

CODONANTHE LUTEOLA (GESNERIACEAE),  
A NEW SPECIES FROM PANAMA

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*Codonanthe* (Mart.) Hanst. is a neotropical genus of ant nest epiphytes (Moore, 1973; Wiehler, 1974a). Nearly 20 species of *Codonanthe* occur from Mexico to Bolivia and southeastern Brazil. Three species are found in Panama: *C. crassifolia* (Focke) Morton, *C. uleana* Fritsch (known from Panama as *C. decurrens* Johnston), and *C. macradenia* Donn.-Sm. The first two species are widely distributed, from southern Mexico to Amazonian Brazil, while *C. macradenia* is native to Panama and Costa Rica. On recent field trips to Panama Robert L. Dressler and I collected live material of a new species of *Codonanthe* which appears to be endemic to Panama. In fact, it has only been found in the eastern part of the Province of Panama. The proposed name for the new species is *Codonanthe luteola*, in reference to the light yellow color of the corolla (Yellow Group 8C, R.H.S., 1966). In all other species of the genus the corolla is either white or cream-colored. *Codonanthe luteola* has also the longest corolla of its congeners.

All four Panamanian *Codonanthe* species are in cultivation at the Marie Selby Botanical Gardens; the three previously described species are represented by several collections from different areas. While it is easy to distinguish the live species by their flowers, it is difficult to determine these species from herbarium material with dried flowers, or especially in the absence of the easily caducous mature corolla. It would be highly desirable to have picked *Codonanthe* flowers accompanying any future field collections. *Codonanthe* species have therefore suffered from identity confusion in the past, as well as more recently. This confusion is discussed on page 160.

Polyploidy is a comparatively rare phenomenon in the Gesnerioideae (Wiehler, 1970, p. 208), the ant nest genus *Codonanthe* an apparent exception. The base number in this group is  $x = 8$ , but most of the species examined so far are tetraploids with a chromosome count of  $n = 16$ . *Codonanthe luteola* is the first known species in the group with both a diploid and a tetraploid form. The two collections in cultivation came from adjacent trees in the same sub-cloud forest: one has smaller leaves and flowers and the chromosome number  $n = 8$ , the other grows more slowly but has larger leaves and flowers and a chromosome count of  $n = 16$ . The difference in ploidy level is, however, only weakly expressed in the size of the epidermis cells of the leaf in the two collections (Fig. 1F, G.) The cells of the tetraploid plant are only slightly larger. Table I lists the chromosome numbers reported for the genus *Codonanthe* and also presents a few new counts.

The type locality of *Codonanthe luteola* is the region of Cerro Jefe in the Province of Panama. This cloud forest and sub-cloud forest area is rich in Gesneriaceae, but apparently no other member of *Codonanthe* has been found there, judging from the herbarium collections at MO, F, and US, and from my own field work. This apparent isolation of the new species is noteworthy because the other three *Codonanthe* species in Panama are now known to be sympatric in at least several areas. Both *C. crassifolia* and *C. uleana* occur on Barro Colorado Island, *C. macradenia* and *C. uleana* are found in close proximity along the Santa Rita lumber road in the Province of Colón, and both *C. macradenia* and *C. crassifolia* grow on trees of the banks of Rio Guancho, near Portobelo in the same province.

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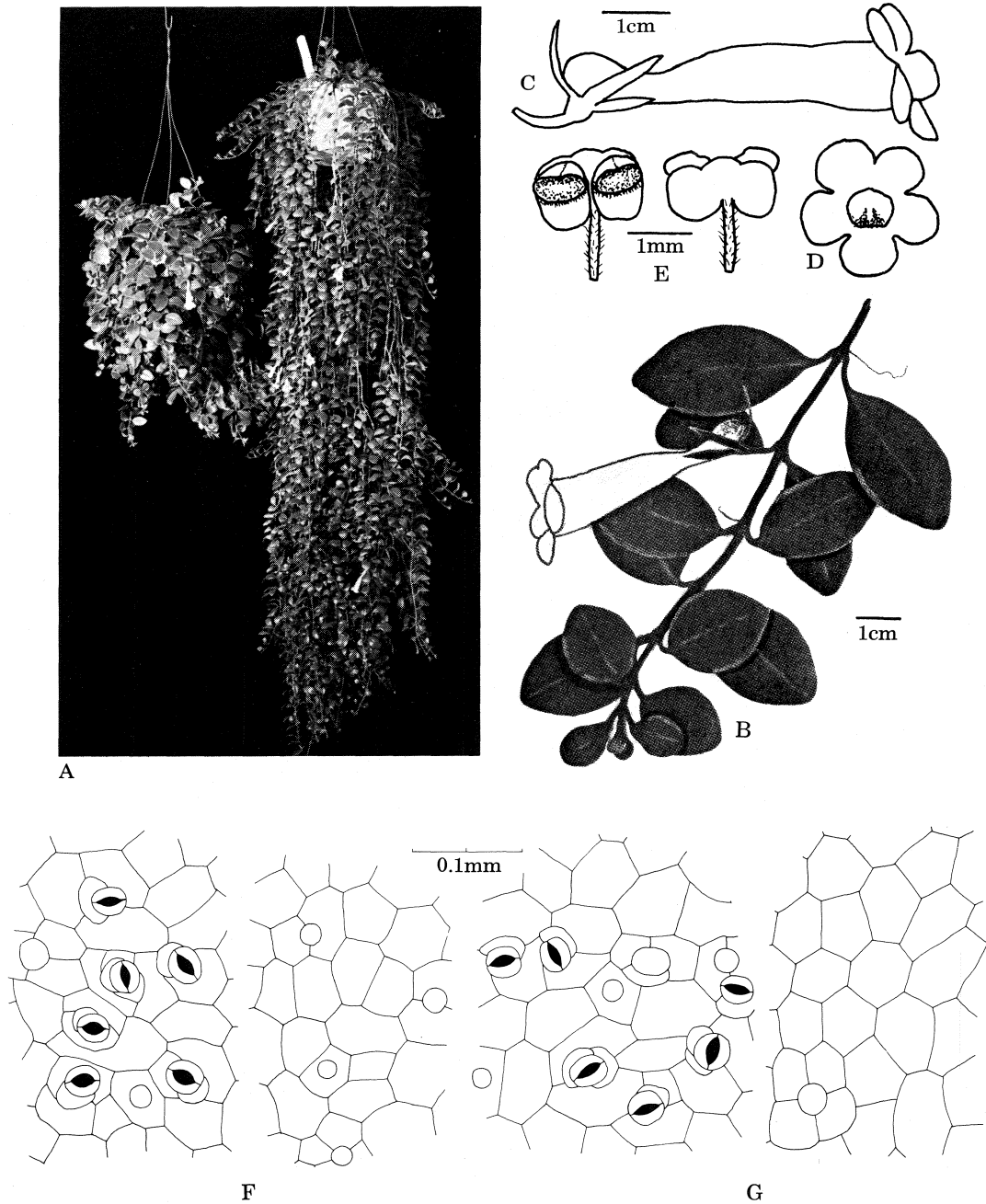


Fig. 1. *Codonanthe luteola*, (B-E, tetraploid form). A, diploid plant (right; SEL greenhouse acc. no. W-1183) and tetraploid plant (left; acc. no. W-1630) in hanging baskets, photo by Richard Kent; B, xerograph of branch with flower,  $\frac{2}{3}$  nat. size, some lines retouched; C, flower; D, frontal view of corolla limb; E, anthers, dorsal (right) and ventral (left) views; F and G, epidermis of the leaf, adaxial side (right) and abaxial side with stomata (left); F, diploid form; G, tetraploid form.

**Codonanthe luteola** Wiehler, sp. nov. (Figure 1.)

Herba perennis, epiphytica; caules graciles, repentes, scandentes vel pendentes, 1 m longi vel longiores, 1-2 mm diametro, parce ramosi, internodiis 1-2.5 cm longis, primo atrovinosis, brunneo-vinosis vel viridibus, denu ravis, puberulis. Folia opposito-decussata, aequalia, parce puberula, sub oculis glabra, petioli 8-10 mm longi, laminae obovatae, apice obtuso, margine integro, basi cuneata vel attenuata, 3-3.5 cm longae, 1.5-1.9 cm latae, venis lateralibus primariis invisibilibus, coriaceae, succulentae, supra atrovirentes, subtus pallide virides vel roseo-suffusae. Florescentia cyma axillaris redacta, floribus 1-2, pedunculo destituto, prophylla minuta, 0.5 mm longa lataque, pedicelli 7-12 mm longi, virides vel vinacei, puberuli; calyx vinaceus vel flavovirens puberulus, lobis subaequalibus, e basi discretis, lanceolato-subulatis, integris, 9-11 mm longis, 1.5 mm latis; corolla obliqua, tubaeformis, luteola, puberula, 36-42 mm longa, calcar 5 mm longum, constricta supra basim ad 3 mm diametro, faucem versus ampliata, sub limbo 8-9 mm diametro, leviter ventricosa, limbus obliquus, 15-17 mm diametro, lobi 5, subaequales, 5-6 mm longi et lati, calcari externo et fauce interna rubro-notata; stamina 4, inclusa, filamentis 20-24 mm longis, basi cum tubo corallae adnatis, parce pubescentibus, connectivis latis, antheris per paria cohaerentibus, loculis parallelis, apicem versus foramine parvo dehiscentibus; ovarium 4.5 mm longum, luteolum, vinaceo-notatum, puberulum, stylo 16-18 mm longo, albo, vinaceo-suffuso, piloso, stigmatate stomatomorpho; nectarium glandula dorsalis, duplo-connata, 2.3 mm longa, 2 mm lata, alba, vinaceo-notata, glabra. Fructus maturus ignotus. Chromosomata collectionis typi  $n = 8$ .

The description is based on live material of the diploid collection, *Wiehler & Dressler 71184*; the tetraploid form, *Wiehler & Dressler 71185*, has a larger lamina, 3.5-5.3 cm long, 2.2-2.7 cm broad, and a larger corolla, 45-50 mm long, the limb 20 mm in diameter.

**TYPE:** PANAMA: PANAMA: Cerro Jefe, ca. 20 km N of Tocumen airport. Humid sub-cloud forest, elevation ca. 800 m. "Epiphyte on tree in swampy area, near road to orchidarium. More plants on taller trees nearby. Lvs. dark grey-green above, paler below, with a pink flush, petioles, young stems, and pedicels reddish. Calyx light green, some lobes pink-flushed. Corolla light yellow, spur with irregular red spots, nectar-guide inside pink-red." 11 Aug. 1971, *H. Wiehler & R. L. Dressler 71184* (HOLOTYPE: US; ISOTYPES: PAN, SEL, MO, NY, GH, F, UC, K, P, B).

**DISTRIBUTION:** Apparently endemic to Panama, known only from two sub-cloud forest localities NE of Panama City.

**ADDITIONAL MATERIAL EXAMINED:** PANAMA: PANAMA: La Eneida, region of Cerro Jefe, 30 March 1968, *R. L. Dressler 3471* (SEL); from type locality, two trees, or 5 m away from the diploid type collection, 11 Aug. 1971, *H. Wiehler & R. L. Dressler 71185* (SEL; = tetraploid form,  $n = 16$ ); Cerro Jefe, between orchidarium and Finca de Don Pedro Riviera, 19 May 1972, *H. Wiehler & R. L. Dressler 72277* (SEL, US, MO); El Llano-Cartí highway, about 20 km N of El Llano, 8 March 1974, *R. L. Dressler 4633* (SEL).

KEY TO THE SPECIES OF *Codonanthe* IN PANAMA

1. Anther cells with horned pores; calyx lobes with decurrent keels; stems ascending, non-repent; leaves usually serrate; (the sinuses of the calyx lobes not

- marked by red dots; corolla white, 38-42 mm long, without ventral grooves) ..... *C. uleana*
1. Anther cells with unadorned pores, the horns absent; calyx lobes without keels; stems repent, scandent, or pendent; leaves usually entire.
    2. Corolla with 2 prominent ventral grooves, the white tube arched dorsally, 20-35 mm long; (the sinuses of the calyx lobes red-dotted) ..... *C. macradenia*
    2. Corolla without ventral grooves, the dorsal side of the tube  $\pm$  straight.
      3. Sinuses of the calyx lobes with red dots; corolla white, 15-28 mm long, the limb 7-12 mm in diameter ..... *C. crassifolia*
      3. Sinuses of the calyx lobes unadorned; corolla yellow, 36-50 mm long, the limb 15-20 mm in diameter ..... *C. luteola*

#### COMMENTS ON CONFUSION OF SPECIES OF *Codonanthe*

The species of *Codonanthe* are easily differentiated by their diverse flowers in living or pickled material, but the distinguishing features are often hard to discern from pressed and dried specimens. The result has been some confusion in the determination of herbarium material and a subsequent misjudgment concerning the validity of some of the species. *Codonanthe macradenia* was reduced to the synonymy of *C. crassifolia* (Morton, 1938, p. 1159); the first published illustration and detailed English description of *C. macradenia* (based on living material) was under the title of *C. crassifolia*, (Moore, 1957, p. 208); and *C. decurrens* (= *C. uleana*) was recently placed into synonymy under *C. macradenia* (Moore, 1973, p. 21).

The confusion about *C. macradenia* and *C. crassifolia* has been resolved, and these comments deal in part with the mix-up of *C. macradenia* and *C. decurrens*. An examination of the holotype of *C. decurrens* from Guatemala, *von Tuerckheim 7645* (US), reveals the presence of two horns at the pore of each anther cell, a feature absent from the anthers of the holotype of *C. macradenia* from Costa Rica, *A. Tonduz 6769* (US), and in all other collections of *C. macradenia*. The horns are also clearly evident in the other collections cited by Johnston in his description of *C. decurrens*, and in other collections of this species from Panama, Costa Rica, Honduras, Guatemala, Mexico, and from the Provinces of Chocó, El Valle, and Cauca in Colombia; these distinct horns are also present on the anthers in the live collection at SEL, from the Santa Rita lumber road, Colón, Panama, *Wiehler & Dressler 71300*. The keels on the calyx lobes are not as evident in pressed as in live material, but they are discernible. The key above expresses the remaining differences between *C. decurrens* (= *C. uleana* in key) and *C. macradenia*.

From a comparison of live and type material of both *C. decurrens* and *C. uleana* one can only conclude that the two species are conspecific. An isotype of *C. uleana* from Amazonas, Brazil, *E. Ule 5617* (HBG), is currently on loan at SEL, and this sheet is herewith designated as the lectotype of *C. uleana*, since the holotype was destroyed at Berlin. The fine illustration of *C. uleana* in Bailey (Moore, 1973, p. 23), based on a live collection from

TABLE I: CHROMOSOME NUMBERS IN *Codonanthe*

Species	Accession Number at BH or SEL	Voucher Specimen at	Origin of Collection	n
1. <i>C. calcarata</i> (Miq.) Hanst.	W-1823	SEL	Bolivar, Venezuela Wiehler, Steyermark & Wurdack 72441	16 Wiehler
2. <i>C. caribaea</i> Urb. (as <i>C. triplinervia</i> Britt.)	G-976	BH	Trinidad H. Teuscher s.n.	8 Lee (1966)
3. <i>C. caribaea</i>	W-1810	SEL	Sucre, Venezuela Wiehler & Steyermark 72450	8 Wiehler
4. <i>C. crassifolia</i> (Focke) Morton	G-621	SEL	Nicaragua G. S. Bunting s.n.	16 Wiehler
5. <i>C. crassifolia</i>	G-928	SEL	Iquitos, Peru R. L. Dressler s.n.	16 Wiehler
6. <i>C. crassifolia</i>	G-929	SEL	Iquitos, Peru R. L. Dressler s.n.	16 Wiehler
7. <i>C. crassifolia</i>	W-1185	SEL	Tena, Ecuador Wiehler & Diehl 71123	16 Wiehler
8. <i>C. crassifolia</i>	W-1992	SEL	Cañitas, Panama Dressler s.n. 1974	16 Wiehler
9. <i>C. crassifolia</i>	W-2028	SEL	Rio Dulce, Guatemala H. Wiehler 7548	16 Wiehler
10. <i>C. devosiana</i> Lem.	W-1719	SEL	Hort. Edinburgh acc. no. C-5463	8 Wiehler
11. <i>C. ?gracilis</i>	W-1139	SEL	Hort.	8 Wiehler
12. <i>C. luteola</i> Wiehler	W-1183	SEL	Cerro Jefe, Panama Wiehler & Dressler 71184	8 Wiehler
13. <i>C. luteola</i>	W-1630	SEL	Cerro Jefe, Panama Wiehler & Dressler 71185	16 Wiehler
14. <i>C. macradenia</i> Donn-Sm. (as <i>C. crassifolia</i> )	C-70	BH	C. Z., Panama R. G. Wilson s.n.	16 Fussell (1958)
15. <i>C. macradenia</i>	G-357	BH	Costa Rica C. K. Horich s.n.	16 Lee & Gear (1963)
16. <i>C. macradenia</i>	W-1186	SEL	Rio Guanche, Panama Wiehler & Dressler 71154	16 Wiehler
17. <i>C. macradenia</i>	W-1187	SEL	Santa Rita, Panama Wiehler & Dressler 71220	16 Wiehler
18. <i>C. macradenia</i>	W-1677	SEL	Santa Rita, Panama Wiehler & Dressler 72265	16 Wiehler
19. <i>C. picta</i> Lem.	W-1720	SEL	Hort. Edinburgh acc. no. C-4334	16 Wiehler
20. <i>C. uleana</i> Fritsch	G-936	BH	Peru R. W. Read s.n.	16 Lee (1967, unpublished data)
21. <i>C. uleana</i> (as <i>C. decurrens</i> Johnston)	Morley 418	K	Costa Rica	16 Morley (1967)
22. <i>C. uleana</i>	W-1182	SEL	Santa Rita, Panama Wiehler & Dressler 71300	16 Wiehler
23. <i>C. species</i>	G-932	BH, SEL	Iquitos, Peru R. L. Dressler s.n.	16 Lee, 1967 (unpublished data) 16 Wiehler

Peru (*R. W. Read s.n.*, ca. 1966, BH acc. no. G-936, also present at SEL), agrees fully with the live collections from Panama, *Wiehler & Dressler 71300*. There is also no gap between the geographical distribution of *C. uleana* and *C. decurrens*, since the species occurs under the first name in the Putomayo area of Colombia, and under the second name in the Cauca region of the same country. In summary, *Codonanthe decurrens* is a rather distinct species in Panama. It bears no particular close relationship to *C. macradenia*, but needs to be placed into synonymy under *C. uleana*.

*Codonanthe uleana* Fritsch, Bot. Jahrb. Syst. 37:492. 1906.

*Codonanthe decurrens* Johnston, Sargentia 8:275. 1949.

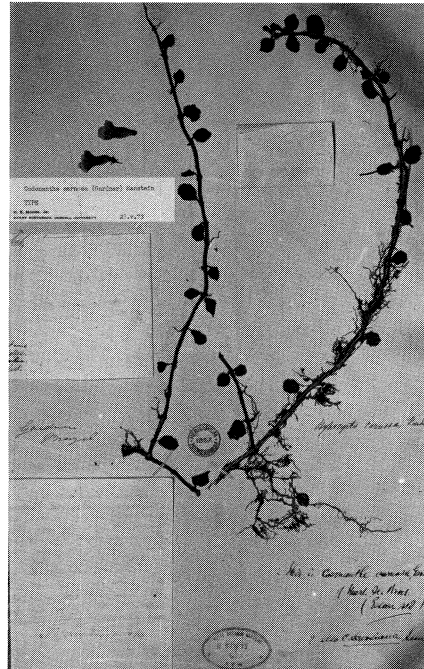
*Columnnea calcarata* Donn.-Sm., Bot. Gaz. (Crawfordsville) 33:254. 1902;  
non *Codonanthe calcarata* (both synonyms are based on the same type,  
von Tuerckheim 7645).

DISTRIBUTION: The upper Amazon basin in Bolivia, Peru, Brazil, Colombia, and from there north to southern Mexico.

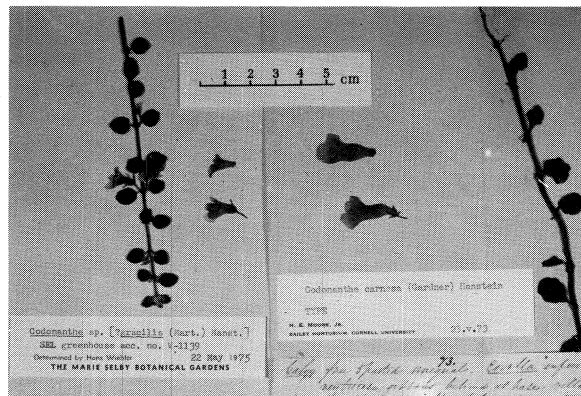
Another confusion concerns the holotype of *Codonanthe carnosa* (Gardner) Hanst. from Brazil, *Gardner 73* (K) and live material now in cultivation in North America which is shown in four photographs in Moore's recent treatment of *Codonanthe* (Moore, 1973, p. 14-15). These photos are subtitled "*Codonanthe carnosa*," but the material they represent and the holotype of *C. carnosa* at Kew are definitely two different species. The leaves of both collections are similar in size, shape, and indumentum, but in Gardner's type the stems are much more robust and thicker in diameter (2.5 mm versus 1 mm in mature stems of the cultivated material); the corolla is twice as large and of a different shape in Gardner's collection (23 mm versus 12 mm, see Fig. 2), and, most significantly, the anther cells of the holotype are completely white, but violet-banded in the cultivated material. The red-violet color does not change when the corollas are pickled, or pressed and dried.

Gardner's unpublished description of the corolla, pasted as a note in his own handwriting on the type sheet, is more explicit than the text he published in the London Journal of Botany (1:178. 1842). The note reads, in part: "Corolla inferior, oblique, tube ventricose, gibbose behind at base, villous within - limb spreading, unequally 5-lobed. Segments rounded, the two posterior smaller than the three anteriors." These ventricose and gibbous characteristics of the corolla can be seen in the loose pressed flowers of the type, but these same features are almost completely absent in the cultivated material, as can be seen in the Bailey photographs and in Fig. 2B.

The handwritten note on the holo- and isotype at Kew reveals further that Gardner found his species in September of 1837 "on the upper part of the trunk of a giant of the forest which has been recently felled, at the head of the valley of Rio Comprido," in the dense forests of Mount Corcovado (Minas Gerais, about 125 km NNE of Rio de Janeiro). The material in cultivation in North America is of unknown origin. According to Mrs. Frances Batcheller of Durham, New Hampshire (personal communication in 1971), the first plants were grown from mixed gesneriad seed of an unknown source by Mr. David Allen of San Francisco; cuttings of these plants were sent to Mrs. Batcheller around 1970 who then distributed this horticulturally interesting species to members of the two gesneriad societies in North America. It is now offered in commercial catalogues. I have grown this species since 1971.



A



B

Fig. 2. Herbarium specimens of two species of *Codonanthe*. A, Holotype of *C. carnosa* (Gardner) Hanstein, *G. Gardner* 73 (K); B, detail of the same holotype of *C. carnosa* (right), compared with material now in cultivation, erroneously labelled "*C. carnosa*" in Bailey 19(1):14-15, 1973 (left; dried specimen from SEL greenhouse plant, acc.no. W-1139). Notice the difference in size and shape of the flowers of the two species.

Moore's (1973) circumscription of *Codonanthe carnosa* is based on the plant material now in cultivation which does not agree with the holotype. The plants in cultivation under the name of *Codonanthe carnosa* and the holotype of *C. carnosa* are different species, and the difference lies in corolla and stamen characters. Such features as the size and shape of the corolla and particularly any specialization of the anthers (in this case red-violet

banding) are essential characters in the classification of the species of *Codonanthe*. Indications are that speciation in this genus and other members of the neotropical Gesneriaceae is based on changes of these very features (Wiehler, 1975b).

The true *Codonanthe carnososa* is not yet in cultivation in North America, and the name of the material now eagerly cultivated and labelled *C. carnososa* can only be determined after an examination of the type of *C. gracilis* (Mart.) Hanst. which, according to Martius' description, has rose-red anthers ("antheris . . . roseis"). Whether the species placed by Moore into synonymy under *C. carnososa* are actually conspecific can probably only be determined by matching lots of different live material from Brazil with the types and old illustrations. *Orobanche carnososa* Vell., for instance, has the stamens exerted from the corolla, a fact mentioned in the scanty description and shown in the rather crude type-illustration nicely reproduced in Moore's article on page 12. The stamens in the holotype of *Codonanthe carnososa* are included. There is now another *Codonanthe* species in cultivation which looks superficially somewhat like the material determined by Moore as *C. carnososa*, but which is nevertheless quite distinct (anther cells white, but the corolla dissimilar to that of the true *C. carnososa*). This species has been labelled provisionally as *C. devosiana* Lem. in the greenhouses of SEL. Another Brazilian *Codonanthe* species cultivated at SEL is provisionally labelled *C. picta* Lem. The anther cells in this attractive and large-flowered species are white, and the stems are thin and pendent, just as in Lemaire's type illustration. Moore and other workers before him have placed *C. picta* in the synonymy of *C. gracilis*, which according to the type description has upright and thicker stems and reddish anther cells.

There appears to be a great proliferation of *Codonanthe* species in south-eastern Brazil. The Marie Selby Botanical Gardens will make an effort to bring these horticulturally worthwhile epiphytes into cultivation, as well as observe them and their pollinators in their natural habitats. This appears to us the best way to solve the taxonomic problems in this fascinating genus.

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