



## Nomenclatural notes in the Pleurothallidinae (Orchidaceae): *Phloeophila*

GUY R. CHIRON<sup>1</sup>, ADAM P. KARREMANS<sup>2,3</sup> & CASSIO VAN DEN BERG<sup>4</sup>

<sup>1</sup>Herbiers, Université de Lyon I, F-69622 Villeurbanne Cedex, France; E-mail: [g.r.chiron@wanadoo.fr](mailto:g.r.chiron@wanadoo.fr)

<sup>2</sup>Lankester Botanical Garden, University of Costa Rica, P.O. Box 302-7050 Cartago, Costa Rica

<sup>3</sup>Naturalis Biodiversity Center, Leiden, The Netherlands

<sup>4</sup>Universidade Estadual de Feira de Santana, Departamento de Ciências Biológicas, Av. Transnordestina s.n., 44036-900, Feira de Santana, Brazil

### Abstract

Two of us found some years ago that *Phloeophila nummularia*, type species of the genus *Phloeophila*, was placed in a molecular phylogenetic study in *Pabstiella*. In this article, we show with the inclusion of new sequences of *Phloeophila* that this result was not correct. *Phloeophila* forms a unique clade in Pleurothallidinae and is not closely related to *Pabstiella*. In addition, the exclusion of three species, one transferred to *Dryadella* and two others to *Acianthera*, is proposed.

**Key words:** Brazilian Pleurothallidinae, *Pabstiella*, *Phloeophila nummularia*, phylogenetics of Pleurothallidinae

*Phloeophila* Hoehne & Schlechter (1926: 199), previously (Luer 1986) placed in synonymy of *Pleurothallis* Brown (1813: 211), was re-instated by Pridgeon & Chase (2001) and Pridgeon (2005). In their molecular phylogenetic analysis of Pleurothallidinae, Pridgeon *et al.* (2001) showed that *Phloeophila peperomioides* (Ames 1923: 64) Garay (1974: 118) and a few other species formed a distinct clade. Nevertheless, Chiron *et al.* (2012) in a molecular phylogeny of Brazilian Pleurothallidinae found that two accessions labeled as *Phloeophila nummularia* (Reichenbach 1865: 276) Garay (1974: 118) were embedded in *Pabstiella* Brieger & Senghas (1976: 195). Because *P. nummularia* is the type species of *Phloeophila*, the authors considered both genera synonymous. In order to avoid having to transfer over one hundred names from *Pabstiella* to *Phloeophila*, Chiron & van den Berg (2013) proposed conserving the generic name *Pabstiella* against the older *Phloeophila*. At that time, one of us (AK) had obtained (but not yet published) ITS sequences of Brazilian and Cuban material of *Phloeophila nummularia*. Analysis of this material produced different results: the samples were placed in the *Phloeophila* clade, not in *Pabstiella* (Karremans *et al.* in press). Therefore, one of the samples labeled *P. nummularia* in Chiron *et al.* (2012) was re-extracted and sequenced. The new sequences confirmed the position of *P. nummularia* within the *Phloeophila* clade, proving once and for all that the previously used samples must represent some type of mistake in the laboratory. Therefore, we here present an emended phylogenetic analysis of *Phloeophila*, using the same data set as in Chiron *et al.* (2012) complemented with a few additional species of *Phloeophila*.

### Material and Methods

We added and manually aligned ten (five *Phloeophila* species and five *Pabstiella*) additional sequences (Table 1) of the internal transcribed spacer (ITS) of the nuclear ribosomal DNA to the matrix used by Chiron *et al.* (2012) using the same methods as in that paper. Phylogenetic analysis was carried out using Bayesian inference in MRBAYES 3.2.6 (Ronquist *et al.* 2012). The data were partitioned into ITS1 and ITS2, whereas coding 18S, 5.8S and 26S were excluded because they contained no variation. Both partitions were modeled using GTR+I+G with unlinked parameters. The runs consisted of 2 runs of 4 chains of MCMC with the default temperatures for 10 million generations, sampling every 1,000 trees. The topology and posterior probabilities for nodes are shown in Fig. 1, which was prepared with FigTree 1.4.2. The tree was graphically simplified by collapsing large generic clades not relevant for *Phloeophila/Pabstiella* and manually annotating the number of terminals.

**TABLE 1.** Accession numbers and vouchers from sequences new to this study. Other accessions are available in Pridgeon *et al.* (2001) and Chiron *et al.* (2012).

Taxon	Voucher collector and number	ITS	Source
<i>Pabstiella</i> sp.	Chiron 13241	LT574822	
<i>Pabstiella</i> sp.	Chiron 13131	LT574823	
<i>Pabstiella</i> sp.	Chiron 14017	LT574824	
<i>Pabstiella ribeironensis</i> Chiron & Xim.Bols.	Chiron 13095	LT574825	
<i>Pabstiella ruschii</i> (Hoehne) Luer	Chiron 12091	LT574826	
<i>Phloeophila nummularia</i> (Rchb. f.) Garay (1)	Karremans 5959	KF747839	Karremans unpubl.
<i>Phloeophila nummularia</i> (2)	Stenzel 896	KC425841	Stenzel 2004
<i>Phloeophila nummularia</i> (3)	Tesch sn	LT574821	
<i>Phloeophila pelecanceps</i> (Luer) Pridgeon & M.W. Chase	Chase 1128	AF262810	Pridgeon <i>et al.</i> 2001
<i>Phloeophila peperomioides</i> (Ames) Garay (1)	None (see paper)	AF275690	Pridgeon <i>et al.</i> 2001
<i>Phloeophila peperomioides</i> (2)	Bogarín 7112	KC425745	Karremans in press
<i>Phloeophila pleurothallopsis</i> (Kraenzl.) Pridgeon & M.W. Chase (1)	Chase 978	AF262812	Pridgeon <i>et al.</i> 2001
<i>Phloeophila pleurothallopsis</i> (2)	Karremans 4818	KC425746	Karremans unpubl.
<i>Phloeophila pleurothallopsis</i> (3)	Karremans 4856	KC425747	Karremans unpubl.

## Results

The general phylogenetic relationships found for Pleurothallidinae (Fig. 1,2) are comparable to those obtained by Chiron *et al.* (2012). All *Phloeophila* accessions, with the exception of those from the original study (Chiron *et al.* 2012), form a strongly supported *Phloeophila* clade (PP=1; Fig. 1). The three independently extracted and sequenced accessions of *Phloeophila nummularia* form a highly supported cluster (PP=1). The two obtained from plants of Brazilian origin being almost identical to each other (Karremans 5959 and Tesch sn), whereas a third accession obtained by Stenzel (2004) from Cuban material is sister to these and has some variation in sequence.

## Taxonomic treatment

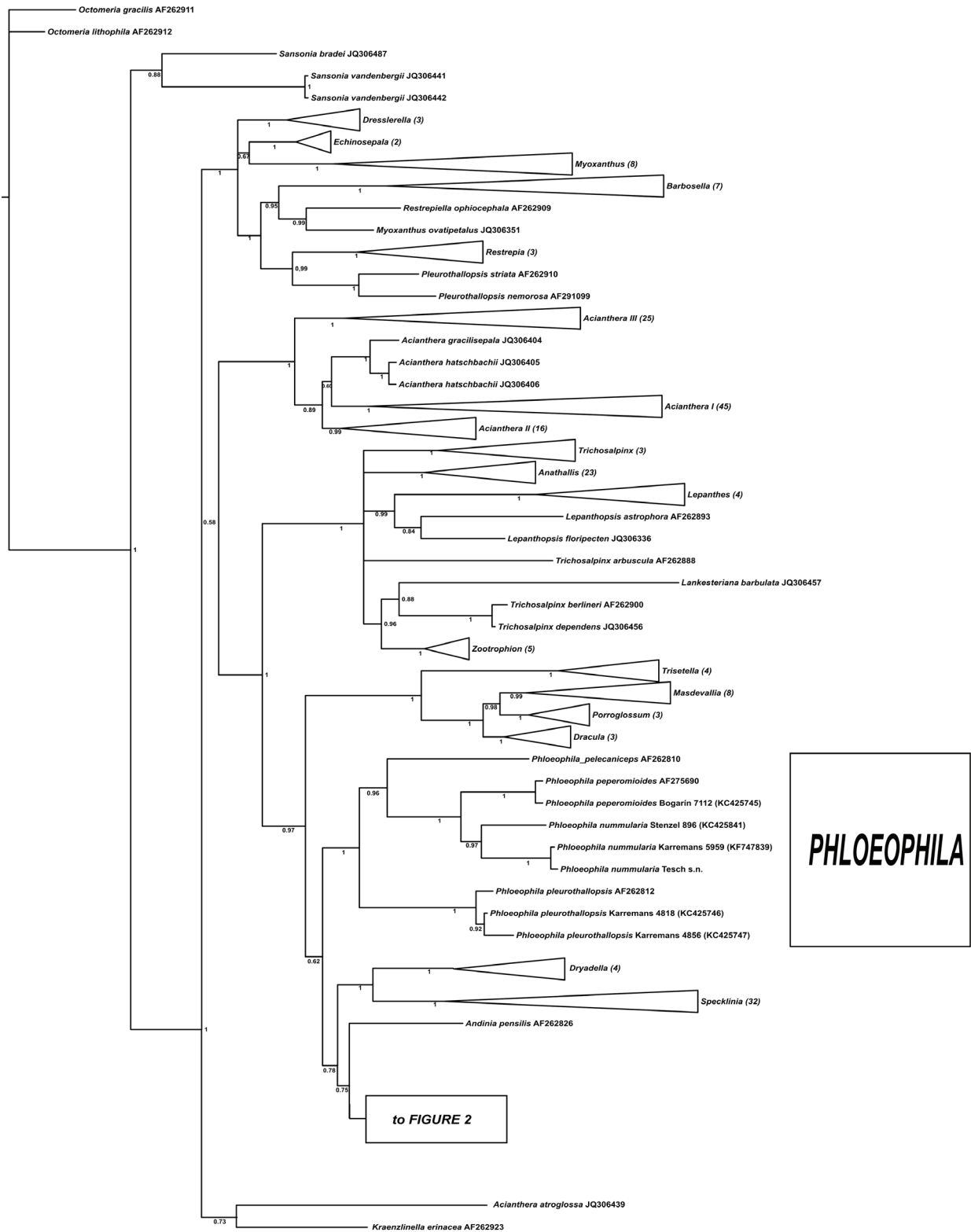
***Phloeophila*** Hoehne & Schltr. (1926: 201)

Synonyms: *Luerella* Braas (1979: 108), *Ophidion* Luer (1982: 79).

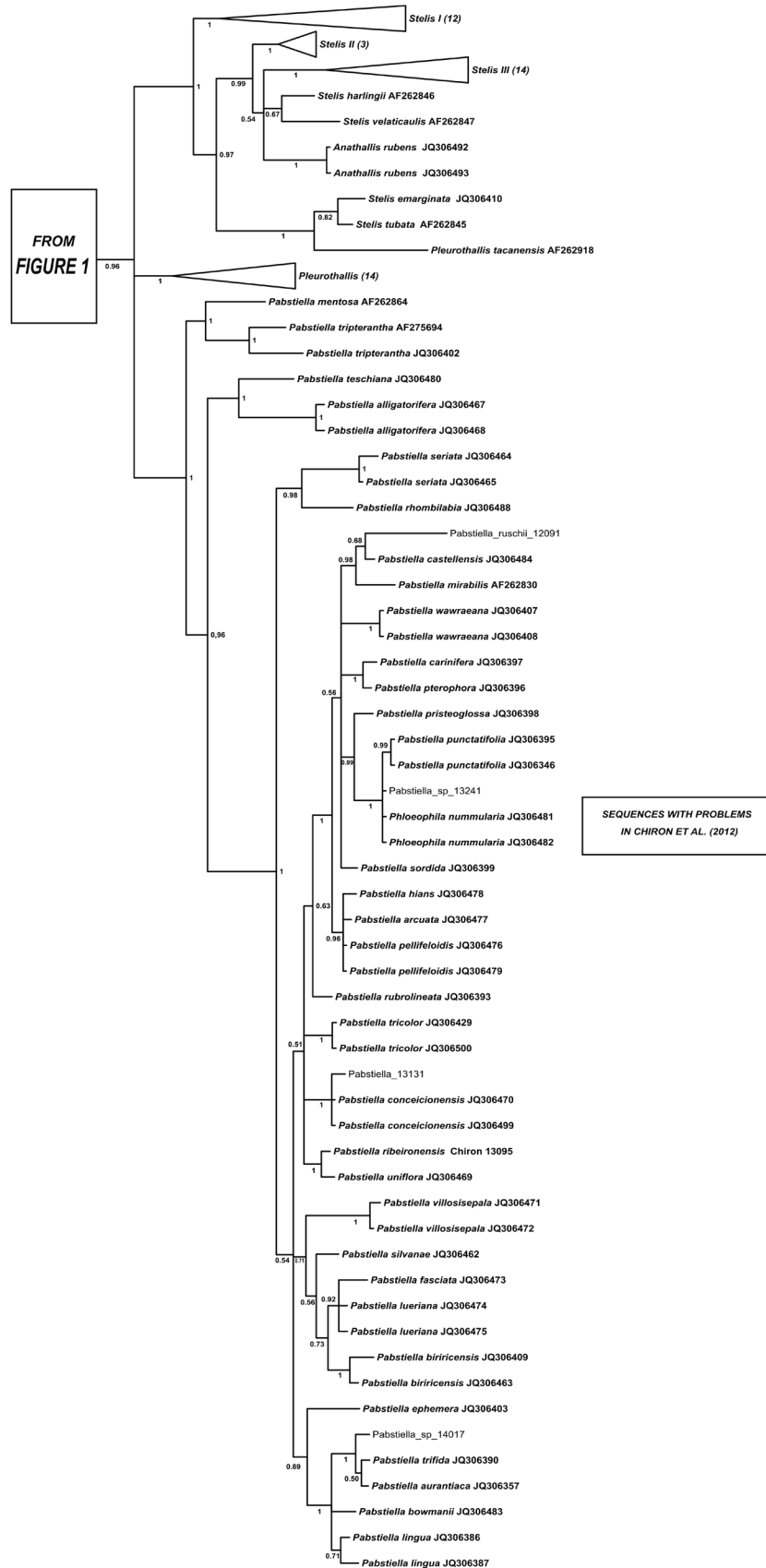
*Phloeophila* originally included only three species (Hoehne & Schlechter 1926), whereas four species were considered to belong in the genus by Luer (2006). Here, we adhere to the broad circumscription of *Phloeophila* that accounts for about a dozen species and includes the genera *Luerella* and *Ophidion* (Pridgeon 2005). We slightly modify that circumscription to exclude a few species that belong elsewhere. In that sense, *Phloeophila* includes nine species distributed from Belize through Central America and the Antilles to Bolivia and Brazil. The highest diversity is found in the Andes of Colombia and Ecuador.

***Phloeophila carrilloi*** (Ortiz) Pfahl (2014: 1)

Basionym: *Ophidion carrilloi* Ortiz (2005: 6).



**FIGURE 1.** First part of the tree obtained in a Bayesian analysis of 335 internal transcribed spacer (ITS) sequences of Pleurothallidinae. Numbers on the nodes represent posterior probabilities (PP), triangles represent large clades that were collapsed. The number of terminals in these clades are presented in brackets after the genus name. Taxa in *Pabstiella* and *Phloeophila* were not collapsed because they are the focus of this study.



**FIGURE 2.** Second part of the tree obtained in a Bayesian analysis of 335 internal transcribed spacer (ITS) sequences of Pleurothallidinae. Numbers on the nodes represent posterior probabilities (PP), triangles represent large clades that were collapsed. The number of terminals in these clades are presented in brackets after the genus name. Taxa in *Pabstiella* and *Phloeophila* were not collapsed because they are the focus of this study.

***Phloeophila cunabula*** (Luer & R.Escobar) Pridgeon & Chase (2001: 254)

Basionym: *Cryptophoranthus cunabulus* Luer & Escobar (1981: 114).

***Phloeophila cymbula*** (Luer) Pridgeon & Chase (2001: 254)

Basionym: *Cryptophoranthus cymbulus* Luer (1980: 346).

***Phloeophila dasyglossa*** (Luer & R.Escobar) Pridgeon & Chase (2001: 254)

Basionym: *Cryptophoranthus dasyglossus* Luer & Escobar (1981: 116).

***Phloeophila nummularia*** (Rchb.f.) Garay

Basionym: *Pleurothallis nummularia* Reichenbach (1865: 276).

***Phloeophila pelecanceps*** (Luer) Pridgeon & Chase (2001: 254)

Basionym: *Masdevallia pelecanceps* Luer (1976: 22).

***Phloeophila peperomioides*** (Ames) Garay

Basionym: *Pleurothallis peperomioides* Ames (1923: 64).

***Phloeophila pleurothallopsis*** (Kraenzl.) Pridgeon & Chase (2001: 254)

Basionym: *Cryptophoranthus pleurothallopsis* Kraenzlin (1925: 115).

***Phloeophila ursula*** (Luer & Hirtz) Luer (2006: 194)

Basionym: *Pleurothallis ursula* Luer & Hirtz (1996: 193).

Excluded taxa:

*Phloeophila oricola* (H.Stenzel) Luer (2006: 193) = *Acianthera oricola* (H.Stenzel) Karremans, Chiron & van den Berg, *comb. nov.*

Basionym: *Pleurothallis oricola* Stenzel (2002: 101).

*Pleurothallis oricola* was placed in *Phloeophila* in Luer's monograph of that genus. Nevertheless, the free dorsal sepal, narrowly obovate petals and prominently trilobed lip and verrucose-papillose above the middle are more similar to some species of *Acianthera* from the Antilles than to *Phloeophila*. Stenzel (2007) suspected such a relationship too.

*Phloeophila similis* (Schltr.) Garay (1974 : 118) = *Acianthera similis* (Schltr.) Karremans, Chiron & van den Berg, *comb. nov.*

Basionym: *Cryptophoranthus similis* Schlechter (1919: 323).

*Cryptophoranthus similis* was placed by Luer in *Pleurothallis* sect. *Phloeophilae* Luer (1986: 17) together with other species that would later be recognized as belonging to genus *Phloeophila*. Nevertheless, Schlechter (1919) clearly described the sepals as "apice cohaerentibus" and the lip as "brevissime auriculato", both features of species belonging to *Acianthera* sect. *Cryptophoranthae* (Luer) Chiron & van den Berg (2012: 68) rather than *Phloeophila*. Luer (2006) in fact excluded *P. similis* from his monograph of *Phloeophila*.

*Phloeophila yupanki* (Luer & R.Vásquez) Pridgeon & Chase (2001: 254) = *Dryadella yupanki* (Luer & R.Vásquez) Karremans, *comb. nov.*

Basionym: *Pleurothallis yupanki* Luer & Vásquez in Luer (1984: 203).

*Pleurothallis yupanki*, as the previous, was also member of *Pleurothallis* sect. *Phloeophilae* and was therefore transferred to *Phloeophila* by Pridgeon and Chase (2001). It was later segregated into the monotypic genus *Incaea* Luer (2006: 87) due to its aberrant morphology. Nevertheless, DNA results (Karremans *et al.*, in press) place it embedded within *Dryadella* Luer (1978: 207), which it resembles morphologically.

## Conclusion

*Phloeophila nummularia*, type species of the genus *Phloeophila*, is not situated in *Pabstiella* as suggested by Chiron *et al.* (2012), and two of us (GC and CvdB) have to apologize for our original mistake. The proposal to conserve *Pabstiella* vs. *Phloeophila* by Chiron and van den Berg (2013) should therefore also be considered unnecessary. *Phloeophila nummularia* is a variable species in its wide distribution from Cuba to Bolivia and Brazil. It is sister to the also morphologically similar *P. peperomioides*. A more detailed morphological and genetic study of this group across their whole geographical range will help in the future to understand what the natural variation of the species is. We can at least confirm that species of *Phloeophila* form a distinct clade in Pleurothallidinae and are not closely related to *Pabstiella*.

## References

- Ames, O. (1923) New or noteworthy orchids. *Schedulae Orchidianae* 6: 60–65.
- Ames, O. & Schweinfurth, C. (1930) New or noteworthy orchids. *Schedulae Orchidianae* 10: 1–112.
- Braas, L.A. (1979) Einige Anmerkungen zur Revision der Gattung *Masdevallia* RUIZ et PAVÓN, sowie über notwendige Ergänzungen der Gattungsreihe *Masdevalliae* (Subtr. Pleurothallidinae). *Die Orchidee* 30: 108.
- Brieger F. & Senghas, K. (1976) *Pabstiella*, eine neue Orchideengattung aus Brasilien. *Die Orchidee* 27: 193–196.
- Brown, R. (1813) *Pleurothallis*. In: Aiton, W.T. (Ed.) *Hortus Kewensis* (2nd ed.) 5. Taylor, London, 211 pp.
- Chiron, G.R. & van den Berg, C. (2012) Révision taxinomique du genre *Acianthera* (Orchidaceae, Pleurothallidinae). *Richardiana* 12: 59–77.
- Chiron, G.R. & van den Berg, C. (2013) Proposal to conserve the name *Pabstiella* against *Phloeophila* (Orchidaceae). *Taxon* 62: 176–177.
- Chiron, G.R., Guiard, J. & van den Berg, C. (2012) Phylogenetic relationships in Brazilian *Pleurothallis* sensu lato (Pleurothallidinae, Orchidaceae): evidence from nuclear ITS rDNA sequences. *Phytotaxa* 46 (1): 34–58.  
<http://dx.doi.org/10.11646/phytotaxa.46.1.5>
- Garay, L.A. (1974) *Acostaea* y los géneros del complejo *Pleurothallis*. *Orquideología* 9: 103–124.
- Hoehne, F.C. & Schlechter, R. (1926) Contribuição ao conhecimento das Orchidaceas. *Archivos de Botânica do Estado de São Paulo* 1: 165–349.
- Karremans, A.P., Albertazzi, F.J., Bakker, F.T., Eurlings, M.C.M., Pridgeon, A., Pupulin, F. & Gravendeel, B. (in press) Phylogenetic reassessment of *Specklinia* and its allied genera in the Pleurothallidinae (Orchidaceae). *Phytotaxa*.
- Kraenzlin, F.W.L. (1925) New species of *Masdevallia* and allied genera. *Bulletin of Miscellaneous Information, Kew* 1925: 97–117.  
<http://dx.doi.org/10.2307/4118655>
- Luer, C.A. (1976) *Icones pleurothallidarum*: miscellaneous new species in *Barbosella*, *Lepanthes*, *Masdevallia*, *Platystele* and *Scaphosepalum*. *Selbyana* 3: 10–37.
- Luer, C.A. (1978) *Dryadella*, a new genus in the Pleurothallidinae (Orchidaceae). *Selbyana* 2: 207–209.
- Luer, C.A. (1980) Miscellaneous new species in the Pleurothallidinae (Orchidaceae). *Phytologia* 46: 345–386.  
<http://dx.doi.org/10.5962/bhl.part.14732>
- Luer, C.A. (1982) *Ophidion* and *Zootrophion*, two new genera in the Pleurothallidinae. *Selbyana* 7: 79–87.
- Luer, C.A. (1984) Miscellaneous new species in the Pleurothallidinae (Orchidaceae). *Phytologia* 55: 175–203.
- Luer, C.A. (1986) Systematics of the genus *Pleurothallis* (Orchidaceae). *Monographs in Systematic Botany from the Missouri Botanical Garden* 20: 1–107.
- Luer, C.A. (1996) New species of *Pleurothallis* (Orchidaceae) from Ecuador. *Lindleyana* 11: 141–197.
- Luer, C.A. (2006) *Icones pleurothallidarum* XXVIII. Reconsideration of *Masdevallia*, and the systematics of *Specklinia* and vegetatively similar genera (Orchidaceae). *Monographs in Systematic Botany from the Missouri Botanical Garden* 105: 1–274.
- Luer, C.A. & Escobar, R. (1981) Miscellaneous new species in the Pleurothallidinae (Orchidaceae). *Orquideología* 14: 114–187.
- Luer C.A. (1996) New species of *Pleurothallis* from Ecuador. *Lindleyana* 11: 141–197.
- Ortiz Valdevieso, P. (2005) Nuevas especies de Orquídeas de Colombia. *Orquideología* 24: 3–20.
- Pfahl, J. (2014) *Phloeophila carrilloi*. *Internet Orchid Species Photo Encyclopedia Nomenclatural Notes* 2014 (1): 1.
- Pridgeon, A.M. (2005) *Phloeophila*. In: Pridgeon, A.M., Cribb, P.J., Chase, M.W. & Rasmussen, F.N. (Eds.) *Genera orchidacearum*, volume 4, Epidendroideae (part one). Oxford University Press, Oxford, pp. 381–383.
- Pridgeon, A.M. & Chase, M.W. (2001) A phylogenetic reclassification of Pleurothallidinae (Orchidaceae). *Lindleyana* 16: 235–271.

- Pridgeon, A.M., Solano, R. & Chase, M.W. (2001) Phylogenetic relationships in Pleurothallidinae (Orchidaceae): combined evidence from nuclear and plastid DNA sequences. *American Journal of Botany* 88: 2286–2308.  
<http://dx.doi.org/10.2307/3558390>
- Reichenbach, H.G. (1865) Neuheiten aus Cuba von Wright. *Flora* 48: 276.
- Schlechter, R. (1919) Orchidaceae novae, in caldariis Horti Dahlemensis cultae. II. *Notizblatt des Botanischen Gartens und Museums zu Berlin-Dahlem* 7: 323–330.  
<http://dx.doi.org/10.2307/3994364>
- Ronquist, F., Teslenko, M., van der Mark, P., Ayres, D.L., Darling, A., Höhna, S., Larget, B., Liu, L., Suchard, M. & Huelsenbeck, J.P. (2012) MrBayes 3.2: efficient Bayesian phylogenetic inference and model choice across a large model space. *Systematic Biology* 61: 539–542.  
<http://dx.doi.org/10.1093/sysbio/sys029>
- Stenzel, H. (2002) New species of *Platystele* and *Pleurothallis* (Orchidaceae) from Cuba. *Willdenowia* 32: 99–104.  
<http://dx.doi.org/10.3372/wi.32.32110>
- Stenzel, H. (2004) *Systematics and evolution of the genus Pleurothallis R.Br. (Orchidaceae) in the Greater Antilles*. Dissertation thesis. Mathematisch–Naturwissenschaftlichen Fakultät I der Humboldt– Universität zu Berlin. 178 pp.
- Stenzel, H. (2007) Orchidaceae - II. Pleurothallidinae 1. In: Greunter, W. & Rankin Rodríguez, R. (Eds.) *Flora de la Republica de Cuba*, fascicle 12 (2). Gantner, Liechtenstein, pp. 1–152.