

**Introduction.** The orchid flora of Panama is one of the most diverse in the Neotropics. The early efforts to understand this family were ephemeral and made by European explorers or expeditions passing through the isthmus on the route to North or South America. James Wallace in 1700 was perhaps the first plant collector in Panama. Wallace collected in the settlement of New Caledonia, on the Atlantic coast of the Kuna Yala (now Punta Escocés and Isla de Oro), in a failed attempt of Scotland to colonize lands in the New World. However, these specimens were not studied by the botanists at the time and no orchid species based on those collections are recorded or mentioned in literature (Wallace 1700-1701). The first documented record of an orchid in Panama was an illustration of *Catasetum* sp., made by Joseph Guío, illustrator of the expedition led by Alessandro Malaspina between 1789 and 1794. The illustration was based on a collection by Louis Néé on Taboga Island in December 1790 (Fig. 1). One of the

earliest mentions of an orchid collected in Panama in a floristic treatment was made by Beurling (1800-1866), in the “*Primitiae florum Portobellensis*” who cited a specimen of *Brassavola nodosa* Lindl., a plant collected “*in rupibus extimis ad introitum portus*” by J.E. Billberg in 1826 (Fig. 2). However, the first descriptions of new species based on collecting expeditions in Panama were published subsequent to the exploration of Hugh Cuming (Fig. 3A) for the nursery firm of Messrs Loddiges of Hackney. Around 1829-1831 he collected in some areas of the Pacific coast such as Taboga Island, the Las Perlas Archipelago (Pearl Islands), Bay of Montijo and Chiriquí River. Although several of his collections were made at these sites and others on the Pacific coast of Colombia, almost all herbarium specimens were labeled “*Panama et Columbia occidentalis*”. Lindley (1830-1840) described some of these collections: *Aspasia epidendroides*, *Dichaea panamensis*, *Hexisea bidentata* and *Oncidium ampliatum* (Fig. 4). Another



FIGURE 1. Left, Alessandro Malaspina (1754-1810). Navy Museum, Madrid. Right, The first documented record of an orchid in Panama: *Catasetum* sp. Illustration by José Guío in Real Jardín Botánico de Madrid, 1989: plate 137.

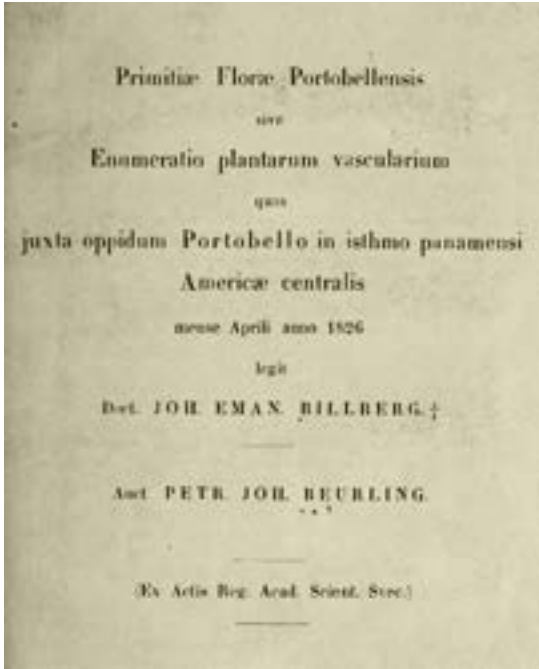


FIGURE 2. Cover of “*Primitiae florae Portobellensis*” by Beurling (1800-1866)

expedition that reached Panama and Taboga Island was *The Voyage of the HMS Sulphur* between 1836-1842. The botanical collections were led by Andrew Sinclair, George Barclay and Richard B. Hinds (1812-1847). A few collections of orchids, including *Lockhartia*

*micrantha* Rchb.f., *Oncidium stipitatum* Lindl. ex Benth. and *Ornithocephalus bicornis* Lindl. ex Benth., were reported (Hinds 1844, Reichenbach 1852). They also correspond to the first orchid species described from Central America (Fig. 5). These species are typical of coastal areas, indicating that explorations did not penetrate deep into Panama.

Berthold Seemann was another of the pioneer explorers and the author of the work entitled *Flora of the Isthmus of Panama* published in 1854. In 1846 he undertook his first exploration to Panama under *The Voyage of the H.M.S Herald during the years 1845-1851* (Seemann 1852-1857). He explored Chagres, Panama City, Coiba Island, Chiriquí and Darién (Fig. 3B). Seemann (1854) managed to accumulate a total of 104 species of Panamanian orchids.

However, the first plant collector to undertake a serious expedition into the interior was Josef Ritter von Rawicz Warscewicz (Fig. 3C). In 1848, he crossed the intricate Cordillera de Talamanca, starting in the Pacific at David, Chiriquí, ascending towards Dolega to Boquete and Volcán Barú (the highest elevation of Panama) and finishing at Laguna de Chiriquí Grande on the Caribbean (Savage 1970, Fig. 6). Warscewicz (1850) recorded 18 species mainly from Chiriquí and Veraguas. Later, Reichenbach (1866) recorded 63 species that were collected by Warscewicz in Panama. Of them, 34 species and one variety were described



FIGURE 3. Hugh Cuming (1791-1865). From a lithograph by Hawkins, 1850. Courtesy of Rudolf Jenny. B — Carl Berthold Seemann (1825-1871). From *Gardeners' Chron.*, 1871. Courtesy of the Hunt Institute for Botanical Documentation C — Josef Ritter von Rawicz Warscewicz (1812-1866). Courtesy of the Hunt Institute for Botanical Documentation



FIGURE 4. Type specimen of *Oncidium ampliatum* Lindl., collected in “Panama et Columbia occidentali” by H. Cuming in 1831. Reproduced with permission by the Board of Trustees, Royal Botanic Gardens, Kew.



FIGURE 5. *Peristeria elata* Hook., the National Flower of Panama described in 1831 by Sir William Jackson Hooker. Taken from the *Curtis's Botanical Magazine*, t. 3116.

as new to science (Reichenbach 1852, 1854, 1866). Warszewicz returned to the country in 1851 and was the first to introduce living orchid plants from Panama to Europe. Then, William Hemsley (1884) published an annotated checklist to the orchids of Central America in the third volume of the botany series of Godman and Salvin's *Biologia Centrali-Americana*, listing 54 species mainly based on the collections of Behr, Cuming, E.P. Duchassaing, S. Hayes, P. Henderson, A. F. Fendler, Seemann, A. Sinclair, F.F. Stange, Stanger, G. Wallis, Warszewicz and G. Zahn. In the fourth volume, Hemsley (1884) listed 104 species and 41 genera for the flora of Panama (Fig. 7).

After sporadic expeditions by European travelers, floristic studies received a major boost with the construction of the Panama Canal between 1904 and 1914 (Fig. 8). From 1910 until 1912 Henry Pittier collected plants in the isthmus as part of the Biological Exploration of Panama by the Smithsonian Institution (Fig. 9). He visited places such as Colón, Darién, San Blas, Puerto Obaldía and the province of Chiriquí. Along with Robert W. Maxon, he explored the region of Boquete in the Chiriquí highlands (the Eldorado of the orchid-lovers in Panama according to Rudolf



FIGURE 6. The route of Josef von Warszewicz in Panama (Savage 1970).

Schlechter), Volcán Barú, Alto de Las Palmas and the Cerro de La Horqueta (Fig. 10). Some 18 species of orchids from these expeditions were described by Schlechter (1913a, 1913b, 1918), including *Lepanthes eciliata* Schltr. and *L. maxonii* Schltr. Schlechter (1918), who listed a total of 117 species for the country. Subsequently, Schlechter (1920a, 1920b, 1921) received a few specimens from Panama mainly by W. Joseph, Pittier and M. Wagner. He described nine species from those collections.

The first major effort to cultivate and study orchids in Panama was undertaken by Charles Wesley Powell. He kept a large collection of orchids near Balboa in Panama City and become the most prolific discoverer of Panamanian orchids (Fig. 11). With Abel A. Hunter he explored the country. Initially, he established contact with Robert Rolfe in Kew. However, after Rolfe's death in 1921, the identification of Powell's specimens ceased (Fig. 12B). Through a correspondent in Costa Rica, Schlechter contacted Powell who later sent his first set of samples to Berlin (Fig. 12C). Based on this material Schlechter (1922) published *Orchidaceae Powellianae Panamensis*, a treatment of collections made by Powell in Panama. Although this work was





FIGURE 7. Orchid species collected in Panama and illustrated in *Xenia Orchidacea* I,II,III. A — *Selenipedium chica* Rchb.f. B — *Epidendrum prismatocarpum* Rchb.f. C — *Odontoglossum warszewiczii* Rchb.f. D — *Pseudepidendrum spectabile* Rchb.f.



FIGURE 8. Panama Canal. National Geographic Society (U.S), 1912.

not a formal treatment of the Orchidaceae, at the time it constituted the largest published compilation on the family (including 260 collections) in the country. From that material, Schlechter identified 184 species in 60 genera, with 75 species described for the first time (Fig. 13). With this contribution, the number of genera in Panama increased to 72 and the number of species to 192. Unfortunately, these were the last of Schlechter's contributions, as he died in 1925 (Ossenbach 2009).

After a short visit to Panama where he met Powell, the American orchid specialist Oakes Ames received some of Powell's specimens. Of these, 29 were new to science. Ames (1921, 1922a, 1922b), Ames & Schweinfurth (1925, 1930, 1937) published the latest orchid species from Panama based on collections by A.M. Bouché, S. Hayes, E.P. Killip, W.R. Lindsay, W.R. Maxon, Pittier and R.S. Williams (Fig. 12A, 12D). Ames and collaborators added a total of 49 species new to science. However, no compilation of all of the orchids of Panama had yet been published. During this period only a few floristic works for specific regions were published, most significantly, the Flora of Barro Colorado Island (Standley 1927) covering 15 species and Flora of the Panama Canal Zone (Ames 1928) with 134 species in 57 genera. Also, 25 species were listed in The Botany of San Jose Island (Gulf of Panama) by Johnston (1949) (where the *Lycaste campbellii* C. Schweinf. was described). Subsequently, the Flora of Barro Colorado



FIGURE 9. Henri Francois Pittier (1857-1950) by Sava Botzarus in the frontispiece of Häslér & Baumann, 2000.

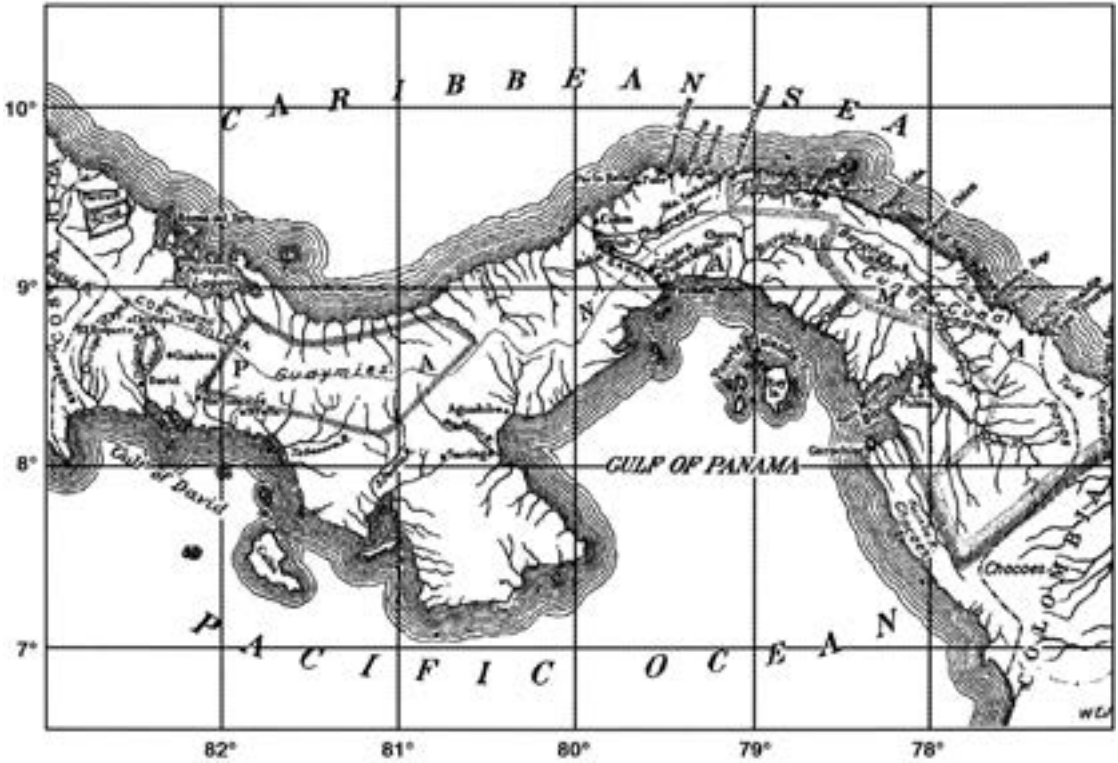


FIGURE 10. Map of Panama by H. Pittier. In Heckadon-Moreno, 1998: 113.



FIGURE 11. Left: exterior side of the orchid garden of Charles W. Powell in Balboa, Canal Zone, Panamá. Right: view of the Powell's living collection of over 7000 specimens of Panamanian orchids. Taken from page 376 of the 1924 Annual Report of the Board of Regents of the Smithsonian Institution.

Island by Croat (1978) treated 89 species.

Woodson & Schery (1943-1981) edited the first formal floristic treatment for the Flora of Panama, based on the accumulated data from herbarium collections. Orchid collections increased from 1930 through the efforts of collectors such as: P.H. Allen, H.P. Butcher, H. A. Dunn, F. H. von Hagen, I. M. Johnston, E.M.

Kieswetter, W.R. Lindsay, R.J. Seibert, O. Shattuck, M.E. Spence Davidson, E. D. Starry, W.R. Taylor, R.H. Woodworth, P.A. Vestal, H. von Wedel, G. and P. White, V. Wolfgang and R.E. Woodson. The orchid contribution for Flora of Panama, prepared by Louis O. Williams and Paul H. Allen (Fig. 14), comprised a total of 469 species (Williams 1940, 1946a, 1946b, Allen



FIGURE 12. A — Oakes Ames (1874-1950). Courtesy of the Oakes Ames Herbarium, Harvard University. B — Robert Allen Rolfe (1855-1921). Courtesy of the Oakes Ames Herbarium, Harvard University. C — Rudolf Schlechter (1872-1925), Courtesy of Dr. N. Kilian, Archives BGBM Berlin-Dahlem. D— Charles C. Schweinfurth (1890-1970). Courtesy of the Oakes Ames Herbarium, Harvard University.

1949a, 1949b, 1953, Williams & Allen 1980). A further five species were added to the Flora of Panama in an update of the Orchidaceae of Mesoamerica, by Williams (1956), producing a total of 474 species in 88 genera.

Robert L. Dressler who worked at the Smithsonian Tropical Research Institute in Panama (STRI) was the most important orchid specialist based in Panama (Fig. 15). In over 20 years of work, he managed to add 328 new records to Williams & Allen (1980) list. D'Arcy

(1987) continued to update the checklist generated during the Flora of Panama project, recording 893 orchid species.

Subsequently, the floristic and taxonomic work of Dressler gave a new impetus to the study of the orchids on the Isthmus. He also encouraged other orchid specialists such as John T. Atwood (Maxillarinae), Eric Hágsater (*Epidendrum*), Carlyle A. Luer (Pleurothallidinae), Norris H. Williams and Mark Whitten (Oncidiinae,





FIGURE 13. Lectotype of *Lycaste powellii* Schltr., collected by C.W. Powell on hills near Panama City. Courtesy of the Oakes Ames Herbarium, Harvard University.



FIGURE 14. A — Paul H. Allen (1911-1963). B — Louis O. Williams (1908-1991). Courtesy of L.D. Gómez.

Stanhopeinae) who all making outstanding floristic contributions (Fig. 16). In 1993, Dressler published his Field Guide to the Orchids of Costa Rica and Panama, where some 950 species of orchids are recorded. In the following years Dressler added many new species (Dressler 1997, 2000, 2002, 2003a, 2003b, 2003d, 2003e, 2004a, 2004b, 2004d, 2005a, 2005b, 2006a, 2006b, 2006c, 2007, Dressler & Pupulin 2003, Pupulin & Dressler 2006, Dressler & Bogarín 2007a, 2007b, 2010). From 1960 other new species and new records for Panama were made by: T. Antonio, W. G. D'Arcy, H. Butcher, D. Cáceres, M.D. Correa, T.B. Croat, R.L. Dressler, J. Duke, J. D. Dwyer, J. Folsom, C. Galdames, A. Gentry, Hágsater, B.E. Hammel, H. Kennedy, L.A. Kenoyer, J. Kirkbride, S. Knapp, W. Lewis, Luer, A. Maduro, G. McPherson, S. Mori, M. Nee, E. Olmos, I. Oviedo, D. Porter, R. Rincón, P.C. Standley, K. Sytsma, Whitten, and Norris Williams among others.

Correa *et al.* (2004), in the Catalogue of Vascular Plants of Panama, listed 1150 orchid species. Although herbarium vouchers (exsiccata) were not cited in most cases, but there is a reference citation for each species. In this treatment, Orchidaceae was the most diverse family of plants in Panama (12.08% of the 9520 species listed),

surpassing any other angiosperm family, and also the family with most endemic species with an impressive 173 species. Ossenbach *et al.* (2007) listed a total 1385 species and 267 endemics, adding 235 species and 94 endemic species but no herbarium vouchers were cited.

Species lists are useful to present an overview of the diversity of a specific area, providing basic information on species distribution, biogeography, conservation, standardization and updating of nomenclature that are starting points for more detailed floristic and ecological studies (Funk *et al.* 2007, Brundu & Camarda 2013).

The aim of this paper is to present an updated checklist of all orchid species found so far in Panama and supporting herbarium vouchers. The data presented here are analyzed to explain the patterns of geographic distribution of species, most diverse taxa, endemism, and relationships with nearby floras. This checklist is a basis for a detailed and updated floristic treatment “*Flora Panamensis: Orchidaceae*” currently developed within the framework of the project “Towards a modern orchid flora of Panama” (Bogarín *et al.* 2013b) by the Jardín Botánico Lankester, Universidad de Costa Rica and the UCH Herbarium of the Universidad Autónoma de Chiriquí, David, Panama.