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AN INFRAGENERIC CLASSIFICATION OF HOLCOGLOSSUM SCHLTR. (ORCHIDACEAE: SARCANTHINAE) WITH A KEY TO THE GENERA OF THE AERIDES-VANDA ALLIANCE

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ABSTRACT. Examination of *Vanda amesiana* Reichb. f., *V. saprophytica* Gagnep., and *V. subulifola* Reichb. f. shows that these species are better placed in *Holcoglossum*. These three species, together with *H. kimballianum* (Reichb. f.) Garay and *H. rupestre* (Hand.-Mazz) Garay are placed in a newly proposed section, *Holcoglossum* sect. *Kimballianum*. A new species, *H. sinicum* E. A. Christenson, allied to *H. flavescens* (Schltr.) Tsi, is described. *Holcoglossum junceum* Tsi is excluded from the genus and is included in *Ascocentrum* as a synonym of *A. himalaicum* (Deb, Sengupta & Malick) E. A. Christenson. A synopsis of *Holcoglossum* is given. Keys are provided for *Holcoglossum* and the genera of the Aerides-Vanda alliance.

INTRODUCTION

Aerides Lour., *Ascocentrum* Schltr., *Holcoglossum* Schltr., *Papilionanthe* Schltr., *Rhynchostylis* Bl., *Seidenfadenia* Garay, and *Vanda* Jones represent a group of closely related genera that may be called the '*Aerides-Vanda* alliance'. This alliance includes some of the most aesthetically and economically important orchids in cultivation. Genera such as *Aerides*, × *Ascocenda* (*Ascocentrum* × *Vanda*), *Ascocentrum*, *Rhynchostylis*, and *Vanda* are popular horticultural subjects for amateur growers. *Papilionanthe* (e.g. 'Vanda' × Agnes Joaquim), × *Aeridachnis* (e.g. × *A.* Bogor) and *Vanda* intergeneric hybrids such as × *Aranda* (*Arachnis* × *Vanda*) are major components of ASEAN cut flower export production and international orchid cut flower trade. Other than a revision of *Aerides* (Christenson, in prep.), notes on *Holcoglossum* (Tsi, 1982), a synopsis of *Papilionanthe* (Garay, 1974), and notes on *Rhynchostylis* (Christenson, 1986c), these genera have not been studied recently. To aid other workers in this group a provisional key to the alliance is presented in this paper.

In preparing a cladistic analysis of *Aerides* (Christenson, unpubl.) many problems associated with the taxonomy of related genera were revealed. The imprecisely defined morphological and taxonomic limits of the genera in the the *Aerides-Vanda* alliance currently preclude their effective application as cladistic outgroups of *Aerides*. In the course of reviewing these genera it was obvious that *Holcoglossum* was in particular need of study. A treatment of the genus is provided following the key to the genera.

Vanda, the largest closely related genus to *Aerides*, is in need of a thorough revision. Though the circumscription of *Vanda* has been improved recently with the removal of four species to *Papilionanthe* (Garay, 1974), *Vanda* is poorly known and neither a synopsis nor a revision exists. One *Vanda* species, *V. kimballiana* Reichb. f., was transferred to *Holcoglossum* by Garay (1972). Three closely related species, *V. amesiana* Reichb. f.,

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V. saprophytica Gagnep., and *V. subulifolia* Reichb. f., should also be transferred to *Holcoglossum* for reasons given below. What remains in *Vanda* requires further study before anything meaningful can be said about the relationships of the several distinct morphologies and species complexes in the genus. Erecting genera such as *Trudelia* Garay (Garay, 1986) for the more distinctive species complexes is premature.

In a review of *Holcoglossum* and related genera, Tsi (1982) published *H. junceum* Tsi. I consider this species better placed in *Ascocentrum* near *A. semiteretifolium* Seidenf. An informal discussion of *Ascocentrum* was published by Christenson (1986a) and the generic limits of *Ascocentrum* were further clarified with the removal of *A. hendersonianum* (Reichb. f.) Schltr. to *Dyakia* E. A. Christenson (Christenson, 1986b).

KEY TO THE GENERA OF THE 'AERIDES-VANDA ALLIANCE'

1. Leaves planar or V-shaped in cross-section, apices obtusely bilobed, either smoothly rounded or praemorse 2
\+ Leaves semiterete, sulcate or terete, apices acute 7
2. Leaf apices smoothly rounded 3
\+ Leaf apices praemorse-erose 4
3. Flowers with a prominent column foot, spur anterior to the perianth (except in *A. maculosa* Lindley), inflorescences arching-pendent (except in *A. rubescens* (Rolfe) Schltr.), flowers white, rose, white and rose or rarely yellow and rose ..... **Aerides**
\+ Flowers with an obscure column foot, spur posterior to the perianth, inflorescences stiffly erect, flowers concolor yellow .. **Vanda spathulata**
4. Labellum 3-lobed, the sidelobes obvious 5
\+ Labellum 1-lobed, sidelobes when present appearing as small flanges at the base of the column (vestigial column wings in *R. coelestis* (Reichb. f.) Reichb. f.) ..... **Rhynchostylis**
5. Pollinia 2, perforate, column foot absent ..... **Ascocentrum**
\+ Pollinia 2, each one unevenly cleft, column foot present 6
6. Spur forward projecting, labellum articulate to a prominent column foot ..... **Aerides inflexa** Teijsm. & Binn
\+ Spur not forward projecting, labellum not articulate ..... **Vanda** p.p.
7. Leaves terete, flowers few per inflorescence, column foot distinct, inflorescences arising from near the apex of long, trailing plants **Papilionanthe**
\+ Leaves sulcate or semiterete, flowers few to many per inflorescence, column foot obscure, either absent or fused with the lateral sepals or the sidelobes of the labellum, inflorescences arising from the base or the centre of the plant 8
8. Spur bilaterally compressed, column foot absent, clinandrium dorsal **Seidenfadenia**
\+ Spur more or less cylindric, column foot obscure, either absent (*Ascocentrum*) or fused with the sidelobes of the labellum (*Holcoglossum*), clinandrium not dorsal 9
9. Sidelobes of the labellum forming a bridge between the midlobe of the labellum and the column, column foot absent, midlobe not flexible, ligulate ..... **Ascocentrum** p.p.

+ Sidelobes of the labellum fused to the column foot, midlobe easily deflexed, column foot continuous with the labellum, midlobe more or less elliptic, not ligulate ..... **Holcoglossum**

HOLCOGLOSSUM

Holcoglossum was defined by Garay (1972) as:

> 'Characterized by the short, footless column with prominent wings. Clinandrium deeply cleft in front; rostellum short, bifid. Pollinia 2, notched, on linear, tapering stipes. Lip sessile with a slender, arcuate spur. Stem rather short, completely enclosed by distichously arranged leaf sheaths. Leaves articulate, triquetrous or terete.'

The genus is easily recognized by its sulcate or triquetrous leaves, perforate pollinia, and characteristic labellum morphology. The labellum of *Holcoglossum* is its most distinctive feature, and flowers in the genus typically have 3-lobed labella with long nectar spurs. The only deviations from a long-spurred floral plan in *Holcoglossum* are *H. amesianum* and *H. subulifolium*. The spur morphology of these two species represents a secondarily derived condition and the presence of a long spur is accepted as a synapomorphy for *Holcoglossum* (Christenson, cladistic analysis, unpubl.).

Both Garay (1972) and Tsi (1982) consider *Holcoglossum* to have a footless column in contrast with *Papilionanthe* which they consider to have a column foot. This is more a semantic argument than a morphological distinction: a column foot is present in both genera. In *Holcoglossum* the labellum sidelobes are decurrent to the column foot while in *Papilionanthe* there is a free segment of column foot between the column and the adnation of the labellum sidelobes (this free segment is the column foot of both Garay and Tsi). Deflection of the midlobe by a potential pollinator in *Holcoglossum* is achieved by flexible tissue at the junction of the midlobe and sidelobes at the throat of the spur. Deflection of the labellum in *Papilionanthe* occurs by flexing the free segment of column foot.

Holcoglossum is most closely related to *Papilionanthe*. In addition to the lip characters discussed above, *Holcoglossum* and *Papilionanthe* differ by their spur structure, vegetative morphology, inflorescence origin, and pollinia. *Holcoglossum* have long narrow spurs, sulcate or triquetrous leaves, inflorescences borne near the base or the centre of the plant, and perforate pollinia. In contrast, *Papilionanthe* have short broad spurs, terete leaves, inflorescences borne near the apex of long trailing plants, and unevenly cleft pollinia.

In addition to differences in morphology, *Holcoglossum* and *Papilionanthe* are ecologically isolated. *Holcoglossum* occur at high elevations in some of the most montane, cool habitats tolerated by members of the subtribe. *Holcoglossum sinicum* is known from an elevation of 3200 m (*SBEC* 246) and other species appear to be restricted to elevations greater than 1000 m. Veitch (1890) stated that *H. amesianum* 'flowers in December and January; the temperature at that season ranging from about 2°–18°C (36°–65°) in the course of twenty-four hours, the ground being sometimes quite white with hoar frost in the early morning (4–6 a.m.)'. On the other hand, most species of *Papilionanthe* occur at low elevations: they are the terete-leaved 'Vandas' common to lowland tropical horticulture.

Holcoglossum can be divided into two sections. The first, sect. *Holcoglossum*, is comprised of small, fan-shaped plants that bear 1–4-flowered

inflorescences. *H. quasipinifolium*, the type of the section, is a not infrequent horticultural subject and has been discussed and figured in Sheehan (1985) and Teuscher (1977). The flowers pictured in the latter are misshapen due to culture under excessive heat.

The other two species in the section, *H. flavescens* and *H. sinicum*, are little known. *H. flavescens*, initially described as an *Aerides*, was based on a Yunnan collection by Tschang. The type (Herb. *S. Ten* 23) was subsequently destroyed at Berlin and no isotype material is known. However, a collection from Hubei (*Fu* 21, PE) appears to agree with the original description and extant drawings of the type. Garay (1972) transferred *Aerides flavescens* Schltr. to *Papilionanthe*. Examination of drawings made from the type by Tang show this species is properly a *Holcoglossum* as pointed out by Tsi (1982). Tsi reduced *H. rupestre* to the synonymy of *H. flavescens*. Examination of a photograph of the type of *V. rupestris* Hand.-Mazz. (*Hand.-Mazz.* 8802, W) shows that it is distinct from *H. flavescens* and referrable to *Holcoglossum* sect. *Kimballianum*. *H. flavescens* has 2–4-flowered inflorescences of yellow flowers and is a smaller plant (leaves 4–8·5 cm long) than *H. rupestre*. The latter has 10-flowered inflorescences of rose-lipped white flowers on a larger plant (leaves to 20 cm long).

Holcoglossum sinicum is known only from the two collections cited and a cultivated plant at the Royal Botanic Garden, Edinburgh (Acc. No. 812808). This species was discovered during the 1981 Sino-British Expedition to China (Mitchell, 1984).

The second section, sect. *Kimballianum*, is comprised of short or long-stemmed plants that bear more or less upright, usually long-pedunculate, many-flowered inflorescences. The most floriferous species, *H. amesianum*, can bear branched inflorescences with upwards of 80 flowers. *H. kimballianum* and *H. subulifolium* are more or less scandent and plants of these species can attain considerable size. In all aspects, species of sect. *Kimballianum* are physically larger than those of sect. *Holcoglossum*.

Holcoglossum amesianum, *H. kimballianum*, and *H. subulifolium* were in cultivation during the last century (see *Bot. Mag.* t. 7139, 7112, and 8109 respectively). All three are in limited cultivation today. The other two species in this section, *H. rupestre* and *H. saprophyticum*, have never been in cultivation and are known only from their type specimens. An illustration of *H. saprophyticum* (as *H. kimballianum*) was published in Seidenfaden (1975).

KEY TO THE SPECIES OF HOLCOGLOSSUM

1. Plants with short internodes, fan-shaped, leaves strictly distichous. Inflorescences unbranched, laxly pendent, 1–4-flowered. (sect. *Holcoglossum*) 2
\+ Plants usually ± scandent, leaves distichous or spirally arranged, not fan-shaped. Inflorescences branched or unbranched, upright or arching, never pendent, 10–80-flowered. (sect. *Kimballianum*) 4
2. Base of labellum midlobe with parallel callus ridges 3
\+ Base of labellum midlobe without parallel callus ridges .... **H. sinicum**
3. Base of labellum midlobe with 7 parallel callus ridges, apex of midlobe finely erosely fringed (Taiwan) ..... **H. quasipinifolium**

+ Base of labellum midlobe with 3 parallel callus ridges, apex of midlobe entire (Yunnan) ..... **H. flavescens**

4. Spur long and slender, as long or nearly as long as the midlobe of the labellum, at 90° to the labellum midlobe 5

+ Spur short and broad, either $\frac{1}{2}$ as long as the labellum midlobe and parallel to it or shallowly saccate 7

5. Labellum midlobe erosely fringed. Lateral sepals strongly falcate and dissimilar to the petals and dorsal sepal. 5-keeled callus present, labellum sidelobes acutely corniform ..... **H. kimballianum**

+ Labellum midlobe entire. Sepals and petals subsimilar. 2- or 3-lobed callus present. Labellum sidelobes broadly rounded or acturely corniform 6

6. Callus 2-lobed. Labellum sidelobes acutely corniform **H. saprophyticum**

+ Callus 3-lobed. Labellum sidelobes broadly rounded ..... **H. rupestre**

7. Flowers white. Callus, sac and labellum sidelobes yellow spotted with brown. Spur shallowly saccate. Stem scandent. Roots typical for the genus. Labellum midlobe narrowly clawed, fimbriate. Labellum sidelobes acute ..... **H. subulifolium**

+ Flowers white with a pink labellum, no yellow pigment in the flowers. Spur short, less than $\frac{1}{2}$ the length of the labellum midlobe. Stem short, never scandent. Roots extremely fleshy for the genus. Labellum midlobe undulate entire, cordate, not narrowly clawed. Labellum sidelobes rounded ..... **H. amesianum**

SYNOPSIS OF HOLCOGLOSSUM

Holcoglossum Schltr. in Repert. Spec. Nov. Regni. Veg. Beih. 4:285 (1919).
Type species: *H. quasipinifolium* (Hayata) Schltr.

Holcoglossum sect. **Holcoglossum**
Inflorescences with 1–4 flowers, usually laxly pendent.

H. quasipinifolium (Hayata) Schltr. in Repert. Spec. Nov. Regni. Veg. Beih. 4:285 (1919).
Basionym: *Saccolabium quasipinifolium* Hayata in Ic. Pl. Form. 2:144 (1912).
Distribution: Taiwan.

H. flavescens (Schltr.) Tsi in Acta Phytotax. Sin. 20:441 (1982).
Basionym: *Aerides flavescens* Schltr. in Repert. Spec. Nov. Regni Veg. 19:382 (1924).
Syn.: *Saccolabium yunpeense* Tang & Wang in Acta Phytotax. Sin. 1:97 (1951).
Papilionanthe flavescens (Schltr.) Garay in Bot. Mus. Leafl. 23:371 (1974).
Distribution: China.

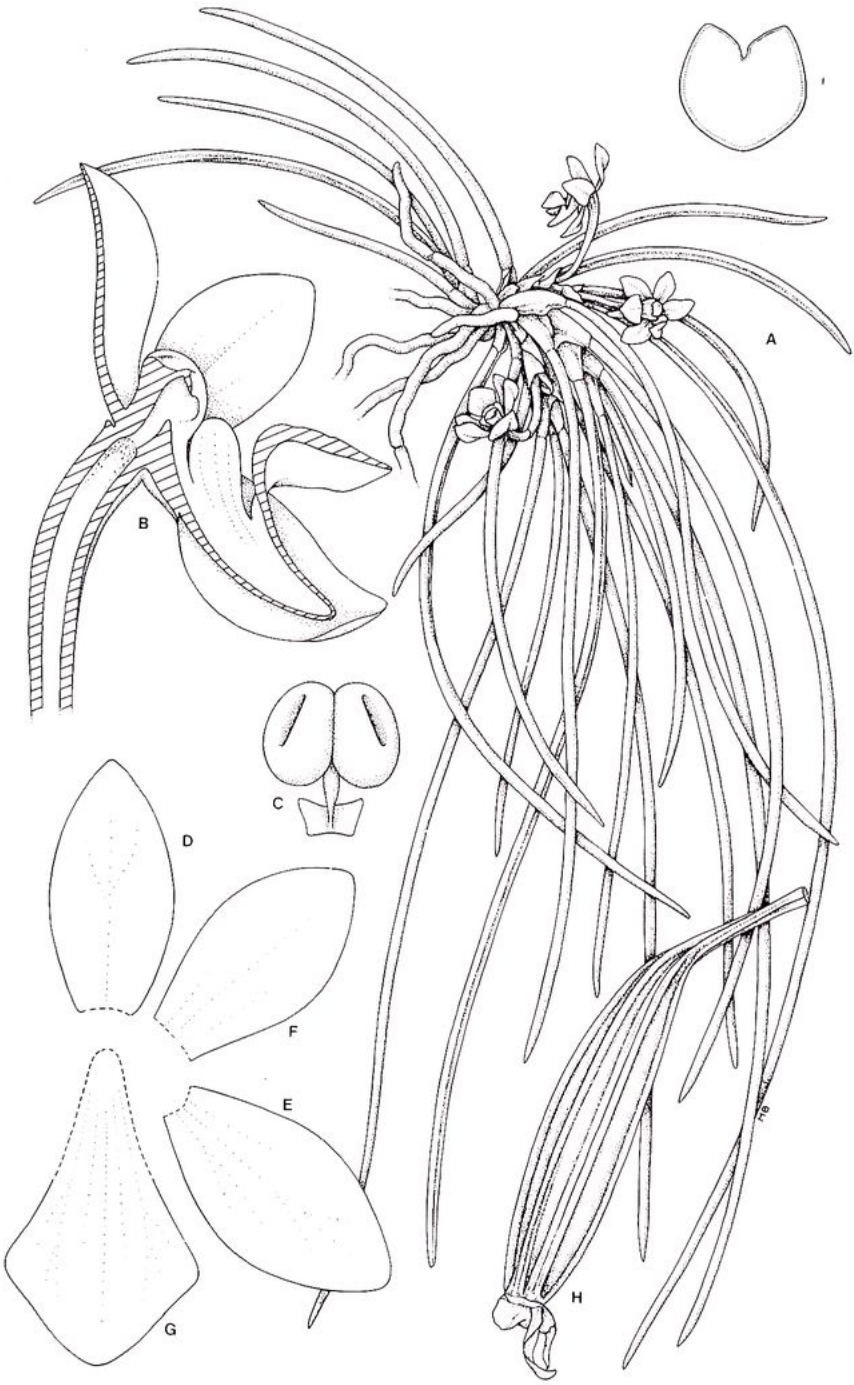

FIG. 1. *Holcoglossum sinicum* E. A. Christenson: A, habit ×⅔; B, flower L.S. ×4; C, pollinia ×12; D, dorsal sepal ×4; E, lateral sepal ×4; F, petal ×4; G, labellum ×4; H, fruit ×2; I, leaf T.S. from just above junction with petiole ×8. All except H from living collection Acc. No. 812808, *SBEC* 380. H from *SBEC* 246.

Holcoglossum sinicum E. A. Christenson, **sp. nov.** Fig. 1.

H. flavescenti (Schltr.) Tsi et *H. quasipinifolio* (Hayata) Schltr. affinis sed labello medio ecalloso notabilis.

A pendent fan-shaped epiphyte. Roots terete, white. Leaves semiterete, articulate, to 23 cm long. Inflorescence 1–3-flowered, not exceeding the stem. Flowers patent, white with a yellow patch at the base of the labellum midlobe. Lateral sepals elliptic, 1 cm long, 0·5 cm wide. Dorsal sepal elliptic, 0·9 cm long, 0·4 cm wide. Petals similar to the dorsal sepal, 0·8 cm long, 0·4 cm wide. Labellum 3-lobed, spurred, not articulate. Labellum midlobe obtrullate, entire, 0·7 cm wide. Labellum sidelobes obovate, obtuse, decurrent to the column foot, 0·2 cm wide. Spur conic, 0·8 cm long. Column foot 0·2 cm long. Column erect, 0·3 cm long. Pollinia 2, subglobose, perforate, 0·1 cm wide. Stipe linear. Disc trapezoid. Fruit capsular, cylindric, 6-ribbed, column foot persistent, 1·3 cm long, 0·3 cm wide.
Type: China: Yangbi County, Shangchang, 2700 m, epiphyte on *Alnus* in light forest, 9 v 1981, *SBEC** 380 (Holo. E, Iso. AMES).
CHINA: Yangbi County, Duanging, 3200 m, growing in forest, epiphyte on tree trunk, 5 v 1981, *SBEC* 246 (E).
Distribution: China.

Holcoglossum sect. **Kimballianum** E. A. Christenson, **sect. nov.**

Inflorescentiis erectis vel arcuatis, ultra 10-floribus.
Type species: *H. kimballianum* (Reichb. f.) Garay.

H. amesianum (Reichb. f.) E. A. Christenson, **comb. nov.**
Basionym: *Vanda amesiana* Reichb. f. in Gard. Chron. 1:764 (1887).
Distribution: Burma, China, Kampuchea, Laos, Thailand, Vietnam.

H. kimballianum (Reichb. f.) Garay in Bot. Mus. Leafl. 23:182 (1972).
Basionym: *Vanda kimballiana* Reichb. f. in Gard. Chron., III, 5:232 (1889).
Distribution: Burma, China, Thailand.

H. rupestre (Hand.-Mazz.) Garay in Bot. Mus. Leafl. 23:182 (1972).
Basionym: *Vanda rupestris* Hand.-Mazz., Symb. Sin. 7:1359 (1936).
Distribution: China.

H. saprophyticum (Gagnep.) E. A. Christenson, **comb. nov.**
Basionym: *Vanda saprophytica* Gagnep. in Bull. Soc. Bot. Fr. 79:37 (1932).
Distribution: Laos.

H. subulifolium (Reichb. f.) E. A. Christenson, **comb. nov.**
Basionym: *Vanda subulifolia* Reichb. f. in Flora 69:552 (1886).
Syn: *Vanda watsoni* Rolfe in Gard. Chron. 1905:82 (1905).
Distribution: Vietnam.

Excluded species:
H. falcatum (Thunb.) Garay in Bot. Mus. Leafl. 23:182 (1972).

This species was placed in the genus through an error (Garay, pers. comm.). It is correctly *Neofinetia falcata* (Thunb.) Hu.

*Sino-British Expedition to China.

H. junceum Tsi in Acta Phytotax. Sin. 20:442 (1982).

This species, described from a Szechuan plant, is synonymous with the earlier *Saccolabium himalaicum* Deb, Sengupta & Malick, described from Bhutan. It is a sister species to *Ascocentrum semiteretifolium* Seidenf. known only from Thailand. I agree with Seidenfaden's placement of his species and also refer *S. himalaicum* to *Ascocentrum*. The combination is made here:

Ascocentrum himalaicum (Deb, Sengupta & Malick) E. A. Christenson, **comb. nov.**

Basionym: *Saccolabium himalaicum* Deb, Sengupta & Malick in Bull. Bot. Soc. Beng. 22:213 (1968).

Syn.: *Holcoglossum junceum* Tsi in Acta Phytotax. Sin. 20:442 (1982).

BURMA. Between Ukhrul and Tusom Khulen, 6–7000 ft, *Kingdon-Ward* 18339 (NY); N Burma, North Triangle, Kachin State, Hkinlum, 4000 ft, 29 x 1953, *Kingdon-Ward* 21528 (BM).

CHINA. W Yunnan, Shweli-Salwui divide, 8000 ft, xi 1924, *Forrest* 26130 (E, K).

INDIA. Assam, Karong, Manipur, 3500 ft, 25 xi 1950, *Koeltz* 27016 (MSU).

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