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The resurrection of *Boesenbergia albosanguinea* (Zingiberaceae) with a new record for Peninsular Thailand

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ABSTRACT. *Boesenbergia albosanguinea* (Ridl.) Loes. (Zingiberaceae) is resurrected from the synonymy of *B. prainiana* (King ex Baker) Schltr. It is redescribed in detail with comparative tables, figures, and illustrations. This species is a new record for Thailand.

Keywords. *Boesenbergia prainiana,* Langkawi Islands, limestone, Malaysia, Penang

Introduction

During fieldwork in Satun Province for the *Flora of Thailand* Project in 2012, a *Boesenbergia* species [*J. Mood & P. Vatcharakorn M3291* (BKF)] was found growing on a limestone outcrop near the sea (Fig. 1). Although it was superficially similar to other large *Boesenbergia* species in the peninsula, such as *B. trangensis* K.Larsen and *B. plicata* (Ridl.) Holttum, its distinct inflorescence and unusual habitat placed it as an unknown species. In a follow-up review of all *Boesenbergia* published from Thailand and Peninsular Malaysia, only one species appeared to be similar, *B. albosanguinea* (Ridl.) Loes. Curiously, that species had been made a synonym of *B. prainiana* (King ex Baker) Schltr. by Holttum (1950). As this latter species had been collected on several occasions by the first author, it was well-known and could be described as a small to medium sized, 1–2 leaf ginger found growing in wet, shady forest areas on sandstone or quartz-derived soils. It is not known to occur near the sea or on limestone. In order to sort this issue of synonymy and try to positively identify the Satun collection, an in-depth investigation of the taxonomic history of these two species was initiated.

Taxonomic History

In September 1894 a ginger plant cultivated at the Botanic Gardens Penang flowered for the first time and was illustrated in excellent detail (Fig. 2). The drawing was

annotated by Charles Curtis (1853–1928) as "12–18 in. high, sepals white, linear, incurved; upper petal white with pink tinge, lower large with dark red margins, stamens/anthers two celled, Perak, 1894, Nat. size." Five years later Ridley (1899) published this ginger as *Gastrochilus albosanguineus* ['*albo-sanguineus*'] with a brief description. No mention was made of the artwork or specimen. During or soon after this publication, Curtis added more annotations to the 1894 drawing, "*Gastrochilus albo-sanguineus* Ridl., collected by F.A. Wooldridge on Maxwell's Hill, Perak, flowered in the botanical garden of Penang, Sept. 1894" and with a separate pencil note "drawing of the type collection". This latter note refers to a specimen at Kew (K) labelled as the holotype. Both the drawing and this specimen are annotated with a stylized "A".

In 1902 several more living plants identified as *Gastrochilus albosanguineus* were brought to the gardens by Curtis from Langkawi, from which specimens were taken (SING0155198, SING0155248, SING0155266) and a watercolour drawn by M. Hussain (Fig. 3). Five years later, Langkawi was added to the distributional record of *G. albosanguineus* based on this material (Ridley, 1907).

Although Kuntze (1891) replaced *Gastrochilus* Wall. with *Boesenbergia* Kuntze, as *Gastrochilus* Wall. is a later homonym of *Gastrochilus* D.Don (Don, 1825), some botanists of the day, including Ridley and Curtis, did not accept this change and continued to use *Gastrochilus.* It was not until Loesener (1930) that *Gastrochilus albosanguineus* was eventually moved to *Boesenbergia albosanguinea* (Ridl.) Loes. Holttum (1950) later reviewed the *Boesenbergia* of Peninsular Malaysia. He decided that *Boesenbergia albosanguinea* was the same as *B. prainiana* and discussed a number of reasons why Ridley's taxon is just "re-describing" *B. prainiana*. Among them were minor inconsistencies in plant/stem height of the type as compared to the drawing, calling the longer stem length (noted in the protologue) as "maybe due to conditions of cultivation." His conclusion was that "There is no other clear distinction from *B. prainiana*." It should be noted that in this discourse, Holttum erroneously uses "*B. albo-marginata*" throughout (rather than *B. albosanguinea*) to include the holotype which he cites as "Maxwell's Hill, per Wooldridge, cult. Penang (type of *G. albo-marginata*)." There is no doubt to which species Holttum is referring (based on the references) and this error is to be regarded as a slip of the pen and not a *nomen novum.*

Boesenbergia prainiana was first described as *Kaempferia prainiana* King ex Baker [*King's collector = Kunstler 726* (CAL, K, SING)] from Goping, Perak, Malaysia (Baker, 1890). Ridley (1899) transferred it to *Gastrochilus* Wall. and later Schlechter (1913) to *Boesenbergia.* Holttum's (1950) description added considerable detail to the earlier protologue, as did the several publications by Ridley (1899, 1907, 1924).

Materials and Methods

Soon after the collection of *J. Mood & P. Vatcharakorn M3291*, an investigation was begun to study the taxonomic history, specimens, illustrations and photographs from Malaysia and Thailand of *Boesenbergia albosanguinea* and *B. prainiana*. In August

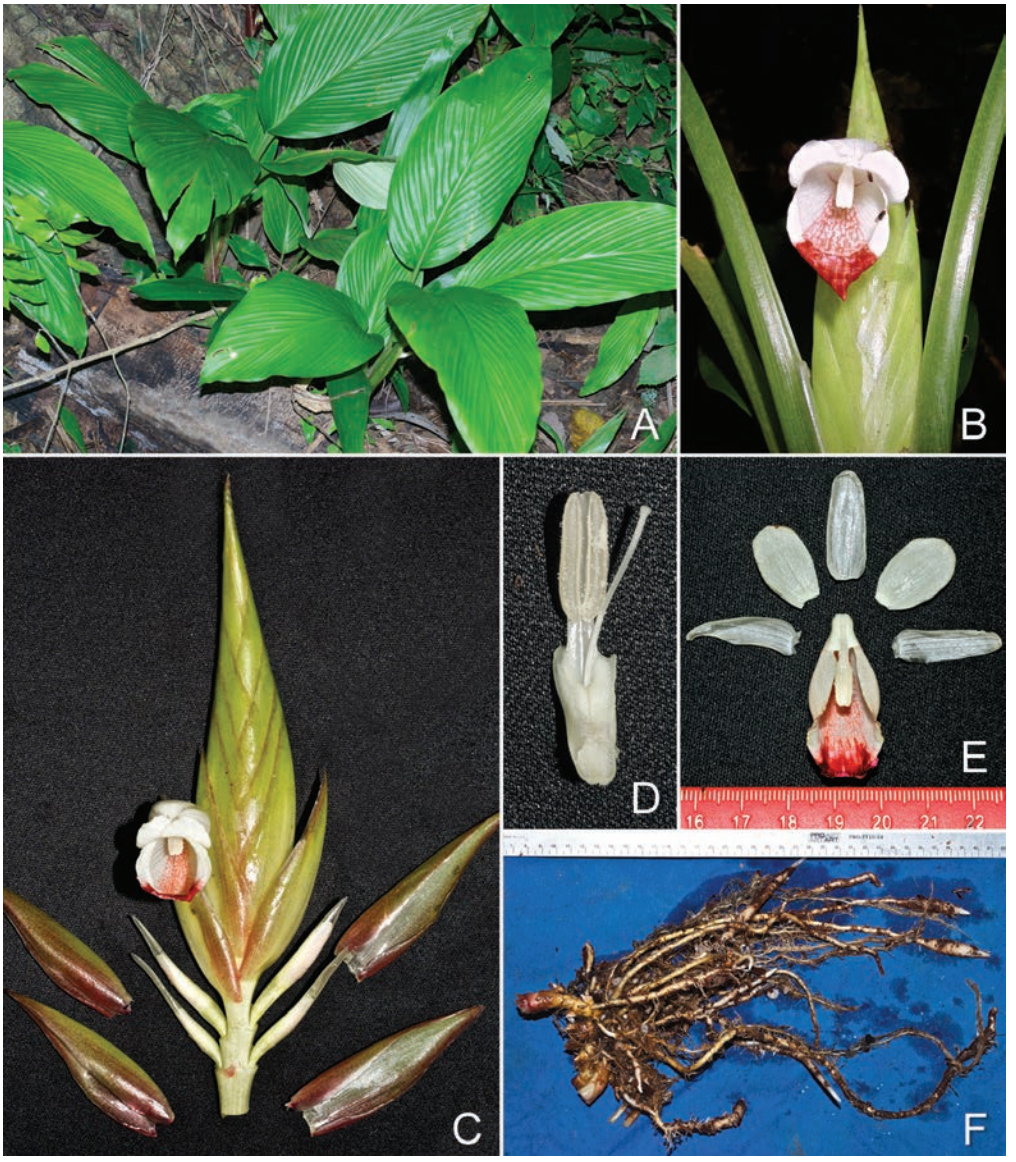

Fig. 1. *Boesenbergia albosanguinea* (Ridl.) Loes. **A.** Mature plants on limestone. **B.** Inflorescence and flower. **C.** Dissected inflorescence with flower. **D.** Anther with staminodal cup. **E.** Flower dissected. **F.** Rhizome with roots. From *J. Mood & P. Vatcharakorn M3291*. (Photos: J. Mood)

2013 another visit to Satun Province, Thailand was undertaken to reassess the coastal, limestone habitat and look for more populations of *B.* aff. *albosanguinea*. In addition, BK and BKF herbaria were visited to study and photograph specimens, as was SING herbarium later in March 2014. With considerable information in hand, a final fact-finding trip was made to Langkawi Islands, Malaysia in August 2015 to locate, study

Fig. 2. *Boesenbergia albosanguinea* (Ridl.) Loes. Ink line drawing by an unknown artist (1894) at Penang Botanic Gardens. Reproduced with permission of the Singapore Botanic Gardens.

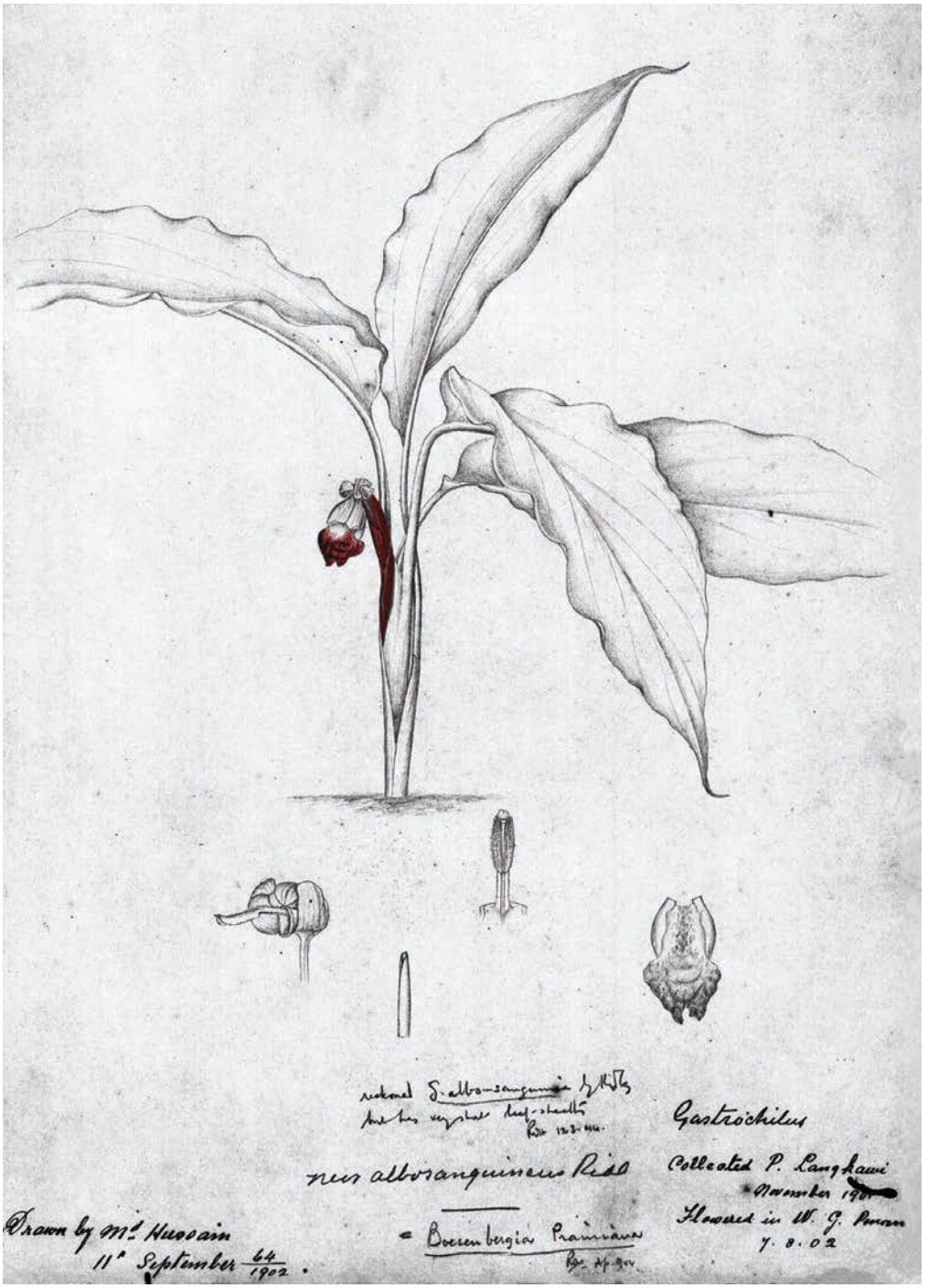

Fig. 3. *Boesenbergia albosanguinea* (Ridl.) Loes. Ink line drawing with watercolour by Md. Hussain at Penang Botanic Gardens (1902). Reproduced with permission of the Singapore Botanic Gardens.

and document any *Boesenbergia* aff. *albosanguinea* populations which might remain, as over 100 years had passed since the last known collections. At the same time, any other *Boesenbergia* species encountered were documented, with special emphasis on finding *B. prainiana* and, if so, in what habitat.

Results

The isolectotype of *Boesenbergia prainiana* in Singapore Botanic Gardens (*SING0044027*) is a two-leafed plant, c. 30 cm tall with erect leaves and a very narrow, cylindrical inflorescence c. 20 cm. long. The plant is tufted with only a c. 3 cm stem made up of a bladeless sheath and two leaf sheaths. No flowers are present. Across Peninsular Malaysia and adjoining Peninsular Thailand, considerable variation can be seen in plant height, leaf size/shape and inflorescence length/shape. Unmentioned in any known description is that this species is evergreen and as such has a growth habit distinct from deciduous *Boesenbergia* species such as *B. plicata*. With one to two thick leaves per element, *Boesenbergia prainiana* is similar to *B. minor* (Baker) Kuntze, another evergreen ginger from Perak. Since evergreen *Boesenbergia* species can grow throughout the year, plant elements do not require a large foliar area for perennation and are often unifoliate with the inflorescence coming directly off the rhizome, clasped by a bladeless sheath and one leaf sheath (Fig. 4). Due to unknown factors, occasionally up to four leaves can occur [*Corner 30209* (SING)]. The leaf number aside, stem length is c. 3 cm in material measured from Malaysia and Thailand.

To further address Holttum's synonymy, comparisons of both living fertile plants and herbarium specimens of the two species were made. The most obvious difference is vegetative, as *Boesenbergia albosanguinea* has a distinct stem made up of tightly appressed leaf sheaths with 4–6 (rarely 2) thin-textured leaves, while *B. prainiana* has a very short stem and 1 or 2 (rarely 3) thick-textured leaves per element. The inflorescence on the latter is elongate and cylindrical or sometimes slightly flattened with a short peduncle covered by the sheaths. The many dull green, red-dotted bracts (up to 22) are loosely appressed and appear puffy. As the inflorescence matures, the bracts often open outward. In comparison, *Boesenbergia albosanguinea* has a lanceolate inflorescence with fewer (up to 16), firm, tightly appressed, shiny green bracts. Both species have distichous bracts with the rachis fully covered on both sides.

In a comparative floral test, fresh flowers of *Boesenbergia* aff. *albosanguinea* (*J. Mood & P. Vatcharakorn M3291*) and of *B. prainiana* from a Peninsular Malaysian collection [*J. Mood 3395* (BKF)] were compared to the 1894 drawing of the former (Fig. 2) and a watercolour of the latter (Fig. 4). The artwork and living samples were easily matched and distinguishable by species. The same flowers were then pressed and dried to compare with those on the holotype of *Boesenbergia albosanguinea* (Fig. 5f). The flower from the Thai collection matched in shape and size (Fig. 5d), whereas the flower of *B. prainiana* was smaller with a shorter floral tube and smaller, vertically oriented lateral staminodes which barely covered the labellum (Fig. 5e). In

Fig. 4. *Boesenbergia prainiana* (King ex Baker) Schltr. Ink line drawing with watercolour by Juraimi at Singapore Botanic Gardens (1948). Reproduced with permission of the Singapore Botanic Gardens.

Boesenbergia albosanguinea, the lateral staminodes initially hide the long anther, so that it cannot be seen from the top looking down. This appearance is due to the long staminodal length, broad width and full overlap of the margins. Only later in the floral development do the broad staminodal apices slightly curl toward the corolla lobes, opening the entrance and making the anther tip slightly visible from above. Even then, the result is a narrow, tubular entrance for pollinators, something mentioned by Ridley (1899) and seen in the drawings (Figs. 2, 3, 7). Conversely, in *Boesenbergia prainiana* the lateral staminodes are shorter, narrower, acute at the apices, and only overlap at their bases. Upon opening of the flower, this morphology allows for over half the anther length to be seen from the top, providing a broad, rounded, top entrance for pollinators. The top of the anther and connective is glabrous and shiny with glandular hairs only along the thecae margins. This is an important diagnostic character state as compared with *Boesenbergia albosanguinea* which is completely covered with glandular hairs on both anther and connective. Thus the basic floral differences between these two species rest in the length of the floral tube, labellum shape/length, lateral staminode shape/length and anther length/vestiture (Table 1).

Table 1. Comparison of *Boesenbergia albosanguinea* (Ridl.) Loes. and *B. prainiana* (King ex Baker) Schltr. from living plants.

Character	***B. albosanguinea* (Thailand)**	***B. prainiana* (Malaysia)**
Plant height	To c. 60 cm, not tufted	To c. 40 cm, tufted
No. of leaves	(2–)4–6	1–2 (–3)
Leaf longevity	Deciduous	Evergreen
Petiole length	2–11 cm	2–15 cm
Lamina	c. 38 × 15 cm	c. 24 × 7 cm
Inflorescence	To c. 20 × 2.5 cm, lanceolate to fusiform, flattened	15–23 × 2 cm, oblong to cylindrical, slightly flattened
Bracts	Shiny green, tightly appressed	Dull green, red-dotted, puffy, later loosely imbricating
Floral tube	c. 3.7 cm long	c. 2.5 cm long
Lateral staminodes	Rotund, c. 20 × 12 mm	Obovate, c. 7 × 2 mm
Labellum	Saccate, c. 3 × 1.7 cm	Saccate, c. 2 × 1.2 cm
Labellum apex	Bilobed, margin frilled	Entire, margin plain
Labellum colour	White with dark red pattern	White with a dark red pattern
Anther	c. 13 mm long, adaxial glandular hairs throughout	c. 7 mm long, glandular hairs on the margins of thecae only
Flowering	July to mid-October	May–November
Ecology	Limestone outcrops, seashore	Evergreen forest, mountains
Elevation	5–20 m	normally >100 m

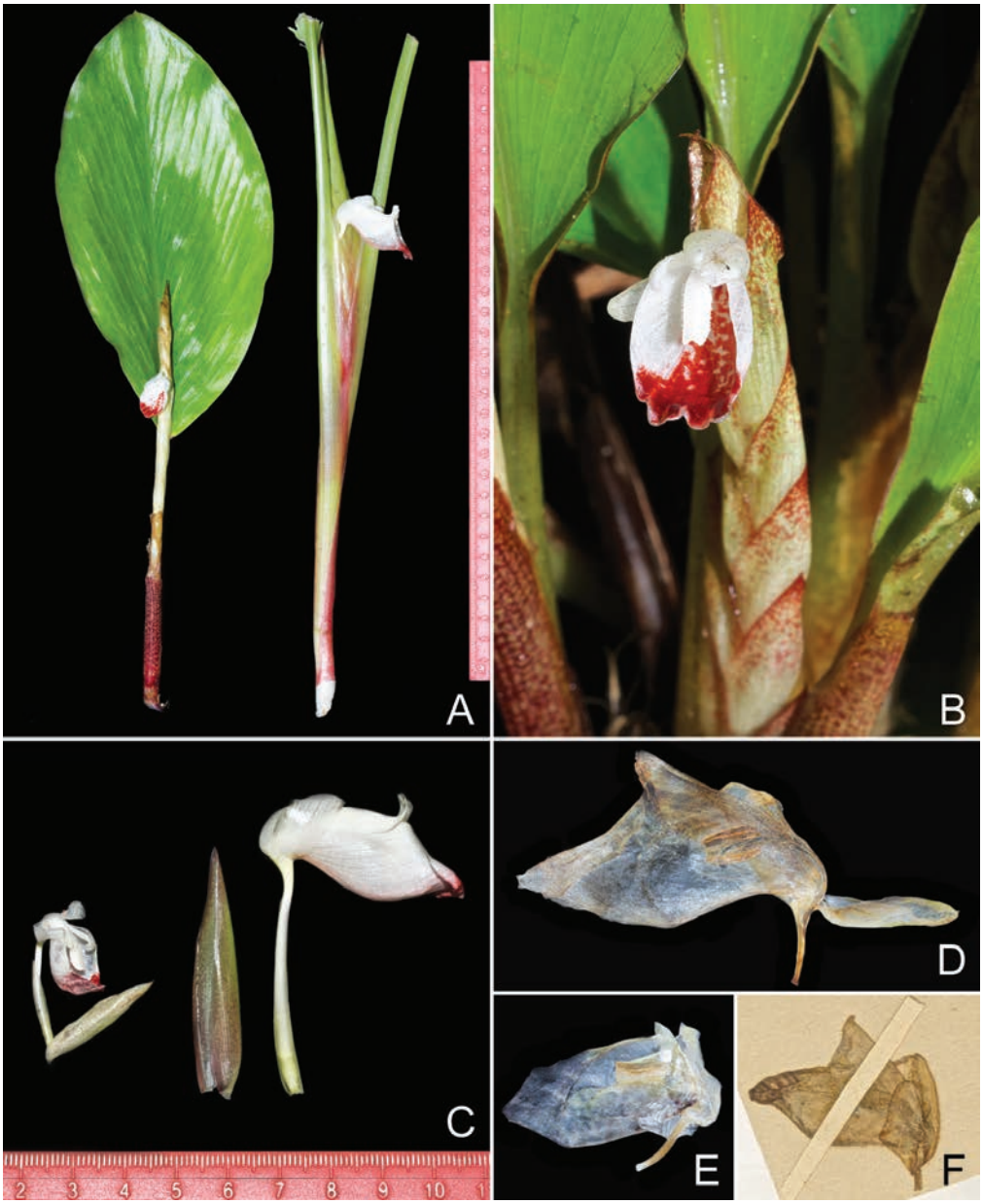

Fig. 5. Species comparison. **A.** *Boesenbergia prainiana* (Baker) Schltr. (left), *B. albosanguinea* (Ridl.) Loes. (right). **B.** *B. prainiana* inflorescence and flower. **C.** *Boesenbergia prainiana*, (left), *B. albosanguinea* (right). **D.** Pressed and dried flower of *B. albosanguinea* (*M3291*). **E.** Pressed and dried flower of *B. prainiana* (*M3172*). **F.** Pressed and dried flower of *B. albosanguinea* (holotype). (Photos: J. Mood)

When Ridley (1899) published *Boesenbergia albosanguinea*, he classified the known *Boesenbergia* species into three “groups” based on the position and source of

the inflorescence: *Acranthi* (spike borne on the top of a leafy stem), *Mesanthi* (centre of the leaf tuft), and *Exanthi* (outside the leaf tuft). *Boesenbergia albosanguinea*, along with the type of the genus, *B. pulcherrima* (Wall.) Kuntze, was placed in the first group, while *B. prainiana* was placed in *Exanthi* with species now considered as *Scaphochlamys* Baker. Holttum made no mention of this classification which, although now rather outdated, has some diagnostic importance. The character state of having a significant stem vs little or none at all is quite important. Clearly *Boesenbergia albosanguinea* is caulescent (stemmed) as can be seen in the drawings (Figs. 2, 3), although on the holotype, which is a poor specimen, it is less distinctive due to separation of the leaves and lack of inclusion of the full stem (Holttum, 1950). If the 1894 drawing is compared to this type (supposedly drawn from the same plant), it is initially hard to see distinctive similarities except in the leaves. If this drawing is compared to the isolectotype of *Boesenbergia prainiana* at SING, the caulescent vs acaulescent (tufted) character state is very evident. If the inflorescences of the types of both species are compared with the 1894 drawing (Fig. 2), they are very similar, but differ in length and number of bracts.

The historic materials aside, if well-prepared and fully documented herbarium specimens of the two species are compared, two additional identifying clues are the date of collection and location/ecology. *Boesenbergia prainiana*, being evergreen, occurs primarily in wet, evergreen forest on sandstone or quartz derived soils while *B. albosanguinea* is deciduous, goes dormant for c. 5 months of the year and has only been found near the sea on shaded, limestone outcrops. Consequently, the latter cannot be collected November to March, whereas the former can be collected year-around. It was also stated that the original collection area of *B. albosanguinea* was Maxwell's Hill (c. 1000 m), far inland from the sea. The type locality of *Boesenbergia prainiana* is also in Perak. Currently there are no other *Boesenbergia* species known from the Thaiping Hills area that have a morphology similar to *B. prainiana*, with the exception of *Boesenbergia minor*.

So how is this incongruence of habitat (mountain vs coastal) explained if *Boesenbergia albosanguinea* is synonymous with *B. prainiana* as Holttum stated? Firstly, the holotype of *Boesenbergia albosanguinea* was not collected in the field on Maxwell's Hill, but was from a cultivated plant in the botanic gardens of Penang. Supposedly this plant was originally given to the gardens by Theodore A. Wooldridge, an orchid collector who employed local people to make collections. There are many avenues for error, starting from the time of collection to months later when it flowered in Penang, e.g., labelling, accession records, etc. At least four years prior, Curtis had already collected at least one specimen in Langkawi [*Curtis 2677* (SING)]. Given Curtis's love of horticulture and previous employment from 1878–1884 as a collector for the horticultural company Veitch & Son, England, he most likely always collected living plants for the gardens. Consequently, it seems that when the drawing was made and then the holotype processed from the same plant, the resultant components were not taken from Wooldridge's donated plant, but from a different plant collected in Langkawi by Curtis. As Ridley was writing his description prior to publication (Ridley, 1899), it is quite likely he saw living plants at the Penang Botanic Gardens as he stated

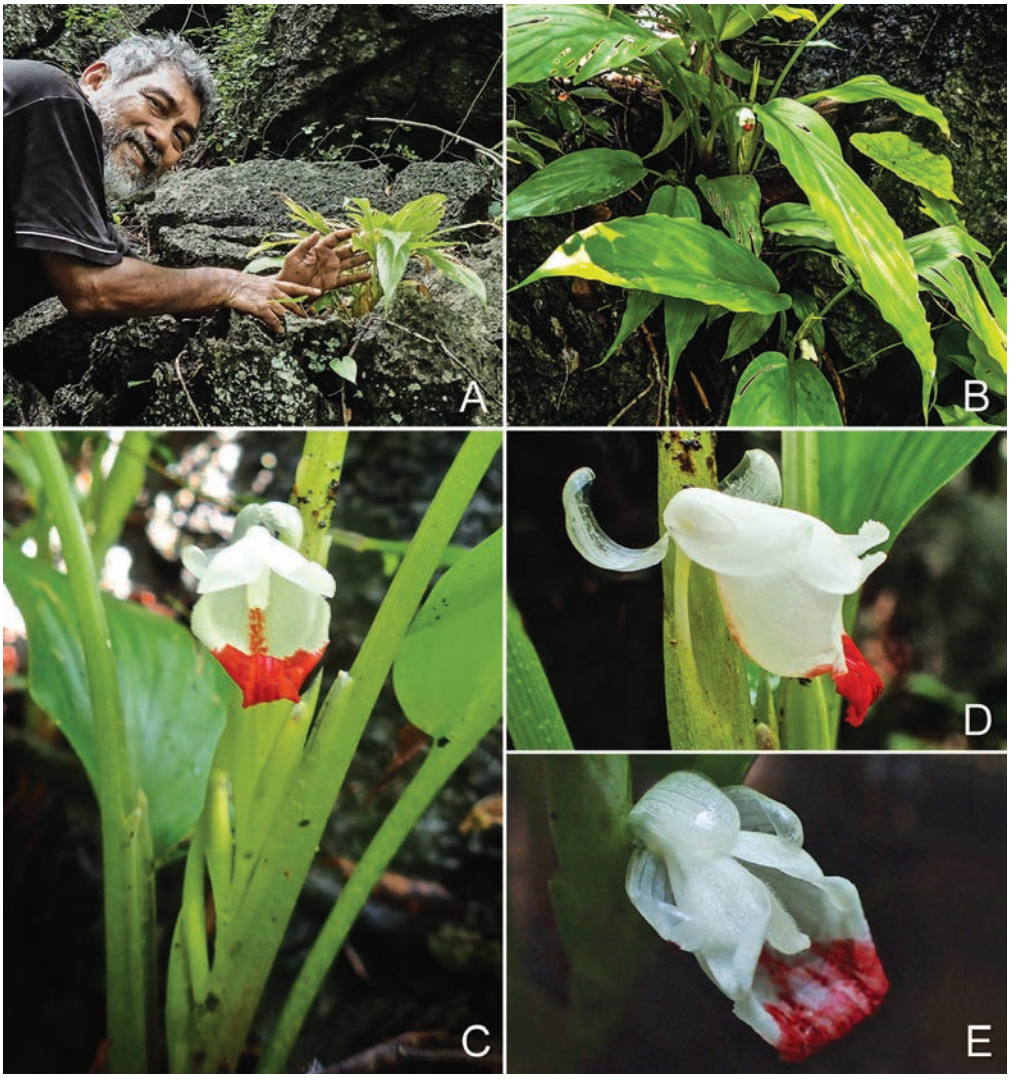

Fig. 6. *Boesenbergia albosanguinea* (Ridl.) Loes. **A.** A.G. Hussain with wild plants on limestone at Pulau Langgun, Langkawi. **B.** Mature plant population. **C.** Flowering plant. **D.** Flower in profile. **E.** Flower showing anther. (Photos: A.G. Hussain)

"an exceedingly similar if not identical plant occurs also in Langkawi (*Curtis 2677*)," an observation difficult to deduce from herbarium specimens alone. Note: Curtis made eight explorations to Langkawi Islands 1888–1902 (http://www.nationaalherbarium.nl/FMCollectors/C/CurtisC.htm).

As a final comparison of materials, in 2015 the second author photographed (Fig. 5 & 6) and collected plants of *Boesenbergia albosanguinea* [*Ghani s.n.* (KEP)] on Palau Langgun, a small, limestone island off the northeast coast of Langkawi Island. Based on AGH's many years of local collecting, this is the only location where this

species has been found in recent times. Further, the only other *Boesenbergia* species known to occur on Langkawi and the surrounding islands are *B. curtisii* (Baker) Schltr. and *B. plicata.*

Taxonomy

=*Boesenbergia albosanguinea* (Ridl.) Loes. in Engler & Prantl, Nat. Pflanzenfam., ed. 2, 15a: 566 (1930). – *Gastrochilus albosanguinea* Ridl., J. Straits Branch Roy. Asiat. Soc. 32: 109 (1899) ("*albo-sanguinea*"). – Type: Specimens from a plant cultivated at Penang Botanical Gardens, Sep 1894, "*Wooldridge*" [but more likely Curtis] *s.n.* (holotype K! [*K000255404*]). (Fig. 1–3, 5–7; Tab. 1, 2).

Boesenbergia prainiana auct. non (Baker) Schltr.: Holttum, Gard. Bull Singapore 13: 111 (1950).

Deciduous, perennial herb up to 60 cm, tightly clumping; ***rhizome*** with multiple elements developing linearly and vertically, c. 3 cm tall, 1 cm diam., externally yellowish white, internally with two concentric rings, both dark yellow, new rhizome elements produced at some nodes; roots fleshy to 22 cm long, 4 mm diam., white, short root hairs along the full length, swollen and fusiform at the tips, these c. 5 × 1 cm, white, surface smooth, root hairs along the full length; fibrous roots few from the rhizome to 27 cm long. ***Stems*** five to numerous, up to 7 cm long, base ovoid, c. 2 cm diam., without bladeless sheaths (cataphylls), with (rarely 2) 4–6 leafy sheaths 6–16 cm long, dark red, changing to green towards the ligule, surface finely veined, glabrous. ***Leaves*** (rarely 2) 4–6, lower leaves in pairs, nearly opposite; petiole 2–11 cm, longer on upper leaves, green, glabrous; ligule bilobed, each lobe triangular, 2–15 mm long, shortest on upper leaves, translucent, glabrous, from the ligule base a red, hyaline margin extends down the leaf sheath 2–7 cm long; lamina elliptic to ovate, 15 × 9 cm (lower) to 38 × 15 cm (upper), base rounded, apex acuminate, adaxially veins raised, medium shiny green, glabrous, abaxially convex between the veins, light green, glabrous. ***Inflorescence*** terminal, clasped between the sheaths, peduncle short, c. 8 mm diam.; spike broadly lanceolate to slightly fusiform, 15–20 long, 2 cm wide, c. 1 cm thick, exserted for half of its length, ovate in cross-section, dull green with a reddish centre in the lower one-third. ***Bracts*** distichous, overlapping equally on both sides of the rachis, cymbiform, lanceolate when opened and flattened, lowest bract sterile, 9 cm long, fertile bracts open to the base, c. 3 × 3 cm, distally decreasing slightly in size, green in the centre, light red on a wide margin, glabrous; ***bracteole*** lanceolate, curved, open to the base, on the opposite side of the floral tube from the bract, margins overlap and fully enclose the floral tube, 4.2 cm long, 4 mm diam. at the base, white, glabrous. ***Flowers*** 16–18, one flower per bract, c. 6 cm. long, flowering sequence basipetalous (from the apex downward), labellum oriented 90° to the bract apex, all facing the same direction and downward. ***Calyx*** tubular, c. 1.1 cm long, translucent white, glabrous, apex undulate, truncate. ***Floral tube*** c. 3.7 cm long, c. 4 mm diam.

Fig. 7. *Boesenbergia albosanguinea* (Ridl.) Loes. Ink line drawing with watercolour by Linda Ann Vorobik (2015). Based on *J. Mood & P. Vatcharakorn M3291*.

at base, white, glabrous; dorsal corolla lobe broadly elliptical, cymbiform, c. 25 × 14 mm, apex cucullate, white, glabrous, ventral corolla lobes elliptical, c. 2.5 × 1.0 cm, apex cucullate, white, glabrous; androecial cup oriented 90˚ to the floral tube, c. 8 × 6 mm wide, throat with long hairs. ***Labellum*** deeply saccate, orbicular (natural shape), c. 3 × 1.7 cm wide, c. 3 cm wide (flattened), throat light red, maculate, lip streaked with dark red to the apex, lobe margins violet with age, glabrous and iridescent on both sides, apex emarginate, 2–3 mm, overall white; ***lateral staminodes*** obovate, c. 2.2 × 1.3 cm, apex slightly reflexed, white, sparsely pubescent, iridescent. ***Stamen*** c. 13 mm long, filament c. 3 × 2 mm, white, dorsal, with glandular hairs, thecae c. 11 × 2 mm (each), white, dehiscent full length, connective white, dorsally with glandular hairs, no anther crest, pollen white**.** ***Ovary*** trilocular, elongate, c. 5 × 2 mm, green, glabrous; *style* filiform, c. 6 cm, white, *stigma* triangular, white, ostiole oval with "v" notch, glabrous***;*** *epigynous glands* aculeate, c. 6 mm long, yellow**.** ***Fruit*** not seen. [Measurements based on living, cultivated material of *J. Mood & P. Vatcharakorn M3291* from Thailand].

Distribution. Malaysia: Langkawi, Pulau Langgun; Thailand: Satun Province.

Ecology. Found on limestone outcrops in shaded habitats in close proximity to the sea.

Phenology. Observations in Satun Province and Langkawi indicate that flowering normally occurs from July to mid-October. Flowers open in the morning and close the following day.

Etymology. Named for the white and blood-red colour of the labellum.

Specimens examined. MALAYSIA: **Kedah:** Langkawi, Pulau Langgun, limestone outcrop, shoreline forest, 10 m asl, 15 Sep 2015, *Ghani s.n.* (KEP); no exact location, Sep 1890, *Curtis, C. 2677* (SING); no exact locations, cultivated at Penang Botanical Gardens, no dates (SING [SING0155198, SING0155248, SING0155266]).
THAILAND: **Satun:** La Ngu, Ko Kabeng, 80 m, Sep 1999, *Phengklai, C. 12105* (BKF), *12106* (BKF); La Ngu, Mu Ko Phetra N.P., 70 m, 10 Sep 2008, *Middleton, D.J. et al. 4436* (BKF, E); La Ngu, Mu Ko Phetra N.P., 30 m, 20 Sep 2010, *Middleton, D.J. et al. 5492* (E); near Ko Phetra, 10 m, evergreen scrub forest on limestone, 06°51.162'N 99°45.781'E, 1 Aug 2012, *Mood, J. & Vatcharakorn, P. M3291* (BKF); near Langu, 54 m, evergreen scrub forest on limestone, 06°51.162'N 99°45.781'E, 4 Aug 2013, *Mood, J. & Vatcharakorn, P. M3386* (BKF).

Notes. This species as it appears in Satun Province is upright to slightly decumbent with thick, multiple stems in a clump, quite similar to the vegetative habit of *Boesenbergia trangensis* and *B. plicata*. The leaves are also plicate, but tend to be slightly smaller in size with a rounded leaf base. When fertile, it is easily identified by the very symmetrical, lanceolate inflorescence that is narrow at the base, wider in the centre and slowly tapered to the apex. The bracts are symmetrical and tightly overlap on both sides of the rachis. The leaf sheath margins and lower bracts are reddish which gives the appearance of a broad, red streak on the stem and partially up the centre of

the inflorescence. The inflorescence protrudes for about half its length out of the leaf sheaths and maintains a mostly vertical stance. The flowers are pure white with a light red, narrowed, maculate pattern in the throat, and a lip lightly streaked with dark red especially on the apex margin. Ridley's comment on the narrow opening for pollination is due to the large, overlapping lateral staminodes which cover roughly two-thirds of the labellum length, forming a tube. In the Langkawi populations, the plants tend to be generally less robust, shorter in height with narrower, shorter leaves. The leaf sheaths are red but the colour does not extend onto the rachis. The inflorescences are more cylindrical, less flattened with slightly longer, narrower bracts which sometimes deflex slightly away from the rachis on some plants. Flower shape and colour are nearly identical to the Thai populations, albeit slightly smaller.

Boesenbergia prainiana (King ex Baker) Schltr., Repert. Spec. Nov. Regni Veg. 12: 316 (1913). – *Kaempferia prainiana* Baker in Hook.f., Fl. Brit. India 6: 220 (1890). – *Gastrochilus prainianus* (Baker) Ridl., J. Straits Branch Roy. Asiat. Soc. 32: 115. (1899); Ridl., Mat. Fl. Malay Penins. 2: 18 (1907); Ridl., Fl. Malay Penins. 4: 247 (1924). – Type: Malay Peninsula, Perak, Gopeng, Kinta Valley, *King's Collector (Kunstler) 726* [cited as "*226*" by Ridley (1899, 1907)] (lectotype K [K000255402!], designated here; isolectotypes CAL [CAL0000001005!], K [K000255403!], SING [SING0044027!]). (Fig. 4; Table 1)

Conclusions

It is concluded that *Boesenbergia albosanguinea* is distinct from *B. prainiana*. The Langkawi collections by Curtis labelled as *Boesenbergia albosanguinea* are confirmed, as are those from Satun Province, the latter constituting a new record for Thailand.

The disparity of Wooldridge's type locality in the mountains of Perak as compared with the documented coastal collections in Langkawi and Satun Province cannot be explained by any known historical references such as accession books or associated Wooldridge memorabilia (pers. com. Singapore Botanic Gardens Library). The facts remain that *Boesenbergia albosanguinea* has never again been recorded from the Thaiping Hills and, ecologically, it is unlikely that species otherwise only known from coastal limestone sites would also be found in a distinctly different, mountainous environment. Therefore, the only logical explanation for this inconsistency is that the plant at Penang used for the holotype, protologue and illustration was not the same plant Wooldridge collected. More likely it was one of Curtis's plants collected from Langkawi between 1890 and 1893.

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