

Orchids of Perlis: New Records and Distribution

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ABSTRAK

Satu kajian diversiti orkid secara intensif telah dijalankan di Perlis terutamanya di dalam kawasan Taman Negeri Perlis dari tahun 2003 hingga 2004. Melalui banyak kerja lapangan yang dilaksanakan, sebanyak 1783 sampel orkid telah berjaya dikumpulkan dari 12 bukit (11 bukit batu kapur dan satu gunung separa batu kapur dan granit). Sampel ini telah dikenal pasti kepada 119 spesies dalam 50 genera yang diwakili oleh 4 subfamili. Daripada jumlah ini, 62 spesies dalam 20 genera adalah rekod baru untuk Perlis and 9 spesies dan satu genus *Panisea* merupakan rekod baru untuk Malaysia. Diversiti orkid di Perlis menunjukkan pertalian yang rapat dengan flora orkid di Thailand, iaitu Kawasan Flora Indo-Malaya atau Kawasan Flora Thai-Myanmar berbanding dengan kawasan Malaya. Pertalian rapat ini disumbangkan oleh keadaan iklim (monsun utara yang kering), kedudukan geografi (bersempadan dengan Semenanjung Thailand) dan jenis habitat iaitu batu kapur yang sememangnya terkenal dengan kadar keendemikan spesies yang tinggi. Sebanyak 90% daripada rekod baru ini dijumpai di kawasan berdekatan sempadan Thailand dan juga di Gunung Perlis yang merupakan puncak paling tinggi di Perlis (733m).

ABSTRACT

An intensive study on orchid diversity was conducted in Perlis especially within the Perlis State Park during the period 2003 – 2004. During the numerous field trips and studies, a total of 1,783 orchid specimens were collected from the 12 hills (11 limestone hills and one partly granite stone mountain). These samples were identified and differentiated into 119 taxa in 50 genera which are represented by 4 subfamilies. Ninety were identified to species level and the remaining 29 were only identified to genus level as the specimens were incomplete, because of lack of flowers. From these numbers, 62 species in 20 genera are new records for Perlis and 9 species and one genus, *Panisea*, are new records for Malaysia. The diversity of orchids in Perlis is characteristically closely related to Thailand's orchid flora, which is Indo-Malayan Floristic Region or Thailand – Burmese Floristic Region as compared to the other parts of Malaya which is Malayan Floristic Region. This can be to the climatic conditions (northern dry – monsoon), geographical location (bordering Peninsular Thailand) and the limestone habitat which is known to harbour a high rate of species endemism. As much as 90% of these new records of orchids were collected from near the Malaysian-Thailand border and from Gunung Perlis, the highest peak in Perlis (733m).

INTRODUCTION

Perlis is the smallest and farthest north state in Peninsular Malaysia, bordered by Thailand in the north and Kedah in the south. Perlis covers an area of 80,302 ha with about 12,048 ha of total forested land scattered into seven permanent forest reserves. Four large forest reserves, namely, Wang Mu, Bukit Bintang, Mata Ayer, and Kurong Batang Forest Reserves

are located on the Nakawan Range, which is part of the Setul Formation that lies between the Perlis – Thailand border. It extends to the eastern part of Langkawi Islands and extends to the north into Thailand where it is known as Tung Song Formation. Nakawan Range is the oldest, and the longest continuous limestone Range in Peninsular Malaysia, aged from Ordovician to Devonian (450 – 350

millions years ago). Perlis has unique flora and known to have many species unique only to limestone and endemic to the northern part of Peninsular Malaysia and Perlis.

These massive limestone hills contain a variety of vegetations that support a great diversity of limestone flora. However, botanical records for Perlis are poor compared to the limestone areas of other Malaysian states, as most floral studies of flora were focused on Langkawi Island (Kiew *et al.* 1993).

The history of botanical collection in Perlis started in 1896 by Ridley, who collected plants from Bukit Lagi and Bukit Chuping. This was followed by Henderson (between 1923 and 1937) who explored Bukit Chuping, Bukit Lagi, Wang Tangga and Tebing Tinggi. A local collector, Kiah (1938) did some collecting from Wang Tangga. In 1965, Burt and Woods collected plants from Bukit Bintang. These collections are summarized in Chin (1977, 1979, 1983a, b) who also recorded 80 species from Perlis (Kiew *et al.* 1993). Several collections were done between 1990s to present; in 1992 by the World Wild Fund (WWF) Malaysia team headed by Sharma who collected from Bukit Rongkit and Yong, Rahimatshah and Tan collected from Sg. Anak Chelong and Wang Kelian (Sharma 1992); Kiew *et al.* (1993) who recorded 215 species of plants in 164 genera and 65 families (recorded 22 species of orchids). During a scientific expedition conducted in 1999 covering the Wang Kelian area, Faridah Hanum *et al.* recorded 164 species in 129 genera and 65 families of non herbaceous flowering plants; Rusea *et al.* has recorded 45 species from 21 families of herbaceous plants including 6 species of orchids (Latiff *et al.* 2001). In the year 2000, another scientific expedition was conducted covering the Wang Mu Forest Reserve, which recorded 145 species from 116 genera and 54 families (with only one orchid species recorded) (Latiff *et al.* 2002). Shakirah (2003) recorded 41 species of orchids on a single limestone hill, Bukit Pelarit.

This study is focused on limestone hills grouped as Setul Limestone Formation, the

oldest limestone formation in Peninsular Malaysia (Ordovician to early Devonian) except for Bukit Chabang and Bukit Mata Air which belong to Chuping limestone formation (early Permian to late Triassic). Most of the limestone hills are located in the Perlis State Park (Latiff *et al.* 2002) (Fig. 1).

SITE DESCRIPTION AND METHODS

Perlis

Perlis is situated at latitude 6° 15' N and longitude 100° 6' to 100° 23'E. Perlis shares borders with Thailand in the north and the state of Kedah in the south. The climate in Perlis is warm and dry from January to April with temperatures ranging from 21° to 3°C and an average annual rainfall ranging between 2000 mm to 2500 mm. The wet season is between September and December. The rainfall peak is in October and between April – May (Rahimatsah-*et al.* 2001).

Most of the forest in Perlis is the semi-deciduous type influenced by the northern and dry monsoon element from Thai-Burmese that differentiate the flora in Perlis from the in other parts of Peninsular Malaysia (Mathew *et al.* 1993). Ridley (1911) mentioned that the difference between the flora, especially the limestone flora, at lower Thailand (including Perlis which was part of Thailand at that time) and the other states of Peninsula Malaysia south of Alor Setar may be due to the distinct dry season (December to February) in the extreme north of Peninsular Malaysia (Chin 1977).

Perlis has about 10,631 ha of forested area scattered in 7 forest reserves and a proposed forest reserve. The Perlis State Park with an area greater than 5,000 ha was established in 1997 and comprises Mata Ayer, Wang Mu and Wang Tangga Forest Reserves. The state park was established to conserve and protect the limestone biodiversity. The limestone hills in Perlis contain a high number of endemic and rare plants including the Orchidaceae (Latiff 2002; Wong 2002).



Plate 1. New orchid species records for Perlis* and Malaysia**. A. *Thelasis pymae**, B. *Dendrobium kentrophyllum**, C. *Dienia ophrydis**, D. *Acampe rigida**, E. *Eria ochracea*** , F. *Oberonia langbianensis*** , G. *Cymbidium ensiformis** and H. *Thrixspermum pensile***

Methods

Four botanical surveys or field studies were carried out on limestone hills in Perlis between 2003 and 2004. Orchids were collected from eleven limestone hills and a limestone/granite hill, in Gunung Perlis. Specimens were collected along the trails. Each specimen was assigned a collection number under the author series (Wendy Yong 1-478). However, if there were too few surviving plants of a species in the collection site, the species was not collected but all its characteristics were recorded in the field notebook and noted as seen on site and photographed as evidence. Notes on morphology and habitat for each specimen collected or observed *in situ* were documented. Photographs were taken whenever possible. All specimens collected were processed according to standard herbarium specimen preparation techniques outlined in Forman (1989). Specimens were identified using characters described and identification keys in Brühl (1926), Holttum (1957), Seidenfaden and Smitinand (1959–1961), Seidenfaden (1968, 1973, 1975, 1976, 1977, 1978a, 1978b, 1979, 1980), Banerji (1978), Teo (1985), Seidenfaden and Wood (1992), Vermeulen (1991), Wood (1997, 2001) and Comber (1990, 2001). All herbarium specimens collected during this study were deposited at the Herbarium of Biology Department, Faculty of Science, Universiti Putra Malaysia.

RESULTS AND DISCUSSION

A total of 119 species of orchids belonging to 50 genera were identified from 12 hills surveyed during this study (Table 1), of which 44 species (37%) are new records for Perlis

(Plate 1) and 11 species (9.2%) are new records for Malaysia (Plate 2), an addition to the existing checklist (Tables 2 and 3). Therefore, the total orchid species in Perlis (excluding the 11 new recorded species for Malaysia) represented 12.3% of 878 species of the total orchids species recorded from Peninsular Malaysia (Schuiteman 1999). This result clearly shows the great diversity of orchids for the smallest state, Perlis, which covers an area of 81, 063 hectares only.

The genus *Dendrobium* is the largest with about 16 species which stands 13.4% of the orchids in Perlis followed by *Flickingeria* with 11 species (9.2%), then *Eria* with 9 species (7.6%) and *Bulbophyllum* with 8 species (6.7%) (Table 4). A noteworthy discovery during this study is that 6 species (54.5%) out of 11 new recorded species for Peninsular Malaysia were actually found on a single hill, Bukit Rongkit, where it was also discovered that an abundance of *Flickingeria* spp. grows on the exposed limestone rocks (some grows on tree trunks) along the way to the hill top. The *Flickingeria* spp. is well adapted to the extreme hot and dry conditions which enable them to survive well in the extreme climate.

However the distribution and the diversity of orchids in Perlis are more related to the Indo-Malayan orchids compared to the Malayan orchids. Most of the orchid species found are restricted to the northern part of Peninsular Malaysia (Langkawi Island, Kedah, Kelantan and Perlis) and Peninsular Thailand, which do not occur elsewhere outside this range such as *Habenaria carnea*, *Paphiopedilum niveum* and *Eria ornata*.

TABLE 1
Orchids distribution in Perlis

Species	Bukit Rongkit	Bukit Merah	Bukit Bintang	Bukit Genting Hantu	Bukit Wang Mu	Bukit Teluk Tapu	Bukit Ayer	Bukit Gua Ikan	Bukit Chabang	Bukit Wang Tangga	Bukit Wang Pisang	Gunung Perlis
<i>Acampe rigida</i>		✓										
<i>Aerides odorata</i>	✓	✓			✓							
<i>Agrostophyllum</i> sp.												
<i>Apotasia nuda</i>												✓
<i>Ascocentrum miniatum</i>	✓	✓				✓		✓				
<i>Ascocentrum</i> sp.											✓	
<i>Biermannia ciliata</i>											✓	
<i>Bulbophyllum dentiferum</i>					✓							
<i>Bulbophyllum microglossum</i>						✓						
<i>Bulbophyllum mutabile</i>												✓
<i>Bulbophyllum purpurascens</i>	✓	✓						✓		✓		
<i>Bulbophyllum taeniophyllum</i>												✓
<i>Bulbophyllum</i> sp. 1	✓											
<i>Bulbophyllum</i> sp. 2	✓		✓									
<i>Bulbophyllum</i> sp. 3												✓
<i>Calanthe</i> sp.	✓											
<i>Ceratostylis radiata</i>												✓
<i>Ceratostylis subulata</i>												✓
<i>Chamaeanthus brachystachys</i> **											✓	
<i>Cleisostoma discolor</i>						✓						
<i>Cleisostoma williamsonii</i>			✓									
<i>Coelogyne trinervis</i>	✓										✓	
<i>Coelogyne</i> sp. 1		✓										
<i>Coelogyne</i> sp. 2												✓
<i>Coelogyne</i> sp. 3								✓				
<i>Cymbidium aloifolium</i>						✓		✓	✓			
<i>Cymbidium ensifolium</i> ssp. <i>haematodes</i>	✓			✓		✓						
<i>Cymbidium lancifolium</i>												✓
<i>Cymbidium</i> sp. 1	✓			✓								
<i>Cymbidium</i> sp. 2	✓											
<i>Dendrobium acerosum</i>	✓											

TABLE 1 (Continued)

Species	Bukit Rongkit	Bukit Merah	Bukit Bintang	Bukit Genting Hantu	Bukit Wang Mu	Bukit Teluk Tapu	Bukit Ayer	Bukit Gua Ikan	Bukit Chabang	Bukit Wang Tangga	Bukit Wang Pisang	Gunung Perlis
<i>Dendrobium aloifolium</i>		✓										
<i>Dendrobium anosmum</i>					✓							
<i>Dendrobium concinnum</i>		✓										
<i>Dendrobium crumenatum</i>	✓											
<i>Dendrobium hughii</i>												✓
<i>Dendrobium indivisum</i>					✓							
<i>Dendrobium indivisum var pallidum</i>	✓	✓										
<i>Dendrobium kentrophyllum</i>												✓
<i>Dendrobium leonis</i>	✓	✓								✓		
<i>Dendrobium linguella</i>		✓								✓		
<i>Dendrobium salaccense</i>		✓		✓							✓	
<i>Dendrobium secundum</i>	✓	✓									✓	
<i>Dendrobium setifolium</i>												✓
<i>Dendrobium trinervium</i>				✓	✓	✓						
<i>Dendrobium truncatum</i>												✓
<i>Denia ophrydis</i>		✓										✓
<i>Eria</i> sp.												✓
<i>Eria floribunda</i>												✓
<i>Eria javanica</i>		✓	✓	✓								✓
<i>Eria mucronata</i>				✓								✓
<i>Eria nutans</i> Lindl.												✓
<i>Eria ochracea</i> **												✓
<i>Eria ornata</i>	✓	✓		✓								
<i>Eria tenuiflora</i>												✓
<i>Eria</i> sp.												✓
<i>Eulophia andamanensis</i>			✓	✓								✓
<i>Flickingeria angustifolia</i>												✓
<i>Flickingeria bancana</i>												✓
<i>Flickingeria convexa</i>												✓
<i>Flickingeria fimbriata</i>	✓											
<i>Flickingeria pallens</i>	✓											
<i>Flickingeria xantholeuca</i>				✓								
<i>Flickingeria</i> sp. 1	✓											
<i>Flickingeria</i> sp. 2				✓								

TABLE 1 (Continued)

Species	Bukit Rongkit	Bukit Merah	Bukit Bintang	Bukit Genting Hantu	Bukit Wang Mu	Bukit Teluk Tapu	Bukit Ayer	Bukit Gua Ikan	Bukit Chabang	Bukit Wang Tangga	Bukit Wang Pisang	Gunung Perlis
<i>Flickingeria</i> sp. 3		✓										
<i>Flickingeria</i> sp. 4			✓									
<i>Flickingeria</i> sp. 5												
<i>Gastrochilus hainanensis</i> **		✓										
<i>Gastrodia javanica</i>												✓
<i>Grosourdyia incurvicalar</i>											✓	
<i>Grosourdyia muscosa</i>												✓
<i>Habenaria carnea</i>	✓	✓	✓								✓	
<i>Habenaria reflexa</i>				✓							✓	
<i>Kingidium deliocosum</i>	✓	✓	✓	✓				✓			✓	
<i>Liparis aurita</i> **											✓	
<i>Liparis caespitosa</i>												✓
<i>Liparis viridiflora</i>		✓										
<i>Luisia</i> sp.	✓											
<i>Macodes petola</i>												✓
<i>Malaxis calophylla</i>											✓	
<i>Malaxis prasina</i>											✓	
<i>Malaxis</i> sp.1											✓	
<i>Malaxis</i> sp.2											✓	
<i>Malaxis</i> sp.3											✓	
<i>Nephelaphyllum pulchrum</i>												✓
<i>Nervilia plicata</i>				✓							✓	
<i>Nervilia punctata</i>											✓	
<i>Oberonia ensiformis</i> **		✓										
<i>Oberonia langbianensis</i> **	✓											
<i>Oberonia</i> sp.		✓										
<i>Panisea uniflora</i> **											✓	
<i>Paphiopedilum niveum</i>	✓	✓	✓									
<i>Pennilabium struthio</i>	✓	✓				✓					✓	✓
<i>Pholidota imbricata</i>												✓
<i>Pholidota</i> sp.	✓											
<i>Podochilus lucescens</i>	✓	✓	✓	✓	✓						✓	

TABLE 1 (Continued)

Species	Bukit Rongkit	Bukit Merah	Bukit Bintang	Bukit Genting Hantu	Bukit Wang Mu	Bukit Teluk Tapu	Bukit Ayer	Bukit Gua Ikan	Bukit Chabang	Bukit Wang Tangga	Bukit Wang Pisang	Gunung Perlis
<i>Polystachya concreta</i>	✓											
<i>Pomatocalpa andamanica</i>	✓	✓			✓	✓					✓	
<i>Pomatocalpa spicata</i>					✓		✓				✓	
<i>Porpax</i> sp.											✓	
<i>Renanthera</i> sp.												✓
<i>Renantherella histrionica</i>		✓										
<i>Spathoglottis plicata</i>					✓							
<i>Stresosandra javanica</i>												✓
<i>Taeniophyllum</i> sp.												✓
<i>Tainia speciosa</i>												✓
<i>Thelasis pygmae</i>		✓	✓									
<i>Thelasis rhomboglossa</i> **	✓											
<i>Thelasis</i> sp.											✓	
<i>Trichoglottis bipunctata</i>				✓	✓			✓				
<i>Trichoglottis cirrhifera</i>	✓	✓			✓	✓		✓				
<i>Trichotosia gracilis</i>												✓
<i>Thrixspermum pensile</i> **												✓
<i>Tropidia cucurlioides</i>	✓			✓								
<i>Tropidia</i> sp.		✓										
<i>Tuberolabium odoratissimum</i> **	✓											

TABLE 2
New records for Perlis

No.	Species	Notes
1.	<i>Acampe rigida</i>	Previously only known from Langkawi Island and Penang.
2.	<i>Biermannia ciliata</i>	Previously found at Sungai Siput, Perak, Sungai Sat in Pahang and Kemaman.
3.	<i>Bulbophyllum microglossum</i>	Previously found in Gunung Tahan and Cameron Highlands.
4.	<i>Bulbophyllum mutabile</i>	Previously only collected at Bukit Fraser, Ulu Kali (Pahang) and Bukit Larut, Perak.
5.	<i>Bulbophyllum purpurascens</i>	Previously not recorded from Perlis.
6.	<i>Bulbophyllum taeniophyllum</i>	Previously found on limestone in Kelantan
7.	<i>Ceratostylis radiata</i>	Previously only known from Langkawi Island
8.	<i>Coelogyne trinervis</i>	Previously found at Pahang, Kelantan, Pinang and Langkawi Island.
9.	<i>Cymbidium aloifolium</i>	Previously only recorded from Langkawi Island.
10.	<i>Cymbidium ensifolium</i> ssp. <i>haematodes</i>	Previously only recorded from Langkawi Island.
11.	<i>Dendrobium hughii</i>	Previously found in Gunung Raya in Langkawi Island, Gunung Jerai, Kedah, Bukit Fraser, Ulu Kali, Gunung Tahan and Gunung Benom.
12.	<i>Dendrobium kentrophyllum</i>	Previously found on Taiping Hills, Cameron Highlands, Bukit Fraser and Gunung Ulu Kali.
13.	<i>Dendrobium setifolium</i>	Previously only found in Pahang.
14.	<i>Dendrobium truncatum</i>	Previously found in Kedah, Perak, Selangor, Pahang and Pulau Tioman.
15.	<i>Dienia ophrydis</i>	Previously found in Gunung Raya, Langkawi Island and Negeri Sembilan.
16.	<i>Eria floribunda</i>	-
17.	<i>Eria javanica</i>	Previously found in Pahang and Terrengganu.
18.	<i>Eria mucronata</i>	Previously found in Gua Musang, Kelantan and Bukit Takun, Selangor.
19.	<i>Eria nutans</i>	-
20.	<i>Eria tenuiflora</i>	-
21.	<i>Flickingeria angustifolia</i>	
22.	<i>Flickingeria bancana</i>	
23.	<i>Flickingeria convexa</i>	Previously found at Pontian, Johor and Gunung Ulu Kali, Selangor.
24.	<i>Flickingeria xantholeuca</i>	Previously found in Langkawi Island, Perak, Pahang, Johor.
25.	<i>Gastrodia javanica</i>	-
26.	<i>Grosourdia incurvicalar</i>	Previously found in Tembeling.
27.	<i>Grosourdia muscosa</i>	Previously found in Pahang.
28.	<i>Habenaria reflexa</i>	Previously found in forest on limestone in Pahang and Perak.
29.	<i>Kingidium deliocosum</i>	-
30.	<i>Liparis cespitosa</i>	-
31.	<i>Liparis viridiflora</i>	Previously found in Perak, Penang and Pahang.
32.	<i>Mecodes petola</i>	Found from north to Penang.
33.	<i>Malaxis calophylla</i>	Found on Bukit Bendera, Penang, on limestone at Baling, Kedah, at Gua Ledang, Johor and at Gua Musang, Kelantan.
34.	<i>Nephelaphyllum pulchrum</i>	-
35.	<i>Nervilia punctata</i>	Previously found in Langkawi Island, Perak and Penang.
36.	<i>Pholidota imbricata</i>	Common on limestone.
37.	<i>Pomatocalpa andamanica</i>	Previously recorded from Batu Caves, Selangor.
38.	<i>Pomatocalpa spicata</i>	Previously found in Perak, Pahang and Negeri Sembilan.
39.	<i>Spathoglottis plicata</i>	-
40.	<i>Stresosandra javanica</i>	Previously found in the north part and Penang.
41.	<i>Tainia speciosa</i>	Previously recorded from Genting Highlands and Fraser's Hill.
42.	<i>Thelasis pygmae</i>	-
43.	<i>Trichotomia gracilis</i>	-
44.	<i>Tropidia cucurlioides</i>	-

TABLE 3
New records for Malaysia

No.	Species	Notes
1.	<i>Chamaeanthus brachystachys</i>	Previously recorded in Java and south Thailand.
2.	<i>Eria ochracea</i>	Previously recorded as an endemic species to Thailand.
3.	<i>Gastrochilus hainanensis</i>	Previously recorded from Hainan and Thailand.
4.	<i>Liparis aurita</i>	Previously recorded from Thailand and Timor.
5.	<i>Oberonia ensiformis</i>	Previously recorded from Thailand, Northwest Himalaya, Deccan, Myanmar, China and Indochina.
6.	<i>Oberonia langbianensis</i>	Previously recorded from Thailand and Vietnam
7.	<i>Panisea uniflora</i>	Previously recorded from Yunnan, Bhutan, Cambodia, India, Laos, Myanmar, Nepal, Thailand and Vietnam.
8.	<i>Pholidota recurva</i>	Previously recorded from Sikkim, Nepa, Burma (Tenasserim), Thailand and Vietnam
9.	<i>Thelasis rhomboglossa</i>	Previously recorded as an endemic species to Sumatera.
10.	<i>Thrixspermum pensile</i>	Previously recorded from Java and Thailand.
11.	<i>Tuberolabium odoratissimum</i>	Previously recorded from Java and Sumatera.

TABLE 4
Summary of orchids found in Perlis

Genera	No. of species
<i>Acampe</i>	1
<i>Aerides</i>	1
<i>Agrostophyllum</i>	1
<i>Apotasia</i>	1
<i>Ascocentrum</i>	2
<i>Biermannia</i>	1
<i>Bulbophyllum</i>	8
<i>Calanthe</i>	1
<i>Ceratostylis</i>	2
<i>Chamaeanthus</i>	1
<i>Cleisostoma</i>	2
<i>Coelogyne</i>	4
<i>Cymbidium</i>	5
<i>Dendrobium</i>	16
<i>Dienia</i>	1
<i>Eria</i>	9
<i>Eulophia</i>	1
<i>Flickingeria</i>	11
<i>Gastrochilus</i>	1
<i>Gastrodia</i>	1
<i>Grosourdya</i>	2
<i>Habenaria</i>	2
<i>Kingidium</i>	1
<i>Liparis</i>	3
<i>Luisia</i>	1

Table 4 (Continued)

Genera	No. of species
<i>Macodes</i>	1
<i>Malaxis</i>	5
<i>Nephelaphyllum</i>	1
<i>Oberonia</i>	3
<i>Panisea</i>	1
<i>Paphiopedilum</i>	1
<i>Pennilabium</i>	1
<i>Pholidota</i>	3
<i>Podochilus</i>	1
<i>Polystachya</i>	1
<i>Pomatocalpa</i>	2
<i>Porpax</i>	1
<i>Renanthera</i>	2
<i>Renantherella</i>	1
<i>Spathoglottis</i>	1
<i>Stresosandra</i>	1
<i>Taeniophyllum</i>	1
<i>Tainia</i>	1
<i>Thelasis</i>	3
<i>Trichoglottis</i>	2
<i>Trichotisia</i>	1
<i>Thrixspermum</i>	1
<i>Tropidia</i>	2
<i>Tuberolabium</i>	1
Total 50 genera	Total 119 species

CONCLUSION

Perlis shows a great diversity of orchids including 119 species collected during this study (from year 2003 – 2004). A total of 44 new species were recorded for Perlis and 11 are new records for Malaysia (Plate 1). These results simultaneously increase the number of orchid species found in Peninsular Malaysia from 878 species (Schuiteman 1999) to 889 species. Nine species from the 11 new records for Malaysia are also recorded in Thailand. This shows a strong connection between the Perlis flora and the Thailand flora especially the orchidaceae family.

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REFERENCES

- BANERJI, M. L. 1978. *Orchids of Nepal*. New Delhi: International Bioscience Publisher.
- CHIN, S. C. 1977. The limestone flora of Malaya 1. *Gard. Bull. Sing.* **30**: 165 — 219.
- CHIN, S. C. 1979. The limestone flora of Malaya 2.— *Gard. Bull. Sing.* **32**: 64 — 203.
- CHIN, S. C. 1983a. The limestone flora of Malaya 1. *Gard. Bull. Sing.* **35**: 137 — 190.
- CHIN, S. C. 1983b. The limestone flora of Malaya 1. *Gard. Bull. Sing.* **36**: 31 — 91.
- COMBER, J.B. 1990. *Orchids of Java*. Royal Botanic Garden, Kew: Bentham-Moxon Trust.
- COMBER, J.B. 2001. *Orchids of Sumatera*. Malaysia: Natural History Publications (Borneo).
- FARIDAH-HANUM I., MAT-SALLEH K., RAHIM OTHMAN A., RIZAL KHALIT A., SHAMSUL KAMIS and NAZRE M. 2001. In *An Annotated Checklist of Flowering Plants at Wang Kelian, Perlis State Park, Perlis*, ed. I. Faridah-Hanum, K. Osman and A. Latiff, pp. 227-247. Forest Department of Perlis, Kangar, Perlis, Malaysia.
- GO, R., P. LEPUN and A. BADROL. 1999. *Noteworthy Herbaceous Plants of Tasik Meranti and Bukit Pelarit, Wang Kelian, Perlis*, ed. I. Faridah Hanum, K. Osman, A.R. Yussof and A. Latiff, pp. 267—274. Forest Department of Perlis, Kangar Perlis, Malaysia.
- HOLTUM, R.E. 1957. A revised *Flora of Malaya: An Illustrated Systematic Account of the Malayan Flora, including Commonly Cultivated Plant*. Vol. I, *Orchids of Malaya*. Botanic Garden, Singapore: Government Printing Office.
- JASIN, B. and Z. HARUN. 2002. *Geomorphology and Geology of the Setul Formation in Perlis*, ed. I. Faridah-Hanum, K. Osman, A.R. Yussof and A. Latiff, pp. 68—82. Forest Department of Perlis, Kangar, Perlis, Malaysia.
- KIEW, R., D.G.C. YONG, S. ANTHONYSAMY and J. ANTHONYSAMY. 1993. A floral survey of limestone hill in Perlis with management recommendation. WWF Malaysia. 57 pp.
- LATIFF, A. KASIM OSMAN, I. FARIDAH-HANUM and RAHIMATSAM AMAT. 2001. *Perlis State Park at Wang Kelian: An Introduction*, ed. I. Faridah-Hanum, K. Osman and A. Latiff, pp. 19—27. Forest Department of Perlis, Kangar, Perlis, Malaysia.
- MATHEW, D. S. K., SHARMA. 1993. Biodiversity in Peninsular Malaysia Transfrontier Forest: A case study at Mata Ayer Forest Reserve (FR) and Proposed Bukit Wang Mu, Perlis. 26 p.
- MOHD NOOR, S. 2002. Kajian kepelbagaian flora Orchidaceae di kawasan batu kapur, Bukit Pelarit, Wang Kelian, Taman Negeri Perlis. BSc. Thesis, Universiti Putra Malaysia, Serdang, Malaysia. 159 p.

- RAHIMATSAH, A. and K. OSMAN. 2002. *The Administration and Management of Perlis State Park* ed. I. Faridah-Hanum, K. Osman, A.R. Yussof and A. Latiff, pp. 23-43. Forest Department of Perlis, Kangar, Perlis, Malaysia.
- RIDLEY, H.N. 1911. The flora of lower Siam. *Journal of Strait Branch Royal Asiatic Society* **59**: 27-234.
- SCHUITEMAN, A. 1999. Biogeography of Malesian Orchidaceae. *Flora Malesiana Bulletin* **12(6)**: 273-287.
- SEIDENFADEN, G. 1968. The genus *Oberonia* in Mainland Asia. *Dansk Botanisk Arkiv* **32 (2)**: 108-180.
- SEIDENFADEN, G. 1975a. Orchid genera in Thailand 2. *Cleisostoma* Bl. *Dansk. Bot. Ark.* **29(3)**: 80 p.
- SEIDENFADEN, G. 1975b. Orchid genera in Thailand 3. *Coelogyne* Lindl. *Dansk. Bot. Ark.* **29(4)**: 92 p.
- SEIDENFADEN, G. 1976. Orchid genera in Thailand 4. *Liparis* A. C. Rich. *Dansk. Bot. Ark.* **31(1)**: 61-84.
- SEIDENFADEN, G. 1977. Orchid genera in Thailand 5. Orchidoideae. *Dansk. Bot. Ark.* **31(3)**: 149 p.
- SEIDENFADEN, G. 1978a. Orchid genera in Thailand 6. Neottioideae. *Dansk. Bot. Ark.* **32(2)**: 195 p.
- SEIDENFADEN, G. 1978b. Orchid genera in Thailand 7. *Oberonia* Lindl. and *Malaxis* Sol. ex. Sw. *Dansk. Bot. Ark.* **33(1)**.
- SEIDENFADEN, G. 1979. Orchid genera in Thailand 8. *Bulbophyllum* Thou. *Dansk. Bot. Ark.* **33(3)**: 228.
- SEIDENFADEN, G. 1980. Orchid genera in Thailand 9. *Flickingeria* hawkes and *Epigenium* gagnep. *Dansk. Bot. Ark.* **34(1)**: 104.
- SEIDENFADEN, G. 1982. Orchid genera in Thailand 10. *Trichotosia* Bl. and *Eria* Lindl. *Dansk. Op. Bot.* **62**: 145.
- SEIDENFADEN, G. and J.J. WOOD. 1992. *The Orchids of Peninsular Malaysia and Singapore, A Revision of R.E. Holttum: Orchids of Malaya*. Fredenborg, Denmark: Olsen & Olsen.
- SHARMA, D. 1992. A survey of the fauna, flora and geological features at the Mata Ayer Forest Reserve and the proposed Bukit Wang Mu Forest Reserve, Perlis. WWF Malaysia.
- TEO, C.K.H. 1985. *Native Orchids of Peninsular Malaysia*. Singapore: Times Books International.
- WONG, S. L. 2002. Plant life. In *Pearl of Perlis: Perlis State Park Guide*, ed. K. Osman, R. Amat and S. Suksuwan, pp. 45—59. Forest Department of Perlis, Kangar, Perlis, Malaysia.

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