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NEW COMBINATIONS IN *ODONTOGLOSSUM* (ORCHIDACEAE: ONCIDIINAE) AND A SOLUTION TO A TAXONOMIC CONUNDRUM

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Abstract. The diminutively flowered *Oncidium koechliniana* demonstrates a unique combination of features that justifies a transfer of it and all here accepted species in closely related genera *Cochlioda* and *Solenidiopsis* to *Odontoglossum*, which is executed here. Distinguishing features to separate *Odontoglossum* from *Oncidium* are based on geographic distribution, and flower morphology, which is demonstrated with illustrations.

Resumen. *Oncidium koechliniana*, de flores diminutas, presenta una combinacíon de características únicas que justifica su transferencia, así como de todas las especies aquí aceptadas de los géneros *Cochlioda* y *Solenidiopsis* a *Odontoglossum*, transferencias que se hacen en este artículo. La características distintiva para separar *Odontoglossum* de *Oncidium* están basadas en distribución geográfica y morfología floral, que se muestran a través de ilustraciones.

Key words: DNA, Machu Picchu, *Odontoglossum*, *Oncidium*, Oncidiinae

When Chase and others transferred orchid genera *Cochlioda* Lindl., *Odontoglossum* Kunth, *Sigmatostalix* Rchb.f., and *Solenidiopsis* Senghas into *Oncidium* Sw., in Lindleyana (Chase *et al*. 2008), based on molecular evidence (Williams *et al*. 2001a, 2001b, Chase *et al*. 2009), a rather strange situation developed, seen from a taxonomic point of view. Many different looking plants (some mistakenly from the distantly related genus *Cyrtochilum* Kunth) with very different flower morphology, ended up in the same genus. In fact, the flowers are so different from each other that it becomes virtually impossible to visually define the genus *Oncidium*, and to separate it from many other genera in the Oncidiinae. In addition, some of the transferred *Odontoglossum* species, such as *O. contaypacchaense* D.E.Benn. & Christenson, *O. machupicchuense* D.E.Benn. & Christenson, *O. pseudomelanthes* D.E.Benn. & Christenson and *O. rubrocallosum* D.E.Benn. & Christenson, display all the critical features for belonging in *Cyrtochilum* (a transfer will be made) and should not have been included in the *Oncidium* transfer at all. A plausible explanation why this happened anyway is that no DNA data were analyzed prior to the transfer due to a lack of available plant material. It seems they were transferred because they were originally described as *Odontoglossum* species, like so many other and similar former "odontoglossums" that now reside in *Cyrtochilum* (Dalström 2001a). In a matter of speaking, this maneuver puts user-friendly and practical Oncidiinae taxonomy "out of business".

I therefore prefer to treat the visually recognizable species in genera *Cochlioda*, *Odontoglossum* and *Solenidiopsis* as a separate and single genus/clade rather than sinking them into a large "waste-basket" *Oncidium.* This is done in accordance with the same DNA data published by Chase and others. The reason behind combining *Cochlioda*, *Odontoglossum* and *Solenidiopsis* is to avoid having to create several new monotypic genera for species such as *O. povedanum* P.Ortiz (Fig. 1E, 3E), and *O. tenuifolium* Dalström (Fig. 1F, 3F), due to their apparently separate cladistic paths. These latter Andean species display many typical morphological and ecological *Odontoglossum* features and are therefore easiest treated as such. The oldest name for this large complex

of species is *Odontoglossum* (Kunth 1816), which has nomenclatural priority.

The general difference between *Cochlioda* and *Odontoglossum* is traditionally based on the bright rose to orange floral colors of *Cochlioda*, that suggest bird pollination (although no actual evidence of bird pollination has been documented, or seen by the author), as opposed to sparsely documented bee pollination for *Odontoglossum* (van der Pijl & Dodson 1966). Another and more distinct morphological difference is the divided stigma of *Cochlioda*, which consists of a single stigma variably divided into two lobes by the "in-bent" rostellum. The stigma of all known *Odontoglossum* species is more or less uniformly rounded.

Odontoglossum sanguineum (Rchb.f.) Dalström [syn: *Oncidium strictum* (Cogn.) M.W.Chase & N.H.Williams] also has rose colored flowers but with a rounded stigmatic surface, which supports the nomenclatural transfer executed in this paper. This species has an impressive synonymy list and has jumped back and forth between genera *Cochlioda, Mesospinidium* Rchb.f. and *Symphyglossum* Schltr. through time, to finally land in *Odontoglossum* based on molecular evidence (Dalström 2001, Williams *et al*. 2001a), before being lumped into *Oncidium* (Chase & Williams 2008) under the name "*Oncidium strictum*" (from the synonym *Cochlioda stricta* Cogn.), since the name "*Oncidium sanguineum*" was already occupied.

The flowers of *Solenidiopsis* show a similar stigmatic profile as *Cochlioda* (as do the distantly related members of genera *Oliveriana* Rchb.f., and *Systeloglossum* Schltr.), but lack the bright colors, which may indicate a return to a bee pollination syndrome. Traditionally, the three here accepted species of *Solenidiopsis*; *S. galianoi* Dalström & Nuñez, *S. peruviana* (Schltr.) D.E.Benn. & Christenson, and *S. tigroides* (C.Schweinf.) Senghas (Fig. 1H, 3H), all have non-resupinate flowers with the lip uppermost, as opposed to *Cochlioda* and *Odontoglossum*, which have normal flowers with the lip lowermost. Otherwise these genera are very similar both vegetatively and in the general flower appearance.

The first known species of *Cochlioda* (*rosea*) was actually described as *Odm. roseum* by Lindley (1845), and later transferred to *Cochlioda* by Bentham and Hooker (1881). Similarly, *Solenidiopsis tigroides* was also originally described as an *Odontoglossum* by Schweinfurth (1945). In other words, the link to *Odontoglossum* has always been strong for these plants. Until now, however, it has been possible to separate them as distinct genera based on combinations of visual features; the color, non-resupinate flowers, divided stigma etc.

This is no longer possible due to the discovery of a rather insignificant but highly interesting species from the Machu Picchu sanctuary in Peru; *Oncidium koechliniana* Collantes & G.Gerlach (2011), (Fig. 1I, 3I). Although described as an *Oncidium* due to the recent transfers by Chase and others (Gerlach, pers. comm.), this species displays all the features that justify a placement in an expanded *Odontoglossum* clade. It has flowers less than 1 cm across that present the lip lowermost, like *Cochlioda* and *Odontoglossum*. It has a divided stigma similar to *Cochlioda* and *Solenidiopsis*. The coloration (greenish yellow with brown spots) is very much like an *Odontoglossum* or *Solenidiopsis*. The column has large spotted *Solenidiopsis*-like wings, but also a well developed hood, like *Cochlioda* and species in the *Odontoglossum astranthum* Linden & Rchb.f. (Fig. 1D, 3D) complex. It has a richly pubescent callus like many species in all three genera, a long and branched inflorescence like many *Odontoglossum* species, and long and narrow leaves like some *Odontoglossum* and *Solenidiopsis* species. Although the exact position in a molecular based cladogram for this small-flowered species is currently unknown, there is little doubt about its nomenclatural status as an (expanded) *Odontoglossum*.

Distinguishing features for *Odontoglossum*

Higher altitude (rarely lower than 1500 -3000 m), strictly Andean (here including Sierra Nevada de Santa Marta) plants with relatively thin roots and glossy, distinctly compressed (ancipitous) pseudobulbs (except for *Odontoglossum praestans* Rchb.f. & Warsz., which has weakly edged, walnut-shaped pseudobulbs), and generally strongly scented flowers (except for *Odontoglossum crispum* Lindl. and possibly *O. nobile* Rchb.f.), with an ovary that continues in a more or less straight line into the base, and to a various extension of the variously elongate column. The lip is generally parallel with the column

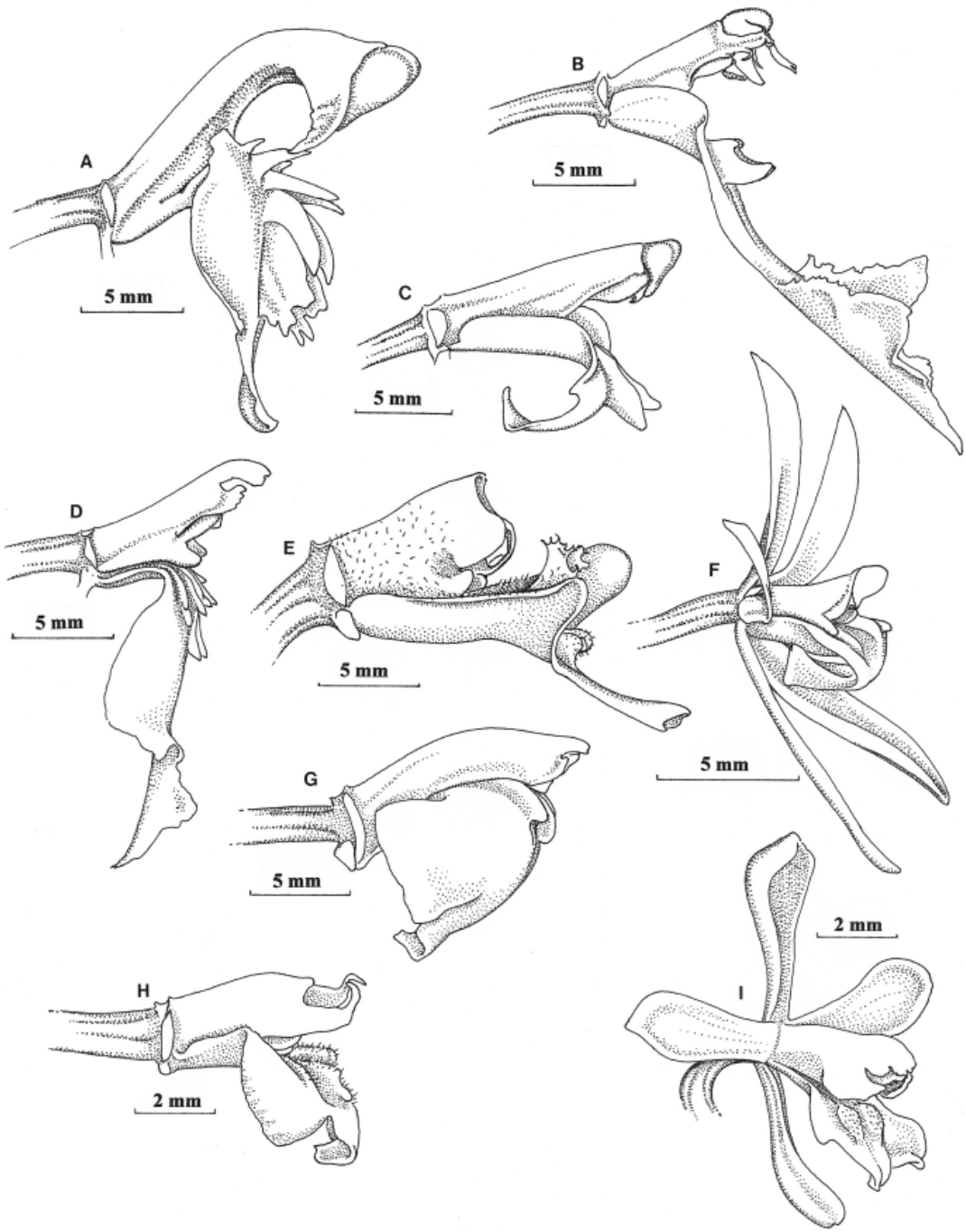

Figure 1. Lateral views of lip-column structures. A — *Odontoglossum cristatum* Lindl. (*OIC 7394*, SEL). B — *O. blandum* Rchb.f. (*Dalström 2486*, SEL). C — *O. mirandum* Rchb.f. (*Dalström 987*, SEL). D — *O. astranthum* (*Dalström 925*, SEL). E — *O. povedanum* P.Ortiz (*Escobar s.n.* SEL). F — *O. tenuifolium* Dalström, flower lateral view (*Dalström 2019*, SEL). G — *O. noezlianum* (*Dalström 2611*, SEL). H — *O. tigroides* (*Dalström 2483*, SEL). I — *O. koechlinianum*, flower lateral view (*Fernández 37*, USM). All illustrations by the author.

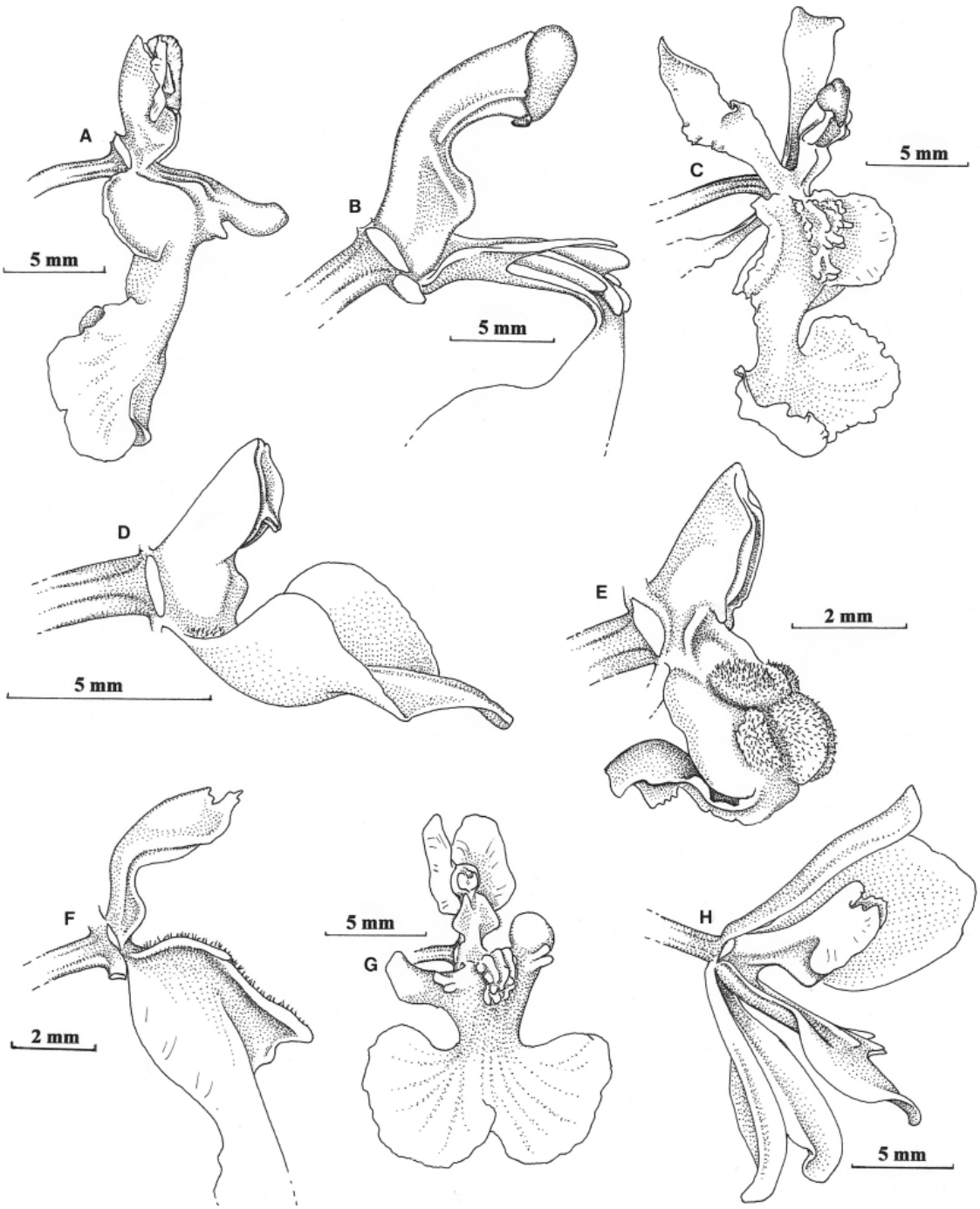

FIGURE 2. Lateral views of lip-column structures. A — *Oncidium mantense* Dodson & R.Estrada (*Estrada s.n.,* SEL). B — *O. hastilabium* (Lindl.) Beer (*Dalström 939*, SEL). C — *Oncidium* cf. *citrinum* Lindl. (OIC 15210, SEL). D — *O. andradeanum* Dodson & D.E.Benn. (OIC 12087, SEL). E — *O. toachicum* Dodson (OIC 5786). F — *O. hapalotyle* Schltr. (OIC 4059, SEL). G — *O. bryolophotum* Rchb.f. (*Alfaro 25500*, SEL). H — *O. acinaceum* Lindl. (*Harling 11265*, SEL). All illustrations by the author.

near the base and with few exceptions connected with the column either by lateral "seams" or by a central and longitudinal ridge ("suture"), and very differently from the main bulk of *Oncidium* species. The column of *Odontoglossum* has a pollinarium with a well developed and elongate stipe, placed on a relatively huge ovate viscidium, sometimes as long as the stipe. The placement and shape of the pollinarium generally presents the viscidium from "above", and hidden from a frontal view, as opposed to *Oncidium* species, where the pollinarium generally consists of a much smaller and rounded viscidium positioned so that it is clearly visible from a front view (See Figures 1-3). There are a very few exceptions from this where some Central American *Oncidium* species have developed a similar morphology (and pollination syndrome?), although in these cases, the distinct geographic distribution should make it easy to distinguish the groups. In addition, very few (if any) of these "intermediate" *Oncidium* species display both a "hidden" and "*Odontoglossum*"-shaped ovate viscidium.

Concerning the taxonomic status of a small group of species, such as *Oncidium chrysomorphum* Lindl., *O. tipuloides* Rchb.f. and *O. hapalotyle* Schltr. (syn: *O. trinasutum* Kraenzl.), etc., that seem to "wobble" somewhere between *Odontoglossum* and *Oncidium* depending on which molecular cladogram is studied, it is uncertain at this time how to best handle them. Some species in this group (herbarium specimens) are misidentified, and some consist of flowers in silica gel only, where the identities are not easily verified. An attempt to rehydrate these latter specimens for identification purposes is under way, however, but more data is clearly needed in order to give them a stable home in the "DNA trees".

New combinations and list of transferred species

Odontoglossum galianoi (Dalström & P. Nuñez) Dalström, ***comb. nov.***

Basionym: *Solenidiopsis galianoi* Dalström & P. Nuñez, Selbyana 23: 197. 2002. *Oncidium galianoi* (Dalström & P. Nuñez) M.W.Chase & N.H.Williams, Lindleyana 21(3): 24. 2008. Type: Peru. Cuzco: Province of Paucartambo, District of Challabamba, the Biosphere Reserve of Manu, between Pillahuata and Nueva Esperanza, alt 2800-3200 m, 18 Feb. 2001, *P. Nuñez, W. Galiano, E. Suclli, A. Rodriguez & F. Carazas 28694* (holotype, CUZ).

Odontoglossum koechlinianum (Collantes & G.Gerlach) Dalström, ***comb. nov.***

Basionym: *Oncidium koechliniana* Collantes & G.Gerlach., OrchideenJournal (2): 79-81. 2011. Type: Peru. Cusco: Province of Urubamba, District of Machu Picchu, Quebrada Alccamayo, alt. 2500 m, 11 Dec. 2003, *Moisés Quispe & Carmen Soto 148*. Flowered in cultivation at Inkaterra, Machu Picchu (holotype, USM).

Odontoglossum mixturum (Dalström & Sönnemark) Dalström, ***comb. nov***.

Basionym: *Cochlioda mixtura* Dalström & Sönnemark, Selbyana 22(2): 135. 2001. *Oncidium mixturum* (Dalström & Sönnemark) M.W.Chase & N.H.Williams, Lindleyana 21(3): 25. 2008. Type: Bolivia. Chapare, along road between Cochabamba and Villa Tunari, in wet cloudforest at 2000 - 2100 m, Mar. 7, 1998, *S. Dalström & J. Sönnemark 2342* (holotype, SEL).

Odontoglossum noezlianum Mast., Gard. Chron., III, 8: 570. 1890.

Basionym: *Cochlioda densiflora* Lindl., Fol. Orch. 4 (*Cochlioda*): 1. 1853; [non *Odontoglossum densiflorum* Lindl. = *Cyrtochilum densiflorum* (Lindl.) Kraenzl., Notizbl. Bot. Gart. Berlin-Dahlem 7:99. 1917]. *Mesospinidium densiflorum* (Lindl.) Rchb.f., Gard. Chron. 12: 393. 1872. Type: Peru. Amazonas: Chachapoyas, *Mathews s.n.* (holotype, K-L; isotype, BM, W).
Cochlioda noezliana Rolfe, Lindenia 6: 55, pl. 262. 1891. *Oncidium noezlianum* (Rolfe) M.W.Chase & N.H.Williams, Lindleyana 21(3): 25. 2008. Type: Peru. *J. Nötzli s.n*. (holotype, specimen unknown; illustration in original publication).
Cochlioda miniata L.Lind., Lindenia, 12: 71, pl. 562. 1896. *Oncidium miniatum* (L.Lind.) M.W.Chase & N.H.Williams, Lindleyana 21(3): 25. 2008. Type: Peru[?], *L. Linden s.n.* (holotype

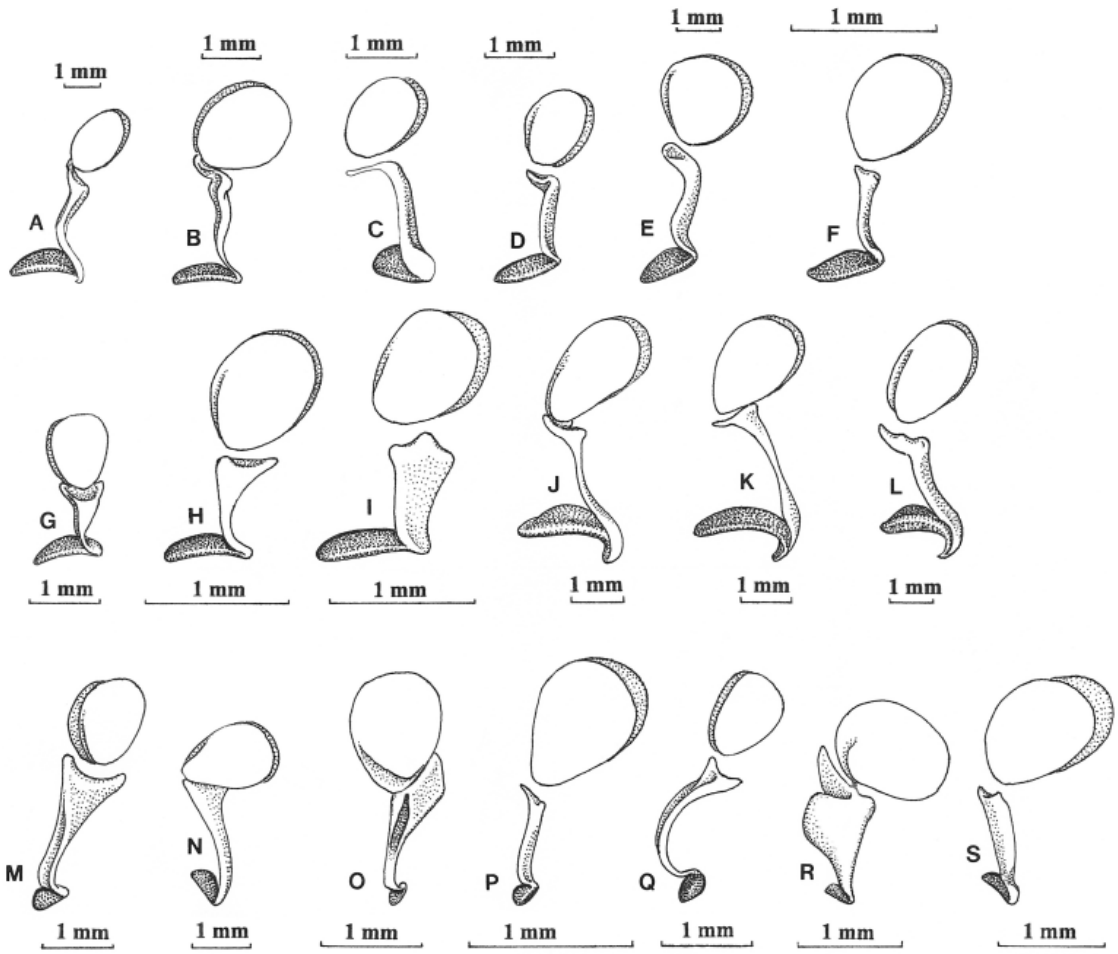

FIGURE 3. Pollinaria, lateral views. A — *Odontoglossum cristatum* (*OIC 7394*, SEL). B — *O. blandum* (*Dalström 2486*, SEL). C — *O. mirandum* (*Dalström 987*, SEL). D — *O. astranthum* (*Dalström 925*, SEL). E — *O. povedanum* (*Escobar s.n*. SEL). F — *O. tenuifolium* (*Dalström 2019*, SEL). G — *O noezlianum* (*Dalström 2611*, SEL). H — *O. tigroides* (*Dalström 2483*, SEL). I — *O. koechlinianum* (*Fernández 37*, USM). J — *O. crispum* Lindl. (*Dalström 936,* SEL). K — *O. epidendroides* Kunth (*Dalström 1496,* SEL). L — *O. juninense* Schltr. (*Dalström 2378*, SEL). M — *Oncidium mantense* (*Estrada s.n.* SEL). N — *O. hastilabium* (*Dalström 939*, SEL). O — *O. andradeanum* (*OIC 12087*, SEL). P. — *O. toachicum* (*OIC 5786*, SEL). Q — *O. hapalotyle* (*OIC 4059*, SEL). R — *O. bryolophotum* (*Alfaro 25500*, SEL). S — *O. acinaceum* (*Harling* 11265, SEL). All illustrations by the author.

specimen unknown; illustration in original publication).

Cochlioda floryi Rolfe, Orchid Rev. 19: 144. 1911. *Oncidium floryi* (Rolfe) M.W.Chase & N.H.Williams, Lindleyana 21(3): 24. 2008. TYPE: Peru. *H. A. Tracy s.n*. (holotype, specimen unknown).

Cochlioda beyrodtiana Schltr., Orchis 13: 5. 1919. *Oncidium beyrodtioides* M.W.Chase & N.H.Williams, Lindleyana 21(3): 22. 2008. TYPE: Peru. *O. Beyrodt s.n.* (holotype, B, destroyed; photo at F, SEL).

Odontoglossum peruvianum (Schltr.) Dalström, ***comb. nov.***

Basionym: *Solenidium peruvianum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 9: 113. 1921, illustration in Mansf., Repert. Spec. Nov. Regni Veg. Beih. 57: t. 129, nr. 507. 1929. *Solenidiopsis peruviana* (Schltr.) D.E. Benn. & Christenson,

Brittonia 46: 44. 1994. *Oncidium peruvianoides* M.W.Chase & N.H.Williams, Lindleyana 21(3): 26. 2008. Type: Peru. Loreto: near Moyobamba, *Filomeno s.n.* (holotype, B, destroyed; lectotype: Tabula 129, 507).

Solenidiopsis flavobrunnea Senghas, Orchidee (Hamburg) 40(6): 205. 1989. *Oncidium flavobrunneum* (Senghas) M.W. Chase & N.H. Williams, Lindleyana 21(3): 24. 2008. Type: Peru. Piura: near Huancabamba, ca. 2600 m, *B. Wurstle s.n.* BGH Nr. 0-18778 (holotype, HEID).

Odontoglossum roseum Lindl. *in* G.Benth., Pl. Hartweg. 151. 1845.

Cochlioda rosea (Lindl.) Benth. & Hook.f., J. Linn. Soc. 18: 327. 1881. *Mesospinidium roseum* (Lindl.) Rchb.f., Gard. Chron. 12: 392. 1872. *Oncidium roseoides* M.W. Chase and N.H. Williams, Lindleyana 21(3): 26. 2008. Type: Ecuador. Loja: Quebradas de Las Juntas, *T. Hartweg 57* (holotype, K-L).

Odontoglossum tigroides C.Schweinf., Amer. Orchid Soc. Bull. 14: 22, Fig. 167. 1945.

Solenidiopsis tigroides (C. Schweinf.) Senghas, Orchidee (Hamburg) 37(6): 274. 1986. *Oncidium tigroides* (C. Schweinf.) M.W. Chase & N.H. Williams, Lindleyana 21(3): 27. 2008. Type: Peru. Yanano, about 1800 m, on mossy tree, *Macbride 3840* (holotype, AMES).

Solenidiopsis rhombicalla D.E. Benn. & Christenson, Brittonia, 46(1): 44. 1994. *Oncidium rhombicallum* (D.E. Benn. & Christenson) M.W. Chase & N.H. Williams, Lindleyana 21(3): 26. 2008. Type: Peru. Amazonas: Bongara, km 358 along road from Olmos to Jumbilla, 1450 m, July 1965, *D.E. Bennett et al. 2066* (holotype, AMES; isotype, AMES).

Odontoglossum vulcanicum (Rchb.f.) Dalström, ***comb. nov***.

Basionym: *Mesospinidium vulcanicum* Rchb.f., Gard. Chron. 12: 393. 1872. *Cochlioda vulcanica* (Rchb.f.) Benth. & Hook.f., J. Linn. Soc. 18: 327. 1881. *Oncidium vulcanicum* (Rchb.f.) M.W.Chase & N.H.Williams, Lindleyana 21(3): 27. 2008. Type: Ecuador. Tungurahua: *R. Spruce 6243* (holotype, W; isotype, K-L, K).

Excluded species (*nomen nudum*):

Cochlioda chasei D.E. Benn. & Christenson, Brittonia 46: 26 (1994).

Oncidium chasei (D.E. Benn. & Christenson) M.W. Chase & N.H. Williams, Lindleyana 21(3): 22. 2008. Type: Peru. Amazonas: Bóngara, reportedly from Rio Nieva above 1700 m, 20 Nov. 1987, *M. Arias ex D. Bennett & M. Chase 4080* (holotype, USM in original publication, but no type exists there!).

This appears to be a confused concept based on a drawing of *Odontoglossum tigroides* and a "lost" *Cochlioda* specimen. According to Bennett (pers. comm.) no dried specimen was ever made. According to Chase (pers. comm.), no living material was ever introduced to horticulture by him. According to Christenson (pers. comm.), the type specimen was actually deposited at MOL, Lima, but no such dried or alcohol preserved specimen exists there either (Trujillo pers. comm., and pers. obs.). See Dalström (2001) for further discussion.

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