Selbyana 20(1): 1–9. 1999.

THE GENUS *SOLENIDIOPSIS* SENGHAS (ORCHIDACEAE: ONCIDIINAE), A DISCUSSION AND REVISION

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ABSTRACT. The genus *Solenidiopsis* Senghas is analyzed and revised, and its range in Peru is provided. Two species, *S. peruviana* (Schltr.) D.E. Bennett & Christenson and *S. tigroides* (C. Schweinf.) Senghas, are recognized and differentiated in a key. Synonymy is discussed. Evidence at this point indicates that *Solenidiopsis* should be subsumed into *Cochlioda* (Lindl.) Benth. or possibly both into *Odontoglossum* Kunth.

Key words: Orchidaceae, *Solenidiopsis, Cochlioda,* Peru

INTRODUCTION

Solenidium peruvianum Schltr. (FIGURE 1) originally was found near Moyobamba in Loreto, Peru, by a collector named Filomeno and described by Schlechter (1921); but the holotype was probably destroyed during World War II. A drawing (Schlechter ex Mansfeld 1929) survives. Bennett and Christenson (1994) concluded that this drawing represents the type and transferred this species to *Solenidiopsis.*

The genus *Solenidiopsis* Senghas was described from a plant at the Botanical Garden in Heidelberg, Germany (Senghas 1986), that Werner Rauh (*Rauh 54142,* HEID) had collected in the Mendoza Valley, Peru, 1980, and labeled "*Odontoglossum.*" Subsequent judgments by Senghas placed this plant in *Solenidium* and later identified it as *O. tigroides* C. Schweinf.

Odontoglossum tigroides C. Schweinf. (FIGURE 2) was originally collected by Macbride, May 1923 (AMES), near Yanano in Huánuco, Peru, at about 2000 m. Schweinfurth (1961) included *O. tigroides* in Orchids of Peru along with *Solenidium peruvianum* but mentioned that he had seen no material of the second taxon. His first supplement (1970) did cite the latter species (*Hutchison & Bennett 4663,* UC, AMES). Senghas (1986) noted that *O. tigroides* has a divided stigma and that the only other member of Oncidiinae with a similar feature is *Cochlioda* Lindl. (FIGURE 3A–D) not realizing that *Oliveriana* Rchb.f. (FIGURE 3G, H) and *Systeloglossum* Schltr. (FIGURE 3E, F) have similar morphology. DNA sequence analysis by Norris Williams, Mark Chase, and others indicates that at least *Systeloglossum* is not closely related to *Solenidiopsis* (Williams & Chase pers. comm.), whereas no DNA information is currently available for *Oliveriana.* The flowers of *Oliveriana* and *Systeloglossum* have a broadly triangular stipe; whereas species of *Cochlioda* have a broadly rectangular to obtrapezoid stipe; and species of *Solenidiopsis* have a narrowly rectangular stipe similar to most *Odontoglossum* species of the *O. epidendroides* complex and its allies (Dalström 1995). *Solenidiopsis* is distinguished by the divided stigma and the free lip, whereas *Cochlioda* has a lip fused to the column. Adnation varies among species, however, being quite conspicuous in some comparisons, such as *S. tigroides* vs. *C. vulcanica* (Rchb.f.) Benth. (FIGURE 3A, B), and being subtle enough between others to suggest congeneric status, such as *S. tigroides* vs. *C. rosea* (Lindl.) Benth. (FIGURE 3C, D).

Solenidiopsis flavobrunnea Senghas (1989) was described from a plant collected by Würstle, near Huancabamba in northern Peru. Features such as the distinct color pattern and less waviness of the sepal and petal margins were used to separate this species from *S. tigroides.* The callus also distinguishes these two taxa, but no details were provided. Had *S. flavobrunnea* been compared with *S. peruviana,* Senghas would have seen that the morphology of the former parallels the illustration of the latter close enough to indicate conspecific status and synonymy for *S. flavobrunnea.*

Bennett and Christenson (1993, 1995) treated *Solenidiopsis flavobrunnea* and *S. peruviana* as separate species. Specimens of both taxa were collected, however, at the same locality in Peru: Amazonas, Chachapoyas, Cordillera Callacalla, 18–19 km above Leimebamba along the road to Balsas. Bennett and Christenson cited *Hutchison & Bennett 4693* (UC), collected in April 1964, as *S. peruviana* (1995) and *Hutchison & Wright 5638* (UC), collected in November the same year, as *S. flavobrunnea* (1993). I conclude that they represent the same species because they are inseparable by morphology, grow together, and remain confused in herbaria and citations.

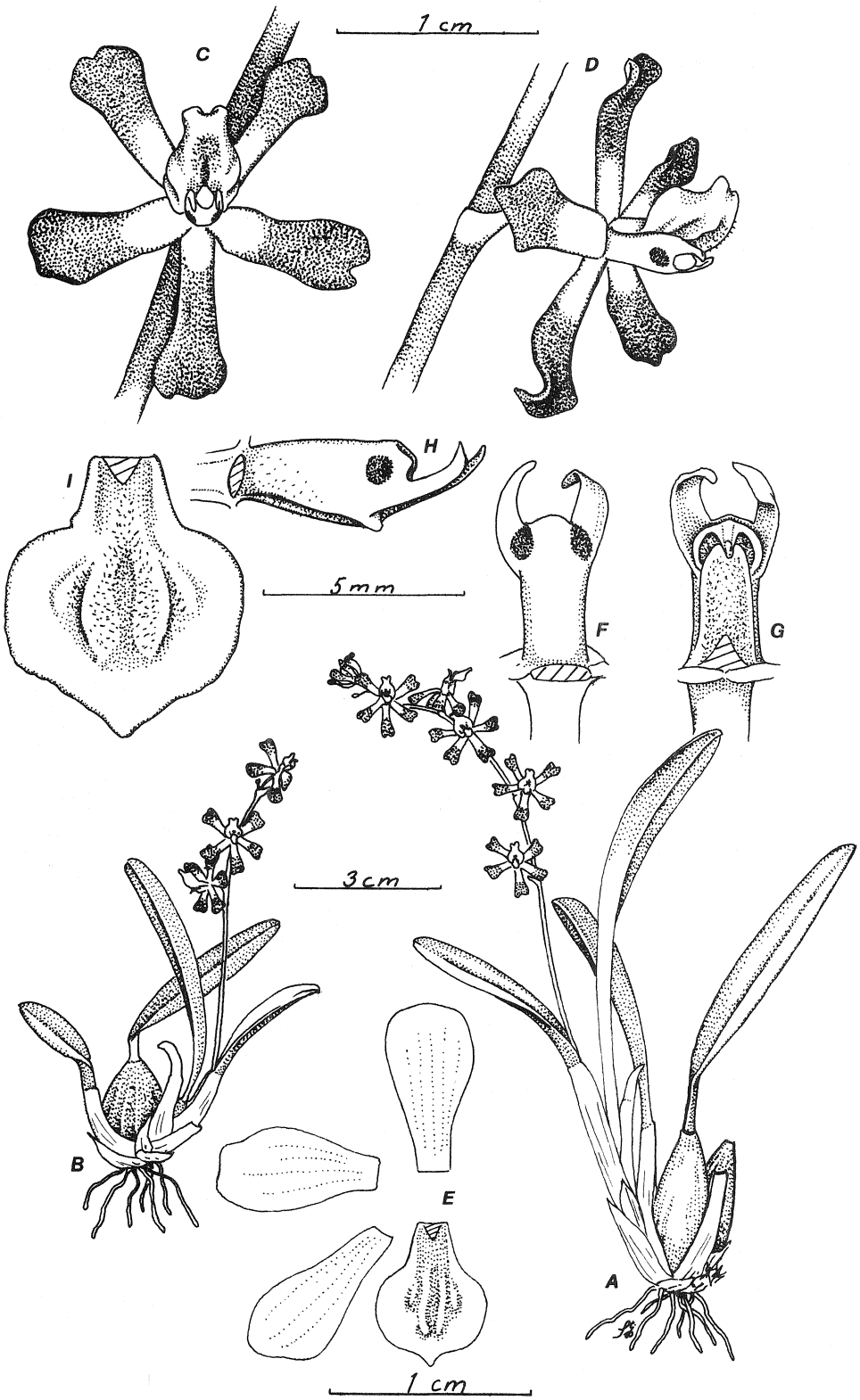

FIGURE 1. *Solenidiopsis peruviana*: **A** and **B.** Plant habit. **C** and **D.** Flower frontal and side view. **E.** Floral diagram. **F.** Column dorsal view. **G.** Column ventral view. **H.** Column lateral view. **I.** Lip flattened dorsal view. (Anther cap and pollinarium not available.) (A, B, E–I drawn from *P.C. Hutchison & K. von Bismarck 6477,* AMES; C and D drawn from *S. Beckendorf*, color transparency, SEL).

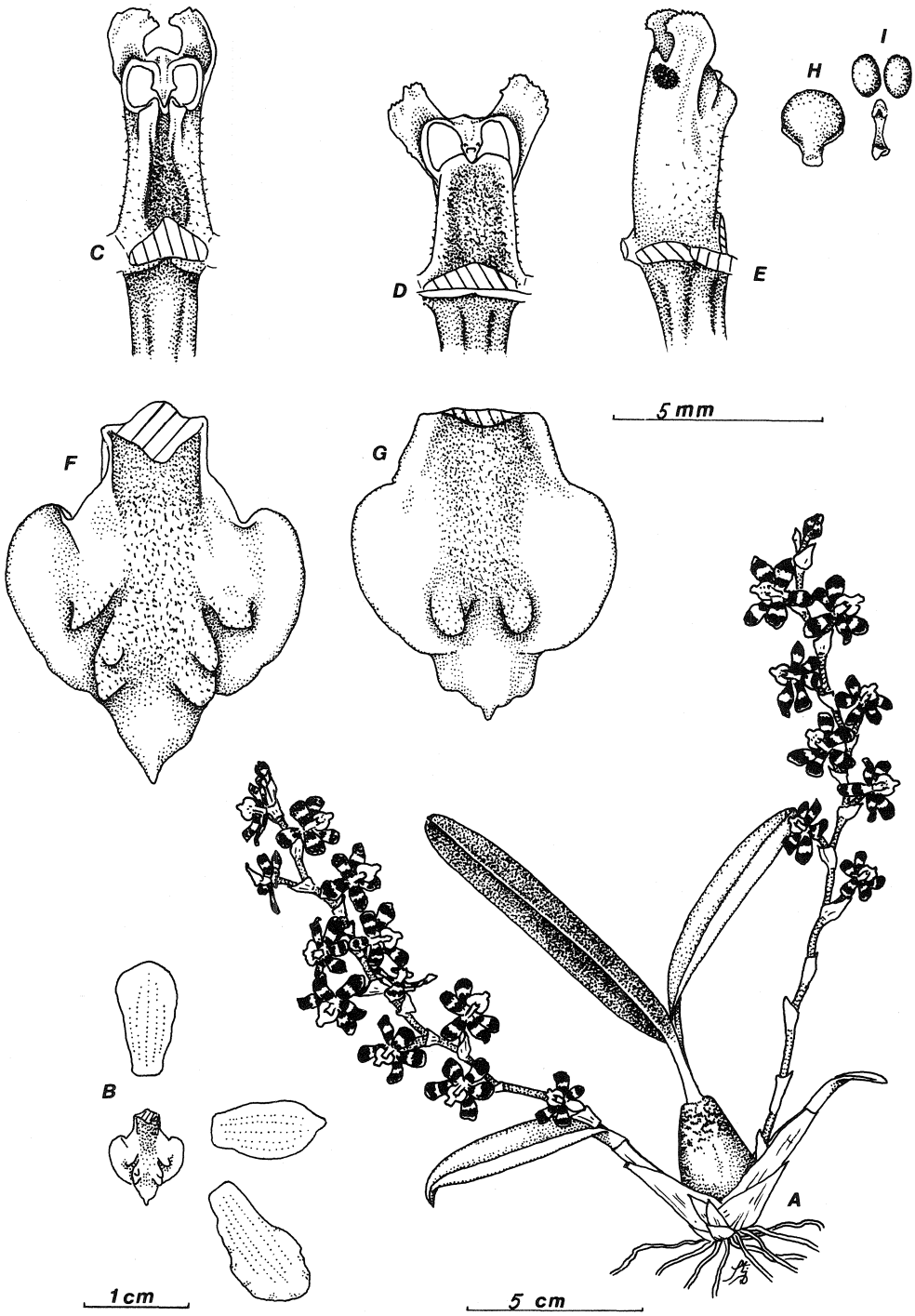

FIGURE 2. *Solenidiopsis tigroides*: **A.** Plant habit. **B.** Floral diagram. **C.** Column, lowermost flower, ventral view. **D.** Column, uppermost flower, ventral view. **E.** Column, lowermost flower, lateral view. **F.** Lip, semiflattened, lowermost flower. **G.** Lip, flattened, uppermost flower. **H.** Anther cap, dorsal view. **I.** Pollinarium. (Drawn from *J.F. Macbride 3840*, AMES).

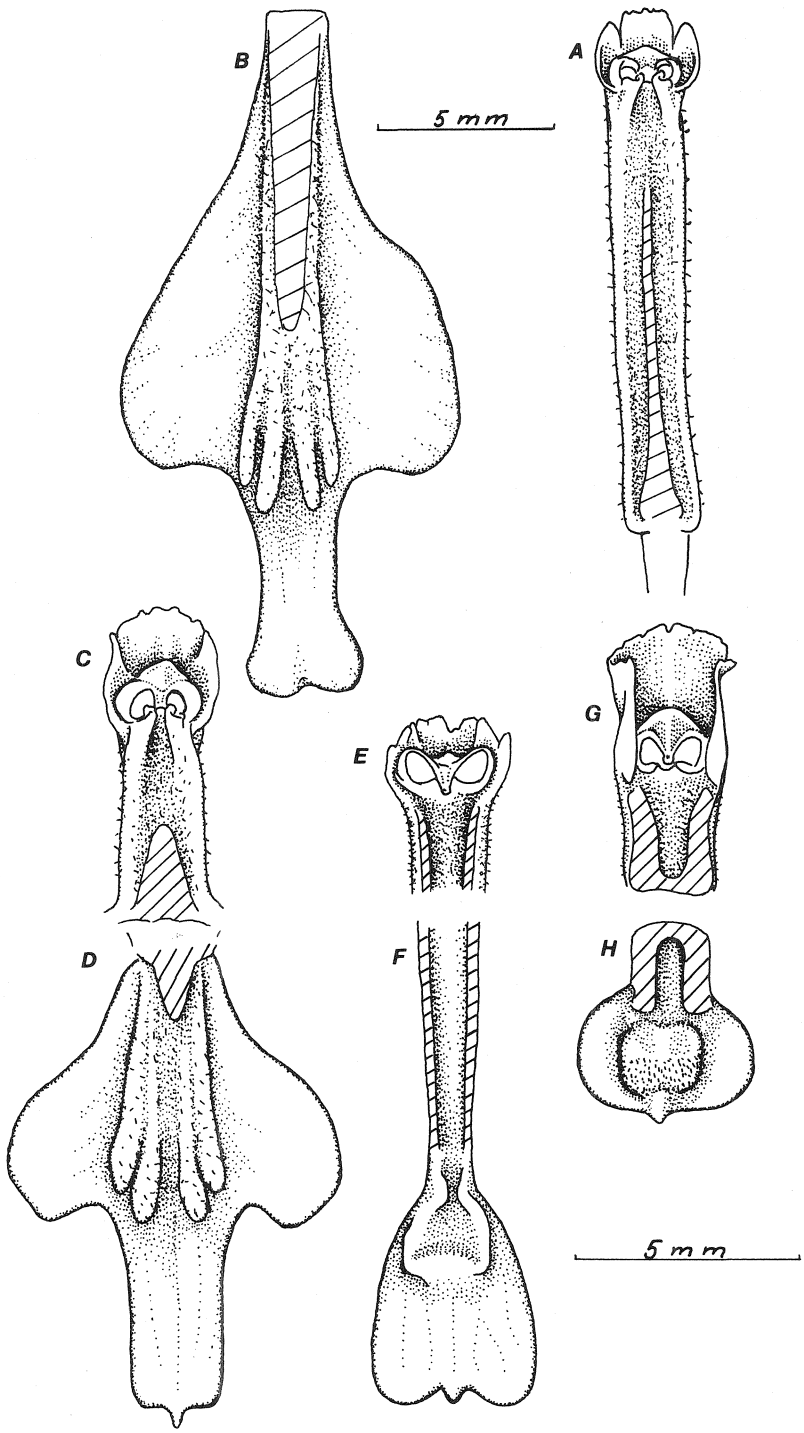

FIGURE 3. *Cochlioda vulcanica*: **A.** Column, ventral view. **B.** Lip, flattened. *Cochlioda rosea*: **C.** Column, ventral view. **D.** Lip flattened, dorsal view. *Systeloglossum ecuadorense*: **E.** Column ventral view. **F.** Lip, flattened dorsal view. *Oliveriana brevilabia*: **G.** Column, ventral view. **H.** Lip, flattened, dorsal view. (A and B drawn from *S. Dalström 1682*, SEL; C and D drawn from *S. Dalström 190*, SEL; E and F drawn from *S. Dalström s.n.*, SEL; G and H drawn from *S. Dalström 95*, SEL).

Solenidiopsis rhombicalla D.E. Benn. & Christenson (1994) (FIGURE 4) is based on a collection from northern Peru (*Bennett 2066,* AMES) and is distinguished from *S. tigroides* by its smaller flower, different callus structure, and bilobed labellum apex. Comparison using the measurements provided in the description of *S. rhombicalla* and those accompanying the original description of *S. tigroides,* however, indicate otherwise. A rehydrated flower taken from the type specimen of *S. rhombicalla* (FIGURE 4) closely resembled its counterpart from an isotype of *S. tigroides.* The front lobe is in fact broadly acute when flattened and only appears to be bilobed because the apex is reflexed in fresh flowers (FIGURE 4B, C, G).

I propose that *Solenidiopsis rhombicalla* is a synonym of *S. tigroides.* Rehydrated flowers from an isotype of *S. tigroides,* one from the base of the inflorescence (FIGURE 2C, E, F) and one from the top (FIGURE 2D, G) revealed that the former was larger. The lowermost flower also possessed a much more developed callus on the lip. Viewed separately, one specimen corresponded to the description of *S. tigroides* and the other to *S. peruviana.* Accordingly flower size and morphology, particularly the callus, fail as reliable taxonomical markers for these taxa. This discovery should come as no surprise, as flower size in particular varies greatly within many oncidioids and should be avoided when distinguishing species, especially when only a few plants are available for comparisons.

Steve Beckendorf of Oakland, California, reported (pers. comm.) that *Solenidiopsis peruviana* and *S. tigroides* are readily distinguishable in cultivation by flower color and fragrance. Those of *S. tigroides* are yellow with a white lip and bold dark brown bars or spots on the segments. Fragrance is sweet and pleasant. *Solenidiopsis peruviana* produces greenish sepals and petals with the apical half almost covered by a dull, dark brown color. The lip is yellowish and the odor relatively unappealing, although Hutchison and Von Bismarck described *S. peruviana* as "sweetly fragrant" (*Hutchison & von Bismarck 6477,* AMES, UC).

Solenidiopsis peruviana generally produces unifoliate pseudobulbs whereas those of *S. tigroides* are bifoliate, although the diagnosis of both *S. rhombicalla* and *S. tigroides* describe trifoliate pseudobulbs. Those appear to be misinterpretations, judging from personal examinations of type specimens. *Solenidiopsis peruviana* is precocious with anthesis beginning while the pseudobulb is still partially hidden by the bracts. *Solenidiopsis tigroides* appears to flower later on mature growths. Most *S. peruviana* specimens have been collected at elevations around 2750–3100 m, whereas *S. tigroides* is documented at 1450–2000 m.

The lip in *Solenidiopsis* is described as free from the column, as opposed to fused in *Cochlioda*; but in fact, it is fused to the base of the column through a very short central keel, similarly to a *C. rosea. Solenidiopsis* flowers are green to yellow and more or less covered with spots or shades of brown and distinctly fragrant. *Cochlioda* flowers are bright rose-purple to orange-red and apparently scentless, as would be expected for hummingbird pollination. Flower fragrance, color, and orientation, which vary among species in many orchid genera (e.g., *Dendrobium* Sw., *Epidendrum* L., *Maxillaria* Ruiz & Pav., *Pleurothallis* R. Br.), seem to be a distinction unworthy of generic status. Species of *Cochlioda* generally produce racemes with resupinate flowers, but they also can be irregularly tilted. When mounted on a herbarium sheet, the flowers can point in any direction and appear resupinate or nonresupinate. When plants of *Solenidiopsis* are grown in pots, they generally produce erect inflorescences with nonresupinate flowers; but when mounted on bark or in baskets, they develop inflorescences in various directions displaying nonresupinate as well as resupinate flowers. *Cochlioda* and *Solenidiopsis* are vegetatively similar with ovate to elliptic, compressed, ancipitous, glossy pseudobulbs. In general, ecology and flower morphology are similar. Recent DNA sequence analysis also indicates that they are closely related (N. Williams & M. Chase pers. comm.).

The description of *Cochlioda chasei* D.E. Bennett & Christenson (1994), which is based on a single collection near Río Nieva, above 1700 m, in the Province of Bóngara, Amazonas, Peru, in November 1987 (*Arias, Bennett & Chase 4080,* USM), further strengthens the case for congeneric treatment. They describe the flowers as rosy-purple and the column "white with lilac markings basally tinted lilac." Pastorelli's illustration of the type (Bennett & Christenson 1994) shows the column with two dark spots on the side away from the lip (as in *Solenidiopsis* but unknown for other species of *Cochlioda*). The column has two large apical wings (as in *Cochlioda* and *Solenidiopsis*) but lacks the hood (as in *Solenidiopsis*). Judging by all features, *C. chasei* fits comfortably in either genus. Color is more consistent with *Cochlioda,* whereas morphology indicates *Solenidiopsis.* In summary, I conclude that members of these two genera are in fact congeneric.

DNA sequence analysis indicates that both *Cochlioda* and *Solenidiopsis* are more closely related to *Odontoglossum* Kunth than to any oth-

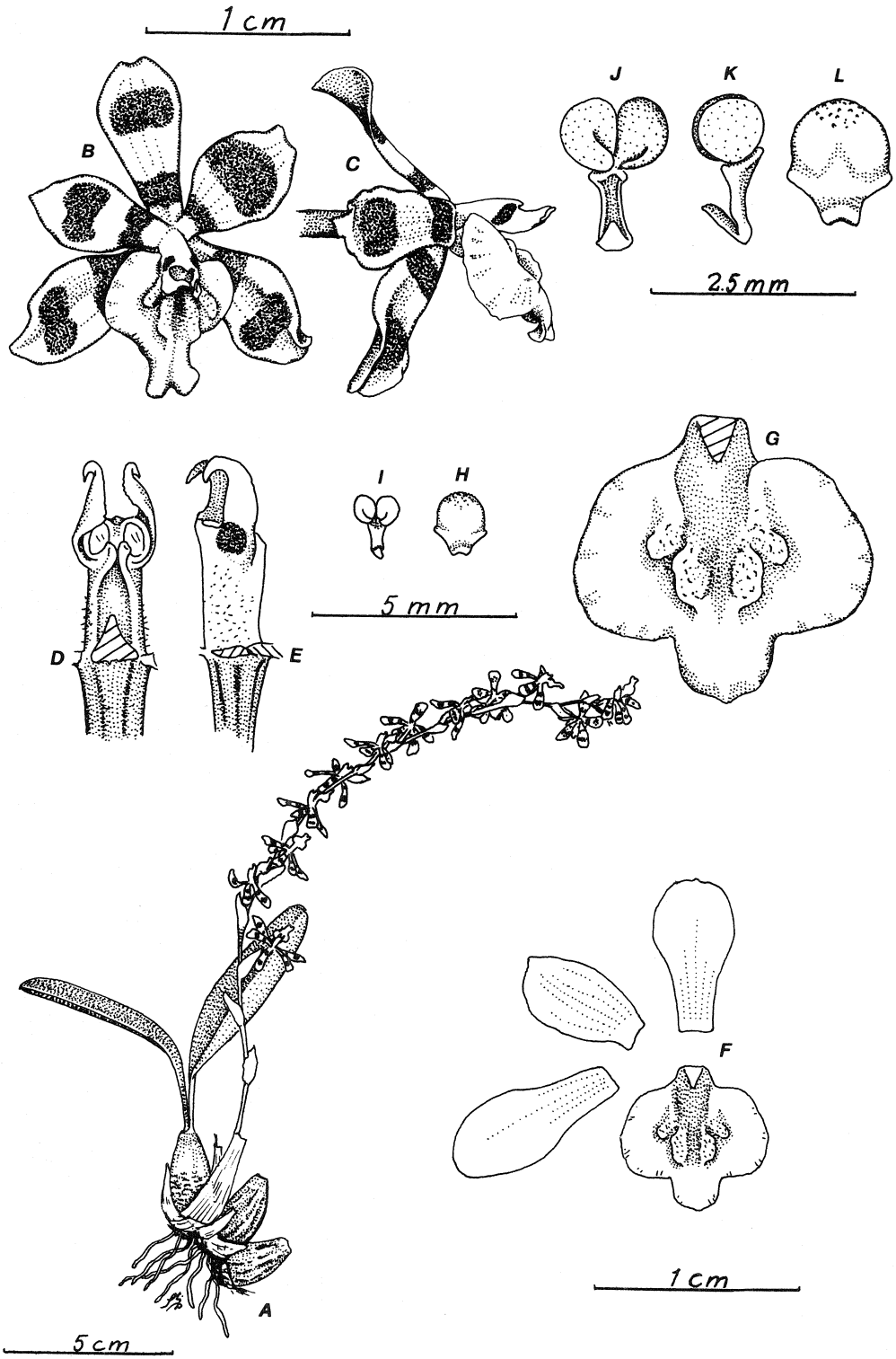

FIGURE 4. *Solenidiopsis tigroides*: **A.** Plant habit. **B.** Flower, frontal view. **C.** Flower, lateral view. **D.** Column, ventral view. **E.** Column, lateral view. **F.** Floral diagram. **G.** Lip, flattened, dorsal view. **H.** Operculum, dorsal view. **I.** Pollinarium. **J.** Pollinarium, ventral view. **K.** Pollinarium, lateral view. **L.** Anther cap, dorsal view. (Drawn from *D.E. Bennett 2066*, AMES).

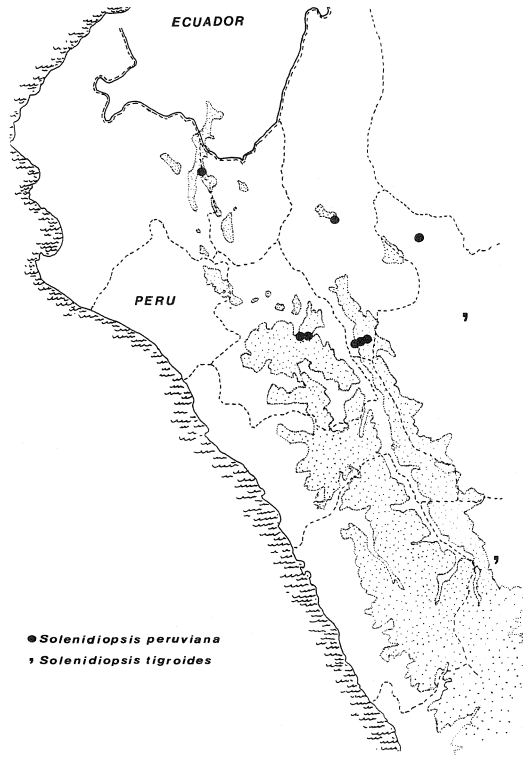

FIGURE 5. Distribution of *Solenidiopsis peruviana* and *S. tigroides* in Peru.

er oncidioid and probably constitute species of that genus (N. Williams & M. Chase pers. comm.). Closest morphological relatives appear to be the *O. astranthum* Linden & Rchb.f. complex (Dalström 1993, 1996, in press).

TAXONOMIC TREATMENT

Key to the species of *Solenidiopsis*

1. Pseudobulbs unifoliate; flowering on immature growth; sepals and petals greenish, covered with brown on the apical halves; lip yellow with a darker yellow spot in front of the white callus . . . . . *S. peruviana*
1. Pseudobulbs generally bifoliate (or trifoliate); flowering on mature growth; sepals and petals yellow with dark brown bars and spots; lip whitish with a brown spot on the front lobe and yellow spots on the callus . . . . . *S. tigroides*

Solenidiopsis peruviana (Schltr.) D.E. Benn. & Christenson, Brittonia 46: 44. 1994. —*Solenidium peruvianum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 9: 113. 1921 (illustration in Mansf., Repert. Spec. Nov. Regni Veg. Beih. 57: t. 129, nr. 507. 1929). TYPE: Peru. Loreto: near Moyobamba, *Filomeno s.n.* (Holotype: B–destroyed; Lectotype Tabula 129, 507!)

Solenidiopsis flavobrunnea Senghas, Orchidee (Hamburg) 40(6): 205. 1989. TYPE: Peru. Piura: near Huancabamba, ca. 2600 m, *B. Wurstle s.n.* BGH Nr. 0-18778 (Holotype: HEID).

Plant an epiphytic herb. ***Pseudobulbs*** caespitose, ovate to elliptic, ancipitous, 1.5–3 × 1.0–2.0 cm, unifoliate, subtended by 4–6 distichous sheaths, the uppermost foliaceous. ***Leaves*** conduplicate, shortly petiolate, oblong-elliptic, acute, shortly apiculate, 4–13 × 0.6–1.5 cm. ***Inflorescences*** 1 or 2, axillary, from the uppermost sheaths on new growth, erect to arching racemes, 6–21 cm long, 2–8-flowered; bracts scale like, adpressed to rather open, 3–5 mm long. ***Pedicel*** with ovary 5–10 mm long. ***Flowers*** stellate, generally nonresupinate; sepals and petals greenish yellow near the base then gradually turning dark brown; dorsal sepal weakly spathulate to obovate, obtuse to truncate, entire, 7–9 × 3–4 mm; lateral sepals similar; petals similar to the sepals, 6–8 × 3–4 mm; lip pale yellowish with lower basal part of the callus white and the apical part darker yellow, pubescent basally, rigidly fused to the base of the column and through a short, fleshy, central, longitudinal keel, lamina rounded to weakly trilobulate, side lobes revolute, front lobe obtuse to acute, sometimes apiculate, recurved apically, 7–8 × 6–7 mm; callus of 2 finely pubescent fleshy keels or knobs, sometimes with additional lateral humps on larger flowers; column whitish to greenish with 2 purple spots on the opposite side from the lip, shortly clavate, straight to slightly curved with 2 prominent falcate, apical wings and with 2 projecting lobes beneath the stigma (lobes may be less developed on smaller specimens); stigma divided into 2 orbicular lobes by the inbent rostellum; anther cap orbicular to rostrate; pollinarium of 2 globose pollinia on an oblong stipe ca. 1 mm long.

Additional specimens examined. PERU. Amazonas: Chachapoyas, Cerro Calla Calla, 15 km above Leimebamba on the road to Balsas, 2950 m, 27 Mar. 1964, *P.C. Hutchison & D.E. Bennett 4663* (AMES, UC); same location, 19 km above Leimebamba on the road to Balsas, 3100 m, 8 June 1964, *P.C. Hutchison & J.K. Wright 5638* (UC). Cajamarca; Hualgayoc, Hacienda Taulis, 11 km beyond Palmito junction toward La Playa, 2760 m, 3 Sept. 1964, *P.C. Hutchison & K. Von Bismarck 6461* (UC); Hualgayoc, Río Taulis, above La Playa, 2900 m, 3 Sept. 1964, *P.C. Hutchison & K. Von Bismarck 6477* (AMES,

UC). Peru, exact locality unknown, cultivated, 8 Mar. 1966, *L.M. Mason 1586* (K).

Solenidiopsis peruviana is an epiphyte in wet montane forest in northern Peru at elevations from 2000 (Senghas 1989) to 3100 m. The flowering season is March to September in nature but probably throughout the year in cultivation.

Solenidiopsis tigroides (C. Schweinf.) Senghas, Orchidee (Hamburg) 37(6): 274. 1986.—*Odontoglossum tigroides* C. Schweinf., Amer. Orchid Soc. Bull. 14: 22, Fig. 167. 1945. TYPE: Peru. Huánuco: Yanano, about 2000 m, May 1923, *Macbride 3840* (Holotype: AMES; Isotype: AMES!).

Solenidiopsis rhombicalla D.E. Benn. & Christenson, Brittonia, 46(1): 44. 1994. TYPE: Peru. Amazonas: Bongara, km 358 along road from Olmos to Jumbilla, 1450 m, July 1965, *D.E. Bennett et al. 2066* (Holotype: AMES; Isotype: AMES!).

Plant an epiphytic herb. ***Pseudobulbs*** caespitose, ovate, ancipitous, 2–3.5 × 1.2–2.5 cm, bifoliate or trifoliate, subtended by 4–6 distichous sheaths, the uppermost foliaceous. ***Leaves*** conduplicate, shortly petiolate, oblong-elliptic, rounded oblique-apiculate, 6–13 × 1–1.7 cm. ***Inflorescences*** 1 or 2, axillary, from the uppermost sheaths on mature growth, erect to arching, weakly fractiflex racemes, 16–32 cm long, 8–15-flowered, sometimes carrying sterile bracts between flowers; peduncular and floral bracts conspicuous, amplexicaul, equaling or slightly surpassing the ovary, 5–15 mm long. ***Pedicel*** with ovary 7–10 mm long. ***Flowers*** stellate, generally nonresupinate; dorsal sepal yellowish with broad brown bars, obovate, minutely apiculate, slightly revolute and undulate, entire, 7.5–11 × 4–6 mm; lateral sepals similar, sometimes slightly oblique, 7–14 × 3–7 mm; petals similar, acute to broadly apiculate, slightly oblique, 7–11 × 3–4 mm; lip white with a dark brown bar across the front lobe and yellow spots on the callus, pubescent basally and rigidly fused at the base of the column and through a short, fleshy, longitudinal, central keel; sides erect at the base, clasping the column, lamina almost orbicular to distinctly trilobate, side lobes weakly revolute, slightly undulate and serrate to entire, front lobe revolute, apiculate, 7–8 × 4–8 mm; callus of 2–4 variable, radiating, fleshy, pubescent, short, sometimes bluntly denticulate keels, emerging from the center of the lamina extending towards the base of the front lobe; column whitish with 2 dark brown or purple spots on the opposite side from the lip, shortly clavate, straight to slightly curved with 2 prominent, projecting falcate, apical wings and 2 projecting lobes below the stigma, which are lesser developed or missing on smaller flowers, even on the same inflorescence; stigma divided into 2 orbicular lobes by the inbent rostellum; anther cap orbicular rostrate; pollinarium of 2 globose pollinia on an oblong, slightly convex, stipe, ca. 1–1.3 mm long.

Additional specimens examined. PERU. Moyobamba, 10 Sept. 1996. *L. Moore 2B,* (SEL [OIC 11885, flower in alcohol]). Locality unknown, *B. Dillard C160-4,* 25 Aug. 1997 (SEL [OIC 12121, flower in alcohol and photograph]).

Solenidiopsis tigroides is an epiphyte of mossy montane forests of northern Peru at 1450–2000 m. Flowering season is May–July in nature but probably throughout the year in cultivation. The specific epithet *tigroides* refers to the tiger-like coloration of the flowers.

ACKNOWLEDGMENTS

I thank the staff at the Marie Selby Botanical Gardens as well as at other herbaria mentioned in this paper for their support. Thanks also to David Benzing, Calaway Dodson, and Robert Dressler for suggestions on the manuscript and to the volunteers at the Selby Gardens Museum Shop who support my research by offering my artwork for sale.

LITERATURE CITED

Bennett, D.E. Jr. and E.A. Christenson. 1993. Icones Orchidacearum Peruviarum: pl. 137, 187.

———. 1994. New species and new combinations in Peruvian Orchidaceae. Brittonia 46(1): 24–53.

———. 1995. Icones Orchidacearum Peruviarum: pl. 383, 384.

Christenson, E.A. 1995. The Genus *Solenidiopsis.* Amer. Orchid. Soc. Bull. 64(7): 768.

Dalström, S. 1993. A new species of *Odontoglossum* (Orchidaceae: Oncidiinae) from Bolivia. Lindleyana 8(1): 15–19.

———. 1995. Enigmatic Odontoglossums. Part 1: The Epidendroides Complex. Amer. Orchid. Soc. Bull. 64(11): 1218–1223.

———. 1996. A new small flowered species of *Odontoglossum* (Orchidaceae: Oncidiinae) of the *O. astranthum* complex from Bolivia. Lindleyana 11(2): 114–117.

———. (in press). A new Bolivian species of *Odontoglossum* (Orchidaceae: Oncidiinae) in the *Odontoglossum astranthum* complex. Lindleyana.

Schlechter, R. 1921. Repert. Spec. Nov. Regni Veg. Beih. 9: 113.

———. 1929. Ex Mansf. Repert. Spec. Nov. Regni Veg. Beih. 57: t. 129, no. 507.

Schweinfurth, C. 1945. Amer. Orchid Soc. Bull. 14: 22, Fig. 167.

———. 1961. Orchids of Peru. Fieldiana, Bot. 30(4): 829–831, 850, 851.
———. 1970. First Supplement to the Orchids of Peru. Fieldiana, Bot. 33: 75.
Senghas, K. 1986. *Solenidiopsis,* eine neue Gattung aus der Subtribus Oncidiinae. Orchidee (Hamburg) 37(6): 271–275.
———. 1989. Eine zweite Art der Gattung *Solenidiopsis*: *Solenidiopsis flavobrunnea* aus Peru. Orchidee (Hamburg) 40(6): 205–207.