MACROFUNGI DIVERSITY IN MOUNT BURNI TELONG BENER MERIAH REGENCY ACEH PROVINCE

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Abstract

Mount Burni Telong has a diversity of fungi that play an important role in the forest ecosystem. This study aimed to determine the types of macrofungi found in Mount Burni Telong and index diversity macrofungi found in Mount Burni Telong. The method used in this study was to use the pathway method by observing macrofungi along the hiking trail with a distance of 10 meters to the left and 10 meters to the right starting from an altitude of 1800 mdpl to an altitude of 2600 mdpl. Macroscopic fungi found were identified and measured the physico-chemical parameters of the environment. Macroscopic fungi found were dominated by the Basidiomycota division and the Polyporaceae family. The results obtained were 31 macroscopic fungi from 2 divisions, 6 classes, 6 orders, 21 families, 26 genera, and 31 species. The most macroscopic fungi found in the Basidiomycota division, Agaricomycetes class, were 23 species and at least in the Ascomycota division, Pezizomycetes class, was as many as 1 species.

Keywords: Diversity; Fungi; Burni Telong

INTRODUCTION

Mount Burni Telong is one of the active volcanoes in Aceh Province. This mountain is located in the Gayo Highlands, Bener Meriah Regency with a peak altitude of 2624 m above sea level. Mount Burni Telong last erupted on December 7, 1924 which caused damage to the surrounding vegetation (Putri et al., 2015). Mount Burni Telong has a high diversity of flora and fauna with typical vegetation characteristics of wet highlands, including Edelweiss, nepenthes, pine and coffee (Gemashih et al., 2017). Mount Burni Telong also has a fungi diversity that plays an important role in the forest ecosystem.

Hawksworth & Robert (2017) stated that the number of species of fungi that have been identified is around 2.2 to 3.8 million species, there is an increasing compared to that in 2001 of 1.5 million species. The highest increasing occurred in 2010 as many as 1,800 species per year due to the use of molecular identification for species restrictions. In Indonesia it is assumed that there are about 12,000 types of fungi (mushrooms), while in the world there are around 47,000 types. Types that have been known are around 28,700 macro fungi and 24,000 rusts, smuts and molds and 13,500 lichens (Mardji & Massofian, 2009).

Fungi or mushrooms are one of the biotic components that play a role in maintaining balance and preserving nature. In addition, mushrooms contain complex organic compounds such as cellulose, hemi cellulose, pectin, starch, and lignin, which act as decomposers to help the decomposition of organic matter in the forest ecosystem. In this case (Khayati & Hadi, 2016) reported that ecologically, fungi have a real role in ecological events such as associations with plants that play a role in the nutrient cycle, food webs that affect the survival of tree saplings and tree growth. Anggraini et al., (2015) also reported that fungi help to fertilize the soil by providing nutrients for plants. Fungi also play a role in regulating the nutrient cycle. The nutrient cycle will be hampered if the litter does not decompose properly, so that the fungus becomes a decomposing organism with the help of enzymes found in fungal mycelium (Nasution et al., 2017; Wahyuni et al., 2019). Thus, macroscopic fungal research is very significant to determine the rate of nutrient decomposition and soil fertility.

MATERIALS AND METHODS

This research was conducted in the area of Mount Burni Telong, Bener Meriah Regency, Aceh Province. Determination of sampling points was carried out using the path method by observing macroscopic fungi along the climbing route with a distance of 10 meters to the right and 10
meters to the left along the hiking trail (Wahyuni et al., 2019). Mount Burni Telong has an altitude of 2600 masl. This research was conducted on the climbing route of Mount Burni Telong starting from an altitude of 1800 masl to an altitude of 2600 masl (Gemasih, et al., 2017).

The fungi obtained during observation were then measured for environmental physico-chemical parameters in the form of pH and soil moisture as measured using a soil tester, humidity and air temperature were measured using a hygrometer, and light intensity was measured using a lux meter; measurements were made in the area where each fungus was found. The fungi (mushrooms) specimens found were then documented using a digital camera. The documentation process started from the appearance of the macrohabitat and microhabitat of the fungus, then led to the top of the mushroom cap and the height of the fungus starting from the base to the tip of the mushroom cap. Documentation was carried out by juxtaposing mushrooms with a comparison scale in the form of a measuring instrument, namely a ruler (Wahyuni et al., 2019).

Observation was made on color, pores, volva, rings, hoods, stalks and smell of fungi, habitat/substrate (dead wood, living wood, soil, leaf litter/soil or rocks). Mushroom samples found were photographed based on where they grew. Mushroom samples were taken, namely for soft mushrooms taken with the substrate so that all parts of the mushrooms were taken and not cut, while for mushrooms with a hard texture and sticking to them, taking mushrooms by using a knife could also cut the substrate thinly. The mushroom samples obtained were put in a plastic bag containing 70% alcohol and labeled hanging (Darwis et al., 2020).

Mushrooms whose morphological characters have been recorded were then identified by referring to the identification book, namely World Biology Encyclopedia of Conifers and Mushrooms (Suhono, 2012) and A guide to Common Fungi of The Hunter Central Rivers Region (Skye and Pam, 2014).

RESULTS AND DISCUSSION
Types of Macroscopic Fungi on Mount Burni Telong

The results obtained shows that 31 macroscopic fungi from 2 divisions, 6 classes, 6 orders, 21 families, 26 genera, and 31 species can be seen in Table 1.
<table>
<thead>
<tr>
<th>No.</th>
<th>Division</th>
<th>Class</th>
<th>Ordo</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
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<td>Exidia alba</td>
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</table>
The most common macroscopic fungi found in the Basidiomycota division, Agaricomycetes class, were 23 species and the least was in the Ascomycota division, Pezizomycetes class, as many as 1 species (Table 1). In this case Santoso (2004) explained that the macroscopic fungal species were most often found from the basidiomycota division. The characteristic of the basidiomycota division is macroscopic, while the members of the ascomycota division are microscopic and only a small part is macroscopic or have fruiting body.

**Macroscopic Fungus Description**

The characteristics of macroscopic fungi that were found on Mount Burni Telong are as follows.

1. *Agaricus parvitigrinus*
   
   **Habitat**: dead wood twigs
   
   **Description**
   
   Mushrooms *Agaricus parvitigrinus* has a convex hood shaped, smooth surface with fine striped edges. The middle hood is black with white edges. It has dark gray lamellae from the stalk of the fruiting body, initially light pink, then grayish brown. The shape of the stalk of the fruiting body is the same from the base to the tip, the location of the eccentric fruit stalk, the surface of the stalk is smooth, and grayish in color. The habitat of this fungus is on soil and dead wood twigs, solitary life and this fungus was found in Pintu Rimba and Shelter 2.

2. *Marasmius epiphyllus*
   
   **Habitat**: rotten leaves
   
   **Description**
   
   Mushrooms *Marasmius epiphyllus* has a convex hood shaped, smooth hood surface with ribbed hood edges. White Lamella with regular type of lamella. Fruit stalk is slender and thin, brittle, white-yellow on top and yellow-brown towards the base, and the type of location of the central stalk. This mushroom has a height of 2 cm (Marasmio, 2017). This fungus grows on dead leaves, precisely on the nerves of the leaves in groups and was found in Pintu Rimba and Shelter 2.

3. *Marasmius calhouniae*
   
   **Habitat**: weathered logs
   
   **Description**
   
   Mushrooms *Marasmius calhouniae* has a convex hood shaped, white, the surface of the hood is translucent when moist with the edges of the hood raised, and has very thin flesh. Regular type of lamella with white lamellae edges. The stalk of the fruiting body is brittle, hollow, tapered at the base, smooth surface, white at the top and gray-brown to light brown at the base, and the type of location is the central stalk. This mushroom has a height of 0.3 mm (Marasmio, 2017). *Marasmius calhouniae*
mushroom grows on dead tree branches in groups and was found in the Jungle Door.

4. **Scleroderma sinnamariense**
   Habitat: weathered logs
   Description
   Mushrooms *Scleroderma sinnamariense* have a round shape and grow on the ground. Scleroderma sinnamariense has a yellow color with irregular white warts. This fungus does not have a stalk, only rhizoid or mycelium which attaches directly to the ground. When this fungus breaks, it releases grayish spores (Lee, 2012). This fungus grows solitary on the forest floor and was found in Shelter 1.

5. **Mycena cystidiosa**
   Habitat: leaf litter
   Description
   Mushrooms *Mycena cystidiosa* have a white convex papilla hood shaped with a brown center. It has a smooth hood surface covered with smooth fibrils with notched hood edges. The height is 6.5 cm. Regular lamellae with white lamellae margins and become brownish with age towards the stem. The stalk of the fruiting body is initially brown and pale towards the hood, slender in the shape of a slindric, has a smooth surface, and the type of location of the stalk is central (Skye & Pam, 2014). This fungus grows in the leaf litter in groups and was found in Shelter 1.

6. **Fomes annosus**
   Habitat: weathered logs
   Description
   Mushrooms *Fomes annosus* have no stalk, hard woody texture of the fruiting body, and brown with white on the edge of the fruiting body. Slightly convex and flat, the edges of the fruiting body are thin, and white. The underside of the fruiting body is white, and the lamellae is porous (Tampubolon, 2010). This fungus grows on rotten logs in groups and was found in Shelter 1.

7. **Craterellus cornucopiodes**
   Habitat: land
   Description
   Mushrooms *Craterellus cornucopiodes* have the shape of a hood like a funnel that extends at the top. The top and inner surfaces are black or dark gray while the outer surfaces are light gray with a non-smooth surface. The stalk of the fruiting body in this fungus is eccentric and the edges are smooth with the fruit stalk is the same size from base to tip (Tri et al., 2016). This mushroom has a height of 2 cm, grows solitary on the ground and was found in Shelter 1.

8. **Galerina clavata**
   Habitat: land
   Description
Mushrooms *Galerina clavata* has a convex hood shaped and there is a thin umbo in the middle so that the hood is broad convex, orange and brown in the center, and over the edge of the hood is pale yellow. Smooth hood surface with pointed hood edges. Regular type of lamella, brown, lamella adnate attachment, and subdistant spacing lamellae with brown lamellae edges. The stalk of the fruiting body is the same size from base to tip, has a smooth warty surface, and brownish yellow (Jordan, 2004). This mushroom has a height of 2 cm, grows solitary on the ground and was found in Shelter 1.

**9. Hygrophorus eburneus**
Habitat: weathered logs
Description
Mushrooms *Hygrophorus eburneus* has a white convex hood shape, with a smooth hood surface and straight striped hood edges. Mushrooms have a height of 0.8 cm. Types of lamellae are branch to the edge, slightly curved upward, and shaped like an arc. In case the spacing is far enough, that space can be seen between the short lamellae (lamellulae). The stalk of the fruiting body has the same width along the fruiting body and is hollow. It is slightly tapered downwards, white, and the upper part of the fruiting body is covered with short white fibrils and the type of location of the eccentric stalk (Skye & Pam, 2014). It grows on rotten logs in groups and was found in Shelter 1 and Shelter 2.

**10. Coprinellus disseminatus**
Habitat: weathered logs
Description
Mushrooms *Coprinellus disseminatus* has a beige-brown hood and parabolic shape, smooth hood surface with pointed hood edges. This mushroom has a height of 3.3 cm. Lamella is gray brown, when adults turn brownish black. The stalk of the fruiting body is creamy-brown, shiny, cylindrical, slender and hollow, and the type of location of the stalk is central and smooth (Skye & Pam, 2014). It grows on rotten logs in groups and was found in Shelter 1.

**11. Hexagonia tenuis**
Habitat: weathered logs
Description
Mushrooms *Hexagonia tenuis* has no stalk, the texture of the fruiting body is hard woody, there are concentric zones of brown with lighter colored edges when actively growing. Semicircular, smooth surface with slightly wavy edges. The lower part of the fruiting body is light brown (Skye & Pam, 2014). It grows solely on weathered logs and was found in Shelter 1.

**12. Pycnoporus coccineus**
Habitat: weathered logs
Description
Mushroom *Pycnoporus coccineus* its fruiting body is fan-shaped, has a hard texture, and is yellow to reddish yellow. The type of reed / pore lamellae is seen from the outside such holes. Life sticks to the substrate. The habitat of the *Pycnoporus coccineus* fungus is mostly found in weathered wood and lives in groups (Rahma et. Al., 2018). This mushroom has a height of 1.5 cm and was found in Shelter 1.

13. *Gloeoporus* sp.
Habitat: tree roots
Description: mushrooms *Gloeoporus* sp has a hood that resembles a fan, dark brown, a bit thick and hard, while the outside is white and wavy. Regular lamella is brownish in color. The stalk is sessil attached to the dead wood (Frescha, 2017). This fungus grows on dead wood solitary and was found in Shelter 2.

Habitat: weathered logs
Description
Mushrooms *Microporus* sp. has a woody texture and resembles a fan. Shiny hood is light brown, there are concentric zones of dark brown. Smooth surface with wavy edges. The underside of the fruiting body is white and the lamellae is porous. The stalk is lateral, and sticks to deadwood (Frescha, 2017). This fungus has a height of 3.5 cm, grows solitary on weathered logs and is found in Shelter 2.

15. *Microporus* sp.2
Habitat: weathered logs
Description
Mushrooms *Microporus* sp.2 has a woody hard fruiting body texture, the hood is colorful, and alternating dark brown with slightly curved yellowish edges. Shaped like a fan, with a smooth hood surface. The underside of the fruiting body is white with porous lamellae. The stalk is lateral and sticks to the dead wood (Frescha, 2017). This fungus has a height of 6 cm, grows on rotten logs solitary and was found in Shelter 2.

16. *Pluteus lutescens*
Habitat: weathered logs
Description
Mushrooms *Pluteus lutescens* has a lime yellow hood, a convex hood shape with a fine grain surface of the hood. White lamellae closely spaced. The stalk of the fruiting body is yellow, the shape of the base is rounded, with a striped surface. Has a height of 4 cm (Skye & Pam, 2014). It grows solely on weathered logs and was found in Shelter 2.

17. *Exidia alba*
Habitat: weathered logs
Description
Mushrooms *Exidia alba* has a gelatinous fruiting body, an upper surface containing spores and a sterile lower surface. Smooth surface and fruiting body grow in groups (Skye & Pam, 2014). This fungus grows on weathered stems in groups and was found in Shelter 2.

### 18. *Polyporus sp.*

**Habitat:** weathered logs  
**Description**  
Mushrooms *Polyporus sp.* has a fan-shaped fruiting body, has a chewy fruiting body texture, light brown with dark brown edges. The upper surface is smooth and slippery while the bottom is smooth and wrinkled. The type of lamellae is crossed and white (Skye & Pam, 2014). It grows on rotten logs in groups and is found in Shelter 2.

### 19. *Ganoderma aplanatum*

**Habitat:** weathered logs  
**Description:** mushrooms *Ganoderma aplanatum* is a wood rot fungus. This mushroom has a semicircular fruiting body with a fruiting body size of 10 cm in diameter, hard and stiff texture with a thickness of 1.5 cm, and on the upper side it has a radial line with a reddish brown color on the fruiting body and the lower side has a hymenophore in the form of pores small pores. It does not have a fruit stalk, so it is directly attached to the substrate and lives solitary by sticking to the dead trees (Elis et al., 2016). This mushroom was found in Shelter 2.

### 20. *Tremella fuciformis*

**Habitat:** weathered logs  
**Description**  
Mushrooms *Tremella fuciformis* has a hood shaped like a leaf blade that separates from the stem with a length of 3-4 centimeters. This mushroom is yellowish white with curly tufted edges. The fruiting body is directly attached to the damp log, and without the stem. This fungus is a soft fungus, the surface is not slippery but also not rough, but rather gummy because it contains substances like jelly (Solle et al., 2017). Mushroom *Tremella fuciformis* has a height of 4 cm, grows in rotten banana stalks in groups and was found in Shelter 2.

### 21. *Panellus stipticus var. albus*

**Habitat:** weathered logs  
**Description**  
Mushrooms *Panellus stipticus var. albus* has a parabolic hood shaped, is white, smooth surface with toothed edges with small round teeth, and curves slightly inward. The lamella type is regular with white edges, closely spaced, and often branched. The stalk of the fruiting body is the same size from the base to the tip of the smooth surface and the type of location of the stalk is eccentric (Roody, 2003). This
fungus has a height of 2.2 cm, grows in banana stems that have rotted solitary and was found in Shelter 2.

22. *Conocybe apala*
Habitat: rotten banana stalks
Description
Mushrooms *Conocybe apala* has a light pink hood, is conical shaped with a pointed hood edge, and has a smooth hood surface. It has height of 3.4 cm. Creamy lamella with regular type of lamella, and cream colored edges of lamella. The stalk of the fruiting body is light-colored, cylindrical, has a smooth, hollow and brittle surface with a slightly swollen base, and the type of location of the stalk is central (Skye & Pam, 2014). The fungus grows solely on weathered logs and was found in Shelter 2.

23. *Pleurotus* sp.
Habitat: rotten banana stalks
Description
Mushrooms *Pleurotus* sp. has a sideways (lateral) stalk, white color and a rounded base. The hood of the mushroom has a white color with a slippery surface and slightly grooved edges (Trubus, 2007). This mushroom has a height of 2 cm, lives in groups in rotten banana leaves, and was found in Shelter 2.

24. *Omphalotus nidiformis*
Habitat: weathered logs
Description
Mushrooms *Omphalotus nidiformis* has a deep fan-shaped hood, smooth surface with inward rolled edges. *Omphalotus nidiformis* has a cream-colored hood with a brown edges. Lamella is creamy and decurrent and often dripping with and has a smooth edge. The stalk of the fruiting body is tapered to the base, the type of the stalk is lateral. This mushroom has a height of 2.4 cm and its thin flesh is generally creamy white. This fungus lives on rotting logs in groups and was found in Shelter 2.

25. *Cookeina sulcipes*
Habitat: weathered logs
Description
Mushrooms *Cookeina sulcipes* belongs to the fungal cup group, which can be identified by the shape of the sporocarp like a bowl, has a stalk, and spores are produced on the inside of the smooth bowl. Cookeina sulcipes are red in color and have hair and thin lines (Weinstein et.al, 2002). This fungus grows solitary on weathered logs and is found in Shelter 2.

26. *Microporus affinis*
Habitat: weathered logs
Description
Mushrooms *Microporus affinis* has a fruiting body in a lateral position such as a fan, a pale white hood with brownish red stripes, a smooth, unlined edge 2-4 cm in
diameter, and a smooth smooth upper surface that has a stalk located on the edge of the hood or eccentric (Elis et al., 2016). This fungus grows on weathered branches in groups and was found in Shelter 2.

27. *Scleroderma citrinum*
Habitat: land
Description
Mushrooms *Scleroderma citrinum* known as the earth ball mushroom because it is round and grows on the ground. *Scleroderms* citrinum has a round fruiting body with a hard and scaly surface, yellow with irregular brown warts. This fungus does not have a stalk, only rhizoid or mycelium which attaches directly to the ground. When this fungus breaks, it will produce a dark gray ash (Skye & Pam, 2014). This fungus grows solitary on the ground and was found in Shelter 2.

28. *Nidula candica*
Habitat: weathered logs
Description
Mushrooms *Candida nidula* is often called bird’s nest fungus, because of the very small cup-shaped fruiting body between 3-8 mm in diameter, 5-15 mm high which looks like a small bird's nest covered with thin skin and on the outside there are fine feathers. When the cover peels off, it looks like eggs which are small collections (peridioles) of compressed spores (Desjardin et.al, 2015). This fungus grows on dead tree branches in groups and was found in Shelter 2.

29. *Galerina marginata*
Habitat: weathered logs
Description
Mushrooms *Galerina marginata* has a parabolic hood shape, is orange-brown color, and has a grain-coated hood surface with smooth edges without lines. The type of lamella is regular, attached to the stem, and closely spaced yellowish at first and turns brown as the spores mature. The fruiting body stalk is lateral type, the surface of the stalk is mottled with whitish fibrils, and the shape of the stalk is the same size from base to tip and is brownish yellow (Kuo, 2016). This fungus has a height of 3.4 cm, grows solitary on weathered logs and was found in Shelter 2.

30. *Paxillus involutus*
Habitat: land
Description
Mushrooms *Paxillus involutus* has a convex hood shape, when it is old the hood begins to flatten and form a funnel, and the surface of the hood is smooth. Lamella is brown and gets browner with age, fusing to the stalk of the mushroom fruiting body. Mushroom fruit stalk has a smooth surface and is cylindrical in shape, yellowish brown with an eccentric stalk type (Mazza, 2008). This mushroom has a height of 4 cm, grows
solitary on the ground, and was found in Shelter 3.

**31. Armillaria mellea**

*Habitat:* weathered logs

*Description*

The fungus *Armillaria mellea* has a convex hood at first but then flattens eventually with the central umbo raised, then becoming plate-shaped. Has golden yellow color and fades to yellowish or brownish, there are small brown scales lying in the center arranged radially. Smooth hood surface with curved hood edges. White lamellae initially changes color to brownish yellow with age, the lamellae is attached to the stem. The stalk of the fruiting body is the same at the top, but tapers to the base due to the clustered growth pattern, light brown color, and smooth surface (Kuo, 2016). This mushroom has a height of 2 cm, grows on dead wood trees in groups and was found in Shelter 3.

**Location Characteristics**

At each post of the hiking trail had a different vegetation character. From the ranger post to the jungle door there were coffee plantations along the path to the jungle door. At Shelter 1, there were shrubs and trees that can be found. Shelter 2 was a very humid area, there were lots of mushrooms and trees with a high canopy density, while shelter 3 had little canopy cover, low tree density, and a lot of light intensity so that there were few mushrooms. The physical-chemical conditions of the environment were measured with one measurement and can be seen in Table 2.

<table>
<thead>
<tr>
<th>Location</th>
<th>soil pH</th>
<th>Soil moisture (%)</th>
<th>Air temperature (°C)</th>
<th>Humidity (%)</th>
<th>Light intensity (candela)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The jungle door</td>
<td>6</td>
<td>30</td>
<td>19</td>
<td>90</td>
<td>226</td>
</tr>
<tr>
<td>Shelter 1</td>
<td>6</td>
<td>30</td>
<td>19</td>
<td>90</td>
<td>467</td>
</tr>
<tr>
<td>Shelter 2</td>
<td>6</td>
<td>30</td>
<td>19</td>
<td>90</td>
<td>301</td>
</tr>
<tr>
<td>Shelter 3</td>
<td>5.3</td>
<td>40</td>
<td>18</td>
<td>89</td>
<td>1812</td>
</tr>
</tbody>
</table>

The macroscopic fungi that grew on Mount Burni Telong had physical environmental factors that supported the area. The physical and environmental factors measured in the Mount Burni Telong area were different, it could be seen from the various types of macroscopic fungi found in the Mount Burni Telong area. The factors that affected the growth of fungi were temperature, humidity, pH and light intensity. Based on the environmental temperature range, fungi can be classified as psychrophilic fungi, mesophiles and thermophiles. Macroscopic fungi required temperatures above 20 °C (Tampubolon, 2010). According to Deacon...
(2006), most macroscopic fungi were mesophilic, grew at moderate temperatures of 10-40 °C, and the optimum temperature was 25-35 °C. Mushrooms can live at 70-90% humidity (Khayati & Hadi, 2016). Mushrooms activity at a pH below 7.0. According to Deacon (2006), mushrooms can grow in a pH range of 4.8-8.0 and the optimum pH is 5.5-7.5. The density of the crown cover would affect the incoming light. If the canopy density was high, the incoming light intensity is low. According to Achmad (2011) light with low light intensity will affect the growth of fungi for the formation of fruiting bodies, spores or the release of spores for fungi that were positive phototropism. While the canopy density was low, the incoming light intensity was high. If the incoming light was high intensity it will inhibit the growth of the structure of the reproductive tools and fungal spores.

![Image of various mushroom species](image_url)

CONCLUSION

The types of fungi found in Mount Burni Telong were 31 macroscopic fungal species from 2 divisions, 6 classes, 6 families, 21 orders, 26 genera. Most species of fungi were found from the Polyporaceae family.

REFERENCES


