Biodiversity of Mushrooms in Conservative Forest of Batu Katak resort, Langkat regency, North Sumatra

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Abstract. Eighty mushroom species were collected during a field study at Conservative Forest in Batu Katak resort, Langkat regency, North Sumatera. Inventory was conducted by exploring four accessible paths and mushrooms were recorded for its identity and growth substrates. The most common mushroom species found in this study were lignicolous species, i.e. *Polyporus*, *Marasmius*, *Schizophyllum*, *Trametes* and *Xylaria*. The most utilized substrates for mushroom growth were dead logs which indicate a light-penetrated area of opened gap in forest favoring the growth of bracket fungi or lignicolous species. This baseline study may be used as data record for further mycological and laboratory studies. In addition, our records may be utilized as valuable information to local and foreign tourists who interest of mushroom picking and hunting in the future.

1. Introduction
Mushrooms are non-timber product in forest with potential as economical and medicinal products. Mushrooms are bio-products with multifunctional properties as medicine, food and forest ecological drivers of successions through wood decomposition [1]. Mushrooms may grow on variety of substrates, explaining their versatility to inhabit or even colonize spatial region especially during rainy season [2]. To date, ± 140,000 mushroom species have been identified with 70% of informations were derived from Northern America as a country known for its mushroom hunting [3].

To date, information or study of tropical mushroom in Indonesia is still limited. In North Sumatra, tropical distribution of mushrooms have been recorded with 89 lignicolous macromycetes found in Sibolangit forest [4]. During a field study in forest region of Gunung Leuser National Park, we attempted to collect lignicolous fungi or mushrooms community inhabiting Conservative Forest near Batu Katak resort. To our understanding, there is no information on mushroom diversity in this forest area.

2. Method
The study was an exploratory survey conducted in Batu Katak forest resort managed by Bahorok district officials. Batu Katak forest resort is located ± 80 km from Medan, a capital city of North Sumatra, Indonesia. The exploration began by following accessible paths in Conservative Forest adjacent to Gunung Leuser National Park forest region (N: 03°26′,53.2″ E: 98°07′06.4″). Mushrooms were visually observed and collected by hand. Mushroom specimens were identified tentatively and stored in paper wrap prior laboratory identification. Substrates of growth were also noted in the field.
Identification was based on morphological characteristics using literatures [5,6]. Information regarding taxa of mushrooms is presented and analyzed descriptively.

3. Results and Discussion

Our survey found 51 mushroom species belonging to 8 species of Ascomycota and 43 species of Basidiomycota. The 8 species of Ascomycota represented 7 genera from 4 families while 43 species of Basidiomycota represented 28 genera from 19 families. Marasmiaceae and Polyporaceae were two most speciose families in this study. The list of taxa is presented in Table 1. The percentage of colonization based on variety of growth substrates is presented in Figure 1.

Table 1. List of mushroom taxa collected in Batu Katak Conservative Forest

| N  | Division     | Class       | Order   | Family                  | Genera/Species          |
|----|--------------|-------------|---------|-------------------------|-------------------------|
| 1  | Ascomycota   | Pezizomycetes | Peziales | Helvellaceae            | Helvella sp.            |
| 2  |              |             |         | Pyrenomataceae          | Scutellinia scutellata  |
| 3  |              |             |         | Sacroscyphaceae         | Cookeina speciosa       |
| 4  |              |             |         |                         | Microstoma sp.          |
| 5  |              |             |         |                         | Pityha sp.              |
| 6  | Sodariomycetes | Xylariales |         |                          | Daldinia concentrica    |
| 7  |              |             | Xylariaceae |                       | Xylaria hypoxylon       |
| 8  |              |             |         | Xylaria polymorpha      |                         |
| 9  | Basidiomycota | Agaricomycetes | Agaricales | Agaricaceae            | Coprinus arramentarius  |
| 10 |              |             |         |                         | Coprinus disseminatus   |
| 11 |              |             |         |                          | Lencogaricus puidicus   |
| 12 |              |             |         |                          | Lycoperdon perlatum     |
| 13 |              |             |         |                          | Lycoperdon pyriforme    |
| 14 |              |             |         | Clavariaceae            | Ramariopsis kunzei      |
| 15 |              |             |         |                          | Ramariopsis tenuiramosa |
| 16 |              |             |         | Crepidotaceae           | Crepidotus sp.          |
| 17 |              |             |         | Marasmiaceae            | Marasmiellus affixus    |
| 18 |              |             |         |                          | Marasmiellus candidus   |
| 19 |              |             |         |                          | Marasmius androsaceus   |
| 20 |              |             |         | Marasmius candidus      |                         |
| 21 |              |             |         |                          | Marasmius cohaerens     |
| 22 |              |             |         |                          | Marasmius siccus        |
| 23 |              |             |         | Pleurocybella porignens |                         |
| 24 |              |             |         | Mycenaceae              | Mycena vulgaris         |
| 25 |              |             |         | Physalaciaceae          | Rhizomarasmius pyrocephalus |
| 26 |              |             |         |                          | Oudemansiella mucida    |
| 27 |              |             |         | Pleurotaceae            | Pleurotus ostreatus     |
| 28 |              |             |         | Plateaceae              | Plateus sp.             |
| 29 |              |             |         | Psathyrellaceae         | Psathyrella foeniseccii |
| 30 |              |             |         |                          | Psathyrella longipes    |
| 31 |              |             |         | Schizophyllaceae        | Schizophyllum commune    |
| 32 |              |             |         | Strophariaceae          | Pholiota carbonaria     |
| 33 |              |             |         | Tricholomataceae        | Clitocybe trullaeformis |
| 34 |              |             |         |                          | Collybia cirrhata       |
During our field observation, the tracking paths were less covered by forest canopies. Many dead logs were found during exploration indicating intense gap opening within forest. The conservative forest in Batu Katak was still considered as secondary forest due to its official status not yet recognized by the government. Hence, the dense dead logs are suitable habitat for the growth of lignicolous fungi (Figure 1) such as Polyporus, Marasmius, Schizophyllum, Trametes and Xylaria. Dead logs are suitable habitat for mushrooms in wet tropical forest by increasing possible substrate for growth [7]. Mushrooms play a significant role in wood decomposition in the forest. Although mostly substrates found were dead logs, some white-rot fungi may also act as facultative pathogen to infect living trees [8].

Batu Katak is a tourist resort located in Batu Jong Jong village and managed by local communities. Prolonged survey within varying season is assumed to record more species in Batu Katak
Conservative Forest but existence of bracket fungi is seemed to persist in forest area through the year. Bracket fungi species, *Ganoderma* and *Phelinus* were reported to persist all around year in Western Ghats, India [9]. A higher dominance of mushroom species was also reported during rainy season than dry season in Nigeria [10]. A two-year survey conducted in Central India has reported 153 edible mushroom species with participation of local community [11]. Other discipline, called ethnomycology is of recent interest as well in discovering potential medicinal mushroom in tropical region. To date, ethnomycology studies in Indonesia were still limited. A study reported the utilization of *Xylaria* as traditional remedies by Dayak Ngaju tribe in Central Kalimantan [12]. Other study also reported the use of bracket fungi by Baduy tribe in Banten, Java in specific of *Ganoderma lucidum* [13]. By looking to our result, many possibility on finding unique application of indigenous mushrooms can be achieved in the future investigations.

4. Conclusion
The preliminary investigation of mushroom taxa has recorded 51 mushroom species belonging to 4 classes, 9 orders and 23 families of Ascomycota and Basidiomycota. Further investigations are needed to extract more valuable information upon their assemblages in Conservative Forest of Batu Katak.

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