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HOW MANY ORCHID SPECIES IN COSTA RICA? A REVIEW OF THE LATEST DISCOVERIES

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ABSTRACT. Abstract. Despite its well-established tradition in botanical exploration, which started in 1846 with the visit of Oersted (1846), Costa Rica is still far from having a complete inventory of its orchidaceous flora. After the publication of the most recent and complete treatment of the family by Dressler in 2003, new species and records have been added on a regular basis to the country's inventory. Showy, large-flowered species in previously monographed and botanically well-sampled genera such as *Brassia*, *Dracula*, *Lycaste*, *Polycycnis*, *Stanhopea*, and *Trichopilia* have been described, but the vast majority of species are small-flowered and belong to the subtribes Laeliinae, Pleurothallidinae, and Zygopetalinae. Identifying taxa with ephemeral flowers such as *Sobralia* is problematic, but a large living collection revealed many new species. Previously described species from other countries have regularly been recorded in Costa Rica. These new records have floristic affinities mainly with the floras of Panama, Colombia, Ecuador, and Venezuela. As an example, *Acianthera aberrans*, *Epidendrum scharfii*, *Epidendrum stellidiforme*, *Lockhartia chocoensis*, *Maxillaria bolivarensis*, *Ornithidium pendulum*, *Ornithocephalus montealegrae*, and *Warmingia zamorana* have been found in both Costa Rica and Ecuador. The genus *Uleiorchis* with the Venezuelan species *Uleiorchis ulaei*, identified in the MO herbarium by Ron Liesner, constitutes an interesting new record in Costa Rica. *Maxillaria appendiculoides*, first described from Costa Rica, has recently been reported from Ecuador. *Campylocentrum tenellum*, *Lepanthes droseroides*, *Lepanthes mariposa*, and *Sobralia bouchei* from Panama were also lately collected in Costa Rica. Although much floristic work remains to be completed and the country has significant areas that are poorly sampled, the establishment of large and documented collections of living plants at Lankester Botanical Garden, associated with an increasing access to critical documentation (types and literature), have been the keys to improving our understanding of orchid diversity in Costa Rica and its floristic relationships with other areas.

Resumen. A pesar de su bien establecida tradición en exploración botánica, la cual comenzó en 1846 con la visita de Oersted (1846), Costa Rica está todavía lejos de tener un inventario completo de su flora de orquídeas. Después de la publicación del tratamiento más reciente y completo de la familia por Dressler (2003) nuevas especies y registros han sido añadidos regularmente al inventario del país. Especies llamativas, de flores grandes han sido descritas en géneros previamente monografiados y botánicamente bien muestreados, tales como: *Brassia*, *Dracula*, *Lycaste*, *Polycycnis*, *Stanhopea*, y *Trichopilia*, pero la gran mayoría de especies son plantas de flores pequeñas que pertenecen a las subtribus Laeliinae, Pleurothallidinae, y Zygopetalinae. Las flores efímeras, como *Sobralia* tienen problemas especiales con su identificación pero una colección viva, grande, revela muchas nuevas especies. Las especies previamente descritas de otros países han sido registradas en Costa Rica con regularidad. Estos nuevos registros tienen afinidades florísticas principalmente con la flora de Panamá, Colombia, Ecuador, y Venezuela. Por ejemplo, *Acianthera aberrans*, *Epidendrum scharfii*, *Epidendrum stellidiforme*, *Lockhartia chocoensis*, *Maxillaria bolivarensis*, *Ornithidium pendulum*, *Ornithocephalus montealegrae*, y *Warmingia zamorana* han sido encontradas tanto en Costa Rica como en Ecuador. El género *Uleiorchis* con la especie venezolana *Uleiorchis liesneri*, identificado en el herbario MO por Ron Liesner, constituye un nuevo registro interesante en Costa Rica. También, *Maxillaria appendiculoides* descrita de Costa Rica, ha sido registrada recientemente en Ecuador. *Campylocentrum tenellum*, *Lepanthes droseroides*, *Lepanthes mariposa*, y *Sobralia bouchei* de Panamá también fueron colectadas recientemente en Costa Rica. Aunque mucho trabajo florístico queda por ser completado y el país tiene áreas significativas que

están mal muestreadas, el establecimiento de colecciones grandes y documentadas de plantas vivas en el Jardín Botánico Lankester, asociado con un acceso creciente a la documentación crítica (tipos y literatura), han sido la llave para el mejoramiento de nuestro entendimiento de la diversidad de orquídeas en Costa Rica y sus relaciones florísticas con otras áreas.

KEY WORDS: Orchidaceae, Costa Rica, novelties

Despite its well-established tradition in botanical exploration, which started in 1846 with the visit of Oersted (1846), Costa Rica is still far from having a complete inventory of its orchidaceous flora (Bogarín *et al.*, 2008). During the second half of the 19th century Hemsley (1883) and Reichenbach (1886) published the first inventories for the orchids of Mesoamerica. Later, Schlechter (1918), Ames (in Standley, 1937), and Williams (1956) updated the species' list for Central America. The need for an up-to-date checklist of the Orchidaceae in Costa Rica was filled in part by Mora-Retana and García (1992), Pupulin (2002), and Dressler (1993; 2003). More recently, Ossenbach *et al.* (2007) published a checklist of the orchids of Costa Rica and Mesoamerica.

Throughout the history of documentation of the Orchidaceae in Costa Rica, more than three quarters of the species were named by botanists who deposited the material outside the country. Although botanical exploration began almost 150 years ago, the documentation of the orchid flora was developed sporadically by botanists during the past 15 decades. In the 19th century, Bateman, Lindley, Reichenbach, and Rolfe named the first species known for the country. Orchid research declined from 1860 to 1900 until Ames and Schlechter worked intensively on the Neotropical Orchidaceae (Fig. 1). However, the number of species named declined dramatically between 1950 and 1960, when less than 30 species were described for Costa Rica, contrasting with the decade of 1920 when nearly 300 of the species were named (Fig. 1). Even though there was botanical exploration in those years, the botanists never managed to document permanently the flora of Costa Rica. This was mainly attributable to the lack of critical materials to identify the species and also the fact that the literature was often published as a few copies that circulated only in developed countries.

The Global Taxonomy Initiative (GTI) of the Convention on Biological Diversity (CBD) pointed out a critical problem for effective conservation management that largely depends on taxonomic

knowledge: “the inadequate taxonomic information and infrastructure, coupled with declining taxonomic expertise.” Unfortunately, one of the main problems developing taxonomic expertise in tropical countries has been the lack of adequate information for species identification. The existence of this taxonomic impediment is the major problem to solve by global strategies such as GTI. With the establishment of Lankester Botanical Garden (LBG) in 1973 and other institutions such as Museo Nacional de Costa Rica and Instituto Nacional de Biodiversidad (INBio) there has been an increase in orchid research that has continued until the present. It has been demonstrated that LBG has played a major role in revealing orchid diversity through a well-developed taxonomic system (Fig. 1). The mission of LBG has been to eliminate the taxonomic impediment through gathering critical information and making it available for researchers and students.

Floristics and botanical exploration in Costa Rica are the basis for future research and conservation actions. New techniques for species identification using DNA sequences or DNA barcoding have been developed; however, a well-established taxonomic system is needed to solve the problem of incomplete floristic inventories and for developing new techniques that

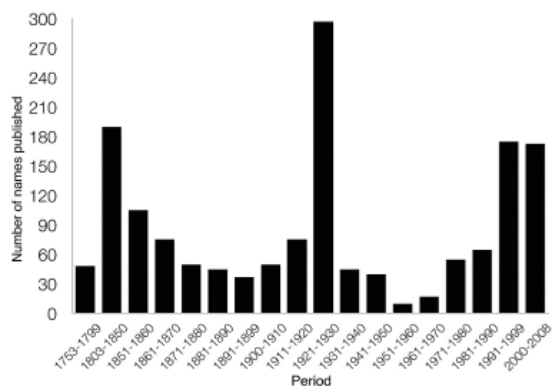


FIGURE 1. Comparison of the number of species of orchids described from Costa Rica at different periods.

will not work without an adequate taxonomic basis (Lahaye *et al.*, 2008). The aim of the present paper is to discuss the status of the Orchidaceae in Costa Rica, where new species are continuously being discovered.

A review of the latest discoveries

After the publication of the most complete treatment of the Orchidaceae from Costa Rica by Dressler (2003), new species and new records have been added on a regular basis to the country's orchid checklist. Ossenbach *et al.* (2007) estimated that 1461 orchid species occur in Costa Rica. After Ossenbach *et al.* (2007), 34 species were described as new to science and 24 species previously described outside Costa Rica were recorded for this country. The number now stands at 1519 species. A summary of the latest discoveries and a list of additional material of several species known from a single locality or specimen are provided in Table 1 with synonyms, authorities, and voucher information. Endemic species are annotated there with an asterisk.

Several species recorded by Ossenbach *et al.* (2007) are listed here with their respective voucher. Among the species cited, 29 are endemic to Costa Rica. There are 25 species found both in Costa Rica and Panama, and 14 shared with Ecuador. Some disjunctions are recorded, such as *Epidendrum stellidiforme* and *Warmingia zamorana*, which are known only from Costa Rica and Ecuador, but their presence in Panama and Colombia is highly probable (Bogarín *et al.*, 2008). Also, there are 16 species widespread from Costa Rica to South America and 10 ranging from Costa Rica to Nicaragua, Honduras, Guatemala or Mexico.

Subtribe Angraecinae: *Campylocentrum tenellum* Todzia is recorded for a first time in Costa Rica. Two specimens of *C. tenellum* from different localities in Costa Rica are known, but unfortunately in sterile condition. A recent fertile collection provided a proper recording of this species (Fig. 2a, 3c). An aphyllous species with flat roots was recorded from El Valle del General on the Pacific watershed of the Cordillera de Talamanca. Although *C. pachyrrhizum* (Rchb.f.) Rolfe is expected to occur in Costa Rica, the material collected indicates that it may correspond to an undescribed species. *Campylocentrum multiflorum* Schltr. is accepted and considered as distinct from *C.*

fasciola (Lindl.) Cogn. The name *C. tyrridion* Garay & Dunst. should be best applied to the species from Venezuela. The Costa Rican voucher of *C. dressleri* H.Dietr. & M.A.Díaz (*J. Villalobos s.n.* (USJ!)) clearly corresponds to *C. multiflorum* Schltr., so *C. dressleri* is excluded from Costa Rica (Bogarín and Pupulin, 2009).

Tribe Gastrodieae: An interesting record of the holomycotrophic orchid genus *Uleiorchis* is *U. ulaei* (Cogn.) Handro, which was recently identified by Ron Liesner at MO. The species had been recorded in Honduras, Panama, and South America.

Subtribe Goodyerinae: Studies published by Ormerod (2007, 2008) revealed a new species of *Aspidogyne*, *A. grayumii* Ormerod, known from the Estación Biológica Las Cruces in southern Costa Rica near Panama. A new *Kreodanthus*, *K. curvatus* Ormerod, is known from the northwest slope of Volcán Barva in the Central Cordillera and also from a collection in the Cordillera de Talamanca. It is compared with the Panamanian *K. bugabae* Ormerod. Two new species of *Microchilus* were also recorded — *M. maasii* Ormerod from the Monteverde region (also from central Panama) and *M. tessellatus* Ormerod, endemic to Costa Rica. The recently described *M. valverdei* Ormerod is now a synonym of *M. calophyllus* (Rchb.f.) Ormerod. Also, *Platythelys alajuelae* Ormerod is endemic to Costa Rica and known from the Cordillera de Tilarán and the Cordillera Central.

Subtribe Laeliinae: Preliminary results of a revision of *Encyclia* in Costa Rica yielded a new record: *Encyclia gravida* (Lindl.) Schltr. Plants of this species are usually recognized by having cleistogamous flowers. The number of new species and records is considerable in the large genus *Epidendrum*. The additions have been mainly published by Hágsater and co-workers (2004, 2006, 2008). The following new species have been described: *E. apatotylosum* Hágsater, *E. astro-selaginellum* Hágsater & E.Santiago, *E. bicuniculatum* Hágsater & E.Santiago, *E. isthmoides* Hágsater & E.Santiago (recorded recently; Fig. 6d), *E. xnocteburneum* Hágsater & L.Sánchez (a natural hybrid between *E. eburneum* Rchb.f. and *E. nocturnum* Jacq.), *E. philowercklei* Hágsater & E.Santiago, *E. salpichlamys* Hágsater & E.Santiago, *E. steno-*

TABLE 1. List of recent additions to the orchid flora of Costa Rica

Species	Voucher
1. <i>Acianthera aberrans</i> (Luer) Pupulin & Bogarín, Lankesteriana 8(2): 53-55. 2008.	Pupulin 4857, JBL
2. <i>Acianthera cabiriae</i> Pupulin, G.A.Rojas & J.D.Zuñiga, Harvard Pap. Bot. 12(1): 160. 2007. *	Karremans 1433, CR
3. <i>Acianthera fecunda</i> Pupulin, G.A.Rojas & J.D.Zuñiga, Harvard Pap. Bot. 12(1): 158. 2007. *	Bogarín 2650, CR
4. <i>Acianthera hamata</i> Pupulin & G.A.Rojas, Harvard Pap. Bot. 12(1): 156. 2007. *	Quesada Chanto s.n., CR
5. <i>Aspidogyne grayumii</i> Ormerod, Harvard Pap. Bot. 11(2): 147. 2007. *	Grayum 9267, MO
6. <i>Barbosella orbicularis</i> Luer, Selbyana 3(1,2): 10-11, f. 108. 1976.	Bogarín 1949, JBL
7. <i>Bensteinia ramonensis</i> Pupulin, Selbyana 28(2): 113. 2008. *	Bogarín 1923, CR
8. <i>Campylocentrum tenellum</i> Todzia, Ann. Missouri Bot. Gard. 72: 877. 1985.	Bogarín 5844, JBL
9. <i>Dichaea gomez-lauritoi</i> Pupulin, Harvard Pap. Bot. 12(1): 87. 2007. *	Gómez-Laurito 8174, CR
10. <i>Dryadella fuchsii</i> Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 76: 162-163. 1999.	Standley & Valerio 45606, AMES
11. <i>Echinosepala lappiformis</i> (A.H.Heller & L.O.Williams) Pridgeon & M.W.Chase Lindleyana 17(2): 101. 2002. <i>Pleurothallis lappiformis</i> A.H.Heller & L.O.Williams, Fieldiana, Bot. 31(2): 42, f. 8. 1964. <i>Myoxanthus lappiformis</i> (A.H.Heller & L.O.Williams) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 15: 38. 1986. <i>Brenesia lappiformis</i> (A.Heller & L.O.Williams) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 255. 2004. <i>Echinella lappiformis</i> (A.Heller & L.O.Williams) Pridgeon & M.W.Chase, Lindleyana 16(4): 253. 2001.	Dressler 6768, JBL
12. <i>Elleanthus ligularis</i> Dressler & Bogarín, Lankesteriana 7(3): 539. 2007.	Dressler 6836B, CR
13. <i>Encyclia gravida</i> (Lindl.) Schltr., Beih. Bot. Centralbl. 36(2): 472. 1918. <i>Epidendrum gravidum</i> Lindl., J. Hort. Soc. London 4: 114. 1849.	Pupulin 5377, JBL
14. <i>Epidendrum acroamparoanum</i> Hágsater & L.Sánchez S., Icon. Orchid. (Mexico) 8: t. 802. 2006. *	Morales 4737, MO
15. <i>Epidendrum atypicum</i> Hágsater & E. Santiago A., Icon. Orchid. (Mexico) 8: t. 810. 2006. *	Weber 6081, AMES
16. <i>Epidendrum angustilobum</i> Fawc. & Rendle, J. Bot. 47(556): 124-125. 1909. <i>Epidendrum latifolium</i> (Lindl.) Garay & H.R. Sweet, J. Arnold Arbor. 53(3): 392. 1972.	Moraga 312, INB
17. <i>Epidendrum apatotylosum</i> Hágsater, Icon. Orchid. 9: t. 909. 2007. *	Horich sub E. Hágsater 7117, INB
18. <i>Epidendrum arcuiflorum</i> Ames & C.Schweinf., Schedul. Orch. 10: 58-59. 1930. <i>Epidendrum powellii</i> Schltr., Repert. Spec. Nov. Regni Veg. Beih. 17: 38. 1922.	Herrera 3595, CR
19. <i>Epidendrum astroselaginellum</i> Hágsater & E.Santiago, Icon. Orchid. 9: t. 910. 2007.	Gómez 23814, MO
20. <i>Epidendrum bicuniculatum</i> Hágsater & E.Santiago, Icon. Orchid. 9: t. 913. 2007. *	Grayum & G. Herrera 7716, MO
21. <i>Epidendrum buenaventurae</i> F.Lehm. & Kränzl., Bot. Jahrb. Syst. 26(5): 470-471. 1899.	Gómez 19984, MO
22. <i>Epidendrum chalcochromum</i> Hágsater, Icon. Orchid. (Mexico) 8: t. 818. 2006. *	Hágsater & Mora de Retana 9495, INB

Species	Voucher
23. <i>Epidendrum cristatum</i> Ruiz & Pav., Syst. Veg. Fl. Peruv. Chil. 1: 243. 1798. <i>Epidendrum raniferum</i> Lindl., Gen. Sp. Orchid. Pl.109. 1831.	<i>Brade 1281</i> , AMES
24. <i>Epidendrum dolichoclamys</i> Hágsater & E.Santiago A., Icon. Orchid. (Mexico) 8: t. 829. 2006. *	<i>Chavarría 661</i> , INB
25. <i>Epidendrum gibbosum</i> L.O.Williams, Ann. Missouri Bot. Gard. 28(4): 420-421, pl. 21, 7-10. 1941. <i>Epidendrum acrostigma</i> Hágsater & García-Cruz, Icon. Orchid. 3: t. 301. 1999.	<i>Grayum 4578</i> , CR
26. <i>Epidendrum haberi</i> Hágsater & L.Sánchez S., Icon. Orchid. (Mexico) 8: t. 840. 2006. *	<i>Haber & Cruz 7245</i> , INB
27. <i>Epidendrum hawkesii</i> A.H.Heller, Phytologia 14(1): 2-4, t. 1. 1966.	<i>Horch sub Hágsater 7649</i> , AMO
28. <i>Epidendrum isthmoides</i> Hágsater & E.Santiago, Icon. Orchid. 11: t. 1133. 2008. *	<i>Bello 1516</i> , INB
29. <i>Epidendrum maduroi</i> Hágsater & García-Cruz, Icon. Orchid. (Mexico) 3: pl. 352. 1999.	<i>Bogarín 1465</i> , JBL
30. <i>Epidendrum microrigidiflorum</i> Hágsater, Icon. Orchid. (Mexico) 8: t. 853. 2006.	<i>Dressler 6259</i> , AMO
31. <i>Epidendrum nocteburneum</i> Hágsater & L.Sánchez, Icon. Orchid. 11: t. 1148. 2008.	<i>Weston 57 sub Rodríguez 1042</i> , USJ
32. <i>Epidendrum orthodontum</i> Hágsater & L.Sánchez, Icon. Orchid. 3: t. 361. 1999.	<i>Karremans 2255</i> , JBL
33. <i>Epidendrum pachyepalum</i> Hágsater & E.Santiago A., Icon. Orchid. (Mexico) 8: t. 865. 2006.	<i>Burger 8253</i> , F
34. <i>Epidendrum pendens</i> L.O.Williams, Ann. Missouri Bot. Gard. 28(4): 421-422, pl. 23. 1941.	<i>Haber & Cruz 7986</i> , CR
35. <i>Epidendrum philowercklei</i> Hágsater & E.Santiago A., Icon. Orchid. (Mexico) 8: t. 870. 2006.	<i>Fernández 677</i> , CR
36. <i>Epidendrum platystomoides</i> Hágsater & L.Sánchez S., Icon. Orchid. (Mexico) 8: t. 872. 2006. *	<i>Hágsater & Mora de Retana 9507</i> , AMO
37. <i>Epidendrum purpurascens</i> H.Focke, Tijdschr. Wis- Natuurk. Wetensch. Eerste Kl. Kon. Ned. Inst. Wetensch.) 4: 64-65. 1851. <i>Epidendrum glumibracteum</i> Rchb.f., Hamburger Garten- Blumenzeitung 19: 11. 1863.	<i>Valerio 1017</i> , CR
38. <i>Epidendrum rousseauae</i> Schltr., Beih. Bot. Centralbl., Abt. 2 36(2): 407-408. 1918.	<i>Todzia 552</i> , CR
39. <i>Epidendrum salpichlamys</i> Hágsater & E.Santiago A., Icon. Orchid. (Mexico) 8: t. 883. 2006. *	<i>Grayum & Pam Sleeper 3446</i> , MO
40. <i>Epidendrum scharfii</i> Hágsater & Dodson, Icon. Orchid. 2: t. 185. 1993.	<i>Pupulin 6500</i> , JBL
41. <i>Epidendrum serruliferum</i> Schltr., Repert. Spec. Nov. Regni Veg. Beih. 19: 44. 1923. *	<i>Wercklé 114</i> , B, destroyed; drawing of type, AMES
42. <i>Epidendrum stellidiforme</i> Hágsater & Dodson, Icon. Orchid. (Mexico) 4: t. 487. 2001.	<i>Bogarín 2814</i> , JBL
43. <i>Epidendrum stenoselaginellum</i> Hágsater & E.Santiago, Icon. Orchid. 9: t. 991. 2007.	<i>Hágsater 11115</i> , AMO
44. <i>Epidendrum tritropianthum</i> Hágsater & E.Santiago A., Icon. Orchid. (Mexico) 9(6): t. 998. 2007.	<i>Ingram & Ferrell 743</i> , INB
45. <i>Epidendrum villotae</i> Hágsater & Dodson, Icon. Orchid. 3: pl. 398. 1999.	<i>Herrera 5151</i> , MO

Species	Voucher
46. <i>Epidendrum vulcanicola</i> A.H.Heller, Fieldiana, Bot. 32(2): 11, f. 2. 1968.	Alcázar 56, USJ
47. <i>Epidendrum vulgoamparouanum</i> Hágsater & L.Sánchez S., Icon. Orchid. (Mexico) 8: t. 898. 2006.	Hágsater 6963, INB
48. <i>Epidendrum zunigae</i> Hágsater, Karremans & Bogarín, Lankesteriana 8(2): 63. 2008. *	Bogarín 2680, JBL
49. <i>Gongora boracayanensis</i> Jenny, Dalström & W.E.Higgins, Selbyana 28(2): 99. 2007. *	Clark et al. 314 B, SEL
50. <i>Kefersteinia alata</i> Pupulin, Harvard Pap. Bot. 8(2): 161-164, f. 1, 2A-B. 2004.	Carman s.n., JBL
51. <i>Kefersteinia saccata</i> Pupulin, Willdenowia 38(1): 188. 2008. *	Pupulin 6549, CR
52. <i>Kreodanthus curvatus</i> Ormerod, Harvard Pap. Bot. 13(1): 61. 2008. *	Grayum 7481, MO
53. <i>Lepanthes droseroides</i> Luer, Lindleyana 2: 188. 1987.	Bogarín 5234, JBL
54. <i>Lepanthes gratiosa</i> Pupulin & D.Jiménez, Orchid Digest 73: 137-139. 2009. *	Pupulin 7350, CR
55. <i>Lepanthes machogaffensis</i> Pupulin & D. Jiménez, Orchid Digest 73: 139-140. 2009. *	Pupulin 7308, CR
56. <i>Lepanthes mariposa</i> Luer, Phytologia 55: 187. 1984.	Bogarín 5034, JBL
57. <i>Lepanthes pelvis</i> Pupulin & D.Jiménez, Orchid Digest 73: 142-144. 2009. *	Pupulin 7336, CR
58. <i>Lockhartia chocöensis</i> Kränzl. in H.G.A.Engler (ed.), Pflanzenr., IV, 50(83): 19. 1923.	Bogarín 2352, JBL
59. <i>Lycaste angelae</i> Oakeley, Lycaste, Ida, Anguloa 27. 2008.	Oakeley A5 (CR7), K-HFO
60. <i>Lycaste bruncana</i> Bogarín, Lankesteriana 7(3): 543. 2007. <i>Lycaste crystallina</i> Wubben ex Oakeley, Lycaste, Ida, Anguloa 73. 2008. *	Bogarín 3987, CR
61. <i>Lycaste x daniloi</i> Oakeley, Lycaste, Ida, Anguloa 76. 2008.	Oakeley 14 (CR14), K-HFO
62. <i>Lycaste panamanensis</i> (Fowlie) Oakeley, Orchid Digest 71: 205. 2007. <i>Lycaste macrophylla</i> subsp. <i>panamanensis</i> Fowlie, Lasca Leaves 14(1): 40, f. 1964.	see Oakeley (2008)
63. <i>Maxillaria bolivarensis</i> C.Schweinf., Bot. Mus. Leafl. 20: 22. 1962.	Whitten 2030, JBL
64. <i>Microchilus maasii</i> Ormerod, Harvard Pap. Bot. 11(2): 161. 2007.	Bello 2809, CR
65. <i>Microchilus tessellatus</i> Ormerod, Harvard Pap. Bot. 11(2): 172. 2007. *	Grayum 8925, MO
66. <i>Ornithidium pendulum</i> (Poepp. & Endl.) Cogn., Fl. Bras.3(6): 92. 1904.	Karremans 448, JBL
67. <i>Palmorchis nitida</i> Dressler, Die Orchidee 34(1): 29-30. 1983.	Gómez 26248, USJ
68. <i>Platythelys alajuelae</i> Ormerod, Harvard Pap. Bot. 11(2): 174. 2007. *	Ingram & Ferrell 680, MO
69. <i>Pleurothallis bogarinii</i> Pupulin & J.D.Zuñiga, Orchids 76 (Lindleyana): 690. 2007. *	Pupulin 5285, CR
70. <i>Pleurothallis caudatipetala</i> C.Schweinf., Bot. Mus. Leafl. 10: 175, t. 22, f. 5-8. 1942. <i>Specklinia caudatipetala</i> (C. Schweinf.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard.95: 259. 2004. <i>Panmorphia caudatipetala</i> (C. Schweinf.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard.105: 150. 2006.	Luer 12137, MO
71. <i>Pleurothallis duplooyi</i> Luer & Sayers, Revista Soc. Boliv. Bot.3(1/2): 48-50. 2001. <i>Specklinia duplooyi</i> (Luer & Sayers) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 260. 2004. <i>Panmorphia duplooyi</i> (Luer & Sayers) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 105: 153. 2006.	Bogarín 6955, JBL

Species	Voucher
72. <i>Pleurothallis minutalis</i> Lindl., Fol. Orchid. Pleurothallis 40. 1859. <i>Humboldtia minutalis</i> (Lindl.) Kuntze, Revis. Gen. Pl.2: 668. 1891. <i>Humboldtia minutalis</i> (Lindl.) Kuntze, Revis. Gen. Pl.2: 668. 1891. <i>Panmorphia minutalis</i> (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard.105: 167. 2006. <i>Specklinia minutalis</i> (Lindl.) Luer, Monogr. Syst. Bot. Missouri Bot. Gard. 95: 262. 2004. <i>Anathallis minutalis</i> (Lindl.) Pridgeon & M.W. Chase, Lindleyana 16(4): 249. 2001.	Endrés s.n., W
73. <i>Restrepia lueri</i> Pupulin & Bogarín, Willdenowia 37(1): 325. 2007. *	Bogarín 3009, CR
74. <i>Scaphyglottis robusta</i> B.R.Adams, Phytologia 64: 253. 1988.	Bogarín 2662, JBL
75. <i>Sobralia aspera</i> Dressler & Pupulin, Orquideología 25(2): 148. 2008. *	Dressler 6783, CR
76. <i>Sobralia blancoi</i> Dressler & Pupulin, Orquideología 25(2): 139. 2008. *	Dressler 6706, CR
77. <i>Sobralia bouchei</i> Ames & C.Schweinf., Schedul. Orchid. 10: 4. 1930.	Bogarín 4201, JBL
78. <i>Sobralia pendula</i> Dressler & Pupulin, Orquideología 25(2): 140. 2008. *	Dressler 6746, CR
79. <i>Sobralia rarae-avis</i> Dressler, Orquideología 25(1): 38. 2007. *	Dressler 6793, CR
80. <i>Trichopilia primulina</i> Dressler & Bogarín, Orchideen J. 16(2): 60. 2009. *	Dressler 7030, CR
81. <i>Uleiorchis ulaei</i> (Cogn.) Handro, Arq. Bot. Estado São Paulo 3(4): 175. 1958. <i>Wulfschlaegelia ulaei</i> Cogn., Fl. Bras. 3(4): 244. 1895.	Hammel 11657, MO
82. <i>Warmingia zamorana</i> Dodson, Icon. Pl. Trop., II, 6: t. 599. 1989. <i>Warmingia margaritacea</i> B.Johans., Lindleyana 7: 194. 1992.	Karremans 1123, JBL

selaginellum Hágsater & E.Santiago (from Nicaragua, Costa Rica, and Panama), and *E. zunigae* Hágsater, Karremans & Bogarín (Fig. 4g, 5d). The following new species were described by Hágsater *et al.* (2006) and recorded by Ossenbach *et al.* (2007): *Epidendrum acroamparoanum* Hágsater & L.Sánchez, *E. atypicum* Hágsater & E.Santiago, *E. chalcocchromum* Hágsater, *E. dolicho-chlamys* Hágsater & E.Santiago, *E. haberi* Hágsater & L.Sánchez, *E. microrigidiflorum* Hágsater, *E. pachytepalum* Hágsater & E. Santiago, *E. philowercklei* Hágsater & E. Santiago, *E. platystomoides* Hágsater & L.Sánchez, *E. salpichlamys* Hágsater & E.Santiago, *E. tritropianthum* Hágsater & E.Santiago, and *E. vulgoamparoanum* Hágsater & L.Sánchez (previously known as *E. amparoanum* Schltr., which is now treated as a synonym of *E. barbeyanum* Kränzl.). *Epidendrum microrigidiflorum*, *E. pachytepalum*, *E. philowercklei*, and *E. vulgoamparoanum* are found in both Costa Rica and Panama. New collections of previously described species have been added regularly: *E. buenaventurae* F.Lehm. & Kränzl., *E. scharfii* Hágsater & Dodson (Fig. 4f), *E. stellidiforme* Hágsater & Dodson (Fig. 4e, 5c), and *E. villotae* Hágsater & Dodson, all recorded previously from

Ecuador; *Epidendrum hawkesii* A.H.Heller and *E. vulcanicola* A.H.Heller from Nicaragua; and *E. maduroi* Hágsater & García-Cruz (Fig. 4d), *Epidendrum orthodontum* Hágsater & L.Sánchez (Fig. 5b), *E. pendens* L.O.Williams, and *E. rousseauae* Schltr. from Panama, which was formerly listed by Pupulin (2002). The following taxonomic changes affecting Costa Rican species have been noted by Hágsater (2008): *Epidendrum angustilobum* Fawc. & Rendle (= *E. latifolium* (Lindl.) Garay & H.R.Sweet), *E. arcuiflorum* Ames & C.Schweinf. (= *E. powellii* Schltr.), *E. cristatum* Ruiz & Pav. (= *E. raniferum* Lindl.), *E. gibbosum* L.O.Williams (= *E. acrostigma* Hágsater & García-Cruz), *E. purpurascens* H.Focke (= *E. glumibracteum* Rehb.f.), and the reconsidered *E. serruliferum* Schltr. Two new species and a new addition will be soon published by Pupulin and Karremans (unpublished). A collection of *Scaphyglottis robusta* B.R.Adams, previously described from Panama, has been documented in tropical wet premontane forest at an elevation of 1150 m in the Caribbean watershed of the Cordillera de Talamanca (Fig. 10b). Another specimen was collected in the region of Turrialba in the province of Cartago (Fig. 4j).

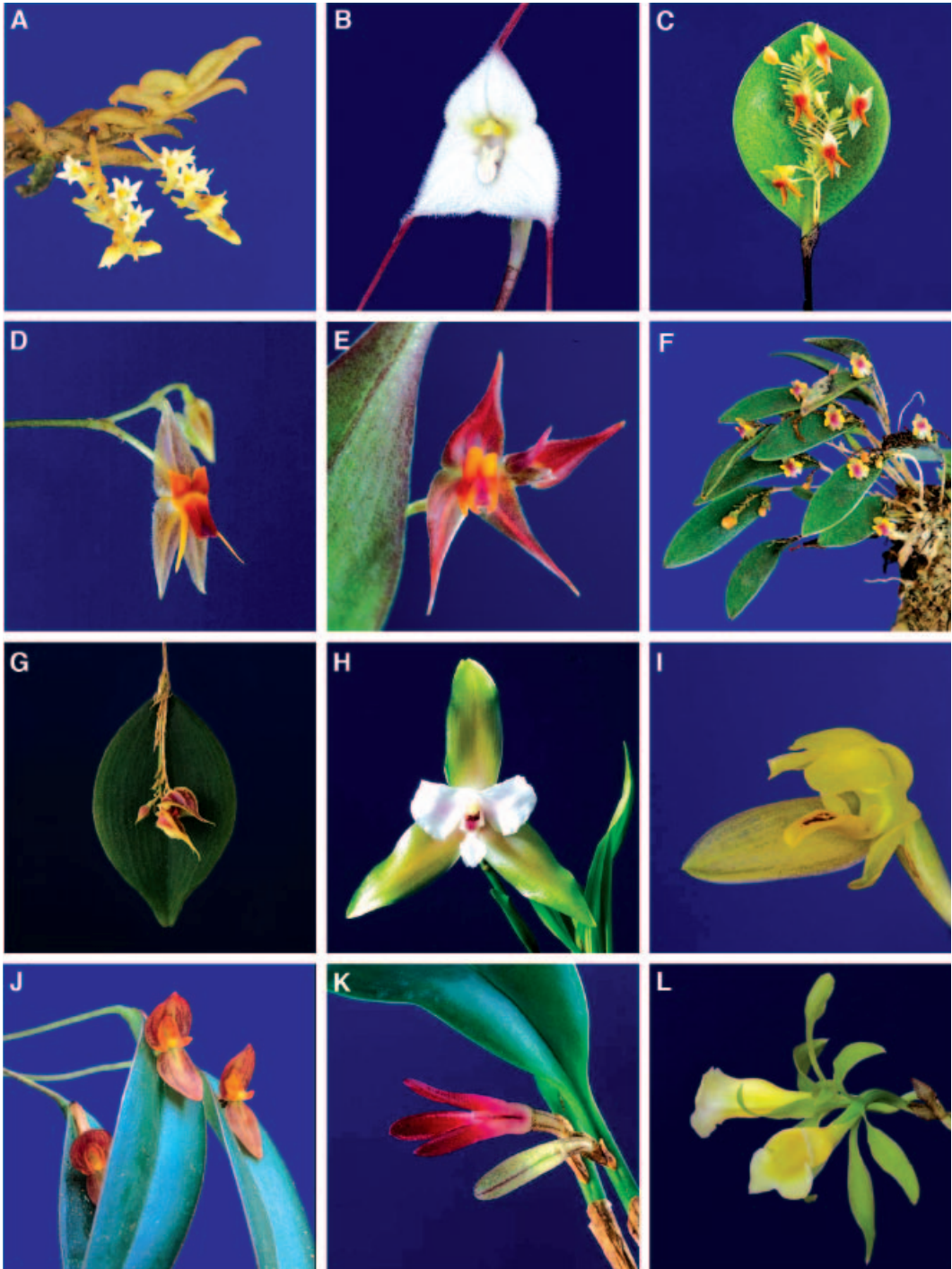


FIGURE 2. Photographs of: A. *Campylocentrum tenellum*; B. *Dracula maduroi*; C. *Lepanthes droseroides*; D. *Lepanthes gratiosa*; E. *Lepanthes machogaffensis*; F. *Lepanthes mariposa*; G. *Lepanthes pelvis*; H. *Lycaste bruncana*; I. *Mormolyca fumea*; J. *Pleurothallis bogarinii*; K. *Restrepiella lueri*; L. *Trichopilia primulina*. Photographs: A-C, F, I, K, L by Diego Bogarín; D, E, G by Franco Pupulin.

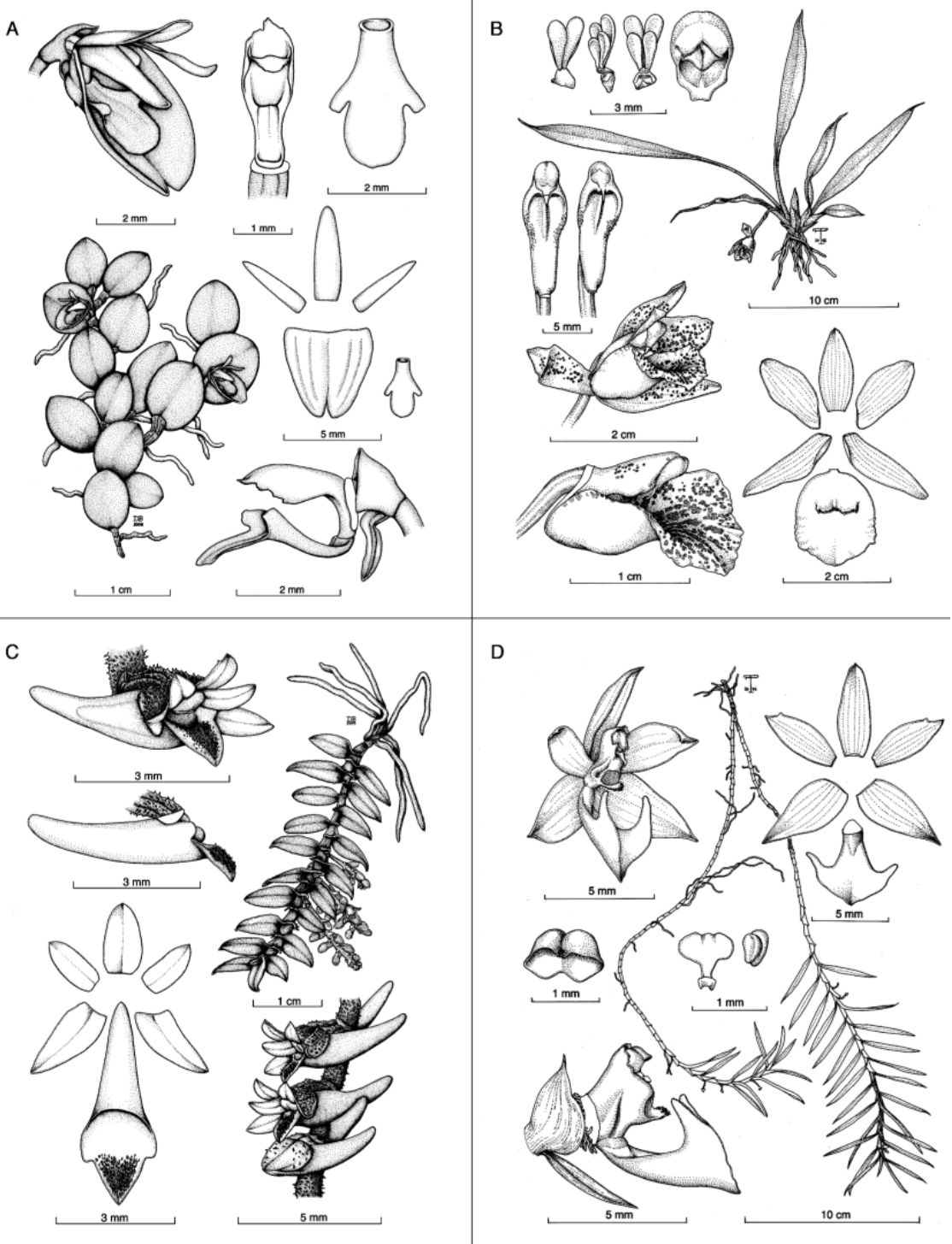


FIGURE 3. Drawings of: A. *Barbosella orbicularis*; B. \times *Bensteinia ramonensis*; C. *Campylocentrum tenellum*; D. *Dichaea gomez-lauritoi*. Drawings: A, C by Diego Bogarín; B, D by Franco Pupulin.

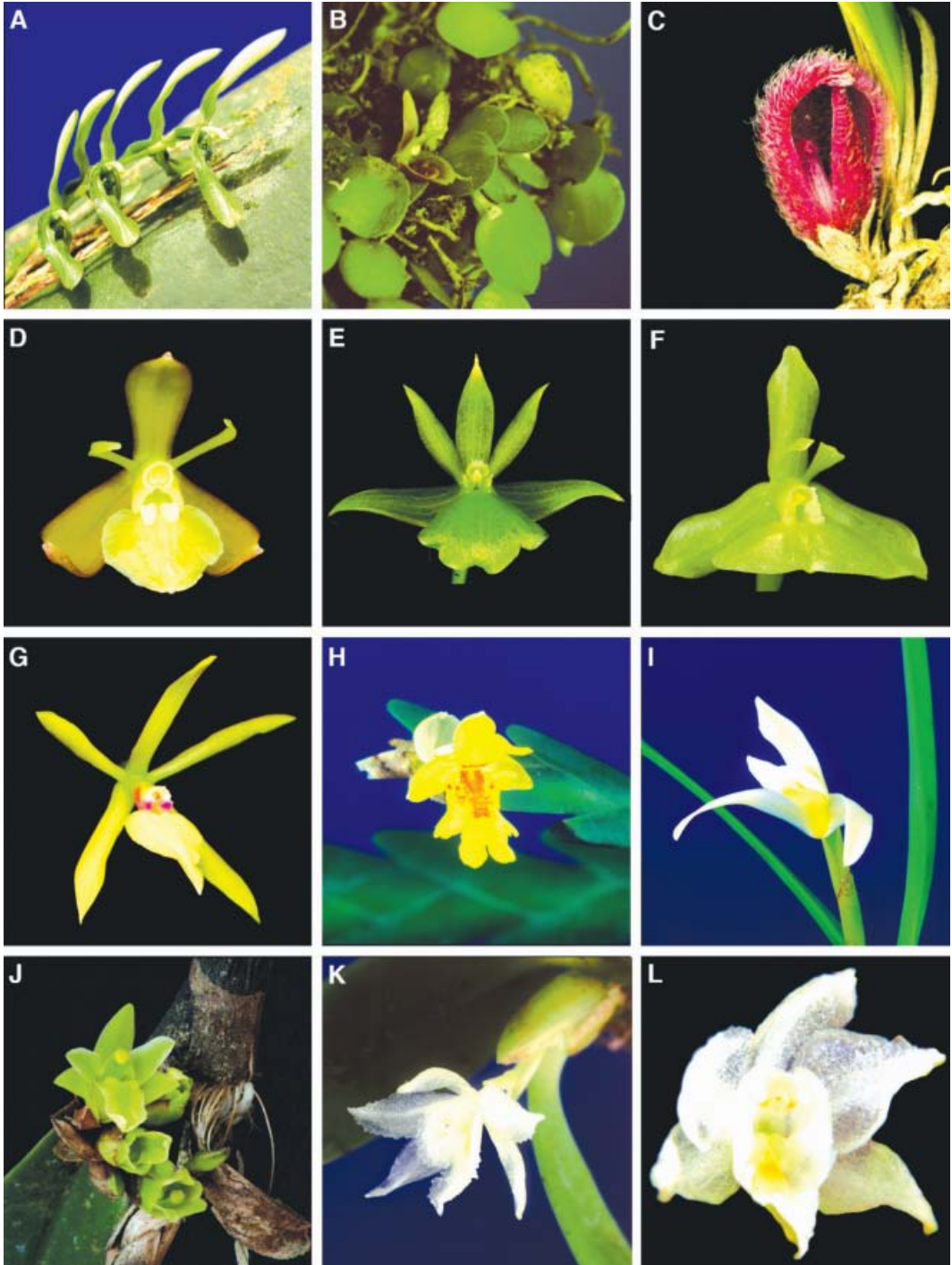


FIGURE 4. Photographs of: A. *Acianthera aberrans*; B. *Barbosella orbicularis*; C. *Brenesia lappiformis*; D. *Epidendrum maduroi*; E. *Epidendrum scharfii*; F. *Epidendrum stellidiforme*; G. *Epidendrum zunigae*; H. *Lockhartia chocoensis*; I. *Maxillaria bolivarensis*; J. *Scaphyglottis robusta*; K. *Warmingia zamorana* (Costa Rica); L. *Warmingia zamorana* (Ecuador); Photographs A, H, K by Franco Pupulin; B, I, J by Diego Bogarín; C-F courtesy of LBG; L courtesy of CIOA.

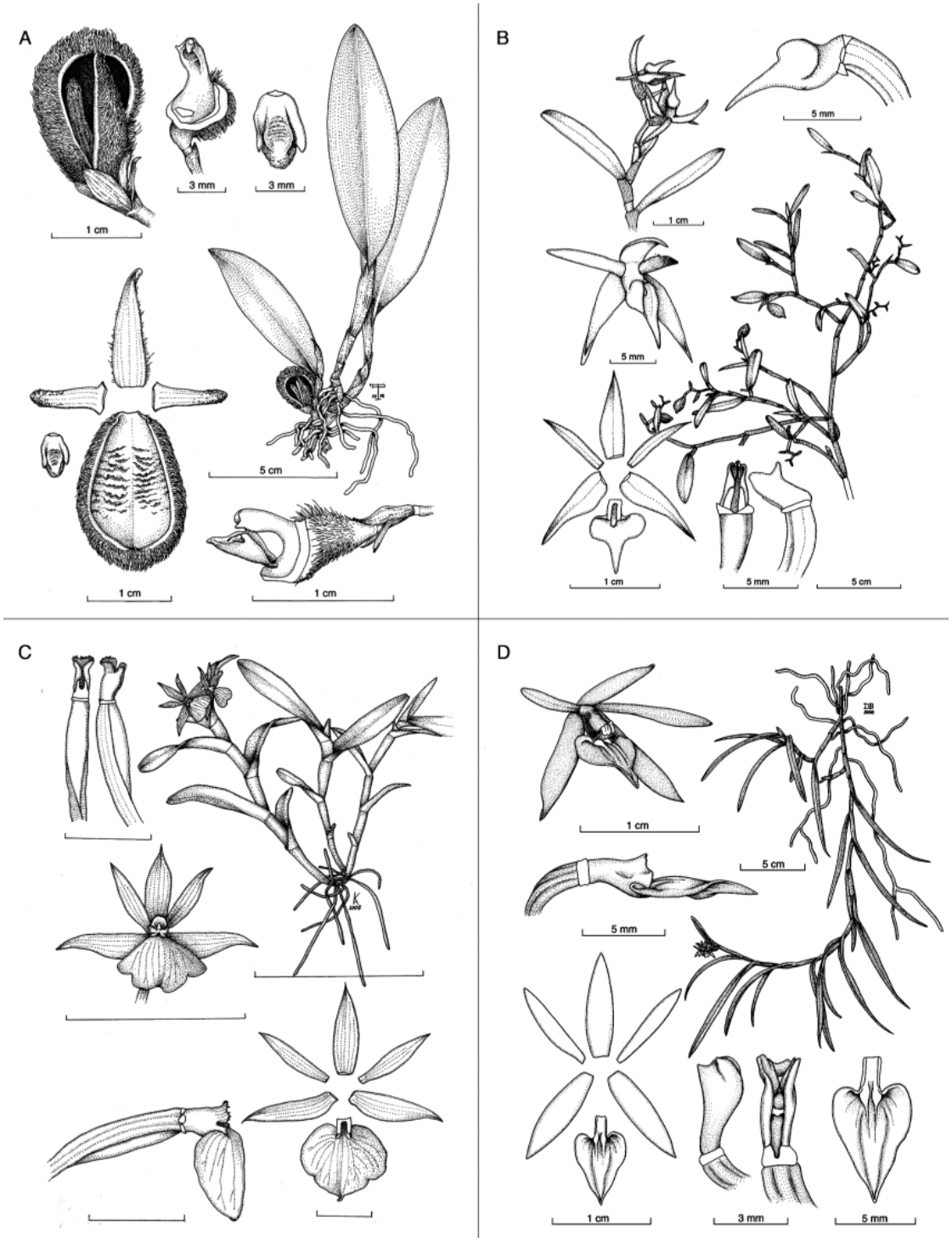


FIGURE 5. Drawings of: A. *Echinosepala lappiformis*; B. *Epidendrum orthodontum*; C. *Epidendrum stellidiforme*; D. *Epidendrum zunigae*. Drawings: A by Franco Pupulin, B, C by Adam Karremans, D by Diego Bogarín.

Subtribe Maxillariinae: The genus *Lycaste* underwent several changes and additions after studies by Bogarín (2007) and Oakeley (2008). A new species restricted to the Pacific watershed of the Talamanca range was described as *Lycaste bruncana* Bogarín (Fig. 2h). It is closely allied to *L. tricolor* Rchb.f. but differs mainly in the twisted column and the shape of the callus and pollinarium. Geographic isolation and molecular evidence also support the distinction between these two species. *Lycaste bruncana* is conspecific with the later-described *Lycaste crystallina* Wubben ex Oakeley. *Lycaste brevispatha* (Klotzsch) Lindl. & Paxton is regarded as a synonym of *L. candida* Lindl., and, according to Oakeley (2008), *L. angelae* Oakeley should replace *L. brevispatha*. However, the application of the names *Lycaste brevispatha* and *Lycaste candida* is controversial. Lindley (1851) cited *Lycaste candida* as a *nomen nudum*. Later, in 1851, J. F. Klotzsch published *Maxillaria brevispatha*, which Lindley and Paxton transferred to *Lycaste* in 1853. Then Reichenbach recognized the distinctiveness

of *L. candida* and validated Lindley's name in 1863. Oakeley (2008) regarded *L. brevispatha* as a synonym of *L. candida* but referring to the name *L. candida* Lindl. *nom. nud.* and not to *L. candida* Lindl. ex Rchb.f. of 1863. The latter is predated by *L. brevispatha* (Klotzsch) Lindl. & Paxton. So, if the two taxa are conspecific, *L. brevispatha* has priority over *L. candida*. A careful analysis of the application of the names is needed to clarify the status of the species of this group. A natural hybrid *Lycaste* x *daniloi* Oakeley is also reported as a cross between *L. angelae* and *L. candida*. *Lycaste angelae* var. *rubra* Oakeley was proposed, but it was ostensibly typified by a photo, and therefore it should be regarded as an illegitimate name according to the *International Code of Botanical Nomenclature* (Art. 37.4) which specifies that the type must be a specimen after 1 January 2007. The nomenclature of the *Lycaste macrophylla* (Poepp. & Endl.) Lindl. complex, formerly represented in Costa Rica by three subspecies (*L. macrophylla* subsp. *desboisiana* (Cogn.) Fowlie, *L. macrophylla* subsp.

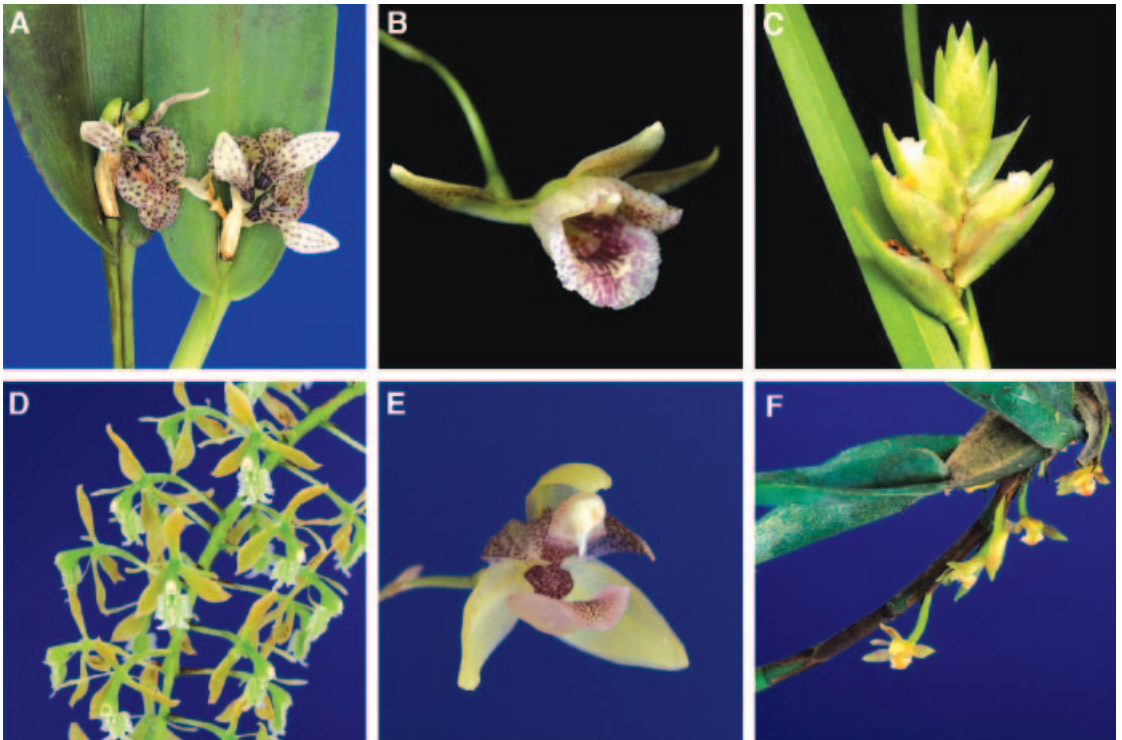


FIGURE 6. Photographs of: A. *Acianthera hamata*; B. *x Bensteinia ramonensis*; C. *Elleanthus ligularis*; D. *Epidendrum isthmioides*; E. *Kefersteinia saccata*; F. *Ornithidium pendulum*. Photographs: A, D, K, E, F by Diego Bogarín; B, courtesy of LBG.

puntarenasensis Fowlie, and *L. macrophylla* subsp. *xanthocheila* Fowlie), also changed in Oakeley (2008). He segregated the taxa within this complex, attributing to Costa Rica the following species: *L. xanthocheila* (Fowlie) Oakeley, *L. panamanensis* Fowlie ex Oakeley (first record for Costa Rica), *L. puntarenasensis* (Fowlie) Oakeley, and *L. measuresiana* (B.S. Williams) Oakeley. *Lycaste macrophylla* subsp. *desboisiana* was treated as synonym of *L. measuresiana* (Oakeley, 2008). However, a previous publication by Archila (2002) seems to have priority over Oakeley (2008), so that the correct names are *Lycaste puntarenasensis* (Fowlie) Archila, *Lycaste xanthocheila* (Fowlie) Archila, and *Lycaste panamanensis* (Fowlie) Archila.

There are new additions to various genera segregated from *Maxillaria s.l.* (Blanco *et al.*, 2007). *Maxillaria bolivarensis* C. Schweinf. described from Venezuela and distributed throughout South America has been recorded based on two collections along the Caribbean lowlands (Fig. 4I, 7b); the recent nomenclatural changes did not affect this name (Blanco 2008). *Ornithidium pendulum* (Poepp. & Endl.) Cogn. (= *Maxillaria pendula* (Poepp. & Endl.) C. Schweinf.), a widespread species ranging from Guatemala, Nicaragua, Panama, and South America, is recorded for a first time in Costa Rica (Fig. 6f, 7c). The misapplied name *Maxillaria ramosa* Ruiz & Pav. has been widely used since its clarification by Blanco *et al.* (2008). *Maxillaria appendiculoides* C. Schweinf., first described from Costa Rica, has recently been reported from Ecuador (M. Blanco, personal communication). A new species of *Mormolyca*, allied to what we call the *Maxillaria rufescens* alliance, was described by Bogarín and Pupulin (2010) (Fig. 2i). Tribe Neottieae: *Palmorchis nitida* Dressler, previously described from Panama, was documented in the Golfo Dulce region of southern Costa Rica by Bainbridge and Aguilar (2008). Subtribe Oncidiinae: A collection of *Lockhartia* similar to *L. micrantha* Rehb. f. has been reported as the Colombian *Lockhartia chocöensis* Kränzl. based on two collections from the tropical wet forest-premontane belt transition on the Caribbean watershed of the Cordillera de Tilarán range northwestern Costa Rica (Fig. 4h, 7a). Studies in *Trichopilia* revealed a new species, *T. primulina* Dressler & Bogarín, from a cultivated plant without specific locality (Dressler and Bogarín, 2009; Fig. 2l, 11b). A recent collection is the first known locality of this species. The only record of *Warmingia*

in Costa Rica, *W. margaritacea* B. Johans., is now considered a synonym of the Ecuadorian *W. zamorana* Dodson (Bogarín *et al.*, 2007; Fig. 4k, 4l, 11c, 11d).

Subtribe Pleurothallidinae: This is one of the largest groups represented in Costa Rica. After the significant contributions by Luer (1987, 2003) and studies by Pupulin (2002), Pupulin and Bogarín (2007), and Pupulin *et al.* (2007), seven new species and two new records have been registered. Three new species of *Acianthera* have been described: *A. cabiriae* Pupulin, G.A. Rojas & J.D. Zúñiga (Fig. 8c), *A. fecunda* Pupulin, G.A. Rojas & J.D. Zúñiga (Fig. 8b), both of these from the Caribbean lowlands of the Turrialba region, and *A. hamata* Pupulin & G.A. Rojas, from an unknown locality (Pupulin *et al.*, 2007; Fig. 8 d). A collection from southern Cartago corresponds to the first locality known for *A. hamata*. All the new species are endemic to Costa Rica (Fig. 6a). A new record, *A. aberrans* (Luer) Pupulin & Bogarín has been found along the Caribbean lowlands in tropical rain forest of the Sarapiquí region (Fig. 4a, 8a). This species was described from Veraguas, Panama.

The Panamanian *Barbosella orbicularis* Luer, previously cited by Pupulin (2002) on the basis of a sterile voucher, was registered from tropical wet forest along the Caribbean watershed of the Cordillera Central (Fig. 3a, 4b). A specimen of *Dracula maduroi* Luer (previously described from Bocas del Toro, Panama) was documented in a recent expedition to Volcán Cacho Negro in the Braulio Carrillo National Park in the Cordillera Central (Fig. 2b). A specimen of *Dryadella fuchsii* Luer, described from Honduras, was cited for Costa Rica by Luer (2005) based on collections by P. C. Standley and J. Valerio around the Tilarán area in the northwestern Costa Rica. The species had not been listed for Costa Rica by Luer (2003) or Ossenbach *et al.* (2007). The Nicaraguan *Echinosepala lappiformis* (A.H. Heller & L.O. Williams) Pridgeon & M.W. Chase (= *Brenesia lappiformis* (A.H. Heller & L.O. Williams)) Luer was recorded based on two collections from the Caribbean lowlands at 500 m of elevation (Fig. 4c, 5a). Another specimen was collected near Guápiles, Limón, and flowered recently in cultivation.

Studies on *Lepanthes* yielded many new records and species in last few years. Three species – *L. gratiosa* Pupulin & D. Jiménez (Fig. 1d), *L.*

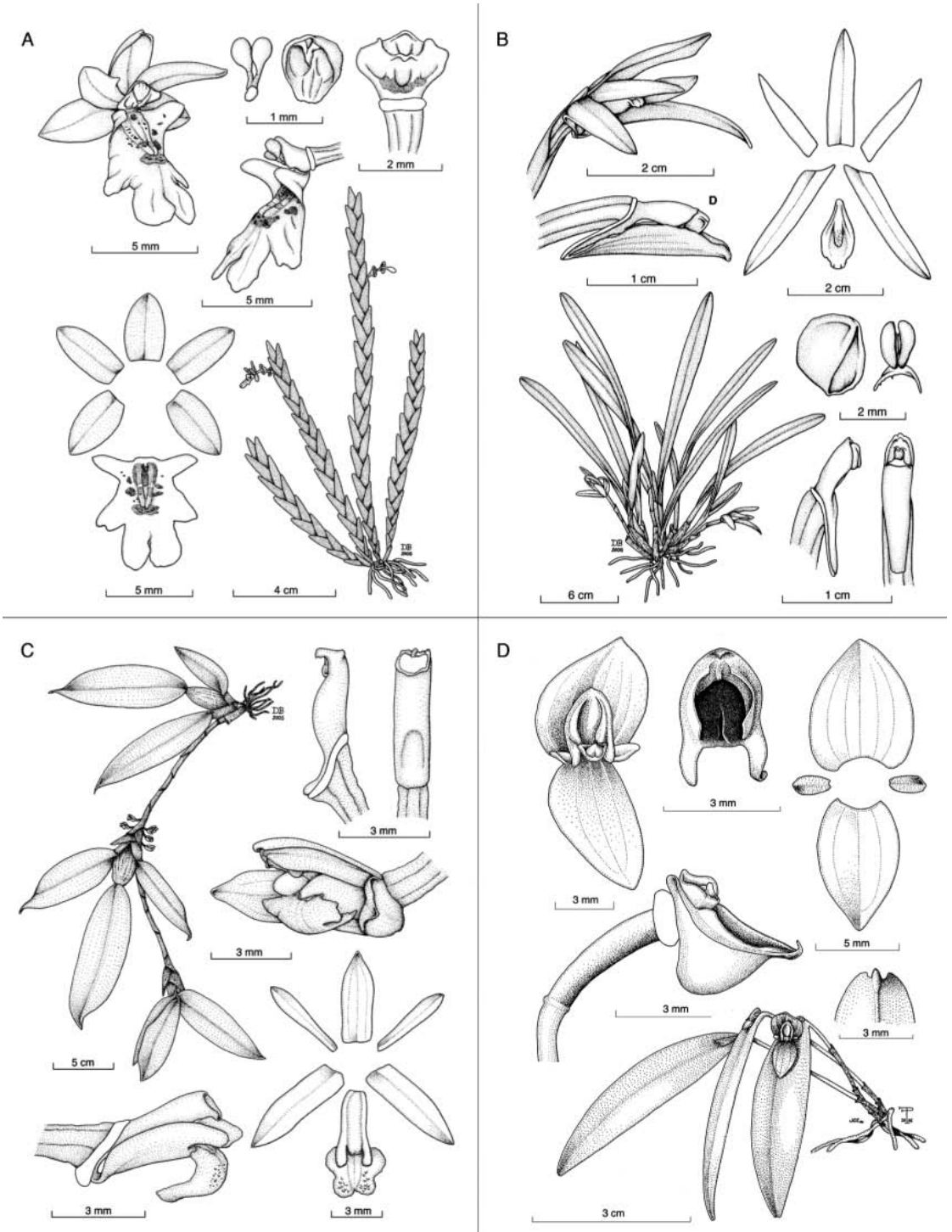


FIGURE 7. Drawings of: A. *Lockhartia chocoensis*; B. *Maxillaria bolivarensis*; C. *Ornithidium pendulum*; D. *Pleurothallis bogarinii*. Drawings: A, B, C by Diego Bogarín; D by Jose Daniel Zúñiga and Franco Pupulin.

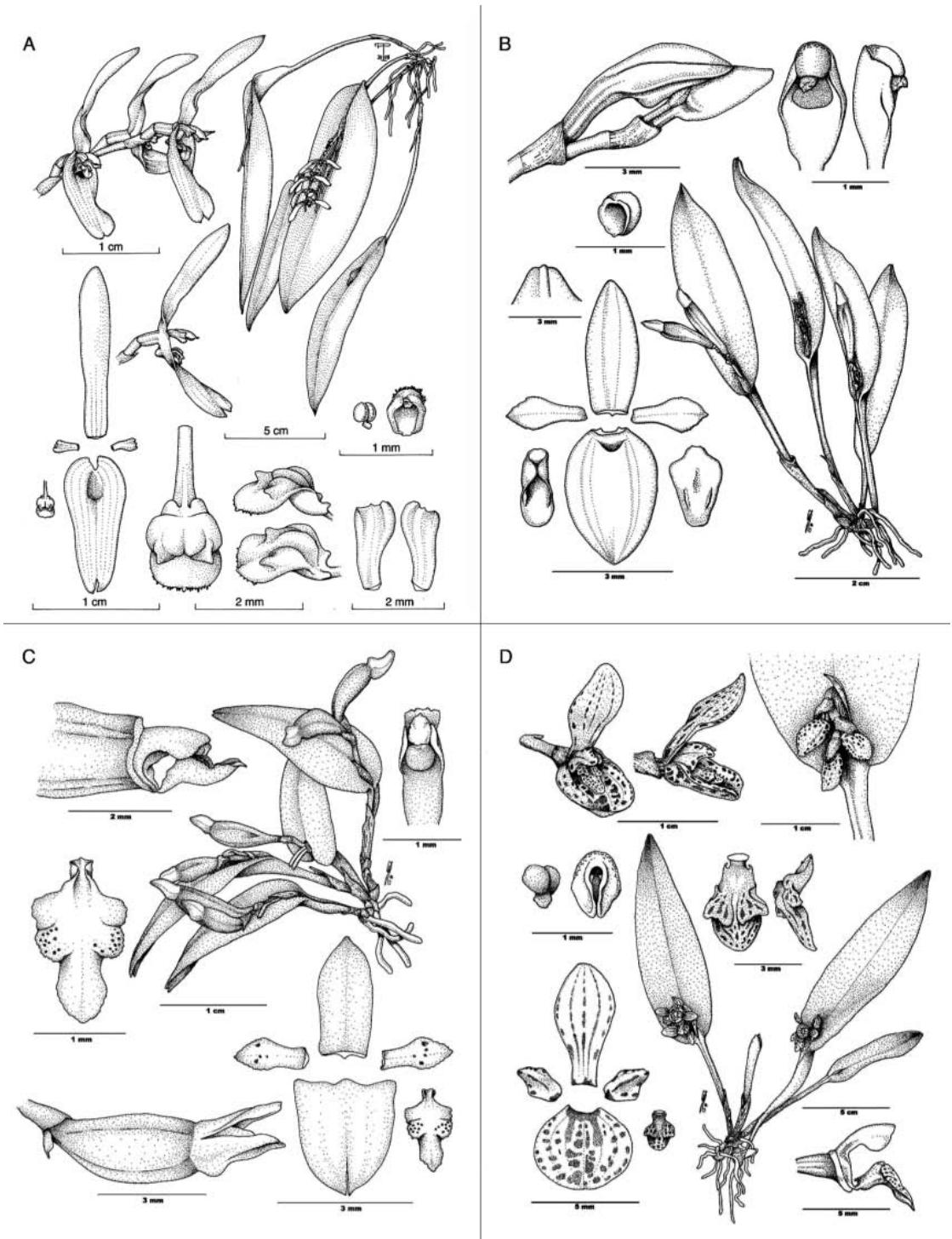


FIGURE 8. Drawings of: A. *Acianthera aberrans*; B. *Acianthera cabiriae*; C. *Acianthera fecunda*; D. *Acianthera hamata*. Drawings: A by Franco Pupulin; B, C, D by Franco Pupulin and Gustavo Rojas.

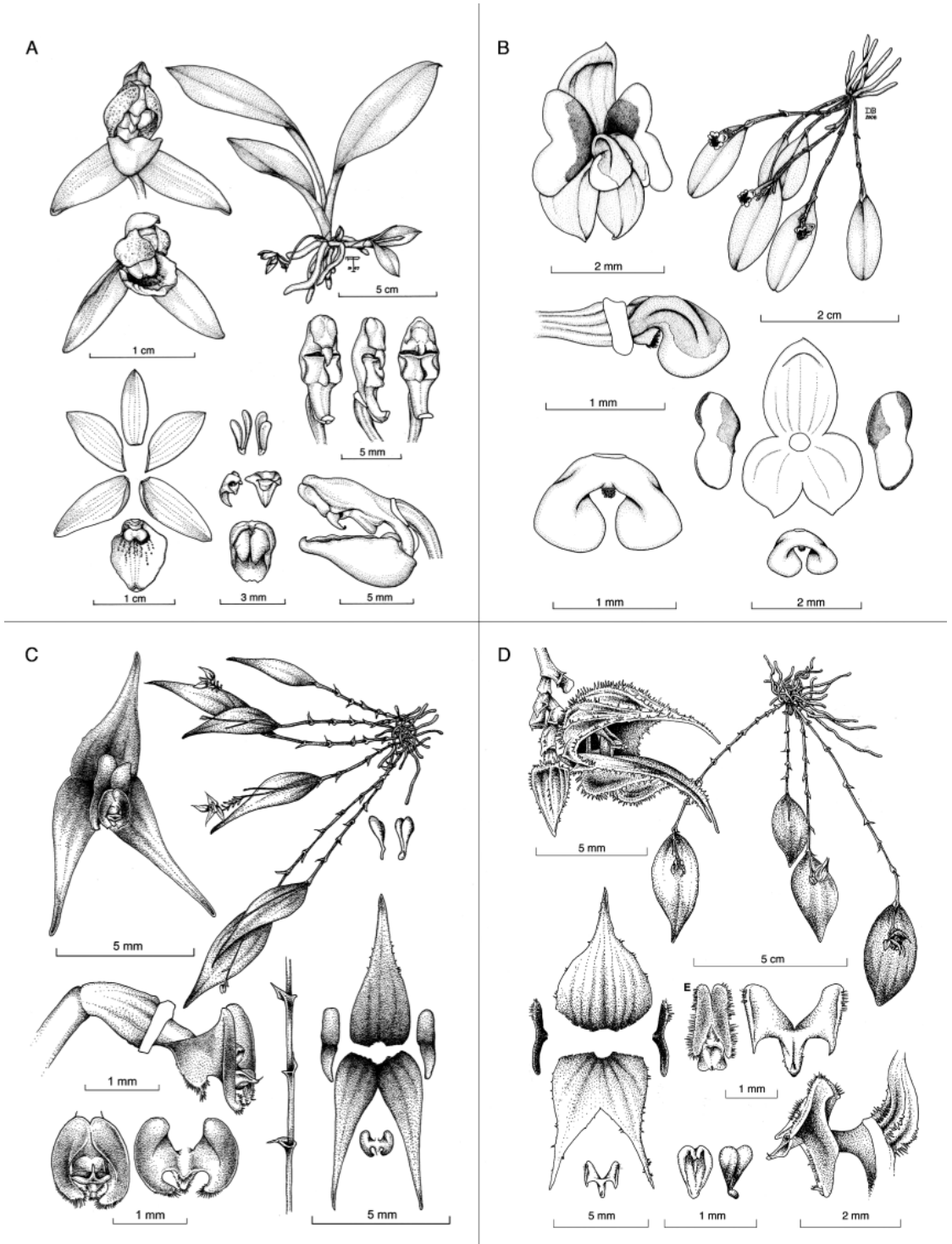


FIGURE 9. Drawings of: A. *Kefersteinia saccata*; B. *Lepanthes mariposa*; C. *Lepanthes machogaffensis*; D. *Lepanthes pelvis*. Drawings: A by Franco Pupulin; B by Diego Bogarín; C, D by Daniel Jiménez and Franco Pupulin. Pupulin.

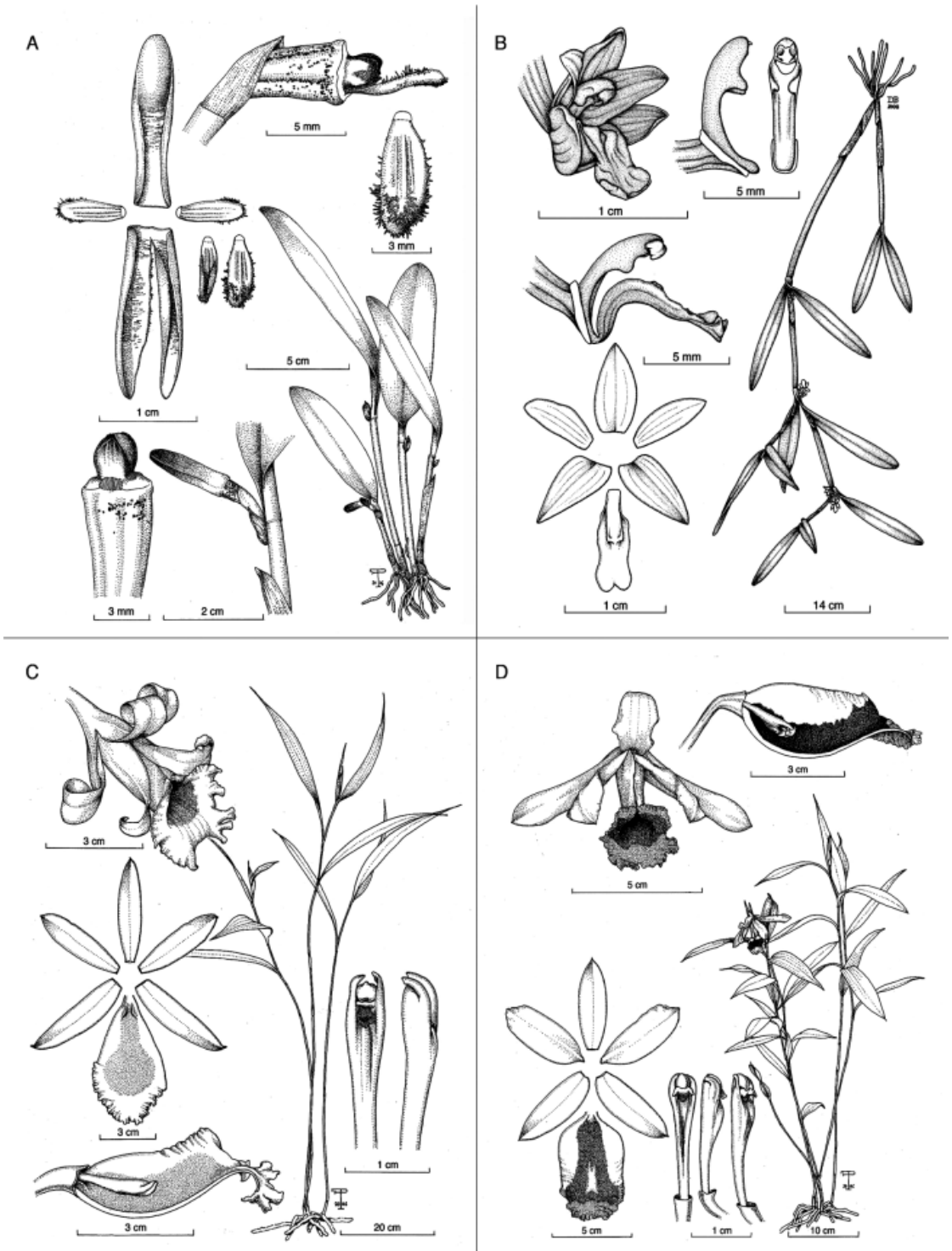


FIGURE 10. Drawings of: A. *Restrepiella lueri*; B. *Scaphyglottis robusta*; C. *Sobralia aspera*; D. *Sobralia blancoi*. Drawings: A, C, D by Franco Pupulin; B by Diego Bogarin.

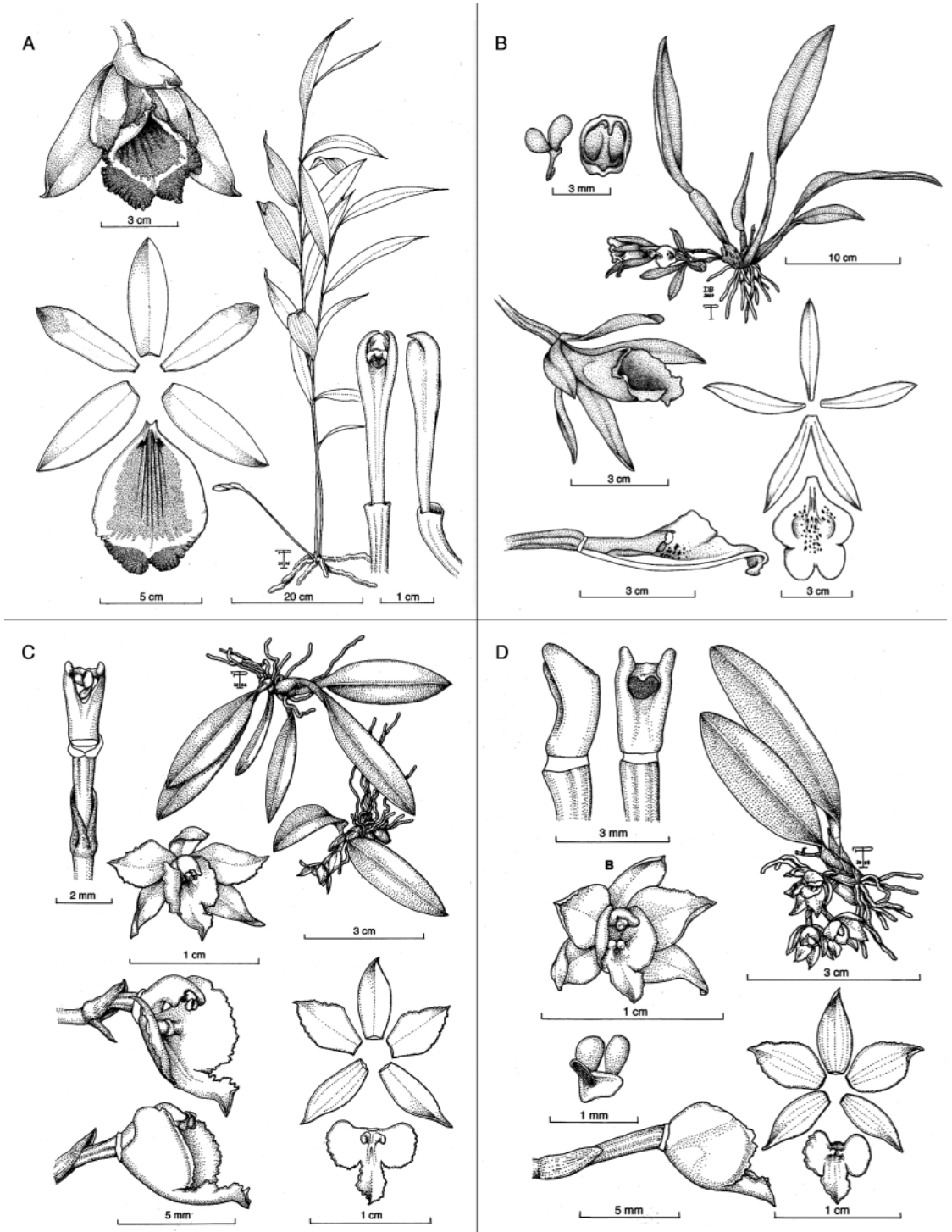


FIGURE 11. Drawings of: A. *Sobralia pendula*; B. *Trichopilia primulina*; C. *Warmingia zamorana* (Costa Rica); D. *Warmingia zamorana* (Ecuador). Drawings: A, C, D by Franco Pupulin; B by Franco Pupulin and Diego Bogarin.

machogaffensis Pupulin & D.Jiménez (Fig. 2e, 9c), and *L. pelvis* Pupulin & D.Jiménez (Fig. 2g, 9d) from the Cordillera de Talamanca — were recorded from a single path in Tapantí National Park. New collections apart from those already known have been registered for *L. pelvis* and *L. machogaffensis*. Also, *L. droseroides* Luer (Fig. 2c), *L. mariposa* Luer (Fig. 2f, 9b), and *L. pexa* Luer (of which it has not been possible to prepare a proper voucher from a cultivated plant collected in Central Volcanic range), all formerly endemic to Panama, have been collected in Costa Rica. Unpublished manuscripts will deal with more novelties in this genus (Bogarín, unpublished; Pupulin and Bogarín, unpublished).

Myoxanthus speciosus (Luer) Luer was cited by Pupulin (2002) and Luer (2003) based on a plant cultivated in Switzerland and collected in “Cordillera de Talamanca, Sierra Hills near Corazón de Jesús, alt. 2100 m” in Puntarenas Province. Luer (2003) stated that its origin is doubtful in all the collection details including the country. However, material collected near Cerro de La Muerte, along the Panamerican Highway and flowered in the living collections at the Lankester Botanical Garden confirms the presence of this species in Costa Rica. A new *Pleurothallis*, *P. bogarinii* Pupulin & J.D.Zúñiga, allied to *P. saphipetala* Luer and restricted to the Caribbean lowlands, has been registered based on two collections (Fig. 2j, 7d).

The former monospecific genus *Restrepiella* has a second species: *Restrepiella lueri* Pupulin & Bogarín (Fig. 2k, 10a). It differs from *Restrepiella ophiocephala* (Lindl.) Garay & Dunst. in the lip without basal lobes, hirsute at apex and ciliate along the margins, twice as long as the column and as long as the petals, the column without a foot and the free lateral sepals.

Two additional records added by Luer (2006) are: *Pleurothallis caudatipetala* C.Schweinf. (= *Specklinia caudatipetala* (C.Schweinf.) Luer, = *Panmorphia caudatipetala* (C.Schweinf.) Luer), previously known from Peru and Ecuador and collected in Costa Rica around Cascajal, northern San José; and *P. minutalis* Lindl. (*Panmorphia minutalis* (Lindl.) Luer, = *Specklinia minutalis* (Lindl.) Luer, = *Anathallis minutalis* (Lindl.) Pridgeon & M.W. Chase), known from Mexico and Guatemala, and based on a collection of A.R. Endrés (*Endrés s.n.*, W). A specimen of

Pleurothallis duplooyi Luer & Sayers (= *Specklinia duplooyi* (Luer & Sayers) Luer, = *Panmorphia duplooyi* (Luer & Sayers) Luer), formerly considered endemic to Belize, has been found in the Caribbean watershed of the Cordillera de Talamanca near Pejibaye in Cartago province. Plants are recognized by the shortly repent rhizome with prostrate lenticular leaves less than 8 mm long and purple flowers on a filiform peduncle. The specimen collected in Costa Rica shows an elliptic dorsal sepal rather than oblong, and basally wider lateral sepals; however, it is consistent with the drawing published by Luer (2006). The plant was sketched from a fertile specimen collected in the field, and one flower has been stored in the spirit collection at JBL. There is currently a project on the taxonomy and phylogeny of the Pleurothallidinae in Costa Rica being developed at the Lankester Botanical Garden. Without doubt many new additions will be revealed in the future.

Tribe Sobralieae: Ephemeral flowers, such as those of *Sobralia*, pose special problems for their identification, but a large living collection held at the Lankester Botanical Garden has allowed discovery of many new species. *Sobralia aspera* Dressler & Pupulin (Fig. 9c), *S. blancoi* Dressler & Pupulin (Fig. 9d), *S. pendula* Dressler & Pupulin (Fig. 11a), and *S. rareavis* Dressler were described as new, and a new record, the Panamanian *S. bouchei* Ames & C.Schweinf., was found in Turrialba on the Caribbean lowlands. Three other new species of *Sobralia* are awaiting publication (Dressler and Bogarín, unpublished). In *Elleanthus*, there is a new species, *E. ligularis* Dressler & Bogarín (Dressler and Bogarín, 2007; Fig. 6c). Plants were collected in Colombia, Costa Rica, Cuba, and Panama, but the species had remained unnamed in the absence of flowers. This species is similar to *E. graminifolius* (Barb.Rodr.) Løjtnant, but the plants are more robust with wider leaves. The blade of the lip is subquadrate rather than obtriangular, with a short base.

Subtribe Stanhopeinae: A new *Gongora*, *Gongora boracayanensis* Jenny, Dalström & W.E.Higgins, was published from the Fila Costeña on the Pacific slope as result of a clarification of the misapplied use of the name *Gongora quinquenervis* Ruiz & Pav. for a horticulturally known but scientifically undescribed *Gongora* from Costa Rica (Jenny *et al.*, 2007).

Subtribe Zygotetalinae: This subtribe has been well documented and revised in Costa Rica by Pupulin (2007). *x Bensteinia ramonensis* Pupulin, a natural bigeneric hybrid (*Benzingia reichenbachiana* (Schltr.) Dressler *x Kefersteinia excentrica* Dressler & Mora-Ret.), was recorded in the Alberto Brenes Reserve on the Cordillera de Tilarán (Fig. 3b, 6b). In the revision of *Dichaea* of Costa Rica (Pupulin, 2007), a new species, *Dichaea gomez-lauritoi* Pupulin, was described from a specimen collected in Guápiles along the Caribbean plains of Limón (Fig. 3d). Four name changes are noted: *Dichaea amparoana* Schltr. (described from Costa Rica) is recognized as different from *D. lankesteri* Ames and removed from its synonymy. *Dichaea standleyi* Ames was placed as a synonym of *D. acrolephrara* Schltr. *Dichaea schlechteri* Folsom is now considered conspecific with *D. similis* Schltr. (formerly synonymized under *D. cryptarrhena* Rchb.f. ex Kränzl.). *Dichaea ciliolata* Rolfe was reduced to a synonym of *D. hystricina* Rchb.f. based on morphological observations (Pupulin, 2005). Two novelties appeared after the revision of *Kefersteinia* (Pupulin, 2001): *Kefersteinia saccata* Pupulin from the Caribbean lowlands (Pupulin and Merino, 2008; Fig. 6e, 9a), and a new record, the Panamanian *K. alata*, collected along Yorkín river on the Costa Rican side of the border with Panama (Pupulin, personal communication).

ACKNOWLEDGEMENTS. I thank the scientific services of Costa Rican Ministry of Environment, Energy and Telecommunications (MINAET) and its National System of Conservation Areas (SINAC) for issuing the collecting permits under which wild species treated here were collected. I am also grateful to Robert L. Dressler, Adam Karremans, and Franco Pupulin for their continuous support and to Melania Fernández, Reynaldo Gómez, and Rafael Trejos for assisting during fieldwork activities and management of the collections at JBL. The present work is part of the Project 814-A7-015, “Inventario y taxonomía de la flora epífita de la región Neotropical — Orchidaceae”, sponsored by the Vice-Presidency of Research, University of Costa Rica.

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