

Annotated Checklist of Orchids Found in Merapoh Trail (Gunung Tahan, Malaysia)

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ABSTRACT

Gunung Tahan is the highest mountain peak in Peninsular Malaysia (2187 m a.s.l.) and is a part of Taman Negara Pahang that houses many rare and endemic species of flora and fauna. This account is conducted to evaluate, compile, and update the orchids collections from Gunung Tahan after almost 126 years, since the first botanical exploration was conducted by H.N. Ridley and other foreign botanist. The compilation presented in this study resulted in 294 species obtained from the selected herbarium, published record, and current expedition. A total of 57 species were recorded for recent work, out of which 18 species were new discoveries for Merapoh Trail and thus reported as new records for Gunung Tahan. IUCN Red List of Threatened Species version 2017.3 listed two species; *Claderia viridiflora* Hook.f. and *Spiranthes sinensis* (Pers.) Ames as least concern species and *Paphiopedilum bullenianum* (Rchb.f.) Pfitzer as endangered species. The list of the compiled species from herbarium and published records for Gunung Tahan is also included.

Keywords: Botanical collections, herbarium, H. C. Robinson, H. N. Ridley, Orchidaceae, Pahang

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INTRODUCTION

Taman Negara Pahang covers an area of about 4343 km² in three protected areas of three states of Pahang, Kelantan, and Terengganu. It is estimated to be 130-million-year-old. Gunung Tahan is one of the mountainous peak zones located in Taman Negara Pahang which covers about

57% of the total area (Pakhriazad, Hasmadi, Aida & Jusoff, 2009).

The mountain was named after a Malay word “Tahan” meaning tough, to reflect the toughness associated with the trekking around it. At present it can be accessed through two main trails of Kuala Tahan (old and traditional trail) and Merapoh Trail. The later trail was developed in 1993 as an alternative trail. Other less popular trail through which the mountainous region can be accessed is Kuala Koh Trail, which is located in the state of Kelantan but rarely used by the climbers due to its remote location, long, and exhausting journey which takes at least 16 days to reach the summit.

Generally, the forest formation up to the summit of Gunung Tahan consists of lowland dipterocarp forest (<350 m a.s.l.) followed by hill dipterocarp forest (>350 m a.s.l.); upper hill dipterocarp forest (>750 m a.s.l.); oak-laurel forest (>1,200 m a.s.l.); and montane ericaceous forest (>1,500 m a.s.l.). The plants and flora communities gradually changes as one reach each of the forest elevations. The most significant changes were observed along the ridges approaching Kem Bonsai at the elevations of 1705 m a.s.l. where most of the plants were dwarf (about 1 m tall) and growing on and among the white sandstone and quartz-fragments rocks. The most abundant plant in the area is *Leptospermum javanicum* Blume which is mixed with *Baeckea frutescens* L. and *Rhododendron elegans* Ridl. (Ridley 1892, 1915). The plants in this area are typically adapted to xerophytic life. Along

the trail from Kem Bonsai to Bukit Botak towards the Tahan summit, there are few damp areas with many hygrophytic plants and low herbaceous shrubs (Robinson, 1908).

One of the noteworthy plants on Gunung Tahan is *Johannesteijsmannia altifrons* (Rchb.f. & Zoll.) H.E. Moore with a huge oar-shaped leaves, and a leaf blade that can extend to over 6 ft long, found growing at the elevation up to about 1000 m. Another notable and rarely seen species only found on the two highest mountains in the Malay Peninsular; Gunung Tahan, and Gunung Korbu is *Utricularia vitellina* Ridl. (Chew & Haron, 2011). It is a small, usually <10 cm tall, terrestrial carnivorous plant. This species grows in a nutrient poor environment with low pH along with the highlands plateau just below the Tahan summit.

The previous expeditions to Gunung Tahan were usually financed by the Trustees of the British Museum in England assisted by the participation of local communities, especially guides, coolies, and local headman. The first expedition to Gunung Tahan was led by H. N. Ridley in 1892, however, the first group that successfully found the trails to reach the Gunung Tahan peak was led by H. C. Robinson in 1908 which resulted in 250 botanical collections that were significantly important in enhancing the knowledge of the flora in Malay Peninsular (Ridley, 1908). However, after almost 126 years from Ridley and Robinson’s explorations, there is no inclusive published report on botanical

collections, particularly on orchids even though numerous botanical expeditions were conducted on Gunung Tahan. Additionally, due to the grant agreement made between the Trustees of the British Museum and Robinson, the whole collections made during the expeditions had been deposited at the Natural History Museum; and the first set had become the property of the Trustees. Therefore, most of the collections can only be accessed by visiting the herbaria or through online herbarium catalog.

This study was conducted to evaluate the species richness of Orchidaceae in Gunung Tahan, focusing on Merapoh Trail to the summit of Gunung Tahan. Most of the specimens collected from Gunung Tahan in the eighteenth century were mostly gathered from Kuala Tahan Trail. Therefore, collections from Kuala Tahan Trail compiled by Ridley, I. M. Turner and herbarium catalog were also provided for comparison. List of orchids from both trails were compiled and evaluated to determine the richness of orchids species in the whole area of Gunung Tahan. Thus, compilation of both data from current and previous studies will represent the most updated checklist for the orchids of Gunung Tahan from the two trails. However, the checklist should be used or quoted with caution. It is expected that more information could be discovered on the orchids if a more comprehensive work could be done in this area apart from the two main trails of Kuala Tahan Trail and Merapoh Trail.

MATERIALS AND METHODS

Orchids documentation was conducted through expedition from September 1–7, 2013 using Merapoh Trail to reach the peak of Gunung Tahan. The expedition covered a floristic survey through four main rivers and tributaries of Kuala Luis, Lata Luis, Kem Kor, Kem Permatang, Kem Kubang, Kem Belumut, Kem Bonsai, and Kem Botak before reaching the summit of the mountain. Annotations were made starting from Kuala Juram all the way to the summit. Photographic images were taken for all the species, respectively; with or without flowers and their details reported in the field notebook.

Collections from the above expedition were then combined and compared with collections published by Ridley in 1908 and 1915 as well as from the herbarium collections in selected herbaria. List of herbarium collections from the Forest Research Institute Malaysia (FRIM) was made possible by visiting the herbarium. While, list of herbarium collections from the Singapore Botanical Garden (SING) and the Royal Botanic Garden (KEW) were accessed online through their herbarium catalog. List of species recorded by Turner (1995) was also included in the compilations.

All of the identified species and compilations from the herbarium specimens were then validated with the World Checklist of Selected Plant Families (WCSP) to check their current accepted names and general distribution.

RESULTS

The expedition along the Merapoh Trail up to the summit has contributed a total of 57 species of orchids, which comprise 35 genera of four subfamilies: Apostasioideae, Cyripedioideae, Epidendroideae, and Orchidoideae (Table 1). No species from subfamily Vanilloideae was collected from this expedition. The highest numbers of species collected were from subfamily Epidendroideae with 48 species, followed by subfamily Orchidoideae with seven species; Apostasioideae and Cyripedioideae with one species for each subfamily. Species collected with flowers were shown in Figures 1 to 3.

Table 1 indicated that *Paphiopedilum bullenianum* was listed as endangered species by the IUCN Red List of Threatened Species version 2017.3 and can only be found in Gunung Tahan. While, *Claderia*

viridiflora and *Spiranthes sinensis* were listed globally as least concern species. Other 55 species were not yet evaluated by IUCN Red List of Threatened Species version 2017.3.

In total, Gunung Tahan harbors 294 species of orchids which were compiled and updated through this expedition as well as herbarium and published records. Species that were published or preserved in the selected herbaria were listed in Table 2, with most of the specimens collected from Kuala Tahan Trail prior to the establishment and opening of the Merapoh Trail. The 18 species that were collected from Merapoh Trail were documented as new record for Gunung Tahan, since they were never recorded before in Kuala Tahan Trail (Table 1). Therefore, the current checklist could be considered as a new and updated orchids collection for Gunung Tahan.

Table 1
Collection of orchids species along Merapoh Trail to the summit of Gunung Tahan and conservation status based on The International List of Threatened Species (IUCN)

2013 Collections (Merapoh Trail)			
Taxon		Collector	Status IUCN
Subfamily Apostasioideae			
Genera <i>Apostasia</i>	<i>Apostasia nuda</i> R. Br.	SFMI et al. 25 [UPM]	NE
Subfamily Cyripedioideae			
Genera <i>Paphiopedilum</i>	<i>Paphiopedilum bullenianum</i> (Rchb.f.) Pfitzer.	SFMI et al. 11 [UPM]	E
Subfamily Epidendroideae			
Genera <i>Agrostophyllum</i>	<i>Agrostophyllum majus</i> Hook.f.	SFMI et al. 84 [UPM]	NE
	<i>Appendicula</i>	* <i>Appendicula cornuta</i> Blume	SFMI et al. 91 [UPM] NE
	<i>Aphyllorchis</i>	* <i>Aphyllorchis montana</i> Rchb.	SFMI et al. 57 [UPM] NE
	<i>Arundina</i>	<i>Arundina graminifolia</i> (D.Don) Hochr.	SFMI et al. 82 [UPM] NE

Table 1 (continue)

2013 Collections (Merapoh Trail)			
Taxon		Collector	Status IUCN
<i>Ascidieria</i>	<i>Ascidieria longifolia</i> (Hook.f.) Seidenf.	SFMI et al. 89 [UPM]	NE
<i>Bromheadia</i>	<i>Bromheadia rupestris</i> Ridl.	SFMI et al. 43 [UPM]	NE
	* <i>Bromheadia aporoides</i> Rchb.f.	SFMI et al. 92 [UPM]	NE
<i>Bryobium</i>	<i>Bryobium hyacinthoides</i> (Blume) Y.P.Ng & P.J.Cribb	SFMI et al. 80 [UPM]	NE
<i>Bulbophyllum</i>	<i>Bulbophyllum coniferum</i> Ridl.	SFMI et al. 54 [UPM]	NE
	<i>Bulbophyllum limbatum</i> Lindl.	SFMI et al. 27 [UPM]	NE
	<i>Bulbophyllum microglossum</i> Ridl.	SFMI et al. 45 [UPM]	NE
	* <i>Bulbophyllum pileatum</i> Lindl.	SFMI et al. 26 [UPM]	NE
	<i>Bulbophyllum tahanense</i> Carr.	SFMI et al. 49 [UPM]	NE
	<i>Bulbophyllum uniflorum</i> (Blume) Hassk.	SFMI et al. 07 [UPM]	NE
	<i>Bulbophyllum viridescens</i> Ridl.	SFMI et al. 42 [UPM]	NE
<i>Calanthe</i>	* <i>Calanthe pulchra</i> (Blume) Lindl.	SFMI et al. 09 [UPM]	NE
<i>Campanulorchis</i>	<i>Campanulorchis pellipes</i> (Rchb.f. ex Hook.f.) Y.P.Ng & P.J.Cribb	SFMI et al. 44 [UPM]	NE
<i>Chelonistele</i>	* <i>Chelonistele sulphurea</i> (Blume) Pfitzer	SFMI et al. 93 [UPM]	NE
<i>Claderia</i>	<i>Claderia viridiflora</i> Hook.f.	SFMI et al. 18 [UPM]	LC
<i>Coelogyne</i>	<i>Coelogyne prasina</i> Ridl.	SFMI et al. 24 [UPM]	NE
	* <i>Coelogyne radicata</i> Ridl.	SFMI et al. 40 [UPM]	NE
<i>Cymbidium</i>	<i>Cymbidium roseum</i> J.J.Sm.	SFMI et al. 32 [UPM]	NE
	<i>Cymbidium finlaysonianum</i> Lindl.	SFMI et al. 76 [UPM]	NE
<i>Dendrobium</i>	<i>Dendrobium angustifolium</i> (Blume) Lindl.	SFMI et al. 41 [UPM]	NE
	* <i>Dendrobium foxii</i> Ridl.	SFMI et al. 78 [UPM]	NE
	<i>Dendrobium hughii</i> Rchb.f.	SFMI et al. 90 [UPM]	NE
	<i>Dendrobium longipes</i> Hook.f.	SFMI et al. 17 [UPM]	NE
	<i>Dendrobium uniflorum</i> Griff.	SFMI et al. 51 [UPM]	NE
<i>Dendrochilum</i>	<i>Dendrochilum gracile</i> (Hook.f.) J.J.Sm.	SFMI et al. 19 [UPM]	NE
<i>Dilochia</i>	<i>Dilochia cantleyi</i> (Hook.f.) Ridl.	SFMI et al. 38 [UPM]	NE
	<i>Dilochia wallichii</i> Lindl.	SFMI et al. 05 [UPM]	NE
<i>Eria</i>	* <i>Eria neglecta</i> Lindl.	SFMI et al. 30 [UPM]	NE
	<i>Eria robusta</i> (Blume) Lindl.	SFMI et al. 79 [UPM]	NE

Table 1 (continue)

2013 Collections (Merapoh Trail)			
Taxon		Collector	Status IUCN
<i>Oxystophyllum</i>	<i>Oxystophyllum carnosum</i> Blume	SFMI et al. 28 [UPM]	NE
	* <i>Oxystophyllum excavatum</i> Blume	SFMI et al. 29 [UPM]	NE
	<i>Oxystophyllum sinuatum</i> (Lindl.) M.A.Clem.	SFMI et al. 94 [UPM]	NE
<i>Pholidota</i>	<i>Pholidota carnea</i> var. <i>carnea</i>	SFMI et al. 21 [UPM]	NE
	<i>Pholidota carnea</i> var. <i>pumila</i> (Ridl.) de Vogel	SFMI et al. 53 [UPM]	NE
<i>Phreatia</i>	<i>Phreatia crassifolia</i> Ridl.	SFMI et al. 20 [UPM]	NE
<i>Podochilus</i>	* <i>Podochilus microphyllus</i> Lindl.	SFMI et al. 10 [UPM]	NE
<i>Spathoglottis</i>	<i>Spathoglottis aurea</i> Lindl.	SFMI et al. 04 [UPM]	NE
	* <i>Spathoglottis plicata</i> Blume	SFMI et al. 81 [UPM]	NE
<i>Tainia</i>	<i>Tainia speciosa</i> Blume	SFMI et al. 36 [UPM]	NE
<i>Thecostele</i>	* <i>Thecostele alata</i> (Roxb.) Par. & Reichb.f.	SFMI et al. 95 [UPM]	NE
<i>Thrixspermum</i>	* <i>Thrixspermum pauciflorum</i> (Hook.f.) Kuntze	SFMI et al. 52 [UPM]	NE
	<i>Thrixspermum tahanense</i> Carr.	SFMI et al. 22 [UPM]	NE
<i>Trichotosia</i>	<i>Trichotosia ferox</i> Blume	SFMI et al. 03 [UPM]	NE
	* <i>Trichotosia gracilis</i> (Hook.f.) Kraenzl.	SFMI et al. 23 [UPM]	NE
Subfamily Orchidoideae			
Genera <i>Corybas</i>	<i>Corybas holttumii</i> J.Dransf. & G.Sm.	SFMI et al. 16 [UPM]	NE
	* <i>Corybas villosus</i> J.Dransf. & G.Sm.	SFMI et al. 15 [UPM]	NE
<i>Cryptostylis</i>	<i>Cryptostylis arachnites</i> (Blume) Hassk.	SFMI et al. 33 [UPM]	NE
<i>Cystorchis</i>	<i>Cystorchis variegata</i> Blume	SFMI et al. 08 [UPM]	NE
<i>Pelatantheria</i>	<i>Pelatantheria angustata</i> (Ridl.) Ridl.	SFMI et al. 34 [UPM]	NE
<i>Spiranthes</i>	* <i>Spiranthes sinensis</i> (Pers.) Ames	SFMI et al. 83 [UPM]	LC
<i>Pinalia</i>	* <i>Pinalia densa</i> (Ridl.) W.Suarez & Cootes	SFMI et al. 37 [UPM]	NE

Note: E = endangered, LC = least concern, NE = not evaluated. Collector: SFMI et al. = Siti Fatimah Md. Isa, Rusea Go, Suhaima Md. Suki, Wong Wee Nee, Nur'izzati Shaipuddin, Nur Adilah Auyob, Yoh Kok Hon, Azizul Aziz, Norazlan, and Helmi Rozario.

* = new record for Gunung Tahan

Checklists of Orchids Found in Gunung Tahan

Table 2
List of published or preserved orchids species collected from Gunung Tahan

Genera	Published/Preserved at				
	FRIM	SING	KEW	Ridley (1908, 1915)	Turner (1995)
<i>Acriopsis</i>		<i>A. indica</i>		<i>A. lilifolia</i> var. <i>lilifolia</i>	
<i>Agrostophyllum</i>	<i>A. stipulatum</i>	<i>A. elongatum</i> <i>A. glumaceum</i> <i>A. stipulatum</i> subsp. <i>bicuspidatum</i>	<i>A. elongatum</i> <i>A. glumaceum</i> <i>A. majus</i>		
<i>Aphyllorchis</i>		<i>A. pallida</i> <i>A. strata</i>			
<i>Apostasia</i>		<i>A. nuda</i> <i>A. wallichii</i>	<i>A. nuda</i>	<i>A. nuda</i>	
<i>Apostasia</i>		<i>A. cornuta</i> <i>A. densifolia</i> <i>A. pendula</i> <i>A. reflexa</i> <i>A. rupestris</i> <i>A. undulata</i>	<i>A. rupestris</i>	<i>A. cornuta</i> <i>A. rupestris</i>	
<i>Arundina</i>	<i>A. graminifolia</i>	<i>A. graminifolia</i>		<i>A. graminifolia</i>	
<i>Ascidieria</i>				<i>A. longifolia</i>	
<i>Ascochilopsis</i>		<i>A. myosurus</i>	<i>A. myosurus</i>		
<i>Biermannia</i>		<i>B. laciniata</i>			
<i>Bromheadia</i>		<i>B. alticola</i> <i>B. pungens</i> <i>B. scirpoidea</i>	<i>B. pungens</i>	<i>B. alticola</i> <i>B. pungens</i> <i>B. rupestris</i>	<i>B. pungens</i> <i>B. rupestris</i>
<i>Bryobium</i>		<i>B. hyacinthoides</i>			
<i>Bulbophyllum</i>	<i>B. gusforfii</i> <i>B. apiferum</i>	<i>B. abbrevilabium</i> <i>B. apodum</i> <i>B. biseriale</i> <i>B. brevipes</i> <i>B. clandestinum</i> <i>B. corolliferum</i> <i>B. dischidiifolium</i> subsp. <i>aberrans</i> <i>B. dryas</i> <i>B. flavenscens</i> <i>B. lilacinum</i> <i>B. lumbriciforme</i> <i>B. mahakamense</i> <i>B. medusae</i> <i>B. microglossum</i> <i>B. nematocaulon</i> <i>B. obtusum</i> <i>B. odoratum</i> <i>B. ovalifolium</i> <i>B. papillosofilum</i> <i>B. praetervisum</i> <i>B. purpurascens</i> <i>B. rugosum</i> <i>B. serratotruncatum</i> <i>B. skeatianum</i> <i>B. sulcatum</i> <i>B. tahanense</i> <i>B. titanea</i>	<i>B. apodum</i> <i>B. coniferum</i> <i>B. dryas</i> <i>B. flabellum-</i> <i>veneris</i> <i>B.</i> <i>nematocaulon</i> <i>B.</i> <i>octorhopalon</i> <i>B. odoratum</i> <i>B. pan</i> <i>B.</i> <i>purpurascens</i> <i>B. skeatianum</i> <i>B. stormii</i> <i>B. tahanense</i> <i>B. tortuosum</i>	<i>B. capitatum</i> <i>B. coniferum</i> <i>B. dryas</i> <i>B. microglossum</i> <i>B. pan</i> <i>B. skeatianum</i> <i>B. uniflorum</i> <i>B. viridescens</i>	<i>B. biseriale</i> <i>B. foetidole</i> <i>B. holttumii</i> <i>B. ignevenosum</i> <i>B. lumbriciforme</i> <i>B. pan</i> <i>B. papillosofilum</i> <i>B. retusiusculum</i> <i>B. tahanense</i> <i>B. tekuense</i> <i>B. titanea</i> <i>B. viridescens</i>

Table 2 (continue)

Genera	Published/Preserved at				
	FRIM	SING	KEW	Ridley (1908, 1915)	Turner (1995)
		<i>B. tortuosum</i> <i>B. uniflorum</i> <i>B. virescens</i> <i>B. viridescens</i> <i>B. sulcatum</i>			
<i>Calanthe</i>	<i>C. angustifolia</i> <i>C. aurantiaca</i>	<i>C. angustifolia</i> <i>C. aurantiaca</i> <i>C. carrii</i> <i>C. ceciliae</i> <i>C. monophylla</i> <i>C. rigida</i>	<i>C. aurantiaca</i> <i>C. carrii</i> <i>C. ceciliae</i> <i>C. ventilabrum</i>	<i>C. ceciliae</i> <i>C. triplicate</i>	<i>C. carrii</i>
<i>Callostylis</i>		<i>C. puchella</i>		<i>C. pulchella</i>	
<i>Campanulorchis</i>		<i>C. pellipes</i>		<i>C. pellipes</i>	
<i>Ceratostylis</i>	<i>C. subulata</i>	<i>C. ampullacea</i> <i>C. eria</i> <i>C. lancifolia</i> <i>C. pendula</i> <i>C. subulata</i>	<i>C. eria</i>	<i>C. gracilis</i>	
<i>Chroniochilus</i>		<i>C. minimus</i>	<i>C. minimus</i>		
<i>Claderia</i>	<i>C. viridiflora</i>				
<i>Cleisostoma</i>		<i>C. halophilum</i> <i>C. scortechinii</i> <i>C. suffusum</i>	<i>C. scortechinii</i> <i>C. teretifolium</i>		
<i>Coelogyne</i>	<i>C. anceps</i> <i>C. prasina</i> <i>C. radicata</i> <i>C. stenochila</i>	<i>C. cumingii</i> <i>C. foerstermannii</i> <i>C. prasina</i> <i>C. radicata</i> <i>C. rochussenii</i> <i>C. septemcostata</i> <i>C. stenochila</i> <i>C. testaceae</i> <i>C. tomentosa</i> <i>C. xyrekes</i>	<i>C. xyrekes</i>	<i>C. cumingii</i> <i>C. radicata</i> <i>C. stenochila</i> <i>C. tomentosa</i> <i>C. xyrekes</i>	<i>C. xanthoglossa</i>
<i>Cordiglottis</i>			<i>C. pulverulenta</i>		<i>C. pulverulenta</i>
<i>Corybas</i>		<i>C. holtumii</i>	<i>C. pictus</i>		<i>C. caudatus</i> <i>C. holtumii</i>
<i>Corymborkis</i>		<i>C. veratrifolia</i>	<i>C. veratrifolia</i>		
<i>Crepidium</i>		<i>C. micranthum</i>	<i>C. micranthum</i>		
<i>Cryptostylis</i>	<i>C. arachnites</i>	<i>C. arachnites</i> <i>C. conspicua</i>		<i>C. arachnites</i>	
<i>Cymbidium</i>		<i>C. atropurpureum</i> <i>C. bicolor</i> subsp. <i>bicolor</i> <i>C. chloranthum</i> <i>C. roseum</i>	<i>C. chloranthum</i> <i>C. chloranthum</i> subsp. <i>chloranthum</i> <i>C. roseum</i>		<i>C. chloranthum</i>
<i>Cystorchis</i>		<i>C. aphylla</i> <i>C. variegata</i>	<i>C. aphylla</i>		
<i>Dendrobium</i>	<i>D. cornutum</i> <i>D. geminatum</i> <i>D. hasseltii</i> <i>D. hughii</i> <i>D. longipes</i>	<i>D. aloifolium</i> <i>D. angustifolium</i> <i>D. bancanum</i> <i>D. cornatum</i> <i>D. crocatum</i>	<i>D. acerosum</i> <i>D. aloifolium</i> <i>D. crumenatum</i> <i>D. farmeri</i> <i>D. fugax</i>	<i>D. angustifolium</i> <i>D. geminatum</i> <i>D. hasseltii</i> <i>D. hymenopterum</i> <i>D. kingie</i>	<i>D. acinaciforme</i> <i>D. luxurians</i> <i>D. pahangense</i> <i>D. rupicolum</i> <i>D. striatellum</i>

Checklists of Orchids Found in Gunung Tahan

Table 2 (continue)

Genera	Published/Preserved at				
	FRIM	SING	KEW	Ridley (1908, 1915)	Turner (1995)
		<i>D. farmeri</i> <i>D. geminatum</i> <i>D. grande</i> <i>D. hendersonii</i> <i>D. hosei</i> <i>D. hughii</i> <i>D. indivisum</i> <i>D. indragiriense</i> <i>D. leonis</i> <i>D. linguella</i> <i>D. longipes</i> <i>D. luxurians</i> <i>D. macropodum</i> <i>D. pachyphyllum</i> <i>D. pensile</i> <i>D. rhodostele</i> <i>D. rupicola</i> <i>D. salaccense</i> <i>D. subflavidum</i> <i>D. uniflorum</i> <i>D. zebrinum</i>	<i>D. geminatum</i> <i>D. hosei</i> <i>D. hughii</i> <i>D. indragiriense</i> <i>D. longipes</i> <i>D. luxurians</i> <i>D. macropodum</i> <i>D. quadrilobatum</i> <i>D. rupicola</i> <i>D. zebrinum</i>	<i>D. longipes</i> <i>D. macropodum</i> <i>D. rupicola</i> <i>D. subflavidum</i> <i>D. uniflorum</i>	
<i>Dendrochilum</i>	<i>D. angustifolium</i> <i>D. carnosum</i> <i>D. linearifolium</i> <i>D. pallidiflavens</i> var. <i>pallidiflavens</i>	<i>D. angustifolium</i> <i>D. carnosum</i> <i>D. gracile</i> <i>D. kingii</i> <i>D. linearifolium</i> <i>D. longifolium</i> <i>D. pallidiflavens</i> var. <i>pallidiflavens</i>	<i>D. linearifolium</i> <i>D. longifolium</i>	<i>D. gracile</i> <i>D. linearifolium</i>	
<i>Didymoplexiella</i>		<i>D. ornata</i>			
<i>Dilochia</i>	<i>D. cantleyi</i>	<i>D. cantleyi</i> <i>D. wallichii</i>	<i>D. cantleyi</i>	<i>D. cantleyi</i>	
<i>Dilochiopsis</i>	<i>D. scortechinii</i>	<i>D. scortechinii</i>	<i>D. scortechinii</i>	<i>D. scortechinii</i>	
<i>Dipodium</i>		<i>D. pictum</i>			
<i>Eria</i>	<i>E. crassipes</i> <i>E. robusta</i>	<i>E. crassipes</i> <i>E. earine</i> <i>E. javanica</i> <i>E. mucronata</i> <i>E. nutans</i> <i>E. robusta</i>	<i>E. crassipes</i> <i>E. javanica</i>	<i>E. crassipes</i> <i>E. earine</i> <i>E. nutans</i> <i>E. robusta</i>	<i>E. earine</i>
<i>Eulophia</i>		<i>E. spectabilis</i>	<i>E. spectabilis</i>		
<i>Gastrochilus</i>	<i>G. calceolaris</i>	<i>G. calceolaris</i> <i>G. patinatus</i>		<i>G. obliquus</i> var. <i>obliquus</i>	
<i>Geodorum</i>		<i>G. densiflorum</i>			
<i>Goodyera</i>					<i>G. colorata</i>
<i>Grammatophyllum</i>		<i>G. speciosum</i>	<i>G. speciosum</i>		
<i>Grosourhya</i>		<i>G. appendiculata</i> <i>G. incurvicalcar</i> <i>G. minutiflora</i>	<i>G. appendiculata</i> <i>G. incurvicalcar</i> <i>G. muscosa</i>		<i>G. minutiflora</i>
<i>Habenaria</i>		<i>H. kingii</i>			
<i>Hetaeria</i>		<i>H. elegans</i>		<i>H. elegans</i>	<i>H. elegans</i>
<i>Hippeophyllum</i>		<i>H. scortechinii</i>	<i>H. scortechinii</i>		

Table 2 (continue)

Genera	Published/Preserved at				
	FRIM	SING	KEW	Ridley (1908, 1915)	Turner (1995)
		<i>D. farmeri</i> <i>D. geminatum</i> <i>D. grande</i> <i>D. hendersonii</i> <i>D. hosei</i> <i>D. hughii</i> <i>D. indivisum</i> <i>D. indragiriense</i> <i>D. leonis</i> <i>D. linguella</i> <i>D. longipes</i> <i>D. luxurians</i> <i>D. macropodum</i> <i>D. pachyphyllum</i> <i>D. pensile</i> <i>D. rhodostele</i> <i>D. rupicola</i> <i>D. salaccense</i> <i>D. subflavidum</i> <i>D. uniflorum</i> <i>D. zebrinum</i>	<i>D. geminatum</i> <i>D. hosei</i> <i>D. hughii</i> <i>D. indragiriense</i> <i>D. longipes</i> <i>D. luxurians</i> <i>D. macropodum</i> <i>D. quadrilobatum</i> <i>D. rupicola</i> <i>D. zebrinum</i>	<i>D. longipes</i> <i>D. macropodum</i> <i>D. rupicola</i> <i>D. subflavidum</i> <i>D. uniflorum</i>	
<i>Dendrochilum</i>	<i>D. angustifolium</i> <i>D. carnosum</i> <i>D. linearifolium</i> <i>D. pallidiflavens</i> var. <i>pallidiflavens</i>	<i>D. angustifolium</i> <i>D. carnosum</i> <i>D. gracile</i> <i>D. kingii</i> <i>D. linearifolium</i> <i>D. longifolium</i> <i>D. pallidiflavens</i> var. <i>pallidiflavens</i>	<i>D. linearifolium</i> <i>D. longifolium</i>	<i>D. gracile</i> <i>D. linearifolium</i>	
<i>Didymoplexiella</i>		<i>D. ornata</i>			
<i>Dilochia</i>	<i>D. cantleyi</i>	<i>D. cantleyi</i> <i>D. wallichii</i>	<i>D. cantleyi</i>	<i>D. cantleyi</i>	
<i>Dilochiopsis</i>	<i>D. scortechinii</i>	<i>D. scortechinii</i>	<i>D. scortechinii</i>	<i>D. scortechinii</i>	
<i>Dipodium</i>		<i>D. pictum</i>			
<i>Eria</i>	<i>E. crassipes</i> <i>E. robusta</i>	<i>E. crassipes</i> <i>E. earine</i> <i>E. javanica</i> <i>E. mucronata</i> <i>E. nutans</i> <i>E. robusta</i>	<i>E. crassipes</i> <i>E. javanica</i>	<i>E. crassipes</i> <i>E. earine</i> <i>E. nutans</i> <i>E. robusta</i>	<i>E. earine</i>
<i>Eulophia</i>		<i>E. spectabilis</i>	<i>E. spectabilis</i>		
<i>Gastrochilus</i>	<i>G. calceolaris</i>	<i>G. calceolaris</i> <i>G. patinatus</i>		<i>G. obliquus</i> var. <i>obliquus</i>	
<i>Geodorum</i>		<i>G. densiflorum</i>			
<i>Goodyera</i>					<i>G. colorata</i>
<i>Grammatophyllum</i>		<i>G. speciosum</i>	<i>G. speciosum</i>		
<i>Grosourdyia</i>		<i>G. appendiculata</i> <i>G. incurvicalcar</i> <i>G. minutiflora</i>	<i>G. appendiculata</i> <i>G. incurvicalcar</i> <i>G. muscosa</i>		<i>G. minutiflora</i>
<i>Habenaria</i>		<i>H. kingii</i>			
<i>Hetaeria</i>		<i>H. elegans</i>		<i>H. elegans</i>	<i>H. elegans</i>
<i>Hippeophyllum</i>		<i>H. scortechinii</i>	<i>H. scortechinii</i>		

Checklists of Orchids Found in Gunung Tahan

Table 2 (continue)

Genera	Published/Preserved at				
	FRIM	SING	KEW	Ridley (1908, 1915)	Turner (1995)
<i>Lecanorchis</i>		<i>L. malaccensis</i> <i>L. multiflora</i>			
<i>Liparis</i>		<i>L. parviflora</i> <i>L. parvula</i> <i>L. rhombea</i>	<i>L. parviflora</i> <i>L. rhombea</i>		<i>L. purpureoviridis</i> <i>L. rhombea</i>
<i>Luisia</i>		<i>L. antennifera</i>			
<i>Malleola</i>		<i>M. dentifera</i> <i>M. penangiana</i>	<i>M. penangiana</i> <i>M. sylvestris</i>		
<i>Mycranthes</i>	<i>M. oblitterata</i>	<i>M. oblitterata</i> <i>M. pannea</i>	<i>M. oblitterata</i>	<i>M. oblitterata</i>	
<i>Nephelaphyllum</i>	<i>N. pulchrum</i>	<i>N. pulchrum</i> <i>N. tenuiflorum</i>			
<i>Nervilla</i>		<i>N. concolor</i> <i>N. punctata</i>			
<i>Neuwiedia</i>		<i>N. griffithii</i>			
<i>Oberonia</i>		<i>O. dissitiflora</i> <i>O. insectifera</i> <i>O. lunata</i> <i>O. lucopodioides</i> <i>O. miniata</i>	<i>O. fungumolens</i> <i>O. lunata</i> <i>O. suborbicularis</i>		<i>O. semifimbriata</i> <i>O. suborbicularis</i>
<i>Octarrhena</i>		<i>O. angraecoides</i> <i>O. parvula</i>		<i>O. angraecoides</i>	
<i>Oxystophyllum</i>		<i>O. atrorubens</i> <i>O. sinuatum</i>	<i>O. carnosum</i>	<i>O. sinuatum</i>	
<i>Paphiopedilum</i>		<i>P. bullenianum</i> <i>P. bullenianum</i> var. <i>bullenianum</i>	<i>P. bullenianum</i>	<i>P. barbatum</i> <i>P. bullenianum</i> var. <i>bullenianum</i>	<i>P. bullenianum</i>
<i>Pelatanthera</i>		<i>P. cristata</i>	<i>P. cristata</i>	<i>P. angustata</i>	
<i>Pennilabium</i>		<i>P. angraecum</i> <i>P. struthio</i>	<i>P. struthio</i>		
<i>Peristylus</i>		<i>P. gracilis</i>	<i>P. gracilis</i>		
<i>Phalaenopsis</i>		<i>P. appendiculata</i> <i>P. fuscata</i> <i>P. maculate</i>	<i>P. appendiculata</i> <i>P. fuscata</i>		<i>P. appendiculata</i> <i>P. fuscata</i> <i>P. maculata</i>
<i>Pholidota</i>	<i>P. carnea</i> var. <i>pumila</i>	<i>P. carnea</i> var. <i>carnea</i> <i>P. carnea</i> var. <i>parviflora</i> <i>P. carnea</i> var. <i>pumila</i>		<i>P. carnea</i> var. <i>carnea</i> <i>P. carnea</i> var. <i>pumila</i>	
<i>Phreatia</i>		<i>P. crassifolia</i>	<i>P. crassifolia</i> <i>P. listrophora</i>	<i>P. crassifolia</i> <i>P. listrophora</i>	<i>P. linearia</i>
<i>Pinalia</i>		<i>P. appendicula</i> <i>P. bicristata</i> <i>P. floribunda</i> <i>P. lancifolia</i> <i>P. pachystachya</i> <i>P. punctate</i>		<i>P. appendicula</i>	
<i>Podochilus</i>				<i>P. sciuroides</i> <i>P. tenuis</i>	
<i>Pomatocalpa</i>			<i>P. simalurense</i> <i>P. spicatum</i>		

Table 2 (continue)

Genera	Published/Preserved at				
	FRIM	SING	KEW	Ridley (1908, 1915)	Turner (1995)
<i>Porpax</i>					<i>P. elwesii</i>
<i>Pteroceras</i>			<i>P. biserratum</i> <i>P. pallidum</i> <i>P. violaceum</i>		<i>P. violaceum</i>
<i>Renanthera</i>			<i>R. elongata</i>		
<i>Spathoglottis</i>	<i>S. aurea</i>		<i>S. aurea</i>	<i>S. aurea</i>	
<i>Taeniophyllum</i>			<i>T. glandulosum</i> <i>T. gracillimum</i> <i>T. palliflorum</i> <i>T. rostratum</i> <i>T. stella</i>		<i>T. pallidiflorum</i> <i>T. rostratum</i>
<i>Tainia</i>	<i>T. speciosa</i>			<i>T. speciosa</i> <i>T. vegetissima</i>	<i>T. vegetissima</i>
<i>Thrixspermum</i>			<i>T. acuminatissimum</i> <i>T. ridleyanum</i> <i>T. sarcophyllum</i> <i>T. trichoglottis</i>	<i>T. sarcophyllum</i> <i>T. scortechinii</i>	<i>T. sarcophyllum</i> <i>T. tahanense</i>
<i>Trichoglottis</i>			<i>T. retusa</i>		
<i>Trichotosia</i>	<i>T. ferox</i> <i>T. poculata</i>		<i>T. pauciflora</i> <i>T. poculata</i>	<i>T. ferox</i> <i>T. pauciflora</i> <i>T. poculata</i>	
<i>Zeuxine</i>					<i>Z. gracilis</i> <i>Z. purpurascens</i>

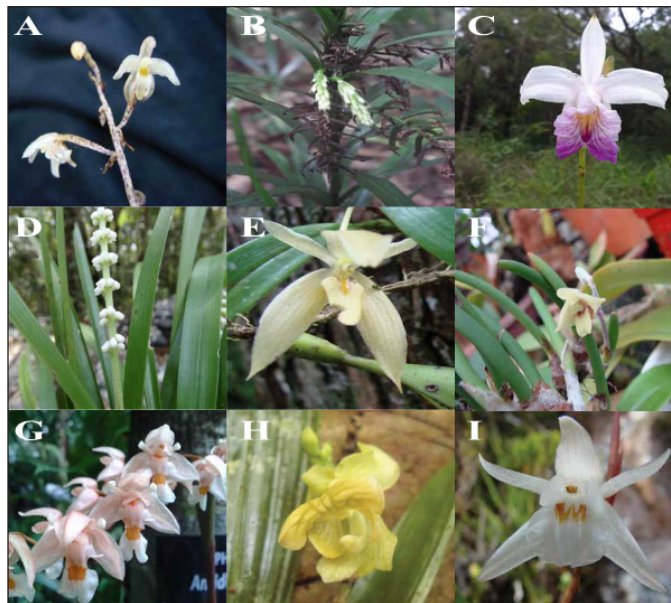


Figure 1. A. *Aphyllorchis montana* Rchb. B. *Apostasia nuda* R.Br. C. *Arundina graminifolia* (D.Don) Hochr. D. *Ascidieria longifolia* (Hook.f.) Seidenf. E. *Bulbophyllum pileatum* Lindl. F. *Campanulorchis pellipes* (Rchb.f. ex Hook.f.) Y.P.Ng & P.J.Cribb G. *Chelonistele sulphurea* (Blume) Pfitzer H. *Claderia viridiflora* Hook.f. I. *Coelogyne radicata* Ridl. Photos by SFMI

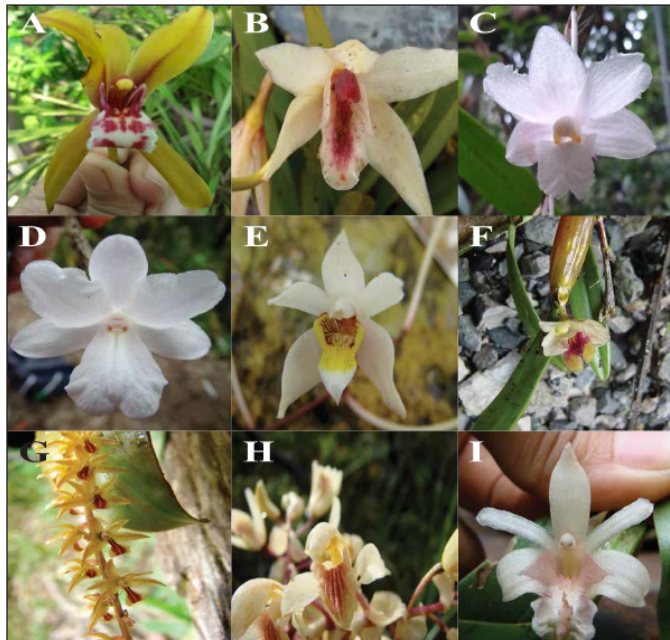


Figure 2. A. *Cymbidium finlaysonianum* Lindl. B. *Cymbidium roseum* J.J.Sm. C. *Dendrobium foxii* Ridl. D. *Dendrobium hughii* Rehb.f. E. *Dendrobium longipes* Hook.f. F. *Dendrobium angustifolium* (Blume) Lindl. G. *Dendrochilum gracile* (Hook.f.) J.J.Sm. H. *Diloehia cantleyi* (Hook.f.) Ridl. I. *Eria neglecta* Lindl. Photos by SFMI



Figure 3. A. *Eria robusta* (Blume) Lindl. B. *Oxystophyllum carnosum* Blume. C. *Pelatantheria angustata* (Ridl.) Ridl. D. *Podochilus microphyllus* Lindl. E. *Spathoglottis aurea* Lindl. F. *Spathoglottis plicata* Blume. G. *Spiranthes sinensis* (Pers.) Ames. H. *Thecostele alata* (Roxb.) Par. & Reichb.f. I. *Trichotosia gracilis* (Hook.f.) Kraenzl. Photos by SFMI

DISCUSSION

The information presented here could serve as a new insight for orchids recorded in Gunung Tahan, particularly from the habitat along the later established Merapoh Trail which may enhance the value of Taman Negara Pahang as the center of flora diversity in Malaysia. More undiscovered or new species could be found if a more comprehensive study from the southern, northern, and western side of Gunung Tahan could be undertaken. This will possibly reveal a habitat specific species of orchids in Gunung Tahan, which may be driven by site-specific preferences.

There were no representative species collected for the subfamily Vanilloideae in this study. Only one genus *Lecanorchis* was preserved in the SING which was collected from Kuala Tahan Trail. *Lecanorchis* is one of the leafless myco-heterotrophs or formerly called as saprophytes species in subfamily Vanilloideae. Their leafless, thin, and brittle dark stem, which bear few-to-many small flowers characters make it difficult for the climbers to find while climbing the mountain. However, one leafless saprophytic species that was characterized under subfamily Epidendroideae, *Aphyllorchis montana* Rchb.f. was found from Merapoh Trail.

Based on the current study two species; *C. viridiflora* and *S. sinensis* were listed globally as least concern species, while *P. bullenianum* was listed as endangered species by IUCN Red List of Threatened Species version 2017.3. According to the IUCN the population of *P. bullenianum* is decreasing which give alarming sign to

the conservation of the species in Gunung Tahan. In addition to the 18 new records for Gunung Tahan, the presence of the endangered species highlights the need for conservation effort in Gunung Tahan even though the area has been gazetted as forest reserve and is one of the Malaysia's premier national park.

ACKNOWLEDGEMENTS

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