

A NEW SPECIES OF *BROMHEADIA* SECT. *APORODES* (ORCHIDACEAE) FROM TERENGGANU, PENINSULAR MALAYSIA

EDWARD ENTALAI BESI¹, DOME NIKONG, MUSKHAZLI MUSTAFA¹ AND RUSEA GO^{1*}

¹Department of Biology, Faculty of Science, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

*Corresponding author's email address: rusea@upm.edu.my

Abstract

A new species, *Bromheadia petuangensis* R.Go et E.E. Besi belonging to Sect. *Aporodes* is described from hill dipterocarp forest in Terengganu, Peninsular Malaysia. This species was rescued from an active logging site in Hulu Terengganu. A field taxonomic key to some species of *Bromheadia* from the Sect. *Aporodes* in Peninsular Malaysia is provided, together with description, including information on colours, distribution, habitat, ecology, and illustration of the newly discovered species.

Key words: Orchidaceae, *Bromheadia petuangensis*, Hill dipterocarp forest, Malaysia, Field key.

Introduction

A new *Bromheadia* species was rescued and collected from a fallen tree in one of the active logging sites by an avid nature conservationist and activist Mr. Dome with the UPM Orchid Research team. This collaboration was initiated as a conservation effort that is aimed to rescue as much orchids from the depleted forests to be nurtured *ex-situ* in a managed conservatory. The genus *Bromheadia* was established by Lindley in 1841 based upon *Grammatophyllum finlaysonianum* in 1833 (Comber, 2001). The genus was named after Sir Edward French Bromhead, whose studies of the natural affinities of plants are well known to systematic Botanists (Kruizinga *et al.*, 1997). The genus *Bromheadia* was later defined into sections *Bromheadia* and *Aporodes* by Schlechter (1914: 367) based on their vegetative dissimilarity. They are easily comparable by the shape of the leaves; Sect. *Bromheadia* has leaves dorsiventrally flattened, tip bilobed, blade more or less narrowed at the base; and Sect. *Aporodes* has leaves laterally flattened, tip acute, blade not narrowed at the base. The two groups are placed together in one genus of *Bromheadia*, in spite of the differences in habit, because of the presence of unique two lateral rostellar flaps, which meet over the viscidium covering the upper margin of the stigma.

The new species described in this paper is belongs to Sect. *Aporodes*. In *Bromheadia* sect. *Aporodes*, the dimensions of the leaf, the leaf index, and the relative length of the upper stem internode compared with the lower part of the stem, offer the diagnostic characters (Kruizinga *et al.*, 1997). The new species differs distinctively in plant and flower sizes if compared to other species of the same section. Its small and tufted habit had provided initial possible new entity to justify it as a new species to science. There are 31 species of *Bromheadia* listed in World Checklist of Selected Plant Families (WCSP) with 20 species are belonging to Sect. *Aporodes* (WCSP, 2018, June), excluding one species insufficiently known due to all known specimens were destroyed during the second world war, but it was stated to be related to *B. aporoides* and *B. falcifolia* (in Kruizinga *et al.*, 1997) and 12 species are found in Peninsular Malaysia with seven species from Sect. *Aporodes* (Ong *et al.*, 2017).

Material and Methods

The young plants without flowers were collected from a logging site in Petuang, Hulu Terengganu, Terengganu in February 2017 and transplanted into the *ex-situ* conservatory in Setiu, Terengganu, as living collections, where they were further nurtured into identifiable samples within six months. The specimens were preserved using standard herbarium technique after Bridson & Forman (2000). The flowering specimens were preserved in Copenhagen Mixture (70% alcohol, 29% water, 1% glycerol) and labeled. Both preserved and fresh flower specimens were dissected, measured, described, and photos were taken for each of the significant part to assist the botanical drawing. Reliable references such as Chan *et al.* (1994), Comber (1990, 2001), Seidenfaden & Wood (1992), Wood (1997, 2003) and Wood & Cribb (1994), and online databases such as National Herbarium of the Netherlands (2017, July), Swiss Orchid Foundation (2018, June) and WCSP (2018, June) were used in the identification process. Also, expert consultations were sought to make positive identification and evaluation.

Taxonomic Treatment

Bromheadia petuangensis R.Go et E.E. Besi sp. nov.
Figs. 1 and 2

Diagnostic Characters. This species shares similarities with *Bromheadia humilis* Kruijz. & de Vogel, an endemic species to Sabah, by having the tufted habit and short height (only up to 10 cm tall), stems entirely covered by leaf sheaths, basal part terete, top part laterally compressed; and the leaves stiff, curved away from the stem. It differs from the latter by having the leaves 2-3 on one side of the stem; leaves less coriaceous, fewer, narrower, and thinner; and smaller size of the flowers, flower purely white with lip almost glabrous and the side lobes with free narrowly acute forwards pointing tips. A detailed comparison is shown in Table 1. Also, this new species and *B. humilis* are different from the commonly found *Bromheadia* species in Malaysia, *B. scirpoidea*, because of its small size and shorter sterile bracts at the base of the inflorescence.

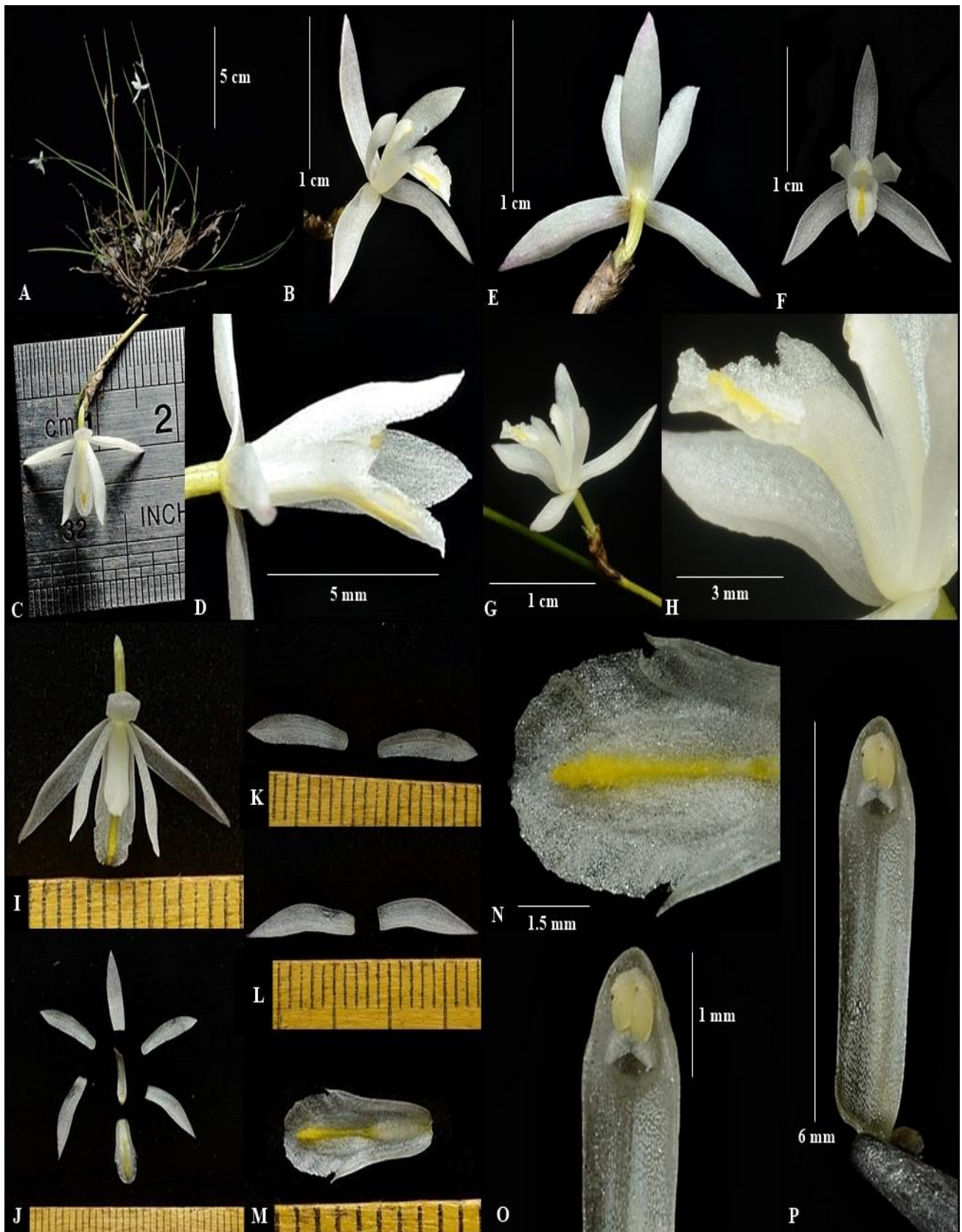


Fig. 1. *Bromheadia petuangensis*, flower's dissection. **A.** Plant with flowers; **B.** Left angle view (lateral) of the flower; **C.** Size of the flower; **D.** Lateral view of the flower showing 3-lobed lip; **E.** Back view of the flower; **F.** Front view of the flower; **G.** Right angle view (lateral) of the flower; **H.** Close-up view of the flower showing the 3-lobed lip with yellow hairy callus; **I.** Top view of the flower; **J.** Size of the sepals, petals, column, and lip; **K.** Size of the petals; **L.** Size of the lateral sepals; **M.** Size of the flattened lip; **N.** Top view of the lip showing oblong to orbicular side lobes with free narrowly acute forwards pointing tips; **O.** Apex of the column showing the exposed pollinia and rostellar flaps at the upper margin of the stigma covering the rostellum and viscidium; **P.** Size of the column. Photos by DigitalDome.

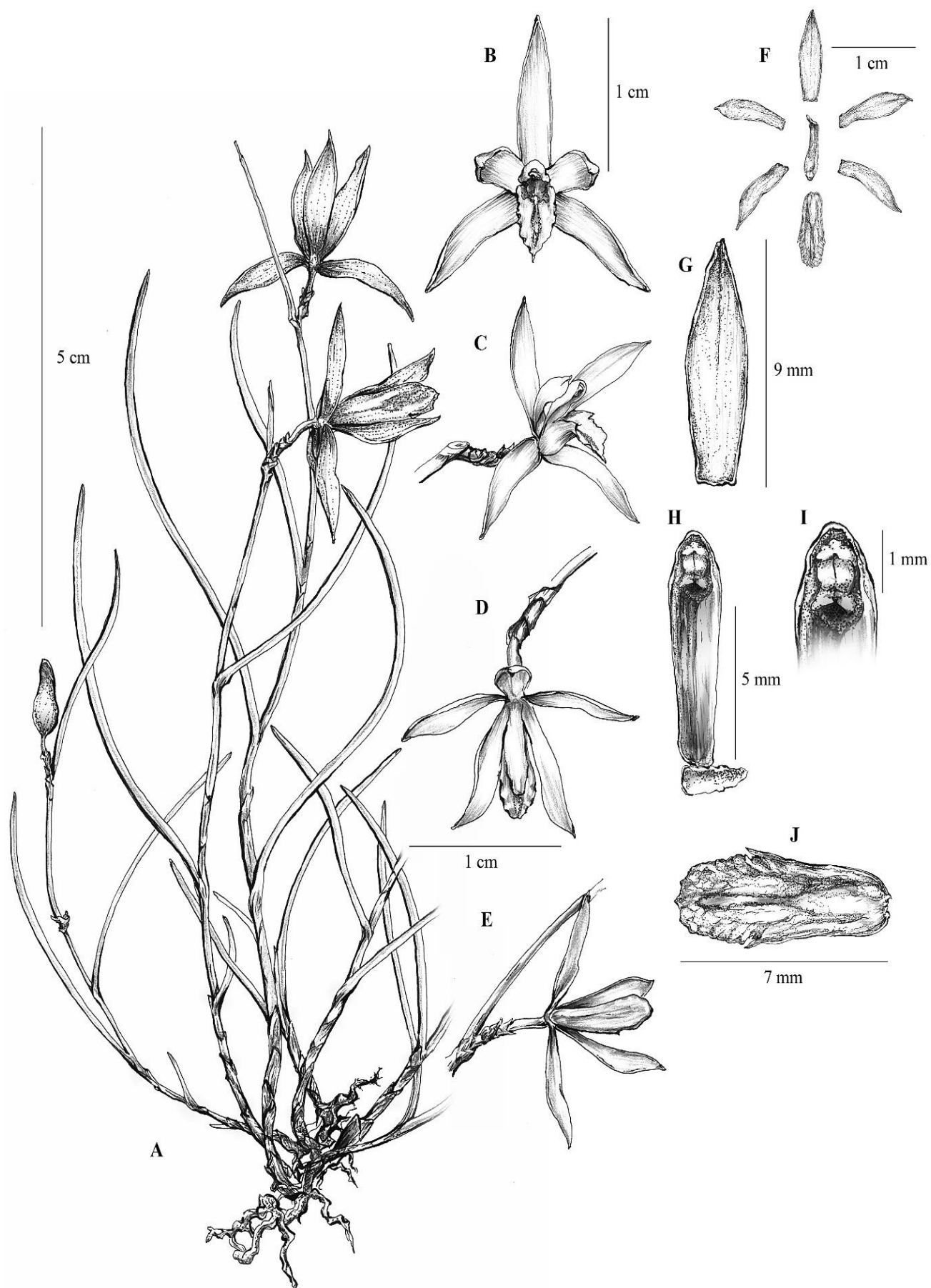


Fig. 2. *Bromheadia petuangensis*. A. Plant with flowers; B. Flower, front view; C. Flower, lateral view; D. Flower, top view; E. Flower, bottom view; F. Sepals, petals, lip, and column; G. Dorsal sepal; H. Column showing a semi-orbicular auricle at the base; I. Column apex; J. Lip. Drawn by Khalid Hashim.

Table 1. Comparison on distinctive morphological features between *B. petuangensis* and *B. humilis*

Morphological characters	<i>B. petuangensis</i>	<i>B. humilis</i>
Leaves	2-3 on one side of a stem, more flexible, less coriaceous, 4-6 cm x 0.1-1.5 cm Smaller, ca 0.8 cm x 1.5 cm in natural position, purely white with lip interior almost glabrous except the central part with yellow callus; callus with scattered hairs; side lobes erect in natural position with free narrowly acute forwards pointing tips, without purple on the front edges; midlobe edges curved	3-6 on one side of a stem, rigid, soft to hard coriaceous, 3.2-4.9 cm x 1.7-2.1 mm Bigger, ca 1.2 cm long, greenish-yellow with lip interior pubescent; side lobes erect, triangular acute without free acute pointing tips and on front edges purple; callus with scattered hairs; midlobe edges
Flower	position, apex slightly emarginate and distinctly apiculate. Column ca 6 mm x ca 1.5 mm, white, slightly transparent, slender, slightly canaliculate, porrect, parallel to the lip blade, top margin laterally on both sides with a more or less triangular rostellar flaps which is bent to cover the median part of the top rim; apex ca 1 mm x 1 mm, covering the back of the anther, obtuse, broad triangular wings; base with a semi-orbicular auricle; anther-cap (not removed for further observation during the dissection); pollinia 2, ovoid, exposed (not removed for further observation during the dissection). Seed capsule not seen.	

Type. Malaysia, Terengganu, Hulu Terengganu, Petuang, 24 February 2017, Besi *et al.* TK119 (UPM, holotype).

Description. Epiphytic, densely tufted, 8-10 cm tall plant. Stems short, ca 2-6 cm long, slender, slightly flattened, entirely covered with distichous brownish-grey sheaths, slightly bulky, tapering towards base, rigid, often tufted, ca 1 mm thick. Leaves 2-3 on a stem, ca 4-6 cm x 0.1-0.15 cm, acicular, linear, sharply pointed, straight to slightly curved, laterally flattened, very flexible. Raceme successively single-flowered arises at the base of the uppermost leaf. Flower solitary, ca 0.8 cm x 1.5 cm in natural position, white with yellow central callus, faintly fragrant. Flower bud lanceolate. Pedicel-with-ovary 6 mm long, greenish, narrowly clavate with ridges, base enveloped by short and overlapping thin, short and close brownish-grey floral bracts. Sepals and petals spreading but not widely, margin subentire, free. Dorsal sepal ca 9 mm long, ca 4 mm wide at the middle part, lanceolate-ovate, apex narrowly acute, base truncate. Lateral sepals ca 8 mm long, 3 mm wide at the base, oblong-falcate, apex narrowly acute, base truncate. Petals ca 9 mm, 1.5 mm wide at the base, oblanceolate, apex broadly acuminate, base rounded. Lip 3-lobed, widely canaliculate in natural position, when flattened ca 8 mm x ca 4 mm, oblong-cuneate in general outline, claw at the base ca 4 mm long, base truncate, yellow central callus extending from base of the mesochile towards the midlobe apex; callus papillose, ca 4 mm long, narrowly panduriform in general outline, distinctly elevated in the epichile and base of the mesochile, apex ensiform, base hastate; side lobes erect in natural position with free narrowly acute forwards pointing tips, ca 0.5 mm long; midlobe ca 2.5 mm x 3.5 mm, oblong to orbicular when flattened, margin crenate to undulate, slightly decurved (curved downwards), acuminate and edges curved in natural

position, apex slightly emarginate and distinctly apiculate. Column ca 6 mm x ca 1.5 mm, white, slightly transparent, slender, slightly canaliculate, porrect, parallel to the lip blade, top margin laterally on both sides with a more or less triangular rostellar flaps which is bent to cover the median part of the top rim; apex ca 1 mm x 1 mm, covering the back of the anther, obtuse, broad triangular wings; base with a semi-orbicular auricle; anther-cap (not removed for further observation during the dissection); pollinia 2, ovoid, exposed (not removed for further observation during the dissection). Seed capsule not seen.

Etymology. The new species is named after the type locality, a logging site in Petuang, Hulu Terengganu, Terengganu, Malaysia.

Phenology. It blooms frequently between February, May and June. Flowers ephemeral. However, this species is very fragile and easily damaged due to the unfavourable and slight changes in ecological conditions.

Distribution and Ecology. It was first collected from a logged hill dipterocarp forest (251 m a.s.l.) in Petuang, Terengganu and threatened by habitat loss due to the on-going forest destruction in the region. The microclimate temperature is extreme within 31°C to 34°C with humidity is at 67%. It has been also recorded growing on trees in a lower montane forest (893 m a.s.l.) in Mount Sarut, Setiu, Terengganu.

Additional Specimens Examined. Malaysia, Terengganu, Hulu Terengganu, Petuang, 24 February 2017, Besi *et al.*, ED/DOME 029, (Living Specimen). It is currently cultivated in an *ex-situ* conservatory under a very low sunlight exposure, mounted on a piece of tree bark, and watered twice a day.

Tentative key to the species of *Bromheadia* of Sect. *Aporodes*, with the stem less than 3 mm wide, completely covered by leaf sheaths, tufted, generally shorter than 20 cm long; leaves laterally flattened, more or less acicular, sharply pointing tips, curved away from the stem.

1. Leaves 3 to 6 on each side of the stem, hardly recurved 2
 Leaves 2 or 3 on each side of the stem, often strongly recurved 3
2. Interior lip pubescent with callus extending from base of mesochile to epichile *B. humilis*
 Interior lip almost glabrous with callus partly on mesochile and slightly swollen on the epichile *B. gracilis*
3. Flower larger, c. 1.7 x 2 cm when spreading; lip pubescent, purple spotted on side lobes and midlobe; side lobes triangular without free erect projecting tips *B. scirpoidea*
 Flower distinctly smaller, ca 0.8 cm x 1.5 cm when spreading; lip almost glabrous without purple spotted; side lobes triangular with distinct free erect projecting tips *B. petuangensis*

Acknowledgements

The authors would like to extend appreciation to the Forest Department Peninsular Malaysia and Department of Wildlife and National Parks Peninsular Malaysia for granting us an access to the studied areas, and to the UPM- KRIBB (Korea Research Institute of Bioscience and Biotechnology) Vot. 6384300 and Universiti Putra Malaysia for the research funding (Putra Grant No. 9413603), and Yayasan Biasiswa Tunku Abdul Rahman scheme for sponsoring this Master of Science degree undertaking. The authors are also very thankful to the staffs and friends in the department for their supports and contributions, with special thanks to Mohamad Alias Shakri, Sohud Yaakob, Muhamad Ikhwanuddin Mat Esa, Micheal Charles Rajaram, and Vaniellie Terrence Justine for their invaluable assistance throughout this project.

References

- Bridson, D. and L. Forman. 2000. *The herbarium handbook, 3rd edition*. Royal Botanic Gardens Kew. 348 pp.
- Chan, C.L., A. Lamb, P.S. Shim and J.J. Wood. 1994. *Orchids of Borneo, Vol. 1: Introduction and a selection of species*. The Sabah Society, Kota Kinabalu, Malaysia, in association with Royal Botanic Gardens, Kew, United Kingdom. 402 pp.
- Comber, J.B. 1990. *Orchids of Java*. Kew: Bentham-Moxon Trust, Royal Botanic Gardens, Kew 407p.-col. illus.. ISBN, 947643214.
- Comber, J.B. 2001. *Orchids of Sumatra*. Malaysia: Natural History Publications (Borneo) Sdn. Bhd. 1026 pp.
- Kruizinga, J., H.J. van Scheidelen and E.F. de Vogel. 1997. Revision of the genus *Bromheadia* (Orchidaceae). *Orchid Monographs*, 8(1): 79-118.
- National Herbarium of the Netherlands (NHN) (2017, July). Retrieved from Browse Dutch Natural History Collections: BioPortal (Naturalis) at <http://bioportal.naturalis.nl/>, [accessed on July 11, 2017].
- Ong, P.T., P. O'Bryne, L.G. Saw and R.C.K. Chung. 2017. *Checklist of Orchids of Peninsular Malaysia*. Research Pamphlet. No. 136.
- Schlechter, R. 1914. Die Orchidaceen von Deutsch Neu-Guinea. In: Fedde, Rep., Beih. 1: 367.
- Seidenfaden, G. and J.J. Wood. 1992. *The Orchids of Peninsular Malaysia and Singapore*. London: The Royal Botanic Garden.
- Swiss Orchid Foundation at the Herbarium Jany Renz. 2018, June. *Bromheadia humilis* Krui. & de Vogel. Accessed at <https://orchid.unibas.ch/index.php/en/database-search/advanced-search>.
- WCSP. 2018, June. World Checklist of Selected Plant Families. Facilitated by the Royal Botanic Gardens, KEW. Accessed at <http://apps.kew.org/wcsp/home>.
- Wood, J.J. 1997. *Orchids of Borneo. Volume 3: Dendrobium, Dendrochilum and others*. Bentham-Moxon Trust.
- Wood, J.J. 2003. *Orchids of Borneo. Vol. 4*. Kota Kinabalu, Sabaha: The Sabah Society, in association with Royal Botanic Gardens, Kew xii, 314p.-illus., col. illus.. ISBN, 1090060183.
- Wood, J.J. and P.J. Cribb. 1994. *A check-list of the orchids of Borneo*. Royal Botanic Gardens, Kew (KRBG).

(Received for publication 8 July 2018)