

## NOTES ON ZEUXINE LINDL. (ORCHIDACEAE: GOODYERINAE)

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**Abstract.** Notes are supplied on various species of the Jewel Orchid genus *Zeuxine*, particularly those taxa found in western Malesia, nearby Thailand, and Cambodia. Narrower circumscriptions are proposed for *Z. gracilis* and *Z. parvifolia*, whereas *Z. flava* is expanded into a broader concept. *Zeuxine leucochila* is reinstated, and the identities of *Z. exilis* and *Z. rupestris* are clarified. *Zeuxine leucochila* var. *cambodiana* is raised to species status as *Z. cambodiana*, and three new species are proposed, namely, *Z. eryliae*, *Z. pseudogracilis*, and *Z. subquadrata*.

**Keywords:** *Zeuxine*, new species, synonymy, Malesia

*Zeuxine* Lindl. is a genus of 90–100 tender, delicate terrestrial herbs, growing among leaf litter on the floors of various types of forest. Only a few species (*Z. strateumatica* [L.] Schltr. and its allies) grow in open places like fields and lawns. The plants have rather small (sepals 3–8 mm long) flowers, usually with greenish sepals, white petals and lip. Because of the superficial similarity (stems with wilted leaves at anthesis, small pubescent flowers, and bilobed lip with rectangular lobules) of some of the taxa discussed here, there has been much confusion in the literature, with several misidentifications evident, thus leading to overly broad synonymies.

In the taxonomic treatment provided below, it is intimated that more attention needs to be paid to certain floral parts of *Zeuxine*, especially the glands in the labellum, the profile of the column, placement of the stigma lobes, and shape of the rostellum lobes. Unfortunately, these parts can be difficult to study in old or poor herbarium material and may shrink or deteriorate.

***Zeuxine cambodiana*** (Gagnep.) Ormerod, *comb. et stat. nov.*  
Basionym: *Zeuxine leucochila* Schltr. var. *cambodiana* Gagnep., in Lecomte, Fl. Gen. Indo-Chin. 6: 555. 1934. TYPE: CAMBODIA. Kep, 18 November 1904, C. Geoffray 453 (Holotype: P; Isotype: P). Fig. 1.

Terrestrial herb. Rhizome terete, slender, short, to 16 mm long. Roots terete, pubescent, emerging from nodes. Stems erect, terete, 5–10 leaved, 47–75 × 2 mm; internodes to 24 mm long. Leaves obliquely oblong-lanceolate to ovate-elliptic, acute, 21–49 × 10–16 mm; petiole and sheath 9–16 mm long. Inflorescence pubescent, 87–173 mm long; peduncle 52–107 mm long; sheathing bracts two to three, lax to scattered, 12–18 mm long; rachis subdensely to densely many-flowered, 35–81 mm long; floral bracts ovate-lanceolate, acute, to 9 mm long. Flowers white rose, slightly fragrant. Pedicel with ovary fusiform, laxly pubescent, ca. 7.5 mm long. Dorsal sepal ovate-lanceolate, acute, concave, forming a galea with the petals, ca. 5.0 × 2.5 mm. Lateral sepals obliquely ovate-lanceolate, acute, ca. 4.8 × 2.0 mm. Petals oblong-obovate, subacute, 2 veined, ca. 4.80 × 1.75 mm. Labellum ca. 4 mm long; hypochile saccate, ca. 2 mm long and wide, inside each side with a single, obliquely

triangular gland with a short, decurved free tip; mesochile semitubular, ca. 1 mm long; epichile bilobed, ca. 1.0 × 4.5–5.0 mm, lobules cuneate, obtuse to truncate, ca. 2.25 × 1.50 mm. Column 2.0–2.1 mm long.

**Distribution:** Cambodia.

Gagnepain (1934) distinguished this taxon from the Thai *Zeuxine leucochila* by its broader leaves and inflorescence with more flowers. However, the isotype of *Z. leucochila* in Paris is a small specimen, thus these differences are somewhat artificial. *Zeuxine cambodiana* may be distinguished from *Z. leucochila* by the glands in the lip that are obliquely triangular with only a short, free apex (vs. subulate-lanceolate and mostly free), and the ligulate (vs. spatulate) arms of the rostellum.

***Zeuxine clandestina*** Blume, Coll. Orch. Arch. Ind.: 70. 1858; Fl. Javae Ins. Adj. n.s. 1: 57. 1858. TYPE: INDONESIA. Java, Eastern part, F.A.C. Waitz s.n. (Holotype: L, not seen). Fig. 2.

Homotypic synonym: *Monochilus clandestinum* (Blume) Miquel, Fl. Ned. Ind. 3: 724. 1859.

**Distribution:** Indonesia (Java); Singapore; Malaysia (Peninsula).

**Additional specimens examined:** INDONESIA. Java: Batavia, Tjiletoeh, NE of Leuwiliang, W of Buitenzorg, 300 m, 14 August 1927, R.C. Bakhuizen van den Brink Sr. 6852 (L). SINGAPORE. Bukit Timah Nature Reserve, Taban Valley, 4 March 2003, R. Kiew, P. Leong, A. Samsuri & A.T. Gwee GW2 (SING); Holland Woods, 5 January 2011, I. Hassan SING 2011-001 (SING); Holland Woods, 16 August 2011, P. Leong & I. Hassan SING 2011-522 (SING); Holland Woods, 16 August 2011, I. Hassan & P. Leong SING 2011-523 (SING).

Seidenfaden (1978) reported *Zeuxine clandestina* from Thailand, Peninsular Malaysia, and Singapore. However, the specimen from Peninsular Malaysia (Haniff 2405) is referable to *Z. pseudogracilis*, and the one from Singapore to *Z. parvifolia*. The collection from Thailand I haven't seen, but it needs to be critically restudied. Nevertheless *Z. clandestina* likely occurs in Peninsular Malaysia since Holtum's 1957 drawing agrees well the characters of the

I wish to thank herbarium and library staff at AMES, BM, and K for their help and hospitality during my visits. K, L, P, and SING also loaned material for this study. Paul Leong (SING) kindly sent images and drawings of Singaporean material of *Z. clandestina*.

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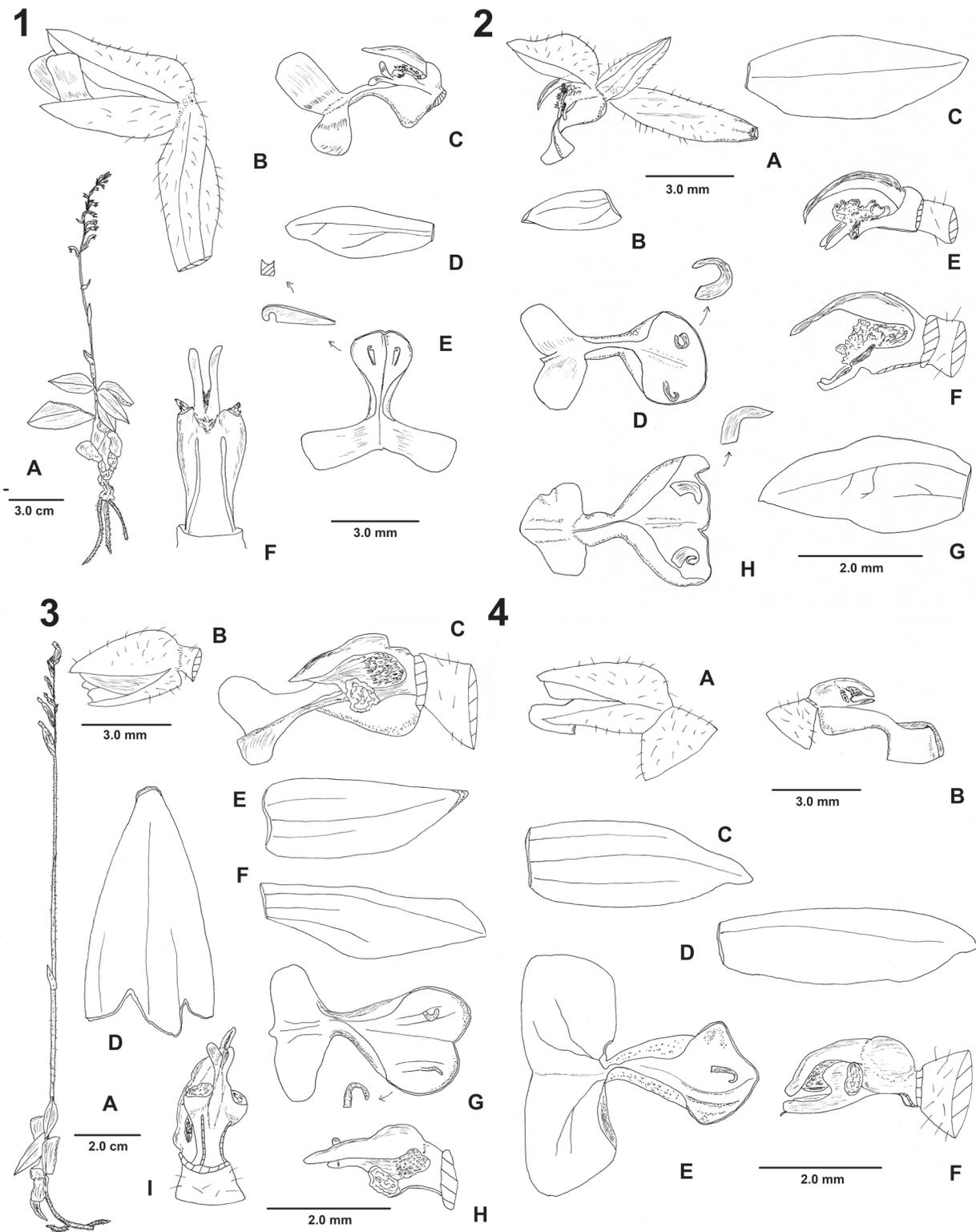


FIGURE 1–4. 1, *Zeuxine cambodiana* (Gagn.) Ormerod. A, plant; B, flower; C, flower minus tepals; D, petal; E, labellum; F, column, ventral. Drawn from holotype. 2, *Zeuxine clandestina* Blume. A, flower; B, lateral sepal; C, G, petals; D, H, labella; E, F, columns. A–E from *Bakhuizen van der Brink 6852* (L); F–H from *Hassan & Leong SING 2011-523* (SING). 3, *Zeuxine eryliae* Ormerod. A, plant; B, flower; C, flower minus tepals; D, dorsal sepal; E, lateral sepal; F, petal; G, labellum; I, H, column, lateral and ventral. Drawn from holotype. 4, *Zeuxine exilis* Ridl. A, flower; B, flower minus tepals; C, lateral sepal; D, petal; E, labellum; F, column. Drawn from lectotype.

species. Unfortunately, I have not seen any collections from Malaysia, though it is apparently common in the lowlands.

The specimens collected after the year 2000 from Singapore represent a new record for that country. Yet specimens collected from 1898 to 1917 by Ridley all represent *Zeuxine parvifolia*. I am not sure if the latter has become extinct in Singapore, but it does seem that the recent collections of *Z. clandestina* in Singapore represent a relatively new colonization event.

*Zeuxine clandestina* may be characterized by the leaves being green (not wilted) at anthesis, the relatively small, bilobed labellum epichile (1.75 mm wide, lobules 0.8 mm long), the short column (1.6 mm long) with a very short basal part, an elongate anther, and seemingly elongate rostellum brachia (this is due to the much reduced clinandrium, which exposes the pollinia and therefore ensures self-pollination).

The Singapore specimen illustrated had an aberrantly shaped labellum epichile, but other flowers agree in lip shape with the Javanese specimens.

***Zeuxine eryliae*** Ormerod, *sp. nov.* TYPE: THAILAND. Khao Rum, 455 m, February 1922, *E.G. Smith 578* (Holotype: K). Fig. 3.

Similar to *Zeuxine clandestina* Blume but differing in the labellum, which has a lateral flange on the mesochile, and subterete (vs. lanceolate) glands in the hypochile.

Terrestrial herb. *Rhizome* terete, creeping, fragment 16 mm long. *Roots* terete, pubescent, emerging from nodes. *Stem* erect, terete, 4–5 leaved, 35–40 × 1 mm. *Leaves* obliquely lanceolate, acute, wilted at anthesis, 25–30 × 8 mm; petiole and sheath 4–5 mm long. *Inflorescence* pubescent, 140 mm long; peduncle 110 mm long; sheathing bracts 1, ca. 8.5 mm long; rachis few (ca. 6), flowered, 30 mm long; floral bracts ovate-lanceolate, subacuminate, ca. 6 mm long. *Flowers* purplish, externally laxly pubescent. *Pedicel plus ovary* fusiform, laxly pubescent, 4–5 mm long. *Dorsal sepal* ovate-lanceolate, obtuse, concave, 3 veined, forming with the petals a galea, 3.4 × 1.9 mm. *Lateral sepals* obliquely ovate-elliptic, subacute, 3 veined, 3.0 × 1.2–1.3 mm. *Petals* obliquely oblong-rhombic, acute, 3 veined, 3.2 × 1.1 mm. *Labellum* 2.7 mm long; hypochile ovate, saccate, ca. 1.7 × 1.9 mm, on outside with a laminate flange, inside each side with a terete, falcate, obtuse gland; epichile obtriangular, ca. 1 × 2 mm, lobules obliquely oblong-elliptic, obtuse, 0.9 mm long, base 0.8 mm wide, 0.6 mm wide near apex. *Column* 1.95 mm long; rostellum brachia oblong-ligulate, obtuse, thin.

**Distribution:** Thailand.

**Habitat:** jungle, 455 m.

**Eponymy:** named after Eryl Glynn Smith (ca. 1890–1930), collector of the type.

This taxon superficially resembles other species that have the leaves wilted at anthesis. It may however be recognized by its small labellum that has an external flange on the hypochile, obtriangular epichile that is only 2 mm wide, and its column bearing narrow, obtuse, thin rostellum brachia. The column of *Zeuxine eryliae* appears to have a very short basal part due to the disintegration of the clinandrium, which thus exposes the pollinia, and probably leads to self-

fertilization. A similar situation occurs in *Z. clandestina* as noted above. The latter species differs in having green leaves at anthesis, no flange on the labellum hypochile, and lanceolate (vs. subterete) glands in the lip.

Two different collections have been assigned the number *E. Smith 578*. The one described here is the small plant with wilted leaves. The other sheet represents an undescribed taxon; it is a taller, laxly leaved plant with unwilted leaves, and though florally similar, the column differs in having two oblong, ventral wings. A very similar plant to the second taxon was illustrated as *Hetaeria* sp. (*Kerr 899*) by Seidenfaden and Smitinand (1959).

***Zeuxine exilis*** Ridl., *J. Str.Br. Roy. As. Soc.* 45: 236. 1906. TYPE: AUSTRALIA. Christmas Island, Murray Hill track, 18 October 1904, *H.N. Ridley s.n.* (Lectotype [designated by Wood, 1982: 143]: K; Isolectotypes: BM, SING, images seen). Fig. 4.

*Flowers* externally pubescent. *Dorsal sepal* ovate-lanceolate, obtuse, 3 veined, forming a galea with the petals, ca. 4.0 × 2.2 mm. *Lateral sepals* broadly oblong-lanceolate, obtuse, 3 veined, 3.40 × 1.25 mm. *Petals* oblong, obtuse, 1 veined, 3.7 × 1.0 mm. *Labellum* ca. 3.2 mm long; hypochile ca. 1.0 × 1.9 mm, inside each side with a retrorse, subulate gland; mesochile semitubular, externally papillose, ca. 1.2 mm long; epichile bilobed, transversely rectangular, ca. 1.2 × 3.1 mm, lobules subquadrate, 1.5–1.6 × 1.6 mm. *Column* 1.8 mm long, ca. 0.9 mm wide laterally.

**Distribution:** Australia (Christmas Island).

This species is closely related to *Zeuxine gracilis*, which occurs nearby on Java. It has been included in the synonymy of the latter (Barretto et al., 2011) but differs in having a fleshier labellum mesochile, and narrower profile of the column with the stigma lobes set slightly further back. *Zeuxine exilis* was for 105 years known only from the type, despite several attempts to relocate it. It was apparently rediscovered in 2009 (Green et al., 2010). I have not seen the modern collections but would like to point out the case in Singapore where *Z. clandestina* taxon has apparently superseded *Z. parvifolia*, and the colonization of Verlaten Island by *Z. pseudogracilis*. A short description of the floral parts with a figure is provided to augment further studies of this enigmatic species.

***Zeuxine flava*** (Wall. ex Lindl.) Trimen, *J. Ceyl. Br. Roy. As. Soc.* 9: 90. 1885.

Basionym: *Monochilus flavum* Wall. ex Lindl., *Gen. Sp. Orch. Pl.*: 487. 1840. TYPE: NEPAL. Without locality, 1821, *N. Wallich Catal. No. 7380A* (Holotype: K-L; Isotypes: K, K-W). Fig. 5.

Homotypic synonym: *Haplochilus flavum* (Wall. ex Lindl.) D. Dietr., *Syn. Pl.* 5: 172. 1852.

Heterotypic synonyms: *Adenostylis benguetensis* Ames, *Leaf. Philipp. Bot.* 5: 1551. 1912 *syn. nov.* TYPE: PHILIPPINES. Luzon, Benguet Prov., Baguio, March 1907, *A.D.E. Elmer 8856* (Holotype: AMES).

*Zeuxine benguetensis* (Ames) Ames, *Bot. Mus. Leaf. Harv. Univ.* 5: 100. 1938.

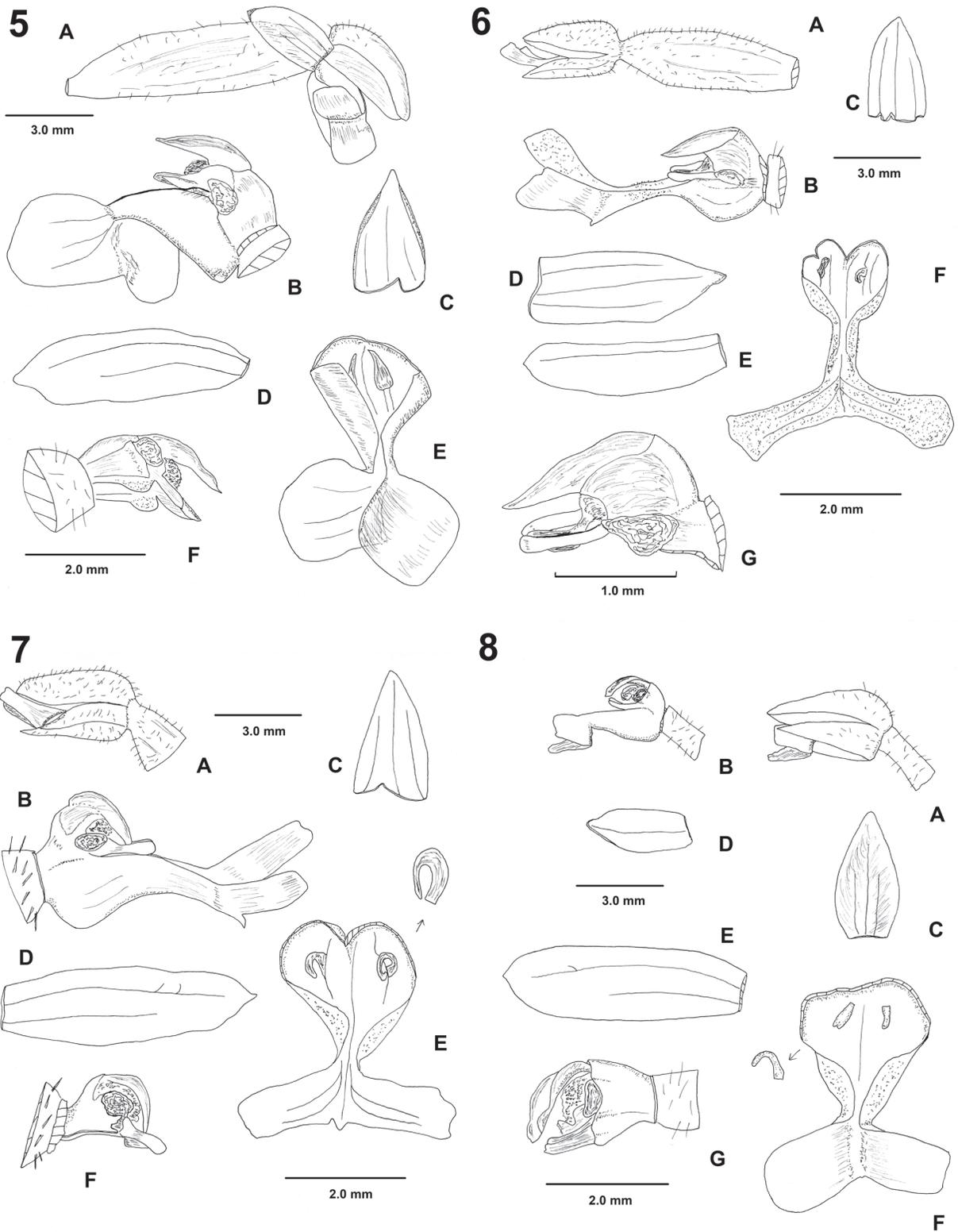


FIGURE 5–8. 5, *Zeuxine flava* (Wall. ex Lindl.) Benth. ex J.D. Hook. A, flower; B, flower minus tepals; C, dorsal sepal; D, petal; E, labellum; F, column. Drawn from Carr 3177 (AMES). 6, *Zeuxine parvifolia* (Ridl.) K. Schum. & Fedde. A, flower; B, flower minus tepals; C, dorsal sepal; D, lateral sepal; E, petal; F, labellum; G, column. Drawn from Ridley s.n. (K). 7, *Zeuxine parvifolia* (Ridl.) K. Schum. & Fedde. A, flower; B, flower minus tepals; C, dorsal sepal; D, petal; E, labellum; F, column. Drawn from Lamb AL 1208A/90 (K). 8, *Zeuxine gracilis* (Breda) Blume. A, flower; B, flower minus tepals; C, dorsal sepal; D, lateral sepal; E, petal; F, labellum; G, column. Drawn from Docters van Leeuwen 2328 (L).

*Zeuxine aurantiaca* Schltr., Rep. Sp. Nov. Regni Veg. 19: 377. 1924. TYPE: CHINA. Yunnan, Shweli-Salween Divide, 2440 m, August 1913, *G. Forrest 11914* (Holotype: E).

*Zeuxine tonkinensis* Gagnep., Bull. Nat. Hist. Mus. Paris 2, s. 3, 7: 325. 1931 *syn. nov.* TYPE: VIETNAM. Tonkin, Mt. Bavi, 400 m, 27 March 1887, *B. Balansa 2002* (Holotype: P).

*Zeuxine kantokeiensis* Tatewaki & Masamune, Bot. Mag. (Tokyo) 46: 772. 1932 *syn. nov.* TYPE: TAIWAN. Taityusyu, 9 April 1932, *M. Tatewaki 18663* (Syntype: lost); Taityusyu, Baibara, 9 April 1932, *M. Tatewaki s.n.* (Syntype: lost).

*Zeuxine sakagutii* Tuyama, Bot. Mag. (Tokyo) 50: 26. 1936. TYPE: JAPAN. Ryukyu Islands, Ishigaki Island, 4 August 1922, *S. Sakaguti s.n.* (Holotype: TNS, not seen).

*Zeuxine gracilis* (Breda) Blume var. *sakagutii* (Tuyama) Hashimoto, Ann. Tsukuba Bot. Gard. 5: 28. 1986.

*Zeuxine taiwaniana* S.S. Ying, Quart. J. Chin. For. 20, 2: 57. 1987. TYPE: TAIWAN. Taitung, Chi-pen, 1 April 1987, *S.S. Ying s.n.* (Holotype: NTUF, not seen).

*Zeuxine uraiensis* S.S. Ying, Col. Illustr. Fl. Taiwan 3: 620. 1988. TYPE: TAIWAN. Taipei, Urai, 10 April 1988, *S.S. Ying s.n.* (Holotype: NTUF, not seen).

*Zeuxine chenkgangensis* Ormerod, Taiwania 55, 1: 26. 2010. TYPE: CHINA. Yunnan, Chen-Kang Hsien, 1640 m, March 1936, *C.W. Wang 72192* (Holotype: AMES).

Usage synonyms: *Zeuxine affinis auct. non* (Lindl.) Benth. ex J.D. Hook., W.W. Smith, Not. Roy. Bot. Gard. Edinb. 13–14: 221. 1921; T.P. Lin, Nat. Orch. Taiwan 3: 280, fig., Pl. 158–159. 1988.

*Zeuxine gracilis auct. non* (Breda) Blume, Carr, Gard. Bull. Singap. 8, 2: 189. 1935; Barretto, Cribb & Gale, Wild Orch. Hong Kong: 158. 2011 p.p.

*Zeuxine leucochila auct. non* Schltr., Garay & Sweet, Orch. S. Ryukyu Isl.: 83. 1974 p.p.

*Zeuxine parvifolia auct. non* (Ridl.) K. Schum. & Fedde, Seidenf., Dan. Bot. Ark. 32, 2: 82–84. 1978 p.p.

*Zeuxine tenuifolia auct. non* Tuyama, F. Maekawa, Wild. Orch. Japan Col.: 251, Pl. 88. 1974.

**Distribution:** Nepal; India; Bhutan; China (Yunnan, Hong Kong); Myanmar; Thailand; Vietnam; Taiwan; Japan (Ryukyus); Philippines; Malaysia (Sabah).

**Select specimens examined:** THAILAND. Nan District, Hue Sala, 400 m, 10 March 1921, *A.F.G. Kerr 396* (AMES). CHINA. Hong Kong, *leg. S.C. Tse*, April 1976, cult. *G. Barretto 173* (K). MALAYSIA. Sabah: Mt. Kinabalu, Kadamaian River, Menetendok Gorge, 255 m, March 1933, *C.E. Carr 3177* (AMES, K, SING); Menetendok River, 305 m, 25 March 1933, *C.E. Carr SFN 26756* (SING).

I have for some time maintained the belief that *Zeuxine benguetensis* could be treated as a western sister species of

*Z. flava*, being distinguished by its leaves that are green (vs. wilted) at anthesis, longer inflorescence peduncle, slightly smaller flowers, and T-shaped labellum (epichile lobules at right angles). However, none of these characters really stand up upon an examination of the broader material, and as such I agree with the widened species concept proposed by Lin et al. (2016).

The type material of *Adenostylis benguetensis* is rather poor, but it was possible to assess its characters from a flower preserved in glycerine at AMES. This showed it to have a number of floral features in common with *Zeuxine flava*, such as the retrorse glands in the lip, and two minutely papillose, small wings under the column. The same features are present in the Vietnamese *Z. tonkinensis*. The latter has narrower epichile lobules (1 mm wide), but even on the same plant (e.g., *Carr 3177*) the lobules can vary from 1.0 to 1.5 mm wide. Analysis of the description of *Z. kantokeiensis* leads me to place it in synonymy here too.

The main reason that influenced Garay and Sweet (1974) to place *Zeuxine benguetensis* and *Z. sakagutii* in the synonymy of *Z. leucochila* seems to have been the width of the labellum epichile (3 mm wide). This was further compounded when Seidenfaden (1978) found the earlier name *Hetaeria parvifolia* Ridl., to which he also added *Z. tonkinensis* in synonymy, both taxa with a 3-mm-wide epichile. Both *Z. leucochila* and *Z. parvifolia* differ from *Z. flava* in having white (not yellow) labellum lobules, erect (not retrorse) glands in the labellum hypochile, and glabrous (not papillose) column wings, or even lacking wings under the column.

Thus *Zeuxine flava* may be recognized by its leaves being either wilted or green at anthesis, the peduncles variable in length, the flowers with a bright yellow labellum epichile, that is Y- to T-shaped, 3–5 mm wide, the lobules 0.95–1.50 mm wide, retrorse glands in the hypochile, and two small papillose wings under the column.

The two specimens cited from Sabah represent a new record for Borneo (and Malaysia).

***Zeuxine gracilis*** (Breda) Blume, Coll. Orch. Arch. Ind.: 69. 1858; Fl. Javae Ins. Adj. n.s. 1: 56. 1858.

Basionym: *Psychechilos gracile* Breda, Gen. Sp. Orch. Asclep.: t.9. 1829. TYPE: INDONESIA. Java, Bantam Prov., *J.C. van Hasselt s.n.* (Holotype: lost). Lectotype (Bhattacharjee et al., 2011: 153): t.9, in Breda, Gen. Sp. Orch. Asclep. 1829. Fig. 6.

Homotypic synonyms: *Monochilus gracilis* (Breda) Miquel, Fl. Ned. Ind. 3: 723. 1859.

*Adenostylis gracilis* (Breda) Ames, J. Str. Br. Roy. As. Soc. (Spec. No.): 141. 1921.

Heterotypic synonym: *Monochilus zollingeri* Rchb.f., Xenia Orch. 1: 215. 1856. TYPE: INDONESIA. Java, near Tjudruk to Tjigalin waterfall, 2 September 1842, *H. Zollinger 592* (Holotype: W-R 1199, image seen).

**Distribution:** Indonesia (Java).

**Specimen examined:** INDONESIA. Java, Preanger Pandang, October 1916, *W.M. Docters van Leeuwen 2328* (L).

*Zeuxine gracilis* has been recorded over a broad area from western India (Santapau and Kapadia, 1962) to Hong Kong, China (Barretto et al., 2011). However, it seems that none of the records outside Java can be substantiated and these are referable to a number of different species.

Thus, some of the Indian records of *Zeuxine gracilis* were found to belong to *Z. blatteri* C.E.C. Fischer, an entity occurring in India and Sri Lanka (Ormerod, 2002). Plants recorded from Odisha State, India (e.g., Misra, 2004) seem to be another entity again, perhaps closer to *Z. pseudogracilis* judging from the single collection (*S. Misra SM 734B* [K]) that I have been able to examine.

A record of *Zeuxine gracilis* from Borneo by Carr (1935) I have found above to represent *Z. flava*. However the record of *Z. gracilis* from Hong Kong (Barretto et al., 2011) appears to represent what is called *Z. affinis* (Lindl.) Benth. ex J.D. Hook. by Taiwanese authors (e.g., Lin et al., 2016), judging from the illustration provided by the former authors.

Seidenfaden (1978) attempted to define the true *Zeuxine gracilis* on the basis of Indonesian material, but unfortunately the plant he illustrated from Verlaten Island (= Pulau Sertung) is referable to *Z. pseudogracilis*.

*Zeuxine gracilis* can be recognized by its leaves being wilted at anthesis, the labellum epichile bent at right angles to the mesochile, the rectangular lobules  $1.4 \times 1.0$  mm, inside each side of the hypochile a lanceolate-subulate forward-pointing gland, and the column (minus the rostellum brachia) distinctly obconical in shape (like the headlights of some 1930s cars), with each stigma lobe placed midway laterally.

***Zeuxine leucochila*** Schltr., Rep. Sp. Nov. Regni Veg. 3: 46. 1907. TYPE: THAILAND. Petchabun, Menam, Phra-Tak-Thal (Phra Sak Valley), 11 December 1905, *C.C. Hosseus 715A* (Holotype: B, destroyed; Isotypes: K; BM, M, P, images seen). Fig. 7.

Homotypic synonym: *Zeuxine siamensis* Schltr. ex Hosseus, Beih. Bot. Centralbl. 28, Abt. 2: 380. 1911 *nom. nud.*

*Flowers* with greenish sepals, white petals, and white labellum, externally pubescent. *Pedicel with ovary* fusiform, pubescent, 4–6 mm long. Dorsal sepal ovate-elliptic, obtuse, concave, 3 veined, forming a galea with the petals,  $4.2 \times 2.7$  mm. *Lateral sepals* obliquely oblong-lanceolate, subacute, 3 veined,  $3.80 \times 1.85$  mm. *Petals* obliquely oblong-oblancheolate, acute to subacute, 2 veined,  $4.0 \times 1.3$  mm. *Labellum* 3.5–3.8 mm long; hypochile ca.  $1.5 \times 2.6$ – $2.7$  mm, inside each side with a lanceolate to lanceolate-subulate gland; mesochile semitubular, ca. 1.2 mm long; epichile ca.  $1.0 \times 3.6$ – $4.2$  mm, lobules oblique to patent, oblong to elliptic-obovate, obtuse,  $1.9$ – $2.1 \times 1.2$ – $1.3$  mm. *Column* 2.4–2.5 mm long; rostellum brachia spatulate; wings 2, ventral, very low, thin.

**Distribution:** Thailand.

**Specimens examined:** THAILAND. Ban Den, near Palunampo, 40 m, 9 December 1913, *A.F.G. Kerr 334* (K); Meh Ping Rapids, 900 m, 15 December 1908, *A.F.G. Kerr 212A* (K).

Garay and Sweet (1974) recorded this taxon from the Ryukyu Islands and included four other heterotypic names in synonymy. Seidenfaden (1978) then reduced *Zeuxine leucochila* to *Z. parvifolia*, and also added *Z. tonkinensis* to the synonymy. Later authors (e.g., Hashimoto, 1986; Lin et al., 2016) have disputed the extensive list of entities referred to *Z. parvifolia*, a view with which I agree. *Zeuxine leucochila* may be generally distinguished from *Z. parvifolia* by its larger flowers (sepals 3.8–4.2 vs. 2.8–3.3 mm long), longer column (2.4–2.5 vs. 1.5–1.7 mm long) with longer, more spatulate rostellum brachia.

In my opinion *Zeuxine leucochila* is much more closely related to *Z. affinis* (Lindl.) Benth. ex J.D. Hook., resembling a small form of the latter. *Zeuxine leucochila* differs from *Z. affinis* in having a smaller labellum epichile (3.6–4.5 vs. 7.0–8.0 mm wide), entire (not bifid) glands in the hypochile, and a shorter column (2.4–2.5 vs. 3.0–3.5 mm long) with more distinctly spatulate rostellum brachia.

Thus, *Zeuxine leucochila* may be characterized by its flowers with a white labellum, small flowers (sepals 3.8–4.2 mm long), the labellum Y- to T-shaped, the epichile lobules oblong to obliquely obovate-elliptic, each  $1.9$ – $2.1 \times 1.2$ – $1.3$  mm, entire, lanceolate to subulate glands in the hypochile, and a 2.4–2.5 mm long column with distinctly spatulate rostellum brachia.

***Zeuxine parvifolia*** (Ridl.) K. Schum. & Fedde, Just's Bot. Jahresb. 31, 1: 786. 1903.

Basionym: *Hetaeria parvifolia* Ridl., J. Roy. As. Soc. Str. Br. 39: 87. 1903. TYPE: MALAYSIA. Penang: Penang Island, Penang Hill, December 1895, *H.N. Ridley s.n.* (Lectotype [designated by Seidenf. 1978: 82–83, as "Type"]; K; Isolectotype: SING, image seen). Fig. 8–9.

Usage synonym: *Zeuxine clandestina* auct. non Blume, Seidenf., Dan. Bot. Ark. 32, 2: 87–88, fig. 54c. 1978 p.p.

Terrestrial herb. *Rhizome* terete, creeping, rooting at nodes. *Roots* terete, pubescent. *Stem* erect, terete, laxly 3–6 leaved,  $49.0$ – $90.0 \times 0.5$ – $2.2$  mm; internodes 7.0–33.5 mm long. *Leaves* obliquely lanceolate, oblong-lanceolate to ovate-lanceolate, acute, green at anthesis,  $8.0$ – $43.0 \times 4.2$ – $11.5$  mm; petiole and sheath 6.5–14.0 mm long. *Inflorescence* pubescent, 97–132 mm long; peduncle 59–100 mm long; sheathing bracts 1–3, 8–20 mm long; rachis subaxly flowered, 32–38 mm long. *Flowers* externally pubescent. *Pedicel plus ovary* fusiform, pubescent, 5–6 mm long. *Dorsal sepal* ovate-elliptic, subacute, 3 veined, forming a galea with the petals,  $3.0 \times 1.6$ – $1.8$  mm. *Lateral sepals* obliquely ovate-lanceolate, acute,  $2.8$ – $3.0 \times 1.0$ – $1.3$  mm. *Petals* oblong, acute, 1 veined,  $2.9 \times 0.9$ – $1.2$  mm. *Labellum* 2.5–2.7 mm long; hypochile saccate,  $1.3$ – $1.4 \times 1.5$ – $1.6$  mm, inside each side with a subulate gland; mesochile semitubular, 0.5–0.8 mm long; epichile bilobed,  $0.6$ – $0.7 \times 2.5$ – $3.1$  mm, lobules rectangular,  $1.0$ – $1.5 \times 0.5$ – $0.8$  mm. *Column* 1.5 mm long; rostellum brachia narrowly clavate.

**Distribution:** Malaysia; Singapore.

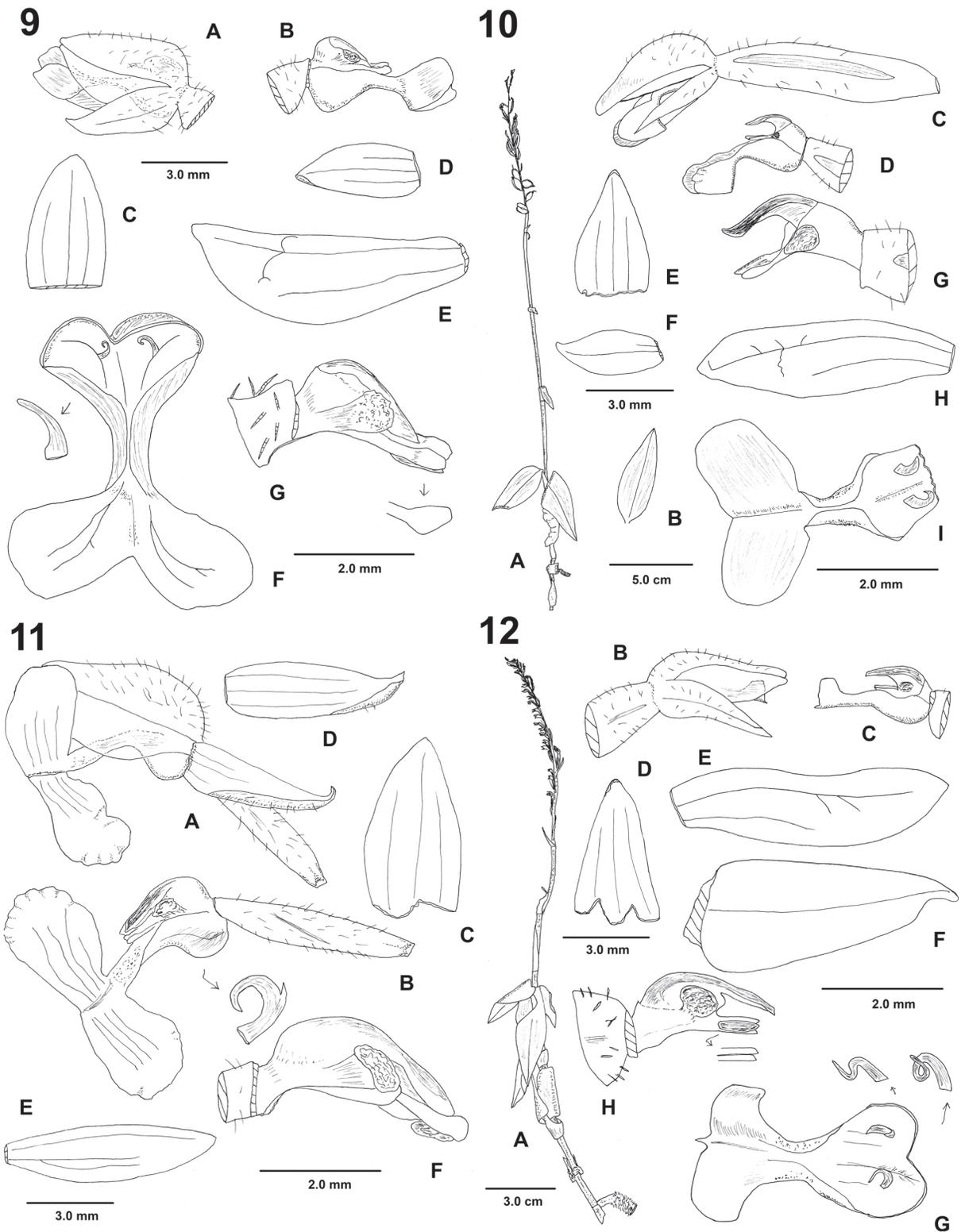


FIGURE 9–12. 9, *Zeuxine leucochila* Schltr. A, flower; B, flower minus tepals; C, dorsal sepal; D, lateral sepal; E, petal; F, labellum; G, column. Drawn from isotype (K). 10, *Zeuxine pseudogracilis* Ormerod. A, plant; B, leaf; C, flower; D, flower minus tepals; E, dorsal sepal; F, lateral sepal; G, column; H, petal; I, labellum. Drawn from holotype. 11, *Zeuxine rupestris* Ridl. A, flower; B, flower minus tepals; C, dorsal sepal; D, lateral sepal; E, petal; F, column. Drawn from *Lobb 434* (AMES). 12, *Zeuxine subquadrata* Ormerod. A, plant; B, flower; C, flower minus tepals; D, dorsal sepal; E, petal; F, lateral sepal; G, labellum; H, column. Drawn from holotype.

**Specimens examined:** MALAYSIA. Penang: Penang Island, dry track from waterfall, 12 March 1915, *H.N. Ridley s.n.* (K); Garden Jungle, Monday 15 th [no year], *sine coll.* (*H.N. Ridley?*) *s.n.* (K); Richmond Road, March 1915, *H.N. Ridley s.n.* (K); Mt. Olivia, 245 m, 22 March 1923, *R.E. Holttum 10284* (K, SING); Highlands Hill, 215 m, 20 January 1918, *M. Nur 3033* (SING). Johore: Sungei Tukong Estate, 11 February 1931, *G.H. Spare 1018* (SING). Sabah: Interior Zone, Tambunan District, near Batu Bajau, 1500 m, 16 January 1990, *A. Lamb AL 1208A/90* (K). SINGAPORE. Garden Jungle, 5 May 1897, *H.N. Ridley 8785* (SING); Garden Jungle, 1898, *H.N. Ridley s.n.* (SING); Garden Jungle, 1904, *H.N. Ridley s.n.* (AMES); Garden Jungle, January 1917, *H.N. Ridley s.n.* (K); Bukit Timah, 1899, *H.N. Ridley s.n.* (SING).

The material available of this species is often in a poor state and difficult to study. I provide two figures, the first is from the type locality (Penang Island), collected by Ridley on the 12 th March 1915. The second is from the Sabah specimen, a new record for Borneo. The identity of the Bornean collection may be questioned when more material is available; it differs from the other specimens in having larger flowers (sepals 3.7–3.9 mm long) and the stigma lobes being located higher up (not in line with the rostellum brachia) on the clinandrium.

The collection *Nur 3033* from Penang Island is also a little different from the other material. The plant is somewhat larger (stems to 14 cm long), peduncle 11.7–15.1 cm long, the flowers slightly larger (sepals 3.2–3.4 mm long), the labellum slightly longer (3.2 mm), and the epichile lobules to 1.7 × 1.0 mm. Thus the above description is based on the non-deviating specimens.

*Zeuxine parvifolia* may be recognized by its leaves often being green at anthesis, small flowers (sepals 2.8–3.0 mm long), oblong petals, short labellum (2.5–2.7 mm long), the epichile (2.0–)2.5–3.1 mm wide with rectangular lobules 1.0–1.5 × 0.5–0.8 mm, a short (1.5 mm long) column with narrowly clavate rostellum brachia, and stigma lobes that are in line with the rostellum brachia.

***Zeuxine pseudogracilis*** Ormerod, *sp. nov.* TYPE: INDONESIA. Sumatra, Dolok Merangir, 245 m, 6 February 1932, *W.N. Bangham & C.M. Bangham 943* (Holotype: AMES). Fig. 10.

Usage synonyms: *Zeuxine gracilis auct. non* (Blume) Breda, Ames & C. Schweinf., *Contr. Arn. Arb.* 8: 22. 1934; Seidenf., *Dan. Bot. Ark.* 32, 2: 86–87, fig. 53. 1978 p.p.; Seidenf. & J.J. Wood, *Orch. Pen. Malays. & Singap.*: 89, fig. 34d–g. 1992 p.p.

*Zeuxine clandestina auct. non* Blume, Seidenf., *Dan. Bot. Ark.* 32, 2: 87–88, fig. 54a–b. 1978 p.p.; Seidenf. & J.J. Wood, *Orch. Pen. Malays. & Singap.*: 87, fig. 33n–o. 1992 p.p.

Related to *Zeuxine gracilis* (Breda) Blume but the column semi-obconical (vs. obconical) in profile, and the stigma lobes placed at base of rostellum brachia (vs. halfway laterally on column).

Terrestrial herb. *Rhizome* terete, creeping, 35.0–38.5 × 1.0–3.0 mm, rooting at nodes; internodes 7.50–21.5 mm long. *Roots* terete, pubescent. *Stems* erect, terete, 3–6 leaved, 95.0–100.0 × 1.5–3.5 mm; internodes 8.5–30.0 mm long. *Leaves* obliquely ovate-lanceolate to lanceolate, acute, 40–45 × 20 mm; petiole and sheath 10–17 mm long. *Inflorescence* pubescent, 185–240 mm long; peduncle 150–160 mm long; sheathing bracts 1–2, 7.5–23.5 mm long; rachis subclaxly to subdensely flowered, 35–80 mm long; floral bracts ovate-lanceolate, acute, to 10 mm long. *Flowers* white (presumably lip and petals are white), externally pubescent. *Pedicel with ovary* fusiform, pubescent, ca. 7.5 mm long. *Dorsal sepal* ovate, obtuse, concave, 3 veined, forming a galea with the petals, 4.4 × 2.4 mm. *Lateral sepals* obliquely oblong-lanceolate, subacute, 3.40 × 1.35–1.50 mm. *Petals* obliquely oblong, obtuse, 2 veined, 3.80 × 1.15 mm. *Labellum* 3.0–3.2 mm long; hypochile saccate, 1.3 × 1.5 mm, inside each side with a ligulate-lanceolate gland; mesochile semitubular, 0.7 mm long; epichile bilobed, 1.2 × 2.8 mm, lobules elliptic, obtuse to truncate, 1.4–1.6 × 1.3–1.4 mm. *Column* 1.7–1.8 mm long; rostellum brachia spatulate.

**Distribution:** Malaysia (Penang); Indonesia (Sumatra).

**Specimen examined:** MALAYSIA. Penang: Penang Island, Government Hill, 760 m, 22 January 1907, *M. Haniff 2405* (AMES, K, SING).

**Etymology:** from the Classical Greek prefix *pseudo-*, false, and the species name *gracilis*, in reference to the similarity with *Z. gracilis*.

This taxon has been mistaken for *Zeuxine gracilis* but may be distinguished from it by the shape of the column and placement of the stigma lobes. It is also closely related to *Z. exilis* but again differs from that in the profile of the column (gently curved dorsally in basal half vs. abruptly raised from the base), and the obliquely angled down (vs. horizontal) rostellum brachia.

Seidenfaden (1978) illustrated a specimen (as *Zeuxine gracilis*) of *Z. pseudogracilis* from Verlaten Island (now Pulau Sertung). This is a very interesting find because Verlaten Island is next to Krakatau (or Krakatoa) Island in the Sunda Strait between Java and Sumatra. The flora of Verlaten Island was obliterated by the famous eruption of Krakatau in 1883. Therefore, the occurrence of *Z. pseudogracilis* on Verlaten Island appears to be from a later colonization event. In my opinion it is highly likely *Z. pseudogracilis* will also be found on Java.

***Zeuxine rupestris*** Ridl., *J. Roy. As. Soc. Str. Br.* 39: 86. 1903. TYPE: MALAYSIA. Penang: Penang Island, Government Hill, 610 m, February 1892, *H.N. Ridley & C. Curtis 2823* (Holotype: K; Isotype: SING). Fig. 11.

Usage synonym: *Zeuxine affinis auct. non* (Lindl.) Benth. ex J.D. Hook., Ridl., *J. Linn. Soc., Bot.* 32: 402. 1896; Seidenf., *Dan. Bot. Ark.* 32, 2: 88. 1978 p.p.

**Distribution:** Malaysia (Penang Island).

**Specimens examined:** MALAYSIA. Penang: Penang Island, Government Hill, 610 m, 1894, *M. Haniff s.n.* (K);

Government Hill, 610 m, November 1910, *M. Haniff s.n.* (SING). ORIGIN DUBIOUS (“Singapore,” “Java”): *T. Lobb 434* (AMES, K-L, SING).

This characteristic species appears to be endemic to Penang Island. Hooker (1890) mentions the occurrence of *Zeuxine flava* on Java, I believe based on the above Lobb collection in Herbarium Lindley. Lobb often gave false localities for his collections, presumably to mislead his horticultural competitors. *Zeuxine rupestris* may be recognized by its few-flowered (up to 6 flowers) inflorescence, labellum with a relatively long (1.8 mm) mesochile, large epichile (6.0–7.9 mm wide) with patent lobules, and large column (3 mm long).

***Zeuxine subquadrata*** Ormerod, *sp. nov.* TYPE: MALAYSIA. Sabah: Ranau District, East Mesilau River, between Mt. Kinabalu golf course site and Mesilau Cave, 1700–1900 m, 26 March 1984, *J.H. Beaman 9147* (Holotype: K). Fig. 12.

Related to *Zeuxine baliensis* J.J. Sm. but with larger (20.0–32.0 × 7.5–13.0 mm vs. 19.5 × 8.5–10.0 mm) leaves, rachis longer (vs. much shorter) than the peduncle, bearing more (ca. 23 vs. 3–4) flowers, with a smaller (2.1 vs. 2.6 mm wide) labellum epichile, and oblong (vs. dimidiately ovate-elliptic) petals.

Terrestrial herb. Rhizome not seen. Roots terete, pubescent, emerging from nodes. Stem erect, terete, subslaxly ca. 8-leaved, 95 mm long, to 2.5 mm thick; internodes

9–21 mm long. Leaves obliquely ovate-lanceolate, acute, wilting during anthesis, 20.0–32.0 × 7.5–13.0 mm; petiole and sheath to ca. 10 mm long. Inflorescence pubescent, 155 mm long; peduncle 65 mm long; sheathing bracts 2, remote, 16 mm long; rachis secundly ca. 23 flowered, 90 mm long; floral bracts lanceolate, acute, to 12 × 3 mm. Flowers externally pubescent, color not known. Pedicel with ovary fusiform, pubescent, to 6 mm long. Dorsal sepal ovate-lanceolate, obtuse, 3 veined, forming with the petals a galea, ca. 3.5 × 2.5 mm. Lateral sepals obliquely ovate-lanceolate, subacute, 3.8–4.0 × 1.5 mm. Petals oblong, acute to subacute, 2 veined, 4.0 × 1.1 mm. Labellum 3.2–3.5 mm long; hypochile saccate, 1.8 × 2.0 mm, inside each side with a linear-lanceolate gland; mesochile semitubular, 0.8 mm long; epichile bilobed, transversely rectangular, 0.9–1.0 × 2.1 mm, lobules subquadrate, ca. 0.9 × 0.7–0.8 mm. Column ca. 1.8 mm long; rostellum brachia ligulate, truncate.

**Distribution:** Malaysia (Sabah).

**Habitat:** oak-laurel forest on Trusmadi Formation and intrusives, 1700–1900 m.

**Etymology:** from the Classical Latin prefix *sub-*, below or almost, and *quadratus*, four-angled, in reference to the shape of the labellum lobules.

This species appears to be related to *Zeuxine baliensis* J.J. Sm. from Bali, Indonesia. It differs in having larger leaves, a more floriferous rachis longer than the peduncle, flowers with narrower petals, and smaller labellum epichile.

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