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Contributions to the orchid flora of Kalimantan I: A new species and a new country record of *Bulbophyllum* (Orchidaceae)

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ABSTRACT: Further discoveries on *Bulbophyllum* section *Beccariana* is presented here. First, a new species from the central part of Kalimantan (Indonesian Borneo), *Bulbophyllum sapathawungense*, is described and illustrated. It resembles two morphologically similar, *B. bruneiense* J.J.Verm. & Lamb. and *B. ecornutum* (J.J.Sm.) J.J.Sm., but the new species differs in having a 3-lobed labellum with narrow, uncinate side-lobes, and the pollinarium lacks a stipe. Second, a new country record for is also presented for *Bulbophyllum abangjoei* Rusea, Besi & Pungga, a previously Sarawak endemic. Information on distribution, ecology, and phenology is provided.

KEY WORDS: *Beccariana*, *Bulbophyllum bruneiense*, *Bulbophyllum ecornutum*, *Bulbophyllum sapathawungense*, West Malesia.

INTRODUCTION

Borneo is the third largest island in the world with a high level of plant diversity (Barthlott *et al*., 2005). It has been considered one of the diversity centres for *Bulbophyllum* Thouars especially in the Malesian Archipelago (Vermeulen *et al*., 2015). Following our studies on orchid diversity on this island (Kurniawan *et al*., 2022; Yudistira *et al*., 2022), we report other noteworthy findings of the genus.

This paper presents results from our recent biodiversity expedition of Sapat Hawung Nature Reserve in 2023 facilitated by Natural Resource Conservation Agency of Central Kalimantan Province (Balai Konservasi Sumber Daya Alam Kalimantan Tengah) and the Ministry of Environment and Forestry of Indonesia. A species new to science with 1-flowered inflorescences carrying relatively large and showy orange flowers is described here. This brings the number of *Bulbophyllum* species known from Borneo to 292 (Vermeulen *et al*., 2015; Go *et al*., 2022; Kurniawan *et al*., 2022; Yudistira *et al*., 2022). In addition, a new country record for Indonesia is presented for *B. abangjoei* Rusea, Besi & Pungga (Go *et al*., 2022), a species previously known only from Sarawak (Malaysian Borneo).

TAXONOMIC TREATMENT

Bulbophyllum sapathawungense Yudistira, R.P.P.Ahmad & Mustaqim, ***sp. nov.*** **Figs.1 & 2**

Type: INDONESIA. Kalimantan Tengah Province, Murung Raya, Kelasin, Sapat Hawung Nature Reserve, *exact locality withheld for conservation purposes*, 800 m elev., 19 September 2023, *YR Yudistira 020* (holotype: CEB!, isotype: WAN!).

Diagnosis: This species is similar to *B. bruneiense* J.J.Verm. & Lamb. and *B. ecornutum* (J.J.Sm.) J.J.Sm. but differs in having an ovate and 3-lobed labellum with the side-lobes basal and hook-like, 3.0–3.5 mm long, with serrate upper margin (vs. labellum without side-lobes) and the absence of a stipe (vs. present). With *B. bruneiense*, it is also differs in the flowers color and dimensions, as well as more veins on dorsal sepals (7–8 vs 5), while with *B. ecornutum*, it also differs in fewer veins on lateral sepals (5 vs c. 11) and the triangular labellum (vs elliptic to ovate) (Table 1).

Creeping, epiphytic, sympodial herb. ***Roots*** mainly below the pseudobulbs, greenish-brown to greenish-white, apical part yellowish-brown. ***Rhizome*** terete, branched, 3.0–4.8 mm in diam., the section between pseudobulbs 0.6–1.3 cm, scales drying and persisting as fibers. ***Pseudobulbs*** distinct, ovoid to ellipsoid, 3-angled, 2.0–2.5 × 0.8–1.4 cm, covered by a papery sheath, persisting as fibers. ***Leaves*** 1 per pseudobulb; petiole channeled above, 1.0–2.1 cm long; blade elliptic, 10.0–16.0 × 3.0–4.5 cm, leathery, green above, pale beneath, base cuneate, entire, apex acuminate, midrib sunken above, 12 soft veins adaxially, glabrous. ***Inflorescences*** from the base of pseudobulbs and nodes on the rhizome, 13.0–14.0 cm long, 1-flowered, peduncle 3.2–3.5 cm long;

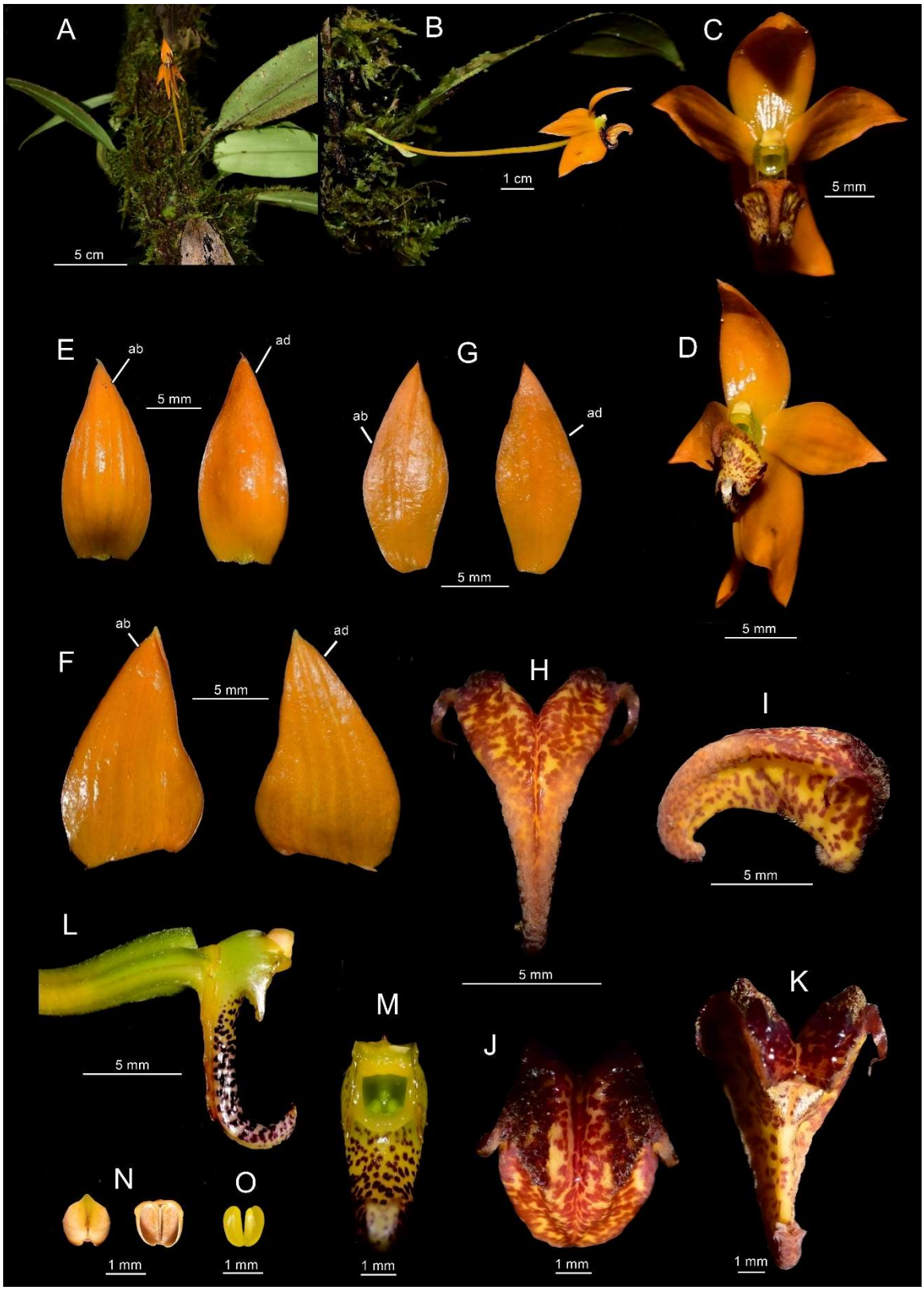

Fig. 1. Morphology of ***Bulbophyllum sapathawungense*** Yudistira, R.P.P.Ahmad & Mustaqim: **A–B.** Living plant with inflorescence, **C.** Flower frontal view, **D.** Flower lateral view, **E.** Dorsal sepal adaxial & abaxial side, **F.** Lateral sepal adaxial & abaxial side, **G.** Petal abaxial & adaxial side, **H.** Labellum frontal view, **I.** Labellum lateral view, **J.** Labellum abaxial view, **K.** Labellum adaxial view, **L.** Column stigma, **M.** Column stelidia with ovary lateral view. **N.** Anther cap, **O.** Pollinia. Photographs by Y.R. Yudistira from the holotype.

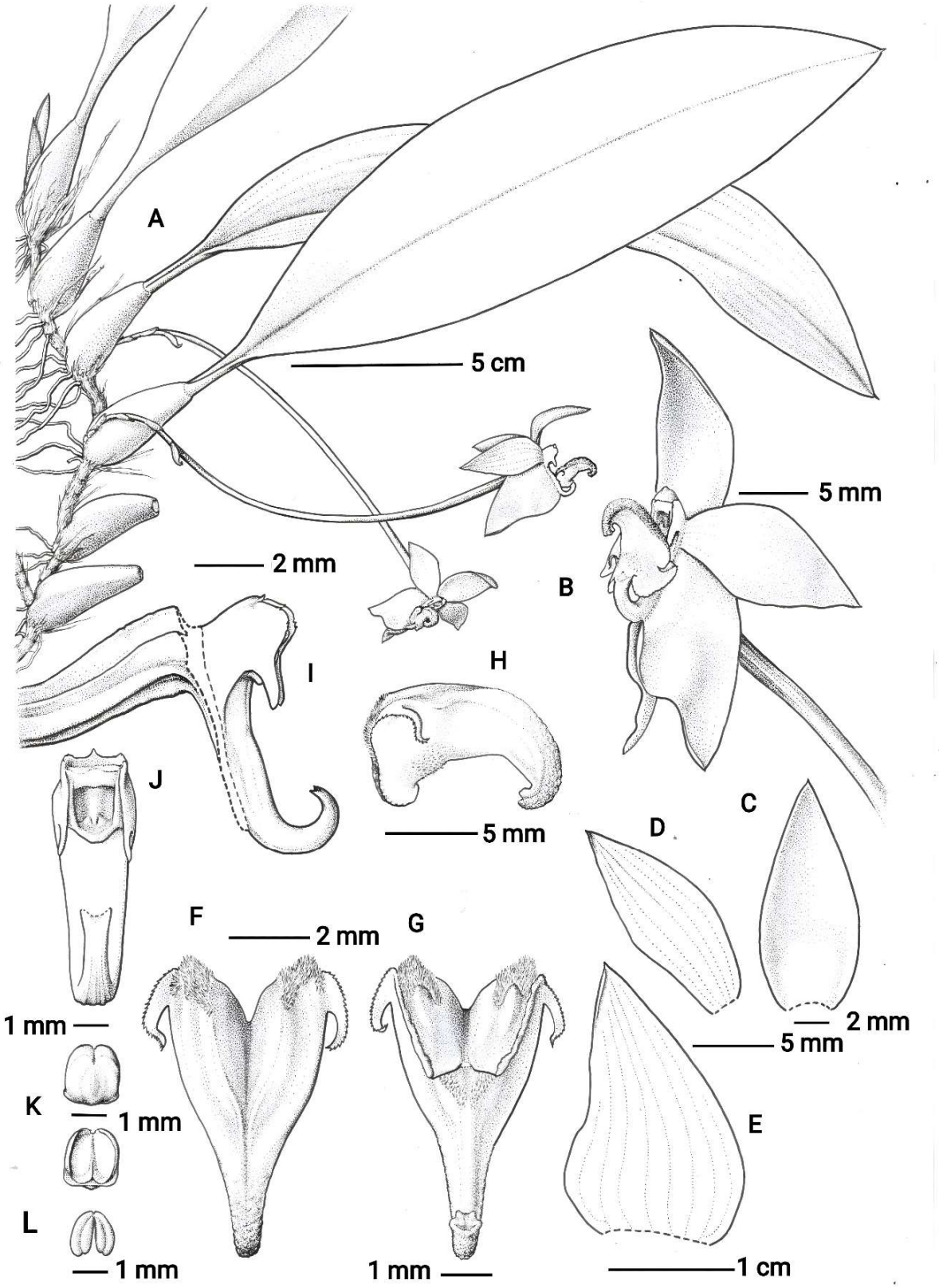

Fig. 2. Morphology of ***Bulbophyllum sapathawungense*** Yudistira, R.P.P.Ahmad & Mustaqim: **A.** Plant habit and inflorescences, **B.** Flower, **C.** Median sepal, **D.** Petal, **E.** Lateral sepal, **F.** Labellum adaxial side, **G.** Labellum abaxial side, **H.** Labellum lateral side, **I.** Column and ovary, **J.** Column stigma, **K.** Anther cap, **L.** Pollinarium. Drawing by Yuanito Eliazar from the holotype.

Table 1. Comparison of diagnostic morphological characters of ***B. sapathawungense***, ***B. bruneiense*** and ***B. ecornutum***

Characters	*B. sapathawungense*	*B. bruneiense*	*B. ecornutum*
Plant			
Rhizome (mm)	3.0–4.8	1.2–2.2	1.5–3.2
Inflorescence			
Length (cm)	13–14	6–7	3–6.5
Peduncle scales	4–5	c. 3	c. 3
Floral bract length (mm)	5–8	8–9	5–7.5
Flower			
Pedicel and ovary length (cm)	7–8	c. 3.6	2.1–3.6
Sepals			
Color	yellow to orange	white base and pale orange-red or ochre to apex	yellow, pale orange or pale green, sometimes with pink apex, sometimes with dark purple spots or entirely purple
Dorsal sepal veins	7–8	5	7
Petals			
Color	yellow to orange	white base and pale orange-red or ochre to apex	yellow, pale orange or pale green, sometimes with pink apex, sometimes with dark purple spots or entirely purple
Veins	4–5	5	5–6
Labellum			
Shape	ovate triangular	subtriangular	triangular with drawn out apical part
Side-lobes	present, uncinate	absent	absent
Size (mm)	9–10 × 4–4.5	c. 7.5 × 4	4.8–7 × 5–11
Length per width (times)	2.5	c. 1.9	0.6–1.2
Column			
Length (including stelidia) (mm)	4–5	c. 3	1.8–3
Stelidia tooth	falcate triangular	narrowly oblong	deltoid to triangular
Pollinia			
Stipe	absent	present	present
Additional literature source	-	Vermeulen *et al*. (2015)	Vermeulen *et al*. (2015)

peduncular scales 4–5, ovate to lanceolate, 2.0–5.0 × 1.0–2.5 mm, pale green, apex, 1-veined, glabrous; floral bract concave, ovate to lanceolate, 5.0–8.0 × 3.0–4.5 mm, pale green, acuminate, 1-veined, glabrous. ***Flower*** with dorsal sepal yellow to orange with abaxial veins yellow, lateral sepals also yellow to orange, petal orange, labellum yellow with many dark red spots and side-lobes dark-brown, column-foot yellow-green with many dark red spots, anther cap creamy white, and pollinia yellow; flower opening widely, sometimes reflexed, 2.0–2.5 cm across. ***Pedicel*** plus ***ovary*** cylindrical, corrugated, 6-angled, 7–8 cm long, the basal node of pedicel is just slightly above the floral bract attachment at about 1/4th the diameter of the pedicel. ***Dorsal sepal*** free, broadly attached, curved, ovate, 15–18 × 4–5 mm, yellow to orange, apex acute to acuminate, margins entire, 7–8-veined; 7 longitudinal prominent veins abaxially, glabrous. ***Lateral sepals*** free, obliquely ovate, 18–20 × 10–12 mm, apex acute to acuminate, margins involute near the tip, sometimes lower margin slightly undulate from the base to the 1/4th the total length, entire, dorsally with 5 veins, slightly prominent, glabrous. ***Petals*** free, spreading, lanceolate, 16–18 × 3–8 mm, acuminate, lower margin slightly obliquely undulate, upwards straight and entire, 4–5 veins, glabrous. ***Labellum*** 3-lobed, narrowly ovate triangular, 9.0–10.0 × 4.0–4.5 mm, index of length/width c. 2.5; mid-lobe strongly recurved downwards at the apex, narrowly ovate triangular, the recurved part subterete and slightly 4-lobed at the apex, somewhat resembling an elephant's trunk; adaxial side with a central longitudinal channel starting from the base and running gradually shallower toward the apical part, in addition there are 2 longituginal crests, from ¼ to ¾ of the length of the labellum, flanking a narrow central ridge running from ¼ to ½ the labellum length, slightly fimbriate projection on the middle-top surfaces, the crests are adorned with a patch of dense, slender papillae on their highest part; adaxial surface smooth in the lower half, rugose towards the apex; abaxial surface convex in the basal half, with a low and narrow median keel running from ¼ above the base towards half of labellum length; side-lobes falcate, hook-like, c. 3.0–3.5 mm long, upper margin serrate, apex bifid, glabrous. ***Column*** oblong, 4–5 mm long including stelidia, stelidia triangular, divaricate, 2.0–2.5 mm long, obtuse; lower margin with patent, falcate triangular tooth, 2 mm long, apex obtuse; stigma obpentagonal; column-foot narrowly oblong, uncinate, 6–7 mm long. ***Anther cap*** subquadrangular, 1.8 × 1.0–1.5 mm. ***Pollinia*** in 2 pairs, obliquely oblong, 2 × 1 mm; stipe lacking.

Distribution: Endemic to Borneo: Kalimantan Tengah Province, only known from the type locality in Sapat Hawung Nature Reserve (**Fig. 3**).

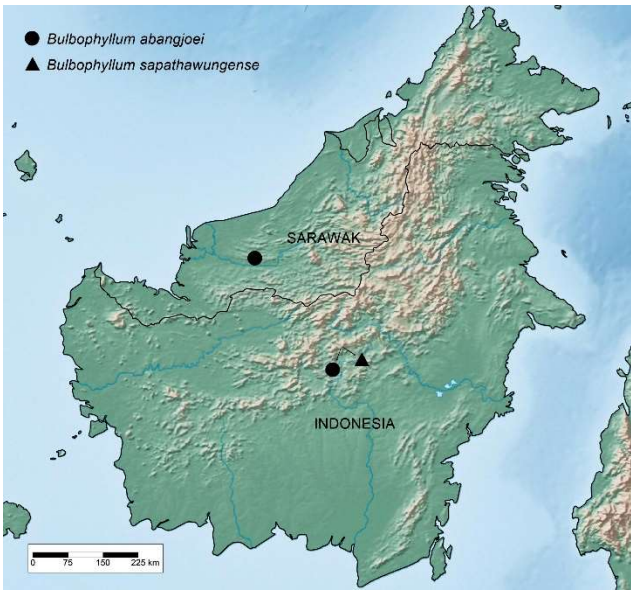

Fig. 3. Geographical distribution of ***Bulbophyllum sapathawungense*** Yudistira, R.P.P.Ahmad & Mustaqim. (▲) and ***Bulbophyllum abangjoei*** in Kalimantan Tengah Province, Indonesia (●). Map prepared using SimpleMappr (Shorthouse, 2010).

Ecology: Epiphytic in mossy forest, 800–900 m asl.

Phenology: Flowering in the wild recorded in September, in cultivation March & June, fruiting unknown.

Etymology: The epithet refers to the type locality, Sapat Hawung Nature Reserve in Kalimantan Tengah Province, Indonesia.

Notes: *Bulbophyllum sapathawungense* belongs to section *Beccariana* due to its 1-flowered inflorescence, the basal node of the pedicel is just slightly above the floral bract attachment (at c. 1/4 times the diameter of the pedicel), sepals with 5–8 veins with the dorsal one free. In the sect. *Beccariana*, this species superficially resembles the Brunei endemic *B. bruneiense* J.J.Verm. & Lamb. (Vermeulen *et al*., 2015). However, the new species differs mainly by the presence of uncinate side-lobes in the labellum (vs absent), longer inflorescence (13.0–14.0 cm vs 6.0–7.0 cm), longer pedicels and ovary (7.0–8.0 cm vs c. 3.6 cm), and dorsal sepals with more veins (7–8 vs 5), and pollinia without stipe (vs. stipe present). The new species also similar to *B. ecornutum* (J.J.Sm.) J.J.Sm., a species from Thailand, West Malesia, and the Lesser Sunda Islands (Vermeulen *et al*., 2015). However, *B. sapathawungense* has longer inflorescence (13.0–14.0 cm vs 3.0–6.5 cm), longer pedicels and ovary (7.0–8.0 cm vs 2.1–3.6 cm), a labellum with distinct, narrow, uncinate side-lobes (vs. indistinct, broadly rounded side-lobes), and pollinia without a stipe (vs. pollinia with a stipe). Complete morphological comparison of these species can be seen in Table 1.

Bulbophyllum abangjoei Rusea, Besi & Pungga. Forests 13(11)-1759: 3 (2022). **Fig. 4**

Type: MALAYSIA. Sarawak, Kapit, Song, Katibas, Lanjak Entimau Wild Sanctuary, Sg. Sekawi, 100 m elev., 26 June 2006, *Go et al. RG2081* (holotype UPM *n.v.*).

Amended from Go *et al*. (2022): Creeping, epiphytic, sympodial herb. ***Roots*** mainly below the pseudobulbs, c. 1 mm across, greenish white. ***Rhizome*** terete, 2–3 mm across, branched, section between pseudobulb 5–15 mm; scales drying brown, partially persisting as fibres. ***Pseudobulbs*** narrowly oblong to cylindrical, 2.5–10 × 0.3–0.5 cm, with shallow and inconspicuous longitudinal furrows, basally covered by brown sheaths. Leaves 1 per pseudobulb; petiole terete, channeled above, 5–7 mm long, glabrous; blade narrowly oblong to narrowly linear, 18–20 × 1–2.5 cm, medium green above, apex acute. ***Inflorescence*** from the base of the pseudobulbs, sometimes inflorescence fasciculately arranged from a node, c. 3 cm long, 1-flowered; basally with subtending bracts; peduncle 10–12 mm long, scales 3; basal nodes of pedicels approximately at level with floral bract attachment; floral bracts ovate, c. 6 × 4 cm, acute, glabrous. ***Flower*** with sepals pale yellow, with veins violet on the adaxial side, abaxial side with veins paler toward the middle, the middle vein yellow; petals translucent white, yellowish at the base and the middle, veins violet, labellum violet above, mottled with white from the edge of median furrow to the margin, pale yellow and mottled violed beneath, column white, violet at apex, with some violet blotches at the lowe base, column foot violet, anther cap violet with white central base, pollinia yellow; flowers widely open, ca 2.5 cm across. ***Pedicel*** plus ***ovary*** 1–1.5 cm long, ovary c. 3.6 × 1.7–2.0 mm, with angular crests, glabrous. ***Dorsal sepal*** free, ovate, 15–25 × 7–10 mm, concave, apex acute, slightly upcurved at tip, margins entire to erose, glabrous, 7–8-veined. ***Lateral sepals*** free, oblong-lanceolate, slightly falcate, 22–30 × 6–8 mm, concave, longer thant the dorsal, lower margin adherent each other, margin entire to erose, apex acute with blunt tip, 7–8-veined, glabrous. ***Petals*** ovate, rather falcate, 13 × 5 mm, apex acuminate, margin entire to erose, 5–7-veined, glabrous. ***Labellum*** ovate-sagittate, 5–7 × 2–3 mm, index of length/width c. 1.4 without side-lobes; adaxially with a median furrow running from the base to apex, margin erose; apex obtuse, swollen, shortly upcurved c. 1 mm high, forming a short transverse furrow at the abaxial side, margin erose, adaxial surface verrucose at the proximal margin bordering the median furrow; base hinged on a thin ligament to the column foot, auricle antrorse, c. 1/3 of the labellum length. ***Column*** 7–10 mm long including stelidia, stelidia rounded with apiculate apex, c. 0.7 mm long, lower margin with a distinct, patent, elliptic-oblong tooth, c. 1.6 mm long, apex obtuse; stigma obpentagonal. Anther cap cucullate, oblong-ovate, c. 1.6 × 1.3 cm, verrucate at the lower margins. ***Pollinia*** two, oval, c. 0.7

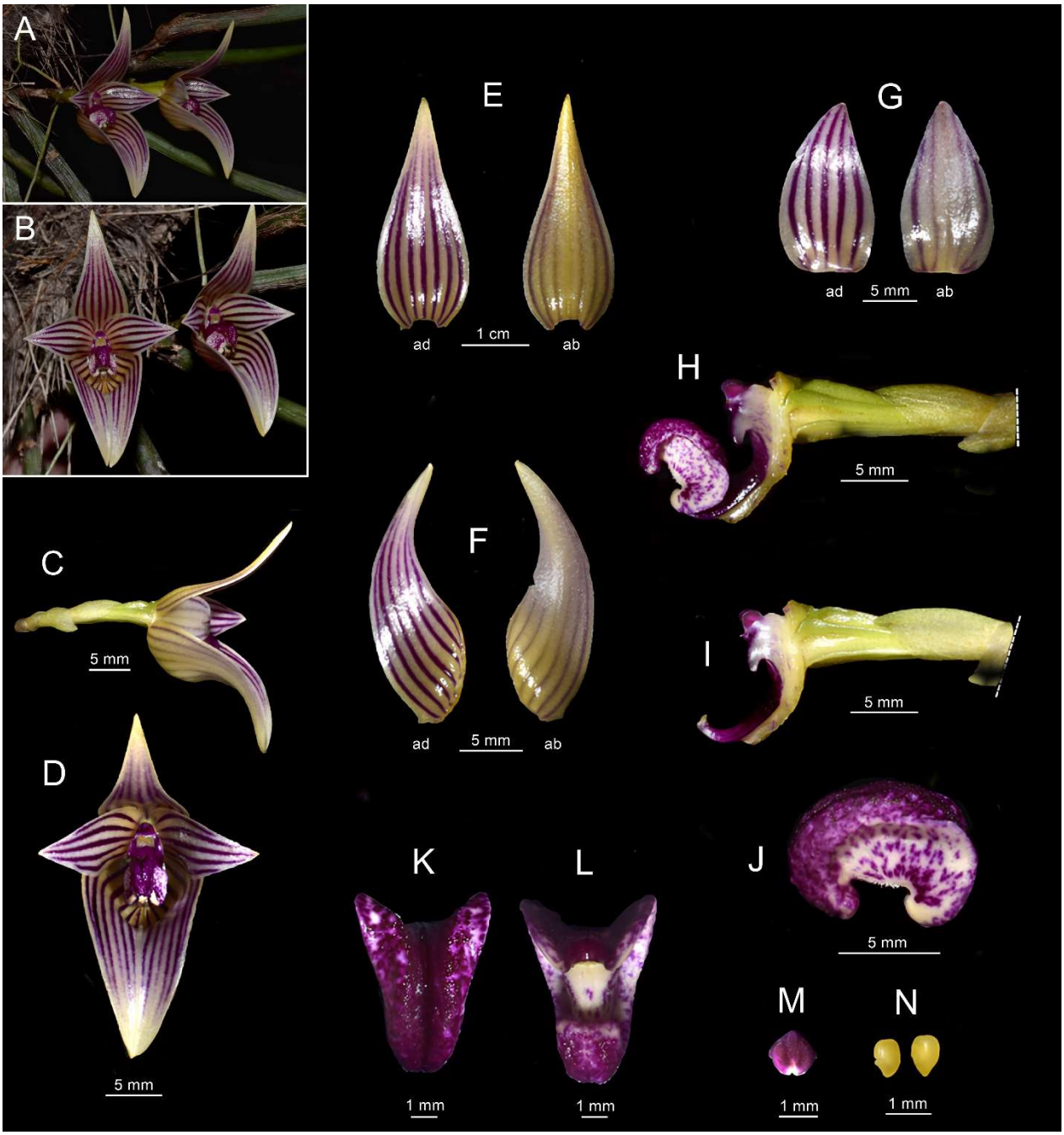

Fig. 4. Flowers of ***Bulbophyllum abangjoei***: **A.** Flower frontal view, **B.** Flower lateral view in natural state, **C.** Lateral view of flower (dissected), **D.** Frontal view of single flower, **E.** Dorsal sepal, adaxial and abaxial view (ab), **F.** Lateral sepals, adaxial and abaxial view (ab), **G.** Petals, adaxial and abaxial view (ab), **H.** Ovary, column, stelidia, column foot, and labellum, **I.** Ovary, column, stelidia, and column foot, **J.** Labellum (lateral view), **K.** Labellum (upper surface), **L.** Labellum (lower surface), **M.** Anther cap, **N.** Pollinia. Photographs by Y.R. Yudistira after Yudistira et al. YRY022-092023.

× 0.7 mm. Seedpods spathulate, acutely angular ribs, green.

***Distribution*:** Sarawak, Malaysia (Go *et al*. 2022) and here newly recorded from Kalimantan Tengah Province, Indonesia (**Fig. 3**).

***Habitat and ecology*:** This species predominantly occurs in riverine vegetation (Go *et al*., 2022). In Kalimantan Tengah, it was found in lowland mixed dipterocarp forest as an epiphyte on tree trunks growing along rivers, 100–250 m.

***Phenology*:** Flowering in the wild observed in September, and in cultivation in March.

***Notes*:** A morphological description of this species was given by Go *et al*. (2022, p. 5) and is ammended here.

In their original description, Go and colleagues compared it to *B. membranifolium* Hook.f. including the non-typical subspecies, subsp. *inunctum* (J.J.Sm.) J.J.Verm. from which it differs in vegetative traits such as elongate-cylindrical pseudobulbs and linear leaves as well as in floral characters such as non-resupinate flowers, reniform labellum, and different coloration. Specimen from Indonesian Borneo matches very well to the original description by Go *et al*. (2022) and only differs in size of some organs, i.e. more distant pseudobulb (up to 15 mm apart vs up to 8 mm in the original description) and a larger dorsal sepal (25 × 10 mm vs 15 × 7 mm) as well as lateral sepals (30 × 8 mm vs 22 × 6 mm).

Our find in Kalimantan Tengah Province increases the number of known localities for this species into four. Go *et al*. (2022) proposed an Endangered (EN) conservation status for the species, but the new record indicates that threat assessment involving a targeted search for this species could lead to a lower threat status. The forest in Sapat Hawung Nature Reserve is poorly explored and fully protected by the Indonesian government.

***Additional specimen examined*:** INDONESIA. Kalimantan Tengah Province, Palangka Raya, Kelasin, Sapat Hawung Nature Reserve, 100–250 m elev., 17 September 2023, *Yudistira et al*. *YRY022-092023* (CEB!)

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