

THE CAUDATUM GROUP

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Phrag. caudatum in situ Peru.

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THE SPECIES in the Caudatum group are very distinctive. They are distinguished by their spectacularly long petals that can reach 80 cm (32 inches). The species in this group belong to section *Phragmipedium* of the genus *Phragmipedium*. There are five species in the group, *Phrag. caudatum*, *Phrag. warszewiczianum*, *Phrag. humboldtii*, *Phrag. guianense*, and *Phrag. lindenii*. There is one verifiable natural hybrid, *Phrag. ×talamancanum*, a cross between *Phrag. humboldtii* and *Phrag. longifolium* that exhibits characteristics consistent with this group that will not be discussed. Other than *Paphiopedilum sanderianum* from Borneo, there is nothing like the species in this group.

The section is one of the most confused in terms of nomenclature. Names for the five species in this group have been confused and argued over for two hundred years. Most of the discussion has centered on personal interpretation and suppositions regarding the authors' intent in nineteenth-century publications. From a taxonomic evidentiary perspective, the intent was never documented and is irrelevant. Either a name was published in reference to a plant, or it wasn't. Whether the nineteenth-century source is scientific, a seed list, or a commercial orchid nursery advertisement, the Latin name is now accepted as a valid publication of a species. This is not the case today but is accepted as valid for that era.

Putting the questions and discussions regarding the names aside for a moment, most taxonomists agree that

the Caudatum group has either five or six species, depending on whose work you are reading. The problem always comes back to the names. This presents challenges for the hobbyist, the judging community, and taxonomists. Hobbyists often buy plants that are not in flower. The judges need to know the correct name for awarded plants. The taxonomist relies on literature that, unfortunately, contains multiple names for these species.

How confusing have the names for this group gotten? For example, *Phragmipedium warszewiczianum* is a name that is a synonym of one species, the valid name for another species, and once was thought to apply to none of the species in this group.

I conclude that there are five species in the Caudatum group, *Phrag. caudatum*, *Phrag. warszewiczianum*, *Phrag. humboldtii*, *Phrag. guianense*, and *Phrag. lindenii*, although I am temporarily accepting *Phrag. guianense* with caution. I reduced *Phrag. exstaminodium* to a synonym of *Phrag. humboldtii* (*Orchid Digest* Vol. 84-4, Oct., Nov., Dec. 2020). My conclusions are not based on interpretations, suppositions as to the intent of others, or what I might personally consider obvious or apparent.

The current concepts with regard to these plants is rather chaotic, but if one pays careful consideration to the actual words in the original descriptions (irrespective of the language used to write the descriptions), then one can make sense of them, and this is reinforced by examining the natural populations.

I did not limit my analysis only to the written word to reach my conclusion. I approached this problem first by considering the natural populations. What do they tell us? The natural populations tell us there are five distinct species. Then I considered what was written and asked if it complies with today's taxonomic rules? Given the broad way taxonomists interpret nineteenth-century publications, all that is needed are the words on the page.

The primary morphological difference between *Phrag. caudatum*, *Phrag. humboldtii*, *Phrag. guianense* and *Phrag. warszewiczianum* is in the characteristics of the lip or slipper and the location where it grows; there is no overlap in the range for these four species. The Andean species, *Phrag. humboldtii*, forms a north to south line and is native to Central America. *Phragmipedium warszewiczianum* is found from Colombia south through San Martin, Peru. *Phragmipedium caudatum* closes out the southern end of the line and is found in southern Peru and parts of western Bolivia. *Phragmipedium lindenii* can be found on the slopes of the volcanoes that straddle the equator in Ecuador and Columbia. *Phragmipedium guianense* is alleged to be from a single location near Saul, French Guiana, not in the Andes and far removed from the other four species.

Phragmipedium caudatum

Phragmipedium caudatum (Lindley) Rolfe, *The Orchid Review*, 4: 327-334 [332]. 1896.

Type: Peru, Pillao, Ruiz & Pavon s.n. (holo. K!; iso. BM!, G!, M!, W!).

Basionym:

Cypripedium caudatum Lindl., *Gen. Sp. Orchid. Pl.*: 531 (1840).

Homotypic Synonyms:

Selenipedium caudatum (Lindl.) Rchb.f. & Warsz., *Bonplandia* (Hannover) 2: 116 (1854).

Paphiopedilum caudatum (Lindl.) Pfitzer, *Jahrb. Wiss. Bot.* 19: 164 (1888).

The long petaled *Phragmipedium* species *Phrag. caudatum* once included the plants found from southern Mexico to Peru and Bolivia. *Phragmipedium caudatum* remained the valid name for these plants until 1922 when Rudolf Schlechter proposed removing the Central American population and gave the long petaled *Phragmipedium* from Central America the name *Phrag. warszewiczianum*.

Phragmipedium caudatum can be found from northern Peru, in the area near San Martin, south to Cusco, then east into Bolivia. Rhizomes are up to 3 cm (1 inch) long and are noticeable on larger plants. Leaves have been described as up to 60 cm (24 inches), but I have seen plants with longer leaves. The leaves are thick and stiff and, in natural populations, can support them-



Phrag. caudatum in cultivation.



Phrag. caudatum flowering in cultivation.



Phrag. caudatum (left) and *Phrag. humboldtii* showing the differences in the lip.

selves and stand upright. *Phragmipedium caudatum* can produce up to five flowers simultaneously on an inflorescence ranging from 30 to 60 cm (12 to 24 inches) in height. The primary difference between *Phrag. caudatum*, *Phrag. warszewiczianum* and the Central American *Phrag. humboldtii* is in the lip of the respective flowers.

Phragmipedium caudatum has a lip veined with green or dark brown. The fold along the distal edge (that part directly across from the staminode) of the lip is subquadrate-angular (almost square and angular) in cross-section. The sepals are oblong-lanceolate, tapering to a point. The dorsal sepal folds in on itself like a tube at the tip and is quite noticeable. The shape of the dorsal sepal and synsepalum present as mirror images. The curve around the front of the flower creates a "C" shape that frames the labellum at the center. The petals are spectacular. They are pendent, slightly twisted, up to 80 cm (32 inches) long, and 1.2 to 1.9 cm (0.5 to 0.8 inches) wide. They tend to be thinner as you move away from the flower toward the tip. The petals continue to lengthen after the flower opens and can continue to lengthen until the flower dies. The staminode is widely triangular, bilobed, and variable.

Overall, the flower color ranges in different degrees from green and white to yellow and brown. The petal color is cream with green veins, becoming reddish-brown to mahogany distally. The staminode has dark red tips on each side, and hairs are long, prominent, and sparse. The shape of the labellum, or slipper, varies from elongated or calceolate (slipper-shaped) to

rounded in appearance. Flowers with brown labellum are known, and a brown lip cannot distinguish *Phrag. caudatum* from the Central American *Phrag. humboldtii*. The amount of pink to red dots on the claw face varies significantly. The overall slipper shape, color, and spotting can vary considerably.

If you know your plant's provenance or mother plant used in breeding the clone, it is easy to determine if your plant is *Phrag. caudatum* or *Phrag. humboldtii* is easy. However, if you don't know where the plant was grown geographically, most of the other variable taxonomic characteristics leave little to help distinguish *Phrag. caudatum* from *Phrag. humboldtii*. The only difference is the distal edge of the lip.

Phragmipedium humboldtii

Phragmipedium humboldtii (Warsz.) J.T. Atwood & Dressler, *Selbyana* 19(2): 246. 1998 (publ. 1999).

Type:

PANAMA. In *Quercubus monitum* Chiriqui (Lectotype, selected by Atwood & Dressler [1998]: "Mai Juni Juli [1848-1851]/Cordill. Chiriqui," J. Warszewicz 41 (W Rchb Orch 15682).

Basionym:

Cypripedium humboldtii Warsz., *Bot. Zeitung* (Berlin) 10(40): 691. 1852.



Phrag. humboldtii in situ. The color is similar to *Phrag. caudatum*. The labellum morphology is inconsistent.

Synonym:

Phragmipedium popowii (Braem, Ohlund & Quéné) Richardiana 4 (4): 185. 2004 *nomen illegitimum*
Based upon same type as *P. humboldtii* Warsz

Phragmipedium exstaminodium (Castaño, Hágsater & Aguirre) Orquídea (México), 9: 191-197. 1984.
Type: Mexico, Chiapas, Tziscaco, Leleu s.n. (holo. AMO!)

Paphiopedilum exstaminodium (Castaño, Hágsater & E. Aguirre) V. A. Albert & Borge Pett., Lindleyana 9: 137 (1994).

Phragmipedium warscewiczii subsp. *exstaminodium* (Castaño, Hágsater & E. Aguirre) Christenson, J. Orchideenfr. 13: 143 (2006).

Phragmipedium humboldtii subsp. *exstaminodium* (Castaño, Hágsater & E. Aguirre) J. T. Atwood & Dressler ex J. M. H. Shaw, Orchid Rev. 119 (Suppl.): 84 (2011).

Phragmipedium humboldtii var. *exstaminodium* (Castaño, Hágsater & E. Aguirre) P. J. Cribb & Purver, Slipper Orchids Trop. Amer.: 204 (2017).

Cypripedium caudatum var. *roseum* Delchev., Rev. Hort. (Paris) 39: 133 (1867).

Selenipedium warscewiczii Rchb. f., Xenia Orchid. 2: 189 (1873).

Selenipedium caudatum var. *roseum* F. Buyss., L'orchidophile; Traité Théor. & Prat.: 470 (1878).

Selenipedium caudatum var. *giganteum* Carrière, Rev. Hort. (Paris) 56: 367 (1884).

Selenipedium caudatum var. *albertianum* Linden, Lindenia 4: 64 (1888).

Selenipedium caudatum var. *warscewiczii* (Rchb. f.) Pucci, Cypripedium: 60 (1891).

Paphiopedilum caudatum var. *warscewiczii* (Rchb. f.) Stein, Orchid.-Buch: 461 (1892).

Cypripedium caudatum var. *warscewiczii* (Rchb. f.) Kerch., Livre Orchid.: 454 (1894), *nom. superfl.*

Phragmipedium caudatum var. *roseum* (Delchev.) Pfitzer in H. G. A. Engler (ed.), Pflanzenr. 12: 52 (1903).

Phragmipedium monstrosus Archila, Revista Guatemalensis 2 (3): 5 (1999).

Phragmipedium triandrum Archila, Revista Guatemalensis 2 (3): 6 (1999).

Phragmipedium exstaminodium subsp. *warscewiczii* Dressler, Orchid Digest 69: 89 (2005).

Phragmipedium warscewiczii (Rchb. f.) Christenson, J. Orchideenfr. 13: 142 (2006).

Phragmipedium caudatum f. *albertianum* (Linden) O. Gruss & M. Wolff, Orchid. Atlas: 337 (2007).

Phragmipedium humboldtii subsp. *monstrosus* (Archila) Mó Mó & Pérez-García, Orchidee (Hamburg) 66: 222 (2015).

Phragmipedium humboldtii subsp. *triandrum* (Archila) Mó Mó & Pérez-García, Orchidee (Hamburg) 66: 222 (2015).

Phragmipedium warscewiczianum sensu (Garay) Orchid Digest 43: 140. 1979, *non* (Reichenbach fil.) Schlechter.



Phrag. humboldtii in situ just after anthesis showing the characteristics of the labellum.



The tri-lobed staminode of *Phrag. humboldtii* in situ. This staminode is representative of the other species in this group.

The Valid Name

Much discussion has centered on the correct name for this species, *Phragmipedium humboldtii*. The specific status of this species does not appear to be in doubt, and it is easy to recognize. There is almost universal agreement in both the taxonomic and horticultural communities that the Central American populations are a distinct species. It is the correct name that is causing all the confusion. Except for Braem, there appears to be a consensus, with which I agree, that the correct name is *Phrag. humboldtii*.

After considering the same history of published names and the International Code of Botanical Nomenclature (hereafter ICBN) as Braem did, the following are all in agreement about the correct name: Cribb, Purver, Atwood, Dressler, Gruss, and Pupulin. All but Braem agree that the correct name is *Phrag. humboldtii*.

In 1999 Atwood and Dressler published the name for this species, *Phragmipedium humboldtii*, a name based upon an 1852 article by Reichenbach attributing the description of *Cypripedium humboldtii* (as *humboldti*) to Warszewicz, and this name takes precedence.

In 2004 Braem (2004) tried to demonstrate that *Cypripedium humboldti* was not described in 1852 and was a name that appeared in an article without validity. The controversy centers on the following 1852 text. I am reproducing the original German text to English as Braem translated it. The translation is from "A Language Trap—*Phragmipedium caudatum*, *Phrag. warszewiczianum*, *Phrag. humboldtii*" (Braem & Ohlund) published in the *Australian Orchid Review*, October/November 2004, page 19,20, 21. In 1852 Reichenbach *fil.* writes:

Cypripedium Humbolti Wszech. I have a specimen and a drawing by the author. I did compare the specimen and the drawing with specimens of *C. caudatum* collected by Ruiz, and with the illustra-

tions in Hooker's *Icones Plantarum* VII. 628 and Paxton's *Flower Garden*, 1:t.9. I agree with Mr. von W[arszewicz] in that there is more than one species involved.

Reichenbach continues:

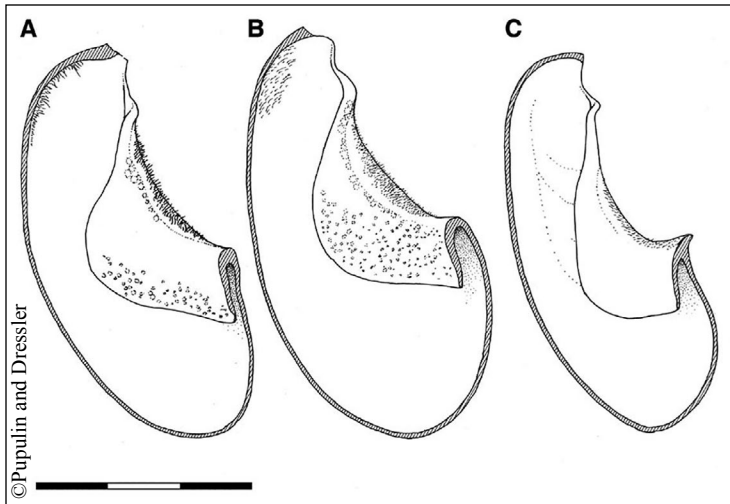
Although I most rarely distinguish plants on the basis of drawings and descriptions that have not been made by myself, it is self-evident that I trust Prof. Lindley's drawings and descriptions. I define the two species as follows...

And ultimately:

Cypr. Caudatum Lindl. Orch. 5. 31.: dorsal sepal broadly oblong, acute. Synsepal similar but broader. Petals very long, linear from a broader base. Pouch oblong, inflated, the margin around the aperture with short hairs, causing a velvet like surface. Staminode three-lobed – Hook. Lc. (loc cit.) "*C. Humbolti* v. Wszech." Flowers deep yellow, veined red. Lip spotted purple. In the forests of the Peruvian Andes. Ruiz! (Herb. Berol! Chiriqui Mountains. Von Warszewicz!

In 2004 Braem published the first of three papers (Braem & Öhlund 2004, Braem, Öhlund & Quené 2004, and Braem 2014), as well as a section in a book (Braem, Teson & Öhlund 2018) challenging the name *Phrag. humboldtii*. In these, he proffers nothing new nor support from anyone else for his contention.

Braem, in place of *Phrag. humboldtii* because he considers it an invalid name, published *Phrag. popowii* as the valid name. The central premise for Braem's challenge to the name *Phrag. humboldtii*, is twofold. From his publications, "This conclusion [*Phrag. humboldtii*], however, is based on a flagrant misinterpretation of the original German text..." (Braem & Ohlund 2004). Braem continues, "...Atwood & Dressler would be right in their interpretation if there were no other facts



Longitudinal sections through the lips in A. *Phrag. caudatum*, B. *Phrag. humboldtii*, C. *Phrag. warszewiczianum*. Scale bar = 3 cm.



Sections through the lips (top) and upper third of the lip rims (bottom) in a, a'. *Phrag. caudatum*, b, b'. *Phrag. warszewiczianum*, c, c'. *Phrag. humboldtii*. Scale bar = 1 cm.

that speak clearly against it. These facts, however, cannot be recognized and/or understood by anyone who is not familiar with the characteristics and finesses of the German Language." (Braem & Ohlund 2004) and "the obvious lack of comprehension of some botanists in respect to the original German literature" (Braem, Öhlund & Quené 2004). Based on the previous statements, Braem concludes that "*Reichenbach unmistakably lists 'C.[ypripedium] Humboldtii' as a synonym for Cypr.[ipedium] caudatum Lindl.*" Braem further contends that "Reichenbach did not describe nor did he intend to describe "*Cypripedium humboldtii*" as an autonomous species" (Braem & Ohlund 2004). Braem is correct in one regard. Reichenbach *fil.* did not describe *Cypripedium humboldtii*, Warszewicz did. Braem does not identify other facts present in the 1852 article other than the language problem.

In 2011 Pupulin & Dressler published an article defending the publication of the name *Phrag. humboldtii*.

Concerning the text of 1852 in which the name *C. humboldtii* appears for the first time, it is necessary to separate the authorship of the publication, which is by Reichenbach *filius*, from that of the taxon, which is ascribed to Warszewicz. Reichenbach *filius* himself confirmed such a view, repeatedly citing the name of the species as "*C. humboldtii* Wzw." (i.e., Reichenbach *f.*, 1854, Linden and Reichenbach *f.*, 1860). According to art. 46.2. of the ICBN, "a name of a new taxon must be attributed to the author or authors to whom both the name and the validating description or diagnosis were ascribed, even when authorship of the publication is different" (see in particular ex. 4, and Art. 31.4., Ex. 3; McNeill et al., 2006). In Reichenbach *filius*'s text for 1852, both the name of the species and the diagnosis, which was published in double quotes, were ascribed to Warszewicz; a footnote on the first page of the article confirms this ascription ("Die mit „" bezeichneten ergänzenden Notizen danke ich Hrn. De Warszewicz"; Reichenbach *f.*, 1852: 689). As the name of *C. humboldtii* must be attributed solely to Warszewicz, the acceptance or otherwise of the name by Reichenbach *filius* is not relevant for valid publication.

Pupulin & Dressler continue; "Article 33.5. of the ICBN establishes that "for names published on or after 1 January 1953, errors in the citation of the basionym or replaced synonym, including incorrect author citation [italics are ours] but not omissions, do not preclude valid publication of a new combination, new generic name with a basionym, or *nomen novum*." As the wrong citation of the authorship by Atwood and Dressler (1998) may be treated as a simple bibliographic error to be corrected, the name *Phragmipedium humboldtii* (Warsz.) J. T. Atwood & Dressler was validly published.

Lastly, I will quote from Cribb & Purver (2017): "Josef von Warszewicz, an eminent plant collector in Central America, recognized as early as 1849 that this taxon was distinct from the Peruvian *Phrag. caudatum* by reason of its lip shape and flower colouration." Cribb & Purver continue. "Atwood & Dressler (1999) published a new combination, *Phragmipedium humboldtii*, based upon *Cypripedium humboldtii* (as *humboldti*), a name with a short description given by Warszewicz and published in an article by H.G. Reichenbach (1852)."

A few things stand out to me, Warszewicz described *Cypripedium humboldti*, not Reichenbach *fil.* The name "*C. humboldti* v. Wszwcz." was published in the article about the Central American populations, explicitly referencing the Chiriqui Mountains as distinct from the Peruvian populations. Only the Central American species we now know as *Phrag. humboldtii* is found in the Chiriqui Mountains. We have an acknowledgment by Reichenbach *fil.* in the article of more than one species. This language is evident in German and English, and I purposefully used Braem's published translation to affirm the previous points. The name *humboldti* was written and published in 1852 specifically about a plant from the Chiriqui Mountains in what we know today as western Panama. However brief, vague, or poor the 1852 publication may have been, its publication in Latin was sufficient for the nineteenth century and is valid. There is compliance with, and support from, the ICBN for the Atwood & Dressler publication. The rules (ICBN) governing the practice of taxonomy allow for the valid publication of species names as published by Atwood & Dressler. According to Pupulin (2016), this has been confirmed by Dr. Kanchi N. Gandhi, the leading expert in plant nomenclature at Harvard University. Whether or not Reichenbach *fil.* thought the plants were from the two locations, Peru and Panama were one species and not two, is not relevant to the question because he did not describe *Cypripedium humboldti*. Reichenbach *fil.* was entitled to his opinion like everyone else. The intent of Reichenbach *fil.* cannot be found anywhere in the article. The publication of the name *Cypripedium humboldti* in reference to the Central American species is evident in any language.

Assertions that none of the authors who support the Atwood & Dressler publication, one of whom, Olaf Gruss, is a native German speaker as capable as Braem, can translate the German text and understand the plain meaning of the words on the page cannot be taken seriously. Therefore, *Phrag. popowii* is a synonym of *Phrag. humboldtii*.

Plant Description

Rhizomes are up to 3 cm (1 inch) and are noticeable on larger plants. The leaves have been described as up to 60 cm (24 inches), but I have not seen leaves this long in natural populations or cultivation. The height of inflorescence is 30 to 60 cm (12 to 24 inches). The leaves are thick and stiff and, in natural populations, can sup-

port themselves and stand upright.

The sepals are spectacular and can exceed the size of the entire plant four times over. The sepals are oblong-lanceolate, tapering to a point. The petals are long, pendent, slightly twisted, up to 80 cm (32 inches) long and 1.2 to 1.9 cm (0.5 to 0.8 inches) wide, tending to be thinner toward the tip of the petals. The color of the petals is cream with green veins, becoming reddish-brown to mahogany distally. The petals continue to lengthen until the flower dies. The labellum is distinctly rounded, not markedly thickened, and is overlaid with brown. The habitats range from 1,200 to 1,800 meters (3,937 to 5,906 feet), with most found near 1,500 meters (4,921 feet).

Dressler & Pupulin differentiate the three long-petaled species, *Phrag. caudatum*, *Phrag. humboldtii*, and *Phrag. exstaminodium*, from each other based on the characteristics of the labellum, or slipper, and I tend to agree. *Phragmipedium humboldtii* has a distinctly rounded labellum, and it markedly thickened, while *Phrag. caudatum* has a lip with a prominent hairy band on each side. Both species' labellums are brown in varying degrees, and color cannot be used as a differentiating taxonomic characteristic. Stamines vary with *Phrag. exstaminodium* having none.

Phragmipedium exstaminodium presents an interesting situation for us in the *Phragmipedium* community. When this species was described, it was the only species that we knew of that occurred in a natural population that did not have a staminode. *Phragmipedium exstaminodium* is, in every way except for the morphology of the staminode, a *Phrag. humboldtii*, and no one has ever proffered anything to the contrary. *Phragmipedium exstaminodium* grows within the known and accepted range of *Phrag. humboldtii*. Vegetative characteristics are consistent with *Phrag. humboldtii*. The labellums are the same. The petals, dorsal sepals, and synsepals are consistent, and the color of the flower is the same. Ecological conditions are consistent with *Phrag. humboldtii*. But there is still that problem of the lack of a staminode in *Phrag. exstaminodium*.

Since the description of *Phrag. exstaminodium*, two other species have been encountered in natural populations that lack a staminode, *Phrag. boissierianum* and *Phrag. schlimii*. The plants are within the natural range, consistent in every way with that species, growing as a small colony without staminodes. We can't separate any of these three groups of plants from the wider population, except for the absence of the staminode. See the *Orchid Digest* Vol. 84-4, Oct., Nov., Dec. 2020 for a more detailed discussion and understanding of *Phrag. exstaminodium* and why it is a synonym of *Phrag. humboldtii*.

Until it can be shown that *Phrag. exstaminodium* differs from *Phrag. humboldtii* in another way than the missing staminode, it is best to treat *Phrag. exstaminodium* for what it is, a form of *Phrag. humboldtii*.



Phrag. lindenii in situ in Central Ecuador.

Phragmipedium lindenii

Phragmipedium lindenii ((Lindley) Dressler & N. Williams, Taxon 24: 691. 1975).

Type:

Venezuela, savannah overlooking Lake Maracaibo, *linden* s.n. (holotype K!)

Basionym:

Uropedium lindenii Lindl., *Orch. Linden.* 28 (1846)

Homotypic synonyms:

Cypripedium lindenii (Lindl.) Van Houtte, *Ann. Gén. Hort.* 18: 155 (1870).

Selenipedium lindenii (Lindl.) G. Nicholson, III. *Dict. Gard.* 3: 413 (1886).

Cypripedium caudatum var. *lindenii* (Lindl.) A. H. Kent in H. J. Veitch, *Man. Orchid.* Pl. 4: 60 (1889).

Selenipedium caudatum var. *lindenii* (Lindl.) Pucci, *Cypripedium*: 56 (1891).

Paphiopedilum caudatum var. *lindenii* (Lindl.) Brongn. ex Stein, *Orchid.-Buch*: 460 (1892).

Phragmipedium caudatum var. *lindenii* (Lindl.) Pfitzer in H. G. A. Engler (ed.), *Pflanzenr.* 12: 52 (1903).

Paphiopedilum lindenii (Lindl.) V. A. Albert & Borge Pett., *Lindleyana* 9: 137 (1994).

Heterotypic Synonyms:

Selenipedium caudatum var. *uropedium* Rolfe, *Lindenia* 7: 69 (1891).

Cypripedium caudatum var. *uropedium* Kraenzl., *Orchid. Gen. Sp.* 1: 50 (1897).

Phragmipedium lindenii was first described as part of a separate genus, *Uropedium*, in 1846. Since then, various authors have either resurrected the name *Uropedium* or placed this species in the genus *Phragmipedium*. I follow the 1975 placement in the genus *Phragmipedium*. The taxonomy of *Phrag. lindenii* is not in doubt, and this species is easily recognizable by the lack of a slipper-shaped labellum. *Phragmipedium lindenii* is the only species of slipper orchid with a labellum formed into a third petal and doesn't have a pouch. This might seem odd at first, as the slipper plays a critical role in pollination. However, *Phrag. lindenii* doesn't need the slipper. Every flower found in the primary habitats or cultivation self-pollinates. The petals are typically between 20 and 40 cm (8 and 16 inches) in length. The elongated labellum, also with the same measurements as the petals, does not appear to facilitate pollination or play a role in attracting pollinators. Given the unique biology of this species, it is not clear if a pollinator will ever be identified. This combination of unique characteristics: obligatory self-pollination, a labellum elongated like a third petal, and the volcanic ecology, separate *Phrag. lindenii* from the rest of the genus. This is an easy species to identify both in and out of flower. Flowers are maroon to green to yellow in varying degrees and tend to become more yellow as the flower ages. *Phragmipe-*



Phrag. warszewiczianum growing terrestrially in Ecuador.

dium lindenii continues to develop after anthesis, as its self-pollination mechanism demonstrates.

Whether at one of my lectures or informally at an orchid show, I am often asked why this species appears to have abandoned a pollinator and developed its unique floral morphology. Self-pollination is not unique to this species. *Phragmipedium boissierianum*, *Phrag. schlimii*, and perhaps *Phrag. kovachii* are self-pollinating while *Phrag. longifolium* is also occasionally self-pollinating. The ancestral form of *Phrag. lindenii* must have been self-pollinating as well before the mutation occurred that changed the pouch in a third long petal.

Many of these self-pollinators are not colonizers of disturbed areas. *Phragmipedium lindenii* grows only in volcanic soil. Road cuts through those areas have *lindenii* near the roads, but that is a function of the road cutting through the habitat and not colonization.

Perhaps self-pollination is due to the environment itself. The slopes of volcanoes are constantly being wiped clean by eruptions, forcing nature to start over again. I can only surmise that any dependency on a specific pollinator must be short-lived. *Phragmipediums* are deception flowers; there is no reward for pollinators. Pollinators require food sources outside the

phragmipedium flowers and are dependent on the surrounding ecosystem to sustain them. Dependency on a species-specific pollinator would be short-lived when the ecosystem resets after an eruption. I surmise that *Phrag. lindenii* has evolved to self-pollinate to continue the species. Self-pollination results in an abundance of seed, making it easier for *Phrag. lindenii* to quickly repopulate areas after eruptions.

I have been lucky enough to see this process firsthand. I first encountered *Phrag. lindenii* on the slopes of Mt. Tungurahua in central Ecuador in 1999. The volcano started to erupt while we were on its slopes. As the sunset, the volcano began spewing a thick ash cloud high into the sky, and thunder shook the ground as we tried to get off the slopes. A few years later, a more powerful eruption wiped clean part of the surrounding area. It is only recently that life has returned to that part of volcanic slopes. *Phragmipedium lindenii* has started repopulating that area, but interestingly enough, many other orchid species not known from that area before the eruption have started to appear. On the other hand, several other species previously known to be in that area did not make it past the recent eruption and can no longer be found.



Phrag. warszewiczianum in situ in Peru

Phragmipedium warszewiczianum

Phragmipedium warszewiczianum (Reichenbach fil.)
Schlechter. *Repertorium specierum novarum regni vegetabilis*, Beihefte. Band XVII: 9 (1922)

Type:

Ecuador, Loja, Zamora, 800-1300 m, Wallis s.n. (holo. W); Ecuador, Zamora, Lehmann 6268 (neo. W!; isoneo. Ames, G, K, L, NY, US).

Basionym:

Cypripedium warszewiczianum Rchb. f., *Bot. Zeitung* (Berlin) 10: 692 (1852).

Synonyms:

Phragmipedium wallisii (Reichenbach fil.) Garay, *Fl. Ecuador*, *Orchid* 9:24. 1979.
Phragmipedium lindenii (Lindl.) Dressler & N. H. Williams subsp. *Wallisii* (Rchb.f.) Dressler in *Orchid Digest* 69, 2: 89 (2005).
Phragmipedium caudatum (Lindl.) Rolfe var. *wallisii* (Rchb. f.) Pfitzer in Engler, *Pflanzenr.* 4, 50, H. 12: 53 (1903).

Homotypic synonyms:

Selenipedium warszewiczianum (Rchb. f.) Rchb. f. & Warsz., *Bonplandia* (Hannover) 2: 116 (1854).
Paphiopedilum warszewiczianum (Rchb. f.) Pfitzer, *Bot. Jahrb. Syst.* 19: 42 (1894).
Phragmipedium caudatum var. *warszewiczianum* (Rchb. f.) Pfitzer in H. G. A. Engler (ed.), *Pflanzenr.*, IV, 50(12): 53 (1903).

Heterotypic synonyms:

Cypripedium wallisii Rchb. f., *Xenia Orchid.* 2: 189 (1873), *pro syn.*
Selenipedium wallisii Rchb. f., *Xenia Orchid.* 2: 189 (1873).
Selenipedium caudatum var. *wallisii* (Rchb. f.) Pucci, *Cypripedium*: 60 (1891).
Paphiopedilum caudatum var. *wallisii* (Rchb. f.) Stein, *Orchid.-Buch*: 460 (1892).
Cypripedium caudatum var. *wallisii* (Rchb.f.) A. H. Kent in H. J. Veitch, *Man. Orchid. Pl.* 4: 61 (1894).
Paphiopedilum wallisii (Rchb. f.) Pfitzer, *Bot. Jahrb. Syst.* 19: 42 (1894).
Phragmipedium caudatum var. *wallisii* (Rchb.f.) Pfitzer in H. G. A. Engler (ed.), *Pflanzenr.*, IV, 50(12): 53 (1903).

Phragmipedium warszewiczianum is another of the long petaled species with a confusing nomenclature history. However, unlike *Phrag. humboldtii*, there does not appear to be any confusion about the correct name for this species. See the *Orchid Digest* Vol. 84-4, Oct., Nov., Dec. 2020 for a more detailed discussion and understanding of the nomenclature history of this species, as well as a discussion about the geographic range.

Phragmipedium warszewiczianum is a terrestrial and rarely epiphytic species. Rhizomes are up to 3 cm (1 inch) and are noticeable on larger plants. Leaves are generally about 60 cm (24 inches) long; however, I have seen large plants in natural populations with leaves one meter (3 feet) in length. The inflorescence usually carries three to four flowers simultaneously. The flower color is a unique white suffused with yellow and pink. The color makes *Phrag. warszewiczianum* easy to identify when placed next to its cousins *Phrag. humboldtii* and *Phrag. caudatum*. The dorsal sepal is ovate-lanceolate and can be as long as 20 cm (8 inches). The labellum is calceolate or obovate, 4 to 6 cm (2 inches) in length. *Phragmipedium warszewiczianum* labellum has a low, narrow keel, with the lower third projecting forward. The labellum morphology is the primary differentiating morphological characteristic from both *Phrag. caudatum* and *Phrag. humboldtii*. The staminode is consistent with the *caudatum* group overall. It is generally triangular with two lobes, one on each side, with some plants showing a noticeable third lobe at the bottom. You might have to look carefully to see the third lobe; it is not always tipped in red and can be bent back, making it difficult to see. The petals are linear cordate and can be as long as 60 cm (24 inches). The petals continue to elongate for the life of the flower.

Phragmipedium guianense

Phragmipedium guianense (Sambin & Braem) *Richardiana* 15:4. (2015).

Type:

French Guyana, near Saul, *Jean-Pierre Bikaëff* in C. Saul 003 AS 02 (holo. CAY)

Phragmipedium guianense is based on a plant collected near Saul in French Guiana and subsequently flowered in cultivation. *Phragmipedium guianense* was differentiated by its smaller flowers, shorter dorsal and synsepalum, and what the authors describe as much shorter petals, from 10 cm to 70 cm (4 to 28 inches). That is a considerable range for the petal length and matches the description of the other species in the *Caudatum* group. The plants are described as 24 cm (9 inches) high. *Phragmipedium guianense* grows primarily on tree branches high in the evergreen forests of French Guiana. The plant size and ecology are consistent with *Phrag. humboldtii*. The inflorescence, slightly taller than the plant, bears one to two flowers said not to open simultaneous-

ly. The ovary is green and spotted with red. The staminode is rhombic with red tips at both sides and a small protrusion at the bottom. The labellum is morphologically similar to *Phrag. warszewiczianum* with a low, narrow keel, with the lower third projecting forward. The claw face is unique. In my opinion, if the claw face is stable and the type plant from a natural population, that sets *Phrag. guianense* apart from the closely related *Phrag. caudatum* as well as *Phrag. klotzschianum*. Some authors have found similarities among these species. In *Phrag. caudatum* and *Phrag. klotzschianum*, the claw face is white. In *Phrag. guianense*, the claw face is heavily spotted with large brown and purple spots.

The description should have spurred a heightened interest in this species from the scientific and horticultural communities. Oddly, since the original description, there have been no photos of *Phrag. guianense* or subsequent blooms on the type plant.

No species of *Phragmipedium* is known from such a restricted range. On the contrary, *Phragmipedium* species are widespread. *Phragmipedium guianense* is currently known only from the type material. I accept *Phrag. guianense* with caution until further information is obtained. I base this on the fact that the description was based on a cultivated plant that may have been aberrant in form or potentially is a man-made hybrid.*

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About the Author

Frank Cervera is a biologist who has been studying the ecology, biology, and taxonomy of the genus *Phragmipedium* throughout natural populations for the past twenty-five years. His journey with *Phragmipedium* started in the 1980s when one of his ecology professors introduced him to orchids that led him to buy a plant of *Phrag. longifolium*. After many years of trying to get a sense of which *Phragmipedium* species were which, and why he was killing so many plants, Frank decided to take the matter into his own hands. This revision is the result of Frank's twenty-five-year sojourn to the jungles of Mexico, Guatemala, Panama, Colombia, Ecuador, Peru, Venezuela, Guyana, and into Brazil studying the genus *Phragmipedium*, its taxonomy, ecology, and culture. Along the way, Frank has met some of the most well-known names and personalities in the phragmipedium community. He has been to some of the most famous, and infamous, orchid nurseries in South America at critical times in the history of the genus and asked them to retell their stories. Frank has had the unique opportunity of going straight to the source and examining plants and flowers. Frank currently works in the Financial Services industry and resides, along with his family and his orchids, in New York.

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