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The inventory of edible mushroom in Kamojang Nature Reserve and Nature Park, West Java, Indonesia

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Abstract. *Arko PF, Marzuki BM, Kusmoro J. 2017. The inventory of edible mushroom in Kamojang Nature Reserve and Nature Park, West Java, Indonesia. Biodiversitas 18: 530-540.* Research on the potential of macroscopic fungi in the forests of Indonesia as food and medicine still hasn't much been done. Until now, the biodiversity data of macroscopic fungi are destitute. On the other hand, we are faced with the rapid rate of decline of biodiversity both by natural processes and by human activities. The purpose of this study was to determine the species of edible mushroom in Kamojang Natural Reserves and Nature Park, Bandung-Garut Districts, West Java. The method used in this research were exploration method assisted with line transect and semi-structural interviews to people around Kamojang Nature Reserves and Nature Parks. The results of the study were obtained and analyzed descriptively. Thirty-five species of macroscopic fungi that categorized as edible mushroom were found in Kamojang Nature Reserves and Nature Parks, i.e. *Armillaria* sp., *Auricularia* sp., two species of *Cerrena*, *Clavulina* sp., *Fistulina hepatica*, two species of *Ganoderma*, *Inocybe* sp., four species of *Marasmiellus*, four species of *Marasmius*, *Microporus xanthopus*, *Oudemansiella* sp., *Phellinus* sp., *Phlebia* sp., *Pleurotus* sp., *Pluteus thomsonii*, *Polyporus meridionalis*, *Polyporus tenuiculus*, *Polyporus udus*, *Postia* sp., *Schizophyllum commune*, *Stereum rameale*, *Stereum gausapatum*, *Stereum ostrea*, *Suillus* sp., *Xylaria longipes*, and two species of *Xylaria*. From the 35 species of edible mushroom, only ten species that had been used by villagers in Kamojang as food and medicine, i.e. *Armillaria* sp., *Auricularia* sp., *Fistulina hepatica*, both species of *Ganoderma*, *Marasmiellus* sp.2, *Oudemansiella* sp., *Polyporus meridionalis*, *Polyporus tenuiculus*, and *Polyporus udus*.

Keywords: Inventory, edible mushroom, fungi, Kamojang

INTRODUCTION

Indonesia is a tropical country that has the third largest tropical rain forest in the world (WWF 2005). One of the tropical rain forests in Indonesia is Kamojang Nature Reserve (Ind.: *Cagar Alam*) and Nature Park (Ind.: *Taman Wisata Alam*) in Bandung-Garut Districts, West Java. Kamojang Nature Reserves and Nature Park has a total conservation area of 8286 ha. This area was divided into two main areas, which are Nature Reserve (7,805 ha) and Nature Park (481 ha) (Minister of Forestry Decree No. 110/Kpts-II/90). These areas are located in the tropical region and have an elevation ranging between 1200-2100 meters above sea level. The rainfall rate per year of this location are between 2500-3000 mm (BKSDA 2014). Consequently, this area has a fairly high humidity. The results of BKSDA monitoring in 2005 and 2013 turned out that there was no reduction in land covering on Kamojang Nature Reserve (70%), proving the beauty of this area was maintained. The type of forest in Kamojang Nature Reserves and Nature Park are heterogeneous and evergreen all year round. Thus the canopy that covered the forest floor will continue to exist. Conditions under the forest canopy are low on light intensity and high on humidity. An organism that can live in these circumstances is a fungus (Hadi 2013).

Until now, research on the potential of macroscopic fungi in the forests of Indonesia as food and medicine are still haven't much been done. Even to this day, the biodiversity data of macroscopic fungi are destitute. On the other hand, we are faced with the rapid rate of decline of biodiversity by both natural processes and by human activities (Gandjar, et. al. 2006). Deforestation in Indonesia reached 840.000 ha per year (Margono, et. al. 2014). If these conditions keep happening, in the next two decades Indonesia will lose its greatest resource (Kondra and Syaukani 2004). Millions of fungal species might even be extinct before we know its potential (Tampubolon, et. al. 2011). Therefore, research is needed to explore the potential of macroscopic fungi especially in the forests that have the conditions favorable for them to grow.

The purpose of this study was to determine the diversity of macrofungi that can be consumed in the Kamojang Nature Reserve and Nature Park, Bandung-Garut Districts, West Java and to determine the species of macrofungi that has been utilized as food and medicine by the local community.

MATERIALS AND METHODS

The method for collected data in the field was exploration method assisted with line transect (Mueller et al. 2004 in Foster 2004; Rugayah, et al. 2004). The results were then analyzed descriptively. While the method used to collect edible mushroom data were semi-structured

interviews (Iskandar 2012; Redzic, et al. 2010) and literature studies.

Study area

This research was conducted in five areas in Kamojang Nature Reserves and Nature Parks (Figure 1). There were two tracks at Nature Reserve West Area, one track at Nature Reserve East Area, and two track at Nature Park. This exploration held in May until August 2015.

Procedures

A preliminary survey was conducted to determine the location that represents all research areas. The site of the research was also chosen based on the recommendations of informants.

Interview process

Interviews were conducted with four informants who were eligible, namely: (i) have/had access to Kamojang Nature Reserve and Nature Park and (ii) his/her side job are mushroom hunters or former mushroom hunters. The questions were posed based on: (i) the type of mushroom that was searched, (ii) the effort to cultivate wild mushrooms, (iii) the used of mushrooms by the public, (iv) the time to hunt mushrooms, (v) the substrates on which certain mushroom grew, and (vi) the choice of flavors, textures, and sizes of edible mushrooms.

Field data collection

A start point and an end point of observation location were defined in the study area. Exploration paths were created with the help of line transects in the study area, connected between the start point and the end point of observation. This line transects then carefully explored. Things to do when macrofungi were found are: documented with a camera from various sides (attachment on the substrate, the top side, besides, the bottom side, and divided fruiting body). Notes of the primary data or morphology characteristics were collected on the field (type of fungus in general; Pileus: surface color, bruise color, flesh color, surface texture, surface condition, shape, margin; Lamellae: color, type of margin, coloring type, attachment, hymenium type, number of lamellulae, pore shape if any; Stipe: color, bruise color, flesh color, attachment to pileus, surface type, base type; Ornamentations: volva type, annulus type; and color of spore print), Morphometric (Pileus: diameter, height, flesh thickness; Stipe: length, apex diameter, middle diameter, base diameter; Lamellae: depth, length of the tube if any), and secondary data, environmental conditions in which it grows (the condition of the substrate and the surrounding vegetation) (Arora 1986; Foster 2004; Læssøe 2013; Largent 1986). Measurements were also performed on the physical condition of the environment in which it grows (coordinates, altitude, humidity, temperature and light intensity). After data had been collected, the fruiting body were collected with a knife and cleaned from various impurities (i.e. dirt, leaf litter, etc.).

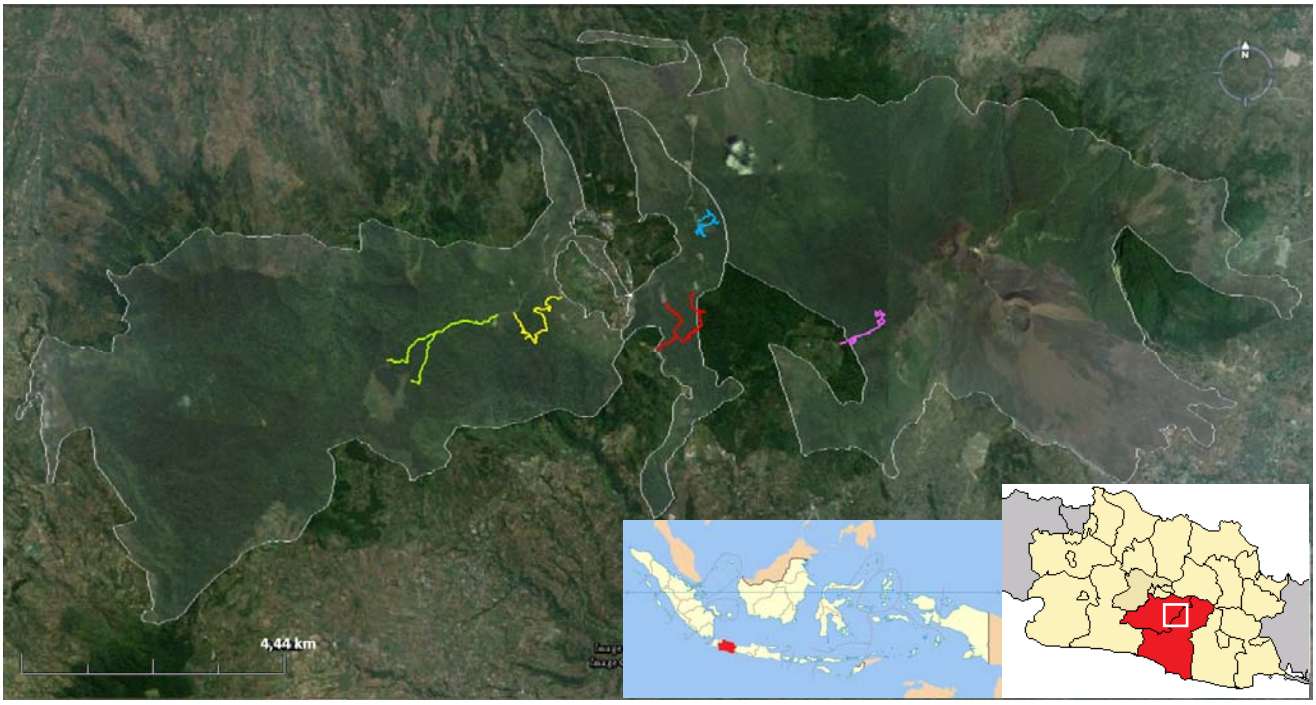

Figure 1. Kamojang Nature Reserve and Nature Park, Bandung-Garut Districts, West Java. Kamojang Nature Reserve West Area Track one (green) at 7° 9'14,01"S-7° 9'52,82"S and 107° 46'15,20"E-107° 45'13,91"E, Kamojang Nature Reserve West Area Track two (yellow) at 7°9'4,18"S-7°9'30,01"S and 107°46'50,82"E-107°46'23,79"E, Kamojang Nature Reserve East Area Track Hutan Gede (purple) at 7°9'12,12"S-7°9'30,68"S and 107°49'49,10"E-107°49'23,77"E, Kamojang Nature Park Area Track Hutan Hotel (red) at 7°9'1,39"S-7° 9'34,03"S and 107°48'10,07"E-107°47'42,25"E, and Kamojang Nature Park Area Track Hutan Kawah (blue) at 7°8'16,51"S-7°8'31,80"S and 107°48'17,38"E-107°48'4,03"E.

Laboratory data collection

The documentation process was repeated in the laboratory for fruiting bodies of macrofungi from all sides (top, side, bottom, divided fruiting body). Morphological characteristics and morphometric were also checked for the second time (type of fungus in general; Pileus: surface color, bruise color, flesh color, surface texture, surface condition, shape, margin diameter, height, flesh thickness, length, apex diameter, middle diameter, base diameter; Lamellae: color, type of margin, coloring type, attachment, hymenium type, number of lamellulae, pore shape if any, depth, length of the tube if any; Stipe: color, bruise color, flesh color, attachment to pileus, surface type, base type; Ornamentations: volva type, type annulus; and color of spore print) from the fruiting bodies that have been collected (Arora 1986; Foster 2004; Læssøe 2013; Largent 1986).

The next process was to make spores print by cutting the mushroom stipe if any and put pileus right between black and white paper. A drop of water was added to the upper surface of pileus and covered it. After 12 hours, the pileus was lifted. If the type of fruiting body were coral fungi, club or jelly-like, put the fruit body on the black and white paper carton. If it was cup fungi, put it upside down on black and white carton. Identification then began after all the data were obtained using various key and monograph based on the morphology character and literature studies were performed to determine whether it can be consumed or not.

Herbarium

Spirit/wet collection was made from the fruiting body which had a small size, fragile, and it wasn't possible to observe when it was dried (perishable). Ways of making spirit collection were, make sure the fruiting body in clean condition and intact. Specimens preserved in glass jars with a fixative solution Formaldehyde-Acetic Acid Alcohol (FAA) with a composition of 50% Ethanol, 37% Formaldehyde, and Glacial Acetic Acid with a ratio of 18: 1: 1 (Foster 2004). Furthermore, a label was given on the bottle to mark the herbarium. Make sure the lid was tightly sealed (airtight).

The dried herbarium was made for the specimens that had a hard, woody, and dry fruiting body. Ways of making the herbarium were, make sure the mushroom fruiting body in clean condition and intact. Dry air the fruiting body in the oven with the lid open on 42°C. The dried herbarium then moved into the airtight container with dry silica gel in it and labeled to mark the herbarium (Arora 1986; Drábková 2014).

All herbarium were stored in herbarium of the Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran, Jatinangor, Sumedang, West Java, Indonesia for cross references purpose.

RESULTS AND DISCUSSION

Physical environmental conditions of the study area

After preliminary survey to determine the study area, five areas within Kamojang Nature Reserve and Nature Park were chosen. There are two tracks in the Nature Reserves West Area, one track in Nature Reserve East Area and two tracks in Nature Park. These five areas have perennials heterogeneous forest with tight canopy cover.

Kamojang Natural Reserves West Area track one is located at 7°9'14,01"S-7°9'52,82"S and 107°46'15,20"E-107°45'13,91"E. The transect length in this area was 7.65 km. The Elevation in this area is 1494-1662 meters above sea level. The starting point of walking trails is located at 7°9'14,38"S and 107°46'15,03"E and ends at 7°9'39,78"S and 107°45'14,07"E. There wasn't any water body in this area.

Kamojang Natural Reserves West Area track two is located at 7°9'4,18"S-7°9'30,01"S and 107°46'50,82"E-107°46'23,79"E. The transect length in this area was 3.51 km. The Elevation in this area is 1484-1622 meters above sea level. The starting point of walking trails is located at 7°9'12,94"S and 107°46'23,96"E and ends at 7°9'5,19"S and 107°46'50,61"E. There wasn't any water body in this location. In the last 300 m, the type of vegetation is shrubs. Moreover, there was a fire resulting in hot and dry conditions.

Kamojang Nature Reserve West Area track Hutan Gede is located at 7°9'12,12"S-7°9'30,68"S and 107°49'49,10"E-107°49'23,77"E. The transect length in this area was 3.51 km. The Elevation in this area is 1619-1816 meters above sea level. The starting point of walking trails is located at 7°9'30,25"S and 107°49'23,93"E and ends at 7°9'12,48"S and 107°49'43,43"E. There was a body of water along the trails in the form of a river.

Kamojang Nature Park track Hutan Hotel is located at 7°9'1,39"S-7°9'34,03"S and 107°48'10,07"E-107°47'42,25"E. The transect length in this area was 5.12 km. The Elevation in this area is 1387-1552 meters above sea level. The starting point of walking trails is located at 7°9'7,52"S and 107°47'47,80"E and ends at 7° 9'2,17"S and 107°48'2,90"E. There are two bodies of water along the trails in the form of a river. This path was also a favorite path for mushroom hunters from the surrounding villages to hunt mushroom called *lember*.

Kamojang Nature Park track Hutan Kawah is located at 7°8'16,51"S-7°8'31,80"S and 107°48'17,38"E-107°48'4,03"E. The transect length in this area was 4.70 km. The Elevation in this area is 1645-1715 meters above sea level. The starting point of walking trails is located at 7°8'27,84"S and 107°48'6,65"E and ends at 7°8'23,52"S and 107°48'5,90E. There is a body of water along the trails in the form of a dry river. Although the river is dry, the moisture in this area reached 85%. Also, around the trails, there is an active crater. This crater is a tourist place in Kamojang Nature Park.

Data of edible mushroom

From five of this research sites, there were found 35 types of fungi that were able to be consumed either as food ingredient or as a medicine (Table S1). For more detail can be seen in Table 1.

Tabel 1. The inventory of edible macroscopic fungi in Kamojang Nature Reserve and Nature Park, May to August 2015

Species	Application	References
Armillaria sp.*	Antibacterial Anticancer Antifungal Anti-hyperglycemic Anti-inflammatory Antioxidant Food	Wu et al. 2012; Chi et al. 2013; Herath et al. 2013; Lai and Ng 2013; Bohnert et al. 2014; Geng et al. 2014; Radzki et al. 2014; Liu et al. 2015; Zavastin et al. 2015; Zhang et al. 2015
Auricularia sp.*	Antibacterial Anticancer Antihypercholesterolemic Antioxidant Food	Arora et al. 2014; Chiu et al. 2014; Yu et al. 2014; Arora and Tandon 2015; Cai et al. 2015; Chellappan et al. 2015; Khaskheli et al. 2015; Park et al. 2015; Reza et al. 2015; Zhao et al. 2015
Cerrena sp.1	Antibacterial Anticancer Antioxidant Antiviral Immunomodulatory	Jaszek et al. 2013; Mizerska-Dudka et al. 2015
Cerrena sp.2	Antibacterial Anticancer Antioxidant Antiviral Immunomodulatory	Jaszek et al. 2013; Mizerska-Dudka et al. 2015
Clavulina sp.	Food	Boa 2004
*Fistulina hepatica**	Antibiotic Food	Alves et al. 2012; Alves et al. 2014
Ganoderma sp.1*	Anti-anemia Antibacterial Anticancer Antioxidant	Ćilerdžić et al. 2015; Hossain et al. 2015; Huang et al. 2015; Kladar 2015; Liang et al. 2015; Reis et al. 2015; Wang et al. 2015; Zhang et al. 2015
Ganoderma sp.2*	Anti-anemia Antibacterial Anticancer Antioxidant	Ćilerdžić et al. 2015; Hossain et al. 2015; Huang et al. 2015; Kladar 2015; Liang et al. 2015; Reis et al. 2015; Wang et al. 2015; Zhang et al. 2015
Inocybe sp.	Anticancer	Patel and Goyal 2012
Marasmiellus sp.1	Food	Boa 2004
Marasmiellus sp.2*	Food	Boa 2004
Marasmiellus sp.3	Food	Boa 2004
Marasmiellus sp.4	Food	Boa 2004
Marasmius sp.1	Antibacterial Antioxidant	Ramesh 2010
Marasmius sp.2	Antibacterial Antioxidant	Ramesh 2010
Marasmius sp.3	Antibacterial Antioxidant	Ramesh 2010
Marasmius sp.4	Antibacterial Antioxidant	Ramesh 2010
Microporus xanthopus	Stop breastfeeding in children	Lee and Chang. 2004; Lee et al. 2009; Tapwal et al. 2013
Oudemansiella sp.*	Antibiotic Antioxidant Food	Anke et al. 1979; Anke et. al. 1990; Rosa et al. 2003
Phellinus sp.	Anti-influenza Antioxidant Antitumor	Hwang et al. 2015; Lee et al. 2015; Li et al. 2015; Mei 2015; Yan 2015; Zhang et al. 2015
Phlebia sp.	Antihypersensitif Antioxidant	Hai Bang et al. 2014
Pleurotus sp.	Antibacterial Antioxidant Antitumor Food	Elbatrawy et al. 2015; Ganeshpurkar et al. 2015; Ren et al. 2015; Xue et al. 2015; Younis et al. 2015
Pluteus thomsonii	Food	Local informants

*Polyporus meridionalis**	Food	Local informants
*Polyporus tenuiculus**	Food	Omarini et al. 2009
*Polyporus udus**	Food	Local informants
Postia sp.	Antitumor	Li et al. 2015
Schizophyllum commune	Antioxidant Antitumor Food	Chowdhary et al. 2013; Ogawa et al. 2013; Sutivisedsak et al. 2013; Yim et al. 2013; Chowdhary et al. 2014; Zhong et al. 2015
Stereum rameale	Antibiotic	Mellows 1973; Lia et al. 2006
Stereum gausapatum	Antibiotic	Mellows 1973; Lia et al. 2006
Stereum ostrea	Antibacterial Anti-malarial	Kim et al. 2006; Praveen, K. 2012
Suillus sp.	Antibacterial Anticancer Antioxidant Food	Patel and Goyal 2012; Radzki et al. 2014; Reis et al. 2014; Ribeiro et al. 2015
Xylaria longipes	Antibacterial Antifungal	Schneider 1996; Rusch et al. 2015
Xylaria sp.1	Antifungal	Schneider 1996
Xylaria sp.2	Antifungal	Schneider 1996

Note: * Has been used by people around Kamojang as foods and medicine

Discussion

In an effort to determine the diversity of macrofungi that can be consumed in the Kamojang Nature Reserve and Nature Park and to determine the species of macrofungi that has been utilized as food and medicine by the local community, we performed inventory, literature study, and interview process with the local community. As a result, in Tabel 1, 35 species have been identified as the edible mushroom. 18 species were shown to have an antibacterial compound are the most common application of macrofungi that can be found in Kamojang Nature Reserve and Nature Park. 13 of these species also contain antioxidant. The other application of macrofungi in Kamojang Nature Reserve and Nature Park are eight species as anticancer, four species as antifungal, one species as anti-hypercholesterolemic, one species as antihyperglycemic, one species as anti-inflammatory, one species as anti-influenza, one species as anti-malaria, four species as antitumor, two species as antiviral, one species as antihypertensive, two species as immunomodulatory, one species to stop breastfeeding in children and 16 species as food. Most macrofungi used by the local community in Kamojang are as food and only one species are used as medicine which is *Auricularia* sp. This species used to treat heat illness by ate it raw.

In species occurrence point of view, *Auricularia* sp. was the one with the highest frequency of occurrence. This species was found in Natural Reserves West Area track one, and track two, Nature Reserve West Area track Hutan Gede, Nature Park track Hutan Hotel, and Nature Park track Hutan Kawah. Based on statements of informants, *Auricularia* sp. also called *lember*, has resilience in the face of weather. Both in the dry season and the rainy season, these species are non-perishable, and no insects will eat this species. It is also the kind that is often hunted by mushroom hunters to be sold to markets and restaurants around Kamojang.

Location of the study that had the most diverse on macroscopic fungi that can be consumed was in Kamojang Nature Park track Hutan Hotel as many as 21 species (Table S2). This is because these locations passed by two rivers that continue to flow even in the dry season. In addition, this location is suitable for survey research on macrofungi throughout the year. While the least diverse on macroscopic fungi that can be consumed was in Kamojang Nature Reserve West Area, track one. This happens due to the fact that there wasn't a single body of water along the trails. In addition, the line was also a bike track that allows people to reach Ciharus Lake. It's probably because the smoke from motor vehicle prevented the growth of mushroom fruiting bodies in the vicinity. Moreover, the land around the path was solidified and dried resulting in the inhibition of growth and the spread of fungal hyphae (Jain et al. 2009).

Regarding the diversity of Phylum in the Kingdom Fungi in Kamojang Nature Reserve and Nature Park, Basidiomycota was ranked first with 87% compared with just 13% Ascomycota (Table S3.). This happens because most macroscopic Ascomycota requires high humidity and low temperatures to form fruiting bodies. Some types of the Ascomycota can even be found on Antarctic area where the temperature is low (Olech and Czarnota 2009).

This study is the first study conducted in Kamojang Nature Reserve and Nature Park on the inventory of macrofungi. If we compare this study with other inventory studies on macrofungi in Java, the diversity of edible mushroom is quite a lot. On Gunung Halimun National Park with the discovery of 31 species of macroscopic fungi only eight species are edible which were four *Ganoderma* sp., *Geoglossum* sp., *Laccaria* sp., and *Trichoglossum* sp. (Tata and Widyawati 2013). In addition, there were nine species of edible mushroom on the Alas Purwo National Park, namely *Auricularia auricula*, *Clavaria fragilis*, *Ganoderma lucidum*, *Gymnopus* sp., *Marasmius aliaceous*, *Marasmius copelandii*, *Lentinus sajor-caju*, *Pleurotus ostreatus*, and *Tremella fuciformis* (Jihad 2013). *Ganoderma* sp. is the only species that exist in all location. Its long history of use for promoting health and longevity in China, Japan, and other Asian countries are responsible for its distribution (Wachtel-Galor et al. 2011)

Based on the results obtained from this study, it's possible that there are still a lot of species that haven't been recorded. So it is advisable to do more inventory on the other locations and other time around Kamojang Nature Reserve and Nature Park to complete the list of edible mushroom. m

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Table S1. Morphology and chemical data

No	Species	Pileus									Lamellae							Pores			Teeth		Stipe															Spore	Chemical Test
		Surface color	Bruise color	Flesh color	Shape	Surface texture	Surface condition	Margin	Diameter (mm)	Height (mm)	Thickness (mm)	Color	Coloring type	Margin	Type	Attachment	Lamellae	Depth (mm)	Pore shape	Color	Lenght (mm)	Lenght (mm)	Color	Surface color	Bruise Color	Flesh color	Attachment to pileus	Surface type	Shape	Attachment to substrate	Flesh type	Annulus type	Volva type	Length (mm)	Apex diameter (mm)	Middle diameter (mm)	Base diameter (mm)	Spore print color	KOH
Agaric Fungi																																						
1	*Armillaria* sp.	Light brown to yellowish brown	Light brown to yellowish brown		Convex to Broadly convex	Smooth	Dry	Translucent striate-Not striate smooth-Rimos,	24-71	54-83		White to cream	Discolorous	Even	Regular	Adnate	3	7						Pale cream reddish	Cream reddish	Light cream to red brownish	Central	Squamulose recurved to Fibrillose	Equal	Caespitose	Stuffed	Superior, Attached, Single		83-108	5-9	5-9	5-9	--	Negative
2	*Inocybe* sp.	Light gray to dark gray	Light gray to dark gray		Broadly convex	Fluccose	Dry	Plane	17	4		Pale pink	Concolorous	Even	Regular	Free	1	3						Pale gray	Pale gray	Pale gray	Central	Fibrillose, strigose	Tapered at base	Inserted	Solid			29	3	3	4	--	Negative
3	*Marasmiellus* sp.1	White	White		Slighthly depressed	Smooth	Dry	Not striate smooth	52	4		Pale pink	Concolorous	Serrate	Regular	Adnexed	3	3						Pink to white	Pink to white	White	Central	Smooth	Tapered at base	Inserted	Solid			51	4	4	4	--	Negative
4	*Marasmiellus* sp.2	White to pale gray	White to pale gray		Moderate indented	Smooth	Slimy	Sulcate striate	65	9		White	Concolorous	Serrate	Regular	Free	3	4						Dark cream to pink	Dark cream to pink	Pale pink	Central	Smooth hingga Strigose	Equal	Mycelial pad	Solid			66	7	7	7	--	Negative
5	*Marasmiellus* sp.3	White to pink	White to dark pink		Broadly parabolic	Smooth	Dry	Not striate smooth	9-12	19-22		White	Concolorous	Even	Regular	Adnate	2	3						Pink	Pink	White	Central	Smooth	Equal	Inserted	Solid			14-21	3	3	3	--	Negative
6	*Marasmiellus* sp.4	White	White		Broadly convex to Campanulate	Smooth	Dry	Translucent striate, Recurved	13-15	4		White	Concolorous	Even	Regular	Decurrent	2	2						White	White	White	Central	Smooth	Equal	Inserted	Solid			20-23	3	3	3	--	Negative
7	*Marasmius* sp.1	White	White		Broadly convex to Plane	Smooth	Dry	Incurved-Decurved	4-8	2		White	Concolorous	Even	Regular	Free	0	1						White	White	White	Central	Smooth	Equal	Attached to rhizomorph	Hollow			15-30	1	1	1	--	Negative
8	*Marasmius* sp.2	White	White		Convex	Smooth	Dry	Not striate smooth	6	4		White	Concolorous	Even	Regular	Free	0	1						White	White	White	Central	Smooth	Equal	Attached to rhizomorph	Solid			28	1	1	1	--	Negative
9	*Marasmius* sp.3	White to pink	White to pink		Broadly parabolic	Smooth	Dry	Not striate smooth	5-7	19-16		White	Concolorous	Even	Regular	Decurrent	0	1						White	White	White	Central	Smooth	Equal	Attached to rhizomorph	Solid			14-24	2	2	2	--	Negative
10	*Marasmius* sp.4	Pale white to pink	Pale white to pink		Convex	Smooth	Dry	Not striate smooth	7-11	3		White	Concolorous	Even	Regular	Free	3	2						White	White	White	Central	Smooth	Equal	Attached to rhizomorph	Solid			13-20	2	2	2	--	Negative
11	*Oudemansiella* sp.	Dark cream to light cream	Dark cream to light cream	white	Plane, Slightly depressed	Smooth	Strongly viscid, Slimy	Decurved	120	90	8	White	Concolorous	Even	Regular	Adnexed	3	10						White	White	White	Central	Smooth	Equal	Inserted	Hollow			93	9	9	9	White	Negative
12	*Pleurotus* sp.	Light brown	Light brown	white	Broadly convex	Smooth	Dry	Incurved, Smooth	12-23	4-6	1	White	Concolorous	Even	Regular	Decurrent	2	1						White	White	White	Lateral	Smooth	Tapered at base	Inserted	Solid			11	5	3	2	--	Negative
13	*Pluteus thomsonii*	Dark grey to light grey	Dark grey to light grey	gray	Convex to Broadly convex	Veined	Moist	Plane	10-21	5-7	2	Gray	Concolorous	Even	Regular	Free	2	4-6						Light gray	Light gray	White	Central	Fibrillose, pubescent	Equal	Inserted	Hollow			31-40	2-4	2-4	2-4	--	Negative
Jelly Fungi																																						
14	*Auricularia* sp.	White brownish to red blackish	White brownish to red blackish	white brownish to red blackish		Velvety	Dry		9-98		2-4				Veined												Sessile			Inserted								White to Cream	Negative
Polypore Fungi																																						
15	*Cerrena* sp.1	Light brown to dark brown	Light brown to dark brown	white			Dry		90-130		33				Porioid				Radially elongated	whie to pale yellow	11						Sessile			Imbricate								--	Negative
16	*Cerrena* sp.2	White	White				Moist		120						Porioid				Radially elongated	white	9						Sessile			Corticoid								--	Negative
17	*Ganoderma* sp.1	White yellowish to black	dark cream to black	white yellowish	Flabelliform	Smooth	Dry, Shiny		55-98	20	18				Porioid				Round	white	3			Black	Black	White yellowish	Lateral	Smooth	Tapered at apex	Inserted	Solid			33	21	19	19	--	Positive
18	*Ganoderma* sp.2	Dark brown	Dark brown	pale white	Flabelliform	Smooth	Dry, Dull		63-347	6-48	5-45				Porioid				Round	white to dark brown	1-3						Sessile			Pileate								--	Positive
19	*Microporus xanthopus*	White to dark brown	White to dark brown	white	Moderate indented to Deeply indented	Velvety	Dry, Shiny	Uplifted	24-53	21-25	2-3				Porioid				Round	white	1			Cream	Cream	White	Central	Smooth	Equal	Inserted	Solid			20-35	6	5	6	--	Negative
20	*Phellinus* sp.	Brown reddish	Brown reddish	brown yellowish	Dimidate	Velvety	Dry		36-55	4-6	3-5				Porioid				Round	dark brown	1						Sessile			Pileate								--	Negative
21	*Polyporus meridionalis*	Light brown to dark brown	Light brown to dark brown		Moderate indented to Deeply indented	Vilose	Dry	Plane-Inrolled	45-50	13-15					Anastamosed				Radially elongated	dull white to pale yellow	3			Pale cream	Pale cream	Cream	Central	Strigose	Equal	Inserted	Solid			45-53	3	3	3	--	Negative
22	*Polyporus tenuiculus*	White to cream	White to cream	white	Petaloid to Flabelliform	Smooth	Dry		15-39	2-4	2				Anastamosed				Radially elongated	white	1			White	White	White	Lateral	Smooth	Equal	Inserted	Solid			3-6	3-4	3-4	3-4	--	Negative
23	*Polyporus udus*	Brown reddish	Brown reddish	white	Flabelliform	Smooth	Moist	Plane	110-137	32-36	23-34				Porioid				Angular	white	9			Dark brown	Dark brown	White	Lateral	Smooth	Equal	Inserted	Solid			24-29	10	10	10	--	Negative
24	*Postia* sp.	White	White	white	Dimidate	Vilose	Moist		28-109	24-29	12-13				Porioid				Angular	white	13-19						Sessile			Pileate								--	Negative
Bolete Fungi																																						
25	*Suillus* sp.	Light brown	Light brown	light yellow	Broadly convex	Smooth	Slightly viscid, Sticky	Recurved	98	30	17				Porioid				Angular	pale yellow	16			Yellow	Yellow	Light yellow	Central	Glandular dotted	Equal	Inserted	Solid			81	13	13	13	Light Brown	Negative
Coral Fungi																																						
26	*Clavulina* sp.																							White	White	White		Smooth	Compressed	Inserted	Solid			12	1	1	1	--	Negative
Flask Fungi																																						
27	*Xilaria longipes*																							Black	Black	White		Smooth	Tampered at base	Inserted	Suffed			14-22	10	7	4	--	Negative
28	*Xylaria* sp.1																							Light cream to black	Light cream to black	White		Smooth	Tampered at base	Inserted	Stuffed			81-229	13	16	6	--	Negative
29	*Xylaria* sp.2																							Gray	Gray	White		Veined	Tampered at base	Inserted	Stuffed			183	14	11	7	--	Negative
Corticoid Fungi																																						
30	*Phlebia* sp.	Light brown	Light brown				Dry																															--	Negative
Steroid Fungi																																						
31	*Stereum rameale*	Pale orange	Orange	Yellow	Dimidate	Smooth	Dry		33-45	3-6	3-6																Sessile			Pileate								--	Positive
32	*Stereum gausapatum*	Dark brown	Dark brown		Dimidate	Smooth	Dry		45																		Sessile			Pileate								--	Negative
33	*Stereum ostrea*	Light brown to green	Light brown to green		Dimidate	Shaggy	Dry		73-98																		Sessile			Pileate								--	Positive
Cyphelloid Fungi																																						
34	*Fistulina hepatica*	Red purpleish to dark red	Red purpleish to dark red	Dark red	Flabeliform	Pruinose	Moderately viscid, Slippery	Lobed	147	23	18								Round	Pale pink	5			Red purpleish	Red purpleish	Dark red	Lateral	Smooth	Tapered at apex	Inserted	Solid			38	27	24	20	--	Negative
35	*Schizophyllum commune*	White to light grey	White to light grey		Conchate	Floccose	Dry	Incurved	6-40	4-7		Light gray	Concolorous	Even	Regular	Free	2	1									Sessile			Inserted								--	Negative

Table S2. Environmental data

No	Spesies	Kamojang Nature Reserve West Area, Track 1						Kamojang Nature Reserve West Area, Track 2						Kamojang Nature Reserve East Area, Track Hutan Gede						Kamojang Nature Park Area, Track Hutan Hotel						Kamojang Nature Park Area, Track Hutan Kawah					
		Elevation (mdpl.)	Humidity (%)	Light Intensity (Lx)	Air Temp. (°C)	Substrate Type	Substrate Condition	Elevation (mdpl.)	Humidity (%)	Light Intensity (Lx)	Air Temp. (°C)	Substrate Type	Substrate Condition	Elevation (mdpl.)	Humidity (%)	Light Intensity (Lx)	Air Temp. (°C)	Substrate Type	Substrate Condition	Elevation (mdpl.)	Humidity (%)	Light Intensity (Lx)	Air Temp. (°C)	Substrate Type	Substrate Condition	Elevation (mdpl.)	Humidity (%)	Light Intensity (Lx)	Air Temp. (°C)	Substrate Type	Substrate Condition
1	*Armillaria* sp.							1519-1533	46-71	513-729	17-21	Wood	Moist, rotten	1660-1661	70-87	810-1550	19-24	Wood	Moist, rotten	1469-1544	72-83	68-233	13.3-22.3	Wood	Dry, rotten						
2	*Auricularia* sp.	1596-1617	54-87	992-1476	15-21	Wood	Moist, rotten	1601-1621	43-90	518-1584	15-25	Wood	Moist, rotten	1658-1788	44-80	446-1427	14-25	Wood	Moist, rotten	1423-1521	68-86	92-287	16.4-22.8	Wood	Moist, hard-rotten						
3	*Cerrena* sp.1																			1389	85	174	22.1	Wood	Moist, rotten						
4	*Cerrena* sp.2																			1443	72	207	18.6	Wood	Moist, rotten						
5	*Clavulina* sp.																									1649	54	667	20.8	Soil	Wet, compact
6	*Fistulina hepatica*																			1449	85	133	23.6	Wood	Moist, rotten						
7	*Ganoderma* sp.1							1554	72	545	23	Wood	Moist, rotten																		
8	*Ganoderma* sp.2							1576	61	970	22	Wood	Moist, rotten	1667	50	1238	16	Wood	Moist, rotten	1444-1526	70-84	68-274	15.2-23.8	Wood	Dry-wet, rotten						
9	*Inocybe* sp.																			1443	69	62	21.2	Soil	Wet crumbly						
10	*Marasmiellus* sp.1																			1389-1401	67-73	145-187	18.8-21.3	Wood	Moist, rotten						
11	*Marasmiellus* sp.2													1700	45	916	19	Wood	Wet, rotten												
12	*Marasmiellus* sp.3																			1390	67	155	20.2	Wood	Moist, rotten						
13	*Marasmiellus* sp.4																			1390	75	129	20.2	Wood	Moist, rotten						
14	*Marasmius* sp.1																									1649	83	500	18.7	Leaf litter	Dry, rotten
15	*Marasmius* sp.2																									1651	80	689	19.2	Wood	Dry, rotten
16	*Marasmius* sp.3																			1391	73	130	19.6	Wood	Moist, rotten						
17	*Marasmius* sp.4																			1416	81	203	19.5	Wood	Moist, rotten						
18	*Microporus xanthopus*													1684	46	335	20	Wood	Moist, rotten	1461-1549	79-82	158-241	18.5-21.9	Wood	Dry, hard-rotten	1646-1692	53-82	320-970	14.1-21.4	Wood	Dry, hard
19	*Oudemansiella* sp.																			1449	82	118	18.9	Wood	Moist, rotten						
20	*Phellinus* sp.																			1542	71	90	24.3	Wood	Dry, rotten						
21	*Phlebia* sp.																			1467	82	230	23.9	Wood	Moist, rotten						
22	*Pleurotus* sp.													1736	61	281	18	Wood	Moist, rotten												
23	*Pluteus thomsonii*																									1678	79	286	17.1	Wood	Dry, rotten
24	*Polyporus meridionalis*													1780	84	40	19	Wood	Moist, rotten	1441-1447	70-77	43-121	21.2-22.5	Wood	Moist, rotten						
25	*Polyporus tenuiculus*							1558	77	928	21	Wood	Dry, rotten	1795	50	764	23	Wood	Moist, rotten	1453-1447	69-88	56-220	15.8-23.0	Wood	Dry-moist, rotten						
26	*Polyporus udus*													1650	58	303	13	Wood	Moist, rotten												
27	*Postia* sp.													1724	52	76	16	Wood	Dry, rotten												
28	*Schizophyllum commune*																			1448	81	281	22.1	Wood	Dry, hard						
29	*Stereum complicatum*							1623	81	857	24	Wood	Dry, rotten																		
30	*Stereum gausapatum*																			1491	74	290	20.1	Wood	Dry, hard						
31	*Stereum ostrea*																			1390	84	114	20.7	Wood	Dry, rotten						
32	*Suillus* sp.													1642	72	972	21	Wood	Dry, hard												
33	*Xylaria longipes*																									1656-1684	50-65	550-881	14.5-20.9	Wood	Dry, rotten
34	*Xylaria* sp.1																									1678-1680	74-83	720-773	14.1-16.5	Wood	Dry-moist, rotten
35	*Xylaria* sp.2																									1657	64	661	17.9	Wood	Moist, hard

Table S3. Diversity group data of fungi

Relationship Group						Form Group
Phylum	**Class**	**Order**	**Family**	**Genus**	**Species**	
Ascomycota	Sordariomycetes	Xylariales	Xylariaceae	*Xylaria*	*Xylaria longipes*	Flask Fungi
					Xylaria sp.	Flask Fungi
Basidiomycota	Agaricomycetes	Agaricales	Fistulinaceae	*Fistulina*	*Fistulina hepatica*	Cyphelloid Fungi
			Inocybaceae	*Inocybe*	*Inocybe* sp.	Agaric Fungi
			Marasmiaceae	*Marasmiellus*	*Marasmiellus* sp.	Agaric Fungi
				Marasmius	*Marasmius* sp.	Agaric Fungi
			Physalacriaceae	*Armillaria*	*Almillaria* sp.	Agaric Fungi
				Oudemansiella	*Oudemansiella* sp.	Agaric Fungi
			Pleurotaceae	*Pleurotus*	*Pleurotus* sp.	Agaric Fungi
			Pluteaceae	*Pluteus*	*Pluteus thomsonii*	Agaric Fungi
			Schizophyllaceae	*Schizophyllum*	*Schizophyllum commune*	Cyphelloid Fungi
		Auriculariales	Auriculariaceae	*Auricularia*	*Auricularia* sp.	Jelly Fungi
		Bolatales	Suillaceae	*Suillus*	*Suillus* sp.	Bolete Fungi
		Cantharellales	Clavulinaceae	*Clavulina*	*Clavulina* sp.	Coral Fungi
		Hymenochaetales	Hymenochaetaceae	*Phellinus*	*Phellinus* sp.	Polypore Fungi
		Polyporales	Fomitopsidaceae	*Postia*	*Postia* sp.	Polypore Fungi
			Ganodermataceae	*Ganoderma*	*Ganoderma* sp.	Polypore Fungi
			Meruliaceae	*Phlebia*	*Phlebia* sp.	Corticoid Fungi
			Polyporaceae	*Cerrena*	*Cerrena* sp.	Polypore Fungi
				Microporus	*Microporus xanthopus*	Polypore Fungi
				Polyporus	*Polyporus meridionalis*	Polypore Fungi
					Polyporus tenuiculius	Polypore Fungi
					Polyporus udus	Polypore Fungi
		Russulales	Stereaceae	*Stereum*	*Stereum gausapatum*	Steroid Fungi
					Stereum ostrea	Steroid Fungi
					Stereum rameale	Steroid Fungi