

## Diversity and Distribution of Polyporales in Peninsular Malaysia (Kepelbagaian dan Taburan Polyporales di Semenanjung Malaysia)

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### ABSTRACT

*Macrofungi of the order Polyporales are among the most important wood decomposers and caused economic losses by decaying the wood in standing trees, logs and in sawn timber. Diversity and distribution of Polyporales in Peninsular Malaysia was investigated by collecting basidiocarps from trunks, branches, exposed roots and soil from six states (Johor, Kedah, Kelantan, Negeri Sembilan, Pahang and Selangor) in Peninsular Malaysia and Federal Territory Kuala Lumpur. This study showed that the diversity of Polyporales were less diverse than previously reported. The study identified 60 species from five families; Fomitopsidaceae, Ganodermataceae, Meruliaceae, Meripilaceae, and Polyporaceae. The common species of Polyporales collected were Fomitopsis feei, Amauroderma subrugosum, Ganoderma australe, Earliella scabrosa, Lentinus squarrosulus, Microporus xanthopus, Pycnoporus sanguineus and Trametes menziesii.*

*Keywords: Macrofungi; Polyporales*

### ABSTRAK

*Makrokulat daripada Order Polyporales adalah antara pereput kayu yang sangat penting dan telah diketahui bahawa banyak spesies Polyporales menyebabkan kerugian daripada aspek ekonomi dengan menyebabkan pereputan pada pokok-pokok kayu, balak serta kayu gergaji. Kepelbagaian dan taburan Polyporales di Semenanjung Malaysia telah dikaji dengan membuat koleksi basidiokarpa yang terdapat pada batang-batang kayu, dahan, akar banir serta yang tumbuh di permukaan tanah di enam buah negeri (Johor, Kedah, Kelantan, Negeri Sembilan, Pahang dan Selangor), termasuk di Wilayah Persekutuan Kuala Lumpur. Hasil kajian menunjukkan taburan Polyporales adalah kurang meluas daripada yang telah dilaporkan sebelum ini. Enam puluh spesies daripada lima famili: Fomitopsidaceae, Ganodermataceae, Meruliaceae, Meripilaceae dan Polyporaceae telah dikenalpasti. Antara spesies yang biasa dijumpai adalah Fomitopsis feei, Amauroderma subrugosum, Ganoderma australe, Earliella scabrosa, Lentinus squarrosulus, Microporus xanthopus, Pycnoporus sanguineus dan Trametes menziesii.*

*Kata kunci: Kulat makro; Polyporales*

### INTRODUCTION

Peninsular Malaysia located approximately between 6° 45' and 1° 20' N latitude and 99° 40' and 104° 20' E longitudes comprises eleven states and the Federal Territory of Kuala Lumpur and Putrajaya. Topographically, Peninsular Malaysia is characterized by extensive coastal plains in the east and west, hilly and mountainous region with steep slopes in the central and undulating terrain in other parts of the peninsula. The forests of Peninsular Malaysia have been classified according to their ecological and physical conditions, but for the purposes of management they can be classified broadly into the Dipterocarp, Freshwater Swamp and Mangrove forests (Hooi 1987). The dipterocarp forest occurs on dry land just above sea level to an altitude of about 900 metres. The forests in Malaysia are mostly dominated by trees from the Dipterocarpaceae family.

Estimates of fungal diversity based on the perception that many species are yet to be discovered vary widely with the most commonly cited estimate of 1.5 million (Hawksworth 1991). For tropical forest systems in

particular, it is clear that the current number of described fungal species is only a small fraction of the number of species that exist there (Rossman 1994). Recently, Mueller et al. (2007) estimated the species of macrofungi in tropical Asia to be in the range between 10,000 and 25,000. Furthermore, in Malaysia, 70-80% of fungi are yet to be discovered (Corner 1996; Lee et al. 1995).

The Polyporales are a large group of macrofungi. Donk (1965) divided poroid mushrooms into five families namely Polyporaceae, Hymenochaetaceae, Ganodermataceae, Bondarzewiaceae and Fistulinaceae. In addition, some poroid genera were also assigned to families Coniophoraceae, Corticiaceae and Thelephoraceae. According to Ainsworth and Bisby's dictionary of fungi (Kirk et al. 2001) there are twenty-three families in the Order Polyporales. However, many of the species belong to Polyporaceae.

In Malaysia, the history of taxonomic studies of polypores started in the 19<sup>th</sup> and early 20<sup>th</sup> century. Cooke (1883, 1884, 1885a, 1885b) was the first mycologist

who collected various species of polypores from the Malay Peninsula. Chipp (1921) reported 102 Polyporales species from the Malay Peninsula while Corner (1935) had studied the occurrence and the seasonal occurrence of fungi in the Malay Peninsula and Singapore. Lim (1972) collected common large fungi such as *Amauroderma* spp., *Ganoderma* spp., *Pycnoporus sanguineus* and *Microporus xanthopus* in Malaysia and Singapore, and then stated that basidiomycetes which were very frequently found in the study sites were polyporous fungi. Later, Oldridge et al. (1985) collected nine species of Polyporales from Pahang and Negeri Sembilan namely *Daedalea flavida*, *Lenzites elegans*, *Microporus affinis*, *M. xanthopus*, *M. luteo-ceraceus*, *Pycnoporus sanguineus*, *Fomitopsis feii* and *Lentinus concinnus*. Additionally, Kuthubutheen (1981) and Noorlidah et al. (2005) have documented the macrofungi of Langkawi. Noorlidah et al. (2007) also studied the diversity of fungi in Endau Rompin National Park, Johor which primarily include the Orders Polyporales and Agaricales. Lee et al. (1995) reported 21 species of the Polyporales in Hulu Perak. Later, Salmiah and Thillainathan (1998) reported *Ganoderma orbiforme*, *Pycnoporus sanguineus* and *Microporus xanthopus* were the common macrofungi in Malaysia. Furthermore, a study on the species diversity and the frequency of the wood-inhabiting fungi from various forest reserves and plantation forests in Peninsular Malaysia, were documented by Salmiah and Jones (2001) with 37 species of Polyporales collected. Sumaiyah et al. (2007) have reported the distribution and new records of *Lentinus* in Peninsular Malaysia. Recently, the diversity of Polyporales has been reported by Noraswati et al. (2006); Hattori et al. (2007) and Noorlidah et al. (2009). The present study investigates the diversity of Polyporales and their distribution at six states (Johor, Kedah, Kelantan,

Negeri Sembilan, Pahang and Selangor) in Peninsular Malaysia and Federal Territory Kuala Lumpur.

## MATERIALS AND METHODS

### SAMPLING SITES

Samples of Polyporales were collected from 40 locations in six states (Johor, Kedah, Kelantan, Negeri Sembilan, Selangor and Pahang) including Federal Territory of Kuala Lumpur (Figure 1).

### POLYPORALES COLLECTIONS

Fungal basidiocarps encountered along the trails were collected from April 2003 to June 2008. Multiple basidiocarps of the same species growing on an individual tree or log were considered as one collection. All fungal specimens were identified to the species level using the keys in Núñez and Ryvarden (2000, 2001) and Hattori (2000, 2005). For colour term and notations of basidiocarps, the colour index in Kornerup and Wanscher (1973) was referred. The basidiocarps were then preserved as oven-dried specimens at University of Malaya herbarium (acronym KLU), Kuala Lumpur.

## RESULTS

Basidiomata of 340 basidiocarps of Polyporales were collected during 62 samplings carried out from April 2003 till June 2008 at various locations in the six states of Peninsular Malaysia and Federal Territory of Kuala Lumpur (Table 1). The samplings were done from May to August and from November to February of each year.

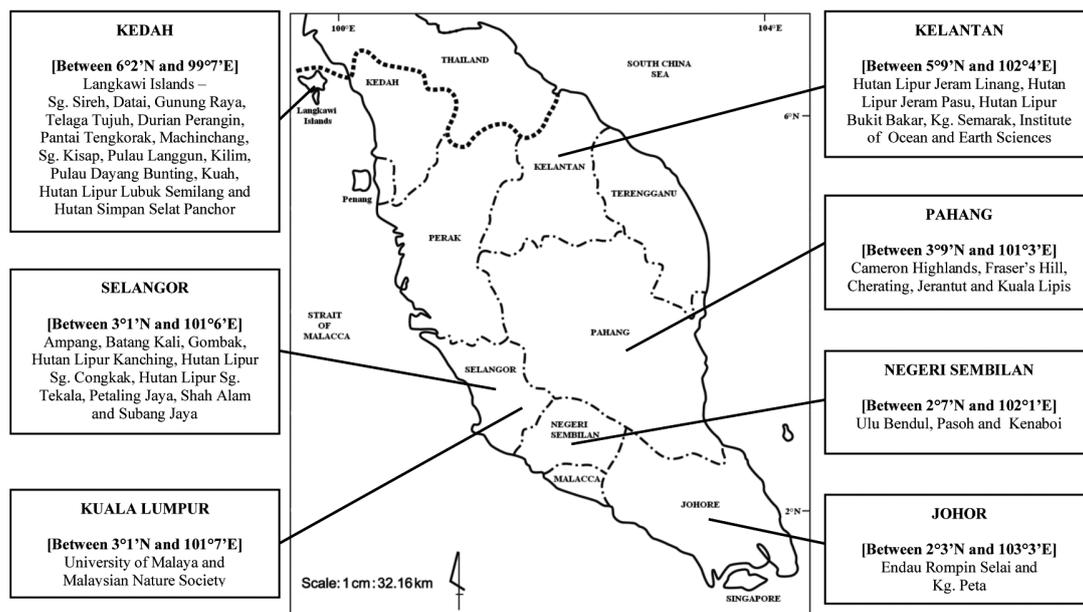


FIGURE 1. Sampling sites of Polyporales in Peninsular Malaysia

TABLE 1. The Polyporales collected from selected locations in Peninsular Malaysia

States and Federal Territory	Johor	Kedah	Kelantan	Kuala Lumpur	Negeri Sembilan	Pahang	Selangor
Frequency of Collections	3	18	4	5	3	11	1
1 <i>Daedalea lusor</i> (Corner) T. Hatt. (2005)							1
2 <i>Fomitopsis feei</i> (Fr.) Kreisel (1971)	4	1			2	1	1
3 <i>Fomitopsis ostreiformis</i> Bose (1923)*				3			
Ganodermataceae							
4 <i>Amauroderma subrugosum</i> (Bres. & Pat.) Torrend (1920)	1	2			2	1	2
5 <i>Ganoderma australe</i> (Fr.) Pat. (1890)	7	2	2	2	11	4	5
6 <i>Ganoderma lucidum</i> complex (Curtis) P. Karst. (1881)					3		
Meripilaceae							
7 <i>Meripilus applanatus</i> Corner (1984)					1		
8 <i>Rigidoporus lineatus</i> (Pers.) Ryvarden (1972)		1					
9 <i>Rigidoporus microporus</i> (Sw.) Overeem (1924)	3	1				3	1
10 <i>Rigidoporus vinctus</i> (Berk.) Ryvarden (1972)							1
Meruliaceae							
11 <i>Flavodon flavus</i> (Klotzsch) Ryvarden (1973)	1			1			1
12 <i>Gloeoporus dichrous</i> (Fr.) Bres. (1913)*	1						
13 <i>Gloeoporus sulphureus</i> Corner (1989)							1
Polyporaceae							
14 <i>Corioloropsis aspera</i> (Jungh.) Teng (1963)					1		
15 <i>Corioloropsis badia</i> (Berk.) Murrill (1907)*	1	1		2			
16 <i>Corioloropsis glabro-rigens</i> (Lloyd) Núñez & Ryvarden (2001)	1					1	
17 <i>Corioloropsis sanguinaria</i> (Klotzsch) Teng (1963)*		1					
18 <i>Corioloropsis strumosa</i> (Fr.) Ryvarden (1976)							1
19 <i>Earliella scabrosa</i> (Pers.) Gilb. & Ryvarden (1985)	8	2		1	6		3
20 <i>Echinochaete brachypora</i> (Mont.) Ryvarden (1978)*							1
21 <i>Favolus tenuiculus</i> P. Beauv. (1806)					1		1
22 <i>Flabellophora licmophora</i> (Masse) Corner (1987)	1						
23 <i>Fomitella rhodophaea</i> (Lév.) T. Hatt. (2005)		1					2
24 <i>Funalia polyzona</i> (Pers.) Niemelä*				1		1	3
25 <i>Hexagonia tenuis</i> (Hook.) Fr. (1838)		1					1
26 <i>Lentinus badius</i> (Berk.) Berk. (1847)	1	1					2
27 <i>Lentinus connatus</i> Berk. (1842)	6	9			1		2
28 <i>Lentinus fasciatus</i> Berk. (1840)*		3	1				
29 <i>Lentinus polychrous</i> Lév. (1844)	1	4			1		
30 <i>Lentinus sajor-caju</i> (Fr.) Fr. (1838)				4			10
31 <i>Lentinus squarrosulus</i> Mont. (1842)	2	4	1	4		5	5
32 <i>Lentinus strigosus</i> (Schwein.) Fr. (1838)		3				1	1
33 <i>Lentinus tigrinus</i> (Bull.) Fr. (1825)*							1
34 <i>Lentinus velutinus</i> Fr. (1830)		1					
35 <i>Lenzites acuta</i> Berk. (1842)		4				1	
36 <i>Lenzites elegans</i> (Spreng.) Pat. (1900)	1				9	3	2
37 <i>Lignosus rhinocerotis</i> (Cooke) Ryvarden 1972					3	1	
38 <i>Macrohyporia dictyopora</i> (Cooke) I. Johans. & Ryvarden (1979)*							1
39 <i>Microporellus inusitatus</i> (Lloyd) Corner (1987)	1					4	7
40 <i>Microporus affinis</i> (Blume & T. Nees) Kuntze (1898)	3					1	1
41 <i>Microporus vernicipes</i> (Berk.) Kuntze (1898)						2	4
42 <i>Microporus xanthopus</i> (Fr.) Kuntze (1898)	2	2	2	1	3	1	
43 <i>Nigroporus vinosus</i> (Berk.) Murrill (1905)	3	1			2	1	
44 <i>Panus similis</i> (Berk. & Broome) T.W. May & A.E. Wood. (1995)*	2	1					
		1					
45 <i>Perenniporia ochroleuca</i> (Berk.) Ryvarden (1972)							
46 <i>Polyporus arcularius</i> (Batsch) Fr. (1821)						1	5
47 <i>Polyporus grammacephalus</i> Berk. (1842)	1				2	1	5
48 <i>Polyporus leprieurii</i> Mont. (1840)		1					2
49 <i>Polyporus philippinensis</i> Berk. (1842)*				1			
50 <i>Polyporus cf. badius</i> (Pers.) Schwein (1832)*							1

(Continued)

TABLE 1. (cont.)

States and Federal Territory	Johor	Kedah	Kelantan	Kuala Lumpur	Negeri Sembilan	Pahang	Selangor
Frequency of Collections	3	18	4	5	3	11	1
51 <i>Pseudofavolus cucullatus</i> (Mont.) Pat. (1900)							1
52 <i>Pycnoporus cinnabarinus</i> (Jacq.) P. Karst. (1881)*						1	
53 <i>Pycnoporus sanguineus</i> (L.) Murrill (1904)	2	2	1	1	6	4	4
54 <i>Pyrofomes albomarginatus</i> (Zipp. ex Lév.) Ryvarden (1972)	2	2					
55 <i>Trametes cf. hirsuta</i> (Wulfen) Lloyd (1924)			1	2	2	1	
56 <i>Trametes lactinea</i> (Berk.) Sacc. (1888)*				1			2
57 <i>Trametes menziesii</i> (Berk.) Ryvarden (1972)	2	2	1	1	2	2	5
58 <i>Trametes pocas</i> (Berk.) Ryvarden (1984)				2			1
59 <i>Trichaptum byssogenum</i> (Jungh.) Ryvarden (1972)*							1
60 <i>Trichaptum durum</i> (Jungh.) Corner (1987)*	1	1			1		1
Total number of basidiocarp collected	58	56	9	27	59	41	90
Number of species identified	25	27	7	15	19	23	39

\* Species not collected by other workers

During this period of Peninsular Malaysia experiences rainy seasons associated with the southwest and northeast monsoon.

During the study period, 60 species identified are includes in five families, Fomitopsidaceae (three species), Ganodermataceae (three species), Meruliaceae (three species), Meripilaceae (four species), and Polyporaceae (47 species). The frequently encountered species based on the number of basidiocarps collected were *Ganoderma australe* (33) followed by *Lentinus squarrosulus* (21), *Earliella scabrosa* (20), *Pycnoporus sanguineus* (20), *Lentinus connatus* (18), *Microporus xanthopus* (16), *Trametes menziesii* (15), *Lenzites elegans* (15) *Lentinus sajor-caju* (14) and *Microporus affinis* (14). The common species of Polyporales collected were *Fomitopsis feei*, *Amauroderma subrugosum*, *Ganoderma australe*, *Earliella scabrosa*, *Lentinus squarrosulus*, *Microporus xanthopus*, *Pycnoporus sanguineus* and *Trametes menziesii*. The respective species were considered as common species because they were collected at most of all the study sites.

Besides, 20 species were only collected once during the study period; *Daedalea lusor*, *Meripilus applanatus*, *Rigidoporus lineatus*, *R. vinctus*, *Gloeoporus dichrous*, *G. sulphureus*, *Coriolopsis aspera*, *C. sanguinaria*, *C. strumosa*, *Echinochaete brachypora*, *Flabellophora licmophora*, *Lentinus tigrinus*, *L. velutinus*, *Macrohyporia dictyopora*, *Microporellus inusitatus*, *Polyporus philippinensis*, *P. cf. badius*, *Pseudofavolus cucullatus*, *Pycnoporus cinnabarinus* and *Trichaptum byssogenum*.

Johor is located in the southern part of Peninsular Malaysia. In Johor, three collections were made in Endau Rompin National Park. The Endau Rompin National Park is located at Mersing and Segamat districts of Johor. This forest is a tropical rainforest which covers 48,905 hectares, encompassing the watershed of the rivers Endau and Rompin. They are two entry points to Endau

Rompin National Park which are through Kg. Peta in Mersing and Kg. Selai in Segamat. Twenty five species were identified from five families. Three frequently found species were *Ganoderma australe*, *Earliella scabrosa* and *Lentinus connatus*. Furthermore, *Gloeoporus dichrous*, *Flabellophora licmophora* and *Microporellus inusitatus* were only collected once throughout the study period.

Kedah is located in the northwestern part of Peninsular Malaysia. The state consists of the mainland and Langkawi. In Kedah, 18 collections were made in Langkawi. Langkawi is a cluster of 99 islands separated from mainland Peninsular Malaysia by the Straits of Malacca with the total land mass of the islands is 47,848 hectares. Two-thirds of the islands are dominated by forest-covered hills and natural vegetation. These study sites are mostly recreational forest except two forest reserves; Gunung Raya and Matchinchang. Twenty seven species from four families; Fomitopsidaceae, Ganodermataceae, Meripilaceae and Polyporaceae were collected, with 18 species belonged to Polyporaceae. *Lentinus* spp. were frequently encountered in Langkawi with seven species collected: *Lentinus badius*, *L. connatus*, *L. fasciatus*, *L. polychrous*, *L. squarrosulus*, *L. strigosus* and *L. velutinus*. Out of nine *Lentinus* species collected in this study, *L. velutinus* was only encountered in Langkawi throughout the study period. In addition, three species; *Rigidoporus lineatus*, *Perenniporia ochroleuca* and *Coriolopsis sanguinaria* were also encountered only in Langkawi.

Kuala Lumpur is the capital city of Malaysia and it is enclaved within the state of Selangor, on the the central west coast of Peninsular Malaysia. The shape, form and disposition of Kuala Lumpur are created by the irregular topography of hills, river and stream valleys throughout the city area. In the Federal Territory of Kuala Lumpur, five collections were made in University of Malaya and Malaysia Nature Society Heritage Trail. Fifteen species belonging to three families; Ganodermataceae,

Meruliaceae and Polyporaceae were identified with twelve species belonged to Polyporaceae. *Fomitopsis ostreiformis* and *Polyporus philippinensis* were only encountered in Kuala Lumpur throughout the study period.

Kelantan is located in the northeastern part of Peninsular Malaysia. It is bordered by Narathiwat Province of Thailand to the north, Terengganu to the southeast, Perak to the west and Pahang to the south. In Kelantan, three collections were made in Bachok which is located 25 kilometers east of Kota Bharu. Most of the collections were done at recreational forest. In Kelantan, six Polyporaceae species were identified namely *Lentinus fasciatus*, *L. squarrosulus*, *Microporus xanthopus*, *Pycnoporus sanguineus*, *Trametes cf. hirusta*, *T. menziesii* and one Ganodermataceae identified as *Ganoderma australe*.

Negeri Sembilan is located on the western coast of Peninsular Malaysia. In Negeri Sembilan, three collections were done at recreational forest. A total of 19 species belonging to four families; Fomitopsidaceae, Ganodermataceae, Meripilaceae and Polyporaceae were identified. Fourteen identified species belonging to Polyporaceae with *Lenzites elegans*, *Earliella scabrosa* and *Pycnoporus sanguineus* were frequently encountered. Three species of Ganodermataceae; *Amauroderma subrugosum*, *Ganoderma australe*, and *G. lucidum* complex were also collected. Furthermore, *Meripilus appianatus* and *Corioloopsis aspera* were only encountered in Negeri Sembilan throughout the study period.

Pahang is the largest state in Peninsular Malaysia and is situated in the eastern coastal region. In Pahang, most of the collections were done in highland areas; Cameron Highlands and Fraser's Hill. Further, collections were also done in lowland areas; Cherating, Jerantut and Kuala Lipis localities. At 1,500 metres above sea level Cameron Highlands is situated at the north-western tip of Pahang with temperatures no higher than 25°C. Twenty three species from four families; Fomitopsidaceae, Ganodermataceae, Meripilaceae and Polyporaceae were collected with 17 species belonged to Polyporaceae. Most of the species were only collected once or twice during each visit, except for *Lentinus squarrosulus* (5 collections), *Ganoderma australe* (4 collections), *Microporus affinis* (4 collections), *Pycnoporus sanguineus* (4 collections), *Rigidoporus microporus* (3 collections) and *Lenzites elegans* (3 collections).

The state of Selangor, which extends along the west coast of Peninsular Malaysia, is the most rapidly developing state in Malaysia, has an area of approximately 800,000 ha. Most of the basidiocarps were collected in Selangor consisting of 39 species belonging to five families; Fomitopsidaceae, Ganodermataceae, Meripilaceae, Meruliaceae and Polyporaceae were collected. Twenty eight species identified belonged to Polyporaceae. *Lentinus* spp. were frequently encountered in Selangor with six species collected; *Lentinus sajor-caju*, *L. squarrosulus*, *L. badius*, *L. connatus*, *L. strigosus* and *L. tigrinus*. Nine species; *Daedalea lusor*, *Rigidoporus vinctus*, *Gloeoporus sulphureus*, *Corioloopsis strumosa*, *Lentinus tigrinus*,

*Macrohyporia dictyopora*, *Pseudofavolus cucullatus*, *Polyporus cf. badius* and *Trichaptum byssogenum* were encountered only during visits to the study sites in Selangor. The frequently encountered species in Selangor were *Ganoderma australe*, *Lentinus sajor-caju*, *L. squarrosulus*, *Microporus affinis*, *Polyporus arcularius*, *P. grammacephalus* and *Trametes menziesii*.

## DISCUSSION

The study documented the diversity and distribution of Polyporales over the six years conducted in 40 localities in Peninsular Malaysia. Our identified specimens do not suffice for any thorough conclusions on the Polyporales species, their host relationships and distribution ranges because 60 species only make a part of the total 155 species reported by Chipp (1921), Oldridge et al. (1985), Lim (1972), Kuthubutheen (1981), Lee et al. (1995); Salmiah and Thillainathan (1998), Salmiah and Jones (2001), Hattori et al. (2007) and Noorlidah et al. (2009). Forty-four species identified in this study were also reported by the previous workers. Nevertheless, the study have identified 16 species which were not yet reported by the previous studies; *Corioloopsis badia*, *Corioloopsis sanguinaria*, *Echinochaetae brachypora*, *Fomitopsis ostreiformis*, *Funalia polyzona*, *Gloeoporus dichrous*, *Lentinus fasciatus*, *Lentinus tigrinus*, *Macrohyporia dictyopora*, *Panus similis*, *Polyporus cf. badius*, *Polyporus philippinensis*, *Pycnoporus cinnabarinus*, *Trametes lactinea*, *Trichaptum byssogenum* and *Trichaptum durum*. The highest number of species identified in this study was from Selangor followed by Kedah, Johor, Pahang, Negeri Sembilan, Kuala Lumpur and Kelantan. The high number of species in Selangor was contributed by the frequent collections made during the study period compared to the other study sites. Conversely, in Johor, the high numbers of species identified were not reflected by the frequent collection but the conditions of the forest itself. As one of the state park in Peninsular Malaysia, the forest environments are well-preserved with only limited areas of the park is open for ecotourism. Additionally, the entry to the park requires a special permit from the Johor National Park Corporation. This provide areas less affected by human activities where a broader range of Polyporales species could be encountered.

The differences in the occurrence of Polyporales in the various localities in this study also can be attributed to several factors such as rainfall, quantities of suitable substrata, damp forests with constant high air humidity and type of forest (Salmiah & Jones 2001). This study, however was not undertaken based on the 'fruiting seasons' proposed by Corner (1935, 1988). The low number of Polyporales recorded in this study could also because of only one to two collecting visits were made to each of these sites. In fact, a complete knowledge of the fungi for any locality would require continuous observation and collection over many years (Pegler 1997). This hypothesis is supported by the findings of Corner (1983, 1989, and

1991) that showed that species diversity and occurrence increased with the increasing number of visits over a longer period.

The present data showed that there are seven commonly encountered Polyporales in Peninsular Malaysia; *Fomitopsis feei*, *Ganoderma australe*, *Earliella scabrosa*, *Lentinus squarrosulus*, *Microporus xanthopus*, *Pycnoporus sanguineus* and *Trametes menziesii*. These common species have also been reported by other workers (Kuthubutheen 1981; Lee et al. 1995; Lim 1972; Salmiah & Thillainathan 1998) except for *Ganoderma australe* and *Lentinus squarrosulus* which have not been reported in earlier studies as among common macrofungi in Peninsular Malaysia.

In this study, *Lentinus* was one of the common genus encountered. *Lentinus araucariae*, *L. polychrous*, *L. squarrosulus*, *L. strigosus* and *L. velutinus* were among the species which had been described by Pegler (1983) who documented 13 species of *Lentinus* in Malaysia. Sumaiyah et al. (2007) reported four *Lentinus* species; *L. connatus*, *L. velutinus*, *L. strigosus*, and *L. fasciatus* which had not been documented by Corner (1981), and *L. fasciatus* was a new record for Malaysia as it had not been documented in Malaysia by Pegler (1983), Corner (1981), Lee et al. (1995), and Salmiah and Jones (2001).

Moreover, the other common genera of Polyporales collected in this study were *Coriolopsis* (five species), *Polyporus* (five species), *Trametes* (four species) and *Rigidoporus* (three species). On the other hand, there were 18 genera with only one species recorded; *Daedalea*, *Amauroderma*, *Flavodon*, *Earliella*, *Echinochaetae*, *Favolus*, *Flabellophora*, *Fomitella*, *Funalia*, *Hexagonia*, *Lignosus*, *Macrohyporia*, *Microporellus*, *Nigroporus*, *Panus*, *Perenniporia*, *Pseudofavolus* and *Pyrofomes*.

#### CONCLUSION

The diversity and distribution of Polyporales in Peninsular Malaysia are less diverse than previously reported, but 16 out of 60 species identified were not yet recorded by previous workers. In conclusion, there is need of further continuous and long-term research to be undertaken for a better knowledge and understanding of Malaysian macrofungal diversity in particular.

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#### REFERENCES

Chipp, T.F. 1921. A list of fungi of the Malay Peninsula. *Gardens Bulletin Straits Settlement 2*: 311-418.  
 Cooke, M.C. 1883. Fungi from Perak. *Grevillea 12*(63): 84.  
 Cooke, M.C. 1884. Fungi of Perak. *Grevillea 13*(65): 1-4.  
 Cooke, M.C. 1885a. Fungi of Malayan Peninsula. *Grevillea 14*(70): 43-44.

Cooke, M.C. 1885b. Some exotic fungi. *Grevillea 14*(69): 11-14.  
 Corner, E.J.H. 1935. The seasonal fruiting of agarics in Malaya. *Gardens Bulletin Straits Settlement 9*: 79-88.  
 Corner, E.J.H. 1981. The agaric genera *Lentinus*, *Panus* and *Pleurotus* with particular reference to Malaysian species. *Beihefte Nova Hedwigia 69*: 1-169.  
 Corner, E.J.H. 1983. Ad-Polyporaceae I. *Amauroderma* and *Ganoderma*. *Beihefte Nova Hedwigia 75*: 182.  
 Corner, E.J.H. 1988. *Higher Fungi*. Oxford, United Kingdom: Pergamon Press.  
 Corner, E.J.H. 1989. Ad-Polyporaceae VI. *Beihefte Nova Hedwigia 97*: 197.  
 Corner, E.J.H. 1991. Ad-Polyporaceae VII. *Beihefte Nova Hedwigia 101*: 175.  
 Corner, E.J.H. 1996. The agaric genera *Marasmius*, *Chaetocalathus*, *Crinipellis*, *Heimiomyces*, *Resupinatus*, *Xerula* and *Xerulina* in Malesia. *Beihefte Nova Hedwigia 111*: 1-175.  
 Donk, M.A. 1965. The mycological publications of K.B. Boedijn. *Persoonia 3*(3): 325-330.  
 Hattori, T. 2000. Type studies of polypores described by E.J.H. Corner from Asia and West Pacific Areas I. Species described in *Polyporus*, *Buglossoporus*, *Meripilus*, *Daedalea* and *Flabellophora* *Mycoscience 41*: 339-349.  
 Hattori, T. 2005. Type studies of the polypores described by E.J.H. Corner from Asia and West Pacific Areas VII. Species described in *Trametes* (1). *Mycoscience 46*: 303-312.  
 Hattori, T., Rashid, N.M.N. & Salmiah, U. 2007. Basidiomycota: Diversity of Malaysian polypores. In Jones, E.B.G., Hyde, K.D. & Vikineswary, S. (Eds.). *Malaysian Fungal Diversity*. Malaysia. pp. 55-68.  
 Hawksworth, D.L. 1991. The fungal dimension of biodiversity: magnitude, significance and conservation. *Mycological Research 95*(6): 641-655.  
 Hooi, C.T. 1987. Forest management systems for tropical high forest, with special reference to Peninsular Malaysia. *Forest Ecology and Management 21*: 3-20.  
 Kirk, P.M., Cannon, P.F., David, J.C. & Stalpers, J.A. (eds.). 2001. *Ainsworth & Bisby's Dictionary of the Fungi* (9<sup>th</sup> ed.). Wallingford, United Kingdom: CABI Publishing.  
 Komerup, A. & Wanscher, J.H. 1973. *Methuen Handbook of Colour* (3<sup>rd</sup> ed.). London, Methuen & Co. Ltd.  
 Kuthubutheen, A.J. 1981. Notes on the macrofungi of Langkawi. *Malayan Nature Journal 34*(3): 123-130.  
 Lee, S.S., Besl, H. & Salmiah, U. 1995. Some fungi of the Sungai Halong and surrounding areas, Temenggor Forest Reserve, Hulu Perak, Malaysia. *Malayan Nature Journal 48*: 147-155.  
 Lim, G. 1972. Some common large fungi in Malaysia and Singapore. *Malayan Nature Journal 25*: 84-89.  
 Mueller, G.M., Schmit, J.P., Leacock, P.R., Buyck, B., Cifuentes, J., Desjardin, D.E., Halling, R. E., Hjortstam, K., Iturriaga, T., Larsson, K.H., Lodge, D.J., May, T.W., Minter, D., Rajchenberg, M., Redhead, S.A., Ryvarden, L., Trappe, J.M., Watling, R. & Wu, Q. 2007. Global diversity and distribution of macrofungi. *Biodiversity and Conservation 16*: 37-48.  
 Noorlidah, A., Vikineswary, S. & Yusoff, M. 2009. Survey of macrofungi in the Kenaboi Reserve, Jelebu, Negeri Sembilan. *Malaysian Journal of Science 28*(4): 39-48.  
 Noorlidah, A., Vikineswary, S., Yusoff, M. & Desjardin, D.E. 2005. Higher fungi of Northeast Langkawi. *Malaysian Journal of Science 24*: 45-102.

- Noorlidah, A., Vikineswary, S., Yusoff, M., Desjardin, D. E. & Jones, E.B.G. 2007. The forest and biodiversity of Selai, Endau-Rompin. In Mohamad, H. & Zakaria-Ismail, M. (Eds.). *Macrofungi at the southwestern region of Endau-Rompin National Park, Johore, Malaysia*. Perbadanan Taman Negara Johor. pp. 39-53.
- Noraswati, M.N.R., Salmiah, U. & Noorlidah, A. 2006. Preliminary study in the genera of Malaysian polypores. *8th Pacific Rim Bio-Based Composites Symposium*, Kuala Lumpur.
- Núñez, M. & Ryvardeen, L. 2000. East Asian Polypores. Vol I. *Synopsis Fungorum* 13: 1-177.
- Núñez, M. & Ryvardeen, L. 2001. East Asian Polypores. Vol II. *Synopsis Fungorum* 14: 170-505.
- Oldridge, S.G., Pegler, D.N., Reid, D.A. & Spooner, B.M. 1985. A collection of fungi from Pahang and Negeri Sembilan (Malaysia). *Kew Bulletin* 41: 855-872.
- Pegler, D.N. 1983. *The genus Lentinus: A World Monograph*, Her Majesty's Stationary Office.
- Pegler, D.N. 1997. *The Larger Fungi of Borneo*. Kota Kinabalu: Natural History Publications.
- Rossmann, A. 1994. A strategy for an all-taxa inventory of fungal biodiversity. In Peng, C.I. & Chou, C.H. (eds.). *Biodiversity and Terrestrial Ecosystem*. Taipei, Taiwan, Institute of Botany, Academia Sinica Monograph. Series No. 14. pp. 169-194.
- Salmiah, U. & Jones, E.B.G. 2001. Occurrence of wood inhabiting fungi in forests of Peninsular Malaysia. *Journal of Tropical Forest Science* 13(2): 237-245.
- Salmiah, U. & Thillainathan, P. 1998. Some common macrofungi in Malaysia. *FRIM Technical Information No. 64*. Forest Research Institute Malaysia.
- Sumaiyah, A., Noorlidah, A., Vikineswary, S. & Grand, E. 2007. Basidiomycota: Distribution and New Records of *Lentinus*. In Jones, E.B.G., Hyde, K.D.H. & Vikineswary, S. (eds.). *Malaysian Fungal Diversity*. Mushroom Research Centre, University of Malaya and Ministry of Natural Resources and Environment. pp. 80-93.
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