Journal of Threatened Taxa

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

Article

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26 January 2017 | Vol. 9| No. 1 | Pp. 9689–9699
10.11609/jott.3075.9.1.9689-9699

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 January 2017 | 9(1): 9689–9699

ARTICLE

Influence of substrate features on distribution of polypores (Fungi: Basidiomycota) in central part of Peechi Vazhani Wildlife Sanctuary, Kerala, India

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Abstract: We examined the effect of substrate features like diameter, type and decay class on the distribution of polypores in the moist deciduous forests of Kerala. Plot based sampling and opportunistic sampling method were adopted to maximize the documentation of polypore fungal distribution. The highest number (2,861) of polypore fungal sporocarps has been recorded in host trees with 21-<30 cm diameter class. Among the substrate types, highest number of individuals (2,480) were observed on logs, living trees supported very few polypores. The newly emerged species during the monsoon season showed more association with decay class 2, the decay class association of some species remained unchanged during all the seasons.

Keywords: Decay class, moist deciduous forests, polypores, substrate diameter, substrate type.

DOI: http://doi.org/10.11609/jott.3075.9.1.9689-9699

Editor: V.B. Hosagoudar, Bilgi, Karnataka, India. **Date of publication:** 26 January 2017 (online & print)

Manuscript details: Ms # 3075 | Received 29 September 2016 | Final received 20 December 2016 | Finally accepted 09 January 2017

Citation: Iqbal, M., K. Vidyasagaran & N. Ganesh (2017). Influence of substrate features on distribution of polypores (Fungi: Basidiomycota) in central part of Peechi Vazhani Wildlife Sanctuary, Kerala, India. *Journal of Threatened Taxa* 9(1): 9689–9699; http://doi.org/10.11609/jott.3075.9.1.9689-9699

Funding: Kerala Agricultural University, Thrissur, Kerala.

Competing interests: The authors declare no competing interests.

Author Details and Author Contrbution: A. Muhammed, research student at College of forestry, Kerala Agricultural University conducted the study as part of the MSc forestry degree. All field studies, specimen collection and preparation of article in the prescribed format was done by him. K. Vidyasagaran, Dean, College of Forestry, Kerala Agricultural University and he is the Principal investigator of the study. P.N. Ganesh, Associate Professor, Department of Botany, Sree Krishna College. Eminent researcher in India who studied the polypores of Kerala and published a monograph on that. The specimens were identified with his help.

Acknowledgements: We thank R. Sreehari, who prepared the map used in this paper. We also thank the Dean, College of Forestry for encouragement and support and the Kerala Agricultural University for the financial support for the conduct of the study. The assistance and the support of the forest trackers is also greatly acknowledged.

INTRODUCTION

Polypores are Basidiomycetes bearing club-shaped basidia typically on the inside of the hymenium lining pores or cavities of tubes formed on the under surface of the fruiting body. Based on the nature of rot formation, the wood decaying fungi (polypores) are classified into 'white rot' fungi that decompose all components of the wood including lignin and 'brown rot' fungi that decompose the cellulose and its associated pentoses, leaving the lignin more or less unaffected (Leelavathy & Ganesh 2000). They are distinguished by their macroscopic basidiocarps with pores. They decompose coarse woody debris like fallen trunks, branches, twigs and stumps and play a pioneer role in ecosystem functioning such as nutrient cycling and transport (Peace 1962). Thus, the ecological role of polypores as decomposers and their dependency on wood for existence have made them to be regarded as good indicators of conservation value (Niemela 2005). Each woody substrate constitutes a dynamic habitat that the fungi can only utilize for a limited time of microclimatic optima or stage of decomposition. Different types of woody substrates like dead standing trees, fallen trunks, roots, branches and twigs constitute discrete patches, where both species richness and composition change substantially over time due to deterministic succession of species accompanying the wood decomposition (Norden et al. 2004). Moreover, some polypores normally inhabit only living trees and as when the tree dies, they are replaced by fungi which are better adapted to saprophytic nutrition (Kuffer et al. 2008). Substrate size is an important factor that determines the occurrence of wood-inhabiting fungi on trees. Studies have shown that these fungi have different preferences for substrate diameter. Bader et al. (1995) suggested that log size significantly influenced total species number, number of threatened species, number of species per log, as well as the hymenial surface area per log. Besides the size of the log, stage of decomposition is also an important determinant for polypores species composition. Renvall (1995) noted the stage of decomposition, that many threatened polypores have distinct preferences for large logs in intermediate stages of decay. Thus, species richness and abundance of polypores depend on the qualities and quantities of the dead wood. The substrate utilization by polypores has been shown to be critical for the species assemblage in the temperate forests (Norden et al. 2004; Juutilainen et al. 2011). The same has shown that species vary in their preferences regarding the features of substrate they colonize in nature. Similar studies undertaken in tropical forests reveal that substrate features are determinant in the occurrence and preference of polypores (Hattori & Lee 2003; Yamashita et al. 2009). Decay class/decay stage is considered as an important measurement when compared to the diameter of the woody substrate. In decay class, a hump-shaped curve has been observed with more species at the intermediate decay stage with that of the early or final stages (Junninen et al. 2007; Jonsson et al. 2008). The proportion of studies in tropical forests dealing with ecology of fungi is seldom reported (Lonsdale et al. 2008). With the available data on the taxonomic studies (Manimohan & Leelavathy 1995; Leelavathy & Ganesh 2000; Manimohan et al. 2004; Kumar & Manimohan 2005; Mohanan 2011) undertaken on polypore diversity in the natural stands of Kerala, it is difficult to conclude the effect of deadwood, decay-class and climatic influence on diversity and abundance. Earlier studies on polypores in the natural stands of Kerala were mainly focused on morphology (Iqbal et al. 2016a,b); no comprehensive studies on the ecology of polypore fungi in Kerala have been undertaken. A detailed analysis of the polypore fungi and the substrate features will give a better picture of the distribution pattern of these fungi. With this background, the present study has been conducted in the moist deciduous forests of Peechi-Vazhani Wildlife Sanctuary to analyse the importance of substrate features in the diversity and distribution of polypores.

MATERIALS AND METHODS

Study Area

Peechi-Vazhani Wildlife Sanctuary (PVWS) lies within the geographical extremes of $10^{0}26'$–$10^{0}40'$N & $76^{0}15$–$76^{0}28'$E, covering an area of 125km^2 in Thrissur District, Kerala State (Fig. 1). Annual average precipitation in the sanctuary is 3,000mm and it is situated at an altitude of 45–900 m. As per Champion & Seth (1986), the forest type of PVWS consists of nearly 80% moist deciduous forest, 15% evergreen and semi-evergreen and the remaining five per cent is under teak and soft wood plantations.

Survey, Collection and Identification of fungi

The survey was conducted during January 2012 to October 2014 in PVWS, Kerala for the collection of polypores. Three permanent fixed size sample plots of 100x100 m were established in three different locations, viz., Vellani, Mannamangalam and Olakkara sections

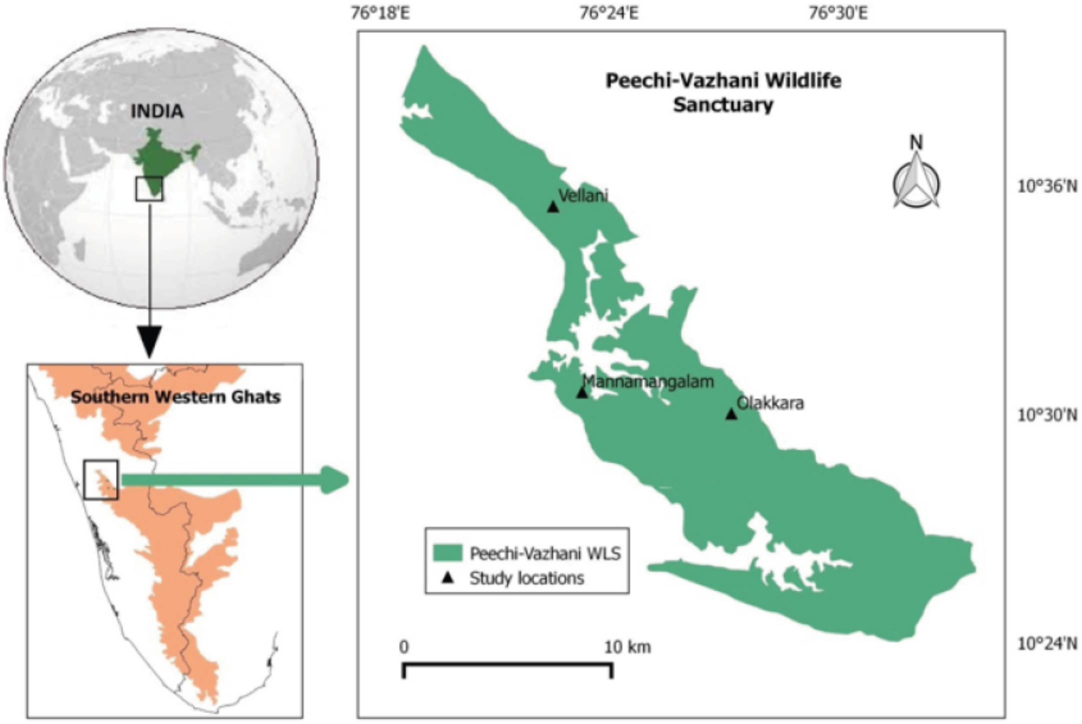

Figure 1. Location map of the study area in Peechi-Vazhani Wildlife Sanctuary

of the sanctuary as per the methods of earlier fungal studies (Yamashita et al. 2010; Mohanan 2011). Also subplots of 10x10 m were fixed in each permanent plot for detailed analysis. The sample plots were visited during pre-monsoon (January–May), monsoon (June–September) and post monsoon (October–December) periods for the documentation of polypores. A total area of 30,000 m^2 was surveyed during each climatic seasons. Additional collection of polypores was also made along the transect other than the permanent plots ("off plots") in the study area. The polypore specimens collected from the study area were kept in paper bags and brought to the lab. The specimens were properly air dried or oven dried and stored in polythene zip-cover under less humid conditions. The identification key provided by Bakshi (1971) and Leelavathy & Ganesh (2000) were used for the confirmation of polypores. The micro-morphological characteristics of the polypores were drawn with the help of camera lucida. Some of the specimens were compared with those in the Herbaria at the Kerala Forest Research Institute, Peechi. All the specimens collected during the study period were catalogued and kept under less humid conditions in the refrigerator in the Department of Forest Management and Utilization, College of Forestry at Kerala Agricultural University (Appendix 1). After proper nomenclature and identification, the current names of the identified polypores were accessed from the website: www.mycobank.org (accessed on 15 January 2015). All fruiting bodies of the same species on a substrate were counted as single occurrence, independent of the number of fruiting bodies. Also if there were several clusters, they were treated as single occurrence. Attempts were made to calculate the number of individuals on all the substrates. To understand the diameter class preference, polypores with more than 10 total occurrences on different diameter classes only were considered. Out of this, more than 50% occurrence on a particular diameter class was selected as preference for diameter class. The distribution of polypores on different substrate type was studied by dividing the substrates into four types, viz., snag (dead standing tree), log, branch/twig and living tree. The decay stage of the substrate was determined according to a 5-grade scale based on decay classification system of Pyle & Brown (1998). A correspondence analysis has been done in version 16.6.04 of XLSTAT 2014 to understand the succession pattern of polypores and decomposition stages of wood during different seasons in moist deciduous forests.

RESULTS AND DISCUSSION

Substrate diameter

Of total individuals, 2861 (56%) occurred on substrates in the two smallest diameter classes (11-<20 cm and 21-<30 cm) and 305 (6%) individuals occurred on substrates in the largest diameter class (51-<60 cm and 61cm and above) (Table 1). Three polypore species (*Daedalea flavida* Lev.*, Fomitopsis feei* (Fr.) Kreisel and *Microporellus obovatus* (Jungh.) Ryvarden) constitute two-third of individuals on substrates in the small diameter class. The reason could be the large diameter substrates decay at a slower rate and persist for longer as well. They have been shown to serve as an important refuge for fungal species that require woody debris in advanced decay (Heilmann-Clausen & Christensen 2004). It is noteworthy that in the hardwood zone of North America Brazee et al. (2014) found a similar pattern of diversity for polypores in different diameter classes. Moreover small diameter substrates have a higher surface to volume ratio for colonization (Norden et al. 2004), hence results of the present study highlights that the small diameter class substrates are also important in maintaining species richness of the polypore fungal community.

On average, a more competition free substrate, could favour the establishment of the common pioneer species (Berglund et al. 2011). Therefore, the diameter class range and preference of polypores have been recorded based on the number of occurrences. The occurrence of polypores showed an interesting pattern of distribution. Species like *Daedalea flavida, Fomitopsis feei* and *Earliella scabrosa* (Pers.) Gilb. & Ryvarden have a wide range of diameter class, while species like *Hexagonia tenuis* (Hook.) Fr. and *Microporus xanthopus* (Fr.) Kuntze have only a very narrow range of diameter class (Table 2). Similarly, the wide range diameter class and preference for a particular diameter class was observed for wood-inhabiting Aphyllophorales in a cool temperate area of Japan (Yamashita et al. 2010).

A total of seven polypores species showed a possible preference for a diameter class as defined by having more than 50% of their occurrence on a single diameter class (Table 2). *Hexagonia tenuis*, *Microporus xanthopus* and *Microporus affinis* (Blume & T.Nees) Kuntze. showed preference for very small diameter class (0-<10 cm). Notably in lowland rainforests in Malaysia, *Microporus xanthopus* are mostly restricted to <10 cm diameter class, whereas perennials *like Erythromyces crocicreas* (Berk. & Br.) Hjorts. & Ryv.*, Ganoderma australe* (Fr.) Pat., and *Phellinus lamaensis* (Murr.) Heim. occur mostly on larger substrates (Hattori & Lee 2003; Yamashita et al. 2009) and these species are considered important decomposers of coarse woody debris in that forest type.

Substrate type

A box plot analysis was also done for the association of polypores with substrate types (Fig 2). In case of snag, the polypore density varied with a minimum of 13 individuals to a maximum of 543 individuals while in the case of living trees, the density varied with a minimum of 32 individuals to a maximum of 81 individuals. In the case of logs, the density of polypores varied by eight to 565 individuals and in the case of branch/twig, the density ranged from a minimum of six to a maximum of 276 individuals. Among the substrate types, the maximum number of individuals was observed in logs (2,480), followed by branch/twig (1,469) and snag (1,012). The living trees supported very few polypores individuals (113). The living trees supported only 2% of the total (113 individuals) (Table 3). *F. feei, D. flavida* and *T. cotonea* made up more than half of their total individuals in trunk and *M. affinis, M. xanthopus, P. grammocephalus* and *H. tenuis* made up more than half of the their total individuals in branch/ twig. Higher richness of fungal species was found in the branches and logs in the hardwood zone of North America (Brazee et al. 2014). *F. feei*, a brown rot fungus showed a high preference for snag (dead standing trees) and Hymenochaetaceae members like *P. dependens* and *F. nilgheriensis* were observed on living trees; no other species were observed on living trees during the entire study period. These living trees belonged to *Xylia xylocarpa*. *D. flavida, T.cotonea*, *M. affinis, M. xanthopus, P. grammocephalus* and *H. tenuis* have wide spread occurrence in trunk (fallen log) and branch/ twig. Mohanan (1994) reported that *M. affinis* and *M. xanthopus* were common in the forest stands of Kerala, which caused mainly white-rot of branches and twigs, and brown fungi including *Fomitopsis* spp. have wide spread occurrence. It was also discussed that despite the diversity of the microbes associated with heart rot of living trees, the degradation of the cell wall components is still ascribable to hymenomycetes.

Substrate decay class

The correspondence analysis for the pre-monsoon season indicated that during this season the species distribution was related with the decay class 1, 2 and 3 while in monsoon and post monsoon seasons, decay class 4 plays a significant role in the distribution of polypores (Figs. 3, 4 & 5). The values for various parameters in

Table 1. Total individuals (D) and occurrence (O) of polypores on different diameter classes

	Fungal species	Substrate diameter class													
		0-<10 cm		11-<20 cm		21-<30 cm		31-<40 cm		41-<50 cm		51-<60 cm		61cm & above	
		D	O	D	O	D	O	D	O	D	O	D	O	D	O
1	*Coriolopsis sanguinaria*	-	-	22	1	-	-	-	-	-	-	-	-	-	-
2	*Coriolopsis telfarii*	-	-	-	-	25	1	-	-	-	-	-	-	-	-
3	*Daedalea flavida*	77	7	242	25	319	24	60	3	-	-	-	-	-	-
4	*Earliella scabrosa*	39	2	117	4	76	4	38	4	-	-	-	-	-	-
5	*Fomitopsis feei*	-	-	207	3	515	9	326	8	-	-	-	-	62	2
6	*Fulvifomes nilgheriensis*	-	-	-	-	-	-	81	9	29	3	24	3	-	-
7	*Fuscoporia gilva*	-	-	-	-	105	8	178	18	55	3	-	-	-	-
8	*Ganoderma lucidum*	-	-	-	-	-	-	21	3	-	-	18	3	-	-
9	*Hexagonia tenuis*	-	-	56	4	-	-	-	-	-	-	-	-	-	-
10	*Melanoporia nigra*	106	16	-	-	-	-	-	-	-	-	-	-	-	-
11	*Microporellus obovatus*	-	-	22	4	11	1	16	2	-	-	-	-	-	-
12	*Microporus affinis*	-	-	28	4	263	6	55	4	-	-	-	-	-	-
13	*Microporus xanthopus*	213	28	24	4	-	-	24	3	-	-	-	-	-	-
14	*Nigroporus vinosus*	276	29	-	-	-	-	-	-	-	-	-	-	-	-
15	*Phellinus dependens*	-	-	53	10	-	-	-	-	-	-	-	-	-	-
16	*Fuscoporia senex*	-	-	26	3	82	8	96	15	-	-	-	-	-	-
17	*Polyporus arcularius*	-	-	31	2	-	-	-	-	-	-	-	-	-	-
18	*Polyporus grammocephalus*	89	10	80	10	14	2	-	-	-	-	-	-	-	-
19	*Polyporus virgatus*	6	2	-	-	-	-	-	-	-	-	-	-	-	-
20	*Trametes cingulata*	-	-	-	-	165	4	36	2	-	-	-	-	-	-
21	*Trametes cotonea*	-	-	112	5	107	6	-	-	-	-	-	-	201	6
22	*Trametes hirsuta*	38	2	2	3	106	10	49	4	-	-	-	-	-	-
	Total	**844**	-	**1073**	-	**1788**	-	**980**	-	**84**	-	**42**	-	**263**	-

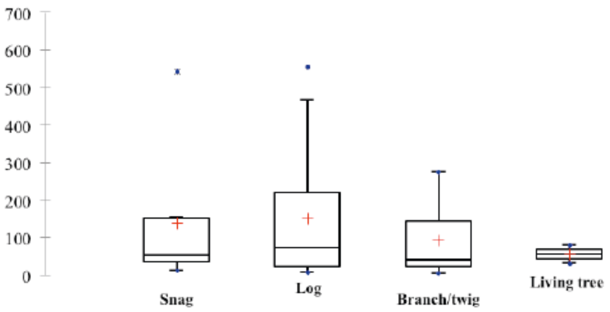

Figure 2. Box plot analysis on the distribution of polypores on different substrate types

the test of association reveals the significance of the correspondence test (Table 4). In all three seasons the chi-square observed value is greater than the critical value and the p-value is below the chosen level alpha; hence it is concluded that the rows (polypore fungi) and the columns (decay class) are significantly associated.

During the pre-monsoon season, species like *M. affinis*, *M. xanthopus* and *M.nigra* have a strong affinity towards decay class 3 and *Phellinus* spp. and *Trametes* spp. showed affinity for decay 1 and 2 respectively. Also species like *Nigroporus vinosus* was found in late decay stages (decay class 3). In this study, *P. dependens, F. nilgheriensis, Fuscoporia* spp. and *Trametes spp.* were the dominant species, comprising more than 70% of the fruit bodies encountered and decay classes 1 and 2 are the advanced decay class. It was widely accepted that dominant species, and in particular their functional traits, are most important in determining current magnitude, rate and direction of ecosystem processes, whereas subordinate and rare species play a minor role in present ecosystem dynamics (Walker et al. 1999; Díaz & Cabido 2001). Yamashitha et al. (2010), however, revealed that in the cool temperate regions of Japan some polypores species occur mainly in the early decay stages of decomposition whereas others form fruiting

Table 2. Diameter class preference of polypores

	Fungal species	Occurrences	No. of diameter class	Preference
1	*Coriolopsis sanguinaria*	1	1	-
2	*Coriolopsis telfarii*	1	1	-
3	*Daedalea flavida*	59	4	-
4	*Earliella scabrosa*	14	4	-
5	*Fomitopsis feei*	22	4	-
6	*Fulvifomes nilgheriensis*	15	3	1
7	*Fuscoporia gilva*	29	3	1
8	*Ganoderma lucidum*	6	2	-
9	*Hexagonia tenuis*	4	1	-
10	*Melanoporia nigra*	16	1	1
11	*Microporellus obovatus*	7	3	-
12	*Microporus affinis*	14	3	-
13	*Microporus xanthopus*	35	3	1
14	*Nigroporus vinosus*	29	1	1
15	*Phellinus dependens*	10	1	-
16	*Fuscoporia senex*	26	3	1
17	*Polyporus arcularius*	2	1	-
18	*Polyporus grammocephalus*	22	3	-
19	*Polyporus virgatus*	2	1	-
20	*Trametes cingulata*	6	2	1
21	*Trametes cotonea*	17	3	-
22	*Trametes hirsuta*	19	4	1

Table 3. Number of polypores on different substrate types

	Fungal species	Snag	Log	Branch/ twig	Living tree
1	*Coriolopsis sanguinaria*	0	0	22	0
2	*Coriolopsis telfarii*	0	25	0	0
3	*Daedalea flavida*	0	468	242	0
4	*Earliella scabrosa*	0	112	169	0
5	*Fomitopsis feei*	543	565	12	0
6	*Fulvifomes nilgheriensis*	53	0	0	81
7	*Fuscoporia gilva*	161	206	0	0
8	*Ganoderma lucidum*	22	18	0	0
9	*Hexagonia tenuis*	0	26	0	0
10	*Melanoporia nigra*	0	0	42	0
11	*Microporellus obovatus*	0	22	23	0
12	*Microporus affinis*	0	272	86	0
13	*Microporus xanthopus*	0	24	242	0
14	*Nigroporus vinosus*	0	0	276	0
15	*Phellinus dependens*	13	8	32	0
16	*Fuscoporia senex*	161	0	12	32
17	*Polyporus arcularius*	0	31	0	0
18	*Polyporus grammocephalus*	0	48	145	0
19	*Polyporus virgatus*	0	0	6	0
20	*Trametes cingulata*	0	211	0	0
21	*Trametes cotonea*	0	288	122	0
22	*Trametes hirsuta*	59	156	38	0
	Total	**1012**	**2480**	**1469**	**113**

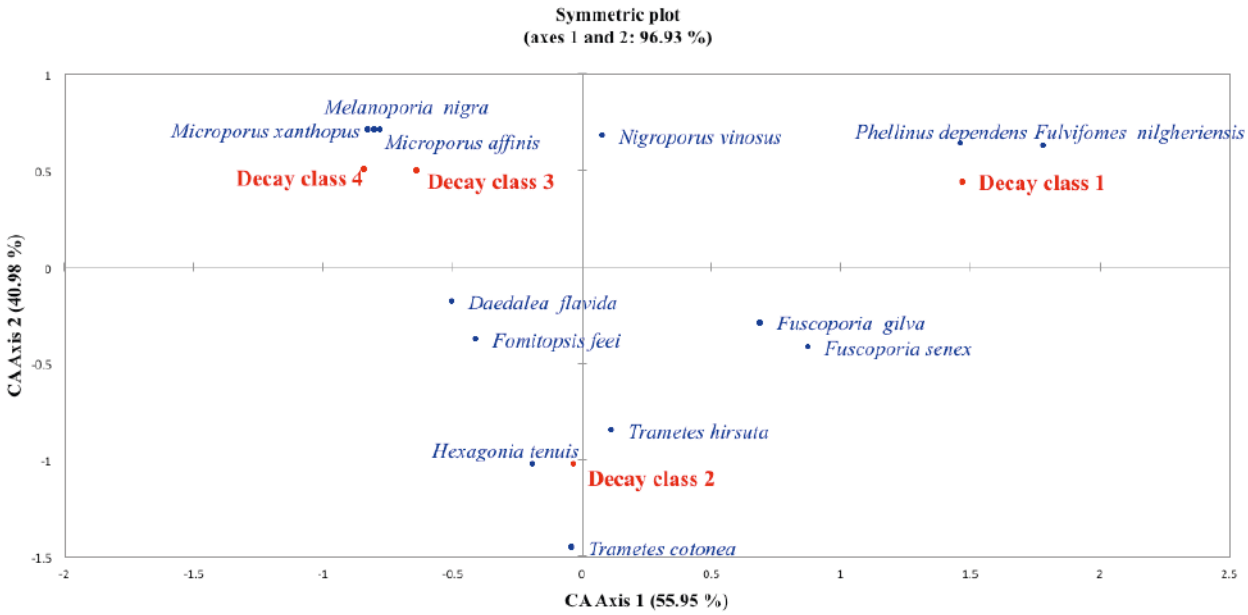

Figure 3. Correspondence analysis for the decay class association of polypores during pre-monsoon period

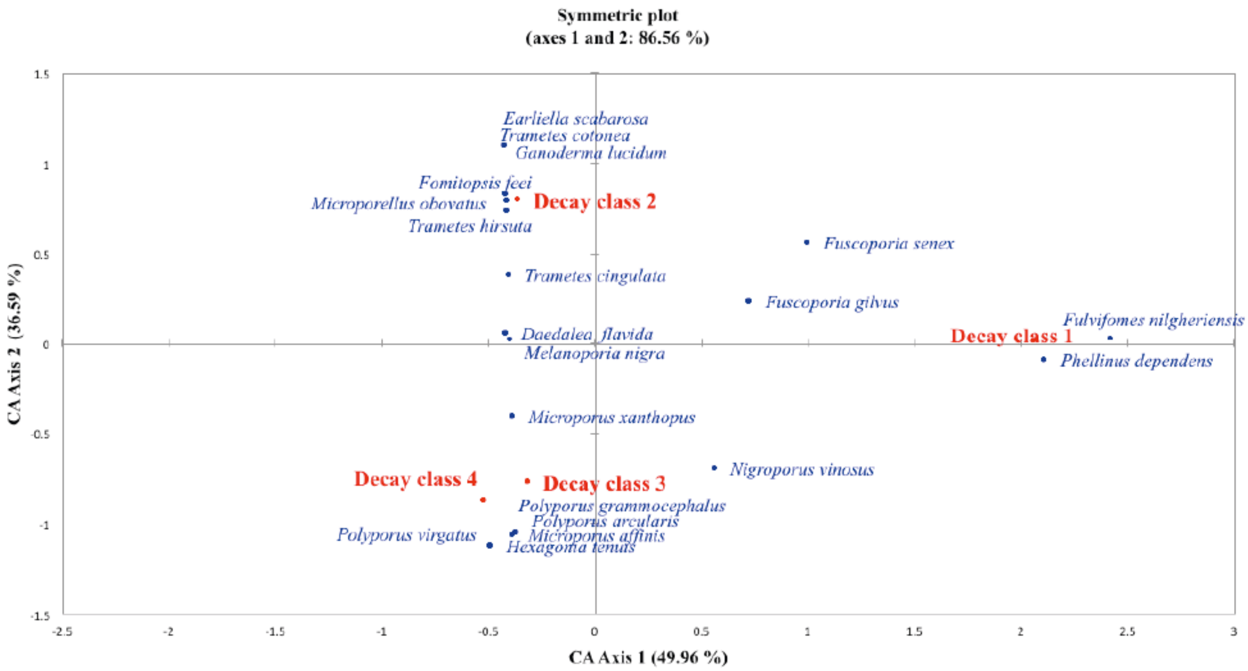

Figure 4. Correspondence analysis for decay class association of polypores during monsoon period

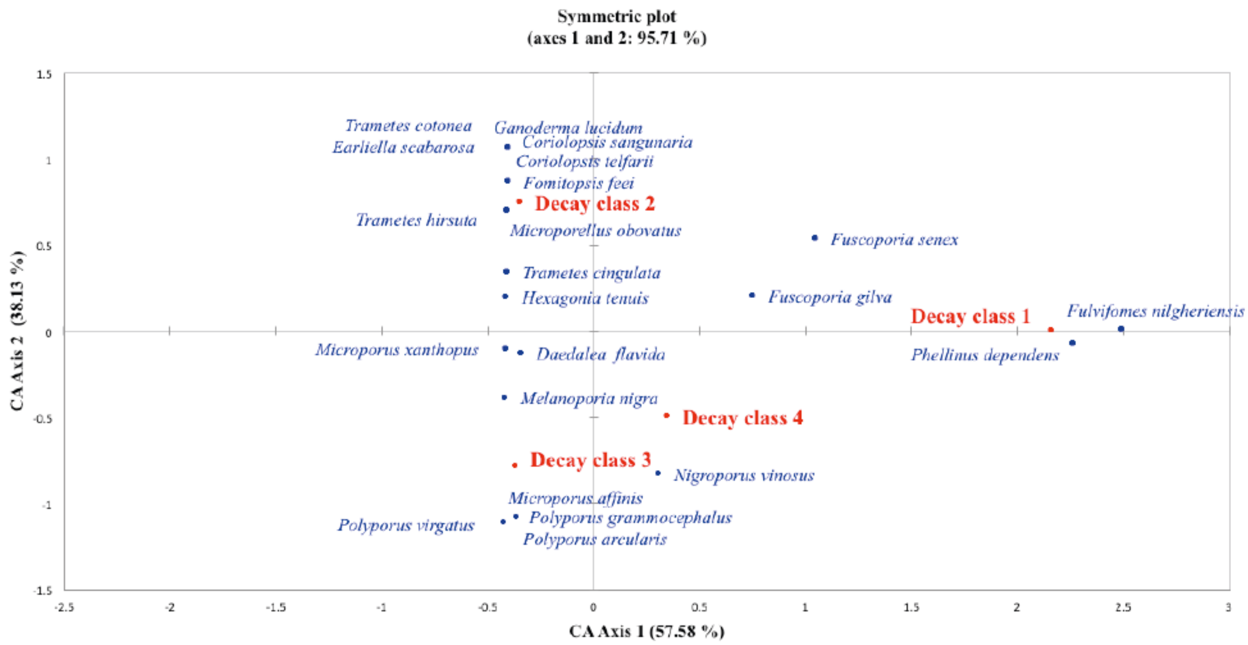

Figure 5. Correspondence analysis for decay class association of polypores during post monsoon season

bodies in later stages of decomposition.

The decomposition of wood materials on the forest floor proceeds through sequential colonization by fungal species with different decay types and their interspecific interactions, which leads to a fungal succession during decomposition (Rayner & Boddy 1988). Apart from the pre monsoon season, during the monsoon season and post monsoon, the newly germinated white rot species like *E. scabrosa*, *T. cingulata*, *G. lucidum*, *M. obovatus*, *C. telfarii* and C. *sanguinaria* showed a high association with decay class 2. Fukasawa et al. (2009) suggested that white-rot basidiomycetes, play a central role in the simultaneous decomposition of acid-unhydrolyzable residue (AUR) and holocellulose in the first phase of

Table 4. Test of independence between the polypore fungi and decay class in the Chi-square test

Season	Chi-square (observed value)	Chi-square (Critical value)	Degrees of freedom (df)	p-value (alpha=0.05)
Pre-monsoon	105.288	50.998	36	<0.0001
Monsoon	189.020	79.082	60	<0.0001
Post-monsoon	189.992	85.965	66	<0.0001

decomposition. In the early stages of decay (decay class 2), *F. feei*, *M. obovatus* and *T. hirsuta* have high similarity between each other. Among these species *F. feei* showed high abundance in the monsoon and post monsoon seasons. The reason could be that inter-specific mycelial interactions among brown rot fungi and white rot fungi resulted in either deadlock or replacement of one fungus by the other and some brown rot fungi are capable of invading and occupying domains within white rot fungal communities in decaying wood (Owens et al. 1994).

Species with annual, small sized fruit bodies like *M. affinis, M. xanthopus, P. grammocephalus, H. tenuis* and *P. arcularius* are highly associated with decay class 3, where there is less energy available. It was also observed that during all seasons, species belonging to genera such as, *Phellinus*, *Fulvifomes*, *Fomitopsis*, *Ganoderma* and *Fuscoporia* with long lived fruit bodies are more abundant in decay class 1 and decay class 2 (i.e., less decayed wood samples), which would typically hold more available energy. These results support the idea of an energy driven control of fruit body production for some species (Schmit 2005). Although, sporophore production, particularly regarding species with short lived sporophores, may also be triggered by other factors, such as shifts in temperature and humidity as well as interspecific interactions (Moore et al. 2008).

M. xanthopus has shown a sign of decay class shift; during the pre- monsoon season it is associated with decay class 3 and during the monsoon and post monsoon seasons, it showed a shift towards decay class 2 and was equally distributed in decay class 2 and 3. This reflects a species turnover towards a community that depends upon a pre-modified wood environment as well as the presence of senescing mycelia (Kubartova et al. 2012). Other polypores species *D. flavida* found in decay class 1 to decay class 4 supports the view that once a primary species is established in a fallen trunk, it may persist in the community for a long time (Vetrovsky et al. 2011). Thus, they can be considered as stress-selected species that move towards competitive-selected life histories as the substrate proceeds to higher decay classes.

CONCLUSION

The findings of the study made clear that the substrate utilization by polypores is critical for the species assemblage in the moist deciduous forests. It can be concluded that compared to the diameter of woody substrate, the decay class is a more subjective measure to study the polypore establishment. Finally this might be the first study in Kerala which explains the relationship with substrate features and polypore assemblage in detail.

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Appendix 1. Catalogue number of polypore specimens collected from the Peechi-Vazhani Wildlife Sanctuary

	Species name	Catalogue no.
1	*Coriolopsis sanguinaria*	MIA 1/29-10-2014
2	*Coriolopsis telfarii*	MIA 2/ 30-10-2014
3	*Daedalea flavida*	MIA 7,30,33,40,43,46/22-4-2012
4	*Daedalea flavida*	MIA 21/ 8-9-2014
5	*Daedalea flavida*	MIA 19/ 8-9-2014
6	*Daedalea flavida*	MIA 9/ 9-9-2014
7	*Daedalea flavida*	MIA 14/ 9-9-2014
8	*Daedalea flavida*	MIA 7/ 9-9-2014
9	*Daedalea flavida*	MIA 9/ 10-9-2014
10	*Daedalea flavida*	MIA 10/10-9-2014
11	*Daedalea flavida*	MIA 4/10-9-2014
12	*Daedalea flavida*	MIA 6/ 10-9-2014
13	*Daedalea flavida*	MIA 7/ 29-10-2014
14	*Daedalea flavida*	MIA 8/ 29-10-2014
15	*Daedalea flavida*	MIA 9/ 29-10-2014
16	*Daedalea flavida*	MIA 6/1-11-2014
17	*Earliella scabarosa*	MIA 4/25-5-2014
20	*Earliella scabarosa*	MIA 3/ 29-10-2014
21	*Earliella scabarosa*	MIA 4/ 29-10-2014
22	*Earliella scabarosa*	MIA 1/ 30-10-2014
23	*Earliella scabrosa*	MIA 13/13-3-2014
24	*Earliella scabrosa*	MIA 14/ 8-9-2014
25	*Earliella scabrosa*	MIA 8/8-9-2014
26	*Earliella scabrosa*	MIA 13/ 8-9-2014
27	*Earliella scabrosa*	MIA 5/ 8-9-2014
28	*Fomes psuedosenex*	MIA 1/1-11-2014
29	*Fomes psuedosenex*	MIA 13/22-4-2012
30	*Fomes psuedosenex*	MIA 13/22-4-2012
31	*Fomitopsis feei*	MIA 16/22-4-2012
32	*Fomitopsis feei*	MIA 3/ 9-9-2014
33	*Fomitopsis feei*	MIA 1/ 10-9-2014
34	*Fomitopsis feei*	MIA 11/ 10-9-2014
35	*Fomitopsis feei*	MIA 7/1-11-2014
36	*Fomitopsis feei*	MIA 2/ 10-9-2014
37	*Fulvifomes nilgheriensis*	MIA 9,36/22-4-2012
38	*Fuscoporia gilva*	MIA 31,32/22-4-2012
39	*Fuscoporia gilva*	MIA 18/8-9-2014
40	*Fuscoporia gilva*	MIA 17/ 8-9-2014
41	*Fuscoporia gilva*	MIA 13/9-9-2014
42	*Fuscoporia gilva*	MIA 10/ 9-9-2014
43	*Fuscoporia gilva*	MIA 10/ 9-9-2014
44	*Fuscoporia gilva*	MIA 4/ 9-9-2014
45	*Fuscoporia gilva*	MIA 5/1-11-2014
46	*Fuscoporia senex*	MIA 10/ 13-3-2014
47	*Ganoderma australe*	MIA 4/ 3-8-2014
48	*Ganoderma lucidum*	MIA 5/3-8-2014
49	*Ganoderma lucidum*	MIA 1/ 8-9-2014
50	*Ganoderma lucidum*	MIA 19/ 9-9-2014
51	*Hexagonia tenius*	MIA 51/22-04-2012
52	*Hexagonia tenuis*	MIA 1/ 25-5-2014
53	*Hexagonia tenuis*	MIA 6/ 30-10-2014
54	*Inonotus luteoumbrinus*	MIA 3/1-11-2014
55	*Melanoporia nigra*	MIA 11/ 13-3-2014
56	*Melanoporia nigra*	MIA 20/ 9-9-2014
57	*Melanoporia nigra*	MIA 21/ 9-9-2014
58	*Melanoporia nigra*	MIA 3/ 10-9-2014
59	*Melanoporia nigra*	MIA 4/1-11-2014
60	*Microporellus obovatus*	MIA 23/ 8-9-2014
61	*Microporellus obovatus*	MIA 17/ 9-9-2014
62	*Microporus affinis*	MIA 34,44,45/22-4-2012
63	*Microporus affinis*	MIA 9/ 13-3-2014
64	*Microporus xanthopus*	MIA 50,20,29/22-4-2012
65	*Microporus xanthopus*	MIA 18/9-9-2014
66	*Microporus xanthopus*	MIA 5/ 29-10-2014
67	*Oxyporus mollissimus*	MIA 2/ 25-5-2014
68	*Phellinus fastuosus*	MIA 22/ 8-9-2014
69	*Phellinus punctatus*	MIA 15/8-9-2014
70	*Phellinus dependens*	MIA 1,2,15/22-4-2012
71	*Phellinus fastuosus*	MIA 7/ 10-9-2014
72	*Phellinus fastuosus*	MIA 5/ 10-9-2014
73	*Phellinus fastuosus*	MIA 10,25/22-4-2012
74	*Phellinus fastuosus*	MIA 10,25/22-4-2012
75	*Phellinus fastuous*	MIA 11/ 29-10-2014
76	*Phellinus ferrugineo-velutinus*	MIA 11/ 9-9-2014
77	*Phellinus gilvoides*	MIA 1/3-8-2014
78	*Phellinus gilvoides*	MIA 6/ 3-8-2014
79	*Polyporus arcularius*	MIA 19/22-04-2012
80	*Polyporus arcularius*	MIA 3, 13/3/2014
81	*Polyporus dictyopus*	MIA 4,5/22-4-2012
82	*Polyporus grammocephalus*	MIA 8/ 13-3-2014
83	*Polyporus grammocephalus*	MIA 5/25-5-2014
84	*Polyporus grammocephalus*	MIA 2/3-8-2014
85	*Polyporus grammocephalus*	MIA 10/ 8-9-2014
86	*Polyporus grammocephalus*	MIA 20/ 8-9-2014
87	*Polyporus grammocephalus*	MIA 8/ 9-9-2014
88	*Polyporus grammocephalus*	MIA 12/ 9-9-2014
89	*Polyporus grammocephalus*	MIA 12/ 10-9-2014
90	*Polyporus virgatus*	MIA 6/ 25-5-2014

	Species name	Catalogue no.
91	*Pycnoporus cinnabarinus*	MIA 3/ 22-4-2012
92	*Rigidoporus lineatus*	MIA 3/3-8-2014
93	*Rigidoporus lineatus*	MIA 12/ 8-9-2014
94	*Trametes cingulata*	MIA 2/29-10-2014
95	*Trametes cingulata*	MIA 6/ 29-10-2014
96	*Trametes cotenea*	MIA 5/ 13-3-2014
97	*Trametes cotonea*	MIA 21,23,24,41,,42,47/22-4-2012
98	*Trametes cotonea*	MIA 10/ 29-10-2014
99	*Trametes cotonea*	MIA 3/ 30-10-2014

	Species name	Catalogue no.
100	*Trametes hirsuta*	MIA 12/ 13-3-2014
101	*Trametes hirsuta*	MIA 6/ 13-3-2014
102	*Trametes hirsuta*	MIA 7/ 13-3-2014
103	*Trametes hirsuta*	MIA 2/ 13-3-2014
104	*Trametes hirsuta*	MIA 4/ 8-9-2014
105	*Trametes lactinea*	MIA 22,23,21/22-4-2012
106	*Trametes lactinea*	MIA 4/ 30-10-2014
107	*Trametes marianna*	MIA 3/ 25-5-2014

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

January 2017 | Vol. 9 | No. 1 | Pages: 9689–9776
Date of Publication: 26 January 2017 (Online & Print)
DOI: 10.11609/jott.2017.9.1.9689-9776
www.threatenedtaxa.org

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