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Species listing of macrofungi on the Bugkalot Tribal community in Alfonso Castañeda, Nueva Vizcaya, Philippines

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Abstract

This study was conducted to determine the different macroscopic fungi present in the Bugkalot tribal community in Alfonso Castañeda, Nueva Vizcaya, Philippines. A total of 45 macrofungi belonging to 6 orders, 15 families and 25 genera was collected, identified and described in the taxonomic checklist. Twenty-five species were able to identify up to species level. Most of the macrofungi are wood-rotters. Family Polyporaceae was recorded as the most abundant macrofungi family present in the area. Out of all macrofungi, 25 species were used by the Bugkalots as either as food or medicine. The Bugkalot tribal community in Alfonso Castañeda, Nueva Vizcaya is a habitat for the different macrofungal species. Thus, further studies should be done on other season to determine the species richness and distribution of macrofungi in the community. Also, these macrofungi is needed to be exploited for possible utilization as it may have a promising bioactivity potential especially for the non-edible ones.

Key words – Bugkalots – edible mushroom – indigenous community – medicinal mushroom – taxonomy

Introduction

Macrofungi are group of fungi that form a large fruiting body which are spore-bearers and visible to the naked eye (Mueller et al. 2007). These include mushrooms, puffballs, false-truffles, cup, bracket fungi etc. Macroscopic fungi are organisms that lacks the ability to produce their own food, thus, they live as saprophytes, parasites or as mycorrhizal symbionts to plants for their survival (Reyes et al. 2009, Tang et al. 2015). They are usually found growing in different substrates like decaying plants and animals, twigs, leaf litter, tree trunks or branches, animal manure, soil and even inside the body of insects (Reyes et al. 2009). They also play a key role in the environment such as for nutrient cycling. They act as decomposers of organic matters and even food for animals, including humans (Tang et al. 2015, Zotti et al. 2013). Many macrofungi are recognized due to their significant medical and economical importance for they are valuable sources of nutraceutical and food products (Arenas et al. 2018).

Currently, there is an estimated 53,000 to 110,000 species of macrofungi worldwide belonging to both Basidiomycota and Ascomycota (Sridhar & Deshmukh 2019). In the Philippines, the number of macrofungi is relatively high (De Leon et al. 2013) but many species of macrofungi are still

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undiscovered. Many taxonomic studies have already been conducted in different parts of the country particularly in Luzon including Nueva Ecija (Sibounnavong et al. 2008, Lopez et al. 2016, Undan et al. 2016), Bulacan (Liwanag et al. 2017), Isabela (Jacob et al. 2017), Aurora (Tadiosa et al. 2011), Tarlac, Pampanga, Zambales (De Leon et al. 2013), Cavite (Arenas et al. 2015), Laguna (De Castro & Dulay 2015) and Batangas (Tadiosa & Briones 2013). This only indicates the species richness of macrofungi in the country. However, many regions are remains unexplored and this further necessitates more taxonomic studies. Hence, the effort to consider this field of study demands the researcher as it can contribute in establishing a database of macrofungi throughout the country.

Alfonso Castañeda is a fourth-class municipality located in the province of Nueva Vizcaya. Its geographical coordinates are situated at 15°48′ North and 121°18′ East. This municipality is home of the Bugkalots and is divided into two portions, the Lower Casecnan (Brgy. Abuyo, Brgy. Galituja and Brgy. Lublub) and the Upper Casecnan (Brgy. Cauayan, Brgy. Lipuga and Brgy. Pelaway). The majority of the Bugkalots is situated in the Upper Casecnan area as this place is highly elevated (4,403.5ft amsl) and mountainous which is a suitable venue for their livelihood. The vegetation type in the area is one of the contributing factors to the species richness of macrofungi in the site (Lodge et al. 2004), hence, the abundance of macrofungal in these mountains is expected.

In the context of ethnomycology, Bugkalots are known to use several species of macrofungi as either food or medicine (Torres et al. 2020). Nevertheless, there are some species with known uses which they do not utilized. It is hope that through this study, these species can be documented for possible utilization in the future. Thus, the researchers aimed to collect and morphologically identify the different macrofungi naturally growing in Mt. Umubi in Alfonso Castañeda, Nueva Vizcaya. The taxonomic classification, description, growth habit, substrate, local names and edibility of each macrofungi is documented in this paper.

Materials & Methods

The collection site

The collection of macrofungi was done in Mt. Umubi situated at Upper Casecnan area of Alfonso Castañeda, Nueva Vizcaya. This place is an ideal habitat for many macrofungal species due to its high temperature and humid condition during rainy season. Also, it serves as the venue for macrofungal collection of the Bugkalots.

Collection and preservation of macrofungi

Purposive sampling was done in the collection of all visible species of macrofungi in the area. Collection was conducted during the rainy season of the year (June 2019) which favors the growth of most macrofungi. Specimens were initially photographed in their substrates, then carefully collected, placed in the containers and labeled prior to immediate transport to the laboratory for further identification. Dried marofungi was air-dried and prepared as herbarium specimen while fleshy macrofungi was preserved using 95% ethanol.

Identification and characterization of collected macrofungi

The identification of the collected macrofungi were based on their macro-morphological (fruiting body) features. Morphometric data collected for each specimen were the different features of the pileus, gills/pores and stipe. The specimens were identified by comparing the morphological features with published literatures (Ostry et al. 2011, Tadiosa et al. 2011, Torres et al. 2020, Arenas et al. 2015, De Castro & Dulay 2015, Liwanag et al. 2017, Arenas et al. 2018). Taxonomic classification was based on the works of Kuo (2020). The authenticity of each specimen was verified in Mycology Department of the National Museum of the Philippines (NMP).

Results

A total of 45 macrofungi was collected in the Bugkalot tribal community in Alfonso Castañeda, Nueva Vizacaya. From these, 25 species were identified up to species level while 20 species were up to genus level only. These 45 macrofungi belong to 6 orders, 15 families and 25 genera. For the taxonomic checklist provided below, the names of order were alphabetically listed as well as the families under each. The description, edibility, growth habit, substrate and local names was recorded. The significant use of some macrofungi by the Bugkalots was also noted.

Table 1 Taxonomic positions of macrofungi in Mt. Umubi, Alfonso Castañeda, Nueva Vizcaya, Philippines

Order	Family	Genus	Species
Agaricales	Bolbitiaceae	*Panaeolus*	*Panaeolus* sp.
	Crepidotaceae	*Crepidotus*	*Crepidotus* sp.
	Marasmiaceae	*Marasmiellus*	*Marasmiellus* sp.
		Marasmius	*Marasmius* sp. 1
			Marasmius sp. 2
	Mycenaceae	*Mycena*	*Mycena* sp.
	Pleurotaceae	*Pleurotus*	*Pleurotus dryinus* (Pers.) P. Kumm.
	Psathyrellaceae	*Coprinellus*	*Coprinellus disseminatus* (Pers.) J. E. Lange
		Coprinopsis	*Coprinopsis atramentaria* (Bull.) Redhead
			Coprinopsis lagopus (Fr.) Redhead, Vilgalys & Moncalvo
		Coprinus	*Coprinus cinereus* (Schaeff.) Gray
	Schizophyllaceae	*Schizophyllum*	*Schizophyllum commune* Fr.
	Tricholomataceae	*Clitocybe*	*Clitocybe* sp.
Auriculariales	Auriculariaceae	*Auricularia*	*Auricularia auricula-judae* (Bull.) Quél.
			Auricularia polytricha (Mont.) Sacc.
Boletales	Boletaceae	*Boletus*	*Boletus* sp.
Hymenochaetales	Hymenochaetaceae	*Hymenochaete*	*Hymenochaete tenuissima* (Berk.) Berk
Polyporales	Ganodermataceae	*Ganoderma*	*Ganoderma australe* (Fr.) Pat.
			Ganoderma lucidum (Curtis) P. Karst.
			Ganoderma sp. 1
			Ganoderma sp. 2
			Ganoderma sp. 3
			Ganoderma tsugae Murrill
	Meripilaceae	*Rigidoporus*	*Rigidoporus microporus* (Sw.) Overeem
	Polyporaceae	*Fomes*	*Fomes* sp.
		Hexagonia	*Hexagonia tenuis* (Hook.) Fr.
		Lentinus	*Lentinus* sp. 1
			Lentinus sp. 2
			Lentinus tigrinus (Bull.) Fr.
		Microporus	*Microporus affinis* (Bl. & T. Nees) Kuntze
			Microporus subaffinis (Lloyd) Imazeki
			Microporus xanthopus (Fr.) Kuntze
		Polyporus	*Polyporus picipes* Fr.
			Polyporus sp. 1
			Polyporus sp. 2
			Polyporus sp. 3
			Polyporus sp. 4
		Pycnoporus	*Pycnoporus sanguineus* (L.) Murrill
		Trametes	*Trametes elegans* 1 (Spreng.) Fr.
			Trametes elegans 2 (Spreng.) Fr.
			Trametes sp.
Russulales	Russulaceae	*Lactarius*	*Lactarius* sp.
		Stereum	*Stereum hirsutum* (Willd.) Pers.
			Stereum lobatum (Kunze ex Fr.) Fr.
			Stereum ostrea (Bl. & T. Nees) Fr.

Order Agaricales

Family Bolbitiaceae

***Panaeolus* sp.** Fig. 1A

Description – pileus is pulvinate, brown black, finely wrinkled, and regular with extending gills on the margin; gills is free, brown, equal and crowded; stipe is centered, flexuous with saccate volva, white, lacunose, fibrous and solid

Edibility – edible

Growth habit – solitary to gregarious (2-3 in a group)

Substrate – soil

Vernacular name – kulat awang

This macrofungal species is utilized by the Bugkalots as food.

Family Crepidotaceae

***Crepidotus* sp.** Fig. 1B

Description – small, fan-shaped, white, wrinkled, sulcate fruiting body with distant forking gills; without stipe

Edibility – non-edible

Growth habit – gregarious

Substrate – decaying twig/leaf litter

Vernacular name – kulat simot-simot

Family Marasmiaceae

***Marasmiellus* sp.** Fig. 1C

Description – small, convex, pale white, wrinkled, sulcate fruiting body with distant forking gills and central, flexuous, white hollow stipe

Edibility – non-edible

Growth habit – gregarious

Substrate – dead twig

Vernacular name – kulat tuto

***Marasmius* sp. 1** Fig. 1D

Description – pileus is conic-shaped, red brown, wrinkled and sulcate; gills is free, creamy white and equally distant; stipe is centered, flexuous, red brown, rigid and solid

Edibility – non-edible

Growth habit – solitary

Substrate – decaying twig

Vernacular name – kulat adang 1

***Marasmius* sp. 2** Fig. 1E

Description – pileus is parabolic with flattened top, tan brown, wrinkled and sulcate; gills is free, tan brown, forking, and close; stipe is centered, flexuous, dark gray, rigid and solid

Edibility – non-edible

Growth habit – gregarious

Substrate – decaying log

Vernacular name – kulat adang 2

Family Mycenaceae

***Mycena* sp.** Fig. 1F

Description – pileus is cuspidate, white, shiny, warty and plicate; pore surface is free, white with distant hollow hexagon-shaped pores; stipe is centered, rounded, white, scabrous and hollow

Edibility – edible

Growth habit – gregarious

Substrate – decaying tree trunk

Vernacular name – kulat kalansepay

This macrofungal species is utilized by the Bugkalots as food.

Family Pleurotaceae

Pleurotus dryinus (Pers.) P. Kumm. Fig. 1G

Description – pileus is broadly convex, white when young then yellowing at maturity, with appressed scales and thick inrolled margin; gills is decurrent, white and often yellowing, closed and unequal; stipe is eccentric, tapering and whitish then becoming yellow at age

Edibility – edible

Growth habit – gregarious

Substrate – decaying tree trunk

Vernacular name – kulat paangan

This macrofungal species is utilized by the Bugkalots as food.

Family Psathyrellaceae

Coprinellus disseminatus (Pers.) J. E. Lange Fig 1H

Description – pileus is parabolic, white when young and expanding to bell-shaped, becoming gray with brownish center, rugulose and plicate at maturity; gills is free, white then becoming black at age with closed spacing and does liquify to black ink (deliquescing); stipe is centered, flexuous, white, fragile and hollow; spore print is black.

Edibility – non-edible

Growth habit – gregarious

Substrate – soil

Vernacular name – kulat alenga buki

Coprinopsis atramentaria (Bull.) Redhead Fig. 1I

Description – pileus is bell-shaped, light brown when young and expanding to broadly convex, becoming gray brown at the same time flattening and curling up at the rim during maturity; gills is free, brown to black with crowded spacing that liquefies to a black ink; stipe is centered, equal, white, fibrous and hollow; spore print is black

Edibility – edible

Growth habit – solitary to gregarious (2-3 in group)

Substrate – soil

Vernacular name – kulat guko-guko 1

This macrofungal species is utilized by the Bugkalots as food.

Coprinopsis lagopus (Fr.) Redhead, Vilgalys & Moncalvo Fig. 1J

Description – pileus is oval, gray when young that expands to broadly convex until become flat with outrolled margin at maturity; gills is free, gray to black with crowded spacing that deliquesces; stipe is centered, equal, white, fibrous and hollow; spore print is black

Edibility – edible

Growth habit – gregarious

Substrate – soil
Vernacular name – kulat guko-guko 2
This macrofungal species is utilized by the Bugkalots as food.

Coprinus cinereus (Schaeff.) Gray Fig. 1K

Description – pileus is conic, brown that expands to broadly convex until become flat, rugulose with split margin at maturity; gills is free, brown to black with crowded spacing that deliquesces; stipe is centered, equal, white, rigid and hollow; spore print is black
Edibility – edible
Growth habit – gregarious
Substrate – soil
Vernacular name – kulat pinkalan
This macrofungal species is utilized by the Bugkalots as food.

Family Schizophyllaceae

Schizophyllum commune Fr. Fig. 1L

Description – small, fan-shaped, whitish gray, velvety fruiting body with irregular margin on the upper surface and brown, closed, unequal gills in the lower surface
Edibility – edible
Growth habit – gregarious
Substrate – dead log/bamboo
Vernacular name – kulat kidedep
This macrofungal species is utilized by the Bugkalots as food.

Family Tricholomataceae

***Clitocybe* sp.** Fig. 1M

Description – pileus is umbilicate, yellow, smooth and hairy; gills is decurrent, yellow, equal and close; stipe is eccentric, flexuous, yellow, fibrous and hollow
Edibility – edible
Growth habit – gregarious
Substrate – dead log
Vernacular name – kulat tegatan
This macrofungal species is utilized by the Bugkalots as food.

Order Auriculariales

Family Auriculariaceae

Auricularia auricula-judae (Bull.) Quél. Fig. 1N

Description – wavy, irregular, ear-shaped, reddish brown fruiting body with gelatinous-rubbery texture that becomes hard and black when dried out
Edibility – edible
Growth habit – solitary to gregarious (2-3 in a group)
Substrate – dead log
Vernacular name – kulat kolang-kolang/tainga ng daga
This macrofungal species is utilized by the Bugkalots as food.

Auricularia polytricha (Mont.) Sacc. Fig. 1O

Description – wavy, irregular, ear-shaped, reddish brown fruiting body with jelly-like texture
Edibility – edible

Growth habit – solitary to gregarious (2-4 in a group)
Substrate – decaying twig
Vernacular name – kulat alenga baboy
This macrofungal species is utilized by the Bugkalots as food.

Order Boletales

Family Boletaceae

***Boletus* sp.** Fig. 1P

Description – pileus is convex, brown, dry and squamose with even margin; gills is adnexed, white, closed and unequal; stipe is centered, clavate, soft, rigid and solid
Edibility – edible
Growth habit – solitary
Substrate – soil
Vernacular name – kulat pungkulan
This macrofungal species is utilized by the Bugkalots as food.

Order Hymenochaetales

Family Hymenochaetaceae

Hymenochaete tenuissima (Berk.) Berk. Fig. 1Q

Description – thin, dry, laterally striated, black bracket fungus with margin becoming wavy or curled and scalloped; without stipe
Edibility – non-edible
Growth habit – gregarious
Substrate – decaying log
Vernacular name – kulat belang

Order Polyporales

Family Ganodermataceae

Ganoderma australe (Fr.) Pat. Fig. 1R

Description – broadly convex, gray brown bracket fungus with hard, woody furrowed zones in upper surface and white lower surface turning brown when scratched; with lateral stipe
Edibility – edible but not palatable
Growth habit – solitary
Substrate – tree trunk
Vernacular name – kulat bungkog 2
This macrofungal species is utilized by the Bugkalots as medicine.

Ganoderma lucidum (Curtis) P. Karst.

Description – petal-shaped, red brown bracket fungus with tough texture in upper surface
Edibility – edible but not palatable
Growth habit – solitary
Substrate – decaying log
Vernacular name – kulat baklag 2
This macrofungal species is utilized by the Bugkalots as medicine.

***Ganoderma* sp. 1** Fig. 1T

Description – thick, semicircular, white to purple bracket fungus with dark purplish margin having a central protuberance on the upper and lower surfaces

Edibility – non-edible

Growth habit – solitary

Substrate – tree bark

Vernacular name – kulat bangkal

This macrofungal species is utilized by the Bugkalots as medicine.

***Ganoderma* sp. 2** Fig. 1U

Description – kidney-shaped, light brown bracket fungus with hard, leathery shiny texture and white margin in upper surface; with lateral stipe

Edibility – edible but not palatable

Growth habit – solitary to gregarious (2-4 in a group)

Substrate – tree trunk

Vernacular name – kulat baklag 1

This macrofungal species is utilized by the Bugkalots as medicine.

***Ganoderma* sp. 3** Fig. 1V

Description – broadly convex, hard bracket fungus with furrowed and concentric zones of various shades of purple in the upper surface and milky white lower surface; with lateral stipe

Edibility – edible but not palatable

Growth habit – solitary

Substrate – tree bark

Vernacular name – kulat bungkog 1

This macrofungal species is utilized by the Bugkalots as medicine.

Ganoderma tsugae Murrill Fig. 1W

Description – broadly convex, orange to maroon, bumpy bracket fungus with hard, leathery shiny texture with white margin in upper surface and white lower surface turning brown when scratched; with lateral stipe

Edibility – edible but not palatable

Growth habit – solitary

Substrate – tree bark

Vernacular name – kulat betang

This macrofungal species is utilized by the Bugkalots as medicine.

Family Meripilaceae

Rigidoporus microporus (Sw.) Overeem Fig. 1X

Description – shiny, fan-shaped, yellow to turmeric bracket fungus with white margin in the upper surface and tiny light brown pores on the lower surface

Edibility – non-edible

Growth habit – solitary to gregarious (2-3 in a group)

Substrate – decaying twig

Vernacular name – kulat lukot-lukot

Family Polyporaceae

***Fomes* sp.** Fig. 1Y

Description – thick, velvety, semi rounded, white fungus with bumpy surface and rusty color inside

Edibility – non-edible
Growth habit – solitary
Substrate – decaying twig
Vernacular name – kulat bungkog 3

Hexagonia tenuis (Hook.) Fr. Fig. 1Z

Description – thin, leathery bracket fungus, with smooth and concentric zones of various shades of brown in the topside and hexagonal or honeycomb-like pores on the bottom of the fruiting body
Edibility – non-edible
Growth habit – solitary to gregarious (2-4 in a group)
Substrate – dead tree trunk
Vernacular name – kulat gilengan

***Lentinus* sp. 1** Fig. 1AA

Description – tan to brown fruiting body with crenate or scalloped edge and dark brown scales on the surface of the pileus; white to cream, crowded space gills extending down to the stipe
Edibility – edible
Growth habit – gregarious
Substrate – decaying log
Vernacular name – kulat bitkalan anoy
This macrofungal species is utilized by the Bugkalots as food.

***Lentinus* sp. 2** Fig. 1BB

Description – tan to brown fruiting body with rolled margin and small, dark brown scales on the surface of the pileus; white to cream, crowded space gills tapering downward the stipe
Edibility – edible
Growth habit – gregarious
Substrate – dead log
Vernacular name – kulat bitkalan lukong
This macrofungal species is utilized by the Bugkalots as food.

Lentinus tigrinus (Bull.) Fr. Fig. 1CC

Description – tan to brown funnel-shaped fruiting body with dark brown scales on the surface of the pileus and split margin; white to cream, crowded space gills extending down to the stipe
Edibility – edible
Growth habit – solitary to gregarious (2-3 in a group)
Substrate – dead log
Vernacular name – kulat bitkalan sipsip
This macrofungal species is utilized by the Bugkalots as food.

Microporus affinis (Bl. & T. Nees) Kuntze Fig. 1DD

Description – thin, flat, leathery bracket fungus banded with color varying from light yellowish, brown, chestnut, bay to black usually darker at the center and creamy white margin in the upper surface and white fine pores in the lower surface, with eroded edge and lateral stipe
Edibility – non-edible
Growth habit – gregarious
Substrate – decaying log
Vernacular name – kulat bitakan

Microporus affinis (Bl. & T. Nees) Kuntze Fig. 1DD

Description – thin, flat, leathery bracket fungus banded with color varying from light yellowish, brown, chestnut, bay to black usually darker at the center and creamy white margin in the upper surface and white fine pores in the lower surface, with eroded edge and lateral stipe

Edibility – non-edible
Growth habit – gregarious
Substrate – decaying log
Vernacular name – kulat bitakan

Microporus subaffinis **(**Lloyd) Imazeki Fig. 1EE

Description – thin, flat, kidney-shaped, woody brown bracket fungus with black tiny patches on the entire upper surface and brown fine pores in the lower surface, with even edge and lateral stipe

Edibility – non-edible
Growth habit – gregarious
Substrate – decaying log
Vernacular name – kulat alengi

Microporus xanthopus (Fr.) Kuntze Fig. 1FF

Description – broadly funnel-shaped fruiting body with various shades of brown and cream on the inner surface and cream to white on the outer surface covered with numerous tiny pores

Edibility – non-edible
Growth habit – solitary
Substrate – dead log
Vernacular name – kulat lading

Polyporus picipes Fr. Fig. 1GG

Description – hard, semicircular bracket, woody black fungus with rough texture on the surface and ridged gills on the underside

Edibility – edible but not palatable
Growth habit – gregarious
Substrate – dead log
Vernacular name – kulat kaneg 1
This macrofungal species is utilized by the Bugkalots as medicine.

Polyporus **sp. 1** Fig. 1HH

Description – flexible, semicirular, pale cream bracket fungus with corky texture and slightly uneven elevated areas on the upper surface; creamy buff, varying pores shape ranging from round to angular to elongate or sinuous-daedaloid on the lower surface; stipe usually but occasionally present as a stubby lateral structure.

Edibility – non-edible
Growth habit – solitary
Substrate – decaying tree trunk
Vernacular name – kulat kaneg 2

Polyporus **sp. 2** Fig. 1II

Description – small, cream, semicircular bracket fungus with smooth texture on the surface and hollow pores joining crossways on the underside

Edibility – edible
Growth habit – solitary to gregarious (2-5 in a group)
Substrate – dead log
Vernacular name – kulat kuyong 1
This macrofungal species is utilized by the Bugkalots as food.

***Polyporus* sp. 3** Fig. 1JJ

Description – jelly-like, lightly tan, seashell-shaped bracket fungus with even warty-like texture on the upper surface and open hollow pores on the underside

Edibility – edible

Growth habit – solitary to gregarious (2-3 in a group)

Substrate – decaying log

Vernacular name – kulat kuyong 2

This macrofungal species is utilized by the Bugkalots as food.

***Polyporus* sp. 4** Fig. 1KK

Description – thick, hard, woody orange bracket fungus with furrowed zones in upper surface and tiny orange pores in the lower surface

Edibility – edible but not palatable

Growth habit – gregarious

Substrate – decaying log

Vernacular name – kulat simbed

This macrofungal species is utilized by the Bugkalots as medicine.

Pycnoporus sanguineus (L.) Murrill Fig. 1LL

Description – thin, shiny, flexible, orange bracket fungus with tiny even pores on the underside

Edibility – non-edible

Growth habit – solitary to gregarious (2-3 in a group)

Substrate – tree bark

Vernacular name – kulat gekagek

Trametes elegans 1 (Spreng.) Fr. Fig. 1MM

Description – semicircular, milky white bracket fungus concentric grooves on the topside and gill-like to maze-like pore pattern in the underside; with lateral stipe

Edibility – non-edible

Growth habit – solitary to gregarious (2-7 in a group)

Substrate – dead log

Vernacular name – kulat lapsyaken

Trametes elegans 2 (Spreng.) Fr. Fig. 1NN

Description – kidney-shaped, white to cream bracket fungus with concentric grooves on the upper surface (old basidiocarp are rigid and green near the center from algae) and gill-like to maze-like pore pattern on the underside; with lateral stipe

Edibility – non-edible

Growth habit – solitary to gregarious (2-3 in a group)

Substrate – decaying log

Vernacular name – kulat sinangap

***Trametes* sp.** Fig. 1OO

Description – hard, semicircular, bracket fungus with concentric zones of various shade of brown with even distinct pores on the underside; without stipe

Edibility – non-edible

Growth habit – solitary to gregarious (2-5 in a group)

Substrate – dead trunk

Vernacular name – kulat lukip

Order Russulales

Family Russulaceae

***Lactarius* sp.** Fig. 1PP

Description – pileus is plane, creamy brown, smooth and even; gills is adnexed; brown, unequal and subdistant; stipe id centered, rounded fibrous and hollow

Edibility – non-edible

Growth habit – solitary

Substrate – soil

Vernacular name – kulat kinegan

Stereum hirsutum (Willd.) Pers. Fig. 1QQ

Description – semicircular or fan-shaped, densely velvety, with concentric zones of color ranging from yellow to tan, brown or reddish brown, laterally attached fruiting body; without stipe

Edibility – non-edible

Growth habit – gregarious

Substrate – decaying twig

Vernacular name – kulat pakat-pakat

Stereum lobatum (Kunze ex Fr.) Fr. Fig. 1RR

Description – broad, irregularly shape, pale yellow bracket fungus with rubbery texture and tiny even pores on the underside; with lateral stipe

Edibility – edible

Growth habit – gregarious

Substrate – decaying log

Vernacular name – kulat kagkagen

This macrofungal species is utilized by the Bugkalots as food.

Stereum ostrea (Bl. & T. Nees) Fr. Fig. 1SS

Description – semicircular or funnel-shaped that has been sliced down on one side, smooth with concentric zones of orange, yellowish and brown on top and underside of fruiting body, without stipe

Edibility – non-edible

Growth habit – gregarious

Substrate – dead log

Vernacular name – kulat agang

Discussion

The collected and identified macrofungi were *Auricularia auricula-judae*, *Auricularia polytricha*, *Boletus* sp., *Clitocybe* sp., *Coprinellus disseminatus*, *Coprinopsis atramentaria*, *Coprinopsis lagopus*, *Coprinus cinereus*, *Crepidotus* sp., *Fomes* sp., *Ganoderma australe*, *Ganoderma lucidum*, *Ganoderma* sp. 1, *Ganoderma* sp. 2, *Ganorderma* sp. 3, *Ganoderma tsugae*, *Hexagonia tenuis*, *Hymenochaete tenuissima*, *Lactarius* sp., *Lentinus* sp. 1, *Lentinus* sp. 2, *Lentinus tigrinus*, *Marasmiellus* sp., *Marasmius* sp. 1, *Marasmius* sp. 2, *Microporus affinis*, *Microporus subaffinis*, *Microporus xanthopus*, *Mycena* sp., *Panaeolus* sp., *Pleurotus dryinus*, *Polyporus picipes*, *Polyporus* sp. 1, *Polyporus* sp. 2, *Polyporus* sp. 3, *Polyporus* sp. 4, *Pycnoporus sanguineus*, *Rigidoporus microporus*, *Schizophyllum commune*, *Stereum hirsutum*, *Stereum lobatum*, *Stereum ostrea*, *Trametes elegans* 1, *Trametes elegans* 2 and *Trametes* sp. (Fig. 1).

All of them belonged to class Agaricomycetes of subdivision Agaricomycotina, division Basidiomycota. This class constituted most of the basidiomycete species such as gilled mushrooms, bracket fungi, puffballs, crust fungi, chanterelles, coral fungi and jelly fungi (Hibbett 2006). It also

represents about one-fifth of the world's fungal species comprising 17 orders, 100 families, 1,147 genus and about 21,000 species (Kirk et al. 2008).

Fig. 1 – Macrofungi of Mt. Umubi in Alfonso Castañeda, Nueva Vizcaya, Philippines. A *Panaeolus* sp. B *Crepidotus* sp. C *Marasmiellus* sp. D *Marasmius* sp. 1. E *Marasmius* sp. 2.

F *Mycena* sp. G *Pleurotus dryinus*. H *Coprinellus disseminates*. I *Coprinopsis atramentaria*. J *Coprinopsis lagopus*. K *Coprinus cinereus*. L *Schizophyllum commune*. M *Clitocybe* sp. N *Auricularia auricula-judae*. O *Auricularia polytricha*. P *Boletus* sp. Q *Hymenochaete tenuissima*. R *Ganoderma austral*. S *Ganoderma lucidum*. T *Ganoderma* sp. 1. U *Ganoderma* sp. 2. V *Ganorderma* sp. 3. W *Ganoderma tsugae*. X *Rigidoporus microporus*. Y *Fomes* sp. Z *Hexagonia tenuis*. AA *Lentinus* sp. 1. BB *Lentinus* sp. 2. CC *Lentinus tigrinus*. DD *Microporus affinis*. EE *Microporus subaffinis*. FF *Microporus xanthopus*. GG *Polyporus picipes*. HH *Polyporus* sp. 1. II *Polyporus* sp. 2. JJ *Polyporus* sp. 3. KK *Polyporus* sp. 4. LL *Pycnoporus sanguineus*. MM *Trametes elegans* 1. NN *Trametes elegans* 2. OO *Trametes* sp. PP *Lactarius* sp. QQ *Stereum hirsutum*. RR *Stereum lobatum*. SS *Stereum ostrea*.

Fig. 1 – Continued.

Fig. 1 – Continued.

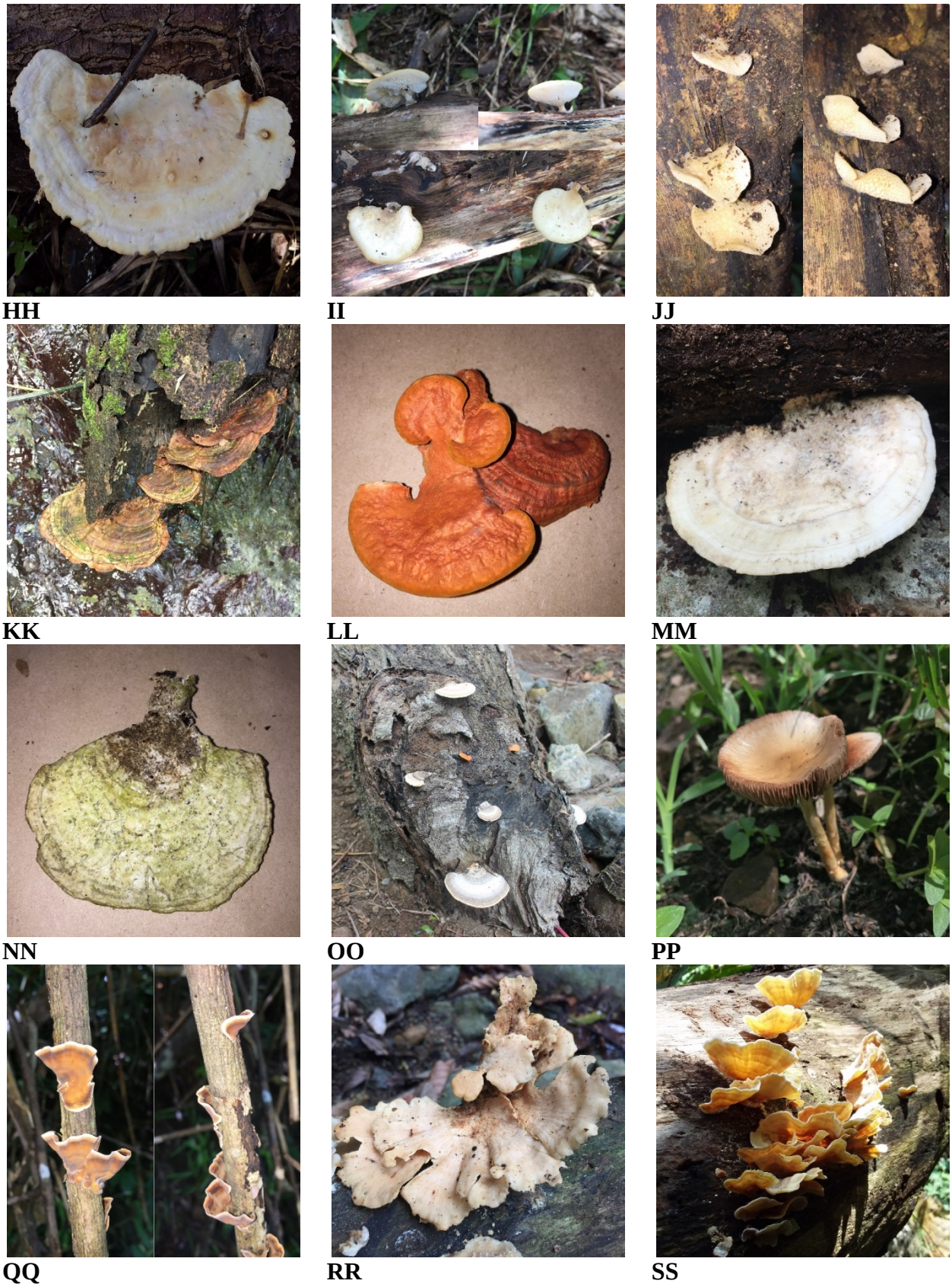

Fig. 1 – Continued.

Most of the collected species are wood-rotters, which are usually found growing on decaying or dead logs, tree trunk, twigs and bamboos. From these, Family Polyporaceae dominated the site having 17 representatives. Their abundance in the area is not surprising since the community where

the Bugkalots live in is a forested mountain. Similarly, family Polyporaceae also outnumbered other macrofungi families in Mt. Maculot in Batangas (Arenas et al. 2018), Mt. Banahaw in the provinces of Quezon and Laguna (Tadiosa et al. 2016) and Mt. Palaypalay in Southern Luzon, Philippines (Arenas et al. 2015). Other wood-rotter macrofungi families are also present including Auriculariaceae, Ganodermataceae, Hymenochaetaceae, Marasmiaceae, Meripilaceae, Mycenaceae, Pleurotaceae, Schizophyllaceae, Stereaceae and Tricholomataceae with 1 to 6 representatives only. Meanwhile, soil macrofungi families such as Boletaceae (*Boletus* sp.), Psathyrellaceae (*C. disseminatus*, *C. atramentaria*, *C. lagopus* and *C. cinereus*), Russulaceae (*Lactarius* sp.) and Bolbitiaceae (*Panaeolus* sp.) and leaf litter macrofungi family such as Crepidotaceae (*Crepidotus* sp.) were also collected. These ecologically grouped basiodiomycetes are carrying out an important role in the nature as they are the natural lignocellulose degraders of plants and trees residues (Chang & Chou 1995). They contribute in enriching the soil with essential mineral compounds to be used by other organisms. However, they also possess threat to ecological balance being silent killer to other valuable trees such as dipterocarps (De Castro & Dulay 2015).

Interestingly, 25 species of macrofungi from the checklist were found to be utilized as either food (*A. auricula-judae*, *A. polytricha*, *Boletus* sp., *Clitocybe* sp., *C. atramentaria*, *C. lagopus*, *C. cinereus*, *Lentinus* sp. 1, *Lentinus* sp. 2, *L. tigrinus*, *Mycena* sp., *Panaeolus* sp., *P. dryinus*, *Polyporus* sp. 2, *Polyporus* sp. 3, *S. commune* and *S. lobatum*) or medicine (*G. australe*, *G. lucidum*, *Ganoderma* sp. 1, *Ganoderma* sp. 2, *Ganoderma* sp. 3, *Ganoderma tsugae*, *P. picipes* and *Polyporus* sp. 4) by the Bugkalot tribal community. The edible mushrooms are cooked as viands, usually prepared boiled or sautéed with meats and other vegetables. Meanwhile, all medicinal mushrooms are also edible but not palatable. They are usually prepared as tea or broth, not a delicacy, instead. Some of the aforementioned mushrooms such as *A. auricula-judae*, *A. polytricha*, *G. lucidum*, *L. tigrinus* and *S. commune* were also used for similar purposes by other indigenous group in the Philippines (De Leon et al. 2012, Lazo et al. 2015, De Leon et al. 2018 Tantengco & Ragrario 2018). These edible mushrooms are so important that they can be used for alleviating health problems considering their nutraceutical and pharmacological benefits. In fact, these wild edible macrofungi has already been investigated from different countries for their biological activities *G. lucidum* demonstrated a positive health benefits, including anticancer, antihypertensive, antiviral, antibacterial and immunomodulatory activities and protection against liver and gastric injury (Wachtel-Galor et al. 2011). *L. tigrinus* showed antidiabetic activity (Dulay et al. 2014) while *S. commune* are good sources of antimicrobial agents (Mirfat et al. 2014). *A. auricula-judae* promotes procollagen biosynthesis in HaCat Cells which also suggest that it has the potential to exhibit antioxidant activity (Choi et al. 2018). *A. polytricha* has been recently reported to be a potent of sources of anti-inflammatory and antioxidative agent (Chiu et al. 2014). Meanwhile, some macrofungi that have been reported in this study, despite being inedible, could possess other potentials such as for solving environmental problems. Many wood decomposing basidiomycetes has been described to be among the most powerful organism to solve problems on pollutions (Zotti et al. 2013). Thus, further exploitation of these macrofungi as potent agent for wastes biodegradation must be considered in future studies. Moreover, they can be valuable sources of bioactive compounds that may be useful for the treatment of several diseases like cancer.

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