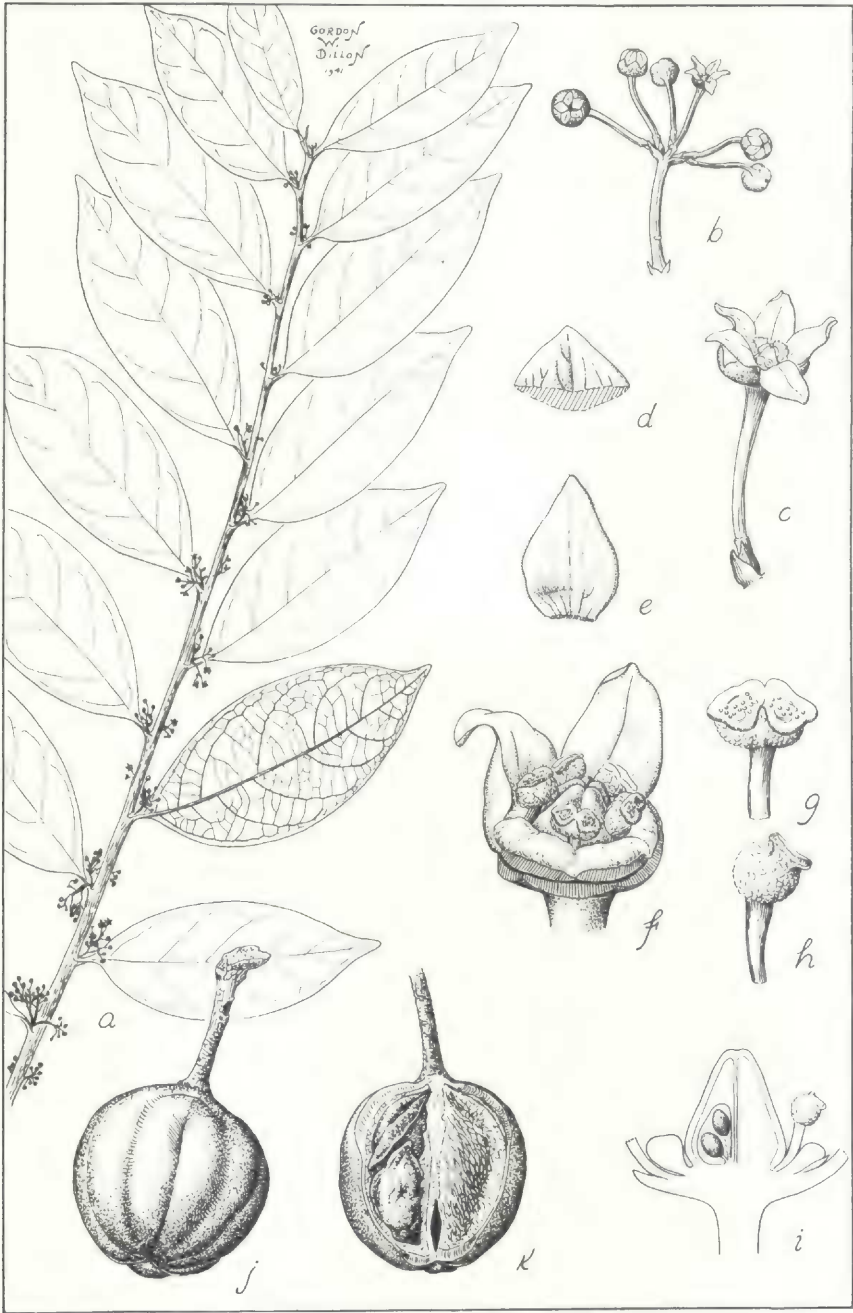


This, indeed, may be the only fixed character by which the families Hippocrateaceae and Celastraceae may be separated. If so, one must consider the families quite artificial, especially since they exhibit parallel series of variations in characters pertaining to wood-anatomy and pollen-structure.

EXPLANATION OF PLATE

FIG. *a*. Flowering branchlet, $\times \frac{1}{2}$; *b*. Inflorescence, $\times 2$; *c*. Flower, $\times 5$; *d*. Sepal, $\times 10$; *e*. Petal, $\times 10$; *f*. Flower with sepals and three petals removed, $\times 15$; *g*. Stamen, exterior view, $\times 30$; *h*. Stamen, lateral view, $\times 30$; *i*. Longitudinal section through flower, $\times 15$; *j*. Fruit, $\times 1$; *k*. Fruit with two carpels removed, $\times 1$.

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BRASSIANTHA PENTAMERA A. C. SMITH

STUDIES IN THE THEACEAE, VII
THE AMERICAN SPECIES OF THE GENUS CLEYERA

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THE genus *Cleyera*, well known and generally accepted as a distinct genus of the Theaceae by students of the Asiatic flora, has been included under the genus *Eurya* by workers on the flora of tropical America. This is probably due to the fact that Szyszyłowicz, in the first edition of Engler and Prantl's *Natürliche Pflanzenfamilien*, treated *Cleyera* as a section of *Eurya*. Included here also as a section was the American genus, *Freziera*. Urban in 1896 protested vigorously at this treatment (and rightly so), feeling that all three should be retained as distinct genera. However, Melchior, in the second edition of Engler and Prantl's work, followed the lead of Szyszyłowicz, if perhaps a little less strongly, and raised the questionable sections of Szyszyłowicz to subgenera.

The genus *Eurya* is confined to the eastern hemisphere and is characterized by dioecious flowers and by having the stamens uniseriate in multiples of five, with glabrous anthers. The pedicels are quite short (usually less than 5 mm.) and decidedly curved. The petals are joined for approximately one-third of their entire length.

Cleyera ranges through the tropics and subtropics of both hemispheres and can be distinguished from the genus *Eurya* by the hermaphroditic flowers and the uniseriate stamens, usually in multiples of five, often in odd numbers, with distinctly setose anthers. The pedicels are seldom less than 10 mm. long (often up to 20–25 mm.), sturdy and conspicuous. The petals are joined only lightly at the base.

Cleyera was first described by Thunberg in his *Nov. Gen.* 3: 69. 1783 and was named in honor of the physician and botanist Andrew Cleyer, Dutch Director of Commerce during the years 1683–1688. Thunberg described a single species, *Cleyera japonica*, and based his description on plants growing near Nagasaki, Japan.

Unfortunately, this description was based upon two shrubs, as an examination of the type indicates. Nearly filling the sheet is an ample specimen of *Cleyera japonica*, while in the upper right corner is a fragment or near fragment of *Ternstroemia gymnanthera* (W. & A.) Sprague. Later, realizing the discrepancy mentioned above, Thunberg

came to the conclusion that *Cleyera* was congeneric with *Ternstroemia* and transferred his *Cleyera japonica* to *Ternstroemia* under the name *T. japonica*.

In 1841, Siebold & Zuccarini took up the original name *Cleyera*. They drew attention to the fact that Thunberg undoubtedly did have the two distinct elements at hand when he first described *Cleyera*. At the same time, however, they emended his description and pointed out that careful study showed that, regardless of what material Thunberg had, his actual generic description was based on the specimen of *Cleyera* and could refer only to *Cleyera*. True enough, in the specific description, the leaf arrangement refers to *T. japonica* (*T. gymnanthera* Sprague). However, this does not affect the status of the genus. They cleared up the whole matter and treated in detail both original elements under their respective genera and gave the specific epithet "*japonica*" to both. Recently Sprague, realizing that *T. japonica* could not be retained, made the combination *T. gymnanthera* (W. & A.) Sprague.

With Siebold and Zuccarini's work, confusion should have ended, because their treatment of the whole subject seems very clear and quite final. Sprague's treatment of the generic status of *Cleyera* in Jour. Bot. 61: 17. 1923 did much to clear up the whole situation and probably directly or indirectly caused the name *Cleyera* to be placed on the list of "nomina conservanda" by the International Congress of 1935.

The generic name *Sakakia* is clearly a true synonym of *Cleyera*. This name was proposed by Nakai, who hoped to clear up the involved synonymy. Evidently unaware of or ignoring the action taken by the International Congress in the case of *Cleyera*, the Japanese botanists have all rallied to Nakai and wholeheartedly accepted the name *Sakakia*. Incidentally, this name would have been most fitting since *Cleyera japonica*, the type of the genus, is generally known throughout the Japanese Empire as "Sakaki." From ancient times the species has been known and revered. It grows wild in the mountainous districts and can be found planted around the homes and about Shinto shrines. It is sometimes called "Mijam Sakaki" meaning "God-of-the-high-mountains." "Tamakushige" a kind of wand, dedicated to the gods, has been made from this plant, explaining the name "Tree-of-God." According to Siebold and Zuccarini, the Buddhists revere the tree because their priests maintain it is a species close to the "Sara tree" under which the founder of their cult died.

Besides the type species itself, there are several varieties growing throughout Formosa, China, Tibet and India. Some of these have been

given specific status at times but are usually considered varieties. The species itself and all its varieties, with the exception of *Cleyera japonica* var. *lipingensis* (Hand.-Mazz.) Kobuski are entire-leaved. In the western hemisphere, all species except *C. albo-punctata*, *C. Ekmani* and *C. integrifolia* have crenulate or serrulate leaves.

Treatment of the Asiatic species was made by the writer in Jour. Arnold Arb. **18**: 118–129. 1937. The present paper is concerned only with the species of the western hemisphere. The specimens used in this study and cited in this current paper are from the herbaria of the Arnold Arboretum (AA); Gray Herbarium (G); Field Museum of Natural History (FM); Missouri Botanical Garden (MO); New York Botanical Garden (NY); and the United States National Museum (US).

Cleyera Thunberg, Nov. Gen. **3**: 69. 1783. — Siebold & Zuccarini, Fl. Jap. 153, t. 81. 1841. — Choisy in Mém. Soc. Phys. Hist. Nat. Genève, 1854, 14 (Mém. Ternstroem. 21). 1855. — Bentham & Hooker, Gen. Pl. **1**: 183. 1862. — Urban in Berichte Deutsch. Bot. Gesellsch. **14**: 49. 1893; in Bot. Jahrb. **21**: 537. 1893. — Sprague in Jour. Bot. **61**: 17, 83. 1923. — Internat. Rules Bot. Nomencl. ed. 3, 135. 1935. — Kobuski in Jour. Arnold Arb. **18**: 118–129. 1937.

Tristylium Turczaninow in Bull. Soc. Nat. Moscou, **31**, **1**: 247. 1858.

Eurya § *Cleyera* Szyszyłowicz in Engler & Prantl, Nat. Pflanzenfam. III, Abt. **6**: 189. 1893.

Eurya subgen. *Cleyera* Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147. 1925.

Sakakia Nakai, Fl. Sylv. Kor. **17**: 77, t. 19. 1928.

Trees or shrubs. Leaves evergreen or deciduous, entire or serrulate. Flowers hermaphroditic, solitary or in fascicles in the leaf-axils. Pedicels usually 1 cm. or more in length, thickened at the apex, bibracteolate, the bracteoles minute, subopposite or alternate near apex of pedicel. Sepals 5, imbricate, unequal, the outer sepals smaller, ciliolate. Petals 5, imbricate, connate at the very base. Stamens about 25; anthers setose, biloculate with longitudinal openings. Ovary usually glabrous, 2–3-celled, with many ovules; style elongate, 3- or 4-fid at the apex. Fruit indehiscent, baccate, spherical or ovoid, many-seeded; seeds with thin endosperm and curved embryo.

TYPE SPECIES: *Cleyera japonica* Thunberg, emend. Siebold & Zuccarini.

KEY TO THE SPECIES

- A. Leaves entire.
- B. Pedicels up to 25 mm. long with persistent bracteoles 4-5 mm. long; sepals up to 8-9 mm. wide; stamens with filaments 5-9 mm. long, the anthers 2.5 mm. long. (Cuba, Porto Rico)1. *C. albo-punctata*.
- BB. Pedicels 10-14 mm. long (rarely up to 20 mm. long in *C. integrifolia*) with bracteoles, when present, not over 2 mm. long; sepals 4 mm. wide or less; stamens with filaments not over 3.8 mm. long, the anthers not over 1.2 mm. long.
- C. Flowers large; petals 7-9 mm. long, 6.0-6.5 mm. wide; sepals always glabrous; leaves rounded or emarginate at apex. (Cuba)2. *C. Ekmani*.
- CC. Flowers medium-sized; petals not over 5 mm. long; sepals usually pubescent, at least at first; leaves acuminate at apex. (Mexico)3. *C. integrifolia*.
- AA. Leaves crenate or serrulate.
- D. Leaves membranaceous.
- E. Leaves oblique, elliptic, rounded at base, the lateral veins numerous and evident on both surfaces. (Dominican Republic)4. *C. Bolleana*.
- EE. Leaves symmetrical, obovate, cuneate at base, the lateral veins 8-10, inconspicuous on both surfaces. (Chiapas, Mexico)5. *C. Matudai*.
- DD. Leaves coriaceous.
- F. Leaves over 5 cm. long, obtuse or acuminate at apex.
- G. Leaves, branchlets, pedicels and calyx definitely pubescent.
- H. Inflorescence 9-10-flowered; calyx-lobes acute, connivent. (Mexico)6. *C. cernua*.
- HH. Inflorescence 1-2-flowered; calyx-lobes obtuse, not connivent.
- I. Leaves revolute, oblanceolate, 1.5-2.5 cm. wide, obtuse or rounded at apex; styles 3-4-parted. (Guatemala)7. *C. revoluta*.
- II. Leaves not revolute, obovate, 3-5 cm. wide, obtusely acuminate at apex; styles always 3-parted. (Guatemalan-Mexican border)8. *C. tacanensis*.
- GG. Young parts and branchlets glabrous or occasionally lightly pubescent, quickly glabrescent.
- J. Ovary hirsute near apex; style small, 1.25-1.50 mm. long; calyx and pedicel densely hirsute. (Mexico)9. *C. serrulata*.

- JJ. Ovary glabrous; styles ca. 3 mm. (2–3 mm. in *C. theaeoides*), calyx and pedicel glabrous or glabrescent.
- K. Pedicels short (5–7 mm. long); petals white. (Guatemala, Mexico).10. *C. Skutchii*.
- KK. Pedicels 10–14 mm. long; petals yellow, greenish yellow or greenish white.
- L. Leaves 3–5 cm. long, sharply serrate. (Costa Rica).11. *C. costaricensis*.
- LL. Leaves 4–8 cm. long, crenate or crenulate.
- M. Calyx pubescent; petals ca. 6 mm. long.
- N. Shrub; petiole 4–7 mm. long; lateral veins 7–10. (Cuba).12. *C. nimanimae*.
- NN. Tree; petioles 7–10 mm. long; lateral veins ca. 12. (Panama, Costa Rica). 13. *C. panamensis*.
- MM. Calyx glabrous; petals ca. 10 mm. long. (Jamaica). . .14. *C. theaeoides*.
- FF. Leaves less than 4 cm. long, rounded or emarginate at apex.
- O. Leaves less than 2 cm. long, less than 1 cm. wide, appressed pilose beneath, the petioles 1–2 mm. long; internodes 2–3 mm. long. (Haiti). . .15. *C. vaccinioides*.
- OO. Leaves 2.0–3.3 cm. long, 1.5–1.9(2.2) cm. wide, glabrous beneath, the petioles 3–5 mm. long; internodes 5–6 mm. long. (Haiti).16. *C. ternstroemioides*.

1. ***Cleyera albo-punctata*** (Grisebach) Krug & Urban in Bot. Jahrb. **21**: 537. 1896.

Ternstroemia albo-punctata Grisebach, Cat. Pl. Cuba, 36. 1866.

Eurya albo-punctata (Grisebach) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147. 1925.

Eroteum albo-punctatum (Grisebach) Britton in Britton & Wilson, Sci. Survey Porto Rico & Virgin Isl. **5**: 582. 1924.

DISTRIBUTION: West Indies (Cuba and Porto Rico).

CUBA. Oriente: Sierra Nipe, near Woodfred, edge of pines, alt. ca. 550 m., *J. A. Shafer* 3050, 3455 (NY), 3148 (NY, G), Dec. 1909–Jan. 1910 (shrub or small tree 15–20 ft. with cream colored flowers).—Camp La Gloria, south of Sierra Moa, *J. A. Shafer* 8115, 8183, 8297 (NY), Dec. 1910–Jan. 1911 (shrub or tree 12–20 ft.; flowers pendent, creamy white; fruit long-pedicelled, red).—Loma del Gato and vicinity of Cobre range of the Sierra Maestra, alt. 850 m., *Fre. Leon, Clement & M. Roca* 10006 (NY), July 11–Aug. 14, 1921 (tree 10 m. or more tall; flowers yellow).

PORTO RICO. H u m a c a o : Sierra de Naguabo, Monte el Duque, mountain forest, *J. A. Shafer* 2242 (NY), Mar. 8, 1914. — Same locality, Rio Prieto and adjacent hills, thickets at top of peak, alt. 1000 m., *J. A. Shafer* 3643 (FM, MO, NY), Aug. 1914 (scrubby tree, 10 ft. with white flowers). — Same locality, thickets at summit of El Duque, alt. 750–1080 m., *J. A. Shafer* 3659 (NY), Aug. 13, 1914 (straggling tree, 8 ft.). — Rio la Mina, Rio Piedras, *C. L. Horn* 49 (NY), April 1934 (tree 50 ft., short trunk with large, long, spreading branches; bark smooth brown; flowers greenish white). M a y a g u e z : in forest near Mariacao, *P. Sintenis* 193 (G, MO, NY) Dec. 10, 1884. L u q u i l l o : Sierra de Luquillo, in sylvis montis Yunque, *Sintenis* 1362 (G), July 14, 1885.

This species is easily distinguished by its large flowers (an inch or more across), the petals of which are strikingly pubescent along the medial strip on the dorsal surface. Persistent, subopposite bracteoles, 4–5 mm. long and wide at the apex of the smooth but rugged pedicels are other characters of note. The species is glabrous except for the individual terminal buds.

The leaves are thick-coriaceous, obovate to obovate-elliptic, rotund or occasionally emarginate at the apex, 5–11 cm. long and 2.0–5.5 cm. wide with the midrib deeply impressed on the upper surface. The under surface is much lighter in shade, the margin revolute, entire or very slightly serrate.

The flowers are solitary or occasionally in two's in the axils; the pedicels are sturdy, 1.0–2.5 cm. long, thickening toward the calyx, up to 2.5 mm. diam. at the point of juncture. The persistent bracteoles are larger than the calyx-lobes of the majority of species in the genus, ca. 4–5 mm. long and 4 mm. broad, deltoid or subrotund, apiculate at the apex. The calyx is typical of the genus, 5–6 mm. long and up to 8 mm. wide, especially leathery, obtuse or subrotund at the apex, the margin scarios. The petals are larger than those of most species (up to 12 mm. long and 7–10 mm. wide) with a scarios margin up to 2.5 mm. wide; the dorsal surface has a strip of dense shining pubescence.

The stamens, about 35 in number, have long filaments (5–9 mm.) and short anthers (ca. 2.5 mm.) which vary in the amount of pubescence. The ovary is glabrous and the style is three-parted for only a short distance from the apex.

The Porto Rican material usually has shorter pedicels and generally smaller flowers than the Cuban specimens.

Here might possibly be cited *Fuertes* 1054 from Santo Domingo. The leaves are smaller, 2.5–5.0 cm. long, acute and mucronulate at the

apex. The flowers, as well, are smaller; the petals only sparingly pubescent. Also, *Fr. Leon 12246* from Cuba probably represents only a slight variation and should be cited here. The young branchlets and the under surface of the younger leaves are puberulent.

2. ***Cleyera Ekmani*** (O. C. Schmidt), comb. nov.

Eurya Ekmani O. C. Schmidt in Rep. Spec. Nov. **22**: 97. 1925.

Freziera Ekmani (O. C. Schmidt) Kobuski in Ann. Missouri Bot. Gard. **25**: 354. 1938.

DISTRIBUTION: West Indies (Cuba).

CUBA: Prov. Oriente, Sierra Maestra, Arroya Jiménez, alt. 600–900 m., *E. L. Ekman 14792* (paratype of *Eurya Ekmani*, NY), Aug. 9, 1922 (tree with white flowers).

Cleyera Ekmani is glabrous except for the leaf-buds and very young branchlets; shortly these both become glabrous. The leaves are glabrous, coriaceous, oblong-obovate or oblong-elliptic, 4–6 cm. long and 1.3–2.0 cm. wide, obtuse at the apex, cuneate at the base, entire or slightly denticulate at the apex, light green on the upper surface, brownish below (exsicc.). The petiole measures 3–4 mm. in length.

The flowers are found singly or in two in the axils, supported by glabrous pedicels 10–14 mm. long. The bracteoles (ca. 1 mm. long and broad) are suborbicular, ciliolate at the margin. The sepals are also suborbicular, unequal, \pm 4 mm. long and wide, and ciliolate at the margin. The petals (fide O. C. Schmidt) are 7–9 mm. long, 6.0–6.5 mm. wide, pubescent up the middle of the dorsal surface. The stamens (fide O. C. Schmidt) ca. 25, the filaments 3.8 mm. long, the anthers elliptic, \pm 1.2 mm. long, (pilose?). The ovary (fide Schmidt) subglobose, 3-celled, each cell containing approximately 25 ovules, with a style ca. 2.2 mm. long, three-parted.

Cleyera albo-punctata (Grisebach) Krug & Urban is the closest ally but can be easily separated by its much larger flowers (an inch or more across), the larger bracteoles (4–5 mm. long and wide), the sturdy pedicels (up to 2.5 cm. long), the larger calyx-lobes (5–6 mm. long and up to 8 mm. wide), the long filaments (up to 9 mm.), and the larger leaves (5–11 cm. \times 2.0–5.5 cm.).

3. ***Cleyera integrifolia*** (Bentham) Choisy in Mém. Soc. Phys. Hist.

Genève **14**: 110. 1855.—Hemsley, Biol. Centr.-Amer. **1**: 93.

1879.—Urban in Bot. Jahrb. **21**: 539. 1896.

Freziera integrifolia Bentham, Pl. Hartweg. 6. 1839.

Cleyera syphilitica Choisy in Mém. Soc. Phys. Hist. Genève **14**: 110. 1855.—Urban in Bot. Jahrb. **21**: 259. 1896.

Ternstroemia syphilitica Pavon ex Choisy, loc. cit. in synon.

- Eurya integrifolia* (Benth) Blume, Mus. Bot. Lugd.-Bat. **2**: 105. 1856. — Szyszyłowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190. 1893. — Melchior, op. cit. ed. 2, **21**: 147. 1925.
- Tristylidium mexicanum* Turczaninow in Bull. Soc. Nat. Moscou, **31**, 1: 248. 1858.
- Cleyera mexicana* (Turcz.) Planchon ex Hemsley, Biol. Centr.-Amer. **1**: 93. 1879.
- Eurya syphilitica* (Choisy) Szyszyłowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 189. 1893. — Melchior, op. cit. ed. 2, **21**: 147. 1925. — Bullock in Kew Bull. Misc. Inform. **1936**: 391. 1936.
- Eurya mexicana* (Turcz.) Szyszyłowicz in Engler & Prantl, Nat. Pflanzenfam. III. **6**: 190. 1893. — Standley in Contrib. U. S. Nat. Herb. **23**, 3: 823. 1923. — Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147. 1925.
- Eurya Benthiana* Bullock in Kew Bull. Misc. Inform. **1936**: 391. 1936.
- Freziera mexicana* (Turcz.) Kobuski in Ann. Missouri Bot. Gard. **25**: 355. 1938.

DISTRIBUTION: Mexico (Jalisco, Michoacan, Mexico and Guerrero).

MEXICO. Jalisco: Bolaños, among pines, *T. Hartweg* 18 (isotype of *Freziera integrifolia*, FM, G, NY), 1837 (shrub 8–10 ft.). Guerrero: Petlacala, north of Mine Santa Elena, streamside, alt. 1880 m., *Y. Mexia* 9041 (NY), Dec. 27, 1937 (common tree 9 m. high with red fruit). — Same general locality, oak and pine forest, alt. 2750 m., *G. B. Hinton* 15402 (AA), Dec. 30, 1939 (tree 10 m. high with dull white flowers). MEXICO: Temascaltepec, *G. B. Hinton* 319 (AA), 1099 (FM), 3835 (AA), 3886 (AA, FM), 7192 (AA), 7227 (AA, NY), 7704 (FM, NY), 7990 (AA, FM, US), 1932–1939. Michoacan: vicinity of Morelia, alt. 2100–2400 m., *Bro. G. Arsène* 5371, 5663, 8461, 8474 (US). — Mountains above Cuernavaca, *C. G. Pringle* 6957 (AA, FM, G, MO, NY, US), Aug. 9, 1898; Zitacuaro, deforested hillsides, rocky soil, alt. 2380 m., *G. B. Hinton* 11950 (AA), June 10, 1938 (tree 15 m., flowers yellow-white); Barroloso, oak forest, alt. 2300–2600 m., *G. B. Hinton* 15085 (G), 15098 (G), Aug. 9–10, 1939 (flowers wax white); Barroloso, alt. 2300 m. *G. B. Hinton* 15374 (G), Oct. 22, 1939 (tree 8 m.). Without locality,? *Sessé & Mociño s. n.* (type of *Freziera syphilitica* Choisy, Genève 23952; photo FM).

In the past, *Cleyera integrifolia* has been separated from *C. syphilitica* by its sericeous calyx, shorter pedicels and smaller leaves. Standley, in 1923, joined these two species under *Eurya mexicana*. Careful study of considerable material reveals that, although this species varies widely in all these characters, it cannot be separated clearly into two entities. The calyx, in the type, is glabrescent, generally appears pubescent to a more or less degree and is extremely sericeous. However, variation can

be found grading from nearly glabrous material (*Hinton 3835, 7227, 7704*) to the extreme pubescence in the type. In all cases, except *Hinton 15085*, the anthers possess a few hairs. Also the pedicels vary in length. *Hinton 15374*, from general appearances, should meet the requirements of *C. syphilitica* nicely. The calyx-lobes appear glabrous, except at the apex, and the peduncles are nearly 20 mm. long. However, the leaves measure only 8.0×3.7 cm. In the type of *C. syphilitica* the pedicels are ca. 20 mm. long and the leaves ca. 9.5 cm. long. These measurements were taken from a photograph. One can only assume that the calyx is glabrescent. *Hinton 15098* has a pubescent calyx, leaves measuring 7×4 cm., but peduncles up to 17 mm. long. *Hinton 7704* has a nearly glabrous calyx but the peduncles are only 5–9 mm. long and the leaves measure only ca. 8.0×2.5 cm. *Hinton 15402* has a pubescent calyx, peduncles 5–10 mm. long but leaves measuring up to 11 cm. long, exceeding the type of *C. syphilitica* in the last character.

4. ***Cleyera Bolleana*** (O. C. Schmidt) comb. nov.

Eurya Bolleana O. C. Schmidt in Rep. Spec. Nov. 33: 177. 1933.

Freziera Bolleana (O. C. Schmidt) Kobuski in Ann. Missouri Bot. Gard. 25: 354. 1938.

DISTRIBUTION: West Indies (Santo Domingo).

The distinguishing characters of this species are the membranaceous, oblique, elliptic leaves, 5.0–8.5 cm. long and 2.4–3.5 cm. wide, rounded at the base, narrow and acute at the apex, the margin minutely serrate-crenate, the midrib impressed above, rather thick and prominent below, the lateral veins numerous and evident on both surfaces.

No material of this species has been available for study. However, the original description shows clearly that the species belongs to *Cleyera*.

The only specimen of *Cleyera* from Santo Domingo examined by me is *Fuertes 1054* cited dubiously under *C. albo-punctata*. I tried to place this specimen with Schmidt's *C. Bolleana* but the leaves are so thick and coriaceous that they could never be confused with the "membranaceous" leaves of the present species.

5. ***Cleyera Matudai***, sp. nov.

Planta lignosa, arbor videtur, ramulis teretibus brunnescentibus pubescentibus. Folia membranacea, primo pubescentia mox glabrescentia, obovata, 7–11 cm. longa et 2.5–3.7 cm. lata, apice basique attenuata margine crenata, costa supra complanata, venarum ca. 8–10 paribus undique inconspicuis, petiolo 3–4 mm. longo. Flores axillares 1- vel 2-fasciculati; pedicelli glabri, ca. 8–12 mm. longi, bracteolis 2,

suboppositis vel alternatis, cito caducis; sepala 5, imbricata, inaequalia, glabra, 2.5–3.0 mm. longa et ca. 2.0–2.5 mm. lata, apice obtusa apiculata margine ciliolata; petala 5, inaequalia, imbricata, ca. 6 mm. longa et 5–6 mm. lata, glabra, apice subrotundata vel emarginata; stamina 30, uniseriata, filamentis 3.5–4.0 mm. longis basi incrassatis et petalis adnatis apice sparse hirsutis; antheris obovatis parvis 0.50–0.75 mm. longis basi attenuatis, loculis inaequalibus apiculatis; ovarium subglobosum, glabrum, ca. 2 mm. longum, in stylum attenuatum triloculare, multi-ovulatum; stylus parvus, 1.5–2.0 mm. longus, glaber, ad medio tri-partitus. Fructus ignotus.

DISTRIBUTION: Mexico (Chiapas).

MEXICO. Chiapas: Mt. Ovando, alt. 1250–2370 m., *E. Matuda* 2560 (AA, TYPE; FM, NY), July 1938. — Finca Irlanda, *C. A. Purpus* 7433 (AA, FM, G, MO, NY, US), June 1914.

In general appearance this species exhibits no outstanding obvious characteristics to distinguish it from other species. However, the stamens, 30 in number, with the small obovate anthers (0.50–0.75 mm.) attenuated at the base, and the filaments sparsely hirsute just below the anthers are characters that easily separate the species from all others. Also the short style (1.5–2.0 mm.), free for nearly $\frac{1}{2}$ its length and the membranaceous leaves are other distinguishing features.

Unfortunately, in both collections cited above, just the barest field notes are available. One can only surmise that the species is a tree in habit.

6. *Cleyera cernua* (Tulasne), comb. nov.

Freziera cernua Tulasne in Ann. Sci. Nat. sér. 3, 8: 338. 1847.

Eurya cernua (Tulasne) Szeszyłowicz in Engler & Prantl, Nat. Pflanzenfam. III, 6: 190. 1893.

DISTRIBUTION: Mexico (Oaxaca).

OAXACA: Canetze, alt. 900 m., *H. Galeotti* 1686 (TYPE of *Freziera cernua*, Genève; isotypes NY, US; photo and fragment, FM); La Lagune, *C. Liebmann* 337, in part (NY, US); 338 (FM, US), August 1842.

This species is characterized by the outstanding rufous, pilose buds, branchlets and undersurface of leaves (especially the midrib). On the older branchlets this pubescence appears black. Other notable characters are the many-flowered fascicles and the connivent, acute calyxlobes.

Tulasne, in his original description, refers to the inflorescence as 2–4-flowered. Unfortunately, *Galeotti* 1686, from which the descrip-

tion was drawn, proves to be a very poor specimen. A photograph of the type in Geneva shows only eight flowers on the whole specimen. On both *Liebmann* 337 and 338 single fascicles possess up to 9–10 flowers, more flowers than can be found on the entire type specimen. Tulasne records the leaf-measurements as 8–10 cm. long and 3.5–4.5 cm. wide. The more complete Liebmann numbers show leaves up to 15 cm. long and 5 cm. wide. According to Tulasne, the calyx-lobes should be 4–5 mm. long and the pedicels 1.0–1.5 cm. long. On the isotypes (NY, US) the calyx-lobes are seldom over 3 mm. long and the pedicels are always less than 1 cm. long. Although only a millimeter or so in variation in length of calyx-lobes, this variation proves interesting because the three-parted style protrudes beyond the calyx-lobes after the petals have fallen. The calyx-lobes are more acute in this species than those of most other species of the genus and the outer lobes are mucronulate as well as ciliolate. Instead of spreading, as is usually the case, the calyx-lobes are connivent, even after anthesis. In the type, the bracteoles are subopposite and close to the calyx. In the Liebmann specimens the bracteoles are usually 2–3 mm. apart. The pedicels are recurved as are those of most species.

The species is most closely related to *C. integrifolia* (Bentham) Choisy, from which it can be separated by the many-flowered fascicles, the usually shorter pedicels, the densely rufous-pilose young parts, the more acuminate leaves, pilose beneath, with a tendency towards serration, and the acute connivent calyx-lobes.

7. *Cleyera revoluta*, sp. nov.

Arbor parva, ca. 10 m. alta, ramis ramulisque teretibus pubescentibus brunnescentibus. Folia 5–9 cm. longa, et 1.5–2.5 cm. lata, revoluta, coriacea, oblanceolata, pubescentia, apice obtusa vel subrotundata, basi cuneata in petiolum 7–10 mm. longum attenuata, supra viridia, subtus argentea, margine crenata, nervis lateralibus 8–10 undique subobscuris. Flores non visi. Fructus immaturi in axillis solitarii, apice leviter pubescentes, pedicellis pubescentibus scabris 1.5–1.7 cm. longis, bracteolis 2 suboppositis cito caducis, sepalis 5 inaequalibus imbricatis pubescentibus 3.0–3.5 mm. longis et 3.5–4.0 mm. latis subrotundatis, stylis persistentibus glabris 3.5–4.0 mm. longis, 3–4-partitis medio liberis.

DISTRIBUTION: Central America (Guatemala).

GUATEMALA: Dept. San Marcos, between La Vega ridge along Rio Vega and northeast slope of Volcán Tacaná, to three miles from Guatemala-Mexico boundary, in vicinity of San Rafael, alt. 2500–3000 m.,

J. A. Steyermark 36208 (FM), February 20, 1940 (tree 35 ft. tall; leaves "involute", coriaceous, rich dark green above, silvery beneath).

Although the material from which this species is described lacks both flowers and mature fruit, the fact that it represents a distinctive new species is unquestionable. Distinguishing characters are the revolute oblanceolate leaves, pubescent in the mature state rather than glabrescent, and the sturdy pubescent pedicels and calyx. The sparsely pubescent immature fruit suggests a pubescent ovary. In this character it resembles the Asiatic *Eurya trichocarpa* Korthals which possesses a densely hirsute ovary that on maturing becomes quickly glabrescent belying the specific name.

Since only two fair-sized fruits are present, one with a 3-parted style and the second with a 4-parted style, it seems inadvisable to sacrifice either of them for sectioning. In both cases the style is free for nearly one-half its total length.

8. *Cleyera tacanensis*, sp. nov.

Arbor 9-metralis, ramulis brunneis hornotinis pilosis. Folia obovata, subcoriacea, pubescentia, 5-10 cm. longa et 3-5 cm. lata, apice obtusa vel abrupte acuminata, basi cuneata, supra opaca, pulchre viridia, subtus pallidiora, margine acute serrata, costa supra canaliculata, venis utrinsecus 9-10 supra impressis, subtus manifeste prominentibus, petiolo 2-4 mm. longo. Flores pauci in axillis solitarii; pedicelli scabri, pubescentes, (5-) 7-12 mm. longi, crassi, apice 2 mm. diam., bracteolis cito caducis; sepala 5, pubescentia, inaequalia, imbricata, obtusa, 2.5-3.0 mm. longa et 3-4 mm. lata, ciliolata; petala 5, alba, inaequalia, imbricata, obovata, apice retusa, glabra (medio dorso excepta), 6-8 mm. longa et 7 mm. lata; stamina ca. 25, filamentis inaequalibus 3-5 mm. longis, antheris ovatis glabris 1.25-1.50 mm. longis apiculatis (etiam bi-apiculatus); ovarium subglobosum, glabrum 3 mm. longum et latum, rubidum, triloculare, multo-ovulatum; stylus crassus, 3 mm. longus et 1 mm. diam., ad medium tri-partitus. Fructus ignotus.

DISTRIBUTION: Central America (Guatemala) and Mexico (Chiapas).

GUATEMALA: Dept. San Marcos, along Quebrada Canjulá, between Sibinal and Canjulá, Volcán Tacaná, lower slopes, alt. 2200-2500 m., *J. A. Steyermark 36052* (TYPE, FM), Feb. 18, 1940 (tree 30 feet with subcoriaceous leaves and white flowers). — Dept. San Marcos, Rio Vega, near San Rafael and Guatemala — Mexico boundary, Volcán Tacaná, alt. 2500-3000 m., *J. A. Steyermark 36280* (FM), Feb. 20, 1940 (tree 25 ft. tall with rigid coriaceous leaves). — Dept. San Marcos, along Quebrada, Canjulá, between Sibinal and Canjulá, Volcán Tacaná, alt.

2200–2500 m., *J. A. Steyermark 36026* (FM), Feb. 18, 1940 (leaves subcoriaceous, rich green above, paler beneath).

MEXICO. Chiapas: Chiquihuite, Volcán Tacaná, alt. 2800 m., *E. Matuda 2845* (AA, NY), Mar. 27, 1939. — Pasitar, *E. Matuda 394* (AA, MO, US), Dec. 1936.

This unusual species is characterized by large, obovate, sharply serrate leaves of a distinctive subcoriaceous texture. The pedicels are sturdy (2 mm. diam. below calyx), scabrous pubescent. The calyx-lobes are quite densely pubescent, wider than long. The petals are white, unequal, large, wider than long (6–8 mm. long and 7–9 mm. wide) with a dense pubescence, similar to that of the calyx, found along the medial strip of the dorsal surface. The stamens have rather long filaments (3–5 mm.). The anthers are glabrous (unique for the genus) and the projection in some instances appears forked. The style is sturdy, ca. 3 mm. long, three-parted for one-third its length with an obvious tendency toward further separation.

There is considerable variation found in the other specimens cited above. *Matuda 394* is placed here dubiously. The leaves are less sharply serrate, in most cases appearing subentire. The flowers are many—but unfortunately only in bud. Upon dissection, the anthers are sparsely hirsute whereas in the type the anthers are glabrous.

The species seems to be quite localized in the vicinity of Volcán Tacaná on the Chiapas-Guatemala border.

9. *Cleyera serrulata* Choisy in Mem. Soc. Phys. Hist. Nat. Genève **14, 1**: 110. 1855.

Ternstroemia serrulata Herb. Pavon, ex Choisy l. c.

DISTRIBUTION: Mexico (Hidalgo).

MEXICO: Hidalgo, vicinity of Chiconquiaco, *G. Schiede 325* (MO).—exact locality unknown, “*Sessé, Mociño, Castillo & Maldonado 2331*” (FM, probable isotype).

Choisy (l. c.) in making the combination states: “5 *Cl. serrulata*. Nob. — *Ternstroemia serrulata*. Herb. Pavon! — Plante du Mexique également fort analogue au *Cl. integrifolia* et offrant, comme celle-ci, des sépales velus; elle en diffère principalement par ses feuilles dentées en scie dans la partie supérieure.” No actual type was cited—nothing but a reference to a specimen in Herb. Pavon. However, Pavon was not known to have collected in Central America or Mexico where most species of *Cleyera* abound. No species of *Cleyera* has been found in Peru where Pavon did most of his collecting.

Standley (Contrib. U. S. Nat. Herb. **23**, 1: 17, 1920) remarked that probably many Sessé and Mociño specimens were distributed from the Madrid herbarium by Pavon and through some error, Pavon's name was affixed to the labels. In the herbarium of the Field Museum of Natural History is a specimen from the herbarium of the botanical garden of Madrid (Norti Botanici Matritensis) collected by "Sessé, Mociño, Castillo et Maldonado . . . (1787-1795-1804)." This specimen has two labels (1) *Ternstroemia serrulata* and (2) *Ternstroemia parviflora* N. Arbor 13 ped. Probably Choisy had a duplicate of this specimen before him and cited it as *T. serrulata* Herb. Pavon. As Choisy stated in his brief description, the pubescent calyx and serrulate leaves separate the species from *C. integrifolia*.

Here also might be cited *C. A. Purpus 6177* (MO) collected between Misantla and Naolinco, Vera Cruz, Aug. 1912. The serration of the leaves of this specimen is more outstanding than that found on the two specimens cited above.

One may assume from the specimens cited that the range of this species lies in southeastern Mexico. Since no complete description of this species has ever been recorded, the following description has been drawn from the type:

Small tree about 4 m. tall with brown glabrescent branchlets. Leaves coriaceous, obovate, glabrescent, 5-8 cm. long, 2-3 cm. wide, obtusely acuminate at the apex, dark green above, paler beneath, cuneate at the base, the margin serrulate, the lateral veins (8-10 pairs) impressed on the upper surface, conspicuous below, the petiole 4-5 mm. long. Flowers few, solitary in the axils, the pedicel appressed pilose, ca. 1 cm. long, the bracteoles quickly caducous; sepals 5, unequal, imbricate, densely hirsute, 3.0-3.5 mm. long, 3-4 mm. wide, rounded at the apex, the outer sepals apiculate; petals 5, unequal, imbricate, obovate, glabrous or sparingly pubescent on medial portion of dorsal surface, ca. 6 mm. long, 4-5 mm. wide, rotundate or emarginate at apex; ovary globose, ca. 2.5 mm. long, hirsute at the apex with pubescence extending sparingly onto style; style short, 1.25-1.50 mm. long, 3-parted, free for one-third distance. Fruit unknown.

10. **Cleyera Skutchii**, sp. nov.

Arbor ad 20-metralis (fide collectoris), ramulis brunneis hornotinis ad apicem subadpresse pilosulis, mox glabrescentibus. Folia oblongo-elliptica vel obovata, coriacea, glabra juventate excepta, 3.5-8.0 cm. longa et 1.0-2.7 cm. lata, apice acuminata, basi cuneata in petiolum 3-4 mm. longum attenuata, margine serrata, nervis lateralibus 10-12

undique prominentibus. Flores in axillis solitarii; pedicelli glabri, recurvi 5–7 mm. longi, bracteolis 2 suboppositis ovatis \pm 1.5 mm. longis cito caducis; sepala 5, inaequalia, imbricata, concava, pergamenacea, rotundata, exteriora pubescentia, 2.5–3.0 mm. longa et ca. 2 mm. lata margine ciliolata; petala 5, alba, glabra, inaequalia, imbricata, emarginata, ca. 6.0–6.5 mm. longa et 5–6 mm. lata; stamina uniseriata, ca. 25, filamentis 3–4 mm. longis basi manifeste crassis et petalis adnatis, antheris sparse hirsutis vel subglabris oblongis \pm 1 mm. longis apiculatis (0.25–0.50 mm. longis); ovarium subglobosum in stylum attenuatum, glabrum, ca. 2 mm. longum, tri-loculare, multi-ovulatum; styli 3, ad medium vel plerumque ad basin liberi. Fructus ignotus.

DISTRIBUTION: Central America (Guatemala) and Mexico (Chiapas).

GUATEMALA. Dept. Chimaltenango: Chichavac, alt. 2400–2700 m., *A. F. Skutch 545* (TYPE AA; isotypes FM, NY, US), Aug. 18, 1933 (common tree, 60 ft. high with white flowers). — Chichavac, dry oak woods, alt. 2400–2700 m., *A. F. Skutch 271* (US), Feb. 21, 1933. — Chichavac Tecpan, *J. G. Salas 1395* (FM), Dec. 1929 (tree 6–8 m.). Dept. Chiquimula: upper slopes of Montaña Tajurán, in vicinity of El Barriol, alt. 1200–1700 m., *J. A. Steyermark 30814* (AA, FM), Oct. 28, 1939 (tree 50 ft. with leaves dark dull green above). Dept. Zacapa: forested slopes near summit of Sierra de las Minas, near Finca Alejandria, alt. 2000 m., *J. A. Steyermark 29805* (AA, FM), Oct. 12, 1939 (shrub with sweet-scented, white flowers, the stamens yellow, the style green; leaves slightly thick, dark green above, paler beneath). Dept. Jalapa: Cerro Alcoba, just east of Jalapa, oak woods near summit, alt. 1300–1700 m., *J. A. Steyermark 32559* (FM), Dec. 2, 1939 (tree 20 ft. with firm subcoriaceous leaves, dark green above, pale silvery gray beneath). — Between Miramundo and summit of Montaña Miramundo, between Jalapa and Mataquescuintla, six miles south of Miramundo, alt. 2000–2500 m., *J. A. Steyermark 32778* (FM, NY), Dec. 5, 1939 (tree 20 ft. with leaves dark green above, silvery beneath, "barratillo"). Dept. Guatemala: Volcán de Pacaya, above Las Calderas, in moist open forest, alt. 1800–2400 m., *P. C. Standley 58402* (FM), *58471* (AA, FM), Nov. 30, 1938 (large tree with greenish white flowers). Dept. Sacatepequez: Santiago, alt. 2000 m., *R. Gómez 790* (G, MO, NY, US). Dept. Sololá: Sololá, alt. 2250 m., *A. F. Skutch 1057* (AA) Aug. 27, 1934.

MEXICO: Chiapas, Mt. Pasitar, *E. Matuda S-211* (AA, MO, NY, US), Aug. 3, 1937.

This species is characterized by short pedicels (5-7 mm.), the white emarginate petals, the rather long filaments (3.5-4.0 mm.), swollen at the base, the anthers only slightly hirsute and distinctly apiculate (0.25-0.50 mm.) and the styles free to the base or nearly so. These characters serve to distinguish the species from *C. costaricensis*, its nearest relative.

The pedicels are unusually short for the genus. In the type, the bracteoles are situated at the apex of the pedicels, close to the calyxlobes, and are subopposite. In *Steyermark 29805* and *Standley 58471*, the bracteoles are alternate, with the lower bracteole situated nearly half-way down the pedicel. It is unusual to find white flowers in the genus; in most other species they are yellow, greenish yellow or even bronze.

Skutch 271, according to the collector, is a fruiting specimen of the type, or at least, of the same species. The leaves are much larger, up to 12 cm. long and 5 cm. wide and a mature fruit (crushed in pressing) measures about 1 cm. across.

Also dubiously cited here might be *E. A. Goldman 961* (US) from Teopisca, Chiapas. On this specimen the lateral veins number as many as fifteen pairs and in most cases appear nearly at right angles to the midrib, although in some leaves the lateral veins are at nearly forty-five degree angles.

11. *Cleyera costaricensis*, sp. nov.

Frutex 2-5 m. altus, ramulis griseis hornotinis ad apicem breviter et subadpresse pilosulis, mox glabrescentibus. Folia oblongo-elliptica, coriacea, glabra juventate excepta, 3-5 cm. longa et 1-2 cm. lata (etiam pauca 6-8 cm. longa et \pm 3 cm. lata), apice obtusa vel abrupte acuminata, basi in petiolum 2-3 mm. longum attenuata, margine serrata, nervis utrinsecus 10-11 subtus manifeste prominentibus. Flores in axillis solitarii vel plures; pedicelli glabri, recurvi, 10-14 mm. longi (*Stork 2592* ad 20 mm.), bracteolis 2 suboppositis vel ad 4 mm. distantibus linearibus 2-3 mm. longis cito caducis; sepala 5, glabra, concava, pergamenacea, acuta \pm 3 mm. longa et 2.0-2.5 mm. lata; petala 5, inaequalia, imbricata, cuneiformia, 6-7 mm. longa et 6-8 mm. lata, apice truncata vel retusa; stamina uniseriata, ca. 25, filamentis 2.0-2.5 mm. longis glabris basi manifeste crassis et petalis adnatis, antheris hirsutis obovatis \pm 1 mm. longis breviter apiculatis; ovarium subglobosum in stylum attenuatum, glabrum, ca. 2 mm. longum, triloculare, multi-ovulatum; stylus ca. 2 mm. longus, ad medium tripartitus. Fructus ignotus.

DISTRIBUTION: Central America (Costa Rica).

COSTA RICA: Forêts du Copey, alt. 1800 m., *A. Tonduz 11716* (TYPE, US), February 1898 (flowers green-white). — Cerro de las Vueltas, wet forest, alt. 3000 m., *P. C. Standley 43588* (US, FM), Jan. 1, 1926 (shrub 10–15 ft. with dark green leaves and bronze-green flowers). — Santa Clara hills, in old cut-over land, alt. 1800 m., *H. E. Stork 2592* (FM), June 6, 1928 (shrub 6 ft. with waxy yellow flowers).

This species is characterized by very small leaves (3–5 cm. long) especially on the flowering branches. Occasionally, larger leaves are present. In the type, two sheets of which were examined, only two leaves measured above 5 cm. The apex is acute and the base tapers into a short petiole. Except for the very young parts, the species is strictly glabrous. The pedicels are semi-recurved.

In *C. panamensis*, although originally described as small-leaved (specimens since collected prove the type exceptional) the leaves are obtuse or rounded at the apex, the margin is crenulate and the calyxlobes are covered with a short appressed pubescence.

12. *Cleyera nimanimae* (Tulasne) Krug & Urban in Bot. Jahrb. **21**: 540. 1896.

Freziera nimanimae Tulasne in Ann. Sci. Nat. sér. 3, **8**: 338. 1847. — Walpers, Ann. Sci. Nat. **1**: 120. 1848.

?*Freziera ilicioides* Tulasne in Ann. Sci. Nat. sér. 3, **8**: 337, 1847. — Walpers, Ann. Sci. Nat. **1**: 120. 1848.

Cleyera nimanimae (Tulasne) Krug & Urban var. β *viridula* Krug & Urban in Bot. Jahrb. **21**: 540. 1896.

Eurya nimanimae (Tulasne) Melchior in Engler & Prantl, Nat. Pflanzenfam. ed. 2, **21**: 147. 1925.

DISTRIBUTION: West Indies (Cuba).

CUBA: S. Yago, Pinol de Nimanima, *J. Linden 2128* (ISOTYPE of *Freziera nimanimae*, FM). — Southern Baracoa region, crest of Punta del Mata, alt. 1230 m., *Fr. Leon 12159* (NY), July–August 1924 (small tree, 5–6 m.). — Near Monte Verde, in dense woods, *C. Wright 1126* (ISOTYPE of *C. nimanimae* var. *viridula*, AA, G, FM, MO), Aug. 2, 1859 (tree 50 ft. with yellowish green flowers).

To my mind this is a rather dubious species. The type itself is distinguished from the other material at hand by the narrow oblong-elliptic leaves. It is closely allied to *C. theaeoides*, the Jamaican species, but can be separated by the leaf shape, smaller floral parts and the pubescent calyx.

The three specimens cited above conform quite well to the description

of the species. However, *Wright 1126* presents an interesting problem. There are available for my study five specimens of this number. Were it not for the specimen from the Field Museum, I could only conclude that two distinct species or forms had been included in the collection. However, this specimen has both the narrow elliptic leaves of *C. nimanimae* and the broader obovate leaves of *C. theaeoides* on a single branchlet.

Other specimens dubiously placed here are *Fr. Leon et al. 10610, 10172, 10979*, and *E. L. Ekman 14701*. These collections have broader leaves, similar in shape to *C. theaeoides*, still they possess the smaller flowers and pubescent calyx of *C. nimanimae*.

Urban, in a key to the West Indian species of *Cleyera*, separated these two species by the absence or presence of buds at the base of the pedicel, besides leaf-shape and size. In the type of *C. nimanimae*, *Linden 2128*, this character (absence of buds) does hold, but in *Fr. Leon 12159* (representing *C. nimanimae*) and the material examined of *C. theaeoides* both the presence and the absence of buds can be noted.

Dubiously cited under this species as a synonym is *Freziera ilicioides* Tulasne. Urban cited *F. ilicioides* under *Cleyera theaeoides*. Unfortunately, I have not been able to examine the type material but from the extensive description I feel that it is more closely associated with the present species.

13. *Cleyera panamensis* (Standley), comb. nov.

Eurya panamensis Standley in Woodson & Seibert in Ann. Missouri Bot. Gard. **25**: 829. 1938; in Field Mus. Nat. Hist. Publ. Bot. Ser. **22**: 169. 1940.

DISTRIBUTION: Central America (Panama and Costa Rica).

PANAMA. Prov. de Chiriquí: valley of upper Rio Chiriquí Viejo, alt. 1300–1900 m., *Gene & Peggy White 16* (TYPE of *Eurya panamensis*, FM; isotype, AA), July 16, 1937 (tree 10–12 m. high with white, very fragrant flowers).—Vicinity of Casita Alta, Volcán de Chiriquí, alt. 1500–2000 m., *Woodson, Allen & Seibert 791* (AA, FM, MO), June 28–July 2, 1938 (tree 6 m. high with yellow flowers).—Vicinity of Finca Lérída, Volcán de Chiriquí, alt. 1750 m., *Woodson & Schery 232* (AA, MO), July 7–11, 1940 (tree 10 m. high with yellow-cream flowers).—Vicinity of Callejón Seco, Volcán de Chiriquí, alt. 1700 m., *Woodson & Schery 499* (AA, MO), July 17, 1940 (tree 6 m. with pale yellow flowers).—Volcán de Chiriquí, Boquete Distr., open hillsides, alt. 1500–2700 m., *M. E. Terry 771* (AA, FM, MO), 785 (FM), 880 (AA, FM, MO), 922 (FM), 1350 (FM), June 26, 1935–

Feb. 13, 1940 (tree 5–9 m. with pale yellow, greenish yellow or greenish white flowers).

COSTA RICA: hills above Zarcero, in woodland, alt. 1800 m., *Austin Smith* 4127 (AA, FM, MO), Aug. 14, 1935 (tree 6 m. with campanulate flowers [15 mm. across], pale citron yellow; bark dark gray, thick, granularly roughened, the wood white). — Alajuela, Palmira, alt. 2100 m., *Austin Smith* 4166 (FM), Apr. 30, 1937 (tree 50 ft.; 2 ft. diam. at base, bark grayish, corrugated; flowers semi-campanulate, yellow to mustard yellow, 15 mm. across). — Paso Ancho, alt. 1675 m., *C. H. Lankester* 287 (FM), June 1919.

Standley distinguishes this species by the small obovate leaves (2.5–5.5 cm. long, 1.0–2.5 cm. wide), very obtuse or rounded at the apex. On the type in the Field Museum, this character holds true. However, on the isotype in the herbarium of the Arnold Arboretum, leaves are found measuring up to 8 cm. × 3 cm. Most of the specimens cited above have larger leaves, with the smaller leaves the exception. The apex of the leaves may be very obtuse or rounded or, as found on later specimens, obtuse but bluntly acuminate. Very characteristic are the densely hirsute, white or greenish white terminal buds. In a group of plants where characters are most variable, this character is consistent. The pubescence carries through on the very young branchlets and younger leaves, especially on the petiole and undersurface. The older leaves appear glabrous or nearly so.

The calyx-lobes, under the hand-lens, may seem glabrous, but under the binocular, they usually appear covered with a dense appressed pubescence. This pubescence is usually found on the inner surface of the calyx-lobes as well.

The serration of the leaves varies somewhat from the distinct dentation as found in the type to the nearly entire margin found in *Terry* 771 and 922.

From *C. costaricensis* this species can be separated by the obtuse acuminate or rounded apex, the texture and veining. In *C. costaricensis* the leaves are in some instances even smaller than the type of this species, quite coriaceous, acute at the apex and less abruptly acuminate.

14. *Cleyera theaeoides* (Swartz) Choisy in *Mém. Soc. Phys. Hist. Nat. Genève* **14**, 1: 110. 1855 "thoeoides." — Grisebach, *Fl. Brit. West Ind. Isl.* 103. 1859. — Urban in *Bot. Jahrb.* **21**: 538. 1896.

Erotemum theaeoides Swartz, *Prodr.* 85. 1788. — Fawcett & Rendle in *Jour. Bot.* **60**: 362. 1922; *Fl. Jam.* **5**: 185. 1926.

Freziera theoides Swartz, *Fl. Ind. Occ.* **2**: 972. 1800. — Willdenow, *Sp. Pl.* **2**, 2: 1179. 1800. — Smith in Rees, *Cyclop.* **15**: no. 1. 1810. — De