PHRAGMIPEDIUM SCHLIMII

FRANK CERVERA

PHRAGMIPEDIUM SCHLIMII, a very attractive species, has always been one of the more important species in the genus from a horticultural point of view and has been used extensively to make hybrids. The treatise that follows is the result of more than twenty-five years of carefully performed observational in situ studies in the field as well as many years of experience in cultivating this species.

Phragmipedium schlimii (Linden ex Reichenbach fil.) Rolfe, *Orchid Rev*. 4:332. 1896.

Basionym:

Selenipedium schlimii Linden ex Rchb. f., *Bonplandia* (Hannover) 2: 277. 1854.

Homotypic synonyms:

Paphiopedilum schlimii (Linden ex Rchb. f.) Stein, *Orchid.-Buch*: 483. 1892.

Paphiopedilum schlimii (Rolfe) Pfitzer, *Bot. Jahrb. Syst*. 19: 42. 1895.

Phragmipedilum schlimii (Linden ex Rchb. f.) Rolfe, *Orchid Rev*. 4: 332. 1896. Type: Colombia, Ocana, *Schlim* 407 (lecto. W!, K! : syn. K!,G!).

Heterotypic synonyms:

Cypripedium schlimii var. *albiflorum* Linden, Ill. Hort. 1874: t. 183. 1874.

Phragmipedium schlimii f. *albiflorum* (Linden) O. Gruss, *Orchidee* (Hamburg) 47: 22. 1996.

Phragmipedium schlimii var. *albiflorum* (Linden) Braem, *Orchids* (West Palm Beach) 65: 128. 1996.

Synonyms:

Phragmipedium andreettae (P. J. Cribb & Pupulin) *Lankesteriana* 6(1): 1 figs 1-2 2006. Type: ?N.W. Ecuador, without exact Prov., hort. Ecuagenera, November 2005, *Portillo s.n.* (holo. QCA!).

Phragmipedium anguloi (Braem, Teson & Manzur) *Richardiana* 14: 290; figs 1-2. 2014. Type: SW Colombia, Dept. of Cauca, Patia-Timbio valley, *R. de Angulo Blum s.n.* (holo. FAUC).

Phragmipedium fischeri (Braem & H. Mohr) Leaflets of the Schlechter Institute 3: 28. 1996: Gruss in *Orchideen Journal* 2013: 7-10. 2013. Type: Ecuador, Maldonado, 1400m, April 1996, cult. Orchids Ltd., USA (holo. SCHL. 96/0414).

Phragmipedium fischeri var. *fischeri* (Braem & H. Mohr) Gruss in *Japan Orchid Society Bulletin* 43: 34. 2000.

Phragmipedium manzurii (W. E. Higgins & P. Viveros) *Lankesteriana* 8 (3): 89. 2008. Type: Colombia, Santander, cult. June 2008, *D. A. Manzur* 1501 (holo. FAUC).

Phragmipedium schlimii var. *manurii* (W. E. Higgins & P. Viveros) P. J. Cribb in *Slipper Orchids of the Tropical Americas*. Borneo: Natural History Publications. 2017.

Phragmipedium ×*colombianum* (O. Gruss) *Die Orchidee* 62: 30. 2011. Type: Colombia, without exact locality, cult. Franz Glanz, Gruss 2010-09-25 (holo. HAL).

Phragmipedium ×*daguense* (Braem & Teson) *Schlechteriana* 5: 1. 2017. Type: Colombia, Dagua, Valle del Cauca, ex hort. Teson. Herbario Nacional Colombiano (COL!).

Phragmipedium ×*narinense* (Braem & Teson) *Schlechteriana* 5: 4. 2017. Type: COLOMBIA, Departamento de Narino, ex hort. Teson. Herbario Nacional Colombiano (COL!).

Phragmipedium schlimii is a new world species of slipper orchid belonging to section Micropetalum. Reichenbach first described it in 1854 as *Cypripedium schlimii*. This species has an impressive distribution, with primary and secondary roadside habitats ranging from the Ecuadorian border in the southwest through Colombia to Cucuta on the northeast border with Venezuela. *Phragmipedium schlimii* inhabits both sides of the eastern and western Cordillera of Colombia, the two principal ranges of the Andes Mountains at altitudes that range from 1,100 to 2,000 meters (3,280 to 6,562 feet). *Phragmipedium schlimii* is found in the southern part of Colombia in populations that demonstrate characteristics found in both the location along the Ecuadorian border and populations further north (Personal communication March 2015, Braem 2017, and per personal communication with E. Tesón). No natural population of *Phrag. schlimii* has been encountered south of the equator.

Phragmipedium schlimii is easy to recognize and is most closely related to *Phrag. besseae* and *Phrag. kovachii*, in section Micropetalum**,** sharing many commonalities. However, *Phrag. schlimii* is readily distinguished by the range of flower color, smaller flower size, geographic distribution, and ecology. Like its cousins in the genus, *Phrag. schlimii* is a broadly defined and highly variable ochlospecies whose flowers continue to develop after anthesis. An ochlospecies is "A very variable (polymorphic) species, whose variation, though partly correlated with ecology and geography, is of such a complex pattern that it cannot be satisfactorily accommodated within a formal classification" (Cronk 1998). It is not separable into distinct subspecific groups. See the *Orchid Digest* Vol. 84-4, Oct., Nov., Dec. 2020 for a more detailed discussion and understanding of the species concept in the genus.

Phragmipedium schlimii

What is *Phragmipedium schlimii*?

Like several other species in the genus, *Phrag. schlimii* self-pollinates. Self-pollination has been observed in natural populations across the entirety of the known range and not exclusive to any sub-population or location. It is part of the species' natural biology. *Phragmipedium schlimii* has sticky pollen masses surrounded by a thin envelop that dries as the flower ages, releasing its granular pollen. The granular pollen can then contact the stigma and self-pollinate (Anon., 1922). Self-pollination in this species is dependent upon the age of the flower. However, self-pollination is not a distinguishing taxonomic characteristic.

The flower color in this species is variable. Color varies from pure white with hints of green to varying degrees of pink and deeper rose-red pouches through dark rose-red flowers. The staminode has varying degrees of pink to purple touches. Flower color has been observed to change from year to year with cultural conditions. Regardless of the preponderance of color variation in one location, color is not a stable taxonomic characteristic and cannot elevate variations within the species concept to a specific level.

Flowers are produced either successively along the inflorescence or on a branching inflorescence with as many as four flowers open simultaneously. Flowers have been observed throughout the year in both natural populations and cultivation.

The lateral petals are rounded to oval-shaped and present with different degrees of reflection. Lateral petal reflex depends both on floral individuality and cultural conditions.

Phrag. schlimii ovaries showing self-pollination.

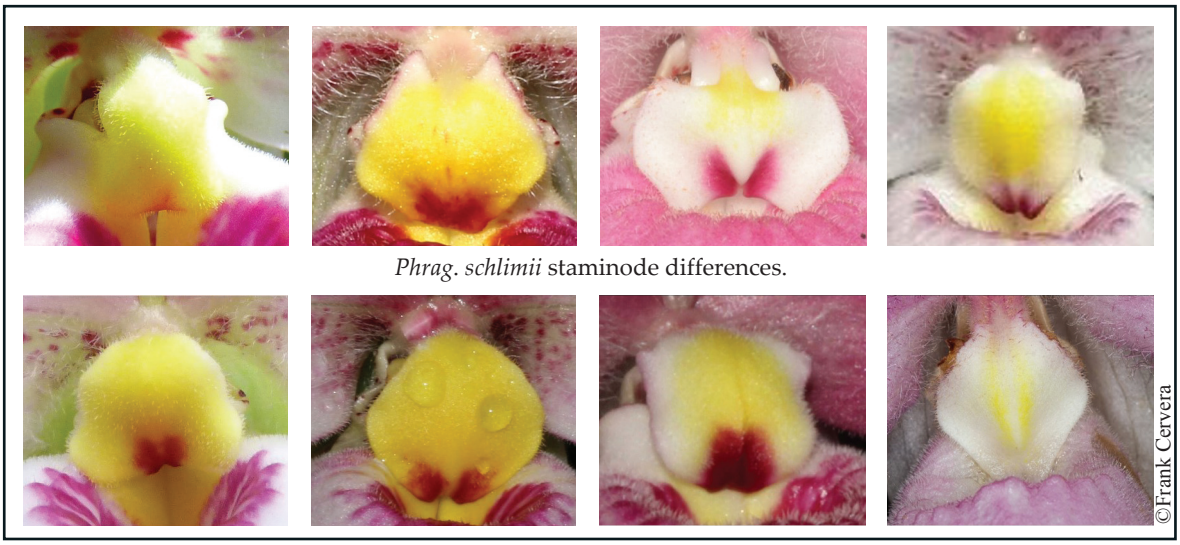
Phragmipedium schlimii

Phragmipedium schlimii

Consistent with the genus overall, the shape of the staminode is highly variable within natural populations across the entire range of the species. The shape varies from oval or generally egg-shaped (triangular), to quadratic or long and tapered, to varying degrees of being shaped like a violin (pandurate). The two side lobes of the staminode approach each other at the bottom, creating a cleft or notch, which varies from plant to plant, from noticeable to non-existent. There is also a ridge down the center of the staminode that presents with varying degrees of prominence. This center ridge has been observed on some flowers to produce a small horn at the staminode center. This ridge is the only constant in the species concept and is present on every staminode. Flowers without a staminode but presenting only the center ridge have been observed both in situ and on nursery raised plants. To date, there is no evidence to support the proposition that the staminode acts as a lure for pollinators in this species.

Vegetative characteristics also vary. Blooming size plants in situ have been observed to range from 12 cm to 45 cm (5 to 18 inches) across. Plants in natural populations have different levels of red at the base of their leaves, and this appears to be an environmental response related to how much light the plants receive. Plants with no red at the base of the leaves have been taken to nurseries in Colombia, where they received more light and subsequently developed a red base to the leaves. Leaves on mature plants can be short and wide and also slender, measuring up to 25 cm (9 inches) long on mature plants. Leaf consistency, or how stiff or erect leaves are, depends on ecological conditions and varies throughout natural populations and cultivation. Elongated rhizomes, similar to those seen in some natural populations of *Phrag*. *besseae*, were observed in one population of *Phrag*. *schlimii* in southern Colombia.

Slipper (labellum) morphology varies. Slippers vary from round and ovate (oval) to more elongated,



Phrag. *schlimii* staminode differences.

bulbous, and narrow. Some slippers have small translucent windows on the labellum, called fenestrations, that present in varying degrees of length, width, and number. These variations are also seen in *Phrag. besseae* with the same degree of variation but have not been observed in *Phrag. kovachii*. Fenestrations vary throughout natural populations as well as in cultivation. The shape of the slipper and the presence of fenestrations are variable throughout the range of *Phrag. schlimii* and apparently have no taxonomic significance.

Like other species in the genus, *Phrag. schlimii* has a flower that continues to develop after anthesis, causing the flower, and its parts, to change over the life of the flower.

Changes in cultural and ecological stimuli can also impact floral and vegetative characteristics. These reactions and adaptations to cultural and ecological variables are referred to as phenotypic plasticity. As habitats become drier or wetter from year to year, as surrounding vegetation overgrows a habitat reducing light levels, characteristics of the plant can change as well. Thus, it is easy to be fooled by what we observe in a statistically insufficient sample size or when we limit our observations to our greenhouse. For example, let us look at vegetative variability. The length, width, and substance of the leaves are responsive to light and moisture levels in the environment. Should a plant germinate in an exposed position, it will develop relatively shorter and more compact leaves. As surrounding vegetation increases, decreasing the light available to the plant, leaves will trend longer and deeper green in response to this change in the immediate environment, allowing the plant to adapt and survive. Misunderstood phenotypic plasticity is the source of some of the claims we see in several recent scientific names applied to variations within this species concept.

Ecologically, *Phrag. schlimii* is distinct from other species in the genus, and ecology helps us understand the species concept. The roots, covered in a layer of decomposing organic material, leaf litter, and wet, sandy mud, embed themselves in cracks and crevices where they can obtain, trap, and maintain humidity at the roots. Runoff from the surrounding jungle is an essential component of its culture; however, plants do not persist in standing water. The surrounding jungle is constantly feeding *Phrag. schlimii* small doses of nutrients.

Phragmipedium schlimii can tolerate varying degrees of light and can be found under a heavy canopy of nearby plants as well as in more exposed positions in the same area. *Phragmipedium schlimii* is a warm grower and cannot persist in cooler conditions.

The past twenty-five-year period has seen a rapid accumulation of new scientific names in this species concept. Three natural hybrids between several of the newly described species have been proposed attempting to account for the natural cline in variation across multiple taxonomic characters. The proposed natural

Phrag. schlimii vegetative characteristics.

Phrag. schlimii vegetative characteristics.

Phrag. schlimii labellum differences.

Phrag. schlimii labellum without fenestrations.

hybrids attempt to account for what the authors describe as "intermediate characteristics" seen in natural populations and greenhouses. If we attempt to name all the possible combinations of variable characteristics seen within natural populations of *Phrag. schlimii*, the species will be left in such a state of taxonomic inflation that the species would require its own genus, and the names would lose all practical value.

Methodology

Each species and hybrid description authored in the past twenty-five years was taken to the type locations in Colombia and compared against natural populations and tested against what was observed. Natural populations revealed errors in our understanding of the species concept, and our treatment must evolve to better align with what the natural populations are telling us. The size of the type population was observed to within ~ 32km (20 miles). The characteristics of the "type" specimen, as defined in each description, were compared to the characteristics evident in each population (population dynamics or mathematical biology), across

Phrag. schlimii on an exposed bank.

multiple visits over twenty years. What regulated the size of the population was found to be the ecology, or how much of the general area was favorable to phragmipediums and year after year changes due to collecting and natural habitat creation and destruction. The sequence of population changes (distribution of morphological variations) was noted, photographed, and compared to the "type" descriptions.

I have observed between 100 and 500 flowering plants at each type location over the past twenty years and in extensive orchid collections of known provenance in nurseries in Colombia and Ecuador. Only *Phrag. manzurii* and *Phrag. andreettae* demonstrated a correlation between the description and the type population of at least twenty-five percent, with seventy-five percent or more of plants at each location exhibiting mixed taxonomic attributes of several of the names that did not match the descriptions. Based on this evidence, these two names can be formally recognized as forms of *Phragmipedium schlimii*. The type location of *manzurii* has been almost completely stripped of plants by collectors, and it would not be possible to repeat those numbers today. The type location of *Phrag. andreettae* was initially misreported, and the correctly identified location was tested. This location exhibited mixed taxonomic attributes with other species in high numbers, and still contains significant amounts of plants both in primary habitats and secondary roadside locations nearby.

Phragmipedium ×*colombianum* lacks a specific location against which to test the description as the type plants were obtained *ex hortis*. Only one name, *Phragmipedium fischeri*, demonstrated zero correlation between the type description and the location from which that plant came. The recent rapid accumulation of scientific names in this species concept has not been due to the discovery of new taxa, but the elevation of variations of *Phrag. schlimii* to specific status. A closer look at the formal descriptions is warranted.

Phragmipedium fischeri

Phragmipedium schlimii remained a single species notwithstanding its variability, phenotypic plasticity, and progressive floral characteristics until 1996 when Braem described *Phrag. fischeri* based on an old (Hopp, 1924) reference in the literature to a *Phragmipedium* with a rose-red flower from Colombia, and a single malformed, abnormal flower, on a single plant, in a greenhouse in the United States. Several authors divided *Phragmipedium schlimii* into five species (*Phrag. schlimii, Phrag. fischeri, Phrag. andreettae, Phrag. manzurii*, and *Phrag. anguloi*) and three natural hybrids (*Phrag.* ×*colombianum, Phrag.* ×*daguense*, and *Phrag.* ×*narinense*). Several of these species have been supported with vague and synonymous language and the indefinable taxonomic characteristic of "different" (more on this later). The language used by the authors in support of specific

In situ phragmipedium identified as *Phrag. fisheri.*

status is important because this is how each "type" is defined. Evolving and changing species descriptions in the trade are problematic as they are inconsistent with how each species is defined. Almost any plant of *Phrag. schlimii, Phrag. fischeri, Phrag. andreettae, Phrag. anguloi, Phrag. manzurii, Phrag.* ×*daguense, Phrag.* ×*narinense,* and *Phrag.* ×*colombianum* can, and will, demonstrate one or more taxonomic characters of the other alleged species and natural hybrids within the species concept, making species boundaries as vague and indefinable as some of the language used to try to differentiate these names from each other. *Phragmipedium fischeri, Phrag. andreettae, Phrag. anguloi, Phrag. manzurii, Phrag.* ×*daguense, Phrag.* ×*narinense,* and *Phrag.* ×*colombianum* are synonyms of *Phrag. schlimii* as discussed and demonstrated within. In addition to the eight names recently applied to this species, a possible ninth name demonstrates the absurdity of the treatment this species has received in the previous twenty-five years.

These authors have not identified a single taxonomic characteristic that can be used to break *Phrag. schlimii* into more than one species, a physical characteristic that is exclusive, static, not progressive, and not variable within individual populations or present in plants across the entire range of *Phrag. schlimii*. The timing of these descriptions is also important. Attempts to self-validate one mistake have led to others.

Almost immediately after Braem described *Phrag. fischeri* in 1996, there were doubts about this species being new to the orchid world. To compare the type specimen against natural populations found at the type location, I attempted to contact Dr. Braem many times requesting photos or access to the type specimen of *Phrag. fischeri* that is on deposit in the herbarium of the Schlechter Institute in Lahnau. However, Dr. Braem has not responded to these requests. It is not known if the herbarium specimen still exists. In the absence of the type specimen, the line drawing, from the original materials, was used. In the event the holotype (type specimen) is lost, and a lectotype is necessary, the line drawing can be designated.

The plant described as *Phrag. fischeri* was part of a collection of phragmipediums taken from a vertical cliff surface facing a river on the border between Ecuador and Colombia. The plant used for the description was purchased from Ecuagenera and flowered in a commercial nursery in the United States. According to Ecuagenera, they were selling *Phrag. schlimii*. Ecuagenera saw nothing new in the initial collection (per personal communication).

In 1999, I made the first visit to the type location and have returned many times over the next twenty years. When I first arrived at the site, I expected to see a new *Phragmipedium* species based on the formal description. The line drawing did not match anything in the population. I found a cautionary tale about greenhouse taxonomy: this was a species description based on a single plant and what appears to be a malformed flower.

A phragmipedium identified as *Phrag. fisheri* but missing the lobe between the labellum and the synsepal.

In support of *Phrag. fischeri*, Braem states in the 1996 description:

> "[*Phragmipedium fischeri*] is based on wild collected materials and although the plants resemble *Phragmipedium schlimii* (Linden ex Rchb. fil.) Rolfe, there are clear cut morphological and structural differences, especially in the flower morphology, besides there being differences in the vegetative habit." Braem continues "*Phragmipedium fischeri* Braem & Mohr differs from *P. schlimii* (Linden ex Rchb. fil) Rolfe in a number of floral aspects. The main taxonomic differentiating character in Slipper Orchids is the morphology of the staminodal shield. In *P. fischeri* it is more quadratic, whereas in *P. schlimii* it is more triangular. In addition to this important difference, the staminode of *P. schlimii* is in its whole curved like a hand with bent fingers (see drawing 'h') whereas in whole staminodium in *P. fischeri* shows a raised edge, not present in *P. schlimii*. *Another important difference seen in the type specimen of P. fischeri is the additional lobe between the slipper formed labellum and the synsepal* (emphasis added). At this time, we refrain from commenting on the nature and purpose of this additional lobe, and we await further flowering plants to obtain the necessary materials

A phragmipedium identified as *Phrag. fisheri*.

to perform detailed studies in regard to this floral part."

"In respect to differences in the vegetative organs, it can be noted that the leaves of P. fischeri are much shorter and of greater consistency than those of *P. schlimii*."

In 2016 Braem published a "Revision of the *Phragmipedium schlimii* complex" in *Richardiana* vol. 16. 293-321, in which he contradicts the original description and type material and further muddies the waters. Braem states in 2016:

"*Phragmipedium fischeri* differs from *P. schlimii* in a number of important characteristics:

1 – In contrast to *Phragmipedium schlimii, P. fischeri* has no fenestrations.

2 – *P. fischeri* is always self-pollinating.

3 – *P. fischeri* has a quasi-spherical pouch.

4 – The staminodal structure of *P. fischeri* is stable and strongly polygonal, whereas the staminodal structure of *P. schlimii* on the whole is curved like a hand with bent fingers whereas the entire staminode in *P. fischeri* is much more straight and of a more complex structure. Furthermore, the surface of the staminodal shield of *P. fischeri* is much more straight and of a more complex structure. Furthermore, the surface of the staminodal shield of *P. fischeri* shows a raised ridge, not present in *P. schlimii*.

5 – In respect to the differences in vegetative organs, it should be noted that the leaves of *P. fischeri* are much shorter and of greater consistency than those of *P. schlimii*."

In this revision, Braem does not include any photos taken contemporaneously with his 1996 description, photos of the herbarium specimen, nor does he include his original 1996 language describing the proposed taxon. The photos of flowers included therein are inconsistent with the type. There is no mention of fragrance, the variability in the length of the rhizome, or any other alleged characteristics common in the horticultural trade regarding this alleged species in either the type description or the 2016 revision.

The original 1996 line drawings indicate two different shapes for the pouch. One is elongated, and the other clearly round. The type description appears to have drawings of pouches from two different flowers. In 1996, Braem made no statement or conclusion about the shape of the pouch. In 1996, the pouch was either elongated or round and was irrelevant to the proposed species concept. However, In the 2014 description of *Phrag. anguloi*, Braem described the pouch of *Phrag. fischeri* as either "elongated [or] calceolate." In 2016, the shape

of the pouch evolved to a "quasi-spherical" shape. It is not clear what Braem is saying in 1996, 2014, or 2016 about the shape of the pouch. The shape of the pouch cannot be defined in anything other than these broad terms because the shape is inherently variable across the entirety of the range of *Phrag. schlimii*.

In 1996 the "clear-cut" defining taxonomic characteristics of *Phrag. fischeri* were a "more quadratic" staminode and an extra floral part, a lobe, between the labellum and the synsepal. In 2016, the defining taxonomic indicator was a polygonal staminode, and the "clear-cut" and "important difference" of a lobe between the labellum and the synsepal that was present in the type specimen, drawing, and description was now referred to as "inconsistent." However, not a single plant from type location has ever been observed to have the referenced floral part in a natural population in the twenty years I have searched.

For those that can remember high school geometry, a polygon is defined as any 2-dimensional shape formed with straight lines. Triangles, quadrilaterals, pentagons, and hexagons are all examples of polygons. Polygons can be regular, irregular, concave, convex, or complex. The 1996 "more triangular" staminode of *Phrag. schlimii* is now in the range of variability for *Phrag. fischeri* and the quadratic staminode is now "polygonal." The use of the term "polygonal" to describe the shape of the staminode can refer to almost any shape on any plant in the range of variability for *Phrag. schlimii*. Specifically, which part of the staminode a "more complex structure" refers to is not made clear. "More complex" is not an objective taxonomic character, perhaps done so by design, and given that *Phragmipedium* flowers continue to develop after anthesis, general, non-specific statements about complexity of any floral part, including the staminode, are of no taxonomic value.

Examination of flowers in cultivation from the original location and further west along the same river demonstrates slippers with and without varying degrees of fenestrations. This characteristic is variable as *Phrag. schlimii* flowers from other populations in Colombia can also be found with and without fenestrations and in varying degrees. This is demonstrated in Braem's 2017 assertions of natural hybridization to account for plants without fenestrations throughout the broader range of *Phrag. schlimii*. The author has two plants of note: one from the eastern Cordilleras, from the original location of what was described as *Phrag. manzurii*, with no fenestrations on the slipper, and the second a plant imported from Colombia in the 1980s as *Phrag. schlimii* from near Cucuta, long before the discovery of the population along the border with Ecuador with no fenestrations. After *Phrag. manzurii* was described, I had the opportunity to examine about one hundred flowering plants in a private nursery in South America. I found plants without fenestrations, as is the case on the plant in my collection. Fenestrations are variable in quantity and size and are not a reliable taxonomic indicator. Varying degrees of length, width, quantity, and whether a slipper has fenestrations at all are not determined by geographic isolation within the broader species range as proposed (2016), and then contradicted by Braem (2017).

Plants at the location of the initial collection of what Braem asserts is *Phrag. fischeri* demonstrate a mixture of longer, more strap-like leaves, broader leaves, and longer, thinner leaves, as do all populations. Ecuagenera correctly noted that the plants they collected from the location were consistent with *Phrag. schlimii*, as are the plants I have seen in all my trips.✾

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.

Frank Cervera
Email: frankrc@optonline.net