

## **Species of *Marasmius* (Agaricales: *Tricholomataceae*) from Kayan Mentarang National Park, East Kalimantan, Indonesia**

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### **Abstract**

Five species of *Marasmius* were encountered from forest surrounding Pa'raye village at Kayan Mentarang National Park, East Kalimantan; three of them are described as new taxa (1 new species and 2 new varieties). The five species of *Marasmius* are *M. cf. purpureostriatus*, *M. guyanensis*, *M. coklatus* var. *mentarangensis*, var. *nov.*, *M. caryote* var. *pa'rayeensis*, var. *nov.*, and *M. gypseus*, *sp. nov.* Comprehensive descriptions, illustrations, and comparison with similar taxa are presented.

### **Introduction**

Among the *Agaricales* in the tropics, *Marasmius* has become a favorite collection item. Species of *Marasmius* grow relatively longer period of time than other agarics. They are very attractive and relatively easy to be spotted. It is the most common genus in tropic, and grows frequently on forest soil, fallen leaves, and on dead or living wood and other plant tissues, such as grass roots and bamboo twigs. Most species of *Marasmius* are saprophytic, some are even parasitic, and none goes into mycorrhizal association.

The earliest report of *Marasmius* from Indonesia with 28 species was made by L veill  (1844, 1846) and many of them were reported from Java. This was followed by several reports by Moritzi (1845-1846), Zollinger (1854), Hennings (1900), Overeem and Overeem-de Haas (1922), Boedijn (1940). Desjardin, Retnowati, and Horak (2000) documented 37 species of the genus from Java and Bali. However, no species of *Marasmius* was recorded from Kalimantan, particularly from Kayan Mentarang National Park, East Kalimantan. This paper presents five species of *Maramius* encountered during a three weeks expedition to survey the fungal flora from the forests surrounding Pa'raye village at Kayan Mentarang National Park in April of 2003.

Kayan Mentarang National Park, which lies between altitudes 116°15'-115° E and 2°-4°30' N, embraces a total area of 1.35 million hectares. It is located in East Kalimantan, bordering with Sabah and Sarawak. The inventory was done from several collecting sites in the mountainous Pa'raye village located north of the National Park. Descriptions of the species are based on fresh collections made by the author. All micro characters were studied from dried materials rehydrated in distilled water and 3% of KOH solution, with the use of Melzer's reagent or Congo Red dye. Color terms and notations are those of Kornerup and Wanscher (1978). Spore sizes were based on measurements of 25 basidiospores.

Spore statistics include -  $\bar{x}$  = the arithmetic mean of the spore length by spore width ( $\pm$  standart deviation); Q, the quotient of spore length and spore width in any one spore to indicate the range of variation in n spores measured;  $\bar{q}$ , the mean of Q-values in a single sample.

The basidiomes in illustration are of natural size, basidiospore (scale bar = 12  $\mu$ m); basidia, cystidia, pileipellis and stipitipellis (scale bar = 15.7  $\mu$ m). All collections examined are deposited in Herbarium Bogoriense (BO) and Harry D. Thiers Herbarium (SFSU).

### Description of taxa

#### 1. *Marasmius* cf. *purpureostriatus* Hongo

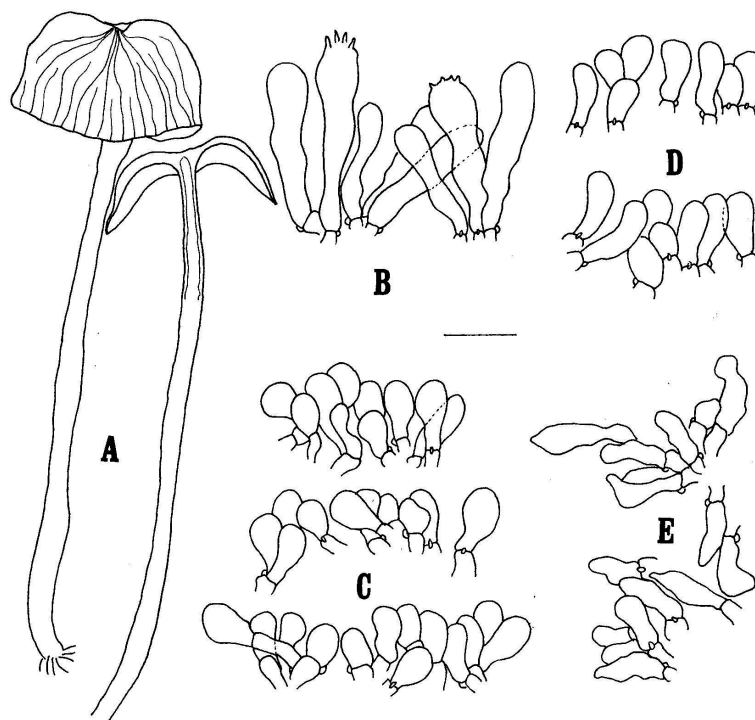
J. Jap. Bot. 33: 344. 1958. –**Type:** Japan, Otsu City, Ishiyama, 7 May 1957, *Hongo 1609* (Isotype, ZT [3221]). **Fig. 1.**

**Pileus** 55 mm diam, convex with slightly depressed center, sulcate; margin crenate, straight; surface pruinose, smooth; greyish magenta (13-E3) overall. Context thin, pale greyish magenta. **Lamellae** adnate, distant (12 attached stipe) with 1 series of lamellulae, narrow, non-marginate; pale greyish magenta. **Stipe** 180  $\times$  5 mm, hollow, central, equal, cylindrical; smooth, pruinose; pale greyish magenta. Odor and taste not distinctive. **Basidiospores** unobserved. **Basidia** 46.4-56  $\times$  12-12.8  $\mu$ m, 4-spored, clavate. Basidioles clavate. **Cheilocystidia** common, 16-24  $\times$  7.2-12.8  $\mu$ m, clavate, broadly clavate, sub-globose to globose, hyaline to weakly yellow, thin-walled. Pleurocystidia absent. **Pileipellis** hymeniform, clavate to broadly clavate or subglobose, 16-25.6  $\times$  8.8-9.6  $\mu$ m, non-diverticulate, hyaline, thin-walled. **Stipe tissue** monomitic; cortical and medullary hyphae indistinguishable, 6.4-20  $\mu$ m diam, parallel, cylindrical, hyaline, thin-walled, strongly dextrinoid. **Stipe vesture** common, composed of clavate, cylindrical to fusoid or irregular in outline, 18.4-32  $\times$  8-12  $\mu$ m, hyaline, thin-walled. Clamp connections present.

*Specimen examined*: INDONESIA. **East Kalimantan**, Kayan Mentarang National Park, forest surrounding Pa'raye village, 4 Apr 2003, A. Retnowati 391 (BO, SFSU).

*Distribution*: Japan (type), Malaysia, Thailand, Republic of Korea, Papua New Guinea, and Indonesia.

*Habit and habitat*: Solitary on soil.



**Figure 1.** *Marasmius* cf. *purpureostriatus* Hongo (A. Retnowati 391). A. Basidiomes; B. Basidioles; C. Cheilocystidia; D. Pileipellis; E. Caulocystidia.

*Notes*: *M. cf. purpureostriatus* is characterized by several peculiar features, which include relatively large, greyish magenta pileus, sulcate, distant lamellae and absence of pleurocystidia. Basidiospores of the material examined are unobserved, but other characters match with description of *M. purpureostriatus* (fide Desjardin and Horak, 1997). As a result, I identify the material as *M. cf. purpureostriatus*.

*M. purpureostriatus* is allied with *M. musisporus* from Papua New Guinea (Desjardin and Horak, 1997). *M. musisporus* differs in forming smaller basidiome (8-25 mm diam), paler pileus, and the absence of stipe vesture (Desjardin and Horak, 1997).

## 2. *Marasmius guyanensis* Mont.

Mont., *Ann. Sci. Nat. Bot.* 4(1): 114. 1854. –**Type:** French Guyana, Leprieur, Dennis 255. (Holo, K). **Fig. 2.**

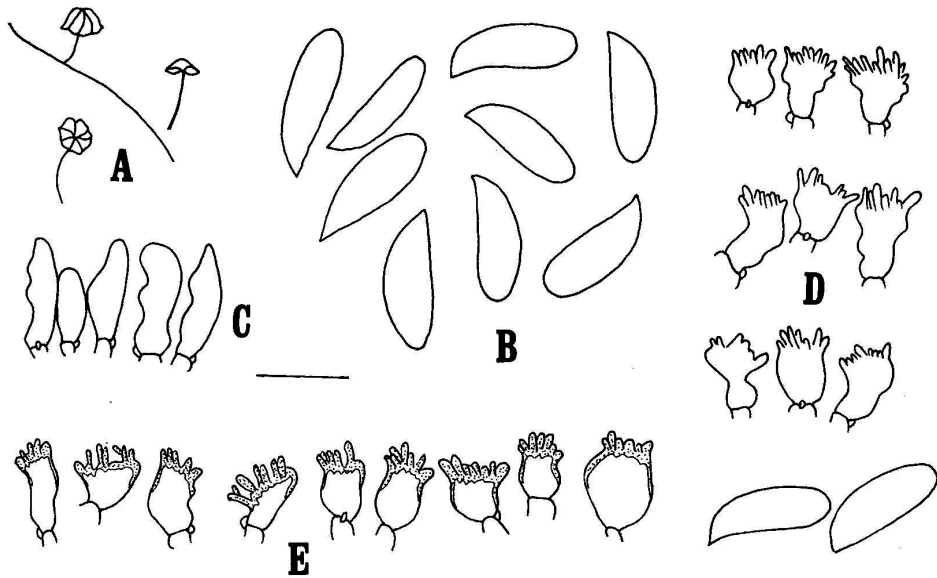
**Pileus** 2-5 mm diam, convex, with a small dark papilla at the depressed center; margin sulcate, straight, crenate; surface dull, dry, smooth, glabrous; orange (6-A6). Context thin, white. **Lamellae** adnate to a collarium, distant (7-9 reaching stipe) with no lamellulae, narrow, white to off-white, non-marginate. **Stipe** 5-7 × 0.1 mm, central, terete, pliant, smooth, glabrous, shiny, insititious, cylindrical; dark brown to black; no-nodes, stipe arises from dark rhizomorphs, black rhizomorphs association. Odor and taste not distinctive. **Basidiospores** (11.2)12-13.6 × 4 μm [ $\bar{x}$  = 12.83 ± 0.67 × 4 ± 0 μm, Q = 2.80-3.40,  $\bar{q}$  = 3.21 ± 0.17, n = 25 spores per one specimen], elongate-ellipsoid, smooth, hyaline, inamyloid, thin-walled. **Basidia** unobserved. **Basidioles** fusoid, clavate. **Cheilocystidia** common, composed of *Siccus*-type broom cells; main body 10.4-23.2 × 6.4-9.6 μm, cylindrical to clavate, broadly clavate, subglobose or irregular in outline; hyaline, thin walled; apical setulae 1.6-3.2 × 0.8 μm, cylindrical to conical, subacute to obtuse or irregular in outline, hyaline, thin-walled. Pleurocystidia absent. **Pileipellis** hymeniform, mottled, composed of *Siccus*-type broom cells; main body 8.8-16 × 5.6-10.4 μm, cylindrical, clavate, broadly clavate, to subglobose or irregular in outline, hyaline, thin-walled; apical setulae 2.4-3.2 × 0.8 μm, cylindrical to conical, obtuse to acute; hyaline, thin-walled. **Stipe tissue** monomitic; cortical hyphae 3.2-5.6 μm diam, parallel, cylindrical, smooth, hyaline; dextrinoid, thin-walled; medullary hyphae 2.4-7.2 μm diam, cylindrical, dextrinoid, thin-walled. **Stipe vesture** absent. Clamp connections present.

*Specimens examined:* INDONESIA. **Java**, Bogor Botanical Garden, 7 Jan 1998, *D.E. Desjardin* 6713 (BO 98-4, SFSU); same location, 8 Jan 1998, *D.E. Desjardin* 6719 (BO 98-19, SFSU); same location, 15 Jan 1998, *D.E. Desjardin* 6797 (BO 98-198, SFSU); same location, 12 Jan 1999, *A. Retnowati* 125 (BO 99-245, SFSU). **East Kalimantan**, Kayan Mentarang National Park, forest surrounding Pa'raye village, 5 Apr 2003, *A. Retnowati* 412 (BO).

*Distribution:* Indonesia, Martinique, Dominica, and French Guiana.

*Habit and habitat:* Gregarious on leaves or arising directly from rhizomorphs.

*Notes:* *Marasmius guyanensis* firstly described by Montagne from French Guiana (*vide* Singer, 1976). It is apparently a widespread species throughout tropical Central and South America (Pegler, 1983) and Asia (Corner, 1996). This species is easily distinguished by having a small, orange pileus with dark



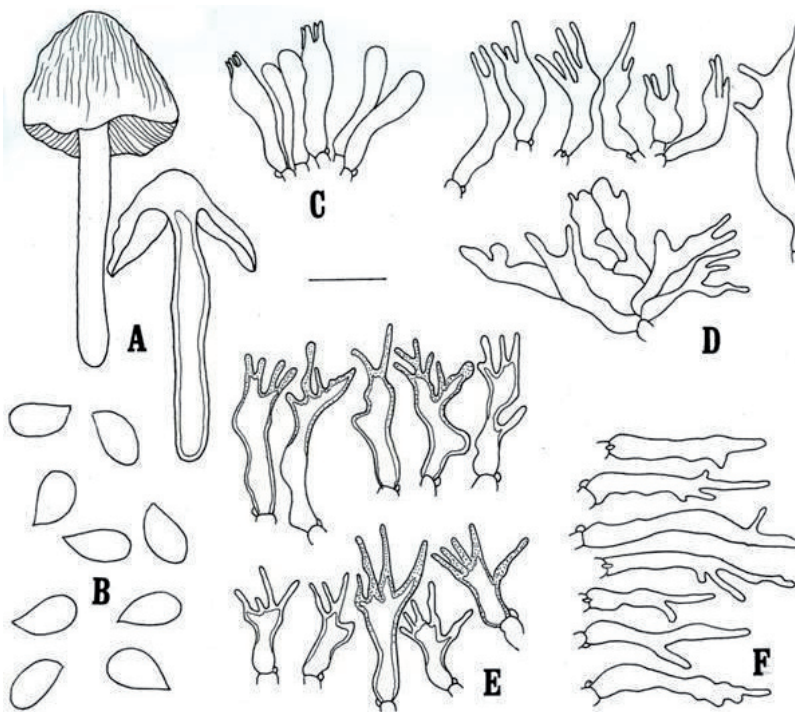
**Figure 2.** *Marasmius guyanensis* Mont. (A. Retnowati 412). A. Basidiomes; B. Basidiopores; C. Basidioles; D. Cheilocystidia; E. Pileipellis.

papilla at the center, a presence of collarium, and basidiospores  $12-13.6 \times 4 \mu\text{m}$  and it is abundant in research sites.

### 3. *Marasmius coklatus* var. *mentarangensis* Retnowati, var. nov.

*Pileus latus, convexus, velutinus. Lamellae adnatae, brunneus marginatae. Stipes teres aequalis, minute pruinose, haud insititiosus. Odor saporque nulli. Basidiosporae* (5.6)  $6.4-7.2 \times 3.2-4 \mu\text{m}$ , *ellipsoideae, leves, hyalinae, inamyloideae, tenui-tunicate. Basidiola*  $21.6-30.4 \times 6.4-7.2 \mu\text{m}$ , *anguste clavata. Cheilocystidia cellulae typi Sicci*,  $11.2-4 \times 4-8 \mu\text{m}$ , *setulosae, clavate vel irregulars, hyalinae; 2-4 setulae ad apicem*  $6.4-13.6 \times 0.8-2.4 \mu\text{m}$ . *Pleurocystidia nulla. Pileipellis hymeniform, cellulae typi Sicci*,  $12-36 \times 4.6-8 \mu\text{m}$ ; *2-6 setulae ad apicem*,  $4-16 \times 1.6-3.2 \mu\text{m}$ . *Gregarius ad terra. –Holotypus:* Indonesia. East Kalimantan, Kayan Mentarang National Park, 4 Apr 2003, A.Retnowati 390 (BO). **Fig. 3.**

**Pileus** 26-80 mm diam, conic at first, then convex in age, hygrophanous; margin incurved, surface strongly wrinkled at the disc, velutinous overall; dark brown overall (9–F8). Context white, thick up to 6 mm. **Lamellae** adnate, 24-26, closely attached to stipe, with 3 series of lamellulae, narrow, dark brown marginate; pure white. **Stipe** 50-100  $\times$  9-14 mm, hollow, cylindrical, equal, center, non-insititious, smooth, pruinose; light brown. Odor and taste



**Figure 3.** *Marasmius coklatus* var. *mentarangensis* Retnowati, var. nov. (A. Retnowati 390, Holotype). A. Basidiomes; B. Basidiospores; C. Basidia and Basidioles; D. Cheilocystidia. E. Pileipellis; F. Caulocystidia.

not distinctive. **Basidiospores** (5.6)  $6.4-7.2 \times 3.2-4 \mu\text{m}$  ( $\bar{x} = 6.46 \pm 0.51 \times 3.39 \pm 0.35$ ,  $Q = 1.60-2.25$ ,  $\bar{q} = 1.92 \pm 0.17$ ,  $n = 25$  spores per 1 specimen), ellipsoid, smooth, hyaline, inamyloid, thin-walled. **Basidia**  $21.6-30.4 \times 6.4-7.2 \mu\text{m}$ , clavate, 4-spored. **Basidioles** clavate. **Cheilocystidia** common, composed of *Siccus*-type broom cells, main body  $11.2-4 \times 4-8 \mu\text{m}$ , clavate, subcylindrical to cylindrical or irregular in outline, yellowish brown, thin to thick-walled; apical setulae  $6.4-13.6 \times 0.8-2.4 \mu\text{m}$ , 2-4 setulae, narrowly cylindrical to conical or irregular in outline, subacute to acute, hyaline, thin to thick-walled. Pleurocystidia absent. **Pileipellis** hymeniform, mottled, composed of *Siccus*-type broom cells; main body  $12-36 \times 4.6-8 \mu\text{m}$ , clavate, subclavate, cylindrical to subcylindrical or irregular in outline, yellowish brown, thin to thick-walled; apical setulae  $4-16 \times 1.6-3.2 \mu\text{m}$ , 2-6 setulae, often branched at the apex, narrowly cylindrical to irregular in outline, yellowish brown, thick-walled. **Stipe tissue** monomitic; cortical hyphae and medullary hyphae undifferentiated,  $6.2-12 \mu\text{m}$  diam, hyaline to weakly yellowish brown, thin-walled, dextrinoid. **Stipe vestiture** common, composed of two types of caulocystidia: a) *Siccus*-type broom cells, main body  $20-66.4 \times 3.2-4.8 \mu\text{m}$ , clavate, clavate to broadly clavate, cylindrical or irregular in outline, hyaline,



thin-walled; apical setulae 3.2-6.4 x 1.6  $\mu\text{m}$ , not crowded, narrowly cylindrical to conical, obtuse to acute, thin to thick-walled up to 0.8  $\mu\text{m}$ ; b) non-setulae, main body 35-36 x 5.6  $\mu\text{m}$ , clavate, cylindrical, thin-walled, hyaline. Clamp connections present.

*Distribution:* Indonesia.

*Habit and habitat:* Gregarious on soil.

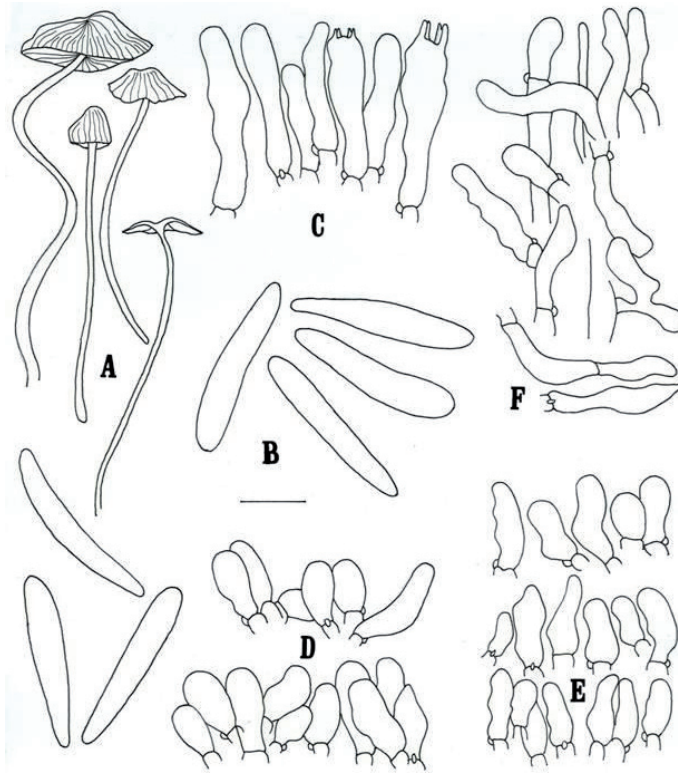
*Notes:* *Marasmius coklatus* was described from Cibodas Botanical Garden by Desjardin, Retnowati and Horak (2000). This javanese materials have a dark chocolate brown, velutinous pileus, remote to distant, broad, greyish brown lamellae, a brownish orange to brown, pruinose stipe, moderately long and broad basidiospores, *Siccus*-type cheilocystidia and pleurocystidia with few (2-5), long (-30  $\mu\text{m}$ ) apical setulae and numerous pileo-, cheilo-, pleuro-, and cauloseae. The material collected from KMNP differs from the Javanese material in having shorter basidiospores (6.4-7.2 x 3.2-4)  $\mu\text{m}$ , and the absence of pleurocystidia. These two characters separate the KMNP collection as a new variety of *M. coklatus*.

4. *Marasmius caryote* var. *pa'rayeensis* Retnowati, var. nov.

*Differt a pileo sulcatus, lamellis numerosus, basidiosporis longissimus* (28)30.4-33.8 x 4.8-5.6  $\mu\text{m}$  longis), *stipitis caulocystidiis cylindricis deim ordinary. Sparsus ad solum.* –**Holotypus:** Indonesia, East Kalimantan, Kayan Mentarang National Park, forest along Parinibung, 10 Apr 2003, A. Retnowati 460 (BO). **Fig. 4.**

**Pileus** 17-48 mm diam, convex at first, then convex with upturned margin in age; hygrophanous, sulcate; margin straight at first, upturned in age; surface glabrous, smooth; light brown. Context thin, light brown. **Lamellae** adnate, close (18 reached stipe) with 2-3 series of lamellulae, narrow, non-marginate; light brown. **Stipe** 100-145 x 1.5-2 mm, equal, cylindrical, central, non-insititious; smooth, pruinose; light brown to dark brown; white base tomentose at the base. Odor and taste not distinctive. **Basidiospores** (28)30.4-33.8 x 4.8-5.6  $\mu\text{m}$  [ $\bar{x}$  = 31.85  $\pm$  1.42 x 5.12  $\pm$  0.40  $\mu\text{m}$ , Q = 5.43-7,  $\bar{q}$  = 6.25  $\pm$  0.51, n = 25 spores per 1 specimen], cylindrical, smooth, hyaline, inamyloid, thin-walled. **Basidia** 42.4-44 x 10.4  $\mu\text{m}$ , 4-spored, clavate. Basidioles clavate. **Cheilocystidia** abundant, 10.4-28 x 8-12.8  $\mu\text{m}$ , clavate, broadly clavate to pyriform or globose, hyaline to weakly yellow, thin-walled. **Pleurocystidia** absent. **Pileipellis** hymeniform, not mottled, 12-21.6 x 5.6-9.6  $\mu\text{m}$ , clavate to broadly clavate, subglobose or globose, hyaline, thin-walled. **Stipe tissue** monomitic; cortical hyphae 7.2-16.8  $\mu\text{m}$  diam, parallel, cylindrical, hyaline,

thin-walled, smooth, weakly dextrinoid; medullary hyphae 5.6-10.4  $\mu\text{m}$  diam, parallel, cylindrical, hyaline to yellowish brown, thin-walled, dextrinoid. **Stipe vestiture** common, 16.8-40  $\times$  4.8-7.2  $\mu\text{m}$ , cylindrical to clavate or irregular shape, hyaline, thin-walled. Clamp connections present.



**Figure 4.** *Marasmius caryote* var. *pa'rayeensis* Retnowati, var. nov. (A. Retnowati 460, Holotype). A. Basidiomes; B. Basidiospores; C. Basidia and basidioles; D. Cheilocystidia; E. Pileipellis; F. Caulocystidia.

*Distribution:* Indonesia.

*Habit and habitat:* Scattered on soil.

*Notes:* Some species of *Marasmius*, e.g., *M. bekolacongoli* Beeli (*vide* Singer, 1965) and *M. titanosporus* Reid & Guillarmod (Reid, 1988), are closely related to the *M. caryote* var. *pa'rayeensis*; however, the Kalimantan material differs in having longer basidiospores from *M. bekolacongoli* (16.5-23(-28)  $\times$  3.5-5  $\mu\text{m}$ ), and shorter basidiospores from *M. titanosporus* (22-36  $\times$  5-7.2  $\mu\text{m}$ ). In addition, the presence of stipe vestiture in this *Marasmius* makes it a new variety different from the related species. *M. caryote* variety typical had been reported from Krakatau Island by Boedijn (1940).



5. *Marasmius gypseus* Retnowati, *sp. nov.*

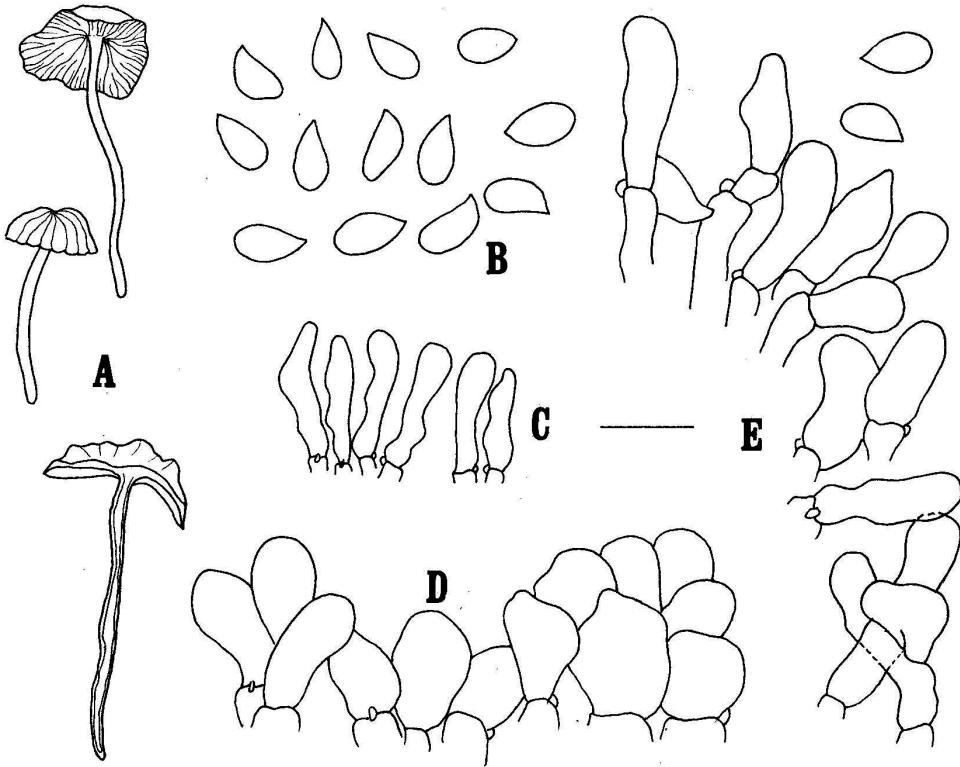
*Pileus* 22-41 mm *latus*, *convexus*, *hygrophanous*, *crenatus*, *glabrus*, *gypseus*. *Lamella* *adnate*, *distantes*, *haud marginatae*. *Stipes* 40-60 × 1.5-3 mm, *aequalis*, *glabrus*, *haud insititious*, *brunneus*. *K-Basidiospores* 6.4-7.2 × 3.2-4 μm, *ellipsoideae*, *leves*, *hyalinae*, *inamyloideae*. *Basidiola* *clavate*, *cheilocystidia* *et pleurocystidia* *nula*. *Pileipellis* *hymeniformis*, *clavate*, *prelate clavate*, *globosus* *vel subglobosus*, *leves*, 16-26.4 × 8-18.4 μm. *Stipitis caulocystidis* *ordinary*, 20-24.8 × 6.4-12 μm, *clavate*, *globosus* *vel subglobosus*. *Cespitosesus* *vel gregarious ad lignum*. –**Holotypus**: Indonesia. East Kalimantan, Kayan Mentarang National Park, trail to sub-camp 1 in forest surrounding Pa'raye village, 3 Apr 2003, A. Retnowati 371 (BO). **Fig. 5.**

**Pileus** 22-41 mm diam, convex with depressed center, strongly hygrophanous, crenate; margin straight, wavy; surface glabrous, wrinkle; white overall. Context thin, white. **Lamellae** adnate, distant with 2 series of lamellulae, narrow, non-marginate, white. **Stipe** 40-60 × 1.5-3 mm, cylindrical, center, hollow, equal, smooth, glabrous, non-insititious; brown. Odor and taste not distinctive. **Basidiospores** 6.4-7.2 × 3.2-4 μm [ $\bar{x}$  = 6.78 ± 0.41 × 3.33 ± 0.30 μm, Q = 1.60-2.25,  $\bar{q}$  = 2.05 ± 0.18, n = 25 spores per one specimen], ellipsoid, smooth, hyaline, inamyloid, thin-walled. **Basidia** unobserved. **Basidioles** clavate, fusoid. **Cheilocystidia and pleurocystidia** absent. **Pileipellis** hymeniform, composed of clavate, broadly clavate, globose to subglobose, non-diverticulate, 16-26.4 × 8-18.4 μm, hyaline, thin-walled. **Stipe tissue** monomitic; cortical and medullary hyphae indistinguishable, 5.6-12.2 μm diam, parallel, cylindrical, hyaline, smooth, thin-walled, dextrinoid. **Stipe vesture** common, composed of clavate, broadly clavate, globose to subglobose, non-diverticulate, scattered, 20-24.8 × 6.4-12 μm, hyaline, thin-walled. Clamp connections present.

*Distribution*: Indonesia.

*Habit and habitat*: Caespitose to gregarious on wood.

*Notes*: This new *Marasmius* can be distinguished by having convex with depressed center pileus, strongly hygrophanous and distant with 2 series of lamellulae, the lacking of cheilocystidia and pleurocystidia, and basidiospores 6.4-7.2 × 3.2-4 μm. Several members of section *Globulares* have a similar



**Figure 5.** *Marasmius gypseus* Retnowati, *sp. nov.* (A. Retnowati 371, Holotype). A. Basidomes; B. Basidiospores; C. Basidioles; D. Pileipellis; E. Caulocystidia.

feature with this *Marasmius*. *M. albertianus* Singer described from Congo has longer basidiospores  $8-10 \times (3)-4(-5) \mu\text{m}$ , presence of cheilocystidia, and is host specific on bamboo (*vide* Pegler, 1977). *M. niveus* from French Guyana (*vide* Singer, 1976) also has longer basidiospores  $6.5-9 \times 2.5-3.5 \mu\text{m}$ , and absence of cheilocystidia and stipe vestiture.

### Acknowledgment

The author thanks to Simon Taka Nuhamara (BIOTROP), Danang Anggoro (BKSDA Kalimantan Timur), and Deni Wahyudi (Mulawarman University) for help during the fieldwork. I am also thankful to Prof. Dr. Mien A. Rifai for his useful comments on this paper, and to Indonesian Plant Taxonomy Association (PTTI) which facilitated the editors of scientific journals to review this paper. This research was funded by World Wide Fund (WWF) Indonesia programme to do fieldwork in Kayan Mentarang National Park in East Kalimantan.

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