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Short Note: The distribution of Trichaleurina javanica in Central Kalimantan (Indonesia) and its Ethnomycology

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ABSTRACT

The genus Trichaleurina is a member of Pezizales, which was previously rarely reported from Indonesia. Trichaleurina was first reported by Boedjin in 1932 and 1959 but still used the name Galiella javanica and Galiella celebica. Trichaleurina is closely related to Galiella, Sarcosoma, and Bulgaria. In Indonesia, the first report on T. javanica from West Java in 2020. In the following year, information about the distribution of Trichaleurina was reported from Central Kalimantan (Indonesia). The current study aimed to describe the specimens from Central Kalimantan based on morphological data and record the ethnomycological use by the local people. Fresh materials were used to describe the morphological features. The macrofungi lived on dead wood in a solitarily manner; fruiting body shape is round to oval, conical at the bottom, dark brown that gets darker at the base, ascus 8-spored, cylindrical in shape, spores 25-26 × 9-10 μm, thick-walled. Our specimen was identical to those reported from Bogor (West Java). T. javanica is used as food in the daily life of the Dayak Maanyan Tribe in Tamiang Terbang, Central Kalimantan, Indonesia. They usually consumed this macrofungi as a local soup. This information adds to the record of the diversity and potency of macrofungi in Indonesia.

Keywords:
Borneo, Inventory, Macrofungi, Macroscopic, Indonesia

1 INTRODUCTION

Pezizales is an order of Ascomycota with 16 families, 199 genera, and 1683 species (Kirk et al. 2008). This order is a hypogeous to epigeous group with saprobic mycorrhizal, or parasitic lifestyles on plants. One member of the Pezizales that is rarely reported is *Trichaleurina javanica*. Compared to other Pezizales groups, this macrofungi has a round shape, rubber-like texture, and apothecary-type of ascomata. This species was previously reported as *Galiella javanica* by Boedijn in 1959. However, Carbone et al. (2013) proposed several changes to the Sarcosomataceae family, including placing *Sarcosoma javanicum* and *Galiella javanica* as basionyms and synonyms of *T. javanica*.

A report on phylogenetic analysis supplemented with morphological data of *T. javanica* in Indonesia (West Java) was first reported by Hermawan et al. (2020). Since then, efforts to explore and inventory this mushroom have continued, one of which is in the Tamiang Layang Forest, Central Kalimantan (Indonesia), in collaboration with mushroom hobbyists who are also Dayak Maanyan people. The local community is known to utilize mushrooms that are morphologically identical to *T. javanica* as a food source in their daily life. This study aimed to provide preliminary biological information complemented by descriptions and ethnomycological aspects of the wild edible mushroom in Indonesia.

2 MATERIALS AND METHODS

Information on the presence of mushrooms was obtained from local/indigenous people from Central Kalimantan (Dayak Maanyan Tribe). Mushroom exploration was carried out by an opportunistic sampling method referring to the explanation of O'Dell et al. (2004) and Arif & Al-Banna (2020) involving local mushroom hobbyists. The mushroom fruiting body was photographed *in situ*. Mushroom descriptions were made by referring to the explanation of Putra (2021) with modifications. Macroscopic identification characters recorded include: how to grow, the shape of the fruiting body, *hygrophanous* (changes in the level of wetness), the color of the hood (cap) when the fruiting body is young and old, the diameter of the cap, the shape of the top and bottom of the cap, the surface of the cap, the edge of the cap, the margin (edge) of the cap, the level of wetness, the type of *hymenophore* (lamella, pore, serration) including the way they are attached to the stipe, the distance between rows, and the margins. Other characters observed were the shape of the stipe, the color of the stipe (when young and old), the surface of the stipe, the position of the attachment to the cap, the type of attachment of the stipe to the substrate, the cross-section of the stipe, the presence of rhizomorphs, partial hoods, universal hoods, fruiting body texture. Microscopic characters observed were spore and ascus. Micromorphological features were done using a digital bright field microscope Olympus. The smell, taste, and information on its use as food (consumed or not) through discussions with the local community to obtain information on the use of the mushrooms found. The mushrooms were then validated based on the description of the information obtained. Mushrooms were identified using several identification keys, including Carbone et al. (2013), Largent (1977), Arora (1986), and Rokuya et al. (2011). The taxonomic position and current identity of the fungi found followed the provisions of Indexfungorum. Additional information regarding the ethnomycology of the fungi was conducted through discussions with local people.

3 RESULTS AND DISCUSSION

Based on characterization and identification using macroscopic characters, the chewy mushroom commonly used by the Dayak Maanyan indigenous people is temporarily placed in the position of *Trichaleurina* cf. *javanica* by following the description of Carbone et al. (2013). Based on the Indexfungorum, taxonomically, this genus is in the position of Pyronemataceae, Pezizales, Pezizomycetidae, Pezizomycetes, Pezizomycotina, Ascomycota, Fungi (http://www.indexfungorum.org/Names/Names.asp; accessed on May 2024). The genus *Trichaleurina* only has four species, subspecies, and varieties from around the world: *T. celebica*, *T. javanica*, *T. polytricha*, and *T. tenuispora*. At the research site, the fungus is often found growing adjacent to *Trichaleurina* sp., which has a different color and shape than apothecia. The following is a description of *Trichaleurina* cf. *javanica*, and *Trichaleurina* sp. found in this research.

Trichaleurina javanica

Fruiting bodies decompose dead wood solitarily (Figure 1A) or in limited groups (Figure 1B). The young fruiting body is round to oval, conical at the bottom, dark brown that gets darker at the base (Figure 1D), hairy surface, spongy texture, directly attached to the substrate, and the apothesis is not fully open (Figure 1A; B). The surface of the apothecium is orange-brown in both young and mature fruiting bodies. Along with its development, the apothecium is widened with margins that are slightly curved inwards (Figure 1C) with an almost perfectly flat surface. The surface color of the apotesium and fruiting body fades. Ornamentation in the form of bristles becomes thinner as it matures, leaving only a few on the apothesis (Figure 1C). In mature fruiting bodies, the shape of the fruiting body becomes more conical and smaller at the basal part, forming a black and thickened pseudo-stalk (Figure 1D) to attach to the substrate. The surface of the pseudo-stalk is smooth with several indentations. The fruit body is soft, spongy, tasteless, contains much water, and is slimy when split (Figure 1C). The interior of the fruit body is predominantly cream-colored, with black at the edges (Figure 1C). The fruit body is without any characteristic odor. The ascus 8-spored, cylindrical in shape, spores 25-26 × 9-10 μm, ellipsoid, and thick walled (Figure2). External hairs are brown to dark brown, septate, and rough on surface (Figure 3).

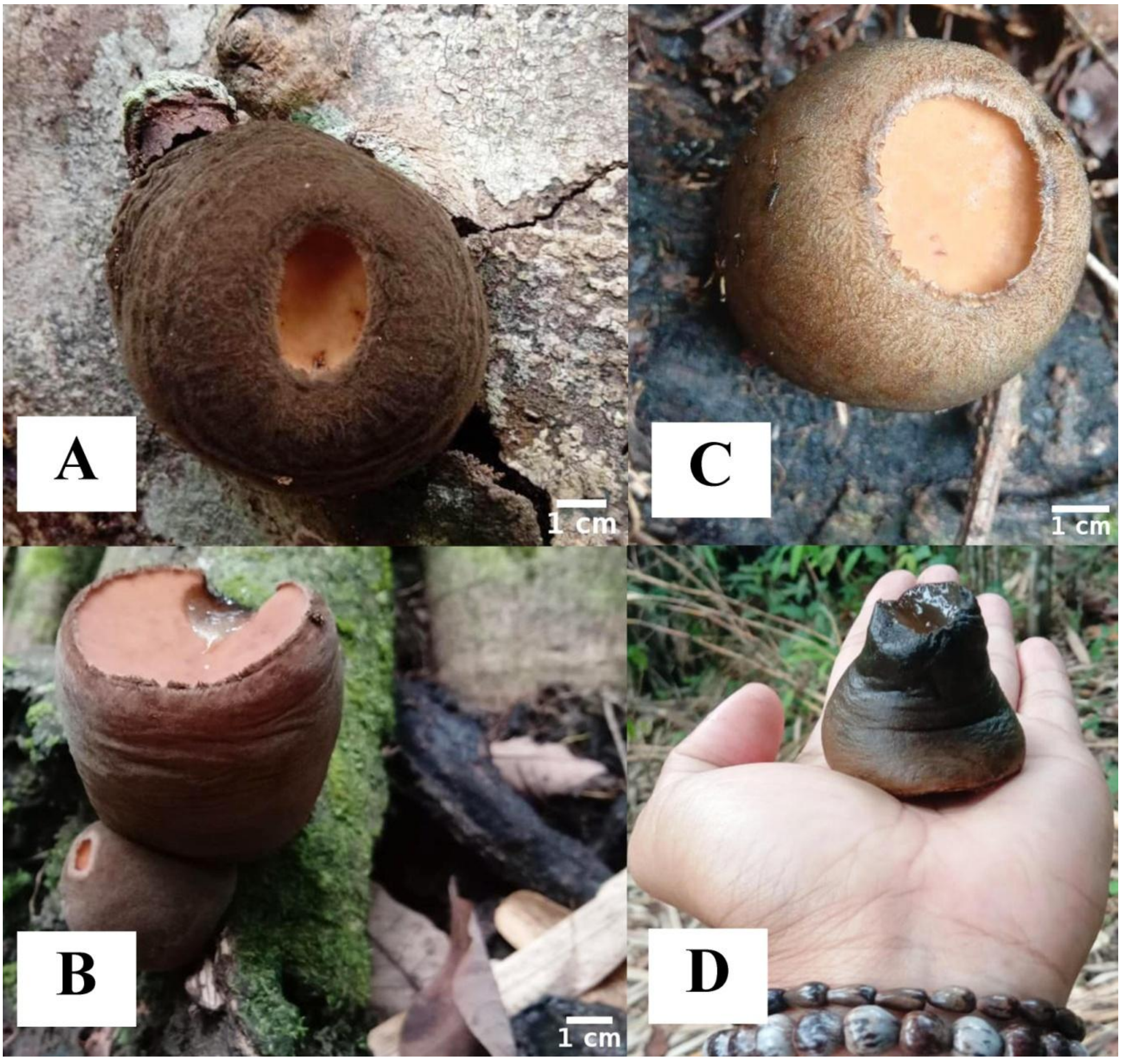

Figure 1. *Trichaleurina javanica* at sampling site. A: Solitary fruiting body. B: Young and mature fruiting bodies grow close together. C: Upper surface of fruiting body with apothecia. D: The lower part of the fruiting body.

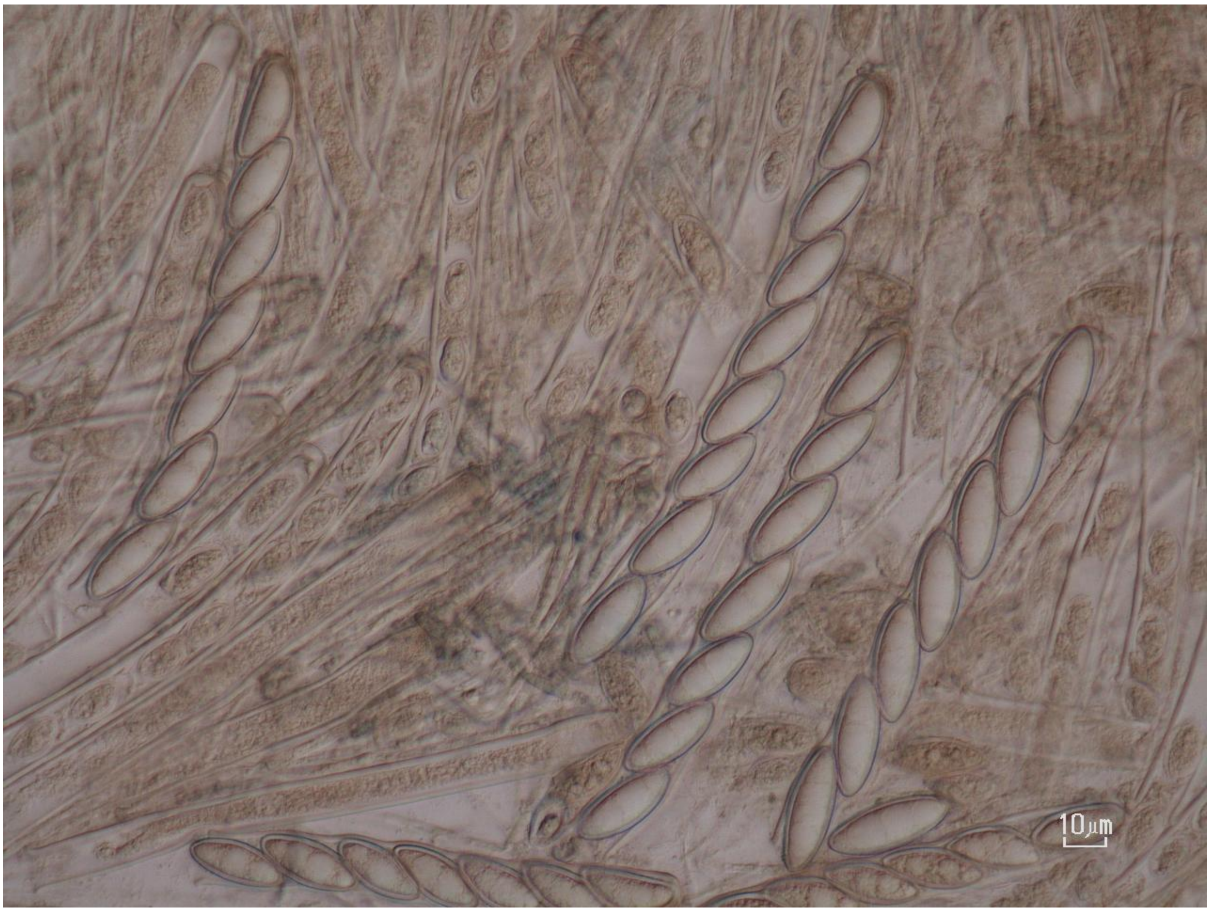

Figure 2. Microscopic characters of *Trichaleurina javanica*. Eight spores inside ascus.

The genus *Trichaleurina* was first constructed by Rehm in 1903 but was still placed as part of *Aleurina* until 1914 when the taxonomic position of *Trichaleurina* was validated (Carbone et al. 2013). The genus is rarely reported, with one of the most recent reports coming from India (Patel et al. 2018). In Indonesia, the first report on *Trichaleurina* was made by Hermawan et al. (2020) by combining morphological and molecular characters. Previously, Boedjin (1932; 1959) had mentioned this group of rubber fungi, but only reports on *Galiella celebic*a, *Bulgaria celebica*, and *G. Javanica* were observed from Sulawesi Island. Prior work (Noverita et al. 2018) reported the presence of *G. celebica* from the Thousand Islands (Jakarta, Indonesia) but with limited information.

The T*richaleurina, Galiella, Sarcosoma*, and *Bulgaria* groups often look morphologically similar. Carbone et al. (2013) placed *Sarcosoma javanicum*, *G. celebica*, and *G. javanica* recorded in Indonesia as basionyms and synonyms of *T. javanica*. This also needs confirmation for *G. celebica* in Indonesia. *Trichaleurina* is proposed to accommodate *Sarcosoma* and *Bulgaria* in the tropics, including Indonesia. Therefore, the genus identified as *Sarcosoma* and *Bulgaria* in Indonesia must be reviewed to be placed in *Trichaleurina*. The reference is also used as the basis for placing mushrooms with purplish-black fruiting bodies in this paper as *Trichaleurina* sp., although it also has similarities with *Bulgaria* sp. Information from Carbone et al. (2013) should be one of the references used to explain the existence and taxonomic position of the rubber fungi group in Indonesia.

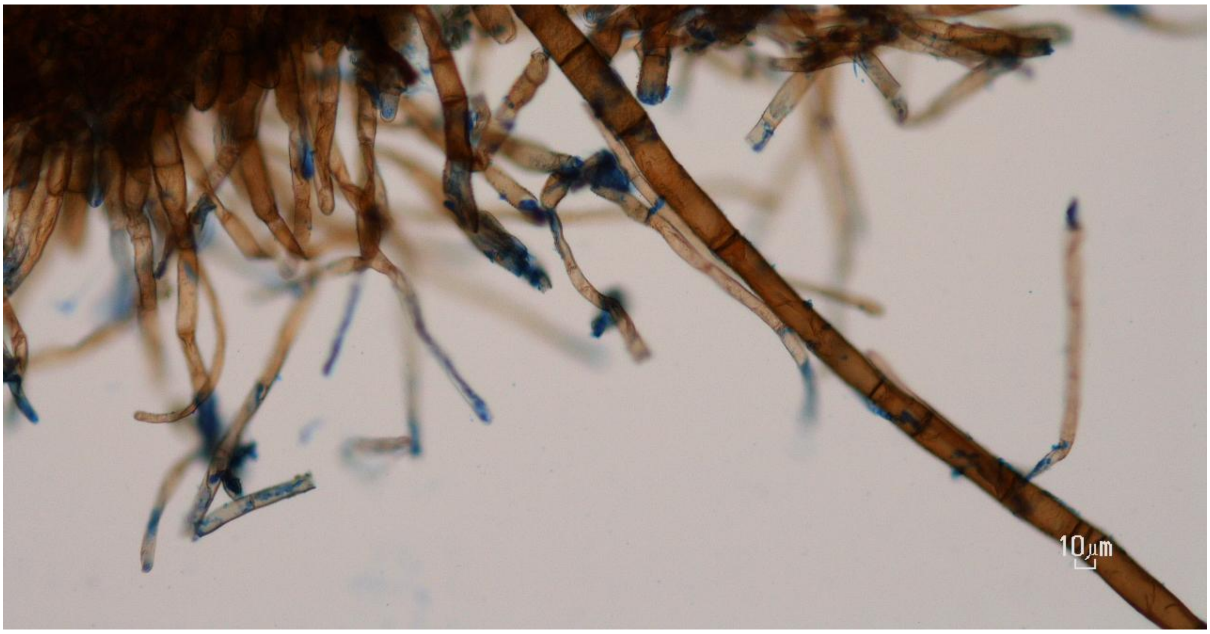

Figure 3. Microscopic characters of *Trichaleurina javanica*. External hairs with septa.

Ethnomycology of *Trichaleurina* cf. *javanica*

The indigenous people in the study site utilize wild mushrooms as food, either raw or processed (Figure 4). This mushroom is known as *jamur mata kerbau* by local mushroom foragers. The mushroom's fruiting body is collected directly from the substrate (Figure 4A) when foraging around the Tamiang Layang Forest. While in the forest, local people also use this mushroom as a thirst quencher. Some cleaned fruiting bodies were eaten raw (Figure 4 B;C). This is because the water content of the mushroom is believed to have some good effect on the human body. Apart from being consumed raw, the split mushroom fruiting bodies are also applied to the face and hair. This is believed to be beneficial for refreshing the body, curing eye pain, and providing nutrition to the hair. Other mushroom fruiting bodies are carried in a basket of woven rattan or bamboo with good air circulation. The fruiting bodies are then washed, cut into pieces, and cooked into soup with shallots, garlic, and salt. Ripe fruit bodies have a chewy texture and thick soup as the boiling process continues. Until now, there has been no nutritional analysis of this mushroom in Indonesia. Ethnomycology is one of the sources of information on the diversity and potential utilization of mushrooms by communities worldwide (Boa 2004), including Indonesia (Putra 2020; Putra and Khafazallah 2020). Further analysis should be done to explore the potential bioprospection of this mushroom, for example the antioxidant activity (Rompas and Gasah 2022), which can be used for the daily life of the Indonesian.

Figure 4. Ethmycology of *Trichaleurina javanica* at the study site. A: Ascomata obtained from forest. B-C: Ascomata were cleaned. D: Ascomata was boiled with onion and garlic.

4 CONCLUSION AND SUGGESTION

4.1 Conclusion

The present study revealed the characteristics of *T. javanica* from Central Kalimantan through an analysis of their morphology, as well as to document the traditional uses of these mushrooms by the local population. These macrofungi were observed growing individually on decaying wood, with their fruiting bodies being round to oval in shape and conical at the base. They exhibited a dark brown color that intensified towards the bottom, with their ascus being 8-spored and cylindrical, and their spores being ellipsoid and thick-walled. It was noted that the specimen closely resembled those previously documented in Bogor, West Java. Additionally, the Maanyan Dayak community has been known to consume one of the fungi species as a food source.

4.2 Suggestion

Based on the findings of this study, it is recommended to further investigate the potential nutritional and medicinal benefits of T. javanica, given its traditional use by the Maanyan Dayak community as a food source. Conducting biochemical analyses could reveal valuable compounds that might contribute to health and wellness. Additionally, conservation efforts should be considered to protect these macrofungi and their natural habitats, ensuring sustainable use and preserving biodiversity. Collaborating with local communities can provide deeper insights into traditional knowledge and promote the sustainable harvesting of these mushrooms.

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