

NEW RECORDS FOR ORCHIDS IN TERENGGANU AND KELANTAN, MALAYSIA

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Abstract: The rampant logging concessions and their aftermath floods that occurred in tropical forests of Peninsular Malaysia have greatly altered the integrity of the wild orchid habitats and their species diversity. Undoing orchid's local extinction in Terengganu and Kelantan is always presented as the topmost conservation priority. Our botanical rescue mission was important to evaluate the diversity of this 'jewels of rainforest' in the disturbed forests by aiming the field collections more to saving the epiphytic orchids on fallen trees in logging sites. A total of 73 orchid species were reported as new records to Terengganu and four species are new records to Kelantan, including nine rare and eight endemic species. The results infer many orchids might have gone to extinction without being recorded owing to the years of unsustainable forest cutting in Terengganu and Kelantan. A brief checklist on the newly recorded orchid species, including information on the important attributes, were included.

Keywords: Orchid, disturbed forest, new record, Kelantan, Terengganu

Introduction

Over many years, the botanical collections of wild orchids have been prioritized towards their urgent need of conservation upon saving them from extinction. Forest clearance for timber extraction and other forms of agricultural and infrastructure developments have been seen as the main threats to their population in the wild. A great number of them may have gone extinct even before they are being discovered and botanised. In the past, collective records of Malaysian orchid species have been recorded by many foreign botanists, including R. E Holttum, H. N. Ridley, J.J. Smith, J. J. Vermeulen, I. M. Turner, G. Seidenfaden and J. J. Wood. Several studies on the orchid diversity covering all elevation gradients in Peninsular Malaysia have included Malaysian conservationist themselves are Yong *et al.* (2005), Go & Hamzah (2008), Go *et al.* (2010, 2011, 2014), Kiew *et al.* (2010), Ng *et al.* (2012). The latest documentation was by Ong *et al.* (2017). Overall, Orchidaceae is the most abundant flowering plant family in Peninsular Malaysia. To date, 245 orchid species of Terengganu and 223 orchid species of Kelantan have been listed according to the inventories provided by the Singapore Herbarium (SING) (2018, January), Swiss Orchid Foundation (2017, July), National Herbarium of the Netherlands (NHN) (2017, July), Turner (1995), Jaafar *et al.* (2007), and Md Isa *et al.* (2015). It is anticipated that there are more orchid species in the Terengganu and Kelantan's vast rainforest areas yet to be discovered. The forests harbour a variety of flora and fauna and can be viewed at a forest trail. The verdant rainforest with lush tropical climate provides great possibilities for new species discoveries.

The book *Wild Orchids of Terengganu: Jewel of the Rainforest* by Jaafar *et al.* (2007) is the first preliminary effort compiled by the local conservationist to record the diversity of orchid species in Terengganu. The book showcases the new and endemic species to Terengganu discovered in January 2005 such as *Dendrobium terengganuensis*, which has been decisively proposed as a critically endangered species due to its limited area of distribution. The book has also advertised the more vivid variations of several rare species, including the rare specimens of old species recorded in the older works of literatures such as *Bulbophyllum restrepia*, *Galeola nudifolia* and a *B. membranifolium* subsp. *membranifolium* with striking flower's variations found in a land illegally cleared for gold mining (Jaafar *et al.*, 2007).

This paper comprises a brief note on several doubtful records with wrong identification listed in the book, in turn to justify the precise number of wild orchids recorded for Terengganu. Nevertheless, an important message to be addressed here is that the disturbed localities where these species were found have put them under imminent threat. This would lead to their extinction if no proper conservation actions are being taken. Years of irresponsible forest exploitations in Terengganu and Kelantan have destroyed and extremely degraded many of the orchid habitats. The orchid's habitats were isolated into fragments which indirectly affecting the moisture and nutrient availabilities, distribution patterns and pollination occurrence. The logging caused soil erosion when trees and leaf litter are being removed and nutrients in the topsoil are washed away. The stresses caused by logging-induced disturbance gradually reduced the area for both epiphytic and terrestrial orchid's colonization and eventually can lead to their local extinction. Hence, this report on newly recorded orchid species is aimed to elucidate the diversity of orchids in the disturbed forests of Terengganu and Kelantan regions in relation to climate changes and their conservation priorities upon drafting their future conservation framework.

Materials and Methods

Botanical rescue missions within Terengganu and Kelantan were done from November 2016 until May 2018. The convenience sampling involved choosing the known existence of disturbed forests in Terengganu and Kelantan, and accessibility. This includes three logging sites located in Gawi and Petuang areas adjacent to Kenyir Lake, Hulu Terengganu, Terengganu and two accessible flood-disturbed secondary forests (DSFs) located in Kuala Koh and Tanah Merah, Kelantan. Also, incorporated in this report are the orchid specimens from earlier botanical collections by Dome prior to his conservation endeavour rescuing orchids at risk in the logging sites and other unspecified disturbed forests within the Terengganu region.

All plants collected were rescued to ex-situ conservatory and cultivated for their identification and phenological study. Herbarium specimens were processed according to the standard preparation techniques outlined in Bridson and Forman (2000). The specimens were deposited in the Herbarium of Universiti Putra Malaysia (UPM). Living specimens were collected following a guideline per modified in Go *et al.* (2010, 2011, 2014, 2015b), Ng *et al.* (2012), and Yong *et al.* (2005). Photographic records were also compiled prior to identification. Reliable references were used in the identification and classification processes, such as Wood (1997, 2003, 2008, 2009, 2014), Seidenfaden and Wood (1992), Chan *et al.* (1994), Wood and Cribb (1994), Turner (1995), Kruizinga *et al.* (1997), Comber (2001), Go and Tang (2007), Ong *et al.* (2017), Ng *et al.* (2012) and O'byrne *et al.* (2018). We studied illustrations from various published works of literature to differentiate between the subspecies or variety of a certain species. The accepted

names of the orchids were validated through KEW World Checklist of Selected Plant Families (WCSP) (2018, January). The expert consultations were sought in order to make an accurate identification.

The information on the current distribution status of each species was retrieved from the published checklists by Wood and Cribb (1994), Turner (1995), Jaafar *et al.* (2007), Md Isa *et al.* (2015), Ong *et al.* (2017) and also compared to the published herbarium collections in the online international databases, including WCSP (2018, January), National Herbarium of the Netherlands (NHN) accessed through Browse Dutch Natural History Collections: BioPortal (Naturalis) (2017, July), Herbarium of Singapore Botanic Gardens (SING) accessed through BRAHMS Online managed by University of Oxford (2018, January), Swiss Orchid Foundation (2017, January), Kew Herbarium Catalogue (2019, January), and Natural History Museum Specimen Collection (2019, April). A visit to the Herbarium of Forest Research Institute Malaysia (KEP) was also made possible.

Results and Discussion

A total of 109 orchid species was recorded from the disturbed forests in Kelantan and Terengganu, belonging to 39 genera. Of these, 38 species are new records to Terengganu and four species are new records to Kelantan. Two hundred and eighty species found and rescued by Dome from the disturbed forests in the Terengganu region are incorporated in this report. Conclusively, 73 species are new records to Terengganu and thus, this has increased the total of orchid species recorded for Terengganu to 318 species in 92 genera. Meanwhile, the recorded orchid species for Kelantan has increased to 227 species in 79 genera. Likewise, this makes a total of nine orchid species rescued from the disturbed forests in Terengganu are rare and eight species are endemic with one species is endemic to Malaysia and eight species are endemic to Peninsular Malaysia; and of which 68 species are epiphytic, 14 species are terrestrial, one species are terrestrial or lithophytic and only one species is myco-heterotroph.

Almost all the epiphytic orchids found were collected from the fallen trees in the logged forests of the Kenyir Lake area. The fallen trees were enriched by a high diversity of orchid species where some are endemic and rare, and a great abundance of them are listed as new records, and importantly a few are potentially new species to science. The most interesting part is the discovery of nine possible new species to science with three species are published in 2018: *Dendrobium ainiae* R.Go *et* E.E. Besi (Besi *et al.*, 2018a), *Dendrobium ruseae* R.Go *et* E.E. Besi (Besi *et al.*, 2018a) and *Dendrobium mizanii* R.Go *et* E.E. Besi (Besi *et al.*, 2018b). Also, a small number of the terrestrial orchids were also found in the forest ridges or forest remnant with tree canopy in the logging sites. The currently on-going clear-cut logging activities in the Terengganu and Kelantan regions might have rapidly destroyed a great number of orchid species, both epiphyte and terrestrial, and a high number of them could be unknown species and could have died without being botanized and further described. The microclimate temperature in the logging sites is much extreme within 31°C to 34°C, in comparison to the local climate's, in which the lowest is at 23.2°C and the highest is at 30.9°C. The average rainfall recorded in the current study was between 125.6-414.9mm (Malaysian Meteorology Department, 2016, 2017). Prolonged exposure to the severe heat and dryness in the opened canopy forests has speeded up their degradation in the wild.

Checklist of Orchids New Record the Disturbed Forests of Terengganu

In this checklist, listed are the newly recorded orchid species to Terengganu, which were largely collected from the logged forests, including a brief information on their growth habit, habitat, current distribution status and significant notes on their flowers' variation or distinguishable morphological characters of each variety or subspecies. The specific information on distribution in Peninsular Malaysia of each species is not being included prior to the need to protect the wild populations from illegal commercial collectors. Some of the newly recorded species are shown in Figure 1 and Figure 2.

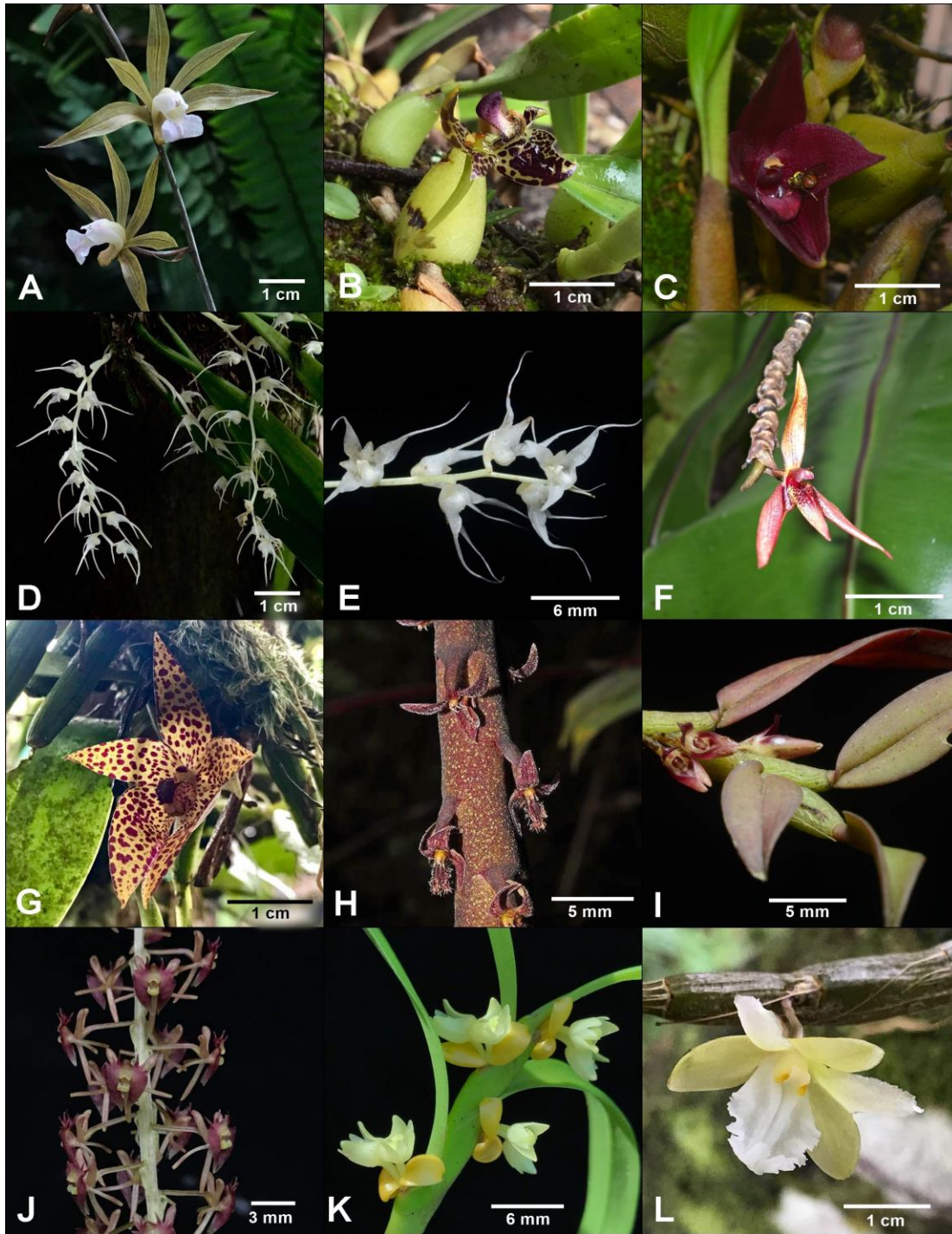


Figure 1 : Newly recorded orchid species found in the disturbed forests of Terengganu: **A**, *Ania penangiana*; **B**, *Bulbophyllum ecornutum* subsp. *ecornutum*; **C**, *Bulbophyllum elevatopunctatum*; **D**, *Bulbophyllum korthalsii*; **E**, *Bulbophyllum leptosepalum*; **F**, *Bulbophyllum lumbriciforme*; **G**, *Bulbophyllum sanguineomaculatum*; **H**, *Bulbophyllum setuliferum*; **I**, *Bulbophyllum tortuosum*; **J**, *Crepidium micranthum*; **K**, *Cylindrolobus biflorus*; **L**, *Dendrobium derryi*. Photos by DigitalDome.

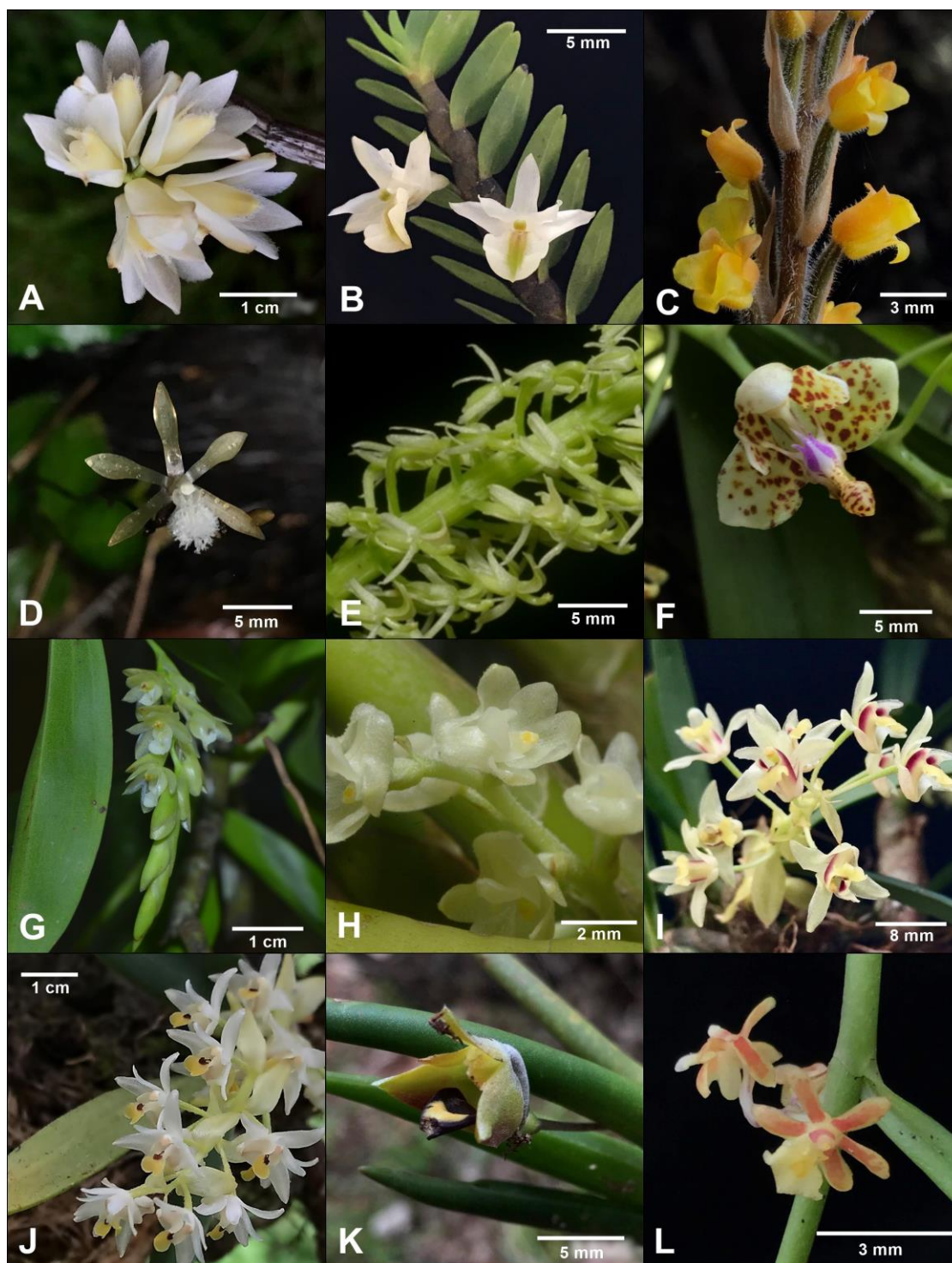


Figure 2 : Newly recorded orchid species found in the disturbed forests of Terengganu: **A**, *Dendrobium stuposum*; **B**, *Dendrobium x pahangense*; **C**, *Hetaeria alta*; **D**, *Lecanorchis multiflora*; **E**, *Liparis viridiflora*; **F**, *Macropodanthus alatus*; **G**, *Pholidota articulata*; **H**, *Pinalia bicristata*; **I**, *Pinalia clavata*; **J**, *Pinalia maingayi*; **K**, *Strongyleria pannea*; **L**, *Trichoglottis lanceolaria*. Photos by DigitalDome.

1. *Adenoccos vesiculosa* Carr, Gard. Bull. Straits Settlem. 7: 37 (1932)
General distribution: Indo-China to Peninsular Malaysia; Distribution in Peninsular Malaysia: Common in lowland forest in Pahang and Selangor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK056), 21/04/2017 (UPM).
2. *Agrostophyllum glumaceum* Hook.f., Fl. Brit. India 5: 824 (1890)
General distribution: Distributed in Sumatra, Philippines and Borneo; Distribution in Peninsular Malaysia: Not uncommon in lowland and mountains in Perak and Selangor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK032), 21/04/2017 (UPM).
3. *Agrostophyllum stipulatum* subsp. *bicuspidatum* (J.J.Sm.) Schuit., Orchid Monogr. 8: 14 (1997)
General distribution: Distributed in Java, Sumatra, Sulawesi, Singapore and Borneo; Distribution in Peninsular Malaysia: Not uncommon in lowland and montane forests in Kedah, Penang and Selangor; **Notes:** This species is very difficult to be distinguished from *A. stipulatum* subsp. *stipulatum* based on its vegetative structures alone, however, the latter can be easily identified by having semi-circular pale purplish stolid on the column part, raised obliquely on both sides of the rostellum (Seidenfaden & Wood, 1992; Go *et al.*, 2015a); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK112), 19/06/2017 (UPM).
4. *Agrostophyllum stipulatum* (Griff.) Schltr. subsp. *stipulatum*, Repert. Spec. Nov. Regni Veg. Beih. 1: 279 (1912)
General distribution: Distributed in Java, Myanmar, Philippine, Singapore, Sumatra, Sulawesi, Thailand and Borneo (Kalimantan); Distribution in Peninsular Malaysia: Common in lowland and montane forests in Kedah, Kelantan and Penang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK040), 21/04/2017 (UPM).
5. *Ania penangiana* (Hook.f.) Summerh., Bot. Mag. 161: t. 9553 (1939)
General distribution: Widespread worldwide from East India to Taiwan and New Guinea, including Thailand; Distribution in Peninsular Malaysia: Uncommon in grassy places in the hills, and montane forest in Penang, Perak and Kedah; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Wetland Bris Forest, Terrestrial, grow on dune-originated soil at *ca.* 10 m a.s.l., Besi *et al.* (EDW021), 01/04/2018 (UPM).
6. *Appendicula uncata* Ridl. subsp. *uncata*, J. Linn. Soc., Bot. 32: 390 (1896)
General distribution: Endemic to Peninsular Malaysia; Distribution in Peninsular Malaysia: Commonly found in lowland forest; **Notes:** The flower of *A. uncata* looks very similar to *A. cornuta*, except the stem longer and leaves well-spaced and narrowly lanceolate with almost pointed notched apices. *A. uncata* subsp. *sarawakensis* J.J.Wood differs from *A. uncata* subsp. *uncata* in having shorter stems (about 26 cm), smaller leaves and flowers with shorter tepals and a narrower lip (Wood, 1984); **Specimen examined:** PENINSULAR MALAYSIA,

TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK017), 08/11/2016 (UPM).

7. *Bulbophyllum biseriale* Carr, Gard. Bull. Straits Settlem. 5: 131 (1930)

General distribution: Distributed in Peninsular Thailand to Peninsular Malaysia, and Borneo; Distribution in Peninsular Malaysia: Not uncommon in riverside montane forests in Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK118), 19/06/2017 (UPM).

8. *Bulbophyllum caudatisepalum* Ames & C.Schweinf., Orchidaceae 6: 166 (1920)

General distribution: Distributed in West Malesia, including Borneo recorded from Sabah and Sarawak; Distribution in Peninsular Malaysia: Found in lower to montane forest, including Pahang; **Notes:** This species is differentiated from *B. flavescens* by having prominent large basal sheaths envelops the pseudobulbs, the leaves, and inflorescences (Comber, 2001); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK038), 21/04/2017 (UPM).

9. *Bulbophyllum cleistogamum* Ridl., J. Linn. Soc., Bot. 31: 277 (1896)

General distribution: Widespread worldwide in West and Central Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Rarely found in the wild in podsol forest, lowland to montane forest in Johor, Kedah, Pahang, Perak and Selangor; **Notes:** The important key to distinguish this species from another two species in Section *Intervallatae* found in Peninsular Malaysia, *B. lumbriciforme* and *B. macrochilum*, on its pseudobulbs longer and almost cylindrical; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (ED/DOME018), 20/03/2017 (UPM).

10. *Bulbophyllum concinnum* Hook.f., Hooker's Icon. Pl. 21: t. 2038a (1890)

General distribution: Distributed in Indo-China to West Malesia, Lesser Sunda Islands (Timor), including Borneo; Distribution in Peninsular Malaysia: Not uncommon in mangrove swamp and riverine forest, including Johor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (EDW005), 01/04/2018 (UPM).

11. *Bulbophyllum ecornutum* (J.J.Sm.) J.J.Sm. **subsp. ecornutum**, Bull. Jard. Bot. Buitenzorg, sér. 2, 13: 32 (1914)

General distribution: Distributed in Java to Lesser Sunda Islands, and in Borneo recorded from Kalimantan; Distribution in Peninsular Malaysia: Rare in lowland to hill forest, the exact localities were withheld to protect the populations and only a few populations were rescued from the logging site to the ex-situ conservatory in this current study; **Notes:** This subspecies can be distinguished from the other subspecies of *B. ecornutum*; *B. ecornutum* subsp. *verrucatum* J.J.Verm., on its lip glabrous without verrucose or warty-like projection in the top half part (Vermeulen, 1991). This species has been listed in Jaafar *et al.* (2007) without a clear separation on the subspecies is provided. Moreover, this subspecies of *B. ecornutum* has also been included in the book, Wild Orchids of Peninsular Malaysia (Ong *et al.*, 2011), except their specimen

shows a slight variation in its flowers yellowish-greenish with dense purple spots, whereas our specimen has its flowers yellowish-greenish but the lateral sepals suffused purple instead of densely purple spotted; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK051, DOME002), 21/04/2017 (UPM).

12. *Bulbophyllum elevatopunctatum* J.J.Sm., Bull. Jard. Bot. Buitenzorg, sér. 3, 2: 99 (1920)
General distribution: Distributed in Thailand to West Malaysia, including Sumatra and Borneo; Distribution in Peninsular: Rare and growing in an old rubber tree trunk in Selangor and Johor; **Notes:** This species was previously differentiated from *B. vinaceum* by not having lip warty and toothed apically. Recently, the latter has been proposed as a synonym for *B. elevatopunctatum* (WCSP, 2018). This species is recorded 'rare' with a very small distribution area. It was previously only found in Thailand and Sumatra. It was also previously remarked as an endemic species to Sumatra by J.J. Smith, until it was then discovered in Malaysia and Borneo (Ong *et al.*, 2011); **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.9-119.2 m a.s.l., Besi *et al.* (TK019), 29/09/2017 (UPM).

13. *Bulbophyllum gusdorffii* J.J.Sm., Bull. Jard. Bot. Buitenzorg, sér. 2, 25: 79 (1917)
General distribution: Distributed in Philippine, Sumatra, including Borneo only known from Sabah; Distribution in Peninsular Malaysia: Not uncommon in lower montane forest in Johor, Pahang and Selangor; **Notes:** This species is recognised among the species with straight lateral sepals allied to two common species, *B. lepidum* and *B. acuminatum* from Section *Cirrhopetalum*, by having a distinctively very short bristle on the tip of its dorsal sepal; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (ED/DOME036), 12/08/2018 (UPM).

14. *Bulbophyllum korthalsii* Schltr., Repert. Spec. Nov. Regni Veg. 3: 320 (1907)
General distribution: Distributed in West Malesia, including Borneo; Distribution in Peninsular Malaysia: Not uncommon in montane and riverine forests in Kelantan and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (EDW007), 01/04/2018 (UPM).

15. *Bulbophyllum leptosepalum* Hook.f., Fl. Brit. India 5: 767 (1890)
General distribution: An endemic species to Peninsular Malaysia; Distribution in Peninsular Malaysia: Widespread in lowland to hill forest; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (ED/DOME037), 21/04/2017 (UPM).

16. *Bulbophyllum lumbriciforme* J.J.Sm., Bull. Jard. Bot. Buitenzorg, sér. 3, 2: 94 (1920)
General distribution: Distributed in Peninsular Malaysia to Sumatera; Distribution in Peninsular Malaysia: Rare and previously only recorded from montane forest in Pahang; **Notes:** A species from a small section of genus *Bulbophyllum* Section *Intervallatae*, with distinct form of inflorescence bears a succession of bracts, triangular (Seidenfaden & Wood, 1992), as in

Thrixspermum; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (EDW009), 01/04/2018 (UPM).

17. *Bulbophyllum mucronatum* (Blume) Lindl. **subsp. mucronatum**, Gen. Sp. Orchid. Pl.: 50 (1830)

General distribution: Distributed in Thailand to West and Central Malesia, including Borneo (Sarawak); Distribution in Peninsular Malaysia: Rare and only recorded from lower montane and disturbed forests in Pahang; **Notes:** It differs from another subspecies, *B. mucronatum* subsp. *alagense*, by having flowers greenish while the latter is yellowish; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Epiphytic, attached to the trees in an upper hill dipterocarp forest at ca. 800 m a.s.l., Besi *et al.* (DOME007), 07/04/2018 (UPM).

18. *Bulbophyllum sanguineomaculatum* Ridl., J. Linn. Soc., Bot. 32: 265 (1896)

General distribution: Distributed in Peninsular Malaysia to Sulawesi, including Borneo (Sabah); Distribution in Peninsular Malaysia: Rare in hill to montane forests in Pahang and Johor; **Notes:** The plant is identical to *B. membranifolium*, but it can be distinguished by the presence of dense reddish circular spots which randomly scattered on its both sepals and petals, which the spots only presence sparsely on the latter species, mostly on its dorsal sepals and lateral petals, and arranged along the veins. It was also said to have lateral sepals open instead of united as in *B. membranifolium* (anonymous), however, this key character is not persistent as our collection shows united lateral sepals; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (EDW006), 01/04/2018 (UPM).

19. *Bulbophyllum setuliferum* J.J. Verm. & Saw, Gard. Bull. Singapore 52: 289 (2000)

General distribution: Endemic to Peninsular Malaysia; Distribution in Peninsular Malaysia: Rare in montane forest; **Notes:** Vegetatively, this species is very similar to *B. concavilabium*, except the bulb is compressed-conical instead of compressed-ovoid on the rhizome. It was first found in a montane forest in Peninsular Malaysia. The plants were rescued from fallen trees in a logged hill forest in the Petuang. So far, this particular species has only been found within Peninsular Malaysia region, and this has listed *B. setuliferum* as another rare and endemic species collected from the deteriorated logged forests; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK108), 19/06/2017 (UPM).

20. *Bulbophyllum tortuosum* (Blume) Lindl., Gen. Sp. Orchid. Pl.: 50 (1830)

General distribution: Distributed in Sikkim to Papuaia, including Borneo recorded from Kalimantan and Sabah; Distribution in Peninsular Malaysia: Common in dry lowland forest and sandstone, including Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (EDW014), 01/04/2018 (UPM).

21. *Calanthe pulchra* (Blume) Lindl., Gen. Sp. Orchid. Pl.: 250 (1833)

General distribution: Distributed in Peninsular Thailand to West Malesia and Philippines, including Borneo; Distribution in Peninsular Malaysia: Common in wet forest, lowland and hill

forests, widespread including Selangor, Pahang and Perak; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Forest Fragment in a logging Site, Terrestrial, grow on soil covered by leaf litter at *ca.* 233.4 m a.s.l., Besi *et al.* (EDW023), 01/04/2018 (UPM).

22. *Calanthe triplicata* (Willemet) Ames, Philipp. J. Sci., C 2: 326 (1907)

General distribution: Distributed in Tropical and Subtropical Asia to Pacific, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Common in wet lowland and montane forest, and freshwater swamp forest, widespread, including Perak; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Wetland Bris Forest, Terrestrial, grow on dune-originated soil at *ca.* 177 m a.s.l., Besi *et al.* (EDW022), 01/04/2018 (UPM).

23. *Callostylis rigida* Blume, Bijdr. Fl. Ned. Ind.: 340 (1825)

General distribution: Distributed in Central Himalaya to China (South Yunnan) and West Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Not uncommon in heath forest, hill forest, and lower montane forest in Kedah; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 233.4 m a.s.l., Besi *et al.* (EDW017), 01/04/2018 (UPM).

24. *Ceratostylis ampullacea* Kraenzl., Bot. Jahrb. Syst. 17: 487 (1893)

General distribution: Distributed in Peninsular Thailand to West Malesia, including Borneo; Distribution in Peninsular Malaysia: Common in montane forest, widespread; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 233.4 m a.s.l., Besi *et al.* (EDW013), 01/04/2018 (UPM).

25. *Ceratostylis pendula* Hook.f., Fl. Brit. India 5: 826 (1890)

General distribution: Distributed in Java, Lesser Sunda Islands, Philippine, Sulawesi, Sumatra, Thailand and Borneo (Sabah); Distribution in Peninsular Malaysia: Common in montane forest in Perak, Pahang and Selangor; **Notes:** In the field, vegetatively, it is commonly mistaken as *B. mutabile* by having rhizome pendulous and branching covered with sheaths. However, the latter has leaves elliptic, blunt and basally abruptly narrowed to a very short petiole (Seidenfaden & Wood, 1992). The latter also having small pseudobulbs but inconspicuous and entirely covered by the sheaths; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK010), 08/11/2016 (UPM).

26. *Ceratostylis subulata* Blume, Bijdr. Fl. Ned. Ind.: 306 (1825)

General distribution: Distributed in Tropical Asia to Vanuatu, including Java, Sumatra, Thailand, and Borneo (Kalimantan and Sarawak); Distribution in Peninsular Malaysia: Widespread in lowland and montane forests, including Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK015), 08/11/2016 (UPM).

27. *Cleisostoma scortechinii* (Hook.f.) Garay, Bot. Mus. Leaf. 23: 174 (1972)
General distribution: Distributed in Indo-China to West and South Malesia, including Borneo recorded from Sabah and Sarawak; Distribution in Peninsular Malaysia: Not uncommon in lowland forest in Kelantan, Perak and Perlis; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK006), 08/11/2016 (UPM).
28. *Coelogyne testacea* Lindl., Edwards's Bot. Reg. 28(Misc.): 38 (1842)
General distribution: Distributed in Sumatra and Borneo (Sarawak and Sabah); Distribution in Peninsular Malaysia: Not uncommon in lowland and riverine forests in Pahang, Penang, Kelantan and Johor (more frequent in the south region); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (EDW030), 01/04/2018 (UPM).
29. *Crepidium calophyllum* (Rchb.f.) Szlach., Fragm. Florist. Geobot., Suppl. 3: 125 (1995)
General distribution: Distributed in East Nepal to Hainan and Borneo (Sarawak); Distribution in Peninsular Malaysia: Not uncommon in hill and limestone forests in Kedah, Kelantan, Penang and Johor (rarely encountered in the wild due to the on-going forest disturbance); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Wetland Bris Forest, Terrestrial, grow on dune-originated soil at ca. 10 m a.s.l., Besi *et al.* (EDW020), 01/04/2018 (UPM).
30. *Crepidium rheedei* Blume **subsp. rheedei**, Bijdr. Fl. Ned. Ind.: 387 (1825)
General distribution: Distributed in West Malesia, including Borneo; Distribution in Peninsular Malaysia: Not uncommon in montane forest in Johor, Kelantan and Perak; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Terrestrial, grow on soil covered by leaf litter in a montane forest at ca. 800 m a.s.l., Besi *et al.* (ED/DOME046), 27/02/2019 (UPM).
31. *Cylindrolobus biflorus* (Griff.) Rauschert, Feddes Repert. 94: 445 (1983)
General distribution: Distributed in Sikkim to West and South Malesia, including Borneo recorded from Sabah; Distribution in Peninsular Malaysia: Not uncommon in lowland and lower montane forest in Kedah, Kelantan and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 230.9 m a.s.l., Besi *et al.* (ED/DOME057), 23/02/2019 (UPM).
32. *Cylindrolobus mucronatus* (Lindl.) Rauschert, Feddes Repert. 94: 445 (1983)
General distribution: Thailand to West Malesia; Distribution in Peninsular Malaysia: Commonly found in the limestone area; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK124), 19/06/2017 (UPM).
33. *Dendrobium angustifolium* (Blume) Lindl., Gen. Sp. Orchid. Pl.: 76 (1830)
General distribution: Distributed in China (Southwest Guangxi) to West Malesia; Distribution in Peninsular Malaysia: Common in lowland and montane forests in Johor, Kedah and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi,

Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK045), 21/04/2017 (UPM)

34. *Dendrobium connatum* var. *distachyon* (Lindl.) P.O'Byrne, Malesian Orchid J. 10: 50 (2012)

General distribution: Distributed in Peninsular Malaysia and Borneo (Sabah); Distribution in Peninsular Malaysia: Not uncommon in lower montane forest, widespread; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK116), 19/06/2017 (UPM).

35. *Dendrobium convexum* (Blume) Lindl., Gen. Sp. Orchid. Pl.: 76 (1830)

General distribution: Distributed in Indo-China to North Queensland, including Borneo (unspecified); Distribution in Peninsular Malaysia: Common in lowland and montane forests in Selangor, Johor and Kedah; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK009), 08/11/2016 (UPM).

36. *Dendrobium derryi* Ridl., Mat. Fl. Malay. Penins. 1: 52 (1907)

General distribution: Distributed in West Malesia, including Borneo (Sarawak and Sabah); Distribution in Peninsular Malaysia: Not uncommon in primary montane forest, including Perak, Pahang and Johor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Terrestrial, grow on soil covered by leaf litter in a montane forest at *ca.* 800 m a.s.l., Besi *et al.* (ED/DOME049), 27/02/2019 (UPM).

37. *Dendrobium kentrophyllum* Hook.f., Fl. Brit. India 5: 725 (1890)

General distribution: Distributed in East Himalaya to West and Central Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Common in montane forest in Perak, Selangor and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK110), 19/06/2017 (UPM).

38. *Dendrobium lobbii* Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 5: 491 (1854)

General distribution: Distributed in Indo-China to North Australia, including Borneo (Sabah, Sarawak and Kalimantan); Distribution in Peninsular Malaysia: Not uncommon in lowland *kerangas* area, lower montane *kerangas* area, hill forest, and riverine forest, including Johor, Melaka and Kedah; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 233.4 m a.s.l., Besi *et al.* (EDW010), 01/04/2018 (UPM).

39. *Dendrobium pachyglossum* C.S.P.Parish & Rchb.f., Trans. Linn. Soc. London 30: 149 (1874)

General distribution: Distributed in Indo-China to Peninsular Malaysia and Borneo (Sarawak); Distribution in Peninsular Malaysia: Not uncommon in lower montane forest in several localities, including Kedah, Perak, Langkawi island and Johor; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal

collection), Epiphytic, attached to the trees in an upper hill dipterocarp forest at *ca.* 800 m a.s.l., Besi *et al.* (DOME025, DOME045), 20/06/2017 (UPM).

40. *Dendrobium pensile* Ridl., J. Linn. Soc., Bot. 32: 253 (1896)

General distribution: Distributed in Nicobar Islands and West Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Rare in riverine, mangrove swamp forest, and hill forest in Pahang and Johor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 230.9 m a.s.l., Besi *et al.* (EDW047), 04/05/2018 (UPM).

41. *Dendrobium* × *pahangense* Carr, Gard. Bull. Straits Settlem. 5: 126 (1930)

General distribution: Endemic to Peninsular Malaysia; Distribution in Peninsular Malaysia: Previously only known to occur in montane forest in Pahang region; **Notes:** It is a naturally occurring hybrid of *D. rupicolum* × *D. connatum*; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Epiphytic, attached to the trees in an upper hill dipterocarp forest at *ca.* 800 m a.s.l., Besi *et al.* (EDW018), 22/06/2017 (UPM).

42. *Dendrobium salaccense* (Blume) Lindl., Gen. Sp. Orchid. Pl.: 86 (1830)

General distribution: Distributed in South India to China (South Yunnan) and West Malesia, including Borneo (Sarawak and Sabah); Distribution in Peninsular Malaysia: Commonly found in riverine and lowland forests, widespread; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 230.9 m a.s.l., Besi *et al.* (EDW041), 01/05/2018 (UPM).

43. *Dendrobium stuposum* Lindl., Edwards's Bot. Reg. 24(Misc.): 52 (1838)

General distribution: Distributed in East Himalaya to China (South Yunnan) and Malesia, including Borneo; Distribution in Peninsular Malaysia: Not uncommon in lower montane forest; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Epiphytic, attached to the trees in an upper hill dipterocarp forest at *ca.* 800 m a.s.l., Besi *et al.* (ED/DOME054), 07/04/2018 (UPM).

44. *Dendrobium xantholeucum* Rchb.f., Xenia Orchid. 2: 73 (1865)

General distribution: Distributed Thailand to South Taiwan and West Malesia, including Borneo (Sabah and Sarawak); Distributed in Peninsular Malaysia: Common in lowland rather open, swampy forest, and limestone hills in Langkawi, Perak, Pahang and Johor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (ED/DOME055), 19/06/2017 (UPM).

45. *Eria javanica* (Sw.) Blume, Rumphia 2: 23 (1836)

General distribution: Distributed in Sikkim to Central Taiwan and New Guinea, including Borneo (Sabah); Distribution in Peninsular Malaysia: Common in the lowland forest in Pahang and Perak; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK060), 21/04/2017 (UPM).

46. *Hetaeria alta* Ridl., J. Linn. Soc., Bot. 32: 404 (1896)
General distribution: Distributed in South Indo-China to West Malesia, including Borneo (Sabah); Distribution in Peninsular Malaysia: Not uncommon in humus in lowland, hill and limestone forests, including Perak and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Forest Fragment in a logging Site, Terrestrial, grow on soil covered by leaf litter at *ca.* 115 m a.s.l., Besi *et al.* (EDW015), 01/04/2018 (UPM).
47. *Lecanorchis multiflora* J.J.Sm., Bull. Jard. Bot. Buitenzorg, sér. 2, 26: 8 (1918)
General distribution: Distributed in China (South Yunnan), Peninsular Thailand to West Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Not uncommon in lowland forest, widespread; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Terrestrial, Myco-heterotrop, hill dipterocarp forest, grow on soil covered by leaf litter at *ca.* 500 m a.s.l., Besi *et al.* (ED/DOME061), 21/04/2017 (UPM).
48. *Liparis maingayi* (Hook.f.) Ridl., J. Linn. Soc., Bot. 32: 226 (1896)
General distribution: Distributed in Peninsular Malaysia to West Sumatera; Distribution in Peninsular Malaysia: Not uncommon in lowland forest, sandstone, and montane oak-laurel forest in Perak and Selangor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Terrestrial, grow on soil covered by leaf litter in a hill dipterocarp forest at *ca.* 500 m a.s.l., Besi *et al.* (EDW019), 23/02/2019 (UPM).
49. *Liparis viridiflora* (Blume) Lindl., Gen. Sp. Orchid. Pl.: 31 (1830)
General distribution: Distributed in Indian Subcontinent to South China and Malesia, including Borneo recorded from Sabah and Sarawak; Distribution in Peninsular Malaysia: Not uncommon in hill and lower montane forests in Penang, Perak, Perlis and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (EDW016), 01/04/2018 (UPM).
50. *Ludisia discolor* (Ker Gawl.) Blume, Fl. Javae Nov. Ser.: 95 (1859)
General distribution: Distributed in South China to Sumatera and Philippines, including Borneo; Distribution in Peninsular Malaysia: Not uncommon on the rocks in lowland, hill, and riverine forests in Johor, Perak, Pahang, Penang and Kedah; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Terrestrial or lithophytic, hill dipterocarp forest, grow on soil covered by leaf litter at *ca.* 500 m a.s.l., Besi *et al.* (ED/DOME063), 23/02/2019 (UPM).
51. *Luisia curtisii* Seidenf., Contr. Orchid Fl. Thailand 13: 49 (1997)
General distribution: Distributed in Indo-China to West Malesia and Philippines, including Borneo (Sabah); Distribution in Peninsular Malaysia: Not uncommon in lower montane forest in Penang, Perak and Negeri Sembilan; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 83 m a.s.l., Besi *et al.* (RG/DOME015), 23/02/2019 (UPM).

52. *Macropodanthus alatus* (Holtum) Seidenf. & Garay, Opera Bot. 95: 261 (1988)
General distribution: Distributed in Indo-China to Peninsular Malaysia, including Thailand; Distribution in Peninsular Malaysia: Rare, it was previously recorded only from Fraser's Hill, Pahang; **Notes:** The fourth record found in Malaysia after the third rediscovery in 2012 from Fraser's Hill by Farah Alia Nordin and Rusea Go (UPM). Only a single individual was collected from the fallen trees in the logging sites and currently cultivated in the ex-situ conservatory. This species looks much alike *Pteroceras* species, but the jaw-like lip is distinct (Nordin, 2012); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 230.9 m a.s.l., Besi *et al.* (EDW036), 30/04/2018 (UPM).

53. *Oberonia brachystachys* Lindl., Sert. Orchid.: t. 8 B (1838)
General distribution: Distributed in East Nepal to Peninsular Malaysia, including Borneo and Thailand; Distribution in Peninsular Malaysia: Common in lowland forest; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK081), 19/06/2017 (UPM).

54. *Oberonia insectifera* Hook.f., Hooker's Icon. Pl. 21: t. 2004 (1890)
General distribution: Distributed in Peninsular Thailand to Peninsular Malaysia, including Borneo; Distribution in Peninsular: Not uncommon in lowland forest in Johor, Terengganu, Perak and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK123), 19/06/2017 (UPM).

55. *Oberonia padangensis* Schltr., Beibl. Bot. Jahrb. Syst. 104: 12 (1911)
General distribution: Distributed in Thailand to New Guinea, including Borneo; Distribution in Peninsular Malaysia: Commonly found in montane forest, ericaceous forest in Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 230.9 m a.s.l., Besi *et al.* (EDW040), 01/05/2018 (UPM).

56. *Oxystophyllum carnosum* Blume, Bijdr. Fl. Ned. Ind.: 336 (1825)
General distribution: Distributed in Indo-China to Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Widespread in lowland and montane forests, including in Pahang, Perlis and Penang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK013), 08/11/2016 (UPM).

57. *Phaius indigoferus* Hassk., Tijdschr. Natuurl. Gesch. Physiol. 9: 140 (1842)
General distribution: Distributed in Peninsular Malaysia and Java; Distribution in Peninsular Malaysia: Not uncommon in hill to montane forest; **Notes:** Recently, it has also been found in Borneo region, and to be more specifically it was found in Long Banga and Tama Abu areas, but the records have not been published; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Besut, Terrestrial, lowland dipterocarp forest, grow on soil covered by leaf litter at ca. 500 m a.s.l., Besi *et al.* (EDW049), 04/05/2018 (UPM).

58. *Phaius tankervilleae* (Banks) Blume, Mus. Bot. 2: 177 (1856)
General distribution: Distributed in Tropical and Subtropical Asia to South Pacific, including Borneo recorded from Kalimantan, Sabah and Sarawak; Distribution in Peninsular Malaysia: Common in lower montane and secondary forest, widespread; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Terrestrial, roadside, grow on soil covered by grasses at ca. 170 m a.s.l., Besi *et al.* (EDW043), 01/05/2018 (UPM).

59. *Pholidota articulata* Lindl., Gen. Sp. Orchid. Pl.: 38 (1830)
General distribution: Distributed in South Central China to Tropical Asia, including Borneo (Kalimantan); Distribution in Peninsular Malaysia: Not uncommon in hill forest in Perak and Selangor; **Notes:** The terete, sometimes cylindrical, and long pseudobulbs are the distinct vegetative characters to identify this species; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 98.8-119.2 m a.s.l., Besi *et al.* (TK002), 08/11/2016 (UPM).

60. *Pinalia bicristata* (Blume) Kuntze, Revis. Gen. Pl. 2: 678 (1891)
General distribution: Distributed in West Malesia; Distribution in Peninsular Malaysia: Not uncommon in lowland forest in Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 234.8 m a.s.l., Besi *et al.* (EDW042), 01/05/2018 (UPM).

61. *Pinalia clavata* (Holttum) Schuit., Y.P. Ng & H.A. Pedersen, Bot. J. Linn. Soc. 186: 196 (2018)
General distribution: Endemic to Peninsular Malaysia; Distribution in Peninsular Malaysia: It was endemic to a montane forest in Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Epiphytic, attached to the trees in an upper hill dipterocarp forest at ca. 800 m a.s.l., Besi *et al.* (ED/DOME058), 22/06/2017 (UPM).

62. *Pinalia densa* (Ridl.) W. Suarez & Cootes, OrchideenJ. 16: 71 (2009)
General distribution: Distributed in South Indo-China to West Malesia, including Borneo recorded from Kalimantan and Sarawak; Distribution in Peninsular Malaysia: Common in lowland forest, *Pandanus* and *Eugenia* forest in Pahang and Kelantan; **Notes:** This species differs from *P. floribunda* and *P. pachystachya* on its lateral sepals spreading slightly showing the lip with mid lobe broad, shortly pointed and unbilobed, while the other two species are having the lateral sepals enclosed the labellum (Smith, 1930-1934; Seidenfaden & Wood, 1992); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 230.9 m a.s.l., Besi *et al.* (EDW048), 04/05/2018 (UPM).

63. *Pinalia maingayi* (Hook.f.) Kuntze, Revis. Gen. Pl. 2: 679 (1891)
General distribution: Endemic to Peninsular Malaysia; Distribution in Peninsular Malaysia: Found in hill forest in Pahang, Penang and Kelantan; **Specimens examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK082), 19/06/2017 (UPM).

64. *Pinalia pachystachya* (Lindl.) Kuntze, Revis. Gen. Pl. 2: 678 (1891)
General distribution: Distributed in Indo-China to West Malesia, including Borneo (Sarawak); Distribution in Peninsular Malaysia: Not uncommon in montane forest and primary forest on sandstone in Perak, Pahang and Kelantan; **Notes:** It differs from *P. densa* on its lateral sepals tightly closed, lip mid lobe end rounded and side curved inwards. It differs from *P. floribunda* by having pedicel brown hairy, while the latter is having the pedicel greenish-white hairy with purple stripes (Smith, 1930-1934; Seidenfaden & Wood, 1992); **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 400 m a.s.l., Besi *et al.* (ED/DOME069), 23/02/2019 (UPM).

65. *Pinalia saccifera* (Hook.f.) Kuntze, Revis. Gen. Pl. 2: 679 (1891)
General distribution: Distributed in lowland to montane forest, swampy forest, including Borneo (Brunei, Kalimantan, Sabah and Sarawak); Distribution in Peninsular: Not uncommon in lowland to montane forest, swampy forest, including Perak; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Setiu, Mountain (details on locality are withheld to avoid illegal collection), Epiphytic, attached to the trees in an upper hill dipterocarp forest at ca. 800 m a.s.l., Besi *et al.* (ED/DOME070), 07/04/2018 (UPM).

66. *Pomatocalpa spicatum* Breda, Gen. Sp. Orchid. Asclep. 3: t. 15 (1829)
General distribution: Distributed in East Himalaya to Hainan and Malesia, including Borneo recorded from Kalimantan, Sabah and Sarawak; Distribution in Peninsular Malaysia: Commonly found in primary evergreen forest, rocky limestone or limestone bedrock, and limestone hill in Langkawi Island, Perak, Pahang and Negeri Sembilan; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (EDW060), 30/09/2017 (UPM).

67. *Pteroceras biserratum* (Ridl.) Holttum, Kew Bull. 14: 269 (1960)
General distribution: Distributed in Sumatra, including Borneo recorded from Kalimantan and Sabah; Distribution in Peninsular Malaysia: Not uncommon in lowland forest in Pahang and Perak; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at ca. 233.4 m a.s.l., Besi *et al.* (ED/DOME071), 01/04/2018 (UPM).

68. *Strongyleria pannea* (Lindl.) Schuit., Y.P. Ng & H.A.Pedersen, Bot. J. Linn. Soc. 186: 201 (2018)
General distribution: Distributed in East Himalaya to South China and West Malesia, including Borneo (Sabah); Distribution in Peninsular Malaysia: Common in lowland forest, widespread; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK105), 19/06/2017 (UPM).

69. *Thecostele alata* (Roxb.) C.S.P. Parish & Rchb.f., Trans. Linn. Soc. London 30: 144 (1874)
General distribution: Distributed in Bangladesh to Malesia, including Borneo (Sabah and Sarawak); Distribution in Peninsular Malaysia: Not uncommon in lowland forest; **Specimen**

examined: PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 211.6-244.6 m a.s.l., Besi *et al.* (TK035), 21/04/2017 (UPM).

70. *Thrixspermum filiforme* (Hook.f.) Kuntze

General distribution: Distributed in Peninsular Thailand to Peninsular Malaysia, and North Borneo; Distribution in Peninsular Malaysia: Not uncommon in lowland forest in Johor, Selangor, Kelantan, Perak and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 233.4 m a.s.l., Besi *et al.* (ED/DOME079), 01/04/2018 (UPM).

71. *Thrixspermum pulchrum* Carr, Gard. Bull. Straits Settlem. 7: 48 (1932)

General distribution: Distributed in Peninsular Malaysia and Borneo (Sarawak); Distribution in Peninsular Malaysia: Not uncommon on trees in *kerangas* and lowland primary forest, and on trees in riparian forest and mixed swamp forest in Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 233.4 m a.s.l., Besi *et al.* (ED/DOME082), 01/04/2018 (UPM).

72. *Trichoglottis lanceolaria* Blume, Bijdr. Fl. Ned. Ind.: 360 (1825)

General distribution: Distributed in Indo-China to West Malesia, including Borneo recorded from Sabah; Distribution in Peninsular Malaysia: Not uncommon in hill and montane forests in Pahang and Johor; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Kenyir Lake, Gawi, Logging Site, Epiphytic, attached to the fallen trees in a logging site at *ca.* 230.9 m a.s.l., Besi *et al.* (ED/DOME080), 01/05/2018 (UPM).

73. *Trichotosia gracilis* (Hook.f.) Kraenzl., Pflanzenr., IV, 50(50): 143 (1911)

General distribution: Distributed in Indo-China to West Malesia, including in Borneo recorded from Sabah and Sarawak; Distribution in Peninsular Malaysia: Common in lowland and montane forests in Penang, Johor, Kelantan and Pahang; **Specimen examined:** PENINSULAR MALAYSIA, TERENGGANU: Hulu Terengganu, Petuang, Logging Site, Epiphytic, attached to the fallen trees in a logging site at 207.2-330.4 m a.s.l., Besi *et al.* (TK080), 19/06/2017 (UPM).

Checklist of Orchids New Record to Kelantan in the Disturbed Forests

In this checklist, listed are the newly recorded orchid species to Kelantan discovered in the disturbed secondary forests, including brief information on their growth habit, habitat, current distribution status and significant notes on their flowers' variation or distinguishable morphological characters of each variety or subspecies, except the specific information on distribution in Peninsular Malaysia of each species prior to the need to protect the wild populations from illegal commercial collectors. Pictures of the newly recorded species are shown in Figure 3.



Figure 3: Newly recorded orchid species found in the disturbed forests of Kelantan: **A**, *Aerides odorata*; **B**, *Micropera pallida*; **C**, *Pomatocalpa diffusum*; **D**, *Thrixspermum merapohense*. Photos A and C by Edward Entalai, Photos B and C by DigitalDome.

1. *Aerides odorata* Lour., Fl. Cochinch.: 525 (1790)

General distribution: Commonly distributed in China (West Yunnan, Guangdong) to Tropical Asia, including Borneo (Kalimantan, Sabah and Sarawak); Distribution in Peninsular Malaysia: Common in primary submontane forest, peaty undisturbed *kerangas*, widespread including Johor; **Specimen examined:** PENINSULAR MALAYSIA, KELANTAN: Tanah Merah, Air Canal, Plantation, Epiphytic, attached to the trees in a lowland *Lansium* plantation area at ca. 44.4 m a.s.l., Besi *et al.* (TM005), 12/11/2016 (UPM).

2. *Micropera pallida* (Roxb.) Lindl., Edwards's Bot. Reg. 18: t. 1522 (1832)

General distribution: Distributed in East India to West Malesia, including Thailand; Distribution in Peninsular Malaysia: Not uncommon in swamp forest, lowland to montane forest, widespread; **Specimens examined:** PENINSULAR MALAYSIA, KELANTAN: Tanah Merah, Air Canal, Plantation, Epiphytic, attached to the trees in a lowland *Lansium* plantation area at ca. 44.4 m a.s.l., Besi *et al.* (TM003), 12/11/2016 (UPM).

3. *Pomatocalpa diffusum* Breda, Gen. Sp. Orchid. Asclep. 4: t. 16 (1830)

General distribution: Distributed in Peninsular Thailand to Malesia, including Borneo recorded from Kalimantan, Sabah and Sarawak; Distribution in Peninsular Malaysia: Common in mixed lowland forest and secondary forest, widespread; **Specimen examined:** PENINSULAR MALAYSIA, KELANTAN: Tanah Merah, Air Canal, Plantation, Epiphytic, attached to the trees in a lowland *Lansium* plantation area at ca. 44.4 m a.s.l., Besi *et al.* (TM002), 12/11/2016 (UPM).

4. *Thrixspermum merapohense* P.O'Byrne & P.T.Ong, Malesian Orchid J. 15: 84 (2015)

General distribution: Endemic to Peninsular Malaysia; Distribution in Peninsular Malaysia: Found growing on trees on a limestone hills in Pahang; **Specimen examined:** PENINSULAR MALAYSIA, KELANTAN: Tanah Merah, Air Canal, Plantation, Epiphytic, attached to the trees in a lowland *Lansium* plantation area at ca. 44.4 m a.s.l., Besi *et al.* (TM001), 12/11/2016 (UPM).

Checklist of doubtful records listed in book Jaafar *et al.* (2007)

A brief list of several doubtful records with wrong identification listed in the book in turn to justify the precise number of wild orchids recorded for Terengganu, including the page number, and the current accepted name and correct identification for each record.

1. *Bulbophyllum abbreviatum* Schltr., Repert. Spec. Nov. Regni Veg. Beih. 33: 198 (1924)

Page number: 7; Correct identification: *Bulbophyllum trigonopus* (Rchb.f.) P.T.Ong, Res. Pam. Forest Res. Inst. Federation of Malaya 136: 42 (2017)

2. *Bulbophyllum curtisii* var. *purpureum* (Ridl.) J.J.Sm., Repert. Spec. Nov. Regni Veg. 32: 308 (1933)

Page number: 11; Correct identification: *Bulbophyllum auratum* (Lindl.) Rchb.f. in W.G.Walpers, Ann. Bot. Syst. 6: 261 (1861)

3. *Bulbophyllum membranifolium* Hook.f., Fl. Brit. India 5: 756 (1890)

Page number: 22; Correct identification: *Bulbophyllum sanguineomaculatum* Ridl., J. Linn. Soc., Bot. 32: 265 (1896)

4. *Cleisostoma subulatum* Blume, Bijdr. Fl. Ned. Ind.: 363 (1825)
Page number: 40; Correct identification: *Micropera pallida* (Roxb.) Lindl., Edwards's Bot. Reg. 18: t. 1522 (1832)
5. *Coelogyne massangeana* Rchb.f., Gard. Chron., n.s., 10: 684 (1878)
Page number: 42; Correct identification: *Coelogyne testacea* Lindl., Edwards's Bot. Reg. 28(Misc.): 38 (1842)
6. *Dendrobium calicopsis* Ridl., J. Straits Branch Roy. Asiat. Soc. 39: 72 (1899)
Page number: 53; Correct identification: *Dendrobium lankaviense* Ridl., J. Straits Branch Roy. Asiat. Soc. 54: 49 (1910)
7. *Dendrobium hymenophyllum* Lindl., Gen. Sp. Orchid. Pl.: 86 (1830)
Page number: 59; Correct identification: *Dendrobium panduriferum* Hook.f., Fl. Brit. India 6: 186 (1890)
8. *Dendrobium panduriferum* Hook.f., Fl. Brit. India 6: 186 (1890)
Page number: 68; Correct identification: *Dendrobium hymenophyllum* Lindl., Gen. Sp. Orchid. Pl.: 86 (1830)
9. *Eria pannea* Lindl., Edwards's Bot. Reg. 28(Misc.): 64 (1842)
Page number: 83; Correct identification: *Strongyleria pellipes* (Rchb.f. ex Hook.f.) Schuit., Y.P. Ng & H.A.Pedersen, Bot. J. Linn. Soc. 186: 201 (2018)
10. *Malaxis elegans* (Ridl.) Ames, J. Straits Branch Roy. Asiat. Soc., Spec. No.: 151 (1921)
Page number: 95; Correct identification: *Crepidium* cf. *micranthum*
11. *Micropera callosa* (Blume) Garay, Bot. Mus. Leafl. 23: 186 (1972)
Page number: 97; Correct identification: *Micropera fuscolutea* (Lindl.) Garay, Bot. Mus. Leafl. 23: 186 (1972)
12. *Tainia* species
Page number: 115; Correct identification: *Tainia maingayi* Hook.f., Fl. Brit. India 5: 822 (1890)

Conclusion

The study showed that the logged forests accumulated a high abundance of orchid's species and dominated by epiphytic orchids, which were pre-determined to be strongly influenced by the high densities of the fallen trees. The fact that 77 orchid species with new distribution records in Terengganu and Kelantan, and a number of new, rare and endemic species were discovered from only a small part of the total area of the disturbed forests in Terengganu and Kelantan through only short-term botanical collections. This has inferred that a high number of these orchid community have dealt with local extinction in the clear-cut logged forest for the past few years, and many may have been new records or new species to science without being recorded and rescued to ex-situ conservatory.

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References

- Besi, E. E., Dome, N., Mustafa, M., & Go, R. (2018a). Two new species of *Dendrobium* Sect. *Calcarifera* (Orchidaceae) from Terengganu, Peninsular Malaysia. *Malayan Nature Journal*, 70(3), 251-259.
- Besi, E. E., Dome, N., Mustafa, M., & Go, R. (2018b). A new orchid species of *Dendrobium* Sect. *Calcarifera* from Terengganu, Peninsular Malaysia (Orchidaceae: Dendrobiinae). *Phytotaxa*, 383(2), 213-218.
- Bridson, D., & Forman, L. (2000). *The Herbarium Handbook* (3rd ed.). United Kingdom: Royal Botanic Gardens, Kew. 348 pp.
- Chan, C. L., Lamb, A., Shim, P. S., & Wood, J. J. (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. (2001). *Orchids of Sumatra*. Kota Kinabalu, Malaysia: Natural History Publications (Borneo) Sdn. Bhd. 1026 pp.
- Go, R., Abdullah, J. O., Nordin, F. A., & Md Isa, S. F. (2015a). *Orchids in the Montane Forests of Peninsular Malaysia*. Serdang, Malaysia: Universiti Putra Malaysia Press. 216 pp.
- Go, R., & Hamzah, K. A. (2008). *Orchids of Peat Swamp Forests in Peninsular Malaysia*. Forest Research Institute Malaysia (FRIM), Kepong, Malaysia, Peat Swamp Forest Technical Series No. 13, 136 pp.
- Go, R., Khor, H. E., Mustafa, M., Abdullah, J. O., Naruddin, A. A., Lee, N. S., Lee, C. S., Eum, S. M., Park, K. W., & Choi, K. (2011). An assessment of orchids' diversity in Penang Hill, Penang, Malaysia after 115 years. *Biodiversity and Conservation*, 20(10), 2263-2272.
- Go, R., Dahalan, M. P., & Abdul Manaf, M. B. (2014). *Orchidèa Selangoreana (Wild Orchids of Selangor)*. Selangor State Forestry Department, Selangor, Malaysia, in association with Selangor State Department, Selangor, Malaysia, 207 pp.
- Go, R., & Tang, C. H. (2007). *Revision of the Genus Eria (Orchidaceae) in Peninsular Malaysia*. Master Dissertation. Universiti Putra Malaysia, Serdang, Malaysia, 324 pp.

- Go, R., Tan, M. C., Naruddin, A. A., Abdullah, J. O., Ng, Y. J., Nordin, F. A., Khor, H. E., & Nulit, R. (2015b). Extinction risks and conservation status of *Corybas* (Orchidaceae; Orchidoideae; Diurideae) in Peninsular Malaysia. *Phytotaxa*, 233(3), 273-280.
- Go, R., Yong, W. S. Y., Unggang, J., & Ridzuan, S. (2010). *Orchids of Perlis, jewels of the forest* (Revised Edition). Jabatan Perhutanan Perlis, Perlis, Malaysia, in association with Universiti Putra Malaysia, Serdang, Malaysia, 152 pp.
- Jaafar, N., Abdul Rasid, J., Zakaria, R., Chu Abdullah, M. R., & Omar, M. (2007). *Wild orchids of Terengganu*. Forestry Department of Terengganu, Terengganu, Malaysia, 120 pp.
- Kew Herbarium Catalogue. (2019, April). <http://apps.kew.org/herbcat/navigator.do>,
- Kiew, R., Chung, R. C. K., Saw, L. G., & Soepadmo, E. (2010). Seed plant families in Peninsular Malaysia. In Kiew, R., Chung, R. C. K., Saw, L. G., Soepadmo, E., & Boyce, P. C. (Eds.), *Flora of Peninsular Malaysia, Series II: Seed Plants, Volume 1*. Forest Research Institute Malaysia (FRIM), Kepong, Kuala Lumpur, pp. 3-20.
- Kruizinga, J., van Scheindelen, H. J., & de Vogel, E. F. (1997). Revision of the genus *Bromheadia* (Orchidaceae). *Orchid Monographs*, 8(1), 79-118.
- Malaysian Meteorological Department. (2016, 2017). Data on monthly rainfall amount and number of raindays, monthly mean minimum and maximum temperature, and monthly mean relative humidity for Pengkalan Gawi, Terengganu. Received on August 8, 2017.
- Md Isa, S. F., Go, R., Mohd Salim, J., & Yong, C. S. Y. (2015). Orchid species found in Coastal heath forest of Terengganu, Malaysia. In Mohamad, F., Mohd Salim, J., Mohd Jani, J., & Shahrudin, R. *Setiu wetlands: Species, ecosystem and livelihood* (Ed.). Terengganu, Malaysia: Universiti Malaysia Terengganu Publications. pp. 40-51.
- National Herbarium of the Netherlands (NHN). (2017, July). Browse Dutch Natural History Collections: BioPortal (Naturalis) <http://bioportal.naturalis.nl/>.
- Natural History Museum Specimen Collection. (2019, April). <https://data.nhm.ac.uk/>,
- Ng, Y. J., Go, R., Nulit, R., Khor, H. E., Tan, M. C., Nordin, F. A., Ahmad, A. N., & Lee, N. S. (2012). Orchids of cloud forest in Genting Highlands, Pahang, Malaysia. *Sains Malaysiana*, 41(5), 505-526.
- Nordin, F. A. (2012). *Orchid flora of Fraser's Hill, Malaysia*. Master Dissertation. Universiti Putra Malaysia, Serdang, Malaysia, 619 pp.
- O'Byrne, P., Ong, P. T., & Gokusing, L. (2018). *Pinalia* in Malesia: Two new species and some allies. *Malesian Orchid Journal*, 21, 5-29.
- Ong, P. T., O'Byrne, P., Saw, L. G., & Chung, R. C. K. (2017). *Checklist of orchids of Peninsular Malaysia*. Perpustakaan Negara Malaysia, Kuala Lumpur, Malaysia. Research Pamphlet. No. 136, 169 pp.
- Ong, P. T., O'Byrne, P., Yong, W. S. Y., & Saw, L. G. (2011). *Wild orchids of Peninsular Malaysia*. Forest Research Institute Malaysia (FRIM), Kepong, Malaysia, in association with MPH Group Publishing Sdn. Bhd., Kuala Lumpur, Malaysia, 196 pp.
- Seidenfaden, G., & Wood, J. J. (1992). *The orchids of Peninsular Malaysia and Singapore*. United Kingdom: Royal Botanic Garden, Kew. 779 pp.
- Singapore Herbarium Online Database (SING). (2018, January). <http://herbaria.plants.ox.ac.uk/bol/sing.>,
- Smith, J. J. (1930-1934). Icones Orchidacearum Malayensium I. *Bulletin du Jardin botanique de Buitenzorg*, Supplement, Vol II, LIVR, 3-4.
- Swiss Orchid Foundation at the Herbarium Jany Renz. (2017, July). <https://orchid.unibas.ch/index.php/en/database-search/advanced-search.>,

- Turner, I. M. (1995). A catalogue of the vascular plants of Malaya: Orchidaceae. *Garden's Bulletin Singapore*, 47(1), 559-620.
- Vermeulen, J. (1991). *Orchids of Borneo Vol. 2: Bulbophyllum*. United Kingdom: Royal Botanic Gardens, Kew. 352 pp.
- Wood, J. J. (1984). New orchids from Gunung Mulu National Park, Sarawak. *Kew Bulletin*, 39, 92.
- Wood, J. J. (1997). *Orchids of Borneo. Volume 3: Dendrobium, Dendrochilum and others*. United Kingdom: Bentham-Moxon Trust, Royal Botanical Gardens, Kew. 299 pp.
- Wood, J. J. (2003). *Orchids of Borneo. Vol. 4*. The Sabah Society, Kota Kinabalu, Malaysia, in association with Royal Botanic Gardens, Kew, United Kingdom, xii, 314p.-illus., col. illus.
- Wood, J. J. (2008). Two species of *Dendrobium* (Section *Calcarifera*) from Sabah. *Malesian Orchid Journal*, 2(6), 5-8.
- Wood, J. J. (2009). A new species of *Dendrobium* (Section *Calcarifera*) from Borneo. *Malesian Orchid Journal*, 3, 31.
- Wood, J. J. (2014). *'Dendrobium' of Borneo*. Sabah: Natural History Publications (Borneo). 946 pp.
- Wood, J. J., & Cribb, P. J. (1994). *A checklist of the Orchids of Borneo*. United Kingdom: Royal Botanical Gardens, Kew. 409 pp.
- WCSP. (2018, January). *World checklist of selected plant families*. Facilitated by the Royal Botanic Gardens, Kew, United Kingdom. <http://apps.kew.org/wcsp/home>.,
- Yong, W. S. Y., Go, R., Tang, C. H., Abdullah, J. O., & Osman, K. (2005). Orchids of Perlis: New records and distribution. *Pertanika Journal of Tropical Agricultural Science*, 28(2), 135-146.