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Mushroom species richness, distribution and substrate specificity in the Kilum-Ijim forest reserve of Cameroon

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ABSTRACT

Objectives: Mushroom species richness, distribution and substrate specificity are essential considerations for conservation and management of forest ecosystems. In this study in the Kilum-Ijim mountain forest, mushroom species richness, distribution and substrate specificity was evaluated.

Methodology and results: Fixed size plot method, opportunistic and downed wood sampling methods according to Mueller *et al*. (2004) was used for mushroom survey in 2015 in five sites in the Kilum-Ijim forest. The number of species, diversity in each site as well as substrate and morphotypes were recorded and calculated. A total of 393 macrofungi samples were collected. Highest collection (135) was recorded in September while January registered the least (22). Plantlife Sanctuary Oku recorded the highest number of macrofungal (109) while the least (44) was recorded in Anyajua community forest. Macrofungi were found on five varying substrates and ten different morphological forms of macrofungal were recorded.

Conclusions and application of findings: Mushrooms species richness differed in the five sites surveyed in the Kilum-Ijim forest. *Podoscypha petalodes* had the highest number of species across all the five sites followed by *Coprinus fissolanatus*, *Polyporus dictopus*, *Favolachia calocera* and *Xylaria sp.* The Agaricaceae and Polyporaceae were the most abundant family. Majority of the mushroom species were found on dead wood substrate and few on dung and standing tree substrates. The result on species richness, distribution and substrate specificity of mushrooms widens the knowledge on mycodiversity and substrate relationship which is an important factor for conservation and utilization as well as for the sustainable forest ecosystem management. Also, the result projects the importance of geographic location of substrates on the distribution of mushrooms which is of immense value for conservation. There is variation in the substrate preferred by mushrooms and likely this factor influences the extent of occurrence and nutritional content.

Keywords: Mushrooms, Species richness, Substrate, Distribution, Kilum-Ijim

INTRODUCTION

Macrofungi are one of the richest and diverse groups of organisms on earth and constitute a significant part of terrestrial ecosystem, forming a large share of species richness and key players of ecosystem processing (Seen-Irlet *et al*., 2007). Macrofungi play essential roles in maintaining forest ecosystems and biodiversity (Hawksworth, 1991; Molina *et al*., 2008). Macrofungi substrate refers to any surface on which the macrofungi attach and grow whereas the macrofungi include fungi distinguished by having fruiting structures visible to the naked eye commonly referred to as mushrooms (Lodge *et al*., 2004). Most terrestrial macrofungi are decomposers, but some species form mycorrhiza and a few are parasitic. Fungi fruiting on woody substrata are usually either saprobes or plant pathogens (Mueller *et al.,* 2007). Macrofungi play significant roles as an integral part of the forest ecosystem. Forest trees form a relationship with some species of macro-fungus (called mycorrhizae) that helps tree roots absorb water and minerals from the soil. Mycorrhiza constitutes the most efficient nutrient uptake facilitators particularly in nutrient deficient soils of tropical regions where it enhances mineral uptake by connecting the plant's roots to a huge nutrient absorbing mycelial network which solubilize minerals such as phosphate, making it available for absorption (Onguene and Kuyper, 2001; Eneke, 2011). Forestry managers and conservationists have realized that dead decaying wood which is mostly facilitated by fungi, forms an important source of biodiversity and an integral part of the recycling of carbon and other nutrients (Gates, 2009). Macrofungi are important source of food for forest animals and they serve as homes for many soil insects and other small organisms that are also part of a healthy forest ecosystem. Moreover, macrofungi fruit bodies have enormous use for the general welfare in human life (Boa, 2004). They are highly useful in pharmaceutical industry and in mass production of cultivated fungi in the food industry (Lindequist *et al.,* 2005), playing vital roles in biodegradation and biodeterioration (Tibuhwa, 2011). Macrofungi comprise different morphological forms. These include the rusts, smuts, jelly fungi, club fungi, coral and shelf (bracket) fungi, mushrooms, puffballs, stinkhorns and bird's-nest fungi. Morphologically they can be broadly divided into the following forms; bracket shaped, stiped and poroid, gilled, smooth andresupniate on woods, coralloid, hood like, dentoid or with cup shaped cap having or lacking stipe (Pacioni and Lincoff, 1981). Species diversity is one of the most obvious and characteristic feature of a community (Krebs, 2014). Diversity comprises two separate ideas-species richness and evenness. Species richness is the oldest and simplest concept of species diversity. It measures the different kinds of organisms present in a community or region. McIntosh (1967) coined the name species richness to describe this concept. Species evenness compares the similarity of the population size of each of the species present. Lloyd and Ghelardi (1964) were the first to suggest the concept of evenness. In Cameroon, there are few community level studies of macrofungi such as the work of Egbe *et al.* (2013) in the Mount Cameroon Region, Kinge *et al.* (2017) who documented mushrooms in the Awing Forest Reserve. Also, Douanla-Meli (2007) studied the ecological diversity of mushrooms from the Mbalmayo forest reserves with emphasis on the taxonomy of non-gilled Hymenomycetes. 271 distinct species belonging to 110 genera in 58 families were recorded. Many new records and species new to science and important ethnomycological notes for people in and around the Mbalmayo forest reserves were documented. Roberts and Ryvarden (2006), reported over 70 poroid species was from the Korup rainforest, Cameroon. There are also single genus studies in Cameroon such as Kinge *et al.* (2012) who worked on the genus Ganoderma. Mossebo *et al.* (2009), and Mossebo *et al.* (2017) worked on the taxonomy genus Temitomyces from Cameroon. Despite the importance of macrofungi in natural and agroecosystems, there is scanty information on macrofungi community structure, substrate specificity and dynamics especially in the tropics

(Hawksworth, 1991; Osemwegie *et al.,* 2006; Muller *et al.,* 2007). Fungal diversity and substrate specificity are usually overlooked during management of forest ecosystems, (Amaranthus, 1998; Tibuhwa, 2011); yet successful conservation of any ecosystem requires understanding of mushroom communities in terms of ecology and distribution. This study therefore aimed at determining the species richness, distribution and substrate specificity of mushrooms in the Kilum-Ijim forest in the North West Region of Cameroon.

MATERIALS AND METHODS

Study area: The Kilum Mountain Range and the Ijim Ridge are situated in the Northwest Region of Cameroon commonly called the Bamenda Highlands. The Kilum-Ijim forest (KIF) is located between Latitude 6°07´N and 6°17´N and Longitude 10°20´E and 10°35´E covering an area of about 20,000 ha. It is found on Mount Oku with Lake Oku lying in a crater in its centre. At 3,011 m, Mount Oku is the second highest mountain in West Africa, after Mount Cameroon (Fomété *et al.,* 2001). The forest within this area borders three districts: Oku, Kom, and Nso. Part of the forest that borders Oku is called Kilum, and the rest that borders Kom and Nso is called Ijim – hence, jointly the Kilum-Ijim forest. The Kilum-Ijim forest has been demarcated in to 18 community forests to enable better management of the forest resources by the communities surrounding the forest (Gardner *et al.,* 2001). The climate of the Kilum Mountain is very humid with very high presence of fog and mist almost throughout the year (Fomété *et al.,* 2001). The precipitation is unimodal (Asanga, 2001). The dry season begins from November to mid-March and the rainy season of 8 months long starts from mid-March to the month of October (Asanga, 2001). The total annual rainfall varies from 1800mm to 3000mm annually, with an average temperature that varies from 22°c at 1800m altitude to 16°c in the higher altitude areas Figure 1.

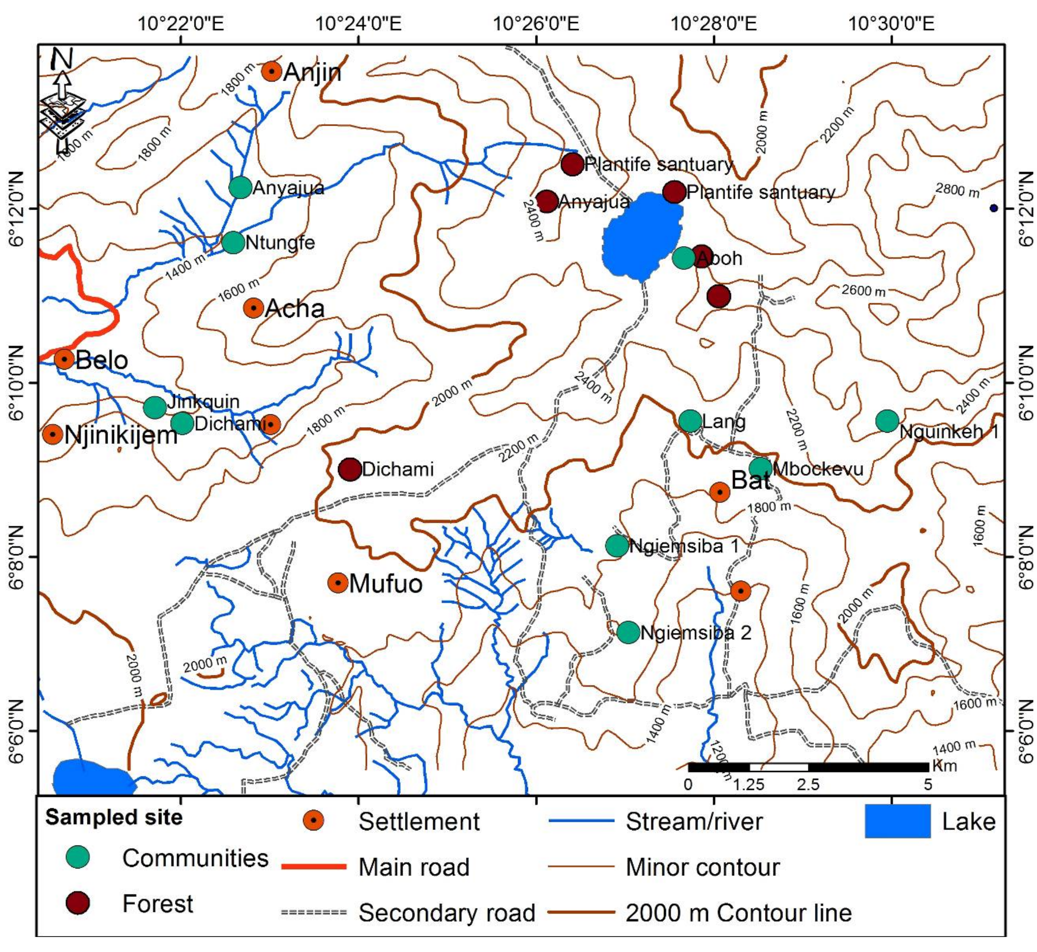


Figure 1: View of the Kilum-Ijim mountain forest, Northwest Region Cameroon

The topography of the area is hilly and constitutes a chain of mountains. The highest of these mountains is mount Oku. The geological landscape found here are mainly of Basalts, trachytes, rhyolites, gneiss and granite origin. The soils here are humified ferralitic soils with a high organic matter content favored by the humid climate and cold. These soils are well drained and of good permeability (Fomété *et al.,* 2001). The montane forest has a unique ecosystem that provides a favorable milieu for the habitation of many endemic plant and bird species (Asanga, 2001). The area is one of the most densely populated parts of Cameroon. It is estimated that close to 300 000 people live within a day's walk of the forest (Forboseh and Maisels, 2000). The majority of the area enclosed by the Kilum-Ijim boundary is at an altitude of over 2000 meters. The vegetation is at this altitude and above consists mainly of montane forest mixed with montane grassland and subalpine communities. Below this, most of the submontane forest has already disappeared due to clearance for agriculture.

Field survey and Sampling: Diversity study was carried out in five community forests of Kilum-Ijim (Figure 2). Before entering into the Kilum-Ijim forest, visitations were made to the fondoms and administrative authorities within the Kom and Oku districts to seek traditional and administrative permission to use the forest. Five community forests out of 18 were selected based on accessibility after a reconnaissance survey was carried out in the area.

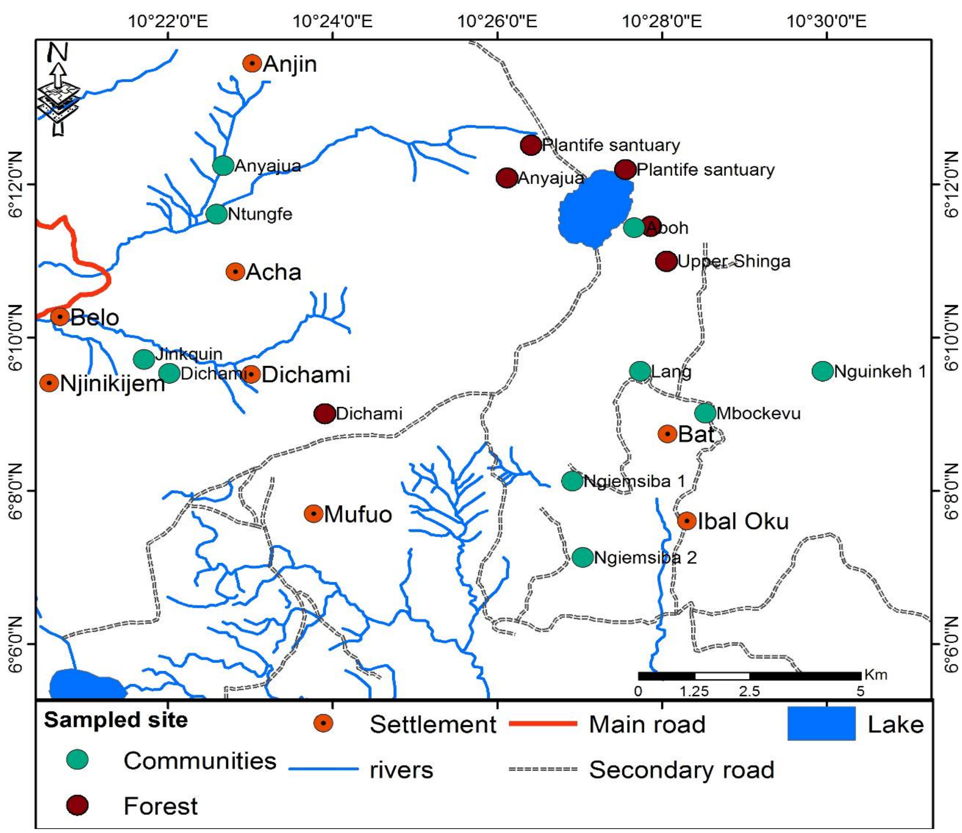


Figure 2: Macrofungal species richness and distribution sites in Kilum-Ijim forest.

One reconnaissance survey and four field surveys were conducted in five community forests within the Kilum-Ijim forest ridge. These included the Plantlife sanctuary (PLSB), Dichami community forest (DCF) and Anyajua community forest (ACF) in Belo subdivision, and Plantlife sanctuary (PLSO) and Upper shinga community forest (USCF) in Bui subdivision (Table 1).

Table 1: Locational coordinates of macrofungi sampling sites in Kilum-Ijim forest

Sampling site	Altitude (m)	Surface area (ha)
Plantlife sanctuary Belo (PLSB)	2421	1081
Anyajua community forest (ACF)	2497	1121
Dichami community forest (DCF)	2032	1034
Plantlife sanctuary Oku (PLSO)	2267	1081
Upper-Shinga community forest (USCF)	2455	1556

Source: Gardner *et al.,* 2001

The reconnaissance survey took place in November 2014 while the species richness survey trips were carried out in January, March, June, September and November 2015. These periods marked the beginning, middle and end of fructification season of different morphological types of macrofungi and each trip lasted seven days. Sampling methods comprised fixed size plot method, opportunistic sampling method and downed wood sampling method. These sampling methods according to Mueller *et al*. (2004), optimizes the number of macrofungal species recorded at any given site. For each sampling site, two plots of 50 X 20m were mapped out since all the studied sites were above 1000ha. Each plot was separated by a distance of 200m. Each plot was 1000m in length. A total of 10 plots were surveyed in all the five sampling sites. To capture maximum diversity, opportunistic sampling and downed wood sampling were carried out in and out of the plots. Coordinates of macrofungi sites were taken by the use of Garmin Etrex Venture Geographical Positioning System (GPS). For each macrofungus collected, the fungus was labelled and the growth substrate recorded. The morphological characters were assessed. These included cap shape, stipe length, size and color recorded. This information was used to place the fungus on different morphotypes according to Mueller *et al.* (2007). Photographs of labelled samples were recorded since some features can change during preservation. Macrofungal samples were dug off the soil or cut off with a knife where they were found on wood substrata. The samples were wrapped with their tags using aluminum foil and put in zip lock bags for drying. Drying at 45°C-55°C was done in a locally designed open air oven for up to 72 hours for thick samples. The number of samples collected in each site and sampling period were compared using the χ^2 statistics.

Estimation of diversity and similarity: The number of species in each sampling site was recorded and the diversity and similarity indices between sites were calculated using Simpson diversity index and Jaccard's similarity index, respectively. Simpson's Diversity Index, 1-D, was estimated as follows:

$$1\text{-D} = 1 - \frac{\Sigma n(n-1)}{N(N-1)}$$

n = the number of individuals of each different species

N = the total number of individuals of all the species

The Jaccard similarity coefficient was estimated as follows:

$$J(A,B) = \frac{A \cap B}{A \cup B} = A \cap \frac{B}{(A)} + (B) - (A \cup B)$$

Where A and B are the number of species in each sample.

RESULT

Distribution of Macrofungi in Different Sampling Sites in the Kilum-Ijim Forest: Macrofungi were recorded at all the five sites studied in the KIF. They occurred in various shapes sizes and colors (Figure 3).

Figure 3: Tagged macrofungi samples of various shapes in their natural habitats

A total of 393 macrofungi samples were collected in the five forest sites studied (Table 2). Highest collection (135) was recorded in the month of September while January registered the least number of macrofungi (22). Plantlife Sanctuary Oku recorded the highest number of macrofungal samples (109) while the least number (44) was recorded in Anyajua community forest. Except for the collection of June 2015, there were no significant differences in the number of samples collected per site. Meanwhile there were significant differences in number of samples collected per sampling date in all the sites except in Anyajua community forest.

Table 2: Collection frequency of macrofungi samples in five sites of the KIF over different sampling periods

Month/Year	Location					Total	χ^2
	PLSB	ACF	DCF	PLSO	USCF		
January 2015	06	03	05	06	02	**22**	**0.929**
March 2015	17	07	14	13	07	**58**	**5.077**
June 2015	27	10	24	31	11	**103**	**18.341***
September 2015	21	15	32	37	30	**135**	**10.207**
November 2015	19	09	14	22	11	**75**	**6.218**
Total	**90**	**44**	**89**	**109**	**61**	**393**	
χ^2	**19.422***	**5.167**	**24.522***	**33.598***	**37.152***		

*= Significant difference (p<0.05)
PLSB= Plantlife sanctuary Belo, ACF= Anyajua community forest, DCF= Dichami community forest, PLSO= Plantlife sanctuary Oku, USCF= Upper-shinga community forest

Macrofungi occurred in soil, deadwood, leaf litter, cow dung and on some standing stems. A total of 218 samples were collected from dead wood while cow dung registered the least number (03) of macrofungi. (Table 3).

Table 3: Occurrence of Macrofungi on different substrates in the different sampling sites

Substrate	Location					Total	χ^2
	PLSB	ACF	DCF	PLSO	USCF		
Deadwood	49	28	47	57	37	**218**	**11.633***
Leaf Litter	24	14	28	22	13	**101**	**8.356**
Soil	15	06	13	16	15	**65**	**5.077**
Cow Dung	00	00	03	00	00	**03**	**0.000**
On standing stem	02	00	01	02	01	**06**	**0.667**
Total	**90**	**48**	**92**	**97**	**66**	**393**	
χ^2	**54.489***	**15.500***	**80.391***	**67.660***	**37.152***		

*= Significant difference (p<0.05)
PLSB= Plantlife sanctuary Belo, ACF= Anyajua community forest, DCF= Dichami community forest, PLSO= Plantlife sanctuary Oku, USCF= Upper-shinga community forest

Morphological diversity of macrofungi: Ten different morphological forms of macrofungi were encountered in the Kilum-Ijim forest. These were the gilled fungi (60%), Earthstar fungi, Polypores fungi, Crampball fungi, Coral fungi, Jelly fungi, Stinkhorns fungi, Bird's nest fungi, and Cup fungi which together constituted 40% of all the collections (Table 4).

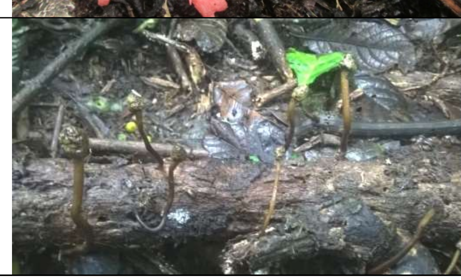
Table 4: Morphoforms and site location of the different macrofungi occurring in the Kilum-Ijim forest.

Species	Sites					Photograph
	1	2	3	4	5	
Gilled Fungi						
*Callistosporium xanthophyllum***	+	-	-	-	-	
*Crinipillis scabella***	+	-	-	+	-	

*Parasola conopilus***	-	-	-	+	-	
*Galerina marginata***	-	-	-	+	-	
*Coprinellus micaceus***	+	+	-	+	-	
*Tubaria serrulata***	-	+	+	-	-	
*Cystolepiota hetieri***	-	-	-	+	-	

*Coprinopsis lagapus***	+	-	+	+	-	
*Melanoleuca pseudoluscina***	-	-	+	-	+	
*Panaeolus foenisecii***	-	+	+	+	-	
Earthstar Fungi						
Geastrum triplex	-	-	+	+	+	
Geastrum minimum	-	-	+	-	+	
Polypores Fungi						

*Abortiporus biennis***	-	-	-	+	-	
*Physisporinus vitreus***	-	-	-	+	-	
*Laetiporus sulphureus***	-	-	+	-	+	
*Skeletocutis nivea***	-	-	+	-	-	
Ganoderma applanatum	+	+	-	-	-	
Crampball Fungi						

<table>
<tr><td>Daldinia concentrica</td><td>+</td><td>-</td><td>+</td><td>-</td><td>-</td><td>
</td></tr>
<tr><td colspan="7">Coral Fungi</td></tr>
<tr><td>Ramaria decurrens</td><td>-</td><td>-</td><td>-</td><td>+</td><td>+</td><td>
</td></tr>
<tr><td colspan="7">Jelly Fungi</td></tr>
<tr><td>Tremella aurantia</td><td>-</td><td>-</td><td>-</td><td>+</td><td>-</td><td>
</td></tr>
<tr><td colspan="7">Stinkhorns Fungi</td></tr>
<tr><td>Clathrus acheri**</td><td>+</td><td>-</td><td>-</td><td>-</td><td>-</td><td>
</td></tr>
<tr><td>Podosordaria muli**</td><td>-</td><td>-</td><td>-</td><td>+</td><td>-</td><td></td></tr>
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*Cordyceps takaomontana***	-	-	+	-	-	
Puffballs Fungi						
Vascellum pretense	+	-	+	-	-	
Bird's nest Fungi						
Cyathus stercoreus	-	-	+	-	-	
Cup Fungi						
*Chlorociboria aeruginascens***	+	+	-	-	-	

**= Species reported for the first time in Cameroon
Site 1= Plantlife sanctuary Belo, Site 2= Anyajua community forest, Site 3= Dichami community forest, Site 4= Plantlife sanctuary Oku, Site 5= Upper-shinga community forest

Plantlife Sanctuary Oku (PLSO) had the highest number of mushroom species (86) and the site with the least number of species (35) was Anyajua Community Forest (ACF). *Podoscypha petalodes* had the highest number of species across all the five sites surveyed (11) followed by *Coprinus fissolanatus* (10), *Polyporus dictopus* (9) and *Favolaschia calocera* and *Xylaria* sp. with 8 species each Table 5.

Table 5: Frequency of occurrence of macrofungi collected from different sampling sites in the Kilum-Ijim forest

S/N	Species	Accession number	Frequency					TOTAL
			PLSB	ACF	DCF	PLSO	USCF	
	AGARICALES							
	Agaricaceae							
1	*Agaricus litoralis* (Wakef. & A. Pearson) Pilat.	JN204436	0	0	1	0	0	**1**
2	*Agaricus xanthodermus* Genev. (1876)	EU326208	0	0	1	0	0	**1**
3	*Cystolepiota hetieri* (Boud.) Singer	AY176459	0	0	0	2	0	**2**
4	*Lepiota* sp PA620 (Pers.) Gray (1821)	EF527355	1	0	0	0	1	**2**
5	*Leucoagaricus cupresseus* (Burl.) Boisselet & Guinb.	GU139787	1	0	1	2	0	**4**
6	*Leucoagaricus flavovirens* J.F. Liang, Zhu L. Yang & J. Xu	EU416295	1	0	0	0	0	**1**
7	*Leucoagaricus gaillardii* Bon & Boiffard 1974	GQ329042	0	0	1	0	0	**1**
8	*Leucoagaricus littoralis* (Menier) Bon & Boiffard 1970	GQ329041	0	0	1	1	0	**2**
9	*Leucoagaricus rubrotinctus* (Peck) Singer (1948)	JN944081	0	0	0	0	1	**1**
10	*Leucoagaricus serenus* (Fr.) Bon & Boiffard 1974	AY176420	0	1	0	1	0	**2**
11	*Leucoagaricus viriditinctus* (Berk. & Broome) J.F.	EU419375	0	0	0	1	0	**1**
12	*Macrolepiota dolichaula* (Berk. & Broome) Pegler & R.W. Rayner	JQ683120	1	1	2	0	1	**5**
13	*Vascellum pretense* (Pers.) Kreise	FJ481033	1	0	1	0	0	**2**
14	*Panaeolus foenisecii* (Pers.) R.Maire (1933).	JF908520	0	1	1	3	0	**5**
15	*Panaeolus sphinctrinus* (Fr.) Quél.	JF908513	1	0	1	0	0	**2**
	Crepidotaceae							
16	*Crepidotus epibryus* (Fr.) Quél. 1888	HM240524	1	1	2	2	1	**7**
17	*Crepidotus mollis* (Schaeff.) Staude 1857	JF907959	0	0	0	1	0	**1**
	Entolomataceae							
18	*Entoloma araneosum* (Quél.) M.M. Moser.	EU784204	0	0	0	0	1	**1**

S/N	Species	Accession number	Frequency					TOTAL
			PLSB	ACF	DCF	PLSO	USCF	
	Hygrophoraceae							
19	*Camarophyllus pratensis* (Pers.) P. Kumm.	FJ596880	0	1	0	0	0	**1**
20	*Hygrocybe helobia* (Arnolds) Bon	JF908056	0	0	0	0	2	**2**
21	*Hygrocybe persistens* (Britzelmayr) Singer	FM208893	0	0	0	0	1	**1**
	Hymenogastraceae							
22	*Galerina badipes* (Pers.) Kühner	JF908012	1	0	0	1	0	**2**
23	*Galerina hybrida* Kühner.	AJ585445	0	0	1	0	0	**1**
24	*Galerina marginata* (Batsch) Kühner (1935)	AF501564	0	0	1	0	0	**1**
25	*Psilocybe cubensis* (Earle) Singer	HM035082	1	0	1	1	0	**3**
	Lyophyllaceae							
26	*Lyophyllum connatum* P.Karst.	JF908332	0	1	0	0	0	**1**
27	*Termitomyces microcarpus* (Berk. & Broome) R.Heim	AF357023	0	0	0	0	3	**3**
28	*Termitomyces striatus* (Beeli) R.Heim	AF321367	0	0	0	4	0	**4**
29	*Termitomyces sp* V1P R.Heim	JF302830	0	0	0	0	1	**1**
30	*Termitomyces sp* Group8 R.Heim	AB073529	0	0	0	1	0	**1**
	Marasmiaceae							
31	*Clitocybula lacerata* (Scop.) Singer ex Métrod	FJ596916	1	1	0	2	0	**4**
32	*Clitocybula oculus* (Peck) Singer 1962	DQ192178	1	1	2	3	0	**7**
33	*Crinipellis scabella* (Alb. & Schwein.) Murrill	JF907969	1	0	0	1	0	**2**
34	*Hydropus marginellus* (Pers.: Fr.) Singer 1948	EU669314	0	0	0	0	1	**1**
35	*Marasmius purpureostriatus* Hongo 1958	FJ904978	0	1	2	0	0	**3**
36	*Marasmiellus ramealis* (Bull.) Singer	JF313670	2	0	3	1	0	**6**
37	*Marasmius rotula* (Scop.) Fr.	JN714927	2	0	0	4	0	**6**
	Mycenaceae							
38	*Favolaschia calocera* R. Heim	EU489640	1	0	4	0	3	**8**
39	*Mycena acicula* (Schaeff.) P.Kumm. (1871)	JF908384	1	1	0	4	1	**7**

S/N	Species	Accession number	Frequency PLSB	ACF	DCF	PLSO	USCF	TOTAL
40	*Mycena laevigata* (Lasch) Gillet	JF908397	0	0	0	1	0	**1**
41	*Mycena pura* (Pers.) P. Kumm.	EU517506	0	1	2	0	0	**3**
42	*Panellus stipticus* (Bull.) P.Karst. (1879)	FJ481038	0	0	1	0	0	**1**
	Nidulariaceae							
43	*Cyathus stercoreus* (Schwein.) De Toni (1888)	FJ478125	0	0	2	0	0	**2**
	Physalacriaceae							
44	*Flammulina mexicana* Redhead, Estrada & R.H. Petersen	AF032129	1	0	0	0	0	**1**
45	*Oudemansiella canarii* (Jungh.) Höhn. (1909)	AY216473	1	0	2	1	0	**4**
	Pluteaceae							
46	*Pluteus romellii* (Britzelm.) Sacc 1895.	HM562078	0	1	0	0	0	**1**
47	*Volvariella volvacea* (Bul. ex Fr.) Singer (1951)	HM246500	0	0	0	0	1	**1**
	Psathyrellaceae							
48	*Coprinus fissolanatus* Park,D.S., Shin,H.S. and Moncalvo,J.M.	AF345812	3	1	1	4	1	**10**
49	*Coprinellus hiascens* (Fr.) Redhead, Vilgalys & Moncalvo	JN159528	0	0	0	0	2	**2**
50	*Coprinellus micaceus* (Bull.:Fr.) Vilgalys, Hopple & Jacq. Johnson	JN943116	1	1	0	1	0	**3**
51	*Coprinopsis lagopus* (Fries) Redhead, Vilgalys & Moncalvo	AF345815	2	0	1	1	0	**3**
52	*Coprinus sterquilinus* (Fr.) Fr. 1838.	FJ501551	0	1	1	0	0	**2**
53	*Parasola auricoma* (Pat.) Redhead, Vilgalys & Hopple (2001).	JN943107	0	1	0	0	1	**2**
54	*Parasola conopilus* (Fr.) Örstadius & E. Larss.	FJ770396	0	0	0	1	0	**1**
55	*Psathyrella bipellis* (Quél.) A.H.Sm. (1946)	FN430689	1	1	0	2	0	**4**
56	*Psathyrella candolleana* (Fr.) Maire (1937)	AB306311	0	0	1	0	0	**1**

S/N	Species	Accession number	Frequency PLSB	ACF	DCF	PLSO	USCF	TOTAL
57	*Psathyrella pyrotricha* (Holmsk.) M.M. Moser	FJ481046	0	0	0	1	0	**1**
58	*Psathyrella spadicea* (Schaeff.) Singer (1951)	FN396134	0	0	0	1	0	**1**
59	*Psathyrella vestita* (Peck) A.H. Smith	FN430693	1	0	0	0	0	**1**
	Strophariaceae							
60	*Hypholoma fasciculare* (Huds.Fr.) P.Kumm. (1871).	FJ481034	1	0	1	0	0	**2**
61	*Pholiota* sp (Fr.) P.Kumm. (1871)	FJ596817	1	0	1	1	0	**3**
	Tricholomataceae							
62	*Callistosporium xanthophyllum* (Malençon & Bertault) Bon 1976.	JF907781	1	0	0	0	0	**1**
63	*Lepista irina* (Fr.) Bigelow 1959.	HM237136	2	0	1	1	0	**4**
64	*Melanoleuca pseudoluscina* (M. Bon) ex M. Bon 1980.	JN616457	0	0	1	0	1	**2**
	Tubariaceae							
65	*Tubaria serrulata* (Cleland) Bougher & Matheny	DQ182507	0	1	1	0	0	**2**
	AURICULARIALES							
	Auriculariaceae							
66	*Auricularia polytricha* (Mont.) Sacc.	FJ792587	0	0	2	1	2	**5**
	BOLETALES							
	Hygrophoropsidaceae							
67	*Hygrophoropsis aurantiaca* (Wulfen) Maire	AJ419202	0	1	0	0	0	**1**
	DACRYMYCETALES							
	Dacrymycetaceae							
68	*Dacrymyces chrysospermus* Berk. & M.A. Curtis	AB712452	0	0	0	1	0	**1**
	GEASTRALES							
	Geastraceae							

S/N	Species	Accession number	Frequency PLSB	ACF	DCF	PLSO	USCF	TOTAL
69	*Geastrum minimum* Schwein	EU784238	0	0	1	0	1	**2**
70	*Geastrum triplex* Jungh.	JN942821	0	0	1	2	1	**4**
	GOMPHALES							
	Gomphaceae							
71	*Ramaria decurrens* (Pers.) R. H. Petersen	AJ408375	0	0	0	1	1	**2**
72	*Ramaria rubribrunnescens* Fr. ex Bonord.	EU652351	1	0	0	0	0	**1**
	HELOTIALES							
	Helotiaceae							
73	*Chlorociboria aeruginascens* (Nyl.) Kanouse	JN943460	2	1	0	0	0	**3**
74	*Chlorociboria awakinoana* P.R.Johnst.	JN943462	1	0	0	0	0	**1**
	Bionectriaceae							
	HYMENOCHAETALES							
	Hymenochaetaceae							
75	*Phellinus repandus* Quél.	AF534076	0	1	0	1	0	**2**
76	*Fuscoporia gilva* (Schwein.) T. Wagner & M. Fisch.	AM269795	0	0	0	1	0	**1**
	HYPOCREALES							
77	*Bionectria ochroleuca* (Schwein.) Schroers & Samuels	GU566253	1	0	0	0	0	**1**
	Cordycipitaceae							
78	*Cordyceps brongniartii* (Saccardo) Petch	AJ309349	0	0	1	0	0	**1**
79	*Cordyceps takaomontana* Fr. (1818)	AB189447	0	0	1	0	0	**1**
	HYSTERANGIALES							
	Phallogastraceae							
80	*Protubera canescens* G.W.Beaton & Malajczuk (1986)	GQ981520	2	0	0	0	0	**2**
	PEZIZALES							

S/N	Species	Accession number	Frequency					TOTAL
			PLSB	ACF	DCF	PLSO	USCF	
	Pezizaceae							
81	*Peziza ostracoderma* Dill. ex Fries (1822)	JN002180	0	0	0	1	0	**1**
	PHALLALES							
	Phallaceae							
82	*Clathrus archeri* (Berk.) Dring 1980".	KP688386	0	0	0	1	0	**1**
83	*Clathrus ruber* P.Micheli ex Pers. (1801)	GQ981501	0	0	0	2	0	**2**
84	*Phallus impudicus* Linnaeus (1753)	AF324171	1	0	0	0	1	**2**
	POLYPORALES							
	Fomitopsidaceae							
85	*Fomitopsis cajanderi* (P.Karst.) Kotl. & Pouzar (1957)	JQ673050	0	1	0	1	0	**2**
	Ganodermataceae							
86	*Ganoderma applanatum* (Pers.) Pat.	AJ608709	2	1	0	0	0	**3**
87	*Ganoderma pfeifferi* Bres.	AM906059	1	1	0	0	0	**2**
	Meripilaceae							
88	*Physisporinus vitreus* (Pers.) P.Karst. (1889)	JN182920	0	0	0	1	0	**1**
	Meruliaceae							
89	*Abortiporus biennis* (Schwein.) Murrill (1944)	FJ608589	0	0	0	1	0	**1**
90	*Panus sp* Fr. (1838)	HM245784	0	1	0	0	0	**1**
91	*Podoscypha petalodes* (Berk.) Boidin	AM773629	2	2	4	1	2	**11**
	Polyporaceae							
92	*Coriolopsis sanguinaria* (Klotzsch) Teng 1963	FJ627251	0	1	0	0	0	**1**
93	*Daedaleopsis confragosa* (Bolton) J.Schröt. (1888).	FJ810177	0	0	0	1	0	**1**
94	*Laetiporus sulphureus* (Bull.) Murrill (1920)	AY835667	0	0	2	0	1	**3**
95	*Lentinus squarrosulus* Mont. 1842.	GU001951	1	2	1	2	0	**6**
96	*Lenzites elegans* (Spreng.) Pat.	HQ248217	0	1	0	0	0	**1**
97	*Microporus subaffinis* (Lloyd) Imazeki 1943.	FJ627249	1	0	1	1	0	**3**
98	*Polyporus arcularius*	AB638344	1	0	1	1	0	**3**

S/N	Species	Accession number	Frequency PLSB	ACF	DCF	PLSO	USCF	TOTAL
	(Batsch) Fr.							
99	*Polyporus dictyopus* Mont. 1835.	AF516561	1	0	4	3	1	**9**
100	*Polyporus tenuiculus* (Beauv.) Fr.	JQ409357	2	2	1	1	1	**7**
101	*Skeletocutis nivea* (Jungh.) Keller.	JQ673120	0	0	1	0	0	**1**
102	*Trametes hirsuta* (Wulfen) Pilát	JN164952	1	0	1	1	0	**3**
103	*Trametes polyzona* (Pers.) Corner	JN164980	0	0	1	0	0	**1**
104	*Trametes sanguinea* (L.) Imazeki	JN164981	1	0	1	1	1	**4**
105	*Trametes versicolor* (L.) Lloyd (1920)	EU153514	1	1	2	1	0	**5**
	RUSSULALES							
	Lachnocladiaceae							
106	*Lachnocladium sp* Lév. (1846)	DQ192176	0	0	0	0	1	**1**
	Stereaceae							
107	*Stereum hirsutum* (Willd.) Pers. (1800).	AM269810	1	0	1	0	2	**4**
108	*Stereum sanguinolentum* (Alb. & Schwein.) Fr. (1838).	EU673084	0	0	1	0	1	**2**
	XYLARIALES							
	Xylariaceae							
109	*Daldinia concentrica* (Bolton) Cesati & de Notaris	AF163021	1	0	1	0	0	**2**
110	*Podosordaria muli* J.D. Rogers, Y.M. Ju & F. San Martín	GU324761	0	0	0	1	0	**1**
111	*Xylaria* sp MUCL 51605 Hill ex Schrank (1789)	FN689802	1	1	2	2	2	**8**
112	*Xylaria adscendens* (Fr.) Fr., 1851.	GU322432	1	0	2	1	2	**6**
113	*Xylaria bambusicola* Y.M. Ju & J.D. Rogers	GU300088	0	0	0	1	1	**2**
114	*Xylaria curta* Fries	GU322444	1	0	1	2	1	**5**
115	*Xylaria grammica* (Mont.) Mont.	AB524025	0	0	1	1	0	**2**
116	*Xylaria ianthinovelutina* (Mont.) Mont.	GU322441	0	0	0	1	0	**1**
	TOTAL		**60**	**35**	**77**	**86**	**45**	**303**

The diversity and similarity indices between sampling sites are presented on Table 6 and 7 respectively. High diversity was observed in all the study sites, though a weak similarity was observed in all the study sites. Plantlife sanctuary Oku and Plantlife sanctuary Belo were more similar than all the other sites.

Table 6: Site variation in the species diversity of macrofungi in the Kilum-Ijim forest

Sampling site	Simpson Diversity Index
PLSB	0.96
ACF	0.94
DCF	0.96
PLSO	0.96
USCF	0.94

PLSB= Plantlife sanctuary Belo, ACF= Anyajua community forest, DCF= Dichami community forest, PLSO= Plantlife sanctuary Oku, USCF= Upper-shinga community forest

Table 7: Jaccard's similarity matrix among different sampling sites within Kilum-Ijim forest

	PLSB	ACF	DCF	PLSO	USCF
PLSB	**1**	**0.257**	**0.391**	**0.408**	**0.224**
ACF		**1**	**0.188**	**0.211**	**0.138**
DCF			**1**	**0.298**	**0.277**
PLSO				**1**	**0.167**
USCF					**1**

PLSB= Plantlife sanctuary Belo, ACF= Anyajua community forest, DCF= Dichami community forest, PLSO= Plantlife sanctuary Oku, USCF= Upper-shinga community forest

Substratum of molecularly identified macrofungi: The substrata of the molecularly identified macrofungi in this study by Teke *et al*. (2017) in the Kilum-Ijim forest were recorded (Table 8). Majority of the macrofungi occurred on dead wood and accounts for high decomposition rate in forest wood while few macrofungi occurred on dung.

Table 8: Occurrence of macrofungi on different substrata in the Kilum-Ijim forest

S/N	Species	Family	Substratum
	AGARICALES		
1	*Agaricus litoralis* (Wakef. & A. Pearson) Pilat.	**Agaricaceae**	Dung
2	*Agaricus xanthodermus* Genev. (1876)	**Agaricaceae**	Dung
3	*Cystolepiota hetieri* (Boud.) Singer	**Agaricaceae**	Leaf litter
4	*Lepiota* sp PA620 (Pers.) Gray (1821)	**Agaricaceae**	Leaf litter
5	*Leucoagaricus cupresseus* (Burl.) Boisselet & Guinb.	**Agaricaceae**	Soil
6	*Leucoagaricus flavovirens* J.F. Liang, Zhu L. Yang & J. Xu	**Agaricaceae**	Soil
7	*Leucoagaricus gaillardia* Bon & Boiffard 1974	**Agaricaceae**	Soil
8	*Leucoagaricus littoralis*(Menier) Bon & Boiffard 1970	**Agaricaceae**	Soil
9	*Leucoagaricus rubrotinctus*(Peck) Singer (1948)	**Agaricaceae**	Soil
10	*Leucoagaricus serenus*(Fr.) Bon & Boiffard 1974	**Agaricaceae**	Soil
11	*Leucoagaricus viriditinctus* (Berk. & Broome) J.F.	**Agaricaceae**	Soil
12	*Macrolepiota dolichaula* (Berk. & Broome) Pegler & R.W. Rayner	**Agaricaceae**	Soil
13	*Vascellum pretense*(Pers.) Kreise	**Agaricaceae**	Leaf litter
14	*Panaeolus foenisecii* (Pers.) R.Maire (1933).	**Bolbitiaceae**	Leaf litter
15	*Panaeolus sphinctrinus* (Fr.) Quél.	**Bolbitiaceae**	Leaf litter
16	*Crepidotus epibryus* (Fr.) Quél. 1888	**Crepidotaceae**	Dead wood

S/N	Species	Family	Substratum
17	*Crepidotus mollis* (Schaeff.) Staude 1857	**Crepidotaceae**	Dead wood
18	*Entoloma araneosum* (Quél.) M.M. Moser.	**Entolomataceae**	Leaf litter
19	*Camarophyllus pratensis* (Pers.) P. Kumm.	**Hygrophoraceae**	Soil
20	*Hygrocybe helobia* (Arnolds) Bon	**Hygrophoraceae**	Soil
21	*Hygrocybe persistens* (Britzelmayr) Singer	**Hygrophoraceae**	Soil
22	*Galerina badipes* (Pers.) Kühner	**Hymenogastraceae**	Dead wood
23	*Galerina hybrid* Kühner.	**Hymenogastraceae**	Dead wood
24	*Galerina marginata* (Batsch) Kühner (1935)	**Hymenogastraceae**	Dead wood
25	*Psilocybe cubensis* (Earle) Singer	**Hymenogastraceae**	Soil
26	*Lyophyllum connatum* P. Karst.	**Lyophyllaceae**	Soil
27	*Termitomyces microcarpus* (Berk.&Broome) R. Heim	**Lyophyllaceae**	Soil
28	*Termitomyces striatus* (Beeli) R. Heim	**Lyophyllaceae**	Soil
29	*Termitomyces* sp V1PR. Heim	**Lyophyllaceae**	Soil
30	*Termitomyces* sp Group8R.Heim	**Lyophyllaceae**	Soil
31	*Clitocybula lacerate* (Scop.) Singer ex Métrod	**Marasmiaceae**	Dead wood
32	*Clitocybula oculus*(Peck) Singer 1962	**Marasmiaceae**	Dead wood
33	*Crinipellis scabella* (Alb. & Schwein.) Murrill	**Marasmiaceae**	Dead wood
34	*Hydropus marginellus* (Pers. : Fr.) Singer 1948	**Marasmiaceae**	Dead wood
35	*Marasmius purpureostriatus* Hongo 1958	**Marasmiaceae**	Dead wood
36	*Marasmiellus ramealis* (Bull.) Singer	**Marasmiaceae**	Dead wood
37	*Marasmius rotula* (Scop.) Fr.	**Marasmiaceae**	Dead wood
38	*Favolaschia calocera* R. Heim	**Mycenaceae**	Dead wood
39	*Mycena acicula* (Schaeff.) P.Kumm. (1871)	**Mycenaceae**	Dead wood
40	*Mycena laevigata*(Lasch) Gillet	**Mycenaceae**	Dead wood
41	*Mycena pura* (Pers.) P. Kumm.	**Mycenaceae**	Dead wood
42	*Panellus stipticus* (Bull.) P.Karst. (1879)	**Mycenaceae**	Dead wood
43	*Cyathus stercoreus* (Schwein.) De Toni (1888)	**Nidulariaceae**	Dead wood
44	*Flammulina mexicana* Redhead, Estrada & R.H. Petersen	**Physalacriaceae**	Dead wood
45	*Oudemansiella canarii* (Jungh.) Höhn. (1909)	**Physalacriaceae**	Dead wood
46	*Pluteus romellii* (Britzelm.) Sacc 1895.	**Pluteaceae**	Leaf litter
47	*Volvariella volvacea* (Bul. ex Fr.) Singer (1951)	**Pluteaceae**	Leaf litter
48	*Coprinus fissolanatus* Park,D.S., Shin,H.S. and Moncalvo,J.M.	**Psathyrellaceae**	Leaf litter
49	*Coprinellus hiascens*(Fr.) Redhead, Vilgalys & Moncalvo	**Psathyrellaceae**	Leaf litter
50	*Coprinellus micaceus* (Bull.:Fr.) Vilgalys, Hopple & Jacq. Johnson	**Psathyrellaceae**	Leaf litter
51	*Coprinopsis lagopus* (Fries) Redhead, Vilgalys & Moncalvo	**Psathyrellaceae**	Leaf litter
52	*Coprinus sterquilinus* (Fr.) Fr. 1838.	**Psathyrellaceae**	Leaf litter
53	*Parasola auricoma* (Pat.) Redhead, Vilgalys & Hopple (2001).	**Psathyrellaceae**	Leaf litter
54	*Parasola conopilus* (Fr.) Örstadius & E. Larss.	**Psathyrellaceae**	Leaf litter
55	*Psathyrella bipellis* (Quél.) A.H.Sm. (1946)	**Psathyrellaceae**	Leaf litter
56	*Psathyrella candolleana* (Fr.) Maire (1937)	**Psathyrellaceae**	Leaf litter
57	*Psathyrella pyrotricha* (Holmsk.) M.M. Moser	**Psathyrellaceae**	Leaf litter
58	*Psathyrella spadicea* (Schaeff.) Singer (1951)	**Psathyrellaceae**	Leaf litter
59	*Psathyrella vestita*(Peck) A.H. Smith	**Psathyrellaceae**	Leaf litter
60	*Hypholoma fasciculare* (Huds.Fr.) P.Kumm. (1871).	**Strophariaceae**	Leaf litter
61	*Pholiota* sp (Fr.) P.Kumm. (1871)	**Strophariaceae**	Dung

S/N	Species	Family	Substratum
62	*Callistosporium xanthophyllum* (Malençon &Bertault) Bon 1976.	**Tricholomataceae**	Soil
63	*Lepista irina* (Fr.) Bigelow 1959.	**Tricholomataceae**	Soil
64	*Melanoleuca pseudoluscina* (M. Bon) ex M. Bon 1980.	**Tricholomataceae**	Soil
65	*Tubaria serrulata*(Cleland) Bougher & Matheny	**Tubariaceae**	Soil
66	*Auricularia polytricha* (Mont.) Sacc.	**Auriculariaceae**	Deadwood
67	*Hygrophoropsis aurantiaca*(Wulfen) Maire	**Hygrophoropsidaceae**	Dead wood
68	*Dacrymyces chrysospermus* Berk. & M.A. Curtis	**Dacrymycetaceae**	Dead wood
69	*Geastrum minimum* Schwein	**Geastraceae**	Leaf litter
70	*Geastrum triplex* Jungh.	**Geastraceae**	Leaf litter
72	*Ramaria rubribrunnescens* Fr. ex Bonord.	**Gomphaceae**	Soil
73	*Chlorociboria aeruginascens* (Nyl.) Kanouse	**Helotiaceae**	Deadwood
74	*Chlorociboria awakinoana* P.R.Johnst.	**Helotiaceae**	Deadwood
75	*Phellinus repandus* Quél.	**Hymenochaetaceae**	Dead wood
76	*Fuscoporia gilva* (Schwein.) T. Wagner & M. Fisch.	**Hymenochaetaceae**	Dead wood
77	*Bionectria ochroleuca* (Schwein.) Schroers & Samuels	**Bionectriaceae**	Soil
78	*Cordyceps brongniartii* (Saccardo) Petch	**Cordycipitaceae**	Soil
79	*Cordyceps takaomontana* Fr. (1818)	**Cordycipitaceae**	Soil
81	*Peziza ostracoderma* Dill. ex Fries (1822)	**Pezizaceae**	Soil
82	*Clathrus archeri* (Berk.) Dring 1980".	**Phallaceae**	Leaf litter
83	*Clathrus ruber* P.Micheli ex Pers. (1801)	**Phallaceae**	Leaf litter
84	*Phallus impudicus* Linnaeus (1753)	**Phallaceae**	Leaf litter
85	*Fomitopsis cajanderi* (P.Karst.) Kotl. Pouzar (1957)	**Fomitopsidaceae**	Leaf litter
86	*Ganoderma applanatum* (Pers.) Pat.	**Ganodermataceae**	Dead wood
87	*Ganoderma pfeifferi* Bres.	**Ganodermataceae**	Dead wood
88	*Physisporinus vitreus* (Pers.) P.Karst. (1889)	**Meripilaceae**	Dead wood
89	*Abortiporus biennis* (Schwein.) Murrill (1944)	**Meripilaceae**	Dead wood
90	*Panus* sp Fr. (1838)	**Meripilaceae**	Dead wood
91	*Podoscypha petalodes* (Berk.) Boidin	**Meripilaceae**	Dead wood
92	*Coriolopsis sanguinaria*(Klotzsch) Teng 1963	**Polyporaceae**	Dead wood
93	*Daedaleopsis confragosa* (Bolton) J.Schröt. (1888).	**Polyporaceae**	Dead wood
94	*Laetiporus sulphureus* (Bull.) Murrill (1920)	**Polyporaceae**	Dead wood
95	*Lentinus squarrosulus* Mont. 1842.	**Polyporaceae**	Dead wood
96	*Lenzites elegans* (Spreng.) Pat.	**Polyporaceae**	Dead wood
97	*Microporus subaffinis* (Lloyd) Imazeki 1943.	**Polyporaceae**	Dead wood
98	*Polyporus arcularius*(Batsch) Fr.	**Polyporaceae**	Dead wood
99	*Polyporus dictyopus* Mont. 1835.	**Polyporaceae**	Dead wood
100	*Polyporus tenuiculus* (Beauv.) Fr.	**Polyporaceae**	Dead wood
101	*Skeletocutis nivea* (Jungh.) Keller.	**Polyporaceae**	Dead wood
102	*Trametes hirsute* (Wulfen) Pilát	**Polyporaceae**	Dead wood
103	*Trametes polyzona* (Pers.) Corner	**Polyporaceae**	Dead wood
104	*Trametes sanguinea* (L.) Imazeki	**Polyporaceae**	Dead wood
105	*Trametes versicolor* (L.) Lloyd (1920)	**Polyporaceae**	Dead wood
106	*Lachnocladium* sp Lév. (1846)	**Lachnocladiaceae**	Dead wood
107	*Stereum hirsutum* (Willd.) Pers. (1800).	**Stereaceae**	Dead wood
108	*Stereum sanguinolentum* (Alb. & Schwein.) Fr. (1838).	**Stereaceae**	Dead wood

S/N	Species	Family	Substratum
109	*Daldinia concentric* (Bolton) Cesati & de Notaris	**Xylariaceae**	Standingwood
110	*Podosordaria muli* J.D. Rogers, Y.M. Ju & F. San Martín	**Xylariaceae**	Dead wood
111	*Xylaria* sp MUCL 51605 Hill ex Schrank (1789)	**Xylariaceae**	Dead wood
112	*Xylaria adscendens* (Fr.) Fr., 1851.	**Xylariaceae**	Dead wood
113	*Xylaria bambusicola Y.M*. Ju & J.D. Rogers	**Xylariaceae**	Dead wood
114	*Xylaria curta* Fries	**Xylariaceae**	Dead wood
115	*Xylaria grammica*(Mont.) Mont.	**Xylariaceae**	Dead wood
116	*Xylaria ianthinovelutina*(Mont.) Mont.	**Xylariaceae**	Dead wood

DISCUSSION

Macrofungi diversity was high in all the five forest sites sampled. The Plantlife Sanctuaries in Belo and Oku recorded the highest species diversity as well as species richness. This was probably due to the fact that these forests are restricted sites to the population and there is little disturbance. The community forests (Anyajua community forest and Upper-shinga community forest) with the exception of Dichami community forest, recorded lower diversity and were very low in species richness. This could be explained by the fact that these sites are more exposed and accessible to the community members and as such liable to large disturbances. These results are similar to the findings of Brown *et al.* (2006) and Douanla-Meli, (2007) who reported that habitat degradation and forest fragmentation were threats to macrofungal diversity in Western Ghats of India and in the Mbalmayo forest reserve in Cameroon respectively. The high macrofungi diversity in Dichami community forest could be due to the fact the inhabitants around this forest are the Fulanis who mostly carry out mostly crazing instead of farming and other anthropogenic activities. A relative high species similarity index was observed between Plantlife Sanctuary in Belo and Plantlife Sanctuary in Oku. This could probably be due to the fact that these sites are restricted to community members. Results also revealed that out of the 116 species identified molecularly, 12% (14) occurred in all or four sites while 47% (54) species occurred only in one site. This result could be explained by the fact that the macrofungal diversity is gradually reducing and some of these species risk being extinct even before they are identified. The highest occurring and most frequent species belong to the genera *Favolaschia, Leucoagaricus, Marasmius, Polyporus, Lentinus, Podoscypha and Termitomyces.* Some genera like *Coprinus, Lepiota, Crepidotus, Ganoderma, Geastrum, Ramaria, Marasmius, Mycena, Polyporus, Trametes* and *Xylaria* have been reported in previous works in Cameroon by Kinge *et al.* (2013) and Douanla-Meli (2007). The order Agaricales was the most represented taxa (56%) recorded during this study. This is broadly consistent with previous works of Isikhuemhen, (2000) in his study on the first International mushroom foray in Nigeria, and Egbe *et al.* (2013) in their study on the diversity and distribution of macrofungi in the mount Cameroon region, and Yanxin *et al.* (2016) in their study on macrofungal diversity in Yaoluoping Nature Reserve Anhui China. Members of the polyporaceae represented the highest number of species. This is in line with different studies carried out by Tadiosa *et al.* (2011), De Leon *et al.* (2013) and Rajput *et al.* (2015), who all reported higher numbers of species belonging to Polyporaceae in the province of Aurora, Central Luzon, Philippines and Gujarat State India, respectively. These findings are probably justified by the fact that most wood inhabiting species are polypores. Seasonal variations recorded vast changes in macrofungi fruiting. The month of September however recorded the highest macrofungal fructification. These results are broadly consistent with those of Lagana *et al*. (2002), Salerni *et al*. (2002), Sibounnavong *et al.* (2008), Mani and Kumaresan (2009) and Baptista *et al*. (2010) who all reported that rainfall favors diversity and productivity of macrofungi fruit bodies. From the substratum point of view, majority of the macrofungi were recorded from dead wood (56%) followed by leaf litter (26%), soil (17%), cow dung (1%) and standing stem (1%). This high occurrence on dead wood is probably due to the fact that the habitat is forest which favors wood inhabiting macrofungi. This probably accounts for the high decomposition rate in forest wood. These results are similar with the findings of Brown *et al.* (2006) who reported that species occurrence in different substrata may probably be due to the environmental conditions and habitat. To the best of our knowledge, this is the first study to examine macrofungi species richness, distribution and substrate specificity in the Kilum-Ijim forest. It is worth noting that the genera *Abortiporus, Callistosporium, Coprinellus, Coprinopsis, Cordyceps, Cystolepiota, Chlorociboria, Crinipellis, Clathrus, Galerina, Laetiporus, Melanoleuca, Panaeolus, Parasola, Podosordaria, Physisporinus, Skeletocutis* and *Tubaria* are new records to the Cameroon macrofungi literature.

CONCLUSION

Plantlife Santuary Oku had the highest number of mushroom species and the least was the Anyajua community forest. *Podoscypha petalodes* had the highest number of species across all the five sites surveyed followed by *Coprinus fissolanatus*, *Polyporus dictopus*, *Favolachia calocera* and *Xylaria sp.* The highest collection of macrofungi was recorded in September while the least was in January. The substrate specificity general trend showed that fungi prefer certain specific substrates. Deadwood and leaf litter substrate supported more macrofungi while dung and standing stem substrates supported the least macrofungi. The Agaricaceae and Polyporaceae were more abundant while Entolomataceae, Tuberiaceae, Auriculariaceae, Hygrophoropsidaceae, Dacrymy cetaceae, Gomphaceae, Bioectriaceae, Pezizaceae, Fomitopsidaceae and Lechnocladiaceae were represented by a single species only. This study adds to the baseline data of macrofungi diversity, distribution and substrate specificity in Cameroon. The data especially on the wood rotting fungi will be an indicator of ecological continuity of forest at the studied area and will be very useful for recording future changes in the climate, vegetation and air composition.

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