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THIRTY-FIVE NEW SPECIES OF AMERICAN CROTON

LEON CROIZAT

THE RANGE of the species published or named as new in this paper extends from Mexico to Argentina. In preparing the manuscript, I have had the use of the unnamed *Croton* material of the U. S. National Museum, the Botanical Garden of Berlin, the Museum of Natural History of Stockholm, the Biological Institute of São Paulo, and I have also taken full advantage of the material available in the collections of the Arnold Arboretum and Gray Herbarium of Harvard University, the New York Botanical Garden and the Brooklyn Botanical Garden. Loans of specimens and photographs were granted by numerous other institutions in the United States, in South America and in Europe, including the Botanical garden of Göttingen. During a trip to Europe in the winter of 1938–1939, I had the opportunity at least of seeing the historic types of the genus preserved in the herbaria of the Royal Botanic Gardens of Kew, the Museum of Natural History of Paris, the Conservatory and Botanical Garden of Geneva and the Botanic Garden of Bruxelles.

In a comparatively recent work, Pax & Hoffmann state (*Nat. Pflanzenf.* 19 [c]: 84. 1931) that the species of *Croton* are more than 600, of which two-thirds are endemic to tropical America. Even as it was being written, this estimate was wide of the correct total. A rough tabulation from the best available sources shows that there are about 1000 published species which may lay claim to the status of valid binomials. Of this number, America has 650 species, continental Africa 65 species, Madagascar 70 species,¹ India and south tropical Asia 65 species, Malaysia, Australia and Oceania 30 species. The American species are approximately distributed as follows: United States 30 species, Mexico 60 species, Central America 20 species, West Indies 140 species, Colombia and Venezuela 55 species, northern Brazil and the

¹The present paper was already in the hands of the printer when a recent publication came to hand in which Léandri added 41 new species to the *Croton* of Madagascar (*Ann. Mus. Col. Marseille*, 5 sér., 7: 5–98. 1939), an increase of about 50% of the total. The significance of this accretion will be better understood considering that the area of Madagascar is less than one-tenth that of Brazil; that Madagascar has been much better explored botanically than the American republic and that the Brazilian domain is almost certainly richer in sectional forms of *Croton* than Madagascar.

Guianas 40 species, Ecuador, Peru and Bolivia 50 species, central and eastern Brazil 200 species, south Brazil, Uruguay and Argentina 50 species.

The West Indies rank next to Brazil in record, which suggests an interesting consideration. In 1866, Mueller Argoviensis recognized 63 species in the West Indies. Almost alone, Urban doubled this figure between 1898 and 1932, the great majority of these additions being good species.

Under the most conservative estimate, it is to be expected that scores of species are as yet unreported. Very few species of *Croton* have more than a regional distribution, it being characteristic that several species known before 1866 have not been collected, to my knowledge, in recent times. In the regions which have been better explored, two factors can be seen to influence active speciation, one regional, the other altitudinal. Of edaphic factors, of course, it is nearly impossible at present to speak, although it may be suspected that certain habitats are responsible for the occurrence of distinct forms. Species that at first glance seem to be widely distributed and fairly constant, turn out to be composed of slightly different forms which it becomes necessary to recognize as distinct. Illustrative of this condition is *C. flavens* which, as the binomial is now understood, may be said to occur in the West Indies, Yucatan, Colombia, Venezuela, Ecuador and Peru. Critically studied, this widespread entity is seen to include *C. ferrugineus*, *C. peraeruginosus*, *C. collinus*, *C. peltoideus*, *C. meridensis*, *C. rigidus*, *C. malacophyllus*, etc. there being no means of separating one form from the other, once too broad a specific concept is used. Thus the comprehensive area of dispersal of *C. flavens*, sensu lato, from Jamaica to Peru must be broken up and recognition granted to the local forms of the aggregate. It is characteristic that states or varieties of *C. flavens*, endemic to the West Indies, are almost identical with forms of *C. ferrugineus* localized on the mountains of Venezuela, the distributional range being one of the most important characters of specific differentiation. In the same manner, *C. pungens* from eastern Venezuela is hardly, if at all, to be separated from *C. sarcopetalus* of northern Argentina, except by range.

In his monograph on the *Croton* of the United States, Ferguson writes (Ann. Missouri Bot. Gard. **12**: 34. 1901) that the species of the genus do not admit of rigid definition. He remarks that while in a restricted locality few variations can be found, the forms that occur at the margin of the area of distribution are in habit noticeably different. The cited example of *C. flavens* and *C. pungens* fully confirm the inherent truth of these statements. My own experience in working with the genus over

a vastly greater range than the one studied by Ferguson is that even the major aggregates within *Croton* cannot be precisely defined, floral and vegetative characters being not infrequently in contrast. It seems impossible to understand the species in this genus otherwise than as a form which, grounded upon a phytogeographic and edaphic foundation, is recognizable in different collections by sums of positive not less than by negative characters and intangibles. Series and sections will eventually be defined by a concept that uses natural groups, understood along phylogenetic lines. The study of *Croton* is today in the initial stage, the thirty-five species that this paper adds to the record and the others to be published later, barely filling in some of the distributional and systematic gaps that have so far impeded the study of the genus.

The fragmentary conditions of present knowledge not less than the difficulty of corresponding with, and of securing material from European institutions since the outbreak of the pending war, make it advisable that this paper be strictly confined to a record of publication, leaving special and general revisions, elaboration of keys and detailed discussions to be presented in papers to follow. Much needed field study, of course, will remain as a legacy from present workers to coming generations of South American botanists and ecologists.

In the descriptions that follow, vegetative characters are first described at some length, followed next by an account of the major characters of the ♀ flower. The ♂ flower is seldom analyzed in detail, this being a departure from standards accepted by taxonomists on the authority of Mueller Argoviensis. Such departure requires an explanation.

The concept of a botanical family as a closely knit unit scarcely answers reality. In the Euphorbiaceae, for instance, at least three affinities can be traced: namely with the Sterculiaceae, the Sapindaceae-Celastraceae and the Malvaceae. The true Euphorbiaceae, about 4000 species out of a total of 8000 present in the family, constitute a fourth group which *Croton* typifies much more satisfactorily than *Euphorbia*.

In the true Euphorbiaceae, the ♂ flower is essentially of malvaceous pattern, that is to say, its androecium is basically to be considered as a staminal column. The ♀ flower, on the contrary, has characters of placentation, coats and arillode reminiscent of the sapindaceous and celastraceous aggregate.

In the malvaceous type of flower, *the petals are appendages of the staminal column* (Duchartre in Ann. Sc. Nat. Bot. sér. iii, 3: 123-150. 1845). They have a status, consequently, which is not unlike that of petaloid staminodes, i.e., of sterile stamens. In *Croton*, the staminal

column is solute and simulates an androecium of more or less numerous free stamens inflexed in veneration. The petals, obviously, are appendages of the androecium in this genus. They are fully developed in the flower in which the androecium is predominant (i.e. in the ♂ flower). They are mostly wanting in the flower in which the androecium is abortive and the gynoecium fully evolved (i.e. the ♀ flower).

Between the petaliferous ♀ flower of *C. alabamensis* and the pseudo-urticaceous ♀ perianth of *C. Bonplandianus*, all manner of intermediates occur. In these intermediates are found petals, ligulae, laciniae, staminodes, nectaries, tufts, fleshy tori of almost every conceivable description, all of which derive from the androecium by total or partial reduction. These relics are sometimes opposite the lobes of the calyx in which case they are shown to have been derived from the androecium proper. Just as often they are alternate with the lobes which indicates that they represent degenerate petals. Theoretically, differences in position as between sepals, petals and stamens are important. In *Croton*, however, these differences mean little because they are liable to represent merely individual variations.

The ♂ flowers of *Croton* are remarkably uniform in structure, the chief differences between those of the various species and groups being the approximate number of the stamens and the length and indument of the petals. The ♀ flower is more variable and much more important to the taxonomist. It is prevailingly apetalous and 5-lobed, as state above, and it is to be understood as such, barring statement to the contrary, in the coming descriptions. The style, like in most Euphorbiaceae, is at least 3-partite to, or very nearly to, the base.

To conform with the recommendations of the latest International Congress (Syn. Prop. Sixth Intern. Bot. Cong. 57. 1935; Proceed. Sixth Intern. Bot. Congr. 1: 356-57. 1936) the generic name *Croton* is treated as masculine, which is its classic gender.

MEXICAN SPECIES

***Croton escathos*, sp. nov.**

Fruticulus dumosus, intricatim ramosus, cortice vetustiore rimis crebris albicante, caulibus florigeris subherbaceis pilis raris fasciculatis hinc inde pubescentibus. Folia supra brunnea, subtus olivacea, 2-1.5 cm. longa, 0.8-0.6 cm. lata, elliptica, apice rotundata, basi cuneata, pilis fasciculatis habitu setulosis parcius induta, margine denticulato-serrata, serraturis potius revolutis incrassatis quam revera glandulosis; venis tenuissimis eximie triplinerviis; petiolo gracillimo ca. 1 cm. longo apice

eglanduloso. Cymae subcapitulatae, parte foeminea aggregata, mascula habitu filiformi, ad 3 cm. longae. Flores ♀: primo intuitu valde glanduloso-pilosi; calyce ad basim partito, 0.7 cm. longo, 0.5 cm. lato, pedicello subclavato ad 1.2 cm. longo, lobis 0.6 cm. longis, 0.15 cm. latis, vulgo ligulatis, acutis, extus undique processibus laciniosis, apice sub lente glandulosis substellatim partitis, onustis; ovario ellipsoideo-trigono, 0.2 cm. magno, parcius hirtello tomentoso; stylis denuo partitis ad 0.5 cm. longis; semine 0.35 cm. longo, 0.25 cm. lato, arillodio tenuissime longitudinaliter sulcato, testa antice rugulosa, columella 0.35 cm. longa. Flores ♂: staminibus 8–12; calyce ca. 0.15 cm. magno, pedicello ca. 0.20 cm. longo.

OAXACA: between San Geronimo and La Venta, 200 ft., 1895, *E. W. Nelson 2778* (TYPUS, Gray Herb.).

A low intricately branching shrub, the only known representative of this group in Mexico. It is confused in herbaria with *C. ovalifolius* from the West Indies, which it superficially resembles, but from which it differs widely in floral ♀ characters and in vegetative details. It is also allied with *C. Venturii* from northern Argentina. The specific epithet alludes to the range of this species compared with that of the group.

***Croton peraeruginosus*, sp. nov.**

Frutex ad 2.5 m. altus, ramulis pube argillaceo-tomentosa serius decidua pulchre fulvo-aurantiaca more *C. ferruginei* indutis. Folia supra grisea vel brunnea, subtus tomento griseo ad ochraceo, ad venas aurantiaco tota induta, 11–8 cm. longa, 4–3 cm. lata, lanceolato-vel ovato-elliptica, apice plus minusve acuminata, mucronulata, basi cuneata, margine subintegra laevissime ciliato-denticulata, venis penninerviis 9–14-jugis, patentibus; petiolo 2–5 cm. longo, glandulis subnullis. Cymae ut ramuli indutae, bisexuales, visae vix 5–6 cm. longae. Flores ♀ subsessiles, parvi; calyce vix 0.15 cm. magno, pedicello ca. 0.15 cm. longo, lobis lineari-triangularibus, glandulis hypogynis obviis nullis; ovario minimo, incluso, tomentoso, stylis denuo partitis basi incrassatis, tomentellis, 2–3 mm. longis; capsula demum glabrata vel parcius tomentosa, ovato-truncata, 0.5 cm. magna, semine plumbeo laevissimo, 0.35 cm. longo, 0.25 cm. lato, columella fructu delapso 4 mm. longa.

YUCATAN: *Gaumer 24095*, 1917–21 (TYPUS, Gray Herb.); Xnocac, December 1916, *Gaumer 23484* (Arnold Arb.). CAMPECHE: Dzibalchen, 1932, *Lundell 1385* (Gray Herb.).

Closely resembling *C. ferrugineus* from Colombia and *C. flavens* from Jamaica. It differs from the former in a generally more robust habit and in the larger floral parts. *Croton flavens* has a smaller capsule and

different ♀ flowers. Like *C. Lundellii* and *C. campechianus* which are both very closely allied with species of the West Indies, (*C. cubanus* and *C. lucidus* respectively), *C. peraeruginosus* represents in the flora of Yucatan an essentially Caribbean element. As noted in the introduction to this paper, the affinity to which the new species is related is vast and widespread, ranging from the páramos of Venezuela to the lower valleys of Colombia and Peru, from Yucatan to Porto Rico and Jamaica. It is not excluded that *C. heterochrous* from Honduras, *C. piahuiensis* from northern Brazil and *C. Virletianus* from Mexico may be sectionally allied to this complex.

Croton Roxanae, sp. nov.

Fruticulus bene ramosus, subflexuosus, apicibus ramulorum cortice brunneo discolori, innovationibus atris pilis minutissimis albidis stellatis vix hinc inde adpersis. Folia tete olivacea vel (igne dessicata) brunneo-discoloria, subtus tenuiter tomentella vel subglabra, 7-4.5 cm. longa, 3.5-1.5 cm. lata, plus minusve elliptica, acuminata, basi plerumque inciso-cordata, margine integra, venis ca. 7-jugis, basi subtriplinerviis caeterum penninerviis; petiolo gracili, 2-1 cm. longo, glandulis subnullis vel nullis. Cymae graciles, 8 cm. longae, bisexuales, longissimo tractu foemineae. Flores ♀ pedicello crasso vix 0.15 cm. longo fulti; calyce cupulato, fere ad basim partito, 0.2 cm. lato, 0.1 mm. longo, lobis triangulari-ovatis, dissitis, integris, petalis (videtur) lineari-ellipticis, lobis subaequilongis glabris; ovario 3-cocco, 0.2 cm. magno, apice hispido, dorso furfuraceo-tomentello, columella fructu delapso gracili 0.5 cm. longa, capitata. Caetera desiderantur.

MARIA MADRE (TRES MARIAS ISLANDS) Nayarit: woods just south of the Penal Colony, 1925, *Roxana S. Ferris 5601* (TYPUS, Arnold Arb.).

Belonging in the same complex with *C. Sonorae* from northern Mexico, *C. fragilis sericeus* from central Mexico, *C. fragilis* from Colombia, to which last *C. cienagensis* probably belongs as a synonym. The type-specimen of the new species is unfortunately not complete and a critical reëxamination with better material is much to be desired. The type of *C. fragilis*, preserved in the Berlin herbarium, as well as the isotype in the Museum of Natural History of Paris, are exceedingly poor specimens which it is almost impossible to interpret with certainty. The Liebmann collection used by Mueller Arg. in the publication of *C. fragilis sericeus* is in the Gray Herbarium, together with other specimens collected in Guerrero and Michoacán (Langlassé 235) and in Sinaloa (Ortega 4212). Schultze 505 from the Berlin herbarium, collected in

Colombia, undoubtedly represents a form which is very near if not identical with the type of *C. fragilis*. The Sinaloa and Guerrero-Michoacán collections are close to the Maria Madre specimen and to all appearances conspecific with it. The Liebmann specimen and *Purpus 10641* in the Gray Herbarium, collected in Chiapas, differ from the type of *C. Roxanae* and from the Langlassé and Ortega specimens in being velutinous pubescent and in having smaller and definitely sessile flowers. It will have to be seen whether the petal found in one of the ♀ flowers of *C. Roxanae* merely represents an abnormal addition to the calyx. The impression is gained from the material so far available that *C. Roxanae* and *C. Sonorae* are extreme forms of the *C. fragilis* complex, with *C. fragilis subsericeus* representing a fairly distinct form, possibly endemic to eastern Mexico. Better collections with ripe seeds and complete field notes as to habit and habitat are needed before a satisfactory disposition of this complex can be attempted. The arrangement here suggested is tentative and is meant merely as a guide in future work.

Croton Standleyanus, sp. nov.

Frutex videtur, ramulis pube plus minusve tenuiter lepidoto-stellata discolori ochracea vel atro-brunnea indutis. Folia utrinque pallide tabacina vel supra olivaceo-viridia, subtus cinereo-grisea, tomento plus minusve induta vel glabrescentia, 7-5 cm. longa, 2.5-1.5 cm. lata, margine integra, nullibi ciliato-glandulosa, apice acuminata, basi plerumque truncata, interdum laevissime inciso-cordata, venis ca. 12-jugis, tenuibus, penninerviis, ascendentibus; petiolo gracillimo ca. 2 cm. longo, glandulis stipitatis pallidis haud obviis. Cymae haud comosae, bisexuales, ca. 6 cm. longae. Flores ♀ sessiles; calyce fere ad basim partito, cyathiformi-toruloso, intus glandulis hypogynis singulis nullis, 0.5 cm. magno, lobis 8-10 in serie duplici dispositis, ligulato-rotundatis 0.7-0.5 cm. longis 0.2-0.1 cm. latis, externis quam internis minoribus, omnibus margine villis capitato-glandulosis ornatis; ovario ellipsoideo, profunde trigono, tomentello, 0.5 mm. longo, 0.4 mm. lato (submaturo), stylis 3 iterum partitis, cruribus ultimis gracillimis ad 3 mm. longis; semine laevi sub lente puncticulato, 0.3 cm. longo, 0.25 cm. lato, caruncula triangulari-hastata, columella 0.5 cm. longa. Flores ♂: staminibus 10-12, calyce ca. 0.3 cm. magno, lobis triangularibus puberulis, petalis glabris subaequilongis, pedicello 0.2-0.3 cm. longo. Nomen specificum cl. P. Standley honorat.

VERA CRUZ: Cuitlahuac, 1937, *Matuda 1461* (TYPUS, Arnold Arb.); Zacuapan, 1917, *Purpus 7752* (Arnold Arb.).

Distributed as *C. rhamnifolius* which it does not resemble. It is

closely allied to *C. decalobus* from Costa Rica, and like it, belongs to sect. **DECALOBIMUM**. From *C. decalobus*, which is probably identic with *C. Pittieri*, *C. Standleyanus* differs in the leaves rounded or truncate, not long-cuneate at base and in a sum of floral details. Standley suggests (Publ. Field Mus. Bot. **18**: 606. 1937) that *C. Turrialva* may be the same as *C. Pittieri*.

Croton tremulifolius, sp. nov.

Frutex habitu pulvinato rotundato, 2-3 ped. altus, cortice in apicibus vinoso-brunneo, pilis luteis subsimplicibus patentibus hirtulo, serius papillato. Folia tabacina vel pallide brunnea, ex gemma deprompta tomento velutinoso cinereo vel ochraceo induta, adultiora subglabra, 9-7 cm. longa, 7-5 cm. lata, late ovata rotundata, basi cordata lobis arcte contiguis vel sese invicem obtegentibus, margine adulta repandula, juniora subserrulata, venis late patentibus obscure anastomosatis, 4-5-jugis; petiolo 1-4 cm. longo, glandulis minutissimis vel subnullis. Cymae interdum inter folia summa verticillata suboccultatae, bisexuales, ad 5 cm. longae. Flores ♀ breviter stipitati, stipite 0.2 cm. longo, crassiusculo; calyce ca. 0.5 cm. lato (deflorato), lobis lineari-lanceolatis plerumque 6 (rarius 5-7), posticis (an semper?) minoribus; ovario hispido, globoso, stylis 3 fere ad basim partitis, intricatim ramosis; semine laevi nitidissimo subochraceo, 0.45 cm. longo, 0.25 mm. lato; caruncula apicali minuta, columella robusta ad 0.5 cm. longa. Flores ♂ breviter pedicellati; staminibus ca. 20; calyce ca. 0.2 cm. magno.

COLIMA: vicinity of Manzanillo, between Cuyutlan Lagoon and the ocean, 1925, *Roxana S. Ferris 6176* (TYPUS, Arnold Arb.); Manzanillo, 1890 *E. Palmer 968* (Gray Herb.).

Near *C. Magdalenae* and *C. morifolius* but easily distinguished from the former by the much less thick indument; from the latter by the hispid pubescence of the branchlets and from both by the peculiar brown-vinose color of the papillate older wood. The prevailing number of the lobes of the ♀ calyx, 6 instead of 5 as usual for the species of the genus, is an interesting character, the full significance of which is at present difficult to appraise.

Croton Ynesae, sp. nov.

Frutex vel arbuscula 4-6-metralis, ramulorum apicibus subherbaceis glabris. Folia atro-viridia, membranacea, lepidibus minutis albicantibus valde sparsis omissis utrinque glabra, 14-9 cm. longa, 8-4 cm. lata, ovato-cuspidata vel elliptico-acuminata, basi rotundata, margine grosse irregulariter dentato-serrata; venis arcuatis 3-4-jugis anastomosatis;

petiolo 7–3.5 cm. longo, glandulis ad 10 aggregatis. Cymae glaberrimae, graciles, atrae, bisexuales ad 8 cm. longae. Flores ♀ sessiles vel subsessiles; calyce minuto, annulato-cupuliformi 0.15 cm. lato, lobis latissime dissitis vix 0.05 cm. longis; ovario minimo, vix 0.1 cm. magno, globoso, nempe in toro glanduloso imposito, pulchre aureo-lepidoto, stylis 3 profunde bipartitis, habitu erectis, ad 0.3 cm. longis; capsula lepidibus minutissimis tantum sparsis pro glabra laudanda, laevi, atra, columella ad 0.5 cm. longa, apice optime tripartita; semine plumbeo, laevissimo, 0.5 cm. longo, 0.35 cm. lato, caruncula subapicali lata. Caetera desiderantur.

JALISCO: Santa Cruz de Vallarta, alt. 300 m. 1926, *Ynes Mexia 1279* (TYPUS, Arnold Arb.). TEPIC: San Blas, Nayarit, on road to Tepic, 1925, *Roxana Ferris 5518* (Arnold Arb.).

Distributed as *C. macrodontus*, which has much smaller leaves and quite different flowers. The peculiar ♀ flower calyx, the lepidote, not hispid nor lanose ovary, the lack of any persistent indument easily distinguish the new species from *C. stylosus*, a Mexican species which it somewhat resembles but has setose-ciliate petioles and leaf-margins.

CENTRAL AMERICAN SPECIES

***Croton callistanthus*, sp. nov.**

Stirps pulchra, arbor ad 45 ped. alta, cymarum longitudine (ad 70 cm.) insignis, apicibus tomento furfuraceo ochraceo detergibili indutis. Folia inter generis maxima, plerumque viridia, adulta glabrescentia, juniora tomento pannoso griseo vel ochraceo detergibili induta, ad 30 cm. longa, 18 cm. lata, vulgo 17–15 cm. longa, 8–10 cm. lata, elliptica, cuspidato-acuminata, basi cordata, margine subintegra, venis ca. 10-jugis, primo jugo subtriplinervio longe ramifero, caeteris late patentibus penninerviis; petiolo herbaceo, fistuloso, glabrescente, vulgo 8–12 cm. longo, ad 19 cm. longo, glandulis sub apicem utrinque 2–3. Cymae longissimae caudatae, basi validissimae (ad 0.6 cm. crassae), basi ♀, dein bisexualibus, floribus glomerulatis. Flores ♀ pedicello 0.5–0.6 cm. longo graciliore fulti; calyce 0.5 cm. lato, 0.3 cm. longo, subrotato, lepidoto-tomentoso, lobis late ovatis triangularibus, ca. 0.2 cm. magnis, laevissime imbricativis; ovario globuloso, ca. 0.3 cm. magno, subincluso, pube laetissime aurantiaca insigni, stylis bis bifidis nigris, gracilibus, 0.3–0.4 cm. non superantibus. Flores ♂ gracillime pedicellati, pedicello ad 0.4 cm. longo, plerumque lutescente; staminibus ad 20; calyce ca. 0.35 cm. magno, lobis petalis subaequilongis.

GUATEMALA: Dept. Quezaltenango, Colomba, 2800 ft. 1934, *Skutch*

2025 (TYPUS, Arnold Arb.); Dept. Quiché, 6000 ft. 1934, *Sketch 1723* (Arnold Arb.).

A very remarkable species distantly resembling *C. panamensis* and *C. Steyermarkianus*, but easily distinguished from both by the vivid-colored ovary and the very large leaves. In vegetative characters this is the largest known species of this group. *Croton Jimenezii*, to judge from the type, *Standley 33204*, which only carries ♂ flowers, is a species in this vicinity but has scurfy-brown pubescence, smaller and differently shaped leaves and larger flowers.

***Croton pagi-veteris*, sp. nov.**

Frutex videtur, apicibus totis ochraceis tomentellis, citius glabratis, cortice adultiore vinoso-brunneo. Folia supra brunnea, pilis fasciculatis subpaucis glabrata, subtus tomento laeviusculo grisea, 10–6 cm. longa, 5–3 cm. lata, ovata, basi late rotundata vel subcuneata, margine distanter atque obiter serrulata, venis tomento magis ochraceo notatis, ca. 5-jugis, primo jugo subtriplinervio, caeteris penninerviis; petiolo 2–3 cm. longo, supra canaliculato, supra in apice glandulis 2 tubulosis ornato. Cymae bisexuales ad 9 cm. longae, floribus utriusque sexus in glomerulis paucifloris segregatis. Flores ♀: calyce turbinato (i.e. in pedicellum crassiusculum ad 0.1 cm. longum abeunte), ca. 0.15 cm. magno, lobis erectis, triangularibus, integris, haud imbricatis; ovario subincluso, pallide ochraceo-tomentello, stylis nigris pro ratione floris minimi crassiusculis, ad 0.25 cm. longis. Flores ♂ immaturi: alabastro tomentello ca. 0.1 cm. magno, breviter pedicellato.

GUATEMALA: Dept. Huehuetenango, Pueblo Viejo, limestone hills, 1896, *Seler 2776* (TYPUS, Gray Herbarium).

Donnell Smith determined this plant as *C. xalapensis* which is altogether different, both in floral and in vegetative characters. The general affinities of *C. pagi-veteris* are with the group of *C. mexicanus*-*C. corylijolius*, of which it represents a distinct, not lepidote form. *Croton Oerstedianus*, which to judge from a photograph of the type has a ♀ calyx similar to that of the new species, is lepidote and seems to be very near *C. Tonduzii* from Costa Rica.

***Croton pseudoxalapensis*, sp. nov.**

Arbor vel frutex ad 3 m. altus, apicibus ochraceis tomento stellato detergibili scabrido plus minusve indutis. Folia supra glabrescentia, ochraceo-brunnea vel subolivacea, subtus pube sat firma cinerascens, 12 cm. longa, 5.5 cm. lata, ovata, cuspidata vel caudata, basi leviter rotundato-cordata, margine serrulata, serraturis 3–4 per cm., venis plus minusve regulariter penninerviis, 10–12-jugis, arcuato-adscendentibus,

obscure anastomosatis; petiolo herbaceo, 2–2.5 cm. longo, subtus in apice glandulis 2 late patellatis ornato. Cyma stricta, 25 cm. longa, bisexualis. Flores ♀ brevissime pedicellati, pedicello ca. 0.1 cm. longo; calyce 0.4 cm. lato, 0.35 cm. longo, ad basim fere partito, lobis 5 [interdum lobulo addito ad 6], triangulari-acutis, subsetaceis, glandulis perigynis 1–2 bacillari-glandulosis, minutis; ovario ca. 0.3 cm. magno subtrigono, pallide luteo-tomentoso, stylis 3 fere ad basim partitis, ad 0.65 cm. longis. Flores ♂ immaturi, pedicello ad 0.1 cm. longo, alabastro subglobuloso, ca. 0.1 cm. magno.

HONDURAS: Dept. of Comaguaya, vicinity of Siguatepec, alt. 1080 to 1400 m. 1928, *Standley 55987* (TYPUS, Arnold Arb.).

***Croton pseudoxalapensis* var. *cobanensis*, var. nov.**

Foliis majoribus ad 25 cm. longis, 14 cm. latis, petiolo ad 11 cm. longo glandulis disciformibus 6–8 sub apicem petioli nempe patellis circumcirca aggregatis a typo distinguitur.

GUATEMALA: Coban 1350 m., 1906, *von Turckheim ii-1015* (TYPUS, Gray Herb.). The type was distributed as *C. flavens* and the variety as *C. panamensis*, both of which are very different species. The nearest affinity of the new species and its variety is with *C. xalapensis*, a well known Mexican endemic. *Croton pseudoxalapensis* is distinguished from *C. xalapensis* by the less pannose indument, by the shorter and less setaceous lobes of the ♀ calyx [0.2 instead of 0.3 cm. long], by the styles [0.3 instead of 0.6 cm. long], and by a sum of intangibles that make it intermediate in vegetative and floral characters between *C. xalapensis* and forms of the aggregate centering around *C. pungens* from Venezuela. The variety differs from the type-form in the peculiar numerous glands, and so far as the type shows, in the much larger leaves. No difference in seed separates *C. pseudoxalapensis* and its variety from *C. xalapensis*.

***Croton Steyermarkianus*, sp. nov.**

Arbor ad 9 m. alta, apicibus pube argillaceo-stellata ochracea cito decidua indutis. Folia discolori-olivacea, supra glabrescentia, subtus pube facillime detergibili subgrisea, 15–10 cm. longa, 12–8 cm. lata, late obovata, apice abrupte in cuspidem ad 1 cm. longam coarctata, basi late cordata, margine integra, venis ca. 7–9-jugis, primo jugo bene ramigero, arcuato-adscendentibus penninerviis; petiolo 6–12 cm. longo, sub apicem utrinque at supra praesertim glandulis parvis 8–9, margine cerinis, centro pustulosis ornato. Cymae validae ad 25 cm. longae, fere totae glomerulis bisexualibus obsitae. Flores ♀ inter plures ♂ plus

minusve centrales, pedicello ad 0.7 cm. longo fulti; calyce 0.45 cm. lato, 0.3 cm. longo, fere ad basim partito, lobis 5 late ovatis, sublepidotis, laevissime imbricativis, 0.25 cm. longis, ca. 0.2 cm. latis; ovario globuloso subdepresso, ca. 0.25 cm. magno, subincluso, pallide luteo-aurantiaco, stylis 3 ad basim partitis, ad 0.3 cm. longis. Flores ♂ pedicello gracili ad 0.4 cm. longo fulti, staminibus 15–20, calyce ca. 0.4 cm. lato, 0.25 cm. longo, petalis lobis subaequilongis. Nomen specificum pro J. E. Steyermark sumitur.

COSTA RICA: Prov. S. José, vicinity of El General, in clearings, 880 m. 1936, *Skutch 2603* (TYPUS, Arnold Arb.).

Distributed as *C. Draco hibisciformis*, but certainly differing from the typical form of that species in the thinner indument, in the longer pedicel of the ♀ flower and in the much more broadly ovate leaves which are abruptly cuspidate not gradually acuminate. *Croton panamensis* has different vegetative characters, resembling *C. draconoides* from Brazil, and to a lesser extent, *C. Lechleri* from Peru. The capsule of *C. panamensis* is tomentose as well as hispid, while that of *C. Steyermarkianus* is only tomentose. Mueller Argoviensis altogether misunderstood the specific limits of *C. Draco*, *C. panamensis* and *C. gossypifolius*. Of these three species, the first occurs only in Mexico, though certain incomplete collections of northern Central America may represent a very near species. The second is certainly known only from Panama. *Croton gossypifolius* is essentially a Venezuelan and Trinidad endemic, which is represented in Colombia by a nearly related species, *C. Funckianus*. The Mexican plant which Mueller Argoviensis has identified as *C. gossypifolius stipularis* (in DC. Prodr. 15²: 539. 1866) is a form of *C. Draco*; a form of this same species is the Liebmann specimen from the vicinity of Vera Cruz cited by the same author (op. cit. 547) under *C. panamensis*. The complex centering around *C. Draco* and *C. gossypifolius* is one of the most important for the regions of Central America, northern South America and southern Mexico. It consists of a multitude of related species and forms which so far have been confused under two or three binomials.

***Croton triumfettoides*, sp. nov.**

Arbor videtur, apicibus pube citius decidua sericeo-hispida simulque conferte stellata hinc inde tomentosis. Folia supra atro-brunnea glabrescentia, subtus tomento detergibili flocculoso griseo pubescentia, 17 cm. longa, 10 cm. lata, ovato vel ovato-elliptica, cuspidata vel acuminata, basi cordata plus minusve rotundata, margine subintegra oculo armato tenuissime serrulata, venis utrinque 7–9-jugis, subobscuris, adscendentibus; petiolo herbaceo 13 cm. longo, sub apice utrinque

glandulis stipitatis atris crebris confecto. Cymae ad 30 cm. longae, bisexuales, totae hispidae, floribus glomerulatis. Flores ♀ pedicello ca. 0.5 cm. longo fulti; calyce 0.4 cm. lato, 0.3 cm. longo, lobis hispidis ligulato-ovatis, apice plus minusve acuminatis, 0.2 cm. magnis; ovario subincluso, ca. 3 mm. magno, pube atrobada toto hispidulo, stylis subcarnosulis, ad basim partitis, nigris, glabris, ad 0.3 cm. longis. Flores ♂ pedicello ca. 0.4 cm. fulti; staminibus ca. 15; calyce 0.3 cm. lato, 0.25 cm. longo, petalis lobis subaequilongis.

COSTA RICA: Pastures (?), 1919, *Lankester K26* (TYPUS, Arnold Arb.).

In vegetative characters near *C. panamensis* which has an altogether different indument; near *C. Purdiei* from Colombia in indument but differing in every other character. The crowded long cyme with the very hispid buds reminiscent of certain specimens of *Triumfetta* carrying immature fruits, is unlike any found in other species of this group so far as is known to me.

COLOMBIAN, VENEZUELAN AND ECUADOREAN SPECIES

***Croton aequatoris*, sp. nov.**

Frutex vel arbuscula ad 4 m. alta, pube stramineo colore in apicibus hispidulo-tomentosa. Folia tenuiter membranacea, iis *C. gracilipedis* forma subsimilia, ovato-cuspidata, utrinque brunnea subtus pallide discoloria, pilis fasciculatis vel patule stellatis, habitu hispido-setulosis, utrinque at subtus praesertim induta, 9–5 cm. longa, 6–3 cm. lata, margine subintegro vel laeviter repando-dentato, venis penninerviis 4–6-jugis, late arcuatis, eleganter a margine 0.3–0.5 cm. remotis anastomasatis; petiolo hispidulo 4–2.5 cm. longo, glandulis suprapetiolaribus stipitatis 2–4. Cymae gracillimae, 10–18 cm. longae, bisexuales, tenuiter hispidae, floribus utriusque sexus glomerulatis. Flores ♀ minuti, sessiles; calyce ad 0.15 cm. magno; calycis lobis lineari-lanceolatis, ovario globuloso hispido dimidio brevioribus, ad 0.05 cm. longis, stylis 3 ad tertium infimum bipartitis ca. 0.3 cm. longis, glandulis hypogynis obviis nullis, semine profunde cerebrato-rugoso 0.5 cm. longo, 0.375 cm. lato, caruncula late patellariformi apicali, coccis (delapsis) pube evanida fere glabris, ad 0.5 cm. longis. Flores ♂: pedicello 0.1 cm. longo, staminibus ad 12, calyce ca. 0.2 cm. magno.

ECUADOR: El Recreo, in fruticetis, 1896, *Eggers 15498* (TYPUS in herb. Berol.).

Nearest in a sum of characters to *C. saltensis* which is strictly localized in northern Argentina and in the adjacent Bolivian region, at the foot

of the Andes. *Croton peruvianus* to judge from a fragment of the typic collection may be near the present species, but its midrib is covered by a very characteristic straw-colored, branching tomentum and its veins are ascending penninerved not broadly and gracefully arching.

***Croton ater*, sp. nov.**

Arbor ad 70–80 ped. alta, 1–2 ped. trunci crassitie, apicibus pube argillacea subaurantiaca scabra indutis. Folia utrinque atro-viridia, pube argillaceo-lepidota rufida parcius induta, inde subglabra, 14–8 cm. longa, 7–3.5 cm. lata ovata, longe acuminata vel subelliptica acuta, basi plerumque truncata vel rotundato-truncata, venis irregulariter 7-jugis, adscendentibus, apice longe furcantibus, margine subremote obscureque crenato, glandulis ceraceis late patelliformibus more proprio obsito; petiolo 4 cm. longo, apice glandulis 2 sessilibus carnosulis utrinque ornato. Cymae validae ad 30 cm. longae, angulosae, basi 0.4 cm. diametientes, totae capitulis confertis florum utriusque sexus obsitae. Flores ♀: pedicello 0.7 cm. longo, rigide exserto; calyce ca. 0.25 cm. magno, ad imam basim partito, laciniis integris, optime dissitis, 0.125 cm. longis, 0.05 cm. latis, ovario globuloso ca. 0.3 cm. magno, pulchre luteo-tomentoso, stylis nigris convolutis 0.3–0.4 cm. longis. Flores ♂: staminibus ca. 8–12, calyce ca. 0.2 cm. magno, lobis petala subaequantibus, pedicello capillaceo 0.7–0.5 cm. longo.

COLOMBIA: Dept. of Boyaca, region of Mt. Chapon, El Umbo, thick forest edge, alt. 3000 ft. 1932, *Lawrance 593* (TYPE, Gray Herb.).

Nearest to *C. panamensis* from Panama and to *C. draconoides* from Brazil which it links within a single taxonomic and phytogeographic close unit. It might also be allied with *C. Sampatik* from Peru, but the type-specimen of this last has only ♂ flowers and can not be satisfactorily compared with the type of the present species. The dull green color of the leaves, the numerous comparatively small, clustered flowers, the color of the ovary and the buttonlike glands of the margin of the leaf are useful characters of sight-determination.

***Croton bolivarensis*, sp. nov.**

Fruticulus videtur, citius glabrescens, cortice laevi vinoso-brunneo, apicibus tomento lepidoto-stellato canescentibus, pilis hinc inde hispidis nigricantibus insignibus. Folia tomentosula supra cinereo-viridia, subtus cinereo-canescens, nervis tomento crassiore perspicuis, 7–4 cm. longa, 4–1 cm. lata, elliptica, apice late acuminata, basi inciso-cordata, margine sub lente minute serrulatis, venis 6–9-jugis, arcte adscendentibus; petiolo gracillimo eglanduloso 4–1 cm. longo, ad basim stipulis

auriculatis (saltem in innovationibus) praedito. Cymae haud comosae, bisexuales, ad 4 cm. longae, floribus subsolitariis bracteola integra lineari, ca. 0.3 cm. longa fultis. Flores ♀ pedicello 0.05 cm. longis fulti; calyce extus basi hispido, apice puberulo, intus tomentello, albicante, in anthesi ca. 0.4, fructu submaturo ca. 0.7 cm. magno, lobis ca. 0.2 cm. longis, reduplicato-imbricativis, integris, ovarium hispidulum, pallide luteum includentibus, secus dorsum pilis nigrescentibus lineato vel notato; stylis iterum partitis, gracilibus. Flores ♂ immaturi, calyce ut illo ♀ notato, alabastro ad 0.2 cm. magno, pedicello ca. 0.2 cm. longo.

VENEZUELA: Santa Catalina, Lower Orinoco, 1896, *Rusby & Squires 278* (TYPUS, Gray Herb.); Ciudad Bolivar, about 35 m. 1931, *Holt & Blake 861* (U. S. Nat. Mus.).

Very near *C. Bredemeyeri* (*Pittier 14008*, U. S. Nat. Mus.) and perhaps ultimately to be considered only a geographic variety of it. In *C. Bredemeyeri* the ♀ calyx is slightly denticulate, while it is entire in *C. bolivarensis*. The difference, however, may be due to age, old ♀ flowers and fruits tend to have denticulate calyces, young ones entire, as this is the case with *C. macrodontus*. Minor intangibles of leaf texture, however, suggest that *C. Bredemeyeri* and *C. bolivarensis* may be distinct, the last representing an intermediate form between *C. jacobinensis* of northern Brazil and *C. Bredemeyeri* endemic in northern Venezuela (Aragua and near Caracas).

Croton Killipianus, sp. nov.

Arbor, ad 20–25 ped. alta, apicibus subgracilioribus, ad 0.35 cm. crassis, pube ochracea argillacea dissite indutis. Folia concoloria olivaceo-viridia, utrinque sed supra praesertim lepidibus argillaceis sparsis ruvidula, 17–13 cm. longa, 11–7.5 cm. lata, subobscure triloba vel sublobulata, basi latissime rotundata ad cuneata, margine laevissime serrulata, apice late acuminata (novella elliptica, acuminata, ca. 5 cm. longa, 1.5 cm. lata), lamina utraque facie hinc inde glandulis cerinis patelliformibus sessilibus ad 0.1 cm. latis more peculiari nempe incrustata, venis 6–9-jugis adscendentibus, primo jugo subtriplinervio, caeteris penninerviis; petiolo 7–3.5 cm. longo, sub apice utrinque glandulis 2–4 patelliformibus cerinis donato. Cymae bisexuales graciliores, paniculatim effusae, floribus utriusque sexus in glomerulis paucifloris aggregatis, ad 25 cm. longae. Flores ♀ in anthesi pedicello ad 0.8 cm. longo fulti; calyce argillaceo-tomentoso, 0.7 cm. lato, 0.5 cm. longo, leviter saltem imbricato, lobis ovato-acuminatis, integerrimis, dorso costato-carinatis, 0.35 cm. longis, 0.35 cm. latis, intus tomentoso-hispidulis; ovario incluso, pallide luteo-tomentoso, ca. 0.3 cm. magno,

stylis flabellatim partitis, laciniis ad 15, 0.3 cm. longis. Flores ♂ haud evoluti, pedicello ad 0.3 cm. longo, alabastro ca. 0.2 cm. magno. Nomen specificum pro cl. E. P. Killip inscribitur.

COLOMBIA: State of Boyaca; region of Mt. Chapon, extreme western part of Dept. of Boyaca, northwest of Bogota, forest edge at stream side, Umbo region, alt. 3700 ft., 1932, *Lawrance 588* (TYPUS, Arnold Arb.).

Like *C. Smithianus* distributed under the erroneous determination *C. palanostigma*, which has different leaves and indument and is endemic in the Amazonas regions, scarcely if at all reaching the foot of the Peruvian Andes. The new species is nearest to *C. Smithianus* but immediately separated from it by the argillaceous thin indument.

Croton Killipianus, *C. Smithianus*, *C. Benthamianus*, *C. cearensis* and *C. palanostigma* form a homogeneous and distinct group, with range extending from Ceará in northern Brazil, to Colombia and to Matto Grosso. The three classic species of this group, *C. cearensis*, *C. Benthamianus* and *C. palanostigma* are not easily separated and may be better understood, pending definite revision, as geographic forms of the same entity.

***Croton meridensis*, sp. nov.**

Croton ferrugineus Pittier in Jour. Wash. Acad. Sci. 2: 10. 1930; non H.B.K.

Fruticulus videtur, dichotome ramosus, apicibus pube ochracea vel pallide aurantiaca tomentellis. Folia supra brunnea glabrescentia, subtus tomento vix conferto discoloria cinerea, venis plus minusve sordide luteis, 3-2 cm. longa, 2-1 cm. lata, elliptica, apice rotundata vel latissime acuminata, mucronata, basi plus minusve rotundato-cuneata, margine subintegra, levissime ciliato-serrulata, venis penninerviis utrinque ca. 5-jugis, adscendentibus. Cymae bisexuales ad 6 cm. longae. Flores ♀ in axilla stipulae minimae triangularis sessiles, 0.2 cm. magnis, lobis erectis, lineari-triangularibus, discretis, sub fructu vix 0.175 cm. longis, 0.05 cm. latis, ovario subincluso ochraceo tomentello, stylis 3, fere ad basim partitis, semine griseo, arillodio granuloso-punctato, testa sub arillodio rugis tenuibus 2-3 exarata, 0.4 cm. longo, 0.2 cm. lato, caruncula apicali. Flores ♂: pedicello ca. 0.2 cm. longo; staminibus ca. 15, calyce 0.3 cm. lato, 0.2 cm. longo, petalis quam lobis $\frac{1}{3}$ longioribus, glabris.

VENEZUELA: Merida, Páramo del Morro, 2500 m. 1922, *A. Jahn 1063* (TYPUS, U. S. Nat. Mus.).

Differs from the holotype of *C. ferrugineus* in the much shorter petioles,

in the fewer primary veins (10–12 pairs in *C. ferrugineus* in a leaf 2 cm. long; 5–6 pairs in a leaf of the same length in *C. meridensis*), in the coarser and not velutinous indument, in the smaller and slenderer styles and in intangibles of habit and flowers. *Croton ferrugineus*, which I judge to be well represented by *Killip 5420*, collected in Colombia, Dept. El Valle, Dagua, is a species apparently endemic to lower altitudes (about 1000 m.) while *C. meridensis* occurs in the high “páramos” at 2500 m. It is worthy of notice that forms of *C. flavens* are found in Porto Rico and Jamaica which closely resemble *C. meridensis*. *Croton meridensis* should not be confused with *C. malacophyllus* (*Pennell 2704*, U. S. Nat. Mus.; *André 1408*, N. Y. Bot. Gard.; *Schultze 183*, Berlin Bot. Gard.) which is mistakenly reduced by Mueller Arg. to a variety of *C. dolichostachyus* (in DC. Prodr. 15²: 610. 1866). *Croton malacophyllus* is intermediate between this species and *C. ferrugineus*, but is much more hairy than either.

***Croton Rimbachii*, sp. nov.**

Arbor mediocris, apicibus pube stellata sordide ochraceo-cinerea indutis. Folia supra levissime rugosa, griseo-discoloria, nervo medio excepto glaberrima, tactu vix scabridula, subtus plus minusve sordide tomentosa, 13–8 cm. longa, 6–4 cm. lata, ovato-elliptica vel subtriangulari-ovata, cuspidata, basi rotundata vel latissime triangulari, margine integro subrevoluto visa nequaquam cordata, venis ca. 8-jugis arcuato-adscendentibus; petiolo 6–3.5 cm. longo, glandulis 2 gracillimis ornato, more *C. celtidifolii* setaceo-capitatis at lentis, ad 0.5 cm. longis. Cymae pro more specierum huius affinitatis breviores, ipsae longissimae visae 15 cm. metientes, vulgo tantum 6–8 cm., novellae ochraceo-hispidae. Flores ♀ optime pedicellati, pedicello hispido 0.8 cm. longo; calyce 0.6 cm. lato, ca. 0.5 cm. longo, ad basim partito, lobis 5 ovatis, extus hispidotomentosis, intus primo intuitu brunneo-nitidis, pilis raris hinc inde praeditis; ovario tomentoso sordide ochraceo, globuloso, ca. 0.3 cm. magno, stylis 3 gracilibus, effusis, fere ad basim partitis, 0.5 cm. longis. Flores ♂ pedicello gracillimo ad 0.8 cm. longo fulti, calyce ca. 0.5 cm. magno, petalis glabris lobos subaequantibus, staminibus numerosis, ad 45.

ECUADOR: Eastern Cordillera 2000 m., on eastern slope of Mt. Tungurahua, 1933, *A. Rimbach 94* (TYPUS, Arnold Arb.); same date and locality, *A. Rimbach 239* (U. S. Nat. Mus.).

Easily mistaken for *C. magdalensis*, from the vicinity of Bogotá and the valley of the Magdalena in Colombia, from which it differs, however, in numerous characters: the leaves are not cordate, the petioles are shorter, the indument is coarser and not ashen-whitish; the lobes of the

♀ calyx are larger, the ♂ flower is bigger and has more numerous stamens. *Croton sordidus* has larger ♀ flowers with shorter pedicels, more scabrid leaves and a more floccose, less hispid indument on the young parts. *Croton polycarpus* is a coarser species with the young leaves and stems heavily clothed with yellow floccose tomentum. *Croton Mutisianus*, which I believe to be represented by Pennell, Killip and Hazen 8716 [under *C. magdalensis glabratus* in Gray Herb.], collected in the Dept. of Caldas, Colombia, is strongly glabrescent to glabrous with about 6–9 pairs of broad spreading primary veins, which are black in all the specimens I have seen so far and strongly contrast with the olivaceous background of the underside of the leaf.

Croton Smithianus, sp. nov.

Frutex paucirameus, 6–12 ped. altus, apicibus pube grossa sub lente straminea in apice pilos stellatos gerente incrassatis. Folia supra brunnea, subtus olivaceo-viridia, utrinque lepidibus argillaceis sparsis ruvida, hinc inde subtus glandulis patelliformibus sparsis obsita, 17–11 cm. longa, 11–7 cm. lata, more Fici Caricae triloba, lobulata vel ovata sub-integra, basi truncata vel levissime cordato-truncata, apice latissime acuminata saepe submucronulata, margine obscure repandula, petiolo tomento incrassato 10–4 cm. longo, glandulis sub apice 2–4 patelliformibus. Cymae [fractae visae], validae, ad 20 cm. longae. Flores ♀ longe deflorati pedunculo ad 2.5 cm. longo fulti; calyce fere ad basim partito, accrescente, lobis 0.7 cm. longis, 0.5 cm. latis, late ovatis, extus ruvidis, hispidis, intus glabris, ad basim glandula maculosa praeditis setarum pennicillis (loco petalorum) cum lobis alternis; semine pallide brunneo undique longitudinaliter striato, corrugato-granuloso, 0.5 cm. longo, 0.3 cm. lato, caruncula dolabriformi valde adpressa, coccis (solutis) 0.9 cm. longis, columella 0.5–0.6 cm. longa. Nomen specificum cl. A. C. Smith honorat.

COLOMBIA: Dept. Santander, Mesa de los Santos, alt. 1500 m., on edge of woods, Dec. 1926, *Killip & Smith 15283* (TYPUS, Arnold Arb.).

Distributed as a form of *C. palanostigma*, but unlike that species. The very scabrid, often trilobed leaves and the peculiar, coarse indument easily distinguish it from *C. gossypifolius* and *C. Killipianus*. Under the lens the lower face of the blade reveals scattered button-like glands.

Croton subsuavis, sp. nov.

Frutex gracilis, ramis fasciculatis, pube pallida ochracea hispida decidua plus minusve indutis, cortice adultiore vinoso-brunneo laevi. Folia ad apicem ramulorum plerumque aggregata, supra brunnea, parcius

tomentella, tactu velutina, subtus tomenti grisei copia incrassata, nervis totis pilis hispidulis ochraceis insignita, 6–2.5 cm. longa, 2–1 cm. lata, lanceolato-elliptica, patenter crenulato-serrata, basi cuneata interdum inaequali; petiolo ca. 1–0.5 cm. longo, glandulis 2 stipitatis. Cymae bisexuales, 3–5 cm. longae. Flores ♀ brevissime pedicellati, pedicello plus minusve 0.15 cm. longo; calyce urceolato, ca. 0.2 cm. magno, lobis lineari-triangularibus, ovario globoso subincluso pilis ochraceis hispidulo, stylis ad basim bipartitis. Flores ♂ nondum evoluti, in cymis immaturis arcte spicato-congestis.

COLOMBIA: locality unknown, *Mutis 4438* (TYPUS, U. S. Nat. Mus.); Dept. Cundimarca, Melgar, 900–1300 m., open slope shrub, *Pennell 2858* (U. S. Nat. Mus.).

I have not seen the type of *C. suavis* which according to the publication (H. B. K. Nov. Gen. Sp. 2: 60. 1817) was collected in eastern Venezuela (Cumana) and is not described as hispid tomentose. I have seen, however, *Schomburgk 944* which Mueller Arg. cites (in DC. Prodr. 15²: 625. 1866) with the type. The Schomburgk collection differs from *C. subsuavis* in the much more appressed and scantier indument; in the leaves with an almost entire margin, suggesting a broad crenation but not a sharp serration; in the larger and less tomentose calyx of the ♀ flower. On the same sheet with *Schomburgk 944* (in herb. Berol.) is mounted *C. salviifolium* Link mss. collected at an unspecified South American locality, which in my opinion is *C. subincanus*. The material seen indicates that *C. subsuavis* represents in Colombia the complex to which belong *C. suavis* (Eastern Venezuela and British Guiana), *C. subincanus* (Guiana) and *C. Gardnerianus* (Cearà, Brazil). This last should not be confused with *C. Gardneri* which is a Brazilian species of the *Astraea* affinity.

***Croton xanthochloros*, nom. nov.**

Croton multicostatus, Pittier in Jour. Wash. Acad. Sci. 20: 7. 1930.
Non Muell. Arg.

Croton multicostatus Pitt. is invalidated by the earlier publication of *C. multicostatus* Muell. Arg. (in Linnaea, 34: 79. 1865). In the Gray Herbarium is preserved a photograph of the type of *C. flavovirens*, typified by a specimen of Bredemeyer in herb. Willd. On this photograph clearly shows a manuscript note of Mueller Arg. to the effect that the binomial is published in the Prodr. It is manifest that Mueller overlooked the binomial after writing the note on the specimen because no trace of it can be found, either in the Prodr. or elsewhere. Kunth ignores *C. flavovirens* altogether (Init. Flor. Venez. 430. 1927 [Fedde

Rept. Beih. lxiii]). I would use the binomial of Mueller were I certain that it represents the same species that Pittier called *C. multicosatus*. Although it is very nearly sure that this is the case, nothing but a direct inspection of the specimen can settle the issue whether *C. flavovirens* is not *C. Pullei* Lanj. which has a large many-veined leaf, or some other species or form of this affinity. The Willdenowian specimen being at present unavailable, I have chosen a new name for the species of Pittier. It is probable that *Pittier 11948* which Pittier himself has provisionally identified as *C. xanthochloros* (*C. multicosatus*, Pitt.) (loc. cit., 8) is in reality *C. megalodendron*, published by Mueller Arg. (Flora, 40: 4. 1872) on a specimen of Bredemeyer collected "propre Caracas." I am very much indebted to Mr. Pittier for the loan of *Pittier 11948* which was collected at Caruaio, near Caracas. The characters of this specimen do not suggest that it is certainly conspecific with *C. xanthochloros*, confirming the wisdom of Pittier's provisional determination. A critical comparison of *all* the types of the species of this affinity is necessary and better collections are desirable before a final disposition of the binomials involved can be attempted.

PERUVIAN AND BOLIVIAN SPECIES

Croton Astianus, sp. nov.

Stirps pro genere adhuc inusitata; frutex ad 4 m. altus, apicibus tomento sordide luteo indutis cortice hinc inde fisso-suberoso. Folia supra facie tenuiter coriacea, rugulosa, griseo-brunnea, subtus tomenti sordide lutei copia villosula; 16-6 cm. longa, 5-3 cm. lata, elliptica vel elliptico-lanceolata, basi cuneato-rotundata, margine more proprio papillis setigeris crebris zonata, venis supra impressis ca. 8-jugis, primo jugo subtriplinervio, caeteris penninerviis, petiolo ad 3.5 cm. longo, basi stipulis subsetaceis 1-1.5 cm. longis integris insignito, glandulis obviis nullis. Cymae caudatifformes, ad 30 cm. longae, tractu majore ♂. Flores ♀ solitarii, calyce 0.9 cm. longo, 0.6 cm. lato, griseo-tomentoso, ad medium partito, lobis longis, triangulari-lanceolatis, acutis 0.6 cm. longis, 0.2 cm. latis, intus glaberrimis atro-brunneis, ovario hispido, pro ratione floris minuto, vix 0.175 cm. magno, globuloso, stylis 3 ad basim bis bifidis, carnosis, nigris, canaliculatis, ad 0.5 cm. longis. Flores ♂ immaturi, alabastro globoso ca. 0.3 cm. magno, pedicello 0.5 cm. longo. Species pro cl. Susanna Ast, de Annonaceis indochinensibus peritissima, nominatur.

PERU: Dept. Junin, Prov. Huancayo, valley of Pariahuanca, between Panti and Rocchac, 2400 m. 1913, *Weberbauer 6536* (TYPUS in Gray Herb.).

One of the most distinct and peculiar species I have seen so far. The long acuminate calyx lobes suggest some affinities with *C. speciosus* from Venezuela and with *C. caldensis* from Brazil, but the vegetative characters are quite different and the ♀ flower is smaller.

***Croton bryophoros*, sp. nov.**

Frutex vel arbuscula, 8–12 ped. altis, apicibus laete ochraceis, indumenti copia subbarbatis, tarde glabrescentibus, cortice vetustiore rugoso, rimoso. Folia rigide coriacea supra luteo-olivacea subscabrida, more proprio nempe resinosa corrugata, subtus tomento flocculoso detergibili griseo-olivacea, venis tomento fasciculato aurantiaco insignibus, 9–7 cm. longa, 5–3.5 cm. lata, ovato-elliptica, longiuscule acuminata vel subcuspidata, basi inciso-cordata, margine revoluta, venis optime penninerviis ascendentibus, 6–8-jugis, anastomosibus obscuris; petiolo laete ochraceo, hispide subbarbato, 3–5 cm. longo, glandulis minutis sub tomento oculate inquirendis. Cymae confertae, bisexuales, habitu incurvae bracteis, praesertim florum ♂, quam alabastris longioribus subcomosae, amentiformes (inde nomen specificum), brunneae, hispide lanulosae, ad 11 cm. longae, ad 0.3–0.4 cm. crassae. Flores ♀: calyce sub fructu ad basim partito, 0.7 cm. lato, lobis linearibus acuminatis, ca. 0.4 cm. longis, 0.1–0.125 cm. latis, glandulis hypogynis in annulum interruptum aggregatis, capsula glabrescente, subellipsoideo-trigona, 1 cm. longa, 0.8 cm. lata, semine plumbeo, utrinque grosse 3–4 ruguloso costatus, 0.5 cm. longo, 0.3 cm. lato, columella 0.6 cm. longa, apicibus incrassatis trifurca. Flores ♂ immaturi: alabastro hispido ca. 0.15 cm. magno, bracteis stipularibus setaceis ad 0.5 cm. longis, apice incurvis, integris.

PERU: Dept. Ayacucho, Carrapa between Huanta and Rio Apurimac, alt. 2800 m., wooded hillside, 1929, *Killip & Smith* 22287 (TYPUS, U. S. Nat. Mus.).

When first seen, tentatively identified as *C. abutiloides* (type in herb. Berol; *Rose & Rose* 22246, vicinity of Huigra, Ecuador, in Gray Herb.) from which it differs in the peculiar texture of the leaves and in the comose catkin-like young cymes. A very distinct species, probably related to the *C. Baillonianus* complex.

***Croton caladiifolius*, sp. nov.**

Arbor videtur, apicibus tomento subargillaceo citrino indutis. Folia supra olivacea, venis albicantibus tomentosis, caeterum glabrescentia, subtus tomento tenuiori induta griseo-olivacea, interdum colore lapideo peculiari, 25–13 cm. longa, 15–8 cm. lata, ovata, bene cordata, breviter cuspidata, margine subintegra ad morem congenerum tenuissime denticu-

lata, nervis ca. 10-jugis, adscendentibus; petiolo crasse herbaceo ad 15 cm. longo, glandulis stipitatis cerinis in apice 2-4. Cymae graciles ad 30 cm. longae, interdum unisexuales. Flores ♀ sparsi; calyce sessili fere ad basim partito, lobis haud imbricatis ligulatis, ad 0.3 cm. longis, 0.15 cm. latis, patentibus; ovario luteo-tomentoso ca. 0.2 cm. magno, stylis 3 gracilibus profunde partitis, 0.3 cm. longis, capsula gibboso-trigona ca. 0.4 cm. magna, semine undique transverse ruguloso, rugis ad 4 in facie quavis, 0.3 cm. longo, 0.2 cm. lato, caruncula depressa minima, columella 0.35 cm. longa. Flores ♂ in glomerulis ad 3-4 congregati pedicellis 0.2 cm. longis fulti; calyce ca. 0.3 cm. magno; staminibus ad 20, lobis petalis subaequilongis.

BOLIVIA: South Yungas, Chimari near Chuhumani, 1400 m. 1908, *Buchtien 4631* (TYPUS, U. S. Nat. Mus.); North Yungas, Polo-Polo near Coroico, *Buchtien 3808* (U. S. Nat. Mus.); Guanai-Tipuani, 1892, *Bang 1343* (Arnold Arb.) huius loci videtur.

Almost intermediate in its essential character between *C. tarapotensis* and *C. Williamsii*, with a cordate leaf larger than either, mostly slaty-gray beneath. The seed is much more coarsely rugose and slightly larger than that of *C. tarapotensis* (as represented by *Spruce 4138*, in herb. Kew, 0.4 cm. long, 0.25 cm. broad). *Croton Williamsii* has smaller lobes of the ♀ calyx. *Croton peltophorus*, which is likely to prove identic to *C. pseudogracilipes*, is an endemic of the southern Bolivian Chaco, very closely allied with *C. Williamsii*, but altogether different from *C. caladiifolius*.

***Croton emporiorum*, sp. nov.**

Frutex videtur, ramulis strictiuscule dichotomis, pube sordide ochracea hispidula in apicibus indutus. Folia supra olivaceo-brunnea glabrescentia, subtus sordide cinerea ad ochracea, tomento firmo, 7-4 cm. longa, 2.5-1 cm. lata, eximie elliptica, utrinque acuminata, apice plerumque mucronulata, margine integro, basi denticulis glandulosis utrinque 2-4 praedito, venis ca. 9-jugis, primo jugo subtriplinervio, caeteris penninerviis; petiolo 1-0.5 cm. longo, glandulis 2 late patelliformibus, sessilibus, in tomento suboccultatis. Cymae ad 4 cm. longae, hispidotomentosae, bisexuales, compacte capitatae. Flores ♀ pedunculo ca. 0.15 cm. longo; calyce ad tertium inferum partito, ca. 0.6 cm. magno; lobis ligulato-ovatis, apice late acuminatis, 0.5 cm. longis, 0.175 cm. latis, utrinque tomentosis, ovario ca. 0.2 cm. magno, incluso, stylis 3 ad basim bipartitis, semine plumbeo sub lente puncticulato, 0.4 cm. longo, 0.2 cm. lato, caruncula minima, columella 0.45 cm. longa. Flores ♂: staminibus ca. 20, ca. 0.4 cm. magno, lobis petalis subaequilongis.

SOUTHERN BOLIVIA: Toldos near Bermejo, 1900 m., *Fiebrig 2243* (TYPUS in Arnold Arb.).

Near *C. Hilari* from Uruguay and the only species of this affinity so far known in Bolivia. It is easily separated from *C. Hilari* by the much less thicker indument and by the larger, not whitish tomentose lobes of the ♀ calyx. Broadly interpreted it is one of the forms on the fringe of the vast and extremely complex group centering around *C. Pohlianus* and *C. Regnellianus*. This last should not be confused with *C. Regelianus* (in Martius, Flor. Brasil., 11²: 133. 1873) which is an altogether different species and only by error is listed (op. cit., 738) as *C. Regnellianus*.

***Croton nudulus*, sp. nov.**

Frutex videtur vel arbuscula, saltem in apicibus subherbaceus, forsan hinc inde glaucescens, fere totus glaber. Folia utrinque olivacea discoloria, pilis late stellatis ad limbum citius deciduis, sub marginem persistentibus, 9–8 cm. longa, 5–4.5 cm. lata, ovato-lanceolata, basi sat profunde cordata, margine subintegra ad serrulata, venis 7–10-jugis, primo jugo subtriplinervio ramigero, reliquis penninerviis; petiolo 3–6 cm. longo, glandulis utrinque 2–3, stipitatis. Cymae ad 16 cm. longae, bisexuales, herbaceae at validae, angulosae, stipulis triangularibus minimis bracteiformibus, floribus glomerulatis. Flores ♀ sessiles: calyce 0.4 cm. longo, 0.3 cm. lato, glaberrimo, lobis 8–10 in serie duplici late imbricatis, interioribus subpetaloideis, externis subfoliaceis costulatis parcius venulosis, omnibus integris; ovario globuloso sulcato, vix trigono, glaberrimo, incluso; stylis 3, bis partitis, crassis, in anthesi depressis ovariumque velut coronantibus. Flores ♂: calyce ca. 0.3 cm. magno, staminibus ca. 15, brevibus, lobis petalis subaequilongis.

BOLIVIA: Montecanto, in shrubbery at the fringe of a mountain wood, 2600 m. 1927, *Troll 637* (TYPUS, Herb. Berol.).

A very peculiar species on account of its ♀ floral characters, but at first sight easily mistaken for any one of the numerous species which it superficially resembles such as *C. Williamsii*, *C. caladiifolius*, *C. peltophorus*, etc. The double row of broadly imbricate lobes in the ♀ calyx, scarcely worthy of being separately distinguished as sepals and petals, is found in no other species which I have seen so far and is the best character of identification together with the pale olivaceous subglabrous to glabrous vegetative parts and the persistently ciliolate margin of the leaves.

***Croton perspeciosus*, sp. nov.**

Arbuscula 4–5 ped. alta, apicibus pube subsericea sordide ochracea

hispidula indutis primo intuito bene *C. speciosum* in mentem vocans. Folia atroviridia vel brunneo-olivacea supra venis hispidulis exceptis glabrescentia, subtus tomento fasciculato adpresso grisea, 24–12 cm. longa, 14–7.5 cm. lata, ovata vel (e folio unico obvio) denticulo ca. 1 cm. longo sublobulata, longe triangulari-acuminata, apice breviter mucronata, basi optime cordata, margine minutissime denticulato-serrata, venis late arcuatis penninerviis, 7–8-jugis, primo jugo ramigero; petiolo 14–7 cm. longo, glandulis stipitatis sub apicem 4–8, stipulis basalibus pinnatosectis ad 1.3 cm. longis, 0.35 cm. latis. Cymae bisexuales, quoad visae nec ultra 10 cm. longae. Flores ♀ deflorati brevissime pedicellati, pedicello 0.25 cm. longo; calyce vix 1 cm. lato, lobis triangularibus integris, 0.4–0.35 cm. longis, ca. 0.25 cm. latis, intus glabris, semine badio nitidiusculo, grosse ruguloso, rugis paucis, 0.6 cm. longo, 0.55 cm. lato, caruncula apicali late transversali ad 0.2 cm. lata, columella ad 0.7 cm. longa, epicarpio secedente processibus luteis stelligeris crassissime pannoso. Flores ♂ immaturi: alabastro ca. 0.25 cm. magno pedicello 0.5–0.4 cm. longo.

PERU: Dept. Ayacucho, Aina, between Huanta and Rio Apurimac, 750–1000 m., open woods, 1929, *Killip & Smith 22841* (TYPUS, U. S. Nat. Mus.); Carrapa, between Huanta and Rio Apurimac alt. about 1500 m., densely forested valley 1929, *Killip & Smith 22402* (U. S. Nat. Mus.).

This is one of several species that is mistakenly identified as *C. callicarpaefolius* in herbaria and in floristic works. It strongly suggests some of the forms of *C. speciosus* in the indument, size and habit of vegetative parts but is altogether unlike this species in the narrow lobes of the ♀ calyx.

In treating *C. callicarpaefolius*, Mueller Arg. (in DC. **15**²: 532. 1866) recognizes a typical form, var. *genuinus*, and a hairy variety, var. *pubescens*. Under the former he lists the Peruvian specimen in the herbarium of Jussieu which is the type of *C. callicarpaefolius* Vahl ex Geiseler, and a Venezuelan specimen collected by Fendler apparently near Colonia Tovar. Under the latter he cites another specimen of Fendler collected at Colonia Tovar and a Moritz number from the same locality, both of which I have seen. It is manifest that *C. callicarpaefolius* as understood by Mueller is a geographic mixture. Worthy of notice is the fact that, on the faith of Mueller, the variety is more pubescent than the type.

Geiseler's publication of *C. callicarpaefolius*, typified by the Jussieuan specimen, is preceded (Crot. Monogr. 36. 1807) by the description of *C. quadrisetus* (actually, *C. quadrisetosus* Lam.). In this description Geiseler states that the specimen of Lamarck has only ♂ flowers, which

is erroneous, as young fruits occur on this specimen which I have seen. Geiseler further errs in listing *C. pungens* as a synonym of *C. quadrisetosus* and in citing as habitat "in Peru, ad Caracas." I cannot refer Geiseler's *C. quadrisetus* to any species which I may identify from description. It is certain that Geiseler misunderstands *C. quadrisetosus* and that, on the other hand, his description of *C. callicarpaefolius* well agrees with the Lamarckian species including the "glandulae 4 pedicellatae, capitatae ad apicem petioli" of which he writes. The entire trend of the literature indicates that both Geiseler and Mueller Arg. are confused, and the descriptions clearly point to *C. callicarpaefolius* and *C. quadrisetosus* as being of the same species, the types of both having probably been collected in Peru by Dombey at the same time.

I much regret not having critically compared the specimen of Lamarck with that of Jussieu in order to settle the issue. However, the remote risk of publishing a synonym, if the specimen of Jussieu should indeed prove to be different from that of Lamarck, does not justify the positive evil of further allowing several important species to be confused or to remain undescribed. *Croton quadrisetosus* is certainly distinct from *C. perspiciosus* in pubescence and in the character of the ♂ and ♀ flowers. It is likewise altogether different from *C. callicarpaefolius* var. *pubescens*, sensu Mueller Arg., which will be discussed in a following paper.

***Croton Rehderianus*, sp. nov.**

Stirps concinna, laete colorata, habitu speciminis maximi *Julocrotonis triquetri*, apicibus subherbaceis tomento rufidulo scaberrimo indutis. Folia olivacea ad rufidula, supra lepidibus stellatis asperata, subtus tomento flocculoso late stellato subgrisea, 22–12 cm. longa, 9–5 cm. lata, ovato-caudata vel sublanceolata acuminata, basi eximie cordata vel incisocordata, margine leviter glanduloso-serrulata, venis luteo-pubescentibus, inaequaliter 10–12-jugis, ascendentibus, subquintuplinerviis; petiolo canaliculato, 4–3.5 cm. longo, glandulis utrinque binis sessilibus instructo, anticis minoribus. Cymae pro ratione stirpis parvae, quoad visae 5 cm. vix excedentia, vulgo verosimiliter longiora, bisexuales, rufidulae. Flores ♀ in axilla bracteolae calyci subaequilongae solitarii subsessiles, ca. 0.35 cm. magni; lobis triangularibus 0.2–0.175 cm. longis, 0.05 cm. latis, ovario ca. 0.2 cm. magno, vulpino-brunneo, grosse tomentoso, globuloso, stylis 3, crassis, ad apicem breviter bifidis, glabris ca. 0.3 cm. longis. Flores ♂ caeteraque desiderantur. Nomen specificum cl. A. Rehder dicatur.

PERU: Dept. Cuzco, below Machu-Picchu, brush covered hillside alt.

2250 m., "very handsome, beautiful tomentum: Mocco-Mocco" 1936. *J. West 6464* (TYPUS in Gray Herb.).

A remarkable species that in color and habit simulates the Brazilian endemic, *Julocroton triqueter*, but in every floral character is typically *Croton*. Its affinities are still obscure. They are to be looked for apparently in the vicinity of *C. bryophoros*.

***Croton rubiginosus*, sp. nov.**

Fruticulus dichotome vel verticillatim ramosus, vix 50 cm. altus, apicibus brunneis totis pilis sub lente in apice stellatim partitis more proprio nempe rubigine confectis ac esquamatis. Folia rufescentia, eodem modo ac apices induta, concoloria, 2–1.5 cm. longa, 1–0.8 cm. lata, ovata vel ovato-acuminata, basi rotundata, margine inconspicue serrulata, venis obscuris 3–5-jugis adscendentibus; petiolo gracili 0.5 cm. longo eglanduloso. Cymae bisexuales ad 1.5 cm. longae. Flores ♀: pedicello vix 0.1 cm. longo, calyce ca. 0.4 cm. longo, 0.3 cm. lato, lobis margine pilis subpaucis glandulosis obsitis, 0.2 cm. longis, 0.175 cm. latis, plus minusve ellipticis, apice rotundatis, ovario globuloso-trigono, lanuloso-tomentoso submaturo fere glabro, stylis 3 ad basim iter partitis, glabris. Flores ♂ ca. 0.2 cm. magnis, staminibus 8–10, petalis glabris quam lobis duplo longioribus.

PERU: Prov. Chachapoyas, eastern banks of the Marañon above Balsas, open grassy land, 2000–2100 m. 1904, *Weberbauer 4273* (TYPUS, Herb. Berol).

A dwarf shrub appearing rusty-scurfy. It may easily be mistaken for *C. Boissieri*, of which it has the habit in herbarium, but this is basically lepidote and has entire calyx lobes, belonging to the very different group of *C. buxifolius* - *C. argentinus*. Its nearest true affinities are with *C. eschatos* from Mexico, with *C. ovalifolius* from the West Indies and with *C. Venturii* from Argentina. It is the only member of this group at present reported from Peru.

***Croton Tyndaridum*, sp. nov.**

Arbor, 15–20 ped. alta, apicibus totis pube capitato-stelligera ochraceo-carnea incrassatis. Folia supra olivacea, tomento detergibili glabrescentia, subtus pallide grisea, tomentosa, 16–10 cm. longa, 14–10 cm. lata, exacte ovato-rotundata, breviter acuminata, margine subintegra levissime denticulata, venis ca. 8-jugis, primo jugo subtriplinervio eximie ramigero, late arcuato-adscendentibus, trabeculis tomentulosis subtus more Tiliacearum concinnis; petiolo subtus in apice subocculte biglandulifero, 13–7 cm. longo, tomenti copia incrassato. Cymae ad

25 cm. longae, tantum floribus ♀ praedita visa. Flores ♀ pedicellati; pedicello anthesi vix peracta ca. 0.3 cm. longo, calyce late partito, 0.5 cm. lato, 0.3 cm. longo, lobis ovatis acuminatis leviter imbricativis, 0.3 cm. longis, 0.15 cm. latis; ovario 0.4 cm. lato, 0.3 cm. longo, subincluso, tomento pallide ochraceo hispidulo; stylis 3, ad basim partitis, vix 0.25 cm. longis. Caetera desiderantur. Nomen specificum in honorem cl. Killip & Smith desumpsi qui velut botanici fratres Tyn-darides florum Americanam lustraverunt.

PERU: Dept. Junin, along Rio Perene, near "Hacienda 3," in thickets, 600 m. 1929, *Killip & Smith 25229* (TYPUS, U. S. Nat. Mus.).

A very interesting form, much resembling *C. Steyermarkianus* from Costa Rica, but with the indument of *C. gossypifolius* from Trinidad and Venezuela. It suggests a possible link between the *C. gossypifolius* aggregate, which is essentially Andine and Central American, and the *C. Urucurana* group which is endemic to eastern and western Brazil. Better material, however, is needed to define its relationships with certainty. Apparently the only known form of this kind in Peru.

***Croton xanthochylus*, sp. nov.**

Arbuscula cortice pallido, ad 4 m. alta, apicibus pube fasciculato-stellata valde appressa parcius indutis. Folia membranacea supra tabacina, glabra, sub lente forti laevissime granulosa, subtus tomento deciduo inconspicue grisea, 8–6 cm. longa, 5–4 cm. lata, in specimine typico optime ovato-cuspidata, basi cordata, margine integra, venis penninerviis tenuibus at perspicuis, ca. 8-jugis, anastomosatis; petiolo gracili, 4–2.5 cm. longo, subtus in apice glandulis patelliformibus nigricantibus subsessilibus binis obsito. Cymae bisexuales, graciles, ad 4 cm. longae: flores ♀ subsessiles (pedunculo vix 0.05 cm. longo), minuti, calyce vix 0.2 cm. magno, lobis subsetaceis ad 0.1 cm. longis, ovario globoso ca. 0.15 cm. magno, luteo-tomentello, glandulis hypogynis facile lente inquirendis, stylis vix 0.15 cm. longis; capsula globoso-trigona, subglabra, ca. 0.3 cm. magna, semine brunneo, 0.25 cm. longo, 0.2 cm. lato, puncticulato, grosse ruguloso, columella fructu delapso ca. 0.3 cm. longa. Flores ♂ pedicello ca. 0.2 cm. longo fulti, vix 0.2 cm. magni, staminibus ca. 10–12.

PERU: La Merced, about 2000 ft., sandy flat, light-barked tree, 1923, *MacBride 5308* (TYPUS, Arnold Arb.).

Very close to *C. erythrochylus*, the type of which, however, has a sublepidote argillaceous indument, distinctly pedicelled ♀ flowers (pedicel about 0.15 cm. long), ovaries colored dark orange, larger and more

clasping calyx lobes and apparently, a slightly rounder and less rugulose seed. *Croton Lechleri* is a more robust species, with capsules similar to those of *C. xanthochylus*, but with larger leaves of the texture and indument of those of *C. draconoides* and *C. panamensis*. It is not excluded that *C. xanthochylus* or some unreported related form may yet prove to be the link connecting the *C. Scouleri-C. Pavonis* affinity with the *C. tarapotensis-C. pungens* group.

***Croton yungensis*, sp. nov.**

Croton pungens, Rusby in Mem. Torrey Bot. Club 4: 257. 1895.
Non Jacq.

Arbuscula videtur, apicibus pallide ochraceis, tomentoso-hispidis. Folia supra pallide brunnea, tomento sat persistenti subsimplici hinc inde pilosa, subtus tomento raro late stellato grisea, 10–6 cm. longa, 6–2.5 cm. lata, ovato-elliptica, longe acuminata, basi cordata, venis adscendentibus conspicuis haud anastomosatis ca. 6-jugis, primo jugo ad basim grosse ramigero quapropter lamina haud raro subquintuplinervia, caeterum penninerviis; petiolo 3.5–2 cm. longo, glandulis subtus utrinque 2, patelliformibus. Cymae bisexuales ad 12 cm. longae valde angulosae. Flores ♀ pedunculo ca. 0.2 cm. longo crassiusculo fulti, calyce deflorato ad basim partito, 0.4–0.3 cm. lato, lobis lineari-triangularibus ca. 0.2 cm. longis, petalis (scilicet glandulis e petalis congestis) minutis, bacilliformibus, semine subellipsoideo, 0.4 cm. longo, 0.2 cm. lato, grosse rugoso columella 0.3 cm. longa. Flores ♂ pedicello 0.3–0.25 cm. longo fulti, ca. 0.25 cm. magni, staminibus ca. 18, lobis petalis subaequilongis.

BOLIVIA: Yungas, 1890, *Bang* 278 (TYPUS, N. Y. Bot. Gard.).

Identified by Rusby as *C. pungens* which is endemic to Venezuela, and even very broadly interpreted, does not occur further south than eastern Colombia. *Croton yungensis* is very close to hispid-pubescent states of *C. Hasslerianus*, which occurs in northwestern Paraguay. Although fairly large material collected by Balansa, Hassler and Schade is available in herbaria, I have not been able to decide whether *C. sarcopetaloides* and *C. Hasslerianus* are to be treated as separate species. From both these plants, *C. yungensis* is distinguished by the range, by the smaller leaves, by the more intricately ramose habit and by intangibles of flowers that make it an undoubtedly good species in various degrees intermediate among *C. Ruizianus* from Peru, *C. pungens* from Venezuela, *C. sarcopetaloides* from western Brazil, *C. Hasslerianus* from Paraguay and *C. sarcopetalus* from northern Argentina. *Croton Williamsii* and *C. peltophorus* have more membranous and less heavily hairy leaves and a more southern Bolivian range.

ARGENTINE SPECIES

Croton Beetlei, sp. nov.

Specimen typicum sistit ramulum ♂ anthesi nondum perfecta, apicibus tomento furfuraceo subcontiguo pilisque fasciculatis griseo-puberulis. Folia membranacea brunnea ad tete discoloria, subtus pube laevi grisea, supra pube hinc inde sparsa vix pilosa, pilis primo intuitu lepides argenteos mentientibus, sub lente fortiori revera stellatis, 14–5 cm. longa, 13–4 cm. lata, plerumque ovato-rotundata, margine crenato-dentata, dentibus inter crenas positis puberulis; venis ca. 5-jugis, primo jugo 3- ad 5-plinervio, caeteris penninerviis, latius arcuatis; petiolo canaliculato 7–2.5 cm. longo, glandulis ad apicem supra 2 tubuloso-turbinatis. Cymae gracillimae ad 8 cm. longae, parcius griseo-tomentosae, ♂ tantum visae. Floribus ad 5 in glomerulo quove, alabastro griseo ca. 0.1 cm. magno, pedicello gracili 0.3 cm. longo.

ARGENTINA: Salta, Dept. Oran, Tarija near Volcan, on the Bolivian border, sandy loam, alt. 800 m., tree 15–20 m. 1938, *Eyerdam & Beetle* 22829 (TYPUS in Gray Herb.).

Although the type-specimen is incomplete, its representing an unreported species must be taken for granted. *Croton Beetlei* belongs to one of the largest and on the whole, to one of the most stable complexes of the American end of the genus. In this complex fall *C. mexicanus* (central and southern Mexico), *C. Lundellii* (Yucatan), *C. Tonduzii* (Costa Rica), *C. corylifolius* (French West Indies), *C. cubanus* (Cuba), *C. caracasanus* (Venezuela) and one other species or variety collected in Ecuador, which is to be discussed in a coming paper. All these plants differ in herbaria only slightly in details of floral structure and pubescence. These details, however, must be given consideration lest the whole complex be turned into one overcomprehensive unit, or arbitrarily grouped under binomials and trinomialis lacking phytogeographic significance. In its vegetative characters and indument, *C. Beetlei* is nearest to *C. mexicanus*, from which, so far as I have learned, it can not certainly be separated in the absence of the record of collection. I am inclined to believe that *Steinbach* 8145, woods of Jorochito, Santa Cruz, Bolivia (in herb. Mus. Stockholm) represents *C. Beetlei*, the localities of the Eyerdam & Beetle and of the Steinbach collections being included within one common, or very nearly common floristic range. The Steinbach specimen has mature ♂ flowers which may be described as follows: calyx 0.5 cm. broad; lobes lanceolate-ovate 0.2 cm. long, 0.15 cm. broad; stamens about 15; petals ligulate, 0.2 cm. long, 0.1 cm. broad; lanulose throughout; glands 4–5, irregularly arranged at the bottom of the calyx.

The fact that in the herbarium *C. Beetlei* and *C. mexicanus* are almost invariably represented by ♂ specimens, tends to indicate that they are markedly polygamous, the ♀ inflorescences being apparently borne on the highest branches.

***Croton curiosus*, sp. nov.**

Fruticulus ad 0.6 m. altus, ramos plurimos floriferos ad 0.20 m. longos e caulibus vetustioribus edens, lepidibus laete ochraceis argillaceo-scabridis persistentibus indutos. Folia nigro-viridia, supra lepidibus argillaceis subnullis subtus hinc inde sparsis ruvidula, in specimine typico habitu conduplicata, 2.5 cm. longa, 1 cm. lata vel minora, lanceolata, integra, venis atris, adscendentibus ca. 6-jugis, petiolo ca. 0.5 cm. longo, glandulis stipitatis suprapetiolaribus binis. Cymae laete ochraceae, bisexualis, ad 7 cm. longae, flores solitarios pro more generis pauciores ad 6–8, interdum ad 12 gerentes. Flores ♀ pedicello 1.5 cm. longo fulti; calyce per anthesin ca. 0.2 cm. magno, laciniis triangularibus haud imbricativis ovario subaequilongis; ovario argillaceo-tomentello, serius glabrescenti, ca. 0.2 cm. magno; stylis primo intuitu obviis, carnosulis, ovario longioribus, fere ad basim partitis; semine plumbeo punctulato 0.45 cm. longo, 0.35 cm. lato. Flores ♂ immaturi.

ARGENTINA: Salta, Rosario de Lerma, on the road to Nevado Castillo 2000 m., in boulders on the bottom of a gulch, 1929, *Venturi 8664* (TYPUS in U. S. Nat. Mus.).

On the whole, a well marked species with obscure affinities. Its floral characters suggest a relationship with *C. andinus* (which I am unable to separate from *C. psammophilus*) and *C. pedicellatus*, but these species are quite different in indument and habit and scarcely suggest *C. curiosus* on sight. It may actually be related to *C. alnifolius*, from Peru.

In the herbarium of the Arnold Arboretum is preserved a poor specimen which might be the present species or a variety of it. According to the label, it was collected by Frère Apollinaire at La Vega near Bogota, Colombia, in 1909 and bears the mss. determination, *C. Apollinaris* followed by an illegible signature. Apparently by the same hand are written labels on other specimens of South American *Croton* which have a questionable origin. Some of the specimens so labelled are manifestly out of their range, the indications on the ticket being in conflict with the known distribution of the species. This fact, not less than my inability to find the place of publication and to decipher the name of the author have suggested that the mss. binomial be disregarded and a new one proposed in its stead.

Croton Venturii, sp. nov.

Croton siderophyllus var. *hirsutus* Griseb. Symb. Flor. Argent. 56. 1879.
Non Mueller Arg.

Fruticulus ad 0.30 m. altus, e caudice ligneo validiusculo, intricato ramulos plurimos sublentos edens, in apicibus pilis sparsis setoso-canescens hirtellis obsitos. Folia tabacina, vix pilis sparsis fasciculato-stellatis hirtella, pro more 2 cm. longa, 0.5 cm. lata, elliptica vel ovato-elliptica, margine serraturis creberrimis glanduloso-viscosis nempe eroso-denticulata, venis obscure ac gracillime 3-plinerviis; petiolo gracili ad 2 cm. longo. Cymae vix 2–3 cm. longae, bisexuales, haud comosae. Flores ♀ pedicello 0.2 cm. longo fulti; calyce ca. 0.3 cm. magno, lobis ligulatis, haud reduplicativis, habitu erectis, apice herbaceis, dorso canescentibus, margine creberrime brevissimeque glanduloso-viscosis; ovario incluso hispido-canescenti, stylis profunde partitis, ca. 0.2 cm. longis, semine 0.4 cm. longo, 0.25 cm. lato, parcius ruguloso. Flores ♂ staminibus ca. 12, alabastro subglabro, lobis petala subaequantibus, 0.2 cm. longis, 0.15 cm. latis.

ARGENTINA: Boundary between province of Tucuman and Salta, Rio del Tala, *Lorentz & Hieronymus* 392 (TYPUS in Herb. H. B. Gotting.); Salta, Dept. Antillas, Cerro Negro, 750 m. 1930, *Venturi* 10295 (in Herb. Arnold Arb.); Santiago del Estero, Cerro del Remate 550 m., *Venturi* 5899 (in Herb. Mus. Stockholm).

The trinomial used by Grisebach cannot be made the base of a new combination because it was introduced for *C. siderophyllus* β. *hirsutus* (in DC. Prodr. 15²: 650. 1866) endemic in eastern Brazil, and wholly unrelated to the present species. In addition, *C. hirsutus* Pet. Th. and *C. hirsutus* Vell. are already extant in the record. The present species is not *C. Bonplandianus* (*C. pauperulus*, *C. sparsiflorus*, *C. rivinaefolius*) a widespread weed with range: southern Bolivia, northwest and northeast subtropical Argentina, Paraguay, Uruguay, southwest Brazil, now introduced into India and there rapidly spreading. The nearest affinities of *C. Venturii* are with the numerous species forming the complex that includes *C. serratifolius*, *C. ovalifolius*, *C. rubiginosus*, *C. eschatos* and, more distantly, *C. fuscus* and its allies. This complex extends from central Mexico to subtropical Argentina, but has its epicenter in the valley of the Paraná and its tributaries.

BRAZILIAN SPECIES

Croton Dusenii, sp. nov.

Fruticulus videtur dioecus, habitu *Rosmarini officinalis*, strictiuscule ramulosus, in apicibus pube sordide albicante furfuraceo-tomentellus.

Folia brunnea, supra glabrescentia, subtus pallida, pube sordida lepidoto-stellata tomentosa, 2-1 cm. longa, 0.5-0.25 cm. lata, spathulata ad sublinearia, margine revoluta, nervo medio utrinque conspicuo, venis supra impressis, 5-6-jugis, subtus oculo nullis. Cymae minimae, pauciflorae. Flores ♀ pedicello ca. 0.2 cm. longo fulti; calyce deflorato ca. 0.5 cm. lato, lobis 0.3 cm. longis, 0.75 cm. latis spatulatis, margine integris, apice rotundatis, fere ad basim liberis; semine badio laevi, 0.25 cm. longo, 0.1 cm. lato, columella, fructu delapso 0.3 cm. longa. Flores ♂ pedicello gracili 0.2 cm. fulti, staminibus ca. 8-10, 0.4 cm. latis, petalis ligulatis glabris lobis subaequilongis.

BRAZIL: Paraná, Calmon¹ in subpaludosis, 1910, *Dusén 9265* (TYFUS in Herb. Stockholm).

The habit of *C. Dusenii* is that of a Rosemary with numerous short spurs (brachyblasts), mostly fertile, arising from the axils of the larger leaves alongside the stems. Its relationships appear to lie in the direction of *C. Tartonraira* and *C. pycnocephalus*. From these species it is easily separated by the peculiar indument. From the last named it differs, in addition, in the pale tomentulose lobes of the ♀ calyx. *Croton argentinus* and *C. serpyllifolius* which in floral characters resemble the present species are distinct from it, the first in the leaf being almost evenly hairy on both faces, the latter in being lepidote.

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¹According to the best available atlases Calmon is not in the State of Paraná, as reported by Dusén, but in that of Santa Catharina, about 20 miles south of Porto Unido, on the Rio Iguassú. Another town, almost of the same name, Miguel Calmon, is in the State of São Paulo, near Pennapolis, but may not be the place of collection of the present specimen.