

Notes on the taxonomy of the genus *Cyrtochilum* (Orchidaceae, Oncidiinae) and description of two new species of the *Cyrtochilum divaricatum*-alliance from Colombia

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Summary: The generic delimitation within *Cyrtochilum* s. l. is discussed in the light of morphological and molecular research results. Notes on the *Cyrtochilum divaricatum*-alliance are provided together with the description of two new Colombian species. The novelties are illustrated and their taxonomic affinities are briefly discussed.

Keywords: biodiversity, *Cyrtochilum*, Orchidaceae, Neotropics, taxonomy

Oncidiinae are one of the largest and most diverse orchid taxon restricted to the Neotropics in its geographical range. Plants included in this subtribe vary in both vegetative and floral characters. They occupy a broad range of habitats from lowlands up to high-montane areas. This great diversity is the reason for the ongoing discussion on the taxonomic relationships within oncidoid orchids and their position in the classification system of Orchidaceae.

One of the most controversial issue concerns the delimitation between and specific composition of the genera *Oncidium* Sw., *Odontoglossum* Kunth and *Cyrtochilum* Kunth. The discussion began in the early XIX century when all three taxa were described (SWARTZ 1800; KUNTH 1815). The most problematic issue was, and still remains, the specific composition of *Cyrtochilum* which was based on *Cyrtochilum undulatum* Kunth, which the author found distinct in its clawed tepals, abbreviated, spurless and convex lip as well as winged apical part of gynostemium, terminal anther and presence of two pollinia. Those characters were not sufficient in Lindley's opinion to clearly segregate representatives of *Cyrtochilum* from other oncidoid orchids. He transferred the *Cyrtochilum* species to *Oncidium* (LINDLEY 1841), *Odontoglossum* (LINDLEY 1838, 1840) or *Miltonia* Lindl. (LINDLEY 1848). The restitution of the genus was proposed by KRAENZLIN (1917) who recognized within *Cyrtochilum* over 100 species grouped in three sections. The nominal section was divided by this author into two subsections based on the petals and sepals similarity. The representatives of sections *Cimicifera* (Lindl. ex Pfitzer) Kraenzl. and *Myanthium* Kraenzl. were later segregated and transferred to separate genera (KÖNIGER & SCHILDHAUER 1994; SZLACHETKO et al. 2006).

A completely different approach to the classification of the genus *Cyrtochilum* was proposed by NEUBIG et al. (2012). The authors included here species essentially different regarding flower morphology and reproductive structures, formerly classified in various smaller genera, as, for example, *Odontoglossum myanthum* Lindl. (generitype of *Dasyglossum* König & Schildh.), *Cyrtochilum flexuosum* Kunth (generitype of *Trigonochilum* König & Schildh.), *Oncidium aureum* Lindl. (generitype of *Siederella* Szlach., Mytnik, Górniak & Romowicz), and members of *Rusbyella*, *Buesiella*, *Neodryas* and *Odontoglossum*. All of them inhabit mainly Ecuadorian Andes

with many species also found in Colombian and northern Peruvian mountains. NEUBIG et al. (2012) created a monophyletic but highly heteromorphic taxon, what resulted in a misrepresenting and uninformative description of the genus (cf. PRIDGEON et al. 2009; DALSTRÖM 2010). Such situation happens usually when authors attach importance to a single set of characters, in this case the outcomes of sequencing of selected molecular markers, concurrently diminishing weight of others. Unfortunately, the studies concerning evolutionary forces which might be responsible for noise in the phylogenetic tree, as hybridization, polyploidization, horizontal gene transfer, or transfer of genetic material by viral or insect vectors, are still too poorly discerned and their influence on the tree topology seems to be underestimated (cf. ARFT & RANKER 1998; AYLIFFE & TIMMIS 1992; AYLIFFE et al. 1998; BERGTHORSSON et al. 2004; BUERKLE & RIESEBERG 2008; GOLDMAN et al. 2004; HEDRÉN 2002; HEDRÉN et al. 2001, 2011; RIESEBERG & WILLIS 2007; STEGEMANN et al. 2012; TSAI et al. 2010).

In this situation we prefer to maintain the narrow concept of *Cyrtochilum*. The plants of the genus are rather easily distinguished from other oncioid orchids by a set of various characters. Their pseudobulbs are usually elliptic in cross-section, each carries 2–4 conduplicate, articulate leaves. The flexuose inflorescence is usually very long and branched. The distinctly clawed tepals are free and the lip is usually triangular to ovate, ornamented with more or less complex callus. The gynostemium is basally sigmoid, elongate, apically clavate and it forms right angles with the lip.

Among those orchids two species, *C. divaricatum* (Lindl.) Dalström and *C. cuencanum* Kraenzl., draw attention. These plants are characterized by shortly connate lateral sepals and a lip which may be divided into two parts. The basal part is transversely elliptic to rhombic and the apical part is much narrower, linear to oblong-triangular, recurved and directed backwards. In DALSTRÖM's (2001) treatment of *Cyrtochilum* under *C. divaricatum* the author synonymized *C. costatum* Kraenzl., *C. mandibulare* (Linden & Rchb. f.) Kraenzl. and *C. refractum* (Rchb. f.) Kraenzl., however, neither of these orchids seems to be closely related with *C. divaricatum*.

Cyrtochilum divaricatum is only known from Colombia and Venezuela and *C. cuencanum* is restricted to Ecuador in its distribution. During the recent studies on oncioid orchids conducted in National Colombian Herbarium two distinctive species of *Cyrtochilum divaricatum*-alliance were found and are described here as new.

Materials and methods

Dried herbarium specimens were examined according to standard procedures. Each studied sheet was photographed and the data were taken from the labels. The morphology of the flower, including the gynostemium were examined after being softened in boiling water. Finally the measurements on the surface of each floral element were studied under a stereomicroscope.

Acronyms for herbaria cited in this paper follow 'Index Herbariorum' (THIERS 2013). CorelDraw v.12 software was used for the preparation of the distribution map.

Description and taxonomy

Cyrtochilum ospinae Szlach. & Kolan., sp. nov. (Fig. 1)

Diagnosis. Species similar to *C. divaricatum*, from which it differs by having strongly undulate tepals (vs weakly undulate), a lip callus consisting of a 3-lobed fleshy pad between apical and

Cyrtorchilum divaricatum-alliance in Colombia

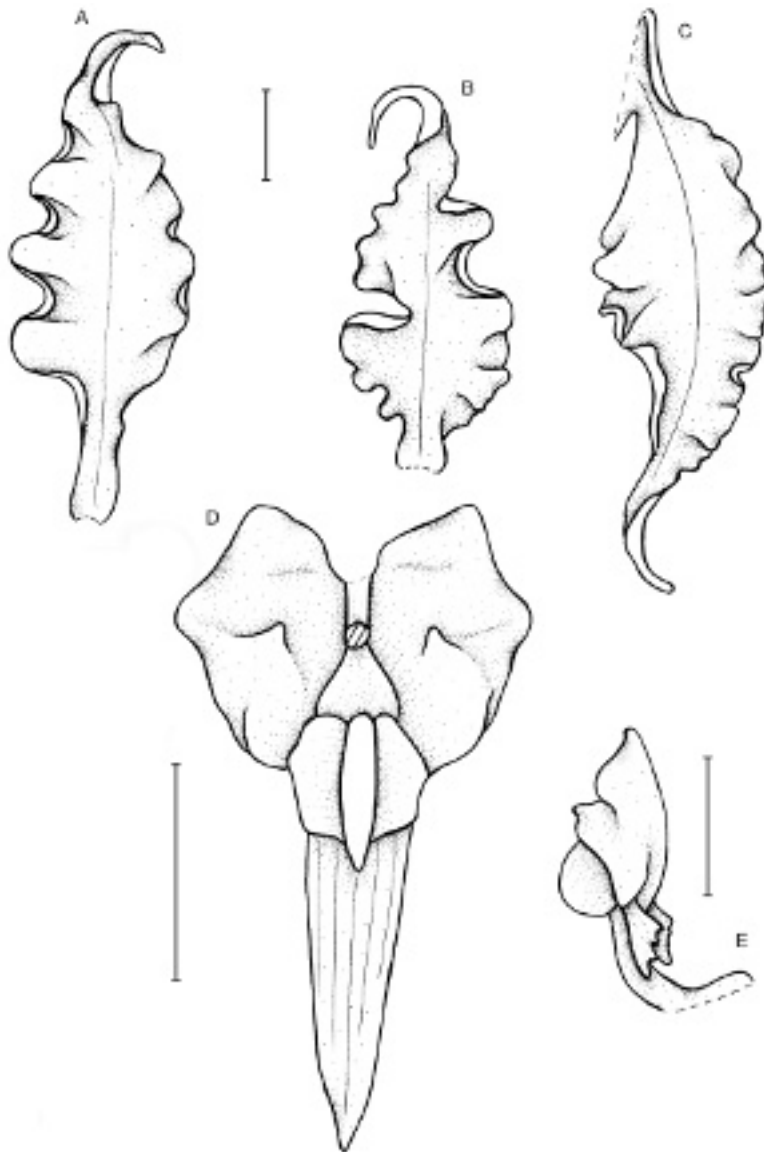


Figure 1. *Cyrtorchilum ospinae*. A – dorsal sepal; B – petal; C – lateral sepal; D – lip; E – gynostemium. Scale bars = 5 mm (drawn by N. Olędrzyńska from M. Ospina H. 1599, COL).

basal parts of the lip and two additional mamillate projections near the lip centre on each side of the gynostemium.

Type. Colombia, Dept. Boyacá, Carretera Garagoa-Miraflores, 2000 m, 5 Sep. 2005, M. Ospina H. 1599 [COL, holotype!].

Description. Pseudobulbs about 6 cm long, strongly compressed, oblong ovoid, enveloped basally by several persistent, leaf bearing sheaths. Leaves 30 cm long and 3.5 cm wide, linear-oblongate, acute. Inflorescence long, branching. Flowers medium-sized, tepals coffee- or yellow-coloured, with yellow, transverse blotches, lip coffee-coloured, internal part yellow, apical part sometimes brownish-red, callus white. Floral bracts 10 mm long. Pedicel 25 mm long, ovary ca 8–10 mm long. Dorsal sepal clawed; claw 4 mm long, rather narrow, canaliculated, wingless; blade 15 mm long,

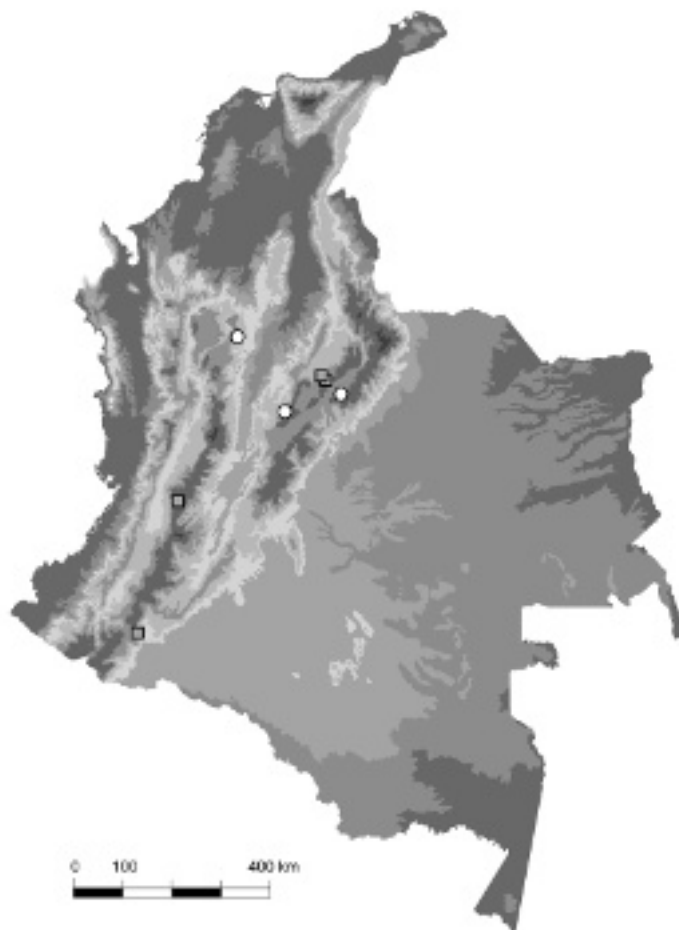


Figure 2. Distribution of *Cyrtochilum ospinae* (circle) and *Cyrtochilum huertasi* (square) in Colombia.

6 mm wide, ovate-lanceolate, long-acuminate, apex recurved, margins strongly undulate. Petals shortly clawed; claw 2 mm long, wingless; blade 12 mm long, 5–6 mm wide, ovate-lanceolate, long-acuminate, acute at the recurved apex, somewhat oblique, margins strongly undulate. Lateral sepals clawed; claw 5 mm long, narrow, connate together along internal margin; blade 16 mm long, 6 mm wide, obliquely lanceolate-ovate, long-acuminate, acute at recurved apex, margins strongly undulate. Lip 14–15 mm long in total, slightly curved in natural position; basal part 7 mm long, 9 mm wide, transversely rhombic, convex, callus 3-lobed, fleshy pad between apical and basal parts of the lip, of which the middle one is elevated, ridge-like, two additional mamillate projections near the lip centre on each side of the gynostemium; apical part 6–7 mm long, 1.5–2 mm wide, lanceolate-triangular, acute. Gynostemium 7 mm long, strongly sigmoid, connate in the basal quarter with the lip, hence appearing as growing from the centre of the basal lip part; lateral appendages obliquely triangular, apical margins irregularly dentate, curved back.

Etymology. Dedicated to M. Ospina H., an eminent collector of Colombian orchids and collector of the type specimen.

Ecology. Terrestrial. It was found growing at altitudes between 2000–2300 m. Flowering in August, September and October.

Cyrtochilum divaricatum-alliance in Colombia

General distribution. Known from the Colombian Central and Eastern Cordilleras of the Andes.

Paratypes. Colombia, Dept. Antioquia, Carretera entre Las Palmas y Rio Negro. Laderas del Rio Negro, 2300 m, 12 Aug. 1957, M. Ospina H. 193^a [COL!]; Dept. Cundinamarca, Pacho. Vereda San Miguel, 2000 m, 14 Oct. 1990, M. Ospina H. 1253 [COL!]. Fig. 2.

Taxonomic notes. The new species resembles *C. divaricatum*, from which it differs in having strongly undulate tepals and a lip callus. It is 3-lobed, fleshy pad situated between apical and basal parts of the lip with the presence of two additional mamillate projections near the lip centre on each side of the gynostemium. In *C. divaricatum* tepals are weakly undulate and the lip callus consists of massive, thick, marginally wrinkled mass.

***Cyrtochilum huertasi* Szlach. & Kolan., sp. nov. (Fig. 3)**

Diagnosis. Species similar to *C. divaricatum*, distinguished by the lip shape, whose basal part is deltoid in general outline and lip callus form consisting of 3 narrow ridges.

Type. Colombia, Dept. Boyacá, Mpio. Arcabuco. Alrededores de poblacion, 2850 m, 20 Oct. 1965, G. Huertas & L. Camargo 6308 [COL, holotype!].

Description. Pseudobulbs 5.8–7.2 cm long, strongly compressed, ovoid, enveloped basally by several persistent, leaf bearing sheaths. Leaves 30 cm long and 2.5 cm wide, linear-oblongate, acute. Inflorescence 60 cm long, branching. Flowers medium-sized, conspicuous, tepals coffee- or reddish-coloured, with transversal yellow markings, lip yellow. Floral bracts 10 mm long. Pedicel 25 mm long, ovary ca 8–10 mm long. Dorsal sepal clawed; claw 4 mm long, rather narrow, canalculated, wingless; blade 12 mm long, 5 mm wide, elliptic-ovate, somewhat twisted, apex long-acuminate, recurved, margins entire. Petals shortly clawed; claw 3 mm long, wingless; blade 12 mm long, 5 mm wide, ovate-lanceolate, long-acuminate, acute at the recurved apex, somewhat oblique, margins undulate. Lateral sepals clawed; claw 3 mm long, narrow, connate in the basal $\frac{2}{3}$ together along internal margin; blade 15 mm long, 4–5 mm wide, obliquely oblong-lanceolate, long-acuminate, acute at recurved apex, margins entire, flat. Lip 14–15 mm long in total, slightly curved in natural position; basal part 7 mm long, 9 mm wide, deltoid, convex, callus limited to the narrow central part, consisting of 3 narrow ridges running from the base of the gynostemium to the base of the lip apical part; apical part 6–7 mm long, 2 mm wide, linear, subobtuse. Gynostemium 6 mm long, strongly sigmoid, connate in the basal quarter with the lip, hence appearing as growing from the centre of the basal lip part; lateral appendages obliquely triangular, apical margins irregularly dentate, pendant.

Etymology. Dedicated to G. Huertas, who along with L. Camargo intensively collected Colombian plants.

Ecology. Terrestrial or epiphytic. It was found growing at altitudes between 2700–2850 m. Flowering in January, May and October.

General distribution. Known from the Colombian Andes. It was found in Central and Eastern Cordilleras as well as south of Nudo de Pasto, on the eastern declivities of the Andes.

Paratypes. Colombia, Dept. Boyacá, Mpio. Arcabuco, Vía Moniquira-Arcabuco. Desvio a la derecha hacia la reserva forestal El Peligro, entre Moniquira y Gachantiva, 2700 m, 14 May 1996, J. L. Fernandez & Sist. Veg. 14282 [COL!]; Dept. Putumayo, Road between San Francisco and

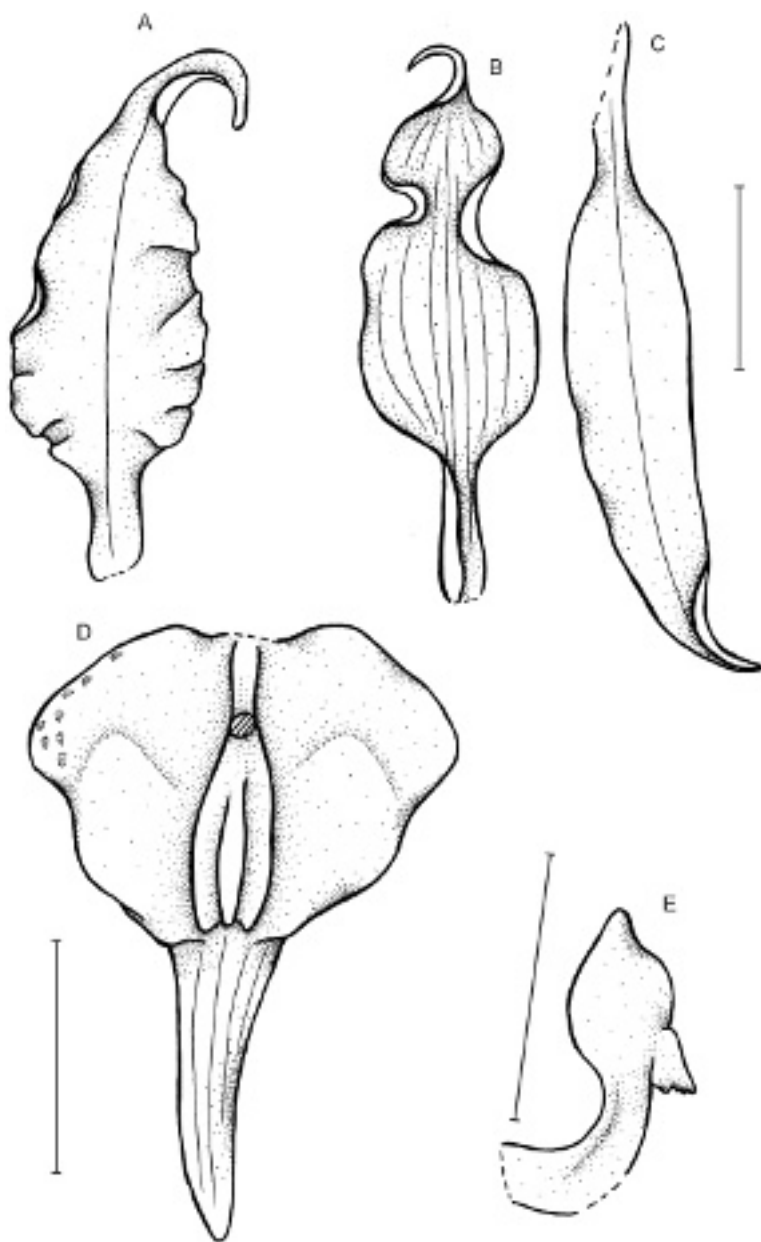


Figure 3. *Cyrtochilum huertasi*. A – dorsal sepal; B – petal; C – lateral sepal; D – lip; E – gynostemium. Scale bars = 5 mm (drawn by N. Olędrzyńska from G. Huertas & L. Camargo 6308, COL).

Mocoa, km 79 from Pasto, 2800 m, 30 Oct. 1974, Plowman & E. Davis 4319 [COL!]; Dept. Valle del Cauca. La Nevera, 26 Jan. 1980, I. Guarin O. 88 [COL!]. Fig. 2.

Taxonomic notes. The new species resembles *C. divaricatum* from which it is distinguishable by the lip shape and callus form. In *Cyrtochilum huertasi* the basal part of the lip is deltoid in outline and the lip callus is limited to its central part only. It consists of 3 narrow ridges running from the base of the gynostemium up to the base of the lip apical part. The lip of *C. divaricatum* is transversely elliptic with callus consisting of massive, thick, marginally wrinkled mass, occupying large part of the basal lip part.

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References

- ARFT A. M. & RANKER T. A. (1998): Allopolyploid origin and population genetics of the rare orchid *Spiranthes diluvialis*. – Amer. J. Bot. **85**: 110–122.
- AYLIFFE M. A., SCOTT N. S. & TIMMIS J. N. (1998): Analysis of plastid DNA-like sequences within the nuclear genomes of higher plants. – Mol. Biol. Evol. **15**: 738–745.
- AYLIFFE M. A. & TIMMIS J. N. (1992): Tobacco nuclear DNA contains long tracts of homology to chloroplast DNA. – Theor. Appl. Genet. **85**: 229–238.
- BERGTHORSSON U., RICHARDSON A. O., YOUNG G. J., GOERTZEN L. R. & PALMER J. D. (2004): Massive horizontal transfer of mitochondrial genes from diverse plant donors to the basal angiosperm *Amborella*. – Proc. Natl. Acad. Sci. USA **101**: 17747–17752.
- BUERKLE C. A. & RIESEBERG L. H. (2008): The rate of genome stabilization in homoploid hybrid species. – Evolution **62**: 266–275.
- DALSTRÖM S. (2001): A synopsis of the genus *Cyrtochilum* (Orchidaceae; Oncidiinae): Taxonomic reevaluation and new combinations. – Lindleyana **16**(2): 56–80.
- DALSTRÖM S. (2010): *Cyrtochilum* Kunth. – In: DODSON C. H. & LUER C. A. [eds]: Flora of Ecuador. 225(3): Orchidaceae; genera *Cyrtochiloides*–*Epibator*: 18–198. – Göteborg: Department of Plant and Environmental Sciences.
- GOLDMAN D. H., JANSEN R. K., VAN DEN BERG C., LEITCH I. J., FAY M. F. & CHASE M. W. (2004): Molecular and cytological examination of *Calopogon* (Orchidaceae, Epidendroideae): circumscription, phylogeny, polyploidy, and possible hybrid speciation. – Amer. J. Bot. **91**(5): 707–723.
- HEDRÉN M. (2002): Speciation patterns in the *Dactylorhiza incarnata/maculata* polyploid complex (Orchidaceae): evidence from molecular markers. – J. Eur. Orchid. **34**: 707–731.
- HEDRÉN M., FAY M. F. & CHASE M. W. (2001): Amplified fragment length polymorphisms (AFLP) reveal details of polyploid evolution in *Dactylorhiza* (Orchidaceae). – Amer. J. Bot. **88**: 1868–1880.
- HEDRÉN M., NORDSTRÖM S. & BATEMAN R. M. (2011): Plastid and nuclear DNA marker data support the recognition of four tetraploid marsh orchids (*Dactylorhiza majalis* s.l., Orchidaceae) in Britain and Ireland, but require their recircumscription. – Biol. J. Linn. Soc. **104**: 107–128.
- KÖNIGER W. & SCHILDHAUER H. (1994): *Dasyglossum* and *Trigonochilum* - two new genera in subtribus Oncidiinae. – Arcula **1**: 1–28.
- KRAENZLIN F. (1917): *Cyrtochilum*. – Notizbl. Bot. Gart. Berlin-Dahlem **7**(63): 81–101.
- KUNTH K. S. (1815): Nova genera et species plantarum quas in peregrinatione ad plagam aequinoctialem orbis novi collegerunt, descripserunt, partim adumbraverunt Amat. Vol. 1. – Paris: Libreria Graeco-Latino-Germanica.
- LINDLEY J. (1838): *Cyrtochilum maculatum*. – Sert. Orchid. **5**: t. 25.
- LINDLEY J. (1840): *Odontoglossum bictoniense*. – Edwards's Bot. Reg. **26**: t. 66.
- LINDLEY J. (1841): *Oncidium barkeri*. – Sert. Orchid. **10**: t. 48.
- LINDLEY J. (1848): New plants, etc. from the society's garden: 7. *Miltonia karwinskii*. – J. Hort. Soc. London **4**: 83.

- 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. – Bot. J. Linn. Soc. **168**: 117–146.
- PRIDGEON A. M., CHASE M. W., CRIBB P. J. & RASMUSSEN F. N. (2009): Genera Orchidacearum, Vol. 5. Epidendroideae (part two). – Oxford: Oxford University Press.
- RIESEBERG L. H. & WILLIS J. H. (2007): Plant speciation. – Science **317**: 910–914.
- STEGEMANN S., KEUTHE M., GREINER S. & BOCK R. (2012): Horizontal transfer of chloroplast genomes between plant species. – Proc. Natl. Acad. Sci. U.S.A. **109**(7): 2434–2438.
- SWARTZ O. (1800): Orchidernes flægter och arter upstaellde. – Kongl. Vetensk. Acad. Nya Handl. **21**: 202–254.
- SZLACHETKO D. L., MYTNIK-EJSMONT J., GÓRNIAK M. & ROMOWICZ A. (2006): *Siederella* Szlach. et al. and *Irenea* Szlach. et al. – new genera of the tribe Oncidieae. – Biodiv. Res. Conserv. **1–2**: 4–6.
- THIERS B. (2013): Index Herbariorum. A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. – <http://sweetgum.nybg.org/ih/>
- TSAI C. C., CHIANG Y. C., HUANG S. C., CHEN C. H. & CHOU C. H. (2010): Molecular phylogeny of *Phalaenopsis* Blume (Orchidaceae) on the basis of plastid and nuclear DNA. – Pl. Syst. Evol. **288**: 77–98.

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