Berita Biologi, Volume 7, Nomor I. April 2004 dan Nomor 2, Agustus 2004
Edisi Khusus: Biodiversitas Taman Nasional Gunung Halimun (III)

NOTES ON DIVERSITY OF AGARICALES IN GUNUNG HALIMUN NATIONAL PARK

[Catatan Tentang Keanekaragaman Jamur Agaricales di Taman Nasional Gunung Halimun]

Atik Retnowati

Herbarium Bogoriense, Bidang Botani, Pusat Penelitian Biologi - LIPI

ABSTRACT

Studi taksonomi jamur di Taman Nasional Gunung Halimun (TNGH) belum dilakukan dengan intensif. Sebanyak 35 jenis Agarics dikoleksi dari kawasan TNGH meliputi 23 marga dan 9 suku. Kekayaan keanekaragaman jamur ini diperoleh dari eksplorasi di 3 lokasi yaitu Cikaniki, Gunung Botol dan Gunung Telaga (Ciptarasa). Sejumlah sampel belum teridentifikasi karena karakter yang belum jelas. Oleh karena itu, jumlah jenis-jenis baru dari eksplorasi ini belum dapat diketahui.

Kata kunci/ Key words: keragaman/diversity, Agaricales, Taman Nasional Gunung Halimun/Gunung Halimun National Park.

INTRODUCTION

From a mycological point, the diversity of Indonesian mushrooms is widely unknown, although as a tropical country with large diversity of plants, it is very easy to facilitate mushrooms to grow. Approximately, over 500 species of Agaricales have been reported between 1845-1951 by Leveille, Henning, Overeem, and Boedijn; and about 50 species of Agaricales are reported by Desjardin, Retnowati and Horak (2000-2004). Within 7 years (1998-2004), the additional specimens of Agaricales kept in Herbarium Bogoriense (BO) are about 1600 collections. Compared to additional collections of higher plants, this number is considered low. To fill this gap, the research, focuses on the inventory of Agaricales is highly recommended.

Among the groups of fungi, the Agaricales is the most well known group, which comprises of many edible and poisonous members. The Agaricales can be characterized as the order consisting of Agarics and Boletes. The mushrooms called Agarics commonly produces their spores on gills, which radiate out from the underside of a protective cap, while Boletes produces their spores on pores. They diverse in form of pileus, stem, colour, and look very similar. Thus, it requires careful examination for accurate identification.

Gunung Halimun National Park (GHNP) is one of the evergreen rain forests left in Java, and it is exciting area to be studied. The inventory of Agaricales from three locations in this park (Cikaniki trail, Mt. Botol and Mt Telaga in Ciptarasa) were carried out, and the chosen genera have been selected on the basis that they are likely to be found from those locations.

Cikaniki trail is located in the eastern and southern parts of GHNP. Primary forest in this trail is dominated by the presence of the genera belong to *Fagaceae* family *(Castanopsis* spp., *Lithocarpus* spp., and *Quercus* spp.), *Schima wallichii* and *Altingia excelsa* (Simbolon *et al*, 1998). The presence of those vegetations can be a sign that many fascinating ectomycorrhiza mushrooms grow well in this particular area.

Since Agarics has never been studied intensively from GHNP, this research has 3 objectives namely 1) to obtain data for measuring mushrooms diversity in the park, 2) to understand what species or genus are presence and their habitats, and 3) to improve the quality and quantity of Herbarium Bogoriense (BO) fungal collections.

METHODS

By comparing to plants, mushrooms are easily collected and the equipments for mushrooms collecting are relatively simple and inexpensive. A basket is good equipment for carrying collections. A hunting knife can be used for cutting and picking fruiting bodies from logs or for digging them. Wrapped paper permits some air circulation around the specimens, so that they do not dry out and stay longer. A hand lens or pocket magnifier is useful for

making observations on small fruiting body or checking details on larger ones.

Sufficient numbers of basidiocarps were collected to demonstrate the stage development. They must represent as many growth stages as were available in order to examine variability within the species and only collect the good quality and healthy specimens are approved.

As needed, photographs were taken from suitable basidiocarps. Spore prints were made in the field on white paper or on microscope slide. By cut off the upper stipe, place the half cap over the black and half cap over white paper. Successful prints were usually obtained after about 24 hours, then spore print color was recorded. When you wish to identify the mushrooms you collect, the most important is what the spore color, then go to selected spore color section. Field notes consisted of the macroscopic characters of the fruiting bodies, habitat, habit, collection number, and collector number were attached to the separate paper of the microscopic characters, which is done in laboratory. Macroscopic characters have to be obtained soon before drying process, which has to be done perfectly. Notes on microscopic features are usually accomplished in the laboratory, and examined by using some reagents namely 1). Melzer's reagent, which is applied to mushrooms tissue, and it composed of dissolved Iodine (1.5 gram), Potassium-Iodine (5 gram), and Chloral Hydrate (100 gram) in 100 ml water. The reaction may produce a blue-black (amyloid), red-brown (dextrinoid), or none et all. 2). Congo Red, which is used to stain the walls ofhyphae (formula: dissolve 1(2) grams of Congo Red in 99 (98 ml) water. 3). Potassium hydroxide (KOH-3-5 %) is applied to inflate mushroom tissues when preparing microscopic mounts of dried materials. 4). Phloxine A (1 %) is used to stain the interioir hyphae. 5). Cotton blue is used to test the spore walls. The formula of this reagent is dissolved SO ml of 1 % aqueous solution of CottonBlue(l gram cottonblue in 99 ml water)in Lactic acid (100 gram), phenol (100 gram), glycerine (ISO ml) andH2O(50ml).

This work is based primarily on the Japan International Cooperation Agency (JICA) project specimens, and some type specimens, which are available in BO.

RESULT

Thirty-five species of agarics belong to *21* genera and 9 families were collected during tb; exploration from three sites in GHNP i.e Cikanik. Mt. Botol, and Mt. Telaga (Ciptarasa). Clearly, tie most dominant mushrooms in GHNP, are whin spored and saprotrophic taxa and som; ectomycorrhizal genera *Lactarius, Russula,* ani *Xerocomus.*

Some can be identified to species or to genen. Some specimens are unidentified, due to ambiguoui characters either microscopic or macroscopic Tracing literature had been done, and the character? do not fit with any descriptions. Because of limited data concerning the diversity of Agaricales \z Indonesia, discussion with others mycologists and study specimens in other herbaria, such as ZT o: SFSU, are needed. The total number and genera encountered of agarics each family collected are given in Table 1.

DISCUSSION

Diversity

In general, the diversity of mushrooms in GHNP is not high. During six days trip, totally was gathered 35 species belong to 23 genera within 9 families. The result should be higher, if there was more trips in the right season; however, there is no guarantee that walking in many hours in the right season will pick many mushrooms. It happens that fleshy fungi tend to be appeared seasonally, and the most productive months are in the rainy season. Nobody will be able to predict when the mushrooms appear. Under this circumstances, collecting regularly in one site is highly recommended. The right time will be rewarded with the right mushrooms in good quality.

Preliminary collection data from the three trips suggest that Cikaniki site should be explored more intensively. The habitat in this site has a greater diversity than other sites. At present, there is not enough information to comment the species richness or endemism in GHNP. More trips from other different locations are highly needed to support the prior data from the previous three different collecting sites in GHNP.

Table 1. List of Agaricales taxa encountered in GHNP.

No	Family	Genera	Number of species
1.	*Tricholomataceae*	*Marasmius*	4
		Vanromburghia	1
		Mycena	1
		Xerula	1
		Armillaria	1
		Mycenaporella	1
		Collybia	2
		Gymnopus	1
		Hemimycena	1
		Lentinellus	1
		Marasmiellus	1
2.	*Russulaceae*	*Russula*	2
		Laclarius	2
3.	*Strophariaceae*	*Hypholoma*	1
		Stropharia	1
		Melanotus	1
4.	*Entolomataceae*	*Entoloma*	3
5.	*Crepidotaceae*	*Crepidotus*	2
6.	*Cortinariaceae*	*Cortinarius*	2
7.	*Hygrophoraceae*	*Hygrophorus*	2
		Hygrocybe	2
8.	*Boletaceae*	*Xerocomus*	1
9.	*Coprinaceae*	*Psathyrella*	1

Overview of the genera **encountered**

Twenty-three genera was found, and belong to 9 families. Four families are considered as high diversity based on the number of species collected.

Tricholomataceae

Genera in the family *Tricholomataceae* are the most common mushrooms found. Fifteen species were collected in GHNP and the most frequently common genus was *Marasmius.* This genus occurs in tropical and temperate area on substrate varying from rotten leaves dead wood, twigs, or soil. Seven collections represent 7 species of *Marasmius* were encountered from three different collecting sites i.e Cikaniki, Mt. Botol, and Mt. Telaga (Ciptarasa). The most fascinating species of this genus is *Marasmius berambutanus* Desjardin, Retnowati, & Horak which was described as a new species from Cikaniki in 2000 (Desjardin *et al,* 2000). This species is distinguished by a very small, white to cream pileus that is covered with small setae and has a reddish brown central papilla, by collariate lamellae, and by a forming stipes that arise directly from rhizomorphs. Another

interesting species is *Vanromburghia silvestris* Holterman. It is characterized by wrinkled pileus colored yellowish brown, and by a smooth hymenophore. It is one of the common genera collected in Cikaniki, Mt. Botol and Mt. Telaga.

Russulaceae

The *Russulaceae* is the second most frequently encountered family of Agarics in GHNP. *Russula* and *Lactarius* are the members of *Russulaceae,* which are differentiated by the presence or absence of latex and sphaerocysts in hymenophoral trama. *Lactarius* exudates latex either watery or milky white, yellow, orange, red, blue, and has no sphaerocysts in hymenophoral trama. In contrast, *Russula* has no latex, and it has sphaerocysts in hymenophoral trama. Both are ectomycorrhizal fungi, which may become important in forestry.

Strophariaceae

Three known genera of *Strophariaceae* were found in GHNP. *Hypholoma,* which was found gregarious on wood, is a difficult genus to work on and many undescribed species in tropic and temperate as well. The second genus is *Stropharia,* which is distinguished by the presence of veil that protects the young gills. As a cosmopolitan genus, *Stropharia* mostly grows on the soil and foliage, on wood or sawdust, or on dung. The genus is comparatively well known but there is no doubt that there are still many undescribed species. The first two genera were found in Cikaniki site. Different from other genera in this family, *Melanotus* is easily distinguished by having eccentric to lateral, very short or absent stipe.

Entolomataceae

Angular spores in end and side view, or subangular in end view, and striate in side view, or angular to angular-warted in end view and warted in side view are most distinctive feature of the *Entolomataceae.* As a cosmopolitan family, the members of *Entolomataceae* can grow on various substrates, even on carphophores of Agaricales and Aphylloprales, also in deep moss, on cortex and wood, dead leaves, etc., most frequently on the soil, not ectomycorrhizal fungi (Singer, 1986). The only genus encountered within this family is *Entoloma.* From three trips to GHNP, it was collected three different collections from Cikaniki and Mt. Botol.

Besides the four biggest genera was mentioned, some other main families in GHNP are Crepidotaceae, Boletaceae, Coprinaceae, Cortinariaceae and Hygrophoraceae. One to two specimens each family were collected in GHNP.

Habitat

The fleshy mushrooms occur in a wide variety of habitat ranging from the arctic to tropic. Some species show a preference for a certain type of habitat. Mushrooms also show a preference for a particular substrate. Some typically are produced on the soil. Others are formed on dead leaves (folicolous), on wood (lignicolous), or dung (coprophilous). A few grow on basidiocarps of other mushrooms and are termed fungicolous. The various habitat and substrate reflect the fact that Agaricales contains parasitic, saprobic, and mycorrhizal form.

In GHNP, soil, wood and dead leaves are the major substrate where mushrooms grow and no mushrooms grow on dung (coprophillous). Some are ectomycorrhizal fungi, such as *Russula, Lactarius,* and *Cortinarius,* which associate with some mycorrhizal trees. *Amanita* occurs gregariously on soil surrounded by *Lithocarpus* (Fagaceae), which is one of the mycorrhizal trees.

During the fieldwork in GHNP, the information concerning edible mushroom was gathered, and not many local people consume wild mushrooms. The only thing comes over to their mind is that mushrooms are poisonous, and they are still afraid to consume the wild mushrooms. Fortunately, no edible mushrooms were collected from three locations in GHNP.

Contribution for the National Park Management

GHNP is one of the evergreen rainforests, and contains the largest lowland forest left in Java. This area is a potential place to be studied from different fields. Related to mycology study on diversity of Agaricales on GHNP, the presence of some certain plants, which associate with mushrooms, are eagerly recommended to conserve them. By looking the presence of the oak *{Lithocarpus* and *Castanopsis),*

and numerous species of Laurels (Fagaceae and Lauraceae), it can be indicated that ectomycorrhizal fungi are presence.

Ectomycorrhizae fungi usually use complex carbohydrate, and also thiamin, vitamins. Having become associate with the host plants, such as *Lithocarpus* or *Castanopsis,* they provide with soluble carbohydrate that enables them to thrive and produce their comparatively large fruiting body. Host plants can be employed the mycelium of mushrooms to transport water and other minerals from environment, which are needed in its life. Symbiosis between ectomycorrhizae fungi and its host plants will be never happened if the host plants disappear from the forest.

ACKNOWLEDGEMENT

Special thanks are given to JICA, as a sponsor, for giving an opportunity to explore the diversity of mushrooms in GHNP, and also GHNP staff who made the research possible.

REFERENCES

Alexopoulos CJ. 1996. *Introductory Mycology.* John Wiley & Sons. USA.

Desjardin DE. 1999. *Spring Fungi of the Sierra Nevada.* San Francisco State University.

_____, **Retnowati A, Horak E. 2000.** The Agaricales of Indonesia (2): The Genus *Marasmius* of Java and Bali. *Sydowia* **52 (2), 92-193.**

Kornerup A and Wanscher JH. 1983. *Methuen Handbook of Colour.* Fletcher & Son. Norwich.

Largent DL and Baroni TJ. 1988. *How to Identify Mushrooms to Genus VI: Modern Genera.* Mad River. Eureka, California.

Landecker EM. 1996. *Fundamentals of the Fungi.* Prentice-Hall. New Jersey.

Simbolon H, Wiriadinata H and Yoneda M. 1998. Plant Diversity in GHNP, West Java Indonesia: Inventorying Activities. In II Simbolon, M Yoneda M and Sugardjito (Eds.). *Gunung Halimun: The Last Submontane Tropical Forest in West Java,* 1-11.