); 12.X.1995 (fl) *Miralha, J. M. S. et al. 311* (INPAKU); 12.X.1966 (fr) *Prance, G. T. et al. 2633* (BFGINPAK NY S VE); 1.IX.1995 (fl) *Ribeiro, J. E. L. S. et al. 1688* (IANINPANYRB U ULM); 29.VIII.1957 (fr) *Rodrigues, W. 590* (INPA S); 21.XII.1963 (fr) *Rodrigues, W. & Coêlho, D. 5633* (INPA); 15.II.1967 (fr) *Rodrigues, W. & Monteiro, O. P. 8323* (INPA); 10.X.1995 (fl) *Sothers, C. A. & Pereira, E. C. 611* (GHINPAKMGPEUFR S U ULM VIC); 10.IX.1992 (fl) *Webber, A. C. 1442* (INPA).

Anaxagorea brevipes can be recognized by glabrous young twigs, and patent, persistent sepals.

1.2 *Anaxagorea manausensis* Timmerman, Proc. Kon. Ned. Akad. Wetensch. C. 87: 301. 1984.

Tree or **shrub**, 3.5–10 m tall, 4–8 cm in diam. Young twigs and petioles densely covered with dark brown, erect hairs. **Leaf** petioles 4–10 mm long. Lamina narrowly elliptic, 8–20 × 2–6 cm, chartaceous to coriaceous, glabrous above, sparsely covered with erect hairs to glabrous below, base obtuse to acute, slightly decurrent, apex long-acuminate, secondary veins 8–14 on either side of midrib, strongly impressed above. **Inflorescences** in foliate zone, ramiflorous, or cauliflorous, axillary, 1–4-flowered. Pedicels 10–20 mm long, 1–3 mm in diam. Flower buds globose, obtuse. Indument of floral parts: outer side of sepals and outer petals densely covered with dark brown, erect hairs. **Flowers** cream. Sepals free, broadly ovate to depressed ovate, 3–4 mm long, curved upward, soon falling off. Petals subequal, concave, elliptic, obovate to broadly obovate, 6–13 mm long, 5–11 mm wide. **Monocarps** brown, 35–40 mm long, subglabrous, beak ca. 1 mm long. **Seeds** 17–18 mm long.

Amazonian Brazil and Peru (Loreto).

In non-inundated forest, on white sand.

Flowering and fruiting in September and October.

Local name: envireira.

11.III.1998 (fr) *Assunção, P. A. C. L. et al. 815* (INPA KMG MONY RB SPU ULM); 3.X.1957 (fl) *Ferreira,*

E. 57–136 (INPA MG S); 11.X.1995 (fl) *Miralha, J. M. S. et al. 301* (GHINPAK MG PEUFR S U ULM VIC); 14.IX.1971 (fl) *Prance, G. T. et al. 14745* (INPA NY VEN); 12.IX.1995 (bd) *Ribeiro, J. E. L. S. & Pereira, E. C. 1693* (INPAK MG U); 22.XI.1993 (fr) *Webber, A. C. 1456* (INPA).

Anaxagorea manausensis was so far only known from a few collections of Reserva Ducke, but recently it has been discovered in forests on white sand in the region of Allpahuayo, near Iquitos, Peru. Several of the measurements have been taken from that material:

Gentry et al. 56014 (U), *Maas et al. 8235* (U), *Pipoly et al. 12195* (U), *Vásquez & Criollo 5754* (U), *Vásquez et al. 5914* (U).

Anaxagorea manausensis can well be recognized by its strongly impressed venation on the upper side of the leaves.

1.3 *Anaxagorea phaeocarpa* Mart. in Mart., Fl. bras. 13(1): 40. t. 5, fig. 4. 1841 (p.p.).

Tree or **shrub**, up to 20 m tall, 5–15 cm in diam. Young twigs and petioles densely covered with brown, erect hairs, glabrous with age. **Leaf** petioles 6–22 mm long. Lamina narrowly elliptic to narrowly ovate, 10–36 × 3–12 cm, chartaceous, glabrous above, sparsely covered with erect hairs to glabrous below, base acute to rounded, slightly decurrent, apex acuminate, secondary veins 10–20 on either side of midrib, impressed above, marginal vein present. **Inflorescences** in foliate zone, axillary, or cauliflorous, 1-several-flowered. Pedicels 8–20 mm long, 1–4 mm in diam. Flower buds ovoid, acute. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, erect hairs. **Flowers** creamy yellow. Sepals connate to above the middle, ovate, 5–11 mm long, erect, soon falling off. Petals subequal, narrowly ovate, 10–20 mm long, 4–8 mm wide. **Monocarps** green, maturing brown, 25–38 mm long, densely to sparsely covered with brownish, erect hairs, beak 0.5–1 mm long. **Seeds** 11–13 mm long.

Costa Rica, Panama, Pacific side of Colombia to French Guiana, and Amazonian Brazil.

In non-inundated forest, on sandy or clayey soil.

Flowering in March and December, fruiting in March, April, and June.

5.IV.1967 (fr) *Albuquerque, B. W.P. & Elias, J. 67–11* (INPA); 2.VI.1993 (bd) *Ribeiro, J. E.L. S. et al. 785* (INPA U); 2.XII.1966 (fl) *Rodrigues, W. & Monteiro, O. P. 8278* (INPA); 6.XII.1966 (fr) *Rodrigues, W. & Monteiro, O. P. 8280* (INPA); 30.III.1995, fl. and fr., *Webber, A. C. 1497* (INPA).

Anaxagorea phaeocarpa can be recognized by a cauliflorous inflorescence, ovoid and acute flower buds, and leaves with a marginal vein.

2. *Annona*

Annona L., *Sp. Pl.* 536. 1753.

Trees, shrubs, or rarely **lianas**. Indument of vegetative and floral part consisting

of simple, rarely stellate hairs. **Leaves** distichous, midrib impressed on the upper side, lower side sometimes with domatia. **Inflorescence** 1–5-flowered, non-axillary, sometimes cauliflorous, pedicels with 2 bracts. **Flowers** white, yellow, often with inner side of petals basally red, sometimes reddish, 3-merous, large to small. Sepals 3, valvate. Petals 6, free or more or less connate in a basal tube, subequal, all valvate, or outer ones valvate and inner ones imbricate. Carpels many, with 1 basal ovule. **Fruit** syncarpous, composed of 20 to over 200 carpels, seeds embedded in a fleshy, often edible pulp. **Seeds** shiny brown, ellipsoid to obovoid, not arillate.

Genus of over 100 species occurring all over tropical America, a few in Africa.

Key to the species of *Annona* in Reserva Ducke

1. Liana 5. *A. haematantha*
- 1'. Trees or shrubs.
 2. Leaves with domatia (small, hairy pits on the lower side of the lamina in the axil of the primary and secondary veins).
 3. Leaves with very obscure secondary veins; flowers in the foliate zone; fruit subglobose, ca. 3.5 cm in diam. 6. *A. densicoma*
 - 3'. Leaves with distinct secondary veins; flowers produced from the main trunk (cauliflorous); fruit ovoid-cylindric, 5.5–7 cm long 4. *A. foetida*
 - 2'. Leaves without domatia.
 4. Leaves 8–14 × 3–5 cm, lower side glaucous; young twigs glabrous; petals connate; outer petals 4–7 mm long 1. *A. amazonica*
 - 4'. Leaves 8–35 × 5–12 cm, lower side not glaucous; young twigs densely covered with brown, erect hairs; petals free or only the outer ones connate; outer petals 20–35 mm long.
 5. Flowers dark red to yellowish red; outer petals connate into a basal tube; fruit 3–5 cm in diam., subglabrous, composed of 20–50 carpels, hardly areolate 2. *A. ambotay*
 - 5'. Flowers yellow; petals free; fruit 5–6 cm in diam., densely hairy, composed of over 150 carpels, each ending in a 1–1.5 cm long, pungent apex .. 3. *A. sp. nov. aff. excellens*

2.1 *Annona amazonica* R.E. Fr., *Acta Horti Berg.* 10: 266. 1931.

Tree, 20–25 m tall, 35–60 cm in diam. Young twigs and petioles glabrous. **Leaf** petioles 7–10 mm long. Lamina narrowly elliptic to narrowly obovate, 8–14 cm × 3–5 cm, herbaceous, shiny, glabrous above, glaucous below, sparsely covered with whitish, appressed hairs below, base mostly obtuse, apex shortly acuminate (acumen 5–10 mm long), secondary

veins 10–15 on either side of midrib. **Inflorescences** in foliate zone, 1–5-flowered. Pedicels 3–15 mm long, 1–2 mm in diam. Flower buds depressed globose, triangular in outline as seen from above. Indument of floral parts: outer side of sepals and outer petals rather densely covered with whitish, appressed hairs. **Flowers** yellow, inner and outer petals deep red at inner base. Sepals free, broadly ovate-triangular, 1–2 mm long. Petals all connate with each other

and falling off as a whole, strongly concave. Outer petals broadly ovate-triangular, concave, 4–7 mm long. Inner petals very broadly ovate-triangular, 4–7 mm long. **Fruit** pale glaucous, brownish green, pulp yellow-orange, subglobose, 2.5–4 cm in diam., composed of 50–100 carpels, hardly areolate, subglabrous. **Seeds** 5–8 mm long.

Amazonian Brazil (Pará and Amazonas).

In non-inundated forest, on sandy soil.

Flowering in September and October, fruiting in October.

11.X.1995 (fr) *Miralha, J. M. S. et al.* 302 (GH INPA K MG PEUFR S U ULM); 30.XI.1963 (fr) *Rodrigues, W.* 5554 (INPA); 20.IX.1994 (fl) *Vicentini, A. et al.* 699 (GH INPA K MG PEUFR S U ULM VIC).

Collections studied from outside Reserva Ducke:

Amapá, Mun. Mazagão, 75–80 km WSW of Macapá, 21.XII.1984 (fl) *Daly, D. C. et al.* 3954 (U); Pará, Mun. Tucuruí, 25 km S of Represa Tucuruí, 15.III.1980 (fr) *Plowman, T. C. et al.* 9598 (U); Manaus-Itacoatiara Hwy., km 101, 19.X.1965 (fl and yfr) *Rodrigues, W. & Loureiro, A.* 7139 (INPA); Manaus-Itacoatiara Hwy., km 160, 10.XII.1965 (fl) *Rodrigues, W. & Coêlho, D.* 7346 (INPA).

Annona amazonica can be distinguished from all other species of *Annona* in the flora area by its very tiny flowers with connate outer and inner petals, and its relatively small, pale glaucous fruit.

2.2 *Annona ambotay* Aubl., Hist. pl. Guiane 1: 616. t. 249. 1775.

Tree or **shrub**, 10–18 m tall, 5–30 cm in diam. Young twigs and petioles densely covered with dark brown, erect hairs. **Leaf** petioles 7–12 mm long. Lamina elliptic to obovate, sometimes narrowly so, 8–27 × 5–12 cm, herbaceous, upper side shiny green, veins at upper side and complete lower side densely covered with dark brown, appressed and erect, simple to stellate hairs, base mostly obtuse, apex shortly acuminate to acute, secondary veins 10–15 on either side of midrib.

Inflorescences in foliate zone to ramiflorous, 1–3-flowered. Pedicels 5–20 mm long, 1–3 mm in diam. Flower buds ellipsoid to conical. Indument of floral parts: outer side of sepals and outer petals densely covered with brown (sepals) or whitish (petals), appressed hairs.

Flowers dark red to yellowish red, fragrant. Sepals free, ovate to broadly ovate-deltate, 2–5 mm long. Outer petals connate into a basal tube, oblong-elliptic, 20–30 mm long, 4–8 mm wide, apex acute, apically spreading. Inner petals adnate to outer ones, elliptic, 4–5 mm long, 2–3 mm wide, acute. **Fruit** pale glaucous green, maturing yellow, subglobose, 3–5 cm in diam., composed of 20–50 carpels, hardly areolate, subglabrous. **Seeds** shiny brown, 10–15 mm long.

Amazonian Colombia, Venezuela, Peru, Brazil, and Bolivia, and the three Guianas.

In non-inundated forest, mostly on clayey soil.

Flowering from June to August, fruiting in October.

Local name: envira-cajú, envira-taia.

30.VIII.1996 (fr) *Assunção, P. A. C. L. et al.* 402 (INPA); 7.V.1974 (st) *Coêlho, D.* INPA s/n (INPA46803); 11.X.1995 (fr) *Miralha, J. M. S. et al.* 303 (INPA K MG U ULM); 11.VII.1994 (bd) *Nascimento, J. R. & Pereira, E. C.* 533 (INPA K MG S U UFMT ULM); 6.VI.1993 (fl) *Ribeiro, J. E. L. S. et al.* 886 (INPA K MG U ULM); 29.VII.1966 (fl) *Rodrigues, W. & Monteiro, O. P.* 8204 (INPA); 5.VIII.1966 (fl) *Rodrigues, W. & Monteiro, O. P.* 8214 (INPA); 25.VII.1995 (fl) *Sothers, C. A. & Assunção, P. A. C. L.* 528 (INPA K MG MONYRB SPU ULM); 23.VII.1968 (fl) *Souza, J. A.* 53 (INPA).

Annona ambotay can be recognized by its reddish flowers with petals connate into a basal tube, and by its large leaves in which the midrib and secondary veins of the upper side are densely covered with dark brown hairs.

2.3 *Annona* sp. nov. ined. aff. *excellens* R.E. Fr., Acta Horti Berg. 10: 215. t. 10. 1931.

Tree, 6–12 m tall, 8–15 cm in diam. Young twigs and petioles densely covered with dark brown, erect hairs. **Leaf** petioles 5–10 mm long. Lamina narrowly obovate, 20–35 cm long, 10–12 cm wide, coriaceous, midrib densely covered with brown, erect hairs above, densely covered with brown, erect hairs below, base acute to obtuse, apex acuminate (acumen 10–15 mm long), secondary veins 10–16 on either side of midrib. **Inflorescences** in foliate zone, leaf-opposed or terminal, 1-flowered. Pedicels 15–20 mm long, to 6 mm in diam.

Flower buds narrowly ovoid. Indument of floral parts: outer side of sepals and outer petals covered with a velutinous indument of brown, erect hairs. **Flowers** yellow. Sepals broadly ovate-triangular, 25–35 mm long, prominently veined. Outer petals ovate-triangular, 25–35 mm long, 20–30 mm wide, slightly acuminate to acute, to 5 mm thick, midrib prominent. Inner petals broadly ovate to obovate, 20–25 mm long, 15–20 mm wide, rounded. **Fruit** pale glaucous green when ripe, with white, very sweet and edible pulp, ovoid, 5–6 cm in diam., composed of over 150 carpels, each carpel ending in a pungent apex 1–1.5 cm long, densely covered with whitish, appressed hairs. **Seeds** shiny brown, 13–18 mm long.

Amazonian Peru and Brazil.

In non-inundated forest, on clayey or sandy soil.

Flowering in June, fruiting in October.

Local name: envireira.

15.XII.1995 (fr) *Assunção, P. A. C. L. & Pereira, E. C. 264* (INPA); III.1997 (fl) *Ribeiro, J. E. L. S. & Pereira, E. C. 1883* (INPA U); 16.VI.1964 (fl) *Rodrigues, W. & Loureiro, A. 5913* (INPA); 12.I.1995 (fr) *Sothers, C. A. & Pereira, E. C. 719* (INPA U).

Specimens studied from outside Reserva Ducke: Manaus-Itacoatiara Hwy., km 155, 3.IX.1971 (fr) *Coêlho, L. & Monteiro 136* (INPA); Manaus-Itacoatiara Hwy., Rio Castanho, Igarapé do Tupanazinho, 17.VI.1972 (fl) *Silva, M. F. et al. 768* (INPA).

For the description the following additional collection has been used: PERU. Loreto: Jenaro Herrera Arboretum, 25.X.1994 (fr) *Maas, P. J. M. et al. 8203* (U).

Annona sp. nov. aff. *excellens* can be recognized by its hairy fruit, with many carpels (over 150) ending in a long, pungent apex. This species which is still undescribed, has a delicious, sweet fruit, as the first author noticed when tasting it in Peru.

2.4 *Annona foetida* Mart. in Mart., Fl. bras. 13(1): 16. 1841.

Tree or **shrub**, 3–15 m tall, 4–15 cm in diam. Young twigs and petioles densely covered with brown, appressed hairs, glabrous with age. **Leaf** petioles 6–8 mm long.

Lamina dull greyish to dull brown above, elliptic to narrowly obovate, 10–16 × 5–7.5 cm, chartaceous, upper side with impressed secondary veins, lower side with minute pit-shaped domatia completely covered by brown hairs, glabrous on both sides, base mostly acute, apex acuminate (acumen 5–10 mm long), secondary veins 7–10 on either side of midrib. **Inflorescences** cauliflorous, 1–5-flowered. Pedicels 15–25 mm long, 3–5 mm in diam. Flower buds globose. Indument of floral parts: outer side of sepals and outer petals densely covered with greyish white, appressed hairs. **Flowers** creamy yellow. Sepals connate for most of their length, depressed ovate-triangular, 3–5 mm long, finally reflexed. Outer petals ovate-triangular, 20–30 mm long, 20–25 mm wide, 3–4 mm thick, midrib prominent. Inner petals broadly obovate to broadly ovate, concave, 15–20 mm long, 15–20 mm wide. **Fruit** pale glaucous green, maturing brown, ovoid-cylindric, 5.5–7 cm long, 4–5 cm in diam., composed of over 200 carpels, slightly areolate, apiculate (apicules 1–3 mm long), densely covered with brown, appressed hairs. **Seeds** shiny brown, 7–10 mm long.

Amazonian Brazil and Peru.

In non-inundated forest, on sandy to clayey soil.

Flowering in April, July, and October, fruiting in October and November

Local name: envira-atá, envireira, graviola da mata.

6.X.1995 (fr) *Miralha, J. M. S. et al. 268* (INPA K MG U); 10.X.1995 (fr) *Miralha, J. M. S. et al. 293* (INPA K U); 10.X.1995 (fr) *Miralha, J. M. S. et al. 297* (INPA K MG U); 24.XI.1994 (fr) *Nascimento, J. R. et al. 663* (INPA U); 29.IX.1976 (st) *Oliveira, A. R. INPA s/n* (INPA72942); 7.X.1966 (st) *Prance, G. T. et al. 2611* (INPA); 14.XII.1966 (fr) *Prance, G. T. et al. 3642* (INPA); 2.VII.1993 (fl) *Ribeiro, J. E. L. S. et al. 981* (INPA K MG MO NY SP U ULM); 19.VIII.1963 (fl) *Rodrigues, W. 5442* (INPA); 26.VI.1964 (fl) *Rodrigues, W. & Loureiro, A. 5924* (INPA); 3.VII.1964 (fl) *Rodrigues, W. & Loureiro, A. 5930* (INPA); 23.VII.1968 (fl) *Souza, J. A. 52* (INPA); 9.X.1968 (fl) *Souza, J. A. 215*

(INPA); 28.IV.1994 (fl) *Vicentini, A. et al. 510* (G INPA K MG RB U ULM US).

Annona foetida can be recognized by chartaceous leaves with domatia and distinct venation, versus *A. densicoma* with domatia, but coriaceous leaves with obscure venation.

2.5 *Annona haematantha* Miq., *Linnaea* 22: 465. 1849.

Liana, ca. 5 cm in diam. Young twigs and petioles densely covered with brown, erect hairs, glabrous with age. **Leaf** petioles 5–6 mm long. Lamina elliptic to obovate, 12–15 × 5–7 cm, membranaceous, veins at both sides sparsely covered with brownish, appressed hairs, base obtuse, apex shortly acuminate (acumen ca. 5 mm long), secondary veins 10–12 on either side of midrib. **Inflorescences** in foliate zone, 1-flowered. Pedicels ca. 10 mm long, ca. 1 mm in diam. Flower buds not seen. Indument of floral parts: outer side of sepals and outer petals densely covered with white (petals) or brown (sepals), appressed hairs. **Flowers** yellow to red on the outer side, red on the inner side. Sepals free, ovate-triangular, 2–3 mm long. Outer petals connate, tube 5–8 mm long, ca. 10 mm in diam., lobes ovate-triangular, 15–20 mm long, 10–15 mm wide. Inner petals connate, tube ca. 7 mm long, upper margin recurved, lobes erect, narrowly triangular, ca. 2 mm long. **Fruit** not seen.

The Guianas and Amazonian Brazil (near Manaus).

In non-inundated forest, on sandy soil.

Flowering in January, fruit not yet found. 9.I.1995 (fl) *Assunção, P. A. C. L. 132* (INPA K MG NY SPU ULM).

Annona haematantha can be recognized by the fact that it is a liana. Another character to distinguish this species is its basally connate, red flowers, a character only met with in the closely related *A. ambotay*.

It is the only liana in the family occurring in Reserva Ducke! Another liana to be expected would be *Guatteria scandens*, a species not rare in the Guianas and the Brazilian state of Pará.

2.6 *Annona densicoma* Mart. in Mart., *Fl bras.* 13(1): 9. 1841.

Tree or shrub, 3–20 m tall, 6–23 cm in diam. Young twigs and petioles rather densely covered with brownish, appressed hairs, soon glabrous. **Leaf** petioles 6–10 mm long. Lamina dull grey or dull black above, elliptic to obovate to narrowly so, 10–14 × 4–6 cm, coriaceous, upper side glabrous, lower side sparsely covered with appressed hairs, mainly along the midrib, with minute, pit-shaped domatia completely covered by hairs, base acute to obtuse, apex very shortly and bluntly acuminate (acumen 2–10 mm long), secondary veins obscure, 8–10 on either side of midrib. **Inflorescences** in foliate zone, 1–2-flowered. Pedicels 6–12 mm long, 2–4 mm in diam. Flower buds ovoid to broadly ovoid. Indument of floral parts: outer side of sepals and outer petals densely covered with brownish, appressed hairs. **Flowers** pale yellow, inner base of petals reddish. Sepals completely connate into a ring-shaped calyx, 2–5 mm long, persistent in fruit. Outer petals ovate-triangular, ca. 20 mm long, 13–15 mm wide. Inner petals ovate-triangular, ca. 15 mm long, 8–10 mm wide. **Fruit** colour unknown, subglobose, ca. 3.5 cm in diam., composed of 75–100 carpels, slightly areolate, apiculate (apicule pungent, to 2 mm long), sparsely covered with brownish, appressed hairs, becoming glabrous. **Seeds** not seen.

Venezuelan Guayana to Central Amazonian Brazil.

In campinarana forest, on sandy soil.

Local name: graviola-brava.

Only vegetative collections known from Reserva Ducke: Tagged tree numbers 3715 and 3716.

Specimen studied from outside Reserva Ducke: Amazonas, Rio Preto (tributary of Rio Negro), 17.VIII.1996 (fl) *Acevedo R. P. et al. 8416* (U).

Annona densicoma can be recognized by having coriaceous leaves with obscure venation, and by the domatia on the lower side of its lamina.

3. *Bocageopsis*

Bocageopsis R.E. Fr., Acta Horti Berg. 10: 143. 1931.

Trees. Indument of vegetative and floral part consisting of simple hairs. **Leaves** distichous, asymmetrical (one half slightly larger than the other one), midrib mostly raised to flat on the upper side. **Inflorescence** many-flowered, axillary, pedicels with 2 bracts.

Flowers white to creamy yellow, 3-merous, small. Sepals 3, valvate. Petals 6, free, subequal, valvate. Carpels few, with 2 lateral ovules.

Fruit apocarpous, consisting of 1–4, shortly stipitate, indehiscent monocarps. **Seeds** 1–4, brown, ellipsoid to depressed globose, with prominent median rib, surface pitted, not arillate.

Genus consisting of four species occurring in tropical South America.

Key to the species of *Bocageopsis* in Reserva Ducke

1. Leaves glaucous on the lower side, shortly acuminate (acumen *ca.* 5 mm long); monocarps 8–20 mm long 2. *B. pleiosperma*
- 1'. Leaves not glaucous on the lower side, long-acuminate (acumen 10–15 mm long); monocarps 2–8 mm in diam. 1. *B. multiflora*

3.1 *Bocageopsis multiflora* (Mart.) R.E. Fr., Acta Horti Berg. 10: 145. fig. 2a. 1931.

Bocagea multiflora Mart. in Mart., Fl. bras. 13(1): 45. t. 14. 1841.

Tree, 12–32 m tall, 10–65 cm in diam. Young twigs and petioles subglabrous. **Leaf** petioles 3–4 mm long. Lamina narrowly elliptic, 6–12 × 2–3 cm, chartaceous, glabrous above, sparsely covered with white, appressed hairs below, base acute, apex long-acuminate (acumen 10–15 mm long), midrib raised above, secondary veins 12–18 on either side of midrib. **Inflorescences** in foliate zone, axillary, 6–15-flowered. Pedicels 10–20 mm long, 1 mm in diam. **Flower** buds globose. Indument of floral parts: outer side of sepals and outer petals densely covered with white, appressed hairs. **Flowers** white to creamy white. Sepals free, broadly ovate-triangular, *ca.* 1 mm long, persistent on fruit. Petals subequal, ovate to narrowly ovate, 3–4 mm long, 2–3 mm wide. **Monocarps** 2–4, red to orange, or yellow, maturing black, globose, 2–8 mm in diam., subglabrous, rounded to apiculate, wall less than 0.5 mm wide, stipes 1–2 mm long. **Seeds** 1(–2) per monocarp, brown, 6–8 mm in diam., ellipsoid, pitted.

Amazonian Colombia, Venezuela, Peru, Brazil, and Bolivia, and the three Guianas.

In non-inundated forest, on clayey to sandy soil.

Flowering in August, fruiting in February.

Local names: envira-bobó, envira-preta, envira-surucucu, envira-surucucu-folha-miúda. 13.I.1995 (fr) *Assunção, P. A. C. L. 141* (U); 26.III.1996 (fr) *Brito, J. M. 19* (INPAMG U ULM); 18.X.1994 (fl) *Costa, M. A. S. et al. 10* (BM INPA K MBM MG R U UB ULM US); 18.IX.1973 (st) *Coêlho, D. INPA s/n* (INPA42229); 19.I.1990 (st) *Gentry, A. H. & Nelson, B. W. 69297* (INPA); 7.XI.1994 (fr) *Hopkins, M. J. G. & Nascimento, J. R. 1507* (INPA K MG MONY SP U ULM); 21.X.1965 (fl) *Loureiro, A. INPA16446* (INPA); 21.VIII.1963 (fl) *Rodrigues, W. 5450* (INPA); 5.III.1964 (fr) *Rodrigues, W. & Monteiro, O. P. 5725* (INPA); 16.IV.1964 (fr) *Rodrigues, W. & Loureiro, A. 5766* (INPA); 23.II.1996 (fr) *Sothers, C. A. & Pereira, E. C. 804* (IAN INPA K MO NY SP U ULM); 27.IX.1968 (fl) *Souza, J. A. 189* (INPA); 1.XI.1994 (fl. and fr) *Vicentini, A. et al. 764* (INPA K MG MONY RB SPU ULM).

For differences with *B. pleiosperma* see under that species.

3.2 *Bocageopsis pleiosperma* Maas, Proc. Kon. Ned. Akad. Wetensch. C. 89: 249. fig. 1, 3a. 1986.

Tree, 5–28 m tall, 18–40 cm in diam. Young twigs and petioles densely covered with whitish, erect hairs, soon glabrous. **Leaf** petioles 4–6 mm long. Lamina elliptic to narrowly elliptic, slightly asymmetrical, 8–16 × 2.5–4.5 cm, chartaceous, brownish when dried, upper side glabrous, lower side glaucous,

densely covered with minute, whitish, appressed hairs below, base obtuse, apex shortly acuminate (acumen *ca.* 5 mm long), midrib slightly raised to flat above, secondary veins 11–14 on either side of midrib. **Inflorescences** in foliate zone, axillary, basally repeatedly branched, 5–25-flowered. Pedicels 5–18 mm long, 1–2 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals rather densely covered with whitish, erect and appressed hairs. **Flowers** creamy yellow, inner base of petals pinkish, with sweet fragrance. Sepals almost free, very broadly triangular, *ca.* 1 mm long, persistent. Outer petals very broadly to broadly ovate, 3–5 mm long, 2–4 mm wide, concave. Inner petals ovate-triangular, 3–4 mm long, 2–3 mm wide, much thicker than the outer ones, slightly concave. **Monocarps** 1–4, green, maturing yellow to red, globose (1-seeded) to ellipsoid (more-seeded), 8–20 mm long, 8–15 mm wide, subglabrous, rounded, young stipes green, 0–2 mm long. **Seeds** 1–4 per monocarp, horizontally arranged, dull brown, 9–11 mm long, discoid, pitted.

Amazonian Brazil (Amazonas and Pará).

In non-inundated forest, on clayey soil.

Flowering in July and August, fruiting in August to October.

Local names: envira-preta.

1.VII.1966 (fl) *Duarte, A. P. & Coêlho, D.* 9826 (INPA); 4.IX.1997 (fr) *Martins, L. H. P. & Pereira, E. C.* 41 (COL F INPA K MBM MG U UEC ULM); 11.X.1995 (fl) *Miralha, J. M. S. et al.* 300 (COL F INPA K MBM MG U ULM); 15.X.1969 (fr) *Monteiro, O. P.* 7 (INPA); 6.VII.1993 (fl) *Ribeiro, J. E. L. S. et al.* 1045 (INPA K MG MO NY RB SP U ULM); 20.VIII.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 6011 (INPA); 26.VIII.1994 (fr) *Sothers, C. A. et al.* 145 (INPA K MG MO NY RB SP U ULM); 16.VII.1995 (fl) *Sothers, C. A. et al.* 513 (BM INPA K MG R U UB ULM US); 16.I.1996 (fr) *Sothers, C. A. et al.* 744 (BM INPA K MG R U UB ULM US).

Bocageopsis pleiosperma can easily be distinguished from *B. multiflora* by the glaucous lower side of the leaves, which are, moreover, shortly instead of long-acuminate.

4. *Cymbopetalum*

Cymbopetalum Benth., J. Proc. Linn. Soc., Bot. 5: 69. 1860.

A genus of 27 species occurring in tropical America.

4.1 *Cymbopetalum euneurum* N.A. Murray, Syst. Bot. Monogr. 40: 71. fig. 24a-d, 25. 1993.

Tree or shrub, 1–5 m tall, 2.5 cm in diam. Young twigs and petioles sparsely covered with white, appressed, simple hairs, glabrous with age. **Leaves** distichous. Petioles 2–4 mm long. Lamina narrowly elliptic to elliptic, 17–29 × 4.5–9 cm wide, chartaceous, glabrous above, subglabrous to sparsely covered with white, appressed hairs below, base acute, apex acuminate (acumen to 30 mm long), midrib distinctly raised above, secondary veins impressed above, 14–16 on either side of midrib. **Inflorescence** in foliate zone, non-axillary, 1-flowered. Pedicels 30–50 mm long, 1–2.5 mm in diam. Bracts absent. Flower buds depressed ovoid. Indument of floral parts: outer side of sepals and outer petals sparsely to densely covered with white, appressed, simple hairs. **Flowers** whitish green. Sepals 3, free, depressed ovate, 3–4 mm long, valvate. Petals 6, valvate. Outer petals broadly ovate, 15–22 mm long, 12–15 mm wide, veins slightly raised. Inner petals broadly ovate, 20–33 mm long, 15–20 mm wide, margins strongly incurved. **Fruit** apocarpous. Monocarps 15–25, greenish red, cylindrical, curved, and with constrictions, 10–30 mm long, asymmetrically glabrous, minutely apiculate, dehiscent, stipes 5–15 mm long. **Seeds** 1–4, laterally attached, black, ellipsoid, 10–14 mm long, aril orange, covering over half of the seed.

Central Amazonian Brazil.

In non-inundated forest, on sandy or clayey soils.

Flowering from March to June, fruiting from August to February.

Local name: envira.

23.IV.1995 (fr) *Assunção, P. A. C. L. & Pereira, E. C.* 195 (INPA K U); 12.III.1957 (fl) *Coêlho, L.* INPA s/n (holotype INPA5119; isotype S); 27.II.1957 (fr) *Ferreira, E.* 57–38 (INPA); 23.VII.1997 (fr)

Forzza, R. C. 305A (INPA); 10.X.1995 (fl) *Miralha, J. M. S. et al.* 286 (INPA); 10.X.1995 (fr) *Miralha, J. M. S. et al.* 289 (INPA U); 11.IV.1991 (fr) *Ramos, J. F. & Guedes, J.* 1738 (INPA); 17.IV.1962 (fr) *Rodrigues, W. & Chagas, J.* 4400 (INPA); 11.IV.1963 (st) *Rodrigues, W. & Chagas, J.* 5281 (INPA); 16.XII.1996 (fr) *Sothers, C. A. & Silva, C. F.* 960 (INPA U); 15.VI.1993 (fr) *Webber, A. C.* s/n (U); 10.III.1993 (fr) *Webber, A. C.* 1448 (INPA).

Cymbopetalum euneurum can be recognized by its flowers hanging on relatively long pedicels, with thick, boat-shaped inner petals, and dehiscent, constricted, greenish red monocarps.

5. *Diclinanona*

Diclinanona Diels, Notizbl. Bot. Gart. Berlin-Dahlem 10: 174. 1927.

Genus consisting of three species occurring in tropical South America (mainly in the Amazon region).

5.1 *Diclinanona calycina* (Diels) R.E. Fr., Acta Horti Berg. 12: 4. 1934.

Xylopia calycina Diels, Notizbl. Bot. Gart. Berlin-Dahlem 10: 175. 1927.

Tree, 8–30 m tall, 8–30 cm in diam. Young twigs and petioles densely covered with white, appressed, simple hairs, glabrous with age. **Leaves** distichous. Petioles 5–15 mm long. Lamina narrowly elliptic to narrowly obovate, 10–25 × 3–8 cm, chartaceous, shiny and covered with brownish, erect hairs to glabrous above, sparsely to rather densely covered with white, appressed hairs below, mainly along the veins, base acute, decurrent, apex distinctly acuminate (acumen 5–15 mm long), midrib strongly impressed above, secondary veins 14–18 on either side of midrib. **Inflorescences** in foliate zone, axillary, 2–4-flowered, pedicels with 2 bracts. Pedicels 6–15 mm long, 0.5–5 mm in diam. Flower buds ovoid to deltoid to narrowly so. Indument of floral parts: outer side of sepals and outer petals densely covered with silvery white, appressed, simple hairs. **Flowers** greenish yellow to yellow, bisexual or male. Sepals 3, valvate, free, ovate-triangular, 4–6 mm long, persistent in

fruit. Petals 6, valvate, subequal, narrowly oblong-elliptic, 9–13 mm long, 2.5–3 mm wide.

Fruit apocarpous. Monocarps 1–5, green when young, globose, 25–35 mm in diam., woody, sessile, rather densely covered with brown, appressed hairs, indehiscent. **Seeds** 3–8, ellipsoid, shiny brown, 17–20 mm long, laterally attached, not arillate.

Amazonian Venezuela, Brazil, and Peru.

In non-inundated forest, mostly on clayey soil.

Flowering in July and August, fruiting in November.

Local name: envireira.

11.XI.1994 (fr) *Assunção, P.A. C. L.* 82 (INPA KMG MONY RB SP U ULM); 23.VII.1997 (fl) *Assunção, P.A. C. L. et al.* 557A (FIAN INPA K MBM SPF U UEC ULM VEN); 1.VII.1966 (fl) *Duarte, A. P. & Coêlho, D.* 9829 (INPA); 10.VII.1997 (bd) *Martins, L. H. P. et al.* 28 (BM INPA K MGR U UB ULM US); 21.VIII.1961 (fl) *Rodrigues, W. & Lima* 2347 (INPA); 8.X.1968 (fl) *Souza, J.A.* 209 (INPA); 12.VII.1994 (fl) *Vicentini, A. & Assunção, P.A. C. L.* 598 (INPA KMG MONY RB SP U ULM).

Specimens studied from outside Reserva Ducke: Amazonas, Tefé, 21.X.1975 (fl fr) *D. Coêlho & Damião* 6208 (INPA); Amazonas, Rio Cuieiras, Rio Branquinho, 12.IX.1973 (fl) *Prance, G. T. et al.* 17801 (INPA).

Diclinanona calycina looks superficially like *Xylopia* by its flowers with elongate, narrow petals, but it is different by its woody, indehiscent, globose, thick-walled monocarps.

6. *Duguetia*

Duguetia A. St.-Hil., Fl. Brasil. merid. ed. fol. 1: 28. 1841; ed. qu. 1: 35. 1824.

Trees or shrubs. Indument of vegetative and floral part consisting of stellate hairs or stellate scales. **Leaves** distichous, midrib impressed on the upper side. **Inflorescence** 1-many-flowered, non-axillary, sometimes cauliflorous or flagelliflorous, pedicels with 2 bracts. **Flowers** white to yellow, often with inner base of petals reddish, sometimes petals completely red, 3-merous, medium-sized to large. Sepals 3, valvate. Petals 6, free, subequal, imbricate. Carpels many, with 1 basal ovule. **Fruit** pseudosyncarpous (the carpels strongly coherent, but not or only partly

connate), composed of 5 to over 500 carpels, seeds embedded in a fleshy pulp. **Seed** 1 per carpel, mostly dark brown, obovoid, smooth, not arillate.

The genus consists of *ca.* 90 species occurring in tropical America (mainly in the Guianas and the Amazon region) and four species in tropical West Africa.

Key to the species of *Duguetia* in Reserva Ducke

1. Inflorescences produced from flagelliform runners (up to 2 m long), originating from the basal part of the main trunk 3. *D. flagellaris*
- 1'. Tree not flagelliflorous.
 2. Flowers produced from the main trunk (cauliflorous).
 3. Inflorescence 1–3-flowered; sepals 15–30 mm long; leaves generally narrowly obovate 10. *D. trunciflora*
 - 3'. Inflorescence up to 70-flowered; sepals 8–12 mm long; leaves narrowly elliptic to narrowly oblong-elliptic 8. *D. stelechantha*
 - 2'. Flowers produced in the leafy zone or on leafless branches (ramiflorous).
 4. Sepals connate for most of their length, 25–55 mm long.
 5. Fruit 1.5–3 cm in diam., composed of 5–30 carpels, covered with a dense, velutinous indument of brown hairs 1. *D. asterotricha*
 - 5'. Fruit 3–4 cm in diam., composed of 40–70 carpels, glabrous 11. *D. ulei*
 - 4'. Sepals free, generally much shorter.
 6. Flowers red; leaves 8–19 × 2–5 cm; fruiting carpels fused for up to half of their length. 9. *D. surinamensis*
 - 6'. Flowers cream; leaves generally larger; fruiting carpels free.
 7. Fruit 12–15 cm in diam., composed of over 500 carpels; lower side of leaves densely covered with erect hairs, soft to the touch 4. *D. megalocarpa*
 - 7'. Fruit much smaller, composed of 3–100 carpels; lower side of leaves hairy, but not soft to the touch.
 8. Leaves bullate.
 9. Fruit 1.5–2.5 cm in diam., composed of 10–30 carpels 6. *D. pycnastera*
 - 9'. Fruit 2–6 cm in diam., composed of 50–100 carpels 7. *D. riparia*
 - 8'. Leaves not bullate.
 10. Fruit 2–2.5 cm in diam., composed of 10–20 carpels; leaves 8–11 × 2–4 cm 5. *D. arenicula*
 - 10'. Fruit 3–8 cm in diam., composed of 50–100 carpels; leaves 13–25 × 4–7 cm 2. *D. calycina*

6.1 *Duguetia asterotricha* (Diels) R.E. Fr., Acta Horti Berg. 12: 87. 1934.

Aberemoa asterotricha Diels, Verh. Bot. Vereins Prov. Brandenburg 47: 128. 1905.

Tree or **shrub**, 1.5–12 m tall, 3–5 cm in diam. Young twigs and petioles densely covered with stellate hairs, glabrous with age. **Leaf** petioles 3–8 mm long. Lamina narrowly obovate to narrowly elliptic, 16–33 × 5–10 cm, chartaceous, glabrous above, sparsely covered with stellate hairs below, base acute to obtuse, apex acuminate

(acumen 10–25 mm long) to acute, secondary veins 12–18 on either side of midrib, marginal vein present. **Inflorescences** in foliate zone, 1–3-flowered. Pedicels 5–15 mm long, 1–3 mm in diam. Flower buds ovoid. Indument of floral parts: outer side of sepals and outer petals densely to sparsely covered with stellate hairs. **Flowers** white to yellow. Sepals connate for up to half of their length, 25–55 mm long, lobes deltate, distinctly ribbed, persistent in fruit. Petals subequal, narrowly obovate-spathulate, 30–

40 mm long, 8–12 mm wide. **Fruit** green, maturing brownish, subglobose, 1.5–3 cm in diam., basal collar absent, fertile carpels free, 5–30, visible part of carpels very broadly to depressed ovoid, 6–8 mm high, minutely apiculate, with a dense velutinous indument of brown, stellate hairs. **Seeds** 7–10 mm long.

Amazonian Brazil and Peru.

In non-inundated forest, on sandy or clayey soil.

Flowering in January, fruiting in January, June, and August.

Local names: envira, envira-surucucu-damata, envireira.

2.XI.1973 (fl) *Coêlho, D.* INPA42236 (INPA); 16.I.1990 (fr) *Gentry & Revillea 69142* (INPA U); 10.X.1995 (st) *Miralha, J. M. S. et al.* 285 (INPA); 5.VI.1993 (fr) *Ribeiro, J. E. L. S. et al.* 877 (INPAKMG NYU ULM); 30.VIII.1995 (fr) *Ribeiro, J. E. L. S. et al.* 1673 (INPA); 17.VII.1963 (st) *Rodrigues, W.* 5378 (INPA).

Duguetia asterotricha can be distinguished by its connate, persistent sepals which almost completely enclose the velutinous fruit. It can easily be confused with *D. ulei* as both species share strongly connate sepals. They can be distinguished by the characters as shown in the key. Furthermore *D. asterotricha* has stellate hairs on its leaves, flowers, and fruits, while *D. ulei* is covered by stellate scales.

6.2 *Duguetia calycina* Benoist, Not. Syst. (Paris) 4: 57. 1923.

Tree or **shrub**, 1–10 m tall, to ca. 20 cm in diam. Young twigs and petioles densely covered with stellate scales, glabrous with age. **Leaf** petioles 3–10 mm long. Lamina narrowly elliptic, 15–25 × 4–7 cm, chartaceous, glabrous above, sparsely covered with stellate scales below, base obtuse, sometimes acute, apex acuminate (acumen 5–20 mm long), sometimes acute, secondary veins 8–14 on either side of midrib. **Inflorescence** in foliate zone, 1–2-flowered. Pedicels 5–15 mm long, 2–4 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate scales. **Flowers** creamy white, with strong scent. Sepals free, broadly ovate-triangular, 10–17 mm long. Petals subequal,

obovate, 15–30 mm long, 10–20 mm wide. **Fruit** brownish to yellow, ellipsoid to subglobose, 3–8 cm long, 2–4.5 cm in diam., basal collar indistinct, fertile carpels basally fused, 50–100, visible part of carpels pyramidal, 1–8 mm high, apiculate (apicle 1–7 mm long), densely covered with a greyish or brownish indument of stellate hairs. **Seeds** 7–11 mm long.

Venezuela (Amazonas, Táchira), the three Guianas, and Brazil (Amapá, Amazonas, Maranhão, Mato Grosso, Pará).

In non-inundated forest, on sandy soil.

Flowering in April and December, young fruits in December.

Local name: envira.

31.XII.1963 (fl and yfr) *Rodrigues, W. & Monteiro, O. P.* 5646 (INPA); 8.IV.1988 (fl) *Santos, J. L. & Lima, R. P.* 901 (INPA U).

Duguetia calycina has only twice been collected in Reserva Ducke. It is a highly variable species which is very common in the Guianas. It is closely related to *D. riparia*. It can be distinguished from that species by having an indument of stellate scales (vs. stellate hairs in *D. riparia*).

6.3 *Duguetia flagellaris* Huber, Bol. Mus. Goeldi Hist. Nat. Ethnogr. 5: 355. 1909.

Duguetia heteroclada R.E. Fr., Acta Horti Berg. 13: 113. 1941.

Shrub or **tree**, 1.5–10 m tall, 2–10 cm in diam. Young twigs and petioles densely covered with stellate scales, glabrous with age. **Leaf** petioles 2–7 mm long. Lamina narrowly elliptic to narrowly obovate, 15–25 × 4–7 cm, chartaceous, glabrous above, sparsely covered with stellate scales below, base acute to attenuate, apex acuminate (acumen to 15 mm long) to acute, secondary veins 10–20 on either side of midrib, marginal vein present. **Inflorescence** flagelliform, sprouting from the base of the trunk or up to 1.5 m from ground level, with 3–25-flowered rhipidia, 0.4–2 m long. Pedicels 7–10 mm long, 0.5–2 mm in diam. Flower buds broadly ovoid to spheroid. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate scales. **Flowers** dark red, with a sweet scent of

overripe pineapples (*Miralha, Maas et al. 225*). Sepals basally connate, ovate, 6–11 mm long. Petals subequal, elliptic to ovate, 6–20 mm long, 3–8 mm wide, acuminate. **Fruit** pink to brown, subglobose, 3–4.5 cm in diam., basal collar composed of 7–9 sterile carpels, fertile carpels free, 15–30, visible part of carpels depressed ovoid, 4–5 mm high, 3–6-ribbed, apiculate (apicule curved, 2–3 mm long), pungent, densely covered with a brown, velutinous indument of stellate scales. **Seeds** 12–16 mm long.

Amazonian Colombia, Venezuela, Ecuador, Peru, Bolivia, also throughout Brazil (Acre, Amazonas, Espirito Santo, Maranhao, Mat Grosso, Pará, Rondonia, and Roraima).

In non-inundated forest, on clayey to sandy soil.

Flowering in August to November, fruiting in March and April.

Local names: amēju-preto, caniceiro-preto, pina'y. 1.VII.1966 (st) *Duarte, A. P. & Coêlho, D. 9819* (INPA); 5.X.1990 (fl) *Miralha, J. M. S. & Maas, P. J. M. et al. 225* (INPA); 26.VIII.1957 (fl) *Rodrigues, W. 557* (INPA); 27.IV.1961 (fr) *Rodrigues, W. & Lima, J. 2429* (INPA); 1.XI.1972 (st) *Rodrigues, W. 9114A* (INPA); 4.VIII.1976 (st) *Souza, J. A. INPA s.n.* (INPA71805); 21.IX.1995 (fl) *Vicentini, A. & Silva, C. F. 1055* (INPA U); 17.XI.1995 (fl) *Vicentini, A. & Pereira, E. C. 1156* (INPA); 21.IX.1995 (fl) *Webber, A. C. & Silva, C. F.* (INPA U); 30.III.1995 (fr) *Webber, A. C. 1495* (INPA).

Vegetative reproduction occurs through shoots ('saplings') formed on the end of the flagelliform inflorescence (*Berg, C. C. P19895; Maas, P. J. M. 7776*).

Duguetia flagellaris is mostly a small shrub occurring all over Reserva Ducke. It is unique by its long, flagelliform inflorescence sprouting from the basal part of the main trunk, thus producing its red flowers on the forest floor, sometimes more than 2 m from the mother tree!

6.4 *Duguetia megalocarpa* Maas, Bot. Jahrb. Syst. 118: 203. fig. 7, 8. 1996.

Tree, 10–30 m tall, 10–40 cm in diam. Young twigs and petioles densely covered with a velutinous indument of brownish, stellate hairs, glabrous with age. **Leaf** petioles 1–5 mm long.

Lamina narrowly elliptic, 9–27 × 3–10 cm, chartaceous, upper side shiny, sparsely covered with many-rayed, stellate hairs, lower side densely covered with many-rayed, stellate hairs, soft to the touch, base obtuse, apex acute to shortly acuminate, secondary veins 9–12 on either side of midrib. **Inflorescence** in foliate zone, 1-flowered. Pedicels 10–30 mm long, 5–7 mm in diam. Flower buds deltoid. Indument of floral parts: outer sides of sepals and outer petals densely covered with stellate hairs. **Flowers** greenish. Sepals basally connate, broadly ovate-deltate, 15–20 mm long. Petals subequal, obovate-elliptic, young ones 20–30 mm long, 13–15 mm wide, midrib distinctly raised on the outer side. **Fruit** green to greenish yellow, globose, 12–15 cm in diam., basal collar composed of 20–25 sterile carpels, fertile carpels free, over 500, visible part of carpels oblong, strongly flattened, 25–30 mm high, acute, prominently 4–6-ribbed, rather densely covered with stellate hairs. **Seeds** ca. 27 mm long, apiculate.

Amazonian Brazil (Acre, Amazonas, and Pará).

In non-inundated forest, on sandy to clayey soil.

Flowering in August, fruiting in February, April and November.

Local names: envira-caju, envireira. 24.IV.1998 (fr) *Assunção, P. A. C. L. & Silva, C. F. 4641* (INPA); 27.II.1961 (fr) *Rodrigues, W. & Coêlho, L. 2169* (INPA RB S U); 25.XI.1964 (fr) *Rodrigues, W. & Loureiro, A. 6762* (INPA U US); 8.VIII.1968 (fl) *Souza, J. A. 87* (INPA).

Duguetia megalocarpa is unique in the genus by its gigantic fruit of up to 15 cm in diam., which is composed of an extremely high number of carpels of over 500, and by its leaves with a shiny upper side, and a lower side densely covered with large, stellate hairs.

6.5 *Duguetia arenicola* Maas, Bot. Jahrb. Syst. 121: 466. fig. 1–3. 1999.

Shrub or treelet, 1.5–4 m tall, 2–5 cm in diam. Young twigs and petioles densely covered with stellate hairs and stellate scales, glabrous with age. **Leaf** petioles 2–3 mm long. Lamina narrowly elliptic to narrowly obovate, 8–11 × 2–

4 cm, chartaceous, glabrous above, sparsely covered with stellate hairs and stellate scales below, base acute, apex long-acuminate (acumen 10–15 mm long), secondary veins 7–10 on either side of midrib. **Inflorescence** in foliate zone, 1–5-flowered. Pedicels 2–11 mm long, 1.5–2.5 mm in diam. Flower buds broadly ovoid. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate hairs and stellate scales. **Flowers** cream to yellow. Sepals free, ovoid-triangular to broadly so, 5–20 mm long. Petals subequal, obovate to narrowly elliptic, 14–27 mm long, 7–14 mm wide. **Fruit** yellowish green, subglobose, 2–2.7 cm long, 1.5–3.2 cm in diam., basal collar composed of 6–7 almost totally reduced sterile carpels, fertile carpels free, 10–20, visible part of carpels pyramidal, ca. 5 mm high, apiculate (apicule to 2 mm long), pungent, densely covered with stellate scales and hairs. **Seeds** 8–12 mm long.

Known only from the Manaus area.

In non-inundated forest, on sandy soil.

Flowering specimens not seen, fruiting in October.

26.X.1995 (fr) *Ribeiro, J. E. L. S. et al.* 1748 (INPA K MG MONY RB SPU ULM); 10.VII.1998 (bd) *Ribeiro, J. E. L. S. & Assunção, P. A. C. L.* 1977 (INPA U).

Duguetia arenicola, a species of which the stems are only up to 4 m tall, is recognized by very small leaves (8–11 cm long), and by a small fruit, composed of few (10–20) carpels. Although it is not much collected in Reserva Ducke, it is locally common.

6.6 *Duguetia pycnastera* Sandwith, Bull. Misc. Inform. Kew 1930: 471. 1930.

Tree, 3–10 m tall, 5–25 cm in diam. Young twigs distinctly grooved, like petioles densely covered with pale yellow, stellate hairs, glabrous with age. **Leaf** petioles 2–4 mm long. Lamina elliptic, 9–29 × 4.5–12 cm, chartaceous, bullate, base acute to obtuse, apex long-acuminate (acumen 10–60 mm long), glabrous above, but midrib and the base of the secondary veins densely covered with simple and stellate hairs, sparsely covered with soon falling stellate hairs below, secondary veins 7–13 on either side of midrib. **Inflorescence** in foliate zone, 1–2-

flowered. Pedicels 2–20 mm long, 1–4 mm in diam. Flower buds broadly ovoid, acute. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate hairs. **Flowers** cream, fragrant. Sepals free, ovate, 8–20 mm long. Petals unequal, the outer ones ovate, 11–18 mm long, 4–9 mm wide, the inner ones oblong-ovate to narrowly ovate, 10–16 mm long, 3–7 mm wide. **Fruit** pale green, maturing peach-coloured, subglobose, 1.5–2.3 cm in diam., basal collar composed of 6–7 almost totally reduced, sterile carpels, fertile carpels free, 10–30, visible part of carpels depressed ovoid, 4–5 mm high, rounded, apiculate (apicule to 3 mm long), densely to sparsely covered with soon falling, pale yellow, stellate hairs. **Seeds** 6 mm long.

The three Guianas, Venezuela (Amazonas, Bolívar, Delta Amacuro, Monagas, and Sucre), and Brazil (Amapá, Amazonas, and Pará).

In non-inundated forest, mostly on sandy soil.

Flowering in April, fruiting in April, September, and October.

Local names: ata, envira, envira-preta, envira-surucucu.

1.X.1992 (fr) *Miralha, J. M. S. et al.* 241 (INPA U); 19.IV.1995 (fl) *Ribeiro, J. E. L. S. & Silva, C. F.* 1606 (INPA); 26.X.1995 (fl) *Ribeiro, J. E. L. S. et al.* 1750 (INPA K MG U ULM); 3.X.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 6741 (INPA); 22.IX.1993 (fr) *Webber, A. C.* INPA s.n. (INPA3801).

Duguetia pycnastera can be recognized by its bullate leaves, a character shared with *D. riparia*. From that species it differs by its fruit. It is also distinguished from that species by a very different hair type, namely erect, stellate hairs, versus appressed stellate hairs (to scales) in *D. riparia*. As these characters can only be seen with a good dissecting microscope, we have not used them in the keys.

6.7 *Duguetia riparia* Huber, Bol. Mus. Paraense Hist. Nat. Ethnogr. 3: 416. 1902.

Duguetia insculpta R.E. Fr., Acta Horti Berg. 12: 91, fig. 5a-c. 1934.

Shrub or tree, 3–10 m tall, 2.5–15 cm in diam. Young twigs and petioles densely covered with stellate hairs, glabrous with age. **Leaf** petioles

2–7 mm long. Lamina narrowly ovate to narrowly obovate, 9–33 × 3.5–7.5 cm, chartaceous, bullate, glabrous above, sparsely covered with stellate hairs and stellate scales below, base obtuse, apex acute to acuminate (acumen 5–30 mm long), secondary veins 9–17 on either side of midrib. **Inflorescence** in foliate zone, 1–7-flowered. Pedicels 2–15 mm long, 2–6 mm in diam. Flower buds very broadly ovoid. Indument of floral parts: outer side of sepals densely covered with stellate hairs and stellate scales, outer side of petals densely covered with stellate hairs. **Flowers** cream to yellow. Sepals free, broadly ovoid-triangular, 8–19 mm long. Petals subequal, elliptic to obovate, 12–30 mm long, 10–19 mm wide. **Fruit** brown, broadly ovoid to broadly ellipsoid, 2.2–6 cm long, 2–4 cm in diam., basal collar composed of 13–24 almost totally reduced, sterile carpels, fertile carpels free, 50–100, visible part of carpels very shallowly pyramidal, 2–3 mm high, long-apiculate (apicule 3–15 mm long), densely covered with brown, stellate hairs. **Seeds** 7–13 mm long.

Amazonian Colombia, Bolivia, and Brazil (Acre, Amapá, Amazonas, and Pará), French Guiana, and Suriname.

In non-inundated forest, on sandy soil.

Flowering in October and November, fruiting in March and November.

Local names: envira-preta, makahymyra (collared peccary tree).

5.X.1990 (fl) *Miralha, J. M. S. et al.* 226 (INPA); 10.X.1995 (fl) *Miralha, J. M. S. et al.* 287 (INPA); 12.X.1995 (fl) *Miralha, J. M. S. et al.* 308 (INPA K MG U); 10.XI.1992 (fl) *Webber, A. C.* 1443 (INPA); 11.XI.1992 (fr) *Webber, A. C.* 1444 (INPA); 3.III.1993 (fr) *Webber, A. C.* 1468 (INPA).

Duguetia riparia can be recognized by its bullate leaves. For the differences with the other species of *Duguetia* with bullate leaves, namely *D. pycnastera*, see under that species.

6.8 *Duguetia stelechantha* (Diels) R.E. Fr., *Acta Horti Berg.* 6: 17. 1919.

Aberemoa stelechantha Diels, *Verh. Bot. Vereins Prov. Brandenburg* 47: 129. t. 1. 1905.

Tree, 5–20 m tall, 5–40 cm in diam. Young twigs and petioles densely covered with brown, entire (the large ones) and stellate (the

small ones) scales, glabrous with age. **Leaf** petioles 5–12 mm long. Lamina narrowly elliptic to narrowly oblong-elliptic, 16–35 × 4.5–10 cm, chartaceous, subglabrous above, rather densely covered with entire (the large ones) to stellate (the small ones) scales below, base obtuse to acute, apex acute to acuminate (acumen 5–20 mm long), secondary veins 11–20 on either side of midrib. **Inflorescence** cauliflorous, branched, rhipidia up to 70-flowered, rachis 2.5–15 cm long, woody. Pedicels 10–30 mm long, 1–5 mm in diam. Flower buds broadly to very broadly ovoid-ellipsoid. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate and entire scales. **Flowers** cream, inner base of inner petals reddish, with scent of bananas (*Miralha* 228). Sepals free, broadly ovate-triangular, 8–12 mm long. Petals subequal, narrowly elliptic, 18–40 mm long, 7–17 mm wide. **Fruit** brownish, globose, 4.5–5.5 cm in diam., basal collar composed of 10–15 sterile carpels, fertile carpels fused for the basal third, 50–100, visible part of carpels deltoid, 6–10 mm high, apex pungent, minutely apiculate, prominently 4–6-ribbed, densely covered with stellate scales. **Seeds** 12–16 mm long.

Central Amazonian Brazil and (?) Guyana.

In non-inundated forest, on clayey soil.

Flowering from April to November, fruiting all year through.

Local names: ata-brava, envira-amarela, envira-jararaca, envirataia, envireira, invira.

18.VI.1958 (fl) *Ferreira, E.* 58–312 (INPA); 23.XI.1974 (fr) *Gentry, A. H.* 12810 (INPA); 5.X.1990 (fl) *Miralha, J. M. S. et al.* 228 (INPA); 2.XI.1994 (fr) *Nascimento, J.R. & Pereira, E. C.* 614 (INPA K MG NY SPU ULM); 1.IX.1966 (fl) *Prance, G. T. et al.* 2151 (INPA); 12.IX.1987 (fl) *Pruski, J. F. et al.* 3234 (INPA U); 8.IV.1995 (fr) *Ribeiro, J. E. L. S. et al.* 1593 (INPA U); 8.IV.1995 (fl) *Ribeiro, J. E. L. S. et al.* 1597 (INPA U); 16.VII.1963 (fl) *Rodrigues, W.* 5370 (INPA); 17.VII.1963 (fl) *Rodrigues, W.* 5376 (INPA); 31.VII.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 5981 (INPA); 4.VIII.1966 (fl) *Rodrigues, W. & Monteiro, O. P.* 8209 (INPA); 29.I.1976 (st) *Shima, D. & Mendonça, S.* 22 (INPA); 19.VIII.1968 (fl) *Souza, J. A.* 94 (INPA); 4.III.1994 (fr) *Vicentini, A. et al.* 417 (INPA K MG U); 17.III.1995 (fr) *Webber, A. C.* 1493 (INPA).

Duguetia stelechantha is unique among the species of *Duguetia* occurring in Reserva Ducke in having a cauliflorous, and strongly branched inflorescence with many-flowered (up to 70 flowers) rhipidia, with a woody rachis of up to 15 cm long.

6.9 *Duguetia surinamensis* R.E. Fr., Acta Horti Berg. 12: 50. 1934.

Duguetia caudata R.E. Fr., Acta Horti Berg. 12: 74. t. 7. 1937.

Tree, 10–30 m tall, 20–40(–75) cm in diam. Young twigs and petioles densely covered with pale brown, stellate scales (the largest ones subentire), glabrous with age. **Leaf** petioles 3–10 mm long. Lamina narrowly ovate to narrowly elliptic, 8–19 × 2–5 cm, chartaceous, often blackish when dried, glabrous above, sparsely covered with stellate scales below, base attenuate to acute, apex acuminate (acumen 5–15 mm long) to acute, secondary veins 10–16 on either side of midrib. **Inflorescence** in foliate zone, sometimes ramiflorous, 1–10-flowered. Pedicels 10–30 mm long, 1–15 mm in diam. Flower buds ovoid to depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate scales. **Flowers** cream, maturing dull red, with a strong smell or with a slightly sweet aroma. Sepals basally connate, broadly triangular to triangular, 10–20 mm long. Petals subequal, ovate-triangular to obovate, 15–30 mm long, 6–15 mm wide. **Fruit** brown to yellowish brown, subglobose, 7–12 cm in diam., basal collar composed of 15–17 sterile carpels, fertile carpels fused for up to halfway, 125–200, visible part of carpels depressed ovoid, 2–8 mm high, apex acute to rounded, pungent, apiculate (apicule 3–5 mm long), apicule breaking off and visible part of carpels becoming obtuse with age, slightly 5–6-ribbed, densely covered with a velutinous indument of brown, stellate hairs. **Seeds** 11–17 mm long.

Colombia (Santander), Amazonian Peru, and Brazil, and the three Guianas.

In non-inundated forest, on clayey soil.

Flowering in April, June, and July, fruiting in January, March and October.

Local names: araticum, ata-braba, ata-brava, biribarana, envira, envira-amargosa, envira-deporco, envira-surucucu, envireira, surucucu. 27.VI.1995 (fl) Assunção, P. A. C. L. & Pereira, E. C. 209 (GINPAKMGR ULM); 18.X.1994 (fr) Costa, M. A. S. et al. 11 (INPAKU); 18.IX.1973 (st) Coêlho, D. s.n (INPA42225); 1.VII.1966 (fl) Duarte, A. P. & Coêlho, D. 9823 (INPA); 27.IV.1994 (fl) Ribeiro, J. E. L. S. et al. 1287 (INPAKU); 7.IV.1995 (fl) Ribeiro, J. E. L. S. et al. 1588 (INPAKMG MONYRB SP ULM); 2.III.1996 (fr) Ribeiro, J. E. L. S. & Assunção, P. A. C. L. 1808 (INPAKU); 12.I.1965 (fr) Rodrigues, W. & Monteiro, O. P. 6832 (INPA); 31.I.1997 (fr) Vicentini, A. et al. 1207 (U).

In Southern Guyana the bark is used against snake bites (*Stoffers* 327), and the wood is used for axe handles and bows (*Jansen-Jacobs* 377).

Duguetia surinamensis can be recognized by its small leaves which become blackish when dried, by the reddish flowers (occurring also in *D. flagellaris*), and by its very large fruits of up to 12 cm in diam.

6.10 *Duguetia trunciflora* Maas & Gentry, Feddes Repert. 106 (1995) 5–8: 341, fig. 1. 1996.

Tree or sometimes **shrub**, 2–20 m tall, 5–20 cm in diam. Young twigs and petioles densely covered with brown, stellate scales, glabrous with age. **Leaf** petioles 8–10 mm long. Lamina narrowly obovate, less often narrowly elliptic, 17–35 × 5–11 cm, chartaceous, sometimes subcoriaceous, glabrous above, sparsely covered with stellate scales below, base acute to obtuse, apex distinctly acuminate (acumen 5–25 mm long), secondary veins 10–20 on either side of midrib. **Inflorescence** cauliflorous, sometimes also in the leafy zone, 1–3-flowered. Pedicels 5–20 mm long, 3–5 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate scales. **Flowers** cream, with a smell of bananas. Sepals free, oblong-ovate to ovate-triangular, 15–30 mm long, long-persistent and finally patent. Petals subequal, obovate to elliptic, 20–40 mm long, 11–22 mm wide. **Fruit** green, maturing brown to yellowish brown, globose, 4–5 cm in diam., basal collar composed of 10–15 sterile carpels, fertile carpels free, 60–150, visible part of carpels pyramidal, 2–7 mm high, apex

acute, pungent, sometimes apiculate (apicule to 2 mm long), strongly and prominently 5–6-ribbed, densely covered with a velutinous indument of brownish, stellate scales. **Seeds** 10–16 mm long, distinctly apiculate.

Amazonian Colombia, Venezuela, Peru, and Brazil, and French Guiana.

In non-inundated forest, on sandy soil.

Flowering in October, fruiting in October and November.

9.X.1995 (fl) *Miralha, J. M. S. et al.* 274 (INPA K MG MO U ULM); 9.X.1995 (fl) *Miralha, J. M. S. et al.* 275 (INPA K MG U); 14.IX.1995 (fl) *Ribeiro, J. E. L. S. & Pereira, E. C.* 1709 (INPA K MG U ULM); 26.X.1995 (fl) *Ribeiro, J. E. L. S. et al.* 1751 (INPA U); 23.XI.1992 (fr) *Webber, A. C.* 1445 (INPA).

Duguetia trunciflora looks superficially similar to *D. stelechantha* and has often been confused with that species. It is different from that species, however, in the few-flowered inflorescence, and larger sepals (15–30 mm long vs. 8–12 mm in *D. stelechantha*).

6.11 *Duguetia ulei* (Diels) R.E. Fr., *Acta Horti Berg.* 12: 67. 1934.

Aberemoa ulei Diels, *Verh. Bot. Vereins Prov. Brandenburg* 47: 130. 1905.

Tree or **shrub**, 2–10 m tall, 3–25 cm in diam. Young twigs and petioles rather densely covered with stellate scales, glabrous with age. **Leaf** petioles 4–6 mm long. Lamina narrowly elliptic, 18–36 × 4–12 cm, chartaceous, glabrous above, sparsely covered with stellate scales below, base obtuse to subcordate, apex acuminate (acumen 5–20 mm long), secondary veins 10–16 on either side of midrib. **Inflorescence** in foliate zone, 1–2-flowered. Pedicels 5–15 mm long, 2–3 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with stellate and fimbriate scales. **Flowers** cream, with a mushroom-like odor. Sepals connate almost up to halfway, 25–45 mm long, lobes triangular to ovate-triangular. Petals subequal, 40–50 mm long, 20–30 mm wide, outer petals with prominent midrib, inner ones basally concave enclosing the pollination chamber. **Fruit** white *in vivo* when young, black when dried, globose, 3–4 cm in diam., basal collar absent, fertile carpels free, 40–

70, visible part of carpels deltoid, 1–5 mm high, apiculate (apicule to 2.5 mm long), polygonal, 6-ribbed, glabrous. **Seeds** 9–15 mm long.

Central Amazonian Brazil and Colombia.

In non-inundated forest, often along creeks, mostly on sandy soil.

Flowering in April, August and October, fruiting in February, July, and October.

Local names: envira, envireira.

3.VIII.1991 (fl) *Gottsberger* 11–030891 (U); 6.X.1990 (fr) *Miralha, J. M. S. et al.* 227 (INPA); 1.X.1992 (fl) *Miralha, J. M. S. et al.* 243 (INPA); 19.IV.1995 (fl) *Ribeiro, J. E. L. S. & Silva, C. F.* 1603 (INPA K U); 15.II.1967 (fr) *Rodrigues, W. & Monteiro, O. P.* 8324 (INPA); 4.VI.1995 (fr) *Sothers, C. A. et al.* 483 (U); 12.VII.1994 (fr) *Webber, A. C.* 1484 (HUAM INPA).

Duguetia ulei is superficially very similar to *D. asterotricha*, by its strongly connate sepals. For differences with that species see also under *D. asterotricha*.

7. *Ephedranthus*

Ephedranthus S. Moore, *Trans. Linn. Soc. London, Bot. ser.* 2.4: 296. 1895.

The genus consists of *ca.* 10 species occurring in tropical South America (mainly in NE Brazil).

7.1 *Ephedranthus amazonicus* R.E. Fr., *Acta Horti Berg.* 12: 200. 1934.

Tree, 4–15 m tall, 5–20 cm in diam. Young twigs and petioles subglabrous. **Leaves** distichous. Petioles 4–10 mm long. Lamina narrowly elliptic to narrowly ovate, 15–32 × 5–12 cm, chartaceous, subglabrous on both sides, dull to glaucous green below, base obtuse to acute, apex acute to acuminate, midrib impressed above, secondary veins distinctly impressed above, 10–15 on either side of midrib. **Inflorescences** in foliate zone to ramiflorous, axillary, 1-flowered. Pedicels 5–10 mm long, 2–5 mm in diam. Bracts several, margins ciliate. Flower buds depressed globose to globose. Indument of floral parts: outer side of sepals and outer petals densely covered with minute, white to brown, appressed, simple hairs. **Flowers** cream, male and bisexual flowers present. Sepals 3, imbricate, free, depressed to broadly ovate, 3–5 mm long. Petals 6, imbricate,

subequal, ovate to broadly ovate, 20–25 mm long, 13–18 mm wide., the outer ones slightly and the inner ones strongly concave. **Fruit** apocarpous. Monocarps 75–150, green, maturing yellow, red, or black, indehiscent, ellipsoid, 10–25 mm long, glabrous, rounded to acute, apiculate (apicule to 2 mm long), receptacle woody, 1–2 cm in diam., stipes red, 20–30 mm long. **Seed** 1 per monocarp, basal, pale shiny brown, ellipsoid to broadly ellipsoid, 15–20 mm long.

Amazonian Venezuela, Peru, Brazil, and Bolivia.

In non-inundated forest, on clayey soil.

Flowering from March to May, fruiting from May to September.

Local names: envira, envira-dura, envira-pretta, envira-surucucu, envirataia, envireira, envireira-dura.

12.IV.1957 (fr) *Albuquerque, B. W. P. s.n.* (INPA5553); 10.VI.1995 (fr) *Assunção, P. A. C. L. & Pereira, E. C. 203* (G INPA K MG RB SPU ULM US); 23.VIII.1995 (fr) *Assunção, P. A. C. L. et al. 223* (INPA); 19.VII.1995 (fr) *Costa, M. A. S. & Silva, C. F. 318* (INPA K U); 4.V.1988 (fr) *Coêlho, D. 07-D* (INPA K MG NY U ULM); 5.V.1988 (fl) *Coêlho, D. 13-D* (INPA K MG U ULM); 9.V.1988 (fr) *Coêlho, D. & Lima, R. P. 26-D* (INPA K MG U ULM); 24.VI.1994 (fr) *Hopkins, M. J. G. et al. 1434* (INPA K MG MO U ULM); 2.IX.1966 (fr) *Prance, G. T. et al. 2165* (INPA); 20.III.1967 (fl) *Prance, G. T. et al. 4692* (INPA); 5.VI.1993 (fr) *Ribeiro, J. E. L. S. et al. 856* (INPA K U); 30.VI.1993 (fr) *Ribeiro, J. E. L. S. et al. 938* (INPA U); 19.VII.1994 (fr) *Ribeiro, J. E. L. S. et al. 1339* (INPA); 4.VIII.1994 (fr) *Ribeiro, J. E. L. S. & Silva, C. F. 1383* (INPA K U); 28.IV.1995 (fl) *Ribeiro, J. E. L. S. et al. 1617* (BM INPA K MG R RB U UB ULM US VEN); 30.VIII.1995 (fr) *Ribeiro, J. E. L. S. et al. 1671* (INPA U); 20.VI.1963 (fr) *Rodrigues, W. & Freitas, J. 5312* (INPA); 19.VIII.1963 (fr) *Rodrigues, W. 5440* (INPA); 4.VI.1964 (fr) *Rodrigues, W. & Loureiro, A. 5825* (INPA); 19.VI.1964 (fr) *Rodrigues, W. & Loureiro, A. 5922* (INPA); 8.X.1964 (fr) *Rodrigues, W. & Monteiro, O. P. 6746* (INPA); 20.VII.1965 (fr) *Rodrigues, W. & Monteiro, O. P. 6955* (INPA); 12.VIII.1965 (fr) *Rodrigues, W. & Monteiro, O. P. 7010* (INPA); 17.VIII.1965 (fr) *Rodrigues, W. & Monteiro, O. P. 7019* (INPA); 12.V.1966 (fl) *Rodrigues, W. & Coêlho, D. 7822* (INPA); 26.VII.1968 (fl) *Souza, J. A. 68* (INPA); 5.IV.1994 (fl) *Vicentini, A. et al. 467* (INPA K MG MO SPU ULM); 12.VII.1994 (fr) *Vicentini, A. & Assunção,*

P. A. C. L. 602 (INPA); 8.VII.1995 (fr) *Vicentini, A. et al. 991* (COL F INPA K MG R U UB ULM VEN).

Ephedranthus amazonicus can be recognized by its axillary, cream flowers, with slightly concave outer petals and strongly concave inner petals. In fruit it may be confused with *Guatteria*, but the seeds of both genera are quite different, those of *Ephedranthus* being much larger than in *Guatteria* and horizontally striped, and the receptacle in *Ephedranthus* is woody.

8. *Fusaea*

Fusaea (Baill.) Saff., Contr. U.S. Natl. Herb. 18: 64. 1914.

The genus consists of two species occurring in tropical South America.

8.1 *Fusaea longifolia* (Aubl.) Saff., Contr. U.S. Natl. Herb. 18: 65. fig. 73–74. 1914.

Annona longifolia Aubl., Hist. pl. Guiane 1: 615. t. 248. 1775.

Tree, 5–15 m tall, 5–15 cm in diam. Young twigs and petioles densely covered with brown, erect and appressed, simple hairs, glabrous with age. **Leaves** distichous. Petioles 3–6 mm long. Lamina narrowly elliptic to narrowly obovate, 15–30 × 4–10 cm, chartaceous, brownish when dried, glabrous above, subglabrous below, base acute, sometimes obtuse, apex acuminate (acumen 5–20 mm long), primary vein impressed above, secondary veins 13–16 on either side of midrib, strongly impressed above, marginal vein present, also strongly impressed above. **Inflorescences** in foliate zone to ramiflorous, non-axillary, 1–3-flowered, pedicels with 2 bracts. Pedicels 5–30 mm long, 2–5 mm in diam. Flower buds depressed globose to globose. Indument of floral parts: outer side of sepals and outer petals densely covered with golden yellow, shiny, appressed, simple hairs. **Flowers** greenish yellow to cream. Sepals 3, valvate, completely connate in bud, irregularly rupturing on the start of anthesis, sepals shallowly ovate-triangular, 10–15 mm long, the base persistent and forming a collar. Petals 6, imbricate. Outer petals oblong-ovate, 20–35 mm long, 10–15 mm wide. Inner petals obovate, 30–50 mm long, 10–20 mm wide. Staminodes present between inner petals and

stamens, narrowly obovate, 4–8 mm long. **Fruit** syncarpous, green, subglobose, 3–10 cm in diam., pulp reddish, edible, sweet, composed of over 100 carpels, slightly areolate, minutely apiculate, glabrous, basal collar woody, 13–15 mm in diam. **Seeds** shiny dark brown, 15–18 mm long, obovoid, distinctly apiculate, without an aril.

Amazonian Colombia, Venezuela, Ecuador, Peru, Bolivia, and Brazil, and the three Guianas.

In non-inundated forest, mostly on clayey soil.

Flowering during the whole year, but mainly in December, fruiting from September to January, and in May.

Local names: envira, envira-cheirosa, envira-preta, envira-preta-de-lasca, envira-surucucuda-preta, envireira.

15.XII.1995 (fl) *Assunção, P. A. C. L. & Pereira, E. C.* 269 (BM G IAN INPA K R RB U US); 18.IX.1973 (st) *Coelho, D. s.n.* (INPA42224); 1.VII.1966 (st) *Duarte, A. P. & Coelho, D.* 9817 (INPA); 27.XII.1980 (fr) *Nelson, B. W.* 938 (INPA); 30.XII.1966 (fl) *Prance, G. T. et al.* 3851 (INPA); 12.XII.1968 (fl) *Prance, G. T. et al.* 9022 (INPA); 28.V.1995 (fr) *Ribeiro, J. E. L. S. et al.* 1636 (INPA U); 29.IX.1961 (fr) *Rodrigues, W. & Lima, J.* 2526 (INPA); 16.I.1962 (fr) *Rodrigues, W. & Coelho, D.* 4096 (INPA); 20.XI.1963 (fl) *Rodrigues, W.* 5525 (INPA); 5.XII.1963 (fl) *Rodrigues, W. & Coelho, D.* 5571 (INPA); 16.VII.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5955 (INPA); 29.X.1964 (fr) *Rodrigues, W. & Coelho, D.* 6734 (INPA); 4.XII.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 6764 (INPA); 21.XII.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 6807 (INPA); 21.XII.1964 (fr) *Rodrigues, W. & Monteiro, O. P.* 6809 (INPA); 3.II.1965 (fl) *Rodrigues, W. & Monteiro, O. P.* 6852 (INPA); 29.XII.1965 (fr) *Rodrigues, W. & Monteiro, O. P.* 7373 (INPA); 28.IV.1966 (fl) *Rodrigues, W. & Coelho, D.* 7726 (INPA); 20.X.1967 (fl) *Rodrigues, W. & Monteiro, O. P.* 8303 (INPA); 10.X.1995 (fr) *Sothers, C. A. & Assunção, P. A. C. L.* 650 (INPA K U); 15.I.1996 (fr) *Sothers, C. A. et al.* 740 (INPA);

27.IX.1968 (fl) *Souza, J. A.* 193 (INPA); 10.XII.1993 (fl) *Vicentini, A. et al.* 396 (INPA K MG NY SP U ULM); 4.IV.1994 (fr) *Vicentini, A. & Silva, C. F.* 463 (INPA K U); 11.X.1994 (fl) *Vicentini, A. et al.* 732 (INPA U).

Fusaea longifolia can be recognized in flower by a dense indument of shiny, appressed hairs on the outer side of sepals and petals, and by the presence of relatively large staminodes (larger than the stamens), situated between petals and stamens. In fruit it could be confused with the genus *Annona* because both genera have a syncarpous fruit, but the fruit in *Fusaea* has a basal, woody collar.

9. *Guatteria*

Guatteria Ruiz & Pav., Fl. Peruv. Prodr. 85. 1794, nom. conserv.

Trees or shrubs. Indument of vegetative and floral part consisting of simple hairs. **Leaves** distichous, midrib impressed on the upper side. **Inflorescence** 1-several-flowered, axillary. **Flowers** greenish to yellow, sometimes reddish, 3-merous, medium-sized, pedicels with 2 bracts, with suprabasal articulation (in other genera basal and not visible, here distinct, a few millimeters above the base of the pedicel). Flower buds open for a long period (up to several months) with petals patent, then petals becoming erect and enclosing with their base a so-called pollination chamber. Sepals 3, valvate, free, often reflexed. Petals 6, free, subequal, imbricate. Carpels many, with 1 basal ovule. **Fruit** apocarpous, consisting of many, distinctly stipitate, indehiscent monocarps. **Seed** 1, brown, ellipsoid to obovoid, mostly smooth, not arillate.

The genus consists of ca. 250 species occurring all over tropical America, with the main centre of distribution in the Amazon Region and in the Guianas.

Key to the species of *Guatteria* and *Guatteriopsis* in Reserva Ducke

1. Upper side of leaves verrucose when dried (i.e. covered by tiny wart-like structures).
 2. Upper side of leaves sparsely verrucose, shiny. 9.7. *Guatteria meliodora*
 - 2'. Upper side of leaves densely verrucose, mostly not shiny.
 3. Young twigs covered with a velutinous indument of erect hairs; leaves very large, 30–50 × 10–18 cm; number of monocarps 50–75 9.5. *Guatteria guianensis*
 - 3'. Young twigs covered with appressed hairs; leaves smaller; number of monocarps up to 20.

4. Petiole *ca.* 2 mm long; leaf surface completely verrucose (not leaving any space between the warts). 9.2. *Guatteria aff. decurrens*
- 4'. Petiole 5–12 mm long; leaves densely verrucose (but not covering the whole surface).
5. Leaves dull above, 22–33 × 5–9 cm, midrib rounded below; sepals 5–8 mm long; monocarps not wrinkled 10.1. *Guatteriopsis blepharophylla*
- 5'. Leaves shiny above, 14–23 × 5–7 cm, midrib keeled below; sepals 4–5 mm long; monocarps wrinkled 9.13. *Guatteria* sp. 2
- 1'. Upper side of leaves not verrucose when dried.
6. Leaves coriaceous, upper and lower side differently coloured 9.3. *Guatteria discolor*
- 6'. Leaves chartaceous, 1-coloured.
7. Leaves very large (20–50 × 4–17 cm), marginal vein present 9.6. *Guatteria megalophylla*
- 7'. Leaves much smaller, marginal vein absent.
8. Young twigs, petioles, leaves, and monocarps densely covered with erect, brownish rough hairs 10.3. *Guatteriopsis hispida*
- 8'. Young twigs, petioles, leaves, and monocarps with a different indument or glabrous.
9. Leaf base cordate 10.2. *Guatteriopsis friesiana*
- 9'. Leaf base acute to obtuse.
10. Young twigs, petioles, and lower side of leaves densely covered with a velutinous indument of dark brown, erect hairs; monocarps sessile 9.1. *Guatteria citriodora*
- 10'. Young twigs, petioles, and lower side of leaves with a different indument; monocarps stipitate.
11. Leaf base obtuse, then abruptly narrowed into the petiole; upper side of leaves with prominent secondary venation 9.4. *Guatteria foliosa*
- 11'. Leaf base acute to obtuse, but then not narrowed into the petiole; upper side of leaves with flat to impressed secondary venation.
12. Lower side of leaves densely covered with silvery white hairs 9.10. *Guatteria scytophylla*
- 12'. Lower side of leaves with a different indument.
13. Midrib of upper side of leaves densely covered with hairs; leaves blackish when dried.
14. Leaves with an acute apex; outer petals 10–15 mm long 9.9. *Guatteria procera*
- 14'. Leaves with an acuminate apex (acumen 10–20 mm long); outer petals 15–30 mm long 9.11. *Guatteria anthracina*
- 13'. Upper side of leaves glabrous, leaves not blackish when dried.
15. Leaf base long-decurrent into a narrowly winged petiole; number of monocarps 75–100; leaves black to dark brown when dried 9.8. *Guatteria olivacea*
- 15'. Leaf base acute; number of monocarps 25–50; leaves pale brown when dried 9.12. *Guatteria* sp. 1

9.1 *Guatteria citriodora* Ducke, Arch. Jard. Bot. Rio de Janeiro 5: 104. t. 2, fig. 3a-c. 1930.

Tree, 6–25 m tall, 15–50 cm in diam. Young twigs and petioles densely covered with dark brown, erect hairs, glabrous with age. **Leaf** petioles 4–6 mm long. Lamina narrowly oblong-elliptic to narrowly ovate, 10–18 × 2.5–4 cm wide, chartaceous, subglabrous above, densely covered with dark brown, erect hairs below (hairs often in bundles of 2–4, appearing stellate), base acute, margins often incurved, apex acuminate (acumen 5–10 mm long) to narrowly acute, secondary veins obscure, 15–17 on either side of midrib. **Inflorescences** in foliate zone, 1-flowered. Pedicels 3–7 mm long, 1–2 mm in diam. Flower buds broadly ovoid. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, erect hairs. **Flowers** green to brown, maturing yellow to red. Sepals triangular, 5–7 mm long, soon completely reflexed. Petals unequal, the inner ones twice as wide as the outer ones, narrowly oblong-elliptic to narrowly obovate, 15–20 mm long, 3–9 mm wide. **Monocarps** 5–10, green when young, ellipsoid, 10–15 mm long, densely to sparsely covered with brown, erect hairs, rounded, stipes absent.

Amazonian Peru, Ecuador, and Brazil, and French Guiana.

In non-inundated forest, on clayey soil.

Flowering from April to July, fruiting material not yet found in Reserva Ducke.

Local names: envira, envira-amarela.

6.V.1988 (fl) *Coêlho, D. & Lima, R. P. 22-D* (INPA K MG U); 26.IV.1988 (st) *Ramos, J. F. 1868* (INPA U); 1.VII.1993 (fl) *Ribeiro, J. E. L. S. et al. 964* (BM G INPA K MBM MG R U UB ULM US); 8.IV.1995 (fl) *Ribeiro, J. E. L. S. et al. 1595* (COL F INPA K MG SPF U UEC ULM); 14.VI.1988 (fl) *Santos, J. L. & Lima, R. P. 920* (INPA K MG MO NY SP U ULM); 4.VII.1968 (fl) *Souza, J. A. 33* (INPA).

Guatteria citriodora forms part of a complex of species around *G. schomburgkiana*, and has often been confused with that species. It is different, however, by its dense, brown velutinous indument on the young twigs and the lower side of the lamina, and by its typical leaf base (with incurved margins).

9.2 *Guatteria aff. decurrens* R.E. Fr., Field Mus. Nat. Hist., Bot. Ser. 13(2): 720. 1938.

Tree of unknown height and diam. Young twigs and petioles densely covered with white, appressed hairs, glabrous with age. **Leaf** petioles ca. 2 mm long. Lamina narrowly elliptic to narrowly obovate, 15–17 × 4–5 cm, chartaceous, upper side densely verrucose when dried (warts completely covering the surface), glabrous, lower side rather densely covered with white, appressed hairs, base long-decurrent, ultimate base obtuse, apex acuminate (acumen 10–15 mm long), secondary veins 15–17 on either side of midrib. **Flowers** and **fruit** unknown.

Distribution unknown.

Tagged tree number 3710.

Guatteria aff. decurrens can be distinguished at first glance by its upper leaf side which is completely covered by warts (verrucose) when dried.

It belongs to *Guatteria* Sect. *Mecocarpus*, and it is probably closest to *G. decurrens* from Amazonian Peru, but in that species the hairs on the young twigs are patent (vs. appressed in this species).

9.3 *Guatteria discolor* R.E. Fr., Acta Horti Berg. 12: 509. f. 33a. 1939.

Tree, 13–28 m tall, 25–35 cm in diam. Young twigs and petioles densely covered with dark brown, erect hairs, glabrous with age. **Leaf** petioles 5–10 mm long. Lamina dull dark green above and brown below (in living material) pale greyish black above and dark brown below (in dried material) narrowly elliptic, 19–28 × 5–10 cm, coriaceous, rather densely covered with brown, erect and appressed hairs but soon glabrous above, densely covered with reddish brown, erect hairs below, base acute, decurrent into a winged petiole, margins often incurved, apex acute to slightly acuminate, secondary veins 15–25 on either side of midrib. **Inflorescences** in foliate zone, 1–3-flowered. Pedicels 8–20 mm long, ca. 3 mm in diam. Flower buds ovoid, acuminate, strongly scented. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, erect and appressed hairs. **Flowers** greenish,

maturing yellow. Sepals broadly ovate-triangular, 6–13 mm long, recurved. Petals subequal, narrowly ovate to narrowly obovate, 25–40 mm long, 10–16 mm wide. **Monocarps** 8–15, dark green when ripe, ellipsoid, 20–25 mm long, surface irregularly wrinkled when dried, rather densely to densely covered with brown, erect hairs, slightly apiculate, stipes 2–6 mm long.

Amazonian Brazil and Bolivia, and French Guiana.

In non-inundated forest, on clayey, sometimes sandy soil.

Flowering in October, fruiting from May to August, but mainly found fruiting in June.

10.VI.1995 (fr) *Assunção, P.A. C. L. & Pereira, E. C. 205* (B COL F INPA K MBM MG U UB ULM); 16.VI.1967 (fr) *Gonçalves, G. B. Filho s.n.* (INPA20591); 12.VIII.1976 (fr) *Mello, F. & Ramos, J. F. INPA s.n.* (INPA58308); 12.X.1995 (fl) *Miralha, J. M. S. et al. 304* (INPA K MG MO NY RB SP U ULM); 6.VII.1994 (fr) *Nascimento, J. R. et al. 528* (BM INPA K MG R U ULM); 25.IV.1988 (fr) *Ramos, J. F. 1853* (INPA K MG MO NY RB SP U ULM); 4.VI.1993 (fr) *Ribeiro, J. E. L. S. et al. 830* (INPA K MG U ULM); 7.VI.1993 (fr) *Ribeiro, J. E. L. S. et al. 900* (INPA K MG SP F U ULM US); 16.X.1963 (fl) *Rodrigues, W. 5502* (INPA); 14.V.1965 (fr) *Rodrigues, W. & Monteiro, O. P. 6927* (INPA); 1.X.1972 (fl) *Silva, M. F. & Rodrigues, W. 1035* (INPA); 9.X.1968 (fl) *Souza, J. A. 218* (INPA); 12.X.1994 (fl) *Vicentini, A. & Pereira, E. C. 738* (INPA K MG U ULM); 7.VII.1995 (fr) *Vicentini, A. et al. 987* (INPA K MG P U UEC ULM).

Guatteria discolor can be recognized by its coriaceous, two-coloured leaves with reddish brown indument on the lower side. The monocarps in this species have a wrinkled surface when dried, whereas the monocarps almost all other species of *Guatteria* (*Guatteria* sp. 3 excepted) have a smooth surface.

9.4 *Guatteria foliosa* Benth., London J. Bot. 2: 360. 1843.

Tree, 4–23 m tall, 10–30 cm in diam. Young twigs and petioles sparsely covered with white, appressed hairs, soon glabrous. **Leaf** petioles 8–15 mm long. Lamina narrowly ovate, 8–16 × 3–6 cm, chartaceous, upper side shiny green, all veins prominent on both sides, subglabrous, lower side dull green, sparsely covered with white, appressed hairs, base obtuse, abruptly

decurrent into the petiole, apex acuminate (acumen ca. 10 mm long), secondary veins 10–13 on either side of midrib. **Inflorescences** in foliate zone, 1–2-flowered. Pedicels 20–30 mm long, 1–2 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with pale brown, appressed hairs. **Flowers** green to yellowish green, maturing brown. Sepals broadly ovate-triangular, 3–5 mm long, reflexed. Petals subequal, narrowly oblong to narrowly obovate, 15–25 mm long, 5–10 mm wide. **Monocarps** ca. 35, green, maturing black, ellipsoid, 8–10 mm long, glabrous, apiculate, stipes pale green, maturing red, 15–20 mm long.

Amazonian Colombia, Venezuela, Peru, Bolivia, and Brazil, and Guyana.

In non-inundated forest or secondary forest, on sandy soil.

Flowering in July, September and October, fruiting in September and October.

Local name: envireira.

9.X.1995 (fr) *Miralha, J. M. S. et al. 276* (INPA K MG MO NY RB SP U ULM); 9.X.1995 (fr) *Miralha, J. M. S. et al. 282* (INPA K MG U ULM); 17.IX.1987 (fl) *Pruski, J. F. et al. 3279* (IAN INPA RB SP U ULM); 21.VII.1994 (fl) *Vicentini, A. et al. 638* (INPA K MG NY SP U ULM).

Specimens studied from outside Reserva Ducke: Manaus, Igarapé do Buião, 24.V.1956 (fl) *Coêlho, D. s.n.* (INPA3872); Amazonas, Rio Cuieras, Rio Branquinho, 14.IX.1973 (fl) *Prance, G. T. et al. 17855* (INPA), 15.IX.1973 (fl) *Prance, G. T. et al. 17959* (INPA); Manaus-Caracará, km 39, Estação Experimental de Silvicultura Tropical, 12.IX.1977 (fl) *Ribamar, J. & Ramos, J. F. 173* (INPA).

Guatteria foliosa can be recognized by its shiny leaves with a typical base (obtuse, and then abruptly decurrent into the petiole), and by the leaf venation which is strongly prominent on both sides.

9.5 *Guatteria guianensis* (Aubl.) R.E. Fr., Acta Horti Berg. 12: 505. fig. 32a-c. 1939.

Aberemoa guianensis Aubl., Hist. pl. Guiane 1: 610. t. 245. 1775.

Tree, 5–15 m tall, 4–15 cm in diam. Young twigs and petioles densely covered with a velutinous indument of brownish, erect hairs,

glabrous with age. **Leaf** petioles 5–10 mm long, Lamina narrowly obovate, 30–50 × 10–18 cm, chartaceous, very densely verrucose when dried, and glabrous above, rather densely covered with white, erect to appressed hairs below, base obtuse, decurrent onto a winged petiole, apex acuminate (acumen 5–10 mm long), secondary veins 20–30 on either side of midrib, impressed on the upper side, distinct marginal vein present close to the margin, also impressed on the upper side. **Inflorescences** in foliate zone, 1-flowered. Pedicels 15–20 mm long, 3–4 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with white, appressed hairs. **Flowers** yellow. Sepals ovate-triangular, 7–10 mm long. Petals subequal, oblong-obovate, 20–35 mm long, 10–15 mm wide. **Monocarps** 50–75, green, maturing dark red, ellipsoid, 18–22 mm long, sparsely covered with appressed hairs, rounded, stipes 6–10 mm long.

French Guiana and Amazonian Brazil.

In non-inundated forest, on clayey soil.

Flowering in June, fruiting period unknown.

30.VI.1993 (fl) *Ribeiro, J. E. L. S. et al.* 955 (INPA K MG U).

Specimens studied from outside Reserva Ducke: Reserva Egler, 8.X.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 6745 (U); Manaus, Francês Novo, 3.X.1956 (fl) *Coelho, D. & Chagas, J.* 4220 (INPA U).

Gutteria guianensis can be recognized by its extremely large, verrucose when dried, narrowly obovate leaves.

9.6 *Gutteria megalophylla* Diels, Verh. Bot. Vereins Prov. Brandenburg 47: 127. 1905.

Tree, 5–13 m tall, 5–20 cm in diam.

Young twigs and petioles densely covered with pale brown, appressed hairs, glabrous with age. **Leaf** petioles 5–20 mm long, strongly thickened. Lamina narrowly elliptic, 20–50 × 4–17 cm, chartaceous, glabrous above, subglabrous below, base acute, long-decurrent into the petiole, apex acute to acuminate, secondary veins 15–20 on either side of midrib, strongly impressed at upper side, marginal vein present. **Inflorescences** ramiflorous, 1–2-flowered. Pedicels 4–7 mm long, ca. 2 mm in diam. Flower buds depressed ovoid. Indument of floral parts: outer side of

sepals and outer petals densely covered with brown, appressed hairs. **Flowers** pinkish orange to red, aromatic. Sepals broadly ovate-triangular, 5–7 mm long, reflexed. Petals subequal, ovate to ovate-triangular, 15–27 mm long, 7–13 mm wide, outer ones mostly acute, inner ones obtuse. **Monocarps** 20–25, green, maturing black, ellipsoid, 17–18 mm long, subglabrous, apiculate, stipes 2–5 mm long.

Amazonian Colombia, Ecuador, Peru, Bolivia, and Brazil (Acre, Amazonas, Pará, Rondônia), and Guyana.

In non-inundated forest, on clayey to sandy soil.

Flowering all year round, fruiting from April to August.

Local names: envira, envira-preta, envireira. 18.V.1988 (fl) *Coelho, D.* 60-D (INPA K MG NY U ULM); 2.VI.1993 (fl) *Ribeiro, J. E. L. S. et al.* 778 (INPA K MG MO RB SP U ULM); 19.IV.1995 (fl) *Ribeiro, J. E. L. S. & Silva, C. F.* 1607 (COL INPA K MG U UEC ULM); 19.IV.1995 (fl) *Ribeiro, J. E. L. S. & Silva, C. F.* 1608 (INPA K MG U ULM); 30.IV.1995 (fl) *Ribeiro, J. E. L. S. et al.* 1624 (B INPA K MBM MG SPF U ULM); 10.IV.1997 (fr) *Ribeiro, J. E. L. S. & Silva, C. F.* 1892 (INPA K MG NY SP U); 21.VIII.1957 (fr) *Rodrigues, W.* 591 (INPA); 27.IV.1981 (fl) *Rodrigues, W. & Lima, J.* 2427 (INPA); 28.IV.1961 (fl) *Rodrigues, W. & Lima, J.* 2450 (INPA); 16.V.1963 (fl) *Rodrigues, W. & Coelho, D.* 5225 (INPA); 8.IV.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5735 (INPA); 25.IV.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5799 (INPA); 5.VI.1994 (fr) *Rodrigues, W. & Loureiro, A.* 5839 (INPA); 26.IV.1994 (fl) *Vicentini, A. et al.* 496 (G INPA K MGR U ULM US); 26.I.1995 (fl) *Vicentini, A. et al.* 808 (BM INPA K MG U UB ULM VEN).

Gutteria megalophylla can be recognized by relatively large leaves with a long-decurrent base and a strongly thickened petiole. It differs from the other large-leaved species of *Gutteria*, *G. guianensis*, by having non-verrucose leaves.

9.7 *Gutteria melodora* R.E. Fr., Acta Horti Berg. 12: 500. 1939.

Tree, 18–20 m tall, 10–20 cm in diam. Young twigs and petioles densely covered with white, appressed hairs, soon glabrous. **Leaf** petioles 5–7 mm long. Lamina narrowly obovate to narrowly elliptic, 22–35 × 8–11 cm, chartaceous, upper side shiny, slightly verrucose

when dried, glabrous, lower side sparsely covered with minute, white, appressed hairs, base acute, decurrent into a winged petiole, apex rounded and shortly acuminate (acumen 5–10 mm long), midrib keeled on the lower side, secondary veins 15–25 on either side of midrib, strongly prominent on both sides. **Inflorescences** in foliate zone, 1-flowered. Pedicels 15–25 mm long, 1–3 mm in diam. Flower buds ovoid. Indument of floral parts: outer side of sepals and outer petals densely to rather densely covered with white, appressed hairs. **Flowers** green, maturing yellow, aromatic. Sepals broadly ovate-triangular, 7–10 mm long, reflexed. Petals subequal, ovate to ovate-oblong, 20–25 mm long, 12–15 mm wide. **Monocarps** ca. 100, colour unknown, ellipsoid, 18–20 mm long, subglabrous, apiculate, stipes 6–7 mm long.

Amazonian Peru and Brazil.

In non-inundated forest, on sandy soil.

Flowering in May and September, fruiting in April.

Local name: envira.

2.X.1957 (fl) *Ferreira, E. 57-122* (INPA); 14.IX.1995 (fl) *Ribeiro, J. E. L. S. & Pereira, E. C. 1710* (INPA U); 11.IV.1972 (fr) *Schultes, R. E. & Rodrigues, W. 26118* (INPA); 27.IX.1968 (fl) *Souza, J. A. 192* (INPA).

Guatteria meliodora can be recognized by its shiny, narrowly obovate to narrowly elliptic leaves which become verrucose after drying, and which are prominently veined on both sides.

9.8 *Guatteria olivacea* R.E. Fr., Acta Horti Berg. 12: 423. 1939.

Tree, 10–27 m tall, 20–32 cm in diam. Young twigs and petioles subglabrous. **Leaf** petioles 6–10 mm long. Lamina narrowly ovate to narrowly obovate, 11–23 × 3–9 cm, chartaceous, black to dark brown when dried, glabrous above, sparsely covered with minute, appressed hairs below, base acute, long-decurrent into a narrowly winged petiole, apex acute to shortly acuminate (acumen to 5 mm long), secondary veins 15–20 on either side of midrib, distinctly impressed above. **Inflorescences** in foliate zone, sometimes ramiflorous, 1–3-flowered. Pedicels 10–25 mm long, 1–3 mm in diam. Flower buds depressed

globose. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, appressed hairs. **Flowers** green, maturing yellow. Sepals broadly ovate-triangular, 4–7 mm long, recurved. Petals subequal, elliptic to obovate, 15–22 mm long, 6–12 mm wide. **Monocarps** 75–100, green when young, ellipsoid, 8–13 mm long, sparsely covered with brownish, appressed hairs, apiculate, stipes pale green when young, 15–20 mm long.

Amazonian Brazil.

In non-inundated forest, on clayey soil.

Flowering and fruiting from July to November.

21.X.1965 (fr) *Loureiro, A. s.n.* (INPA6454); 9.X.1995 (fl fr) *Miralha, J. M. S. et al. 272* (GH INPA K MG U ULM); 12.X.1995 (fl) *Miralha, J. M. S. et al. 306* (INPA K MG P U ULM); 12.X.1995 (fr) *Miralha, J. M. S. et al. 307* (INPA K MG U); 20.I.1976 (fr) *Monteiro, O. P. & Ramos, J. F. 45* (INPA); 29.VIII.1994 (fl) *Nascimento, J. R. & Silva, C. F. 584* (B COL F INPA K MBM MG U UEC ULM); 22.XI.1957 (fl fr) *Rodrigues, W. 604* (INPA); 1.III.1966 (fl fr) *Rodrigues, W. & Coêlho, D. 5626* (INPA); 28.VIII.1964 (bd) *Rodrigues, W. & Monteiro, O. P. 6022* (INPA); 24.XI.1964 (fr) *Rodrigues, W. & Monteiro, O. P. 6763* (INPA); 14.XI.1972 (fl) *Silva, M. F. & Rodrigues, W. 1034* (INPA); 20.VII.1994 (fl) *Vicentini, A. et al. 621* (INPA K MG MO NY RB SP U ULM); 13.X.1994 (fl fr) *Vicentini, A. et al. 749* (BM INPA K MG R U UB ULM US).

Guatteria olivacea can be recognized by its leaves which are black to dark brown when dried, and by its long-decurrent leaf base.

9.9 *Guatteria procera* R.E. Fr., Kew. Bull. 1948: 230. 1948.

Tree, 4–22 m tall, 20–25 cm in diam. Young twigs and petioles densely covered with pale brown, appressed hairs, glabrous with age. **Leaf** petioles 5–6 mm long. Lamina narrowly elliptic to narrowly ovate, 7–14 × 2.5–5 cm, chartaceous, black when dried, upper side rather densely to sparsely covered with brownish, appressed hairs, densely so along the midrib, lower side densely covered with appressed, pale brown hairs, base acute to obtuse, apex acute, secondary veins 10–15 on either side of midrib. **Inflorescences** in foliate zone, 1-flowered. Pedicels 10–20 mm long, 1–

2 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with white to brown, appressed hairs. **Flowers** green when young. Sepals broadly ovate-triangular, 4–5 mm long, reflexed. Petals subequal, obovate to narrowly so, 10–15 mm long, 5–10 mm wide. **Monocarps** ca. 50, green when young, obovoid to ellipsoid, 9–10 mm long, sparsely covered with white, appressed hairs, apiculate, stipes red, ca. 15 mm long.

Guyana and Amazonian Brazil.

In non-inundated forest, on clayey soil.

Flowering in October, fruiting in July and August.

Local names: envira-preta, envireira.

5.VII.1993 (fl) *Ribeiro, J. E. L. S. et al. 1024* (INPA U); 20.X.1963 (fl) *Rodrigues, W. 7359* (INPA); 8.VIII.1966 (fl) *Rodrigues, W. & Monteiro, O.P. 8224* (INPA).

Specimens studied from outside Reserva Ducke: Rondônia, km 215 Madeira-Mamoré railroad near Abunã, 6.VII.1968 (fl) *Prance, G.T. et al. 5752* (INPA).

Guatteria procera can be recognized by relatively small leaves, drying black, with prominent brown hairs along the midrib on the upper side of the leaves.

9.10 *Guatteria scytophylla* Diels, Verh. Bot. Vereins Prov. Brandenburg 47: 127. 1905.

Guatteria micans R.E. Fr., Acta Horti Berg. 12: 451. fig. 20b. 1939.

Tree, 3–23 m tall, 4–40 cm in diam. Young twigs and petioles densely covered with brown, appressed hairs, soon glabrous. **Leaf** petioles (including abruptly narrowed leaf base) 10–25 mm long, 2 mm wide. Lamina narrowly elliptic to ovate, 9–20 × 6–10 cm, chartaceous, upper side soon becoming subglabrous, lower side densely covered with greyish white, appressed hairs, base acute to obtuse, apex acuminate (acumen 5–10 mm long), secondary veins 12–16 on either side of midrib. **Inflorescences** in foliate zone to ramiflorous, 1–3-flowered. Pedicels 10–25 mm long, 1–2 mm in diam. Flower buds globose. Indument of floral parts: outer side of sepals and outer petals densely covered with brownish, appressed hairs. **Flowers** green, maturing

cream with reddish apex. Sepals broadly ovate-triangular, 5–6 mm long. Petals unequal, ovate-oblong to obovate, 15–35 mm long, 6–15 mm wide. **Monocarps** 75–100, green when young, maturing red to black, ellipsoid, 8–12 mm long, subglabrous, apiculate, stipes 15–30 mm long. Amazonian Brazil.

In non-inundated forest, mostly on sandy soil.

Flowering in March and April, fruiting from September to January.

Local names: envira-preta, envireira.

20.XI.1987 (fr) *Kubitzki, K. 87–49* (INPA); 9.X.1995 (fr) *Miralha, J.M.S. et al. 277* (BM INPA K MGR U UB ULM US); 1.XII.1976 (st) *Nascimento, J. R. & Mota, C. D. A. s.n.* (INPA66245); 5.I.1977 (fr) *Nascimento, J. R. 293* (INPA); 20.VII.1976 (st) *Oliveira, A. R. s.n.* (INPA 59782); 13.VII.1976 (st) *Oliveira, A. R. s.n.* (INPA72960); 7.IV.1995 (fl) *Ribeiro, J. E. L. S. et al. 1589* (INPA K MG MONYRB SPU ULM); 27.IV.1995 (fl) *Ribeiro, J. E. L. S. et al. 1612* (BM INPA K MGR U UB ULM US); 9.IV.1964 (fl) *Rodrigues, W. & Loureiro, A. 5739* (INPA); 1.XI.1972 (st) *Rodrigues, W. 9115* (INPA); 15.IX.1994 (fr) *Vicentini, A. et al. 694* (INPA K MG MONYRB SPU ULM); 8.III.1979 (fl) *Webber, A. C. 28* (INPA).

Guatteria scytophylla can be recognized by its generally ovate leaves which are densely covered with appressed, whitish hairs on the lower side, giving them a silky appearance, and by their long relatively petioles (10–25 mm long including the decurrent leaf base).

9.11 *Guatteria anthracina* Scharf & Maas, Blumea 51: 118. fig. 1. 2006.

Tree, 3–10 m tall, 9–16 cm in diam. Young twigs and petioles densely covered with brown, appressed hairs, glabrous with age. **Leaf** petioles 3–5 mm long. Lamina narrowly elliptic, 10–20 × 3–6 cm, chartaceous, upper side shiny and blackish when dried, glabrous except for hairy primary and secondary veins, lower side sparsely to rather densely covered with brown, appressed hairs (particularly along the veins), base acute, apex acuminate (acumen 10–20 mm long), secondary veins 10–12 on either side of midrib. **Inflorescences** in foliate zone, 1-flowered. Pedicels 10–25 mm long, 1 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer

petals densely covered with white, appressed hairs. **Flowers** greenish to yellow. Sepals broadly ovate-triangular to deltate, 4–5 mm long. Petals subequal, narrowly oblong to narrowly obovate, 15–30 mm long, 5–10 mm wide. **Monocarps** ca. 50, green, maturing black, narrowly ellipsoid, 8–10 mm long, subglabrous, apiculate, stipes wine-red, 20–25 mm long.

The three Guianas and Amazonian Brazil (Amapá and Amazonas).

In non-inundated forest, mostly on clayey soil.

Flowering from January to April, fruiting all year round.

18.I.1995 (fl) *Assunção, P. A. C. L. 161* (INPA U); 10.VI.1995 (fr) *Assunção, P. A. C. L. & Pereira, E. C. 204* (INPA U); 25.V.1980 (fr) *Davidson, C. & Martinelli, G. 10008* (INPA); 5.VIII.1991, yfr., *Gottsberger, G. 22-050891* (U); 20.I.1976 (bd fr) *Monteiro, O. P. & Ramos, J. F. 53* (INPA); 11.IV.1991 (fl) *Ramos, J. F. & Guedes, J. 1749* (INPA); 27.IV.1988 (fl) *Ramos, J. F. 1871* (INPA U); 10.IV.1995 (fl) *Ribeiro, J. E. L. S. & Pereira, E. C. 1601* (INPA U); 4.IV.1962 (fl) *Rodrigues, W. & Lima, J. 3579* (INPA); 15.III.1994 (fl) *Webber, A. C. 1472* (HUAMINPA).

The recently described *Guatteria anthracina* has so far been confused with *G. foliosa*. It is completely different from that species, however, in its leaves (shortly petiolate, blackish when dried, hairy on the midrib above).

9.12 *Guatteria* sp. 1.

Tree, 3–19 m tall, up to 15 cm in diam. Young twigs and petioles subglabrous. **Leaf** petioles 5–10 mm long. Lamina narrowly elliptic, 14–18 × 4–6 cm, chartaceous, glabrous above, subglabrous below, base acute, apex acuminate (acumen 5–20 mm long), secondary veins 10–13 on either side of midrib. **Inflorescences** in foliate zone, 1-flowered. Pedicels 5–20 mm long, 1–2 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with brownish, appressed hairs. **Flowers** yellow. Sepals broadly ovate-triangular, 4–6 mm long. Petals subequal, oblong to ovate, 15–20 mm long, ca. 10 mm wide. **Monocarps** 25–50, green, maturing

wine-red, ellipsoid, 7–10 mm long, subglabrous, apiculate, stipes pinkish, 7–15 mm long.

Known only from Reserva Ducke.

In non-inundated forest, on sandy to clayey soil.

Flowering in April and June, fruiting in April, June, and July.

Local name: envira.

5.VI.1993 (fl) *Ribeiro, J. E. L. S. et al. 850* (INPA U); 6.VII.1993 (fr) *Ribeiro, J. E. L. S. et al. 904* (INPA U); 14.VI.1988 (st) *Santos, J. L. & Lima, R. P. 927* (INPA U); 26.IV.1994 (fl) *Vicentini, A. et al. 501* (INPA U).

Guatteria sp. 1 can be recognized by its almost glabrous leaves and its monocarps which become pale brown when dried.

9.13 *Guatteria* sp. 2

Tree, ca. 13 m tall, 15 cm in diam., with small buttresses. Young twigs and petioles black, densely covered with brown, appressed hairs, soon glabrous. **Leaf** petioles 10–12 mm long. Lamina narrowly ovate to narrowly oblong-elliptic, 14–23 × 5–7 cm, chartaceous, upper side shiny, verrucose when dried, glabrous, lower side sparsely covered with pale brown, appressed hairs, base acute to obtuse, apex acuminate (acumen 10–15 mm long), midrib flat above, keeled below, secondary veins inconspicuous, 15–17 on either side of midrib. **Inflorescences** in foliate zone to ramiflorous, 1–3-flowered. Pedicels 5–15 mm long, 1–3 mm in diam. Flower buds not seen. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, appressed hairs. **Flowers** green when young. Sepals broadly ovate-triangular, 4–5 mm long, reflexed. Petals subequal oblong to obovate, 12–13 mm long, 6–8 mm wide. **Monocarps** 15–20, green, maturing cream, ellipsoid to obovoid, 13–15 mm long, subglabrous, surface strongly wrinkled when dried, rounded, stipes 3–10 mm long.

Known only from Reserva Ducke.

In non-inundated forest, on clayey soil.

Flowering and fruiting in August.

8.VIII.1995 (fl fr) *Sothers, C. A. et al. 540* (INPA U).

Guatteria sp. 2 can be recognized by its verrucose leaves with very inconspicuous venation, and few, ellipsoid to obovoid, wrinkled monocarps

10. *Guatterioipsis*

Guatterioipsis R.E. Fr., Acta Horti Berg. 12: 108. 1934.

Small **trees** or **shrubs**. Indument of vegetative and floral part consisting of simple hairs. **Leaves** distichous, midrib impressed on the upper side. **Inflorescence** 1–2-flowered, axillary. **Flowers** cream, 3-merous, medium-sized, pedicels with 2 bracts, articulation suprabasal (*cf. Guatteria*). Sepals 3, valvate. Petals 6, free, subequal, valvate. Carpels many, with 1 basal ovule. **Fruit** apocarpous, consisting of 5–15, stipitate, indehiscent monocarps. **Seed** 1, brown, narrowly ellipsoid, slightly grooved, not arillate.

The genus consists of 4 species occurring in tropical South America. It is very difficult to distinguish the genera *Guatteria* and *Guatterioipsis* as the only difference is the aestivation of the petals, being imbricate in *Guatteria* and valvate in *Guatterioipsis*. As this is very difficult to observe in the field as well in the herbarium, we have, for practical reasons, included the species of *Guatterioipsis* in the key to *Guatteria*.

10.1 *Guatterioipsis blepharophylla* (Mart.) R.E. Fr., Acta Horti Berg. 12: 110. t. 6. 1934.

Guatteria blepharophylla Mart. in Mart., Fl. bras. 13(1): 38. 1841.

Annona sessiliflora Benth., Hooker's J. Bot. Kew Gard. Misc. 5: 8. 1853.

Guatterioipsis sessiliflora (Benth.) R.E. Fr., Acta Horti Berg. 12: 109. 1934.

Tree, 3–6 m tall, *ca.* 5 cm in diam. Young twigs and petioles densely covered with pale brown, appressed hairs, glabrous with age. **Leaf** petioles 5–10 mm long, thickened. Lamina mostly narrowly oblong-elliptic, 22–33 × 5–9 cm, chartaceous, upper side densely verrucose when dried, glabrous, lower side rather densely covered with pale brown, appressed hairs, base acute, decurrent, apex long-acuminate (acumen 10–30 mm long), secondary veins 16–23 on either side of midrib. **Inflorescences** in foliate zone, 1–2-flowered. Pedicels 5–7 mm long, 1–2 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals

and outer petals densely covered with silvery white, appressed hairs. **Flowers** whitish yellow, with pleasant smell. Sepals free, ovate-triangular, 5–8 mm long. Petals subequal, elliptic to obovate, 10–15 mm long, 7–12 mm wide. **Monocarps** 10–15, green, maturing yellow to black, narrowly ellipsoid, 17–25 mm long, sparsely covered with white, appressed hairs, apiculate, stipes 5–6 mm long.

Amazonian Peru, Ecuador, Venezuela, and Brazil.

In non-inundated forest, on clayey soil.

Flowering from March to July, and in October, fruiting in June and July.

Local name: envireira.

6.X.1995 (fl) *Miralha, J. M. S. et al.* 270 (INPA U); 14.VI.1994 (fr) *Ramos, J. F.* 2827 (INPA K MG NY RB SPU ULM); 16.VI.1994 (fl) *Ramos, J. F.* 2844 (INPA K U); 5.VII.1993 (fl) *Ribeiro, J. E. L. S. et al.* 1030 (INPA K MG NY U ULM); 14.VIII.1957 (fl) *Rodrigues, W.* 534 (INPA); 19.VII.1963 (fl) *Rodrigues, W.* 5384 (INPA); 3.VI.1964 (fl) *Rodrigues, W. & Loureiro, A.* 5827 (INPA); 19.VI.1995 (fl) *Souza, M. A. D. & Silva, C. F.* 37 (INPA K U); 21.V.1996 (fl) *Vicentini, A. & Assunção, P. A. C. L.* 1181 (INPA K MG MO RB U).

Guatterioipsis blepharophylla can be recognized by its long-acuminate, verrucose leaves, and its relatively small flowers which are covered with silvery white, long, appressed hairs.

10.2 *Guatterioipsis friesiana* W.A. Rodrigues, Acta Amazonica 11(1): 49. fig. 1. 1981.

Tree, 3–10 m tall, 4–10 cm in diam. black. Young twigs and petioles densely covered with a velutinous indument of blackish brown, minute, erect, long-persistent hairs. **Leaf** petioles 2–5 mm long. Lamina narrowly elliptic to narrowly oblong-ovate, 14–25 × 5–8 cm, chartaceous, glabrous above, sparsely covered with brown, appressed hairs below, base cordate, apex acute to acuminate (acumen 10–15 mm long), secondary veins very obscure, 10–20 on either side of midrib. **Inflorescences** in foliate zone, 1–2-flowered. Pedicels 5–10 mm long, 2–3 mm in diam. Flower buds ovoid, acute. Indument of floral parts: outer side of sepals and outer petals densely covered with dark brown, appressed

hairs. **Flowers** cream. Sepals free, triangular, 10–16 mm long, patent. Outer petals narrowly ovate-triangular, 20–25 mm long, 8–12 mm wide. Inner petals narrowly oblong-ovate, 15–19 mm long, 6–7 mm wide. **Monocarps** 7–10, green, maturing red, ellipsoid, 19–23 mm long, sparsely covered with minute, appressed and erect hairs, apiculate (apicule *ca.* 2 mm long), stipes 1–3 mm long.

Amazonian Brazil.

In non-inundated forest, on clayey to sandy soil.

Flowering in February and March, fruiting from March to June.

Local name: envireira.

10.X.1995 (st) *Miralha, J. M. S. et al.* 283 (INPA); 10.X.1995 (st) *Miralha, J. M. S. et al.* 284 (INPA); 1.III.1994 (fr) *Ribeiro, J. E. L. S. & Pereira, E. C.* 1208 (INPA); 12.VI.1964 (fr) *Rodrigues, W. & Loureiro, A.* 5908 (INPA).

Collections studied from outside Reserva Ducke: Mun. Manaus, Distr. Agropecuário da SUFRAMA, Fazenda Porto Alegre, 25.II.1992 (fl) *Dick, C. & Palheta, E. S.* (INPA U); Fazenda Dimona, 26.III.1992 (fl) *Dick, C.* 79 (INPA U); Transect 9, 19.I.1990 (st) *Gentry, A. H. & Nelson, B. W.* 69284 (INPA U); Reserva 1501, 7.II.1990 (fl) *L. Cunha et al.* 932 (INPA U); Estrada ZF-3, km 24, Reserva 1202, 27.V.1980 (fr) *Lima & Zimmerman* 505 (INPA).

Guatterioopsis friesiana can be recognized by its shortly petiolate leaves with a cordate base, very obscure secondary veins, by the velutinous indument of its young twigs, and very shortly pedicellate flowers.

10.3 *Guatterioopsis hispida* R.E. Fr., Acta Horti Berg. 12: 111. t. 7–8. 1934.

Tree or **shrub**, 2.5–6 m tall, *ca.* 5 cm in diam. Young twigs and petioles densely covered with brown, rough, erect, persistent hairs. **Leaf** petioles 3–5 mm long. Lamina narrowly oblong-elliptic, 13–27 × 3–6 cm, chartaceous, glabrous, and strongly verrucose when dried above, rather densely to sparsely covered with brown, rough, erect hairs below, base obtuse to acute, apex long-acuminate (acumen 10–25 mm long), secondary veins 10–16 on either side of midrib. **Inflorescences** in foliate zone, 1-flowered. Pedicels to 8 mm long, to 3 mm in diam. Flower

buds not seen. Indument of floral parts: outer side of sepals and petals very densely covered with long, brown, appressed hairs. **Flowers** yellow, with pleasant smell. Sepals free, broadly ovate-triangular, 8–10 mm long. Outer petals ovate-triangular, 18–20 mm long, 11–14 mm wide. Inner petals ovate-triangular, 15–17 mm long, *ca.* 10 mm wide. **Monocarps** *ca.* 50, green, maturing wine-red, narrowly ellipsoid, 25–30 mm long, densely covered with brown, rough, erect hairs, apiculate (apicule to 2 mm long), stipes 5–8 mm long.

Amazonian Brazil.

Mostly in campinarana forest, on sandy soil.

Flowering time unknown, fruiting in June and July.

Local name: envireira.

s.d. (fr) *Assunção, P. A. C. L.* 313 (INPA K MG MO NY RB SPU); 13.II.1996 (fl) *Campos, M. T. V. A. et al.* 480 (INPA K NY U); 30.VI.1976 (fr) *Monteiro, O. P.* 1263 (INPA); 4.VI.1993 (fr) *Ribeiro, J. E. L. S. et al.* 845 (GIAN INPA MBM U UB ULM); 4.VII.1993 (fr) *Ribeiro, J. E. L. S. et al.* 1014 (INPA); 5.VII.1993, fr. *Ribeiro, J. E. L. S. et al.* 1034 (INPA U).

Guatterioopsis hispida can be distinguished from all other Annonaceae occurring in Reserva Ducke by its indument of erect, rough, brown hairs on young twigs, leaves, and fruit.

11. *Malmea*

Malmea R.E. Fr., Ark. Bot. 5(4): 3. 1905.

The genus consists of 14 species occurring all over tropical America, with the center of distribution in western South America.

11.1 *Malmea manausensis* Maas & J.M.S. *Miralha, Bot. Jahrb. Syst.* 115: 85. fig. 2. 1993.

Shrub or **tree**, 2.5–8 m tall, 3–8 cm in diam. Young twigs and petioles sparsely covered with pale brown, appressed, simple hairs, glabrous with age. **Leaves** distichous. Petioles 5–8 mm long. Lamina narrowly elliptic to narrowly obovate, 15–23 × 4–7 cm, chartaceous, shiny and glabrous above, sparsely covered with appressed hairs below, base acute, apex acuminate (acumen 5–25 mm long), midrib impressed above, secondary veins 10–15 on either side of midrib, prominent above, at almost right angles to the midrib.

Inflorescences in foliate zone, non-axillary, 1-flowered, pedicels with 2 bracts. Pedicels 30–55 mm long, 1–2 mm in diam. Flower buds globose. Indument of floral parts: outer side of sepals and outer petals sparsely to rather densely covered with whitish appressed hairs. **Flowers** greenish outside, cream inside. Sepals 3, imbricate, free, deltate, 3–4.5 mm long, slightly reflexed. Petals 6, imbricate, subequal, concave, broadly ovate, 20–22 mm long, 18–19 mm wide, margins ciliate. **Fruit** apocarpous. Monocarps 10–15, green, ovoid, indehiscent, 12–16 mm long, glabrous, obtuse, stipes red to purple-red, 15–25 mm long. **Seed** 1, reddish brown, ellipsoid, 14–18 mm long, not arillate.

Endemic to Reserva Ducke.

In non-inundated forest, on clayey soil.

Flowering in June, August, October, fruiting in March, April, and November.

10.X.1995, fl. and yfr., *Miralha, J. M. S. et al.* 292 (INPA); 24.XI.1993 (fr) *Ribeiro, J. E. L. S. et al.* 1180 (INPA KMGU); 15.VIII.1983, yfr., *Morawetz & D. Coêlho* 21–15883, 22–15883 (U); 14.XII.1994 (fr) *Ribeiro, J. E. L. S. & Silva, C. F.* 1520 (INPA KU); 10.V.1995 (fl) *Ribeiro, J. E. L. S. et al.* 1826 (INPA KMGNYU); 18.IV.1961 (fr) *Rodrigues, W. & Lima, J.* 2393 (INPA); 31.XII.1963 (fr) *Rodrigues, W. & Monteiro, O. P.* 5645 (INPA); 19.VIII.1964 (fl) *Rodrigues, W. & Monteiro, O. P.* 6002

(INPA); 12.V.1966 (fr) *Rodrigues, W. & Coêlho, D.* 7823 (INPA, holotype); 2.VI.1966 (fl) *Rodrigues, W. & Coêlho, D.* 7888 (INPA).

Malmea manausensis can be recognized by its leaves which are shiny above and which have almost straight secondary veins, and by its pedicels up to 55 mm long.

12. *Pseudoxandra*

Pseudoxandra R.E. Fr., Acta Horti Berg. 12: 222. 1937.

Trees. Indument of vegetative and floral part consisting of simple hairs. **Leaves** distichous, midrib raised on the upper side, with a marginal vein. **Inflorescence** 1–4-flowered, axillary, sometimes ramiflorous, pedicels with 2–5 ciliate bracts. **Flowers** cream, 3-merous, small. Sepals 3, free, imbricate. Petals 6, free, subequal, imbricate. Carpels many, with 1 lateral ovule. **Fruit** apocarpous, consisting of 5–30, thick-walled, stipitate, indehiscent monocarps. **Seed** 1, lateral, brown, subglobose to depressed globose, with a prominent median rib, surface pitted, not arillate.

The genus consists of 22 species, occurring throughout tropical South America.

Key to the species of *Pseudoxandra* in Reserva Ducke

1. Leaves coriaceous, venation hardly visible; flowers glabrous 1. *P. obscurinervis*
 1'. Leaves chartaceous, with distinct venation; flowers densely covered with appressed, whitish hairs 2. *P. duckei*

12.1 *Pseudoxandra obscurinervis* Maas, Blumea 48: 232. fig. 11. 2003.

Tree, 6–25 m tall, 8–20 cm in diam. Young twigs glabrous. **Leaf** petioles 5–10 mm long. Lamina narrowly oblong-elliptic, 9–16 × 2–4 cm, coriaceous, shiny, upper side densely verrucose and dark brown when dried, glabrous on both sides, base obtuse, basal margins abruptly incurved, apex acuminate (acumen 10–15 mm long) to acute, secondary veins very obscure and not countable, marginal vein obscure, present, 1–1.5 mm from the margin. **Inflorescences** ramiflorous, 1–4-flowered. Pedicels including peduncles 3–6 mm long, 1–

3 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals glabrous. **Flowers** cream. Sepals depressed ovate, ca. 2 mm long. Outer petals erect, ovate, 8–12 mm long, 5–11 mm wide. Inner petals concave in their basal 2/3, apical 1/3 slightly recurved, ovate, 11–15 mm long, 5–10 mm wide. **Monocarps** 2–10, green, maturing orange, globose, 12–18 mm in diam., glabrous, minutely apiculate when young, stipes 2–7 mm long. **Seeds** 8–10 mm long.

Amazonian Brazil.

In non-inundated forest, on clayey to sandy soil.

Flowering in January and June, fruiting in January, May, June, August, and September.

Local names: envira preta, envira-roxa, envireira.

7.XI.1996 (fr) *Assunção, P. A. C. L. 425* (INPA U); 19.VI.1997 (fl) *Martins, L. H. P. et al. 15* (INPA KMG MONY RB SPU ULM); 23.I.1970 (fl) *Pires, J. M. 28* (INPA); 1.VIII.1961 (fr) *Rodrigues, W. & Coêlho, D. 2271* (INPA); 14.V.1963 (fr) *Rodrigues, W. & Coêlho, D. 5208* (INPA); 17.VI.1964 (fr) *Rodrigues, W. & Loureiro, A. 5916* (INPA); 11.I.1965 (fr) *Rodrigues, W. & Monteiro, O. P. 6837* (INPA); 20.XII.1996 (fr) *Souza, M. A. D. et al. 302* (BM INPA KMG R U B ULM US); 21.IX.1994 (fr) *Vicentini, A. et al. 703* (INPA KMG MONY RB SPU ULM).

Pseudoxandra obscurinervis can easily be recognized by its coriaceous leaves without any discernable venation, and by its typical leaf base, in which the margins are distinctly incurved.

12.2 *Pseudoxandra duckei* Maas, *Blumea* 48: 225. fig. 8-9. 2003.

Tree, 5–7 m tall. Young twigs and petioles densely covered with whitish, appressed hairs, soon glabrous. **Leaf** petioles 3–5 mm long. Lamina narrowly elliptic, 9–16 × 3–6 cm, chartaceous, upper side hardly verrucose when dried, sparsely covered with whitish, appressed hairs, soon glabrous, lower side sparsely covered with whitish, long, appressed hairs, particularly along the midrib, base acute to obtuse, apex abruptly acuminate (acumen 5–15 mm long), secondary veins 9–11 on either side of midrib, marginal vein present, 3–6 mm from the margin.

Inflorescences in foliate zone and ramiflorous, 1–2-flowered. Pedicels including peduncles 4–6 mm long, 3–5 mm in diam. Flower buds subglobose. Indument of floral parts: outer side of sepals and outer petals densely covered with whitish, appressed hairs. **Flowers** yellowish green, not yet investigated. Sepals very broadly ovate, 6–10 mm long. Petals only seen in bud. **Monocarps** 10–30, black when ripe, globose, 11–13 m in diam., subglabrous, rounded, stipes 10–15 mm long. **Seeds** 12–13 mm long.

Known only from Reserva Ducke.

In non-inundated forest, on clayey or sandy soil.

Flowering in April and May; fruiting in January, April, and May.

6.IV.1967, fr., *Albuquerque, B. W. P. & Elias, J. 67-16* (INPA, holotype); 3.I.1964 (fr) *Rodrigues, W. & Monteiro, O. P. 5661* (INPA); 4.V.1966 (fr) *Rodrigues, W. & Coêlho, D. 7815* (INPA).

Pseudoxandra duckei can be recognized by its chartaceous leaves with a marginal vein quite far removed from the margin, and by densely hairy sepals and petals.

13. *Rollinia*

Rollinia A. St.-Hil., *Fl. Brasil merid. ed. fol.* 1: 23. 1824; ed. qu. 1: 28. 1824.

A genus consisting of ca. 45 species occurring all over tropical America, with the main distribution center in western South America. Represented by 1 species, namely *R. insignis*. A second species, *R. mucosa* (the well-known biribá, with an edible and delicious fruit), is cultivated near the alojamento in Reserva Ducke.

Key to the species of *Rollinia* in Reserva Ducke

- 1. Lower side of leaves more or less densely covered with erect hairs; sepals strongly swollen (gibbous) at the base 1. *R. insignis*
- 1'. Lower side of leaves sparsely covered with appressed hairs; sepals not swollen at the base. Cultivated 2. *R. mucosa*

13.1 *Rollinia insignis* R.E. Fr., *Acta Horti Berg.* 12: 161. t. 17. 1934.

Rollinia insignis R.E. Fr. var. *pallida* R.E. Fr., *Acta Horti Berg.* 12: 565. 1939.

Tree, 4–30 m tall, 13–51 cm in diam. Young twigs and petioles densely covered with brown,

erect and appressed, simple hairs, glabrous with age. **Leaves** distichous. Petioles 6–20 mm long. Lamina elliptic, 13–30 × 6–14 cm, coriaceous, primary and secondary veins covered with white hairs, otherwise glabrous above, densely to rather densely covered with

brown to white, erect hairs below, base obtuse to rounded, apex acute to obtuse to shortly acuminate, midrib impressed above, secondary veins 18–30 on either side of midrib. **Inflorescences** in foliate zone, non-axillary, 2–5-flowered, pedicels with 2 bracts. Pedicels 15–35 mm long, 1–3 mm in diam. Flower buds depressed globose. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, erect and appressed, simple hairs. **Flowers** 3-merous, green, maturing yellow to cream, inner side of floral tube wine-red, with strong smell of pine-apples. Sepals 3, free, valvate, shallowly triangular, 3–4 mm long, strongly gibbous. Petals 6, valvate, all connate with each other, strongly unequal, tubular part 3–5 mm high, 5–9 mm in diam., inner petals minute, outer petals winged, narrowly obovate, wings subhorizontal, 6–15 mm long, 5–6 mm high. **Fruit** syncarpous, green, maturing yellow, subglobose to broadly ovoid, 2–2.5 cm in diam., composed of 50–75 carpels, densely covered with brownish, appressed, simple hairs, visible part of carpels pyramidal, apicule 1–3 mm long, seeds embedded in a fleshy pulp. **Seed** 1 per carpel, brown, ellipsoid, 7–8 mm long, smooth, not arillate.

Amazonian Brazil and one collection from Amazonian Peru.

In non-inundated forest, on clayey soil.

Flowering in September and October, fruiting in January and March.

Local names: biribá-bravo, envira-ata, envira-bobó, envira-surucucu, envireira-bobó.

6.X.1995 (fl) *Miralha, J. M. S. et al.* 265 (BM INPA K MG R U UB ULM US); 14.I.1977 (fr) *Nascimento, J. R.* 436 (INPA); 14.I.1977 (st) *Nascimento, J. R.* 444 (INPA); 23.I.1995 (fr) *Nascimento, J. R.* 707 (INPA K U); 8.VI.1976 (st) *Oliveira, A. R. s.n.* (INPA59889); 15.VII.1976 (st) *Oliveira, A. R. s.n.* (INPA72961); 20.IX.1995 (fl) *Vicentini, A. & Silva, C. F.* 1044 (INPA K MG MONY RB SP U ULM).

Local uses: the wood is used to sharpen razors (*Coêlho, D. s.n.* (INPA3182), *Rodrigues 1776*).

Rollinia insignis can be recognized by its winged flowers.

14. *Tetrameranthus*

Tetrameranthus R.E. Fr., Acta Horti Berg. 12: 554. 1939.

A genus with 6 species, only occurring in the Amazon Region.

14.1 *Tetrameranthus duckei* R.E. Fr., Acta Horti Berg. 12: 557. fig. 41. 1939.

Tree, 3–10 m tall, 5–8 cm in diam. Young twigs and petioles densely covered with stellate hairs, glabrous with age. **Leaves** spirally arranged. Petioles 8–30 mm long. Lamina elliptic to narrowly elliptic, or obovate, 10–25 × 3.5–10 cm, coriaceous, subglabrous to sparsely covered with stellate hairs on both sides, base acute, apex acuminate (acumen 5–15 mm long), midrib impressed above, secondary veins 10–12 on either side of midrib. **Inflorescences** in foliate zone, axillary, 1-flowered., pedicels with 4 bracts. Pedicels 10–35 mm long, 1.5–3 mm in diam. Bracts linear-subulate, 3–6 mm long, soon falling off. Flower buds broadly ovoid. Indument of floral parts: outer side of sepals and outer petals densely covered with greyish, stellate hairs. **Flowers** green, maturing yellow, with musky odour or strong fragrance of anise. Sepals 4, imbricate, free, elliptic to obovate, 4–7 mm long. Petals 8, imbricate, ovate to narrowly ovate, 15–25 mm long, 6–12 mm wide, inner base callose. **Fruit** apocarpous. Monocarps 1–8, green when young, ellipsoid to oblongoid, indehiscent, 25–80 mm long, glabrous, apex bluntly beaked (beak 5–7 mm long), stipes absent, but monocarps slightly narrowed towards the base. **Seeds** 1–2, laterally attached, brown, ellipsoid, to 30 mm long, verrucose, not arillate.

Amazonian Colombia, Venezuela, and Brazil, particularly common in the Manaus region.

In non-inundated campinarana forest, on sandy soil.

Flower buds found in October, fruiting from October to January.

24.XI.1994 (fr) *Ribeiro, J. E. L. S. & Silva, C. F.* 1501 (INPA); 26.X.1995 (fl) *Ribeiro, J. E. L. S. et al. s.n.* (INPA 1749 K MG U); 18.I.1996 (fr) *Sothers, C. A. et al.* 757 (INPA U).

Specimens studied from outside Reserva Ducke: Igarapé do Parque 10, 9.III.1956 (fl) *Chagas, J. s.n.* (INPA3580); Campus of University of Manaus, SUFRAMA, 6.X.1990 (fr) *Miralha, J. M. S. et al.* 230 (U); Manaus-Caracará

Hwy., Igarapé do Leao; 7.XII.1961 (fr) *Rodrigues, W. A. & Coêlho* 3839 (U); Manaus-Caracará Hwy., km 45, Reserva Biológica, 31.VII.1980 (fl yfr) *Webber, A. C. 162* (U), 22.VII.1980 (fl) *Webber, A. C. 163* (U).

Tetrameranthus is the only genus of the Annonaceae with spirally arranged leaves; its flowers are 4-merous, and the monocarps are very large (25–80 mm long).

15. *Unonopsis*

Unonopsis R.E. Fr., Kongl. Svenska Vetensk. Acad. Handl. n.s. 34(5): 26. 1900.

Small to large **trees**. Indument of vegetative and floral part consisting of simple

hairs. **Leaves** distichous, midrib raised on the upper side, the secondary veins often impressed. **Inflorescence** 1-several-flowered, axillary, pedicels with 2 bracts. **Flowers** cream, 3-merous, small. Sepals 3, free or connate, valvate. Petals 6, free, subequal, the inner ones strongly concave, valvate. Carpels many, with 1-several, basal or lateral ovules. **Fruit** apocarpous, consisting of 10–100, stipitate, indehiscent monocarps. **Seeds** 1–5, brown, depressed globose, with prominent median rib, surface pitted, not arillate.

A genus with *ca.* 50 species occurring all over tropical America.

Key to the species of *Unonopsis* in Reserva Ducke

1. Leaves narrowly obovate; flower buds very depressed globose; monocarps 1(–2)-seeded 3. *U. stipitata*
- 1'. Leaves narrowly elliptic or narrowly elliptic-oblong; flower buds globose; monocarps 1–5-seeded.
 2. Monocarps 1-seeded; large tree 12–20 m tall; inflorescence 1–5-flowered; flowers covered with silvery white hairs; petals 10–16 mm long 1. *U. duckei*
 - 2'. Monocarps 1–5-seeded; small tree to 7 m tall; inflorescence 1–2-flowered; flowers covered with brownish hairs; petals 5–8 mm long 2. *U. guatterioides*

15.1 *Unonopsis duckei* R.E. Fr., Acta Horti Berg. 12: 561. 1939.

Tree, 12–20 m tall, 15–30 cm in diam. Young twigs and petioles densely covered with brown, appressed hairs, glabrous with age. **Leaf** petioles 3–10 mm long. Lamina narrowly elliptic-oblong, sometimes narrowly obovate, 10–26 × 4–8 cm, chartaceous, upper side glabrous, lower side verrucose when dried, rather densely covered with brown, appressed hairs especially on the midrib, base acute, apex acuminate (acumen 15–25 mm long), secondary veins 11–13 on either side of midrib. **Inflorescences** in foliate zone to ramiflorous, 1–5-flowered. Pedicels 20–50 mm long, 1–4 mm in diam. Flower buds globose, 7–12 mm diam. Indument of floral parts: outer side of sepals and outer petals densely covered with silvery white, appressed hairs. **Flowers** cream, with sweet scent. Sepals basally connate, lobes broadly ovate-triangular, 1–4 mm long. Petals unequal. Outer petals concave, outer side longitudinally striped, broadly ovate, 10–16 mm long, 8–15 mm wide. Inner petals concave, very broadly ovate, 7–10 mm long, 9–12 mm wide,

outer side keeled, base abruptly narrowed, callose, grooved. **Monocarps** 50–75, green when young, maturing yellow to orange, ellipsoid, 10–15 mm long, rather densely covered with brown, appressed hairs, rounded, asymmetrically apiculate when young, stipes green when young, 12–29 mm long. **Seed** 1 (rarely 2), brown, 9–11 mm long.

Endemic to Amazonian Brazil (states of Amazonas, Pará, and Rondônia).

In non-inundated forest, on clayey soil.

Flowering and fruiting from July to November.

Local names: envira, envira-preta, envira-surucucu, envireira.

23.VIII.1997 (fl) *Assunção, P.A. C. L. & Pereira, E. C. 639* (INPA K MG MONYRB SPU ULM); 9.IX.1997 (fr) *Assunção, P.A. C. L. & Pinheiro, Z. A. 641* (INPA U); 1.X.1997 (fr) *Assunção, P.A. C. L. et al. 683* (INPA U); 20.XI.1964 (fl fr) *Loureiro, A. & Rodrigues, W. 6758* (INPA); 6.X.1995 (fl) *Miralha, J. M. S. et al. 267* (INPA K MG NY SPU ULM); 6.X.1995 (fl) *Miralha, J. M. S. et al. 269* (G INPA K MG RB U ULM US); 2.IX.1966 (fl) *Prance, G. T. et al. 2170* (INPA); 2.IX.1966 (fr) *Prance, G. T. et al. 2171* (INPA); 1.XII.1964 (fl)

Rodrigues, W. & Monteiro, O. P. 6768 (INPA); 25.VIII.1965 (fr) Rodrigues, W. & Loureiro, A. 7056 (INPA); 23.VIII.1966 (fr) Rodrigues, W. & Monteiro, O. P. 8237 (INPA); 1.X.1968 (fr) Souza, J. A. 198 (INPA); 15.VII.1994 (fr) Vicentini, A. & Assunção, P. A. C. L. 612 (INPA KMG MONY SPU ULM); 4.XII.1996 (fl) Vicentini, A. et al. 1205 (BM INPA K U).

Unonopsis duckei is closely related to *U. stipitata*, both sharing the 1-seeded ellipsoid monocarps. *Unonopsis duckei* can be easily recognized, however, by its much larger flowers. The flower buds are very different as well, being globose and with silvery white hairs in this species and very depressed globose and with brown hairs in *U. stipitata*.

15.2 *Unonopsis guatterioides* (A. DC.) R.E. Fr., Acta Horti Berg. 12: 241. 1937.

Uvaria guatterioides A. DC., Mém. Soc. Phys. Genève 5: 202. 1832.

Tree, 4–7 m tall, 8–18 cm in diam. Young twigs and petioles densely covered with white, erect hairs, glabrous with age. **Leaf** petioles 2–8 mm long. Lamina narrowly elliptic, 12–20 × 4–7 cm, chartaceous, subglabrous above, midrib covered with erect hairs when young, sparsely to rather densely covered with white, erect hairs below, base obtuse, apex acuminate (acumen 10–15 mm long), secondary veins 8–11 on either side of midrib. **Inflorescences** in foliate zone, 1–2-flowered. Pedicels 12–35 mm long, 1–2 mm in diam. Flower buds globose. Indument of floral parts: outer side of sepals and outer petals densely covered with brownish, appressed hairs, outer side of inner petals only with a hairy zone in the center. **Flowers** cream, with a strong odor in the early morning. Sepals free, broadly ovate-triangular, 2–3 mm long. Petals unequal. Outer petals slightly concave, broadly ovate, 4–8 mm long, 6–11 mm wide. Inner petals broadly ovate, 4–7 mm long, 4–6 mm wide, outer side keeled. **Monocarps** 10–15, green when young, subglobose (1-seeded) to ellipsoid (more-seeded) and sometimes constricted, 10–18 mm long, subglabrous, rounded to minutely apiculate, stipes 5–12 mm long. **Seeds** 1–5, 8–10 mm long.

Amazonian Colombia, Venezuela, Peru, Bolivia, Brazil, Paraguay, and the three Guianas.

In non-inundated forest, on sandy to clayey soil.

Flowering in October, fruiting from May to October.

Local name: envireira.

12.X.1993 (fl) Gottsberger, G. 11-121093 (INPA U); 14.X.1993 (fl) Gottsberger, G. 11-141093 (U); 12.X.1995 (fl) Miralha, J. M. S. et al. 309 (INPA K U); 3.V.1988 (st) Nelson, B. W. 1605 (INPA U); 7.VII.1964 (fr) Rodrigues, W. & Loureiro, A. 5939 (INPA); 17.X.1996 (fl) Souza, M. A. D. et al. 266 (INPA U).

Collections studied from outside Reserva Ducke: Manaus, Campus do INPA, near Fitoquímica, 21.XI.1985 (fl) Coêlho, L. F. 2130 (INPA); Rio Negro, near Tapuruquara, 1.VII.1979 (fr) Maia et al. 284 (INPA); Manaus, Distr. Agropecária, Fazenda Porto Alegre, 27.II.1992 (fr) Nee, M. 42660 (U).

Unonopsis guatterioides is different from the 2 other species of *Unonopsis* by its more-seeded, instead of 1-seeded monocarps.

15.3 *Unonopsis stipitata* Diels, Verh. Bot. Vereins Prov. Brandenburg 47: 130. 1905.

Small **tree** or **shrub**, 3–8 m tall, 1–10 cm diam. Young twigs and petioles sparsely covered with pale brown, appressed, minute hairs, glabrous with age. **Leaf** petioles 3–8 mm long, thickened. Lamina narrowly obovate, 15–32 × 4–10 cm, chartaceous, glabrous above, subglabrous below, base acute, apex abruptly acuminate (acumen 5–20 mm long), secondary veins 12–17 on either side of midrib. **Inflorescences** in foliate zone, often ramiflorous, 1-flowered. Pedicels 10–50 mm long, 1–5 mm in diam. Flower buds very depressed globose, 11–15 mm in diam. Indument of floral parts: outer side of sepals and outer petals densely covered with brown, appressed, minute hairs. **Flowers** cream. Sepals free, ovate, 1–2 mm long. Outer petals concave, broadly ovate-triangular, 5–10 mm long, 5–14 mm wide, slightly ribbed. Inner petals concave, broadly ovate-triangular, 3–8 mm long 5–16 mm wide. **Monocarps** 10–60, green, maturing yellow to orange, ellipsoid, 10–20 mm long, sparsely covered with brownish, appressed hairs, rounded, stipes 15–25 mm long. **Seed** 1, 10–15 mm long.

Amazonian Colombia, Venezuela, Brazil, and Peru, and the three Guianas.

In non-inundated forest, sometimes in secondary vegetation, on clayey or sandy soil.

Flowering in January, fruiting from May to January.

Local names: envira, envireira.

9.I.1990 (st) Gentry, A. H. & Nelson, B. W. 69251 (INPA); 19.I.1990 (st) Gentry, A. H. & Nelson, B. W. 69253 (INPA); 19.I.1990 (st) Gentry, A. H. & Nelson, B. W. 69256 (INPA); X.1988 (st) Miralha, J.M.S. & Coelho, L. 94 (INPA); 9.X.1995 (fr) Miralha, J. M. S. et al. 281 (INPA U); 3.VI.1993 (fr) Ribeiro, J. E. L. S. et al. 809 (INPA U); 1.VII.1993 (fr) Ribeiro, J. E. L. S. et al. 959 (INPA); 7.XI.1958 (fr) Rodrigues, W. & Aubréville, A. 1296 (INPA); 8.X.1959 (fr) Rodrigues, W. & Coelho, L. 1345 (INPA); 1.VIII.1961 (fr) Rodrigues, W. & Coelho, D. 2275 (INPA); 19.I.1967 (bd fr) Rodrigues, W. & Monteiro, O. P. 8305 (INPA); 21.V.1995 (fr) Sothers, C. A. & Silva, C. F. 464 (INPA U); 9.VIII.1996 (fl) Sothers, C. A. et al. 893 (INPA U ULM).

Unonopsis stipitata can be recognized by its large, narrowly obovate leaves, and very depressed globose flower buds covered by a brown indument. It is always a small tree, up to 8 m tall.

16. *Xylopia*

Xylopia L., Syst. Nat. ed. 10, 2: 1250, 1759, *nom. cons.*

Trees. Indument of vegetative and floral part consisting of simple hairs. **Leaves** distichous, mostly small, midrib impressed on the upper side, secondary veins often obscure (and not counted). **Inflorescence** 1-many-flowered, axillary, sometimes cauliflorous, pedicels with 2 bracts. **Flowers** white, cream, yellow, or orange, 3-merous, small to large. Sepals 3, valvate, often connate into a cup-shaped calyx. Petals 6, free, unequal, the inner ones often much smaller, valvate. Staminodes sometimes present. Carpels many, with 1-several, lateral ovules. **Fruit** apocarpous, consisting of 5–50, stipitate, dehiscent monocarps. **Seeds** 1-many, shiny black, brown, or blue mostly ellipsoid, 6–8 mm long, smooth, aril present, often white.

A pantropical genus with about 150 species, *ca.* 40 of which occur throughout tropical America.

Key to the species of *Xylopia* in Reserva Ducke

- 1. Tree cauliflorous 2. *X. benthamii*
- 1'. Tree not cauliflorous.
 - 2. Leaves with an emarginate to obtuse apex.
 - 3. Leaves chartaceous, margins glabrous; outer petals 12–15 mm long 5. *X. emarginata* var. *duckei*
 - 3'. Leaves coriaceous, margins hairy; outer petals 17–20 mm long 9. *X. spruceana*
 - 2'. Leaves with an acute to acuminate apex.
 - 4. Leaves very small (2.5–5 × 0.5–1.5 cm), apex of the leaves with a minute, hairy point 7. *X. neglecta*
- 4'. Leaves larger, apex of the leaves without a hairy point.
 - 5. Leaf base often cordate; sepals connate into a cup-shaped calyx, 10–12 mm long 4. *X. crinita*
 - 5'. Leaf base acute; sepals connate or free, 1–5 mm long.
 - 6. Leaves 8.5–13 × 3–4.5 cm; calyx cup-shaped, 4–5 mm long 6. *X. nitida*
 - 6'. Leaves smaller; sepals 1–2 mm long
 - 7. Upper side of leaves shiny, base obliquely truncate. 3. *X. calophylla*
 - 7'. Upper side of leaves not shiny, base acute.
 - 8. Leaves 4–8 × 1–2 cm; petiole 2–3 mm long; buttressed tree 1. *X. amazonica*
 - 8'. Leaves 6–11 × 2–3 cm; petiole 3–6 mm long; tree without buttresses. 8. *X. polyantha*

16.1 *Xylopia amazonica* R.E. Fr., Acta Horti Berg. 12: 562. 1939.

Tree, 7–28 m tall, 15–22 cm in diam., with buttresses of 0.4 m tall. Young twigs and petioles densely covered with white, appressed hairs, glabrous with age. **Leaf** petioles 2–3 mm long. Lamina narrowly elliptic, 4–8 × 1–2 cm, chartaceous, glabrous above, rather densely to sparsely covered with white, appressed hairs below, base acute, apex acuminate (acumen 5–15 mm long). **Inflorescences** in foliate zone or ramiflorous, 2-several-flowered. Pedicels 1–5 mm long, ca. 1 mm in diam. Flower buds narrowly ovate. Indument of floral parts: outer side of sepals sparsely to rather densely covered with silvery white, appressed hairs, outer side of outer petals densely so. **Flowers** cream, aromatic. Sepals basally connate, ca. 2 mm long, lobes broadly ovate-triangular, persistent. Outer petals linear, 10–12 mm long, ca. 3 mm wide. Inner petals linear, 8–12 mm long, ca. 2 mm wide. **Monocarps** 5–7, green, maturing yellow, and finally red, subglobose, 7–12 long, subglabrous, rounded, extremely asymmetrically apiculate, stipes 1–2 mm long. **Seeds** 1–4, aril covering about one third of the seed.

Amazonian Venezuela and Brazil, and Suriname.

In non-inundated forest, on sandy soil.

Flowering from July and September, fruiting in May and December.

V.1988 (fr) *Coêlho, D. & Bittrich, V. s.n.* (INPA150922); 18.VII.1997 (bd) *Forzza, R. C. 296* (COLFIANINPAKMBMUULM); 15.VII.1994 (fl) *Nascimento, J. R. & Pereira, E. C. 540* (GINPAKMGMO NY RB SP U UEC UFMT ULM); 31.VIII.1995 (fl) *Ribeiro, J. E. L. S. et al. 1674* (BM INPAKMG RU UB ULM US VEN); 12.XII.1995 (fr) *Souza, M. A. D. & Silva, C. F. 181* (INPAKMGMO NY RB SP U ULM).

Xylopia amazonica is a large tree with buttresses, small and distinctly acuminate leaves, and tiny flowers (ca. 1 cm long). The monocarps, particularly when young, are extremely asymmetrically apiculate.

16.2 *Xylopia benthamii* R.E. Fr., Kongl. Svenska Vetensk. Akad. Handl. n.s. 34(5): 35. t. 5, fig. 2–4. 1900.

Tree, 6–18 m tall, 5–25 cm in diam. Young twigs and petioles rather densely covered with brown, erect, long hairs, glabrous with age. **Leaf** petioles 2–3 mm long. Lamina narrowly elliptic, 6–14 × 1.5–3.5 cm, chartaceous, glabrous above, sparsely covered with pale brown, erect, long hairs below, particularly on the young leaves and along the midrib, base acute, apex acuminate (acumen 15–20 mm long). **Inflorescences** in many-flowered clusters all over the trunk (cauliflorous). Pedicels 8–35 mm long, 2–5 mm in diam. Flower buds narrowly ellipsoid, apex acute. Indument of floral parts: outer side of calyx and outer petals glabrous, except for the hairy margin of the calyx. **Flowers** creamy yellow to orange. Calyx cup-shaped, 5–10 mm long, lobes minute. Outer petals linear, 35–60 mm long, 7–8 mm wide (9–10 mm on the base), acute. Inner petals linear, 30–50 mm long, 2–4 mm wide (7–8 mm on the base), acute. **Monocarps** ca. 50, reddish green when ripe, sickle-shaped, constricted between each seed, strongly grooved when dried, 30–55 mm long, glabrous, asymmetrically apiculate (apicule 1–4 mm long), stipes ca. 5 mm long. **Seeds** 4–8, ellipsoid, aril covering the base of the seed only.

Amazonian Venezuela, Brazil, and Peru, and the three Guianas.

In non-inundated forest, mostly on sandy soil.

Flowering in August and September, fruiting in February and September.

Local names: embiriba, enbiribá, envira, envira-amarela, envira-imbiriba, pacovi. 31.VIII.1966 (fl) *Prance, G. T. et al. 2117* (INPA); 11.IX.1987 (fl) *Pruski, J. F. et al. 3223* (INPAKMBMU UB ULM); 17.IX.1987 (fl) *Pruski, J. F. et al. 3275* (IANINPAR U ULM VIC); 12.VIII.1993 (bd) *Ribeiro, J. E. L. S. et al. 1131* (INPAKMG NY PEUFR U UFMT ULM); 3.VIII.1994 (fl) *Ribeiro, J. E. L. S. & Silva, C. F. 1376* (INPAKMG U); 15.IX.1994 (fl) *Ribeiro, J. E. L. S. et al. 1421* (GINPAKMGMO RB SP U ULM US); 31.VIII.1995 (fl) *Ribeiro, J. E. L. S. et al. 1682* (BM COLINPAKMG SPFU UEC ULM VEN); 23.I.1998 (fr) *Ribeiro, J. E. L. S. & Assunção, P. A. C. L. 1965* (U); 28.IX.1966 (st) *Rodrigues, W. & Monteiro, O. P.*

8246 (INPA); 3.II.1967 (fr) *Rodrigues, W. & Monteiro, O. P.* 8316 (INPA); 12.IX.1968 (fr) *Souza, J. A.* 159 (INPA); 25.VI.1969 (fr) *Souza, J. A.* 296 (INPA).

Collections studies from outside Reserva Ducke: Igarapé do Tarumã, 21.II.1955 (fr) *Almeida, J.C. s.n.* (INPA824).

Use: tea made of this species is used for stomach problems (*Almeida s.n.* (INPA 824)).

Xylopia benthamii is the only cauliflorous species of *Xylopia* occurring in Reserva Ducke Ducke. It is also characterized by its glabrous flowers and its gigantic, reddish, many-seeded monocarps.

16.3 *Xylopia calophylla* R.E. Fr., Acta Horti Berg. 12: 563. 1939.

Tree, 20–25 m tall, 10–30 cm in diam. Young twigs and petioles densely covered with brown, appressed hairs, glabrous with age. **Leaf** petioles 2–5 mm long. Lamina narrowly elliptic, 5–9 × 1–2.5 cm, chartaceous, shiny, glabrous above, densely covered with long, silvery white to pale brown, appressed hairs below, base obtuse, slightly obliquely truncate, apex bluntly acuminate (acumen 5–10 mm long), midrib keeled below. **Inflorescences** in foliate zone, to 6-flowered, branched. Pedicels 3–5 mm long, 1–2 mm in diam. Flower buds narrowly ovoid. Indument of floral parts: outer side of sepals and outer petals densely covered with pale brown, appressed hairs. **Flowers** white with pinkish stripes inside. Sepals basally connate, 1–1.5 mm long, lobes depressed ovate. Outer petals linear, 10–15 mm long, 1.5–2 mm wide. Inner petals linear, ca. 8 mm long, ca. 1 mm wide. **Monocarps** 5–7, green, maturing red, bean-shaped, 10–20 mm long, longitudinally striped, subglabrous, rounded, stipes 1–3 mm long. **Seeds** ca. 4, aril covering the base of the seed only.

Amazonian Brazil (Amazonas and Pará).

In non-inundated forest, on clayey soil.

Flowering in July, fruiting in January.

23.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 554 (G IAN INPA K R RB U US); 10.X.1995 (st) *Miralha, J. M. S. et al.* 291 (INPA); 2.VII.1993 (fl) *Ribeiro, J. E. L. S. et al.* 978 (INPA K MG MO NY SP U ULM); 19.I.1996 (fr) *Sothers, C. A. & Pereira, E. C.* 772 (INPA K U US); 19.XII.1996 (fr) *Souza, M. A. D. et al.* 299 (G INPA K MG MO NY RB SP U).

Specimens studied from outside Reserva Ducke:

Fonte Boa, rio Solimões, 4.X.1986 (fr) *Cid, C. A. et al.* 8393 (INPA); Basin of Rio Demeni, vicinity of Tototobí, 26.II.1969 (fr) *Prance, G. T. et al.* 10265 (INPA); Serra Aracá, 8–12.III.1984 (fr) *Rodrigues, W. et al.* 10623 (INPA); Novo Airão, Aldeia Maré, 11.VIII.1989 (fl) *Milliken, W. et al.* 493 (INPA); Pará, Tucuruí, 31.VIII.1983 (fl) *Revilla, J. et al.* 8415 (INPA).

Xylopia calophylla can be recognized by its leaves with a shiny upper side, and lower leaf side with an indument of long, silvery white, appressed hairs, and its small, branched, several-flowered inflorescences. It differs from *X. nitida*, which has the same leaf indument, but smaller leaves.

16.4 *Xylopia crinita* R.E. Fr., Ark. Bot. n.s. 1(11): 447. fig. 1a-e. 1950.

Tree, 5–15 m tall, 12–18 cm in diam. Young twigs and petioles densely covered with reddish brown, erect long-persistent hairs. Leaf petioles 1–2 mm long. Lamina narrowly elliptic, 7–12 × 1.5–3 cm, chartaceous, glabrous above, densely covered with dark brown, erect to appressed hairs below, base often cordate, or rounded, obtuse, or acute, apex acuminate (acumen 10–15 mm long). **Inflorescences** in foliate zone, to ramiflorous, 2-flowered. Pedicels 5 mm long, 5 mm in diam. Flower buds narrowly ovoid. Indument of floral parts: outer side of sepals rather densely covered with brown, erect hairs, outer side of outer petals densely covered with yellowish brown, appressed hairs. **Flowers** yellow, inner base of outer petals white. Calyx cup-shaped, 10–12 mm long, lobes depressed ovate-triangular, 2–3 mm long. Outer petals oblong-elliptic, 40–43 mm long, 9–13 mm wide, acute. Inner petals linear, 35–37 mm long, 6–7 mm wide, acute. **Monocarps** ca. 50, brownish, sickle-shaped, slightly grooved when dried, 20–45 mm long, densely covered with brown, erect, long hairs, becoming glabrous with age, asymmetrically apiculate (apicule ca. 1 mm long), stipes 2–5 mm long. **Seeds** several, aril covering the base of the seed only.

Amazonian Venezuela and Brazil, and French Guiana.

In non-inundated forest, on sandy to clayey soil.

Flowering in October, fruiting in March and November.

10.X.1995 (fl) *Miralha, J. M. S. et al.* 288 (INPA U); 10.X.1995 (st) *Miralha, J. M. S. et al.* 298 (INPA); 12.XI.1966 (fr) *Prance, G.T. et al.* 3100 (INPA); 24.III.1993 (fr) *Webber, A. C. & Gottsberger, G.* 1450 (INPA).

Xylopia crinita is recognized from the other large-flowered species of *Xylopia*, namely *X. benthamii*, by its often cordate leaf base and by its young twigs and monocarps which are densely covered with brown to reddish brown hairs.

16.5 *Xylopia emarginata* var. *duckei* R.E. Fr., Acta Horti Berg. 12: 209. 1934.

Tree, 3–25 m tall, 8–30 cm in diam., with stilt buttresses to 2 m high. Young twigs and petioles densely covered with brown, erect, long-persistent hairs. **Leaf** petioles 1 mm long. Lamina narrowly elliptic, 5.5–7.5 × 1.5–2.5 cm, chartaceous, glabrous, shiny above, rather densely covered with brown, erect hairs below, particularly along the midrib, base acute to obtuse, obliquely truncate, apex obtuse, emarginate, midrib keeled below. **Inflorescences** in foliate zone or ramiflorous, 1–2-flowered, pendent. Pedicels 2–6 mm long, 1–4 mm in diam. Flower buds narrowly ovoid. Indument of floral parts: outer side of sepals subglabrous, outer side of outer petals rather densely covered with white, appressed hairs. **Flowers** yellow, with a fruity odor. Sepals connate for about halfway, 2–3 mm long, lobes broadly ovate-triangular. Outer petals linear, 12–15 mm long, 2–3 mm wide. Inner petals linear, ca. 10 mm long, ca. 1 mm wide. **Monocarps** ca. 10, green when young, bean-shaped, 18–25 mm long, 13–18 mm wide, glabrous, rounded, stipes 3–5 mm long. **Seeds** 4, aril covering the base only.

Amazonian Brazil.

In non-inundated forest, near creek margins, on sandy soil.

Flowering in September and December, fruiting in August and October.

Local name: envireira.

2.XII.1994 (fr) *Assunção, P. A. C. L.* 115 (BM INPA K MGR U ULM US); 19.X.1961 (fr) *Rodrigues, W. &*

Lima, J. 2675 (INPA); 30.VIII.1994 (fr) *Sothers, C. A. & Stumpe, P.* 155 (G INPA K MG MO NY RB SP U UB ULM); 20.IX.1993 (fl) *Webber, A. C.* 1454 (INPA).

Collections studied from outside Reserva Ducke: Cachoeira baixa Tarumã, 12.I.1967 (fl) *Prance et al.* 3940 (INPA U); Manaus, Igarapé do Buião, 28.VIII.1961 (fr) *Rodrigues & Chagas* 2407 (INPA); Manaus, Igarapé do Passarinho, 30.XI.1961 (fl) *Rodrigues & Chagas* 2841 (INPA).

Xylopia emarginata var. *duckei* can be recognized by its emarginate leaves, but see also under *X. spruceana*.

16.6 *Xylopia nitida* Dunal, Monogr. Anonac. 122. t. 20. 1817.

Tree, 6–20 m tall, 5–30 cm in diam. Young twigs and petioles densely covered with pale brown, appressed hairs, glabrous with age. **Leaf** petioles 2–6 mm long. Lamina narrowly elliptic, 8.5–13 × 3–4.5 cm, chartaceous, glabrous above, densely covered with long, silvery white to brown, appressed hairs below, base acute, sometimes obliquely truncate, apex acuminate (acumen 5–10 mm long), midrib keeled below. **Inflorescences** in foliate zone, to 8-flowered, branched. Pedicels 1–13 mm long, 1–3 mm in diam. Flower buds narrowly ovoid, acute. Indument of floral parts: outer side of sepals and outer petals densely covered with white, appressed hairs. **Flowers** orange. Calyx cup-shaped, 4–5 mm long, lobes shallowly ovate-triangular, 1–2 mm long. Outer petals linear, 18–20 mm long, 3–5 mm wide. Inner petals linear, ca. 15 mm long, 1–2 mm wide. **Monocarps** ca. 10, green, maturing red, narrowly cylindrical, 10–60 mm long, longitudinally grooved, glabrous, rounded to acute, stipes 2–5 mm long. **Seeds** 4–6, aril covering the base only.

Amazonian Colombia, Venezuela, Peru, and Brazil, and the three Guianas.

In non-inundated forest, on clayey soil.

Flowering in February and December, fruiting in November and December.

Local names: envira-amarela, envira-vermelha.

22.XI.1996 (bd) *Assunção, P. A. C. L. & Pereira, E. C.* 435 (G IAN INPA K RB U US); 22.XI.1996 (bd) *Assunção, P. A. C. L. & Pereira, E. C.* 444 (INPA); 23.VII.1997 (fl) *Assunção, P. A. C. L. et al.* 555 (BM

INPA K MGR U UB VEN); 27.XI.1997 (fr) *Assunção, P. A. C. L. et al.* 729 (BM IAN INPA K MBM U UB ULM US); 2.II.1995 (fl) *Nascimento, J. R. & Costa, M. A. S.* 737 (INPA K MG U); 30.IX.1976 (st) *Oliveira, A. R. s.n.* (INPA72943); 30.XII.1966 (fl) *Prance, G. T. et al.* 3847 (INPA); 27.XII.1963 (fr) *Rodrigues, W. & Coêlho, D.* 5628 (INPA); 22.IX.1965 (st) *Rodrigues, W.* 7930 (INPA); 9.XI.1995 (fr) *Sothers, C. A. & Silva, C. F.* 676 (G INPA K MG MONY RB SP U ULM).

Specimen studied from outside the Reserva: Manaus, estrada do jardim Tarumãzinho, 2 km da cachoeira, 18.XI.1975, fl. and fr., *Monteiro, O. P. s.n.* (INPA53553).

Xylopia nitida can be recognized by its leaves which have a very dense indument of silvery white to brown, appressed hairs on the lower side, by its long, narrowly cylindrical monocarps, and by its flowers with a distinctly cup-shaped calyx.

16.7 *Xylopia neglecta* (Kuntze) R.E. Fr., Kongl. Svenska Vetensk. Akad. Handl. n.s. 34(5): 31. 1900.

Xylopicrum neglectum Kuntze, Rev. gen. pl. 1: 8. 1891.

Xylopia parviflora Spruce, J. Proc. Linn. Soc., Bot. 5: 6. 1861, nomen subnudum; Maas, Proc. Kon. Ned. Akad. Wetensch. C. 89: 277. 1986.

Tree, of unknown height and diam. Young twigs and petioles densely covered with whitish, appressed hairs. **Leaf** petioles 0.5–1 mm long. Lamina narrowly elliptic to narrowly ovate, 2.5–5 × 0.5–1.5 cm, chartaceous, glabrous above, rather densely covered with whitish, appressed hairs below, base acute, apex acuminate with a hairy mucronate point. **Flowers** and **fruit** not seen.

Amazonian Colombia, Venezuela, Brazil, Ecuador, and Peru, and French Guiana and Guyana.

In non-inundated forest, on sandy soil.

Flowering and fruiting material not known from Reserva Ducke.

29.VII.1976 (st) *Souza, J. A. s.n.* (INPA59494); 2.IX.1976 (st) *Souza, J. A. s.n.* (INPA61974).

Collections studied from outside Reserva Ducke: Amazonas: Sao Paulo de Olivenca, basin of Creek Belem, 26.X-11.XII.1936 (fr) *Krukoff, B. A.* 8930 (U).

3 km above Ribeirão, W bank of Rfo Madeira, 27.VII.1968 (fl) *Prance, G. T. et al.* 6535 (INPA).

Xylopia neglecta is very easily distinguished by its very small leaves (2.5–5 cm long), which often have a hairy mucronate apex. Although this species is fairly common in the igarapé Barro Branco region, no fertile material has been collected as yet.

16.8 *Xylopia polyantha* R.E. Fr. Acta Horti Berg. 12: 208. 1934.

Tree, 15–18 m tall, 15–25 cm in diam. Young twigs and petioles densely covered with dark brown, half-appressed hairs, glabrous with age. **Leaf** petioles 3–6 mm long. Lamina narrowly elliptic, 6–11 × 2–3 cm, chartaceous, glabrous above, sparsely covered with pale brown, appressed hairs below, base acute, apex acuminate (acumen *ca.* 10 mm long). **Inflorescences** in foliate zone, many-flowered (up to 10 flowers). Pedicels 1–5 mm long, *ca.* 1 mm in diam. **Flower** buds narrowly ovoid. Indument of floral parts: outer side of sepals rather densely to sparsely covered with brown, appressed hairs, outer side of outer petals densely covered with white, appressed hairs. **Flowers** white. Sepals basally connate, 1–3 mm long, lobes broadly ovate-triangular. Outer petals linear, *ca.* 11 mm long, 1.5–2 mm wide. Inner petals linear, *ca.* 10 mm long, *ca.* 1 mm wide. **Monocarps** 5–10, green when young, globose (1-seeded) to ellipsoid (more-seeded), slightly curved, 5–15 mm long, glabrous, rounded, stipes 1–2 mm long. **Seeds** 1–3, aril covering the basal part of the seed.

Amazonian Brazil and Bolivia.

In non-inundated forest, on clayey soil.

Flowering and fruiting in August.

Local names: envira, envira-amarela, envira-branca, envireira.

20.VIII.1964 (fr) *Rodrigues, W. & Monteiro, O. P.* 6010 (INPA).

Collections studied from outside Reserva Ducke: 3 km above Ribeirão, W bank of Rfo Madeira, 27.VII.1968 (fl) *Prance, G. T. et al.* 6535 (INPA).

Xylopia polyantha is distinguished by its tiny flowers, arranged in dense clusters in the leaf axils.

16.9 *Xylopia spruceana* Benth. ex Spruce, J. Proc. Linn. Soc., Bot. 5: 5. 1861.

Tree, 10–20 m tall, 15–28 cm in diam., with stilt buttresses up to 1.5 m high. Young twigs and petioles densely covered with brownish, appressed hairs, glabrous with age. Leaf petioles 2–4 mm long. Lamina narrowly elliptic, 5–7 × 1.5–2 cm, coriaceous, upper side dark green and shiny, turning to dark brown to blackish when dried, glabrous, lower side with midrib and margins rather densely covered with brown, erect hairs below, base acute to obliquely truncate, apex obtuse, emarginate, but in young sprouts acute.

Inflorescences in foliate zone or ramiflorous, 1–4-flowered, pendent. Pedicels 3–10 mm long, 1–2 mm in diam. Flower buds narrowly ovoid, acute. Indument of floral parts: outer side of sepals subglabrous, outer side of outer petals densely covered with white, appressed hairs. **Flowers** yellow, inner base of outer petals white, scented. Sepals basally connate, ca. 2 mm long, lobes broadly ovate-triangular. Outer petals linear, 17–20 mm long, ca. 2 mm wide. Inner petals linear, 12–15 mm long, ca. 1 mm wide. **Monocarps** 10–20, greenish red, ellipsoid, straight to slightly curved, 10–20 mm long, 6–8 mm wide, glabrous, asymmetrically apiculate (apicule ca. 1 mm long), stipes 4–6 mm long. **Seeds** 1–4, aril covering the base of the seed only.

Amazonian Venezuela and Brazil.

In non-inundated, campinarana forest, on sandy soil.

Flowering in June and September, fruiting time unknown.

17.VI.1995 (bd) *Ribeiro, J. E. L. S. et al. 1641* (INPA U); 14.IX.1995 (fl) *Ribeiro, J. E. L. S. & Pereira, E. C. 1703* (G INPA K MG MO NY RB SP U ULM); 4.II.1997 (fr) *Souza, M. A. D. et al. 321* (INPA K MG MONY RB SP U UB ULM).

Collections studied from outside Reserva Ducke: km 132 of Manaus–Caracará Hwy., 13.II.1974 (fr) *Loureiro, A. et al. s.n.* (INPA47910); Repartimento, Rio Cuieiras, near Igarapé Tucunará, 16.IX.1964 (fl) *Rodrigues, W. 6055* (INPA).

Xylopia spruceana is one of the two species of *Xylopia* with emarginate leaf apex in Reserva Ducke. It differs from *X. emarginata* by its coriaceous (instead of chartaceous) leaves with a hairy midrib and margins on the lower side.

BARK DESCRIPTIONS

General bark description

Outer bark patterns from a distance vary from smooth to rough depending on the age of the bark. Usually on younger barks eye marks and hoops are visible and sometimes, in some species (e.g. *Anaxagorea manausensis*, *Annona foetida*), adventive flower buds may be seen. In smooth barks (often young) lenticels are usually numerous, small, round, solitary. In some species they are arranged in vertical or horizontal lines. Scaling is common in older barks where scales, rarely larger flakes, are adherent or loose-hanged, usually close, irregular and flat-sided. In older trees bark is often cleft as short, boat-shaped fissures shape of which is mostly V-shaped or square-shaped, sometimes irregular and wavy. Fissures are initiated as parallel, but also oblique patterns are common. Ridge types are varying (not reticulate). Typically phelloderm is black. Also the structure of the inner bark is typical: dilatation growth and flame marks frequent. Streaks are clearly distinct in tangential section. For a couple of minutes the colour of the inner bark will become darker, like in the cambium. Texture of the inner bark is mostly a combination of fibres and sclereids. Exudation is absent, except some sap flow in some species. Scent is usually aromatic, but closer definition is often impossible.

Species collected (distinctive features are marked in *italics*):

Anaxagorea brevipes

Outer bark hard-loose, thin and smooth with hoops, later rough. *Lenticels numerous, large, solitary, horizontally linear or round.* Scales loose-hanged, distant, rectangular or irregular, flat-sided. Fissures short, boat-shaped, V-shaped, parallel. Outer surface dark brown-black. Phelloderm black. Inner bark thin, rays form flame marks, ripple marks. Dark brown streaks on cream-coloured-reddish light brown background. On exposure inner bark and cambium turn slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Faint scent.

Anaxagorea manausensis

Outer bark hard, thin, smooth-rugose with eye-marks and warts (adventive flower buds). Lenticels numerous, small-large, mostly horizontally linear or round, solitary, arranged in horizontal lines. Outer surface dark brown. Phelloderm black. Inner bark thin, rays form flame marks. Ripple marks. Light brown streaks on cream-coloured background. On exposure inner bark does not change colour or turns slowly, like cambium, slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent resembles sugar-cane.

Annona amazonica

Outer bark corky, thin and rugose. Lenticels numerous, small, round, solitary, arranged in vertical lines. Fissures shallow, short, boat-shaped, V-shaped, wavy. Outer surface light brown-brown. Phelloderm black. Inner bark thick, rays form flame marks. Ripple marks. Brown streaks on light brown background. On exposure inner bark does not change colour. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent slightly sweetish.

Annona ambotay

Outer bark corky, thin and rough. Lenticels numerous, small, round, solitary, arranged in vertical lines. Scales loose-hanged, close, rectangular or irregular, flat-sided. Fissures deep, short, boat-shaped, V-shaped, parallel or oblique. Ridges flattened or hollow. Outer surface dark brown. Phelloderm brown. Inner bark thin, flame marks obscure. Ripple marks. On exposure inner bark and cambium turn slowly slightly darker. Sapwood cream-coloured. Inner bark hard, mainly fibrous. Scent?

Annona foetida

Outer bark hard, thin and smooth (with cauliflory). Lenticels numerous, small linear or round, solitary, arranged in obscure vertical lines. Outer surface grey-light brown. Phelloderm black. Inner bark thick, rays form flame-marks. Ripple marks (especially in sapwood). Reddish light brown streaks on cream-coloured-yellowish brown background. On exposure inner bark and cambium turn

slowly rusty-coloured. Sapwood white. Inner bark hard, granular/fibrous. Scent sweetish.

Annona haematantha

Outer bark hard, thin and smooth. Lenticels numerous, medium-sized-large, horizontally linear or round, solitary. Initiating fissures. Outer surface dark brown. Phelloderm black. Inner bark thin. Ripple marks. Brownish streaks on cream-coloured background. On exposure inner bark turns slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent strong, slightly sweetish.

Annona* sp. nov. aff. *excellens

Outer bark hard, thin and smooth with eye marks. Lenticels numerous, small-medium-sized, round, solitary, arranged in vertical lines. Initiating fissures. Outer surface dark brown. Phelloderm black. Inner bark thick, rays form flame marks. Ripple marks. Greyish brown streaks on yellowish background. Sapwood cream-coloured. On exposure inner bark turns slowly darker. Inner bark hard, granular/fibrous. Scent slightly sweetish.

Annona densicoma

Outer bark hard, thin, rugose. Lenticels numerous, small-medium-sized, round, compound, arranged in the bases of the fissures. Scales adherent, distant, irregular, flat-sided or chunky. Fissures shallow, continuous, or short-long, boat-shaped, V-shaped, parallel or oblique. Outer surface light brown, darker in fissures. Phelloderm black. Inner bark very thick, rays form flame marks. Ripple marks. Light greyish brown-dark brown streaks/mottles on cream-coloured background. Non-collapsed inner bark light brown. Sapwood white. On exposure inner bark and cambium slowly turn darker. Inner bark hard, granular/fibrous. Scent sweetish.

Bocageopsis multiflora

Outer bark hard, thin and rough. Fissures shallow, short or elongated, boat-shaped, V-shaped, parallel or oblique. Ridges rounded or sometimes flattened or V-shaped. Outer surface dark or greyish brown-light reddish brown. Phelloderm black. Inner bark thick,

rays form flame marks. Ripple marks. Dark brown-dark red streaks on light reddish brown-cream-coloured background. *Non-collapsed inner bark brownish red*. Sapwood cream-coloured. On exposure inner bark and cambium turn slightly darker. Inner bark hard, granular/fibrous. *Sap flow clear, viscous, sticky, scanty and slow*. Scent slightly sweetish.

Bocageopsis pleiosperma

Outer bark hard, thin and rugose, later rough with eye marks or hoops. Fissures shallow, short-elongated, boat-shaped, V-shaped, parallel. Ridges hollow, flattened or rounded. Outer surface light-dark brown. Phelloderm black. Inner bark thick or very thick, rays form flame marks. Ripple marks. Brown streaks on reddish brown background. *Non-collapsed inner bark reddish brown*. Sapwood cream-coloured. On exposure inner bark turns slowly darker. Inner bark hard, granular/fibrous. No exudation, *but some clear sap flow*. Smell sweetish.

Cymbopetalum euneurum

Outer bark hard, thin and smooth. Lenticels numerous, small, linear or round. Initiating fissures. Outer surface light brown. Phelloderm black. Inner bark thin. Ripple marks. Faint streaks visible on white background. *On exposure inner bark does not change colour*. Sapwood white. Inner bark hard, granular/fibrous. Scent sweetish.

Diclinanona calycina

Outer bark hard, partly loose, thin, smooth or rugose with eye marks and hoops, *sometimes obscurely pock-marked*. Lenticels numerous-scarce, small-medium-sized, round, solitary. *Scales loose-hanged*, distant, irregular, *chunky*. Fissures shallow, short, boat-shaped, V-shaped or round, parallel. Ridges hollow. Outer surface light grey-dark brown. Phelloderm black. Inner bark thick or very thick. Faint ripple marks. Light brown-brown streaks on cream-coloured background with *slightly reddish mottles*. On exposure inner bark and cambium turn slowly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent slightly aromatic.

Duguetia asterotricha

Outer bark hard, thin and smooth. Lenticels numerous, small, solitary. Outer surface brown-dark brown. Inner bark thin. Brown streaks on reddish light brown background. *On exposure inner bark does not change colour*. Sapwood white. Inner bark hard, granular/fibrous. Scent sweetish.

Duguetia flagellaris

Outer bark hard, thin and smooth with eye marks. Lenticels numerous, medium-sized, vertically linear, solitary. Fissures shallow, short, boat-shaped, wavy, oblique. Outer surface dark brown. Phelloderm black. Inner bark thin, rays form flame marks. Brown streaks on light brown background. *On exposure inner bark does not change colour*. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent aromatic.

Duguetia megalocarpa

Outer bark hard, thin and rough with obscure eye marks. *Lenticels scarce, medium-large, compact*. Fissures shallow-deep, short, boat-shaped, V-shaped or sometimes round, parallel or oblique. Ridges rounded or V-shaped. Outer surface dark brown. Phelloderm black. Inner bark thick, rays form flame marks. Faint ripple marks. Light brown streaks on yellowish-light brown background. On exposure inner bark and cambium turn slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent fruity.

Duguetia pycnastera

Outer bark soft, cork-like, thin and smooth, later rugose. *Lenticels numerous, small-large, linear or round, arranged in vertical lines*. Fissures shallow, continuous or short, boat-shaped, V-shaped, parallel. Ridges flattened or hollow. Outer surface light brown. Phelloderm reddish brown or black. Inner bark thin, rays form flame marks. Ripple marks. Reddish brown-brown streaks on light brown background. On exposure inner bark and cambium turn slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent slightly aromatic.

Duguetia riparia

Outer bark hard, thin and smooth. Lenticels scarce, small, round. Outer surface dark brown-black. Phelloderm black. Inner bark thin. Light brown streaks on cream-coloured-yellowish background. On exposure inner bark and cambium turn slowly darker. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. Scent sweetish.

Duguetia stelechantha

Outer bark soft, loose, thin and smooth with eye marks. Lenticels numerous, small, round, solitary. Scales loose-hanged, distant, rectangular, flat-sided or chunky. Fissures shallow, short, boat-shaped, V-shaped. Outer surface light brown. Phelloderm black. Inner bark thin, rays form flame marks. Reddish dark brown streaks on light reddish background. *Non-collapsed inner bark red*. On exposure inner bark turns slowly rusty-coloured. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent slightly fruity.

Duguetia surinamensis

Outer bark hard, later soft, thin and rugose or rough. Scales loose-hanged, distant, rectangular, flat-sided. Fissures shallow, short, boat-shaped, V-shaped, some compound, mainly parallel. Ridges flattened, rounded or V-shaped. Outer surface light brown. Phelloderm dark brown-black. Inner bark thick-very thick, rays form flame marks. Dark brown streaks on light brown background. On exposure inner bark turns slowly slightly darker. Sapwood cream-coloured-yellowish. *Distinct corrugations on the inner surface of the inner bark*. Inner bark hard, granular/fibrous. Scent aromatic.

Duguetia trunciflora

Outer bark hard, thin and smooth with eye marks and hoops. Lenticels scarce-numerous, small, round, solitary. Scales loose-hanged, minute, distant, flat-sided. Fissures shallow, short, boat-shaped, parallel. Outer surface light brown. Phelloderm brown. Inner bark thick, rays form flame marks. Faint ripple marks. Brown streaks on light reddish brown background. On exposure inner bark turns slowly darker, *cambium almost*

black. Sapwood cream-coloured. Inner bark hard, granular/fibrous. *Scent aromatic (lauraceous)*.

Ephedranthus amazonicus

Outer bark hard, loose, thin and smooth, later rugose with occasional hoops on young bark. Lenticels numerous, small-large, round, sometimes arranged in vertical lines. Scales, if present, adherent or loose-hanged, close-distant, rectangular-irregular, flat-sided-chunky. Fissures shallow, short, boat-shaped, V-shaped, sometimes wavy and oblique or continuous, V-shaped, parallel. Ridges flattened. Outer surface light-dark brown. Phelloderm black. Inner bark thick, rays form flame marks. Ripple marks. Light brown-brown streaks on cream-coloured background. On exposure inner bark and cambium turns slowly slightly darker or does not change colour. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. No scent or scent aromatic (older bark).

Fusaea longifolia

Outer bark hard, thin and rugose, later rough with eye marks. *Lenticels scarce, large, round, compound, arranged in vertical lines*. Fissures shallow or deep, short, boat-shaped, V-shaped, somewhat wavy, oblique. Ridges rounded. Outer surface dark brown. Phelloderm black. Inner bark thick, rays may form flame marks. Faint ripple marks. *Large dark red streaks on reddish light brown background*. On exposure inner bark and cambium turn slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent?

Guatteria citriodora

Outer bark hard, loose, thin and rugose. Lenticels scarce, medium-sized, horizontally linear, solitary. Scales adherent or loose-hanged, close, rectangular-irregular, flat-sided. Fissures shallow, short, boat-shaped or continuous, square-shaped, wavy, oblique. Ridges flattened or hollow. Outer surface grey-dark brown. Phelloderm black. Inner bark thick, rays form flame marks. Light brown streaks on cream-coloured-light brown background. On exposure inner bark and cambium turn slowly darker. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. *Scent citron-like*.

Guatteria discolor

Outer bark hard-soft, loose, thin and rugose-rough, more or less surface rotten. Scales loose-hanged, close, irregular, flat-sided-chunky. *Some large irregular flakes*. Fissures shallow, short, boat-shaped, V-shaped, parallel. Ridges mostly flattened. Outer surface brown-dark brown. Phelloderm black. Inner bark thick, *rays form scalariform pattern*. Faint ripple marks. Greyish-yellowish brown streaks on yellowish-reddish light brown background. On exposure inner bark and cambium turn slowly rusty-coloured. Sapwood cream-coloured-light brown. *Inner bark hard, mostly fibrous*. Scent slightly aromatic.

Guatteria foliosa

Outer bark hard, thin and smooth with eye marks and hoops. Scales adherent, distant, rectangular or irregular, flat-sided. Fissures shallow, short, boat-shaped, V-shaped or square-shaped, wavy, oblique. Ridges flattened. Outer surface dark brown-grey. Phelloderm black. Inner bark thick, rays form flame marks. Faint ripple marks. Light brown streaks on cream-coloured background. On exposure inner bark and cambium turn slowly darker. Sapwood white. Inner bark hard, granular/fibrous. Smell aromatic.

Guatteria megalophylla

Outer bark hard, thin and smooth with hoops. *Lenticels numerous, medium-sized, linear or round, solitary, arranged in horizontal lines*. Outer surface black. Phelloderm black. Inner bark thin, rays form flame marks. Light brown streaks on reddish light brown background. On exposure inner bark turns slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Smell slightly aromatic.

Guatteria meliodora

Outer bark hard, loose, thin and rough. Scales loose-hanged, distant, irregular, chunky. Fissures deep, short, boat-shaped or continuous, V-shaped, parallel or oblique. Ridges flattened, rounded or V-shaped. Outer surface reddish dark brown. Phelloderm black. Inner bark thin, rays

form flame marks. Reddish brown-brown streaks on cream-coloured-light brown background. On exposure inner bark and cambium turn slowly darker. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. Scent faintly sweet.

Guatteria olivacea

Outer bark hard, thin and smooth with eye marks and hoops. Lenticels numerous, small, linear or round, solitary. Fissures shallow, short or elongated, boat-shaped, V-shaped, wavy, oblique. Ridges flattened. Outer surface grey-brown. Phelloderm black. Inner bark very thick, rays form flame marks. Faint ripple marks. Light brown streaks on cream-coloured background. On exposure inner bark and cambium turn slowly rusty-coloured. Sapwood cream-coloured. Inner bark soft, granular/fibrous. Scent slightly spicy.

Guatteria scytophylla

Outer bark hard, loose, thin and smooth with eye-marks or hoops. Lenticels scarce, small or large, horizontally linear or round, solitary. Scales loose-hanged, irregular, chunky. Fissures shallow, continuous, V-shaped, oblique. Outer surface brown-greyish brown. Phelloderm black. Inner bark thick, rays form flame marks. Light brown streaks on cream-coloured-yellowish background. On exposure inner bark and cambium turn slowly darker. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. Scent sweetish.

Guatteriopsis blepharophylla

Outer bark hard, thin and smooth. Lenticels numerous, small, round, solitary. Outer surface dark brown-black. Inner bark thin. Light brown streaks on cream-coloured background. On exposure inner bark turns slowly slightly darker. Sapwood white. Inner bark hard, granular/fibrous. Scent?

Guatteriopsis friesiana

Outer bark hard, thin and smooth with eye marks. Lenticels numerous, small, round, solitary. Outer surface dark brown. Inner bark thin. Light brown streaks on cream-coloured background. On exposure inner bark does not change colour. Inner bark hard, granular/fibrous. Smell?

Guatterioopsis hispida

Outer bark hard, thin and smooth. *Lenticels* numerous, small, round, *compound*. Scales adherent, close, rectangular, flat-sided. Fissures shallow, short, boat-shaped, V-shaped, wavy, parallel. Outer surface dark brown. Phelloderm black. Inner bark thin, rays form flame marks. Light brown-brown streaks on cream-coloured-reddish light brown background. *Non-collapsed inner bark thin, reddish brown*. On exposure inner bark and cambium slowly turns rusty-coloured. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent aromatic.

Malmea manausensis

Outer bark hard, thin and smooth, later rugose with few eye marks. *Lenticels* scarce-numerous, small, horizontally linear, solitary. Fissures, shallow, continuous, V-shaped, wavy, parallel. Ridges flattened or hollow. Outer surface grey-dark brown. Phelloderm black. Inner bark thin. Reddish brown streaks on cream-coloured-light brown background. On exposure inner bark does not change colour or turn, like cambium, slightly darker. Sapwood cream-coloured. Inner bark mostly fibrous. No scent.

Pseudoxandra obscurinervis

Outer bark hard, thin and smooth with eye marks and hoops. *Lenticels* numerous, small-large, linear or round, solitary, *arranged in horizontal lines*. Scales adherent or loose-hanged, close, rectangular or irregular, flat-sided. Fissures shallow, short, boat-shaped, square-shaped, sometimes wavy, parallel or oblique. Outer surface dark brown. Phelloderm black. Inner bark thick, rays form flame marks. Brown streaks and mottles on yellowish brown-light brown background. On exposure inner bark and cambium slowly turn slightly darker. Sapwood cream-coloured-yellowish. *Inner bark hard, mostly granular*. Scent slightly aromatic or none.

Rollinia insignis

Outer bark hard, thin and smooth with warts. *Lenticels* numerous, *medium-sized-large, vertically linear, compound, arranged in vertical lines*. Outer surface brown.

Phelloderm black. Inner bark very thick, rays form flame marks. Ripple marks. Brown streaks on light brown background (collapsed inner bark). *Non-collapsed inner bark thin, light brown, internal part of the collapsed inner bark reddish brown*. On exposure inner bark turns slowly slightly darker. Sapwood white. *Inner bark hard, mostly fibrous*. Sap clear, liquid. Scent slightly aromatic.

(Bark of the specimen collected by Miralha, Maas et al. 265 differs in the following characters: Outer bark soft, corky and rugose without warts. Fissures shallow, V-shaped, square-shaped, wavy, oblique. Ridges flattened or hollow. No visible layers in the inner bark. Inner bark granular/fibrous. No exudation.)

Unonopsis duckei

Outer bark hard, thin and rough. *Lenticels* numerous, small, round, solitary, *compact*. Fissures shallow, V-shaped, slightly oblique. Ridges rounded or V-shaped. Outer surface dark brown. Phelloderm black. Inner bark thin, rays form flame marks. *Corrugations on the inner surface of the inner bark*. Dark brown streaks on reddish yellow background. *On exposure inner bark does not change colour*. Inner bark hard, granular/fibrous. *Sap flow scanty, slow, clear, reddish hued, viscous, sticky*. Rate of exudation slow. No scent.

Unonopsis stipitata

Outer bark hard, thin and rough, as young smooth with eye marks. Fissures shallow, short, boat-shaped, V-shaped, compound, oblique. Ridges rounded or V-shaped. Outer surface dark brown. Phelloderm black. Inner bark thick, rays form flame marks. Ripple marks. Light brown-dark brown streaks on cream-coloured-light brown background. *Non-collapsed inner bark thin, reddish brown*. On exposure inner bark cambium turn slowly slightly darker. Sapwood cream-coloured-yellowish. Inner bark hard, granular/fibrous. *Sap flow scanty, slow, clear, liquid*. Scent slightly aromatic.

Xylopia amazonica

Outer bark loose, thin and rugose or rough. *Scales loose-hanged, close, mostly*

rectangular, *papery or flat-sided, sometimes shaggy*. Fissures shallow, continuous, V-shaped or square-shaped, wavy, oblique. Ridges hollow. Outer surface red brown. Phelloderm brown-dark red. Inner bark thin, rays form flame marks. Ripple marks. *Corrugations on the inner surface of the inner bark*. Light brown streaks on cream-coloured background. *Non-collapsed inner bark thin, reddish*. On exposure inner bark and cambium turn slowly darker. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. Scent aromatic.

Xylopi*a *benthamii

Outer bark hard, thin and smooth with eye marks. Lenticels scarce, small, round, solitary. Scales loose-hanged, close, irregular, flat-sided or chunky. Fissures shallow, continuous, square-shaped, wavy, oblique. Ridges flattened. Outer surface brown. Phelloderm black. Inner bark thin. Brown streaks on cream-coloured background. On exposure inner bark turns slowly slightly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. No scent.

Xylopi*a *crinita

Outer bark hard, thin and smooth with obscure hoops. Lenticels numerous, small, round, solitary. Outer surface reddish brown. Phelloderm black. Inner bark thin, rays form flame marks. Streaks brown on reddish light brown background. On exposure inner bark turns slowly slightly darker. Sapwood white. Inner bark hard, granular/fibrous. Scent sweetish.

Xylopi*a *nitida

Outer bark hard, loose, thin, smooth, later rough with few eye marks. *Lenticels scarce*, small, *linear, arranged in vertical lines*. Scales loose-hanged, close-distant, mostly rectangular, flat-sided and *form patchy appearance*. Fissures shallow, continuous, square-shaped, wavy, parallel. Ridges flattened. Outer surface reddish brown. Phelloderm brown-black. Inner bark thick, rays form flame marks. Ripple marks (also in sapwood). Brown-red streaks

on cream-coloured-yellowish background. *Non-collapsed inner bark dark reddish brown*. On exposure inner bark and cambium turns slowly darker. Sapwood white. Inner bark hard, mostly fibrous. Scent aromatic.

Xylopi*a *neglecta

Outer bark hard, thin and smooth with hoops. Outer surface reddish brown. Phelloderm dark brown. Inner bark thin, rays form flame marks. Ripple marks (in sapwood). Light brown streaks on reddish light brown background. *Cambium dark brown*. On exposure inner bark turns slowly darker. Sapwood white. Inner bark hard, granular/fibrous. Scent aromatic.

Xylopi*a *polyantha

Outer bark hard, thin and smooth, later rugose with eye marks or hoops. Lenticels numerous, small-medium-sized, vertically linear or round, solitary. Fissures shallow, short, boat-shaped (initiated from lenticels), V-shaped, wavy, parallel. Outer surface light brown-brown. Phelloderm black. Inner bark thick, rays form flame marks. Light brown streaks on cream-coloured-light brown background. *Non-collapsed inner bark reddish-brown*. On exposure inner bark and cambium turn slowly rusty-coloured. Sapwood white-cream-coloured. Inner bark hard, granular/fibrous. Scent sweetish, aromatic.

Xylopi*a *spruceana

Outer bark hard, thin and rugose. Scales adherent, close, irregular. Fissures shallow, short, boat-shaped, V-shaped, wavy, parallel or oblique. Ridges flattened. Outer surface dark brown. Phelloderm black. Inner bark thick, rays form flame marks or *scalariform pattern*. Ripple marks. Reddish brown streaks on light brown-yellowish background. *Non-collapsed inner bark reddish brown*. On exposure inner bark and cambium turn slowly darker. Sapwood cream-coloured. Inner bark hard, granular/fibrous. Scent sweetish, aromatic.