

THE GENUS *CLUSIA* (GUTTIFERAE) IN SURINAME

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(received October 23rd, 1965)

The precursor studies¹⁾ and floristic treatment of P. J. EYMA of the Guttiferae of Suriname²⁾ exhibited a remarkably keen insight into the biology and taxonomy of this rather complicated family. Particularly this is true of the genus *Clusia*, which is the concern of this paper, and for which even yet the overall biology is indeed too little known.

In the Flora of Surinam (l.c.) Eyma admitted eleven species. Now, as a result of more field activity from which much new material has been derived, there can be credited to Suriname fourteen species, of which three have been collected in that country subsequent to the studies of Eyma. Name changes are required for two species.

In this paper new keys are provided, based separately upon flowering and fruiting materials of both male and female plants, and pertinent notes are offered which are intended to supplement the account of Eyma. For five species descriptions which are lacking in the Eyma treatment, or require restatement, are herein provided.

Materials employed in the preparation of this account have kindly been made available by the following herbaria: BR, F, G, GH, K, NY, P, U, US and W.

KEYS TO THE SPECIES OF THE GENUS *CLUSIA* OF SURINAME Based Separately on Pistillate and on Staminate Materials

I. *Key to Clusia of Suriname, pistillate*

1. Stigmas borne on evident styles.
 2. Styles 16, filiform, 3–6 mm 1; ovaries and fruit 16-celled; *Sect. Clusiastrum*.
 3. Sepals commonly 7–10; inflorescence commonly 3- or more-flowered; lamina commonly 20–40 cm 1, broadly ovate to obovate; petioles 1.5–3.0 cm 1, winged. . . . 1. *Clusia stylosa*
 3. Sepals 12–14; inflorescence commonly 1-flowered, sometimes 3-flowered; lamina commonly 10–16 cm 1, elliptic, sessile 2. *Clusia tabulamontana*
 2. Styles 5 (4–6), stout, cornute, ovaries and fruit 5 (4–6)-celled, each cell several-seeded; sepals 4, petals commonly 5; staminodia lacking; *Sect. Anandrogynae* 3. *Clusia sessilis*

¹⁾ EYMA, P. J. 1932. New and critical Polygonaceae, Guttiferae and Lecythidaceae from Surinam, Meded. Bot. Mus. Herb. Univ. Utrecht No. 4: 6–46.

²⁾ EYMA, P. J. 1934. Guttiferae in Pulle. Fl. Surinam 3: 65–118.

1. Stigmas not borne on evident styles, hence essentially sessile.
4. Ovary and fruit 4(5)-celled; capsule 6–15 mm l, each cell commonly 1-seeded; lamina oblong-obovate or broadly obovate to 20 cm l, latex whitish; *Sect. Cruva* . . . 4. *Clusia melchiori*
4. Ovary and fruit 5-celled.
 5. Ovary subtended by 5–10 stout essentially free staminodia; latex white or whitish.
 6. Staminodia 5, sterile, devoid of anthers; capsule obovate-turbinate, 8–14 mm l, commonly strongly transversely rugose, each cell 3–6-seeded; petioles slender, 5–15 mm l, lamina obovate to oblanceolate, (3)8–12 cm l; latex clear; *Sect. Pseudo-quapoa* 5. *Clusia pana-panari*
 6. Staminodia or stamens 10, each bearing a terminal circular embedded usually functional anther; flowers apparently ♂; ovary and fruit 5-celled; stigmas deltoid, at length 8–10 mm l, dimpled; petiole short, winged, lamina obovate-cuneate, to 20 cm l; latex yellowish, oxidizing red; *Sect. Polythecandra* 6. *Clusia scorbiculata*
 5. Ovary subtended by a discoid or cupuliform, commonly sterile, synandrium, or synandrium-like body.
 7. Synandrium (if indeed a synandrium obtains) unknown, but possibly of discrete prismatic staminodia; sepals probably 7–9, the upper imbricate and broadly scarious-margined; capsule pentagonal to 5 cm l, strongly transversely rugose; *Sect. Phloianthera* . . . 7. *Clusia purpurea*
 7. Synandrium or synandrium-like body provided with staminodia; capsule neither pentagonal nor rugose.
 8. Ovules and seed commonly 1 in each cell; staminodia mucous, in several rows, adherent in a low ring 1.5–2.0 mm h; fruit flask-shaped; stigmas 5, ca. 2 mm l, sharply connivent; leaf-apex more often abruptly apiculate or shortly acuminate; latex white; *Sect. Androstylium* 8. *Clusia fockeana*
 8. Ovules and seed commonly several in each cell; staminodia in several rows, flat, linear, awned, anantherous, glutinous, borne on a corona ca. 5 mm h; fruit oblong-ellipsoid, to 3 cm l; stigmas 5–8, ca. 3 mm l, more or less spreading, not sharply connivent; leaf-apex more often acute or obtuse; latex yellowish; *Sect. Clusia* 10. *Clusia nemorosa*
 4. Ovary and fruit more than 5-celled.
 9. Ovary 6–8-celled, with 6–8 stigmas.
 10. Staminodia lacking, or if provided with stamens the anthers fertile and the flowers ♀; stigmas upturned, radiate; leaves sessile or with petioles 1–2 cm l, lamina cuneate-obovate, obtuse, commonly latex canals prominent; latex white; *Sect. "Minor"* 9. *Clusia minor*
 10. Staminodia numerous, plane, several-ranked, awned, anantherous, glutinous; cells of ovary 6–8, sometimes

- only 5; stigmas ascending; petioles 2–3.5 cm l, lamina elliptic or obovate-oblongate, commonly 10–15 cm l, latex yellow; *Sect. Clusia* 10. *Clusia nemorosa*
9. Ovary 10- or more-celled, stigmas 10 or more; latex yellow; *Sect. Clusia*.
11. Fruit depressed-globose, without gynobase; younger internodes coarse, commonly 1 cm more thick.
12. Ovary 12–16-celled; stigmas 12 or 16, forming a thick, broad, umbraculiform adpressed cap; fruit depressed-globose to 10 cm diam; younger internodes decussately angled 11. *Clusia grandiflora*
12. Ovary 12–14-celled; stigmas 12–14, flat, not elevated; fruit depressed-globose to 6 cm diam; younger internodes terete 12. *Clusia platystigma*
11. Fruit ovate-globose; branchlets terete.
13. Ovary and fruit 10-celled, the fruit deeply sulcate, the stigmas capitate, 15–18 mm broad; leaf-blades obovate to orbicular-obovate, to 20 cm l, the base more or less abruptly rounded; bracts and bracteoles ovate-navicular, 1–1.25 cm l; commonly a small tree 13. *Clusia robusta*
13. Fruit to 6 cm l, often provided with an obvious gynobase; stigmas capitate, 6–8 mm broad; branchlets slender, 8 mm or less thick; commonly an epiphyte 14. *Clusia palmicida*

II. Key to *Clusia* of Suriname, staminate

1. Flowers unisexual (occasionally staminodia may be fertile or partially so, cf. *Cl. purpurea* and *Cl. scorbiculata*), staminate, with or without rudimentary pistils.
2. Stamens indefinite in number, much exceeding 10; filaments free to the base; anthers linear, 2-celled; rudimentary pistils lacking.
3. Sepals 7–14, imbricate, only the lower opposite; petals 7–8, obovate, ca. 3 cm l, white; anthers dehiscing laterally towards the apex; latex white; *Sect. Clusiastrum*.
4. Sepals 7–10; inflorescence (3) 5–15-flowered; lamina commonly 20–40 cm l, broadly ovate to obovate; petioles 1.5–3.0 cm l, winged 1. *Clusia stylosa*
4. Sepals commonly 12–14; inflorescence 1–3 (5)-flowered; lamina commonly 6–10 cm l, elliptic, sessile 2. *Clusia tabulamontana*
3. Sepals 4 (bracteoles 4), decussate.
5. Petals (4) 5, elliptic-oblong, 18–22 mm l, greenish-yellow or whitish, stamens \pm 100, 8–12 mm l, inflorescence 3–5-flowered, flowers fragrant; leaves sessile, lamina broadly to narrowly lanceolate, commonly 10–25 cm l; latex white; *Sect. Anandroyne* . . . 3. *Clusia sessilis*
5. Petals 4, elliptic-oblong, 5–6 mm l, greenish-yellow;

- stamens 16–20, free, 3.0–4.5 mm l; inflorescence many-flowered; petioles 5–18 mm l, lamina oblong-obovate or broadly obovate, to 20 cm l; latex white; *Sect. Criuva* 4. *Clusia melchiori*
2. Stamens indefinite or definite in number, aggregated, variously coalesced, or the filaments connate into a ring or corona at the base; rudimentary pistils sometimes present.
6. Stamens forming a synandrium, or aggregate synandrium-like central mass.
7. Androeceum subglobose or globose; a central rudimentary pistil more often lacking.
8. Stamens commonly 15–25, forming a compact subglobose mass; filaments prismatic, stout, anthers distally lateral, opening by two terminal pores; latex clear; *Sect. Pseudo-quapoia* . . . 5. *Clusia pana-panari*
8. Stamens numerous, forming a columnar androeceum surmounted by a globose synandrium, the base of the column subtended by numerous staminodia, these often anther-bearing; petioles 1.5–4 cm l, lamina elliptic, oblong-obovate or rarely lanceolate, abruptly and often obliquely apiculate or short acuminate; latex white; *Sect. Androstylium* 8. *Clusia fockeana*
7. Androeceum cupuliform or connate, enclosing or surrounding a rudimentary (sometimes well developed) pistil.
9. Anthers numerous, 2-celled, synandrium truncate-conical, 1.0–1.5 cm h; pistil probably often functional; sepals 7–9, broadly obovate, to 2 cm l, the lower pair opposite, the upper imbricate, all strongly scarious-margined; leaves subsessile; lamina oblong-obovate or oblong-cuneate, to 20 cm l; latex white; *Sect. Phloianthera* 7. *Clusia purpurea*
9. Anthers 1-celled, saccate, annuliform, embedded in circular apical pits; filaments few, 1 (2)-ranked, massive, prismatic, cupuliform and connate at the base, ca. 1 cm h; flowers ♂; leaves subsessile; blades obovate-cuneate to 20 cm l; latex yellowish, oxidizing red; *Sect. Polytheca* . . . 6. *Clusia scorbiculata*
6. Stamens forming neither a synandrium nor an aggregated body; filaments distinct and free but connate at the base into a distinct collar or corona surrounding a central sterile depressed glutinous mass; latex yellow; *Sect. Clusia*
10. Petals 4–5, the blade white, 2–3 cm l, the claw red-purple or pink within; characteristically a shrub or tree 10. *Clusia nemorosa*
10. Petals 7–8, panduriform, white, flushed within with red or pink; commonly 5 cm or more l.
11. Branchlets coarse, 1 cm or more diam, decussately

- angled 11. *Clusia grandiflora*
11. Younger internodes terete.
12. Branchlets coarse, 1 cm or more diam.
13. Anthers with connective produced as a flat narrowly acute appendage; lamina obovate to cuneate-obovate, to 25 cm l, gradually narrowed toward the base; bracts and bracteoles large, suborbicular 1.5–2.5 cm l; commonly a small tree 12. *Clusia platystigma*
13. Anthers muticous; lamina obovate to orbicular-obovate, to 20 cm l, the base more or less abruptly rounded; bracts and bracteoles ovate-navicular, 1–1.25 cm l; commonly a small tree 13. *Clusia robusta*
12. Branchlets relatively slender, 5–8 mm diam; anthers with connective produced as a conspicuous slender awn; bracteoles small, triangular-ovate, acutish to acuminate, to 5 mm l; commonly an epiphyte 14. *Clusia palmicida*
1. Flowers hermaphroditic (often wholly pistillate, then lacking either stamens or staminodia); stamens usually fertile, sometimes anantherous; leaves subsessile or with petioles to 1 cm l, lamina obovate-cuneate to obovate-rhombic, obtuse, 5–14 cm l; latex canals prominent; latex moderate, white 9. *Clusia minor*

1. ***Clusia stylosa*** Maguire, Bull. Torrey Club 75: 419, fig. 18, 1–6. 1948. Sect. *Clusiastrum* Pl. & Tr.

Shrub or tree to 10 m high, with scanty white or cream latex; branchlets coarse, more or less terete, little or not at all angled. Leaves (15) 20–40 cm l, (8) 10–15 cm w, coriaceous, broadly obovate to oblanceolate, rounded, from above the middle the blade gradually narrowed to the base; the petioles 1.5–3.0 cm l, broadly winged and frequently subauriculate, hence the leaves appearing sessile; the midrib not prominent above, strongly so, elevated and rounded below, the primary nerves prominent below, less so above, 8–10 mm apart, ascending in a 20° angle and collected in a peripheral vein 3–4 mm from the blade margin, secondary veins only a little less prominent. Inflorescence compact, 3–15-flowered, peduncle stout, 3–8 cm l, primary bracts 1.5–2.2 cm l, obtuse, secondary bracts usually ca. 8 mm l, obtuse or apiculate, the ultimate 5–6 mm l.

♂ flowers: sepals 7–10 imbricate or subdecussate, concave, suborbicular, margins scarious, to 1.5 cm long; petals 7–8 obovate, ca. 3 cm l, white; receptacle plane or somewhat convex; stamens numerous, considerably exceeding 100, free, 4–5 mm l, filaments slender ca. 1.5–2.0 mm l, anthers linear, dehiscing laterally and distally for ca. 1.5 mm, tardily or characteristically not dehiscing for their entire length; rudimentary pistil lacking; pollen 3-colporate, sphaeroid-deltoid, essentially isolateral, in equatorial view 27–32.2 μ diam.

♀ flowers: sepals usually 10, essentially imbricate, the outer paired; petals not observed; staminodia anantherous, free, numerous, 4–5 mm l, linear, 5–6-serial, borne on a low corona ca. 1 mm h; ovary 16-celled, ovules numerous, biseriate, axial, sessile; fruit oblong, narrowed at the summit into a crateriform beak 2–4 mm l, styles 16, free, 3–5 mm l, radiate, stigmas subbasally sessile, obovate, ca. 1 mm l; mature fruit probably exceeding 3 cm in length.

Distribution: Suriname.

Tafelberg: Common, *Clusia* bush, line between Savanna VIII and southwest escarpment, Sept. 5, 1944. *Maguire* 24625 ♀ (holotype NY); common, *Clusia* bush, Savanna VIII, *Maguire* 24626 ♂, 24545 ♂; Arrowhead Basin, *Maguire* 24508 ♂. Emma Keten: forest on E. slope of Hendriktop below the top, dominated by this species, Aug. 17, 1959. *Daniëls & Jonker* 960 ♂. Wilhelmina Gebergte: Frederik Top at 1050 m, Aug. 22, 1963. *Irwin et al.* 54951 ♀.

Clusia stylosa and the next, *Cl. tabulamontana*, both of the Sect. *Clusiastrum*, were initially found on Tafelberg. Now they both have been collected on the high portion of the Wilhelmina Mountains, and the first also on Emma Keten, thus enlarging the record of their respective ranges to the adjacent lofty crystalline mountain masses of central Suriname. Otherwise, the ten members of the *Clusiastrum* are known only from the areas of the Roraima Formation, except for Tafelberg, in the Guayana Highland of Venezuela and contiguous British Guiana, Brazil and Colombia.

Members of the Sect. *Clusiastrum* are well set off from the other sections of *Clusia* by the broadly based subsessile or sessile leaves, white latex (oxidizing cream or yellowish), numerous imbricated sepals, free numerous stamens, with anthers dehiscing laterally and subapically, styles filiform, free (except in *Cl. cuneata*), and multicelled ovaries varying from 8 to 16 (in ours 16). The two Suriname species between themselves are readily recognized by leaf distinction alone. Flower differences are manifest.

2. ***Clusia tabulamontana*** Maguire, Bull. Torrey Club 75: 420, fig. 18, 7–10. 1948. Sect. *Clusiastrum* Pl. & Tr.

Shrubs or trees 5–7 m h, with scanty white or cream latex; branchlets coarse, more or less terete, little or not at all angled. Leaves 10–16 cm l, 5–7 cm w, coriaceous, elliptic, broadly obtuse at the apex, little narrowed at the base, essentially sessile, or a broad petiole hardly evident; the midrib depressed and not prominent above, elevated and rounded below, the primary nerves prominent below, ascending at a 40° angle, 4–8 mm apart, collected in a peripheral vein 3–4 mm from the blade margin. Inflorescence 1–3-flowered, peduncle to 6 cm l and 5 mm diam; primary bracts obtuse, 1 cm l, secondary bracts 3–5 mm l; sepals 12–14, the outer pair opposite, suborbicular and connate, the inner imbricate, to 15 mm l and 18 mm w, the inner becoming oblong with narrowed base; petals 8, obovate, 3–4 cm l.

♂ flowers: unknown.

♀ flowers: staminodia 4–5 mm l, numerous, free, linear, sterile,

4–6-serial; ovary 16-celled, ovules numerous, 2-ranked, sessile, oblong; styles 16, 2–4 mm l, free, radiating from a crateriform beak 1–3 mm l; stigmas obovate-oblong, ca. 2 mm l, subbasally attached, articulate. Fruit 3–4 cm l, oval-oblong; seed oblong-ovoid ca. 3 mm l.

Distribution: Suriname.

Tafelberg: small branched tree to 5 m h, petals white, fragile, crimped and erose along the margin, frequent, edge of Savanna V, Aug. 16, 1944. *Bassett Maguire* 24396 ♀ (holotype NY); Savanna II, *Maguire* 24245 ♀, 24738 ♀. *Wilhelmina Gebergte*: Juliana Top, 1000–1230 m alt. Aug. 18, 1963. *Irwin et al.* 54879 ♀.

3. *Clusia sessilis* Klotzsch ex Engl. Sect. Anandrogynae Pl. & Tr. *Clusia cerroana* Steyermark, *Fieldiana*, Bot. 28: 386. 1952.

Tree 3–20 m h, latex clear, moderate; branchlets 5–12 mm diam, terete, internodes commonly 2–5 cm l; leaves sessile; blades subcoriaceous, broadly to narrowly oblanceolate, commonly 10–25 cm l, 5–14 cm w, the apex broadly rounded, narrowed to the clasping base; midrib depressed above, prominent and raised beneath, extending to the apex; primary veins 2–3 mm apart, rising at a 25°–40° angle, collected in a peripheral vein 1–4 mm from the margin. Inflorescence terminal, commonly 3–5-flowered; peduncles stout, to 3 cm l, sometimes lacking; primary bracts sometimes foliar, secondary bracts broadly rounded, wider than long; bracteoles lacking; flowers fragrant.

♂ flowers: sepals 4, decussate, broadly semiorbicular, 6–10 mm l, 10–15 mm w, the inner pair larger. Petals 5(6), oblong to oval-oblong, 15–22 mm l, 8–16 mm w, yellowish-green. Receptacle shallowly cupulate. Stamens linear, numerous, \pm 100, free, the outer filaments borne on a low corona, filaments reddish-brown, 3–6 mm l, compressed, 0.4–0.6 mm broad; anthers contrastingly cream-white, 5–6 mm l, laterally dehiscent for their entire length; pollen 3-colporate, sphaeroid-deltoid, essentially isolateral, in equatorial view 32.5–34.5 μ , sporoderm relatively thin, 2–2.5 μ thick, not thickened toward pores; crystals present.

♀ flowers: sepals 4, decussate, broadly semiorbicular, 6–8 mm h, 8–12 mm w. Petals 5(6), oblong to oval-oblong, 14–18 mm l, 6–10 mm w, yellowish-green. Staminodia lacking. Ovary flask-shaped, 5 (4–6)-celled; stylar processes stout, cornute; stigmas terminal, more or less peltate, obtusely deltoid; ovules several, 1–2-ranked, ascending, aril delicate, becoming hyaline. Fruit subsucculent, the body to 2 cm l, the cornute styles to 1 cm l; seed oblong, to 5 mm l.

Distribution: chiefly of the Roraima sandstone regions of Guayana, where it is common.

In Suriname known by two collections, both from Juliana Top, *Wilhelmina Gebergte*, and both staminate: very common on exposed spots all over summit between 1000 and 1200 m, terrestrial or epiphytic in low trees. Aug. 8, 1963. *J. P. Schulz* 10302 ♂; tree 10 m high, densely branched to the ground, on upper slopes and summit of Juliana Top, at 1000–1230 m alt. Aug. 8, 1963. *Irwin et al.* 54862 ♂.

The flowers of *Wilhelmina* specimens are somewhat larger than the

average, and the color of the petals is noted as "white" and "dirty white". It is possible that the two collections cited above represent a geographic variant. Dr Schulz notes that the plant may be an "epiphyte in low trees". Otherwise there is no record of the species other than terrestrial.

4. **Clusia melchiori** Gleason, Bull. Torrey Club 58: 403-404. 1931.
Sect. *Eucriuva* Engl.

Cl. flaviflora Eyma, Med. B. M. Univ. Utrecht 4: 130. 1932, not Engler in Engl. Bot. Jahrb. 58, Beibl. 130. 1923.

Small or medium tree to 18 m h; younger branchlets stout, angled, soon becoming subterete, latex moderate, clear, oxidizing reddish-brown. Leaves: petioles stout, 5-18 mm l, 5-16 mm w; lamina oblong-obovate to broadly obovate, rounded at the apex, often cuneately narrowed toward the base, (5) 10-20 cm l and (4) 8-15 cm w, coriaceous; midrib prominent and canaliculate above, continuing but diminishing toward the apex, prominent beneath, primary veins equally prominulous on both sides, 2-4 mm apart, making a 45° angle with the midrib, joining a peripheral nerve \pm 1-4 mm from the margin. Inflorescence terminal, ternately or quadrately decom-pound, often botryoid, to 12 cm l, many-flowered; peduncle to 4 cm l, the stout axis and branches sharply angled, the ultimate very short, 0.5-2.0 mm l, bracts and bracteoles ovate to deltoid-acute, 2-5 mm l; flowers subsessile or the pedicel 1-2 mm l, flowers, especially those of the male plants, very fragrant, petals 4, pale greenish-yellow.

♂ flowers: bracteoles 4, decussate, subcarinate, ovate, acutish, the upper pair somewhat rounded, 1.5-2.0 mm l; sepals 4, decussate, the outer pair broadly ovate ca. 2.5 mm l, the inner orbicular-ovate, ca. 4 mm l, subhyaline, the margin broadly scarious; petals 4, elliptic-oblong, 3.5-4.0 mm w, 5.0-6.0 mm l, subcarnose toward the base; stamens normally 16-20, filaments free, 2.5-3.5 mm l, the outer shorter, radially somewhat compressed, ca. 0.4 mm w; anthers 1.2-1.5 mm l, oblong, completely laterally dehiscent, connective prominent, not productate; pollen grains 3-colporate, in equatorial view deltoid, essentially isolateral, 25-30 μ diam, intermixed with numerous spherical, mace-like crystals 10-20 μ diam; abortive pistil lacking.

♀ flowers: bracteoles 6-10, closely imbricated, decussate, subcarinate, broadly ovate-suborbicular, 2-3 mm l, sepals 4, hardly separable from bracteoles, scarious-margined; petals 4, oblong-obovate, 5-6 mm l, 3-4 mm w, subcarnose, greenish-yellow; staminodia vacking; ovary 4-celled, each cell with a single ovule, seldom 2; capsule fleshy, ovoid-globose, 6-15 mm l, abruptly narrowed to a short stylar portion surmounted by 4 ovoid connivent stigmas, 0.8-1.0 mm l, the normally solitary seed oblong, 4-10 mm l, with a separable hyaline testa.

Distribution: sandstone region of the Guayana Highland and on Tafelberg, and proximal mountain tops in Suriname.

Suriname: Emma Ketén, top II, at 700 m alt. (B.W. 5645, young fr., March 1932) (U); Hendriktop, at 1080 m alt. (B.W. n. 5665) (U); Tafelberg, East Ridge

at 760 m alt., Sept. 1944. *Maguire 24585* ♀, *24585a* ♂; Tafelberg, Savanna VIII, at 564 m alt., Sept. 1944. *Maguire 24641* ♀; Wilhelmina Mts., Juliana Top at 1050 m alt., Aug. 4, 1963. *Schulz 10296* ♀, *10303* ♂; *Irwin et al. 54864* ♂.

Clusia melchiori does indeed belong to a "coherent" group of species of northern South America and the West Indies, as indicated by Eyma (Med. B. M. Univ. Utrecht 4: 14. 1932) in his consideration of the Suriname plant under the name *Cl. flaviflora*. Most students of *Clusia* have recognized these relationships, under which probably fall *Cl. havetioides* (Griseb.) Pl. & Tr. and *Cl. krugiana* Urb., in the West Indies; *Cl. melchiori* Gleason, *Cl. cardonae* Maguire, and *Cl. opaca* Maguire in Guayana and Suriname; *Cl. pseudo-havetia* Pl. & Tr., *Cl. trochiformis* Vesque, *Cl. poeppigiana* Engl., *Cl. veneralensis* Cuatrecasas, and others of the Andes.

These species appear to belong to the large and complex *Section Anandrogynae* Pl. & Tr., and may well comprise a distinct subsection within it. Since the delimitation of species and consequent nomenclature of them is not at this time understood, the epithet *melchiori* is here best employed to cover the plants so defined for Suriname and contiguous British Guiana and Venezuela.

5. ***Clusia pana-panari*** (Aubl.) Choisy in D. C. Prodr. 1: 559. 1842. Sect. *Pseudo-quapoa* Engl.

Quapoya Pana-panari Aublet, Hist. Pl. Guiane fr. 2: 900. 1775.

Renggeria guyanensis Splitg. in Tijdschr. Nat. Gesch. 9: 104. 1842.

Quapoya surinamensis Miquel, Stirp. Sur. sch. p. 92. 1851.

Clusia colorans Klotzsch ex Engl. Fl. Bras. 12: 426. 1888.

Clusia microphylla Klotzsch ex Engl. Fl. Bras. 12: 426. 1888.

Shrub, small or medium tree, often epiphytic; latex moderate clear, whitish or milky. Leaves: petioles slender 5–15 mm l; lamina subcoriaceous, obovate to oblanceolate, commonly 8–12 cm l and 3–5 cm w, less often as small as 3 cm l and 1.5 cm w; rounded or obtusely pointed at the apex, gradually and acutely narrowed to the base; midrib somewhat prominent beneath, prominulous above, diminishing toward the apex, primary veins prominulous beneath, inconspicuous or non-evident above, forming a 40°–45° angle with the midrib, canals often conspicuous above, forming a 50°–60° angle with the midrib. Inflorescences terminal, ternate or ternately decompound, often compact, usually 3–5 (9)-flowered, their branches angled, commonly 2–3 cm l, essentially sessile, pedicels 1–6 mm long; bracts ca. 1 mm l, rounded, bracteoles 4, decussate, sepals 5, imbricate, 3.0–4.5 mm l, broad lyrounded, conspicuously brown-scarious-margined; petals 5, pale greenish-white, yellowish or greenish-orange, reddish maculate within, 5–7 mm l.

♂ flowers: stamens usually 15–25, rarely as few as 5, free, forming a subglobose central compacted mass; filaments stout, angled by compression, ca. 1.5 mm l; anthers distally lateral, opening by 2 terminal pores, the connective diameter broader; pollen grains 3-colporate, sphaeroidal, 24.5–28 μ diam; sporoderm thickened at pores,

crystals few, 7.5–19.5 μ diam. Flowers containing a rudimentary pistal usually provided with 8–10 stamens.

♀ flowers: staminodia 5, somewhat broader than stamens of the male flower; ovary 5-celled, each cell with 3–6 ovules, sessile, aril basal, copious, fimbriate, yellow; stigmas 5, deltoid-rhombic, sharply acute, connivent, 2–3 mm l, hispidulous. Fruit turbinate-obovate, 8–14 mm l, at maturity most often strongly transversely rugose when dry because of the transverse cartilaginous thickening of the endocarp walls; seed oblong 3–4 mm l, aril persistent.

Distribution: the region of Coastal Guiana, Venezuela to Brazilian Amazonas and Maranhão.

Commonly distributed in Suriname as a shrub or small tree in open area, especially along water courses, and in forest areas as an epiphyte.

The species is somewhat variable in size of leaf, leading to the two names, *Cl. colorans* and *Cl. microphylla*. The taxonomy is not entirely clear because of the apparent failure of some specimens with large fruit to develop the characteristically rugose form, in which no perceptible cartilaginous thickening occurs. In this condition the stigmas may be smaller and less connivent. There is considerable variation in the number of stamens, in some plants of Amapá there being as few as 5.

6. ***Clusia scorbiculata*** Benoist, Bull. Hist. Nat. Paris 30: 511. 1924. Sect. Polythecandra Pl. & Tr.

Distribution: Guiana; British Guiana to Amapá, Brazil.

The few specimens by which this Guianan species is known indicate that it is an epiphytic strangler. Its near relative in southeastern Brazil, *Cl. fluminensis*, is more often a bushy tree – and is commonly planted in this form as an ornamental. Other close congeners, notably *Cl. schomburgkiana* and *Cl. modesta* of the Guayana Highland region of Venezuela and adjacent British Guiana, Brazil and Colombia, are bushy trees to 15 m in height.

To this time, apparently no wholly staminate material has been collected. All material examined seems to be hermaphroditic or partially so.

Brazil: "Epifita em arvores, Igarapé Pontanarri, Rio Oiapoque", Feb. 14, 1950. *Frés* 26017.

British Guiana: Parasitic shrub, Onoro Creek, Essequibo River, Dec. 15–24, 1937. *A. C. Smith* 2736.

Suriname: Brownsberg, Nov. 6, 1915. *B.W.* 759; epiphyte, Nassau gebergte, Feb. 23, 1949. *Lanjouw & Lindeman* 2264; epiphyte, Capoerica Ridge, Perica, Jan. 21, 1954, *Lindeman* 5338; epiphyte, latex abundant, yellowish, oxidizing blood-red, Jodensavanne–Mapane Creek, Suriname River, Dec. 21, 1954, *Lindeman* 6943.

7. ***Clusia purpurea*** (Splitg.) Engler, Fl. Bras. 12¹: 416, t. 86, f. 2. 1888. Sect. Phloianthera Pl. & Tr.

Arrueda purpurea Splitgerber in Tijdschr. Nat. Gesch. IX, p. 102. 1842. ? *Clusia leprantha* Mart. Nov. Gen. et Sp. 3: 165. 1829.

Distribution: Suriname (and probably British Guiana) south to Maranhão, Brazil, the Amazon Basin to Loreto, Peru, and Amazonas, Colombia and Amazonas, Venezuela.

Suriname: Surinam, Nov. 1846. *Hostmann (Kappler) 1704*; Gran Dam, Saramacca River, Oct. 11, 1944. *Maguire 24934* ♀ (fr.); Moengo, Dec. 24, 1954. *Maguire 38976* ♂; Paramaribo, Nov. 1, 1955. *Lindeman 6639* (sterile); Tigri-hedde, Coppename River, Nov. 17, 1954. *Lindeman 442*; Lucie River, July 2, 1964. *Maguire et al. 54070* ♀ (fr.).

In all probability the Guianan populations are conspecific with those of the upper Amazon Basin. At least at this time I cannot recognize any distinction. If it is to be demonstrated that a single species in fact obtains, then the name *Clusia leprantha* will have to take precedence.

Pistillate flowering material was not available to Eyma (Fl. Surinam 3: 96. 1934). At this much later date female flowers are still lacking to me. Two inadequate ♀ specimens (*Froés 1750, 29460*), both from the eastern Amazon Basin, may shed some light as to the morphology of ♀ flowers. The androecium in *1750* has numerous, 7–8-serial, free, massive, prismatic stamens, and *29460* is similar but with 4–5-series of evidently functional stamens. Contrastively, the large amount of ♂ material uniformly possesses the typical conic synandrium. Alternatively, the two cited Brazilian specimens may represent yet another species. Resolution of the problem must await more observation in the field, and better and more extensive material. All collections of fruiting material seen by me are without a trace of androecium.

8. ***Clusia fockeana*** Miquel, Tijdschr. Nat. Gesch. 10: 82. 1843. Sect. *Androstylium* (Miq.) Engl.

Cl. stahelii Maguire. Bull. Torrey Club 75: 424. 1948.

Distribution: Guiana, from British Guiana to Pará, Brazil.

Cl. fockeana is a common shrub or small tree of savannas or open sites in the Guianas. It is sometimes epiphytic. There appear to be no immediate relatives of this species, which is well marked, readily recognized, and which belongs to the small *Section Androstylium*.

9. ***Clusia minor*** Linnaeus, Sp. Pl. Ed. 1: 510. 1753. Sect. "Minor".

? *Cl. parvicapsula* Vesque, Epharm. 3: 10. pl. 34. 1892.

? *Cl. cartilaginosa* Vesque, in D.C. Monogr. Gutt. 8: 97. 1893.

? *Cl. utilis* Blake, Contr. U.S. Nat. Herb. 24: 14. 1922.

Distribution: West Indies and northeastern South America, probably also the northern Andes and Central America.

Clusia minor L., the second of the original Linnaean species of the genus (see HOWARD, Jour. Arn. Arb. 43: 394. 1962), has since the early history of the genus been a poorly understood and interpreted species. Yet, it is widespread, strongly marked, and a not unusually variable species. Notwithstanding, the three binomials, viz., *Cl. cartilaginosa* Vesque, *Cl. parvicapsula* Vesque, and *Cl. utilis* Blake, have been derived from *Cl. minor*, or at most represent weak segregates of it.

Fruits vary somewhat in size, but are all surmounted by the characteristic upturned radiate stigmas. Leaves also vary somewhat in size but retain fundamental form, venation and prominence of latex canals.

Perhaps the bisexual character of the flowers, unusual in the genus, except in the *Sect. Polytheca*, has led to some confusion and certainly to the exclusion of the species or derivatives from any sectional classification. In another place I shall address this problem. Elsewhere in *Clusia* an element of functional bisexuality obtains, notably in *Sect. Polytheca*, where in essentially pistillate trees flowers normally form anthers with evidently functional pollen.

10. ***Clusia nemorosa*** G. F. W. Meyer, *Primitiae Fl. Essequiboensis* p. 203. 1818. *Sect. Clusia*.

Distribution: Venezuela, Guiana and Brazil, extending south to Rio de Janeiro.

Commonly a shrub or small tree characteristic of savannas or open sites. *Cl. nemorosa* is the only member of the *Sect. Clusia* with the ovary developing as few as 5 cells. Characteristically, members of the section are 10-18-carpellate.

11. ***Clusia grandiflora*** Splitgerber, *Tijdschr. v. Nat. Gesch.* 9: 101. 1842. *Sect. Clusia*.

Distribution: Guiana in the broad sense, extending from Venezuela to Pará, Brazil.

Clusia grandiflora is perhaps the finest of the many species of the very large and generally ornamental genus *Clusia*. Its range seems to be restricted to the Guianas, and is therefore not wholly coextensive with that of the complex *Section Clusia*, the members of which are to be found in the Antilles and in northeastern South America, inclusive of the Amazon Basin. *Cl. grandiflora* is easily distinguished from its immediate congeners by its large flowers, the showiest of the genus, its large depressed globose fruit, and its stout, conspicuously angled younger internodes. The bush or tree form is cultivated in Venezuela and Brazil.

12. ***Clusia platystigma*** Eyma, *Polygon., Guttif., Lecyth.* p. 29, fig. 4. 1932. *Sect. Clusia*.

Distribution: Suriname to Pará, Brazil.

In flowering pistillate and fruiting specimens, *Cl. platystigma* is easily separable from other euclusioids of Suriname and Guiana because of the flat, non-raised stigmas and subsulcate fruit. *Cl. platystigma*, a small tree or an epiphyte, is immediately related to yet undescribed species of the upper Río Guainía and upper Río Atabapo in Amazonas, Venezuela.

Suriname (in addition to specimens cited by Eyma): Zanderij I, Apr. 28, 1945. *Stahel* 295; Moengo, Nov. 22, 1949. *Lanjouw & Lindeman* 406; Jodensavanne-Mapane Kreek area, July 10, 1953. *Lindeman* 4218.

Brazil: Serra do Navio, Amapá, Nov. 8, 1954. *Cowan* 38147.

13. ***Clusia robusta*** Eyma, Polygon., Guttif., Lecyth. p. 29, fig. 4. 1932. Sect. *Clusia*.

Distribution: Known presently only from central Suriname.

Suriname: Tree 10 m h, Hendriktop at 1080 m alt., Mar. 13, 1922. *B. W.* 5728 ♂ (holotype U); shrub or small tree to 8 m h, frequent, borders of Savanna VIII, Tafelberg, Aug. 29, 1944. *Maguire* 24569 ♂, 24570 ♀.

Clusia robusta is apparently known only from the cited localities. It is readily recognized in staminate flower by the muticous anthers, and by the deeply sulcate fruit. In this latter respect it resembles undescribed relatives of *Cl. platystigma*, which have been found in Amazonian Venezuela. The several related species are all trees.

14. ***Clusia palmicida*** L. C. Rich. apud Pl. & Tr., in Ann. Sc. Nat. ser. 4, 13: 326. 1860. Sect. *Clusia*.

Distribution: Guiana in the broad sense, extending from Venezuela to Pará, Brazil.

Probably most often an epiphyte, its habit indicated by its name. *Cl. palmicida* and its near relatives are not clearly understood. Little is added to the knowledge of its biology in this paper. A thorough examination of the Sect. *Clusia* is needed before acceptable interpretation can be offered. Indeed, this holds true for the entire section.