

Notes from the OIC

IT IS NOT EASY BEING GREEN

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A green flowered *Phalaenopsis* is something that many orchid breeders have sought for years, so when a photo of one (FIGURE 1, FIGURE 2: E) was submitted to the Orchid Identification Center (OIC) at the Marie Selby Botanical Gardens, it created considerable interest. The origin of this *Phalaenopsis* could not be traced, but the owner of the plant informed me that when it first flowered, pictures were displayed on the web with the hope that somebody would recognize it. Eventually the plant was identified as *Phalaenopsis stobartiana* Rchb.f., but differing opinions were voiced, suggesting that it could not be that species because the flower has a spur at the base of the lip.

DISCUSSION

I began my quest to identify this *Phalaenopsis* species by searching for clues in available literature and files. I soon came across some contradictory and confusing information which piqued my curiosity and made me decide to do further research.

Reichenbach (1877), described *Phal. stobartiana* based on a top, or branch, of an inflorescence with eight flowers. No information was provided about the origin of the plant other than it belonged to Mr. William C. Stobart of Etherley Ridge, Darlington (England) and was cultivated by Mr. L. Hartley. Reichenbach compared the inflorescence with *Phal. amethystina* [= *Phal. deliciosa* Rchb.f.], but with a very uncommon color for a *Phalaenopsis*, which he describes as “beautiful apple-green colour, ultimately yellowish green. Lip with the lateral partitions white with yellow and amethyst coloured, the middle lobe totally amethyst coloured. This bright amethyst colour finally changes into a nearly cinnabarine red. The base of the white column is also amethyst coloured.” No specimen of *Phal. stobartiana* is included in the IDC microfiche of the Reichenbach herbarium, but there is an unusually clear illustration of it together with some flowers in the Oakes Ames Herbarium at Harvard.

The drawing of *Phalaenopsis stobartiana* was

published by Sweet (1969) as a part of his revision of the genus. In the lower right corner is a pale green flower with a white, yellow, and purplish lip, not dissimilar to the flowers on the submitted OIC photograph. At the base of the lateral lobes of the lip, there is a small nipple-like angle, not a spur. There is no mention of a spur on the flower in either the original description or in Sweet’s revision. Sweet (1969) includes another collection of this species, from Pai-sha Hsien, in the province of Hainan, China, by S. K. Lau, no. 27549 (AMES). The collector states that the plant grows in dense woods, and flowers in July. The Lau collection was later used as a holotype of *Phalaenopsis hainanensis* in Tang & Wang (1974). In Sweet’s republished revision (1980), a collection from Burma (Myanmar) is added from the Patkoi range near the Indian border, Haase s.n. (AMES). Peter Haase (1975) believed this species was the lost *Phalaenopsis wilsonii* Rolfe (FIGURE 2:B, C), and he describes the color of the flower as rose or mauve with a deeper shade in the lip. Sweet (1980) reasons that the green sepals of *Phal. stobartiana* described by Reichenbach quite possibly were due to cultural conditions. This seems unlikely. If this were at all possible, some of the many commercial breeders would most likely have discovered this by now and used it. Sometimes the pollination of a flower will have an effect on the color, but this does not seem to be the case here. It seems more likely that green forms of normally pink flowered species may occur naturally. Incidentally, an additional collection of what appears to be *Phal. wilsonii* but identified as *Phal. braceana* (Hook.f.) Christenson, is reported from the Kameng district of Arunachal Pradesh, India, by Sandhyajyoti Phukan (2003), extending the distribution westwards for this species.

In Christenson’s monographic treatment of the genus (2001) it is stated that only four clones of *Phalaenopsis stobartiana* are known: the type, a color photograph published in Yang et al. (1993), one cultivated plant that perished in the United States, and one cultivated plant that may yet be alive in Japan. This summary is doubtful.

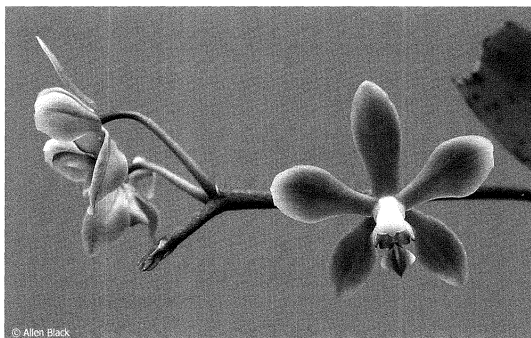


FIGURE 1. *Phalaenopsis honghenensis* F.Y.Liu; OIC 14965 (SEL; photograph).

The photo published by Yang et al. (1993), and cited by Christenson as *Phal. stobartiana* (which does not have a distinct spur) shows a front view of a dull greenish flower. It is not possible to see if the flower has a spur or not. Christenson (2001) also refers to a watercolor painting by Zi Chao Zhen (published as *Kingidium braceanum* by Gruss and Röhlke 1997: 54), as *Phal. stobartiana*. The illustration displays a plant in flower, growing on a mossy branch. Curiously, there is a separate flower in the upper left corner of the painting that is virtually identical with the one on the photo by Yang (1993). Regardless if the artist used the Yang photo or not for the illustration, the flowers undoubtedly represent the same taxon, and again no spur can be seen. The flowers on the inflorescence in the background, however, have short but distinct spurs, hence should represent *Phal. braceana* rather than *Phal. stobartiana*.

There has been a considerable debate, however, about the true identity of *Phal. braceana* (Seidenfaden 1988). This species was originally described by Hooker (1895) as *Doritis braceana*, based on a drawing (Gruss & Röhlke 1997); (see FIGURE 2: H) and a description of a plant that flowered in the Botanical Garden of Calcutta, India. The plant was supposedly collected in Bhutan and brought to James Gamble at Darjeeling in 1882. A drawing and a description was prepared and sent to Hooker by Mr. Brace (Curator of the herbarium at the Royal Botanic Garden in Calcutta between 1882 and 1886). Both the description and the drawing suggest that it really is a *Phalaenopsis taenialis* (Lindl.) Christenson & Pradhan (FIGURE 2: G), with deviating color of the flowers. Hooker describes the spur of the flower to equal in length as the lateral lobes of the lip, which is similar to *Phal. taenialis*, but different from the OIC specimen with a shorter spur. The rather stylized drawing of *Doritis braceana* looks like *Phal.*

taenialis as well, particularly the front and lateral views, showing a deep spur, or mentum, pointing downward in a right angle from the ovary. The deviating color is described as *flavis costa rufescente*, yellow with a reddish centerline, or stripe, on the sepals and petals. Although the common color of *Phal. taenialis* appears to be pinkish to pale rose or white, yellow flowers occur, as can be seen in *Die Orchidee* 48(2): 49 (Gruss and Röhlke 1997). According to the authors, this plant was cultivated under very bright conditions, which may explain the color due to heat related stress. In King and Pantling (1898) we read "Specimens with white flowers are not uncommon; but, after fertilization has been effected, these change to yellow." In an article by Phillip Cribb (2001a) entitled; "Three small-flowered *Phalaenopsis*" [*Phal. braceana*, *Phal. taenialis* and *Phal. wilsonii*], and later in *Orchid Digest* (2002), we read, and see, how the pink flowers of *Phal. taenialis* (from Bhutan) turn orange as they begin to fade and die. Ganesh Mani Pradhan (1972) describes *Phal. taenialis* as coming from 5000–6000 feet, and is best suited for a cool house, or the cool end of an intermediate house. Based on this information it seems reasonable to believe that when a "cooler" orchid is brought to the summer hot Calcutta, it would be under considerable stress, and the flowers may respond by turning prematurely yellow, before dying. I therefore conclude that the normally pink flowers of *Phal. taenialis* can turn yellow due to stress and disturbances, such as pollination, heat, possibly increased light intensity, and aging, which further supports the synonymy of *Phal. braceana* with *Phal. taenialis*. Cribb (2001a) also writes that *Phalaenopsis braceana*, regarded as a "rarer beast," was seen only once in the wild by him, in southwest Yunnan, China, and the photograph of this species shows a plant with bronzy reddish-brown flowers. Another photograph by Cribb (but not credited) of the same inflorescence occurs in "Native Orchids of China in Color," page 272 (Chen et al. 1999), as *Kingidium braceanum*. Yet another sample of the same inflorescence (mirror reversed) can be seen in *Die Orchidee* 52(2): 225 (Cribb 2001b), except that, by mistake, the text refers to it as from a "standort" (place) in Bhutan. This rather innocent mistake (confirmed by Cribb pers. comm.) does add a certain confusion to this case because the original plant of this species (as *Doritis braceana*) was assumed to come from Bhutan. Pearce and Cribb (2002) state in "The Orchids of Bhutan" that they have seen plants of this species only in Yunnan. A photograph of *Phalaenopsis taenialis* is also included (the label is switched with the photograph of *P. mannii* Rchb.f., on plate 30) with an

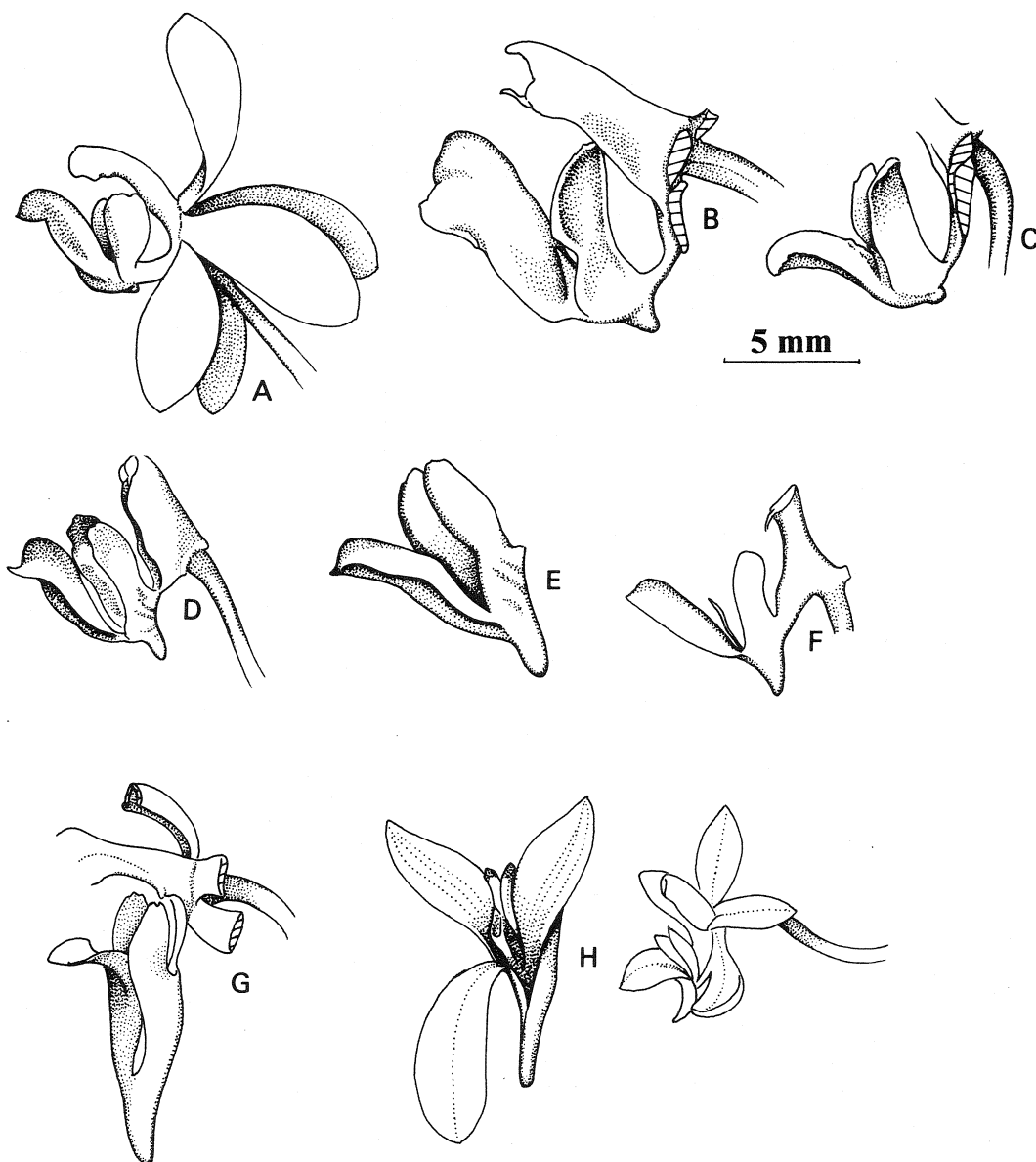


FIGURE 2. Comparison of lip and lip-column relation of some collections included in this paper. **A.** *Phalaenopsis stobartiana* Rehb.f., based on the original drawing, the curved column is probably due to dehydration; Stobart s.n. (AMES, W). **B.** *Phalaenopsis wilsonii* Rolfe; OIC 13220 (SEL). **C.** *Phalaenopsis* cf. *wilsonii* Rolfe, the column of the specimen (not drawn) is shriveled and curved towards the lip; OIC 12995 (SEL). **D.** *Phalaenopsis honghenensis* F.Y.Liu, based on the original drawing; Liu 88002 (KUN). **E.** *Phalaenopsis honghenensis* F.Y.Liu; OIC 14965 (SEL). **F.** *Phalaenopsis honghenensis* F.Y.Liu, based on the drawing by Seidenfaden; Forrest 26706 (K). **G.** *Phalaenopsis taenialis* (Lindl.) Christenson & Pradhan, based on the original drawing of *Aerides taenialis* Lindl.; Wallich s.n. (K). **H.** *Phalaenopsis taenialis* (Lindl.) Christenson & Pradhan, based on the original (obscure) drawing of *Doritis braceana* Hook.F.; Brace s.n. (CAL).

inflorescence carrying five pink and one orange-yellow flower. Pearce and Cribb appear to base the identification of *P. braceana* on Seidenfaden's discussion in *Opera Botanica* (1988), where

he transfers *Doritis braceana* to *Kingidium braceanum*. Seidenfaden (1988) writes that the Forrest 26706 collection from Yunnan [cited as *Phal. wilsonii* by Sweet 1980], was located

among specimens of *Phal. taenialis* at Kew, and identified as a new species by Tang and Wang during their work in transferring *Kingiella decumbens* (Griff.) Rolfe, and *K. taeniale* to *Biermannia* King & Pantl. They called it "*Biermannia navicularis*," but never published the epithet. Seidenfaden (1988) agrees with Tang and Wang, that the Forrest specimen represents a different species from *P. taenialis* but disagrees with Sweet's determination of it as *Phal. wilsonii*, and identifies it as the lost *Doritis braceana*, which he transfers to *Kingidium braceanum* (the generic transfer to *Kingidium* is apparently based on the presence of a spur of the flower and the number of pollinia). A drawing of the Forrest specimen at Kew (FIGURE 2: F) accompanies the article and appears similar to the OIC flowers, displaying a short spur, more or less parallel with the ovary. Based on the above-mentioned information, I disagree with Seidenfaden and conclude that the true *Phal. braceana* is a synonym of *Phalaenopsis taenialis*, in agreement with King and Pantling (1898), Rolfe (1917), and Gruss & Röhlke (1997), and that the Forrest specimen represents a different species.

Phalaenopsis honghenensis F.Y.Liu (1991) is described as having red-purple flowers. The original drawing (FIGURE 2: D) shows a flower with a short but distinct spur, very similar to the OIC plant, as well as the Yunnan entity (including Seidenfaden's "braceanum"; Forrest 26706). Christenson (2001) describes the color of *Phal. honghenensis* as variable. Most clones are a pale rose-pink with a darker lip. He also adds that not infrequently one sees this same color infused with various amounts of pale green. Christenson compares this pastel green with the dark[?] green seen in *Phal. braceana* and *Phal. stobartiana* and states that it is unlikely to be a source of confusion. Based primarily on the morphological similarities, however, I conclude that the OIC specimen, together with the Yunnan entity, is the same as *Phal. honghenensis*.

An English translation of a Japanese article, originally published in *New Orchids* by Akihiko Hashimoto (1984), is published by the Royal Horticultural Society (RHS) in *New Orchid Hybrids* (2003), and we read: "Recently a new species has been found for which Tsi is preparing the name *Kingidium naviculare* Tsi [= *Phal. honghenensis*]. This is deciduous, with green tepals, and a purple lip with a keel on the mid-lobe," . . . — "Between 1981 and 1982 I managed to obtain material [of] *K. naviculare* [*Phal. honghenensis*] among specimens of *Phal. hainanensis*. I also obtained two rather interesting individuals. They were sent as if they were a

single plant with their roots tangled. Perhaps they grew in the same colony. Their lips are almost the same as *Phal. hainanensis* and *Phal. stobartiana* (FIGURES 3, 4) [not included here] but there is a trace of a spur on the lips (FIGURE 5) [not included here] and four pollinia, which differs from *Phalaenopsis*. The colour of tepals is from green to greenish-dark purple. I suppose they are midway between *K. naviculare* [*Phal. honghenensis*] and *Phal. hainanensis*. A lateral view of *Phal. stobartiana* illustrated by Reichenbach has a spur or curve [nipple]: I begin to think that this represented the type specimen and that the species which I describe could be the same taxon." . . . "As it may be difficult to prove whether the plant I received is a natural hybrid or the true *Phal. stobartiana*, I would like to name it \times *Phalaenidium tsiae* for Mr. Tsi. The plant resembles *Phalaenopsis* as a whole, but the flower colour is close to *Kingidium*. This plant could be useful in the breeding of green-tinted *Phalaenopsis*." (translation into English by Yoko Otsuki). It is also mentioned in RHS, *New Orchid Hybrids* (2003): "Akihiko Hashimoto was responsible for naming his two clones [of the supposed natural hybrid?] 'Green Goddess' and 'Tahitian Dancer', which apparently have been used in Japan to breed small-flowered green *Phalaenopsis* hybrids."

A slightly different version of this story, possibly due to errors in translation, is presented by Seidenfaden (1988), after corresponding with Tsi and Hashimoto (the hopefully clarifying notes within brackets are my own): "Dr. Tsi informed me that Hashimoto's plant [presumably referring to the "*Kingidium naviculare*" plant] had been introduced years ago to Kumamoto Experimental Station from Yunnan, and that he, at that time had suggested that it could be the plant Tang & Wang had called *Biermannia navicularis* [Forrest 26706 = *Phal. honghenensis*]. Mr. Hashimoto further explained that his paper also dealt with hybrids [the supposed natural hybrids] between this plant [Tsi's *Kingidium naviculare*] and what he believed to be *Phalaenopsis hainanensis*. This hybrid [the two natural clones growing together] he in his paper called *Phalaenidium* \times *Tsiae*, but felt it may be the same as plants he knew under the name *Phalaenopsis stobartiana*. His [natural] hybrids developed clones with varying colours of the flowers [the 'Green Goddess' and the 'Tahitian Dancer']." A picture of the clone 'Tahitian Dancer' appears in *Die Orchidee* 48 (2), page 56 (1997). I assume that it is the same picture that was published in *New Orchids* by Hashimoto. In any case, the text in *Die Orchidee* refers to the inflorescence as "*Kingidium* \times *stobartianum*, als *Phalaenidium Tsiae*, (nomen nu-

dum), nach Hashimoto eine hybride aus *Kingidium naviculare* × *Phalaenopsis hainanensis*." The same inflorescence appears in Christenson's treatment of the genus (2001) as *Phalaenopsis stobartiana* 'Tahitian Dancer'. Seidenfaden did not believe that the natural hybrid scenario, speculated by Hashimoto, was likely, however, considering the vast geographical distance between the parents. Neither does Christenson (2001: 57), using the photograph of one of the "hybrids" as *Phal. stobartiana*. Gruss and Röhlke, however, agreed that it seemed possible and transferred *Phal. stobartiana* to *Kingidium* × *stobartianum* (1995).

Seidenfaden (1988) also received some flowers from Tsi on loan, and when analyzing them concluded that the flower labeled "*Phal. stobartiana*" (Yunnan, Tsi 82–39) did indeed have a small sac-like spur, but specimens of *Phal. hainanensis* (Lau 27549) and *Phal. wilsonii* (T. T. Yü 5900) did not show any trace of a spur. Because the holotype of *Phal. stobartiana* presently is unavailable to me, I emailed the picture of the OIC plant to Gustavo Romero, Curator of the Oakes Ames orchid herbarium at Harvard (AMES), and asked him if he could find any spur, or nipple, on the isotype deposited there. Coincidentally, Paul Ormerod happened to be visiting Romero, and jumped at the opportunity to undertake the investigation. Ormerod informed me later that no spur could be found on the isotype of *Phal. stobartiana* (a dried flower), which suggests that what Tsi labeled as "*Phal. stobartiana*" and sent to Seidenfaden possibly was another *Phal. honghenensis*. Ormerod also explained that he had been working with this Yunnan entity for quite a while and was about to describe it as new, when pieces started to fall in place, and he also concluded that the taxon consisting of five specimens at AMES, the green-flowered OIC plant, together with Seidenfaden's *Kingidium braceanum*, Cribb's *Phal. braceana* and Tsi's *K. naviculare* (and possibly "*Phal. stobartiana*") are all the same species: *Phalaenopsis honghenensis*.

CONCLUSIONS

When the genus *Odontoglossum* Kunth gained horticultural popularity in Europe during the Nineteenth Century, collectors, growers, and taxonomists alike were amazed and confused by the incredible diversity the plants displayed. Hardly any two plants were alike in aspects of flower shape, size, and color markings. Most of the different looking plants were originally described as distinct species. Gradually, however, as more and more shipments of plants arrived from the Andean regions of South America, it

became clear that something "fishy" was going on. Slowly people began suspecting that although there obviously existed definable species, the many intermediate, often unique, forms represented natural hybrids rather than distinct taxa. Rolfe (1893) undertook a serious study among commercial growers who were breeding *Odontoglossum* hybrids with known parentage. He wanted to compare the man-made hybrids with the supposed natural ones, and managed to conclude that, indeed, natural hybridization was responsible for the high degree of natural variability in the genus. This is also supported by recent observations by Dalström (2003).

A similar scenario may have evolved among species of *Phalaenopsis* Subgenus *Aphyllae* (Sweet) Christenson. About a dozen species have been described in this little complex, and subsequently synonymized differently by various authors. *Phalaenopsis taenialis*, for example, has been placed in seven different genera. The only consistent conclusion we can draw from the various taxonomic treatments is that nobody really seems to agree with anybody else's view of how to classify these plants. Certain species are accepted by some taxonomists, and synonymized by others. This is a strong indication that clear borders or distinguishing features do not exist, or have not yet been discovered, to separate these entities into valid species in a useful system. The characters often used refer to minute differences in the shape of the lip, or number of flowers per stem etc., while also mentioning how variable the species are with numerous intermediate forms in terms of color, shape, size, and number of flowers per stem (Christenson 2001, Gruss & Röhlke 1995). Many of the photographs selected to represent species such as *Phalaenopsis stobartiana* versus *Phal. braceana* and *Phal. wilsonii*, or *Phal. honghenensis* versus *Phal. hainanense* merge in appearance, or seem mixed. As a result, plants are frequently misidentified and awarded as something else (Christenson 2001), demonstrating that the traditional taxonomic approach is unsatisfactory.

As an alternative, my studies show that we are dealing with three morphologically distinct but variable species, and one unresolved entity. These are: a generally pink-flowered species (that turns yellow due to various stress), and with a distinct spur (*Phal. taenialis*); a greenish, bronzy to reddish purple flowered species, with an intermediate but still distinct spur (*Phal. honghenensis*); a pink-flowered species with a small nipple (*Phal. wilsonii*); and a green flowered, unresolved taxon also with a nipple-like structure similar to *Phal. wilsonii* (= *Phal. stobartiana*). Each of the taxa has a wide distri-

bution range where local and deviating forms are to be expected to occur. Rather than to describe these as separate, but indistinct species, they seem better treated as geographical forms, or possibly subspecies of the species they resemble the most. This seems even more reasonable when we consider how few of these plants have been studied in the natural environment. It also seems possible that occasional natural hybridization may occur, which can break down the distinguishing borders even further.

If we hybridize a greenish species (*Phal. honghenensis*) with a pink species (*Phal. wilsonii*), a variation in color and shape can be expected in the offspring, just as Hashimoto experienced. If we believe that Hashimoto's "natural hybrid" was a cross between *Phal. hainanense* (from Hainan island) and *Phal. honghenensis* (as *Kingidium naviculare* fide Tsi, or *Kingidium braceanum*, fide Seidenfaden), from southwestern Yunnan, natural hybridization seems unlikely (as Seidenfaden reasons). If we consider *Phal. hainanense* a synonym of *Phal. wilsonii*, on the other hand, which occurs in the same region as *Phal. honghenense*, the natural hybrid scenario becomes more plausible. This may, in fact, explain the scarcity, morphology, and coloration of *Phal. stobartiana*, just as Hashimoto contemplated. Another scenario that seems even more plausible due to the morphological similarities is that *Phal. stobartiana* is a green colored form of *Phal. wilsonii*. Christenson (2001) includes a color photo of what appears to be a pale greenish flower with a nipple-spur, identified as *Phal. honghenensis* 'Memoria Herman Sweet' CBR/AOS. The type of *Phal. honghenensis* has an intermediate but distinct spur, however, hence the identification is doubtful. It looks like a pale, green-flowered form of *Phal. wilsonii*. When we compare this photo with Reichenbach's colored drawing of *Phal. stobartiana* (Sweet 1969), a striking likeness is obvious. Should this be the case, *Phal. wilsonii* becomes a synonym of *Phal. stobartiana*, but until a closer examination of the AOS awarded plant can be made, the last word most certainly remains to be said.

PRESUMPTIVE SPECIES AND THEIR SYNONYMS

Phalaenopsis honghenensis F.Y.Liu, Acta Bot. Yunnan. 13(4):373. 1991. TYPE: F. Y. Liu 88002 (holotype: KUN).

Kingidium naviculare Tsi ex Hashimoto, New Orchids 3:40. 1984 (invalid name); *Biermannia naviculare* Tang & Wang ex Gruss

& Röhlke, Orchidee (Hamburg) 48(2):56. 1997 (invalid name).

Phalaenopsis taenialis (Lindl.) Christenson & Pradhan, Indian Orchid J. 1:154. 1985. *Aerides taenialis* Lindl., Gen. Sp. Orchid. Pl.: 239. 1833; *Doritis taenialis* (Lindl.) Hook.f., Fl. Brit. India 6:31. 1890; *Kingiella taenialis* (Lindl.) Rolfe, Orchid Rev. 25: 197. 1917; *Biermannia taenialis* (Lindl.) Tang & Wang, Acta Phytotax. Sinica 1(1): 95. 1951; *Kingidium taeniale* (Lindl.) P.F.Hunt, Kew Bull. 24:98. 1970; *Polychilos taenialis* (Lindl.) Shim, Malayan Nat. Journ. 36: 28. 1982. TYPE: Wallich s.n. (holotype: K).

Doritis braceana Hook.f., Fl. Brit. India 6:196. 1890; *Phalaenopsis braceana* (Hook.f.) Christenson, Selbyana 9:169. 1986; *Kingidium braceanum* (Hook.f.) Seidenf., Opera Bot. 95:187. 1988. TYPE: Drawing by Brace s.n. (CAL).

Phalaenopsis wilsonii Rolfe, Kew Bull: 65. 1909. TYPE: Wilson 4576 (holotype: K; isotype: BM).

Phalaenopsis chuxionensis F.Y.Liu, Acta Bot. Yunnan. 18(4): 411. 1996. TYPE: F. Y. Liu 92001 (holotype: KUN), synonymy fide Christenson (2001).

Phalaenopsis hainanensis Tang & Wang, Acta Phytotax. Sinica 12:47. 1947. TYPE: S. K. Lau 27549 (holotype: PE, isotype: AMES).

Phalaenopsis minor F.Y.Liu, Acta Bot. Yunnan. 10(1):119. 1988. TYPE: S. Q. Bao 81001 (holotype: KUN), synonymy fide Christenson (2001).

Unresolved taxon: ***Phalaenopsis stobartiana*** Rchb.f., Gard. Chron., n.s. 8:392. 1877; *Phalaenopsis wightii* var. *stobartiana* (Rchb.f.) Burb., The Garden 22:19. 1882; *Kingidium stobartianum* (Rchb.f.) Seidenf., Opera Bot. 95:188. 1988; *Kingidium* × *stobartianum* (Rchb.f.) Seidenf., fide Gruss & Röhlke, Orchidee (Hamburg) 46(6):233. 1995. TYPE: Stobart s.n. (holotype: W; isotype: Ames).

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