

REVISION OF *CROTON* SECTION *ELUTERIA* (EUPHORBIACEAE)

Croton is second largest genus of the Euphorbiaceae, with about 800 mainly tropical species. Relationships among the species are still imperfectly understood, but in the most recent survey (Webster, 1993) they are referred to 40 sections. Although many of these sections are poorly delimited, sect. *Eluteria* Griseb. is morphologically distinctive because of its lepidote indumentum and pistillate flowers with well-developed petals. Several species, especially *Croton eluteria* (L.) Wright, were of some commercial importance in the eighteenth and nineteenth centuries as the source of "Cascarilla bark" or "Eleuthera bark."

The main diagnostic character for sect. *Eluteria* used since the treatment of Müller (1866) is the full development of petals in the pistillate flower, in contrast to their reduction or suppression in almost all other sections. Curiously, in his original founding of the section, Grisebach (1859) did not use the female petals as a defining character, even though he mentioned it in his description. He did, however, enumerate the other characters used by Müller and others: eglandular leaves with lepidote indumentum, axillary inflorescences, and 4-fid styles.

Although sect. *Eluteria* has been generally accepted as a distinctive group, its circumscription has remained somewhat

uncertain. Grisebach established the section on four West Indian species having lepidote indumentum, but Müller (1866) included a number of Old World species, mostly Malagasian, that have stellate indumentum. It now appears that these "stellate" species are not closely related to the American ones; in the synopsis of Webster (1993) sect. *Eluteria* is restricted to lepidote neotropical species, and the Old World ones are relegated to several other sections.

NOMENCLATURAL HISTORY

The sectional name is taken from the Bahaman Island Eleuthera, as explained by Bennett (1860); the first recorded use of the name appears to be the that of Petiver in his *Petiverianae, s. Collectanea* (1716 or 1717): "Elutheria Providentiae, folio cordato subtus argenteo. Sweet bark, s. cortex bene olens." Petiver's polynomial was the only name cited by Linnaeus when he described the genus *Elutheria* in the "Hortus Cliffortianus" (1738), which was the basis for *Clutia eluteria* L. in the "Species Plantarum" (1753). Thereafter, confusion in the application of both Latin and vernacular names arose from changing and often contradictory interpretations by Linnaeus and his successors. The major confusion arose from the description by Linnaeus (1753) of a second species, *Clutia cascarilla*, whose epithet was taken from the plant producing the commercial bark; unfortunately, however, *Croton cascarilla* (L.) L. is an unrelated species not producing medicinal bark which is the type of sect. *Cascarilla* Griseb. Linnaeus's confused treatment was

at least partly due to his reliance on the treatment of Catesby (1742), whose plat of a *Croton* from the Bahamas was contemptuously described by Lindley (1838): "... I do not see how any argument can be sustained by reference to so wretched a figure."

From the beginning of botanical explorations in the New World, there had been considerable interest in the medicinal properties of West Indian and Mexican species of *Croton*, but unfortunately different species of sect. *Eluteria* and even unrelated species of other sections were confounded under the designation "Cascaquilla bark" (Stephenson & Churchill, 1836; Daniell, 1862). David Don (1834), in a perceptive consideration of the nomenclatural problems, pointed out that that the term "Cascaquilla bark" properly applies to the plant from Veracruz described by Schlechtendal *Croton pseudochina*; and he implied that the term "Cascaquilla bark" used for the Mexican plant was transferred to (and confused with) the "Eluteria bark" derived from the West Indian *Croton eluteria*. Cascaquilla bark in the strict sense (from *Croton eleuteria*) was still of some commercial value in the late 19th century (Bentley & Trimen, 1880; Hooker, 1897). Bark from various species of sect. *Eluteria* is still in popular pharmaceutical use in the Caribbean area; e.g., Martínez (1959) cites *Copalchi blanco* from Mexico, identifying it as *Croton niveus* (although "copalchi" is a widespread common name for various species of the section). A number of later reviews have addressed the nomenclatural problems of the *Croton* species that

furnish Cascarilla bark (Carabia, 1942; Gómez-Pompa, 1966).

In its limited circumscription, sect. *Eluteria* is easily separated from all other sections by a small constellation of characters: mostly axillary (or pseudoterminal) racemes with all bracts 1-flowered; well-developed pistillate petals, lepidote indumentum (with rare exceptions in *Croton fantzianus* and *C. niveus*), multifid styles, and leaves with reduced deciduous stipules and lacking paired apical petiolar glands. However, there appears to be a rather close relationship to sect. *Luntia* (Raf.) G. L. Webster, which has similar lepidote indumentum, stamen number, and stylar morphology, and differs mainly in the presence of paired glands at the apex of the petiole as well as the reduced or suppressed petals in the pistillate flower. Specimens of sect. *Luntia* may therefore be readily confused with those of sect. *Eluteria*, particularly if adequate reproductive material is lacking.

The characteristic lepidote indumentum in sect. *Eluteria* occurs on stems, leaves, inflorescences, flowers, and fruits. Typically, the modified trichomes (scales or lepidae) have 30-50 radii connected by webbing so that they appear as shields with denticulate or serrate margins, each with a central raised umbo (Webster et al., 1993). However, in some species such as *Croton arboreus* the radii are fewer in number (mostly 10-20), and deeply separated so that the lepidae appear lacerate or even stellate-lepidote or stellate. In *Croton niveus* and one variant of *C. fantzianus* the radii of the ovarian

trichomes are separate to the base and not in one plane, so the ovarian indumentum can be described as stellate rather than lepidote. In both *C. niveus* and *C. fantzianus* the foliar trichomes are often porrect, with one to several ascending radii (illustrated in Webster et al. 1993, fig. 14); such trichomes appear at once both "stellate" and "lepidote". Leaf blades of all species of the section are minutely papillate on both faces with minute glands (0.05-0.1 mm in diameter) that presumably can render the foliage aromatic, as noted by a number of collectors.

Because of the variability within and tendency towards morphological convergence between the taxa of sect. *Eluteria*, it is often difficult to determine specimens with only staminate flowers or fruits. All species of the section appear to be monoecious, but individual plants may produce purely staminate spikes in addition to the bisexual ones, especially at the beginning of the flowering season and on smaller shoots; purely pistillate spikes have not been observed. It appears to be characteristic of every species to have either a biseriate or triseriate androecium, with modal numbers centering on 10 or 11 vs. 14--16. Unfortunately, there is considerable developmental "play" in the system; occasionally biseriate taxa will have 8, 9, or 12 stamens, while triseriate taxa may sometimes have 12, 13, 17, or 18. When the first flower of a specimen examined has 12 or 13 stamens, the evidence is ambiguous, and it is desirable to check several more; fortunately, the vast

majority of specimens at least have buds from which stamen number can determined (and, in pistillate buds, the type of indumentum of the ovary).

Measurements given for the various parts are based on mature organs and have been standardized: diameters for petioles, inflorescence rachises, and pedicels are measured across the middle of the longest axis; those for staminate buds are based on mature buds shortly before opening. Since fruiting pedicel length is often crucial, it should be noted that sometimes the pedicel is inserted on top of a pedicel-like axis (pseudopedicel), which usually represents the base of the inflorescence axis or sometimes the subtending lateral branch. Stipules in most species are caducous, so that they may be observed only at the tips of young growing branches; consequently, although they may be distinctively large in some species, the character is of little practical value.

SYNOPSIS OF THE TAXA

Croton section **Eluteria** Griseb., Fl. Brit. W. Ind. 39. 1859. Type: *Croton eluteria* (L.) Sw.

Monoecious trees or shrubs; indumentum of stems, leaves, and perianth lepidote, never glandular (but minutely

glandular-papillate on both faces); leaves alternate, blades entire (or rarely obscurely crenulate) and unlobed, pinnately to palmately veined, lacking paired apical petiolar glands; stipules deciduous, often reduced or absent; inflorescences bisexual, racemose (bracts uniflorous), lower nodes with solitary pistillate flowers; petals alike in staminate and pistillate flowers; disk copiously hirsutulous; stamens mostly 10-17, filaments glabrous or hirsutulous; pistillate flowers subsessile to pedicellate; sepals valvate, entire, more or less equal; ovary 3-locular, indumentum lepidote (rarely stellate); styles multifid; capsules smooth or muricate; seeds smooth, compressed, caruncle deltoid.

Despite its confused nomenclatural history, *Croton eluteria* (L.) Sw. must be designated as type of the section, in accordance with the 1994 International Code of Botanical Nomenclature (Article 22.5). Fortunately, this is in harmony with Grisebach's apparent intention when he created the section.

Section *Eluteria* is phytogeographically as well as morphologically distinctive; it is centered on the Caribbean region, with the major concentrations of species in the Greater Antilles and in Mexico. Only two species, *Croton niveus* Jacq. and *Croton schiedeanus* Schlecht., reach mainland South America.

KEY TO THE SPECIES OF SECT. *ELUTERIA*

1. Leaves palmately veined or triplinerved; scales of ovary

stellate to lepidote.

2. Scales of the ovary deeply divided (stellate-lepidote), mostly 8--15-radiate; seeds 5-9 mm long.

3. Radii of ovary scales all in the same plane, not porrect; scales of stems and foliage never porrect; capsules distinctly verrucose; stamens 9-12.

4. Leaf blades bluntly acuminate, mostly 5-veined and cordate at base; staminate petals usually lepidote abaxially; styles usually stellate=pubescent; capsule verrucae dense, blunt, 1--1.5 mm long; fruiting pedicel 4--5 mm long; seeds 7.5--9 mm long..... 1. *Croton arboreus*

4. Leaf blades caudate-acuminate, mostly 3-veined and truncate to rounded at base; staminate petals not lepidote abaxially; styles glabrous; capsule with slender scattered verrucae 1--2 mm long; fruiting pedicel 6--9 mm long; seeds 5-6 mm long.....
.....2. *Croton gomezii*

3. Radii of ovary scales not in one plane, ovary stellate-

pubescent; scales of stems and foliage often porrect;
stamens 13-18 (rarely 12 or 20); capsules smooth or
slightly roughened; fruiting pedicel 4--5 mm long;
seeds 5.5-6.5 mm long..... 3. *Croton niveus*

2. Scales of ovary denticulate (radii laterally connate
almost to the tips); seeds 4.5-15 mm long.

5. Fruiting pedicels not over 3 mm long; inflorescences
mostly 1--2 cm long, very compact (buds overlapping
and ± covering the rachis); leaves mostly broadly ovate.

6. Scales of ovary 0.3--0.6 mm across; stamens 12--16;
staminate petals usually lepidote abaxially; leaves
cordate at base, densely lepidote beneath.....
..... 4. *Croton fantzianus*

6. Scales of ovary 0.7--1 mm across; stamens 9--11;
staminate petals not lepidote abaxially; leaves
greenish and glabrescent beneath, blade usually
cuneate to truncate at base... 5. *Croton pseudoniveus*

5. Inflorescences mostly over 2 cm long, buds scarcely
overlapping, not hiding the rachis; fruiting pedicels
(3-) 4-20 (-30) mm long; leaves ovate to lanceolate.

7. Stamens 13-18 (rarely 12), filaments glabrous or sparsely hirsutulous at base; leaves mostly ovate, glabrescent adaxially; fruiting pedicel over 5 mm long.

8. Fruiting pedicels mostly 9--17 (rarely to 30) mm long, 0.6--1 mm thick; columella 5--7 mm long; seeds 4.5--6.5 mm long; staminate buds 1.--1.5 mm broad; leaves rounded to truncate or cordate at base; inflorescences 2--6 cm long, rachis 0.6-1.3 mm thick.....6. *Croton reflexifolius*

8. Fruiting pedicels 7--20 mm long, 1--1.5 mm thick; columella 15--16 mm long; seeds 11--16 mm long; staminate buds 1.5--3.5 mm broad; leaves rounded to truncate at base but contracted just above petiole; inflorescences 8--22 cm long, rachis 1.3--2 mm thick.....7. *Croton guatemalensis*

7. Stamens 9-12, filaments hirsutulous; leaves lanceolate, densely lepidote on both faces; staminate pedicels not over 1.5 mm long.

.....8. *Croton eluteria*

1. Leaves pinnately veined (see also *C. eluteria*), usually widest at the middle; ovary scales lepidote (never stellate-lepidote or stellate); stamens mainly 9--11.
9. Twigs and often petioles scurfy-porrect; leaves sparsely lepidote on both faces; filaments hirsutulous.....
 9. *Croton tenuicaudatus*
9. Twigs and petioles strictly lepidote (porrect radii absent), usually densely lepidote on abaxial face; filaments glabrous or hirsutulous..... 10
10. Fruiting pedicels slender (less than 1 mm thick), 10--30 mm long; seeds 6--8 (-9) mm long; leaves mostly elliptic to oblong and ± abruptly acuminate, staminate buds 1.5--2 mm in diameter; filaments glabrous10. *Croton schiedeanus*
11. Fruiting pedicels stouter (mostly 1 mm thick or more), 1.5-8.5 mm long; seeds 4.5--6.2 mm long; leaves rounded or obtuse to acuminate at the tip; staminate buds 1--1.5 mm in diameter; filaments hirsutulous.
 11. *Croton nitens*

1. CROTON ARBOREUS Millsp., Publ. Field Columbian Mus., Bot. Ser. 1(3): 303. pl. XV. 1896. Type: MEXICO. Yucatán: Izamal, *Gaumer 449* (holotype F 36252!).

Shrub or tree 2--7 (-12) m high; twigs angled or compressed and densely lepidote when young, becoming terete and glabrescent. Leaf-blades ovate, (3-) 5--8 (-11) cm long, (2.5-) 3--8 cm broad, abruptly and bluntly acuminate at the apex, rounded to cordate and 3--5-veined at base; adaxial face sparsely lepidote, glabrescent, abaxial face copiously lepidote (scales 0.2-0.4 mm in diameter, 40--50-radiate); petioles densely lepidote, (0.5-) 1--4.5 (-7) cm long; stipules 0.5--1.2 mm long, caducous (sometimes obsolete). Inflorescences 2--7 cm long, 0.8--1.5 mm thick through staminate part, densely lepidote, with (0) 1--2 (-4) pistillate flowers; bracts of staminate flowers 1-flowered, lanceolate, 1--2.5 mm long, persistent or deciduous. Staminate pedicel (0.5-) 1--2.5 mm long, densely lepidote; sepals 5, ovate, densely lepidote adaxially; petals spatulate, 1.5--2.2 mm long, adaxially hirsutulous, abaxially glabrous or lepidote, margins woolly-tomentose; stamens 9--11 (-13); filaments 2--3 mm long, glabrous; anthers 0.9--1.3 mm long. Pistillate pedicels in fruit 3.5--9 mm long, 1.2--1.7 mm thick, densely lepidote; sepals deltoid, 2.5--3.5 mm long, villose

adaxially, densely lepidote abaxially; petals elliptic, 2.5--3.5 mm long, villose adaxially, copiously lepidote abaxially; ovary stellate-lepidote (scales 0.4--0.8 mm across, deeply divided into 8-15 radii); styles 4--6-fid, 2--2.5 mm long, glabrous. Capsules 10--15 mm in diameter (including verrucae), densely echinate-verruculose (verrucae 1--1.5 mm long); columella 7.5--8 mm long; seeds 7--9 mm long.

Distribution and ecology: coastal plain, eastern Mexico (Veracruz to Yucatán) to Belize and Guatemala, in semi-deciduous forests, often on limestone and in secondary vegetation, 0-200 m.

Phenology: collected flowering Dec.--June, fruiting April--July.

Common names: Poc-che (Q.R.); "Sak-pa" (Belize, *Arvigo 499*).

Uses: "Para hacer casas son los "binquiches" (las varas chicas del techo que van longitudinalmente)" (*Sousa 11026*); digestive stimulant (*Arvigo 499*).

REPRESENTATIVE SPECIMENS. **BELIZE. Belize:** 19--22 mi NW of Belize, *Dwyer 10484A, 11054, 12644* (MO); Ferguson Bank, *Dwyer 12478* (MO). **Cayo:** Pine Ridge, Sibun River, *Gentle 1819* (MICH); El Cayo,

Chanek 136 (MICH); E of Roaring Creek, *McDaniel 13068* (MO). **Corozal:** 1 mi N of Buena Vista, *Croat 24956, 24957* (MO). **Orange Walk:** Indian Church, *Arnason & Lambert 17074* (MO); 2.2 mi S of Program for Belize Camp, *Arvigo et al. 499* (DAV). **Toledo:** between Orange Point and Moho River, *Gentle 7671* (MICH). **GUATEMALA. Izabal:** Ceja Ciénaga, *Tún Ortíz 2288* (MICH). **Petén:** Dos Arroyos, *Bartlett 12103* (MICH); Flores and Quexil, *Contreras 9606* (MICH); Laguna Santa Cruz, *Bartlett 12409* (MICH); 18 km E of El Remate, *Contreras 883* (MICH); San Andrés, *Contreras 9656* (DAV, TEX); Tikal, *Lundell 16584, 17209* (MICH), Bajo de Santa Fé, *Contreras 537, Lundell 16712* (TEX); Uaxactun, *Bartlett 12697* (UC). **MEXICO. Campeche:** Mpio. Champotón, 11 km S of Champotón, *Chavelas & Pérez ES-863* (MICH); Mpio. Ciudad de Carmen, Campo Experimental Forestal Tropical "El Tormento", *E. Hernández X. et al. ES-222, 769* (DAV); Mpio. Hopelchén, 4 km N of Xcupil, *Sanders et al. 9655* (DAV); Tuxpeña, *Lundell 1382* (MICH). **Quintana Roo:** Mpio. Cancún, 6 km SW of Puerto Morelos, *Sousa et al. 11026* (DAV); Mpio. Cozumel, Cobá, *Lundell & Lundell 7828* (MICH); Mpio. Chetumal, Ejido Caobas, *Cabrera & Alvarez 1594* (MO); between Nicolás Bravo and Chetumal, *Cowan 3017* (DAV); 17 km N of Chetumal, *Cabrera 4890* (DAV); 15 km S of Ejido Laguna, *Téllez & Cabrera 2684* (DAV). **Tabasco:** Mpio. San Pedro, Ejido López Zamora, *Calzada & Gomez-Pompa 2302* (DAV). **Veracruz:** 4 mi SE of Potrero del Llano, *B. Hansen et al. 1774* (WIS); 8 km N of Unión, *Davidse et al. 20167* (MO). **Yucatán:** 6.3 mi SW of Mexcanú, *Stevens 1127* (MICH); Mpio. Cucunul, 2 km toward Valladolid,

Yam & Ucan (UC); Mpio. José Morelos, Laguna Chichancanab, *Darwin* 2468 (MO), *Gaumer* 23687 (F, MO). Mpio. Peto, *Arias & Vara* 71 (DAV); Mpio. Tahdziu, 6.3 km N of Tahdziu, *Arias & Vara* 264 (DAV); Mpio. Tekax, 15 km S of Becanthen, *Darwin* 2527 (MO); Mpio. Tinum, Chichen Itzá, *Bequaert* 21 (A), *Lundell* 7339, 7402, 7458 (MICH); Mpio. Tixcacalcupul, 20 km S of Valladolid, *Cabrera & Cabrera* 11341 (MEXU); Mpio. Yaxcabá, 4 km S of Yaxcabá, *Arias & Vara* 143 (DAV).

Croton arboreus is very close to *C. gomezii*, and the demarcation of these two taxa requires further study. The larger fruits with denser and blunter verrucae distinguish *C. arboreus*, which also tends to have broader more bluntly pointed leaves. In Guatemala, *C. arboreus* has been confused with *C. guatemalensis*, but that is an upland species of cloud forests which clearly differs in its larger fruits and seeds and larger stamen number. Some specimens have also been determined or reported (e.g., by Standley, 1930) as *Croton niveus*, which does occur at lower elevations but differs in the smaller stellate hairs on the ovary, usually larger stamen number, and much smoother seeds.

2. ***Croton gomezii*** G. L. Webster, nom. nov.

Croton sylvaticus Schltdl., *Linnaea* 19: 240. 1846 (nom. illeg., non *Croton sylvaticus* Hochst., *Flora* 28: 82. 1845). Type:

MEXICO. Veracruz: "in sylvis Papantlae", Dec. 1828, C.J.W.
Schiede 1125 (holotype: HAL 48880!).

Arborescent shrub 2--4 m high; twigs terete or slightly angled, sparsely to copiously lepidote. Leaf-blades thinly chartaceous, ovate to ovate-lanceolate, mostly 5--9 (-12) cm long, 2--5 (-7) cm broad, cuspidate-acuminate (acumen 1--2 cm long), rounded to truncate or distinctly cordate and 3- (5-) veined at base; adaxial face drying brown, sparsely lepidote; abaxial face greenish, very sparsely lepidote to glabrescent (except along veins); petioles sparsely to copiously lepidote, (1-) 2--4.5 cm long; stipules obsolete (precociously deciduous), up to 1.5 mm long. Inflorescences 2.5--8 cm long, rachis 0.5--0.8 thick through staminate part, sparsely to copiously lepidote, entirely staminate or with 1--3 pistillate flowers; staminate bracts 1-flowered, lanceolate, 1.5--2 mm long, persistent. Staminate buds pedicel 2.5-4 mm long, lepidote; sepals ovate, deltoid, densely lepidote abaxially; petals elliptic or obovate, 2--2.5 mm long, 0.6--1 mm broad, adaxially hirsutulous, abaxially glabrous or sparsely lepidote, margins woolly-tomentose; stamens 9--12, filaments 2--3 mm long, hirsutulous at least at base; anthers 0.8--1.2 mm long. Pistillate pedicel in fruit 3--7 (-9) mm long, 0.6--1 mm thick, copiously lepidote; sepals deltoid, 2.5--3.5 mm long, villose adaxially, densely lepidote abaxially; petals elliptic, 2.5--3.2 mm long, villose adaxially, glabrous or lepidote

abaxially; ovary stellate-lepidote (scales 0.6--1.2 mm across, deeply divided into 8--15 (-20) radii); styles 4--8-fid, 2.5--3.5 mm long, glabrous. Capsule 8--10 mm long and broad, verruculose (verrucae tapering, 1--2 mm long); columella 8 mm long; seeds 5.5--9.5 mm long.

Distribution and ecology: eastern Mexico to Guatemala, semi-evergreen and evergreen rain forests, 0-300 m.

Phenology: collected flowering Mar., Apr., fruiting Apr., May.

Common names: "copalchi" (SLP); "palo blanco" (SLP).

REPRESENTATIVE SPECIMENS. **MEXICO. Oaxaca:** Mpio. Tuxtepec, Chiltepec, *Martínez-Calderón 324* (A); Encinal de Tuxtepec, *G. Martínez 1334* (CAS, UC). **Puebla:** Mpio. Hueytamalco, Paxta, *Ventura 16891* (CAS). **San Luis Potosí:** Mpio. Aquismón, *Rzedowski 15563* (MICH), *Dorr et al. 2657* (MO); Tacanhuitz, *Nelson 4364* (GH), *Rzedowski 7483* (MICH); Mpio. Tamazunchale, 3 mi N of Tamazunchale, *Harriman & Jansen 12288* (DAV); Palitla, *Lundell 12228* (MICH); Mpio. Terrazas, Arroyo Seco, 10 km NE of Picholco, *Hernández M. & Tenorio 7008* (CAS); Mpio. Xilitla, 7-12 mi NE of Xilitla, *King 4317, 4363* (MICH, UC). **Tabasco:** Mpio. Tenosique, Ejido La Palma, *Calzada & Arellana 2213* (DAV). **Tamaulipas:** Horcaditas a Tampico, *Berlandier 2164* (GH). **Veracruz:** Mpio. Alto Lucero, Cerro Metates, *Calzada 3210* (DAV); Mpio. Atoyac, *Matuda S-10* (MICH); Mpio. Atzalán, San Javier, *Ventura 1247*

(TEX); Mpio. Medellín, 1866, *Hahn s.n.* (P); Montepío, Río Máquina, Cruz 139 (MICH); Mpio. Tantoyuca, Wartenberg, *Ervendberg 199, 243* (GH); Mpio. Tepatlaxco, Atoyax to Tepatlaxco, *Velázquez 280* (DAV); Tepetzintla, *Chiang 344* (GH); Mpio. Zongólica, El Palmar, *Santos 2873* (TEX).

It is a distinct pleasure to name this species after my colleague Dr. Arturo Gómez-Pompa, in recognition of his perceptive studies on the taxa of sect. *Eluteria* in Veracruz (Gómez-Pompa, 1966). In his study of the species of *Croton* in the Misantla area, he cited specimens of this species as *Croton sylvaticus* Schltdl., which he noted was an illegitimate name (a later homonym of *C. sylvaticus* Hochst., 1845); later, he labelled specimens with an unpublished epithet based on the locality of Schiede's original collection.

As pointed out by Gómez-Pompa, *Croton gomezii* had been confused with *C. reflexifolius* Kunth by earlier authors, including Schlechtendal. In his earlier treatment (Schlechtendal & Chamisso, 1831), he briefly mentioned a collection from Papantla as a variety that might prove specifically different. Unfortunately, the type specimen of *C. sylvaticus* Schltdl. (*Schiede*, 1828, from Papantla; HAL 48880) lacks flowers; but the Liebmann specimen, a topotype, clearly represents the present species.

It seems clear that Schlechtendal and Gomez-Pompa were correct in recognizing *Croton gomezii* as a distinct species, readily

distinguished by its sharply acuminate glabrescent leaves and spiny fruits. However, it is obviously related to *C. arboreus*, the two taxa forming a pair of allopatric vicariant taxa. Some narrow-leaved forms of *C. arboreus*, especially in Petén and Quintana Roo, mimic *C. gomezii* in aspect but can be distinguished by their thicker shinier leaves and thicker inflorescence axes, even if the characteristic fruits are absent. *Croton gomezii* is sympatric with *C. reflexifolius* over much of eastern Mexico, and in the absence of fruits specimens can be easily confounded; however, staminate specimens of *C. reflexifolius* can be distinguished by their larger stamen number.

3. CROTON NIVEUS Jacq., Enum. Pl. Syst. 32. 1760; Select. Stirp. Amer. Hist. 225, pl. 162 fig. 2 1763. Type: cited by Jacquin as Cartagena [Colombia], but no herbarium specimens are known. Neotype: COLOMBIA: Cartagena, XI 1857, Schott s.n. (MO 1905037); selected by Webster (1999).

Croton populifolius Mill., Gard. Dict. ed. 8. 1768. Type: without location, Miller s.n. (holotype: BM).

Croton septemnerius McVaugh, Brittonia 13: 165. 1961. Type: MEXICO. Colima: Manzanillo, 1890, Palmer s.n. (holotype: MICH!).

Arborescent shrub or tree 2--5 (-10) m high; twigs and leaves lepidote, sometimes with porrect trichomes. Leaf blades ovate to lanceolate, 3-11 cm long, 1.5-8.5 cm broad, rounded to more often cordate and 5--7-veined at base; adaxially greenish, sparsely lepidote, glabrescent; abaxially silvery, densely lepidote, scales sometimes porrect; petioles 0.5--4 cm long, 0.5--0.7 mm thick; stipules subulate, 0.5--1.5 mm long, caducous. Inflorescences terminal or pseudoterminal and axillary, sometimes unisexual, 1--4 cm long, with 1 or 2 basal pistillate flowers; rachis densely lepidote, 0.5--0.7 mm thick; staminate bracts lanceolate, 0.5--1.3 m long, \pm persistent; staminate buds 1.5--1.9 mm in diameter; pedicels 1.5-3.5 mm long; sepals deltoid, 1.3--1.7 mm long; petals elliptic, 1.8--2.5 mm long, adaxially hirsutulous, abaxially \pm glabrous, densely villose on margins; stamens 13--16, filaments glabrous, 1.5--2 mm long; anthers 0.7--1 mm long; pistillate pedicel 4-5 mm long in fruit; sepals deltoid, c. 1.5 mm long; petals obovate, c. 2 mm long, adaxially hirsutulous, abaxially \pm glabrous; ovary stellate-tomentose; styles multifid, glabrous, 1.5--2 mm long. Capsules c. 8 mm in diameter, stellate-pubescent; columella 6.5--7.5 mm long; seeds ellipsoid, smooth, 5.5--6.5 mm long.

Distribution and habitat: widespread in the Caribbean region, from western Mexico (Sinaloa) through Central America to northern South America (Colombia, Venezuela) and the Lesser Antilles (St.

Lucia to Trinidad); common in lowland tropical deciduous forests and woodlands, 0-300 m, rarely to 900 m.

Phenology:

Representative specimens examined: **COLOMBIA. Atlántico:** Barranquilla, *Elias 671* (US); Pto. Colombia, *Dugand 6086, 6784* (US). **Bolívar:** Cartagena, *Heriberto 347, Schott 4* (MO); Galeazamba, *A. Gentry & Cuadros 47467* (MO). **César:** 8 km W of Manaure, *A. Gentry et al. 60745* (MO). **Magdalena:** 1 km E of Bonda, *Kirkbride 2470* (DAV); Santa Marta, *H. H. Smith 356* (MO, US). **COSTA RICA. Alajuela:** *Liesner 14255* (MO). **Guanacaste:** Santa Rosa National Park, *Liesner 4608* (MO), *Janzen 10644* (MO). **EL SALVADOR.** **Morazán:** 2.4 km S of Divisadero, *Tucker 599* (UC). **HONDURAS.** **Comayagua:** Comayagua Valley, between Comayagua and Palmerola, *Molinas 26027* (MO); 9 mi NW of Comayagua, *Webster & Millers 12565* (DAV). **LESSER ANTILLES. Grenadines:** Carriacou, *Broadway s.n.* (NY), *Howard 10852* (GH, MICH, NY); Mustique, *A. C. Smith 10174* (NY, UC, US), *10179* (NY, UC). **St. Lucia:** Soufrière--Anse Mamain Road, *Box 1992* (NY). **St. Vincent:** leeward cliffs, *H. H. & G. W. Smith 1258* (NY); Fort Charlotte, *Morton 5728* (US); Oakley Hall Bay, *Eggers 6946* (US). **MEXICO. Colima:** Mpio. Cihuatlán, 8 km NW of Navidad, *McVaugh & Koelz 1698* (MICH); Mpio. Manzanillo, Manzanillo, *Ferris 6055* (DS), *Palmer 1058, 1890* (MICH); 14 mi WSW of Santiago, *McVaugh 20765* (MICH,

TEX). **Guerrero:** Mpio. Zihuatanejo, *Germán et al.* 240 (MO). **Jalisco:** Mpio. La Huerta, Estación Biológica Chamela, *Magallanes* 365 (MICH); between El Higueral and Juan Gil Preciado, *Flores & Ramos* 2945, 4973 (WIS); Rancho Cuixmala, *Guadalupe Ayala* 114B, 157, 1208 (DAV). **Oaxaca:** Mpio. Ixtepec, 6-7 km N of La Ventosa, *Thomas & Villaseñor* 3607 (DAV), *Wendt & Rico s.n.* (MO); Mpio. Juchitán de Zaragoza, Juchitán, 1970, *MacDougall s.n.* (DAV); Mpio. Santiago Astata, 10 km SW of Coyol, *Torres et al.* 5218 (DAV). **San Luís Potosí:** Mpio. Ebano, 5 mi S of Tamuin, *Crutchfield & Johnston* 5298 (TEX). **Tamaulipas:** Mpio. Mante, 14 mi E of Mante, *M. C. Johnston* 4914 (TEX); Mpio. San Fernando, Los Coyotes, *Le Sueur* 589 (TEX). **NETHERLANDS ANTILLES.** **Bonaire:** Seroe Largo, *Arnoldo* 510 (A). **Curaçao:** Seroe Pretoe, *Curran & Haman* 19 (UC). **NICARAGUA.** **Boaco:** W slope of Cerro Coyanchigua, *Stevens* 24171 (DAV). **Carazo:** 3 km S of La Trinidad, *Grijalva & Vanegas* 3430 (DAV). **Chontales:** Juigalpa, *Standley* 9181 (F). **Estelí:** Mun. San Juan de Limay, *Moreno* 2179 (MO). **Granada:** Isla Zapatera, *Grijalva et al.* 3249 (DAV). **Managua:** Río La Aduana, *Stevens* 5404 (MO). **León:** 21 km N of Achuapa, *Moreno* 3241 (DAV). **Matagalpa:** Matagalpa and vicinity, *Araquistain* 3663 (MO), *Molina* 22845 (F). **Rivas:** Hacienda La Flor, *Araquistain & Moreno* 1294 (MO). **TRINIDAD & TOBAGO.** **Trinidad:** Gasparee I., *Britton* 474 (NY, US); Patos I., *Britton et al.* 527 (NY). **VENEZUELA.** **Anzoátegui:** 13 km W of Clarines, *Terán* 343 (MO). **Aragua:** Maracay, *Cornelis* 124 (MO), La Trinidad de Maracay, *Pittier* 5767 (US). **Distrito Federal:** W of Naiguatá, *A. Gentry & Berry* 14733 (MO).

Falcón: 2 km N of La Tabla, *Webster & Armbruster 23621* (DAV, VEN).
Lara: 20 km W of Carora, *A. Gentry & Puig-Ross 14238* (MO). **Miranda:**
4 km W of Tuarenas, *Davidse 4098* (US). **Nueva Esparta:** Isla Margarita,
El Valle, *Miller & Johnston 107* (US). **Sucre:** Peninsula de Araya, 21
km NW of Cariaco, *Liesner & González 11991* (MO). **Zulia:** Dtto. Bolívar,
between Cabimas and Sabana de la Plata, *Bunting 8747* (DAV).

Croton niveus is the commonest and widespread species of sect. *Eluteria* in dry forest habitats; it is primarily confined to coastal lowlands, although it does attain elevations of over 500 m in low mountain ranges within 100--200 km of the Pacific or Caribbean shorelines. It has been confused with most of the palmately veined species, but can easily be distinguished from all of them except *C. fantzianus* by its stellate ovarian indumentum and commonly porrect trichomes on leaves and twigs. It is usually readily separable from *C. fantzianus* by its smaller less crowded floral buds and longer fruiting pedicels.

The distribution of *Croton niveus* in South America and the West Indies is distinctly coastal, and it is striking that it is absent from the Greater Antilles and does not reach Martinique or any of the Leeward Islands. In all probability it is a Mesoamerican species which spread south and east after the Panama land bridge was closed.

4. CROTON GUATEMALENSIS Lotsy, Bot. Gaz. 20: 353. 1895. Type:

GUATEMALA, Dept. Santa Rosa, Santa Rosa, Heyde & Lux 3035
(holotype: F!).

Croton eluterioides Lotsy, Bot. Gaz. 20: 352. 1895. Type:
GUATEMALA, Dept. Santa Rosa, Santa Rosa, Heyde & Lux 3470
(holotype: F!).

Croton pyriticus Croizat, J. Arnold Arb. 26: 186. 1945. Type:
COSTA RICA. Cartago: El Alto RR. station, Allen 661 (holotype:
A!).

Croton wilburi McVaugh, Brittonia 13: 166. 1961. Type: MEXICO.
Jalisco: 10 mi S of Autlán, Wilbur & Wilbur 2431 (holotype:
MICH!).

Tree 5--15 m high; twigs terete or distally angled, densely lepidote. Leaf-blades ovate, (5-) 9--13 cm long, (4-) 7--11 cm broad, bluntly acuminate, cuneate to rounded or truncate (rarely shallowly cordate) and 3--5-veined at base; adaxial surface greenish, sparsely to densely lepidote; abaxial surface paler, densely lepidote (scales denticulate, 0.2--0.3 mm in diameter, 40-50-radiate); petioles (1-) 2--5 (-7) cm long, densely lepidote; stipules subulate, 1--3.5 mm long, deciduous. Inflorescences 8--22 cm long, with 1--4 basal pistillate flowers; rachis 1.3--2 mm thick; staminate bracts

lanceolate, 1--2 mm long. Staminate buds 1.5--3.5 mm in diameter; pedicel 4--7 mm long; sepals deltoid; petals spatulate, 2--3 mm long, abaxially lepidote; stamens mostly 15--17 (rarely to 12, or 20), filaments glabrous or sparsely hirsutulous; anthers 0.8--1.3 mm long; pistillate pedicel in fruit 7--20 mm long, 1--1.5 mm thick; petals elliptic, (2-) 2.5--3.5 mm long, abaxially lepidote; ovary lepidote, scales denticulate, 0.5--1 mm broad, ± lacerate; styles 4-fid, glabrous. Capsule 13--17 mm long, tuberculate; seeds 11--16 mm long.

Distribution and ecology: western Mexico (Jalisco) to Panama, in cloud forest on mountains and ridges, 700--1900 m.

Phenology: collected flowering throughout year except Sept., Nov.; fruiting Jan., Feb., June--Sept.

Representative specimens examined: **COSTA RICA. Alajuela:** 1--3 km E of San Ramón, *Liesner 14255* (DAV). **Cartago:** Cerro Carpintera, 1936, *Dodge & Georger s.n.* (MO). **Heredia:** N of Gethsemini, *Hartshorn 1206* (MO). **Puntarenas:** between Cerro Plano and Monteverde, *Lumer 1179* (DAV). **San José:** Cerro de Escazú, *González & Morales 288* (DAV). El Alto, *Stork 1089* (MIN). **EL SALVADOR. Ahuachapán:** Cerro Campana, *Witsberger 609* (DAV). **GUATEMALA. Quetzaltenango:** between Finca Pirineos and Patzulín, *Standley 86715* (F). **MEXICO. Chiapas:** Mpio. Angel Albino Corzo, below Finca Cuxtepec, *Breedlove 48633* (CAS).

Colima: 3.5 km airline SW of El Terrero, *Cochrane et al.* 11746 (DAV).
OAXACA. Mpio. **NICARAGUA. Estelí:** Cerro Quiabú, *Moreno* 1310, 8173, 16773, 19268 (DAV), *Neill* 1219, 7758 (DAV), *Stevens* 19000 (MO); El Chayote, 23 km N of Estelí, *Moreno* 21217, 21740 (DAV); Llano 4 de Mayo, 20 km SW of Pueblo Nuevo, *Neill* 7354 (DAV); Los Cipresses, 9 km NW of Estelí, *Moreno* 21213 (DAV). **Managua:** camino de Bolas, *Araquistain* 3574 (DAV); between "Los Nubes and "Pochocuape", *Araquistain* 3523 (DAV).

5. CROTON FANTZIANUS Seymour, *Phytologia* 43: 171. 1979. TYPE:

MEXICO. Nicaragua: Dept. Nueva Segovia, Dipilto, *Budier*

6390 (holotype, FLAS; isotypes BM, DAV!, ENAG, GH, MO!, NY, UC!).

Arborescent shrub 2--4 m high; twigs terete, densely lepidote. Leaf-blades chartaceous, ovate, 5--10 cm long, 4--10 cm broad, rounded or obtuse to bluntly apiculate at tip, cordate and 5--7-nerved at base, sparsely lepidote and glabrescent adaxially, copiously to densely lepidote and sometimes with porrect or stellate hairs abaxially; petioles 1--3 cm long, 0.8--1.2 mm thick, densely lepidote, scales sometimes with porrect radii; stipules lanceolate, 1.5--3 mm long, caducous. Racemes axillary or terminal on lateral shoots, 1--1.5 cm long; rachis over 1 mm thick, obscured by the closely packed buds; bracts 2--2.5 mm long, often dilated to cover

the bud, deciduous. Staminate buds dorsiventrally compressed, 2--2.5 mm across, subsessile (pedicel usually less than 1 mm long); sepals deltoid, 1.8--2 mm long; petals spatulate, 2--2.7 mm long, adaxially villose, abaxially glabrous or lepidote, marginally ciliate; stamens mostly 14--16, filaments glabrous, 3--4 mm long; anthers 0.8--1.5 mm long; pistillate flowers sessile or subsessile, pedicel 1--3 mm long in fruit; sepals deltoid, 1.7--2 mm long; petals oblanceolate, c. 2.5 mm long, villose adaxially, lepidote abaxially; ovary lepidote or stellate-lepidote, scales 0.3--0.6 mm across, 20--35-radiate, denticulate to lacerate or divided into distinct radii; styles 2 mm long, glabrous, several times bifid, branches slender. Fruit c. 6 mm in diameter, ± tuberculate with scales raised on processes 0.2--0.3 mm high; columella c. 7 mm long; seeds 7.5--8 mm long, caruncle c. 2 mm broad.

Distribution and habitat: Mexico to Costa Rica, in lowland tropical deciduous woodlands or scrub, 200-1000 m.

Flowering and fruiting: collected in flower Nov., in bud Sept.--Dec.; in fruit Nov.

Specimens examined: **COSTA RICA. Guanacaste:** Santa Rosa National Park, Río Guapote, 13 XII 1977, *Janzen s.n.* (MO). **MEXICO. Guerrero:** Acapulco, *Palmer 561* (UC). **Jalisco:** Mpio. Bolaños, 11 km NE of San Martín de Bolaños, *Lott et al. 2108* (MEXU). **Oaxaca:** Mpio.

Mixtequilla: Cerro Guiengola, *Torres & Torres 211, 1017* (DAV).

Sonora: Cerro la Calera and Las Tatemas, 12--14 km NW of Alamos, *Van Devender et al. 93-334* (DAV); *Steinmann et al. 94-154* (DAV); 14 km NW of Alamos, *Sanders 13346* (DAV); La Higuera, 7 mi N of Alamos, *Van Devender 90-589* (DAV); 2.6 km NE of Sabinito Sur, *Van Devender et al. 92-241, 92-1264* (DAV); 36 km SE of Alamos, *Lindquist 1171A, 1175, 1275* (DAV). **NICARAGUA. Estelí:** 4.5 mi E of Condega, *Croat 42833* (MO); "El Hornillo: S of Santa Cruz, *Moreno 22292* (DAV, MO). **Jinotega:** 7 km a la entrada del camino viejo at Jinotega, *Vega & Robleto 114* (DAV, MO).

Croton fantzianus has often been mistaken for *C. pseudoniveus*, which has similar broad ovate leaves, abbreviated inflorescences, and short fruiting pedicels. However, that species clearly differs in its sparser and homogeneous indumentum, shorter bracts, lesser stamen number, and smaller seeds. *Croton niveus* is more similar in such characters as heterogeneous indumentum, stamen number of mostly 14-17, and its non-lepidote ovaries, but has laxer inflorescences with smaller buds, longer fruiting pedicels, and smaller seeds. In many ways *C. fantzianus* is intermediate between *C. niveus* and *C. pseudoniveus*, having the indumentum, stamen number, and leaf base of the former, but the leaf shape and shorter denser inflorescences of the latter. The possibility of a hybrid origin of *C. fantzianus* thus arises; however, the Sonoran population occurs far north of the

nearest stations of either *C. niveus* or *C. pseudoniveus*, and if hybridization was involved in its origin, it must have happened long ago.

The distribution of *Croton fantzianus* is remarkable, with a population in southeastern Sonora disjunct by hundreds of kilometers from the nearest sites in Guerrero. I am indebted to Susan Lindquist and Victor Steinmann for providing excellent Sonoran specimens in flower and fruit. These are the only known collections with open staminate flowers and seeds, which makes it difficult to compare the Sonoran plants with those to the south. It is possible that the Sonoran population is taxonomically distinguishable, but a formal varietal status is not granted at this time because of the lack of reproductive data from eastern Mexico and Central America.

6. CROTON PSEUDONIVEUS Lundell, *Phytologia* 1: 449. 1940. Type: MEXICO. Sinaloa: Los Labrados [Labradas], *Mexia* 921

(holotype: MICH!).

Shrub or tree 2--6 m high; twigs lepidote. Leaf-blades chartaceous, ovate (less commonly elliptic), acute to bluntly acuminate, obtuse to rounded or subcordate (rarely shallowly cordate) and mostly 5-veined at base; blades adaxially sparsely lepidote and glabrescent, abaxially more copiously lepidote, but greenish and scarcely silvery in age; petioles 1--3 cm long,

0.8--1.2 mm thick; stipules narrowly lanceolate, 4--7 mm long, deciduous. Inflorescences axillary, (0.5-) 1--2 cm long, with 1 basal flower; staminate bracts lanceolate, 0.5--1 mm long, persistent; staminate buds 1.5--2 mm in diameter, pedicel 1--1.5 mm long; sepals deltoid, c. 1.5 mm long; petals obovate, c. 2 mm long, glabrous except for villose margins; receptacle villose; stamens 10 or 11, filaments glabrous; anthers 0.6--0.7 mm long; pistillate pedicel in fruit 1--2.5 mm long, 0.8--1.1 mm thick; sepals 5, deltoid, 1.5--2 mm long; petals c. 2 mm long, glabrous or lepidote abaxially; ovary lepidote with scales mostly 0.7--1 mm across; styles glabrous or nearly so, 2.5--3 mm long. Fruit 5--7 mm high, 6 mm in diameter; columella c. 5.5 mm long; seeds smooth, 5--5.7 mm long.

Distribution and habitat: Pacific lowlands of Mexico (Sinaloa to Chiapas) south to Panama, deciduous tropical forests or woodlands, 0-400 m.

Phenology: flowering Sept., Oct.; fruiting Oct.--Dec.

Representative specimens examined: EL SALVADOR. **MEXICO.**
Chiapas: Mpio. Arriaga, 6 km NE of Arriaga, *Breedlove 25693* (DS), 5 mi NE of Arriaga, *Webster & Lynch 17870* (DAV). **Colima:** Mpio. Colima, 10--11 mi by road S/SSW of Colima, *McVaugh 18056* (MICH, TEX), *McVaugh & Koelz 1692* (MICH), *Webster & Breckon 16094* (DAV, GH, MEXU, MICH);

Mpio. Manzanillo, W of Manzanillo, *Ferris 6062* (A). **Jalisco:** Mpio. Cihuatlán, Playa de Cuastecomate, 8 km NW of Navidad, *McVaugh & Koelz 1692* (MICH); between Bahía de Navidad and La Manzanilla, *McVaugh 20993* (MICH); Mpio. La Huerta, Estación de Biología Chamela, *Bullock 997*, *Lott 1461*, *Magallanes 365* (MICH); Rancho Cuixmala, *Lott 2862* (MICH); Mpio. Tomatlán, 20 km SE of Tomatlán, *McVaugh 25292A* (MICH). **Oaxaca:** Mpio. Santa María Chimalapa, 11 km NW of La Ventosa, *King 519* (TEX). **Sinaloa:** Mpio. Concordia, 5 km S of El Huajote, *Guízar N. 3241* (MEXU); Mpio. Culiacán, Baila, Abuya, *González Ortega 6567* (GH); Cerro Colorado, 1904, *Brandegge s.n.* (UC); Culiacán, *Brandegge s.n.*, *González 4548* (MEXU); "El Tule", 6.5 mi S of Culiacán, *Sanders et al. 4601* (UC); Mpio. Pericos, Cerro Tecomate, *H. S. Gentry 5722* (GH). **PANAMA. Coclé:** Penonomé, *Dwyer 1999* (MO); 2 mi W of Santiago, *Dwyer et al. 7546* (UC). **Panamá:** 5 mi E of Canita, *Tyson & Smith 4160*).

Although it has sometimes been mistaken for *Croton niveus*, *C. pseudoniveus* is usually easily recognized by its larger broader leaves scarcely cordate at base, lack of correct trichomes, short congested inflorescences, and lepidote ovarian trichomes. In leaf shape and shorter inflorescences it is much more similar to *C. fantzianus*, but has different ovarian trichomes, lower stamen number, and the leaf blades are rarely cordate at base and have thinner indumentum abaxially.

7. CROTON REFLEXIFOLIUS Kunth, Nov. Gen. Sp. 2: 68. 1817. Type: MEXICO. Guerrero: "in maritimis prope Acapulco", *Humboldt* (Herb. Humboldt & Bonpland, P!).

Croton pseudochina Schltldl., *Linnaea* 4: 84. 1830. Type:

MEXICO. Veracruz: Plan del Rio, July 1828, *Schiede* 373 (HAL 48871!, holotype; same locality, Mar. 1829, HAL 48878!, paratype) [a label on the type sheet bears the number 57, which is the species number in Schlechtendal's account].

Croton pseudochina var. *minor* Schltldl. & Cham., *Linnaea* 6: 359.

1831. Type: MEXICO. Veracruz: " between Laguna Verde and Actopan, 29 Mar. 1829, *Schiede & Deppe* '57' (HAL 48840!, 2 sheets, holotype and isotype; HAL 48879!, isotype) [The number 57 is probably not a collection number but rather the species number of *Croton pseudochina*; according to a paratype sheet (HAL 48878!), the plant was collected in the vicinity of Plan del Río on the same day].

Shrub or tree 3--10 m high; twigs lepidote. Leaf blades ovate, mostly 5--11 cm long, 4--8 cm broad, bluntly and rather abruptly acuminate, rounded to truncate or cordate and 3--5-veined at base; adaxially olivaceous, sparsely lepidote and glabrescent, abaxially

silvery, densely lepidote; petioles 1--3.5 cm long; stipules subulate, 0.5--1.5 mm long, deciduous. Inflorescences axillary or terminal on lateral shoots, with 1--3 proximal pistillate flowers, 2--6 cm long, rachis 0.6--1.3 mm thick; staminate bracts 0.5--1.2 mm long, deciduous. Staminate buds 1.2--1.5 mm across; pedicel 1.5--5.5 mm long; sepals ovate, 1.7--2.2 mm long; petals spatulate, 2--2.3 mm long, usually lepidote abaxially; stamens (12-) 14--16 (-18), filaments glabrous or hirsutulous near base; anthers 0.7--1 mm long; pistillate pedicels becoming (6-) 9--17 (-30) mm long, 0.6--1 mm thick; ovary lepidote (scales 0.3--0.7 mm in diameter, denticulate or occasionally lacerate); styles 4--6-fid, 1--2 mm long, glabrous. Capsule 6--7 mm in diameter, smooth or slightly tuberculate, silvery-lepidote; columella slender, 5.5--6.5 mm long; seeds ellipsoidal, smooth, 4.5--6.5 mm long.

Distribution and habitat: Mexico (Jalisco east to San Luis Potosí and Tamaulipas) to Guatemala, deciduous or semideciduous lowland tropical forest, 0-700 m.

Phenology: collected flowering throughout the year, fruiting Jan.-Feb., Apr., Aug.-Sept.

Representative specimens examined: **GUATEMALA. Esquintla:** Esquintla, *Hunnewell 14712* (GH). **MEXICO. Chiapas:** Mpio. Acacoyagua,

Matuda 17616 (UC); Mpio. Jiquipilas, *Anderson 5567* (MICH). **Colima:** Mpio. Manzanillo, *Palmer 1058* (MICH). **Guerrero:** Mpio. Acapulco, *Gillis 10320* (MO), *Palmer 156*, 1895 (UC), *Thiébaud 1139*, 1140 (P); Mpio. Quechutenango, 2 mi W of Colotlipa, *Rowell & Kubicek 3727* (MICH). **Oaxaca:** Mpio. San Carlos Yautepec, *Webster & Millers 11647* (DAV). **San Luís Potosí:** Mpio. Tamazunchale, Tamán, *Hernández X. 167* (MICH); Mpio. Valles, El Abra, *Cochrane et al. 8645* (TEX), *Rzedowski 23152* (DS, MICH). **Tamaulipas:** Mpio. Aldama, Rancho Las Varas, 40 km NNW of Aldama, *Dressler 2303* (UC); Mpio. Ciudad Mante, 15 km SW of Mante, *Nee 22270* (DAV); Mpio. Ciudad Victoria, 8 mi S of Victoria, *King 4527* (TEX); Mpio. Gómez Farías, *Gómez-Pompa 2055* (UC); Mpio. Llera de Canales, 6.8 mi S of Tropic of Cancer, *Lemke & Ruff 007* (TEX); Mesa de Llera, *Crutchfield & Johnston 5423* (TEX), *Lundell & Lundell 12486* (UC); 25 mi SE of Victoria, *Webster & Millers 11302* (DAV); Mpio. San Fernando, Los Coyotes, *Le Sueur 589* (TEX); 27--29 mi SW of San Fernando, *Crutchfield & Johnston 5511* (MICH, TEX); Mpio. Santander Jiménez, Mesa de Solis, *Runyon 762* (TEX).

Veracruz: Mpio. Dos Ríos, Cerro Gordo, *Dorantes 380* (CAS); Mpio. Ozutuama, Laguna de Tamiahua, *Le Sueur 560* (TEX); Mpio. Puente Nacional, El Carrizal, *Torres & Hernández 3225* (DAV); La Ceiba, *Ventura 7946* (MO); El Remudadero, *Bunting & Carsten 1493* (DAV).

The application of the name *Croton reflexifolius* has perhaps been more uncertain than any other in sect. *Eluteria*. It has often

been confused with *C. niveus* and *C. guatemalensis*, although it is readily distinguished from the first by its lepidote ovarian scales and longer fruiting pedicels, and from the second by its shorter inflorescences and smaller fruits and seeds. Vegetatively, it can easily be confused with *C. niveus*, although it never has porrect trichomes. Burger and Huft (1995) treated *C. reflexifolius* as a probable synonym of *C. niveus* because of supposed intermediate specimens; however, although the two species are sympatric in Tamaulipas, they appear distinct, and no specimens of *C. reflexifolius* have been positively identified south of Guatemala.

Specimens from Veracruz described by Schlechtendal as *Croton pseudochina* and *C. pseudochina* var. *minor* appear clearly conspecific with *C. reflexifolius*. The small-leaved var. *minor* closely resembles species of *C. reflexifolius* from Tamaulipas that are superficially similar to *C. niveus*. Schlechtendal (1831) and Klotzsch (1843) described the plants producing the drug "Copalche" in Veracruz as *C. pseudochina*, without considering any relationship with *C. reflexifolius*. However, except for a tendency towards lower stamen number, specimens from Veracruz are similar to topotypes of *C. reflexifolius* from the vicinity of Acapulco. Consequently, the suggestion by Gómez-Pompa that *C. pseudochina* is a synonym of *C. reflexifolius* rather than *C. niveus* seems to be correct.

8. CROTON ELUTERIA (L.) Wright, London Med. J. 8: 249. 1787; Sw.,

Prodr. 100. 1788.

Clutia eluteria L., Sp. Pl. 1042. 1753. Type: Hortus
Cliffortianus Herbarium (lectotype: BM).

Croton homolepidus Müll. Arg., DC. Prodr. 15(2): 518. 1866.

Croton eluteria ssp. *homolepidus* (Müll. Arg.) Borhidi,
Ann. Hist.-Nat. Mus. Hung. 69: 48. 1977. Type: CUBA. Oriente,
Wright 1971 (holotype: G; isotype, GH).

Shrub, sometimes arborescent, 1.5--3 m high; twigs terete,
densely lepidote. Leaf-blades chartaceous, ovate-lanceolate, 3--6
(-8) cm long, 1.5--2.5 (-4) cm broad, tapered to an acumen up to 1
cm long, obtuse or rounded and 3-veined at base; adaxial face brown,
copiously lepidote, abaxial face silvery, densely lepidote; petioles
densely lepidote, 0.5--1.5 cm long, 0.7--1 mm thick; stipules
obsolete or up to 1 mm long, caducous. Inflorescences axillary or
pseudoterminal, 1.5--3 cm long,

0.6--0.7 mm thick, densely lepidote, with (0) 1--3 pistillate
flowers; bracts of staminate flowers lanceolate, 0.8--1.2 mm long.
Staminate pedicel 1--1.5 mm long; sepals deltoid, 1.5--2 mm long,
densely lepidote abaxially; petals elliptic, 1.7--2 mm long,
abaxially lepidote; stamens 9--11, filaments c. 2 mm long,
hirsutulous; anthers 0.7--0.8 mm long. Pistillate pedicel in fruit

3--5 mm long, 0.5--0.7 mm thick, densely lepidote; sepals deltoid, c. 2.5 mm long; petals spatulate, 1.7--1.9 mm long, villose adaxially, copiously lepidote abaxially, margins ciliate; ovary lepidote (scales denticulate, 0.3--0.5 mm across, 25--30-radiate); styles 4-fid, c. 2 mm long, glabrous. Capsules not seen entire; valves lepidote, smooth; columella 4--6 mm long; seeds 3.5--4.5 (-5.5) mm long.

Distribution and ecology: Bahamas and Cuba, Isla Tortuga (Haiti), coastal thickets, 0-100 m; incorrectly reported (sometimes as *Croton glabellus* L.) from Jamaica, Mexico, Central America, and northern South America.

Phenology: collected flowering Dec.--Mar., June, July; in fruit Mar.

Common names: Sweet wood, Cascarilla.

Illustrations: Curtis Bot. Mag. III. 5: pl. 7515. 1897. The illustration in Correll & Correll (1982) labelled as *Croton eluteria* actually shows *C. lucidus* L.!

Representative specimens. **BAHAMAS. Acklins I.:** Pinefield Point, Correll 44469 (NY). **Atwood Cay:** Wilson 7386, 7411 (NY). **Cat**

I.: The Bight, *Britton & Millspaugh 5807* (NY). **Eleuthera:** 4.5-5 mi S of Rock Sound, *Webster & Williams 10694* (DAV). **Great Exuma:** NW of Goat Cay, *Correll 44118* (NY); George Town, *Britton & Millspaugh 2985* (NY). **Long Island:** Roses, *Correll 48172* (NY). **New Providence:** Breezy Hill, *Coker 3a* (NY); Hog Island, *Eggers 4151* (NY); Nassau, *Brace 289*, *Curtis 185* (NY); Yamacraw Beach, *Webster & Williams 10861* (DAV). **CUBA. Pinar del Rio:** Cerro de Mendoza, *Ekman 16742* (NY); Sierra de Viñales, *Ekman 16586* (NY). **HAITI. Nord Ouest:** Ile de la Tortue, Mare-Rocher, *Ekman H4133* (DAV).

There was some confusion earlier about the identity of *Croton eluteria*, primarily because Linnaeus, after establishing his genus *Elutheria* in the *Hortus Cliffortianus* (1737), added synonyms, some of dubious affinity. This was of considerable interest to botanists in the 19th century because of the supposed medical virtues of "Cascarilla bark" from the West Indies. Since Linnaeus described a *Croton cascarilla* from a Catesby collection in the Bahamas, there was some confusion between the two species. However, a succession of botanists-- Bennett (1859), Daniel (1862), Hooker (1897), and Carabia (1942a)-- who have examined this problem agree that *Croton eluteria* may be typified by the specimen in the Hortus Cliffortianus Herbarium. It is quite distinct from *C. cascarilla*, which does not belong to sect. *Eluteria*; and the common name "Cascarilla", although applied to *C. eluteria*, appears to be a widespread name given to

various aromatic species of *Croton* in the Caribbean area.

Croton eluteria is the only species of the section in the Bahamas and Cuba. It is easily recognizable by its distinctive ovate-lanceolate leaves that are densely lepidote above. Apparently, the closest species morphologically is the Mexican *C. reflexifolius*, which however has a larger stamen number and longer fruiting pedicels. *Croton eluteria* has been confused with *C. glabellus* L., which however is a synonym of *C. lucidus* L., in sect. *Astraeopsis* (Webster, 1992). It has also been reported from other islands in the West Indies, especially Jamaica, due to a misinterpretation by Swartz (1807).

9. CROTON SCHIEDEANUS Schlttdl., *Linnaea* 19: 243. 1847. Type: MEXICO. Veracruz: Misantla, *Schiede 1126* (holotype: HAL!).

Tree 5--15 m high; twigs terete, closely lepidote. Leaf blades chartaceous, elliptic to oblong, 7--22 cm long, 3--9 cm broad, usually abruptly contracted to an acuminate tip, cuneate to rounded at base, pinnately veined; adaxially sparsely lepidote, glabrescent; abaxially more densely lepidote but greenish; petioles (0.5-) 1--2.5 (-4.5) cm long, 1--1.5 mm thick; stipules subulate, 1--4 mm long, caducous. Inflorescences axillary, 2--10 cm long, sometimes

fascicled; rachis 0.5--0.8 mm thick; staminate bracts 0.5--1 mm long, sometimes persistent; staminate buds 1.5--2 mm in diameter; pedicels 2--4 mm long; sepals lanceolate, 1.5--2 mm long; petals elliptic, 1.3--2 mm long, abaxially glabrous or sparsely lepidote, margins densely villose; stamens 9--12 (rarely 13), filaments glabrous, 1.5--2.5 mm long; anthers 0.7--1 mm long; pistillate pedicel 10--30 mm long in fruit, 0.5--0.8 mm thick; sepals deltoid, 2.2--2.7 mm long; petals elliptic, 1.8--2.7 mm long, abaxially glabrous or sparsely lepidote; ovary lepidote, scales denticulate, 0.3--0.5 mm across; styles 3 times bifid, glabrous, 2.5--3 mm long. Capsules 8--10 mm long and broad, more or less verruculose, lepidote; columella 6.5--8 mm long; seeds ellipsoid, smooth, mostly 6--8 (-9) mm long.

Distribution and habitat: lowland tropical rain forests and semievergreen forests, mainland America from Mexico (Nayarit) south to Ecuador, Peru, Venezuela, and the Guayanas, 0-700 m.

Phenology: collected flowering throughout the year, fruiting Feb.-Apr., June, Sept.-Nov.

REPRESENTATIVE SPECIMENS EXAMINED. **BELIZE.** *Belize*: Churchyard, Sibun River, *Lundell 6948* (TEX). **El Cayo**: Vaca, *Gentle 2255, 2283* (TEX). **BRASIL.** *Amazônia*: Rio Jarí, Pico do Igarapé Pacanarí, *N. T. Silva 1607* (DAV). **Pará**: Altamira, *M. G. Silva et al. 3452* (DAV). **COLOMBIA.** *Antioquia*: Mun. Caucasia, *Callejas et al. 4436* (DAV). **COSTA**

Costa Rica. **Alajuela:** 3.5 mi S of Quesada, *Webster & Millers 12167* (DAV). **Cartago:** Turrialba, *Godfrey 66183* (FLAS). **Guanacaste:** Cantón Liberia, *González & Morales 223* (DAV); Parque Nacional, Guanacaste, Cerro El Hacha, *Espinoza 139* (DAV); Río Las Flores, *Grayum et al. 4926* (DAV). **Heredia:** Finca La Selva, *Hammel & Trainer 12942*, *Hartshorn 1017* (DAV); Llanura de San Carlos, *Rueda et al. 1388* (DAV). **Limón:** Cerro Coronel, E of Laguna Danto, *Stevens et al. 23722* (DAV); El Carmen, Siquirres, *Lent 3665* (DAV). **Puntarenas:** Cantón de Buenos Aires, Quebrada Hato Viejo, *Rojas 121* (DAV); Cantón de Osa, Rancho Quemado Rincón, *Quesada 291* (DAV). **San José:** Reserva Biológica Carara, *Zúñiga 100* (DAV). **ECUADOR.** **Esmeraldas:** San Lorenzo, *Palacios 5209* (DAV, MO). **Los Ríos:** Cantón Vinces, Jauneche Forest, *Dodson et al. 7107* (DAV). **GUATEMALA.** **Alta Verapaz:** 5 mi NW Cubilgüitz, *Steyermark 44665* (MICH). **Petén:** La Cumbre, *Contreras 8916* (MICH), *Lundell & Contreras 20704* (DAV). **GUYANA.** **Rupununi:** SE Kanaku Mts., 6.5 km ENE of Makawana, *Hoffman & Gopaul 466* (DAV). **MEXICO.** **Chiapas:** Mpio. Ocosingo, 8 km S of Benemérito de las Américas, *Martínez 11678* (DAV); 15 km NW Boca Lacantum, *Martínez 18445* (DAV); Mpio. Ocozocuatla de Espinoza, 18-20 km N of Ocozocuatla, *Breedlove & Thorne 21048* (MICH); Mpio. Sabanilla, *Méndez 6097* (DAV). **Nayarit:** Mpio. Compostela, 1-1.5 mi above La Cucaracha, *McVaugh 19200* (DAV, MICH); Mpio. San Blas, 2 km NW of Cora, *Téllez 10057* (DAV). **Oaxaca:** Mpio. Santa María Chimalapa, 45 km NE Real de Sarabia, *Perino 3212* (DAV). **San Luis Potosí:** Mpio.

Huehuetlán, Huichihuayan, *Hernández X. 162* (LL); Mpio. Tamazunchale, Taman, *Hernández X. 167* (MICH). **Tabasco:** Mpio. Cárdenas, 21 km W of Cárdenas, *Zamudia & Magaña 87* (DAV); Mpio. Tacotalpa, Ejido Lázaro Cárdenas, *Cowan 1996* (DAV); Mpio. Teapa, Río Puyacatenco, *Rico & Martínez 740* (DAV). **Veracruz:** Mpio. Catemaco, Playa Escondida, *Nee 22546* (DAV); 7 km NE of Sontecomapan, *Nee 22581* (DAV); Mpio. Hidalgotitlán, brecha Hnos. Cedillo a Augustin Mulgar, *Vázquez et al. 460* (UC); Mpio. Pánuco, 12 km NNW of Pánuco, *Nee 22322* (DAV); Mpio. Pajapan, Cerro San Martín, *Nee & Calzada 22779* (DAV); Mpio. San Andrés Tuxtla, Estación Biológica Tropical Los Tuxtlas, *Croat & Hannon 63141* (DAV). **NICARAGUA. Boaco:** E of Cerro Alegre, San José de los Remates, *Moreno 20343* (DAV); Cerro Mombachito, *Araquistain & Moreno 970, Moreno 274* (DAV). **Chontales:** Cerro Oluma, *Grijalva et al. 3387, Nee 28433* (DAV). **Jinotega:** Salto Kayaska, Río Bocay, *Stevens et al. 16503* (DAV). **Matagalpa:** Macizos de Peñas Blancas, *Stevens et al. 21249* (DAV). **Río San Juan:** Río Sábalos, *Moreno 23054* (DAV). **Rivas:** Isla de Ometepe, *Moreno 18796, Robleto 1747* (DAV). **Zelaya:** Cerro Lívico, 6 km NE of Siuna, *Moreno & Robleto 20822* (DAV); 30 km NE of Río Blanco, *Moreno 24020* (DAV). **PANAMA. Coclé:** 12 mi from Llano Grande towards Coclesito, *Churchill et al. 4104* (DAV). **Colón:** Santa Rita ridge, *D'Arcy et al. 15551* (DAV). **Darién:** Río Morti, *Duke 15407* (DAV). **Panamá:** El Llano-Carti road, *McPherson 9778, Stein 1049* (DAV); 12-15 km N of El Llano, *Dressler 4639* (DAV). **San Blas:** continental divide between El Llano and Carti-Tupile, *Liesner 1256*

(DAV). **PERU. Loreto:** Ucayali, Contamana, *McDaniel 14098* (DAV).

SURINAM. Brokopondo: Brownsberg, *Webster 24126* (DAV). **VENEZUELA.**

Bolívar: Reserva Forestal Imataca, *Stergios 6232* (DAV). **Miranda:**

Dtto. Paéz., Cerro Riberón, *Davidse & González 13523* (DAV); Quebrada

Chaguarama, 6 km SE of Cúpira, *Liesner & González 9179* (DAV).

10. CROTON NITENS Sw., Prodr. 100. 1788; Fl. Ind. Occ. 2(2):
1800. Type: Jamaica, *Swartz* (holotype: probably at S).

Croton squamulosus Vahl in Geiseler, Crot. Monogr. 52. 1807.

Type: St. Domingo [Hispaniola], *Herb. Jussieu* (holotype: P).

Croton sloanei Bennett, Proc. Linn. Soc. Bot. 4: 30. 1859. Type:
Jamaica, *Sloane* (holotype: BM, H.S. 5 f. 109); cited by Dandy,
1958).

Croton perobtusus Lundell, Phytologia 1: 405. 1940. Type: MEXICO.
Tabasco, La Palma, *Matuda 3327* (lectotype: MICH!); a syntype
(now paralectotype), *Matuda 3160* (MICH!) was cited with the
protologue.

Croton pseudoglabeus Lundell, Phytologia 1: 407. 1940. Type:
MEXICO. Quintana Roo: Lake Chichankanab, *G. F. Gaumer 1407*

(holotype: MICH!).

Shrub or tree 2--8 m high; twigs lepidote. Leaf blades lanceolate or elliptic-oblong, chartaceous to coriaceous, 3--15 cm long, 2--7 cm broad, acute to bluntly acuminate at the tip, cuneate to rounded at base, pinnately veined with 7--12 lateral veins on each side, above sparsely lepidote and glabrescent, beneath densely lepidote, margins entire; petioles (4-) 7--20 (-25) mm long, 0.8--1.5 (-2) mm thick; stipules (0.7-) 1--1.5 (-2) mm thick. Inflorescences axillary or pseudoterminal, or terminal on lateral shoots, 2--5 9) cm long, rachis 0.5--1 mm thick, staminate bracts 0.5--1 mm long, cauducous. Staminate buds 1--1.5 mm in diameter; pedicels 1--2.5 (-3.5) mm long; sepals 1.5--1.8 mm long; petals elliptic, 1.7--2 mm long, abaxially glabrous or sparsely lepidote; stamens (8-) 10--12 (-13), filaments hirsutulous, c. 2 mm long; pistillate pedicel in fruit 1.5--7.5 (-10) mm long, 0.8--1.3 mm thick; sepals 1.5--2.5 mm long; petals 1.5--2 (-3) mm long, abaxially glabrous or sparsely lepidote; ovary scales denticulate, 40--50-radiate, 0.3--0.6 mm in diameter; styles 2.5--3 mm long, branches slender, glabrous. Capsules not seen entire; columella 6--7 mm long; seeds 4.5--6.2 mm long.

Distribution and habitat: lowland thickets to montane semievergreen or evergreen rain forests, 0-850 m; eastern Mexico and Guatemala,

Jamaica, Haiti.

Phenology: in Jamaica collected flowering Jan.--Sept., in fruit Apr., June, Sept.

For most of the last two centuries, specimens of *Croton nitens* have commonly gone under the name *C. glabellus* L., following the interpretations of Müller (1866) and Fawcett & Rendle (1920). However, as indicated by Webster (1958) and Gómez-Pompa (1966), this is incorrect, as the type of *C. glabellus* is referable to *C. lucidus* L. A great improvement in the circumscription of *C. nitens* was made by Gómez-Pompa (1966), who included *C. perobtusus* as a synonym. The outstanding remaining problem is the relationship of *C. nitens* with *C. schiedeanus*. Gómez-Pompa (1966) combined the two species, but they are interpreted here as two closely related species.

This species presents difficult problems in defining taxa because of its spotty distribution in mainland Mexico and the Antilles. Tentatively, two varieties are recognized here.

1. Inflorescences pale, not distinctly coppery; leaves not abruptly pointed, margins entire; petioles mostly 1-1.5 mm thick; petals glabrous or sparsely lepidote abaxially.....
..... var. *nitens*

1. Inflorescences coppery; leaves abruptly pointed, margins irregularly undulate or crenulate; petioles mostly 0.7-1 mm in diameter; petals lepidote on back..... var. *icche*

12a. CROTON NITENS VAR. NITENS.

Leaf blades chartaceous to coriaceous, mostly 5--15 cm long, 1.5--5 cm broad; lateral veins mostly 8-12 per side; petioles 1--1.5 mm thick; stamens 10--12 (rarely 8 or 13); fruiting pedicels 1.5--7.5 (-10) mm long, 0.8--1.3 mm thick; petals of pistillate flower glabrous or with 1 or 2 scales; seeds 4.5--6.2 mm long.

Representative specimens examined: **GUATEMALA: Petén:** La Cumbre, *Contreras 8916* (MICH). **HAITI. L'Ouest:** Kenskoff, *Soissons, Alain Liogier 21375* (NY); Pétionville, Source, *Ekman H2338* (NY). **Sud:** 1.5 km N of Carpentier, *Zanoni et al. 33179* (DAV). **JAMAICA. Clarendon:** Mason River Savanna, *Webster et al. 8124* (DAV); The Cross, 2.5 mi SE of MayPen, *Proctor 24018* (DAV). **Hanover:** Hopewell, *Webster et al. 8553* (DAV); Orange Bay, *Britton & Hollick 2173* (NY). **Kingston:** Long Mountain, *Harris 9581* (NY) **Manchester:** Lititz Savanna, *Harris 11755* (NY); Providence, 1.5 mi WSW of Newport, *Proctor 21900* (DAV). **Portland:** John Crow Mountains, *Harris & Britton 10708* (NY); Port Antonio, Nonesuch, *Britton 2590* (NY). **St. Andrew:** Cane River Valley, *Harris 9628* (NY), *Proctor 20801* (DAV), *Webster et al. 8005* (DAV);

Guava Ridge, *Campbell s.n.* (NY). **St. Ann:** James Webster Patent, between Mason River and Stepney, *Proctor 32830* (NY). **St. Catherine:** Bog Walk, *Britton 2614* (NY); 2 mi W of Lluidas Vale, *Webster et al. 8104* (DAV); Spanish Town, *Britton 3060* (NY). **St. Elizabeth:** Kaiser Mine S of Gutters, *Howard & Proctor 13800* (NY); Santa Cruz Mts., Lover's Leap, *Britton 1152* (NY); Potsdam Woodland, *Harris 9750* (NY). **St. Thomas:** Bachelor's Hall, *Britton 3614* (NY). **Trelawny:** Mango Tree Hill, between Burnt Hill and Spring Garden, *Proctor 25674* (DAV, NY); White Bay, 4 mi E of Falmouth, *Proctor 23667* (DAV, NY). **Westmoreland:** Negril, *Britton & Hollick 2076* (NY). **MEXICO. Campeche:** Mpio. Escárcega, El Tormento, *Gómez-Pompa 1311* (MO); Mpio. Hecelchecán, road to Halchachen, *Utley 6467* (MEXU). **Quintana Roo:** Mpio. José Morelos, Chichankanab, *Gaumer 1407* (MO). **Veracruz:** Mpio. San Andrés Tuxtla, Estación Biológica Los Tuxtlas, *Martínez Calderon 2243* (MICH); Mpio. Nautla, San Antonio, W of Barra de Palmas, *Gómez-Pompa 1173* (MICH, UC). **Yucatán:** Mpio. Calotmul, Pocoboch, *Gaumer 2381* (MO).

12b. CROTON NITENS var. **icche** (Lundell) Webster, stat. nov.

Croton icche Lundell, *Phytologia* 1: 404. 1940. Type: MEXICO.

Yucatán, between Pisté and Yokdzonot, *C. L. & A. A. Lundell 7871* (holotype: MICH!).

Leaf blades chartaceous, elliptic to lanceolate, mostly 5--10

cm long, 2--4 cm broad, ± abruptly acuminate at tip, cuneate to rounded at base; lateral veins mostly 6--8 per side; margins usually undulate to sometimes obscurely crenulate; petioles 8--15 (-22) mm long; stipules not evident. Inflorescences coppery, 2--5 cm long, rachis 0.8--1 mm thick; bracts 1--2 mm long. Staminate buds 1.7--2.1 mm in diameter; pedicels 1.5--3 mm long; stamens 10--12; anthers 0.8--1.0 mm long; pistillate pedicel in fruit 2.5--5 mm long, 0.8--1 mm thick; petals 1.8--2.3 mm long, lepidote abaxially; styles 2--4 mm long. Fruits and seeds not seen.

Distribution: seasonal forests or woodlands on limestone, below 100 m, endemic to Yucatán.

Phenology: collected flowering Feb., May, July, Aug., Sept., Nov.

Representative specimens examined: **BELIZE. Belize:** Churchyard, *Lundell 6948* (TEX). **Cayo:** Vaca, *Gentle 2255* (TEX). **MEXICO. Quintana Roo:** Mpio. Cozumel, E of ruins at Cobá, *Lundell & Lundell 7719* (MICH). **Yucatán:** Mpio. Hunucma, 15 km NW of Hunucma, *Cabrera & Cabrera 12925* (DAV); Mpio. Pisté, *Lundell & Lundell 7547* (MICH); Mpio. Valladolid, SSE of Xocén, *Stauning 115* (DAV); Xuilub, *Mogensen 1099* (DAV); Mpio. Yaxcabá, 6 km SW of Yaxcabá, *Varias 395* (DAV).

Although the type specimens of *Croton perobtusus* and *C. icche*

appear very different, the two entities become very difficult to distinguish when specimens are examined over the entire Yucatán Peninsula. Despite the considerable variation in Mexican *C. nitens*, it is not clear whether intraspecific taxa can be convincingly delineated.

11. CROTON TENUICAUDATUS Lundell, *Phytologia* 1: 451. 1940. Type: COSTA RICA. San José: El General, *Sketch 2575* (MICH).

Tree 6--20 m high; twigs with scurfy-porrect lepidote indumentum. Leaf blades chartaceous, elliptic to elliptic-oblong, mostly 8--16 cm long, 5--8 cm broad, ± abruptly acuminate, rounded to truncate at base, pinnately veined with 8--12 straight lateral veins per side; sparsely lepidote on both sides; petioles 2--10 cm long, 1--2 mm thick; stipules lanceolate to subulate, 2--4 mm long, caducous. Inflorescences axillary, 7--15 cm long, with usually 3 or 4 proximal pistillate flowers; bracts less than 1 mm long. Staminate buds; pedicels 2.5--4.2 mm long; sepals 2.2--2.8 mm long; petals elliptic to oblanceolate, 2.4--3.2 mm long, abaxially lepidote; stamens 10--13; filaments hirsutulous, 2--4.5 mm long; anthers 1--1.2 mm long. ; pistillate pedicels 3.5--7 mm long at anthesis; sepals 2.2--2.7 mm long; petals obovate, 2.2--3 mm long, abaxially lepidote; ovary densely lepidote, scales denticulate, 0.3--0.5 mm in diameter; styles 3 times bifid, glabrous, 2.5--3.5

mm long. Fruit and seeds not seen.

Distribution and habitat: evergreen rain forest, 0-900 m, eastern Costa Rica to western Panamá.

Specimens examined: **COSTA RICA. Puntarenas:** Fila de Cal, between Las Cruces and Nelly, *L. D. Gómez 19626* (DAV, MO). **PANAMA. Chiriquí:** between Concepción and El Volcán, *White 309, 316* (MO); trail from Fortuna Dam Camp to La Fortuna, *Hampshire & Whitefoord 190* (F).

Although still poorly known, *Croton tenuicaudatus* appears very similar to *C. nitens*, separable mainly by the presence of porrect trichomes and sparser indumentum. As pointed out by Burger and Huft (1995), I was mistaken in describing large fruit (35 mm) and seeds (20-22 mm) in *C. tenuicaudatus*; this was based on a misdetermined specimen (*Allen 3719*, MO) of *C. pachypodus* G. L. Webster from Panamá (Coclé). Until fruits and seeds of *C. tenuicaudatus* are collected, its status as a distinct species must remain in doubt.

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