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A New Orchid Species of *Dendrobium* Sect. *Calcarifera* from Terengganu, Peninsular Malaysia (Orchidaceae: Dendrobiinae)

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Abstract

Dendrobium mizanii, a new species to science belonging to *Dendrobium* Sect. *Calcarifera* was discovered in a summit region of a disturbed montane forest in Setiu, Terengganu, and named after His Majesty Sultan of Terengganu, Tuanku Mizan Zainal Abidin. A description, illustration, field and comparison with the closely related species *D. crocatum* from Peninsular Malaysia and *D. doloisumbinii* from Borneo are provided here.

Keywords: endangered, rescue, *ex-situ*, conservation, *Dendrobium*, new species

Introduction

Malaysia is one of the 12 ‘mega biodiversity’ countries that harbours at least 60% of the world’s known species, and home to some 3,000 species of orchid nationwide with about 1,000 species found in Peninsular Malaysia (Rusea *et al.*, 2015). A number of collective records of Malaysian orchid species have been published by foreign botanists, including R. E. Holttum, H. N. Ridley, J. J. Smith, J. J. Vermeulen, I. M. Turner, G. Seidenfaden, and J. J. Wood; and also by local botanists themselves. To date, 248 orchid species of Terengganu are inventoried in several known herbaria, databases, and checklists, including SING Herbarium (2018), Swiss Orchid Foundation (2017), National Herbarium of the Netherlands (NHN) (2017), Turner (1995), Jaafar *et al.* (2007) and Siti Fatimah (2015).

We anticipated that there are still abundant of interesting orchid species in the Terengganu’s vast rainforest areas yet to be uncovered. However, the orchid community in this region are most vulnerable to local extinction with a high current rate of forest destruction driven by uncontrolled logging concessions.

In 2015, a rescue mission was initiated by a keen nature conservationist, Dome, and joined by the UPM Orchid Research team, as a botanical conservation endeavour that is aimed to rescue as much as possible orchids from the degraded forests, to be nurtured *ex-situ*, in a privately managed conservatory, and also to be documented upon drafting their conservation’s framework. Until now, 124 species new record to Terengganu, two species new record to Peninsular Malaysia and Malaysia, and several new species to science (two species are published) have been recorded throughout this rescue mission.

The new orchid species described in this paper was discovered in the summit region of a mildly-disturbed montane forest in Terengganu, and it is identified belong to the *Dendrobium* Sect. *Calcarifera*. *Dendrobium* Sect. *Calcarifera* was created in 1908 by J.J. Smith, who proposed eight species. The type specimen of the section is *Dendrobium pedicellatum* J.J.Sm. In the field, Sect. *Calcarifera* is distinguished by the stems often short and lateral culminates pendent racemes on newer and older leafless stems, and the pedicel is inserted at a right angle to the long spur-like mentum instead of pressing against it as in Sect. *Pedilonum*.

This new species is named for His Royal Highness Sultan of Terengganu, Tuanku Mizan Zainal Abidin. His Highness has given much commitment and accomplishment towards conserving and maintaining Kenyir Lake (an artificial lake surrounded by hectares of a dipterocarp forest located in the Hulu Terengganu, Terengganu) as a designated forest reserve to attract local and foreign nature admirer. Also, for instance, the implementation of Sultan Mizan Royal Foundation, which is an innovation of the Sultan himself, representing his enthusiasm towards the development of Terengganu’s tourism, arts, culture, heritage, natural environment conservation and social well-being; and also

the initiation of Sultan Mizan Antarctic Research Foundation (YPASM), which its pivotal mission is to ensure the conservation of the polar regions, especially the Antarctic continent, for the promotion of research and conservation, and research collaboration between countries for the global well-being.

Taxonomy treatment

Dendrobium mizanii R.Go et E.E. Besi, *sp. nov.* (Figure 1 and 2)

Type:—MALAYSIA. Terengganu: Setiu. *ca.* 1,300 m, 15 June 2017, Besi *et al.* EDW004 (holotype: UPM!); MALAYSIA, Terengganu, Setiu, *ca.* 1, 300 m, 30 April 2018, Besi *et al.* EDW044 (isotype: UPM!).

Diagnosis:—This species is very identical to *D. crocatum* Hook.f., a widely distributed species in Malaysia and Thailand, by having the plant almost similar morphologically with the stems slender, green-purplish, leaves lanceolate, flowers spreading with tip reflexed, and lip widely canaliculate but it clearly differs from the latter by having the lip 3-lobed, blade almost in the same length as the column (in natural position), midlobe widely rounded with apex decurved (curved downwards) and margin copiously undulate and crenate; mentum slightly bent downward; and roots distinctly thicker about 3 mm wide, white and covered with *velamen*. It shares similarities with *D. doloisumbinii* J.J. Wood on its stems up to 40 cm long, lip yellowish-green in with reddish-purple speckles and the midlobe apex wide, slightly decurved, but it differs by having the flower (less than 4 cm long) smaller, mentum (less than 2.5 cm long) shorter, and the lip distinctly 3-lobed with the apex copiously undulate. The *D. doloisumbinii* is also having blade much longer in length than the column (in natural position), similar to that observed in *D. crocatum* and other species in Sect. *Calcarifera*, including *D. subflavidum* Ridl. and *D. lankaviense* Ridl.. A detailed comparison between *D. mizanii* and *D. doloisumbinii* is provided in Table 1.

Description:—Plants epiphytic and terrestrial. Roots 3 mm thick, white, completely enveloped by *velamen*. Stems up to 35–45 cm long, *ca.* 0.5 cm wide, leafy at the distal portion; internodes 2.3–4 cm long. Leaves 7.4–10 × 1.6–2 cm, about 2 cm apart, lanceolate, apex oblique, acute. Racemes hanging, borne from the upper nodes of both leafy and leafless stems, 2 to 3-flowered. Flowers *ca.* 3.8 × 3.5 cm, not scented, yellowish-green in general with petals and sepals almost entirely white, petals and sepals with a prominent median vein; lip yellowish-green in general with reddish-purple speckles; petals and sepals spreading and slightly reflexed after two days blooming period. Flower buds narrowly spathulate with base slightly decurved (curved downwards). Mentum *ca.* 2.1 cm long, whitish to yellowish green at the apex, widely conical, laterally compressed, gradually tapering towards apex; apex obtuse, slightly decurved. Pedicel-with-ovary *ca.* 1.6 cm long, narrowly clavate. Dorsal sepal 1.5 × 0.8 cm, oblong to ovate, acute. Lateral sepals 2.7 × 0.8 cm, spathulate, ovate apically, acute, margin entire; free portion ovate, acute, 1 cm long, 0.7 cm wide at the base; unfree portion narrowly clavate 1.7 cm long, 3.5 mm wide at the base. Petals 1.5 × 0.5 cm, oblong to obovate, apex widely acute, margin entire. Lip yellowish-green with flushed darker yellowish at the central disc, irregular-sized reddish-purple spots at the interior and along the margin of the side lobes; *ca.* 3.5 × 1 cm in natural position, 3.5 × 1.3 cm when flattened; 3-lobed, widely spathulate in general outline, firmly and widely clawed at the base; 2 cm long indistinct glabrous keel at the median part extending from the base of the claw towards the base of the midlobe; disc *ca.* 1 × 0.35 cm; midlobe *ca.* 6 mm × 9 mm when flattened, widely rounded with apex straight when at young stage and widely decurved at matured stage, very shortly bilobulate, widely cleft in the middle with a minute sinus, margin copiously undulate; side lobes 2 mm long, free, semi-circular, obliquely rounded tips, strongly raised and curved inward, margin entire to crenate at the edges with a minute sinus at the junction with the midlobe; claw *ca.* 1.5 cm long, 3 mm wide at the base (unflattened), widely canaliculate, margins erect and widely raised like a gutter with basal jointed to a rounded end, a median keel in the middle extending towards the base of the midlobe. Column *ca.* 3 cm long including stelidia and foot, greenish with tip darker yellowish, narrowly clavate, yellow entirely; apex *ca.* 1 cm long including stelidia, 5 mm wide; rostellum with triangular acute, erect, pointing tip at the base; stelidia 1 mm long, oblong with retuse tip; foot *ca.* 2 cm long, 3 mm wide at the apex, slightly tapered towards base; anther-cap *ca.* 3.7 × 3.5 mm (described from a spirit-preserved material), oblong, cucullate, entire to minutely ciliate at the basal margin, whitish yellow; pollinia 4, paired, *ca.* 2.5 × 1.1 mm, pyriform (described from a spirit-preserved material), light yellowish. Seed capsule not seen.

Etymology:—This species is named after His Majesty Sultan of Terengganu, Tuanku Mizan Zainal Abidin. To commemorate His Majesty's continuous dedications towards conservation ventures in Terengganu.

Phenology:—The flowering period under *ex-situ* acclimatization is April, June and August. The flowers show

a significant variation between the first day and the days onwards of the blooming period, where the lip apex would appear straight and the mentum straight with sharp tip in the first day, and the lip apex gradually decurved (curved downwards) and the mentum slightly wider with the apex decurved and obtuse in the following days.

Distribution and Ecology:—The earliest specimen (holotype) was found in a summit of a montane forest in Setiu, Terengganu, at about 1,300 m above sea level, and growing terrestrially at the moist humus at the base of a tree. Then, the second specimen (isotype) was collected from the same area, but growing epiphytically on a medium-sized phorophyte tree.

Additional Specimens Examined:—MALAYSIA. Terengganu: Setiu. ca. 1,300 m, 15 June 2017, Besi *et al.* ED/DOME 028 (living specimen: UPM).

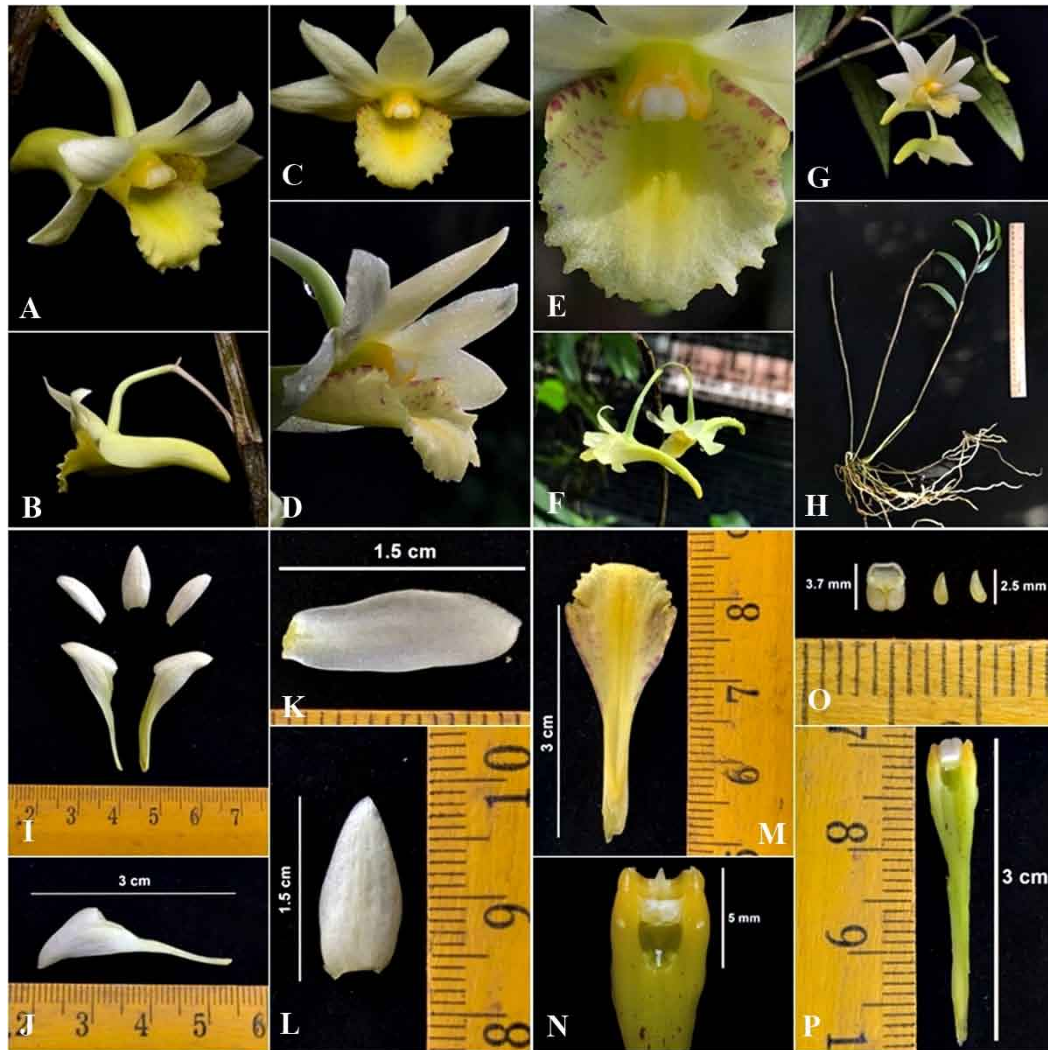


FIGURE 1. *Dendrobium mizanii*, flower's dissection. **A.** Flower, top-lateral view showing the 3-lobed lip. **B.** Flower, lateral view showing decurved and copiously undulate lip apex. **C.** Flower, front view. **D.** Flower, closed-up lateral view. **E.** Flower, closed-up front view showing yellowish green with reddish purple speckles. **F.** Flowers at young stage during the pre-bloom period. **G.** Flowers at matured stage after the pre-bloom stage. **H.** Plant. **I.** Perianth. **J.** Lateral sepal. **K.** Petal. **L.** Dorsal sepal. **M.** Lip, flattened. **N.** Column apex showing stamens and rostellum. **O.** Anther-cap and pollinia. **P.** Column showing narrow foot. Photos by DigitalDome.

Tentative key to the species of *Dendrobium* Sect. *Calcarifera* from Peninsular Malaysia with raceme 2-4 flowered; lip widely canaliculate, blade not bent and parallel to column with 1 indistinct or not raised keel at the central part extending from base of the claw towards the apex, apex slightly decurved (curved downwards); mentum long, more than 1.5 cm long; including *D. doloissumbinii* from Borneo.

- 1 Stems only up to 45 cm long2
- Stems about 60 to 70 cm long3
- 2 Lip without side lobes; midlobe shortly narrowed with apex emarginate; margin entire to minutely crenate4
- Lip with side lobes; midlobe widely rounded with apex straight when at young stage and widely decurved at matured stage, very shortly bilobulate, widely cleft in the middle with a minute incision; margin copiously undulate.....*D. mizanii*

- 3 Lip apex slightly notched; margin crenate *D. subflavidum*
 Lip apex trilobulate; margin crenate to undulate *D. crocatum*
 4 Lip apex broadly rounded, slightly notched; blade glabrous *D. lankaviense*
 Lip apex shortly narrowed, widely cleft; blade ecallose *D. doloisumbinii*

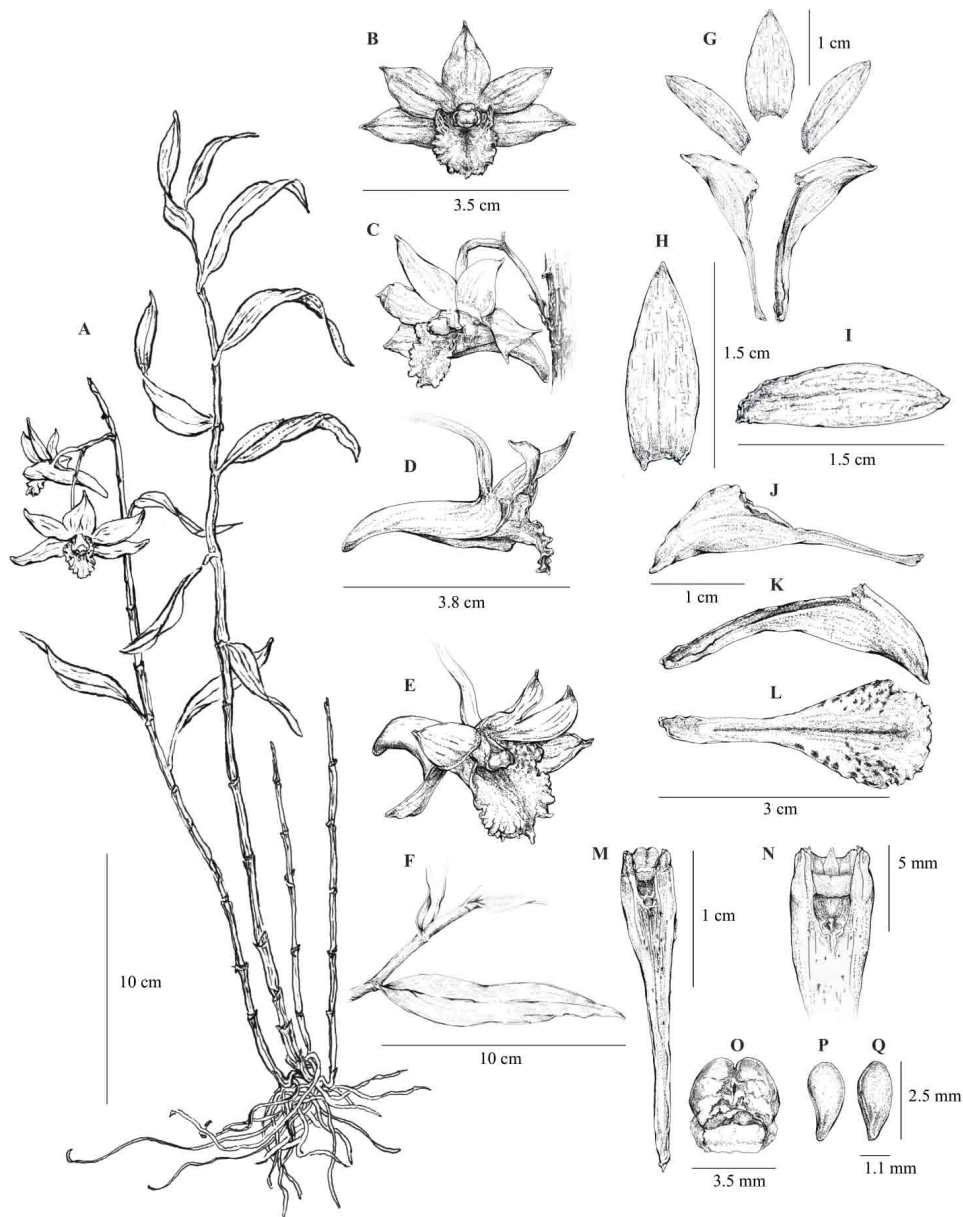


FIGURE 2. *Dendrobium mizanii*. **A.** Plant with flowers. **B.** Flower, front view. **C.** Flower, lateral view. **D.** Flower, lateral view. **E.** Flower, top-lateral view. **F.** Lanceolate leaf. **G.** Perianth. **H.** Dorsal sepal. **I.** Petal. **J-K.** Lateral sepals. **L.** Lip, flattened. **M.** Column. **N.** Column apex. **O.** Anther-cap. **P-Q.** Pollinia. Drawn by Khalid Hashim.

Proposed conservation status:—As for a preliminary view on its conservation priority, authors would suggest that this species should be classified as “critically endangered” [CR B2(a)], in accordance to the IUCN Red List Categories and Criteria version 13 (March, 2017). Until now, it has only been collected from a single locality in Peninsular Malaysia, confined to a montane forest area with a mildly disturbed environment. This mountain is renowned and actively visited by tourist and local people for hiking and other recreation activities that has projected in a drastic disturbance towards its vegetation, especially in the summit area. Therefore, the exact locality is withheld in this paper to protect the populations.

TABLE 1. Comparison on morphological characteristics between *D. mizanii* and *D. doloisumbinii*.

Characters	<i>D. mizanii</i>	<i>D. doloisumbinii</i> (Wood 2009: 31)
Stems	up to 35–45 cm long	up to 27–40 cm long
Leaves	7.4–10 × 1.6–2 cm, lanceolate, apex oblique, acute	4.3–6.7 × 1–1.5 cm, narrowly elliptic, apex oblique, subacute or acute
Flowers	3.8 × 3.5 cm, yellowish-green in general with petals and sepals almost entirely white, petals and sepals with a prominent median vein; lip yellowish-green in general with reddish-purple speckles on the inner surface below the lateral margin	4.2 × 3 cm, glossy, yellow-cream with pinkish speckles and streaks, petals and sepals with many prominent lateral veins; lip white with pink or purplish spotting on the inner surface below the lateral margins; apex purple, petals white
Mentum	<i>ca.</i> 2.1 cm long, whitish to yellowish green at the apex, laterally compressed and gradually tapering towards apex; apex obtuse, decurved (curved downwards)	3 cm long, yellowish flushed purple, narrowly conical, straight, apex sometimes slightly upcurved
Lip	3.5 cm long and 0.9 cm wide at the apex, distinctly 3-lobed with side lobes free; side lobes 2 mm long; blade with a 2 cm long indistinct glabrous keel at the median part extending from the base of the claw towards the base of the midlobe; claw <i>ca.</i> 1.5 cm long, 3 mm wide at the base (unflattened), widely canaliculate with inconspicuous median keel in the middle extending towards the base of the midlobe	3 cm long and 0.3 cm wide at the apex, entire or very obscurely distally 3-lobed; blade with a median keel (not mentioned in the description and illustrated clearly in the botanical drawing), ecallose; claw 1.4–1.5 cm long, 1.5–2.5 mm wide (unflattened), canaliculate, with a narrow, sulcate basal ridge
Column	<i>ca.</i> 3 cm long including stelidia and foot, greenish with tip darker yellowish, yellow entirely; stelidia 1 mm long, oblong with retuse tip; foot <i>ca.</i> 2 cm long	<i>ca.</i> 4 cm long including stelidia and foot (based on the botanical drawing), whitish to cream; stelidia oblong, shallowly obtusely bilobulate; foot 1.8–3 cm long
Anther-cap	3.7 × 3.5 mm, oblong, cucullate, entire to minutely ciliate at the basal margin	3 × 2.9–3 mm, oblong, cucullate, basal margin minutely ciliate

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