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NEW COMBINATIONS AND OTHER TAXONOMIC CHANGES FOR THE FORTHCOMING 'FLORE DES MASCAREIGNES' ORCHIDACEAE ACCOUNTS

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Abstract. In preparation for the forthcoming orchid accounts of the *Flore des Mascareignes* lectotypifications are made for *Angraecum cadetii*, *A. cornigerum*, *A. corrugatum*, *A. costatum*, *A. eburneum*, *A. mauritianum*, *A, patens*, *A. pingue*, *A. tenuifolium*, *Benthamia erinacea*, *B. perfecundum*, *Bulbophyllum commersonii*, *B. compressum*, *B. conicum*, *B. cordemoyi*, *B. densum*, *B. pusillum*, *B. variegatum*, *Cynorkis arnottioides*, *C. calcarata*, *C. calcaripotens*, *C. cordemoyi*, *C. falcata, C. fastigiata*, *C. flexuosatis, C. graminea*, *C. lilacina*, *C. nervilabris*, *C. paradoxa*, *C. pleiadea*, *C. purpurascens*, *C. reticulate*, *C. squamosa*, *C. trilinguis*, *C. variegata*, *Disperis cordata*, *Gastrorchis villosa*, *Habenaria arachnoides*, *H. lancifolia*, *H. praealta*, *H. undulata*, *Platylepis densiflora*, *P. margartifera*, *P. occlusa*, *Oeceoclades analavelensis* and *O. pulchra*. Neotypifications are made for *Angraecum tenuifolium*, *Benthamia spiraloides*, *Cynorkis coccinelloides* and *C. constellata*. Clarification is provided of the taxonomy of *Angraecum crassifolium*, *A. tenellum*, *Benthamia erinacea*, *Bulbophyllum densum*, *B. elliotii*, *B. incurvum*, *B. pendulum*, *Cheirostylis boryi*, *C. gymnochiloides*, *C. nuda*, *Cynorkis calcarata*, *C. coccinelloides*, *C. falcata*, *C. flexuosatis*, *C. squamosa*, *Habenaria sigillum*, *Oeceoclades analavelensis*, *Platylepis densiflora*, *P. margaritifera* and *P. occulta*. New combinations are made for *Benthamia spiraloides*, *Bulbophyllum elliotii* var. *latibracteatum, Cheirostylis boryi*, *Cynorkis aristei* and *C. flexuosatis*.

Keywords/Palabras clave: Mauritius, new combinations, nuevas combinaciones, new synonyms, nuevos sinónimos, Reunion, Rodrigues, typification, tipificación

Introduction. Taxonomic research on the orchid flora of the Mascarenes (Mauritius, Réunion and Rodrigues) has a long and rich history and the archipelago has been more intensively studied than the much larger neighbouring island of Madagascar. This is probably related to the position of Mauritius and Réunion on major trade routes and to their history during colonial times (Mauritius and Rodrigues were colonised at various times by the Dutch, French and British until 1968 and Réunion remains an overseas Département of France).

The earliest works were related to scientific expeditions, such as Jean-Baptise Bory de Saint-Vincent's '*Voyage dans les principales Îles des mers d'Afrique*' (1804). Louis-Marie Aubert-Aubert du Petit-Thouars (Thouars henceforth) published the first accounts of the orchid flora of the islands, culminating in his extensively illustrated *Histoire particulière des Plantes Orchidées recueillies sur les trois* Îles *Australes d'Afrique* (1822). This was soon followed by Achille Richard's *Monographie des Orchidées des* Îles *de France et Bourbon* (1828) and Wenceslas Bojer's *Hortus Mauritianus* (1837). Towards the end of the 19th century, Spencer Le Marchant Moore produced the orchid part for John Gilbert Baker's *Flora of Mauritius and the Seychelles* (1877) while Eugène Jacob de Cordemoy (Cordemoy henceforth) published Charles Frappier de Montbenoît's (Frappier henceforth) manuscript on orchids several years after Frappier's death, as part of his *Flore de l'Île de la Réunion* (1895). The French botanist Jean Bosser sparked a renaissance of interest in the orchids in the 1960's when he started work on the *Flore des Mascareignes*, especially in an extensive series *Contribution à l'Étude des Orchidaceae de Madagascar et des Mascareignes* published in *Adansonia* (1965–2007). Regretfully, Bosser was unable to complete his work but he left various manuscript notes on some of the genera; with his permission, these have been interpreted and incorporated in our own work and are fully acknowledged. Thérézien Cadet (1981)

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and Janine Cadet (1989) were also active at the same time. Recently, there has been a surge in publications by amateur and professional botanists alike: David Roberts (Roberts 2001, Roberts *et al*. 2004), Jean-Bernard Castillon (2009, 2010, 2012, 2014), Claire Micheneau (Micheneau *et al*. 2008), Patrice Bernet (Bernet 2010a,b,c, 2011, Bernet & Castillon 2012), Michel Szelengowicz and Jean Maurice Tamon (Szelengowicz *et al*. 2012, Szelengowicz & Tamon 2013), Claudia Baider (2012a,b), Thierry Pailler and his colleagues at the University of Réunion (Pailler *et al*. 2013, 2018, Pailler & Henze 2020, Pailler & Baider 2020), Hermans and collaborators (Hermans *et al*. 2017, 2020a,b) and many others have all contributed greatly to the knowledge of taxonomy, conservation, pollination and biology of Mascarene orchids.

The *Flore des Mascareignes* project, initiated in 1970, covers the plant families of Mauritius, Réunion and Rodrigues in the Western Indian Ocean. It is published jointly by the Institut de Recherche pour le Développement (IRD), the Mauritius Sugar Industry Research Institute (MSIRI) and the Royal Botanic Gardens, Kew. Twenty-eight fascicules have been published so far with 2500 species described in 201 families. The final two volumes, on the Orchidaceae, are scheduled for publication in 2021–2022 and will contain an account of all the known species from the area, including detailed descriptions, keys, literature, specimen references and illustrations.

The orchid family is represented in the Mascarenes by some 165 species in 40 genera; with 88 recognised species in Mauritius, 152 in Réunion and 8 in Rodrigues. Their principal relationships are with the rich orchid flora of Madagascar (with a 44% overlap) and it is likely that they arrived in this more recently evolved volcanic archipelago by the dispersal of their light wind-blown seeds. There also is an overlap with the Comoros (15%), continental Africa (13.5%) and the Seychelles (7%) with just 5% having a more global distribution. A total of 74 species (*ca*. 45%) are endemic to the Mascarenes, with 7% endemic to Mauritius, 28.5% to Réunion and 0% for Rodrigues.

In preparation for the forthcoming accounts of the family Orchidaceae for the Flore des Mascareignes, several taxonomic changes were necessary and are validated here. Our aim is to confirm these changes to support ongoing research.

Materials and methods. Herbarium specimens of Mascarene and Madagascar in all the relevant herbaria have been systematically examined, photographed and databased. Where necessary, the critical specimens were dissected and drawn, notably the type collections. This archive now contains over 85,000 records. A comprehensive bibliography on the orchid flora of the region (J. & C. Hermans in Du Puy *et al*. 1999; updated in Hermans *et al*. 2007) kept up-to-date and now containing over 2200 references, has been an invaluable resource for this work.

Where necessary, field work in Madagascar and the Mascarenes has been undertaken and many type and other localities have been visited.

Following recommendations in the International Code of Nomenclature (Turland *et al*. 2018) and McNeill (2014), lectotypes have been recognised when more than one sheet of original material with the same collecting number has been located. The most representative sheet has been designated as lectotype and the others as isolectotypes or isotypes (article 9.5). In a few cases neotypes had to be selected when original material is missing or destroyed (article 9.8).

Taxonomic treatment

1. Angraecum Bory

1. *Angraecum cadetii* Bosser, Bull. Mus. Nation. Hist. Nat. B., Adansonia, sér. 4, 9, 3: 252 (1987). Fig. 1.
TYPE: Réunion, Plaine des Affouches, Feb. 1971, *Bosser* 20690 (**lectotype designated here**: P00107185; isolectotype: P00107194).
Hadrangis cadetii (Bosser) Szlach., Mytnik & Grochocka, Biodiv. Rec. Conserv. 29: 14 (2013).

Bosser cited as the type his own collection (*Bosser* 20690) which comprises two sheets in P: P00107185, being the most complete and corresponding best to the description, is chosen here as the lectotype. The species is endemic to Mauritius and Réunion (Fig. 1).

2. *Angraecum cornigerum* Cordem., Rev. Gén. Bot. 9: 418, pl. 10 (1899). Fig. 2.
TYPE: Réunion, environs des eaux thermals, Cilaos, bras de Benjoin, *Cordemoy s.n*. (**lectotype designated here**: MARS with temporary barcode P00750178).

Figure 1. *Angraecum cadetii* in Réunion. Photograph by Rogier van Vugt.

FIGURE 2. Watercolour of *Angraecum cornigerum* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Pseudojumellea cornigera (Cordem.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 21 (2013).

Following Bosser (in ms) we select here *Cordemoy s.n.* in MARS as the lectotype because it agrees well with Cordemoy's original description. It is endemic to Réunion.

3. *Angraecum corrugatum* (Cordem.) Micheneau, Molec. Phylogen. Evol. 46: 920. (2008). Fig. 3–4.

TYPE: **Lectotype designated here**: Fig 10, no. 20-23 in Cordemoy, Rev. Gén. Bot. 11. 1899).

Bonniera corrugata Cordem., Rev. Gén. Bot. 11: 426., fig. 20-23 (1899).

Cordemoy (1899) described and illustrated *Bonniera corrugata* from the '*Sommet de la Nouvelle Grande-Montée de la Plaine des Cafres'* in Réunion but he did not indicate a specimen on which the description was based. No associated material has been found in the Cordemoy herbarium in MARS, P or in

REU. The description is accompanied by a drawing, based on a watercolour by Eudoxie de Cordemoy (MAU/MSIRI), her illustration is therefore chosen as the lectotype (Fig. 4). It is endemic to Réunion.

4. *Angraecum costatum* Frapp. in Cordem., Fl. Réunion: 211 (1895). Fig. 5–6.

TYPE: Réunion, *s. loc.*, *Richard* [663] (**neotype, designated here**: P00541652).

Angraecum costatum Frapp., Cat. Orchid. Réunion: 13 (1880), *nom. nud.*

Angraecum longinode Frapp., Cat. Orchid. Réunion: 13 (1880), *nom. nud.*

Angraecum longinode Frapp. in Cordem., Fl. Réunion: 210 (1895). TYPE: Réunion, *Richard s.n.* (not located).

Angraecum pseudopetiolatum Frapp. in Cordem., Fl. Réunion: 207 (1895). TYPE: Réunion, *Cordemoy* 1 (**lectotype designated here**: K00306533).

Mystacidium costatum (Frapp. in Cordem.) Cordem., Rev. Gén. Bot. 11: 425 (1899).

Mystacidium longinode (Frapp. in Cordem.) Cordem., Rev. Gén. Bot. 11: 424 (1899).

Mystacidium pseudopetiolatum (Frapp. in Cordem.) Cordem., Rev. Gén. Bot. 11: 425 (1899).

Macroplectrum costatum (Frapp. in Cordem.) Finet, Mém. Soc. Bot. France 9: 25 (1907).

Angraecum floribundum sensu Szelengowicz & Tamon (2013: 92).

Lemurangis costata (Frapp. in Cordem.) Szlach., Mytnik & Grochocka, Biodiv. Rec. Conserv. 29: 16 (2013).

Lemurangis longinodis (Frapp. in Cordem.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 16 (2013).

Lemurangis pseudopetiolata (Frapp. in Cordem.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 16 (2013).

Angraecum sp. 2. Bernet, Orchid. Réunion: 318 (2010).

Mystacidium scalare var. *pectine?rum in sched.* in Herb. Cordemoy MARS087764

Frappier (1895) described *Angraecum costatum*, *A. longinode* and *A. pseudopetiolatum* in Cordemoy's *Flore de Réunion*. All three were illustrated on the same page by Cordemoy (1899: pl. 7, fig. 5, 9, 10). Garay (1973: 505) considered *Angraecum baronii* (Finet) Schltr. from Madagascar to be the same species but this has a longer pendent stem, much shorter and narrower leaves, a different habit of the inflorescence and slightly larger flowers. *Angraecum longinode* and *A. pseudopetiolatum* were synonymized with *A. costatum* by Pailler & Henze (2020: 48, 189) who selected the latter as the accepted name. It is endemic to Réunion.

A herbarium specimen exists in the Cordemoy herbarium in MARS that corresponds with the description but it has a damaged and indecipherable label; a lectotype was selected but not published by Bosser in his manuscript notes of 1987.

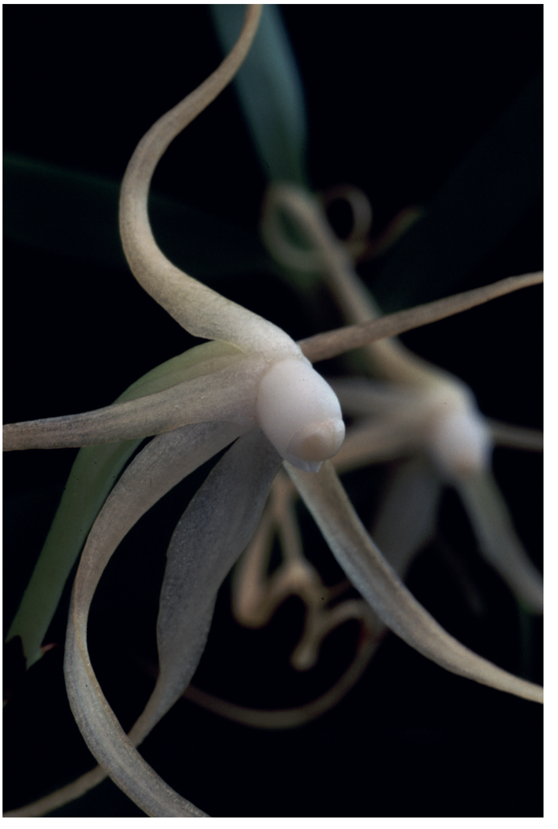

FIGURE 3. Flower detail of *Angraecum corrugatum*. Photograph by Johan Hermans.

5. *Angraecum crassifolium* (Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 433 (1915). Fig. 7–8.

TYPE: Réunion, Grand Bénard, *Cordemoy* 37 (holotype: MARS P00750177).

Mystacidium crassifolium Cordem., Rev. Gén. Bot. 11: 422 (1899).

Angraecum cordemoyi Schltr., Beih. Bot. Centralbl.

FIGURE 4. Watercolour of *Angraecum corrugatum* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Figure 5. Watercolour of *Angraecum costatum* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

FIGURE 6. *Angraecum costatum* in Réunion. Photograph by Johan Hermans.

FIGURE 7. *Angraecum crassifolium* in Madagascar. Photograph by Johan Hermans.

33, 2: 432 (1915) ***syn. nov***.

Angraecum acutipetalum Schltr., Beih. Bot. Centralbl. 34, 2: 337 (1916) ***syn. nov***. TYPE: Madagascar, Mt.Tsiafajavona, *Perrier* XXXIX (holotype: B†).

Angraecum acutipetalum var. analabeensis H.Perrier in H. Humbert ed., Fl. Madagasc. Orchid. 2: 229 (1941). Based upon: Madagascar, Analabe (N. Imerina), *Perrier* 18516 (P).

Angraecum acutipetalum var. *ankeranae* H.Perrier, Fl. Madagasc. Orchid. 2: 230 (1941). Based upon: Madagascar, Ankeramadinika, *François* in *Perrier* 18517 (P).

Angraecum acutipetalum var. *analabeensis* H.Perrier ex Hermans, Orchid. Madag. 28, 287 (2007), ***syn. nov***. TYPE. Madagascar, Analabe (N. Imerina), *Perrier* 18516 (holotype: P).

Angraecum acutipetalum var. *ankeranae* H.Perrier ex Hermans, Orchid. Madag. 28, 287 (2007), ***syn. nov***. TYPE: Madagascar, Ankeramadinika, *François* in *Perrier* 18517 (holotype: P).

Gomphocentrum acutipetalum (Schltr.) Szlach., Mytnik & Grochocka, Biodiv. Rec. Conserv. 29: 14 (2013).

Gomphocentrum cordemoyi (Schltr.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 14 (2013).

Gomphocentrum crassifolium (Cordem.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 14 (2013).

Mystacidium striatum Cordem. (1899: 422), not *Angraecum striatum* Thouars (1809). TYPE: not known.

Cordemoy (1899) described *Mystacidium striatum* but because of the earlier *Angraecum striatum* Thouars (1822) the epithet is no longer available in *Angraecum*. Cordemoy described *Mystacidium crassifolium*, which is conspecific with *M. striatum*, in the same year; this has therefore the first available valid epithet. It occurs in Madagascar and Réunion.

6. *Angraecum eburneum* Bory, Voy. Îles Afrique 1: 359, t. 19 (1804). Fig. 9.

TYPE: Réunion, between plaine des Chicots and l'îlet à Guillaume, **lectotype designated here**: illustration t. 19 in Bory, Voy. Îles Afrique 1 (1804).

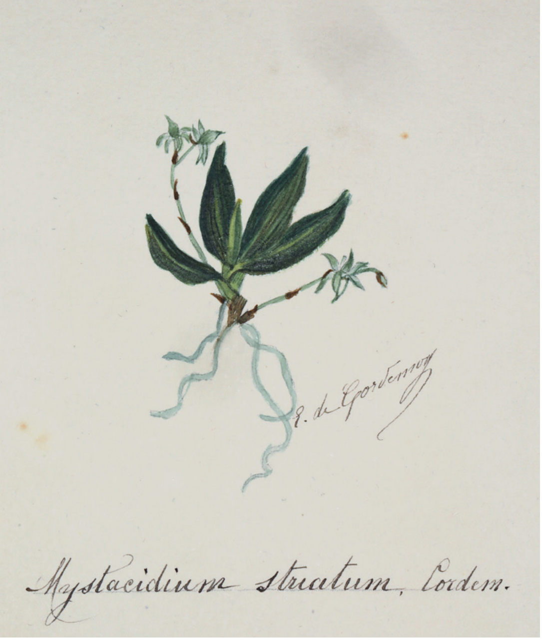

Figure 8. Watercolour of *Angraecum crassifolium* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Figure 9. *Angraecum eburneum* from Réunion. Photograph by Johan Hermans.

Limodorum eburneum (Bory) Willd., Sp. Pl. 4: 125 (1805).

Angorkis eburnangis Thouars, Nouv. Bull. Sci. Soc. Philom. Paris: Tabl. *Angorkis* (1809); Thouars, Hist. Orch.: Table 2: O. 15, t. 65 (1822), *nom. superfl*.

Angraecum superbum Thouars, Nouv. Bull. Sci. Soc. Philom. Paris: Tabl. *Angorkis* (1809). TYPE: Madagascar, *Thouars s.n*. (holotype: P0098777; isotype: BM000539230).

Angorkis superbangis Thouars, Nouv. Bull. Sci. Soc. Philom. Paris: Tabl. *Angorkis* (1809).

Aerobion superbum (Thouars) Spreng., Syst. Veg. 3: 718 (1826).

Angraecum virens Lindl., Edwards's Bot. Reg. 33: t. 19 (1847). TYPE: India, cult. Serampore B. G. (holotype: K).

Angraecum brongniartianum Rchb.f. ex Linden, Pescatorea 1: t. 16 (1854). TYPE: Bourbon, *Quesnel s.n*. (holotype: W).

Angraecum eburneum var. *virens* Hook., Curtis's Bot. Mag. 86: t. 5170 (1860).

Angorchis eburnea (Bory) Kuntze, Revis. Gen. Pl. 2: 651 (1891).

Figure 10. *Angraecum mauritianum* from Madagascar. Photograph by Johan Hermans.

Angorchis brongniartiana (Rchb.f. ex Linden) Kuntze, Revis. Gen. Pl. 2: 651 (1891).

Angorchis superba (Thouars) Kuntze, Revis. Gen. Pl. 2: 652 (1891).

Angraecum comorense Kraenzl., Bot. Jahrb. Syst. 17: 60 (1893), *non* (Rchb.f.) Finet. TYPE: Comoros, *Schmidt* 154 (not located).

Angraecum voeltzkowianum Kraenzl., Bot. Jahrb. Syst. 36: 116 (1905). TYPE: Comoro Islands, Grande Comore, *Voeltzkow* 193 (holotype not located).

Angraecum superbum var. *brongniartianum* (Rchb.f.) Finet, Bull. Soc. Bot. France 54, Mém. 9: 14 (1907).

Angraecum eburneum var. *brongniartianum* (Rchb.f. ex Linden) Schltr., Ann. Mus. Colon. Marseille, sér. 3, 1: 50 (1913).

Angraecum eburneum subsp. *typicum* H.Perrier in H. Humbert ed., Fl. Madagasc. Orchid. 2: 314 (1941), *nom. superfl.*

Angraecum eburneum subsp. *superbum* (Thouars) H.Perrier in Humbert ed., Fl. Madagasc. Orchid. 2: 315 (1941).

Angraecum richardianum A.Rich. *nom. invalid*. Based upon *Richard s.n.* (K-LINDL).

Bory (1804: 359) described and illustrated *Angraecum eburneum*, having found it between plaine des Chicots and l'îlet à Guillaume in Bourbon [Réunion]. In the English version (Bory, 1805: 98), he mentioned the same species growing at the bottom of a ravine towards l'îlet à Guillaume. Herbarium material in the Reichenbach herbarium in W, labelled from '*Les Crettes de l'ille aguillaume*' and indicated as originating from Bory, could be associated with the original collection of the species but it consists of a few fragments on a mixed sheet (W-R39268). A more representative sheet in the de Candolle herbarium at G (G00015997) is labelled from 'Bory, 1821' which is later than Bory's original collections. The engraving in Bory (1804) is chosen here as the most reliable and closely associated with the protologue.

The delimitation of this species; its subspecies, varieties and other forms has been debated for centuries with flower colour, lip shape, length of spur and column shape as the most frequently used characteristics (Lindley, 1832; Hooker, 1854; Rolfe, 1897; Senghas, 1979). It is a very widespread and variable species found in a variety of habitats ranging from coastal cliffs, as an epiphyte in moist evergreen forest, a terrestrial in dry deciduous forest and on dry exposed rock. These factors undoubtedly have led to a great deal of variation. To ascertain its variability 220 herbarium specimens of the species and its variants from different localities were measured, tabulated and compared. Combined with photographic and field observations, we conclude that there is no obviously correlation between plant habit, the size and shape of the leaves and the flowers except in *Angraecum eburneum* subsp. *xerophilum* H.Perrier. Flowers from Madagascar show the greatest variability, both in lip shape and spur length ranging from 6 to 19 cm (and longer if *Angraecum longicalcar* is taken into account); flowers from Réunion have a lip that is fairly consistently a little longer than wide with a spur between 5 and 10 cm long, the limited number of plants from Mauritius seem similar to those from Madagascar. Flowers from the Comoros are similar to those from Madagascar but the spur is often longer, flowers from mainland Africa have a lip as long as wide and a short spur. The lip, often used as a distinguishing feature, is greatly variable in size and shape with individual plants and colonies having a rounded or angular lip. It has also been observed that the lip shape changes and becomes more angular as the flowers mature. The length of the spur is also very inconsistent with numerous intermediate forms between the extremes. Flower colour is also quite variable and changes as the flowers mature.

It has not been possible to find any reliable and consistent characteristics to distinguish *Angraecum eburneum* Bory and *A. superbum* Thouars, they are therefore considered conspecific with the former having priority. Some variants from Madagascar and the Seychelles are more consistent and can be formally recognised at infraspecific rank. It is found in Madagascar, the Comoros, the Seychelles (including Aldabra), and the Mascarenes (Mauritius and Réunion).

7. *Angraecum mauritianum* (Poir.) Frapp., Orchid. Réunion, Cat. Especes Indig.: 13 (1880). Fig. 10.

TYPE: Mauritius, *Commerson* 222 (**neotype designated here**: P00754625).

Orchis mauritiana Poir. in Lamarck, Tabl. Encycl. 4: 601 (1798).

Orchis mauritiana was described by Poiret (1798)

Figure 11. *Angraecum patens* from Réunion. Photograph by Rogier van Vugt.

in Lamarck's *Encyclopaedia* as the '*Orchis des* îles *Maurice*', and was seen by Commerson in the Lamarck herbarium. No herbarium material corresponding to the description has been found in the Lamarck herbarium in P. There are several extant Commerson specimens from Mauritius and Réunion but *Commerson* 222 (P00754625) in the P general herbarium represents the species well; it has therefore been chosen as the neotype. It is found in Madagascar and the Mascarenes (Mauritius and Réunion), but records from the Comoros are dubious.

8. *Angraecum patens* Frapp. in Cordemoy, Fl. Réunion: 206 (1895). Fig. 11.

TYPE: Réunion, *Cordemoy* 22 (**neotype designated here**: MARS in REU).

Angraecum paniculatum Frapp., Cat. Orchid. Réunion: 13 (1880), *nom. nud*.

Angraecum paniculatum Frapp. in Cordem., Fl. Réunion: 215 (1895). TYPE: Réunion, Herb. *J. M. C. Richard s.n.* (holotype: not located).

Frappier described *Angraecum patens* in Cor-

Figure 12. *Angraecum pingue* from Madagascar. Photograph by Johan Hermans.

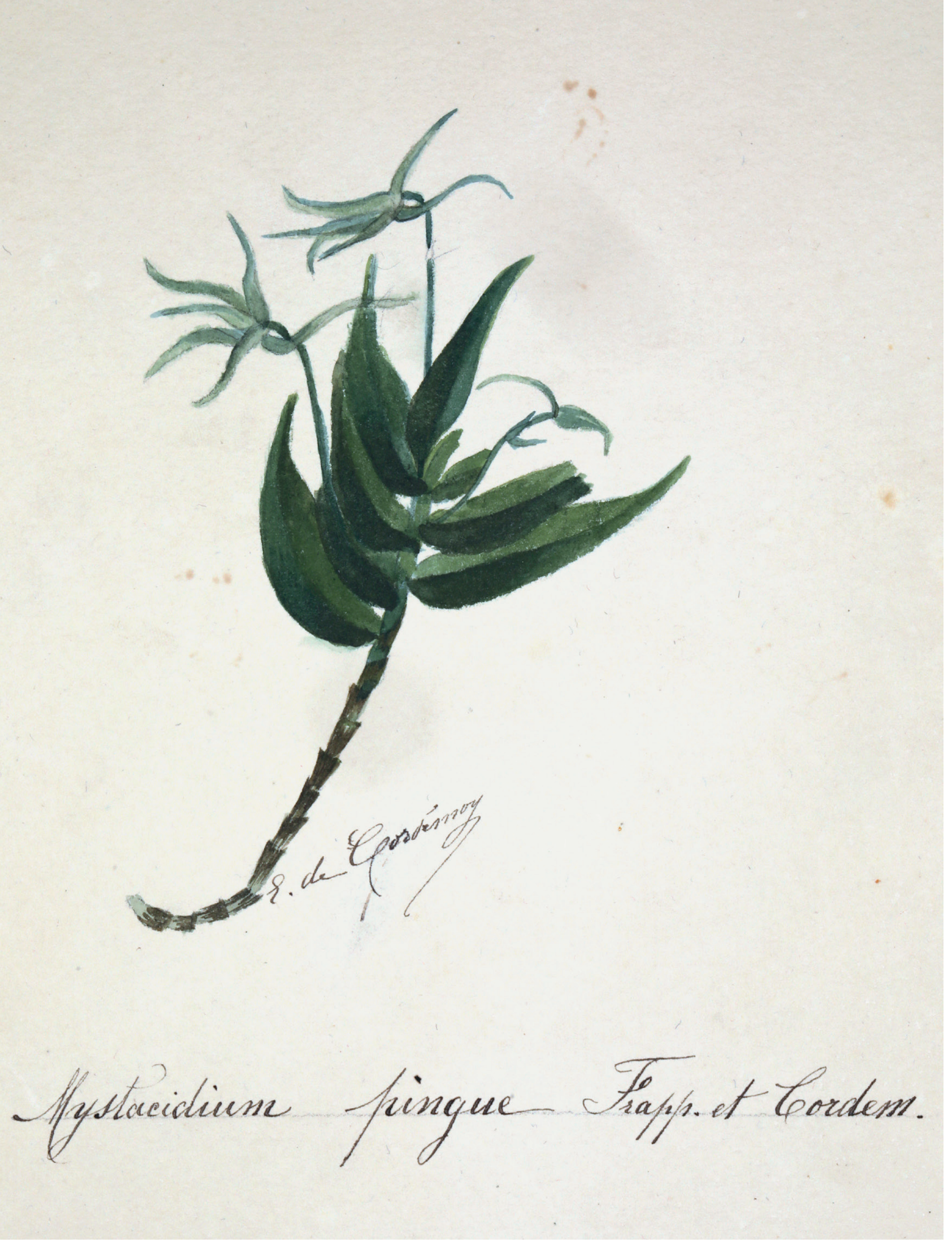

Figure 13. Lectotype of *Angraecum pingue*. Watercolour by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

demoy (1895: 206), but did not mention herbarium material in his description, commenting that it was first found in 1881 by Hermann at 'St Pierre, bras de la Plaine' in Réunion where it is more or less abundant. No corresponding Commerson material has been found in P and MARS. Cordemoy (1899: 421) mistakenly considered both *Angraecum patens* and *A. paniculatum* as conspecific with *A. calceolus*, and this was followed by Garay (1973: 512). Bernet (2010a: 298) first included *Angraecum paniculatum* as a synonym of *A. patens*. It is endemic to Réunion.

9. *Angraecum pingue* Frapp. in Cordem. Fl. Réunion: 214 (1895). Fig. 12–13.

TYPE: Cordem., Rev. Gen. Pl. Bot.: pl. 7 no 8 (1899), **lectotype designated here**: as *Mystacidium pingue*, based on the watercolour by E. de Cordemoy in MAU.

Angraecum pingue Frapp., Cat. Orchid. Réunion: 13 (1880), *nom. nud.*

Mystacidium pingue (Frapp.) Cordem., Rev. Gen. Pl. Bot.: 421 (1899).

Angraecum nasutum Schltr., Repert. Sp. Nov. Regni Veg. Beih. 33: 315 (1925). TYPES: Madagascar, Mt. Tsaratanana, *Perrier* 15307 (holotype: P00098451; isotype: P00098452).

Angraecoides nasuta (Schltr.) Szlach., Mytnik & Grochocka, Biodiv. Rec. Conserv. 29: 10 (2013).

Angraecoides pinguis (Frapp. in Cordem.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 10 (2013).

As no herbarium material associated with Frappier has been located, Cordemoy's published illustration is selected as the lectotype here. It is a widespread species in Madagascar and the Mascarenes (rare in Mauritius, locally more common in Réunion).

10. *Angraecum tenellum* (Ridl.) Schltr., Beih. Bot. Centralbl. 33, 2: 438 (1915). Fig. 14–15.

TYPE: Madagascar, S. Betsileo, Ankafana, 1880, *Deans Cowan s.n.* (holotype: BM000539208).

Saccolabium micromegas Frapp., Orchid. Réunion, Cat. Espèces Indig.: 14 (1880), *nom. nud.*

Mystacidium tenellum Ridl., J. Linn. Soc., Bot. 21: 489 (1885).

Epidorchis tenella (Ridl.) Kuntze, Revis. Gen. Pl. 2: 660 (1891).

Saccolabium microphyton Frapp. in Cordem., Fl. Réunion: 195 (1895). TYPE: Réunion; Salazie; 1879, *Cordemoy s.n.* (**lectotype designated here**: MARS).

Mystacidium spicatum Cordem., Rev. Gén. Bot. 11: 423 (1899). ***syn. nov***. TYPE: Réunion, Cilaos, Oct. 1896, *Hermann s.n.* (holotype: not located).

Angraecum oberonia Finet, Mém. Soc. Bot. France 9: 10 (1907). TYPE: Réunion, Hell-Bourg, 1875, *de L'Isle* 119 (P. W, syn.), 229 (P, syn.), 576 (P, syn).

Angraecum microphyton (Frapp.) Schltr., Beih. Bot Centralbl. 33, 2: 435 (1915).

Angraecum spicatum (Cordemoy) Schltr., Beih. Bot. Centralbl. Abt 2, 33, 2: 437 (1915).

Lesliegraecum oberonia (Finet) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 17 (2013).

Lesliegraecum tenellum (Cordem.) Szlach., Mytnik & Grochocka, Biodiv. Rec. Conserv. 29: 18 (2013).

Lesliegraecum spicatum (Cordem.) Szlach., Mytnik & Grochocka, Biodivers. Res. Conservation 29: 18 (2013).

Angraecum waterlotii H.Perrier was considered a synonym of *A. tenellum* by Garay, (1973: 516) and this was followed by subsequent authors. There are considerable differences between these species: the Madagascan *Angraecum waterlotii* is distinguished by its longer and less fleshy leaves, a laxly and fewer-flowered inflorescence, different floral bract that envelop the pedicel, flowers that are a little larger, with a lip with an attenuate (vs. acute) apex and a very short and conical spur.

Pailler & Henze (2020: 191) considered *Angraecum spicatum* to be the same as *A. parvulum* but it corresponds better with the description and herbarium material of *A. tenellum* which occurs in both Madagascar and Réunion.

11. *Angraecum tenuifolium* Frapp. in Cordem., Fl. Réunion: 207 (1895). Fig. 16.

TYPE: Réunion, Cilaos, Grand Matarum, 1400 m, Jan. 1975, *T. Cadet* 4906 (**neotype designated here:** REU; isoneotypes: P00754653, P00754724).

Lepervenchea tenuifolia (Frapp. in Cordem.) Cordem., Rev. Gén. Bot. 11: 416 (1899). Szlachetko *et al.*, Biodiv. Res. Conserv. 29: 17 (2013).

Figure 14. *Angraecum tenellum* from Madagascar. Photograph by Johan Hermans.

Angraecum tenuifolium, which is endemic to Réunion, was first described by Frappier in Cordemoy (1895: 207) based upon a living plant as well as a fruiting herbarium specimen collected in 1873 by Potier but the latter has not been located. Szelengowicz & Tamon (2013: 121) listed *Bosser* 21695 (P) as the (neo)type but did not formally designate it. Both the illustration of this taxon in Cordemoy (1899: pl. 9 fig. 18) and Eudoxie de Cordemoy's watercolour of it in MAU/MSIRI lack clarity and detail; therefore *T. Cadet* 4906 (P & REU) has been designated here as the neotype as it is representative of the species and present in both P and REU.

2. Benthamia A.Rich.

1. *Benthamia erinacea* (Cordem.) Hermans & P.J.Cribb**,** ***comb. nov***. Fig. 17–18.

TYPE: Réunion, Plaine des Palmistes, Feb. 1883?, (Herb. Cordemoy (**lectotype designated here**: MARS087704); Watercolour 55 by Eudoxie de Cordemoy (MAU/MSIRI, para.).

Figure 15. Watercolour of *Angraecum tenellum* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Basionym: *Habenaria erinacea* Cordem., Fl. Réunion: 261. (1895).

Peristylus secundiflorus S.Moore ex Boivin, J. Bot. 5: 293 (1876), *nom. nud*. TYPE: Réunion, *Boivin* 1063 (P).

Peristylus erinaceus Frapp., Cat. Orchid. Réunion: 9 (1880), *nom. nud*.

Habenaria secundiflora Cordem., Fl. Réunion: 260, 551 (1895).

Benthamia nigrescens Schltr., Beih. Bot. Centralbl., Abt. 2. 34, 2: 301 (1916), *syn*. ***nov***. TYPE: Madagascar, 1350 m, March 1921, E. of Mt. Tsiafajavona, *Perrier* 13506 (holotype: P).

Benthamia nigrescens subsp. *typica* H.Perrier, Bull. Soc. Bot. France 81: 30 (1934).

Benthamia nigrescens subsp. *borbonica* H.Perrier, Bull. Soc. Bot. France 81: 31 (1934), ***syn. nov***. Type not designated.

Benthamia nigrescens subsp. *secundiflora* (Frapp. in Cordem.) H.Perrier, Bull. Soc. Bot. France 81: 31 (1934), ***syn. nov***. TYPE: Réunion, *Boivin* 1063 (holotype: P, syn.).

Figure 16. *Angraecum tenuifolium* in Réunion. Photograph by Johan Hermans.

Benthamia nigrescens subsp. *decaryana* H.Perrier, Bull. Soc. Bot. France 81: 31 (1934), ***syn. nov***. TYPE: Madagascar, Ankaizina, *Decary* 1982 (holotype: P).

Benthamia nigrescens subsp. *humblotiana* H.Perrier, Bull. Soc. Bot. France 81: 31 (1934), ***syn. nov***. TYPE: Madagascar, Mt. Tsaratanana, *Perrier* 16110 (holotype: P).

Peristylus micranthus A.Rich. & *Benthamia micrantha* A.Rich., *in sched*. Based upon: Bourbon [Réunion], ex Herb. Richard (K-LINDL.; P004742; W).

Benthamia erinacea, a widespread, relatively common and variable species in Madagascar and Réunion, was first identified by Achille Richard in the 1830's as *Peristylus* / *Benthamia micrantha* but was not formally described by him.

Moore (1876b) listed it as *Peristylus secundiflorus* and Frappier (1880) followed him but both failed to formally describe it. Cordemoy (1895: 260) listed it without description as *Habenaria secundiflora* but added a note on p. 551 on the flowers being small, greenish-yellow and appearing in March. It was depicted by Eudoxie de Cordemoy's watercolour 58 (MAU/MSIRI) but there is herbarium material of it at MARS.

Figure 17. Watercolour of *Benthamia erinacea* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Cordemoy (1895: 261), in the same work described *Habenaria erinacea* Cordem.; "a small species from the high mountains, recognised by its bristly (*hérisssonné*) appearance, created by the many very acute bracts which are twice as long as the flower". Although short, this constitutes a valid description of the species. Furthermore, a herbarium sheet from Plaine des Palmistes in Réunion on Cordemoy's herbarium in MARS is labelled as this species and corresponds well with the description and other material. In addition there is a contemporary watercolour by Eudoxie de Cordemoy in MAU/MSIRI (no. 55) which shows all the characteristics of the species (Fig. 17). Cordemoy's name is used here (over *Habenaria secundiflora*) because of its more complete and diagnostic description and the material associated with the protologue. The necessary combination is made above.

Schlechter (1916) later described it from Madagascar as *Benthamia nigrescens*. Perrier de la Bâthie (1934), in his revision of the genus added several subspecies, including two from the Mascarenes: subsp. *borbonica* differentiated by its small habit with small leaves and flowers and a shortly apiculate anther; and subsp. *secundiflora* differing in its tall habit, with larger leaves and a unilateral raceme with smaller flowers and a retuse anther. After examining all available herbarium material and examining plants in the field it is clear that there are many intermediate forms with the number and size of leaves varying greatly, as does the shape, arrangement and size of the flowers, even within colonies. Both subspecies are therefore considered here as the extremes of one variable species.

FIGURE 18. *Benthamia erinacea* in Réunion. Photograph by Rogier van Vugt.

2. *Benthamia perfecunda* H.Perrier, Notul. Syst. (Paris) 14: 140 (1951).

TYPE: Madagascar, E. summit of Marojejy, *Humbert* 23754 (**lectotype designated here**: P00094564); *Humbert* 23755 (P0009565-6, syn.).

This seldom-seen species was described from the Marojejy massif in northern Madagascar. It is characterised by its long grass-like leaves and small flowers with a lip with blunt calceiform apex. *Humbert* 23754 is selected here as the lectotype. Photographic records from Réunion in Szelengowicz & Tamon (2013: 252) and Pailler *et al*. (2018: 70) do not match this species as the foliage appears different and the rachis is less dense. No herbarium material of this species has been located from Réunion and it therefore remains as an ambiguous species for the Mascarenes.

3. *Benthamia spiraloides* (Cordem.) Hermans & P.J.Cribb, ***comb. nov***. Fig. 19–20.

TYPE: Réunion, Plaine des Palmistes, *Cordemoy* s.n. [not found], **neotype designated here**: Réunion, Plaine des Palmistes, path to Îlet Patience, 1100 m, April 2002, *Pailler* 48 (P).

Basionym: *Habenaria spiraloides* Cordem., Fl. Réunion: 551 (1895).

Benthamia sp. 1 *sensu* Bernet (2010a: 138).

Cordemoy (1895) described this species, as *Habenaria spiraloides*, in an appendix to his Flore account. He considered it close to Thouars's *Satyrium spirale* (*Benthamia africana*) but distinct by its double tuberoids, single leaf enveloping the stem base, three stem sheaths and flowers with more obtuse segments. Confusingly, he referred to the latter as '*Habenaria spiralis* Cordem.'; a watercolour by Eudoxie de Cordemoy (59 in MAU/MSIRI) resembles *H. spiraloides* but is labelled *H. spiralis* Cordemoy. The floral structure is typical for *Benthamia*.

No relevant material has been found in the Cordemoy herbarium in MARS; *Pailler* 48 has been chosen as the neotype because it represents the species well and comes from the same general locality mentioned by Cordemoy.

It resembles the widespread and variable *Benthamia africana* in its somewhat spiral raceme, narrow

Figure 19. *Benthamia spiraloides* in Réunion. Photograph by Johan Hermans.

Figure 20. *Benthamia spiraloides* in Réunion. Photograph by Johan Hermans.

Figure 21. *Bulbophyllum clavatum* in Réunion. Photograph by Johan Hermans.

FIGURE 22. Lectotype of *Bulbophyllum clavatum*. Thouars (1822).

leaves and small flowers but differs by the combination of one or two main leaves, several stem sheaths, the large pedicellate ovary, and flowers that do not open widely (vs. spreading lateral sepals) and have a lip with a shorter, thicker mid-lobe. The inflorescence and exterior of the flowers are generally reddish-brown but almost pure yellow forms have been observed. It is endemic to Réunion where several natural hybrids and hybrid swarms have been observed.

3. BULBOPHYLLUM Thouars

1. *Bulbophyllum clavatum* Thouars, Hist. Orchid.: Table 3 u. 6, t. 99 (1822). Fig. 21–22.

TYPE: Mauritius, Thouars, **lectotype designated here**: Hist. Pl. Orchid.: t. 99 (1822).

Phyllorkis clavophylis Thouars, Hist. Orchid.: t. 99 (1822) [alternative name for *Bulbophyllum clavatum*].

Bulbophyllum conicum Thouars, Hist. Orchid.: Table 3, u7, t. 100 (t. 99 in other issues) (1922) (as *Bulbophyllum conitum*, in the Coleman (1979) reprint but other editions have different table numbers). TYPE: Mauritius, Thouars, **lectotype designated here**: Hist. Orchid.: t. 100 (1822).

Phyllorkis coniphylis Thouars, Hist. Orchid.: t. 100 (1822) [alternative name for *Bulbophyllum conicum*].

Bulbophyllum clavatum Thouars var. *conicum* (Thouars), Spreng., Syst. Veg. ed. 10, 3: 732 (1826).

Phyllorkis clavata (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891).

Thouars (1822) illustrated *Bulbophyllum clavatum* (Fig.22) and *B. conicum*, both from Mauritius: his short descriptions of their characteristics are very similar. There is little doubt that they are the same taxon but there is no certainty because no herbarium material associated with either name survives. Both *Bulbophyllum conicum* and *B. conitum* have been used in synonymy; the former spelling was used in Thouars's descriptive table, while the latter on the illustration is almost certainly a typographical error. The name *Bulbophyllum conicum* has recently been used in error for plants referable to *B. cordemoyi*.

The name *Bulbophyllum clavatum* has been used historically for plants with a thickened densely flowered rachis and fused lateral sepals. Thus, several literature and herbarium records include Madagascar and the Comoros in its distribution; there are a number of very similar species in Madagascar but the size and shape of the dorsal sepal, lip decorations and shape of the stelids are slightly different. Therefore, *Bulbophyllum clavatum*, the Mascarene plant, is considered to be a distinct endemic. In Mauritius it is found mainly in the centre and south-west of the island, in Réunion principally in the east.

2. *Bulbophyllum cordemoyi* Frapp. in Cordem., Fl. Réunion: 172 (1895). Fig. 23.

TYPE: Réunion, St-Benoît, *Cordemoy s.n.* (**lectotype designated here**: MARS).

Bulbophyllum jacobi Frapp., Cat. Orchid.: 16 (1880), *nom. nud.*

B. conicum sensu Bernet (2010a: 54).

B. prismaticum sensu Pailler *et al.* (2013: 37); Pailler *et al.* (2018: 84); Pailler & Henze (2020: 91).

Bulbophyllum cordemoyi, which is endemic to Réunion, was first described by Frappier in Cordemoy's *Flora of Réunion* (1895: 172) based on a Cordemoy discovery and named for him. The same species had already been listed in 1880 by Frappier as *Bulbophyllum jacobi* but without description. Although a locally common plant, the species has been consistently misidentified as *Bulbophyllum conicum* (see details under *B. clavatum*). Herbarium material from the locality cited by Frappier in the protologue has recently been identified in Cordemoy's collection at MARS. Together with Frappier's detailed description it enables placement of this characteristic species in section *Ploiarium*: it has a very long scandent rhizome, a long inflorescence with a short, few-flowered rachis and flowers with strongly recurved dorsal sepal and petals.

3. *Bulbophyllum densum* Thouars, Hist. Orchid.: 3rd Table u.14, t. 108 (t. 107 in other issues) (1822). Fig. 24–25.

TYPE: Mauritius, *Thouars s.n.* (not located); **lectotype designated here**: Thouars, Hist. Orchid., t. 108 (1822) (in the Coleman (1979) reprint but other editions have different figure numbers).

Phyllorkis densophylis Thouars, Hist. Orchid.: t. 108

FIGURE 23. *Bulbophyllum cordemoyi* in Réunion. Photograph by Johan Hermans.

FIGURE 24. *Bulbophyllum densum* in Mauritius. Photograph by Johan Hermans.

(1822) [alternative name for *B. densum*].

Bolbophyllum densum (Thouars) Lindl., Gen. Sp. Orchid. Pl.: 52 (1830).

Phyllorkis densa (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891).

Bulbophyllum sp. 1 & sp. 2 *sensu* Bernet (2010a: 78-9).

Bulbophyllum mascarenense Pailler & Baider, in Pailler & Henze, Orchid. Réunion: 84, 194 (2020), *nom. nud.*

Bulbophyllum mascarenense Pailler & Baider, *Botany Letters*, https://www.tandfonline.com/doi/full/10.1080/23818107.2020.1817145: 2 (2020). TYPE: Réunion, St-Philippe, Basse Vallée, 1000 m, Feb. 2004, Pailler 122 (holotype: REU007926; isotypes: MAU ex REU007927) ***syn. nov.***

Bosser (2010a), Szelengowicz & Tamon (2013) and Bernet & Castillon (2012) reviewed the identity of this enigmatic species; this is discussed further under *Bulbophyllum pendulum*. Thouars's short description and illustration are of a Mauritian plant c. 12 cm tall with oval pseudobulbs, two long leaves, and an inflorescence with a terminal raceme of small flowers with divided lateral sepals and an ovate lip. Richard (1828: 64) included *Bulbophyllum densum* with a short description, based on Thouars' plate but did not examine any plants of it. Moore in Baker (1877: 347) included *Bulbophyllum densum* and described it based on Thouars's illustration, citing two herbarium specimens: 'Bojer (not seen by Moore and not found since)' and 'Ayres!' from Quartier Militaire which is at K, together with a drawing by Moore showing a typical flower of *B. pendulum*. Some of the confusion over the identity of *Bulbophyllum densum* and *B. pendulum* may have originated from the interpretation of this specimen and drawing.

It has not been possible to find reliable herbarium material directly relating to *B. densum* but Thouars's description and drawing are clear and can be associated with plants known from Mauritius and Réunion to-

Figure 25. Lectotype of *Bulbophyllum densum*. Thouars (1822).

FIGURE 26. *Bulbophyllum elliotii* in Madagascar. Photograph by Johan Hermans.

day. The species is similar to *Bulbophyllum nutans* and has frequently been confused with it: thus, several herbarium specimens have been annotated by Bosser (*Vaughan* 200 & 3001) as being a little different from *B. nutans*. It was also illustrated as distinct by J. Cadet (1989, pl. 33) and Bernet (2010a: spp. 1 & 2). A drawing in Bosser's manuscript archive shows both species on one plate.

Bulbophyllum nutans is variable and common on Mauritius and Réunion but *B. densum* is distinct in having a long inflorescence with the peduncle at least twice as long as the densely flowered rachis and flowers in which the petals and sepals are usually more obtuse at the apex. Thouars's drawing (Fig. 25) of *Bulbophyllum densum* depicts a characteristic thick rhizome and ovoid pseudobulbs, and relatively long leaves but herbarium material of this species shows great variability in these features. Some forms have long and narrow leaves (e.g. *Pailler* 122 in REU, MAU & *T. Cadet* 4043 in P). Thouars (1822: t. 108) shows a plant with a straight inflorescence lacking the curved rachis often seen in the species but a straight rachis is not unusual in herbarium material (e.g. *Bosser* 22471, *Cadet* 3139, *Pailler* 122). *Bulbophyllum mascarenense* corresponds well with all its characteristics. These specimens all have the typical peduncle sheaths, floral bracts and dense rachis, a lip with a very characteristic shape, including the undulate margin, and more or less acute tepals as shown in Thouars's sketchy drawing but well within the variability of the species.

Bulbophyllum densum, which is endemic to the Mascarenes (Mauritius and Réunion), is undoubtedly closely allied to *B. nutans* but further evidence is required to establish their exact relationship.

4. *Bulbophyllum elliotii* Rolfe, J. Linn. Soc., Bot. 29: 51 (1891).
TYPE: Madagascar, nr. Fort Dauphin, *Scott Elliot s.n.* (holotype: K; isotype: P).

Bulbophyllum sambiranense var. *typicum* H.Perrier, Notul. Syst. (Paris) 6, 2: 86 (1937), *nom. inval.*

Bulbophyllum sambiranense var. *ankeranense* H.Perrier, Notul. Syst. (Paris) 6, 2: 86 (1937), *nom. nud.*

Bulbophyllum sambiranense Jum. & H.Perrier, Ann. Fac. Sci. Marseille 21, 2: 214 (1912), *syn.* ***nov***. TYPE: Madagascar, Manongarivo massif, *Perrier* 1916 (holotype: P).

Bulbophyllum malawiense B.Morris, Proc. Linn. Soc. London 179: 63 (1968). TYPE: Malawi, Cholo, *Morris* 172 (holotype: K).

The species has often been identified in recent literature as *Bulbophyllum sambiranense* (Hermans *et al*. 2007: 123, Cribb & Hermans 2009: 238, Bernet 2010a: 75, Bosser & Lecoufle 2011: 201, Hervouet 2018: 241, Pailler & Henze 2020: 92) but the plant and flowers of that species fall within the variation of those of the widespread *B. elliotii*. *Bulbophyllum pusillum*, also from the Mascarenes, is similar to this species but there are consistent differences.

var. *elliotii* Rolfe

Widespread in tropical E. and S. Africa and Madagascar but rare on the Mascarenes (Mauritius and Réunion). (Fig. 26).

var. *latibracteatum* (H.Perrier ex Hermans) Hermans, ***comb. nov***.

Basionym: *Bulbophyllum sambiranense* var. *lati-*

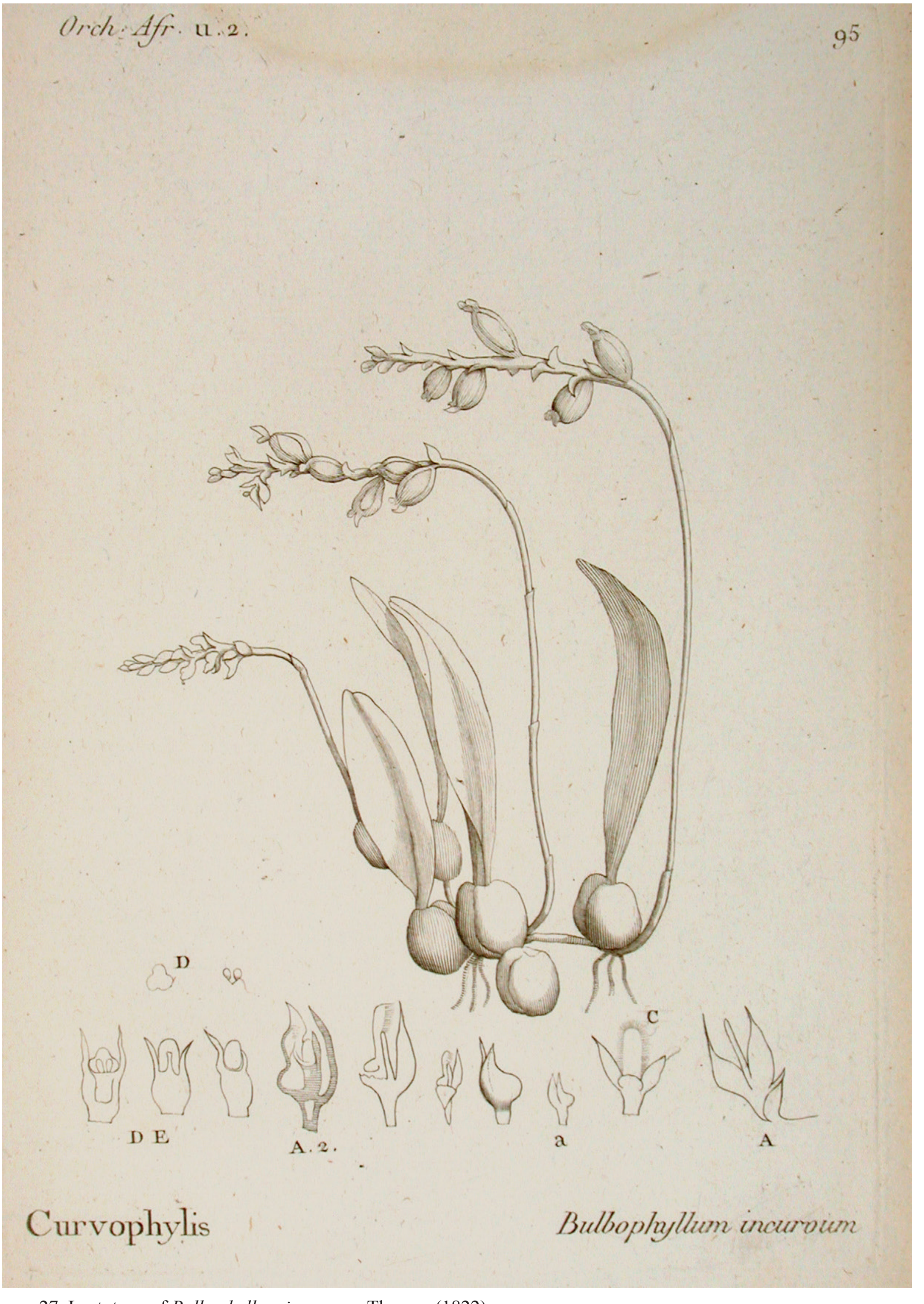

Figure 27. Lectotype of *Bulbophyllum incurvum*. Thouars (1822).

FIGURE 28. Lectotype of *Bulbophyllum pendulum*. Thouars (1822).

FIGURE 29. *Bulbophyllum pendulum* in Réunion. Photograph by Johan Hermans.

bracteatum H.Perrier ex Hermans in Hermans *et al*., Orchid. Madag. ed. 2: 288 (2007). TYPE: Madagascar, Centre, Tampoketsa between the Ikopa and the Betsiboka, Aug. 1924, *Perrier* 16724 (holotype: P).

Bulbophyllum sambiranense var. *latibracteatum* H.Perrier, Notul. Syst. (Paris) 6, 2: 86 (1937), *nom. nud*.

This variety is Madagascan and does not occur in the Mascarenes. It has less angular orbicular pseudobulbs, wider leaves and broadly oval floral bracts that are longer than the flowers.

5. *Bulbophyllum incurvum* Thouars, Hist. Orchid.: Table 3 u.2., t. 95 (t. 94 in other editions) (1822). Fig. 27. TYPE: Mauritius, *Thouars s.n.* (holotype: P).

Phyllorkis curvophylis Thouars, Hist. Orchid.: t. 95 (1822), *nom. superfl*. [alternative name for *Bulbophyllum incurvum*].

Bulbophyllum commersonii Thouars, Hist. Orchid.: Table 3, u.4., t. 97 (t. 96 in other issues) (1822), ***syn. nov***. TYPE: Réunion, Thouars, **lectotype designated here**: Hist. Orchid., t. 97 (in the Coleman (1979) reprint). (Fig. 27).

Phyllorkis comersophylis Thouars, Hist. Orchid.: t. 97 (1822), *nom. superfl*. [alternative name for *Bulbophyllum commersonii*]

Bolbophyllum incurvum (Thouars) Lindl., Gen. Sp. Orchid. Pl. 52 (1830).

Bolbophyllum commersonii (Thouars) Lindl., Gen. Sp. Orchid. Pl. 52 (1830).

Bulbophyllum thompsonii Ridl., J. Linn. Soc., Bot. 21: 464 (1885), ***syn. nov***. TYPE: Mascarenes, without exact provenance: *Thompson s.n.* (holotype: BM).

Phyllorkis thompsonii (Ridl.) Kuntze, Revis. Gen. Pl. 2: 678 (1891).

Phyllorkis incurva (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891).

Phyllorkis commersonii (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891).

In agreement with Bosser's manuscript notes we treat *Bulbophyllum commersonii* as conspecific with *B. incurvum*. No herbarium specimens of the former are known but Thouars's drawing shows a plant with the same habit and proportions.

Bulbophyllum thompsonii Ridl. is also reduced here to synonymy. Its description and type specimen (*Thompson s.n.* BM) correspond well with this species. The type material is annotated 'Madagascar' in a different hand from Ridley's, it is likely to have come from Mauritius where John Vaughan Thompson spent most of his time (1814–1816) in the region, the BM specimens came via Robert Brown in the 1850's.

Bulbophyllum incurvum, endemic to the Mascarenes, including Rodrigues, is similar to *B. hildebrandtii* from Madagascar but the latter is more robust, its pseudobulbs are 2-leaved and both its petals and column are a different shape; it is also close to *B. erectum* from Madagascar but the flowers of that species are smaller and the lip and stelidia a different shape.

6. *Bulbophyllum pendulum* Thouars, Hist. Orchid.: Table 3 u.11, t. 104 (1822). Fig. 28–29.

TYPE: Mauritius, Thouars, Hist. Pl. Orch, t. 104 (lectotype) (in the Coleman (1979) reprint) other editions have different numbers.

Phyllorkis pendiphylis Thouars, Hist. Orchid.: t. 104 (1822). [alternative name for *Bulbophyllum pendulum*].

Phyllorkis pendula (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891), *nom. superfl.*

Bulbophyllum densum sensu Cadet (1989: pl. 27).

Bulbophyllum bernadetteae J.-B.Castillon in Bernet & Castillon, Richardiana 13: 19 (2012), ***syn. nov***. TYPE: Réunion, Forests de l'île, 700 m, March 2012, *J.-B. Castillon* 53 (holotype: P04021589).

Bulbophyllum densum sensu Pailler *et al*. (2018: 73); Pailler & Henze (2020: 80).

Thouars (1822) described and illustrated *Bulbophyllum pendulum* from Mauritius (Fig. 28). No specimens have been found that can be associated with this name and we therefore have to rely on Thouars's limited description and his relatively detailed engraving (1822: t. 104). The latter clearly shows an epiphyte with ovoid pseudobulbs with two long narrowly elliptic leaves and an arching inflorescence with the peduncle partly covered by sheaths and the rachis densely flowered with the flowers slightly overlapping. The main characteristics are in the detailed floral dissection, showing the lateral sepals joined into boat-like synsepal (typical for section *Ploiarium*), fairly large petals and a characteristic sub-orbicular lip; the coloured version of the plate, although unreliable, shows yellow flowers marked with some red. Overall, this illustration corresponds very well with the plant found today in Mauritius and quite commonly in Réunion. The peduncle is fairly short and appears at first sight to be covered by sheaths while the rachis seems thin in the old inflorescence but these are all within the limits of Thouars's draughtsmanship and within the variability of the species (e.g. *Bosser* 21800, *Delteil s.n.* and *Lamusse* 21349, all at P, have short inflorescences and long sheaths). Reviewing all of the available herbarium material and field observations confirms that *Bulbophyllum pendulum*, which is endemic to Mauritius and Réunion, is a very variable species in plant size and habit, inflorescence length and flower colour.

It was recognised by Frappier in Cordemoy (1895) from Réunion where it was said to be abundant; there also is a herbarium specimen in MARS that matches the description.

Bosser (2010a), Bernet & Castillon (2012) and Szelengowicz & Tamon (2013), amongst others, have discussed the identity of the species with some of them considering it to be conspecific with *Bulbophyllum densum*, which was also described and illustrated by Thouars (1822). However, Thouars's illustration shows that while *Bulbophyllum densum* has a similar habit to *B. pendulum* and *B. nutans*, it differs in having an erect inflorescence, short peduncle sheaths with small flowers in which the lateral sepals are divided and divaricate: it belongs in a different section to *Bulbophyllum pendulum*.

The description and illustration of *Bulbophyllum bernadetteae* correspond very well with the main characteristics of *B. pendulum* and is undoubtedly conspecific.

7. *Bulbophyllum pusillum* Thouars, Hist. Orchid.: Tab. 3, u. 90. t. 102 in some editions, *s.n.* in others (1822). Fig. 30–32.

TYPE: Mauritius, Thouars; **lectotype designated here**: Hist. Orchid., t. 102 (in the Coleman (1979) reprint).

Phyllorkis pusiphylis Thouars, Hist. Orchid.: t. 102

FIGURE 30. Lectotype of *Bulbophyllum pusillum*. Thouars (1822).

FIGURE 31. *Bulbophyllum pusillum* in Mauritius. Photograph by Johan Hermans.

(1822) [alternative name for *B. pusillum*].

Bulbophyllum clavatum Thouars var. *pusillum* (Thouars), Spreng., Syst. Veg. ed. 10, 3: 732 (1826).

Phyllorkis pusilla (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891).

Bulbophyllum compressum Frappier, Cat. Orch. Réunion: 16 (1880), *nom. nud.*; Frapp. in Cordem., Fl. Réunion: 172 (1895), *nom. illeg.*, *non* Teijsm. & Binn. (1862) from Sumatra. TYPE: Réunion, *Cordemoy s.n.* (**lectotype designated here**: MARS).

Bulbophyllum frappieri Schltr., Beih. Bot. Centralbl. 33, 2: 417 (1915), *nom. nov. pro B. compressum* Frappier.

Bulbophyllum frappieri Hawkes, Lloydia 19: 92 (1956), *nom nov. pro B. compressum* Frappier, *nom. illeg.*

Bulbophyllum elliotii sensu Szelengowicz & Tamon (2013: 182, 204).

Bulbophyllum sambiranense sensu Pailler *et al.* (2013: 38); Pailler *et al.* (2018: 85).

This species, which is endemic to Mauritius and Réunion, has frequently been confused in herbaria and in the literature with *Bulbophyllum sambiranense* (now *B. elliotii*). Thouars's description and illustration (Fig. 30) are minimal but the details of the plant and flower show the distinct morphology of the species that is still frequent on Mauritius and Réunion. The drawing of the lip does not show the hairs that are typical for the species, but this feature often effectively disappears quickly after drying. Bojer included it in his *Hortus Mauritianus* (1837: 322) from high elevations on Le Pouce and Pieter Both but new records disappear after this. Bosser, in his manuscript notes, considered that it could be a dwarf form of *Bulbophyllum clavatum* from an exposed position but the differences in size and habit are considerable. The species is undoubtedly close to *Bulbophyllum elliotii* but it is sufficiently distinct and geographically isolated to warrant specific status. In common with *Bulbophyllum elliotii*, the number of leaves per pseudobulb can be one, two or a mixture within one plant, it is therefore not a diagnostic feature. It differs in having a more compact habit, generally shorter inflorescence, smaller flowers that are almost entirely yellow (vs. extensively marked red-purple) and cleistogamous. This last feature is frequently found in isolated island populations and is well documented (Stebbins 1957; Roberts 2001).

The species described by Frappier in Cordemoy as *Bulbophyllum compressum* is undoubtedly conspecific, the Cordemoy herbarium material in MARS and a detailed watercolour (t. 25) by Eudoxie de Cordemoy in MAU/MSIRI, corresponds very well (Fig. 32). The name *Bulbophyllum compressum* was used previously for a Sumatran species, both Schlechter and Hawkes renaming it as *B. frappieri*.

8. *Bulbophyllum variegatum* Thouars, Hist. Orchid.: Table 3 u.12 & u.12bis, t. 105 & t. 106 (t. 107 & t. 108 in other editions) (1822). Fig. 33–34.

TYPE: Réunion, *Thouars s.n.* (not located); **lectotype designated here**: Thouars, Hist. Orchid., t. 105 (in the Coleman (1979) reprint) other editions have different table numbers (1822).

FIGURE 32. Watercolour of *Bulbophyllum pusillum* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium

Phyllorkis variphylis Thouars, Hist. Orchid.: t. 105 (1822) [alternative name for *Bulbophyllum variegatum*].

Phyllorchis variegata (Thouars) Kuntze, Revis. Gen. Pl.: 675 (1891).

This species is widespread in north-eastern and southern Madagascar and the Mascarenes (Réunion and Mauritius). No type specimen of it has been located and, therefore, we have chosen Thouars's plate as the lectotype (Fig. 34).

4. Calanthe R.Br.

1. *Calanthe sylvatica* (Thouars) Lindl., Gen. Sp. Orchid. Pl.: 250 (1833). Fig. 35–37.

TYPE: Mauritius or Réunion, (*Thouars s.n.* **lectotype designated here**: P00107344; isolectotype: P00107345; Herb. Smith, *Thouars* 250 (LINN-HS 1403.10)).

Centrosis sylvatica Thouars, Hist. Orchid.: t. 35 & t. 36 (1822).

Alismorkis sylvalismis Thouars, Hist. Orchid.: Table 1, l., t. 35, t. 36 (1822) [alternative name for *Centrosis sylvatica*].

Centrosis corymbosa Thouars, Hist. Orchid.: t. 35 (1822), *nom. superfl.*

Centrosis plantaginea Thouars, Hist. Orchid.: t. 35 (1822), *nom. superfl.*

Bletia sylvatica (Thouars) Spreng., Syst. Veg. 3: 743 (1826); Bojer, Hortus Maurit.: 318 (1837).

Centrosia auberti A.Rich., Mém. Soc. Hist. nat. Paris, 4: 45, t. 7 (1828), *nom. illeg*.

Calanthe sylvestris Lindl. ex Steud., Nomencl. Bot., ed. 2, 1: 253 (1840), *orth. var.*

Alismorkis centrosis Steud., Nomencl. Bot., ed. 2, 1: 49 (1840).

Calanthe sylvatica var. *natalensis* Rchb.f., Linnaea 19: 374 (1846). Type from S. Africa.

Calanthe natalensis (Rchb.f.) Rchb.f., Bonplandia 4: 322 (1856).

Calanthe corymbosa Lindl., J. Linn. Soc., Bot. 6: 129 (1862). Type from Bioko (Fernando Po).

Calanthe sanderiana B.S.Williams, Nursery Cat. (Williams, 1887: 21); Rolfe, Gard. Chron., ser. 3, 12: 396 (1892). Type not located.

Alismorkis natalensis (Rchb.f.) Kuntze, Revis. Gen. Pl. 2: 650 (1891).

Alismorkis plantaginea (Thouars) Kuntze, Revis. Gen. Pl. 2: 650 (1891)

Calanthe delphinioides Kraenzl., Bot. Jahrb. Syst. 17: 55 (1893). Type from Cameroon.

Calanthe sylvatica var. *alba* Frapp. in Cordem., Fl. Réunion: 225 (1895). Type not located.

Calanthe sylvatica var. *purpurea* Frapp. in Cordem., Fl. Réunion: 225 (1895). Type not located.

Calanthe sylvatica var. *lilacina* Frapp. in Cordem., Fl. Réunion: 225 (1895). TYPE: Herb. *Cordemoy s.n.* MARS087657.

Figure 33. *Bulbophyllum variegatum* in Réunion. Photograph by Johan Hermans.

Calanthe sylvatica var. *iodes* Frapp. in Cordem., Fl. Réunion: 225 (1895). TYPE: Herb. *Cordemoy s.n.* MARS087661.

Calanthe volkensii Rolfe in Thiselton-Dyer, Fl. Trop. Afr. 7: 46 (1897). Type from Tanzania.

Calanthe violacea Rolfe, Kew Bull. 1913: 29 (1913). TYPE: Madagascar, cult. England (holotype: K, not found).

Calanthe neglecta Schltr., Bot. Jahrb. Syst. 53: 570 (1915). Type from Tanzania.

Calanthe stolzii Schltr., Bot. Jahrb. Syst. 53: 569 (1915). Type from Tanzania.

Calanthe schliebenii Mansfeld, Notizbl. Bot. Gart. Berlin 11: 808 (1933). Type from Tanzania.

Calanthe sylvatica var. *pallidipetala* Schltr., Repert. Sp. Nov. Regni Veg. Beih. 33: 166 (1924). TYPE: Madagascar, NE. of Inanatonana, *Perrier* 8104 (holotype: P).

Calanthe perrieri Ursch & Genoud, Nat. Malg. 3, 2: 102 (1951), *nom. nud*. Based upon *Duran* 811 (P) from Madagascar.

Calanthe sylvatica forma *imerina* Ursch & Genoud, Nat. Malg. 3, 2: 108 (1951), *nom nud*. Based upon

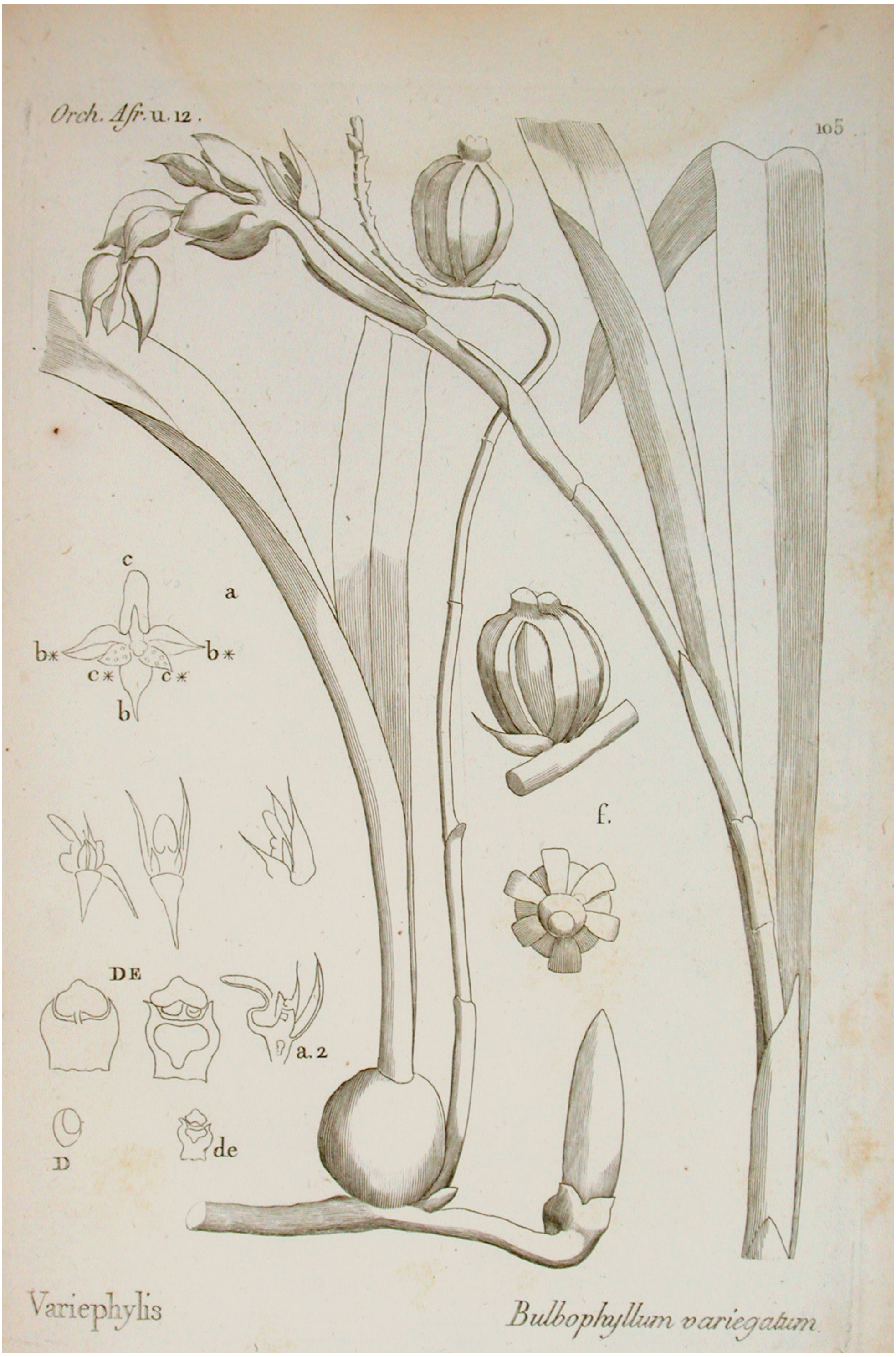

Figure 34. Lectotype of *Bulbophyllum variegatum*. Thouars (1822).

Figure 35. Watercolour of *Calanthe sylvatica* variants by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

FIGURE 36. *Calanthe sylvatica* in Réunion. Photograph by Johan Hermans.

FIGURE 37. *Calanthe sylvatica* in Réunion. Photograph by Johan Hermans.

Ursch 24 (P) from Madagascar.

Calanthe sylvatica forma *humberti* Ursch & Genoud, Nat. Malg. 3, 2: 108 (1951), *nom nud*. Based upon *Humbert s.n.* cult. Bot. Garden Antananarivo 808 (P) from Madagascar.

This is a very widespread and variable species in habit and flower size and colour. Frappier and others recognised a number of colour varieties but there are many intermediate colour forms.

5. CHEIROSTYLIS Blume

The identities of *Cheirostylis boryi*, *C. gymnochiloides* and *C. nuda* have been historically confused, culminating in them, together with *Zeuxine gymnochiloides* and *Z. sambiranoensis*, being considered to be one widespread and variable species, *Cheirostylis nuda* which is the oldest name and has been considered to be a peloric form of the others (Ormerod, 2002). This concept was mainly based on interpretation of herbarium material at K; however, further examination of the available herbarium material along with field observations have identified three distinct taxa as follows:

1. *Cheirostylis boryi* from Réunion and mainland Africa, characterised by its creeping rhizome, petiolate leaves, terminal dense rachis, hirsute inflorescence and exterior of the petals and sepals, flowers that do not open much, and a transversally oblong lip slightly indented at the front with characteristic calli at the base.

2. *Cheirostylis gymnochiloides* from Madagascar and the Comoros which is very different from the above by its more open campanulate flowers with the segments more detached, and a lip with two hooked appendages at the base and more deeply divided anterior lobes.

3. *Cheirostylis nuda* from the Mascarenes with a more laxly racemose rachis, fewer hairs, and a lip with an oblong-ovate apex and a few small hairy appendages at the base.

Zeuxine gymnochiloides from Madagascar and *Z. sambiranoensis* from Madagascar and the Comoros are distinct species with a dissimilar habit, and flowers with detached segments and of a different shape.

1. *Cheirostylis boryi* (Rchb.f.) Hermans & P.J.Cribb, ***comb. nov***.
Basionym: *Monochilus boryi* Rchb.f., Linnaea 41: 60 (1877). TYPE: Réunion, *Bory s.n.* (holotype: W-R1201).
Goodyera nuda sensu Richard (1828: t.6).
Zeuxine boryi (Rchb.f.) Schltr., Beih. Cot. Centralbl. 33: 2: 410 (1915).
Cheirostylis sarcopus Schltr., Bot. Jahrb. Syst. 53: 558 (1915). TYPES: Tanzania, Nyassa Highlands, Kilambo to Mbaka, Aug. 1912, *Stolz* 1530 (M0103580, neo.; K, HBG, S, syn.).
Cheirostylis gymnochiloides sensu Fontaine *et al*. (2010: 108).

Reichenbach (1877) described *Monochilus boryi* from Réunion, based on a specimen collected by Bory. Schlechter (1915) described the same species as *Cheirostylis sarcopus* from mainland Africa. It is endemic to eastern and southern Africa and Réunion. Records from Madagascar (Candolle 1901: 557) are likely to be *Cheirostylis gymnochiloides*.

6. Cynorkis Thouars

Floral morphology in some *Cynorkis* species in the Mascarenes is often even more variable than that found in Madagascar and mainland Africa; within a single species the lip and spur especially can vary greatly in shape and size, the spur can sometimes be absent or vary within one inflorescence. This is undoubtedly due to pollinator interaction or the lack of it on these more recently emerged islands. Hybrid swarms are also not uncommon on all of the islands. This variation was recognised by Frappier (in Cordemoy, 1895) when he described a great number of species and varieties, many of them based on small differences in shape of the floral segments and spur. The phylogenetic position of some of the species in the genus was recently reviewed by Ngugi *et. al*. (2020).

No other group of orchids from the western Indian Ocean has caused more nomenclatural confusion than the *Cynorkis* species with the lip uppermost, in section *Hemiperis*, all of which were placed in '*Amphorkis*' by Frappier. They are widely distributed, locally common, very variable and often form hybrid swarms: this is well illustrated by Bernet (2010a: 176-). Much of the confusion stems from the misinterpretation of the descriptions and type herbarium material. Historical and recent literature, including Hermans *et al*. (2007), Cribb & Hermans (2009), Pailler *et al*. (2018) and Szelengowicz & Tamon (2013), and Bernet (2010a), have either accepted past misinterpretations or lacked access to the appropriate type materials. The type of *Orchis squamosa* Poir. had remained undiscovered in the Lamarck herbarium in Paris and, as a consequence, the validity of Thouars's *Amphorkis calcarata* was ignored, we recognise the following:

Cynorkis squamosa, which is widespread in Madagascar and Réunion, and has often been confused with *C. ridleyi* and *C. reticulata*.

Cynorkis calcarata from Mauritius and Réunion which has generally been confused with *C. ridleyi*.

Cynorkis discolor which is more or less distinct and endemic to Réunion.

We consider *Cynorkis ridleyi* T.Durand & Schinz (1894) to be endemic to Madagascar and the Comoros: it has slightly different floral characteristics and particularly a different spur from *C. calcarata* and *C. discolor* but these species seem to have evolved on Réunion as a result of environmental and pollinator factors. There are a great number of obvious natural hybrids between the three species in the Mascarenes. More detailed comparisons are made under the individual species.

1. *Cynorkis aristei* (J.B.Castillon) P.J.Cribb & Hermans, ***comb. et stat. nov***. Fig. 38.
TYPE: Reunion, Plaine des Palmistes, *Castillon* 1 (holotype: P; isotype: TAN).
Basionym: *Physoceras boryana* var. *aristei* J.B.Castillon, Richardiana 11, 1: 14, fig. 2 (2010).
Cynorkis boryana var. *aristei* (J.B.Castillon) Hermans & P.J.Cribb, Kew Bull. 72, 3, 38: 29 (2017).
Physoceras mesophyllum sensu Szelengowicz & Tamon (2013: 315).

Cynorkis aristei, which is endemic to Réunion, was described by Castillon (2010) as a variety of *C. boryana*; the floral morphology and colour and flower-

FIGURE 38. Watercolour of *Cynorkis aristei* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

ing time are considerably different and it can therefore be considered a species in its own right.

2. *Cynorkis calcarata* (Thouars) T.Durand & Schinz, Consp. Fl. Afr. 5: 96 (1894). Fig. 39–40.

TYPE: **Lectotype designated here**: Thouars's plate t. 4 in Hist. Orchid. (1822).

Amphorkis calcarata Thouars, Hist. Orchid.: t. 4 (1822), as *Amphorchis*.

Orchis dubia Thouars, Hist. Orchid.: table b 1 (1822).

Habenaria amphorchis Spreng., Syst. Veg. 3: 689 (1826), based on *Amphorkis calcarata*.

Cynosorchis variegata (Frapp. in Cordem.) Schltr. Beih. Bot. Centralbl. 33, 2: 403 (1915), ***syn. nov***. TYPE: **lectotype designated here**: painting 46 by Eudoxie de Cordemoy at MAU/MSIRI (labelled *Cynorchis variegata*).

Amphorkis variegata Frapp. in Cordem., Fl. Réunion: 234 (1895), ***syn. nov***.

Amphorkis variegata var. *digitata* Frapp. in Cordem., Fl. Réunion: 234 (1895), ***syn. nov***. Type not located.

Amphorkis variegata var. *polymorpha* Frapp. in Cordem., Fl. Réunion: 234 (1895), ***syn. nov***. Type not located.

Cynorkis cylindrostachys Kraenzl., Orchid. Gen. Sp. 1: 489 (1898), as *Cynosorkis*; Schlechter, Beih. Bot. Centralbl. 33: 399 (1915), ***syn. nov***. TYPE: Île de France [Mauritius] *Commerson s.n.* (holotype: P00541673).

Cynorkis squamosa sensu Cadet (1989: pl. VI); *sensu* Benke (2004: 100); *sensu* Bernet (2010a: 165); *sensu* Szelengowicz & Tamon (2013: 289); *sensu* Pailler *et al*. (2013: 46); *sensu* Pailler *et al*. (2013: 109); *sensu* Pailler & Henze (2020: 120).

Gymnadenia inversiflora A.Rich. *nom. in sched*. [Herb. Delessert, *Néraud* 79 (G)].

This species was first described as '*Calcaramphis–Orchis–dubio*' in Table 1 of Thouars's Hist. Orchid. in 1822, and illustrated in plate 4 (Fig. 40), entitled '*Calcaramphis–Amphorchis calcarata*', of which a plant and flower dissection were shown. The drawing clearly shows an elongate lanceolate leaf and non-resupinate flowers with a broad fan-shaped lip with small basal lobes and a short tubular spur. A Thouars herbarium specimen in P is labelled as *Amphorchis* and bears a copy of his plate 4 but no other information; the specimen is in poor condition and incomplete. Another specimen in the Smith herbarium at LINN is labelled 'Th.' but it is difficult to associate it with Thouars. As it has a more immediate connection with the protologue, Thouars's plate 4 has been chosen as the lectotype for the species.

Figure 39. *Cynorkis calcarata* in Réunion. Photograph by Johan Hermans.

Amphorkis variegata was described by Frappier in Cordemoy (1895) without reference to any herbarium material but his description corresponds well with *Cynorkis calcarata*. There is also a contemporary watercolour by Eudoxie de Cordemoy in MAU/MSIRI which represents this species. Frappier described several varieties of it based upon variations of the lip shape, but all fall within the variability range of *Cynorkis calcarata* except for the variety *hastata* which belongs to *C. squamosa*.

Cynorkis cylindrostachys was described by Kraenzlin in 1898 based on a Commerson specimen from Mauritius. Both the type (P00541673) and the description correspond well with Thouars's *Cynorkis calcarata*.

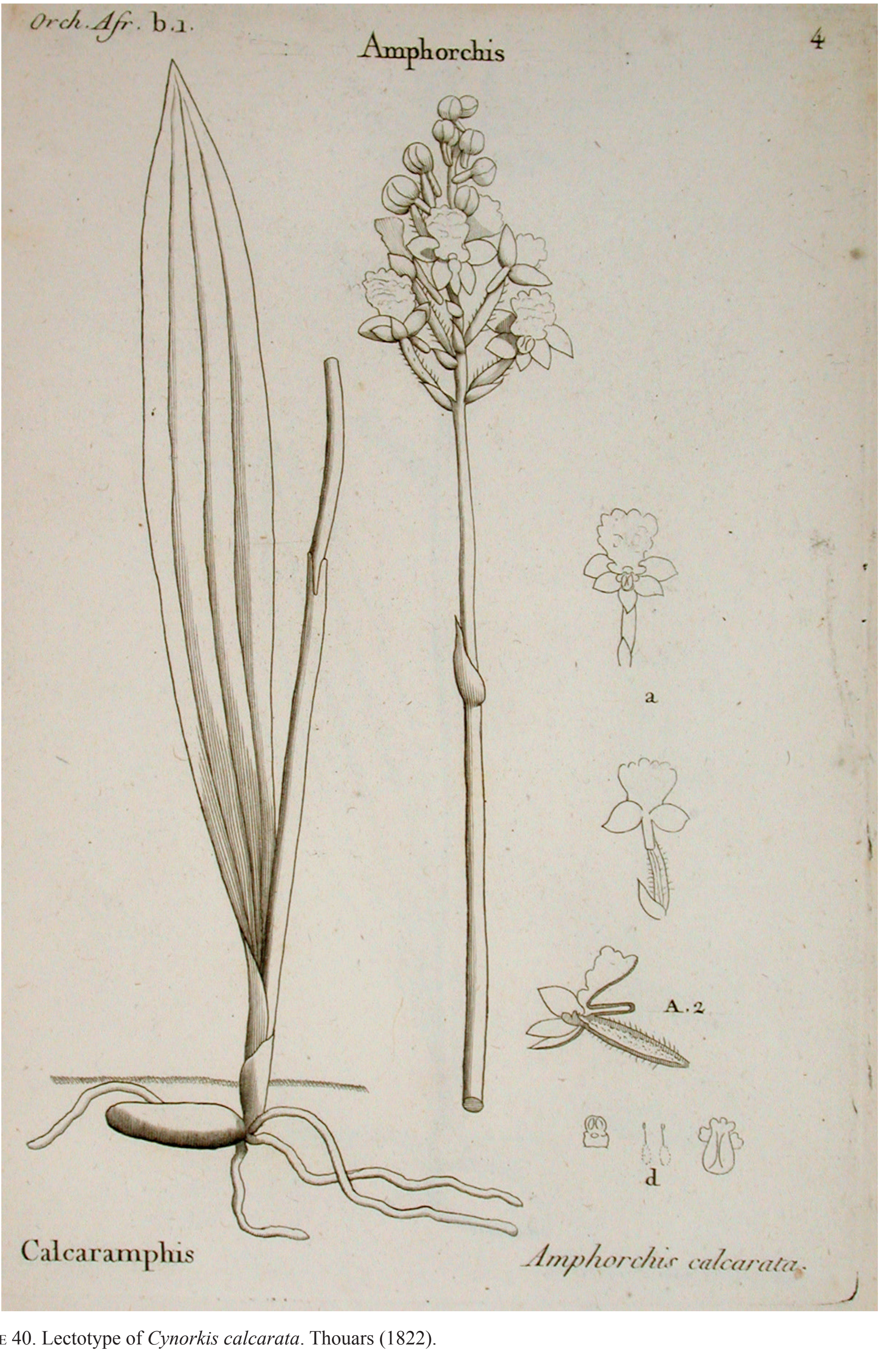

FIGURE 40. Lectotype of *Cynorkis calcarata*. Thouars (1822).

Cynorkis calcarata, which is endemic to the Mascarenes (common on Réunion, scarcer on Mauritius), is similar to *C. ridleyi* from Madagascar but is distinct by the narrowly ovate to elliptical leaf (vs. broadly ovate-elliptic), divergent petals (vs. spreading) and short tubular spur (vs. thickened or sinuate).

3. *Cynorkis coccinelloides* (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 399 (1915). Fig. 41–42.
TYPE: Réunion, without exact provenance, 1897, *Cordemoy* 3 (**neotype designated here:** K).

Camilleugenia coccinelloides Frapp., Orchid. Réunion Cat.: 10 (1880), *nom. nud.*; Frapp. in Cordem., Fl. Réunion, 234 (1895).

Cynorkis brachycentra A.Rich. ex Kraenzl., Orchid. Gen. Sp.: 1, 8: 484 (1898), as *Cynosorchis brachycentra*, ***syn. nov***. TYPE: Réunion, Grand Bénard, 1847-1852, *Boivin* 1072 (P00693006, syn.).

Bicornella coccinelloides (H.Perrier) Szlach. & Kras, Richardiana 6: 141 (2006).

Frappier cited three herbarium specimens from Réunion in his description of *Camilleugenia coccinelloides*, namely: St-Denis, ravine à Verdure in the J. M. C. Richard Herbarium, Plaine des Cafres in the Frappier Herbarium, and Côteau Maigre du Piton des Neiges in the J.-B. Potier herbarium. None of these can be identified with any certainty in existing herbaria. It was therefore necessary to select a neotype: *Cordemoy* 3 at K is chosen because it is closely associated with the author and corresponds well with the protologue. It is also similar to a watercolour by Eudoxie de Cordemoy in MAU/MSIRI.

Cynorkis brachycentra, described by Kraenzlin in 1898, was based on a Boivin herbarium sheet annotated by Achille Richard as *Cynosorchis brachycentra* and as *Gymnadenia brachcentra* Brogn. Although not indicated on the herbarium sheet, Kraenzlin cited it as coming from 'Comoren, Grand Bénard (Boivin N. 1072!)': Boivin's numbering corresponds to the sequence used when he was collecting on Réunion and 'Grand Bénard' is very likely to be a locality in central Réunion (Grand Bénare); the Comoro Island locality is therefore an error. It should not be confused with *Cynorkis brachycentra* (Frappier) Schltr. (1915: 399) which is a different species and based on different type material.

Although the description is sparse and the specimen poor, it is clear that *Cynorkis brachycentra* is the same as *C. coccinelloides* (Frapp. in Cordem.) Schltr. (1915: 399). Kraenzlin compared it with *Cynorkis elegans* Rchb.f. from Madagascar which has a similar marbled leaf but much larger flowers and a distinct lip. Kraenzlin described a 3-lobed lip but the Boivin type specimen has five lobes, two being tiny basal ones. The size and shape of the rachis, flowers, puberulous lip and spur correspond well with *Cynorkis coccinelloides* that Frappier described three years earlier.

This species is widespread in Madagascar but more common in Réunion.

4. *Cynorkis commersoniana* (A.Rich.) Kraenzl., Orchid. Gen. Sp. 1: 922-3 (1901). Fig. 43–44.
TYPE: Réunion [Bourbon], Bois du Gol, *Commerson* in Herb. Richard (holotype: P00689706).

Gymnadenia commersoniana A.Rich., Mém. Soc. Hist. nat. Paris, 4: 26 (1828) [as *Gymnadenia commersonii* in t. 4].

Peristylis commersonianus Lindl., Gen. Sp. Orchid. Pl.: 297 (1830).

Platanthera commersoniana Frapp., Cat. Orchid. Réunion: 10 (1880), *nom. nud.*

Hemiperis tenella Frapp. in Cordem., Fl. Réunion: 237 (1895); Frappier, Cat. Orchid. Reunion: *nom. nud.* (1880: 11), ***syn. nov***.; *non Cynorkis tenella* Ridl., J. Linn. Soc., Bot. 22: 124 (1886).

Habenaria commersoniana (A.Rich.) T.Durand & Schinz, Consp. Fl. Afr. 5: 75 (1894).

Cynorkis frappieri Schltr., Beih. Bot. Centralbl. 33: 400 (1915), as *Cynosorchis frappieri*, ***syn. nov***. TYPE: Réunion [Île Bourbon], Herb. Delteil (Herb. Drake) (P00693021, neo. designated by Hermans *et al*. (2020)).

Cynosorchis raymondiana H.Perrier, Arch. Bot. Bull. Mens. 5 (1931: 48) (unpublished): Perrier, Fl. Madagasc. Orchid. 1: 97 (1939). TYPES: Madagascar, nr. Fort-Dauphin, *Decary* 10142 (P00102022, syn.; *Decary* 10019 P00102023, syn.).

Cynorkis raymondiana H.Perrier ex Hermans *et al*., Orchid. Madag. ed. 2: 292 (2007), ***syn. nov***. TYPE: Madagascar, nr. Fort-Dauphin, *Decary* 10142 (lectotype: P00102022, designated by Hermans *et. al*. (2020)); *Decary* 10019 (P00102023, para.).

Bicornella raymondiana (H.Perrier.) Szlach. & Kras,

Figure 41. Watercolour of *Cynorkis coccineloides* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Figure 42. *Cynorkis coccineloides* in Réunion. Photograph by Rogier van Vugt.

Richardiana 6, 3; 145 (2006), *nom. inval.*

Gymnadenia commersoniana was described and illustrated by Achille Richard in 1828. Richard clearly designated the holotype at P by ('*Gymnadenia commersoniana Nob. Orchid. Maurit. p.27 t. 4'*). His drawing (t. 4) has caused much confusion: it shows the plant as in the herbarium specimen but the detail of the lip differs partly from his description and considerably from the herbarium material; the lip is shown as cuneiform with the front margin incurved. Dissection of the type material by Bosser and the first author clearly show an obcordate 5-lobed lip, 3-lobed at the front with a small triangular midlobe and small basal wings, floral details are otherwise correct. This may have led to some of the confusion in the nomenclature, especially by Kraenzlin (1901: 923) where he included it under *Species subdubiae v. dubiae*. When comparing the species with *Cynorkis frappieri* Schltr. (1915: 400) and its synonyms, it is obvious that they are conspecific. The nomenclature of *Cynorkis frappieri* is discussed by Hermans *et al*. (2020). *Cynorkis commersonii* Rchb.f. (1855: 213) has sometimes been listed as a valid species but Reichenbach clearly compared it with his *C. parviflora* and referred to the Richard species.

It is widespread in Madagascar and the Mascarenes being common in Réunion, but known from a single locality in western Mauritius.

5. *Cynorkis constellata* (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 399 (1915). Fig. 45–46.
TYPE: Réunion, Plaine des Cafres, 1852, *Cordemoy s.n.* (**neotype designated here:** MARS).

Hemiperis constellata Frapp., Cat. Orchid. Réunion: 11 (1880), *nom. nud.*

Camilleugenia constellata Frappier 134 (1852), *in sched.* (REU).

FIGURE 43. *Cynorkis commersoniana* in Réunion. Photograph by Rogier van Vugt.

FIGURE 44. *Cynorkis commersoniana* in Réunion. Photograph by Rogier van Vugt.

Hemiperis constellata Frapp. in Cordem., Fl. Réunion: 246 (1895).

Hemiperis clavata Frapp. in Cordem., Fl. Réunion: 247 (1895), ***syn. nov***. TYPE: Réunion, Cilaos, *Cordemoy s.n*. (holotype: REU or MARS)?

Hemiperis ludens Frapp. in Cordem., Fl. Réunion: 239 (1895), ***syn. nov***.

Hemiperis nitida Frapp. in Cordem., Fl. Réunion: 245 (1895); Frappier, Cat. Orchid. Réunion: 11 (1880), *nom. nud*.

Cynorkis clavata (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 399 (1915) ***syn. nov***.

Cynorkis ludens (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 401 (1915), ***syn. nov***. Type not located.

Cynorkis nitida (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 401 (1915), ***syn. nov***.

Frappier (1895: 246), in his description of *Hemiperis constellata* cited three collections: Tampon, Cilaos (*Potier*) and Grand Bénard (Herb. Richard). However, no herbarium material has been found that match them. A specimen in the Cordemoy herbarium (MARS) bears a label '*c'est mon Hemiperis constella-*

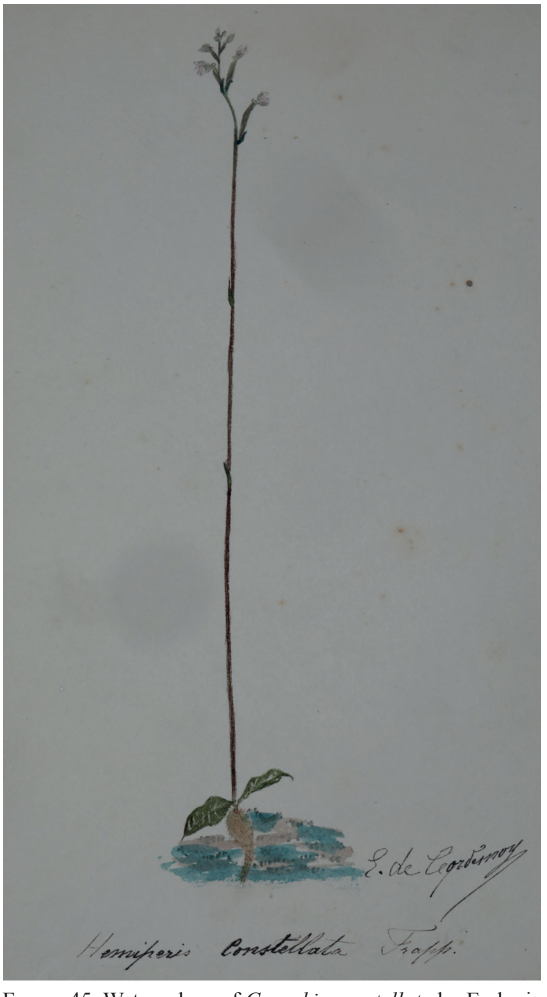

FIGURE 45. Watercolour of *Cynorkis constellata* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

ta, *1852*' from Plaine des Cafres and has been selected as the neotype for the species because it is closely associated with the author and the protologue.

Hemiperis clavata was described by Frappier (1895: 247) but there is very little herbarium material that can be associated with the protologue. Frappier distinguished it from *Cynorkis constellata* by the peculiarities of the spur and especially the size and number of spots on the lip. It is considered here as part of *Cynorkis constellata*, a very variable species. They share the same habitat, general flower shape, habitat and flowering time. The plants are virtually identical while the flowers are the same size. The pubescence on the ovary and the back of flower can range from

FIGURE 46. *Cynorkis constellata* in Réunion. Photograph by Rogier van Vugt.

almost absent with just a few scattered hairs to densely hirsute-glandulose. The lip is always 3-lobed but the size and division of the lobes ranges from obscure to roundly-3-lobed; there being a full range of intermediate forms. The spur is also variable in shape and size: sometimes it is conical but generally clavate, the shape often varying within the same inflorescence. The lip pattern can range from almost suffused with fine spotting to just a few large red blotches.

Hemiperis ludens was described by Frappier in 1895, his text clearly referring to one of more glabrous variants of *Cynorkis constellata*. The shape of the leaves and flowers, colour of the flowers and especially the variable spur within one inflorescence are typical for the species. It was reported from le Tampon where it is abundant.

Hemiperis nitida was described by Frappier (1895) from le Piton des Neiges but no associated herbarium material has been found. The description clearly refers to one of more hirsute variants of *Cynorkis constellata*.

Cynorkis constellata, which is endemic to Réunion,

Figure 47. *Cynorkis falcata* in Réunion. Photograph by Rogier van Vugt.

Figure 48. *Cynorkis falcata* in Réunion. Photograph by Rogier van Vugt.

is similar to *C. bimaculata* from Madagascar but the latter's spur is different (slightly hooked vs. clavate) and the shape and position of the lateral sepals is also distinct.

6. *Cynorkis falcata* (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33: 400 (1915), as *Cynosorchis falcata*. Fig. 47–48.

TYPE: Réunion, without exact provenance: *Cordemoy s.n.* (**lectotype designated here**: MARS087655).

Peristylus sacculatus Balf.f. & S.Moore, J. Bot. 14: 293 (1876), ***syn. nov***. TYPE: Réunion, without exact provenance: *J. H. Balfour s.n.* (holotype: K).

Hemiperis micrantha Frapp., Cat. Orchid. Réunion: 11 (1880), *nom. nud.*

Hemiperis micrantha Frapp. in Cordem., Fl. Réunion: 239 (1895).

Hemiperis falcata Frapp. in Cordemoy, Fl. Réunion: 241 (1895); Frappier, Cat. Orchid. Réunion: 11 (1880), *nom. nud.*

Cynorkis micrantha (Frapp. in Cordem.) Schltr., Bot. Jahrb. Syst. 53: 488 (1915). TYPE: Réunion, *Cor-*

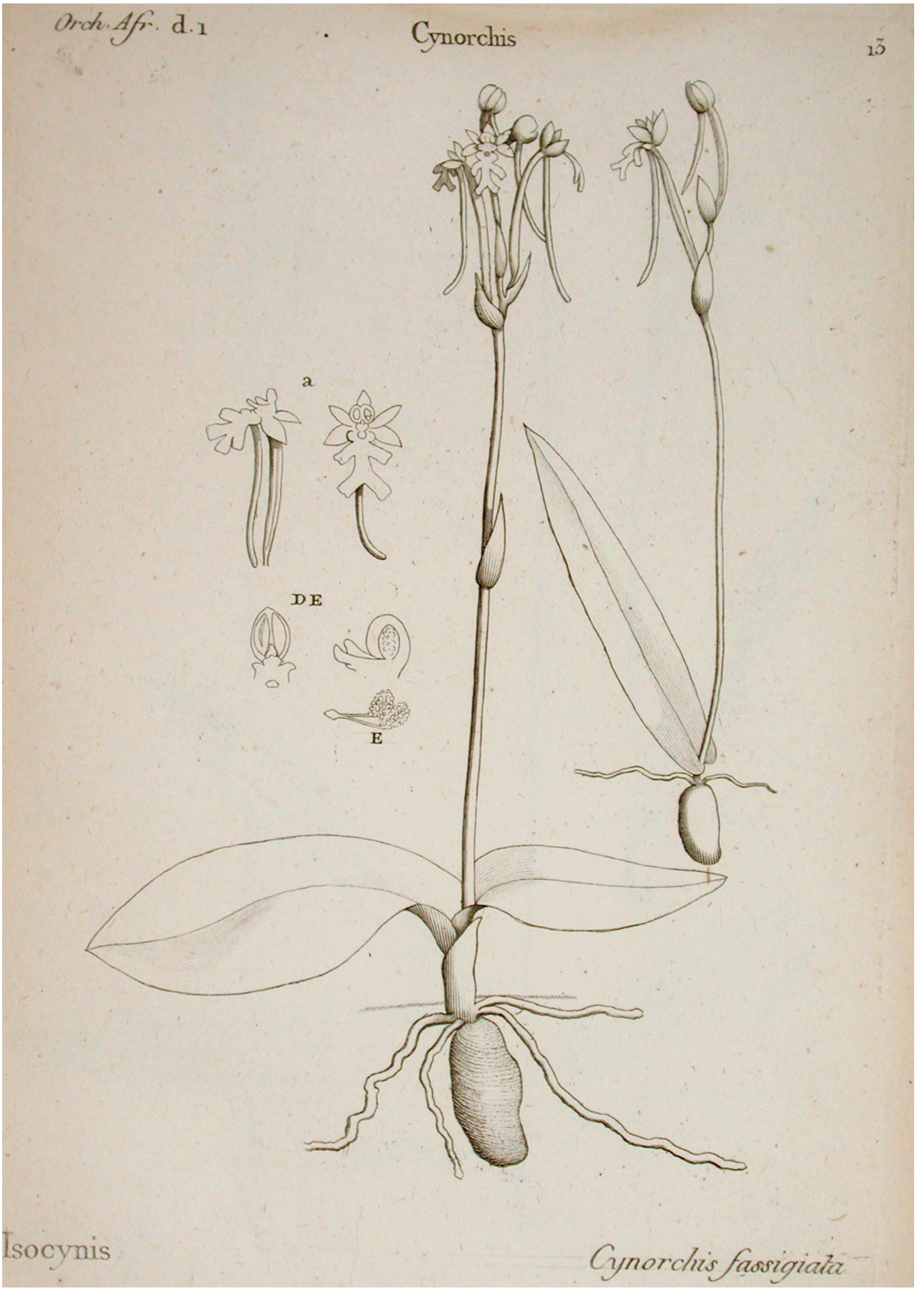

FIGURE 49. Lectotype of *Cynorkis fastigiata*. Thouars (1822).

demoy 9 (**lectotype designated here**: MARS; isolectotype, K).

Hemiperis (*Habenaria*) (*Bescherellia*) *aphylla* Cordem., *nom*. based upon *Cordemoy* 9 (MARS).

Habenaria sacculata (Balf.f. & S.Moore) T.Durand & Schinz, Consp. Fl. Afr. 5: 85 (1894), ***syn. nov***., *non Cynorkis sacculata* Schltr., Beih. Bot. Centralbl. 34, 2: 310 (1916).

In 1876, Balfour & Moore described *Peristylis sacculatus* from Réunion based on material collected during the Transit of Venus Expedition of 1874-1875; the type is at K. It was later transferred to *Habenaria* by Durand & Schinz. In 1895 Frappier described *Hemiperis falcatus* from Réunion with the type in the Cordemoy herbarium at MARS. Comparison of the types and other associated material makes it clear that they are conspecific in the genus *Cynorkis*, Frappier’s 1895 name being the next available, as the name *Cynorkis sacculata* had already been used by Schlechter in 1916 for a Madagascan species.

Cordemoy saw the type of *Hemiperis micrantha*, collected by Frappier in the ‘Herb. Mus. de la Réunion’: it was said to be in poor condition, and it has not been possible to identify an exact matching specimen. A Cordemoy collection (MARS and K) is close to the description and both match more recent material; for clarity it is selected as lectotype. The material is annotated as *Hemiperis,* (*Habenaria*), (*Bescherellia*) *aphylla* but this name was never formally described. Bosser considered it to be a new species and described it in manuscript in P. Although their basionyms were published earlier in Frappier’s 1895 work, the name *Cynorkis falcata* was chosen over *C. micrantha* in Pailler & Henze (2020: 196).

It was thought to be endemic to Réunion but there are credible sight records from Madagascar (Angavokely) by Jean-Michel Hervouet (pers. comm. 2015).

7. *Cynorkis fastigiata* Thouars, Hist. Orchid.: Table 1, d 1, t. 13 (1822), *nom. cons*. (Hermans & Cribb 2006: 1042). Fig. 49–51.

TYPE: without exact provenance: *Thouars s.n*. (**lectotype designated here**: P00102259).

Orchis obcordata Willem., Usteri Ann. Bot. 18: 52 (1796); Schlechter, Beih. Bot. Centralbl. 33: 401 (1915), *non* Buch-Ham. ex D.Don, Prodr. Fl. Nepal. 23 (1825). TYPE: Mauritius, *Commerson s.n*. (P00340443, neo).

Cynorkis isocynis Thouars, Hist. Orchid.: t. 13 (1822).

Cynorkis triphylla Thouars, Hist. Orchid.: Table 1, d.2., t. 14 (1822).

Orchis triphylla (Thouars) Spreng., Syst. Veg. 3: 687 (1826).

Orchis fastigiata (Thouars) Spreng., Syst. Veg. 3: 687 (1826).

Gymnadenia triphylla (Thouars) A.Rich., Mém. Soc. Hist. nat. Paris, 4: 26 (1828).

Gymnadenia fastigiata (Thouars) A.Rich., Mém. Soc. Hist. nat. Paris, 4: 23 (1828).

Cynorkis triphylla (Thouars) Lindl., Gen. Sp. Orchid. Pl.: 332 (1835).

Orchis mauritiana Sieber ex Lindl., Gen. Sp. Orchid. Pl.: 332 (1835). TYPE: Mauritius, *Sieber* 169 (holotype: K; isotypes: P, W).

Cynorkis fastigiata var. *triphylla* (Thouars) S.Moore in J.G.Baker, Fl. Mauritius: 337 (1877), ***syn. nov***. TYPE: Mauritius, without exact location, **lectotype designated here**: Thouars t. 14 in Hist. Orchid. (1822).

Cynorkis cordemoyi Frapp. in Cordem., Fl. Réunion: 229 (1895), ***syn. nov***. TYPE: watercolour by Eudoxie de Cordemoy (**lectotype designated here**: MAU/MSIRI, the painting showing 3 open flowers).

Cynorkis obcordata (Willem.) Schltr., Beih. Bot. Centralbl. 2, 34: 401 (1916).

Cynosorchis hygrophila Schltr., Beih. Bot. Centralbl. 34, 2: 309 (1916). TYPE: Madagascar, along the river Fandrarazana (NE), *Perrier* 11398 (*Schlechter* 100) (holotype: B†; isotype: P).

Cynosorchis diplorhyncha Schltr., Repert. Spec. Nov. Regni Veg. Beih. 15: 325 (1918). TYPE: Madagascar, Ste-Marie, *Laggiara s.n*. (holotype: B†).

Cynosorchis laggiarae Schltr., Repert. Spec. Nov. Regni Veg. Beih. 15: 326 (1918). TYPE: Madagascar, *Laggiara s.n*. (holotype: B†)

Cynosorchis laggiarae var. *ecalcarata* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 15: 326 (1918). TYPE: Madagascar, *Laggiara s.n*. (holotype: B†).

Cynosorchis decolorata Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 46 (1924). TYPE: Madagascar, Sambirano mountains, *Perrier* 15713 (holotype: P).

Habenaria cynosorchidacea C.Schweinf., Bernice Bi-

Figure 50. *Cynorkis fastigiata* in Réunion. Photograph by Johan Hermans.

Figure 51. Watercolour of *Cynorkis fastigiata* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

shop Mus. Bull. 141: 18 (1936). TYPE: from Fiji.

Cynorkis fastigiata var. *typica* H.Perrier in Humbert, Fl. Madagasc., Orchid. 1: 141 (1939), *nom. inval*.

Cynorchis fastigiata var. *decolorata* (Schltr.) H.Perrier in Humbert, Fl. Madagasc., Orchid. 1: 141 (1939) *nom. inval*.

Cynorchis fastigiata var. *diplorhyncha* (Schltr.) H.Perrier in Humbert Fl. Madagasc. Orchid. 1: 141 (1939) *nom. inval*.

Cynorchis fastigiata var. *hygrophila* (Schltr.) H.Perrier in Humbert, Fl. Madagasc., Orchid. 1: 140 (1939) *nom. inval*.

Cynorchis fastigiata var. *laggiarae* (Schltr.) H.Perrier in Humbert, Fl. Madagasc., Orchid. 1: 141 (1939) *nom. inval*.

Cynorkis seychellarum Aver., Bot. Zhurn. 68, 11: 1566 (1983), ***syn. nov***. TYPE: Seychelles, Praslin, *Tzuelev* 318 (holotype: LE)

Cynorkis fastigiata is a very widespread and variable species in Madagascar, the Comoros, the Seychelles, Mauritius and Réunion: it sometimes has one leaf, more commonly two and occasionally three; the number of leaves is often inconsistent in individual colonies. Thouars named and illustrated *Cynorkis triphylla* from Mauritius which was considered a variety by Moore (1877: 337) but it falls within this phenotypically plastic species and the flowers are typical of *C. fastigiata*, it therefore is considered conspecific here. Flower shape and size also vary considerably: *Cynorkis seychellarum* Aver., is close to the typical form and does not warrant specific status.

Cynorkis cordemoyi, was described by Cordemoy in 1895 based on Frappier's manuscript notes. He noted that it was rare on the escarpments of the rivière des Marsouins and quite abundant on the talus on chemin de Bethléem. No type material has been located but two watercolours by Eudoxie de Cordemoy are labelled as '*Cynorkis cordemoyi* Frapp.' in MAU/MSIRI (Fig. 51). One represents *Cynorkis fastigiata* but the other *C. purpurascens*, both being widespread in Réunion and quite variable: Frappier's description of *C. cordemoyi* agrees most closely with *C. fastigiata* in its number of flowers and the size of the leaf.

It occurs as a weed in Fiji and in orchid collections around the world.

8. *Cynorkis flexuosatis* (Thouars) Hermans, ***comb. nov***. Fig. 52–54.

TYPE: Mauritius, Thouars, **lectotype designated here**: Hist. Orchid.: t. 7 (1822).

Basionym: *Satorkis flexuosatis* Thouars, Hist. Orchid.: Table 1, c.2 & t. 7 (1822) ***syn. nov.***

Satyrium flexuosum Thouars, Hist. Orchid.: Table 1 c. 2, t. 7 & 12 (1822), *non Satyrium flexuosum* (L.) Thunb., Prodr. Pl. Cap.: 5 (1794) [= *Disa flexuosa* (L.) Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 212 (1800)].

Habenaria flexuosa (Thouars) Spreng., Syst. Veg. 3: 690 (1826).

Gymnadenia flexuosa (Thouars) A.Rich., Mém. Soc. Hist. nat. Paris, 4: 25 (1828).

Peristylus flexuosus (Thouars) S.Moore, J. Bot. 5: 293 (1876).

Hemiperis nervilabris Frapp. Cat. Orchid. Réunion: 11 (1880), *nom. nud*.

Habenaria thouarsii T.Durand & Schinz, Consp. Fl. Afr. 5: 87 (1894), *nom. superfl*.

Hemiperis nervilabris Frapp. in Cordem., Fl. Réunion: 250 (1895).

Hemiperis pleiadea Frapp. in Cordem., Fl. Réunion: 243 (1895); Frappier in Cordemoy, Fl. Réunion: 11 (1895), *nom. nud*.

Hemiperis trilinguis Frapp. in Cordem., Fl. Réunion: 242 (1895); Frappier, Cat. Orchid. Réunion: 11 (1880), ***syn. nov***.

Cynorkis nervilabris (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 401 (1915), ***syn. nov***. TYPE: Bélouve, to Côte Monique, Feb. 1875, *de l'Isle* 71 (**lectotype designated here**: P)

Cynorkis trilinguis (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 403 (1915), ***syn. nov***. TYPE: Réunion, Îlet de Patience, 1900 m, *Cordemoy s.n.* (**lectotype designated here**: MARS with temporary number P00541671).

Cynorkis pleiadea (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 401 (1915), ***syn. nov***. TYPE: **Lectotype designated here**: Eudoxie de Cordemoy watercolour 62, titled *Hemiperis pleiadea* Frapp. in MAU/MSIRI.

Satyrium flexuosum was described and illustrated by Thouars in 1822 (Fig. 52) but the name had already been used by Thunberg (1794), based on Linnaeus's *Orchis flexuosa* of 1760; it was therefore necessary to revert to Thouars's alternative name *Satorkis flexuosatis*. It should not be confused with *Cynorkis flexuosa*, described by Lindley (1835) which is an entirely different species common in Madagascar. No type material was found for Thouars's *Satorkis flexuosatis* /*Satyrium flexuosum*, so his plate 7 (1822) is selected here as it clearly shows the characteristics of plant and flowers. Neither *Hemiperis nervilabris* nor *H. trilinguis*, described by Frappier in 1895, have associated type material. To facilitate identification, neotypes have been designated: *de l'Isle* 71 (P) for *Cynorkis nervilabris* because it is contemporary and close to the protologue; *Cordemoy s.n.* (P00541671) for *Cynorkis triliguis* because of its association with the description and Cordemoy's manuscript label. The descriptions and related herbarium material refer to small glabrous plants with 1 to 2 leaves, flowers with a distinctly 3-lobed lip and a short spur; they both correspond well with Thouars's *Satyrium flexuosum*, especially considering the variability of this common species.

Hemiperis pleiadea was first described by Frappier in (Cordemoy, 1895) as a glabrous plant, up to 35 cm tall with 1 to 3, 5–15 cm long leaves, and slightly purple flowers with a noticeably 3-lobed lip with a large mid-lobe, the lip and part of the petals being unequal spotted violet (hence the name), and a short arched spur. He implied that it was common and widespread between 1100-1300 m on Réunion. Only one herbarium specimen has been found that was identified as such (*Delteil s.n.* P00693020) but this has a different habit and lip shape from the one described by Frappier and resembles more *Cynorkis constellata*. There is however a contemporary watercolour by Eudoxie de Cordemoy that shows the species in some detail (this has been chosen as the lectotype) (Fig. 53). Based upon this, and Frappier's description, we are

Figure 52. Lectotype of *Cynorkis flexuosatis*. Thouars (1822).

FIGURE 53. Watercolour of *Cynorkis flexuosatis* (as *Cynorkis pleiadea*) by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

convinced that this is one of the many colour variants of *Cynorkis flexuosatis*.

It is a common and widespread in Réunion, but with only one record from Mauritius, where Moore (1877: 336) reported it 'at Moka and Quartier Militaire Bojer'. A single herbarium specimen from Mauritius has been found in the Reichenbach herbarium in W, but it has not been found since in Mauritius. There are similar species in Madagascar, including *Cynorkis andringitrana* Schltr. but the spur and plant habit differ slightly.

9. *Cynorkis graminea* (Thouars) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 51 (1924). Fig. 55–56.

TYPE: Madagascar, *Thouars s.n.* (not located); Thouars, **lectotype designated here**: Hist. Orchid.: t. 6 (1822).

Satyrium gramineum Thouars, Hist. Orchid.: table 1, c. 1, t. 6 (1822).

Satorkis graminisatis Thouars, Hist. Orchid.: t. 6 (1822).

Habenaria graminea (Thouars) Spreng., Syst. Veg. 3: 690 (1826).

Platanthera graminea (Thouars) Lindl., Gen. Sp. Orchid. Pl.: 292 (1835).

Bicornella longifolia Lindl., Gen. Sp. Orchid. Pl.: 335 (1838). TYPE: Madagascar, Herb. Lehmann *s.n.* (holotype: K).

Peristylus gramineus (Thouars) S.Moore in J.G.Baker, Fl. Mauritius: 336 (1877).

Bicornella parviflora Ridl., J. Linn. Soc., Bot. 21: 500 (1885). TYPES: Madagascar, Imerina, *Deans Cowan s.n.* (BM, syn.; *Hildebrandt* 3820 (BM, HBG, syn.; *Lyall* 308 (BM, syn.).

Bicornella similis Schltr., Beih. Bot. Centralbl. 34, 2: 305 (1916). TYPE: Madagascar, Antsirabe, *Perrier* XXXIII (8125A) (holotype: B).

Benthamia graminea (Thouars) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 24 (1924).

Cynosorchis similis (Schltr.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 71 (1924).

Cynosorchis longifolia (Lindl.) Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 59 (1924).

Bicornella graminea (Thouars) Szlach. & Kras, Richardiana 6, 3; 144 (2006).

Szelengowicz & Tamon (2013: 271) typified the species in error with *Armange s.n.* (P00738407) which is a *Benthamia*.

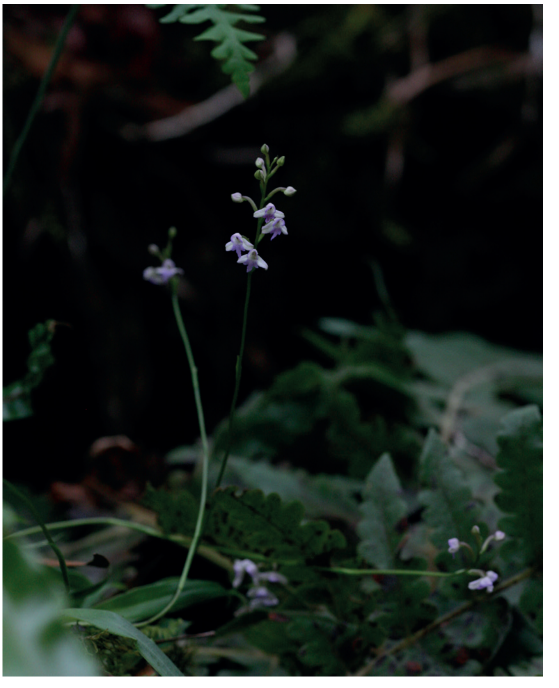

FIGURE 54. *Cynorkis flexuosatis* in Réunion. Photograph by Johan Hermans.

It is common and widespread in Madagascar, but rare in the Mascarenes with one historical collection from Mauritius and a handful from Réunion.

10. *Cynorkis inermis* (Thouars) Hermans & P.J.Cribb, Kew Bull. 72: 38, 28 (2017). Fig. 57–58.

TYPE: Mauritius or Réunion, *Thouars* 4 (holotype: P00693148).

Amphorkis inermis Thouars, Hist. Orchid.: Table 1, b.2. t. 5 (1822).

Ophrys dubia Thouars, Hist. Orchid.: t. 1 (1822).

Amphorchis dubia Thouars Hist. Orchid.: t. 5 (1822) [alternative name for *Ophrys dubia*].

Inermamphis dubia Thouars, Hist. Orchid.: Table 1 (1822) [alternative name for *Ophrys dubia*].

Rodriguezia mascarenensis Spreng. Syst. Veg. 3: 719 (1826).

Amphorkis nilarmis Steudel, Nom. Bot. 80 (1840).

Cynorkis arnottioides Rchb.f., Bonplandia (Hannover) 3: 213 (1855), ***syn. nov.*** TYPE: Réunion [Bourbon], 1849, *Giraudy s.n.* (**lectotype designated here**: W-R46815).

Arnottia mauritiana A.Rich., Mém. Soc. Hist. nat.

Figure 55. Lectotype of *Cynorkis graminea*. Thouars (1822).

Paris, 4: 30 (1828). TYPE: Bourbon [Réunion], Herb. Richard, *Commerson s.n.*, 1771. (lectotype: P, selected by Hermans *et al*. 2017: 28).

Arnottia inermis (Thouars) Moore in Baker, Fl. Mauritius: 339 (1877).

Arnottia silvicola Kraenzlin *nom. nud*. based upon: Mauritius, 1835, *Bouton s.n*. (BR0000006410704).

Reichenbach (1855) established *Cynorkis arnottioides* from a collection by "M. Girandy (Giraudy)" from 'Bourbon', describing it as having lanceolate, acute leaves, cuneate at the base, and flowers with an oblong-ligulate lip with a very small conical spur. The Giraudy herbarium sheet in the Reichenbach herbarium in Vienna corresponds well with the description. There is no doubt that it is the same as Thouars's *Cynorkis inermis*.

Cynorkis inermis could be considered part of the variable *C. nutans* (Ridl.) H.Perrier from Madagascar and the Comoros but the lack of a spur makes it distinct. A few plants of *Cynorkis inermis* have been found in Réunion that have a short remnant spur (Bernet 2010a: 122 & pers. comm. and Szelengowicz & Tamon 2013: 277) and recently plants with a much reduced spur have also been found in eastern Madagascar (Mme M. Izouard, pers. comm. 2019). The loss of (or reduction in the length of) the spur suggests a change in pollinator interaction and its endemism to the islands of Mauritius and Réunion warrant its recognition as a distinct species. A detailed analysis of the species is given by Hermans *et al*. (2020).

It is endemic to the Mascarene Islands (Mauritius and Réunion), but scarce on Mauritius.

11. *Cynorkis lilacina* Ridley, J. Linn. Soc., Bot. 21: 515 (1885). Fig. 59.

TYPE: Madagascar, Ankafana, *Deans Cowan s.n.* (**lectotype designated here**: BM00034792); former syntypes: *Baron* 229 (K000415583; P00080967 syn.); & *Lyall s.n*. (K? syn., not located).

Cynosorchis lilacina (Ridl.) T.Durand & Schinz, Consp. Fl. Afr.: 5: 92 (1894).

Hemiperis calcaripotens Frapp. in Cordem., Fl. Réunion: 252 (1895). TYPE: Bourbon [Réunion)], Herb. Drake, Herb. Delteil *s.n*. (**lectotype designated here**: P00693022).

Cynorkis boiviniana Kraenzl., Orchid. Gen. Sp. 1: 483 (1901). TYPE: Comoros, Grande Comore, *Boivin s.n*. (holotype: HBG500953; isotype: P00024638 in part).

FIGURE 56. *Cynorkis graminea* in Madagascar. Photograph by Johan Hermans.

Cynorkis calcaripotens (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 399 (1915).

Cynorkis lilacina var. *typica* H.Perrier in H. Humbert ed., Fl. Madagasc. Orchid. 1: 90 (1939), *nom. inval*.

Cynorkis lilacina var. *boiviniana* (Kraenzl.) H.Perrier in H. Humbert ed., Fl. Madagasc. Orchid. 1: 92 (1939), ***syn. nov***.

Bicornella lilacina (Ridl.) Szlach. & Kras, Richardiana 6, 3; 145 (2006).

Deans Cowan's specimen (BM) is chosen as the lectotype of *Cynorkis lilacina* because it corresponds well to the protologue and there is an associated drawing of it in his watercolour album at BM (Cowan 1880: fig. 74).

Cynorkis lilacina is a common and variable species from Madagascar and has only been reported from

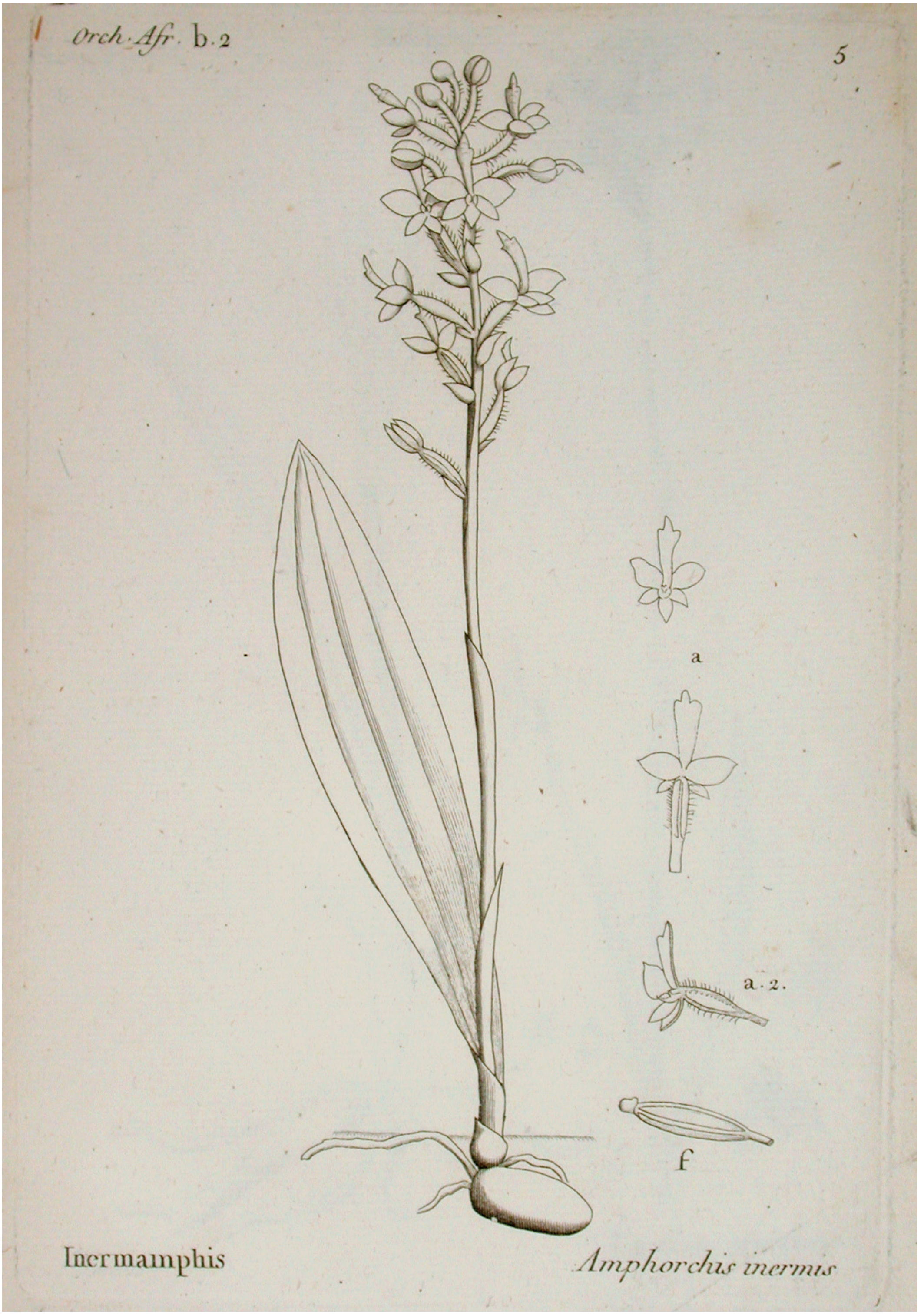

FIGURE 57. *Cynorkis inermis*. Thouars (1822).

FIGURE 58. *Cynorkis inermis* in Réunion. Photograph by Johan Hermans.

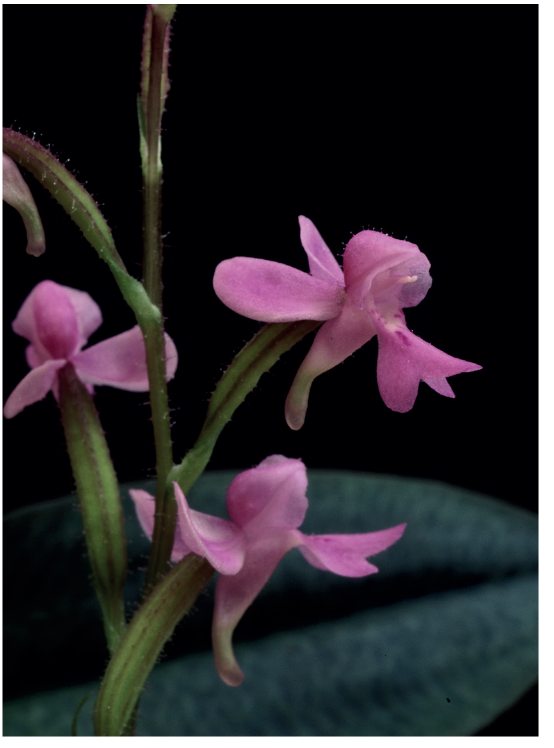

FIGURE 59. *Cynorkis lilacina* in Madagascar. Photograph by Johan Hermans.

Réunion by Szelengowicz & Tamon (2013: 271) from a single locality at around 1200 m, the photographs confirming its identity.

Cynorkis boiviniana, based on a Boivin specimen from the Comoros and described in 1901 by Kraenzlin, was later considered a variety of the species. Its spur is over half the length of the ovary (as in most forms) and Kraenzlin differentiated it from *Cynorkis lilacina* by its more hirsute flowers, most forms of *C. lilacina* being somewhat hirsute. Examination of the type material shows a typical specimen of *Cynorkis lilacina*, the lip and spur falling well within the range of variation of that species. Photographs of the variety, discovered by J. Louise (Parc National de La Réunion) and included in Szelengowicz & Tamon (2013: 273 bottom right), resemble the typical form but no vouchers are available.

A photograph from Réunion (Szelengowicz & Tamon (2013: 273 bottom left) of *Cynorkis lilacina* Ridl. var. *comorensis* H.Perrier ex Hermans (2007: 288) resembles the variety with narrow angular lateral lobes of the lip but no verified herbarium material is available.

Cynorkis calcaripotens, described by Frappier (1895: 252) in *Hemiperis*, was reported from several localities in Réunion. Its main characteristics are a single elliptic or lanceolate leaf, distinct purple spots on the lateral sepals and the 3-lobed lip with a long funnel-shaped pendant spur. A herbarium specimen from Bourbon [Réunion] in the Drake Herbarium (P) is labelled *Hemiperis calcaripotens* and has been chosen as the lectotype. Frappier's description and the habit and floral details correspond well with those of *Cynorkis lilacina*, described from Madagascar ten years earlier by Ridley. Photographs labelled as *Cynorkis calcaripotens* in Szelengowicz & Tamon (2013 260) show *C. nutans*.

Cynorkis lilacina, which is widespread in Madagascar, very rare in Réunion where it is only known from photographic records and only known from old records from the Comoros, is similar to *Cynorkis kassneriana* Kraenzl. from mainland Africa, differing in details of the flower and spur shape.

12. *Cynorkis paradoxa* (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 401 (1915) (as *Cynosorchis*). Fig. 60.

Figure 60. *Cynorkis paradoxa* in Réunion. Photograph by Rogier van Vugt.

Figure 61. Watercolour of *Cynorkis purpurascens* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

TYPE: Réunion, Plaine des Cafres, 1610 m, *Cordemoy* 1 (**lectotype designated here**: K).

Acrostylia paradoxa Frapp. in Cordem., Fl. Réunion: 228 (1895).

Acrostylia fissirostris Frapp. in Cordem., Fl. Réunion: 228 (1895); Frappier, Cat. Orchid. Réunion: 11 (1880), *nom. nud*.

Microtheca madagascarica Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 77 (1924).

Cynorkis ×madagascarica (Schltr.) Hermans in Hermans *et al*., Orchid. Madag. ed. 2: 156 (2007). TYPE: Madagascar, Mt. Tsiafajavona, *Perrier* 13504 (holotype: P).

Frappier (in Cordemoy 1895: 227) established the monotypic genus *Acrostylia* based upon herbarium material in the J. M. C. Richard herbarium which he had provisionally named *Hemiperis fissirostris* but without further details; this was followed by his description of *Acrostylia paradoxa*. Cordemoy's specimen no.1 at K, labelled from 'Réunion, Plaine des Cafres, 1610 m', is chosen as the lectotype because of its condition and its close association with the protologue. There are also specimens in poor condition in MARS (087761) and P (ex Herb. Delteil in Herb. Drake, P00693048) associated with Frappier's text. It has been assumed to be a hybrid of *Cynorkis lilacina* × *ridleyi* H.Perrier, the flowers being very variable, always sterile, the anther failing and the spur often missing, but, considering current nomenclature and distribution, it is more likely to be a natural hybrid of *Cynorkis lilacina* × *squamosa*. Its nomenclature was discussed in Bernet (2010c). It is endemic to Madagascar and Réunion.

FIGURE 62. *Cynorkis purpurascens* in Réunion. Photograph by Johan Hermans.

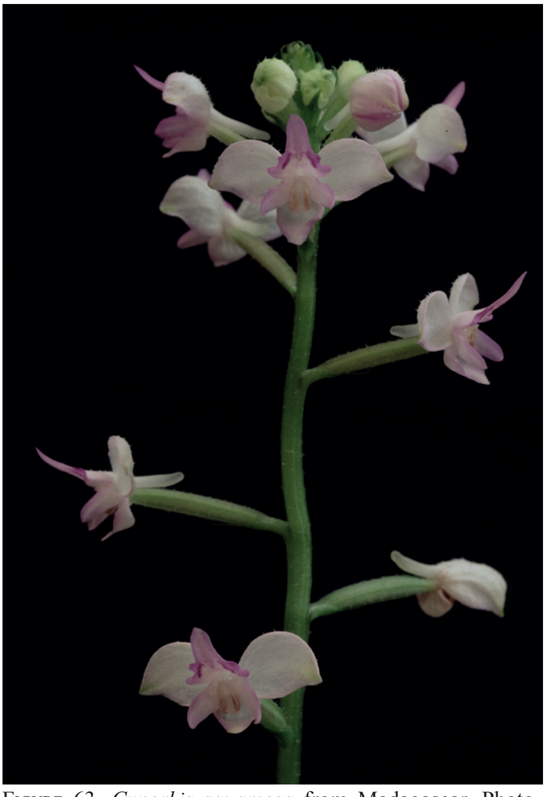

FIGURE 63. *Cynorkis squamosa* from Madagascar. Photograph by Johan Hermans.

13. *Cynorkis purpurascens* Thouars, Hist. Orchid.: Table 1. d. 2, t. 15 (1822). Fig. 61–62.

TYPE: Mascarenes, *Richard* 497 (**lectotype designated here**: P00102238; isolectotypes: P00102236 and P00102237), *non Cynorkis purpurascens* Lindl., Gen. Sp. Orchid. Pl.: 331 (1835), *nom. illeg*.

Cynorkis purpurocynis Thouars, Hist. Orchid.: t. 15 (1822).

Orchis purpurascens (Thouars) Spreng., Syst. Veg. 3: 687 (1826).

Gymnadenia purpurascens (Thouars) A.Rich., Mém. Soc. Hist. nat. Paris, 4: 29, t. 6 (1828). Bojer, Hortus Maurit.: 311 (1837).

Cynosorchis purpurascens var. *praecox* (Schltr.) Schltr., Ann. Mus. Col. Marseille, sér. 3, 1: 153 (1913).

Cynosorchis praecox Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 65 (1924). TYPES: Madagascar, Mt. Tsitondroina, nr. Maevatanana *Perrier* 425 (P, syn.) & Bemarivo, *Perrier* 1938 (33?) (P, syn.).

Cynorkis multiflora Rchb.f. *nom. in sched*. based upon: *Bojer s.n.* I.129 (W-RCHB).

Several herbarium sheets of *Richard* 497, that historically have been considered the type of Thouars's *Cynorkis purpurascens*, exist in the herbarium of Louis Claude and Achille Richard (P). It is likely that they are connected to Thouars's collections: sheet P00102238 is selected here as lectotype as it is the most complete, and it complements Thouars's plate 15. It is widespread in Madagascar, the Comoros and Réunion, but only historical records exist from Mauritius.

14. *Cynorkis squamosa* (Poir.) Lindl., Gen. Sp. Orchid. Pl.: 332 (1835). Fig. 63–65.

TYPE: Réunion, Herb. Lamarck, *Commerson s.n.* (**lectoype designated here**: P00738540, right hand plants only).

Orchis squamosa Poir. in Lam., Encycl. 4: 601 (1798); Willd., Sp. Pl. 3: 42 (1805).

Gymnadenia squamata (Poir.) A.Rich., Mém. Soc. Hist. nat. Paris, 4: 22 (1828).

Amphorkis squamosa (Poir.) Frapp. in Cordem., Fl. Réunion: 231 (1895). Frappier, Cat. Orchid.

Figure 64. Watercolour of *Cynorkis squamosa* by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

Figure 65. *Cynorkis squamosa* in Réunion. Photograph by Johan Hermans.

Réunion: 11 (1880), *nom. nud*.

Amphorkis reticulata Frapp. in Cordem., Fl. Réunion: 231 (1895). Frappier, Cat. Orchid. Réunion: 11 (1880), *nom. nud*.

Amphorkis reticulata var. *alba* Frapp. in Cordem., Fl. Réunion: 232 (1895), ***syn. nov***. Type not located.

Amphorkis reticulata var. *rosea* Frapp. in Cordem., Fl. Réunion: 233 (1895), ***syn. nov***. Type not located.

Amphorkis reticulata var. *appendiculata* Frapp. in Cordem., Fl. Réunion: 231 (1895), ***syn. nov***. Type not located.

Amphorkis reticulata var. *exappendiculata* Frapp. in Cordem., Fl. Réunion: 232 (1895), ***syn. nov***. Type not located.

Amphorkis variegata var. *hastata* Frapp. in Cordem, Fl. Réunion: 234 (1895), ***syn. nov***. TYPE: Réunion, Entre Deux, Ravine Citrons, 800 m, Oct. 1881, *Cordemoy s.n.* (REU).

Amphorkis variegata var. *stenolabris* Frapp. *in sched*. Based upon: Réunion, Brulé de St-Denis, *Potier s.n.* (P00693169).

Cynorkis reticulata (Frapp. in Cordem.) Schltr., Beih. Bot. Centralbl. 33, 2: 402 (1915), ***syn. nov***. TYPE: **Lectotype designated here**: painting 45 by Eudoxie de Cordemoy in MAU/MSIRI, labelled *Cynorchis reticulata*.

Cynorchis squammata orth. var. sensu Friedmann (1988: 23), the illustration is of *Cynorkis calcarata*.

Cynorkis variegata sensu Pailler & Henze (2020: 122).

Orchis resupinata Lehmann *in sched*. [in K-LINDL].

Poiret's description of *Orchis squamosa*, in 1798 in Lamarck's *Encyclopedia*, was short but specific: he wrote about a slender plant with two oval leaves, several caulinary sheaths, a lax rachis, floral bracts a third of the ovary, white flowers, lip (*pétale supérieur*) longer and narrower than the other segments, oval lateral

Figure 66. Lectotype of *Disperis cordata*. Thouars (1822).

Figure 67. *Disperis cordata* in Réunion. Photograph by Rogier van Vugt.

sepals, the lower petal (*pétale inférieur*) entire and a short obtuse spur c. 1/3rd of the ovary. It was collected by Commerson in Bourbon [Réunion] and was seen by the author in the Lamarck herbarium. A Commerson specimen from 'Isle de Bourbon' was found in the Lamarck herbarium in P, two plants of *Cynorkis fastigiata* are on the same sheet but the third specimen (P00738540) on the right of the sheet is chosen here as the type. The specimen matches the description very well, and it and the description combined give a very clear definition of the species. There are several other Commerson specimens representing this species in herbaria, especially P, including several in the de Jussieu herbarium, a few also contain specimens of *Cynorkis calcarata*. The species was placed in the genus *Cynorkis* by Lindley (1835: 332) who tentatively (and in error) considered Thouars's *Amphorchis calcarata* a synonym.

Figure 68. *Disperis cordata* in Réunion, detail of flower. Photograph by Rogier van Vugt.

Frappier (in Cordemoy, 1895) described *Amphorkis reticulata*, but did not cite herbarium material. His description corresponds well with *Cynorkis squamosa*, while there is also a contemporary watercolour of this species by Eudoxie de Cordemoy in MAU/MSIRI (Fig. 61). Frappier described several varieties of *Cynorkis reticulata* but they are merely colour forms or slight morphological aberrations, all falling within the range of variability found in *C. squamosa*. *Amphorkis variegata* var. *hastata*, described by Frappier as a common plant with the mid-lobe of the lip linear-oblong, corresponds well with *C. squamosa*, fragments of herbarium material of it can be seen at REU. *Amphorkis variegata* and its other varieties are included under *Cynorkis calcarata*.

This species, which is widespread in Madagascar and Réunion, is similar to *Cynorkis ridleyi* from Madagascar but is distinct in having a less dense raceme, lateral sepals with almost straight horizontal basal margins (vs. rounded), a lip with small angular lobes and a mid-lobe narrowly ovate to trullate and with an entire margin (vs. an obovate to broadly obovate midlobe with a crenate to serrate margin) and a short tubular spur (vs. thickened or sinuate).

7. Disperis Sw.

1. *Disperis cordata* Sw., Kongl. Vetensk. Acad. Nya Handl. 21: 218 (1800). Fig. 66–68.

TYPE: Mauritius, *Thouars s.n.* (holotype: P, not located; **lectotype designated here**: Thouars, Hist. Orchid.: t. 2 (1822), *Arethusa cordata* (Sw.) Poir. in Lamarck, Encycl., Suppl. 1: 444 (1811).

Dryopeia discolor Thouars, Hist. Orchid.: Tab.1, a. 1, t. 2 (1822). Type not known.

Dryorkis erythrodrys Thouars, Hist. Orchid.: t. 2 (1822), *nom. superfl.* [alternative name for *Dryopeia discolor*].

Disperis discolor (Thouars) Frapp. Cat. Orchid. Réunion: 10 (1880), *nom. nud.*

No herbarium material associated with Thouars's description has been found; it is therefore necessary to designate his 1822 drawing as the lectotype (Fig.66).

This small orchid has also recently been reported from northern Madagascar (Bernet 2010b: 72).

8. Gastrorchis Schltr.

1. *Gastrorchis villosa* (Thouars) J.V.Stone & P.J.Cribb, Lady Tankerville's Legacy: 258 (2017). Fig. 69–71.

TYPE: Mauritius, Thouars, **lectotype designated here**: Hist. Orchid.: t. 32 (1822).

Limodorum villosum Thouars, Hist. Orchid.: Table 1, j., t. 32 (1822).

Gastorkis villogastris Thouars, Hist. Orchid.: Table 1, j., t. 32 (1822), [alternative name for *Limodorum villosum*].

Bletia villosa (Thouars) Spreng., Syst. Veg. 3: 743 (1826).

Phaius villosus (Thouars) Blume, Mus. Bot. 2: 182 (1856).

Calanthe inaperta Ayres *nom. nud.* & *Bletia lancifolia* S.Moore, J. Bot., 5: 290 (1876).

Bletia bracteosa sensu Boivin; Frappier, Cat. Orchid. Réunion: 12 (1880).

Phaius stuppeus Blume, Coll. Orchid. 14 (1858). TYPE: Réunion, Herb. Richard 638 (P).

Phaius villosus var. *longibracteatus* S.Moore in J.G.Baker, Fl. Mauritius: 349 (1877). TYPES: Mauritius, Le Pouce, *Ayres s.n.* (K, syn.); Grand Bassin, *Bouton s.n.* (K, syn.) & *Bojer s.n.* (K, syn.).

Phaius longibracteatus (S.Moore) Frapp. in Cordem., Fl. Réunion: 226 (1895).

Gastrorchis lutea subsp. *longibracteata* (S.Moore) P.Bernet, Richardiana 12: 12 (2011).

Gastrorchis lutea sensu Pailler *et al*. (2018: 117).

Calanthe villosagastris (Thouars) M.W.Chase, Christenh. & Schuit., Phytotaxa 472(6): 166 (2020).

The only species of the genus found outside of Madagascar is unusual in that its yellowish flowers never fully open. Moreover, its floral bracts are exceptionally long, the basal ones up to 12 cm long but progressively shorter above. It is the only species of *Gastrorchis* in the Mascarenes, being found on both Réunion and Mauritius. Moore in Baker (1877: 349) recognised two variants of the species with var. *longibracteata* having longer bracts but this was based on a misunderstanding of Thouars's illustration (Fig. 69) and the herbarium material available to him. Bernet (2011: 12) treated it as subspecies of the Madagascan *Phaius luteus* but it is distinct in being a much taller plant, with floral bracts, much longer than the flowers, and in its self-pollinating flowers with an entire, yellow-green lip with dark purple markings and with three hairy longitudinal ridges running from the callus to the apex.

9. Habenaria Willd.

1. *Habenaria arachnoides* Thouars, Hist. Orchid.: Table 1, e. 3., t. 18 (1822). Fig. 72–73.

TYPE: Madagascar, Thouars, **lectotype designated here**: Hist. Orchid. t. 18 (1822).

Habenorkis arachnabenis Thouars, Hist. Orchid.: Table 1, e. 3 (1822) [*H. arachnahenis* t.18], [alternative name for *Habenaria arachnoides*].

Habenaria ovalifolia A.Rich., *nom. nud*. Based upon: 'Bourbon', *Commerson s.n.* (P00735328).

Habenaria borbonica Kraenzlin, *in sched*. Based upon: Réunion, without collector (HBG501012).

The species was first described from Madagascar but also occurs in Réunion and possibly Mauritius. It has not been possible to locate any herbarium material associated with Thouars's description; his plate 18 in

Figure 69. Lectotype of *Gastrorchis villosa*. Thouars (1822).

FIGURE 70. *Gastrorchis villosa* in Réunion. Photograph by Rogier van Vugt.

FIGURE 71. *Gastrorchis villosa* in Réunion. Photograph by Rogier van Vugt.

Hist. Orchid. (1822) is therefore chosen as the lectotype (Fig. 73).

The name *Habenaria borbonica* appears on a few herbarium specimens in W & HBG, annotated by Kraenzlin as a new species, but it is not included in his 1892 monograph and it does not appear to have been described. The specimens correspond to our broad interpretation of *Habenaria arachnoides*.

2. *Habenaria lancifolia* A.Rich., Mém. Soc. Hist. nat. Paris, 4: 19 (1828).
TYPE: Mauritius, *Commerson s.n.* (**lectotype designated here**: P00112416).

Although holotype and isotype labels were later added to P herbarium sheets, they were not indicated by the author. Therefore, Commerson's specimen (P00112416) has been chosen as the lectotype because it corresponds with Richard's 1828 illustration.

The distribution and identity are tentative: most herbarium material refer to 'Ile de France, but P00112419 is annotated 'Bourbon', whereas part of the Montpellier (MPU) specimen is labelled Madagascar but these may be errors. Both Pailler *et al*. (2018: 122) and Szelengowicz & Tamon (2013: 301) repro-

FIGURE 72. *Habenaria arachnoides* in Madagascar. Photograph by Johan Hermans.

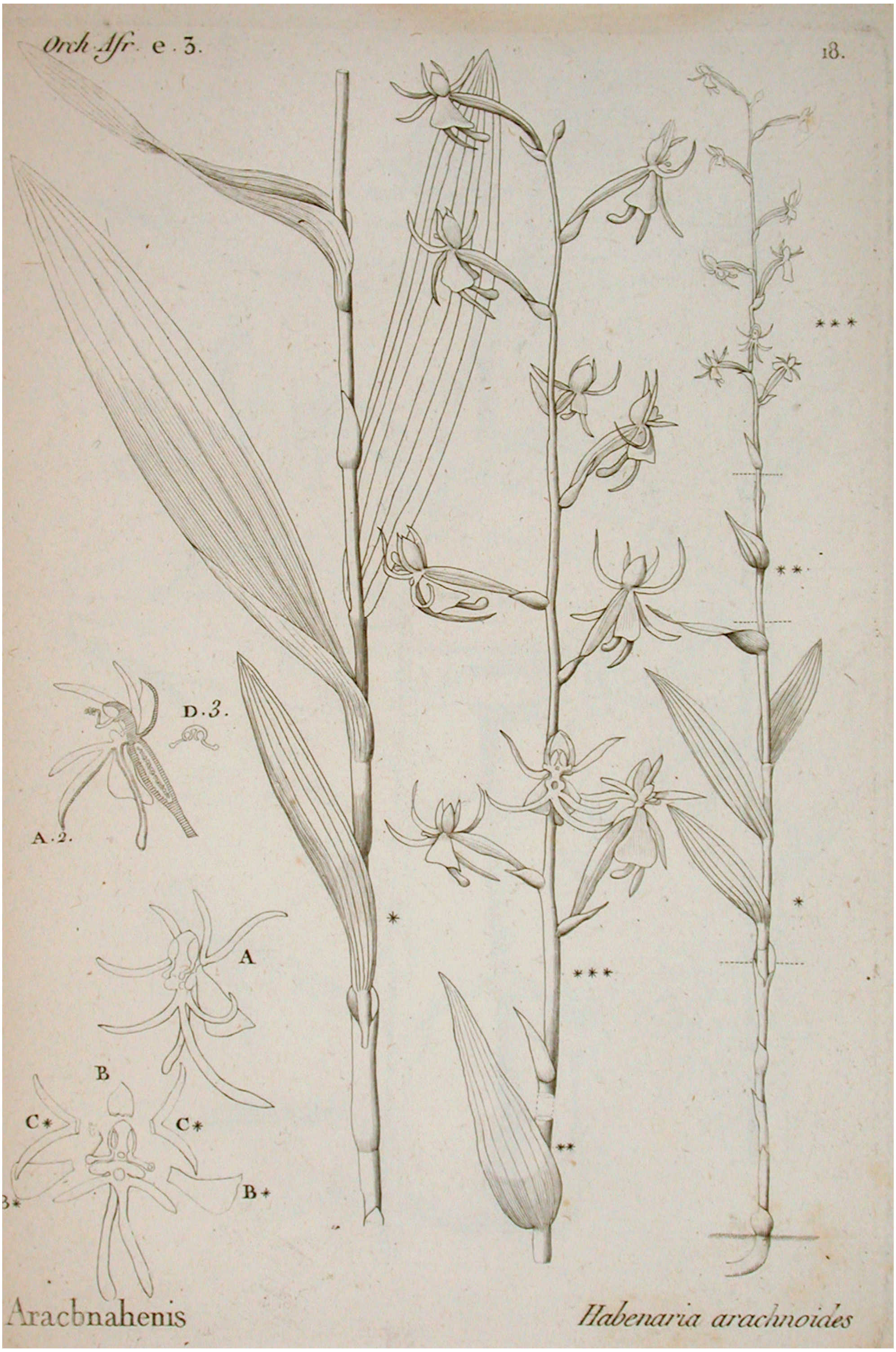

Figure 73. Lectotype of *Habenaria arachnoides*. Thouars (1822).

FIGURE 74. Lectotype of *Habenaria praealta*. Thouars (1822).

Figure 75. *Habenaria praealta* in Réunion. Photograph by Johan Hermans.

Figure 76. *Habenaria sigillum* Thouars (1822).

duce Richard's description and illustration.

It is possibly endemic to Mauritius with unconfirmed records from Madagascar and Réunion.

3. *Habenaria praealta* (Thouars) Spreng., Syst. Veg., ed. 16 3: 691 (1826). Fig. 74–75.

TYPE: Thouars, **lectotype designated here**: Hist. Orchid., t. 11 (1922).

Satyrium praealtum Thouars, Hist. Orchid.: Table 1. c. 6. t. 11 & t. 12 (in part) (1822).

Satorkis altisatis Thouars, Hist. Orchid.: t. 11 (1822) [alternative name for *Satyrium praealtum*].

This large terrestrial is found in both Madagascar and Réunion, It has not been possible to locate herbarium material associated with Thouars's description; his plate 11 in Hist. Orchid. (1822) is therefore chosen as the lectotype.

4. *Habenaria sigillum* Thouars, Hist. Orchid.: Table 1 e.4. t. 19 & 20 (1822). Fig. 76–77.

Figure 77. *Habenaria sigillum* in Réunion. Photograph by Rogier van Vugt.

TYPE: Réunion, *Thouars s.n.* (holotype: P00735313).

Habenorkis sigillahenis Thouars, Hist. Orchid.: t. 20 (1822) [alternative name for *Satyrium sigillum*].

Habenaria polyphylla Boivin, *nom.* Based upon: Herb. Mus. Réun. in Frappier in Cordemoy, Fl. Réunion: 258 (1895).

Habenaria sigillum var. *angusta* Frapp. in Cordem., Fl. Réunion: 258 (1895), ***syn. nov***. Type not located.

Habenaria sigillum var. *lata* Frapp. in Cordem., Fl. Réunion: 258 (1895), ***syn. nov***. Type not located.

Habenaria sigillum var. *cruenta* Frapp. in Cordem., Fl. Réunion: 258 (1895), ***syn. nov***. Type not located.

Habenaria disticha Cordemoy, *nom.* based upon: Herb. Cordemoy (MARS).

Thouars's type of *Habenaria sigillum* in P is in fruit and has no other indication of its origin. His two plates (Hist. Orchid.: tt. 19 & 20) are more reliable, although the lower lobes of petals were confused for the basal lobes of the lip, making it appear 5-lobed, this was repeated in the description by Moore in Baker (1877: 333). The error was also noted by Kraenzlin (1892: 82) and Frappier (1895: 258).

The varieties mentioned in Cordemoy (1895: 258) are variants of the species: *angusta* with fewer narrow leaves, *lata* with wider leaves and *cruenta* with a brownish-red stem and leaves. These all fall within the range of variation of the species. It is endemic to Mascarenes.

5. *Habenaria undulata* Frapp. in Cordem., Fl. Réunion: 256 (1895). Fig. 78–79.

TYPE: Réunion, painting 60 by Eudoxie de Cordemoy (**lectotype designated here**: MAU/MSIRI).

Habenaria richardii Cordem., Fl. Réunion: 259 (1895), as *H. richardi*; Moore, J. Bot. 5: 293 (1876), as *H. richardiana*; Schlechter, Beih. Bot. Centralbl. 33: 406 (1915). TYPE: Réunion, *Richard* 496 (holotype: P).

Platanthera richardi Frapp., Cat. Orchid. Réunion: 10 (1880), *nom. nud.*

Cordemoy (1895: 256) described this species but failed to mention any collections. Herbarium specimens labelled as this species are found in Cordemoy's herbarium in MARS. One lacks flowers and the other two are in poor condition and may not be this species and they post-date its publication. Because of the lack of reliable herbarium material, the contemporary watercolour painting by Eudoxie de Cordemoy in MAU/MSIRI has been chosen as the lectotype (Fig. 78).

Platanthera richardi was first listed by Frappier in 1880 and then mentioned without description by Cordemoy in 1895 as being in the 'Museum Herbarium' but without further detail. Moore in Balfour (1876b) also listed it from Réunion from the Richard Herbarium. A herbarium sheet in P (*Richard* 496, P00735317) labelled as '*Habenaria Richardiana sp. nova.*', but relabelled *H. sigillum*, has a habit and flowers that correspond well with *H. undulata*. Two herbarium sheets, annotated as *Habenaria richardiana*, can be found in the Lindley herbarium at Kew; one as '*H. richardiana A. R. ms., Bourbon, Richard'*, the other from Balfour, presented in 1875; both are *Habenaria undulata*. All these may well be connected to the name *Habenaria richardiana* but without certainty. It therefore remains as a *nomen nudum* attributable to *H. undulata*.

Habenaria undulata, which is endemic to Réunion, is very close to *Habenaria arachnoides* and *H. frappieri* but differs by the strongly undulate leaves, slightly larger flowers, the longer lower lobes of the petals and lobes of the lip about equal in size and a spur that is longer than the pedicellate ovary.

Pailler & Henze (2020: 198-) consider it conspecific with both *Habenaria sigillum* and *H. undulata* but it has a characteristic plant habit, longer floral segments and a longer spur.

10. Oeceoclades Lindl.

1. *Oeceoclades analavelensis* (H.Perrier) Garay & P.Taylor, Bot. Mus. Leafl. 24: 259 (1976). Fig. 80.

TYPE: Madagascar, Analavelona, N. of Fiherenana, 950-1250, March 1934, *Humbert* 14218 (**lectotype designated here**: P00109018; isolectotypes: P00109019, P00109020, B, G, K, TAN).

Lissochilus analavelensis H.Perrier, Not. Syst. (Paris) 8: 41 (1939); Perrier in Humbert, Fl. Madagasc., Orchid. 2: 23 (1941).

Eulophidium analavelense (H.Perrier) Summerh., Bull. Jard. Bot. Bruxelles 27: 395 (1957).

Oeceoclades angustifolia (Senghas) Garay & P.Taylor, Bot. Mus. Leafl. 24: 258 (1976); ***syn. nov***. TYPE: Madagascar, nr. Diego Suarez, *Rauh & Buchloch*

Figure 78. Lectotype of *Habenaria undulata*, Watercolour by Eudoxie de Cordemoy. Courtesy MSIRI and the Mauritius Herbarium.

FIGURE 79. *Habenaria undulata* in Réunion. Photograph by Jean-Michel Hervouet.

FIGURE 80. *Oeceoclades analavelensis* from Madagascar. Photograph by Johan Hermans.

7987 (holotype: HEID; isotype: P, not located).

Eulophidium angustifolium Senghas, Adansonia, sér. 2, 6: 557 (1967).

Eulophidium angustifolium subsp. *diphyllum* Senghas, Adansonia, sér. 2, 6: 561 (1967); ***syn. nov***. TYPE: Madagascar, nr. Sakaraha, River Fiherenana, *Rauh* 10423 (holotype: HEID).

Oeceoclades lavergneae J.B.Castillon, Richardiana 12, 4: 159 (2012); ***syn. nov***. TYPE: Réunion, Rivière des Galets, March 2012, *Castillon* 52 (holotype: P; isotype: REU).

Eulophia analavelensis (H.Perrier) M.W.Chase & Schuit., Phytotaxa 491(1): 50 (2021).

Eulophia angustifolia (Senghas) M.W.Chase & Schuit., Phytotaxa 491(1): 51 (2021).

Eulophia lavergneae (J.-B.Castillon) M.W.Chase & Schuit., Phytotaxa 491(1): 53 (2021).

Perrier (1939) described *Lissochilus analavelensis* from herbarium material collected by Humbert in south-western Madagascar. Subsequently, Senghas (1967: 561-) described *Eulophidium angustifolium*

FIGURE 81. *Oeceoclades pulchra* from Madagascar. Photograph by Johan Hermans.

and its var. *diphyllum*, both collected by Rauh from the same area in Madagascar as *Lissochilus analavelensis*; since then both have been reported from other parts of Madagascar. Castillon (2012: 159) described *Oeceoclades lavergneae*, which he considered to be endemic, from Réunion. Examination of the type material of these and other collections, including spirit material, photographs by Rauh and others, and field observations make it clear that all the above belong to the same variable species. Plants can have one or two leaves; the type of *Oeceoclades analavelensis* has a mixture with the unifoliate and bifoliate plants, the former in the majority. The leaves are generally narrowly obovate with dark marbling on the upper surface. Branching of the rachis is also variable with the more mature plants often producing a few short branches but young plants having simple inflorescences. Flower colour, shape and size is also somewhat variable but the shapes of the segments, the lip callus and spur are consistent. It is widespread in Madagascar, but rare in Réunion.

2. *Oeceoclades pulchra* (Thouars) P.J.Cribb & M.A.Clements, in Clements, Austr. Orchid. Res. 1: 99 (1989). Fig. 81–82.

TYPE: Réunion, *Thouars s.n.* (**lectotype designated here**: BM000525727).

Basionym: *Limodorum pulchrum* Thouars, Hist. Orchid.: t. 43-44 (1822); Richard, Mém. Soc. Hist. nat. Paris, 4: 43 (1828); Bojer, Hortus Maurit.: 313 (1837). TYPE: Réunion, *Thouars s.n.* (holotype: not located).

This widespread species (tropical Africa and W. Pacific & Australia, Madagascar, the Comoros and the Mascarenes) was described by Thouars in 1822 from Réunion but little associated herbarium material remains, none was found in P but a few flowers were located in BM. The illustrations in Thouars', Hist. Orchid.: t. 43-44 (1822) are also clear.

11. PLATYLEPIS A.Rich.

Mém. Soc. Hist. nat. Paris, 4: 34 (1828), *nom. cons.* TYPE: *Platylepis goodyeroides* A.Rich., *nom. illeg.* (basionym: *Goodyera occulta* Thouars).

Erporkis Thouars, Nouv. Bull. Sci. Soc. Phil. Paris 1: 317 (1809), as *Erporchis*, *nom. rej.*. Lectotype: *Goodyera occulta* Thouars.

Notiophrys Lindl., J. Linn. Soc., Bot. 1: 189 (1857), *nom. illeg.* TYPE: *Goodyera occulta* Thouars.

Moerenhoutia Blume, Fl. Javae n.s. 1: 99 (1858); Orchid. Arch. Ind.: 99, t. 28 fig. 3. TYPE: *M. plantaginea* Blume.

Diplogastra Welw. & Rchb.f., Flora 48: 183 (1865). TYPE: *D. angolensis* Welw. ex Rchb.f.

Coralliokyphos H. Fleischm. & Rech., Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturw. Kl. 85: 252 (1910). TYPE: *C. candidissimum* H. Fleischm. & Rech.

Bathieorchis Bosser & P.J.Cribb, Adansonia 25, 2: 229 (2003), ***syn. nov***. TYPE: *B. rosea* (H.Perrier) Bosser & P.J.Cribb (basio.: *Gymnochilus roseum* H.Perrier).

1. *Platylepis densiflora* Rolfe, Bull. Misc. Inf. Kew: 378 (1906).

TYPE: Madagascar, North, rec.d Jan. 1892 *Baron* 6550 (**lectotype designated here**: K; isolectotype: P00094743).

Platylepis bigibbosa H.Perrier, Bull. Soc. Bot. France 83: 26 (1936); Perrier in Humbert, Fl. Madagasc., Orchid.. 1: 223 (1939), ***syn. nov***. TYPES: Madagascar, Analamahitso, *Perrier* 7972 (P, syn.) & Manongarivo, *Perrier* 1949 (P, syn.).

Platylepis densiflora was described by Rolfe in 1906 based upon several specimens (*Warpur s.n.*, *Baron* 6550, 6753 from Madagascar, and *Ayres s.n* from Mauritius). *Baron* 6550 is selected here as the lectotype because it corresponds well with the protologue, is in good condition and there are specimens at K and P. The Warpur specimen has leaves of a *Goodyera* or *Platylepis* but flowers of a *Liparis*, the *Ayres* sheet is representative and in good condition but was said by Rolfe to be in fruit only although it has many flowers.

Platylepis bigibbosa was described by Perrier de la Bâthie in 1936 from Madagascar and was said to be distinct by being bigibbose at the base of the lip and with distinct lip calli and floral bracts less than three times their width. Examination of the types and other herbarium material makes it clear that the lip shape and calli are somewhat variable and no consistent differences were found between it and *Platylepis densiflora*. The proportions of the floral bracts vary within the inflorescence. The similarity was observed by Bosser in

FIGURE 82. Lectotype of *Oeceoclades pulchra*. Thouars (1822).

Figure 83. *Platylepis margaritifera* from Madagascar. Photograph by Johan Hermans.

Figure 84. *Platylepis occulta* from Madagascar. Photograph by Johan Hermans.

1999 (in his unpublished notes). It occurs in Madagascar and the Mascarenes (Mauritius and Réunion).

2. *Platylepis margaritifera* Schltr., Repert. Sp. Nov. Regni. Veg. Beih. 15: 328 (1918). Fig. 83.
TYPE: Madagascar, *Laggiara s.n*. (holotype B†; **lectotype designated here**: illustration by Schlechter in Mansfeld, Repert. Spec. Nov. Regni Veg. Beih. 68: Tafel 50 Nr. 200 (1932).

Gymnochilus roseum H.Perrier, Bull. Soc. Bot. France 83: 24 (1936); Perrier in Humbert, Fl. Madagasc., Orchid., 1: 218 (1939), ***syn. nov***. TYPE: Madagascar, Maromizaha, Feb. 1924, *Perrier* 15694 (holotype: P).

Bathieorchis rosea (H.Perrier) Bosser & P.J.Cribb, Adansonia 25, 2: 229 (2003) ***syn. nov***.

Goodyera rosea (H.Perrier) Ormerod, Taiwania 51, 3: 158 (2006) ***syn. nov***.

Schlechter described *Platylepis margaritifera* in 1918, based on a plant collected by Laggiara, very likely on the island of Sainte Marie [Nosy Boraha] off the north-east coast of Madagascar. Most of Schlechter's Berlin herbarium was destroyed (Butzin, 1981) and no specimen has been located to typify the species. His description, however, is clear and his drawing of it, published posthumously (Schlechter in Mansfeld (1932: t. 50 no. 299)), is chosen as the lectotype of the species because of its close link to the protologue.

Perrier described *Gymnochilus roseum* in 1936 from Eastern Madagascar but expressed doubt as to which genus it belonged, since then it has been transferred to *Bathieorchis* and *Goodyera* but with its typical broad floral bracts and lip with basal calli it clearly belongs in *Platylepis*. When comparing the descriptions, drawings and dissecting of herbarium material and field observations it is clear that this is the same as *Platylepis margaritifera*: habit, size of the leaves and flower size are well within the variability of the species, Schlechter's drawing shows a flower with the segments spreading instead of campanulate but this was undoubtedly distorted during the analysis. His drawing has the typical elongate lip with a small triangular epichile, two longitudinal keels at the base and the characteristic calli at the base, variously described as 'seven, pearl-like calli' by Schlechter and 'six to ten

FIGURE 85. *Platylepis occulta* from Madagascar. Photograph by Johan Hermans.

Figure 86. Lectotype of *Platylepis occulta*. Thouars (1822).

golden pedicellate glands' by Perrier; existing herbarium material confirms them to be more or less rounded calli. It occurs in Madagascar and Réunion.

3. *Platylepis occulta* (Thouars) Rchb.f., Linnaea 41: 62 (1877). Fig. 84–86.

TYPE: Mascarenes, Thouars, **lectotype designated here**: Hist. Orchid.: t. 28 (1822).

Goodyera occulta Thouars, Hist. Orchid.: t. 28 & 30 (1822), as *Goodiera*.

Goodyera bracteata Thouars, Hist. Orchid.: Table 1, i. 1, (1822), as *Goodiera*.

Erporkis crypterpis Thouars, Hist. Orchid.: 1, i. & t. 28 (1822) [alternative name for *Goodyera bracteata*].

Platylepis goodyeroides A.Rich. Mém. Soc. Hist. nat. Paris, 4: 34 (1828). TYPES: Mauritius, *Commerson s.n.* (P, syn.) & Réunion, *Thouars s.n.* (P, syn.).

Hetaeria occulta (Thouars) Lindl., Edwards's Bot. Reg. 24: 94 (1838), as *Aetheria*.

Notiophrys occulta (Thouars) Lindl., J. Linn. Soc. 1: 189 (1857).

Platylepis polyadenia Rchb.f., Flora 68: 537 (1885), ***syn. nov***. TYPE: Comoros, Grande Comore, *Humblot* (1)427 (lectotype: W; isolectotype, P, chosen in Perrier (1936: 25).

Orchiodes occultum (Thouars) Kuntze, Revis. Gen. Pl. 2: 675 (1891).

Erporkis bracteata Kuntze, Revis. Gen. Pl. 2: 660 (1891), *nom. illeg*.

Only fragments of Thouars's material of this taxon has been located at BM (BM000077838) but their origin is uncertain. Thus, Thouars's plate 28 (1822) is selected here as the lectotype (Fig. 86).

Platylepis polyadenia, described by Reichenbach in 1885 and based on a specimen from the Comoros, was subsequently accepted as a more widespread species by several authors. The description and dissection of the type and other associated material shows it to be identical with Thouars's *P. occulta*. Perrier (1936: 25) compared the two species but his comparison is based on material associated with *Platylepis densiflora* (*Commerson s.n.* & *Delteil s.n.* in P).

It is found in Madagascar, the Comoros, the Seychelles and the Mascarenes (Mauritius and Réunion).

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STUDIES IN *OBERONIA*, 9: LESSONS FROM EXCESS NAMES IN *OBERONIA* FOR ORCHIDACEAE SYSTEMATICS, INCLUDING A REVISION OF THE *OBERONIA* SECT. *SCYTOXIPHIUM*

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Abstract. The reasons for excess names in microfloral orchids such as *Oberonia* Lindl. can be traced to poor scholarship (e.g., failure to review the literature, ignoring expert advice), typological thinking, and erroneous assumption of microendemism. Some extraordinarily poor descriptions, including some from the 21st century, can be termed "taxonomic vandalism". The outdated reliance on drawings as opposed to z-stacked photographs and scanning electron micrographs poses further problems due to an abundance of demonstrable problems with drawings. The *Oberonia* sect. *Scytoxiphium* Schltr. with eight described species is reduced to one species, *Oberonia heliophila* Rchb.f.; it is illustrated by original drawings, live photographs and scanning electron microscope images. The distribution is extended from Java through Micronesia and Samoa. The species occurs predominantly from 0–500 m, less frequently to 900 m, and possibly to even 1900 m. It flowers throughout the year.

Keywords/Palabras clave: *Oberonia*, *Oberonia* sect. *Scytoxiphium*, revision, revisión, synonymies, sinonimias, taxonomic vandalism, vandalismo taxonómico

Introduction. *Oberonia* Lindl. is a genus of malaxid orchids with some 470 published species, of which some 200–300 have been considered to be correct by various authors over the past 190+ years. That number has dropped recently by identifying at least 60 new synonyms (Geiger 2016, 2019, 2020a, Geiger *et al*. in press, Bunpha *et al*. 2019), but more excess names need to be formally removed (Geiger unpubl. data). It appears that the presumed diversity of *Oberonia* has been overestimated by approximately one third. The degree of overnaming in the genus is astounding. Previous work on minute organisms such as the marine microsnail family Scissurellidae *s.l*. (Geiger 2012 and references therein) with a similar number of species-level names had fewer unrecognized synonyms, but over 60 genuinely new species (and even genera). The question arises, why do microfloral orchids still contain so many unrecognized synonyms?

Here I try to provide some explanations, which may serve other orchid systematists as an incentive to critically assess already described orchid diversity, to encourage to formally synonymize excess names, and not to contribute to the problem by describing even more taxa that ultimately prove to be synonyms. The last aspect, akin to the medical maxim of "do no harm" should apply to orchid systematics. The importance of alpha taxonomic assessment was recently stressed by Karremans *et al*. (2020) in their landmark contribution on *Vanilla* Plum. ex Mill.

Taxonomic vandalism.— It is remarkable that most of the names of *Oberonia* introduced in the later 20th and 21st century turn out to be synonyms of previously described species. In some cases, the descriptions are so poor in terms of lack of elementary scholarship that they qualify as "taxonomic vandalism" (see also Moore *et al*. 2014, Páll-Gergeley *et al*. 2020, Geiger 2020a). This term may sound like hyperbole, but examining the definition of vandalism as "willful or ignorant destruction of artistic or literary treasures" (Random House Dictionary of the English Language 1973) or "any activity that is considered to be damaging or destroying something that was good" (Cambridge Dictionary) shows that the term is appropriate in some cases.

In academic publishing, review of the existing literature is a key element of any contribution. If an author did not cite a single reference or missed a well-known

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and key reference, and thereby introduced superfluous names instead of using a good, correct name, it fits the definition of vandalism. The first situation is found in Chen's (2003) description of *Hippeophyllum micrathum* S.C.Chen, a synonym of *Oberonia rhizomatosa* J.J.Sm. (Geiger 2020a), with not a single reference cited. The second case is exemplified by George *et al.* (2019) who did not cite Ansari and Balakrishnan (1990) as the key review of Indian *Oberonia* in their description of *O. saintberchmansii* Kad.V.George & J.Mathew, which would have immediately identified their specimen as *O. brunoniana* Wight (Geiger 2020a).

A second category is willful ignorance of expert advice. The present author communicated the identity of a specimen as *O. griffithiana* Lindl. That specimen was described anyway as *O. khuongii* Aver. & V.C.Nguyen (Averyanov *et al.* 2019). The new species was compared to a very dissimilar species (*O. cavaleriei* Finet), but *O. griffithiana* was only mentioned in passing and no differentiating characters were given. The protologue of *O. griffithiana* is easily available on-line from the Biodiversity Heritage Library, and the illustrations are exquisite. The two species were synonymized formally by Geiger (2020a).

Explanatory taxonomy.— If we subscribe to the premise that systematics as a branch of the natural sciences is explanatory (e.g., Popper 1983, Josephson & Josephson 1993), and the simplest explanation is the best (Ockham's Razor, Mach's Principle of Economy, parsimony), it follows that the goal of systematics should be to explain biodiversity by postulating the fewest species. The term parsimony is used here in the broad philosophical sense, as opposed to the more restricted meaning in phylogenetic systematics generally associated with Hennigian cladistics (Wiley *et al.* 1991). In cladistics, the phylogeny requiring the fewest character state changes, the most parsimonious tree, is the best evolutionary explanation for the characters observed. This is a special application of a general principle that the simplest explanation should be preferred, or the explanation requiring the fewest ad hoc assumptions. This guiding principle is so widely applied that it is known under several names including Ockham's razor and Mach's Principle of Economy.

van Steenis phrased the above: "It is not our task to find out how many species there are, but how few." (P. Hovenkamp pers. comm.). This approach is also termed "lumping" as opposed to "splitting" in systematics. In a perfect world and as a normative goal, we strive to find out how many true species exist in the world. In the real world, though, there are borderline cases. Both, from the philosophical-economical explanation perspective, as well as following van Steenis' circumscription, it follows not to describe an additional species unless there is good evidence for it. From an explanatory and information criterion perspective, the postulation of a new species should be a measure of last resort. It should be viewed as an admission of failure to explain the observed specimen as an instance of already described species, applying the species-as-kind concept (Mahner & Bunge 1997).

Such a restrained approach to describing species may surprise some readers, particularly in the light of habitat loss and the sixths mass extinction of the Anthropocene. Taxonomy is a pure science, not a branch of practical conservation biology. As taxonomists we evaluate specimens and place them in order to the best of our abilities. If an endangered species turns out to be the same as a widespread one, a responsible taxonomist will synonymize the two. The reduced number of endangered species is of no concern to a taxonomist. Similarly, math does not change its rules. One plus one still is two, even if three would look better to some as it is a larger number.

There is always the possibility that novel characters may justify additional taxa. That possibility should not be abused by wantonly introducing new species and leaving it to subsequent workers to find the characters. Every new species must be justified in its protologue.

Specimen/gathering vs. species.— An overlooked source of unrecognized synonyms is the confusion between specimen/gathering and species. This point may seem to be ill founded as every biologist is well aware of the distinction. However, problems arise from implicit assumptions.

To set the stage, some elementary clarification is required. A single specimen and even multi-specimen gatherings are generally presumed to contain one genotype of one species. Accordingly, a specimen/gathering is one instance of a species. Species are composed of multiple specimens/genotypes, exhibiting some natural variability, which serves the raw material on which selection acts; species may also show some variability due to phenotypic plasticity stemming from genotype × environment interaction. The existence of variability is undoubted in biology, but it is hardly ever explicitly taken into account in species descriptions or comparisons. When natural variability is not considered, and the type specimen is taken as the immutable template of a species' morphology, this approach is referred to as typological thinking (Mayr 1994). Such practices are in stark contrast to the principles of systematics, where names are not given to specimens but to species, which are composed of multiple individuals making up at least one population. It is well understood that types are specimens by necessity, but they are only name bearers (semaphoronts) for the species, having some natural variability, that they define. Ideally, the name-bearing type (holotype, lectotype) exhibits near the average or typical form of the species, but there are many counter examples, while syntypes as well as isotypes and paratypes may document some variability of the species.

When comparing two species, the variability of both need to be considered. The assessment of variability is the domain of statistical analysis, both in terms of descriptive statistics (mean, mode, standard deviation, standard error, skewness, kurtosis) as well as in comparative statistics (t-test, chi square test, ANOVA, DFA). The principles of statistics can easily be applied to systematics.

The interrelation of sample size and smallest detectable significant difference is important to bear in mind. All other things being equal, with large samples, small significant differences can be detected. With small samples, the difference needs to be large to be demonstrably meaningful. Translated to systematics, for a species to be distinct, either a large sample size with consistent small differences is required, or the difference needs to be stark if only few specimens are available. Minute differences between few plants are more likely to represent intraspecific variability than species-level differences.

Assessments of single observations are a special case, because variance cannot be calculated from samples with $n = 1$. This case is treated in statistics as a t-test of a single value with a mean (Sokal & Rohlf 1981). The variance of the single specimen is presumed to be the same as the one from a sample with multiple observations. Translated to botanical systematics, the variability of specimens from potentially new species, typically known from only limited material, needs to be presumed to be equal to that of a well-studied species with plenty of available material. When assessing species that both have only very limited material available (e.g., both only known from type), then the variance of both is presumed to be that of a reasonably close species. Species in the same genus, or section if well-defined, provide that information.

The practical application comes particularly when reading older diagnoses and comparisons, for instance by Schlechter, J. J. Smith, Ridley, or Gagnepain. Their descriptions were typically based on a single gathering, $n = 1$. If a comparison was provided, it was typically based on information from the protologue of other species also based on single gatherings, $n = 1$. However, a comparison of two *species* implicitly assumes and suggests that those differentiations are based on multiple specimens. That assumption is frequently mistaken, as the observational basis for all taxa is $n = 1$. Accordingly, a comparison of *specimens* is carried out, masquerading as comparison of *species*. Intraspecific variability could not be taken into account and adducing known variance from other species was never done. Such descriptions should all a priori be considered to be synonyms, unless the difference is very pronounced. Schlechter (1911), however, in his treatment of *Oberonia* species frequently noted that the differentiation is difficult, which is an immediate red flag.

In my experience as a practicing systematist over 30 years, in instances where few specimens are at hand, it is easy to focus on small differences and to separate them into putative new species. As more and more material is examined, small differences evaporate and are correctly recognized as intraspecific variability or ontogenetic stages. I am not opposed to describing species, and even genera, based on small number of specimens, but they need to be strikingly different. Examples include *Depressizona exorum* Geiger (2003) and *Severnsia strombiformis* Geiger (2016) both introduced as a new genus and a new species based on four and two specimens, respectively (Geiger 2003, 2016). They were both radically different from any other known genus or species.

Appropriate comparisons.— When describing a new species, comparison to the most similar taxa is critical. A lack of any comparison is a first indication of a problem (e.g., Chen 2003). It is more difficult to notice meaningless comparisons in little-known groups. Authors frequently compare their supposed new species to ones that bear very little resemblance to them, instead of those that are much more similar. That comparison then suggests erroneously a large difference despite limited material, although, if the appropriate comparison would have been made, the differences would be much smaller, or even non-existent.

In order to be able to identify the most similar species, it is necessary to understand the species concept of every even remotely similar species, at a global level. This typically requires an understanding of every name ever applied in the genus. This is no small undertaking. After at least seven years of immersing myself in one genus, I still do not fully understand many species names in *Oberonia*. Authors describing new species in many groups, particularly those that have not been globally revised, are highly likely to introduce synonyms.

The above-mentioned case of *O. khuongii* is a case in point. The specimen has a common vegetative habit with flattened leaves on a moderately caulescent shoot. The only comparison was made to the acaulescent *O. cavaleriei* Finet with terete leaves, a character only found in two other species. There are multiple more appropriate comparisons, such as to *O. rufilabris* Lindl., *O. insectifera* Hook.f., *O. jenkinsiana* Griff. ex Lindl., and lastly also *O. griffithiana* Lindl., which is the correct name for *O. khuongii*. Those species all have flattened leaves.

Oberonia manipurensis Chowlu *et al.* (2015) with moderately fleshy long falcate leaves and subquadrate lip without distinct lateral lobes was compared to *O. pachyphylla* King and Pantl. with short, stubby and very fleshy leaves, and *O. multidentata* Aver. (= *O. jenkinsiana* Griff. ex Lindl.?) with distinct serrated lateral lobes, but not to *O. mucronata* (D.Don) Ormerod & Seidenf. or any of its synonyms, which it represents (Geiger 2019).

Oberonia saintberchmansii mentioned above having flowers with distinct lateral lobes and reflexed remaining tepals was only compared to *O. falconeri* Hook.f. with a triangular lip without lateral lobes and spreading remaining tepals (section IV of Ansari & Balakrishnan 1990), but not to any species in Ansari and Balakrishnan's (1990) section III with distinct lateral lobes and reflexed tepals (*O. bruononiana* Wight, *O. chandrasekharanii* V.J.Nair, V.S.Rachman & R.Ansari, *O. josephii* C.J.Saldanha, *O. nayarii* R.Ansari & N.P.Balakr., *O. balakrishananii* R.Ansari, *O. platycaulon* Wight, *O. sebastiana* B.V.Schetty & Vivek., *O. seidenfadeniana* J.Joseph & Vajr., *O. wallichii* Hook.f. = *O. brunoniana*, and *O. wynadensis* Sivad. & R.T.Balakr.). This list of inappropriate comparisons could be extended significantly.

The number of instances of genuine disagreement on intraspecific variability vs. biodiversity is limited. One recent example is *O. janae* Aver. vs. *O. pachyphylla* King & Pantl. Averyanov *in* Averyanov *et al.* (2015), which erroneously cited shared characters as differences (e.g., serration of bracts), and did not adduce known variability in other species to estimate variability. The case is discussed in more detail elsewhere (Geiger 2020a).

The geographic dispersal ability of species needs to be considered, and the list of potential species that need comparison adjusted accordingly. In the case of *Oberonia*, microendemism is highly unlikely given that they have the smallest seeds in the family Orchidaceae, and by extension, angiosperms. Average seed size is on the order of 150 × 30 μm (Barthlott *et al.* 2014, Geiger 2014, 2020a, Geiger unpubl. data, Geiger *et al.* 2020), hence, wind-dispersal will likely be extensive in these epiphytic species.

The term endemism is not well-defined in biology, as it is relative the geographic area it is compared to. All species are endemic to the planet earth. In general, an "endemic" species has a narrower distribution than one would expect based on comparison to closely related species. Microendemic species are even more restricted than one would expect. There are no hard rules on the cut-offs. As an arbitrary number, one could use less than 10% and 1% of range of a widespread species as a first approximation for those two terms. Frequently they are used with respect to a country such as Vietnam, i.e., a political entity, which has no biological relevance.

Some orchid species seem to have narrow distributions despite their small seeds. Such occurrences require additional explanation, such as host association, special niche requirements, or a combination of biotic and abiotic factors. The null hypothesis, though, has to include extensive dispersal abilities. Distribution is not a character of the species, and taxonomy only uses observations from the specimens. Any specimen should be able to be identified without knowing where it came from; two specimens that are indistinguishable except for provenance should be considered taxonomically identical, belonging to the same species.

A key problem in botany is the focus on geographically limited floras, rather than phylogenetic units. Species not known from a particular country are rarely considered in comparisons of new species descriptions. Imposing political boundaries on plants following phytogeographic patterns is untenable. With molecular techniques being applied, we can now confidently demonstrate extraordinarily wide distribution patterns in *Oberonia*, for instance from Malaya to French Polynesia (Geiger *et al*. 2020).

The drawback of drawings.— In botany, the standard for illustrations is usually still the line drawing. One perceived advantage is the easy juxtaposition of different parts of the plant at different scales. An overview of the entire plant is artfully integrated with an enlargement of the flower and other details. Such artistic composites can also be generated from images using current digital imaging technologies. In zoology, specimens <5 mm have customarily been illustrated with z-stacked photographs or SEM images for at least the past 20 years as will be apparent from a quick perusal of publications in *Zootaxa*. It is not clear why botany has lagged behind in adopting 20th and 21st century imaging technologies.

On the other hand, and this is a rather specific issue with small objects, the detail that can be observed and rendered with a stereomicroscope is limited. For one, the extremely limited depth of field makes it difficult to recognize the overall structure in three dimensions. Some stereomicroscopes are equipped with a diaphragm to increase depth of field but closing the aperture will also reduce resolution due to diffraction. For scanning electron microscopy, depth of field, or more accurately depth of focus, is usually sufficient and stacking is not necessary. It can be increased with longer working distance with a slight loss in resolution. At the relatively low magnifications used, that reduced resolution is inconsequential. In variable pressure, the longer mean free path leads to signal attenuation, which can be compensated for with higher probe currents (100 vs. 500 pA). That large spot size is also inconsequential from the perspective of resolution at low magnification, but improves signal-to-noise ratio and, hence, image quality; see also Stokes (2008). Different detectors are more or less sensitive to changes in working distance in variable pressure. For instance, the Zeiss VPSE detector is more susceptible than the Zeiss C2DX detector (Geiger pers. obs.).

Light has intrinsic limitations with respect to potential resolution, which in practice is further limited by the optical system used. The theoretical resolution limit for light is half its wavelength ($\lambda/2$ for λ = 400–700 nm ~ ¼ µm, Ray 2002). The limited numerical aperture (NA) particularly of stereomicroscopes, typically less than 0.1, reduces the resolution limit to >~7 µm (1.22 × λ/NA: range 4.9–8.5 µm). The SEM is limited by the probe size, typically 2–5 nm (= 0.002–0.005 µm), i.e., approximately $10^3\times$ better in linear dimension, $10^6\times$ in 2D area. At low magnifications, the number of pixels of the digital capture is the limiting factor. For an image 3000 pixels wide with a field of view of 2 mm (an entire *Oberonia* flower), each individual pixel represents approximately 0.7 µm. Even at low magnifications, the SEM has a better resolution by $\sim 10^1\times$ in linear dimension, by $\sim 10^2\times$ in 2D area. This level of detail is available to the investigator during the study, as the image can be displayed at full resolution on screen. Such an image shown in print approximately 3″ wide with a 150 lpi line screen can reveal details at a scale of 14 µm.

A further factor is the interrelationship of contrast and resolution, well-known from the modulation transfer function in light optics (Ray 2002). Low contrast features require lower spatial frequencies (= larger structures) than high contrast features to be discernable. Fine flower detail is typically low in contrast. It will increase the size of the smallest recognizable feature in light optical examination of flowers by an estimated factor of 5× ~>35 µm. The SEM, on the other hand, accentuates edges due to effects of the electron beam and its interaction volume in the sample (Goldstein *et al.* 1992), hence, can display the full detail at the level of individual pixels. The SEM applies an unsharp mask filter to the image.

It is an open question of how much actual detail information is usually captured by a skilled scientific

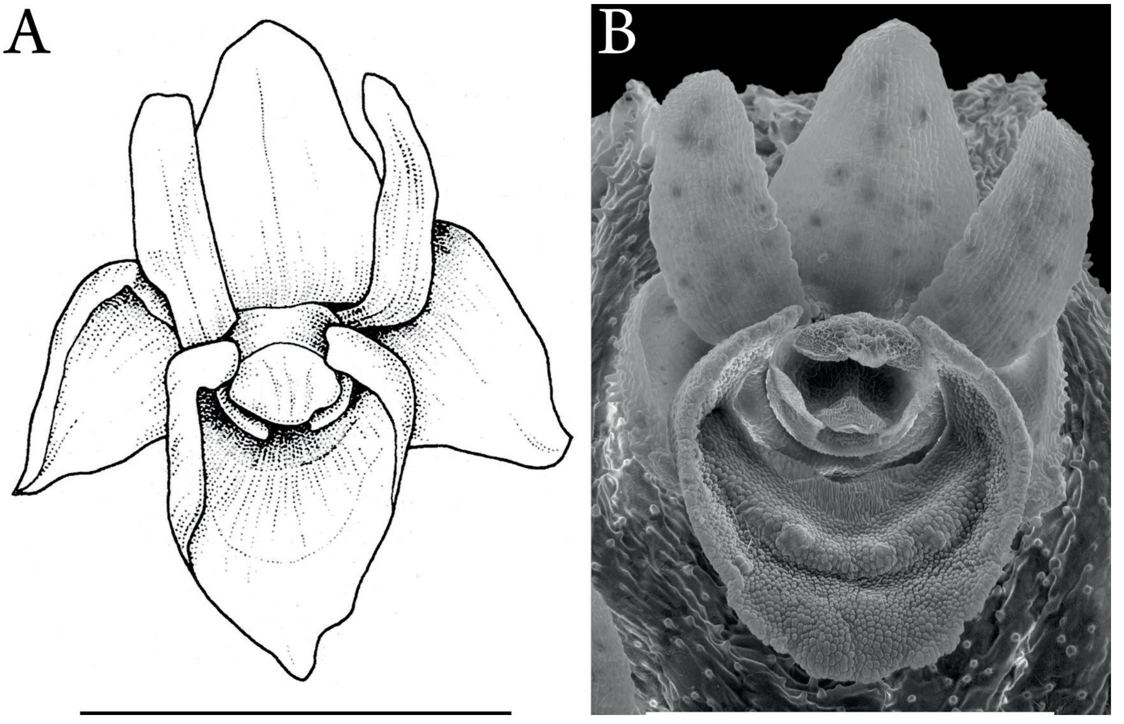

FIGURE 1. Comparison of botanical line drawing with SEM, *Oberonia pachyrachis*. **A**. Drawing from Seidenfaden (1978). **B**. SEM image. *Menzies & Dupuy 192* K 47170 from Thailand. Scale bars = 1 mm.

illustrator, but it is very doubtful that the theoretical limit of the observation optics is transferred to the drawing. The above sample calculations were carried out at the low magnification end, and thus were least favorable to the SEM. At higher magnifications, the SEM's advantages become much more pronounced.

A comparison of a standard line drawing and an SEM image serves here as a case in point (Fig. 1). I have chosen the best line drawing available for *O. pachyrachis* Rchb.f. ex Hook.f. from a key work on *Oberonia* by the highly respected botanist Gunnar Seidenfaden. Seidenfaden's (1978: Fig. 3C; Fig. 1A here) illustration is compared to an SEM image (Fig. 1B). The line drawing shows the shape and proportions of the tepals well, but many details are not recognizable. The concentric dotted rings on the mesochile and epichile seem to allude to the distinct folded ridges revealed by the SEM. However, without the SEM image, it is impossible to understand the 3D folds based on the drawing. The short hairs on the back of the lateral sepals, clearly visible in the SEM, are not indicated in the line drawing. Most drawings in the literature of *Oberonia* do not attain the quality of Seidenfaden's illustration. They may be better referred to as sketches rather than drawings.

One argument in favor of line drawings is their inherent interpretative nature, and that specimen defects can be ameliorated to provide an idealized representation of the organism. However, this augmentation also has the potential for introducing unintended errors or suppressing details that may turn out to be significant in hindsight. Schlechter's (1923, 1934) drawings often show differences between the illustration of the entire flower and the individual floral elements. They may rather suggest intraspecific variability or show the appearance of the floral elements from different perspectives or may be drawing errors. For instance, the isolated lip of *O. crassilabris* Schltr. (Fig. 2H) shows distinct auricles, which are not shown in the drawing of the entire flower. Geiger (2019) discussed inconsistencies in the drawings of *O. nayarii* Ansari & N.P.Balakr. and *O. balakrishnanii* Ansari *in* Ansari and Balakrishnan (1990). Inconsistencies in the drawings of *O. ensiformis* (Sm.) Lindl. flowers were discussed by Geiger (2020a). A particularly striking case is the drawing in the protologue of *O. caprina* Gilli (1983: fig. 29), which bears little resemblance to the holotype

(W 16722 *Gilli 164*); see Geiger (2019) for details. Unfortunately, a bad drawing is not immediately recognizable as such; it must be taken at face value. On the other hand, deficiencies of photographs or SEM images are immediately apparent. This uncertainty factor surrounding drawings is a significant drawback.

Treatment in literature.— The treatment of species in the literature can be a further indication regarding the validity of the species. While there are genuinely rare species, if highly similar species are only treated by reference to the protologue with no new material, it raises questions. In some cases, voucher material can be helpful in untangling questionable species names.

For most early 20th century synonyms, it is notable that they have hardly ever been cited after their introduction (e.g., *O. vulcanica* Schltr., *O. nitida* Seidenf.). Drawings are frequently copied and re-copied, while the discussions and comparisons are scant at best. It is assumed that every described species is correct. It may be better to treat every species epithet in a genus not clearly distinct from every species described before as a *nomen dubium* or *nomen inquirendum* (e.g., *O. zimmermanniana* J.J.Sm., *O. werneri* Schltr.).

The presumption of names to be correct may lead authors to focus on minute differences. Bunpha *et al*. (2019) distinguished *O. denticulata* Wight from *O. gammiei* King & Pantl. by the shape of the rostellum and the position of a slight depression in the lip slightly above or below the middle of the lip. Neither illustrations to support their claims nor any indication on the number of specimens examined was provided. In the same article, however, *O. nitida* Seidenf. was correctly synonymized under *O. denticulata*, and *O. falcata* King & Pantl. was correctly synonymized under *O. anthropophora* Lindl. The latter pair shows extensive variability in the shape of the lip, for which reason it is unclear why Bunpha *et al*. (2019) elected to consider minute differences as significant in one species pair, but meaningless in others. Last but not least, these authors missed the senior synonym of *O. denticulata*, namely *O. mucronata* (D.Don) Ormerod & Seidenf. as the correct name for both *O. denticulata* and *O. gammiei*.

The untenable distinction of *O. fungum-olens* Burkill from *O. padangenesis* Schltr. by Bunpha *et al*. (2019) correctly synonymized by Geiger (2019) was discussed elsewhere (Geiger *et al*. 2020).

Materials and methods. Taxonomic assessments were made based on available information from primary and secondary literature, herbarium holdings (B, BM, F, K, MEL, MICH, MO, P, SING, US, W), and on-line databases (HBG, L).

Illustrations were processed in AffinityPhoto. Z-stack photography was carried out on a Zeiss Discovery V20 stereomicroscope with planapochromatic lenses and motorized focus. Images stacks were captured with a Zeiss Axicocam HRc camera and processed in ZereneStacker. For scanning electron microscopy (SEM), flowers were preserved in 95% ethanol, brought to 100% ethanol through three changes of 100% ethanol, critical point dried in a Tousimis 815A using standard settings, then mounted on double sided carbon tabs (Ted Pella), sputter coated with gold, and imaged in a Zeiss EVO 40 XVP using the VPSE detector in variable pressure (30 Pa) at 20 kV and probe currrents ranging from 30–500 pA depending upon working distance and magnification.

Section *Scytoxiphium* Schltr.

TYPE: *Oberonia crassilabris* Schltr., subsequent designation by van Royen (1979: 711).

Remarks.— The section *Scytoxiphium* serves to illustrate some of the points made above. As the first sign of overnaming, Schlechter (1911: 176, translated from German) noted that "The establishment of boundaries of the species is difficult, because they are all closely related." Schlechter (1911) described in his new section *O. pachyglossa* and *O. crassilabris* from New Guinea and included *O. dolichophylla* Schltr. and *O. rivularis* Schltr. both previously described from New Guinea, *O. heliophila* Rchb.f. from Fiji, and *O. betchei* Schltr. from Samoa, but not *O. asperula* J.J.Sm. described previously from New Guinea (Smith 1908: see below).

Although Schlechter (1911: 176, translated from German) referred to "rich material of *Scytoxiphium*", the names were all introduced based on single gatherings (n = 1) except for *O. dolichophylla* based on two gatherings. It might well be that he used the term rich in the sense of number of species, as opposed to a large number of specimens. As the Berlin herbarium with all Schlechter's material was destroyed in World War II, it is impossible to verify either interpretation.

Schlechter (1911) compared his new species only to his own species from New Guinea. Although he

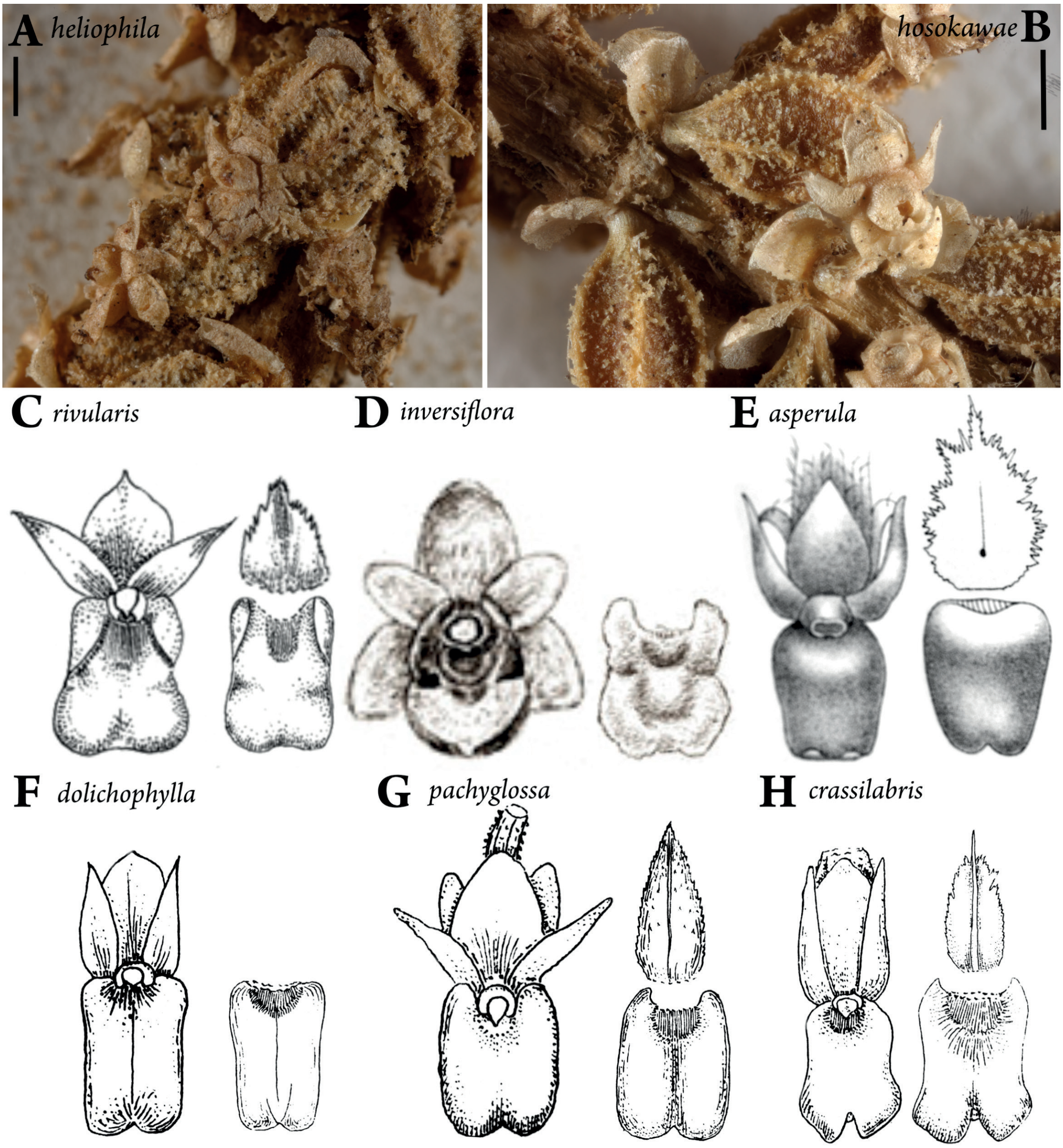

FIGURE 2. *Oberonia heliophila* and its synonyms. **A**. Flowers from lectotype of *O. heliophila* W37726. **B**. Flowers on MICH syntype of *O. hosokawae*. **C–H**. Drawings of flower, isolated lip, and bract. **C**. Original figures of *O. rivularis* from Schlechter (1911). **D**. Drawing of flower of *O. inversiflora* by J.J. Smith (from Schuiteman & deVogel 2006). **E**. Illustration of flower of *O. asperula* from Smith (1909). **F**. Illustration of *O. dolichophylla* from Schlechter (1923); the bract was not figured. **G**. Illustration of *O. pachyglossa* from Schlechter (1923). **H**. Illustration of *O. crassilabris* from Schlechter (1923). Scale bars A, B = 1 mm.

included *O. heliophila* from Fiji and *O. betchei* from Samoa in his section *Scytoxiphium*, those species were not mentioned again. Schlechter (1911: 177, translated from German) noted under *O. pachyglossa* that "... in *Scytoxiphium* the individual species are always closely related amongst each other and not only in the same areas, but also in widely separated regions, whose floras tend to have little in common.” Despite morphological similarities, he discounted those similarities a priori because species distributed over larger areas was considered highly improbable. In Schlechter’s opinion, there was no need of comparing the New Guinea species to those from areas further away.

Smith (1908, 1912) described *O. asperula* and *O. inversiflora* J.J.Sm., the latter explicitly in the section *Scytoxiphium*, introduced one year earlier. It demonstrates that Smith was aware of Schlechter’s (1911) work on the orchids of New Guinea. However, neither of Smith’s species were compared to any other. Smith is known to have been an extreme splitter, even in cases where he wondered whether his species had already been described, such as *O. salakana* J.J.Sm. [= *O. merapiensis* Schltr. as discussed in Geiger (2019)]. The lack of comparisons, the n = 1 problem, and Smith’s demonstrated tendency to excess splitting make his taxa highly suspicious.

Oberonia hosokawae Fukuy. (in Hosokawa 1941) was also described in section *Scytoxiphium*. While the membership in the section appears to have been discussed in the remarks in Japanese, no other species assigned to the section seems to have been discussed. The lack of comparison and the n = 1 problem make this species equally suspicious. The specific epithet was erroneously corrected to *hosokawai* by Geiger (2020a), an error noted by Geiger (2020b).

The synonymy of several of the species under *O. heliophila* has been discussed elsewhere (Geiger 2020a): *O. asperula*, *O. rivularis*, *O. inversiflora*, *O. hosokawae*. *Oberonia pachyglossa* Schltr. has been treated as a synonym of *O. heliophila* by WCSP (2020); I have not been able to trace a literature reference for the establishment of this synonymy. *Oberonia crassilabris* and *O. dolichophylla* are still recognized species. These three species are formally synonymized here.

Taxonomic treatment

The type concepts used are in strict accordance with the ICN (McNeill 2014, 2015). Isotypes are duplicate specimens of the same gathering as the holotype explicitly specified with a repository in the protologue. If no holotype was specified, then all specimens are referred to as syntypes, even if from a single gathering.

Oberonia heliophila Rchb.f. (1878: 56). (Fig. 2–7).

TYPE: *U.S. Exploring Expedition s.n.* (lectotype W37726: designated by Kores 1989), Mountains of Mathuata Province, Vanua Levu, Fiji. The rather convoluted assessment of other type material has been discussed elsewhere (Kores 1989, Geiger 2020a). Thanks to Paul Omerod (pers. comm.) the *Gräffe s.n. [1257]* syntypes from Upolu, Samoa, were recently found at HBG 501809 and HBG 500445; an additional duplicate is at MO 4338405. While the collector was spelled “Graeffe” in Reichenbach’s (1878: 56) Latin protologue, the label spells the name with an umlaut.

Syn.: *Oberonia dolichophylla* Schltr. *in* Schumann and Lauterbach (1905: 114). Schlechter 1923: pl. 69, fig. 248.

TYPE. *Schlechter 14579* (syntype: B, lost). At the river board of the Garup, at the foot of the Toricelli mountains [Papua New Guinea], ~100 m, ***syn. nov.***

Syn.: *Oberonia pachyglossa* Schltr. 1911: 177. Schlechter 1923: pl. 69, fig. 249.

TYPE. *Schlechter 16756* (syntype: B, lost). Forests at the Kaulo [River, Madang, Papua New Guinea] 400 m, ***syn. nov.***

Syn.: *Oberonia crassilabris* Schltr. 1911: 177; Schlechter 1923: pl. 69, fig. 250.

TYPE. *Schlechter 17948* (syntype: B, lost). Forest of the Finisterre mountains, Papua New Guinea, 700 m, ***syn. nov.***

Material examined: **Country unknown**. *Wight 441* (MEL s.n.), Arbor dolan. **Fiji**. *Degener 15465* (F 1473815, K s.n., MO 1256922, MICH s.n., P 00310689), Ra, vicinity of Rewasa, near Vaileka. *Degener & Ordonez 14166* (K s.n.), Thakaundrove, Marvu, near salt lake. *Gillespie 3877* (K s.n.), Valley of Kalindina near Nambai, Namosi Province. *Greenwood 603* (K s.n.), Mount Mamata coast. *Greenwood 709* (K s.n.), Haulikno, N side. *Greenwood 1113* (K s.n.), Naitasiri, near Nasinu. *Praham 30* (BM 000088476), Vanua Levu. *Smith 7075* (K s.n., P 00310688), Tailevu, Hills E of Wainimbuka River vicinity of Ndakuivuna. *Parks 20174* (K s.n). **Indonesia**. *Comber 1373* (K s.n.), Rannpane, N of Semeru. **New Guinea**. *Carr 10045* (BM s.n., CANB 46410, CANB 46321, SING 0141494, SING 0141462 K s.n.), Koitaki. *Carr 10667* (B s.n., BM 000088448, CANB 46443, F 1497506, K s.n., P 00364412, SING 0141482, SING 0141483), Kokoda. *Conn 544* (MEL 1528545), Gulf Province, N side of Lake Tebera. *Reeve 923* (CANB 8500636), Lagaip District. *O’Byrne O.020* (SING

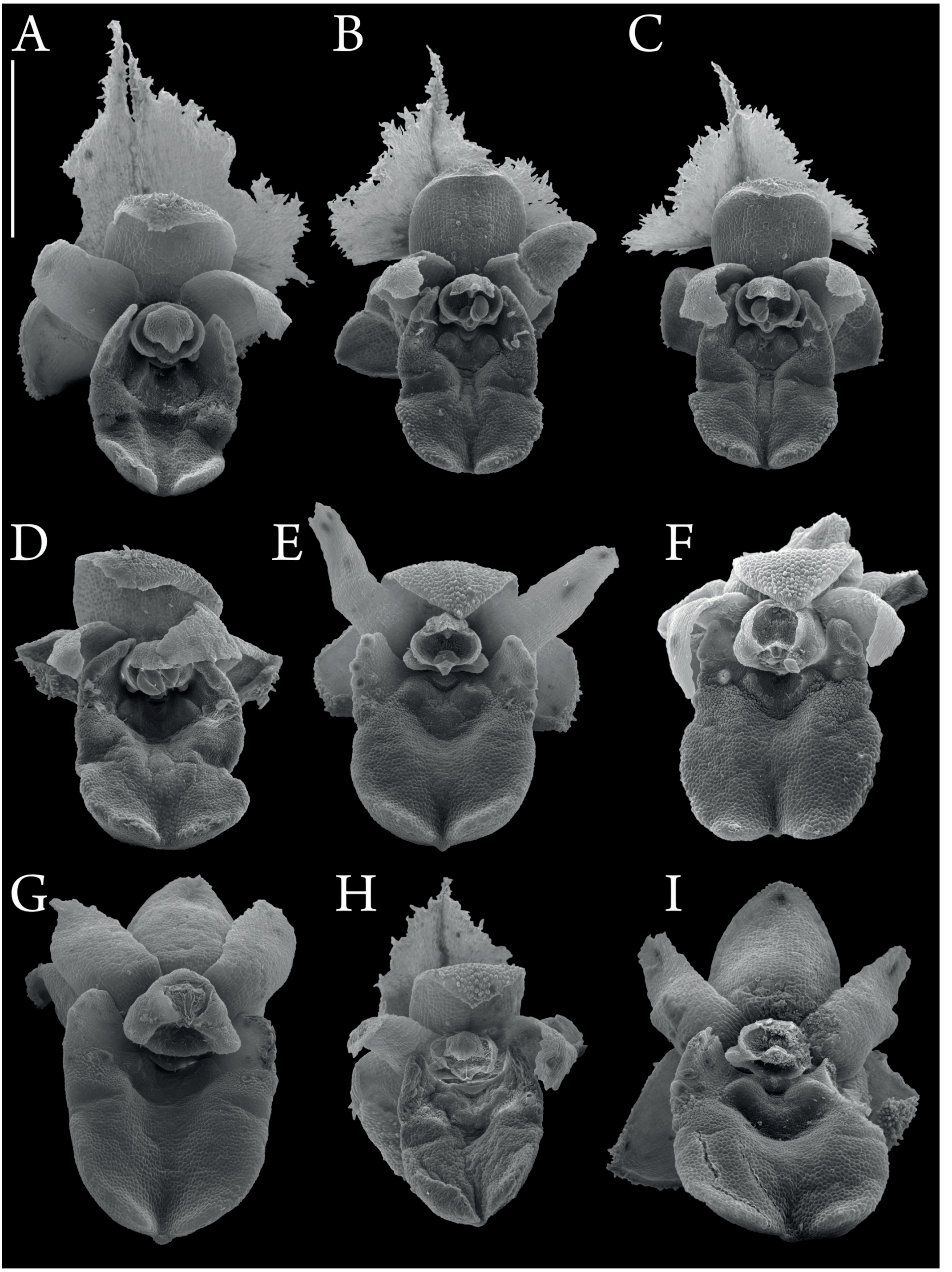

FIGURE 3. *Oberonia heliophila* SEM images of face of flowers. **A**. *Schuiteman 90/555* L 23197 from Papua New Guinea. **B–C**. *Harris 1514* L 19688 from Papua New Guinea. **D**. *deVogel s.n*. L 20059 from New Guinea. **E**. *Mulder s.n*. L22448 from Fiji. **F**. *Hunt 2226* K28510 from the Solomon Islands. **G**. *M.A. Clements 5603* CANB 8916245, from Vanuatu, live image in Figure 6H. **H**. *Mason 1645* K 7169, from Fiji. **I**. *Mulder s.n.* L 24117 Fiji. Scale bar = 1 mm.

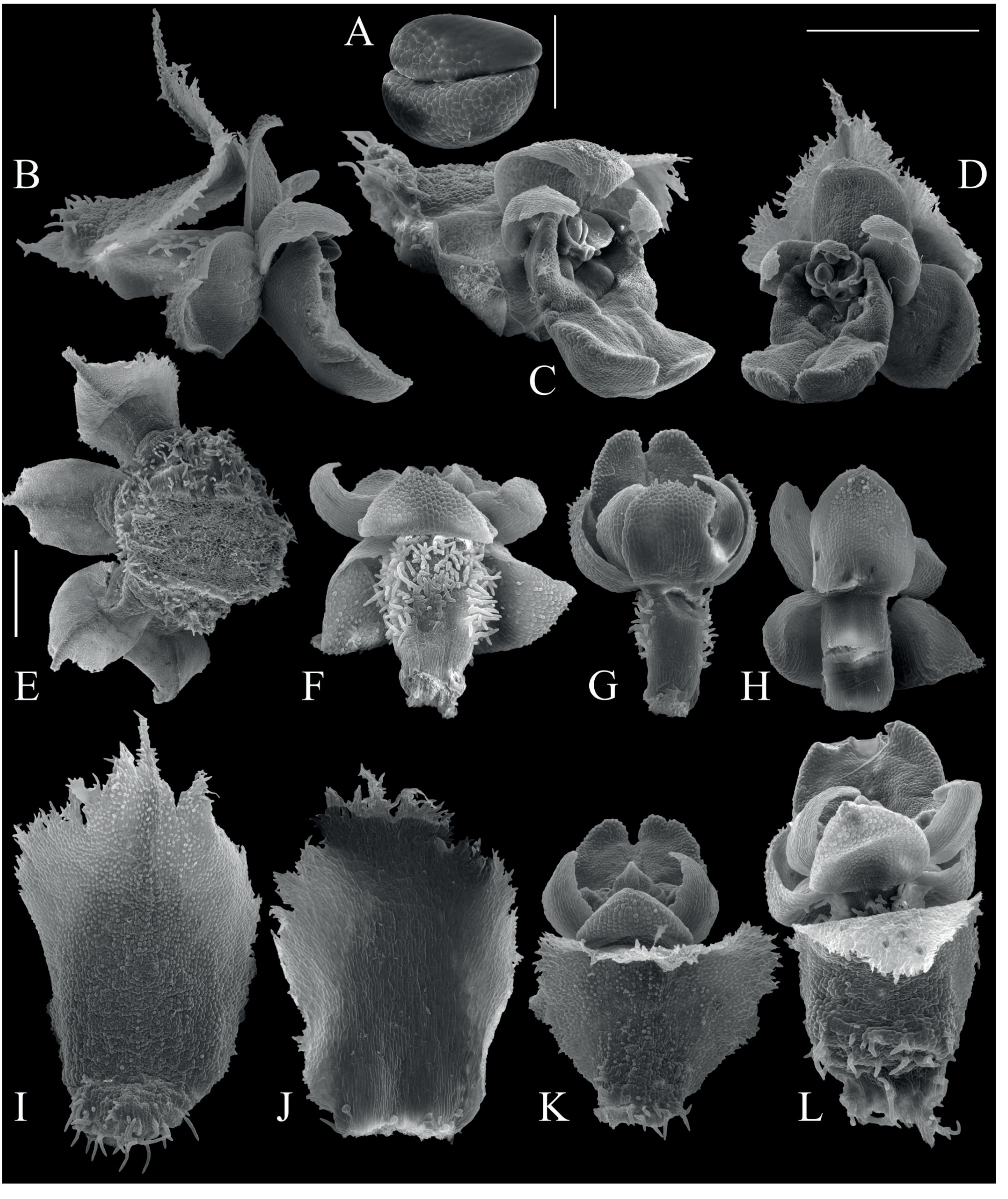

Figure 4. *Oberonia heliophila* SEM images. **A**. Pollinaria. Scale bar = 100 µm. **B**. Flower lateral with curved up bract and sparse hairs on pedicelled ovary. **C–D**. Oblique view of flower showing thick lip. **E**. Cross section though rachis with several attached bracts. Scale bar = 1 mm. **F–H**. Top of view of flower without bracts showing variable degree of hairs on pedicelled ovary. **I–J**. isolated floral bract. **I**. External view. **J**. Internal view. **K**. Top view of flower with spreading bract. **L**. Top view of flower with clasping bract. Scale bar except A, E = 1 mm. A, I, J. *deVogel s.n*. L20059 from New Guinea. B, D, G, K. *Harris 1514* L19688 from Papua New Guinea. C. *deVogel s.n*. L20059 from New Guinea. E, F. *Hunt 2226* K28510 from the Solomon Islands. H. *Schuiteman 90/555* L23197 from Papua New Guinea. L. *Leg. ign.*. *s.n*. K 21001, *loc. ign*.

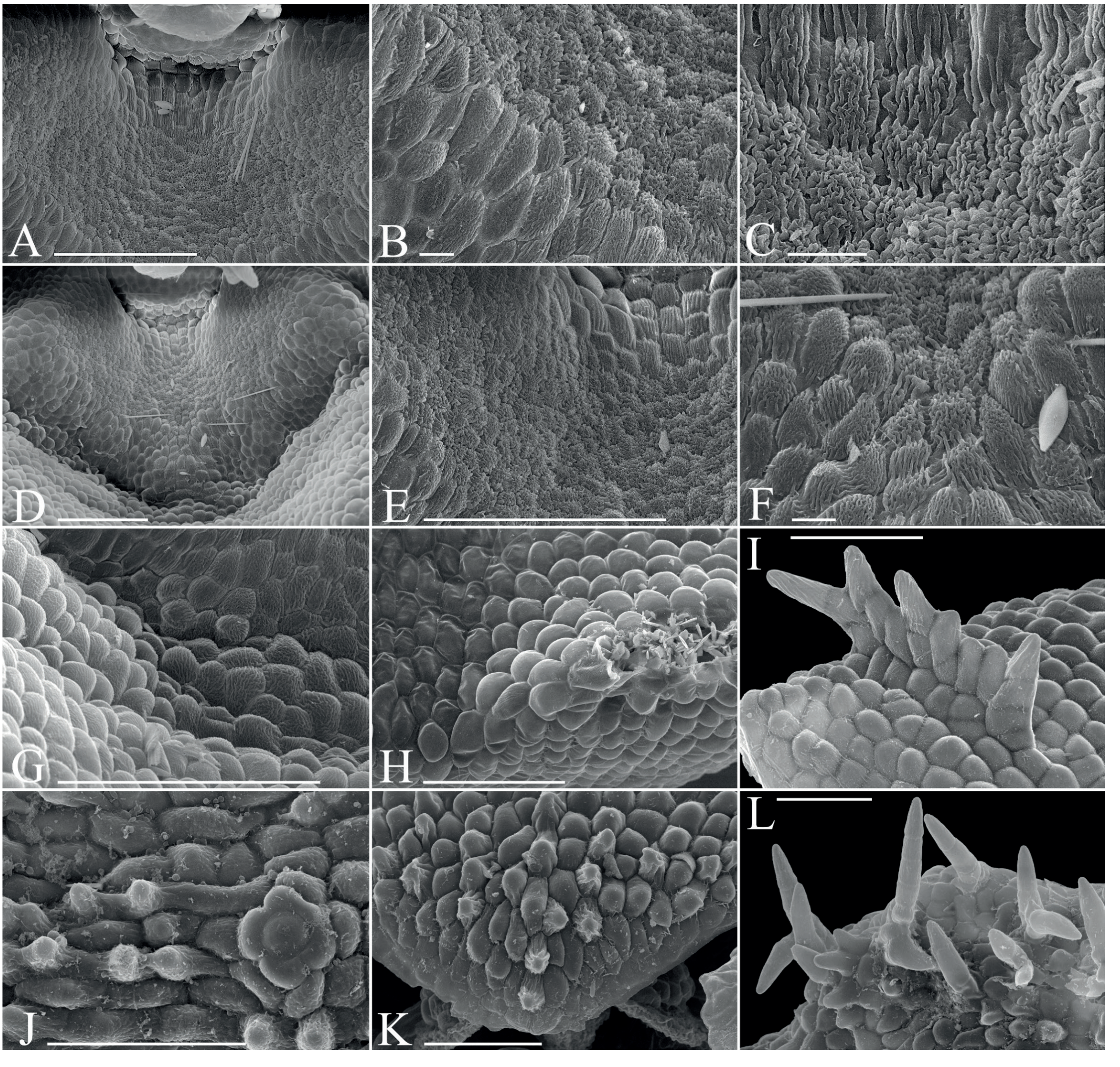

FIGURE 5. Floral details of *Oberonia heliophila*. **A, D**. Disc area with sac. Scale bar = 100 µm. **B**. Transition between mesochile with elongaged moderately rugulate cells to disc with round strongly rugulate cells. Scale bar = 10 µm. **C**. Transition between disc with round strongly rugulate cells to sac with rectangular striate cells. Scale bar = 10 µm. **E**. Transition from mesochile (lower left) through disc (center) to sac (upper right). Scale bar = 100 µm. **F**. Median tip of disc (round strongly rugulate cells) and mesochile (elongated moderately rugulate cells). Scale bar = 10 µm. **G**. Transition between mesochile and epichile with crease and and reduction in rugulosity. Scale bar = 100 µm. **H**. Edge of thick epichile. Ruptured cells with mineral deposits. Scale bar = 100 µm. **I**, **L**. Trichome ridge on lateral sepals. Scale bar = 100 µm. **J**. Top surface of bract with short trichomes and cross cells. Scale bar = 100 µm. **K**. Tip of median sepal with rugulate-mammilate cells. Scale bar = 100 µm. **L**. Trichomes at base of bract. Scale bar = 100 µm. (A–I: *deVogel s.n*. L 20059 from New Guinea. J–L: *Harris 1514* L 19688 from Papua New Guinea).

0141441), Papua New Guinea. *Reeve 5397* (K s.n.), Seargu [Beneni] SW side of Lak Kutubu, Nipa District, Southern Highlands. **Samoa**. *Mansfeld 146* (P 00310612), near Malololelei. *Mansfeld 1882* (K s.n.), Matavanu. *Vaupel 234* (K s.n., MO 1614357), Matautu. *Walter s.n*. (MEL 2394315), Samoa. *Whistler W2790* (K s.n.), W of Aoloaufou. *Whitmee 43* (MEL 2394729), Samoa. *Whitmee 45* (K s.n.), Samoa. *Whitmee 48* MEL 2394730), Samoa. *Whitmee 165* (K s.n.), Samoa. *Whistler W1702* (K s.n.), N of Potlacthc Lumber Mill at Asau. **Solomon Islands**. *Hunt 2226* (K s.n.), 1/4 mile below confluence of Warahito and Pegato rivers. *Wickison 87* (K s.n.), Chariveghu Drainage system.

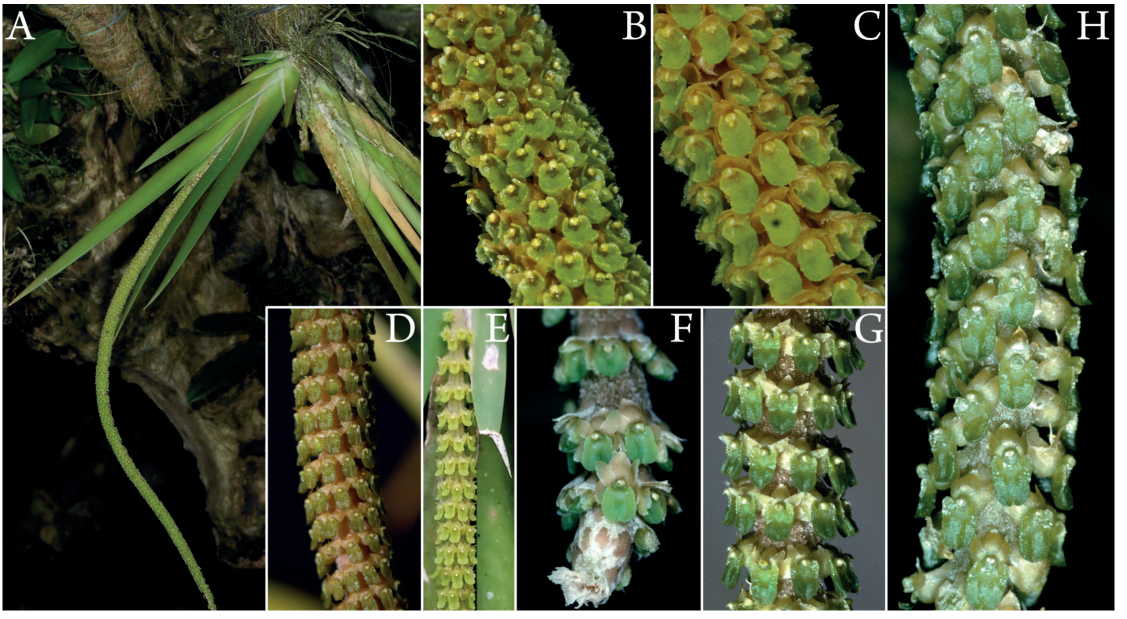

Figure 6. Live *Oberonia heliophila*. **A–C**. Cultivated plant from Papua New Guinea, collection and photographs Jeffrey Champion. **A**. Habit. **B**. Flowers of plant shown in A, first flowering with flowers scattered on inflorescence. **C**. Flowers of plant shown in A, second flowering, with flowers in whorls. **D**. Flowers of plant in cultivation from Papua New Guinea at Leiden Botanical Garden 20031565, photograph by Eduard de Vogel. **E**. Almost entirely green flower in plant in cultivation from Papua New Guinea, collection and photograph of Maryse Devaeve. **F**. Flowers of *Clements KK6916* from Simbai, New Guinea. **G**. Flowers of *Clements 5392* from Efate, Vanuatu. **H**. Flowers of *Clements 5603* from Santo, Vanuatu; SEM image in Figure 3G. F–H. Photographs by Mark Clements.

Vanuatu. *Clements 5603* (CANB 8916245), 30 km W of Luganville, Santo, Wounauss Village area. *Morrison s.n.* (K s.n.), Gulley near Amlganhat, Aneityum mountain. **Wallis and Futuna**. *Pillon 895* (P 02102968), Wallis, Mout Lulu Fakahega. *MacKee 39257* (P 00310691, P 00310690), Wallis, Mount Lulu.

Notes: *Oberonia dolichophylla* is a synonym of *O. heliophila*. There are no known surviving syntypes of *Schlechter 14579*. *Schlechter 19997* of *O. dolichophylla* at BO (Cribb & Robbins 1990: a duplicate of the now destroyed B specimen) is not a syntype but a voucher for the species' listing in Schlechter (1911). The species was described as rather large for an acaulescent *Oberonia* (45 cm), with pointed and hairy bracts, green flowers, oblique lanceolate petals, lip oblong with truncated end [= subquadrate], and the epichile with a shallow notch. All these characters agree with *O. heliophila*. Schlechter in Schumann & Lauterbach (1905) compared his *O. dolichophylla* only known from the type *Schlechter 14579* with *O. rivularis* only known from the type *Schlechter 13801*. It is an example of comparing specimens instead of species and the n = 1 problem discussed above. He noted the longer inflorescence, bracts and lip, as well as thicker leaves in *O. dolichophylla*. The length of the inflorescence is meaningless in *Oberonia* as has been shown from plants grown in cultivation (cf. Geiger 2018, 2019). The diameter of the inflorescence is given as 1 mm in *O. rivularis* and 2 mm in *O. dolichophylla*, the bracts are approximately 1.5 mm long in *O. dolichophylla* and 1 mm in *O. rivularis*, and the lip is given as 2 mm long in *O. dolichophylla* and slightly >1 mm in *O. rivularis*. Whether those measurement are accurate is unknown and unverifiable as the material at B was destroyed. Inaccuracies in measurements and scale bars have been documented previously (Geiger 2019). Given that the comparisons are based on single specimens (n = 1 each), those small differences are not sufficient to justify species-level differentiation.

Oberonia pachyglossa is a further synonym of *O. heliophila*. The name has rarely been mentioned in the literature since its initial publication. O'Byrne's (1992, 1994) voucher (SING 0141441) can be referred to *O. heliophila*, while Schuiteman and de Vogel (2006)

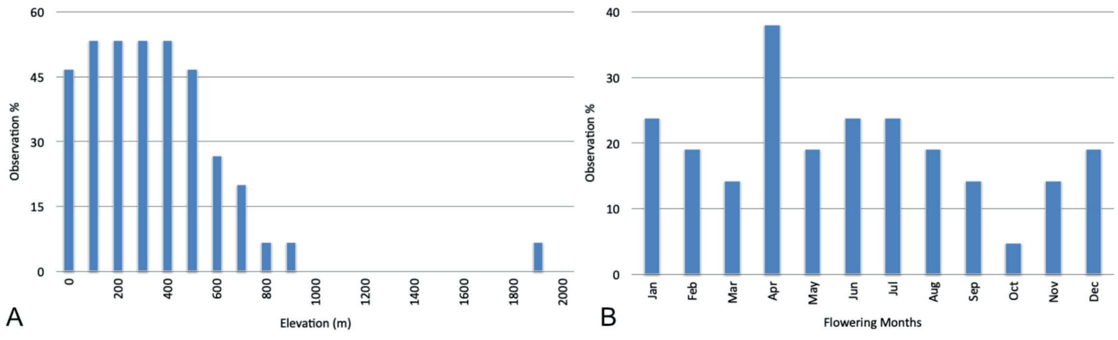

FIGURE 7. Ecological data for *Oberonia heliophila*. **A**. Elevation, n = 16. **B**. Phenology, n = 22. (references under any known synonym. Elevation: Christophersen 1935, Cribb & Whistler 1996, Fukuyama *in* Hosokawa 1941, Hawkes 1952, Kores 1991, Lewis & Cribb 1991, Millar 1999, O'Byrne 1994, Schlechter 1911, Schlechter *in* Schumann & Lauterbach 1905, Schuiteman & de Vogel 2006, herbarium records. Phenology: Christophersen 1935, O'Byrne 1994, Reichenbach 1878, Schlechter 1910, 1911, Schlechter *in* Schumann & Lauterbach 1905, Schuiteman & de Vogel 2006, Smith 1909, 1915, herbarium records).

reproduced Schlechter's (1923) figure. The species was described as being of large habit (55 cm), having dentate bracts, green flowers, linear-lingulate petals, with a thick, subquadrate lip with small auricles and somewhat truncated epichile. All these characters agree with *O. heliophila*. Schlechter considered *O. pachyglossa* only known from type *Schlechter 16756* and *O. dolichophylla* only known from type *Schlechter 14579* as distinct based on the slenderer inflorescence (3 mm in *O. dolichophylla*, no measurements given for *O. pachyglossa*) and the linear petals. The claim about the width of the inflorescence cannot be evaluated due to lack of data. The shape of the petals is continuously variable in *O. heliophila* (Fig. 3); bimodal distribution, pattern, or covariance cannot be identified. The simpler explanation is variability in this character, rather than postulating multiple, almost cryptic species with additional intermediates that cannot be clearly assigned to any of the postulated species.

Oberonia crassilabris is a synonym of *O. heliophila*. The taxon has been designated as the type species of the section *Scytoxiphium* by van Royen (1979) and a second time by Schuiteman and de Vogel (2006), who copied Schlechter's figure. The type specimen was described as large (60 cm), with deeply incised bracts, tepals with a green lip with remaining tepals brownish, thick lip, subquadrate with small auricles and bilobed epichile over one quarter of lip length. All these characters agree with *O. heliophila*. Schlechter considered *O. crassilabris* only known from type *Schlechter 17948* and *O. dolichophylla* only known from type *Schlechter 14579* as distinct based on the oblique lanceolate vs. oval lanceolate petals, and the depth of the incision of the epichile of the lip. As indicated above, the shape of the petals is variable, and the alleged differences are at best slight. The depth of incision of the epichile is equally variable with no pattern discernible (Fig. 3).

A syntype of *O. betchei* Schltr. was found in MEL and confirms the synonymy with *O. heliophila* (Geiger pers. obs.).

Plant large, acaulescent, fan-shaped, *leaves* to 75 × 1.6 cm, acuminate, laterally compressed, fleshy; flowering plants as small as 25 cm. *Inflorescence* terminal, to 64 cm long, flowers typically in clearly separated whorls (Fig. 6C–F), occasionally scattered (Fig. 6B, H). *Bract* as long as flower to somewhat longer, typically curved upwards (Fig. 4A, D, K, L), typically wider than flower, occasionally as wide as flower, triangular acuminate, at base hirsute, at tip strongly dentate, occasionally laciniate (Fig. 3B–C, 4D, I–L), frequently with 1–2 terminal awns (Fig. 3A). Pedicelled *ovary* rather short for genus, strongly pubescent towards flower to glabrous (Fig. 4B, F–H). *Flower* with lip in green tones, remainder of tepals typically in shades of tan (Fig. 4E–H), occasionally yellowish (Fig. 4B–C), occasionally entire flower light green (Fig. 4E). Considerable variation in flower color on same inflorescence (O'Byrne 1994: as *O. pachyglossa*). *Sepals* triangular, sometimes with sparse short hairs abaxially (Fig. 4C, F). *Petals* narrowly ovoid to lanceolate, about as long as sepals. *Lip* thickened (Fig. 4B–C), auricles extending to middle of gynostemium; indistinct lateral lobes with irregular margins (Fig. 3, 4C–D); disc with shallow sac (specific shape affected by preservation: Figs 3, 4C–D, 5A, D) flanked by thickened pads of variable shape and distinction; indistinct constriction in middle of lip (Figs. 3, 4C–D, 5D); epichile broad with more or less distinct apical notch separating two lobes (Fig. 3). *Gynostemium* short and thick for genus. *Pollinaria* composed of two pollinia of unequal size, kidney shaped, without caudicle or viscida (Fig. 4A).

Cell surface morphologies consisting of striate around disc (Fig. 5C, E), coarsely rugulate around mesochile end, central portion of epichile (Fig. 5C, F), finely rugulate on main portion of mesochile and epichile (Fig. 5A, B, G), glabrous pneumate at tips of epichile (Fig. 5H). Short rugulate trichomes on the backside of the sepals (Fig. 5J, K), longer uniserial trichomes at base of bract (Fig. 5L).

The arrangement of flowers in whorls and scattered is variable as demonstrated by repeat flowering of same plant in cultivation, based on photographs taken by J. Champion (Fig. 6A–C). The presence and density of the hairs on the pedicelled ovary varies continuously with no patterns discernible. A few conditions are illustrated here: dense hairs (Fig. 4F), scattered hairs (Fig. 6B), sections variously hairy and glabrous (Fig. 4G), glabrous (Fig. 4H).

DISTRIBUTION: Indonesia (Java: *Comber 1373* K s.n.), Fiji, Micronesia, New Guinea, Samoa, Solomon Islands, Vanuatu, Wallis and Futuna (citation under any of the known synonyms: Cribb & Whistler 1996, Hawkes 1952, Kores 1989, 1991, Lewis & Cribb 1989, 1991, Millar 1999, O'Byrne 1994, Parham 1972, Reichenbach 1878, Schlechter 1910, 1911, Schuiteman & de Vogel 2006, Smith 1908, 1912, 1915, Williams 1938, 55 herbarium records: B, BM, CANB, F, K, MEL, MICH, MO, NSW, P, SING, US, W).

ECOLOGY: Mostly pendulent, occasionally erect, branch and trunk epiphyte on mangrove trees, bread fruit (*Artocarpus altilis*: Moraceae), *Hevea* (Euphorbiaceae), *Terminalia catappa* (Combretaceae), *Pterocarpus* (Fabaceae), *Pometia* (Sapindaceae), mahogany (*Swietenia humilis*: Meliaceae), *Melaleuca* sp. (Myrtaceae) and palms (*Cocos nucifera*, *Metroxylon* sp.). In coastal to montane forest, sun exposed. The species flowers throughout the year (Fig. 7B).

Oberonia heliophila is found regularly from sea level to about 500 m, with decreasing frequency to 900 m (Fig. 7A). The single record from 1900 m (*Comber 1373* K s.n. from Java) needs verification. The elevation at the named location matches the indicated elevation based on GoogleEarth. That record could be mislocalized. However, a photograph by Mark Clements of the species was taken around Simbai, New Guinea, which is at approximately 1900 m elevation, including its surroundings (Fig. 4E).

CULTIVATION: This warm growing species can be cultivated on tree fern slabs, possibly with some coco fiber pad, ideally in bright shade (lath house), but tolerating wide range of light, with high humidity, daily watering, and excellent ventilation (O'Byrne 1994, Schuiteman & de Vogel 2006, J. Champion pers. comm.).

Discussion. One reviewer criticized that the findings here are not supported by molecular data, therefore, are only an unsubstantiated opinion. A similar position was advanced by Jones (2021) with respect to the Australian *Oberonia* names synonymized by Geiger (2019). Such a point of view is ill founded for the following reasons.

1) Taxonomic assessments are based on types. Type specimens cannot be destructively sampled. Taxa with lost types have no chance of being evaluated based on genetic data, which applies to all three names synonymized here. Taxonomic assessment is based by necessity on the available information, such as herbarium sheets, illustrations and the protologue.

2) If species can be described based on morphology, then they can also be synonymized based on morphology. An asymmetry of evidentiary burden is unjustifiable. Otherwise, one would have to require all new species descriptions to be supported by molecular data as well. The vast majority of species descriptions even today are based exclusively on morphology, some notable exceptions notwithstanding.

3) The inclusion of molecular data does not guarantee a better outcome. Questions such as selection of marker(s), choice of analytical settings, choice of ingroup and outgroup taxa, mistakes in the laboratory (contamination), and identification of material all har-

bor potential for erroneous results. There is no question that molecular data have produced tremendous advances in systematic biology, and I have used those techniques myself. However, there have also been high-profile blunders.

4) The insistence on using molecular data would invalidate all systematic paleontology.

Additionally, the main point made here of incorporating intraspecific variability into taxonomic assessments is supported by molecular data from better known species, such the molecular phylogeny of *O. equitans* (Forster) Mutel by Geiger *et al*. (2020a) including fine morphological examination of flowers. Extensive morphological variability is also suggested by the molecular phylogeny of Li *et al*. (2016), which showed six samples of *O. austro-yunnannensis* S.C.Chen & Z.H.Tsi and ten samples of *O. jenkinsiana* Griff. ex Lindl. in a completely unresolved polytomy with extremely short terminal branches. This is a strong indication of synonymy.

Last but not least, scientific progress is incremental, and all taxonomic assessments are opinions, whether supported by morphology or molecular data. Additional information can either lead to confirmation of an earlier result, or it can lead to a new hypothesis being advanced. I welcome a re-examination of this proposal.

Conclusion. Within *Oberonia* sect. *Scytoxiphium*, taxonomic ranks have typically been employed at one level higher than is appropriate for species recognition. Specimens were named as species, while the single species was treated as a section. The underlying reason is typological thinking, not considering intraspecific variability, assuming limited distribution of species, and failing to review literature. The section is reduced from eight species to one. Distribution of the section ranges from Java through Micronesia to Samoa.

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RUDOLF SCHLECHTER'S SOUTH-AMERICAN ORCHIDS IV. SCHLECHTER'S "NETWORK": VENEZUELA AND COLOMBIA

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Abstract. The fourth chapter of the series about Rudolf Schlechter's South-American orchids again presents abridged biographical information about the botanists and orchid collectors that formed part of Schlechter's South-American network and who travelled and worked in those countries on the continent's northern and Caribbean coasts, through Venezuela and Colombia. In the case of Colombia, we cross the isthmus of Darien and arrive for the first time on the Pacific coast of South America. As in other chapters, brief geographical and historical introductory outlines are presented for each of these countries, followed by a narrative on those orchidologists who visited the area, chronologically by the dates of their botanical collections.

Keywords/Palabras clave: biography, biografía, history of botany, historia de la botánica, Orchidaceae

Venezuela. In March 1498, Christopher Columbus sailed past the Orinoco delta during his third voyage and continued into the Gulf of Paria. Columbus described the new territory as *la tierra de Gracia* ('the land of Grace'). One year later, Alonso de Ojeda arrived at the same coast and sailed into the Gulf of Maracaibo. An Italian merchant from the city of Florence by the name of Amerigo Vespucci (1454–1512) was part of this expedition. Not only did Vespucci lend his name to the new continent (Fig. 1), but he observed the native stilt houses along the shores of the lake, which reminded him of the city of Venice (Fig. 2). This prompted him to call this region *piccola Venezia* (little Venice) or *Venezziola* in the Italian language of his time, hence the country's name of Venezuela, by which we know it today (Fig. 3).

The name "Little Venice" became popular in Europe probably because of the concession made by the Spanish Court to the German merchants of the Welser family to explore and govern parts of the South American territory. Its translation "Klein-Venedig" appears in various German documents of its time.

Following Schlechter (1919: 2), the territory of Venezuela can be divided into four distinctive regions: the flatlands along the Caribbean coast, limited to the south by the second region, the northern mountain chains (Fig. 4); the plains ("llanos") which extend to the west across the border with Colombia and to the south and southeast across the Orinoco River basin (Fig. 5–7); and the Venezuelan Guiana Highlands, limited to the east and south by Guyana and Brazil, respectively.

In the five volumes of his series *Die Orchideenfloren der südamerikanischen Kordillerenstaaten* (1919–1922), Rudolf Schlechter first gives a brief description of each country's geography, followed by an outline of the history of its botanical exploration. It seems reasonable to follow along the same lines.

In 1669, the Spanish Jesuit priests Monteverde and Castan established the first mission to the tribe of the Saliva along the Orinoco River in Venezuela, under the name of Nuestra Señora de los Salibas. Another Jesuit, José Gumilla (1686–1750), arrived in Bogotá in 1705 and, in 1714, went as a missionary to the plains along the Orinoco, where he would spend the remaining 35 years of his life. A precursor of the enlightenment, Gumilla showed great interest in natural history; in 1731 he published his main work, *Historia Natural, Civil y Geográfica de las Naciones situadas en las riberas del río Orinoco* (*Natural, civil and geographic history of the nations located on the shores of the Orinoco River*). On page 324 of this work, Gumilla gives a description of vanilla which is worthy of being repeated here: "…the country offers everywhere a large correspondence of rich and abundant fruits, among which it is of not less importance that fruit or

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FIGURE 1. Amerigo Vespucci (1454–1512) awakening America. Engraving by Jan Galle after Jan van der Straet, ca. 1615. The scene depicts Amerigo Vespucci representing the Old-World explorers as he wakes up a Native American from her hammock slumber. Local flora and fauna dot the background, as well as natives having a cannibalistic roast.

FIGURE 2. Maracaibo Indian dwellings. From The Universal Geography with Illustrations and Maps, Elisée Reclus.

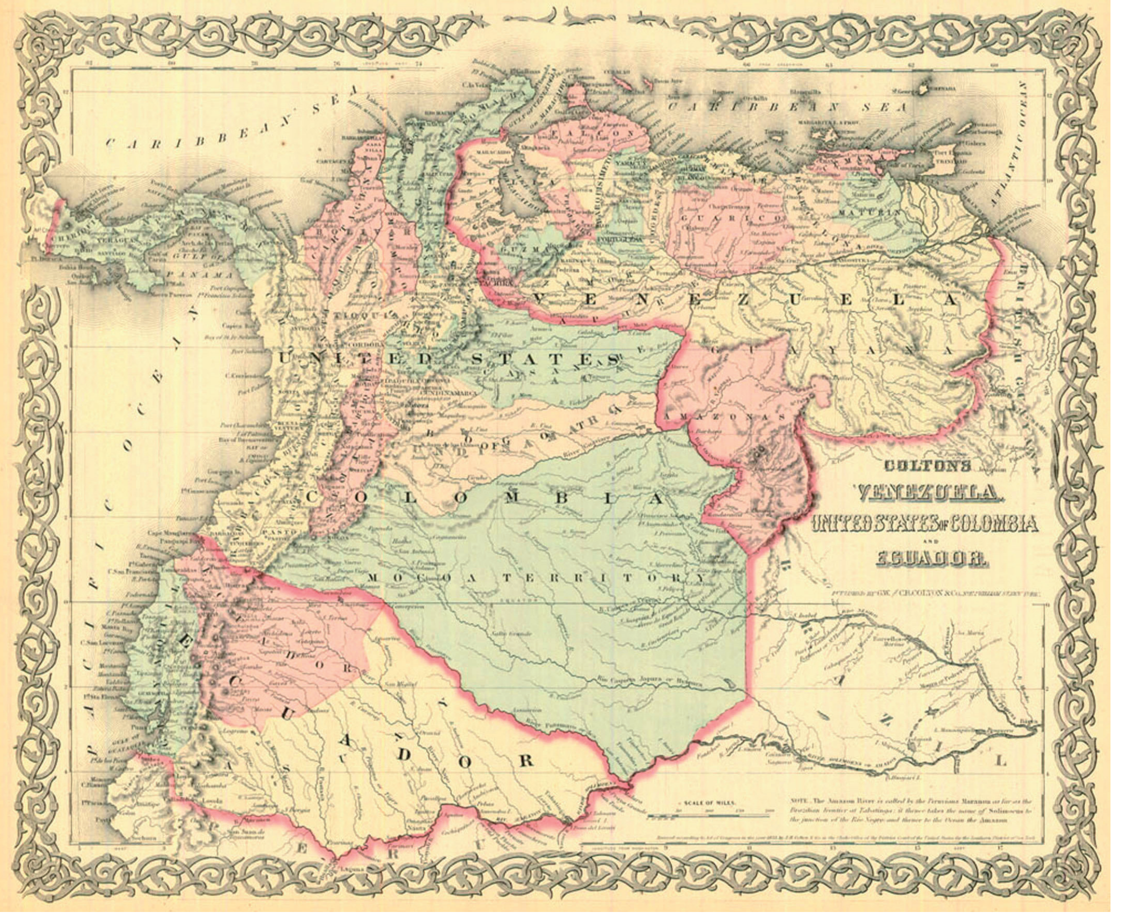


Figure 3. Colton's map of Venezuela, Colombia, and Ecuador, 1855.

aromatic spice which is commonly called Baynilla, which by nature and condition grows wild (although a method has already been found to cultivate it). It grows in the dense parts of the forests and meadows and, if it finds a hold, clings to the trunks and branches, no less than the vines, which here climb and take possession of the poplars. But if the seed falls -when it is ripe, and the Baynilla opens and has the misfortune to grow where it cannot find hold- then it follows the same adversity of those men who, as much as they deserve it, do not find who gives them a hand…" (Ossenbach 2020: 112–114).

In February 1754, the Swede Pehr Löfling (1729–1756), one of Linnaeus' disciples, sailed from the Spanish port of Cádiz to Cumaná on Venezuela's Caribbean coast. For two years, Löfling botanized in Cumaná and undertook several expeditions to the Orinoco River and the Venezuelan Guiana, which proved fatal to him. Plagued by malaria and yellow fever, Löfling passed away in February 1756 in the Jesuit mission of San Antonio de Caroní. Löflings herbarium has disappeared, but his botanical collections were described by Linnaeus, who in 1758 published Löfling's *Iter Hispanicum*… (*Travel to the Spanish countries*…) with special mention of the genus *Epidendrum*. Also, the Library of the Royal Botanical Garden in Madrid holds a manuscript of a *Flora cumanaensis*, written by Loefling during his journey, in which he described a total of 11 new orchid species. Madrid also keeps several drawings prepared by the draftsmen of the expedition (Fig. 8).

Alexander von Humboldt (1769–1859) and Aimé Bonpland (1773–1858) arrived in Cumaná in June 1799 during their "Journey to the Equinoctial Regions

Figure 4. The Sierra Nevada of Merida. Unknown photographer.

Figure 5. The “llanos” of Venezuela. Unknown photographer.

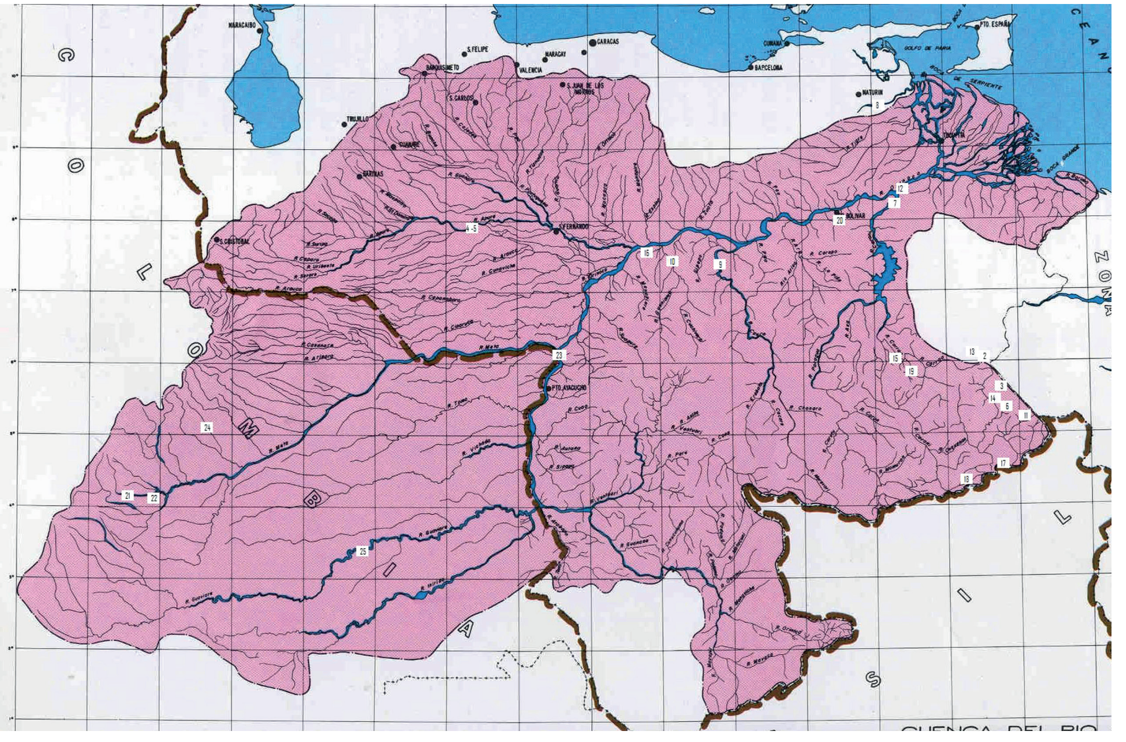


Figure 6. The Orinoco River Basin.

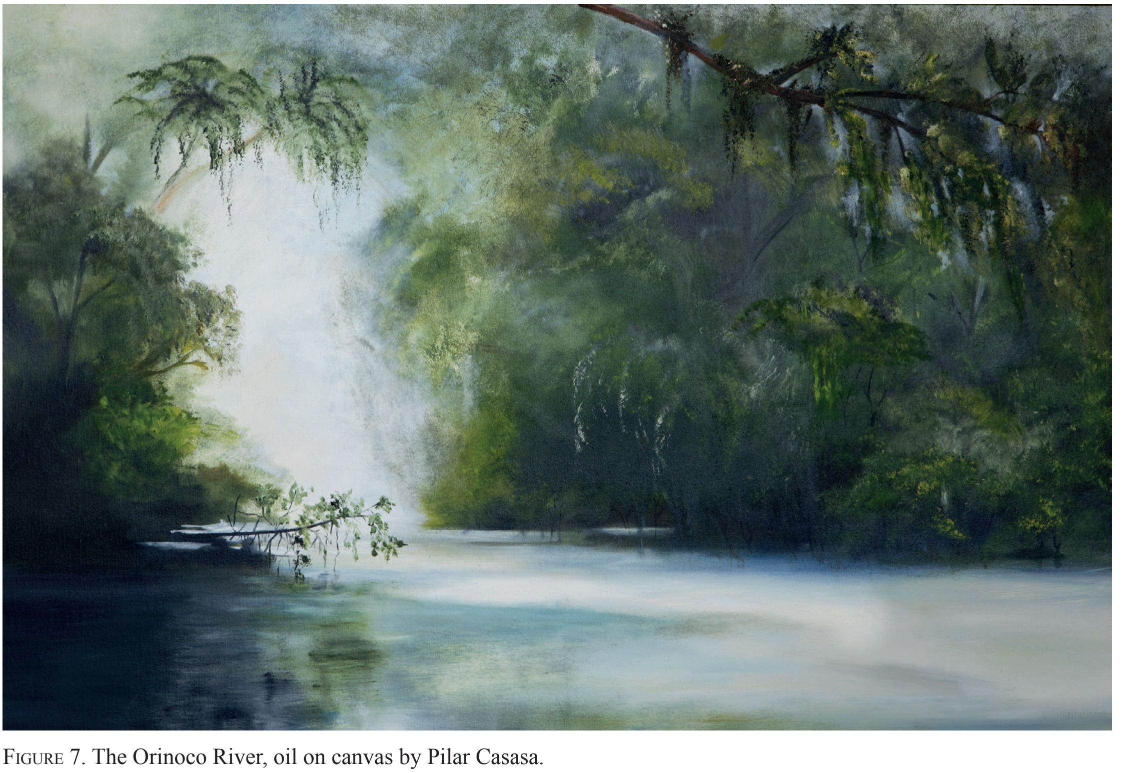


Figure 7. The Orinoco River, oil on canvas by Pilar Casasa.

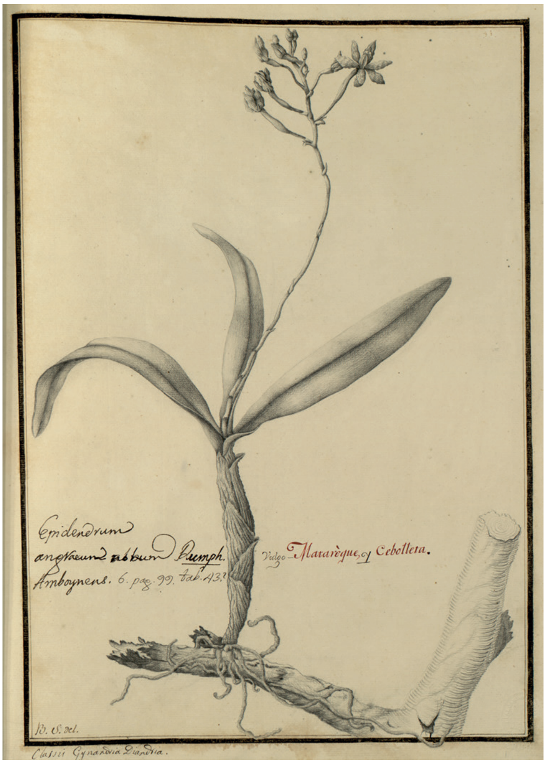


FIGURE 8. *Caularthron bilamellatum* (Rchb.f.) R.E.Schult. Archives of the Royal Botanical Garden, Madrid. Div. II, plate 49.

of South America". They explored Cumaná and then travelled west to Caracas. From there, their journey took them through the "llanos" and to the Casiquiare River, which connects the Orinoco to the Río Negro and thence with the Amazon.

David Lockhart (–1846), from 1828 Director of the Botanical Garden in Port-of-Spain, Trinidad, made several excursions to Venezuela's mainland, from where he sent several Orchidaceae to William Hooker at Kew. Carl Friedrich Eduard Otto (1812–1885) travelled to Cuba in 1838 and, in 1840, went to the north coast of Venezuela. He stayed in the country until 1841, travelling from Cumaná southwards to the Orinoco and making important botanical collections.

In 1840, Colonia Tovar, an important German settlement 65 km to the west of Caracas (Fig. 9), saw the arrival of traveller and botanist Johann Wilhelm Karl Moritz (1797–1866). Moritz lived in Colonia Tovar until his death. He travelled throughout Venezuela and made extensive collections of orchids, mostly described by Klotzsch and Reichenbach. The epithet *moritzii* was coined in his honour.

Belgian orchidologist Jean Jules Linden (1817–1898), accompanied by Nicolas Funk (1816–1896) and Louis Joseph Schlim (1819–1863), disembarked in Venezuela in 1841 during their third voyage to America. From Cumaná they travelled to Mérida and went on further to Trujillo, the "llanos" and Carabobo, returning in 1845 to Caracas. John Lindley described dozens of new orchids collected during this journey. Funk and Schlim again explored the departments of Miranda, Carabobo, Barquisimeto, Zulia, Trujillo and Mérida during the following years. Many of their new orchid collections were, in this case, described by H.G. Reichenbach.

Reinhart Frans Cornelis van Lansberge (1804–1873) was Consul of the Netherlands in Caracas during the 1840s and was later promoted to Governor of Suriname. In 1845, during his time in Venezuela, he sent a collection of orchids to Europe, described by H.G. Reichenbach as *Orchideae Lansbergianae.* German plant collector Hermann Wagener (1823–1877) explored the northern Venezuelan states along the Caribbean coast and the northern mountain chain in the state of Mérida between 1848 and 1853, again from 1854 to 1855. Wagener's orchid specimens were described by Reichenbach in over a dozen different articles in the years 1854 and 1855.

Gustav Carl Wilhelm Hermann Karsten (1817–1908) travelled in America from 1844 to 1847 and 1848 to 1856. He explored the states of Carabobo and Bolívar and, for several months, made the German Colonia Tovar his headquarters. During his second journey, Karsten collected also in Colombia and Ecuador. Another German, August Fendler (1813–1883), spent the years of 1856–1858 in Colonia Tovar, where he acquired a small property. His orchid collection was especially rich in the genera *Stelis* and *Pleurothallis* and was studied by J. Lindley and R. Schlechter (Todzia 1989).

Finally, David Burke (1854–1897), a collector sent by James Veitch & Sons, collected several orchids on Mount Roraima in 1891.

ADOLF ERNST (1832–1899; collected 1861–1899)

"I will never forget the pleasant surprise I felt when for the first time, some twenty-seven years ago,

Figure 9. Colonia Tovar in 1844. Copper engraving after an oil painting by Ferdinand Bellermann.

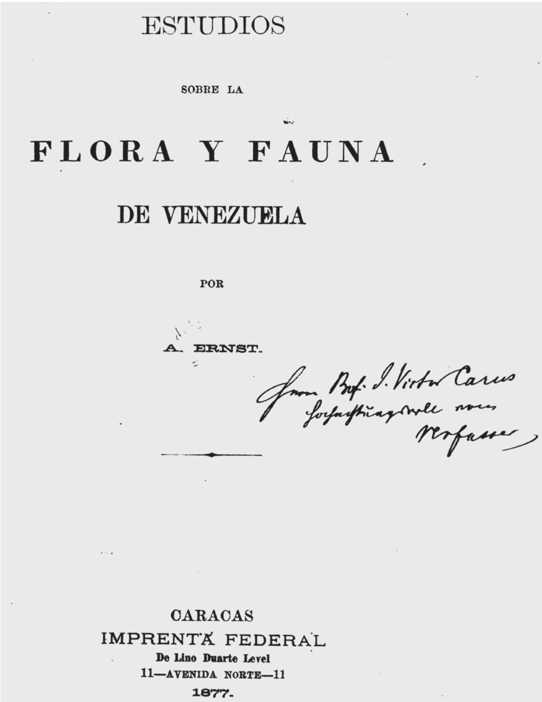
the splendid panorama of the valley of Caracas opened before my eyes from the heights of La Cruz, on the old road from La Guaira. Pastures, mountains and hills, and in the midst, the city with its red roofs, like a big ruby set amongst countless emeralds." (A. Ernst quoted in Jahn 1932: 320).

Adolfo (Adolf) Ernst (1832–1899) (Fig. 10), a German of Jewish origin, was born in Primkenau, Silesia. After finishing high school in his hometown, he moved to Berlin, where he studied natural sciences, pedagogy, and modern languages. It was during this time that he met the two children of Venezuelan general Judas Tadeo Piñango. He developed a warm friendship with them, and it was through their encouragement that he moved to Venezuela.

Ernst arrived at the port of La Guaira in 1861 and became Professor of Natural Sciences at the University of Caracas in 1874 (Anonymous 1900: 48). He established his permanent residence in Caracas, dedicated in body and soul to science. In May 1867, now completely adapted to the Venezuelan life, he founded the Society of Physical and Natural Sciences of Caracas and later, in 1874, the National Museum. In 1876, he was named director of the National Library, giving the institution great impulse. During the government of Antonio Guzmán Blanco, who was the absolute ruler of Venezuela from 1870 to 1899, he took part in the organization of international exhibitions in Vienna (1873), Bremen (1874), Santiago de Chile, and Philadelphia (1876). In 1874, at the dictator's request, he organized the chair of Natural History at the Central University of Venezuela, where he spread Lamarck's and Charles Darwin's "natural selection" theories, of which he was a fervent follower and which were fundamental in Zoology and Botany.

During the 38 years he lived in Venezuela, his work was unanimously praised by all who knew him or knew his writings. An anonymous writer commented in 1878: "Dr. Adolf Ernst is, as his name betrays, a German who has deserted the Fatherland for Caracas and is there labouring to grow science upon a somewhat uncongenial soil. In botany, zoology, and ethnology alike, he has worked hard and is the founder of the "Sociedad de Ciencias Físicas y Naturales de Caracas," and, we believe we may add, the writer of the greater part of the memoirs of that learned association" (Anonymous 1878: 231). Venezuelan historian Guillermo Morón wrote, "He came to Caracas following in the footsteps of Alexander von Humboldt -as many other Germans had done before. He wrote in Spanish, French, English, German, even in Portuguese and Italian… His ground-breaking work was abundant and pointed the way for many others to follow. Venezuelan Jews have now the task to divulge his complete works" (cited in Padrón Toro 2013: 10). And finally, in the words of Rudolf Schlechter, he was

FIGURE 10. Adolfo Ernst. Archives of Rudolf Jenny.



ESTUDIOS

SOBRE LA

FLORA Y FAUNA

DE VENEZUELA

POR

A. ERNST.

Herrn Prof. J. Victor Carus
hochachtungsvoll vom
Verfasser

CARACAS
IMPRENTA FEDERAL
De Lino Duarte Level
11—AVENIDA NORTE—11
1877.

FIGURE 11. Title page of Ernst's work.

FIGURE 12. *Habenaria caracasana* Schltr. (=*Habenaria trifida* Kunth). Unknown photographer.

the man with "the best knowledge about Venezuela's fauna and flora" (Schlechter 1919:10).

He travelled around the country and became an authority on Venezuelan wildlife. However, with few exceptions, he seldom made contact with the leading European botanists, nor did he send specimens to the leading institutions of his time. His collections, which must have been numerous, ended up in the herbarium of the University of Caracas, where insects devoured them. Ernst is essential because, in his works, we find the first attempts to prepare an orchid flora of Venezuela (Schlechter 1919:10). This modest flora, an *Alphabetic catalogue of the genera and species of orchids which have so far been collected in the territory of the Republic*, as Ernst called it, was published in 1877 as part of his 'Estudios sobre la flora y fauna de Venezuela' (Fig. 11). It enumerated 412 orchid species in 78 genera, *Epidendrum* (77 species), *Pleurothallis* (46 species), *Oncidium* (41 species), and *Maxillaria* (37 species) being the best represented (Ernst 1877: 249–273).

Goodyera neglecta Ernst, was named by Ernst from a collection at the Selva del Catuche, near Caracas. However, the name is considered a *nomen nudum* since Ernst never published a formal new species description.

In September 1871, Ernst visited the islands of San Roque, and from 28 to 31 May 1873, he made a short excursion to the island of Margarita, which resulted in his *List of plants observed on Margarita Island* (1881). In this, he followed the order of families established by Grisebach in his *Flora of the British West Indian Islands*. The list included mostly plants in cultivation. Foldats mentions a collection by Ernst on Margarita of *Oncidium luridum* Lindl. Finally, in January 1874, he explored Tortuga Island, off the north coast of Venezuela. Ernst apparently also collected in the British Virgin Islands and the Bermudas at some point of his life (Ossenbach 2016: 362).

Joseph Dalton Hooker was among the few European scientists with whom Ernst corresponded; in a letter from Caracas dated 23 April 1869, Ernst wrote that he was anxious to hear from Hooker although he understood it was a busy time at Kew. He hoped that Hooker had received a box of orchids and a parcel of seeds as well as a letter that contained

Figure 13. *Gomphichis gracilis* Schltr. as *G. adnata* (Ridl.) Schltr. Photograph by K. Senghas.

Figure 14. *Epidendrum ernstii* Schltr. as *E. klotzscheanum* Rchb.f. Photograph by José David Lacruz.

a diploma for Hooker as an honorary member of Ernst's society [Young Naturalist Society in Caracas]. The last box Ernst dispatched to Kew contained *Pleurothallis*, *Maxillaria,* and a climbing *Oncidium* (most likely a *Cyrtochilum*).

In 1919, Rudolf Schlechter published the first volume of his famous series *Die Orchideenfloren der Südamerikanischen Kordillerenstaaten* (the orchid floras of the South American Andean States), which was dedicated to Venezuela (see Schlechter 1919). In this, Schlechter described 6 new orchid species, collected by Adolfo Ernst, some of them named in his honour. *Habenaria caracasana* (Fig. 12), *Gomphichis gracilis* (Fig. 13), *Pogonia nana*, *Epidendrum ernstii* (Fig. 14), *Habenaria ernstii*, and *Govenia ernstii* (Fig. 15)The building that contains the collections of Venezuela's National Museum was named in his honour "Centro Adolfo Ernst".

Paul Rudolf Preuss (1861–1926; collected 1889–1900)

Paul Rudolf Preuss was born in the city of Thorn, in Pommerellen, a region on the Baltic coast that during the preceding 1000 years had frequently changed hands between the Kingdom of Prussia and the Polish Republic, to which it now belongs. Preuss studied Natural Sciences at the universities of Königsberg and Berlin, where he received his Ph.D. in 1885 with a botanical dissertation.

In 1886, he travelled to Sierra Leone and the Gold Coast collecting insects and plants. In the following years (1888–1890), he was part of Dr. Zintgraff's expedition exploring the hinterland of Cameroon. He was admitted into the German Colonial Service in 1890 and engaged as director of the Barombi Station in Cameroon (Fig. 16A).

From 1892 until 1903, he was director of the experimental garden in the city of Victoria (today is known as Lembe), with an interlude from 1899 to 1900, during which he travelled under contract with the Colonial Economical Committee (Berlin) to Central and South America. While he continued in the service of the Colonial office, over the next 20 years, he collected animals and plants in New

Figure 15. *Govenia ernstii* Schltr. Photograph by Ivo Kindel.

Guinea, Sierra Leone, Togo, and Cameroon (Frahm & Eggers, 2001: 384).

A number of African orchids (all collected in Cameroon) were named in his honour by Kränzlin and Rolfe; among them are *Calyptrochilum preussii* Kränzl., *Disa preussii* Kränzl., *Disperis preussii* Rolfe, *Eulophia preussii* Kränzl., *Peristylus preussii* Rolfe, *Platanthera preussii* Kränzl., and *Polystachya preussii* Kränzl.

During his journey to the American Tropics, his main interest focused on the cultivation of cocoa, coffee, and sugar cane, but while travelling from one plantation to another, he always found the time to increase his botanical collections. After visiting Suriname and Trinidad, he arrived in Venezuela, where he spent several months. Since Preuss was travelling on an official mission for the German Colonial Office, he found guidance and support from the representatives of the *Grosse Venezuela Eisenbahn-Gesellschaft* (Great Venezuelan Railroad). This German enterprise had built what was considered the most significant engineering accomplishment in the history of the country (Fig. 16B). Preuss used the railroad to travel across Venezuela. He then continued to Ecuador, Panama, Nicaragua, Salvador, Guatemala, and Mexico, where he was especially interested in the production of *Vanilla*. Kränzlin described *Vanilla preussii* from a specimen collected by Preuss in Guatemala. He returned to Europe in 1900 after stopping briefly in Cuba and Jamaica (Karsten 1902: 223– 225).

Paul Preuss published his journal of the expedition under the title *Expedition nach Zentral-und Südamerika 1899/1900* (Preuss 1901). While travelling from plantation to plantation, Preuss always stopped to admire the magnificent Venezuelan landscape and often commented on the vegetation he found in the different regions. "At 1,100 m we arrived at the rim of the forest and enjoyed one last glance over the cordillera, the valley of Aragua, and across Lake Valencia into the 'llanos'. The forest enclosed us with its tropical vegetation, the gigantic tree-trunks and a surprising variety of epiphytic Aroids, Orchids, Bromeliadas and even an epiphytic palm, a species of *Carludovica*"; "*Vanilla pompona* grows wild in the forest, its fruits are used to parfume the linen"; "On the coast, near Puerto Cabello, one finds vanilla growing wild, probably *Vanilla planifolia.*" (Preuss 1901: 48–51).

Among the orchid specimens collected by Preuss in Venezuela, Kränzlin described *Dikylikostigma preussii* [=*Discyphus scopulariae* (Rchb.f.) Schltr.] (Fig. 17), *Habenaria galipanensis,* and *Habenaria turmerensis* as new species (Fig. 18). In 1919, Schlechter added an additional new species by Preuss, named *Epidendrum tricallosum* (Fig. 19).

Karl Wilhelm John (–; collected imported plants into Germany 1904–1905)

While at the turn of the century, British and other European collectors and nurseries stayed loyal to Kew, German botanists, collectors, and orchid growers saw Berlin as their main orchid research center, and when in need of species determinations, they initially turned to Kränzlin. However, in the first decade of the 20th century, Kränzlin was overshadowed by Rudolf Schlechter, who became Germany's leading orchidologist and maintained this position until he died in 1925.

By 1906 Schlechter had already described a plant of unknown origin as *Oncidium johnianum* in honour of Karl Wilhelm John (-), retired captain of the German Army and owner of a well-reputed orchid nursery in the small city of Andernach, on the

Figure 16. A. Barombi Station in Cameroon, 1888. Photograph by Karl Zeuner. B. One of the bridges of the Grosse Venezuela Eisenbahn–Gesellschaft, ca. 1904. Unknown photographer.

Figure 17. *Dikylikostigma preussii* Kraenzl. [=*Discyphus scopularieae* (Rchb.f.) Schltr]. Photograph by Magnus Manske.

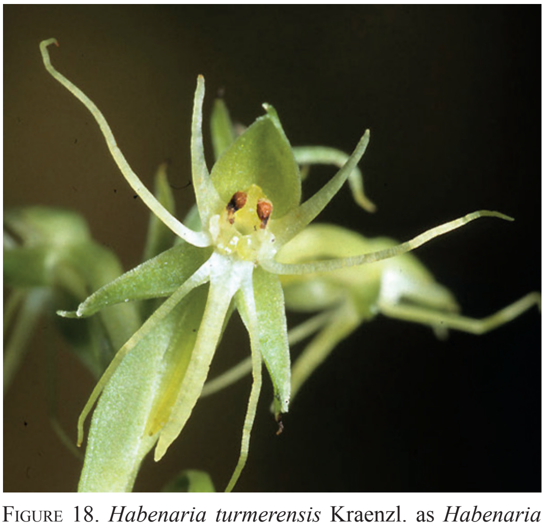


Figure 18. *Habenaria turmerensis* Kraenzl. as *Habenaria armata* Rchb.f. Photograph by K. Senghas.

Rhine River (Schlechter 1906: 4). In the same year, F. Ledien published an article about the singularities of *Coryanthes maculata* Hook., basing his observations on a plant supplied by John and probably of Venezuelan origin (Ledien 1906: 18). A founding member of the German Society for Orchidology, Karl W. John was elected to the board of directors of the Society during its inauguration ceremony on 10 May 1906. The first President was Max, Baron of Fürstenberg.

John published several small articles in the horticultural magazines *Orchis* (John 1906) and *Gartenflora*, in which he also regularly announced the arrival of new orchid species at his nursery (Fig. 20).

"Several European nurseries, including Sander and Sons, Veitch, and other English firms, have imported large numbers of orchids, mainly of horticultural value, from Venezuela. Here in Germany, the author has received many specimens of Venezuelan orchids for determination from Mr. O[tto] Beyrodt of Manienfelde, near Berlin and K[arl] W[ilhelm] John of Andernach. The latter has also sent herbarium specimens among which were a few

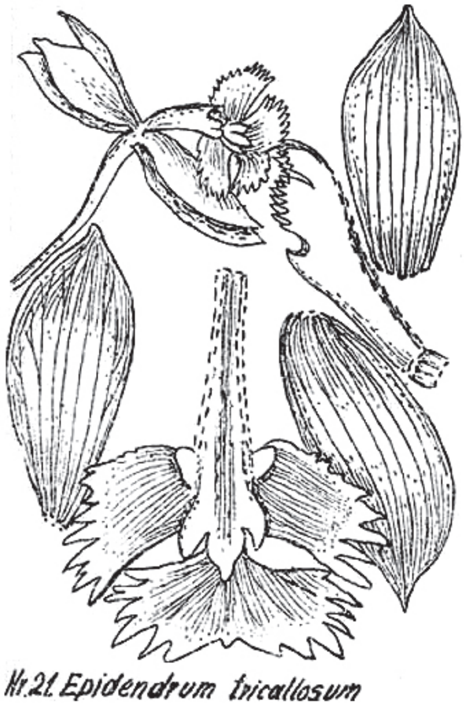


Figure 19. *Epidendrum tricallosum* Schltr. Illustration from Schlechter's *Figuren-Atlas* (Mansfeld, R. 1929. Figuren-Atlas zu den Orchideenfloren der südamerikanischen Kordillerenstaaten. t16.


Orchideen.

Ein ausserordentlich preiswerthes Angebot theils bekannter, theils neuer, hervorragend schöner **Cyprissedium Hybriden** erscheint Anfang Januar in meiner Special-Offerte 25. Werthe Bestellungen erbittte zeitig, weil die Nachfrage sehr gross sein wird.

K. W. John, Orchideengärtnerei, Andernach a. Rh.

Figure 20. K.W. John's advertising in Gartenflora, 1913.

novelties, especially those from the small–flowering groups" (Schlechter 1919:11).

Before his publication on the orchid flora from Venezuela, Schlechter had already described two Brazilian orchid species imported by John: *Brassavola multiflora* (Fig. 21) and *Oncidium johnianum* (Fig. 22).

But Venezuela was undoubtedly the country from where John received his main supplies. In 1919,

Figure 21. *Brassavola multiflora* Schltr. as *Brassavola martiana* Lindl. Photograph by Maarten Sepp.

Figure 22. *Oncidium johnianum* Schltr. as *Oncidium barbatum* Lindl. In Lindley's Collectanea botanica…, plate 27, 1821.

Figure 23. *Diacrium venezuelanum* Schltr. (=*Caularthron bilamellatum* (Rchb.f.) R.E. Schultes). Photograph by José Pestana.

Figure 24. *Encyclia leucantha* Schltr. Photograph by E. Hunt.

Figure 25. *Stelis amblyophylla* Schltr. (=*Stelis grandiflora* Lindl.). Photograph by O. Gaubert.

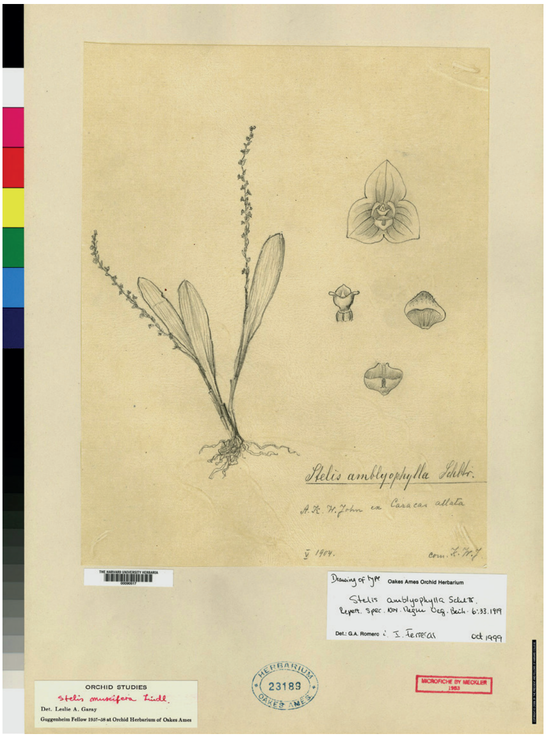


Figure 26. *Stelis amblyophylla* Schltr. Drawing of type at the Harvard University Herbaria, # 00090517.

Schlechter described 12 species imported by John from that country, all of which had been collected in the surroundings of Caracas. Besides *Microstylis johniana*, dedicated to him by Schlechter, John sent the following new species to Berlin for their determination: *Bletia stenophylla*, *Comparettia venezuelana*, *Diacrium venezuelanum* (Fig. 23), *Encyclia leucantha* (Fig. 24), *Stelis amblyophylla* (Fig. 25–26), *Epidendrum pachyanthum* (Fig. 27), *Epidendrum venezuelanum*, *Notylia venezuelana*, *Pleurothallis intermedia* (Fig. 28), *Pleurothallis nephrocardia* (Fig. 29), and *Epidendrum laetum* (Fig. 30). Schlechter also described *Laelia johniana* from Colombia and *Maxillaria fuerstenbergiana* from Peru. Kränzlin and Oppenheimer found two additional new species among John's collections: *Maxillaria johniana* from Peru and *Oncidium johnii* from Mexico.

Henri François Pittier (1857–1950; collected 1906–1950)

Henry François Pittier (Fig. 31), a Swiss engineer with strong interests in natural sciences, followed the

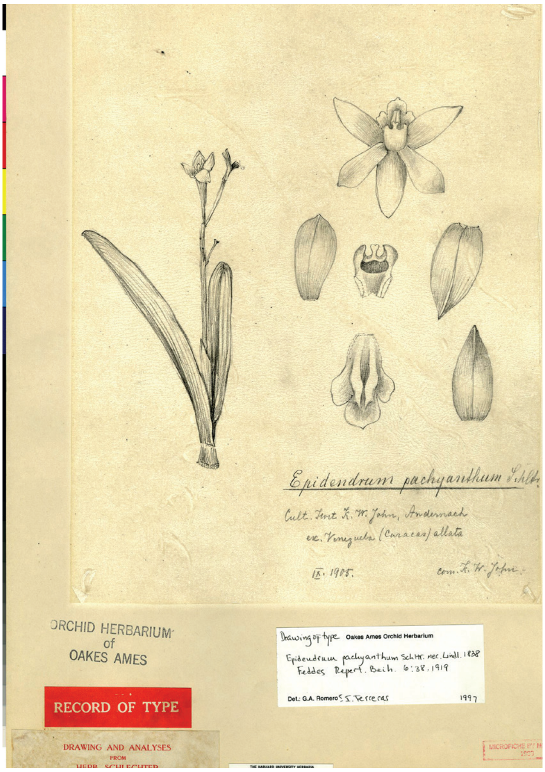


Figure 27. *Encyclia pachyanthum* Schltr. (=*Prosthechea hartwegii* (Lindl.) W.E.Higgins). Drawing of type at the Harvard University Herbaria, # 00070653.

Figure 28. *Pleurothallis intermedia* Schltr. (=*Pleurothallis loranthophylla* Rchb.f.). Photograph by Daniel Jiménez.

Figure 29. *Pleurothallis nephrocardia* Schltr. Photograph by P.C. Brouwer.

Figure 30. *Epidendrum laetum* Schltr. (=*Epidendrum calanthum* Rchb.f. & Warsz.). Photograph by Eric van den Berghe

Figure 31. Henri Pittier. Photographed in 1880, 1903, 1914, and 1946. Courtesy of Luko Hilje.

Figure 32. The city of Caracas in 1908, shortly before Pittier's arrival. Unknown photographer.

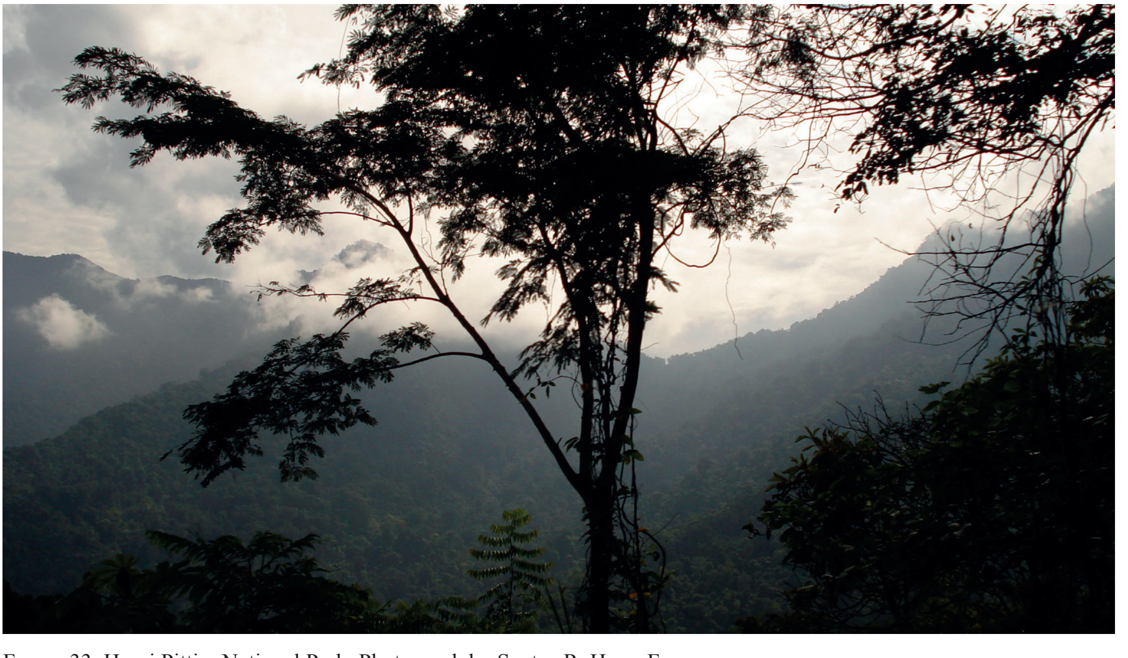


Figure 33. Henri Pittier National Park. Photograph by Santos R. Herra Faro.

Figure 34. Bust of Pittier at Henri Pittier National Park. Unknown photographer

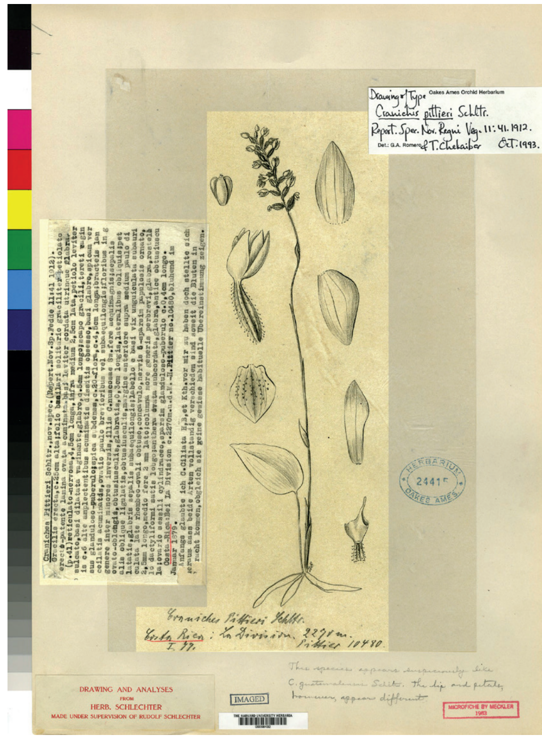


Figure 35. *Cranichis pittieri* Schltr. Drawing of type at the Oakes Ames Orchid Herbarium, #24415

call of Costa Rican Secretary of Education Mauro Fernández and arrived in the small Central American country in October 1887. He would never return to Switzerland. Fernández wanted to staff a number of recently founded high schools and successfully recruit a number of Swiss professionals, among whom Pittier, Rudin, and Biolley were the most important.

Pittier was born in Bex, Canton Waadt, on 13 August 1857. He graduated as a civil engineer from the University of Lausanne and started a mapping survey of the alpine flora of Switzerland. After breaking his leg in an accident and while immobilized, he began to read intensively about natural sciences. Thus, he came into contact with the work of Eduard Haeckel, the famous German naturalist, and was so fascinated by his ideas that he decided to go to Germany, where he started doctoral studies at the University of Jena.

From 1887 to 1903, Pittier organized and directed the 'Instituto Físico-Geográfico de Costa Rica', one of whose objectives were to map the republic. In need of an assistant, Pittier convinced the Costa Rican government to give the position to Swiss botanist Adolphe Tonduz. Together, they became involved in the organization of the National Herbarium in San Jose. Pittier and Tonduz made botanical collections from 1887 to 1904: One of the results of these collections was the *Primitiae Florae Costaricensis*, published between 1891 and 1901 in three volumes containing 12 fascicles and written in collaboration with Theophil Alexis Durand from the Botanical Garden in Brussels.

Pittier went to Washington D.C. in 1904 to work for the United States Department of Agriculture at the Bureau of plant industry. His grand title was 'Special agent in the botanical investigation in tropical agriculture"; this was shortened in 1912 to 'Botanist'. Between 1905 and 1919, he worked in Washington and also travelled extensively in Central and South America, where he collected in Panama, Mexico, Guatemala, El Salvador, Colombia, Ecuador, and Venezuela. In 1906, he made botanical collections in the region of Santa Marta, Colombia. *Epidendrum sanctae-martae* was described by Schlechter from a collection by Pittier on the slopes of Santa Marta's Sierra Nevada dated June 1906. From 1910 to 1912, Pittier took part in the

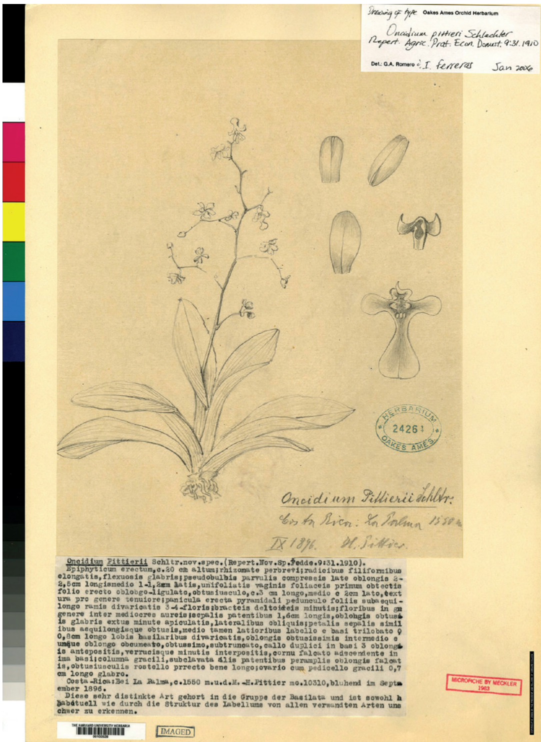


FIGURE 36. *Oncidium pittieri* Schltr. Drawing of type at the Oakes Ames Orchid Herbarium, #24261.


FIGURE 37. *Ornithidium pittieri* Ames (=*Maxillaria pittieri* (Ames) L.O.Williams). Photograph by Daniel Jiménez.

'Biological Exploration of Panama' by the Smithsonian Institution, collecting over 4000 specimens. His collections were of utmost importance for the flora of Panama, where he would become a key actor after the decision of Panama's president Belisario Porras to establish the Experimental Agricultural Station Matías Hernández in 1916, the first research center in Panama. Pittier was its first director.

While in Washington, Pittier travelled to Venezuela, then under the government of Juan Vicente Gómez, for the first time in 1913 as a consultant for establishing a school of agriculture (Fig. 32). However, his opinions were disregarded, and he decided to return to Washington. During his short stay, Pittier found time to make an essential collection of plants in the state of Miranda, among which Schlechter described a number of new species (Schlechter 1919). In 1917, he returned to Venezuela in another failed venture to establish an Experimental Agricultural Station.

In 1919, at the age of 62, Pittier travelled once more to Venezuela, this time as director of the Commercial Museum in Caracas. He established himself in the country and, notwithstanding his age, travelled extensively throughout Venezuela, publishing his well-known *Manual de las Plantas usuales de Venezuela* in 1926, followed in 1939 by its first supplement. He also founded the National Herbarium in Caracas and published some 300 books and articles in different journals. Henri Pittier never left Venezuela again and died at the age of 93 on 27 January 1950.

There are still discussions about the final number of plants collected by Pittier, but without doubt, he made a most important contribution, especially to the knowledge of the floras of Panama, Costa Rica, and Venezuela (biographical information mainly after Jenny 2017).

The history of Venezuela's National Parks began in 1937, when Pittier advocated the creation of the Rancho Grande National Park, situated to the north of Maracay, in the state of Aragua. After Pittier's death, the park was renamed Parque Nacional Henri Pittier in 1953 (Fig. 33–34).

A large number of orchids were dedicated to Pittier by Schlechter and Oakes Ames. We find from his Costa Rican collections: *Cranichis pittieri* Schltr. (Fig. 35), *Vanilla pittieri* Schltr., *Notylia pittieri* Schltr., *Oncidium pittieri* Schltr. (Fig. 36),

FIGURE 38. *Epidendrum pittieri* Ames. Illustration from Mutis' Flora de la Real Expedición del Nuevo Reino de Granada, vol. IX (Orchidaceae III), plate 33.

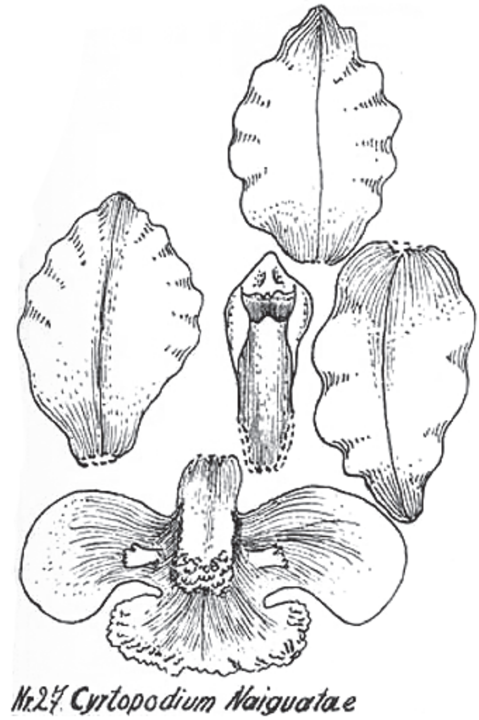


FIGURE 39. *Cytopodium naiguatae* Schltr. Illustration from Schlechter's *Figuren-Atlas* (Mansfeld, R. 1929. Figuren-Atlas zu den Orchideenfloren der südamerikanischen Kordillerenstaaten. t8.

Ornithidium pittieri Ames (Fig. 37), *Pleurothallis pittieri* Schltr., and *Scaphosepalum pittieri* Schltr. In Panama, Pittier collected *Lockhartia pittieri* Schltr. and *Microstylis pittieri* Schltr.,

Pittier collected *Epidendrum pittieri* Ames (Fig. 38) in Colombia. And finally, the following Venezuelan species were dedicated to him: *Bletia pittieri* Schltr. ex Knuth, *Habenaria pittieri* Schltr. ex Knuth (*nom. nud*), *Physurus pittieri* Schltr., and *Stelis pittieri* Schltr. (*nom. nud*).

Additional new species from Venezuela were described by Schlechter in 1919, including *Elleanthus galipanensis*, *Hapalorchis cheirostyloides*, *Scaphosepalum trachypus*, *Cyrtopodium naiguatae* (Fig. 39–40), *Notylia venezuelana*, *Stelis covilleana,* and *S. calceolus*.

Among Pittier's collections in Colombia are: *Elleanthus scopulae*, *Epidendrum sanctae-martae*, *Gomphichis caucana* (Fig. 41–43) (all determined by Schlechter); as well as *Epidendrum suaveolens*, *E. sulcatum*, *Lepanthes mirabilis*, *Gomphichis foliosa*, *Stelis insignis*, *S. colombiana*, *S. pleurothalloides*, and *S. vagans* (determined by Ames).

According to Standley (1937–1938:49), "Henri Pittier has undoubtedly gained a more intimate knowledge of the natural history and especially the botany of Central America and northwestern South America than has ever been possessed by any single person."

PAUL RUDOLF WOLTER (1862–1942) **AND SALOMON BRICEÑO GABALDÓN** (1826–1912; collected ca. 1912–1919)

Paul Rudolf Wolter (Fig. 44) was –together with other important German orchid growers such as Otto Beyrodt and Wilhelm Hennis– among the founding members of the *Deutsche Gesellschaft fur Orchideenkunde* in 1906. Ernst Hugo Heinrich Pfitzer, the leading German orchidologist of his time, also took part in the inaugural meeting in May of that year.

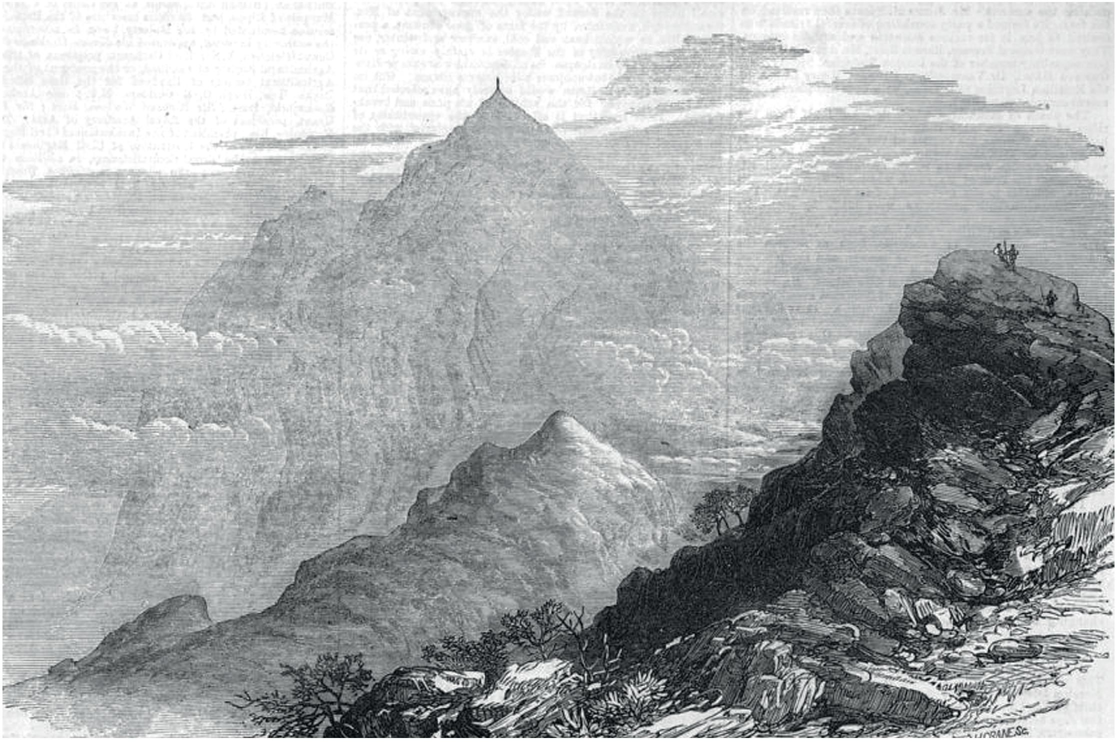


Figure 40. Naiguata Peak (2765 m.) in Venezuela's Coastal Mountain Range. Antique print of 1872.

Figure 41. *Gomphichis caucana* Schltr. Drawing of type made under Schlechter's supervision at the Oakes Ames Orchid Herbarium, #24628

Figure 42. *Gomphichis caucana* Schltr. Unknown photographer.

FIGURE 43. Valley of the River Cauca. Photograph by C.V.C.

FIGURE 44. Paul Rudolf Wolter (1862–1942). In Orchis 45/1941.

However, he passed away unexpectedly in December of the same year, leaving a vacuum soon occupied by Rudolf Schlechter.

Paul Wolter's firm, which he founded in 1885 in Wilhelmstadt, near Magdeburg, was one of the oldest German orchid nurseries. The firm published its first sales catalogues in 1894. An anonymous note remarked: "Paul Wolter has founded a specialized orchid nursery at Kleine Strasse N° 1 (20 minutes from the main station) and has published its first catalogue. Each plant has a special symbol indicating whether it must grow in a cold-, medium- or hot-house. We wish this enterprise the best of successes." (Anonymous 1894: 388).

Wolter served as an apprentice in horticulture at several of the most prestigious German nurseries. When he established his firm, he focused on high-quality plants. He began with the import of plants from all parts of the world, but before the turn of the century, he started growing his first orchids from seed and moved more and more towards orchid breeding. By 1904, Wolter already had 10,000 orchids in cultivation, among them about 70 hybrids, the first German stock. The first primary hybrids from *Cattleya* came from Magdeburg; some of the most popular among them were *Cattleya* Wolteriana = *C. aurantiaca* × *C. schroederae,* and *Stanhopea* Wolteriana = *S. tigrina* × *S. martiana* (Henze-Brzesowski 1997: 124–125, Jenny

Figure 45. *Acineta wolteriana* Schltr. Photograph by Finca Dracula.

Figure 46. *Maxillaria abelei* Schltr. as *Maxillaria rufescens* Lindl. Photograph by Danny Lentz.

Figure 47. *Mormodes wolteriana* Kraenzl. Photograph by E. Hunt.

2017: 281). Wolter became Germany's most important specialist in the difficult task of orchid hybridization (Anonymous 1906: 197). Besides hybridization, his main business interest was not the production of cut flowers but the acclimatization of imported plants for sale to wealthy collectors.

Paul Rudolf Wolter sold his nursery in 1941 for health reasons; he passed away the following year on 28 April. Botanists Friedrich Kränzlin and Rudolf Schlechter were frequent visitors to Wolter's nursery. Many hybrids and species were dedicated to him. Besides the already mentioned hybrids (*C.* × *wolteriana* and *S.* × *wolteriana*), a few South American orchids were named in his honour by Schlechter: *Acineta wolteriana* (Fig. 45) from Colombia and *Batemania wolteriana* from Peru. Another Peruvian species imported by Wolter was *Maxillaria abelei* Schltr. (Fig. 46). Finally, Kränzlin described *Mormodes wolteriana* (Fig. 47)*,* also from Peru.

Schlechter, in the introduction to his orchid flora of Venezuela, mentions a small orchid collection from the state of Mérida, of which no further information is available: "We received from Mr. P. Wolter, while this work was in print, a small orchid collection gathered by merchant Salomon Briceño in the vicinity of the city of Merida. The collection consists mainly of valuable horticultural plants, only usable for the cut-flower cultivation." (Schlechter 1919:11).

Salomón Briceño Gabaldón (Fig. 48), based in Mérida, was engaged in the commercial collecting of natural history specimens from the early 1870s. He was one of the leading suppliers of bird skins to the well-known British zoologist Walter Rothschild (Dorr *et al*. 2017: 20).

Colombia. Spain claimed the territory of Colombia during a journey by Rodrigo de Bastida, who from

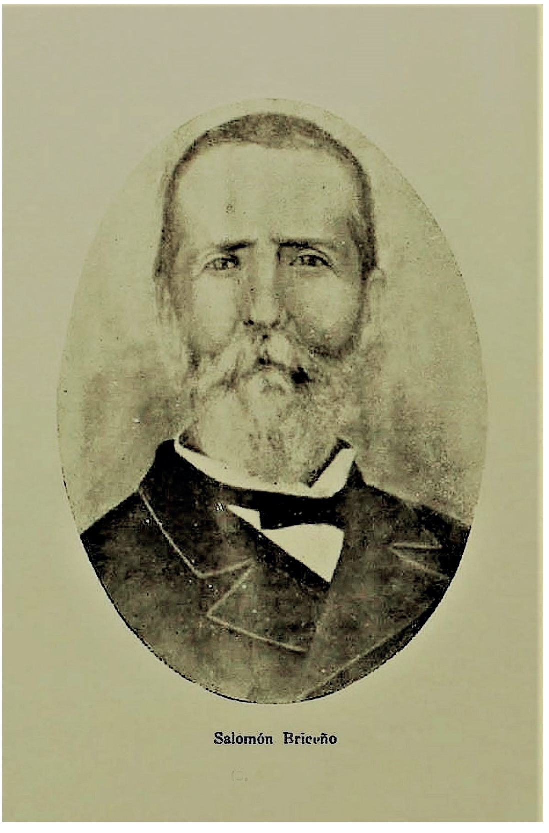


FIGURE 48. Salomón Briceño Gabaldón. Archives of Rudolf Jenny.

1501 to 1502 sailed from the region of Guajira (along the border of present-day Venezuela and Colombia) to the Gulf of Urabá, on the isthmus of Darien. During this voyage, de Bastida discovered the mouth of the Magdalena River. Colombia's geography is usually classified into five natural regions.

The Andes mountain range stretches from the border with Ecuador to the Sierra Nevada de Santa Marta, near the border with Venezuela. It includes Pico Cristóbal Colón (5730 m) (Fig. 49), Colombia's highest peak. Nearly three-fourths of Colombia's population lives in the highlands of the Andes.

To the east are the **Caribbean Lowlands**, where the Andes split into three distinct, roughly parallel chains or "cordilleras", extending northeastward almost to the Caribbean Sea. The valley of the slow-flowing Magdalena River, a major transportation artery, separates the Cordillera Central from the main eastern range, the Cordillera Oriental (Fig. 50). The Magdalena is navigable deep into the interior of the country, as far as the city of Neiva. The course is, however, interrupted midway by rapids.

The **Pacific coastal region** is shared with Panama and Ecuador. It is separated from the Caribbean Lowlands by the lowlands of the Isthmus of Darién.

To the East are **the great plains,** or "llanos"; these are often flooded in the region of Orinoquia, and they continue into Venezuela (Fig. 51). They are bounded to the east and south with the **Amazon region**. The rivers of this region drain partly into the Orinoco basin and partially into the Amazon.

Colombia has perhaps the richest and most exciting orchid history of the Spanish-speaking South American countries. During the 18th century, its botanical exploration centred on the search for plants with medicinal or commercial uses. Later, in the 1840s to 1850s, at the peak of the wave of 'Orchidomania', Colombia became one of the hotspots for orchid collectors, especially for those searching for the spectacular species of *Cattleya* and *Odontoglossum*. During the last decades of the 19th century, orchid history in the country slowly turned its back on commercial collecting and focused again on scientific botanical research.

Nikolaus Joseph Freiherr von Jacquin (1717–1827) was the first European Botanist to collect on Colombian soil. Jacquin was sent to the Caribbean in 1754 by Emperor Francis I of Austria. He spent a short time in the vicinity of Cartagena, where he made botanical collections that included several orchids, which he described after his return to Europe in his famous *Selectarum Stirpium Americanarum Historia*. We remember him in the orchid genus *Jacquiniella*, established by Schlechter in his honour in 1920.

José Celestino Mutis (1732–1808) was born in the Spanish city of Cadiz. He studied botany and medicine at the University of Seville and went to Bogotá in 1760 as a personal physician of the Viceroy of New Granada. He soon began a systematic exploration of the native flora with the idea of publishing an extensive Flora of New Granada, which he never realized although he was able -with the help of native artists- to produce many beautiful illustrations, including those of dozens of orchids. It was said of Mutis that he never wrote a *Flora of New Granada*… he painted it. The genus *Mutisia* of the Asteraceae was dedicated to him by

Figure 49. Sierra Nevada de Santa Marta as seen from the Palomino River. Photograph by Matias Recondo.

Figure 50. Steamboat anchored to the shore of the Magdalena River, 1933. Photograph by Robert S. Platt.

FIGURE 51. Flood-lands in Orinoquia. Unknown photographer.

Linnaeus the Younger and beautifully illustrated for Mutis' flora (Fig. 52).

In 1801, Mutis received two prestigious visitors at his home in Bogotá: Alexander von Humboldt (1769–1859) and Aimé Bonpland (1773–1858). They had navigated the Magdalena River upstream to the city of Honda before continuing by land to Bogotá. After making rich botanical collections in the surroundings of the city, Humboldt and Bonpland crossed the Quindiu Pass in September and rode into Ecuador (Fig. 53). August Weberbauer, a famous plant collector in Peru, called them "the second discoverers of America".

French botanist Justin Goudot (–1848) arrived in Colombia in 1822 and explored the country over the following 20 years. He travelled in all directions: on the Magdalena River, which he followed up to Honda; to Bogotá and across the Andes; in the district of Santa Marta on the Caribbean Sea; and finally, for a short period, also in the vicinity of Caracas, in Venezuela. His botanical collections were deposited at the National History Museum in Paris.

After their travels mentioned above in Venezuela, Jean Jules Linden and Louis Joseph Schlim crossed into Colombia, making rich collections of orchids. They travelled throughout the country, from the mountain peaks of the Andes to the shores of the Caribbean Sea, returning in 1843 to Caracas. They crossed back into Colombia to explore the Sierra Nevada of Santa Marta and finally embarked in Río Hacha to return to Europe, making brief stops in Jamaica and Cuba. Nicolas Funck (1816–1896), who had travelled previously with Linden to Mexico and Brasil, arrived in Venezuela in the company of Schlim in the year of 1845 and explored both Venezuela and Colombia. Funck returned to Europe in 1846, but Schlim continued collecting and returned to Belgium in 1852.

Karl Theodor Hartweg (1812–1871) visited Colombia from 1842 to 1843. He had been in Ecuador before he crossed the Andes towards Bogotá. He sailed down the Magdalena River to the Caribbean coast from Honda, where he met with Jean Jules Linden.

On a Kew Botanical Gardens mission, William Purdie (1817–1857) came from Jamaica to Santa Marta, where he climbed the Sierra Nevada along the same route taken by Funck the year before.

An important figure in the history of Colombia's natural sciences was José Jerónimo Triana (1828–1890), who began his botanical journeys across Colombia in 1851 as a member of the 'Comission chrographique de la Nouvelle Grenade'. Triana travelled in the company of one of the most important botanists and orchid collectors of his time, Józef Ritter

Figure 52. *Mutisia clematis* L. fil. Tempera on paper by Salvador Rizo. Iconografía mutisiana, div III, 1154. Archives of the Royal Botanical Garden, Madrid. Mutis' initials (C. M.) are skillfully interwoven with the plant details.

Figure 53. Pass of Quindiu. Engraving by Christian Friedrich Traugott Duttenhofer after a sketch by Humboldt, 1810.

von Warscewicz (1812–1866). In 1851, he explored the Pacific coast, accompanying Warscewicz to the port of Buenaventura, where the latter embarqued for Guayaquil in Ecuador. The Polish collector would return to Colombia in 1853 on his way back to Europe. *Cattleya trianae*, one of the most beautiful of its genus and the national flower of Colombia, known as 'Flor de Mayo' (flower of May), was named by Linden and Reichenbach *f.* in Triana's honour. Triana travelled to the Quindiu mountains in 1854 in the company of Dr. Gustav Karl Wilhelm Hermann Karsten.

Hermann Karsten (1817–1908), in Schlechter's words, one of the "keenest observers among the collectors and botanists of the South American Andes states" (Schlechter 1919: 11), worked in Colombia between 1852 and 1866. He arrived in Santa Marta in 1852, after having spent 8 years in Venezuela (see above). He spent almost a year exploring the Sierra Nevada and then proceeded to Bogotá, where he worked as a physician during 1853. After crossing the Andes, he went as far as Riobamba, in Ecuador and returned north to embark in Cartagena on his way to Europe. Between 1862 and 1869, he published a two-volume flora of Colombia, under the title *Florae Columbiae: terrarumque adiacentium specimina selecta in peregrinatione duodecim annorum observata /delineavit et descripsit H. Karsten* (Flora of Colombia and its neighboring states with selected specimens observed during twelve years of travel, ilustrated and described by H. Karsten) (Figs. 54–55).

A countryman of Karsten, Hermann Wagener, already mentioned above, had his headquarter in Venezuela but visited Colombia twice (1852, 1855) under contract to Jean Jules Linden. Although he spent a relatively short time in Colombia, he collected a large number of orchid species, most of which were described by Reichenbach.

Gustav Wallis (1830–1878), again a German collector, who brought over 1,000 plant species to Europe, travelled through Colombia in 1866 and again in 1872. From the Amazon to the Andes and Sierra Nevada to the Magdalena River and Bogotá,

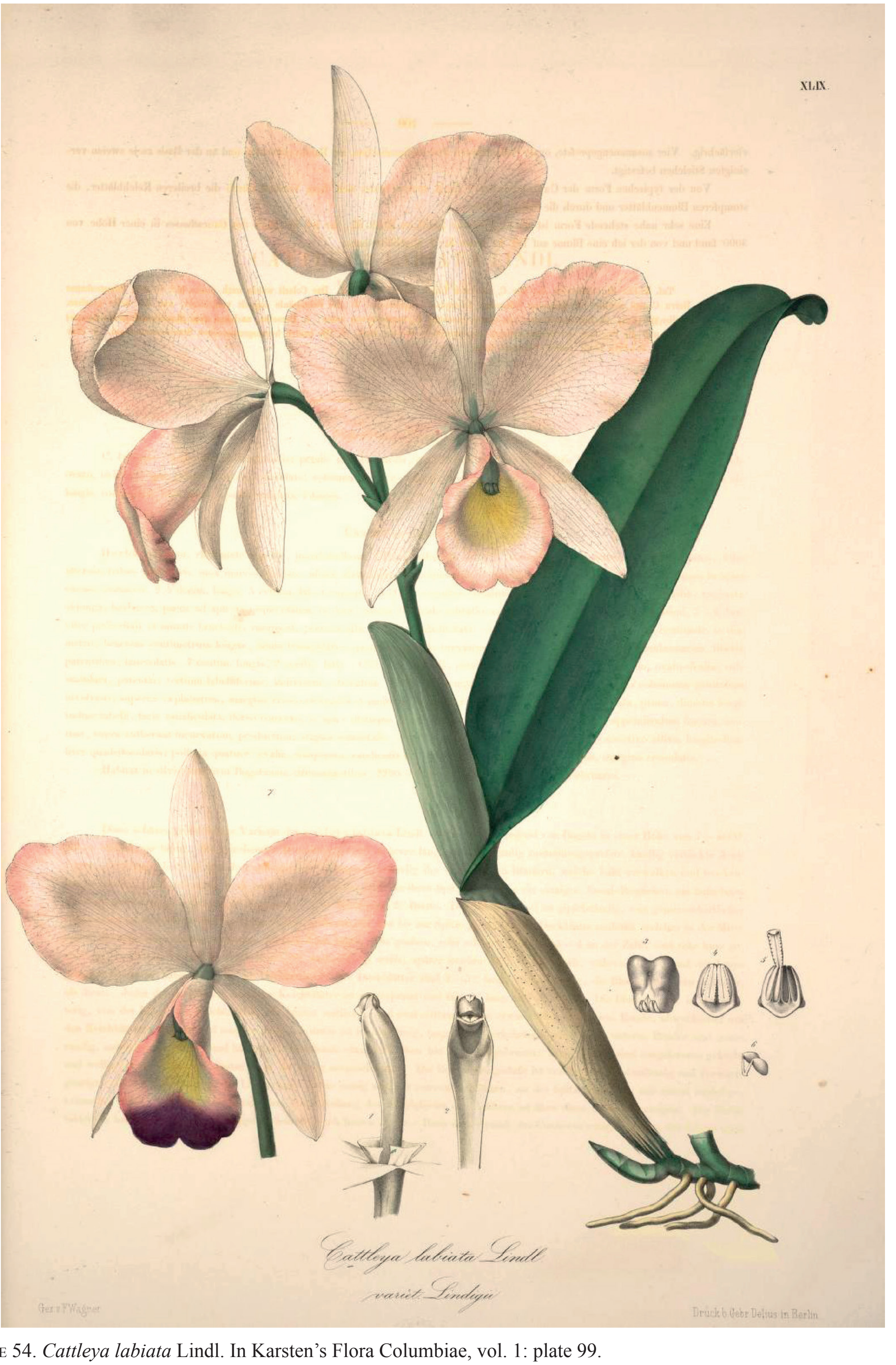


Figure 54. *Cattleya labiata* Lindl. In Karsten's Flora Columbiae, vol. 1: plate 99.

FIGURE 55. *Masdevallia coriacea* Lindl. & *Masdevallia caudata* Lindl. In Karsten's Flora Columbiae, vol. 2: plate 42.

Figure 56. *Cypripedium roezlii* Regel. Curtis's Botanical Magazine, 1876, vol. 102 (Ser. 3 no. 32): pl. 6217.

Figure 57. Friedrich Lehmann, plant collector and German Honorary Consul In Popayan, Colombia. Gardeners' Chronicle, ser. 3, Vol. 35, 1904: 106.

he explored the country, making important orchid collections. In 1878 he continued to Panama and Ecuador, dying in Cuenca in 1878. We remember him in *Masdevallia wallisii* and *Neomoorea wallisi*.

Benedikt Roezl (1824–1885), probably the most famous collector of orchids of his time, was a Czech traveller, gardener, and botanist. Roezl travelled through the United States and Mexico (where he collected over 2000 orchids in the vicinity of Acapulco) and then to Caracas, from where he proudly wrote that he had shipped three tons of *Cattleya* plants to Europe. In 1869, Roezl went for the first time to Colombia, where he collected in the Sierra Nevada of Santa Marta. Three years later, he returned to Panama and the Colombian port of Buenaventura. Finally, he visited Peru, Bolivia, and Ecuador. He discovered the Colombian species *Cypripedium roezlii* (Fig. 56) and *Cattleya chocoensis,* among many others. Roezl died in Prague at the age of 61.

Friedrich Carl Lehmann (1850–1903; collected 1867–1903)

No one could introduce Friedrich Carl Lehmann (Fig. 57) better than Phillip Cribb: "Friedrich Carl Lehmann collected orchids and other plants in Colombia and Ecuador over almost three decades from 1876 (Rolfe 1904). He was by profession a commercial plant collector. He was also eventually a landowner, a mine-owner, and German Consul in Colombia. His extensive preserved collections of herbarium specimens and illustrations of the plants he collected form one of the most significant archives of the northern Andes plants. His plant-hunting's main target was orchids, and the most important collection of his preserved plants is now held in the Herbarium at the Royal Botanic Gardens, Kew. Here they are all part of the *Herbarium Lehmannianum Colombianum* (Figs. 58–59). His specimens are also to be found in a dozen other significant herbaria in Europe and North America. He collected many living plants, especially orchids, originally for Stuart Low of the nursery firm of Messrs. Hugh Low & Co. of Upper Clapton, London, and for Frederick Sander of Messrs. Sander & Sons of St Albans".

Lehmann also painted many of the plants he collected; his iconography is now in the Archives of

FIGURE 58. *Pleurothallis urosepala* F.Lehm. & Kraenzl. Herbarium specimen by Lehmann, Kew Herbarium # 742778.

FIGURE 59. *Caucaea phalaenopsis* (Lindl. & Rchb.f.) N.H.Williams and M.W.Chase. Herbarium specimen by Lehmann, Kew Herbarium # 245759.

the Royal Botanic Gardens, Kew, where almost 1000 paintings are deposited. Small numbers of his paintings are also found at the Natural History Museums in London and Vienna." (Cribb 2010: 9). Several of Lehmann's herbarium specimens are accompanied by pencil or water–color illustrations of the flowers or flower details (Fig. 60–62).

Born in Platkow, Germany, Lehmann received elementary schooling and did an apprenticeship in gardening before travelling in South America, where we first hear of him in 1876, when he was collecting orchids in Ecuador for the London nursery of Hugh Low & Co.

In the same year, he also sent a collection of orchids to Reichenbach, who described among these a number of new species in his *Orchideae F. C. Lehmannianae Ecuadorenses* (Reichenbach 1878b). Several of these were named in Lehmann's honour, such as *Aeranthes lehmannii*, *Masdevallia lehmannii* (Fig. 63), and *Odontoglossum lehmannii*.

Around 1889, we find Lehmann in Colombia. He married a Colombian lady in the city of Popayán and soon moved there, establishing the headquarters for all his future plant collecting expeditions. Shortly after that, he was named German Consul in the city.

Popayán (Fig. 64), in the valley of the Cauca River, the surrounding mountains, and the slopes of the Cordilleras well into adjacent Ecuador offered an astonishing variety of flora and fauna. Lehmann could not have found better ground for his orchid collections. "Paradise for an orchid collector is a trail that runs through the rich orchid habitat. Preferably the trail should decrease in elevation from 3000 to 500 m over a protracted distance, it should be in a high annual rainfall area with the rain distributed evenly throughout the year, it also should be in a region of extremely high biodiversity and very pronounced local endemism. The adjoining forests, cliffs, and embankments would be festooned with the natural epiphytes and terrestrials of the zone." (C. Dodson in the foreword to Cribb 2010).

Lehmann's travel journals contained descriptions of the orchids he collected and often pencil drawings of plant and flower details of those which aroused his particular interest (Fig. 65–66). To accompany his plant sales, he also sketched brilliantly, even decorating his

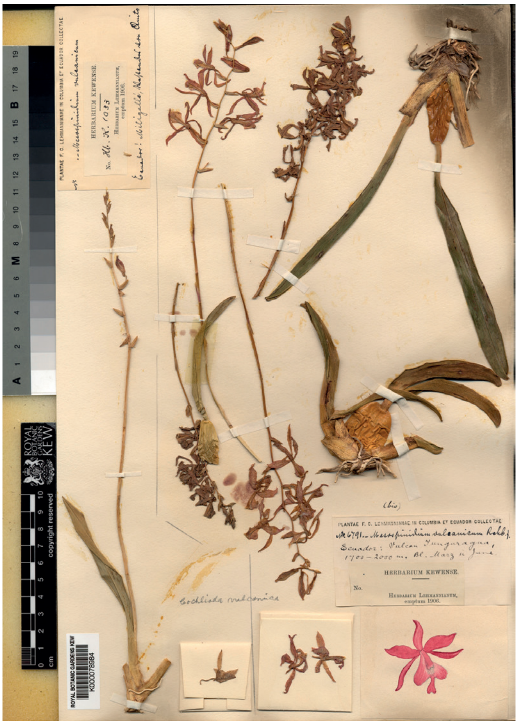


Figure 60. *Cochlioda vulcanica* (Rchb.f.) Benth. & Hook. ex B.D. Jacks. Herbarium specimen and color sketch by Lehmann. Kew Herbarium #254448.

Figure 61. *Lycaste trifoliata* Lehm. ex Mast. Herbarium specimen and color sketch by Lehmann. Kew Herbarium #251476.

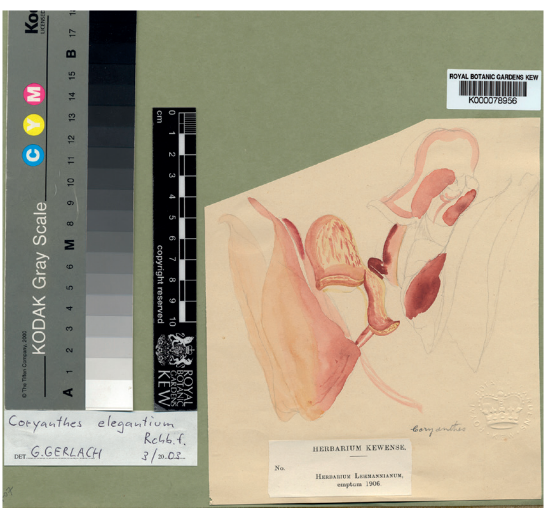


Figure 62. *Coryanthes elegantium* Rchb.f. Color sketch by Lehmann. Kew Herbarium #75414.

Figure 63. *Masdevallia lehmannii* Rchb.f. Photograph by E. Hunt.

letters with watercolors of orchids (Bynum & Bynum 2017: 55) (Fig. 67–69).

With no prior experience in orchid collecting, Lehmann had to face, as an additional handicap, the presence in the field of rivals such as Roezl and his nephews Eduard and Franz Klaboch and Gustav Wallis, among others. The competition was fierce, and Lehmann often resorted to following other collectors

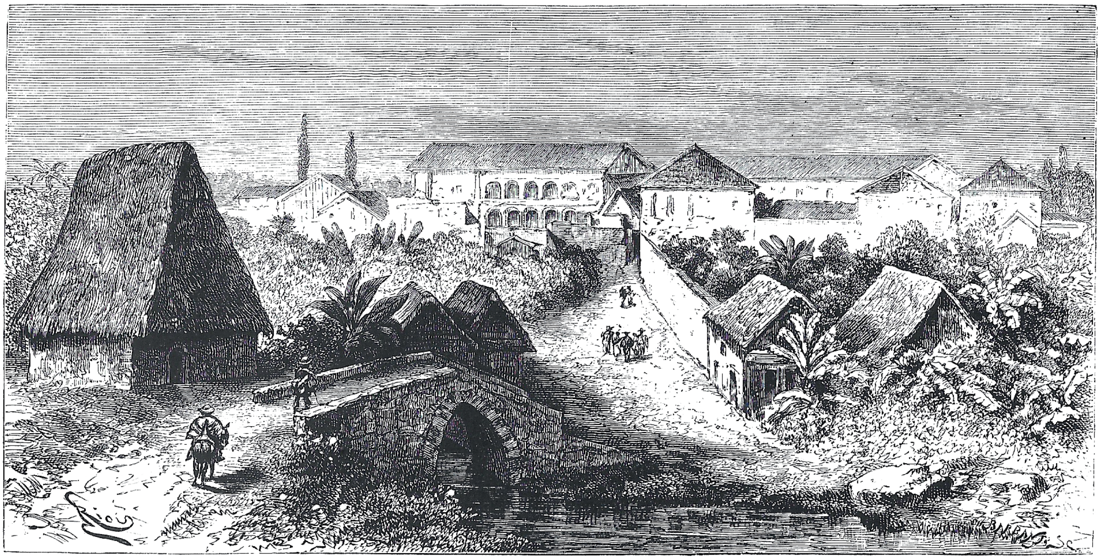


Figure 64. Houses at the entrance into Popayán, ca. 1876, after a sketch by Edouard André in his L'Amérique Équinoxiale, p. 289.

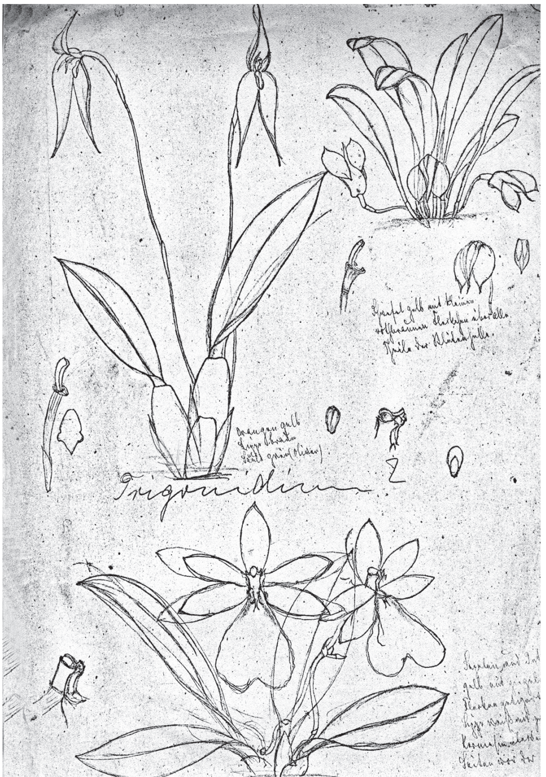


Figure 65. Sketch of orchids [*Mormolyca* (=*Maxillaria*), *Masdevallia*, *Trichocentrum*] in Lehmann's travel journals. Archives of Rudolf Jenny

Figure 66. Sketch of an orchid [*Vanilla* sp.] in Lehmann's travel journals. Archives of Rudolf Jenny.

FIGURE 67. Watercolor made on location by Lehmann of *Pescatoria lehmannii* Rchb.f. (Bynum & Bynum 2017: 54).

FIGURE 68. Watercolor made on location by Lehmann of *Masdevallia radiosa* Rchb.f. (Bynum & Bynum 2017: 54).

Popayan den 30. Mai 1886.

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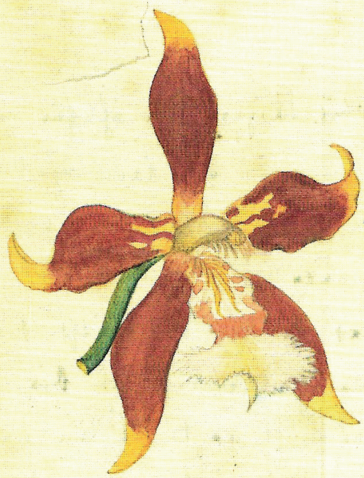


Sehr geehrter Herr Sander!

Bisher ist noch keine Nachricht von Ihnen da, welche mich über die am 8 März von Barranquilla gesandten Cattleyen und deren Ankunft bei Ihnen unterrichtete. Ja wenn ich die prächtige Entwickelung dieser Cattleyen Varietät in Erwägung nehme, dann mehr wünsche ich dass sie in guter Ordnung in Ihre Hände gekommen sein möchten. Ich habe bisher nicht gesehen, was derselben gleich zu stellen wäre und ich bin überzeugt dass Sie Freude an der Sendung erleben werden. Es thut mir nur leid dass ich Ihnen nicht gleich mehr davon sandte, oder senden konnte.

Heute lenke ich Ihre Aufmerksamkeit auf ein paar Odontoglossums von denen ich Ihnen Eins hier in einer Blüthe abbilde. Es ist unzweifelhaft eine Varietät von Odontogl. radiatum Rchb.f. aber doch sowohl in der Stellung der Perigonien und ihrer verschiedenen Färbung als auch in der sonderbar gestalteten Lippe verschieden und vielleicht eigenartig genug eine neue Art aufzustellen. Die Blüthe ist von einer in meinem Hause kultivirten und unvollkommen entwickelten Pflanze, so dass man wohl eine grössere Entwickelung der Blüthen annehmen darf. Der sich hier entwickelte Blüthenstand trägt 11 Blüthen, welche sehr

Figure 69. Decorated letter to F. Sander, 30 May1886. (Bynum & Bynum 2017: 58).

Figure 70. *Gongora* sp. Color sketch by Lehmann. Kew Herbarium #75416.

Figure 71. *Restrepia striata* Rolfe. Color sketch by Lehmann. Kew Herbarium #75438.

Figure 72. *Stanhopea annulata* Mansf. Color sketch by Lehmann. Kew Herbarium #75412.

Figure 73. *Sigmatostalix lehmanniana* Kraenzl. Unknown photographer.

to their favorite locations. Nevertheless, he gained experience and sent thousands of both living plants and herbarium specimens to Europe over the years.

"Friedrich Lehmann was a competent artist, and the completed watercolour paintings are accurate and attractive representations of the orchids that he saw and collected. Many of the partly-colored ones are also worth publishing, being good representations of the plants that are easily recognisable." (Cribb 2010: 3). During his lifetime, he painted hundreds of orchids, of which the collection at Kew is a part (Fig. 70–72).

Figure 74. *Cyrtochilum lehmannianum* Kränzl. as *Cyrtochilum retusum* (Lindl.) Kränzl. Photograph by E. Hunt.

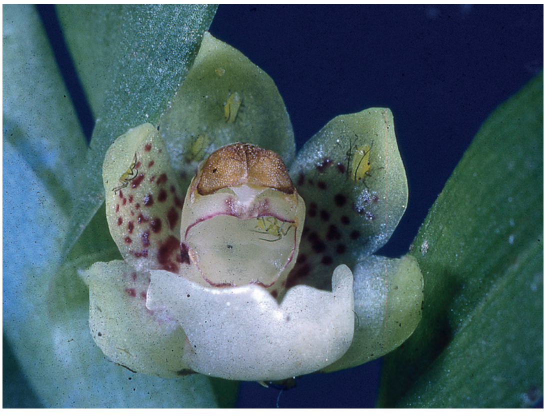


Figure 75. *Dichaea lehmannii* Schltr. Photograph by the Sociedad Colombiana de Orquideología

After the first consignment of orchids to Reichenbach, Lehmann repeated this strategy and presented plants to other orchidologists and botanic Gardens, such as Kew and Berlin. He "hoped for identifications that would allow him to present new plants to both the learned and the commercial world". (Bynum & Bynum 2017: 55).

Near the end of the century, Friedrich Kränzlin published an extensive work about Lehmann's orchids, under the title *Orchidaceae Lehmannianae in Guatemala, Costa-Rica, Columbia et Ecuador collectae, quas determinavit et descripsit* (Kränzlin 1899). Among the many new species that he described, a large number was dedicated to their collector: *Sigmatostalix lehmanniana* (Fig. 73) *Pinellia lehmanniana*, *Leochilus lehmannianus*, *Diotonea lehmanniana*, *Goodyera lehmanniana*, *Habenaria lehmanniana*, *H. lehmannii, Notylia lehmanniana*, *Pelexia lehmanniana*, *Cyrtochilum lehmannianum* (Fig. 74), *Dichaea lehmannii*, *Bulbophyllum lehmannii*, *Ornithidium lehmannii* and *Ornithocephalus lehmannii.*

Although he never met Lehmann in person, Rudolf Schlechter always showed great interest in his orchid collections. Lehmann began to sell herbarium specimens to the British Museum in 1888, and Robert A. Rolfe was engaged in describing them at Kew. When Schlechter arrived in London in 1898 after his first South African expedition, the British Museum already had a significant number of Lehmann's Colombian orchid specimens. Lehmann's collections were the first to open Schlechter's eyes to the botanical richness of South American continent.

In a letter to Oakes Ames dated 22 October 1919, Schlechter wrote: *My list of Colombian Orchids is ready for print, and I hope to bring the whole volume out before the end of the year.* […] *I have described over 250 new Colombia Orchids and 5 or 6 new genera. Quite a lot of Lehmann's things are included…* And again a few weeks later (11 November 1919): *I have not made a list of the Lehmann determinations, but Cogniaux before he died has sent me, as he wished that I should continue his work on the South–American orchids, a book in which he had entered all the determinations that he has found of the different collectors in literature and that he made himself.*

Schlechter made frequent reference to specimens collected by Lehmann in his works of 1920 and 1924 on the Colombian orchid flora; he dedicated several of them to the German Consul: *Dichaea lehmannii* (Fig. 75), *Lepanthes lehmannii*, *Ornithocephalus lehmannii*, *Pleurothallis lehmanniana and Telipogon lehmannii*.

Friedrich Lehmann advertised his living plants in the *Gardeners' Chronicle*: One of his wealthy clients was the Marquess of Lothian, who had a passion for orchids of which he had a remarkable collection at his home, Newbattle Abbey in Scotland. *Masdevallia* plants were the Marquess' favorites, and thus, he conceived the idea of publishing a book on this genus. *The Genus Masdevallia,* in the words of Cribb, "is considered by many to be one of the finest illustrated orchid books of the Victorian age" (Cribb 2010: 21).

FIGURE 76. Florence Woolward. Unknown photographer.

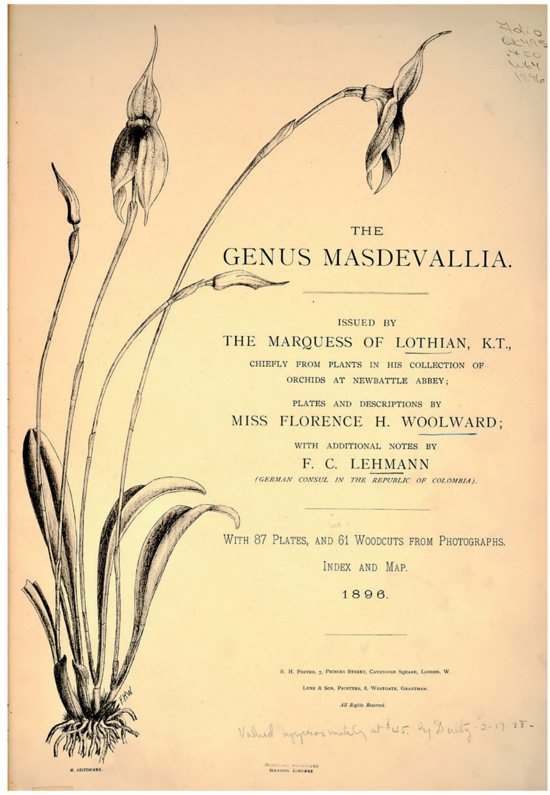


FIGURE 77. Title page of "The Genus *Masdevallia*", 1896.

Florence Woolward (1854–1936) (Fig. 76), a freelance artist and botanical illustrator, was commissioned by the Marquess to illustrate the book, and Friedrich Lehmann wrote the description and the geographical distribution for each plant. Kränzlin, who had published a treatise of this genus (*Die Gattung Masdevallia*, 1925), wrote in the introduction to his work: "Then occurred a crowning element of luck which rarely happens to a group of plants. The Marquis of Lothian -Newbattle Abbey- made a sacrifice to science by commissioning one of the most precious monographs, which to this day is unsurpassed."

The book contained 87 illustrations and was published in nine parts between 1891 and 1896 (Fig. 77–78). Lehmann often sent copies of his drawings of *Masdevallia* to Woolward. Three of these would appear in the book: *Masdevallia fractiflexa* (Fig. 79), *M. ophioglossa,* and *M. ventricularia* (Fig. 80) (Cribb 2010: 23). Friedrich C. Lehmann described two new orchid genera: *Trevoria* and *Gorgoglossum* (= *Sievekingia* Rchb.f.).

WILHELM HENNIS (1856–1943; collected 1876–1889 / imported plants into Germany 1891–1943 / business continued by his successors to the present day)

"It is said with right of the second third of the nineteenth century, that in was in this period that the great revolution in Europe's flower culture and plant breeding industry began. Especially England, France, and Germany took up with enthusiasm all those novelties that scientific explorers of the eighteenth century had brought from the tropics of the old and new world, mainly to the botanical gardens. From the original scientific interest in the flora of the tropics arose soon a demand from the wealthy garden friends […] European gardeners became aware of the great possibilities and tasks with which they were entrusted through the exploitation of the tropical flora." (Hennis & Hennis 1966: 2).

Wilhelm Hennis (Fig. 81) would establish the first commercial orchid nursery in Germany in 1891. The company, "Hennis Orchideenkulturen" has survived for over four generations.

Figure 78. *Masdevallia coccinea* Linden ex Lindl. By Florence Woolward in "The Genus *Masdevallia*".

Figure 79. *Masdevallia fractiflexa* Lehm. & Kraenzl. By Florence Woolward after a drawing by F.C. Lehmann in The Genus *Masdevallia*".

Figure 80. *Masdevallia ventricularia* Rchb.f. By Florence Woolward after a drawing by F.C. Lehmann in The Genus *Masdevallia*".

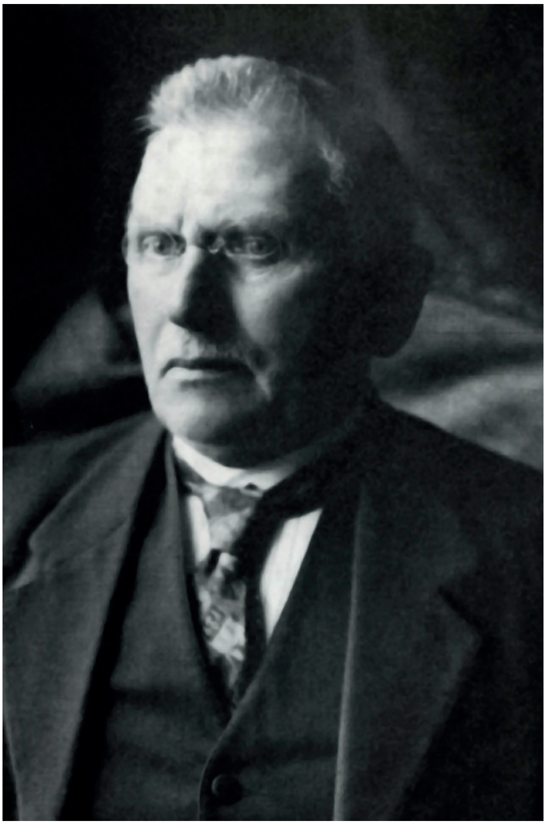


FIGURE 81. Wilhelm Hennis. In Hennis & Hennis 1966.

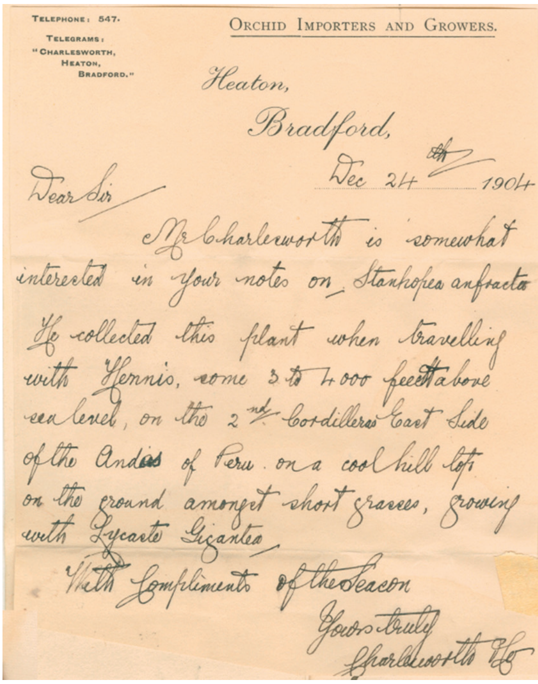
FIGURE 82. Specimen of *Stanhopea anfracta* Rolfe. Kew Herbarium.

In 1875, after having learned the gardening trade with several of the most distinguished European gardening firms, Hennis was hired by the great Henry Frederick Conrad Sander at his establishment in Brügge, in Belgium. He progressed rapidly, and one year later, Sander suggested sending him as an orchid collector to Colombia. The 'suggestion' was rather imperative: "In two weeks you are to embark for Colombia, to take over the work in the departments of Tolima and Cundinamarca." (Hennis & Hennis 1966: 10).

"Everything then happened very rapidly - the young Hennis had only three days to say farewell to his parents in Germany, and in late autumn 1876, he landed for the first time on South American territory." (Manning 2010: 350).

Hennis travelled for three years through Colombia and did not return to England until 1879. He concentrated his efforts on living orchids and thus seldom prepared herbarium material. In 1881, Hennis left Sander & Co. and joined Joseph Charlesworth in Bradford, Yorkshire, who was starting his commercial nursery. Charlesworth and Hennis then travelled together to South America, where they explored, sometimes individually, sometimes together, vast regions of Colombia, Ecuador, and Peru. From a living plant collected by Charlesworth and Hennis in Peru, Rolfe described a new species: *Stanhopea anfracta*, a specimen of which is kept at Kew together with a note from Charlesworth to Rolfe relating the circumstances and locality of its collection (Figs. 82–83).

Wilhelm Hennis later wrote about some of his experiences in Colombia in a vivid relation of orchid collecting in the 19th century, which showed total indifference to the destruction of forests and orchid habitat: "Winter 1892/93. From the department of Tolima [Colombia] I sent some 200 crates of *Cattleya trianaei*. I have thrown away three times as many plants, those which were damaged either during transit to my



Telephone: 547.
Telegrams: "Charlesworth, Heaton, Bradford."

Orchid Importers and Growers.

Heaton,
Bradford,
Dec 24th 1904

Dear Sir

Mr Charlesworth is somewhat interested in your notes on Stanhopea anfracta. He collected this plant when travelling with Hennis, some 3 to 4000 feet above sea level, on the 2nd Cordilleras East Side of the Andes of Peru on a cool hill top on the ground amongst short grasses, growing with Lycaste Gigantea.

With Compliments of the Season

Yours truly
Charlesworth & Co

Figure 83. Note from Charlesworth to Rolfe, Dec. 24, 1904.

Figure 84. Hennis nurseries in 2001. Photograph by Thilo Hennis.

Figure 85. *Odontoglossum hennisii*. Photograph by Guido Deburghgraeve.

Figure 86. *Trichopilia hennisiana* Kränzl. Photograph by Svetlana Bogatyrev.

Figure 87. *Acineta hennisiana* Schltr. Photograph by Lourens Grobler.

Figure 88. *Maxillaria hennisiana* Schltr. Photograph by Ecuagenera.

headquarters or during the felling of the trees on which they grew." (In Manning 2010: 350). After having travelled through South America and Southeast Asia until 1899, always under contract with Charlesworth, Hennis decided to settle in his hometown. In 1891 opened his nursery in Hildesheim to the public.

The demand for Colombian orchids rose continuously, and Hennis decided to send his own collector to explore northern South America. Hermann Hopf (see later), with an apprenticeship in gardening at the renowned Pfitzer nursery in Stuttgart, established himself in Bogotá. There he found in his countrymen Kalbreyer and Bungeroth, at the former's nursery "La Flora", support and advice during the first months of his stay (Hennis & Hennis 1966). The most important German orchidologists of their time, the eternal rivals Kränzlin and Schlechter, were frequent guests of Wilhelm Hennis. However, following the 'rule' established when they visited the Wolter nurseries, they planned their visits to not clash with each other.

But the time came when Europe especially began to realize that orchid habitats and virgin tropical forests had to be preserved. "… large importations of orchids from the tropics were no longer possible, so Hennis had to use his other horticultural skills. Patience coupled with tedious and difficult work resulted in many orchids being raised from seed, but taking from four to six years to flower." (Manning 2010: 352). Hennis's efforts were continued by his son Heinrich and his grandson Kurt. In March 1945, everything seemed lost: the city of Hildesheim was destroyed during an allied bombing raid. The Hennis nurseries were burned to the ground. Heinrich and Kurt Hennis, under indescribable difficulties, built new greenhouses which -once again- slowly filled up with orchids (Fig. 84). Thilo Hennis, old Wilhelm's great-grandson, became the last link to the now almost 130-year-old traditional enterprise (Knott 1986).

Besides *Stanhopea anfracta*, Rolfe described from Hennis's collections in South America *Cattleya* *hennisiana* (1889) and *Odontoglossum hennisii* (1891) (Fig. 85). Collected by Hennis, these plants reached Rolfe through Charlesworth´s nursery. All other contributions by Wilhelm Hennis to the knowledge of the Colombian orchid flora were made after he had returned from South America in 1889. It was from his imports of living plants that first Kränzlin and then Schlechter received a critical number of specimens that they described as new orchid species in 1906–1908 and 1920, respectively. And then there were the collections of Hennis's collector Hermann Hopf, which Schlechter would describe in 1924 in his *Beiträge zur Orchideenkunde von Colombia.*

Two new South American orchid species were dedicated to Hennis by Friedrich Kränzlin: *Trichopilia hennisiana* Kränzl. (1906) (Fig. 86), and *Lycaste hennisiana* Kränzl. (1908). Schlechter added several new Colombian orchids that he named after Hennis: *Stelis hennisiana* Schltr., *Maxillaria hennisiana* Schltr., *Gongora hennisiana* Schltr., and *Acineta hennisiana* Schltr. Finally, Walter Sandt contributed *Stenorrhynchos hennisianum* in 1928.

Figure 89. Wilhelm Kalbreyer. In Hennis, 1912: 479.

Wilhelm Kalbreyer (1847–1912; collected 1877–1912)

According to Hortus Veitchii, the Veitch family history: "Guillermo Kalbreyer, a promising young man, twenty-nine years of age, entered Messrs. Veitchs' service as a plant collector in 1876, and his first trip was to the West Coast of Africa in search of tropical flowering and foliage plants, very popular at that time." (Veitch 1906: 70).

Wilhelm Kalbreyer (Fig. 89) was born in the German city of Hildesheim and did an apprenticeship in gardening with Justus Ludewig von Uslar, who owned a well-known plant nursery in the city. After serving as his apprentice, he was engaged as an assistant at the famous gardens of Herrenhausen, near Hannover, where he worked under the direction of Hermann Wendland (well-known to the reader for his expedition to Central America in 1856). Wendland, who soon discovered Kalbreyer's talent, gave him letters of recommendation, which allowed him to gain his early experience in several important gardens until in 1876, he was engaged by Messrs. James Veitch and Sons in Chelsea (Anonymous 1912: 26). Thus, he travelled for the first time to the tropics and collected in the mountains of Cameroon, returning to Chelsea in 1877 with a rich collection of plants, among them two new orchid species described by Reichenbach in his *Orchideae Kalbreyerianae* (Reichenbach 1878).

In October 1877, Veitch sent Kalbreyer to Colombia on the first of several collecting expeditions to that country. The village of Ocaña, in north-eastern Colombia on the border with Venezuela formed by the Eastern Cordillera, was chosen by Kalbreyer as his headquarters and he returned to the same location in July 1878. The third expedition to Colombia was undertaken in 1879, but this time Kalbreyer explored western Colombia, mainly the department of Antioquía. This was his most successful expedition; in the spring of 1879, Kalbreyer was back in England carrying with him significant botanical treasures. His last journey to Colombia under contract with Veitch began in December 1880, and he reached Ocaña once more in January 1881, when he sent orchids to Veitch. He continued southwards through the departments of Santander, Boyacá, and Cundinamarca to Bogotá (Fig. 90), a city that would become his residence for the remainder of his life. In June 1881, he travelled to England and cancelled his contract with Veitch,

Figure 90. Panorama of Bogotá, ca. 1890. Unknown photographer.

returning immediately to Bogotá, where he established a plant nursery which he named "La Flora".

Only twice did Kalbreyer return to his native Hildesheim: in 1888 when he married a lady from Hannover with whom he returned to Bogotá and in 1908, to visit his only sister and his son, who studied at the local highschool. He returned to Bogotá the following year, and the Colombian government named him Consul for the district of Hildesheim. His business was managed in the meantime by the well-known orchid collector Erich Bungeroth, whom we will read later (Hennis 1912: 479–480).

Kalbreyer published two articles in the German *Deutsche Gärtner-Zeitung* (Kalbreyer 1899, 1903). In the first, he gave a brief account of the development of "Orchidomania" in Germany and described several of the showiest Colombian orchids. The second was about the problems he had encountered establishing his nursery in Bogotá, especially when trying to acclimatize European plants to the Andean climate.

Reichenbach would describe further new orchid species among Kalbreyer's Colombian collections, including *Maxillaria kalbreyeri* and *Odontoglossum kalbreyeri* (a hybrid between *O. pescatorei* and *O. luteopurpureum*) (Fig. 91).

In 1920, Friedrich Kränzlin published a long list of orchids collected by Kalbreyer in Colombia under the title *Orchidaceae Kalbreyerianae* I. He dedicated a number of them to their collector: *Telipogon kalbreyerianus*, *Zygopetalum kalbreyerianum*, *Houlletia kalbreyeriana*, *Microstylis kalbreyeriana*, *Oncidium kalbreyerianum*, *Ornithocephalus kalbreyerianus,* and *Masdevallia kalbreyeri* Rchb.f. ex Kränzl. (Fig. 92).

Schlechter described *Sobralia kalbreyeri* (Fig. 93); H. G. Hills and L. Garay followed respectively with *Dressleria kalbreyeri* and *Elleanthus kalbreyeri*.

Gustav Schmidtchen (–?; collected ca. 1880)

In the words of Steve Manning (2010: 347), Gustav Schmidtchen was one of the "shadowy figures" in the history of orchidology. Very little is known about him. The only information we have about Schmidtchen comes from H. G. Reichenbach. In his description of *Restrepia falkenbergii*, he wrote: "My recent specimens were gathered by two fresh collectors,

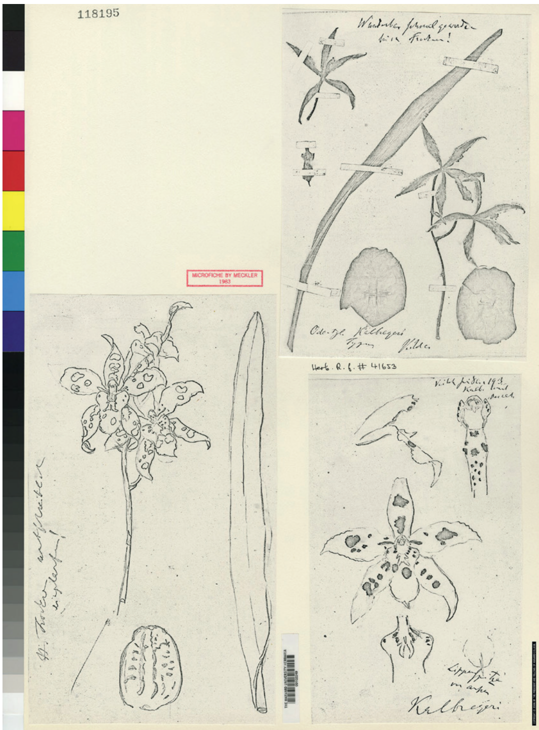


Figure 91. *Odontoglossum kalbreyeri* Rchb.f. Drawing of type by Reichenbach at the Oakes Ames Orchid Herbarium, Harvard University Herbaria, #00102249.

Figure 92. *Masdevallia kalbreyeri* Rchb.f. ex Kränzl. as *Masdevallia urceolaris* Kraenzl. Photograph by Lourens Grobler.

Messrs. Falkenberg and Schmidtchen. […] As to Mr. Schmidtchen, from Dresden, he has just made his *début*. Mr. F. Sander has kindly sent sketches of flowers, dried specimens, some highly curious itinerary sketches, and a living *Restrepia*, all evidences which speak highly in favour of the young traveller, to whom I wish good success, provided he is not yet tired of the career. This, however, is a rare case. Usually, the traveller loses the peace of mind necessary for domestic life, preferring the adventurous risks of a nomadic career." (Reichenbach 1880a: 232). Reichenbach wrote some 10 months later in a commentary about *Masdevallia roezlii*: "The plant that has now flowered was obtained from Mr. F. Sander, hence it may have been collected by Messrs. Klaboch, Schmidtchen, and Falkenberg, two of whom fell as victims for the benefit of those in the trade." (Reichenbach 1880b: 778). Manning (2010: 348) concluded that Schmidtchen died in 1880: "as the Klaboch brothers were still alive, he could only be referring to Schmidtchen and Falkenberg- so both were now dead, just ten short months later." This, however, is not conclusive: Eduard Klaboch was still alive at the time [Eduard lived until August 1915, when he passed away in the Czech city of Smichov], but his brother Franz had died the year before in Mexico, on 24 January 1879, another victim of yellow fever (see Anonymous 1879: 369). Falkenberg, according to Sander (1880: 173), died in June 1880 on the Caribbean island of St. Thomas. Therefore, one would tend to believe that Franz Klaboch and Carl Falkenberg were Reichenbach's "two victims", and Gustav Schmidtchen, the sole survivor.

What became of Gustav Schmidtchen after 1880? Nothing else is known, except for Schlechter's words when he complained that Schmidtchen's considerable orchid collection "still lies undetermined in Reichenbach's herbarium in Vienna" (Schlechter 1924: 149). And further on, in the dedication of *Stelis schmidtchenii*: "I am happy to dedicate this species to Mr. G. Schmidtchen, whose merits in the exploration of Colombia's orchid flora have not yet been sufficiently acknowledged." (Schlechter 1924: 157). Both

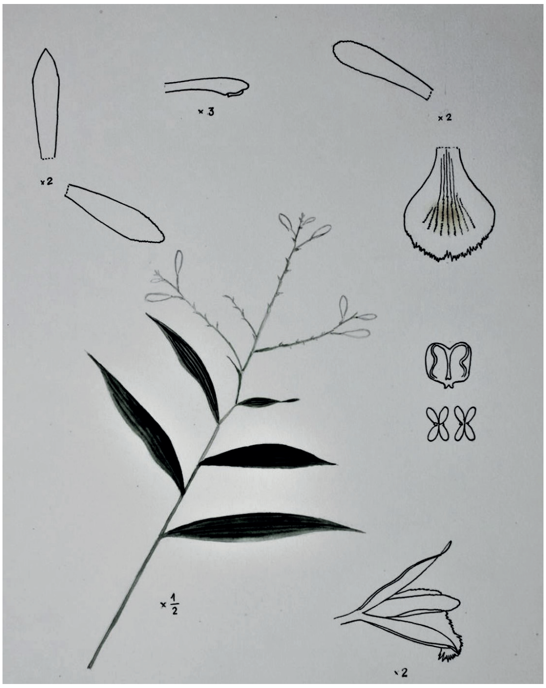


Figure 93. *Sobralia kalbreyeri* Schltr. as *Sobralia sobralioides* (Kränzl.) Garay. Specimen and drawing by Pedro Ortiz.

Figure 94. Junin bridge in Medellín (Antioquia), ca. 1900. Unknown photographer.

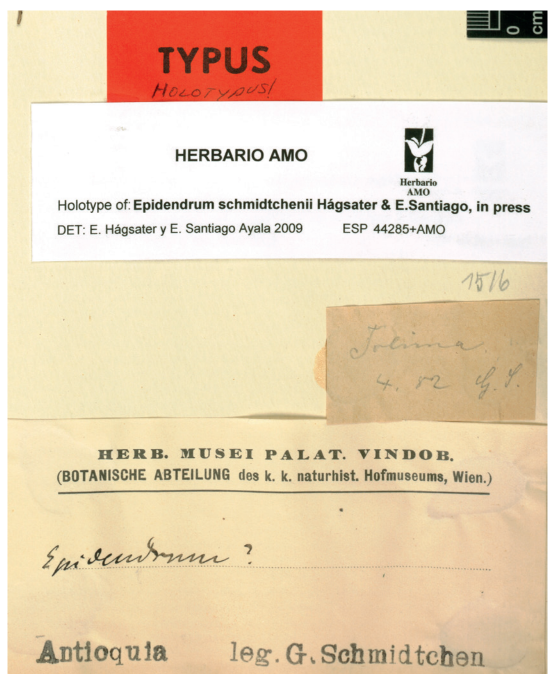


Figure 95. Herbarium label of *Epidendrum schmidtchenii* Hágsater & E. Santiago. Natural History Museum, Vienna, #W 0027141.

expressions seem to indicate that Schmidtchen spent a prolonged period collecting orchids in Colombia, perhaps even during Schlechter's time.

Schmidtchen collected chiefly for Frederick Sander, 'the Orchid King', who confirmed this when he wrote in 1888 of "our collectors Schmidtchen and Hennis." (Sander 1888); yet another indication that Schmidtchen was still alive at that time. According to Manning, he collected chiefly near the city of Medellín in the department of Antioquia (Fig. 94), a place that "seems to have been almost a rendezvous for German plant collectors in the1880s." (Manning 2010: 347).

Gustav Schmidtchen contributed to the knowledge of the Colombian orchid flora by collecting an important number of new species, among them: *Platystele schmidtchenii* Schltr., *Stelis schmidtchenii* Schltr., *Elleanthus formosus* Garay, *Telipogon radiatus* Rchb.f., *Epidendrum carautaense* Hágsater & L. Sánchez, *Epidendrum schmidtchenii* Hágsater & E. Santiago (Fig. 95), *Epidendrum corallinum* Hágsater, *Masdevallia fasciata* Rchb.f. (Fig. 96), *Restrepia falkenbergii* Rchb.f., *Telipogon*

FIGURE 96. *Masdevallia fasciata* Rchb.f. Unknown photographer.

FIGURE 97. *Masdevallia schmidtchenii* Kränzl. as *Masdevallia mollossus* Rchb.f. Photograph by A. Sijm.

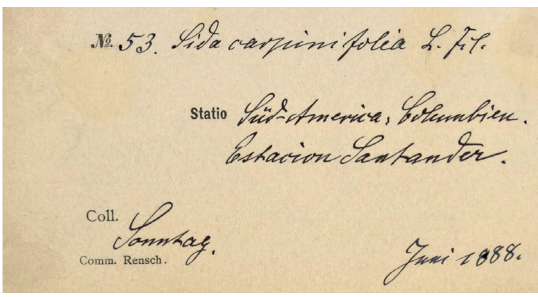


FIGURE 98. K. Sonntag – Herbarium label from Colombia (June 1888). National Natural History Museum, Paris, specimen MNHN–P–P06725820.

schmidtchenii Rchb.f. ex Kränzl., and *Masdevallia schmidtchenii* Kränzl. (Fig 97.)

KARL RENSCH (1837–1905) and **K. SONNTAG** (–?; collected 1888)

Karl Rensch, a school–teacher in the German city of Eisleben, moved to Halle after finishing his education. There he studied botany under Professor Diederich Franz Leonhard von Schlechtendahl. In 1867 he was named director of the Berliner school in the 101 district, which he held until his death.

A passionate plant collector, Rensch founded the "Plant Exchange Club" of Berlin in the 1870s, which was under his direction for several years. He formed a rich herbarium in this position, complemented with plants sent by other botanical collectors for distribution. His collection encompassed plants from most tropical floras (Ascherson & Retzdorff 1906).

Karl Rensch was responsible for the commercial distribution of many exotic plants and, at some point, came in contact with K. Sonntag (–?), an obscure plant collector whom he engaged in collecting plants in Colombia. Sonntag arrived in Colombia in 1888, collecting (mainly in the department of Santander) from June through August of that year. His herbarium labels all bear the stamped inscription "comm. Rensch" ("commissioned by Rensch") (Fig. 98).

According to Ignaz Urban (1903: 59), in 1888, the Berlin Botanical Garden received a collection of 73 Colombian species collected by K. Sonntag. The Harvard University Herbaria holds a specimen of *Epidendrum ciliare* L., allegedly collected a few years earlier (1880) by K. Rensch in Jamaica. However, Rensch either bought or traded this plant since he never travelled outside Germany.

From collections in Africa by J.M. Hillebrandt (whose plants had been distributed in Europe by Rensch), a new orchid species, *Nervilia renschiana* (Rchb.f.) Schltr. (Fig. 99), and *Solanum renschii* Vatke in the Solanaceae were named in his honour.

Among Sonntag's Colombian collections, Rudolf Schlechter described one new orchid species, *Galeandra leptoceras* (Fig. 100).

ERICH BUNGEROTH (ca. 1850–1937; collected 1891–1921)

"Among the Germans I was especially fond of seventy-year-old Mr. Bungeroth, who had been for forty years an orchid collector in South America and had explored during the last ten years the "white spots" on the map of the South American Andean states under contract with well-known English nurseries. He

FIGURE 99. *Nervilia renschiana* (Rchb.f.) Schltr. Photograph by Elke Faust.

FIGURE 100. *Galeandra leptoceras* Schltr. Photograph by Danny Lentz.

FIGURE 101. *Catasetum bungerothii* N.E.Brown. Archives of Rudolf Jenny.

FIGURE 102. *Catasetum bungerothii* N.E.Brown. Type specimen, Kew Botanic Garden, #K00588863.

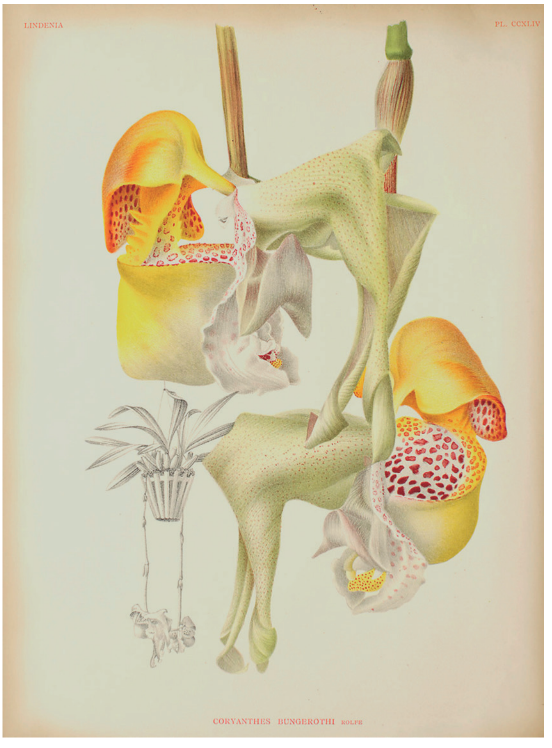


Figure 103. *Coryanthes bungerothii* Rolfe as *Coryanthes bruchmuelleri* Rchb.f. Lindenia – Iconographie des Orchidées, plate 244 (1890).

Figure 104. *Notylia bungerothii* Rchb.f. Photograph by Dalton Holland Baptista.

was in a very difficult situation: his noble patrons had broken up all relations with him immediately after the outbreak of the war.

"Bungeroth came often to the brewery to chat with me since I was the only German who showed an interest in botany, especially in his favorites, the

Figure 105. *Cattleya labiata* Lindl. Unknown photographer.

orchids. Sometimes, when we had a drink together, he told me stories from his travels on the Casiquiare River, this mysterious connection between the Orinoco, the Río Negro and the Amazon. There, in the midst of the tropical forest, he discovered the splendid *Catasetum bungerothii*. Now he sat, poor as a beggar, dressed like a Colombian peasant, in Bucaramanga. His only income were 30 Dollars which he received monthly from a rich German-American orchid enthusiast from California" (Werner Hopp 1944: 29, about his encounter with Erich Bungeroth around 1918).

Nothing is known about Bungeroth's early years. We first learn of him in 1886, when he collected plants in the Amazon region for the Cowan Nursery near Liverpool. He was to assist and receive botanical training from Carl Kramer, a German plant collector who lived in Manaus after years of travels through Asia and Central America.

Bungeroth was later sent to Colombia, but due to the revolution devastating that country was forced to return to England. He offered his services to the Linden firm and was sent to Venezuela, exploring the Orinoco River for three years (Menezes 2002: 67). Apart from *Catasetum bungerothii* N.E.Brown (Fig. 101–102), Bungerfoth collected in Venezuela many other orchids named in his honour, such as *Coryanthes bungerothii* (Fig. 103), *Notylia bungerothii* (Fig. 104), *Rodriguezia bungerothii*, and *Oncidium bungerothii.*

In 1889, Erich Bungeroth went again to Colombia. After a few months, he started on an expedition that would take him to Brazil, navigating the Amazon to

Figure 106. *Cattleya rex* O'Brien. In Reichenbachia, second series, vol. 2: plate 72 (1894)

Peru. In the state of Pará he met a group of rubber gatherers who revealed to him the existence of "parasites" with beautiful large red flowers in the forest of that northeastern state. So, it came about those thousands of plants of *Cattleya labiata* Lindl. (Fig. 105) collected in Pernambuco were sent by Bungeroth to Europe, where they were grown as a new species, called *Cattleya warocqueana* Linden. (Menezes 2002: 69–70)

Erich Bungeroth was an important link in Schlechter's South American network. As we have seen, he covered large territories during his botanical expeditions and collected in Brazil, Venezuela and Colombia before arriving in Peru. In 1921, in the fourth volume of his series on the orchid floras of the Andean states, Schlechter wrote: "Erich Bungeroth made an important contribution to the exploration of the orchid flora of Peru. After he had rediscovered *Cattleya labiata* in 1890, he travelled on the Amazon to Iquitos, then to Yurimaguas and Huallagua, and then overland to Moyobamba. Here, he discovered the new *Cattleya rex* O'Brien (Fig. 106). Trying to find more plants of this species, he went on a long excursion along the Río Mayo, however with little success, although he discovered the new *Oncidium sanderae* Rolfe (Fig. 107). In October 1892, he was again in Yurimaguas and in his letters expresses the hope to return finally to Europe. However, he shared the fate of many other orchid collectors and was soon defrauded by his patrons. He was told that most of his deliveries had been damaged during transport; at the same time, his orchids were offered on the market, without mention of his name. Deeply disappointed, Bungeroth soon left Peru. His contract with the Belgian firm that had betrayed him so often was cancelled; he had unfortunately similar experiences during his later journeys through Venezuela and Colombia with other European nurseries. " (Schlechter 1921b: 10–11).

The demand for *Cattleya rex* was increasing and the supply of new plants scarce. This moved German nursery owner Robert Blossfeld (1882–1944) to plan, together with his son Harry, a new expedition into the Andean region where Bungeroth had collected the first plants.

After studying botany at the University of Berlin, Harry Blossfeld (1913–1976) left Germany before the ascent of the Nazi party to the German government and took part in several botanical expeditions through South America (Fig. 108). He established himself in São Paulo and founded an orchid nursery in 1937.

Figure 107. *Oncidium sanderae* Rolfe as *Psychopsis sanderae* (Rolfe) Lückel & Braem. Photograph by I. Rolando.

It was from São Paulo in 1935 that Blossfeld started on his expedition in search of Bungeroth's famous *Cattleya*. Erich Bungeroth, at the time living in Bucaramanga, Colombia, took an interest in this expedition. Being unable to travel with Blossfeld because of his advanced age, he supplied him with all his notes, sketches, and maps from his first expedition decades before. Harry Blossfeld travelled mainly by airplane but still faced enormous difficulties. He managed, however, to collect 800 plants in about two months. The plants were shipped to São Paulo and, after a long journey through the Panama Canal, arrived at their destination, 40% of them having unfortunately perished on the way. (Maatsch, 1976: 37–38).

Herbert Huntington Smith (1851–1919; collected 1898–1902)

On 22 March 1919, Herbert Huntington Smith (Fig. 109), Curator of the Alabama Museum of Natural History, was walking to work when he was hit by a freight train. Smith's deafness, magnified by a recent

FIGURE 108. Harry Blossfeld in the province of Salta, Argentina (1938). Archives of the Cactus and Succulent Society of America.

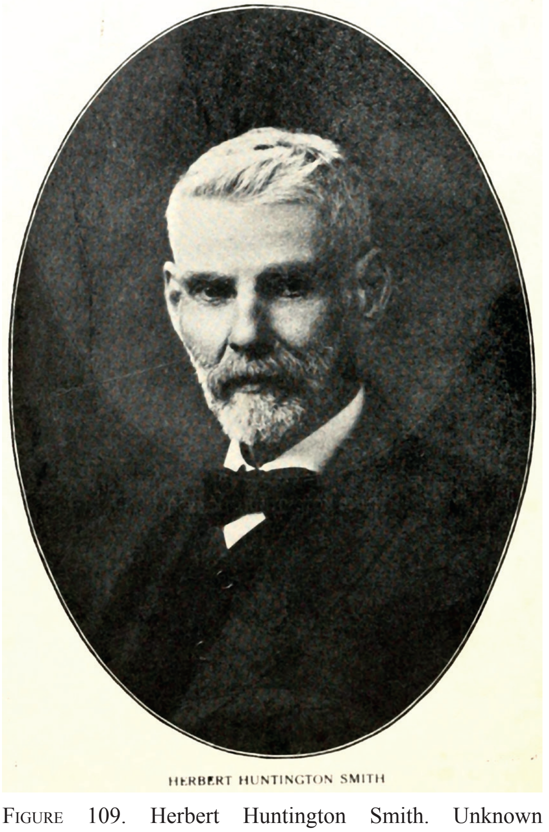


FIGURE 109. Herbert Huntington Smith. Unknown photographer. In The Nautilus, 1919–1920.

bout of flu, was the cause of the accident. The tragic spot on the University of Alabama campus was known for years afterwards amongst students and staff as "Smith's Crossing".

An amateur conchologist, Smith was born in Manlius, New York. He showed an interest in natural history from an early age, a subject in which he graduated from Cornell University in 1872. As a student, Smith had the opportunity to be part of the famous Morgan Expedition to Brazil in 1870 (named after one of its sponsors, Col. Edwin B. Morgan), accompanying its leader, Smith's professor Charles Frederick Hartt. The expedition explored the basin of the Tapajós River in the state of Pará and was mainly of a geological nature. This encounter with the tropics would act as a constant attraction to bring Smith back to Brazil in the following years in many capacities.

Smith would later concentrate on studying insects and molluscs, of which he collected thousands of specimens. A successful collector and preserver, he assembled extensive collections found in many of the world's natural history museums (Fig. 110–111). Besides the zoological material, Smith also collected ethnographic and botanical material, completing approximately 500,000 natural history specimens during his lifetime.

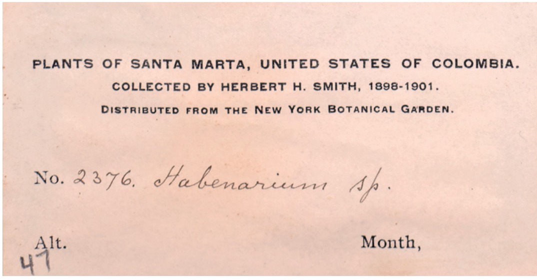


Figure 110. H. Smith herbarium label (New York Botanical Garden).

Figure 111. H. Smith herbarium label (National Natural History Museum, Paris).

Smith went to Brazil in 1874 to collect the insects and molluscs of the Amazon and, in 1876 was invited by Hartt to form part of the Geological Commission of the Empire of Brazil. Smith stayed with the commission for almost a year, exploring the valleys of the Amazon and Tapajós (Kunzler et *al.* 2011).

Smith departed to the United States in 1881 and, after his marriage to Amelia Woolworth, returned to Brazil, where they lived until 1886. Smith signed a contract with the National Museum of Brazil, under which he was to explore the interior of the country to collect specimens of natural history. The contract was extended several times, and Smith and his wife travelled widely. Their explorations took them to Paraguay and Matto Grosso. Smith's journal of this adventure was published years later under *Do Rio de Janeiro a Cuyabá: notas de um naturalista* (Smith, 1922).

Smith collected in Mexico in 1889 and he was then commissioned by the Royal Society to collect in the West Indies (1889–1895) (Clapp 1919, Holland 1919).

After a short time as Curator of the Carnegie Museum, Smith was sent to Colombia, where he would stay from 1898 to 1902, collecting for the American Museum of Natural History. It was during this expedition that Smith dedicated himself to the collection of plants. In his collections are many new

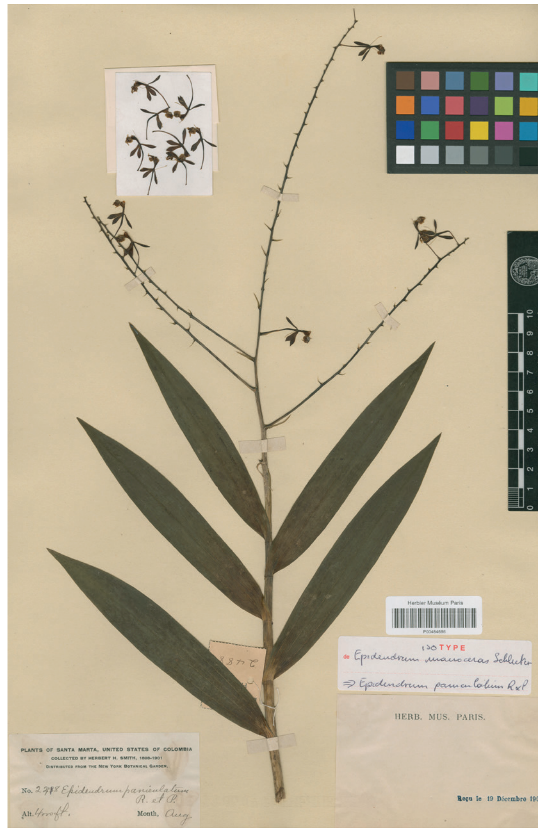


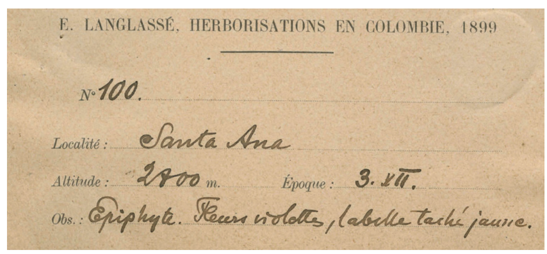
Figure 112. Type of *Epidendrum macroceras* Schltr. National Natural History Museum, Paris.

orchid species, many of which Schlechter described in his orchid flora of Colombia (Schlechter 1920). Among these, the great German orchidologist determined as new to science *Pleurothallis leptantha*, *Physurus procerus*, *Pleurothallis schistopetala*, *Scaphyglottis sanctae-martae*, *Epidendrum macroceras* (Fig. 112), *Govenia platyglossa* (Fig. 113), *Habenaria smithii*, *Elleanthus smithii*, *Prescottia smithii*, *Pleurothallis smithii*, *Epidendrum smithii* and *Sarcoglottis smithii.*

Other orchids collected by H.H. Smith in Colombia include *Habenaria petalodes* Lindl., *Ponthieva diptera* Linden & Rchb.f., *Ponthieva racemosa* (Walter) C.Mohr, *Pleurothallis setigera* Lindl. (Fig. 114), *Epidendrum paniculatum* Ruiz & Pav., *Scaphyglottis behrii* (Rchb.f.) Benth. & Hook.f. ex Hemsl., *Trichopilia subulata* (Sw.) Rchb.f., *Odontoglossum nevadense* Rchb.f., *Lockhartia pallida* Rchb.f., *Sobralia violacea* Linden ex Lindl., *Maxillaria miniata* (Lindl.) L.O. Williams, and *Sacoila lanceolata* (Aublet) Garay.

FIGURE 113. *Govenia platyglossa* Schltr. as *Govenia superba* Lindl. Edwards's Botanical Register, volume 21 plate 1795.

FIGURE 114. *Pleurothallis setigera* Schltr. as *Muscarella zephyrina* (Rchb.f.) Luer. Photograph by Andreas Kay.


E. LANGLASSÉ, HERBORISATIONS EN COLOMBIE, 1899

Nº 100.

Localité : Santa Ana

Altitude : 2800 m. Époque : 3. VII.

Obs. : Epiphyte. Fleurs violettes, labelle taché jaune.

FIGURE 115. Langlassé herbarium label, MNHN (Isotype of *Epidendrum eugenii* Schltr.)

In 1902, in poor health, Smith and his wife returned to the United States, where he resumed his position as Curator of the Carnegie Museum. Soon, however, and looking for a warmer climate, Smith moved to Alabama, where he was hired as Curator of the Alabama Natural History Museum in 1910.

EUGÈNE LANGLASSÉ (ca. 1865–1900; collected 1898–1900)

"The results of this second expedition, so unfortunately ended, will at the end prove not to be very important. Many dry plants have suffered from humidity and are mouldy; as for living plants, packed in moss in humid conditions, the majority has perished. We could only save several Orchids and a few Aroids which began to sprout and among which we will find, hopefully, some interesting types." So wrote M. Micheli (1900: 415) about the end of Eugène Langlassé's expedition to Colombia from September 1899 to January 1900. He found death from yellow fever in the coastal town of Buenaventura, from where he shipped his last consignment of plants to Europe. (MacVaugh, 1951: 167). As we will see, Langlassé's expedition was at least in part quite successful. Among his Colombian botanical specimens, at least a dozen new orchids were described by Cogniaux and Schlechter, not counting a critical number of Orchidaceae he collected in Mexico from 1888 1889, before his short-lived South American adventure. His collections can be found in several of the most important European herbaria, but mainly at the National Natural History Museum, Paris (Fig. 115).

Little is known of Langlassé's young years. He was the son of a gardener who lived near Paris. From around 1892 to 1895, he travelled to Ceylon [Sri Lanka], Cochinchina, Singapore, Borneo, and the Philippines. These journeys were sponsored by

Figure 116. Alexandre Godefroy–Lebeuf. Archives of Rudolf Jenny.

Figure 117. Marc Micheli. Archives of Rudolf Jenny.

Alexandre Godefroy-Lebeuf (1852–1903) (Fig. 116) of Paris, a wealthy horticulturist interested in tropical plants. After returning to France in the summer of 1895 and until 1897, shortly before travelling to America, Langlassé wrote several short articles in the *Revue Horticole*, all related to some aspect of the vegetation of Southeast Asia.

Early in February 1898, Langlassé left France for Mexico, this time under contract with the French mining company *Compagnie de Inguarán*, to explore the mineral resources of this Mexican region. Co-sponsored by Marc Micheli (1844–1902) (Fig. 117), the celebrated botanist and horticulturist of Geneva, he also made important collections all along the Gulf of Mexico, the eastern slopes of the Sierra Madre. After this, and through a recommendation by Eduoard André, the French horticulturist who had travelled extensively through Colombia, Ecuador, and Peru some 25 years before, he prepared to travel to Colombia.

Langlassé followed André's advice and from Panama took a boat to the small village of Tumaco, on Colombia's Pacific coast, where he arrived in the second half of July 1899. André unwittingly sent Langlassé to his death: no other region in Colombia was so heavily infested with yellow fever as the coastal strip between Panama (which was still part of Colombia) and Buenaventura.

Langlassé travelled to Tumaco in the erroneous assumption that he would find a French consulate in the village. Thus he had to arrange to have his funds sent from France through the Chilean consul in Barbacoas, about 165 kilometers away, a complicated process that hindered him during his whole stay in Colombia.

Langlassé began his exploration of Colombia by a trip to Barbacoas, continuing then to Altaquer (Fig. 118), a "miserable village composed of eighteen houses of sordid aspect, with 60 inhabitants, ugly, lazy and a hundred times less interesting than the savages I had seen before" (André 1999: 366–367).

From Altaquer he explored the mountains to the southwest, at elevations between 1400 and 1700 meters, close to the Ecuadorean border (MacVaugh, 1959: 170). As he wrote to Micheli from Tumaco on 14 September 1899, he collected 33 living plants (mostly orchids, aroids, and bromeliads) in these mountains, which he shipped via Panama. After exploring the rivers Mira and Nulpe, Langlassé travelled west over the mountains to Cali and Popayán. It was there that he

Figure 118. Church of Altaquer, ca. 1876, after a sketch by Edouard André in his L'Amérique Équinoxiale, p. 366.

collected most of the over 100 herbarium specimens known from his Colombian expedition.

A letter to Micheli written from Popayán and dated 16 November was Langlassé's final communication before his death. In this, he discussed his plans for the following weeks.

Several orchids were named in honour of Langlassé, the first being *Stanhopea langlasseana* by A. Cogniaux (Figs. 119–120). "At the request of M. Micheli, I name this species in memory of the courageous and unfortunate collector Langlassé, who found it, in September 1899, on a mountain to the S.E of Altaquezo [= Altaquer] in the valley of the Río Mira, at about 1700 m altitude" (Cogniaux 1901, in the protologue to *Stanhopea langlasseana*).

In his orchid flora of Colombia, Schlechter dedicated to Langlassé *Scelochilus langlassei* (Fig. 121), *Isochilus langlassei* (Fig. 122), *Maxillaria langlassei* (Fig. 123), *Pleurothallis langlassei, Stelis langlassei*, *Cyclopogon eugenii*, *Epidendrum eugenii*, and *Stelis eugenii*. Other new species collected by Langlassé and described by Schlechter are *Epidendrum ionodesme*, *E. melinanthum*, and *Maxillaria plicata.*

Otto Beyrodt (1870–1923; Imported orchids into Germany ca. 1906–1917)

As one of the founders of the German Society of Orchidology, Otto Beyrodt (Fig. 124) became one of the leading orchid growers in Germany in the first decade of the 20th century.

Beyrodt was born in Erfurt. Following his father's footsteps, he began an apprenticeship in gardening at the Olberg firm in Dresden and expanded his knowledge by travelling as a young man to England, then to Belgium, and finally to the United States. He returned to Germany in 1893 and in 1900, after a time spent managing his brother's farm, decided to establish himself by building a modern nursery in Marienfelde, a suburb of Berlin (Fig. 125).

"Already in its first year, Beyrodt's nursery had around 50,000 orchids, among them 20,000 *Odontoglossum* (especially *O. crispum*), 10,000 *Paphiopedilum*, 3000 *Oncidium*, 15,000 *Cattleya*, 500 *Vanda coerulea*, and a number of other species, varieties, and hybrids." (Anonymous 1976: 3) Some years later, in 1907, the local garden club visited Beyrodt's nursery. It was then reported that thousands

Figure 119. Type specimen of *Stanhopea langlasseana* Cogn. National Botanical Garden of Belgium, Brussels.

Figure 120. *Stanhopea langlasseana* Cogn. as *Stanhopea tricornis* Lindl. Archives of Rudolf Jenny.

Figure 121. *Scelochilus langlassei* Schltr. Photographed by Sociedad Colombiana de Orquideología.

Figure 122. *Isochilus langlassei* Schltr. as *Isochilus linearis* (Jacq.) R.Br. Photograph by Luis Filipe Varella.

Figure 123. *Maxillaria langlassei* Schltr. as *Maxillaria longissima* Lindl. Photograph by Michael Graupe.

of orchids were under cultivation, mainly for the production of cut-flowers; among them were 25,000 *Odontoglossum crispum*, 50,000 *Cattleyas* of different species, 10,000 *Oncidium,* and as many *Cypripedium*, *Laelia*, *Phalaenopsis*, etc. …" (Amelung 1907: 436).

"In recent times […] numerous Colombian orchids have been found, of which no specimens are known which were collected in the wild, but only inflorescences of plants grown in European collections. Besides the already mentioned English firms, several German gardening enterprises have gained a reputation for importing novelties from Colombia, such as Wilhelm Hennis in Hildesheim, Paul Wolter in Magdeburg, and Otto Beyrodt in Marienfelde. The author wants to express his gratitude to these firms for having supplied him with abundant material of several new species." (Schlechter 1920: 16).

New orchid species were described among Beyrodt's imports from several South American countries. So, we have from Brazil *Oncidium beyrodtianum* Schltr. (Fig. 126), from Colombia *Gongora beyrodtiana* Schltr. (Fig. 127), *Acineta beyrodtiana* Schltr. (Fig. 128) and *Pleurothallis beyrodtiana* Kränzl., and from Peru *Cochlioda beyrodtiana* Schltr.

P. Baumann & M. Madero (–?; collected 1909–1911)

"It shall finally be mentioned that through the mediation of one of my acquaintances, commercial traveller P. Baumann, a Colombian orchid collector, M. Madero prepared in the years 1909–1911 an orchid herbarium especially for me. I received the first consignment in the year 1911. It contained many interesting things and was well prepared. A second consignment was announced shortly after the outbreak

Figure 124. Otto Beyrodt. Die Gartenwelt, 1923.

of the World War; it must have been lost, like so many other things, on its way to Europe. Since the first shipment promised so much, with several hundred numbers, the loss of the second was an especially hard blow." (Schlechter 1920: 16).

Baumann is lost in history and only remembered in two orchids named by Schlechter in his honour: *Epidendrum baumannianum* (Fig. 129) and *Maxillaria baumanniana* (Fig. 130), both collected by Madero.

As for Madero, nothing else was known about him until a recent communication from Colombian researcher and orchid conservationist Luis Eduardo Mejía brought a small ray of light into the mystery.

During research into the export of egret feathers, and working through the papers of a famous character – an exporter of gold, Indian artifacts, orchids, shrunken heads, feathers, and other things – whose name was Leocadio María Arango, Luis Eduardo Mejía found several receipts for payments made to Mr. Madero. He had sold to Arango orchids from the department of Cauca. There were other receipts for plants from Antioquía and a receipt by Mr. Madero paying Mr.

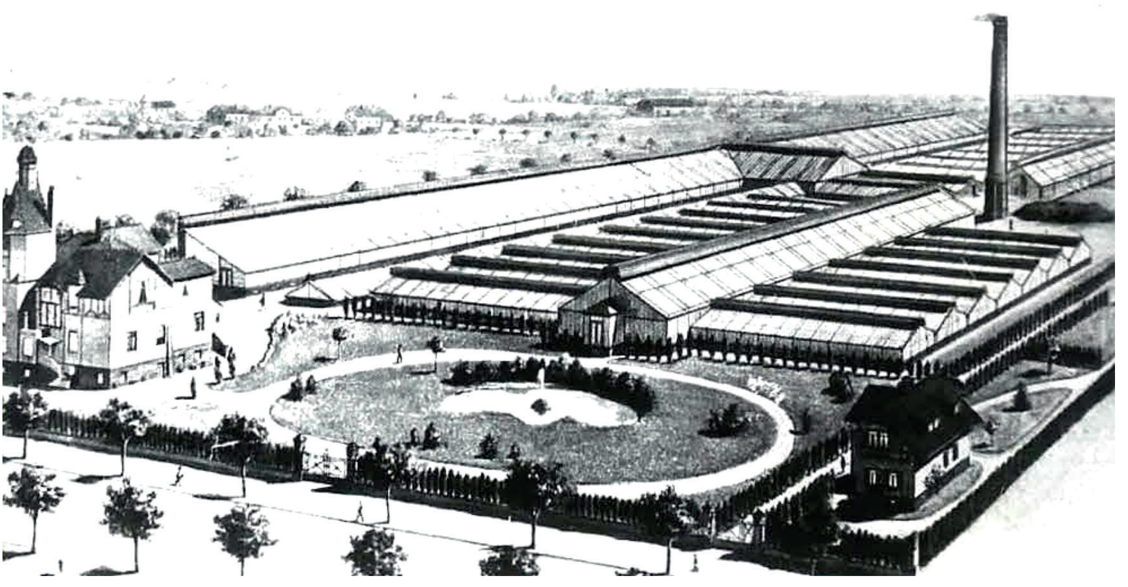


Figure 125. Beyrodt residence and nursery in Marienfelde. In Die Orchidee, 2013, vo. 64(4): 298.

Figure 126. *Oncidium beyrodtianum* Schltr. as *Oncidium bifolium* Sims. R. Warner, Select Orchidaceous Plants, plate 5.

Figure 127. *Gongora beyrodtiana* Schltr. as *Gongora scaphephorus* Rchb.f. & Warsc. Unknown photographer.

FIGURE 128. *Acineta beyrodtiana* Schltr. Photograph by Ecuagenera.

FIGURE 129. *Epidendrum baumannianum* Schltr. Photograph by Diego Bogarín.

FIGURE 130. *Maxillaria baumanniana* Schltr. (=*Sauvetrea alpestris* (Lindl.) Szlach. Photograph by Ecuagenera.

Arango for the shipment of botanical specimens to Germany, to the "classifier Rudolf Schlechter" ("classifier" probably meaning ¨taxonomist¨).

Luis Eduardo Mejía also found a short reference to Madero in the Municipal Archives of the village of Pitalito Huila, near San Agustín. He is mentioned as being fined for quarreling in a brothel, and he is referred to as "the plant collector of the Germans" (Luis Eduardo Mejía, pers. comm. 10 April 2020).

Mejía refers here to Locadio María Arango Uribe (1831–1918), a merchant, miner, and banker from the city of Medellín, the capital of the department of Antioquia. A wealthy member of Medellín's 'high society', he amassed a collection of natural history objects, ranging from mineralogy and ethnology to zoology and botany, which constitutes today an important part of the collection of the Museum of the University of Antioquia.

M. Madero, from the little information we have about his life, was probably a professional collector, not only of plants but also of zoological specimens. One can expect that his collecting of orchids for Schlechter was chiefly commercial. Notwithstanding, Madero undoubtedly had a good knowledge of the orchids of his country and a keen eye for novelties. Among his collections, Schlechter described no less than five new orchid genera and 175 new species. Of these, almost half still retain their original names.

Madero's types were all destroyed during the bombing of the Berlin herbarium in 1943. However, Ames financed the drawing and flower analysis of some 30 of these types, all made under the supervision of Schlechter personally. These are kept today at the Oakes Ames Orchid Herbarium (Fig. 131–132). Madero's new orchid genera were *Porroglossum* (Fig. 133), *Cyrtoglottis*, *Anthosiphon*, *Caucaea*, and *Sphyrastylis.*

Among his new species, Schlechter dedicated a total of 11 to Madero: *Aa maderoi*, *Cyclopogon maderoi*, *Encyclia maderoi* (Fig. 134), *Epidendrum maderoi*, *Habenaria maderoi*, *Maxillaria maderoi*, *Odontoglossum maderoi*, *Oncidium maderoi*, *Pogonia maderoi*, *Psilochilus maderoi*, and *Stelis maderoi*.

M. Madero surely deserves to be known better. A detailed biography -as far as this is possible- and an account of his life as a plant collector are presently underway, hopefully with the collaboration of renowned Colombian researchers.

Figure 131. *Cranichis stictophylla* Schltr. Drawing of type. Oakes Ames Orchid Herbarium #26831.

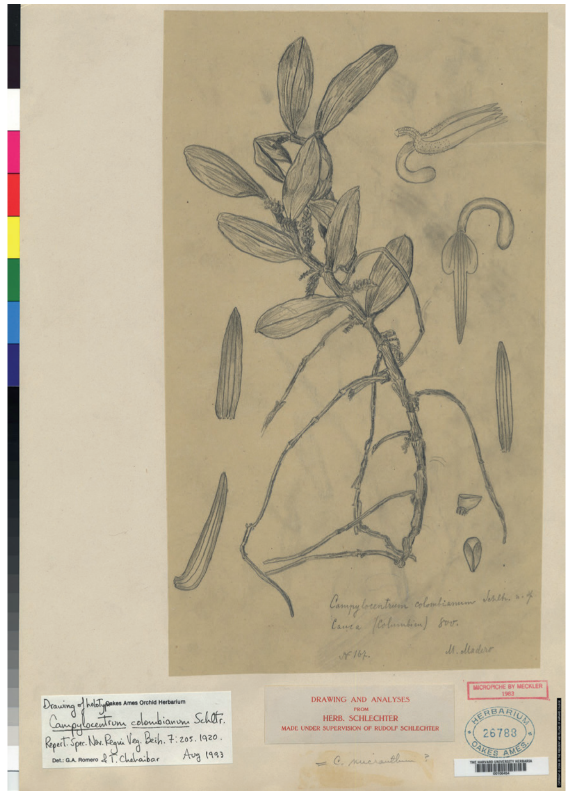


Figure 132. *Campylocentrum colombianum* Schltr. Drawing of type. Oakes Ames Orchid Herbarium #26788.

Figure 133. *Porroglossum colombianum* Schltr. as *Porroglossum mordax* (Rchb.f.) Luer. Photograph by Marni Turkel

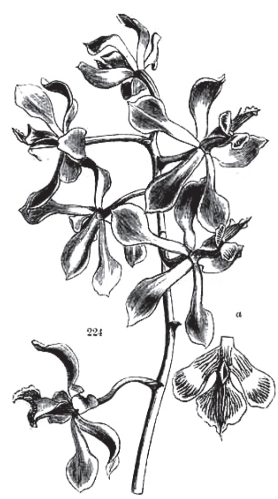


Figure 134. *Encyclia maderoi* Schltr., is a synonym of *Encyclia replicata* (Lindl. & Paxton) Schltr.

FIGURE 135. *Pleurothallis schnitteri* Schltr. as *Pleurothallis phalangifera* (C.Presl.) Rchb.f. Photograph by S. Manning.

FIGURE 137. *Epidendrum peperomia* Schltr. Photograph by Orchi.

FIGURE 136. *Stelis oxypetala* Schltr. Photograph by the Species Identification Task Force.

RICHARD ECKARD SCHNITTER (–?; collected 1920–1922)

Volume II of Schlechter's *Orchideenfloren der Südamerikanischen Kordillerestaaten* (Colombia), was published on 31 January1920. A few months later, he began to receive, at irregular intervals, small packages with dried orchids from a German horticulturist who had emigrated years earlier to Colombia: Richard Schnitter Eckhard, or simply Ricardo Schnitter, as he was known in his adoptive country. "I received from Mr. R. Schnitter in Bogotá during the past months several small packages with dried orchids, which he had collected in the surroundings of Bogotá, the capital city of Colombia" (Schlechter 1921: 527).

Among Schnitter's orchids Schlechter found and described a few new species, including *Stelis schnitteri*, *Pleurothallis cundinamarcae*, *Pleurothallis platycardium*, *Pleurothallis pulvinipes*, *Pleurothallis schnitteri* (Fig. 135), and *Epidendrum schnitteri*. All these had been collected between April and August 1920.

As in so many other cases, little is known about the life of Richard Schnitter. He left Germany in a new wave of emigration following the disaster of World War I and Germany's hopeless economic situation.

Figure 138. Arnold Schultze-Rhonhof. Archives of Rudolf Jenny.

After his arrival in Bogotá, he is frequently mentioned as a well-known horticulturist. A Presidential Decree of 9 December 1914 created the 'National Institute for Agriculture and Veterinary Science'. In March 1915, the first academic staff was named, comprising 10 professors, and among them Richard Schnitter, who was appointed to the Chair of Horticulture. Around the time he started collecting orchids for Schlechter, Schnitter was mentioned as a member of the staff of the National School of Agronomy; some years later, in 1931, he arrived at what was probably his final destination, for a few years occupying the position of Agricultural Expert in the Caribbean archipelago of San Andrés and Providencia.

It was not until 1924, in his *Beiträge zur Orchideenkunde von Colombia*, under *III. Orchidaceae novae vel rariores collectorum variorum*, that Schlechter comes to speak of Schnitter again. He describes here a number of new Colombian orchids, received "mostly from Mrs. R. Schnitter and H. Hopf" (of whom we will read later) (Schlechter 1924: 148).

Thirteen additional species were described from Schnitter's collections, again all from Bogotá, among them *Stelis cundinamarcae*, *Stelis decipiens*, *Stelis oxipetala* (Fig. 136), *Stelis verecunda, Lepanthes schnitteri*, *Pleurothallis bogotensis*, *Pleurothallis nasuta*, *Pleurothallis nutans*, *Epidendrum peperomia* (Fig. 137), *Epidendrum strictum*, *Maxillaria camaridioides*, *Maxillaria schnitteri,* and *Dichaea trachysepala.*

A grandson of Schnitter, Gonzalo Ruíz Schnitter, collected the type of *Epidendrum pomecense* Hágsater in 1996 in the neighbourhood of Boyacá, in the company of Clara Lucía Patiño de Ruíz, his wife, Eric Hágsater and Father Pedro Ortiz Valdivieso.

Arnold Schultze–Rhonhof (1875–1948; collected 1920–1928 [Colombia] / 1934–1939 [Ecuador])

"In the morning of 5 September an English airplane flew above us. In the afternoon, we were about 300 sea miles southwest of Tenerife, in the Canary Islands, when we were stopped by an English cruiser. Flag order: heave to, stop, set out boats! We were allowed to take only the most necessary personal items and then our little birds. Everything was over in a matter of minutes. Twelve cannon rounds sank our ship with all our belongings, above all our valuable collections. We are now poor as paupers!" (Arnold Schultze-Rhonhof, in a letter to his relatives, shortly after being released from an internment camp in Dakar. - In Zeckau & Zischler 2010: 240).

Arnold Schultze-Rhonhof (Fig. 138) was born in Cologne and was the son of an officer of the German Army. After a short time at the University of Göttingen, where he took courses in Botany, Schultze-Rhonhof enlisted in the German Army in 1896 and was soon commissioned as an artillery officer. After several expeditions to Cameroon in the service of the German Colonial Office, he left the Army in 1906 due to serious health problems. Back in Germany, he studied Geography and Natural Sciences at the University of Bonn. From 1910 to 1911, he went again to Africa, this time as part of the Central-African Expedition led by Adolf Friedrichs, Duke of Mecklenburg. In the company of botanist Gottfried Wilhelm Johannes Midbraed of the Botanical Museum in Berlin, he collected botanical and zoological specimens on the lower Congo, in southern Cameroon, and on the islands of Fernándo Poo and Annobon, off the coast of Guinea.

FIGURE 139. Puerto Colombia, ca. 1920. Unknown photographer.

FIGURE 140. Páramo de Sumapaz. Unknown photographer.

FIGURE 141. *Sobralia odorata* Schltr. Photograph by David Haelterman.

FIGURE 142. *Epidendrum arnoldii* Schltr. Illustration by Constanza Rodríguez.

FIGURE 143. *Schomburgkia schultzei* Schltr. Photograph by Dorothy Potter Barnett.

FIGURE 144. *Sievekingia rhonhofiae* Mansf. Photograph by Rudolf Jenny.

After World War I and the loss of all German colonies, Schultze-Rhondorf went to South America in 1920, disembarking on 14 July in Puerto Colombia, near Barranquilla (Fig. 138). He worked in Colombia as a topographer, geologist, and agronomist and was active in writing articles against the devastation of the tropical forests (Anonymous 1950: 271–272).

"In his condition as researcher and expert for new oil fields in the eastern parts of the country, Schultze, during his extensive expeditions, had the opportunity to gather a small but very interesting orchid collection for me." (Schlechter 1924: 124) This expedition, the most important for the purposes of this article, took Schultze to the region of the *páramo* of Sumapaz (Fig. 140), on the border between the department of Cundinamarca and the old Territory of San Martín, to the headwaters of the Orinoco, and further east to the lowlands of the rivers Meta and Orinoco.

FIGURE 145. *Stanhopea annulata* Mans. Photograph by Orchi.

FIGURE 146. *Pleurothallis hopfiana* Schltr. Photograph by Maria and Grzegorz Garbuzowie.

FIGURE 147. *Pleurothallis bogotensis* Schltr. as *Pleurothallis phalangifera* (C. Presl.) Rchb. f. Archives of Rudolf Jenny.

Unfortunately, a bout of malaria forced Schultze to cut short his expedition and to return to Bogotá.

Arnold Schultze's orchid collections were made, with few exceptions, in the Colombian department of Cundinamarca. They were described by Rudolf Schlechter under the title *Orchidaceae Schultzeanae* (Schlechter 1924: 125–147). A large proportion of orchid species were described as new to science by Schlechter from this collection: *Habenaria schultzei*, *Epistephium lamprophyllum*, *Sobralia odorata* (Fig. 141), *S. schultzei*, *Elleanthus leiocaulon*, *Epidendrum anitae*, *E. arnoldii* (Fig. 142), *E. euchroma*, *Schomburgkia elata*, *S. schultzei* (Fig. 143), *Mormodes schultzei*, *Polycycnis acutiloba*, *Xylobium modestum*, *Lindleyella saxicola*, *Maxillaria schultzei*, *M. sulfurea*, *Camaridium quercicolum*, and *Odontoglossum schultzei.*

Arnold Schultze-Rhonhof returned to Germany in 1928. After a short rest, he left again in 1929 on an entomological expedition to the Congo, and then in 1931 to study the flora of the Balearic Islands. In the last months of 1934, with his wife Hertha, he started on his last long journey, this time to Ecuador, with the sole purpose of making botanical and entomological collections. After a short period in the highlands, they turned to the rain forests on the Pacific coast between the Pastaza River and Napo.

In the spring of 1939, having completed their collections, the Schulze-Rhonhofs started on their way home, travellling on the Putumayo and Amazon Rivers to Pará in northwestern Brazil. Here they embarked in the last days of August on the steam-ship *Inn*. Their fate was described in Schultze's letter that was mentioned at the beginning of these lines.

All botanical collections, among them presumably many orchids, were lost. The exceptions were a few specimens sent for determination to Rudolf Mansfeld from Ecuador; all of these were destroyed during the bombing of the Berlin Museum in 1943. He published two of these specimens sent to Mansfeld as new species: *Sievekingia rhonhofiae* (Fig. 144) and *Stanhopea annulata* (Fig. 145).

After seeing their scientific harvest of 5 years sink into the Atlantic, Arnold and Hertha Schultze-Rhonhof were taken to Dakar, prisoners of the French Army. However, they were released shortly after that through Théodore Monod's intervention, the famous French explorer of western Africa.

They moved to the city of Funchal, on the Portuguese island of Madeira, never returning to Germany. Arnold Schultze-Rhonhof dedicated the next years to his literary hobbies, writing about his travels and preparing numerous pencil drawings and watercolors that were greatly appreciated when shown at an exhibition in 1946. Meanwhile, he earned his living as an expert in agricultural pests and diseases. He passed away in Funchal on 22 August 1948.

Hermann Hopf (–?; collected 1900–ca. 1919–1921)

As mentioned above, Hermann Hopf came to Bogotá in 1900 as a collector for the Hennis nurseries in Hildesheim. A catalogue of plants received by Hennis in the year 1907 mentions that he received from Mr. Hopf in Colombia 2500 *Cattleya schroederae,* 2000 *Cattleya trianae,* 5000 *Odontoglossum crispum,* 1000 *Cattleya gigas* var. 'Sanderiana', and plants of *C. gigas* und *C. aurea.* However, there were no new species among Hopf's collections of these years. Nothing could be found about Hopf in the years following; he presumably returned to Germany at the outbreak of WWI.

He is heard of again in 1919, when he presented a claim to the Colombian Post Service in Barranquilla for excessive shipping charges for two packages posted to a Mr. Ferdinand Hopf, in Germany. He then must have moved to Bogotá, since in 1924 Schlechter described several new orchid species, which, with no exception, are labeled as collected "in the department of Cundinamarca, in the surroundings of Bogotá." The collection dates are invariably 1920 or 1921. They are described in Schlechter's "Contributions to the orchid flora of Colombia" in the third chapter entitled "*Orchidaceae novae vel rariores collectorum variorum*" (Schlechter 1924: 148–183).

Hermann Hopf's new orchid species were: *Elleanthus bogotensis*, *Pleurothallis belocardia*, *P. hopfiana* (Fig. 146), *P. bogotensis* (Fig. 147), *Epidendrum bogotense*, *E. hopfianum*, and *Pachyphyllum bryophytum*.

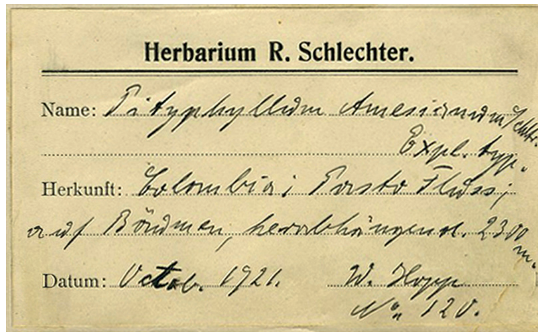


Figure 148. Schlechter's herbarium label of *Pityphyllum amesianum*. Oakes Ames Orchid Herbarium #22320.

Werner Hopp (1887 –?) and Santiago Arévalo (–?; collected 1921–1923)

In a letter from Berlin dated 26 September 1922, Rudolf Schlechter wrote to Oakes Ames: "Today you have got your birthday, I wish to show you that I have been thinking of you and therefore send you […] a little thing that, I hope, will give you certain pleasure and show you that you can always be sure of my cooperation in all your work. This time it is a representative of one of my new genera, *Pityphyllum*, of which I found a very characteristic new species in the Colombian collection of Mr. Hopp […] So please accept this simply as a token of my esteem and a sign that I have not forgotten the day." (from the correspondence files of Oakes Ames, Harvard University, 2018).

With the dedication of *Pityphyllum amesianum* (Fig. 148), Schlechter simultaneously introduced Werner Hopp to the orchid world. Werner Hopp, a young German civil engineer, came to South America for the first time in 1910. In 1914 he made two failed attempts to return to Germany, but WWI forced him to wait until 1919 when he could finally find a ship to carry him back across the Atlantic. In the meantime, he worked in Ecuador, from 1915 to 1917, at the Siemens-Schukert Works in Quito, and then until 1918 in Colombia as chief engineer at the Clausen brewery in Bucaramanga. Once back home in 1919, he soon became disappointed by the difficult economic circumstances in Germany and began planning to return to South America. It was then, in

FIGURE 149. Tunja street, in the city of Pasto, ca. 1920. Unknown photographer.

FIGURE 150. Werner Hopp in Peru, ca. 1932. In the background the Misti Volcano. In Hopp, 1944.

May 1920, that he made the acquaintance of Rudolf Schlechter. "As I found out that Mr. Hopp was not only highly qualified in his profession but also showed great interest in natural sciences, I asked him to collect herbarium specimens of orchids for me during his stay in South America. His response was positive, and it soon became evident that he had prepared himself intensively not only by studying collecting methods and the preparation of herbarium specimens but in becoming familiar with the main Colombian orchid genera" (Schlechter 1924: 5).

Hopp arrived in Bogotá and, during the first months, explored the area around the city. Shortly after that, he was contracted to direct the construction work of a large hydroelectric project near the city of Pasto (Fig. 149) to the southwest of Bogotá, near the Ecuadorian border. He would stay there for the next two years, using his little free time to continue collecting orchids and butterflies, his second interest.

Figure 151. *Stanhopea hoppii* Schltr. as *Stanhopea jenischiana* F. Kramer ex Rchb.f.

Figure 152. *Houlletia clarae* Schltr. as *Houlletia sanderi* Rolfe. Phograph by Hans-Gerhardt Seeger.

Figure 153. *Diothonaea arevaloi* Schltr. as *Epidendrum arevaloi* (Schltr.) Hágsater. Photograph by Jay Pfahl.

Figure 154. *Rodriguezia arevaloi* Schltr. Photograph by Laurens Grobler.

Wanting to explore this large region in-depth, he engaged a Colombian plant collector named Santiago Arévalo, an experienced field man, having been in the past the guide to several other expeditions.

Arévalo and Hopp went as far as the department of Chocó and to the ridge of the mountains overlooking Colombia's Pacific Coast. Schlechter would later write about Santiago Arévalo: "We have to thank him for his contribution to the scientific results of Hopp's research" (Schlechter 1924: 6). Werner Hopp left Colombia in 1923 for Peru to lead maintenance work on a hydroelectric plant in Arequipa (Fig. 150). After a short trip to Germany in 1928, Hopp returned to Ecuador to work in Guayaquil in 1930. He then began extensive travels to the Amazon (see his narrative of 1944), collected for several German museums, and was engaged as a zoologist at the Goeldi Museum in Belém from 1934 to 1936.

Werner Hopp worked from 1936 to 1938 as an engineer in different positions in São Paulo and Buenos Aires. Finally, in 1939 he returned "to a mighty and greater Germany", as he wrote (Hopp 1944: v). He would never cross the Atlantic again. In 1957, he published a narrative about his travels and plant collecting in South America, under the title *Blütenzauber der Orchideen* ('Magic of the orchid flowers').

Schlechter described Hopp's and Arevalo's orchid collections in 1924 in *Orchidaceae Hoppianae* (Schlechter 1924: 5–123). A total of 123 new orchid species were described. We list here only those dedicated by Schlechter to Hopp: *Sobralia hoppii*, *Elleanthus hoppii*, *Microstylis hoppii*, *Masdevallia hoppii*, *Stelis hoppii*, *S. werneri*, *Pleurothallis hoppii*, *P. werneri*, *Epidendrum werneri*, *Stanhopea hoppii* (Fig. 151), *Maxillaria hoppii*, *Cryptocentrum hoppii*, *Odontoglossum hoppii*, *Oncidium hoppii*, *Sphyrastylis hoppii*, *Telipogon hoppii*, and *Houlletia clarae* (dedicated to Clara Hopp, Hopp's mother) (Fig. 152) and to Santiago Arévalo: *Stelis arevaloi*, *Pleurothallis arevaloi*, *Diothonaea arevaloi* (Fig. 153), *Epidendrum sculptum* var. *arevaloi*, and *Rodriguezia arevaloi* (Fig. 154).

The following chapters will continue with biographical information on Schlechter's orchid collectors in their principal collecting areas, first following South America's Pacific Coast to Ecuador and Peru (chapter V), then continuing to Bolivia, Chile, Argentina, Uruguay, and Paraguay (chapter VI and final).

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RUDOLF SCHLECHTER'S SOUTH-AMERICAN ORCHIDS V. SCHLECHTER'S "NETWORK": ECUADOR AND PERU

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Abstract. The fifth chapter of the series about Rudolf Schlechter's South-American orchids introduces us to those botanists and orchid collectors who travelled and worked in Ecuador and Peru and supplied Schlechter with many of the new orchid species he described. As in previous chapters, the biographies and accomplishments of these travellers are preceded by brief geographical and historical outlines for each of these countries. It is worth mentioning that the lives and orchids of such prominent figures in the orchidology of South America as F.C. Lehmann, W. Hennis, E. Bungeroth and E. Ule, who collected in Ecuador and Peru, have already been mentioned in previous chapters and are therefore omitted here.

Keywords/Palabras clave: biography, biografía, history of botany, historia de la botánica, Orchidaceae

Ecuador. Ecuador is divided geographically into three continental regions: the lowlands along the Pacific coast known as 'Costa', the mountain ranges of the Andes, known as the 'Sierra', and the eastern lowlands or 'Oriente', which form part of the Amazon River basin.

The Costa consists of lowlands, coastal mountains, and rolling hills that separate river valleys (Fig. 1). The Coastal Mountain Range, or Cordillera Costanera, elevations up to 1000 m, divides the region into the Costa Externa, along the coast, and the Costa Interna, along the Andes. Guayaquil, the most important centre in the region, is Ecuador's second-largest city.

The Sierra consists of two mountain chains of the Andes, the Cordillera Occidental and the Cordillera Oriental, with an intermontane plateau where the main cities of Quito, the capital of the country, and Cuenca, Ecuador's third-largest city, are located. The Sierra has dozens of peaks that rise over 4200 m, mostly of volcanic origin, including Mount Chimborazo, Ecuador's highest point at 6267 m (Fig. 2). The intermontane plateau lies at an altitude between 2000 and 3000 m.

The Oriente stretches from the piedmont of the Andes to the lowlands along the borders of Peru and Colombia. In Schlechter's time mostly unexplored, the lowlands are crossed by large rivers which flow into the Amazon, among them the Río Napo (Fig. 3), Río Pastaza, Río Tigre, and Río Morona. For this reason, the region is also known as 'Amazonía'.

Over 1000 km west of the coast of Ecuador, we find the archipelago of the Galapagos, of volcanic origin. The largest island is Isabela, which is 120 km long. Santo Tomás, located on Isabela Island, is the highest peak of the Galápagos at 1490 m of elevation.

At the end of September 1791, the expedition to the Pacific of Alessandro Malaspina (1754–1810), an Italian seaman sailing under the Spanish flag, after rounding Cape Horn and visiting Chile and Peru, disembarked in Guayaquil, Ecuador's main port on the Pacific coast (Fig. 4). The French botanist Louis Neé (1734–1807) was part of the expedition as a botanist. From his collections of plants, we have a species of *Caularthron* (= *Diacrium*), beautifully illustrated by one of Malaspina's draftsmen, José Guío. It is, to our knowledge, the first illustration in Ecuador's orchid history: it is now preserved in the archives of Madrid's Royal Botanical Garden (Fig. 5). Malaspina's expedition to the Pacific would open the way to numerous explorers and travellers who would visit Ecuador in the century before Rudolf Schlechter's appearance on the scene.

Eight years after the arrival of the Malaspina expedition, Juan José Tafalla (1755–1811), a member of Hipólito Ruiz and José Pavón's expedition to Peru and Chile, received the order to proceed from Lima to Guayaquil, on Ecuador's Pacific coast. Tafalla, in the company of his assistant Juan Agustín Manzanilla and a draftsman, arrived in Guayaquil on September 28 1799, where the party

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FIGURE 1. Lagoon of Cube, in the province of Esmeraldas – Ecuador's coastal region. Unknown photographer.

FIGURE 2. Humboldt and Bonpland at the foot of mount Chimborazo. Oil on canvas by F.G. Weitsch.

Figure 3. Confluence of rivers Napo and Arajuno, in Ecuador's eastern plains. Photograph by Humberto Castillo

Figure 4. View of Guayaquil in 1791. By José Cardero, draftsman of Malaspina's expedition. Courtesy of the Royal Botanical Garden, Madrid.

Figure 5. *Caularthron* sp. by José Guío. Collected by Louis Neé during Alessandro Malaspina's expedition. Courtesy of the Royal Botanical Garden, Madrid.

Figure 6. *Cyrtochilum macranthum* (Lindl.) Kränzl. Illustration by José Gabriel Rivera. Courtesy of the Royal Botanical Garden, Madrid.

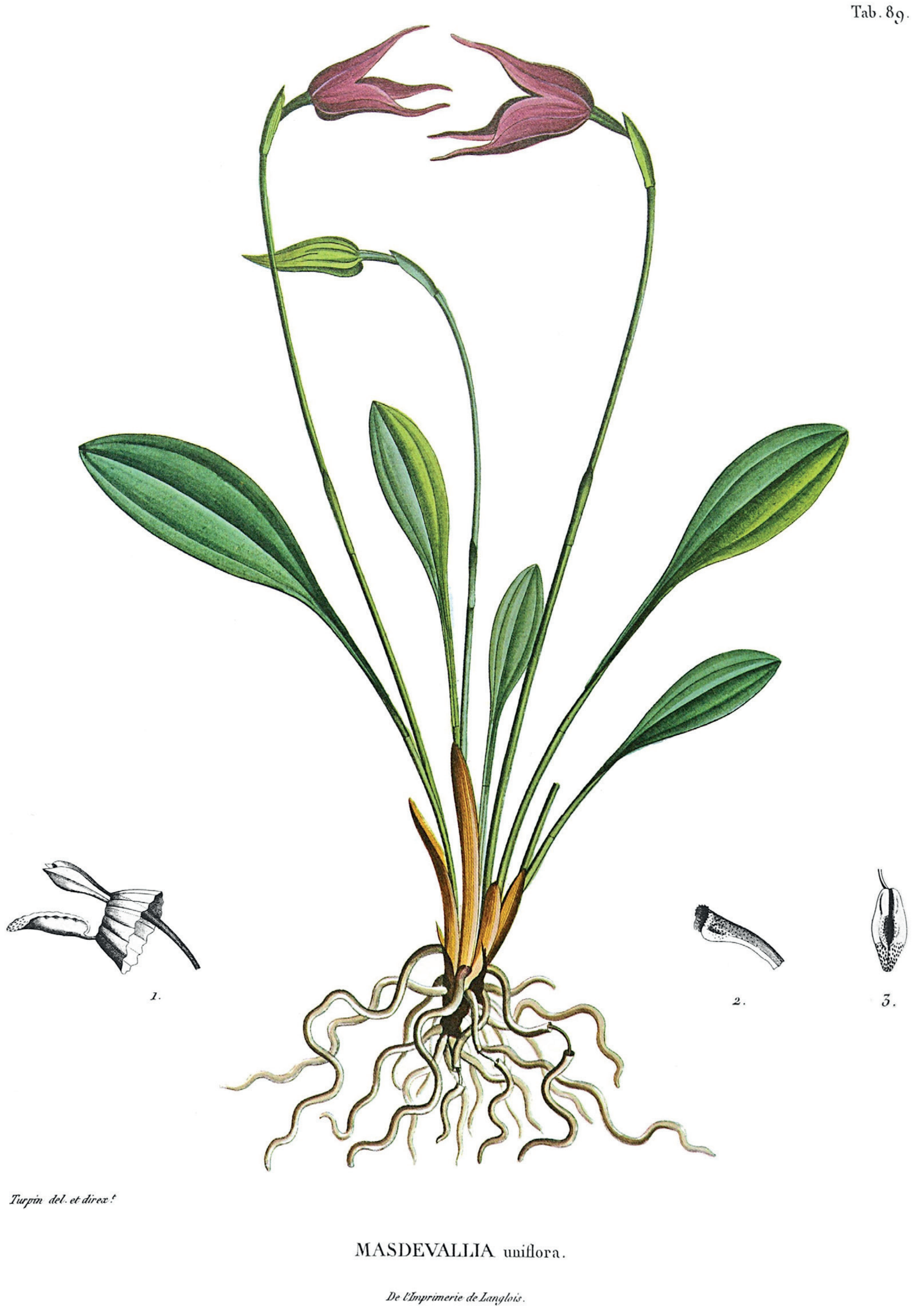


FIGURE 7. *Masdevallia uniflora* Kunth (= *Masdevallia bonplandii* Rchb.f.), collected by Humboldt and Bonpland in Ibarra, Ecuador. Nova Genera et Species Plantarum, vol. I, plate LXXXIX.

Figure 8. Holotype of *Prosthechea hartwegii* (Lindl.) W.E.Higgins, collected near Loja, in the Cordillera. Courtesy of Kew Herbarium # K000364654.

Figure 9. Bust of Josef Ritter von Rawiez Warscewicz (1812-1866) at the Cracow Botanic Garden. Unknown photographer.

would botanize for the next four years. Tafalla was the author of the famous *Flora huayaquilensis*, a great work that would unfortunately not be published until 1989–1991 by the Royal Botanical Garden in Madrid (Ossenbach 2020: 244). It contained not less than 290 beautiful illustrations, of which five were of orchids (Fig. 6).

Alexander von Humboldt (1769–1859) and Aimé Bonpland (1773–1858), on their long journey across northern South America, crossed the border between Colombia and Ecuador in December 1801 and arrived in Quito in the following January; the city would be their headquarters until August 1802, when they continued their journey to Peru. From Quito, they organized numerous excursions, climbing to the heights of the Chimborazo and the Pichincha volcanoes. According to Schlechter, their botanical collections, especially those of Orchidaceae, will always be the basis for our knowledge of the Ecuadorian flora. Then, Humboldt and Bonpland travelled on to Peru and sailed from the port of Callao to Guayaquil. Here, they met Tafalla and went in his company on several botanical excursions. In Guayaquil, Humboldt wrote the manuscript of the first scientific document of his long expedition, *Essai sur la géographie des plantes*, which would be published upon his return to Europe (Humboldt & Bonpland 1805).

The majority of the orchids collected during Humboldt and Bonpland's journey were published in 1815 in the first volume of their *Nova Genera et Species Plantarum*, a work they co-authored with Carl Sigismund Kunth. It contained a total of 24 illustrations of orchids, all by Pierre Jean François Turpin (1775–1849), considered one of the greatest floral and botanical illustrators of the Napoleonic era (Ossenbach 2020: 328) (Fig. 7).

William Jameson (1791–1873), a Scot by birth, arrived in Guayaquil in 1822 and lived in Ecuador for the rest of his life. He was appointed Professor of Chemistry

FIGURE 10. Franz Theodor Wolf (1841-1924). Archives of Rudolf Jenny.

and Botany at the Central University of Ecuador in Quito and was one of the most prolific orchid collectors of his time. Dozens of his orchid specimens were described as new to science, and a number of them named in his honor. Jameson -at different periods of his life- was acquainted with other important orchid collectors who worked in Ecuador. Years later, the famous plant collector and traveller Richard Spruce (1817–1893) was in Ecuador between 1857 and 1863. He had only words of praise for Jameson: "one of the most amiable of men, an ardent collector [...] and a very fair botanist and mineralogist" (in a letter to Daniel Hanbury from 1866) (Spruce 1908: 342).

Francis Hall (1791–1833), a British officer who fought in Ecuador's war of independence against Spain, and was murdered in 1833, collected many new orchid species described mainly by Lindley. Jameson wrote of him as the "only person in this part of the world for whom I had formed a sincere attachment" (in a letter to William Hooker) (Hooker 1835: 79).

Carl Theodor Hartweg (1812–1871), a German collector for the Royal Horticultural Society, arrived in Guayaquil early in 1841, after collecting in Mexico and Guatemala between 1836 and 1840. Hartweg made his way from Guayaquil to Loja, near the Peruvian border, and then rode northwards to Cuenca and Quito until, at the end of the year, he crossed into Colombia to continue his botanical collections. Hartweg's Mexican and Central American orchids were described mainly by Lindley in *Plantae hartwegianae* (Bentham 1839) (Fig. 8).

Josef Ritter von Rawiez Warscewicz (1812–1866), a Pole who collected orchids mostly for Reichenbach, seems to have spent only a few months in Ecuador, traversing the country from Loja in the south to the border with Colombia in the north in 1851 and 1852. Many orchids were named after him, among them the new genus *Warszewiczella* Rchb.f. A recurrence of yellow fever in 1853 compelled Warscewicz to return to Poland, where he became supervisor of the Botanical Gardens in Cracow. He retained this position until his death (Fig. 9).

Moritz Wagner (1813–1887) visited Ecuador between 1858 and 1859. Although his main interest was geology, he also gathered an important botanical and zoological collection. His botanical specimens, among them many orchids, are kept at the Botanical Museum in Munich. Schlechter, however, complained because he did not find any novelties among Wagner's collections.

FRANZ THEODOR WOLF (1841–1924; Geologist and botanist in Ecuador 1870–1891)

Franz Theodor Wolf (Fig. 10) was born in the German village of Barthlomä, the third of the seven children of a schoolteacher. As a young man of 16, he became a member of the Jesuit order and studied theology. From 1862 he took courses in natural sciences at the University of Bonn but interrupted his studies in 1864 when he was called to work as a teaching assistant at the Jesuit abbey of Maria Laach.

It was in 1866, while in Maria Laach, that Wolf occupied himself for the first time with orchids and published an article under the title *Beitrage zur Enwicklungsgeschichte der Orchideen-Blüthe* (=*Contributions to the history of the evolution of the orchid flower*), which has several interesting illustrations with flower analysis of different orchid genera (Fig. 11).

In 1870, the year of his ordination as a priest, he was appointed professor of geology and mineralogy at the recently founded Polytechnical School in Quito, where he found his strong pro-Darwin scientific opinions to conflict with his religious beliefs. After his fellow Jesuits accused him of neglecting his duties as a priest, Wolf left the Jesuit order in 1874 and had to

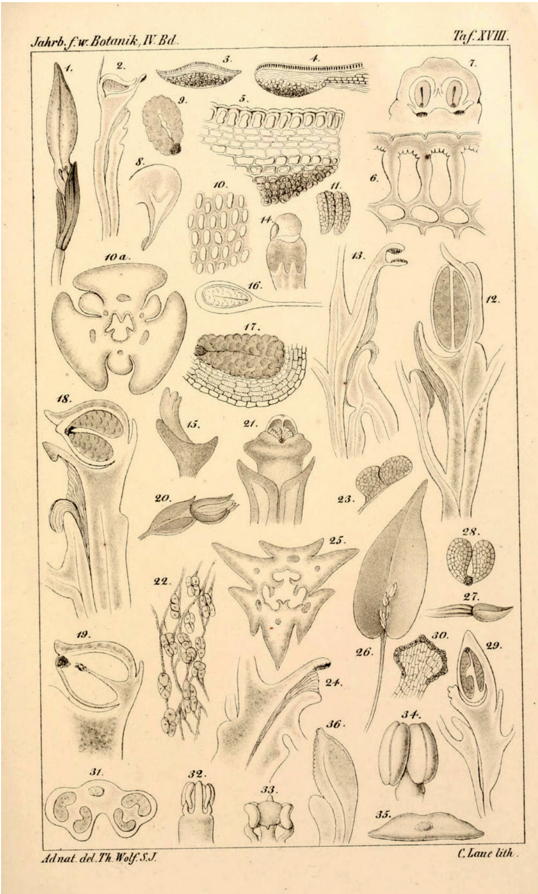


Figure 11. Plate XVIII of Wolf's work which includes three tropical American orchids: 1-10a: *Trichopilia suavis,* 20-25: *Coelia macrostachya* and 26-28: *Pleurothallis tridentata*.

take leave from his post at the University. However, his decision to return to secular life might have had other, more mundane reasons: barely a year later, he married a beautiful 13-year-old Ecuadorian girl named Jacinta Pasaguay, with whom he had seven children.

When he lost his government salary, he sought private commissions, surveying private estates and producing a new city plan of Guayaquil. Wolf travelled to the Galápagos archipelago in 1875 and described its flora. Wolf Island, remote from the main island group and with no permanent population, and Wolf volcano (Fig. 12) on the main island of Isabella, were named after him. Unfortunately, only nine specimens remain from his botanical collections as most of his plants were lost in storage in Guayaquil.

At his return from the islands, Wolf was named "Official Geologist of Ecuador" by the President of Ecuador. He went back to Germany in 1891 and published his main work, *Geografía y Geología del Ecuador* (Wolf 1892), probably the best description of a South American country in the 19th century.

Friedrich Carl Lehmann described two species of *Coryanthes* in 1891. He wrote: "The first, *Coryanthes wolfii* (Fig. 13–14), was named by me in honour of Professor Dr. Wolf, formerly of Guayaquil, now of Dresden. Dr. Wolf will shortly favour the world with a reliable map of the physical phenomena of Ecuador. In his house, I had the pleasure of seeing, examining, and sketching the first flowers of this marvelous plant. However, it was known to me many years previously as an Ecuadorean species" (Lehmann 1891: 483).

Rudolf Schlechter, in his *Orchideenflora von Ecuador* (1921), described a new orchid species as *Pleurothallis wolfiana* (Fig. 15) and wrote: "I dedicate this species to Mr. Theodor Wolf, the most knowledgeable man about Ecuador's Andean regions" (Schlechter 1921: 65).

Luigi (Luis or Aloysius) de Sodiro (1836–1909; collected 1876–1907)

Luigi Sodiro (Fig. 16) was born in Muzzolon, in the community of Cornedo in the Italian province of Vicenza. Still a young man, he entered the order of the Jesuits and began his career as a professor of Natural Sciences at the College of Ragusa. Sodiro undertook botanical excursions in his native Italy and neighbouring Dalmatia, Austria, and Switzerland. There he gained the knowledge and experience which prepared him for his life-long work (Porter 1909: 47). "It was the Jesuits that sent him to the Republic of Ecuador, and fortune could not have taken him to a better place to find food and incentives for his tireless work" (Briosi 1914: iv).

"With the work of (William) Jameson and his publication of *Synopsis Plantarum Equatoriensium* in 1865 and with the arrival of (Father) Luigi Sodiro in 1870 with his great and intense collections, it can be said that the second half of the past century constitutes the golden age of Ecuadorian botany" (Acosta-Solís 1968: 36). Luis Sodiro, in his publications, used the Italian form of his name, Luigi, as well as the Spanish and Latin versions: Luis and Aloysius.

FIGURE 12. Wolf volcano on Isabela island, Galápagos. Photograph by Viri Vondrak.

FIGURE 13. *Coryanthes wolfii* F.Lehm. Sketch by F.C.Lehmann made at Wolf's house. Courtesy of the Kew herbarium.

FIGURE 14. *Coryanthes wolfii* F.Lehm. as *C. elegantium* Linden & Rchb.f. Photograph by Günter Gerlach.

Figure 15. *Pleurothallis wolfiana* Schltr. as *Acianthera sicaria* (Lindl.) Pridgeon & M.W. Chase. Photograph by Duane McDowell.

Figure 16. Father Luigi Sodiro (1836-1909). Unknown photographer.

Sodiro established himself in Quito (Fig. 17), where he was appointed professor of Botany at the University in 1870; he also founded the University Botanical Garden. Until he died in 1909, he would explore the plant life on the high mountains in the province of Quito, such as the volcanoes Corazón and Pichincha (Baldini & Guglielmone 2012: 14).

"The rich collections of Sodiro were kept in his herbarium (Fig. 18) at the College of San Gabriel de Quito, and were administered by his successor, Father L. Mille (1873–1954), I have news that a great part of this herbarium was sold to C.M. Hicken, of the Darwinion Institute of the Republic of Argentina. This commercial transaction represented a great loss for the Ecuadorian science" (Acosta-Solís 1968: 37).

A very significant collection of orchids was made by Sodiro and sent for botanical description to Alfred Cogniaux in Belgium. However, the Belgian botanist feared he would not be able to cope with the work, so in 1904 called on Rudolf Schlechter, who determined most of Sodiro's plants and Louis Mille's plants (see later). Schlechter described them partly in his *Additamenta ad Orchideologiam ecuadorensem* I–III (Schlechter 1914-1916, 1917-1919) and finally in his *Orchideenflora von Ecuador* (Schlechter 1921).

Sodiro's specimens were destroyed during the bombing of the Berlin Museum during WWII. Fortunately, many photographs and drawings were prepared before the war and are kept today at the Oakes Ames Orchid Herbarium at Harvard University (Fig. 19).

In addition, Schlechter dedicated 19 species and a new genus (Fig. 20) to Sodiro: 16 with the epithet *sodiroi* and three others named *aloisii*. These are listed here under Schlechter's basionym names: *Camaridium sodiroi*, *Dichaea sodiroi* (Fig. 21), *Diothonea sodiroi*, *Elleanthus sodiroi* (Fig. 22), *Epidendrum aloisii*, *Epidendrum sodiroi*, *Gomphichis sodiroi*, *Govenia sodiroi*, *Habenaria sodiroi*, *Masdevallia sodiroi* (today a synonym of *Dracula sodiroi*) (Fig. 23), *Microstylis sodiroi*, *Odontoglossum sodiroi*, *Oncidium aloisii*, *O. sodiroi*, *Pelexia sodiroi*, *Pleurothallis aloisii*, *P. sodiroi*, *Stelis sodiroi* and *Stenorrhynchos sodiroi*.

Henrik Franz Alexander von Eggers (1844–1903; collected 1893–1897)

Towards the end of April 2020, don Gonzalo González Cabal (Fig. 24) told a story to a reporter

FIGURE 17. Independence Place in Quito, 1870. Unknown photographer.

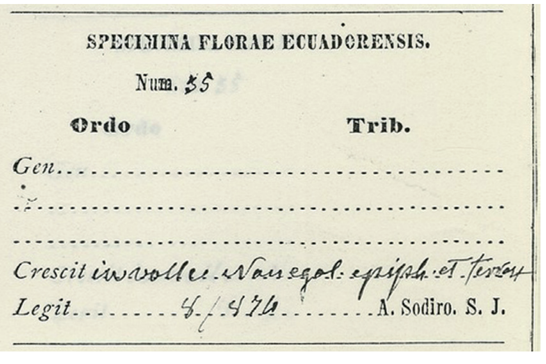


FIGURE 18. Sodiro's herbarium label. Courtesy of Harvard University Herbaria #00099031

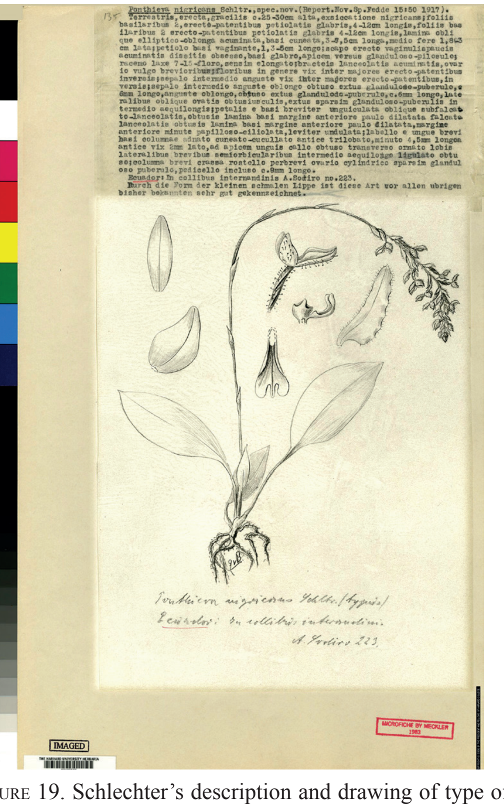


FIGURE 19. Schlechter's description and drawing of type of *Ponthieva nigricans* Schltr. (collected by Sodiro). Courtesy of Harvard University Herbaria #00103550.

from the journal *La Revista*, published by the newspaper group El Universo in Guayaquil Ecuador. As he recalled, he was walking one day through a forest in his "hacienda" El Recreo, in the province of Manabí, in Ecuador's coastal region, when he found a beautiful small plant whose flowers shone brightly white. Fascinated, he took a photograph of it and put it on the Facebook page of the hacienda.

A few weeks later, don Gonzalo was contacted by the New York Botanical Garden. He was told that it was the first time that anybody had seen a picture of *Steriphoma urbanii* (Fig. 25), a plant which was only known from the type specimen collected and described as a new

Figure 20. *Sodiroella ecuadorensis* Schltr. (= *Telipogon selbyanus* N.H.Williams & Dressler. Photograph by Andreas Kay.

Figure 21. *Dichaea sodiroi* Schltr. Photograph by Orchi.

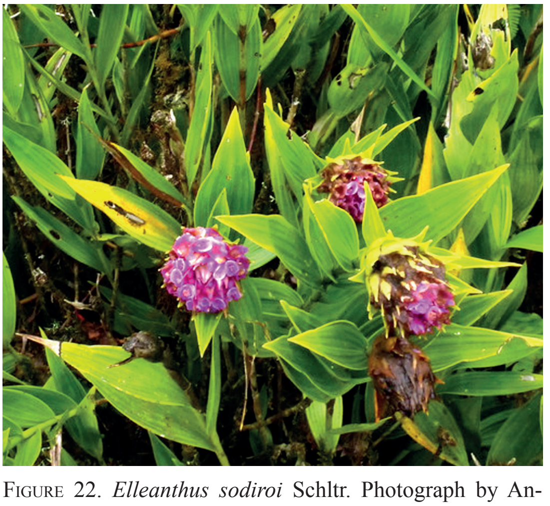


Figure 22. *Elleanthus sodiroi* Schltr. Photograph by Andreas Kay.

Figure 23. *Draula sodiroi* (Schltr.) Luer. Archives of Rudolf Jenny

Figure 24. Don Gonzalo González Cabal, photographed in his Hacienda el Recreo.

Figure 25. Isotype of *Sterophoma urbanii* Eggers. Courtesy of Munich Botanical Garden.

species in 1897 by Henrik Alexander, Baron von Eggers (1844–1903) (Fig. 26) and was believed to be extinct. It belongs to the family of the Capparaceae.

Henrik Franz Alexander von Eggers (1844–1903), a Dane born in Schleswig, began an important botanical exploration of the Antillean flora in 1870 on St. Croix, from where he made his first publication in 1876, under the title of *St. Croix's Flora*. After moving to St. Thomas, he studied the local vegetation and explored the neighbouring islands of Water, Vieques, and St. Jan, which resulted in his publication in 1879 of *The Flora of St. Croix and the Virgin Islands*.

In 1893 Henrik Alexander von Eggers travelled to Ecuador and purchased a cocoa plantation named "Hacienda el Recreo" in the coastal province of Manabí, not far from the Bay of Caraquez. He spent the next six years in Ecuador and -aside from his agricultural enterprise- spent his time botanizing in the coastal lowlands. A few excursions took him also to Balao, on the slopes of the Sierra de Cuenca, and to Guayaquil.

Among the orchid specimens collected by Eggers in Ecuador, we find *Vanilla odorata* C.Presl., *Dichaea longa* Schltr., *Cryptarrhena kegelii* Rchb.f., *Gongora grossa* Rchb.f., and many others. In addition, in 1921 Schlechter described three species that were new to science amongst Eggers' Ecuadorian collections: *Pogonia lutea*, *Polystachya ecuadorensis* (Fig. 27), and *Pleurothallis henrici* (Fig. 28).

Figure 26. Henrik Franz Alexander von Eggers (1844–1903). From Virgin Island Daily News, 2 August 2016.

Figure 27. *Polystachya ecuadorensis* Schltr. [=*Polystachya foliosa* (Hook.) Rchb.f.].

The genus *Eggersia*, of the Nyctaginaceae was named for him by Joseph Dalton Hooker.

Louis (Aloysius) Mille (1873–1954; collected ca. 1894–ca.1940)

"The oldest collections at Herbarium QCA (Quito, Catholic University) are 890 specimens collected by Father Louis Mille, S. J. (1873–1954) (Fig. 29), who in 1894 studied botany under Father Luigi Sodiro, S. J., at the Jesuit college of San Gabriel in Quito" (Jórgensen *et al*. 1992: 53). The Jesuits established themselves in Ecuador in colonial times, and built a magnificent group of buildings surrounding the Church of the Society of Jesus (Fig. 30). The San Gabriel college is part of this architectural complex.

Louis Mille, a Jesuit of Belgian origin, arrived in Ecuador as a young man -probably around 1882- and soon became one of Luigi Sodiro's favorite students. Ecuador became his second home, and he would live in this country until the end of his days. In 1921 Rudolf Schlechter welcomed Mille onto Ecuador's botanical scene: "Father Louis Mille has continued in recent years with the study of the flora of Ecuador -and thus with the work of Jameson and Sodiro- with great zeal and botanical knowledge" (Schlechter 1921: 12). As the successor of Sodiro, who passed away in 1909, Mille developed his main botanical activity in Ecuador between 1900 and 1940 and published numerous articles and books on this subject, among them one of his main works: 'Nociones de Geografía Botánica aplicadas al Ecuador' (=Notions of geographic botany applied to Ecuador) published in 1922 (Dávalos 1977: 227).

Mille taught Botany at the prestigious Jesuit colleges in Quito and Riobamba, and his main collecting activities took place in the Andean regions surrounding these cities, especially, according to Schlechter, in the provinces Chimborazo and adjacent Tunguragua, on the slopes of the two famous volcanos that give the name to the provinces (Fig. 31). Other localities frequently visited by Mille were the provinces of Pichincha and Riobamba. In 1922, however, due to ill health, he moved to Guayaquil and continued his collections in Guayas and Manabí.

Dozens of new orchid species were described by Schlechter from the Andean collections of Louis Mille. Among them, we find *Aa macra, Aa riobambae*, *Cranichis sororia*, *Cyclopogon macer*, *Cryptophoranthus beloglottis*, *Diothonaea viridiflora* (Fig. 32), *Epidendrum chortophyllum*, *Epidendrum cuniculatum*, *Epidendrum fruticetorum*, *Epidendrum geminatum*, *Epidendrum mojandae*, *Epidendrum orthocaule*, *Epidendrum riobambae*, *Epidendrum sarcoglottis, Lepanthes pensilis*, *Pleurothallis lassioglossa*, *Pleurothallis lloensis*, *Ponthieva disema, Ponthieva ecuadorensis*, *Ponthieva orchioides* (Fig. 33–34), *Stelis altigena*, *Stelis coturcoensis,* and *Stelis lloensis* (Schlechter 1921).

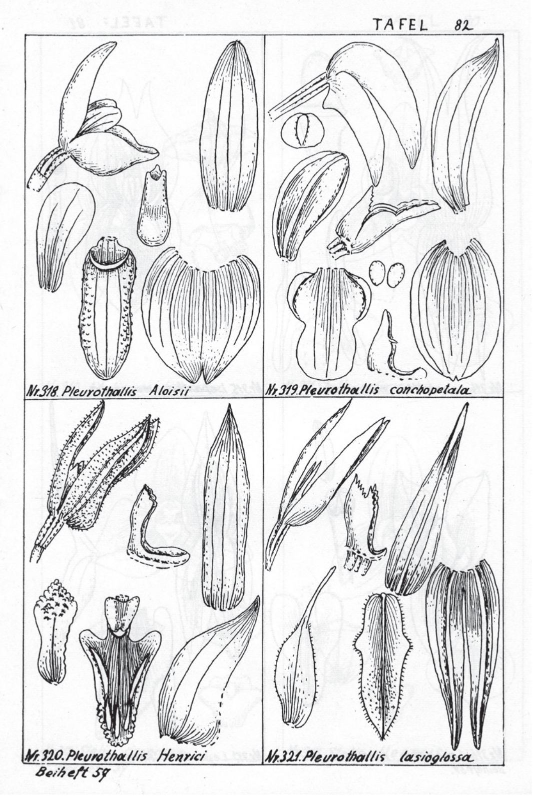


Figure 28. *Pleurothallis henrici* Schltr. (lower left corner). Flower analysis by Rudolf Schlechter in Mansfeld, 1929: plate 82

Many other orchid species were named by Schlechter in honor of the great Belgian botanist. Worthy of mention are *Cyclopogon millei*, *Epidendrum millei*, *Habenaria millei*, *Lepanthes millei*, *Liparis millei*, *Oncidium millei*, *Pleurothallis millei*, *Stelis millei*, and *Stenorrhynchos millei* (Fig. 35) (Schlechter 2015).

It is noteworthy that among the many new orchids described by Schlechter from Mille's collections, we do not find a single one from the Ecuadorian low-

FIGURE 29. Father Louis Mille (1873–1954) (first from left, back row) with members of his congregation, 1940. Archives of Rudolf Jenny.

FIGURE 30. Domes of the church of the Jesuit Company in Quito. Photograph by Marcelo Quinteros.

Figure 31. Tunguragua vulcano, the 'Black Giant'. Photograph by Andrés Heredia.

Figure 33. *Ponthieva orchioides* Schltr. Drawing of type, courtesy of Harvard University Herbaria, #00103552.

Figure 32. *Diothonaea viridiflora* Schltr. as *Epidendrum neoviridiflorum* Hágsater. Photograph by Laurens Grobler.

Figure 34. *Ponthieva orchioides* Schltr. Photograph by Jim Fowler.

lands, where Mille collected for several years. The reason for this seems clear if we remember that Mille only started collecting along the coast at a time when Schlechter was nearing the end of his life's work.

August Rimbach (1862–1943; collected 1894–1934)

August Rimbach received his Ph.D. in Natural Sciences in 1897 after studying under Swiss Professor Simon Schwendener at the University of Berlin. In 1890 he was offered the position of Professor of Botany and Zoology at the University of Cuenca, Ecuador, where he spent the following four years.

Figure 35. *Stenorrhynchos millei* Schltr. as *Stenorrhynchos speciosum* (Klotzsch) Rchb.f. Unknown photographer.

In 1894, together with his brother Carl, Rimbach descended the Río Bobonasa to the Río Pastaza of eastern Ecuador. The journey was described in an article published in 1897 by the German Geographic Society under the title *Reise im Gebiet des oberen Amazonas* (=*Journey to the region of the Upper Amazon*), together with a detailed map of the complex river systems in eastern Ecuador (Rimbach 1897, plate 23; Renner 1993: 4) (Fig. 36).

Between 1895 and 1900, August Rimbach travelled to Germany and was for a short period at the University of Nebraska in the United States. He then returned to Ecuador, where he settled in Guayaquil until 1908 when he decided to move once more to the city of Riobamba, the capital of the province of Chimborazo, at an altitude of 2750 m. (Fig. 37). In 1910 Rimbach was called to serve as professor of Botany at the Agronomical Institute in Montevideo, Uruguay, with his brother Carl as his assistant. For almost ten years, he would make important studies and wrote a series of articles in which he tried to further Uruguay's agricultural production (Izaguirre 2006: 2). In 1921 the Rimbach brothers were back in Riobamba, where they would live for the rest of their lives (Acosta Solís 1968: 45–46 and Arosemena

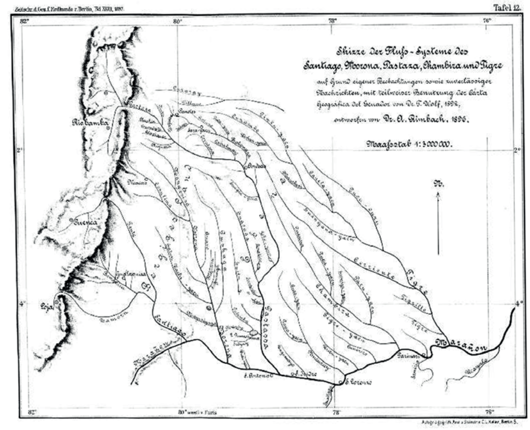


Figure 36. Map drawn by Rimbach of the river systems in Ecuador's Amazonia. In Rimbach, 1897, plate 12.

2017: 13). Rimbach's collections from that area are famous for their quality. His collections were widely distributed; the first set apparently went to Berlin, where it was destroyed during the Second World War; other sets are today in Munich, Stockholm (Fig. 38), Geneva, Jena, Chicago, Cambridge, and Washington (Jørgensen & León-Yañez 1999: 36).

In his orchid flora of Ecuador, Schlechter described an important number of new orchid species collected by Rimbach, in the vicinity of Guayaquil and in the Andean valleys around Riobamba. Worth mentioning among those collected in the province of Guayas are *Bulbophyllum ecuadorense* (Fig. 39), *Campylocentrum ecuadorense, Campylocentrum rimbachii* (Fig. 40), *Epidendrum rimbachii* (Fig. 41), *Maxillaria hedyosma,* and *Notylia rimbachii*. In the province of Chimborazo Rimbach collected *Cyclopogon rimbachii*.

Peru. The geography of Peru is similar in many ways to that of Ecuador. In the east, we have the lowlands of the Amazon basin, called *selva baja*, representing over half of the country's territory. The region is one of the immense forests irrigated by one of the world's largest river systems, including the Amazon itself and its tributaries Huallaga (Fig. 42), Marañon, and Ucayali Rivers.

The main city in the region is Iquitos, which grew in the 1880s from a small village to a large city, following the rubber boom, the plantations of which extended from Brazil to Peru. The rubber boom lasted until 1914 when Iquitos fell back into the misery of a small village on the shores of the Amazon (Fig. 43).

Figure 37. Riobamba, ca 1900. Unknown photographer.

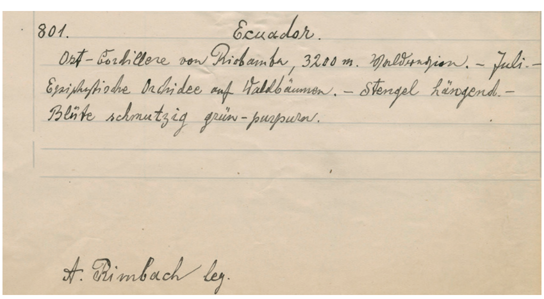


Figure 38. Rimbach signature and herbarium label of type specimen of *Pleuranthium cardiochilum* Garay. Courtesy of Swedish Museum of Natural History Department of Botany, S-R-4946.

With elevations up to 6600 m, the Andes occupy the centre of the country and offer the most extensive variety of climates in Peru. Conditions vary from semi-arid in the valleys to moist at higher elevations and towards the western flanks. Two regions show special characteristics. The first is the 4000 m table land "altiplano", which extends in Peru from Puno on the shores of Lake Titicaca across portions of Bolivia, Chile, and Argentina. (Fig. 44). The other is the mountainous alpine tundra ecosystems of lower elevation regions of northern Peru (Fig. 45).

The Peruvian coast can be divided into two prominent sub-regions with entirely different climates: the central and southern Pacific coast have a subtropical desert climate, with almost no rainfall or vegetation. On the other hand, the northern coast is a typical tropical savanna, with clearly marked dry and rainy seasons. The vegetation consists of shrubs, equatorial dry forests (Fig. 46), and mangroves. Two main rivers, the Chira and the Tumbes, irrigate this region.

The history of orchidology in Peru begins with the use that noble Incas gave to a plant with which they adorned the heads of young maidens. This they called *Viñay Huayna* or *Wiñay Huayana,* which translates into *forever young* or *eternal youth*. This plant was nothing other than *Epidendrum secundum* Jacq. In 1942 a smaller Inca city was discovered near Machu Picchu. The eminent Peruvian archaeologist, Dr. Julio C. Tello, gave it the name of Wiñay Wayna. It is no coincidence that *Epidendrum secundum* grows profusely in the surroundings of Wiñay Wayna (Ossenbach 2020: 31).

FIGURE 39. *Bulbophyllum ecuadorense* Schltr. as *B. pachyrachis* (A.Rich.) Griseb. Unknown photographer

FIGURE 40. *Campylocentrum rimbachii* Schltr. as *Campylocentrum pachyrrhizum* (Rchb.f.) Rolfe. Photograph by Von Gastam

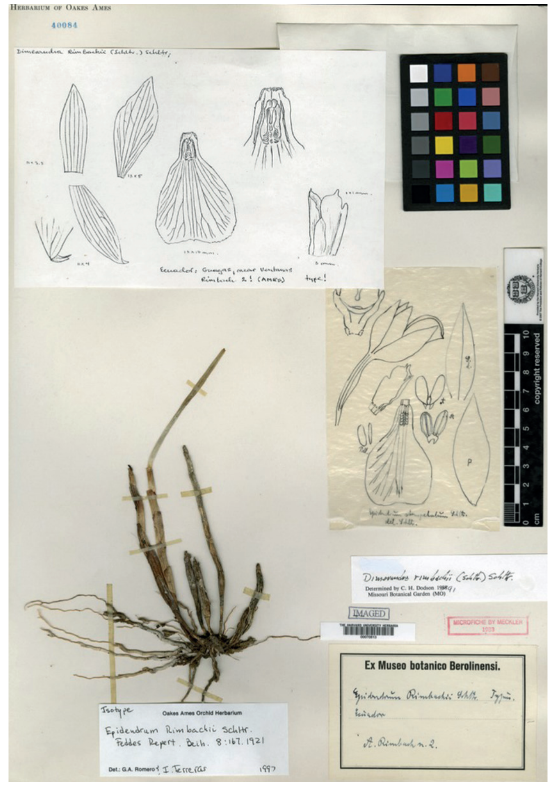


FIGURE 41. Isotype of *Epidendrum rimbachii* Schltr. Herbarium of Oakes Ames #40084.

The first herbarium specimens of Orchidaceae from Peru are at the Natural History Museum in Paris. They were collected by Joseph de Jussieu (1704–1779) during his odyssey in that country between 1735 and 1771 (Ossenbach 2020: 90) (Fig. 47).

The first state-funded Spanish botanical expedition arrived in Peru in 1777 under the direction of Hipólito Ruiz (1653-1816 and José Pavón (1754–1844). They were accompanied by French botanist Joseph Dombey (1742–1794). Their mission was to explore and make botanical collections in Peru and Chile and at a later stage in Guayaquil, on Ecuador's Pacific coast. Thousands of specimens and a significant number of beautiful botanical illustrations were sent to the 'Botanical Office' in Madrid. Pavón sold a majority of the specimens and illustrations to European collectors. However, the portion that was retained in Madrid was not described for almost 150 years. Many new orchid genera and species were determined by Ruiz and Pavón, although only a Prodromus and the three first volumes were published of their intended *Flora Peruvianae et Chilensis* (Fig. 48–49) (Ruiz & Pavón 1798–1802).

Notwithstanding all the above, the orchid collections of Ruiz, Pavón, and Dombey were outstanding and the botanical material now deposited at the Royal Botanical Garden in Madrid and the Natural History Museum in Paris are of enormous importance.

A singular event was the arrival, in May 1790, of the expedition of Alessandro Malaspina. On the expedition was the Czech botanist Thaddeus Haenke (1761–1817). Haenke spent several months in Peru, with Ruiz and Pavón acquiring many important botanical specimens. Haenke would stay in South America for the rest of his life and never return to Europe again. His botanical collections in Peru and Bolivia, which included many

Figure 42. Huallaga River. Unknown photographer.

Figure 43. Boat landing in Iquitos, ca. 1900. Unknown photographer.

Figure 44. The Puna ecoregion. Unknown photographer.

Figure 45. The páramo of Piura. Unknown photographer.

FIGURE 46. Tropical dry forest near Tumbes. Unknown photographer.

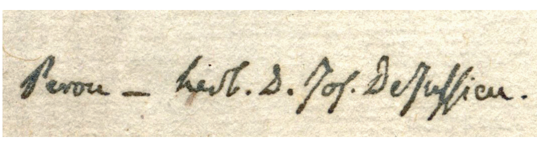
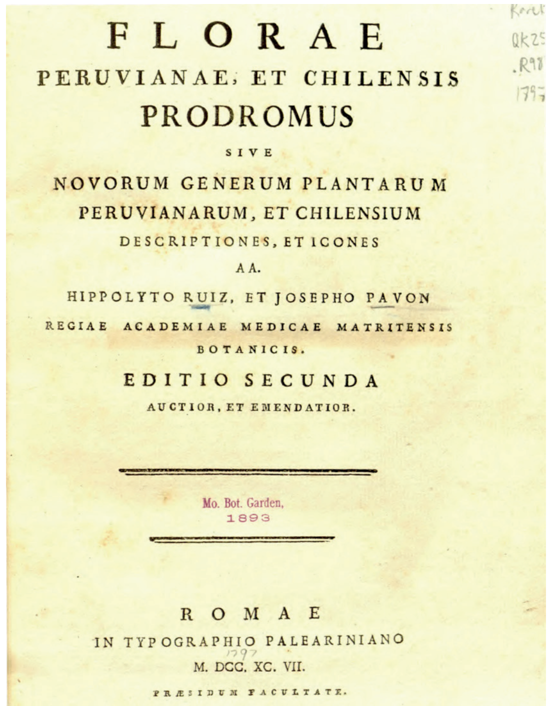


FIGURE 47. Jussieu herbarium label on an undetermined specimen of *Epidendrum* collected in Peru. Courtesy of MNHN Paris, #MNHN-P-P00673094.

new orchid species, were later described by his Czech countryman Karel Bořivoj Presl in his work *Reliquiae Haenkeanae*. We remember Haenke in *Epidendrum haenkeanum* Presl, *Gyrostachys haenkeana* Kuntze, and *Maxillaria haenkei* Correll.

Eduard Friedrich Poeppig (1798–1868) went from Chile to Peru in 1829 and followed in the footsteps of Ruiz and Pavón over months, collecting in Huanuco and Cuchero in the Peruvian Andes before descending the Huallaga River to the Amazonas and then crossing into Brazil. Many new orchid genera and species were described from his herbarium specimens. Poeppig, with the collaboration of Austrian botanist Stephan Endlicher (1804–1849), published the botanical results of his travels



FLORAE
PERUVIANAE, ET CHILENSIS
PRODROMUS
SIVE
NOVORUM GENERUM PLANTARUM
PERUVIANARUM, ET CHILENSIUM
DESCRIPTIONES, ET ICONES
AA.
HIPPOLYTO RUIZ, ET JOSEPHO PAVON
REGIAE ACADEMIAE MEDICAE MATRITENSIS
BOTANICIS.
EDITIO SECUNDA
AUCTIOR, ET EMENDATIOR.

Mo. Bot. Garden,
1893

ROMAE
IN TYPOGRAPHIO PALEARINIANO
M. DCC. XC. VII.
PRÆSIDUM FACULTATE.

FIGURE 48. Title page of the Prodomus for the *Flora Peruviana et Chilensis* (2nd edition, 1797).

between 1835 and 1845 in a large, beautifully illustrated work entitled *Nova genera ac species plantarum quas in regno chilensi, peruviano et in terra amazonica* (Fig. 50).

The British traveller Andrew Mathews (1801–1841) spent the last ten years of his life in Peru. John Lindley described many new orchids from his botanical collections. Schlechter's only complaint was the fact that Matthews never indicated the precise collecting locations.

Antonio Raimondi (1826–1890) was an Italian-born Peruvian scientist who arrived at the port of Callao in 1850 and remained in the country until his death. According to Schlechter and Weberbauer, Raimondi gathered over 20,000 herbarium specimens, among which Schlechter assumed must have been many orchids. However, Raimondi's collection remained undescribed until long after Schlechter's death. The Field Museum of Natural History in Chicago holds a specimen of a new orchid species described by Raimondi, *Chloraea undulata* (=*C. pavonii* Lindl.) (Fig. 51–52), also known as 'the orchid of Lima'.

Finally, in 1859 Richard William Pearce (ca. 1835–1868) was sent by the firm of Veitch & Sons as a 'collector of plants, seeds, land-shells and other objects of

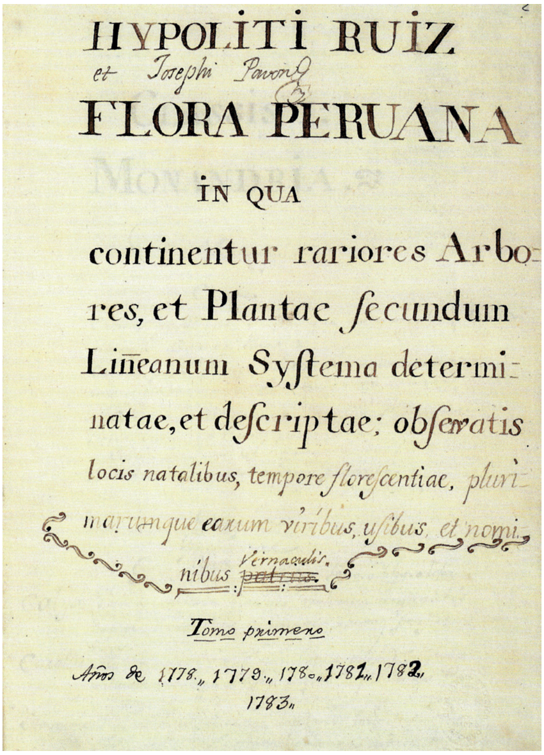

HYPOLITI RUIZ
et Josephi Pavon
FLORA PERUANA
IN QUA
continentur rariores Arbo-
res, et Plantae secundum
Lineanum Systema determi-
natae, et descriptae; observatis
locis natalibus, tempore florescentiae, pluri-
marumque earum viribus, usibus, et nomi-
nibus ~~patrio~~ Vernaculis.
Tomo primero
Anno de 1778, 1779, 1780, 1781, 1782,
1783.

FIGURE 49. Front cover of the manuscript of the first volume of the *Flora Peruviana et Chilensis*.

FIGURE 50. *Scaphyglottis pendula* Poepp. & Endl. [= *Ornithidium pendulum* (Poepp. & Endl.) Cogn.], collected near the village of Cuchero. Plate 98 of Nova Genera ac Species…, volume 1.

Natural History'. He travelled initially to Chile before spending three years in Peru, Bolivia, and Ecuador. From Peru, we know of his collections of *Odontoglossum brachypterum* Rchb.f., *Otoglossum brevifolium* (Lindl.) Garay & Dunst., *Odontoglossum multistellare* Rchb.f., and *Pseudocentrum bursarium* Rchb.f. The genus *Pearceae* of the Geseneriaceae was named in his honour.

WILLIBALD LECHLER (1814–1856; collected 1850–1854)

The son of a clergyman, Willibald Lechler (Fig. 53) was born in the German city of Klosterreichenbach. He studied pharmacy in Reutlingen and practiced his profession in Augsburg, Vevey, Geneva, and Basel. Lechler established himself in Stuttgart where he owned a pharmacy from 1839 to 1849 (Krauss 1858). In 1850 Lechler was called upon to take part in an expedition to Chile with an advisory committee of the Stuttgart Society for Emigration and Colonisation to inspect land for a possible settlement along the River Bueno. When the expedition returned to Germany, Lechler stayed in Chile and settled at Arique. From there, he made exploratory journeys and collected plant specimens for sale in Europe. In 1850 he collected in the Falkland Islands, in Chile from 1850 to 1852 and 1852–1853 along the Straits of Magellan.

In 1854 Lechler went to Peru, where he collected mainly in Puno (Fig. 54). He stayed until 1855 when he returned to Germany. After his first wife died in 1854 in a boat accident on the river Calle-Calle in Chile, Lechler married again and in 1856, returned to South America. After crossing the Isthmus of Panama, he sailed to Guayaquil but died at sea, a victim of yellow fever.

Willibald Lechler's plants from the Falkland Islands, Chile, and Peru were distributed in Europe by Swiss botanist Rudolph Friedrich Hohenacker (1798 –1874). They were advertised as 'W. Lechler *plantae insularum Maclovianarum*', 'W. Lechler *plantae chilenses*', and 'W. Lechler *plantae peruvianae*' (Godley 1970: 69–70).

FIGURE 51. *Chloraea undulata* Raimondi. Courtesy of Field Museum of Natural History #2142248.

FIGURE 52. *Chloraea undulata* Raimondi (=*Chloraea pavonii* Lindl.), ‘the orchid of Lima’. Photograph by Delsy Trujillo.

Several new orchid species were found among Lecher’s botanical collections. Lindley described *Chloraea lechleri* (Fig. 55), Reichenbach *Epidendrum lechleri*, Schlechter *Aa lechleri* and *Brachystele lechleri* (Fig. 56), and Ormerod *Microchilus lechleri*. Schlechter also transferred Reichenbach’s *Altensteinia inaequalis*, whose type specimen had been collected by Lechler (Fig. 57), to *Aa inaequalis* (Rchb.f.) Schltr.

Serafín Filomeno (1846–1922; collected ca. 1900–1910) (In collaboration with Delsy Trujillo)

“The small collections which I received from Mr. Serafín Filomeno (1846–1922) from the vicinity of Moyobamba have shown that this is the homeland for the beautiful *Cattleya O’Brien*, and magnificent species of *Coryanthes*, *Stanhopea*, *Epidendrum*, *Maxillaria*, *Odontoglossum*, *Brassia*, and many other types” (Schlechter 1921b: 28).

Filomeno was born in San Jerónimo de Ica, in southern Peru, and at the age of 10, moved to Lima, where he completed his primary and secondary studies. In 1876 he received his Ph.D. in Humanities, Philosophy, and History at the University of San Marcos. After that, he decided to dedicate his life to education and was the director of several high schools in El Callao and Lima. In 1889 he was put in charge of the foundation of a new high school in Moyobamba, the ‘Colegio Secundario San José’ (Fig. 58) (Alves Milho 2019).

Moyobamba is located in northern Peru, valley of Alto Mayo, at an elevation of 900 m on the eastern slopes

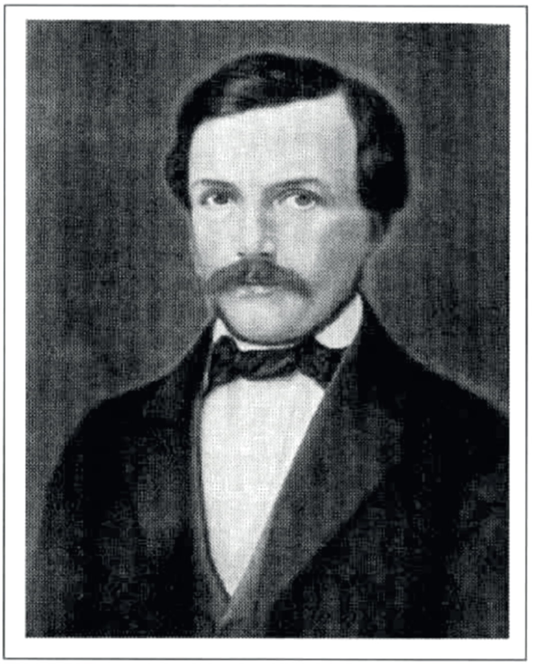


Figure 53. Willibald Lechler (1814–1856). Archives of Rudolf Jenny.

Figure 54. Cathedral of Puno, 1875. Allegedly the oldest photograph of Puno, by Ricardo Villalba.

Figure 55. *Chloraea lechleri* Lindl. Archives of Rudolf Jenny.

Figure 56. *Brachystele lechleri* Schltr. as *Brachystele unilateralis* (Poir.) Schltr. Photograph by Patricio Novoa.

of the Andes. It was the first city founded by Spaniards in the Peruvian jungle. About 3500 different orchid species grow in the neighbourhood of the city, and for this reason, it is known in Peru as "the city of orchids". Rudolf Schlechter dedicated several new orchid species found amongst Filomeno's collections to this city: *Cyclopogon moyobambae* (Fig. 59), *Schomburgkia moyobambae*, and *Notylia moyobambae*.

Filomeno left Moyomaba in 1909 and moved to Iquitos, the capital of the Department of Loreto, on the banks of the Amazon. There he would live, alternating between work at public schools and a small private school he had founded until he passed away in 1922 (Herrera 1937).

During his time in Iquitos, Serafín Filomeno explored the Department of Loreto and continued sending new orchids to Schlechter, who dedicated several new

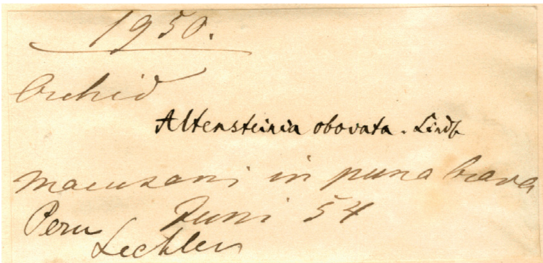


FIGURE 57. Herbarium label of *Altensteinia inaequalis* Rchb.f. Kew Herbarium #K000364533.

species to this territory *Scaphyglottis loretoenses* (Fig. 60), *Trigonidium loretoense*, and *Campylocentrum loretoense*. Several new orchid species were dedicated by Schlechter to Filomeno himself, among them *Brassia filomenoi*, *Epidendrum filomenoi* (Fig. 61), *Xylobium filomenoi* (Fig. 62), *Lycaste filomenoi* (Fig. 63), and *Stelis filomenoi*. Schlechter mentioned an additional new species as growing in the Department of Loreto: a white and yellow *Sobralia filomenoi*. However, no species of *Sobralia* has ever been described under that name.

Eugen Koehler (father) (1866–1945), **Anton and Carl Koehler (sons)** (–); collected 1906–1919)
(In collaboration with Delsy Trujillo)

Schlechter seldom provided many biographical details about those who contributed to his herbarium. This is -once more- the case with Eugen Koehler, a German seaman born in Munich who arrived in 1894 in Peru, where he dedicated himself to the cultivation of coffee in the valley of Chanchamayo, also called the 'gateway to the Amazon' (Fig. 64)

Koehler's coffee plantation, the 'Hacienda La Merced', and the valley of Chanchamayo as a whole became over the years well known for the incredible richness of their orchid flora. Schlechter would dedicate *Pleurothallis chanchamayoensis* (Fig. 65) to this region.

Eugen Koehler made a small collection of orchids in 1906, which was described by Rudolf Schlechter in 1912 in his *Orchidaceae novae et criticae, Decas XIX–XX* (Schlechter 1912). In 1921 Schlechter again published specimens of the Koehlers, now collected jointly by the father and his sons, Anton (Antonio) and Carl (Carlos), in his *Die Orchideenfloren der südamerikanischen Kordillerenstaaten*, vol IV, dedicated to Peru (Schlechter 1921). Unfortunately, like so many others,

FIGURE 58. Serafín Filomeno (1846–1824) (in dark suit), together with his students at the Colegio de San José in Moyobamba, ca. 1905. Notice the students in gala uniform but barefoot! Unknown photographer.

all these specimens were destroyed during the bombing of Berlin during World War II.

Antonio and Carlos Koehler continued botanizing, and after Schlechter's death, sent a number of orchid specimens in 1930 to the Missouri Botanical Garden in St. Louis, Missouri (Herrera 1937b).

Eugen Koehler collected several new orchid species, among them *Cyclopogon densiflorus, Gomphichis plantagineae, Pachyphyllum tenue, Physurus stenocentrum, Pleurothallis divaricans, Ponthieva microglossa* (Fig. 66), and *Stelis rhomboglossa*.

Many others were dedicated to him, among them the new orchid genus *Neokoehleria* (= *Comparettia*), with two species: *Neokoehleria equitans* (type) (Fig. 67) and *Neokoehleria peruviana* (Fig. 68). Other orchids that carry Koehler's name are *Cranichis koehleri* (Fig. 69), *Gomphichis koehleri*, *Elleanthus koehleri*, *Lepanthes koehleri* (Fig. 70), *Notylia koehleri*, and *Odontoglossum koehleri* and *Stelis koehleri* (Fig. 71).

Koehler's sons collected the already mentioned *Pleurothallis chanchamayoensis* and *Odontoglossum trilobum*. In addition, several other orchid species from amongst their collections were dedicated by Schlechter to

Figure 59. *Cyclopogon moyobambae* Schltr. as *Cyclopogon inaequilaterus* (Poepp. & Endl.) Schltr. Photograph by Rudy Gelis.

Figure 61. *Epidendrum filomenoi* Schltr. as *Epidendrum calanthum* Rchb.f. & Warsz. Phograph by Olbrich Botanical Gardens, Madison, Wisconsin.

Figure 60. *Scaphyglottis loretoenses* Schltr. as *Scaphyglottis graminifolia* Lindl. Photograph by Dwittkower.

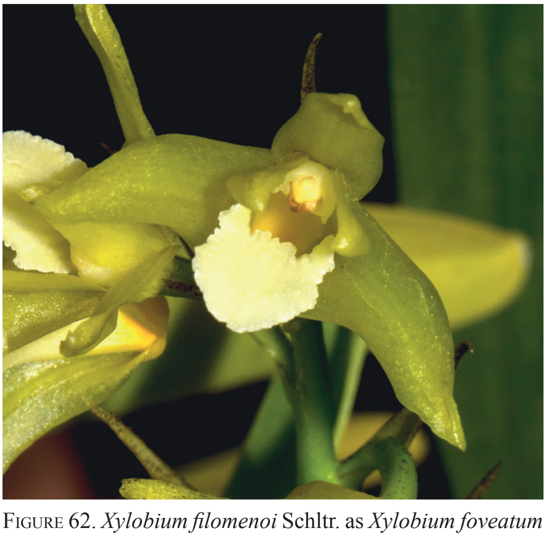


Figure 62. *Xylobium filomenoi* Schltr. as *Xylobium foveatum* (Lindl.) G. Nicholson. Photograph by Quito Botanical Garden.

both brothers: *Elleanthus carolii*, *Scaphyglottis antonii*, *Maxillaria koehleri*, and *Brassia koehlerorum* (Fig. 72).

August Weberbauer (1871–1948; collected 1908–1948)

August Weberbauer (Fig. 73) was undoubtedly one of the most prominent members of Schlechter's South American network of orchid collectors. Weberbauer's contributions, especially in the field of systematic botany, became a cornerstone for our present understanding of the orchid flora of the Andes in general and Peru in particular. In the words of Rudolf Schlechter, "with the arrival of A. Weberbauer began a new era in the exploration of the flora of Peru" (Schlechter 1921b: 11).

Weberbauer was born in Breslau, the son of mycologist Otto Weberbauer. He studied biology at the Universities of Berlin, Heidelberg, and Breslau. However, it was in his hometown that he received his doctorate in 1898.

August Weberbauer travelled to Peru for the first time in 1901, with the financial support of the Royal Prussian Ministry for Culture and the Prussian Academy of Sciences and the Peruvian government. He travelled around the country until 1905, sending his plant

Figure 63. *Lycaste filomenoi* Schltr. as *Lycaste macrophylla* (Poepp. & Endl.) Lindl. Edwards's Botanical Register, volume 29 (N.S. 6) plate 35.

Figure 64. Forest above La Merced, Chanchamayo. Photograph by A. Weberbauer (1911), plate XXVII.

Figure 65. *Pleurothallis chanchamayoensis* Schltr. As *Pleurothallis bivalvis* Lindl. Photograph by Andreas Kay.

collections of over 5200 specimens mostly to the herbarium of the Botanical Garden and Museum of Berlin-Dahlem. The first orchids collected by Weberbauer were described by Friedrich Kränzlin in 1905 under the title *Orchidaceae Weberbauerianae in republica Peruviana lectae*. *Orchidaceae andinae, imprimis peruvianae Weberbauerianae* followed in 1906, and a third publication, which included an important number of orchids collected by Weberbauer, *Orchidaceae andinae*, was published by Kränzlin in 1916.

After a short two-year interlude as director of the Botanical Gardens in Victoria, Cameroon (then a German colony), Weberbauer returned to Peru in 1908 to take charge of the Zoological and Botanical Gardens in Lima. Unable to return to Germany due to the outbreak of World War I, he resigned from the Gardens in 1914 to pursue more intensive research in the Peruvian Andes. During this period, in 1911 he published his most important work, *Die Pflanzenwelt der peruanischen Anden* (= 'The Vegetation of the Peruvian Andes') (Fig. 74–75).

Between 1917 and 1920, financial difficulties forced him to occasionally work for a mining company in the province of Huaura and occupy teaching posts at the Institute of Lima and the German 'Alexander von Humboldt' high school. However, he had by then already decided to remain in Peru for the remainder of his life. Rudolf Schlechter published his work on the orchid flora of Peru (Schlechter 1921b), based mainly on Weberbauer's collections in the Andes.

In 1922, Weberbauer was appointed to the chair in pharmaceutical botany at the Universidad Mayor de San Marcos, which he held for ten years. During the years 1925 to 1927 and 1929, he travelled across the Andes, studying the flora and collecting plants (Schuhmacher

FIGURE 66. *Ponthieva microglossa* Schltr. Drawing of type. Courtesy of Harvard University Herbaria #001093544.

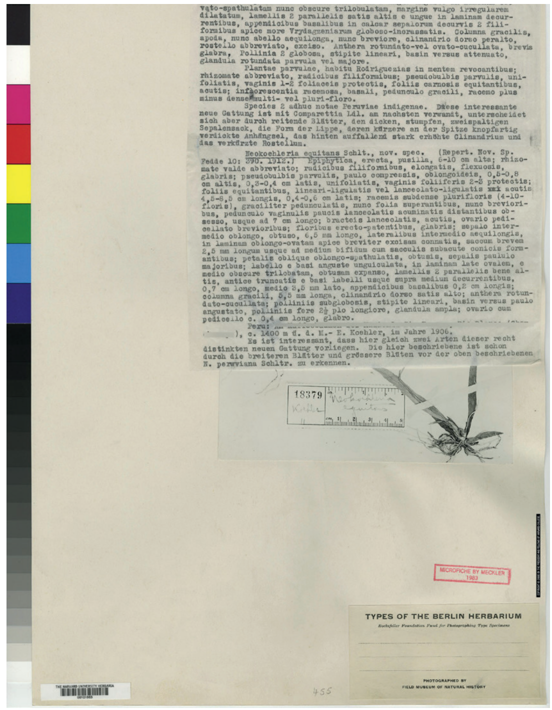


FIGURE 67. Photograph of the type of *Neokoehleria equitans* Schltr., and original description by Schlechter. Courtesy of Oakes Ames Orchid Herbarium, Harvard University.

FIGURE 68. *Neokoehleria peruviana* Schltr. as (= *Comparettia peruvioides* M.W.Chase & N.H.Williams). Photograph by Brent Baker.

FIGURE 69. *Cranichis koehleri* Schltr. as *Cranichis fertilis* (F.Lehm. & Kränzl.) Schltr. Photograph by Lourens Grobler.

& Wolff 2001–2001: 7–9). These excursions were made possible due to his friendship with Francis Macbride, the director of the 'Flora of Peru' program of the Field Museum for Natural History in Chicago (Baca de Garcia 1949). An extensive collection of Weberbauer's specimens, among them many orchids, are, therefore today, part of the Field Museum's herbarium.

Weberbauer travelled through Bolivia, Argentina, and Chile in 1928 and in 1929 to Germany to study his own specimens at the Berlin herbarium. After returning to Peru in 1930, he became head of the Botany Department of the University of San Marcos and remained in this position until the end of his life. During these years, he published a phytogeographical map of Peru

FIGURE 70. Photograph of type of *Lepanthes koehleri*. Courtesy of Field Museum of Natural History # F0BN018372.

FIGURE 71. *Stelis koehleri* Schltr. (=*Stelis superbiens* Lindl.) Photograph by Luis Diego Arias.

FIGURE 72. *Brassia koehlerorum* Schltr. Unknown photographer.

FIGURE 73. August Weberbauer (1871-1948). Photograph by José de la Riva Agüero. Archives of Rudolf Jenny.

and research on various aspects of the Andean vegetation, particularly plant distribution studies, among them his well-known *Phytogeography of the Peruvian Andes* (Weberbauer 1936).

On January 16, 1948, at his funeral, he received the 'Orden del Sol del Perú' (= 'Order of the Sun of Peru') for his scientific achievements. In addition, the cactus genus *Weberbauerocereus* was named by Curt Backeberg in his honor.

Between 1905 and 1916 Fredrich Kränzlin described over 76 new species of orchids collected by Weberbauer. Finally, in 1921, Schlechter described 85 new species collected by Weberbauer (Schlechter 1921b). Of these, we will limit our list to a small selection, naming especially those species named in honor of Weberbauer by Kränzlin and Schlechter. By Kränzlin: *Bulbophyllum weberbauerianum*, *Cochlioda weberbaueriana*, *Elleanthus weberbauerianus* (Fig. 76), *Epidendrum weberbauerianum*

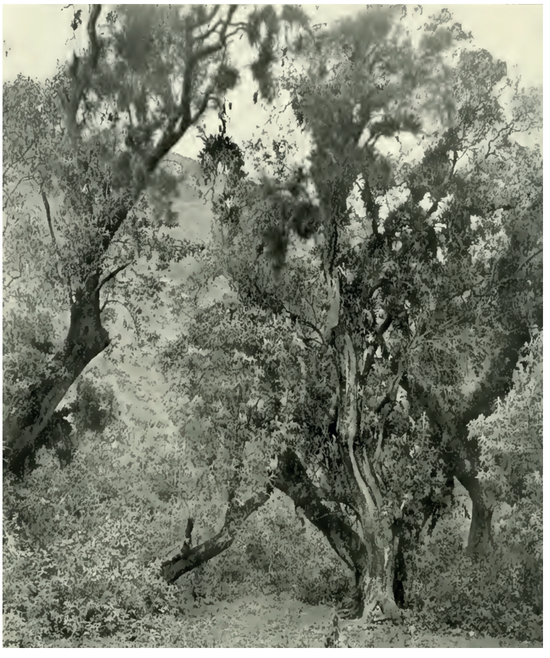


Figure 74. Forest of *Buddleia incana* R. & P. in Conin, valley of Puccha. Photograph by A. Weberbauer (1911), plate XI.

Figure 75. Indian dwelling near Moyobamba. Photograph by A. Weberbauer (1911), plate IIa.

(Fig. 77), *Liparis weberbaueriana*, *Oncidium weberbauerianum*, *Ornithidium weberbauerianum*, *Pterichis weberbaueriana*, *Schomburgkia weberbaueriana* (Fig. 78), *Spiranthes weberbaueri*, and *Vanilla weberbaueriana*. By Schlechter: *Aa weberbaueri*, *Masdevallia weberbaueri* (Fig. 79), *Maxillaria weberbaueri*, *Pelexia weberbaueri*, *Ponthieva weberbaueri*, and *Stelis weberbaueri*.

We assume that Weberbauer was acquainted with Koehler from two collections by Weberbauer in his early years in Peru, *Lanium peruvianum* Schltr. and *Trigonidium peruvianum* Schltr., both collected in La Merced, while he was likely a guest at the Koehler's 'hacienda'.

Weberbauer's specimens can be found in many of the world's herbaria, such as the Botanical Museum in Breslau, Poland, Geneva, Field Museum of Natural History in Chicago, Harvard, Kew, and Paris.

The next and last chapter will relate to Schlechter's network in Bolivia and the other, mostly subtropical South American countries: Argentina, Chile, Paraguay , and Uruguay. The pattern will remain the same: brief geographical and historical outlines of the countries and their orchid history, followed by short biographical notes on the most important orchid collectors directly or indirectly related to Schlechter.

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FIGURE 76. *Elleanthus weberbauerianus* Kränzl. As *Elleanthus graminifolius* (Barb.Rodr.) Løjtnant. In Iconographie des Orchidees du Brésil.

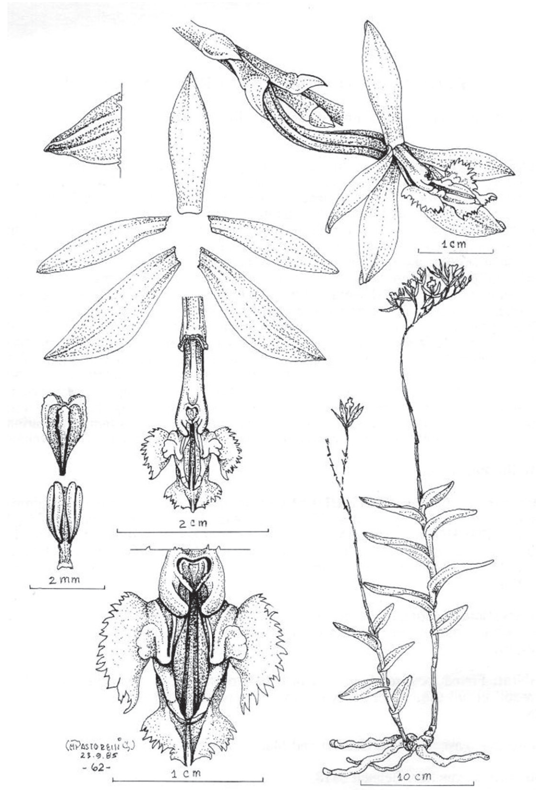

FIGURE 77. *Epidendrum weberbauerianum* Kränzl. Drawing by Pastorelli in Icones Orchidacearum Peruviarum, Plate 254, 1995.

FIGURE 78. *Schomburgkia weberbaueriana* Kränzl. as *Laelia weberbaueriana* (Kränzl.) C.Schweinf. Photograph by Eric Hunt.

FIGURE 79. *Masdevallia weberbaueri* Schltr. Unknown photographer.

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A NEW AND PREVIOUSLY MISIDENTIFIED SPECIES OF *TRISETELLA* (PLEUROTHALLIDINAE: ORCHIDACEAE) FROM SOUTHEAST ECUADOR

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Abstract. *Trisetella pachycaudata*, a new species in the subtribe Pleurothallidinae, was discovered in the Zamora Chinchipe province of southeast Ecuador, and it is described here. *Trisetella pachycaudata* is compared with the most similar species (and others with which it has been confused in cultivation), *T. triglochin, T. strumosa,* and *T. vittata*. It differs from them in the flowers with a much thicker apex of the sepaline tails (the thickest in the genus), and the petals expanded at the labellar margin, with the cuspidate apices erose on the upper margin and entire at the lower margin.

Resumen. *Trisetella pachycaudata,* una nueva especie de la subtribu Pleurothallidinae, ha sido descubierta en la provincia de Zamora Chinchipe al sureste de Ecuador y es descrita aquí. *Trisetella pachycaudata* es comparada con las especies más similares (y con las que se le ha confundido en cultivo) *T. triglochin, T. strumosa,* y *T. vittata.* Se diferencia de estas por producir flores con los ápices de las caudas sepalinas más gruesas en comparación con cualquier otra especie conocida del género, los pétalos expandidos hacia el margen labelar, con el margen superior eroso mientras el margen inferior es entero y cuspidado.

Key words / Palabras clave: *Trisetella strumosa*, *Trisetella triglochin*, *Trisetella vittata*, Zamora Chinchipe

Introduction. The first species of *Trisetella* was described as *Masdevallia triaristella* Rchb.f. by Gustav Reichenbach in 1876. Due to the particular morphological features of this species compared to the rest of the members of *Masdevallia*, Reichenbach created a new subdivision for this particular species called *Triaristellae* described in *Masdevallia* a total of five species in what is now known as *Trisetella* (Luer 1989). Besides this group of weird *Masdevallia* species, Kränzlin included in the *Triaristellae* group, a couple of species belonging to *Barbosella* Schltr. (Luer 1989). In 1976, Brieger recognized all the species included in the *Triaristellae* subdivision as belonging to a new genus (Brieger 1975). However, the name *Triaristella* was already used for a group of fossil fungi, so it was replaced with *Trisetella* in 1980 by Luer (1980, 1989).

The species of *Trisetella* are recognized by the small to tiny plants with thick, sometimes terete, leaves, the slender inflorescences are successively few-flowered and congested racemes are born low on the ramicaul. All the species have sepaline tails, and, except for *T. hoeijeri* Luer & Hirtz, all the species have the lateral sepals completely connate into a more or less concave synsepal. In addition, all the species have a lip cleft to the column foot with two lobes towards the base and two to five longitudinal carinae in the disc (most of the species have two). There is molecular evidence that *Trisetella* forms a monophyletic clade, supporting its recognition as a good genus (Luer 1989, Karremans 2016)

Orchid species from Ecuador are commonly illegally exported for cultivation even before the species are described. The names given by the exporter to these species are normally based on the morphological similarity to other known species. This is the case with *Scaphosepalum tarantula* Baquero & Hirtz (sold as *S. fimbriatum* Luer & Hirtz *"pink"*), *S. luannae* Baquero [sold as *S. breve* (Rchb.f.) Rolfe *"pink"*], *Platystele baqueroi* Jost & Iturralde [known as *P. caudatisepala*

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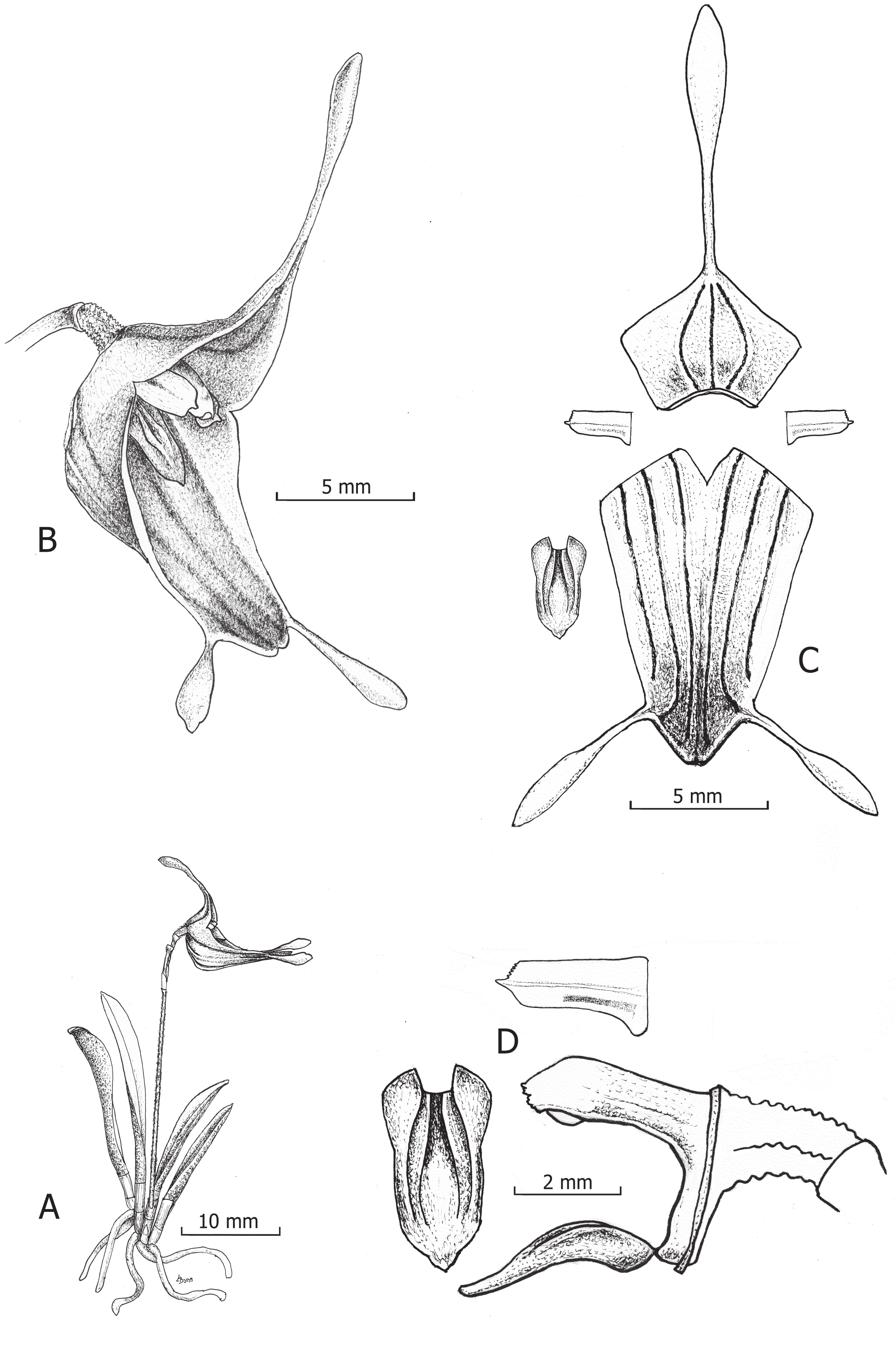

FIGURE 1. Illustration of *Trisetella pachycaudata* Mogrovejo-Herrera & Baquero. **A**. Habit. **B**. Flower. **C**. Dissected perianth. **D**. Side view of column and lip, adaxial view of lip and petal. Drawn by Luis E. Baquero from the holotype (*LB 3139*).

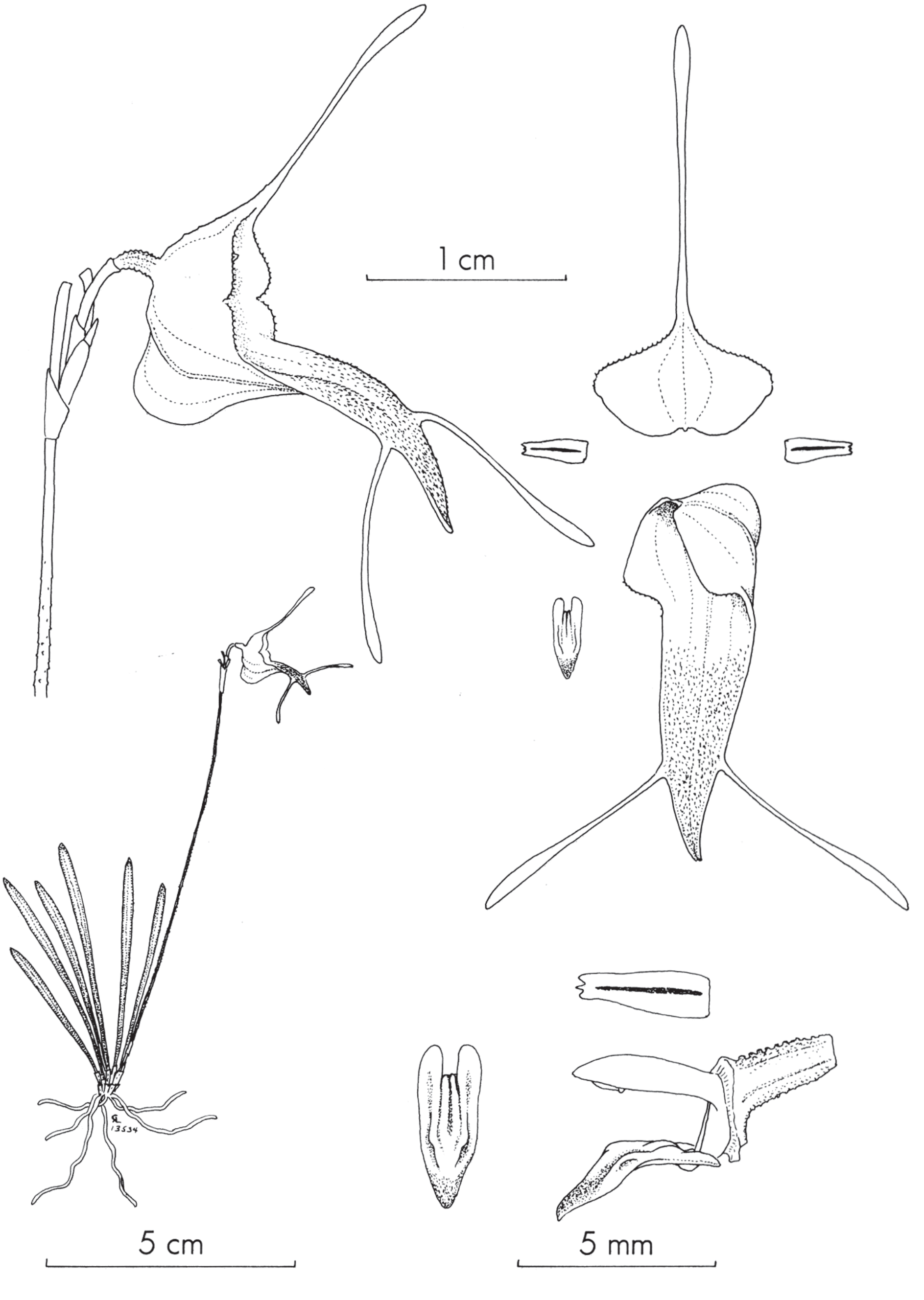

Figure 2. Illustration of *Trisetella strumosa* by C. Luer, taken from the Systematics of the genus *Trisetella*: Monographs in systematics botany of the Missouri Botanical Garden, volume 31, plate 16. Reproduced with kind permission of Missouri Botanical Garden Press.

(C.Schweinf.) Garay in cultivation] and *Dracula trigonopetala* Gary Mey. & Baquero [sold as *D. radiosa* (Rchb.f.) Luer], to name a few (Meyer *et al*. 2012, Jost & Iturralde 2017, Baquero *et al*. 2018, Baquero 2019). Also, according to Yeager *et al*. (2020), about twice the number of plants of *Lepanthes* Sw. exported out of Ecuador up to 2016 belong to unidentified species (including new species to science) versus the total amount of plants belonging to identified species of *Lepanthes*. Nevertheless, several new species of Ecuadorian orchids are not always exported as misidentified species intentionally and are due to common taxonomic errors in complex groups.

The new species of *Trisetella* from southeast Ecuador, treated here, is not an exception; it was exported out of this country and it has been misidentified in cultivation as *T. triglochin* (Rchb.f) Luer, *T. strumosa* Luer & Andreetta, or *T. vittata* (Luer) Luer. However, plants of this species have recently been discovered growing in nature, and the species is described here and compared to other similar species.

Materials and methods. Material of the new species was collected in Ecuador during a research on orchids of the Cordillera del Cóndor, under Research Permit No. 008-2016-IC-FLO-DNB/MA. Specimens were cultivated and photographed in the Jardín Botánico de Quito, Ecuador. Fresh flowers were preserved in 70% ethanol and 1% glycerol. Living and stored material were examined for morphological and taxonomic comparisons, the taxonomic revision of *Trisetella* by Luer (1989) and other original descriptions from related species were reviewed and compared. Digital images were taken with a Nikon D5100 camera with an AF-S Micro Nikkor 60 mm lens.

Taxonomic treatment

Trisetella pachycaudata Mogrovejo-Herrera & Baquero, ***sp. nov.*** (Fig. 1–4)

TYPE: Ecuador. Zamora Chinchipe: between Palanda and Zumba: 4° 38' 18" S, 79° 19' 415" W, 1968 m, 25 Jan 2017, *L. Baquero 3139* (holotype, QCNE).

Diagnosis: *Trisetella pachycaudata* is similar to *T. strumosa* Luer & Andreetta, from which it differs in the small plant, up to 22 mm (*vs*. medium in size, up to 50 mm in size), the entire sepals (*vs*. and minutely ciliate), transversely ovate dorsal sepal (*vs*. transversely obovate), glabrous sepals with raised veins (*vs*. minutely short-pubescent veins not raised), the lateral sepals connate into a concave synsepal (*vs*. connate into a retrorse synsepal with a basal mentum), thickly clavate tails of the sepals (*vs*. clavate), petals oblong dilated at the base of the labellar margin (*vs*. oblong-ovate), the apex of the petals truncate, cuspidate, erose at the upper margin, and entire at the lower margin (*vs*. truncate, tridentate), lip rose-colored channeled at the center of the disc (*vs*. not channeled disc), and the clinandrium crenate (*vs*. entire) (Fig. 2–4).

Plant small, up to 25 mm, epiphytic, caespitose, roots slender 0.5 mm thick. *Ramicauls* 3 mm long, enclosed by 2–3 tubular sheaths. *Leaf* olive-green adaxially, speckled with purple abaxially, erect, linear, conduplicate, fleshy, semiterete, apex acute minutely retuse at the tip, wedge-shaped at the base 13–22 × 2.0–2.3 mm. *Inflorescence* a few-flowered (2–3), congested, successive raceme, with an erect, slender, verrucose peduncle 24 mm long, with a bract close to the base, from low on the ramicaul, floral bracts 1.7 mm long, pedicel 4.5– 5.7 mm long, ovary 1.8 mm long, verrucose. *Dorsal sepal* waxy yellow, suffused with red-brown, glabrous, transversely ovate, concave, 7.0 × 5.6 mm, with three dark red-brown veins, raised internally from the base towards the middle of the blade, connate to the lateral sepals for 3.8 mm to form a sepaline cup, margins entire with a thick, clavate yellow tail 6.7–7.1 mm long. *Lateral sepals* waxy yellow, suffused with red-brown from the apex towards 3/4 of its length, with six dark red-brown veins raised internally from the base towards the apex, concave, 11.9 × 8.9 mm, connate for 10.9 mm into an emarginate synsepal, with a 4.5 mm long mentum, narrowing from the base towards the apex, entire margins with a pair of yellow, thickly clavate tails produced laterally 5.3 mm long. *Petals* translucent yellow, suffused with a purple line slightly below the midvein, which extends for two-thirds of the length of the petal, concave, oblong, broadly dilated at the base of the labellar margin, 2.6 × 1.4 mm, with apex truncate, cuspidate, erose at the upper margin, and entire at the lower margin. *Lip* rose-colored, oblong-ovate, 3.2 × 1.4 mm, with a pair of slightly inflexed, thickened lobes at the base, the apex narrowly obtuse and thickened, the disc with a low pair of longitudinal carinae extending from the base of the lip towards the middle, separated by a wide central channel, flanked by another, thicker pair of low, longitudinal carinae, extending for two-thirds of the length of the lip, channeled centrally, the cordate base hinged to the compressed apex of the column foot. *Column* yellowish-green suffused with rose, clinandrium crenate, semiterete, 2.9 mm × 0.7 mm, the foot 1.6 mm long. *Pollinia* and *anther cap* not seen.

ETYMOLOGY: From the Greek *pachy* "thick" and Latin *caudatus* "caudate, ending with a tail-like appendage", in reference to the thick (the thickest know for the genus) sepaline tails.

HABITAT AND CONSERVATION STATUS: *Trisetella pachycaudata* was found in southeast Ecuador growing in a cloud forest of the Cordillera del Cóndor, between Palanda and Zumba. The southeast Ecuador is the area with the highest diversity of the genus *Trisetella,* with ten described species (Luer 1989). *Trisetella strumosa* is known from further north, Morona Santiago Province, *T. vittata* is restricted to the western Andes of Ecuador, and *T. triglochin* is a widely distributed species that has not been found growing sympatrically with *T. pachycaudata* (Luer 1989). Currently, the Cordillera del Cóndor is extensively affected by mining activity due to government concessions and illegal mining. Although *T. pachycaudata* has not been witnessed to be affected directly, its populations are considered to run a high risk of extinction due to the destructive nature of imminent mining activities. Very close to where the plants of *T. pachycaudata* were discovered growing, illegal mining (developed by local people) takes place and was observed by the authors. An excellent example of a threatened species is the recently described *Lepanthes vere-aurum* Baquero & Donoso. The type locality of this species has been logged, and the population disappeared (Baquero *et al*. 2020).

TAXONOMICAL NOTES: *Trisetella pachycaudata* has been exported and grown outside of Ecuador by hobbyists under different names (*T. strumosa*, *T. triglochin*, and *T. vittata*) (Fig. 3). In general terms, *T. pachycaudata* is immediately recognized by a unique combination of morphological characters: the clavate tails of the sepals with the thickest apex in the genus, waxy yellow at the base synsepal, suffused with red-brown towards the apex and with dark red-brown veins raised internally from the base towards the apex, a rosy lip with four longitudinal carinae at the disc, with the two central carinae separated by a wide central channel, and a crenate clinandrium (Fig. 1–2, 3F).

Trisetella pachycaudata is not a member of the *T. triglochin* species-complex because of the conspicuously verrucose peduncle (occasionally slightly or sparsely scabrous in *T. triglochin*), the veins raised internally from the base towards the apex at the adaxial side of the synsepal (absent in *T. triglochin*), the clavate tails extremely thick at the apex (in *T. triglochin* some populations have clavate tails but not as thick as in *T. pachycaudata*), the petals broadly dilated at the base of the labellar margin, erose at the upper margin and entire at the lower margin, the acuminate apex (the base of the petals not broadly dilated in *T. triglochin* with the apex erose to tridenticulate), and the lip with four longitudinal carinae at the disc (2 carinae in *T. triglochin*) (Fig. 1–3). *Trisetella pachycaudata* is different from *T. strumosa* in having thicker apices of the tails and the absence of a retrorse mentum, and a glabrous synsepal compared to the minutely short-pubescent synsepal of *T. strumosa*. The petals of *T. pachycaudata* are broadly dilated at the labellar margin, erose at the upper margin, and entire at the lower margin at the cuspidate apex vs. the petals of *T. strumosa*, which are oblong and tridentate at the apex. Also, *T. pachycaudata* has a rosy lip with a wide central channel at the middle of the disc, different from the red-brown lip with a cramped, central channel (Fig. 3). Although the veins of the synsepal in *T. pachycaudata* are reminiscent of what is seen in *T. vittata*, the tails of the synsepal in both species are born from different parts, directly from the apex in *T. vittata* and laterally in *T. pachycaudata*. Again, the extremely thick apices of the sepaline tails in *T. pachycaudata* separate it from *T. vittata* (Fig. 3).

The thick broadenings of the apices of the sepaline tails in *T. pachycaudata* (Fig. 2) are similar to the osmophores on the dorsal sepal and petals of

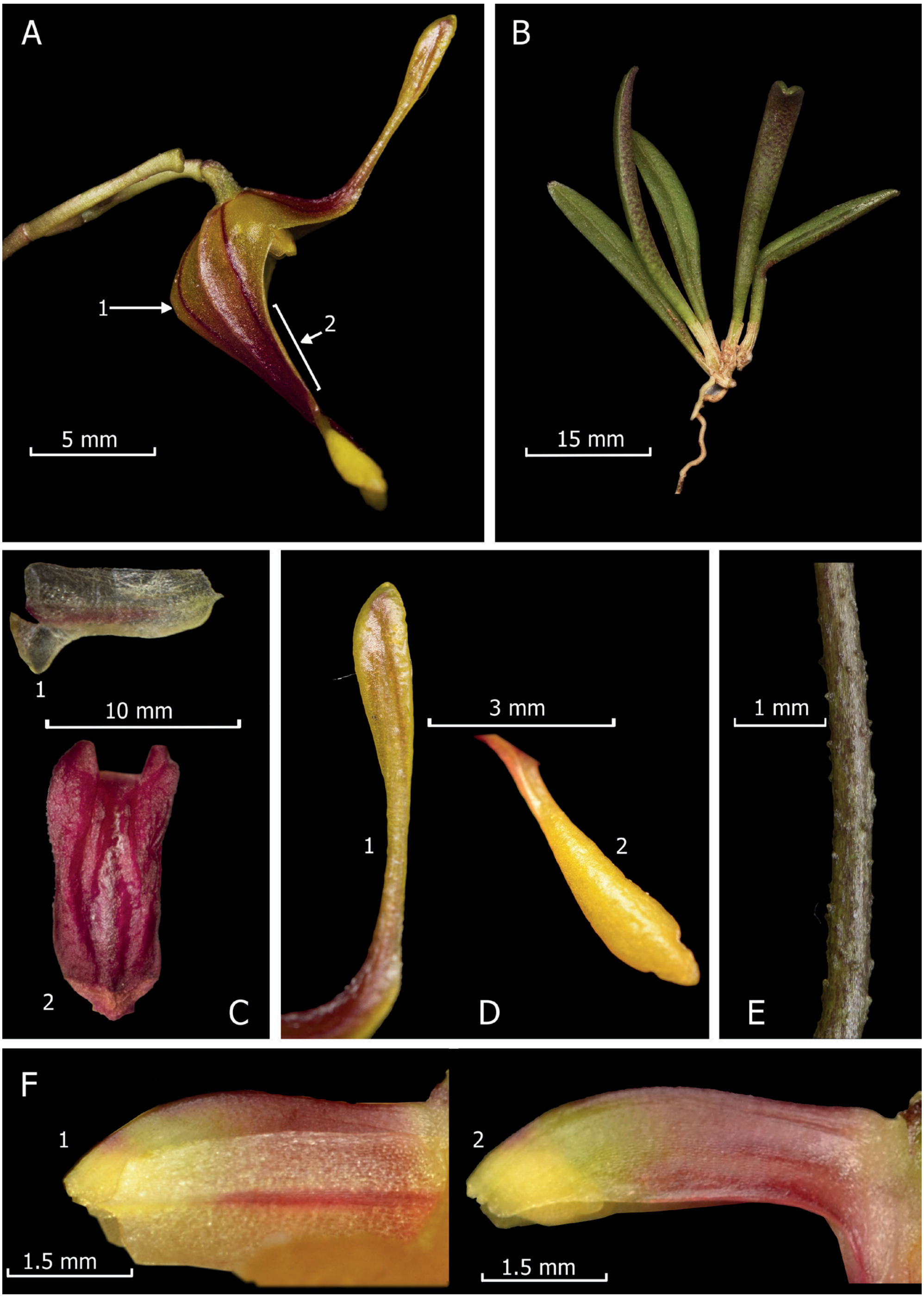

FIGURE 3. *Trisetella pachycaudata* Mogrovejo-Herrera & Baquero. **A**. Flower, side view, A1. Mentum of the flower, A2. Entire margin of the sepals. **B**. Plant. **C**. Adaxial view of a petal (1) and the lip (2). **D**. Thickened tails of the sepals, D1. Tail of the dorsal sepal, D2. Tail of a lateral sepal. **E**. Verrucose peduncle. **F**. Lateral view of the column and petal: F1. crenate clinandrium and apex of the petal; F2. Lateral view of the column with the crenate clinandrium withouth the petal. Photos by Luis E. Baquero from the holotype (*LB 3139*).

FIGURE 4. Comparison of *Trisetella pachycaudata* Mogrovejo-Herrera & Baquero with the most similar species (and species it has been confused with). **A**. *Trisetella pachycaudata.* **B**. *Trisetella strumosa* Luer & Andreetta. **C**. *Trisetella vittata* (Luer) Luer. **D**. *Trisetella triglochin* (Rchb.f) Luer. Photos by Luis E. Baquero (A, from the holotype, C and D) and Thomas Ditlevsen (B).

some species of *Restrepia* Kunth (Millner & Baldwin 2016). Dressler (1993) defined the osmophores as floral glands specialized in the biosynthesis and secretion of floral fragrances. Also, osmophores are often involved in deceptive pollination in the Pleurothallidinae (Millner & Baldwin 2016). According to Pridgeon & Stern (1983), osmophores may enable the pollinator to locate flowers by scent trails, increasing as the insect approaches the flower. No studies could confirm the presence of osmophores in *Trisetella* but the morphology of the thickened apices of the tails in several species resemble such. More studies need to be developed, but in the case that these structures are osmophores, we speculate that the thickness and shape of the tails could be regarded as diagnostic characters, considering the ecological and evolutionary implications of differences in the flowers' interactions with their pollinators.

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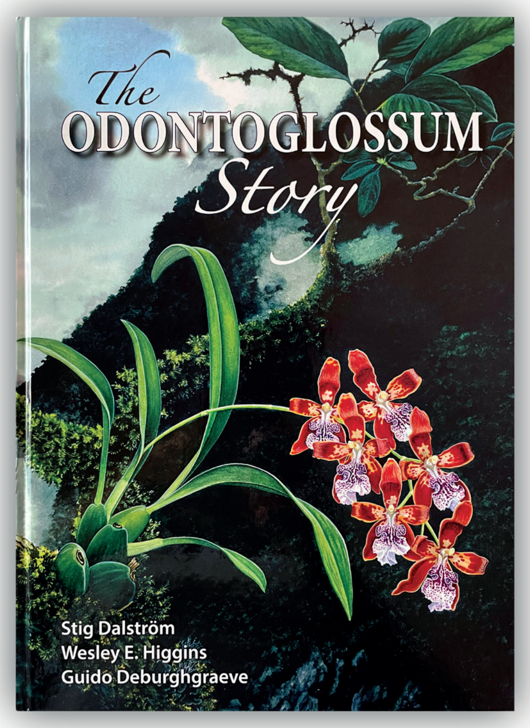
BOOKS

The *Odontoglossum* Story, by Stig Dalström, Wesley E. Higgins & Guido Deburghgraeve. Koeltz Botanical Books, Oberreifenberg (Germany) and Stig Dalström, Sarasota (U.S.A.), 2020. ISBN: 978-3-946583-27-1. Large *in-octavo* volume (30 × 22 cm), 782 pages, more than a thousand color illustrations, with dozens of botanical drawings. Hardbound. Price: 194,74 € (EU buyers); 182,00 € excl. VAT (Other buyers); 227,50 US$). Ordering: https://koeltz.com



There are books that resemble their authors. In the case of literature this is, perhaps, the rule, but in systematic botany it is a much rarer occurrence. "The *Odontoglossum* Story" bears a striking resemblance to Stig Dalström. I say this, of course, as a great compliment because in the often somewhat arid and impersonal world of botanical monographs, Stig's original ideas and personal views make the book a breath of fresh air. But, on the other hand, it is perhaps right to admit that since the beginning of this book, starting with its genesis and the chosen words of the title, "The *Odontoglossum* story" doesn't seem to be strictly a systematic monograph. I say "strictly" because the book contains, in fact, also a systematic monograph of the genus *Odontoglossum*.

Dalström is a botanist like those that were made in the good old days. A prepared, curious, patient, refined observer and even more selective illustrator, a friend of the dusty works in herbarium and in historical literature, a good and prolific storyteller, with that pinch of adventurer, deeply in love with his object of study and continuously opening the way to new discoveries. I add, because in exploratory botany this is as important as knowledge, with a marked "gift for people" that has allowed him to create and maintain a network of friendships and collaborations at all levels and in the countries he has known and explored. His book, a synthesis of at least thirty years of exploration, observation, and study, is also a synthesis of the Stig Dasltröm that friends love and that his many readers appreciate all over the world.

It is no coincidence that, even if Dalström is the main author of this volume, indeed the chief and most important author, he also welcomed interventions by some of his friends who have enriched the book with their specific experiences in the fields of botanical history and horticulture, molecular systematics, ecology, traditional and under artificial light cultivation. Wesley E. Higgins and Guido Deburghgraeve share with Stig the honor of being co-authors of this important work, but the list of contributors includes resonant names such as those of Phillip Cribb, Alex Hirtz, Peter Sander and Gerhard Vierling, to name but a few.

Thirty years after the publication of the only other monograph of the genus *Odontoglossum* (Bockemühl 1989), "The *Odontoglossum* Story" represents an epochal event for the study of oncidioid orchids. The worldwide COVID-19 pandemic has delayed our review of this beautiful book. Despite being published just after Christmas 2020, our copy of "The *Odontoglossum* Story" only arrived at Lankesteriana's editorial office recently. Physically, this is a beautifully published book. Despite its nearly 800 pages, Koeltz managed to pack it in a still manageable format, printing it on a rather thin semi-matte coated paper, without sacrificing the quality and variety of the illustrations, both in color and in black and white, which complement the texts. The hard cardboard cover, without dust jacket, covered with a scratch-proof transparent coating, shows on the front and back two of Dalström's rightly famous watercolor illustrations (*Odontoglossum deburghgraveanum* and *O. harryanum*, respectively); the spine is slightly curved, as in the tradition of the best bound books, to facilitate opening and to ensure that the pages remain flat on the desk once opened.

There are 96 pages of text and illustrations that precede the actual monograph. Another 20 pages, including a chapter on "Oddballs and Pecularities", one on the authors' bios, a glossary, abundant cited literature, acknowledgments, and index, follow the monograph.

There is a short chapter in the Introduction dedicated to "What is a species?", an exciting and often controversial topic. Dalström deals with it in a personal way, but I have the impression that he has kept himself quite distant from the "heart" of the problem, even speaking strictly of *Odontoglossum*. Instead, what is really welcome is the author's discussion regarding his decision to adopt a given *Odontoglossum* circumscription, versus the proposal to submerge the genus in the broadest definition of *Oncidium*. Dasltröm had already approached this topic in the past, presenting some of the reasons that lead him to prefer a taxonomic and nomenclatural distinction between the two genera (Dalström 2012, Dalström & Higgins 2016). But in this case, he treats the topic in a broad and general perspective, presenting his conclusions based on the analysis of all the evidence at his disposal and including, among others, his interpretation of the phylogenetic tree derived from the analysis of molecular sequences presented by Neubig *et al.* (2012) and were used as basis to treat *Odontoglossum* as part of *Oncidium*. It is clear that Dalström's interpretation, which has its roots in an intimate knowledge of the morphology and ecology of the genera related to *Oncidium*, doesn't collide with the molecular data but rather represents a different – and in my opinion legitimate – interpretation of those data, and it constitutes a solid rationale for the monographic treatment of the genus and for the nomenclatural changes needed to reflect its systematics according to the author's views.

Two other interesting introductory chapters dedicated to "The Rise of *Odontoglossum*" (by P. Cribb) and "*Odontoglossum* at St. Albans", a saga of the Sander dynasty (by P. Sander), both beautifully illustrated with the delicate watercolors of the past, offer profound insights on the history of this genus, which certainly during the late nineteenth and early twentieth centuries enjoyed a reputation among horticulturists and the wide audience incomparable with those of today.

The systematic monograph is organized into six sections, with 16 series, and a chapter on natural hybrids. Each section chapter begins with a dichotomous key to series and species. Unfortunately, the treatment is not preceded by a general key to the different sections, so that to identify a given species it is necessary to go through the dichotomous keys of the six sections one by one. However, such a key is provided as a PDF document that can be downloaded for free within the web page presenting the book at Koeltz's web site. The document has the same size and layout as the monograph. It is advisable to have it printed and physically inserted into the books at the beginning of the taxonomic treatment.

Within each section, species treatments are arranged according to series, introduced by convenient photographic synopses, so that the morphologically similar species are close to each other. Species are then arranged not alphabetically but according to their appearance in the dichotomous key. Each species is presented with information on the type (types are cited for all synonyms), a general discussion, full description, notes on habitat and phenology, material seen, etymology, and pertinent literature. For each species, a full-page botanical illustration is provided, mostly done by Dalström himself, often accompanied by Lankester Digital Composite Plates, and several photographs showing variation, plants in their habitats, and images of people variously related with that given taxon. From what I was able to judge, the list of synonyms under each species treatment is verified by the author and virtually complete.

The last systematic chapter, devoted to natural hybridization, is also extremely interesting. Nine natural hybrids are documented, mostly illustrated with informative botanical drawings, and comparative photographs showing the hybrid flowers side by side with those of their putative parents. Such a treatment suggests both that the role of natural "mistakes" is probably greater than suspected in the evolutionary history of the genus, and that a strictly morphologically-based taxonomy can be a true nightmare in this specific groups of plants...

The ammount of first-hand information packed into this book is prodigious. It offers great additions and suggestions on the natural history, distribution, expected variation, and key characters for identifying the different species, but also significant insights about the author's methodology of study and the rationale behind his taxonomic decisions. The profusion of photographs is a delight and will prove of great utility for all those concerned with this taxonomically difficult genus, particularly in those regions where it presents the greatest diversity.

From the perspective of the treatment of the Costa Rican flora (which is quite poor in *Odontoglossum*), the reduction of *Odontoglossum obryzatum* (aka *Oncidium klotzschianum*) under the concept of *Odontoglossum pictum*, originally described from the region of Cauca in Colombia, caught my attention.

I clearly don't have enough words to praise this fundamental work, which certainly shouldn't be missing in any library specializing on neotropical flora, nor in those of the many enthusiasts who appreciate these once very precious orchids or, more generally, oncidioid orchids and their more than exuberant variety.

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Bockemühl, L. (1989). *Odontoglossum, a Monograph and Iconograph*. Hildesheim, Germany: Brücke Verlag.

Dalström, S. (2012). New combinations in *Odontoglossum* (Orchidaceae: Oncidiinae) and a solution to a taxonomic conundrum. *Lankesteriana*, 12(1), 53–60.

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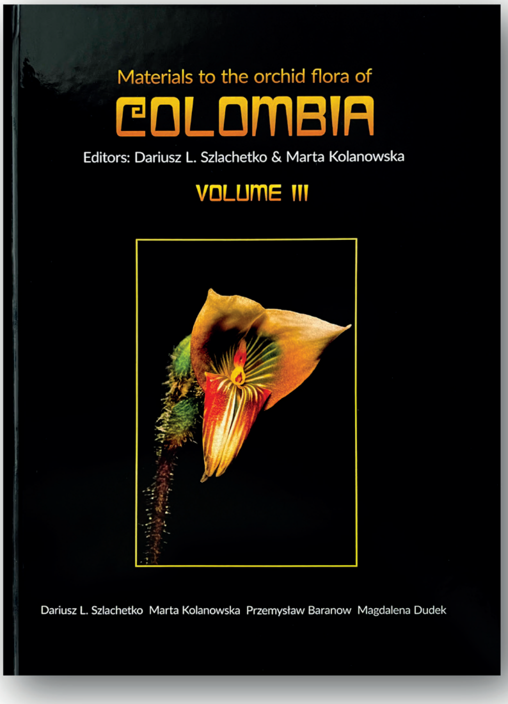
Neubig, K. M., Whitten, W. M., Williams, N. H., Blanco, M. A., Endara, L., Burleigh, J. G., Silvera, K., Cushman, J. C. & Chase, M. W. (2012). Generic recircumscriptions of Oncidiinae (Orchidaceae: Cymbidieae) based on maximum likelihood analysis of combined DNA datasets. *Botanical Journal of the Linnean Society*, 168, 117–146.

Materials to the orchid flora of Colombia. Vol. III. Orchidaceae. Spiranthoideae-Cranichideae, Vanilloideae, by Dariusz L. Szlachetko, Marta Kolanowska, Przemyslaw Baranow & Magdalena Dudek (D. L. Szlachetko & M. Kolanowska eds.). Oberreifenberg, Germany, Koeltz Botanical Books, 2020. ISBN 978-3-946583-29-5. Large volume *in octavo*, 22 × 30 cm. 580 pages, 288 colour photographs, 466 line illustrations, 73 maps. Hardcover. Price: 176,00 € (EU buyers); 164,86 € excl. vat (other buyers). Orders: https://koeltz.com



The volume represents the third of a series of twenty planned volumes dedicated to what is, to date, the most diverse orchid flora on the planet. The venture has so far given birth to two previous volumes, published in 2017 and 2019, dedicated respectively to the families Cypripediaceae and Orchidaceae subfamilies Orchidoideae (tribe Orchideae), Tropioideae, and Spiranthoideae (tribe Goodyereae) (Volume I) and five subtribes of the tribe Spirantheae (Prescottiinae, Spiranthinae, Discyphinae, Stenorrhynchidinae, and Cyclopogoninae) in subfamily Spiranthoideae (Volume II). The present volume completes the treatment of subfamily Spiranthoideae, with the tribe Cranichideae, and presents a treatment of subfamily Vanilloideae. As many of our readers will be able to observe even from this summary of the groups treated in the volumes published so far, the suprageneric systematics used in the work doesn't currently have wide acceptance outside the academic circle of the editors of this flora, and in some cases boldly collide with the evidence provided by the analyses of molecular data.

The book begins without preambles, which were included in the previously published parts. Before starting the systematic treatment of the subtribe Cranichidinae (the only one belonging to the tribe Cranichideae, according to the author's scheme), there is a short paragraph of acknowledgments (mostly to herbaria staff and to the 46 individuals who agreed to have their photographs used in the book) and an index of the new taxa (18 new species and one new combination) and the lectotypyfications proposed in the work. Particularly worthy of note is the proposal of four species of *Sobralia* and the lectotypification of another seven species. Contrarily to what has been shown by several phylogenetic analyses of the Orchidaceae based on molecular data, where the tribe Sobralieae is placed together with the Tropidieae among the basalmost nodes of the Epidendroideae, sister to the basal Neottieae, the authors of the present treatment include Sobraliinae (with the only genera *Sobralia* and *Brasolia*) in tribe Arethuseae, as one of the four subtribes of subfamily Vanilloideae. Similarly, also included within Vanilloideae, and accordingly treated in this volume, are other basal members of the Epidendroideae, such as the genera *Palmorchis* (of tribe Neottieae), *Monophyllorchis*, *Psilochilus*, and *Triphora* (of tribe Triphoreae), *Uleiorchis* (tribe Gastrodieae), and *Wullschlaegelia* (tribe Wullschlaegelieae). Until a general index of the genera discussed in the work is available, finding the treatment of these "misplaced" groups may be less than convenient.

For each subtribe, a short description and a useful key to the genera are provided, followed by the treatments of the single genera. These include a large bibliographical list of the previous systematic treatments arranged by year, a description of the genus, a key to the "groups of species" when requested, and finally, a key to the species. Within each genus, species are arranged alphabetically according to their "group". For both the species and their proposed heterotypic synonyms, type information is limited to the country and collector, without specific reference to the type locality. A full description, ecology, distribution, a list of the representative specimens studied, and miscellaneous notes are provided for each taxon. Every species is also illustrated with a diagram of the sepals, petals, and lip, more rarely of the column and occasionally of the habit. These were prepared in part from drawings associated with the original material or from exsiccata preserved in various herbaria. In several cases, the illustrated material is not from the concerned region of study or reproduced from works devoted to the orchid floras of different areas. Also, the proposed new species, mostly based on a single or a few dried specimens, are illustrated by relatively schematic floral analyses.

A selected list of references, an Index of scientific names, and an Index of the numbered collections cited conclude the text. A section of maps follows, with 73 black and white maps of northern South America, where the distribution of species representative of the various supragenetric taxa is shown, including not only Colombia but also the other Andean countries, Brazil, the Guyanas, and some countries from the Central American isthmus.

Then there is a section of "Plates", with 288 color photographs printed on coated paper. Being the work of so many different authors, the quality of the photographs is obviously quite uneven, but in their large majority, they are useful and illustrative of the depicted species. My major concern about these photographs is the provenience of the portrayed plants, which is not specified in the captions. The reader could perhaps imagine that the images loaned by Alex Hirtz were likely taken in Ecuador and those by Gustavo Romero in Venezuela, but for many of the other photographers this essential information is not available.

I must confess that a work of this nature, which purports to clarify the diversity of orchids of the most diverse country on the planet with limited access to natural populations and the intrinsic variability of the species, leaves me honestly perplexed. I can recognize the effort, but I find it hard to understand how the interpretation of such a diversity of organisms can still be based, with the availability of scholars and local institutions, on the study of dried and deformed specimens, without the curiosity to observe (and possibly document) at least a living individual characteristic of a particular species. In short, I still have doubt as to what the real contribution of such a work is. On which and how many individuals are the descriptions based? How "typical" of a given species is the specimen of which some floral parts have been schematically illustrated? What exactly are the photographs referring to? If they are not Colombian plants, with what rationale were they used? How have heterotypic synonyms been included, especially when they are based on types originally collected in Colombia?

This third volume of the series, like the two that preceded it, certainly can't be ignored, due to the enormous effort it represents to collect, gather, and present in a uniform way a mass of information scattered in a disorderly manner in a myriad of books, magazines, herbaria, museums. As such, it undoubtedly represents a contribution to the knowledge of Colombian orchids, but I believe it is still very far from being the beginning of a true orchid flora of that rich country.

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