

Agaricales of Indonesia. 5. The genus *Gymnopus* from Java and Bali

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Twenty-four species of *Gymnopus* are described from the Indonesian islands of Java and Bali. Of these, nine represent new taxa (*G. austrosemihirtipes*, *G. bicolor*, *G. diminutus* var. *clavatus*, *G. indoctoides*, *G. melanopus*, *G. spissus*, *G. trogioides*, *G. virescens*, *G. vitellinipes*), ten require new combinations in *Gymnopus* of names originally described in *Marasmius* or *Clitocybe*, three are provisional taxa, and all 24 taxa represent first distribution reports for Java and Bali. Phylogenetic analyses of 19 Indonesian *Gymnopus* species are included using sequence data from nrDNA ITS1 & 2 regions and 5.8S region. Comprehensive descriptions and illustrations are provided for all 24 taxa.

Keywords: Agaricales, Basidiomycetes, *Collybia*, collybioid fungi, phylogeny, taxonomy.

Indonesia is a tropical archipelago that has one of the larger biotas in the world. A country of more than 17,000 islands, Indonesia is home to nearly 17% of the world's animal and plants species. Until recently, fleshy basidiomycetous fungi had been poorly documented from the region. Previous studies of the Agaricales of Indonesia left inadequate records and descriptions along with poorly preserved specimens. The documentation that exists, however, suggests a large diversity of basidiomycete fungi that reflects the overall biodiversity of the area. The monograph presented herein is the fifth in a study of the Agaricales of Indonesia (Desjardin & Horak, 1999, 2002; Desjardin & al., 2000; Verbeken & al., 2002), and represents the first work describing species of *Gymnopus* from Java and Bali. Phylogenetic analyses are included using sequence data from nrDNA internally transcribed spacer (ITS) regions 1 and 2, and 5.8S region.

Gymnopus is composed of collybioid agarics (*sensu* Largent, 1986) with white to cream-colored basidiospores and a cutis-type pileipellis.

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These mushrooms are usually relatively small and brown-pigmented and function ecologically as litter decomposers in forests and other plant communities. The genus „*Collybia*“ s.l. formerly contained hundreds of taxa, of which most now belong in the genus *Gymnopus* as redefined by Antonín, Halling & Noordeloos (1997). „*Collybia*“ s.l. is heterogeneous and shares many morphological characters with *Gymnopus*. However, the type species of *Collybia*, *C. tuberosa* (Bull. : Fr.) P. Kumm., is characterized by basidiomes arising from sclerotia – a developmental character not shared by *Gymnopus*. Antonín & al. (1997) also identified limits between *Gymnopus* and other closely related genera. The genus *Marasmiellus* is differentiated by an insititious stipe, and *Micromphale* differs by having gelatinized pileus tramal tissues (*Micromphale* is now accepted as a synonym of *Marasmiellus* ss. Antonín & Noordeloos, 1997). *Gymnopus* is separated from *Marasmius* by having a pileipellis composed of cylindrical to irregularly inflated hyphae, whereas *Marasmius* has a pileipellis composed of a hymeniform layer of broadly clavate cells or broom cells. Since the resurrection of the generic name *Gymnopus* by Antonín & al. (1997), no reports of the genus have been made from Indonesia.

Prior to this study, six species of *Collybia* were reported from Indonesia by Overeem (1922, 1927) and Hennings (1900), viz., *C. eurrhiza* (Berk.) Höhn., *C. longipes* P. Kumm., *C. muciflua* Höhn., *C. radicata* (Relhan) Fr., *C. sparsibarbis* Berk. & Broome, and *C. subconfluens* Henn. Of these six species, two species belong in the genus *Xerula* (*X. longipes* (P. Kumm.) Maire, *X. radicata* (Relhan) Dörfelt), two belong in *Termitomyces* (*T. eurrhizus* (Berk.) R. Heim, with *C. sparsibarbis* as a synonym), and one is of unknown taxonomic placement (*C. muciflua* probably represents a *Mycena*). Only *C. subconfluens* may represent a species of *Gymnopus*; unfortunately, the protologue provides limited data from which accurate taxonomic placement can be evaluated, and the type specimen is no longer extant (see commentary for *G. allegetii*).

E. J. H. Corner is one of the more recent researchers of agarics from this region of the world. In 1996 he published a monograph of the genus *Marasmius* from Malesia. In it he accepted a broad circumscription of the genus and included taxa that are more appropriately placed in *Cyptotrama*, *Flammulina*, *Gymnopus*, *Hemimycena*, *Hydropus*, *Marasmiellus*, *Marasmius*, *Mycena*, and other genera (Desjardin & al., 2000). A major focus of Corner's (1996) monograph was to distinguish *Trogia* species from *Marasmius*. One of the only consistent features he could find was the presence of subaceroise basidioles in *Marasmius* ss. Corner and their absence in *Trogia*. Many species of *Gymnopus* have subaceroise basidioles and were thus placed by Corner (1996) in *Marasmius*, despite the availability of other taxonomically informative characters that distinguish the latter two genera. We have

collected a number of species described by Corner in *Marasmius*, and these are formally transferred to *Gymnopus* in this study.

Gymnopus is a character-poor genus, with many specimens differing in only very subtle characters, such as basidiome macro-morphology, pileipellis anatomy, cystidia shape and basidiospore size. This makes the task of species recognition difficult from a morphological perspective. Taylor & al. (2000) describe the limitations of recognizing fungal species through morphology, a practice responsible for establishing the ca. 70,000 described fungi (Hawksworth & al., 1996). The use of morphology alone may be problematic in recognizing species because of the possibility of grouping morphologically similar, yet evolutionarily unique taxa. For this reason, phylogenetic analysis of rDNA ITS sequences was chosen to aid in recognizing species. For phylogenetic species recognition, however, the use of a single gene or DNA sequence is not recommended. Taylor & al. (2000) suggest that phylogenetic analysis, with the use of multiple genomic regions, is the most efficient method in recognizing species. The comparison of phylogenies based on different genomic regions may show incongruence; here evolutionarily different species can be recognized at the point where phylogenetic similarities between trees end and the incongruities begin (Taylor & al., 2000). Using single genomic regions has the opposite problem from that of morphological species recognition. It has the potential to falsely identify several lineages within a single taxon. An example would be of a gene used for phylogenetic species recognition that has multiple alleles. A group with one allele may be considered a species at the exclusion of another group with a different allele, when in fact they are both members of the same species. However, the use of single gene sequences will help species recognition when the morphological characters used to distinguish between species are vague or invariable yet sequence variation is detectable. The combination of single gene phylogenetic species recognition and morphological species recognition may serve to stabilize the otherwise problematic approaches. Some studies have taken this approach to identify taxa at the generic and species levels. Studies using morphology in conjunction with phylogenetic analysis of ITS data have been performed by Wang & al. (2002) for *Cudonia sichuanensis*, O. K. Miller & al. (2002) for *Gomphidius* species, and Smith & al. (2001) for *Botryosphaeria eucalyptorum*.

To aid in distinguishing phenetically similar taxa, sequences from nrDNA internal transcribed spacer regions 1 and 2 and 5.8S region were obtained from selected specimens and subjected to phylogenetic analyses. A combination of morphological and molecular data was used to aid in species diagnosis and in placing the species into appropriate infrageneric taxa.

Materials and methods

Morphological studies

Collecting trips were made to the Indonesian islands of Java and Bali in March 1977 and in January 1998, 1999, 2000 and 2001. Sixty specimens representing species of *Gymnopus* were collected. Voucher material is deposited in Herbarium Bogoriense (BO) in Bogor, Java, in the Harry D. Thiers Herbarium (SFSU) at San Francisco State University, in the Herbarium Zurich (Z+ZT), and in the New York Botanical Garden (NY) as indicated.

Macro- and micromorphological terminology used for descriptions follow Largent (1986), Largent & al. (1977), and Vellinga (1988). Color terms and notations in parentheses are from Kornerup & Wanscher (1978). All measurements and colors reported for microscopic features were made from dried material rehydrated in 100% ethanol followed by distilled water, 3% KOH or Melzer's reagent. Microscopic analyses were performed using an Olympus CH30 microscope with a drawing tube. The terms used to describe lamellae spacing refer to the number of lamellae that reach from the pileus margin to the stipe, and do not include lamellulae whose spacing is indicated by the number of series present. Spore statistics include: \bar{x} , the arithmetic mean of the spore length by spore width (\pm standard deviation) from spores measured in a single specimen; \bar{x}_r , the range of spore means and \bar{x}_m , the mean of spore means (\pm SD) where more than one specimen is available; Q, the quotient of spore length and spore width in any one mean of Q-values in a single sample; \bar{q}_n , the range of q-values and \bar{q}_m , the mean of q-values where more than one specimen is available.

Unless stated otherwise, in the figures the basidiomes are natural size. Figures for basidiospores are at 2000x (scale bar = 5 μ m); basidia, cystidia, setae, pileipellis and stipitipellis are at 1000x (scale bar = 10 μ m).

Molecular techniques

Sequences collected from specimens were subjected to phylogenetic analysis to determine taxon placement. Phylogenetic analysis was used to resolve ambiguity between morphologically similar species. In addition, multiple specimens from a morphologically determined species were chosen for phylogenetic analysis in order to assess the importance of selected morphological characters used for taxon recognition. Nucleotide sequences of the internal transcribed spacer regions 1 and 2 and 5.8S rDNA genes (ITS1, ITS2 and 5.8S) were produced for 31 Indonesian specimens (Table 1). DNA was extracted from dried herbarium material, or from fresh samples

preserved in CTAB. Extractions of samples were performed using two methods: 1) DNA mini-preps used approximately 10–20 mg tissue ground in liquid nitrogen and extracted samples in 500 µl 10x CTAB extraction buffer (1% CTAB, 50 mM Tris, 10 mM Na₂EDTA, 0.7 M NaCl) at 65° C for 30 min. Samples were then purified with phenol-chloroform-isoamyl alcohol (25:24:1), with two more additional purifications of chloroform-isoamyl alcohol (24:1) steps. DNA was precipitated with 600 µl ice-cold isopropanol overnight. 2) Additional extractions were performed with E.Z.N.A. fungal DNA Miniprep Kit from Omega Bio-tek, Inc. (P.O. Box 47310, Doraville, GA 30362).

Primers used for DNA amplification and sequencing were ITS1, ITS2, ITS4 (White & al., 1990), ITS1-F, ITS4-B (Gardes & Bruns, 1993), 5.8SR (Hopple & Vilgalys, 1999) and its complement 5.8S, and new primer 5.8SAW (5'-CAAGGTGCGTTCAAAGATTTCG) designed from *Gymnopus* sequences. Multiple external and internal primers were needed to obtain ITS1 and ITS2 sequences. PCR and cycle sequencing reactions were performed on ABI 9700 and MJ Bioworks PTC 200 DNA Engine (987 Tahoe Blvd. #106, Incline Village, Nevada 89451) thermal cyclers. Sequence was read on ABI 377 DNA Sequencer Assembly and correction of the sequence fragments was done on Sequencher v.3.1.1 (GeneCodes Corp., Ann Arbor, Michigan) software.

Sequences generated as part of this project were deposited in GenBank (Tab. 1).

Phylogenetic analysis

Assembly of the data matrix was performed with Clustal X 1.81 (Thompson & al., 1997) for initial alignment, and MacClade v.4.03 (Maddison & Maddison, 2001) for additional alignment by hand. A single data set was created containing 31 Indonesian specimens including the type specimen for *Gymnopus menehune* from Hawai'i. The data set also includes *Lentinula lateritia*, *L. novaezelandiae*, and *L. edodes*. The *Lentinula* spp. sequences were acquired from GenBank and used for rooting purposes. Sequences for *Gymnopus dryophilus* and *G. subnudus* were also acquired from GenBank to assist in identification of subgeneric groups in *Gymnopus*. GenBank accession numbers are indicated in Table 1. Parsimony analysis was performed with PAUP* v. 4.0b (Swofford, 2002), with equal weighting and gaps treated as missing data.

The heuristic search was performed with MAXTREES unlimited, random taxon addition sequences with 1000 replicates, and TBR branch swapping. Bootstrap analysis of the data was performed using 1000 replicates with 10 random taxon addition sequences, and

Tab. 1. – List of specimens used in the molecular analyses

Gymnopus Species from Java and Bali	Location	Sect.	Collection No.	GenBank no.
<i>Gymnopus</i> aff. <i>moseri</i>	Java	<i>Vestipedes</i>	AWW10	AY263431
<i>G. aurantiipes</i>	Bali	<i>Levipedes</i>	AWW118	AY263432
<i>G. aurantiipes</i>	Bali	<i>Levipedes</i>	AWW131	AY263433
<i>G. austrosemihirtipes</i> (Holotype)	Java	<i>Levipedes</i>	AWW65	AY263422
<i>G. bicolor</i> (Holotype)	Bali	<i>Levipedes</i>	AWW116	AY263423
<i>G. brunneigracilis</i>	Java		AWW01	AY263434
<i>G. gibbosus</i>	Java	<i>Vestipedes</i>	AWW12	AY263436
<i>G. gibbosus</i>	Java	<i>Vestipedes</i>	AWW66	AY263437
<i>G. gibbosus</i>	Java	<i>Vestipedes</i>	AWW95	AY263438
<i>G. gibbosus</i>	Java	<i>Vestipedes</i>	AWW112	AY263435
<i>G. indoctoides</i> (Holotype)	Bali	<i>Levipedes</i>	AWW125	AY263424
<i>G. indoctus</i>	Java	<i>Vestipedes</i>	AWW04	AY263439
<i>G. indoctus</i>	Java	<i>Vestipedes</i>	AWW17	AY263440
<i>G. indoctus</i>	Java	<i>Vestipedes</i>	AWW32	AY263441
<i>G. melanopus</i>	Java	<i>Vestipedes</i>	AWW54	AY263425
<i>G. melanopus</i> (Holotype)	Java	<i>Vestipedes</i>	AWW50	AY263442
<i>G. aff. menehune</i>	Bali	<i>Vestipedes</i>	AWW113	AY263430
<i>G. menehune</i>	Java	<i>Vestipedes</i>	AWW15	AY263443
<i>G. menehune</i>	Java	<i>Vestipedes</i>	AWW87	AY263444
<i>G. nonnulus</i> var. <i>attenuatus</i>	Java	<i>Vestipedes</i>	AWW05	AY263445
<i>G. nonnulus</i> var. <i>attenuatus</i>	Java	<i>Vestipedes</i>	AWW55	AY263446
<i>G. salakensis</i>	Java		AWW29	AY263447
<i>G. sepiiconicus</i>	Bali	<i>Levipedes</i>	AWW117	AY263448
<i>G. sepiiconicus</i>	Bali	<i>Levipedes</i>	AWW126	AY263449
<i>G. spissus</i> (Holotype)	Bali		AWW129	AY263427
<i>G. tamblinganensis</i>	Bali	<i>Vestipedes</i>	AWW39	AY263450
<i>G. termiticola</i>	Java		AWW106	AY263451
<i>G. termiticola</i>	Java		DED7264	AY263452
<i>G. trogioides</i> (Holotype)	Java	<i>Vestipedes</i>	AWW51	AY263428
<i>G. vitellinipes</i>	Bali	<i>Levipedes</i>	AWW115	AY263453
<i>G. vitellinipes</i> (Holotype)	Bali	<i>Levipedes</i>	AWW127	AY263429
Additional taxa				
<i>G. menehune</i> (Holotype)	Hawai'i	<i>Vestipedes</i>	DED5866	AY263426
<i>G. dryophilus</i>	N. America & Europe	<i>Levipedes</i>	–	AF079580
<i>G. subnudus</i>	N. America	<i>Vestipedes</i>	–	CSU43781
<i>Lentinula edodes</i>			–	AF356169
<i>L. novaezelandiae</i>			–	U33082
<i>L. lateritia</i>			–	AF356170

MAXTREES set to 100. Searches were performed with missing data excluded.

Maximum likelihood scores were obtained for the most parsimonious trees in this study using an optimal evolutionary model determined by a likelihood ratio test (LRT). The likelihood scores for the most parsimonious trees were compared using a Shimodaira-Hasegawa (Shimodaira & Hasegawa, 1999) test of tree topology in PAUP* using RELL approximation. This was done to see if there was a significant difference between the parsimony tree with the lowest likelihood score and the other parsimony trees.

For the purpose of this study, species are determined using a combination of phylogenetic and morphological species recognition criteria. With molecular data, species were determined by the presence of resolved terminal branches $\geq 92\%$ bootstrap values (Fig. 1). Phylogenetically informative morphological characters were identified and described for the species that were determined through phylogenetic analysis. Those characters were then used to aid in identifying specimens not included in the molecular analyses.

Results of phylogenetic analyses

ITS rDNA sequences ranged from 675 base pairs (*Gymnopus* aff. *moseri* AWW10) to 782 bp (*G. austrosemihirtipes* AWW65, *G. termiticola* AWW106). Alignment in Clustal X resulted in many ambiguous areas in both ITS regions. Preliminary analysis of phylogenetic trees suggested clades that conformed to sect. *Vestipedes* and *Levipedes*. Additional alignment was done in MacClade. The final data matrix was 920 base pairs in length.

Three hundred ninety-two characters in the matrix were ambiguously aligned and therefore excluded from analysis. All gapped characters were excluded leaving 431 characters for analysis. Of these, 120 characters were parsimony informative.

Parsimony analysis yielded four equally parsimonious trees of 398 steps (CI = 0.538, RI = 0.784; Figs. 1–2). The LRT of various models of evolution for the four parsimony trees indicated model GTR+ Γ +I to be the best model for likelihood estimation (data not shown). Parsimony tree number 1 has the highest likelihood score for all models of evolution evaluated in the LRT. The Shimodaira-Hasegawa test for significance between tree topologies, using the GTR+ Γ +I model, indicates that there is no significant difference between tree number 1 and the three other parsimony trees (data not shown). For this study, parsimony tree number 1 was chosen to represent the most parsimonious tree and is shown in Figure 1.

Nineteen species of Indonesian *Gymnopus* were delimited in the molecular analysis. Two sections of *Gymnopus* are partially resolved



Fig. 1. – Phylogeny of *Gymnopus* from Indonesia. Tree one of four most parsimonious trees. Numbers indicate bootstrap values $\geq 50\%$. This tree was selected for having the best maximum likelihood score ($-\ln L=2603.51388$) using model GTR+ Γ +I. However, a Shimodaira-Hasegawa test with RELI approximation of 1000 bootstrap replicates indicate that there is no significant difference between the likelihood score of this tree and the scores of the other three trees.

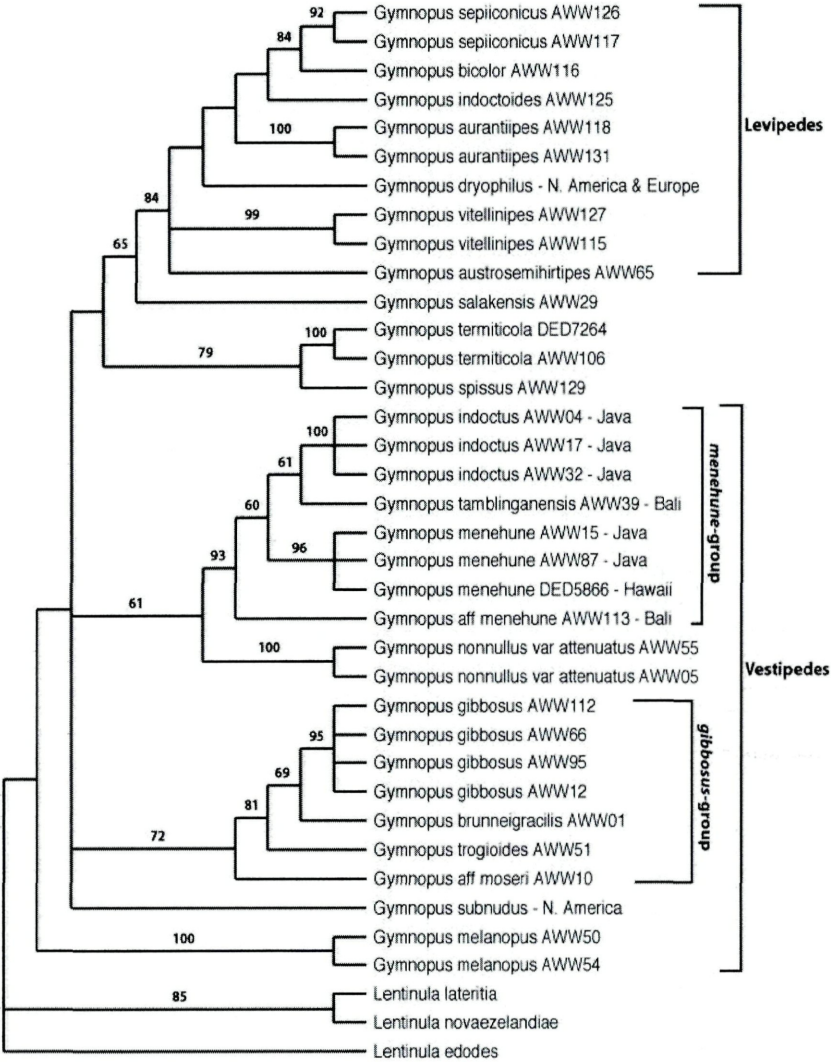


Fig. 2. – Phylogeny of *Gymnopus* from Indonesia. Strict consensus tree of four most parsimonious trees. Numbers indicate bootstrap values $\geq 50\%$.

in the most parsimonious trees (Figs 1–2). Sect. *Levipedes* has the stronger resolution with 84% bootstrap support. The type species for this section, *G. dryophilus*, falls in this clade with six identified species: *G. aurantiipes*, *G. bicolor*, *G. indoctoides*, *G. sepiiconicus*, and *G. vitellinipes*. *Gymnopus salakensis* is the sister taxon to this clade with 65% bootstrap support. *Gymnopus termiticola*, and *G. spissus* form a clade with 79% bootstrap support that is weakly

supported as the sister clade to the *Levipedes-salakensis* clade. Sect. *Vestipedes* is not monophyletic in the most parsimonious trees (Figs. 1–2). This sect. traditionally included the North American species *G. subnudus*. In several of the most parsimonious trees, *G. subnudus* is sister to the clade containing sect. *Levipedes*, *G. salakensis*, *G. spissus*, and *G. termiticola*. *Gymnopus subnudus* forms a polytomy with two clades within *Vestipedes* in the strict consensus tree (Fig. 2), along with the clade containing sect. *Levipedes*, *G. salakensis*, *G. spissus*, and *G. termiticola*.

Moderate (72%) to low (61%) bootstrap values support the two clades that form part of the polytomy representing sect. *Vestipedes* in the strict consensus tree (Fig. 2). *Gymnopus nonnullus* var. *attenuatus* and the clade labeled the *menehune*-group forms a clade with 61% bootstrap support. A branch with 93% bootstrap value supports the *menehune*-group. This clade includes the type specimen for *G. menehune*, which was described by Desjardin & al. (1999) from Hawai'i. There are four Indonesian species identified in this group: *G. indoctus*, *G. menehune*, *G. aff. menehune* and *G. tamblinganensis*. The other clade, with 72% bootstrap support, that is represented in sect. *Vestipedes* is labeled as the *gibbosus*-group. It represents 4 species from Indonesia: *G. gibbosus*, *G. brunneigracilis*, *G. trogioides*, and *G. aff. moseri*. *Gymnopus melanopus* falls outside either clade, and is weakly supported as the sister species to all other *Gymnopus* taxa in this study. Morphologically, *G. melanopus* resembles members of sect. *Vestipedes*. ITS sequences were not obtained from five taxa represented in the monograph.

Discussion of phylogenetic data

Of the two *Gymnopus* sections represented in this study, only sect. *Levipedes* is well-resolved by the ITS rDNA trees (Figs. 1–2). The sequence of the type species for this section, *G. dryophilus*, falls in this clade. These species share a *dryophila*-structure pileipellis, which is a definitive character for the section (sensu Halling, 1983; Antonín and Noordeloos, 1997). *Gymnopus aurantiipes* and *G. indoctoides* are the most similar morphologically to *G. dryophilus* in terms of their pileipellis structure, sharing a well-developed *dryophila*-structure pileipellis of inflated cells. The remaining species in *Levipedes*, viz., *G. austrosemihirtipes*, *G. bicolor*, *G. sepiiconicus*, and *G. vitellinipes*, form a weak *dryophila*-structure of pseudo-cylindrical, swollen, highly branched hyphae.

Sect. *Vestipedes* is not a monophyletic group in this analysis. Morphologically, the species of this section share radially-arranged, repent, cylindrical hyphae and an ornamented stipe (pruinose to pubescent or tomentose). Based on morphology, *G. subnudus* is a

North American member of this group but its placement in the trees is not consistent with *Vestipedes* (Figs. 1–2).

Of the two groups recognized in sect. *Vestipedes*, the *gibbosus*-group has the strongest bootstrap support at 72%. All of the *gibbosus*-group species are distinguished by their relatively large basidiospores ($\bar{x}_r = 8.8\text{--}13.12 \times 3.72\text{--}5.06 \text{ }\mu\text{m}$ vs. $7.98\text{--}8.9 \times 3.52\text{--}4.1 \text{ }\mu\text{m}$ for the remaining *Vestipedes*). *Gymnopus trogioides* has a different spore morphology compared to other species of *Gymnopus*: spores are sub-fusiform in contrast to the ellipsoid spores common to most *Gymnopus* taxa. The other clade representing sect. *Vestipedes* is not as well-supported as the *gibbosus*-group. It consists of the *menehune*-group and its sister taxon *G. nonnullus* var. *attenuatus*. *Gymnopus nonnullus* var. *attenuatus* forms basidiomes that have a subinsititious stipe and fruit on woody debris whereas the members of the *menehune*-group have a basal tomentum and grow on leaf litter. The *menehune*-group has strong bootstrap support (93%) and includes the type specimen for *G. menehune* (DED5866), which was initially described from Hawai'i (Desjardin & al., 1999). In the monograph, it was hypothesized that *G. menehune* was an introduced species of Australasian origin because of its association with introduced plants.

The results of this study are consistent with this hypothesis. The relationships revealed in the ITS trees indicate a difference between the *G. menehune* isolates from Java, and the *G. aff. menehune* found on Bali that warrants distinction at the species level. This is somewhat perplexing because there is virtually no morphological difference between the two taxa. Branch and bound and bootstrap analysis were performed for this group, with *G. nonnullus* as the outgroup (results not shown). These analyses yielded the same tree with similar bootstrap support. The reason for the difference between the molecular data and morphology may be a result of a lack of morphological divergence, convergent evolution, or incorrect resolution from the ITS sequence. Until more work can be done with this group, this study will treat the „*menehunes*“ from Java and Bali as separate species, with the Javanese species linked to the type from Hawai'i.

There are, however, distinguishing characteristics among the remaining *menehune*-group members, viz., *G. indoctus*, *G. tamblinganensis*, and *G. menehune*. *Gymnopus indoctus* forms paler basidiomes than *G. menehune*, and has broadly clavate cheilocystidia. *Gymnopus tamblinganensis* forms broadly umbonate pilei, and has cheilocystidia that are clavate and unlobed, while *G. menehune* forms brown umbilicate basidiomes with clavate-contorted and lobed cheilocystidia.

Several taxa have been treated as being outside both sect. *Levipedes* and *Vestipedes*. *Gymnopus salakensis* is the sister taxon to the *Levipedes* clade in Fig 1. Although it is supported as sister to sect.

Levipedes by low bootstrap support (65%), morphologically it lacks a *dryophila*-type cutis, which is a key feature for the section. The morphology of *G. salakensis* suggests it to be a member of sect. *Vestipedes*. In this study *G. salakensis* is not considered to be a member of sect. *Levipedes* because of weak bootstrap support and conflicting morphology.

Gymnopus termiticola and *G. spissus* are sister to each other with 79% bootstrap support, and as a group are sister to the *Levipedes-salakensis* clade (Figs. 1–2). Both species have unusual features. *Gymnopus termiticola* forms basidiomes with strongly sulcate pilei, has conspicuous lanceolate pleurocystidia, has a pileipellis of interwoven, cylindrical hyphae, and is associated with termite nests. *Gymnopus spissus* forms basidiomes that are similar to *G. meneshune*, although *G. spissus* lacks an umbilicate pileus, has much smaller basidiospores and forms clavate cheilocystidia that are not nodulose nor lobulate.

The relationship between *Gymnopus termiticola* and *G. spissus* is not clearly understood, but neither is their placement as a distinct group in the ITS tree. Their location as sister to the *Levipedes-salakensis* clade does not warrant consideration for inclusion in sect. *Levipedes*. Like *G. salakensis*, neither have a distinct *dryophila*-type pileipellis or significant bootstrap support as members of the clade. As a result, neither *G. termiticola* nor *G. spissus* are treated as belonging in sect. *Levipedes*.

Reasons for the placement of *G. melanopus* outside of the major *Gymnopus* clade are not clear. Morphologically, its pileipellis of radially repent, cylindrical hyphae, suggest that this taxon should be placed in sect. *Vestipedes*. Parsimony analysis of different data sets, including one with the addition of *Marasmiellus synodicus* and *Marasmius appalanatipes*, shows *G. melanopus* grouping within the *Vestipedes* clade, but always lacking >50% bootstrap support (results not shown). A Blast search done with *G. melanopus* sequence retrieved a nearly identical sequence from an unknown basidiomycete (E score = 0.0; Genbank no. AF241323). Since sect. *Vestipedes* is not monophyletic in our analyses, *G. melanopus* will be treated as a member based on morphological data.

The five taxa that are included in the monograph but not represented in the ITS tree are *G. purpureicollus*, *G. johnstonii*, *G. virescens*, *G. aff. allegetii*, and *G. diminutus* var. *clavatus*. These five taxa are unique morphologically from all the taxa identified in the ITS analysis and have been placed in sect. *Vestipedes* with the exception of *G. purpureicollus* which was not placed in either section. *Gymnopus purpureicollus* is similar to *G. salakensis*, but has a cutis of interwoven, cylindrical hyphae, which is not recognized in either *Levipedes* or *Vestipedes*.

In conclusion, these analyses suggest that there are at least 24 species of *Gymnopus* in Java and Bali; six are in sect. *Levipedes*, fourteen belong to sect. *Vestipedes*, and four cannot yet be placed in a defined section. Of these 24 species, eight are new to science, one is a new variety, and three are provisional taxa. In addition, eleven species epithets described originally in *Marasmius* are transferred to *Gymnopus*. Approximately one third of the species of *Gymnopus* reported herein from Java and Bali are new to science. This result matches that reported for Indonesian *Marasmius* (32% new to science; Desjardin & al., 2000), and for Indonesian poroid mycenoid agarics (ca 35% new to science; Kelly Collins & al., unpubl. data).

An unpublished study of *Gymnopus* in southern oak forests of Costa Rica (Mata & al., poster presentation, 2002 Intl. Mycol. Congress) suggests the possibility of another unidentified section within *Gymnopus* that is independent of *Levipedes* or *Vestipedes*. The existence of an additional section might resolve placement of the ambiguous taxa in this study. A broader analysis of the phylogeny of *Gymnopus* is needed to better understand the relationship of taxa within the genus.

Synopsis of Java and Bali Species of *Gymnopus*

Section *Levipedes*

1. *Gymnopus aurantiipes* (Corner) A. W. Wilson, Desjardin & E. Horak
2. *Gymnopus austrosemihirtipes* A. W. Wilson, Desjardin & E. Horak
3. *Gymnopus bicolor* A. W. Wilson, Desjardin & E. Horak
4. *Gymnopus indoctoides* A. W. Wilson, Desjardin & E. Horak
5. *Gymnopus sepiiconicus* (Corner) A. W. Wilson, Desjardin & E. Horak
6. *Gymnopus vitellinipes* A. W. Wilson, Desjardin & E. Horak

Section *Vestipedes*

7. *Gymnopus alligretii* (Seynes) A. W. Wilson, Desjardin & E. Horak
8. *Gymnopus brunneigracilis* (Corner) A. W. Wilson, Desjardin & E. Horak
9. *Gymnopus diminutus* var. *clavatus* A. W. Wilson, Desjardin & E. Horak
10. *Gymnopus gibbosus* (Corner) A. W. Wilson, Desjardin & E. Horak
11. *Gymnopus indoctus* (Corner) A. W. Wilson, Desjardin & E. Horak
12. *Gymnopus johnstonii* (Murrill) A. W. Wilson, Desjardin & E. Horak
13. *Gymnopus melanopus* A. W. Wilson, Desjardin & E. Horak
14. *Gymnopus menehune* Desjardin, Halling & Hemmes
15. *Gymnopus* aff. *menehune* Desjardin, Halling & Hemmes

- 16. *Gymnopus* aff. *moseri* Antonín & Noordel.
- 17. *Gymnopus nonnullus* var. *attenuatus* (Corner) A. W. Wilson, Desjardin & E. Horak
- 18. *Gymnopus tamblinganensis* nom. prov.
- 19. *Gymnopus trogioides* A. W. Wilson, Desjardin & E. Horak
- 20. *Gymnopus virescens* A. W. Wilson, Desjardin & E. Horak

Taxa of uncertain infrageneric placement

- 21. *Gymnopus purpureicollus* (Corner) A. W. Wilson, Desjardin & E. Horak
- 22. *Gymnopus salakensis* nom. prov.
- 23. *Gymnopus spissus* A. W. Wilson, Desjardin & E. Horak
- 24. *Gymnopus termiticola* (Corner) A. W. Wilson, Desjardin & E. Horak

Artificial Key to Java and Bali species of *Gymnopus*

- 1. Pileipellis composed of interwoven, typically inflated or broad irregularly-shaped hyphae forming a *dryophila*-structure, seldom cylindrical, never radially arranged [Plates 1.7, 2.6, 3.5, 4.5, 5.5, 6.5, 21.4] 2
- 1*. Pileipellis composed of radially arranged, cylindrical hyphae, not a *dryophila*-structure 8
- 2. Basidiomes associated with needles of *Pinus merkusii*. Cheilocystidia absent [if cheilocystidia are present, compare with 22. *G. salakensis*] 21. *G. purpureicollus*
- 2*. Basidiomes associated with hardwood debris or on soil in hardwood forests. Cheilocystidia present 3
- 3. Stipe tissue turning green in alkaline solution (3% KOH). Cheilocystidia clavate, not lobulate or with finger-like projections 2. *G. austrosemihirtipes*
- 3*. Stipe tissue not turning green in alkaline solution. Cheilocystidia lobulate or with few to numerous finger-like projections 4
- 4. Stipe deep yellow to yellowish orange overall. Lamellae yellow to pale orange brown. Basidiospores with mean length >8.3 µm. Cheilocystidia broadly clavate to sphaeropedunculate (10–14.5 µm diam), with or without a few finger-like projections. 6. *G. vitellinipes*
- 4*. Stipe pale orange brown, brownish orange, reddish brown or brown. Lamellae white to pale yellowish white. Basidiospores with mean length <6.5 µm. Cheilocystidia cylindrical to clavate (<10 µm diam), lobulate 5

5. Pileus with an orange disc and yellow margin, not striate. Pileipellis terminal cells highly diverticulate and antler-like [Plate 1.6]. 1. *G. aurantiipes*
- 5*. Pileus brown to brownish beige, sometimes with a hint of cream or yellow on the striate to sulcate margin. Pileipellis terminal cells not diverticulate or antler-like. 6
6. Stipe reddish brown and contrasting with pileus, evenly pigmented fleshy beige at maturity. Pileipellis a loosely interwoven, poorly-developed *dryophila*-structure 3. *G. bicolor*
- 6*. Stipe pale orange-brown to brown, not contrasting markedly with the pileus at maturity. Pileipellis a tightly interwoven, well-developed *dryophila*-structure 7
7. Lamellae distant (18–22), broad (3–5.5 mm). Stipe typically 50–95 × 3–5 mm. Basidiospores with mean width < 3 µm 4. *G. indoctoides*
- 7*. Lamellae crowded (28–35), moderately broad (2–3 mm). Stipe typically 40–52 × 1–2 mm. Basidiospores with mean width > 3 µm 5. *G. sepiiconicus*
8. (1*). Basidiomes associated with needles of *Pinus merkusii* . . . 9
- 8*. Basidiomes associated with hardwoods 10
9. Pileus < 20 mm diam. Lamellae crowded and very narrow (< 0.5 mm). Basidiospores 5.5–8 × 2.5–4 µm. Cheilocystidia 17.5–32 µm long. Pileocystidia absent. 22. *G. salakensis*
- 9*. Pileus > 20 mm diam. Lamellae close to subdistant, broader (> 1 mm). Basidiospores 8–10.5 × 3–5.5 µm. Cheilocystidia 49.5–56 µm long. Pileocystidia abundant 16. *G. aff. moseri*
10. (8*). All parts of basidiome turning green in alkaline solution (3% KOH). Pileus dark reddish brown. Stipe dark brown to dark reddish brown overall. Cheilocystidia absent 20. *G. virescens*
- 10*. No part of basidiome turning green in alkaline solution. Basidiomes not dark reddish brown in combination with absence of cheilocystidia 11
11. Basidiomes tiny. Pileus 2.5–6 mm diam. Stipe 4–16 × 0.5–1 mm, pale orange white overall. 9. *G. diminutus* var. *clavatus*
- 11*. Basidiomes much larger. Pileus typically > 10 mm diam. Stipe > 20 mm long. Basidiomes more deeply pigmented 12
12. Pleurocystidia conspicuous, lanceolate. Pileus 8–120 mm diam, rugose-sulcate, grayish red. Lamellae distant, 3–6 mm broad, grayish orange. Stipe 50–155 mm long, twisted-striate. Associated with termite nests 24. *G. termiticola*

- 12*. Pleurocystidia absent. Basidiomes variable but not as above.
Not associated with termite nests 13
- 13. Basidiospores subfusiform, 10.5–16×3.2–4 µm, with mean
Q >3.5 19. *G. trogioides*
- 13*. Basidiospores ellipsoid to lacrymoid, <13 µm long, with mean
Q <2.7 14
- 14. Pileus distinctly umbilicate to subumbilicate at maturity .. 15
- 14*. Pileus umbonate or subumbonate at maturity, seldom merely
convex or shallowly depressed, but not umbilicate to subum-
bilicate 20
- 15. Basidiomes on woody debris 16
- 15*. Basidiomes on leafy debris or in soil amongst leaves 17
- 16. Pileus typically <30 mm diam, dark chocolate brown when
fresh, striate. Lamellae close to subdistant, 1–3 mm broad. Stipe
pruinose to furfuraceous. Basidiospore mean 8.5×4 µm
..... 17. *G. nonnullus* var. *attenuatus*
- 16*. Pileus typically >30 mm diam, reddish brown to light brown
when fresh, sulcate. Lamellae distant, 3–6 mm broad. Stipe sub-
glabrous. Basidiospore mean 11×5 µm 8. *G. brunneigracilis*
- 17. (15*). Basidiomes small. Pileus 8–14 mm diam. Stipe 20–24 mm
long. Pileocystidia absent. 12. *G. johnstonii*
- 17*. Basidiomes larger. Pileus 10–50 mm diam. Stipe typically >25
mm long. Pileocystidia abundant 18
- 18. Pileus pallid, light brown to cream with a white margin. Chei-
locystidia broadly clavate, not contorted or lobulate
..... 11. *G. indoctus*
- 18*. Pileus darker, disc dark brown to brown with brown to pale
brown margin. Cheilocystidia clavate-contorted, lobulate .. 19
- 19. Stipe apex pruinose. Caulocystidia single or in small clusters of
2–8 cells 14. *G. menehune*
- 19*. Stipe apex densely short-hirsute. Caulocystidia in agglutinated,
erect clusters of 10–20 or more cells 15. *G. aff. menehune*
- 20. (14*). Basidiomes on woody debris 21
- 20*. Basidiomes on leafy debris or in soil amongst leaves 23
- 21. Cheilocystidia broadly clavate, 9.5–16.5 µm diam. Stipe base
black 13. *G. melanopus*
- 21*. Cheilocystidia irregularly cylindrical to narrowly clavate, 5.5–
9 µm diam. Stipe base ochraceous tawny to brown or dark
brown 22

22. Pileus typically <30 mm diam, dark chocolate brown when fresh, striate. Lamellae close to subdistant, 1–3 mm broad. Stipe pruinose to furfuraceous. Basidiospore mean $8.5 \times 4 \mu\text{m}$ 17. *G. nonnullus* var. *attenuatus*
- 22*. Pileus typically >30 mm diam, reddish brown to light brown when fresh, sulcate. Lamellae distant, 3–6 mm broad. Stipe subglabrous. Basidiospore mean $11 \times 5 \mu\text{m}$ 8. *G. brunneigracilis*
23. (20*). Basidiospores small, $4\text{--}5.6 \times 2.4\text{--}3.6 \mu\text{m}$ ($\bar{x} = 4.9 \times 2.8 \mu\text{m}$). Lamellae crowded (28–40 with 4–6 series of lamellulae), up to 1 mm broad. 23. *G. spissus*
- 23*. Basidiospores larger, in the range $6.8\text{--}11.8 \times 3.2\text{--}6.4 \mu\text{m}$ [$\bar{x}_r = 8\text{--}9.4 \times 4\text{--}5.2 \mu\text{m}$]. Lamellae close to distant (18–30 with 2–3 series of lamellulae), 1–5.5 mm broad 24
24. Pileus non-striate to translucent-striate. Lamellae close (25–30) 10. *G. gibbosus*
- 24*. Pileus sulcate to plicate. Lamellae distant to subdistant (18–24) 25
25. Pileus light brown, becoming pale yellowish brown overall in age. Lamellae subdistant (20–24), buff to pale cream; stipe $55\text{--}150 \times 3\text{--}5 \text{ mm}$ 7. *G. allegetrii*
- 25*. Pileus with dark brown disc and striae, paler elsewhere, remaining radially striped in age. Lamellae distant (18–20), brownish gray; stipe up to $50 \times 2 \text{ mm}$ 18. *G. tamblinganensis*

Descriptions to Java and Bali species of *Gymnopus*

***Gymnopus* sect. *Levipedes* (Fr.) Halling in Antonín & Noordel., Lib. Bot. 17: 83. 1997.**

Bas.: *Agaricus* subtribus *Levipedes* Fries, Epic. Syst. Mycol. 90. 1838.

Syn.: *Collybia* sect. *Levipedes* (Fr.) Quél., Mém. Soc. Emul. Montbéliard, 2 (5): 96. 1872.

Marasmius subtribus *Tergini* Fries, Epic. Syst. Mycol. 376. 1838.

Marasmius subsect. *Tergini* (Fr.) Quél., Mém. Soc. Emul. Montbéliard, 2 (5): 220. 1872.

Type species: *Gymnopus dryophilus* (Bull.: Fr.) Murrill.

1. *Gymnopus aurantiipes* (Corner) A. W. Wilson, Desjardin & E. Horak, comb. nov. – Plate 1: 1–7.

Bas.: *Marasmius aurantiipes* Corner, Beih. Nova Hedwigia 111: 32. 1996.

Type: Borneo, Mt Kinabalu, Mesilau, 1700m alt., 7–8 March 1964, RSNB 5657 (E).

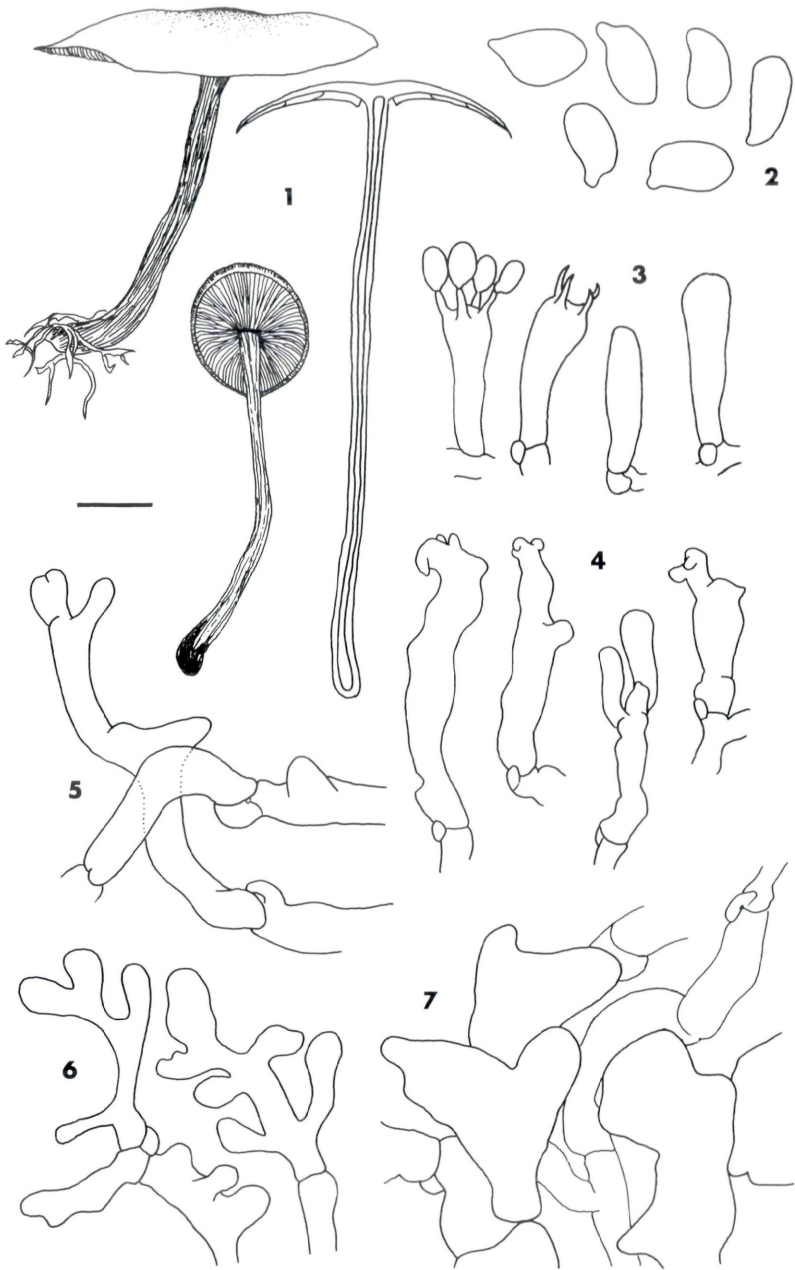


Plate 1. *Gymnopus aurantiipes* – 1. Basidiomes (AWW 118). – 2. Basidiospores. – 3. Basidia and basidioles (AWW 131). – 4. Cheilocystidia (AWW 118). – 5. Caulocystidia (AWW 131). – 6. Pileipellis terminal cells (AWW 118). – 7. Pileipellis (AWW118). – Bar: 2 = 5 μ m; 3–7 = 10 μ m.

Pileus 8–48 mm diam, hemispherical when young to appanate at maturity, glabrous, moist, orange at center (5A6-7) to yellow at the margin, hygrophanous, turning yellowish white (3-5A2) in age, margin entire to slightly eroded, incurved in younger specimens. Context 2 mm thick, concolorous with the pileus, moist and gelatinous. – Lamellae subfree to adnexed or shallowly adnate, densely crowded, with multiple series of lamellulae, narrow (<1 to 2 mm), edge concave and entire, yellowish white (3A2). – Stipe 15–100 × 2–5.5 mm, central, equal to compressed, fistulose, pliant, fibrous, glabrous when moist becoming pruinose upon drying, yellow (4A6-7) at apex darkening to orange brown to reddish brown (7C-D8) at base, basal rhizoids beige orange (5-6A3). – Odor and taste not distinct. – Basidiospores $4.8\text{--}7.2 \times 2.4\text{--}4\ \mu\text{m}$ [$\bar{x}_r = 5.1\text{--}5.9 \times 3.1\text{--}3.2\ \mu\text{m}$; $\bar{x}_m = 5.5 \pm 0.5 \times 3.2 \pm 0.1\ \mu\text{m}$; $Q = 1.4\text{--}2.3$; $\bar{q}_r = 1.7\text{--}1.8$; $\bar{q}_m = 1.8 \pm 0.1$; $n = 20$ spores per 2 collections] ellipsoid, smooth, inamyloid, acyanophilic. – Basidia $17.5\text{--}18.5 \times 5.5\text{--}6.5\ \mu\text{m}$, clavate, 4-spored, clamped. – Basidioles broadly clavate to subcylindrical (not subaceros), clamped. – Pleurocystidia absent. – Cheilocystidia $21.5\text{--}34.5 \times 4\text{--}6.5\ \mu\text{m}$, abundant (lamellar edge sterile), clavate to fusoid, sometimes lobulate or with small digital projections at the apex, or with a single narrow apical projection, hyaline, clamped. – Pileipellis a well-developed *dryophila*-structure of inflated irregular shaped hyphae, strongly branching, clamped, hyaline, terminal cells appressed, occurring in clusters, diverticulate with multiple bifurcations, cells highly branched, looking like moose antlers, clamped. – Pileus trama of loosely interwoven cylindrical, clamped hyphae, $3\text{--}9.5\ \mu\text{m}$ diam, pinched at septa, clamped, smooth, yellowish, not staining green in 3% KOH, mostly inamyloid but with some dextrinoid hyphae at junction of lamellar trama. – Lamellar trama parallel, mostly dextrinoid, hyphae cylindrical, clamped, hyaline. – Stipitipellis consisting of cylindrical, smooth and clamped hyphae with bifurcations forming caulocystidia. – Caulocystidia $26.5\text{--}60 \times 5\text{--}6.5\ \mu\text{m}$, clavate-contorted, sometimes diverticulate, clamped, sometimes arising as outgrowths from stipitipellis hyphae, sometimes forming chains of two cells.

Habit, habitat and distribution. – Solitary to gregarious on leaf litter: Bali.

Material examined. – INDONESIA: Bali, Bedugul, Bali Botanical Garden, S8°16.3' E115°9.3', elev. 1375 to 1400 m, 19 Jan. 2001, Wilson 118 (SFSU, BO); same location, 22 Jan. 2001, Wilson 131 (SFSU).

Gymnopus aurantiipes is characterized by a pileus colored deep sulfur-yellow on the margin and orange on the disc, and by densely crowded gills that are either white or yellow. The stipe is yellow at

the top turning pale orange-red at the base with beige-orange rhizoids. Microscopically, *G. aurantiipes* has many clavate cheilocystidia with digitate diverticula occurring at the apex. A unique feature of this species is the terminal elements of its *dryophila*-structure pileipellis that are highly branching, appressed and resemble moose antlers.

Gymnopus aurantiipes was described originally by Corner (1996) from material collected in Borneo, and placed in genus *Marasmius*. Pileipellis anatomy clearly indicates that it is better placed in *Gymnopus* sect. *Levipedes*. The species is a tropical Asian analog to *G. subsulphureus* (Peck) Murrill, a species common to the southeastern United States (Holotype: NYS !). The latter species differs from *G. aurantiipes*, however, in lacking the antler-like terminal cells on pileipellis hyphae, in broader and more widely-spaced lamellae, and in lacking caulocystidia on the stipe apex.

2. *Gymnopus austrosemihirtipes* A. W. Wilson, Desjardin & E. Horak, sp. nov. – Plate 2: 1–6.

Pileus 5–19 mm diam, planoconvexus vel umbonatus, glabrus, translucenter striatus, brunneus apicaliter albidulus, hygrophanus. Lamellae adnexae vel liberae, confertae, ad aciem integrae, albae, angustatae. Stipes 46–50 × 1–1.5 mm, cylindricus, teres, fistulosus, glabrus, brunneus apicem versus, obscure brunneus vel fuliginosus basim versus. Caro concolor. Odor saporque nulli. Basidiosporae 5.6–8 × 2.8–4 µm, ellipsoideae, leves, hyalinae. Basidia 21.5–28 × 4 µm, clavata, 4-spora. – Pleurocystidia nulla. – Cheilocystidia 36–49 × 7–8 µm, clavata, inconspicua. Pileipellis ex hyphis cylindratis cutem formantibus (*G. dryophili* similis), cellulae terminalia multiramosae vel diverticulatae, hyalinae, brunneoincrustatae. Trama lamellarum irregularis. Caulocystidia 31–52 × 5.5 µm, cylindrica vel clavata, subincrustata. Fibulae praesentes. Ad terram in silvis latifoliis tropicalibus. Indonesia (Java). Holotypus: Mt. Halimun National Park, Loop trail from Cikaniki, 8 Jan. 2001, Wilson 65 (BO).

Pileus 5–19 mm diam, plano-convex to subhemispherical, umbonate, surface uneven, glabrous, moist, translucent-striate, margin entire to crenulate, wavy, slightly incurved, brown (6E6–7) at disk paler or pallid (4A1–2) to 1 mm from margin, hygrophanous. Context thin (1 mm), concolorous. – Lamellae adnexed to free, white, close, lamellulae in multiple series, edge entire, even, narrow (1 mm). – Stipe 46–50 × 1–1.5 mm, cylindrical, terete, fistulose, pliant, glabrous, upper half of stipe brown (6E5), lower half dark brown to brownish black (8F8), basal tomentum of malt brown (4–5B3) hyphae. – Odor and taste indistinct. – Basidiospores 5.6–8 × 2.8–4 µm [\bar{x} = 6.68 ± 0.62 × 3.22 ± 0.3 µm; Q = 1.67–2.5; \bar{q} = 2.09 ± 0.24; n = 20 spores per 1 specimen], ellipsoid, smooth, hyaline, inamyloid, acyanophilic. – Basidia 21.5–28 × 4 µm, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia

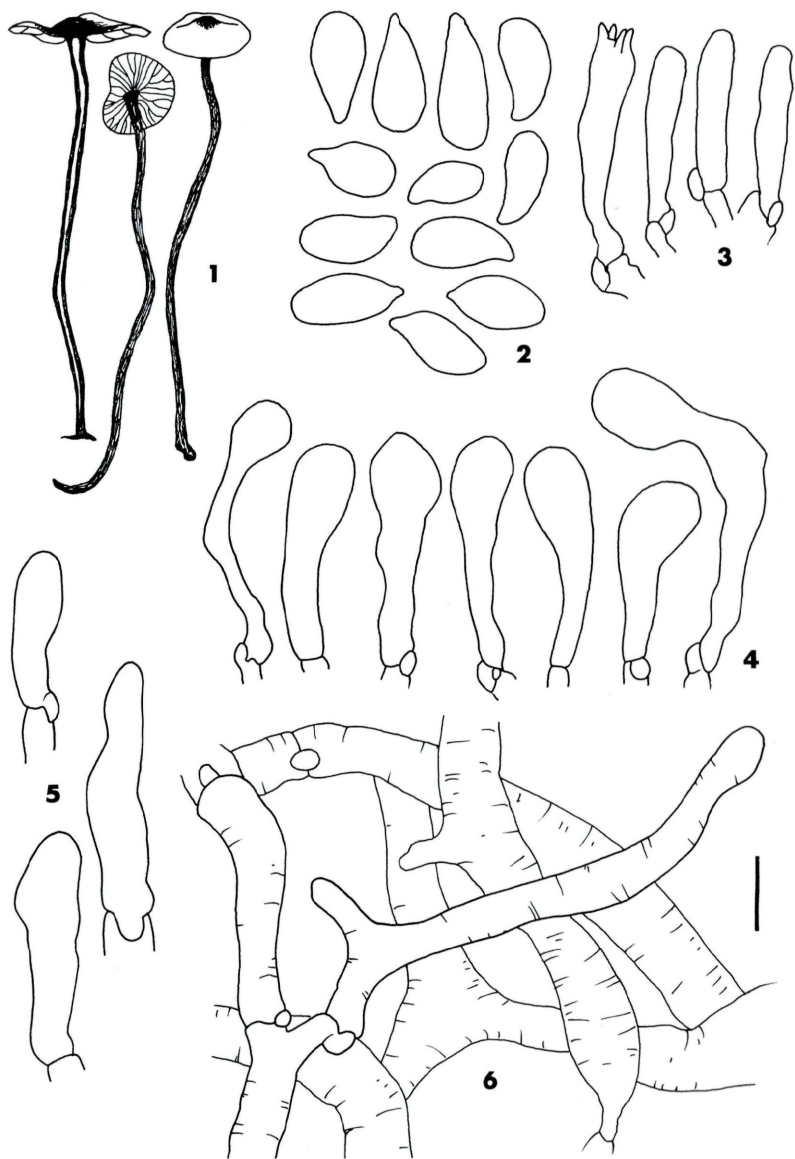


Plate 2. *Gymnopus austrosemitiptipes* (Holotype: AWW 65). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidium and basidioles. – 4. Cheilocystidia. – 5. Pileocystidia. – 6. Pileipellis. – Bar: 2 = 5 μ m; 3–6 = 10 μ m.

absent. – Cheilocystidia $36\text{--}49 \times 7\text{--}8\ \mu\text{m}$, clavate, not well-differentiated, basidiole-like, clamped, lamellar edge sterile. – Pileipellis a cutis of interwoven hyphae, on disk a well developed *dryophila*-structure, marginal areas composed of hyaline, loosely interwoven hyphae (not radially arranged), highly branching, diverticulate, weakly annular-incrusted, clamped. – Pileocystidia scattered on disk, irregularly cylindrical with brown incrustations. – Pileus trama cylindrical, smooth to weakly incrusted, clamped. – Lamellar trama of interwoven, cylindrical, smooth, clamped hyphae. – Stipitipellis hyphae cylindrical, brown annular incrustations, becoming pale olivaceous green in 3% KOH, clamped. – Caulocystidia $31\text{--}52 \times 5.5\ \mu\text{m}$, cylindrical to clavate, smooth to weakly annular-incrusted, clamped or occurring as outgrowths from stipitipellis hyphae.

Habit, habitat and distribution. – On soil. Java.

Material examined. – INDONESIA: Java, Mt. Halimun National Park, Loop trail from Cikaniki, 8 Jan. 2001, Wilson 65 (Holotype, BO; Isotype, SFSU).

Gymnopus austrosemihirtipes is characterized by basidiomes with a small, umbonate pileus colored dark brown on the disc and beige on the margin, with close and narrow, white lamellae, and a glabrous, dark brown to black stipe with greyish orange basal tomentum. Micromorphologically, the species forms relatively small basidiospores, basidiole-like cheilocystidia, scattered and rare, cylindrical caulocystidia, brown pigment-incrusted stipe tramal hyphae that turn green in alkaline solution, and a poorly- to well-developed *dryophila*-structure pileipellis. Collectively, these features indicate that the species belongs in sect. *Levipedes* subsect. *Alkali-virentes*. The new Javanese species is similar to the North American *G. semihirtipes* (Peck) Halling, but the latter species differs subtly in forming paler, amber-brown to cinnamon or fawn-brown pilei, adnate to sinuate lamellae, larger basidiospores $(7.5\text{--}8.6\text{--}(9.8) \times 3.2\text{--}4.2\text{--}(5)\ \mu\text{m}$, and lacking cheilocystidia (Halling, 1983).

Gymnopus austrosemihirtipes keys to *Marasmius malesianus* var. *minor* Corner (1996), but the latter species was described as having a puberulous stipe with sparsely to irregularly branched and lobulate terminal cells in the stipitipellis ('superficie stipitis Rameales'), and in having more numerous lamellae. No indication of the alkaline reaction to stipe tissue was reported in the protologue (Corner, 1996). Based on the protologues, it is difficult to accept *Marasmius malesianus* var. *malesianus* and *M. malesianus* var. *minor* as being conspecific; moreover, both taxa are better placed in *Gymnopus*.

3. *Gymnopus bicolor* A. W. Wilson, Desjardin & E. Horak, **sp. nov.** – Plate 3: 1–5.

Pileus 22–28 mm, convexus vel applanatus, glabrus dein minute sordidus, siccus, translucenter striatus, apicaliter brunneus, pallidior vel subargillaceoroseus marginem versus, hygrophanus. Lamellae adnexae vel subadnatae, numerosae, ad aciem integrae, albae. – Stipes 30–42 × 2–3 mm, cylindricus, aequalis vel apicaliter attenuatus, fistulosus, glabrus ad apicem, furfuraceus basim versus, longitudinaliter costatus, flexilis, pallide rubrobrunneus vel aurantiobrunneus, pallidior aetate. Caro pilei concoloris, subgelatinosa. Odor saporque nulli. Basidiosporae 5.2–8 × 2.4–3.6 µm, ellipsoideae, leves, hyalinae. Basidia 14.5–22.5 × 4–6 µm, clavata, 4-spores. Cheilocystidia 17.5–25.5 × 6.5–9.5 µm, late clavata, lobulata, levia, hyalina. Pleurocystidia nulla. Caulocystidia 49.5–68 × 5–6 µm, sparsa, cylindrica, levia. Pileipellis ex hyphis irregularibus (*G. dryophili* similis), 4–12 µm diam. Cellulae terminalia diverticulata, membrana incrustata instructa. Trama pilei irregularis, ex hyphis cylindraceis ramosisque, 4–12 µm diam, membranae leves pigmento luteo intraparietali pigmentatae. Fibulae praesentes. Ad frustula dejecta in silvis latifoliis tropicalibus. Indonesia (Bali). Holotypus: Bedugul, Bali Botanical Garden, 19 Jan. 2001, Wilson 116 (BO).

Pileus 22–28 mm diam, convex to applanate, glabrous becoming minutely felted upon drying, smooth, moist, margin translucent-striate, entire, undulating, disk brown (6E-F8) with a beige white (4A2-1) margin, hygrophanous turning fleshy beige (5A4-5) overall with moisture loss. Pileus context thin (≥ 1 mm), gelatinous, concolorous with pileus. – Lamellae adnexed to narrowly adnate, crowded, broad (2.5–3.5 mm), edge even with pileus, entire, white, lamellulae in multiple series. – Stipe 30–42 × 2–3 mm, central, cylindrical to compressed, equal to tapering from bottom to the top, fistulose, glabrous above, furfuraceous below, longitudinally ridged or cleft, pliant, reddish brown (8C-D8) becoming pale orange-brown (7B8) and lightening to white beige (4A1-2) at top, sometimes entirely pale orange-brown, sometimes with beige (4-5A2) at base when drying, base with wiry mycelium. – Odor and taste indistinct. – Basidiospores 5.2–8 × 2.4–3.6 µm [$\bar{x}_r = 6.4\text{--}6.6 \times 3.2$ µm; $\bar{x}_m = 6.5 \pm 0.2 \times 3.2 \pm 0.01$ µm; $Q = 1.8\text{--}2.6$; $\bar{q}_r = 2\text{--}2.1$; $\bar{q}_m = 2 \pm 0.1$; $n = 20$ spores per 2 specimens], ellipsoid to pip-shaped, smooth, hyaline, inamyloid, acyanophilic. – Basidia 14.5–22.5 × 4–6 µm, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 17.5–25.5 × 6.5–9.5 µm, broadly clavate, lobulate, smooth, hyaline, clamped. – Pileipellis a poorly-developed *dryophila*-structure of irregularly inflated hyphae, interwoven hyphae 4–12 µm diam, diverticulate with short terminal elements present, with annular incrustations, clamped. – Pileocystidia 47 × 3.5 µm, rare, cylindrical-flexuous, smooth, hyaline, clamped. – Pileus trama of interwoven cylindrical hyphae, 4–12 µm diam, branching, smooth, with yellow intraparietal pigmentation, inamyloid, clamped. – Lamellar trama parallel, hyphae cylindrical, 3–10 µm diam, smooth to weakly incrustated, hyaline, inamyloid,

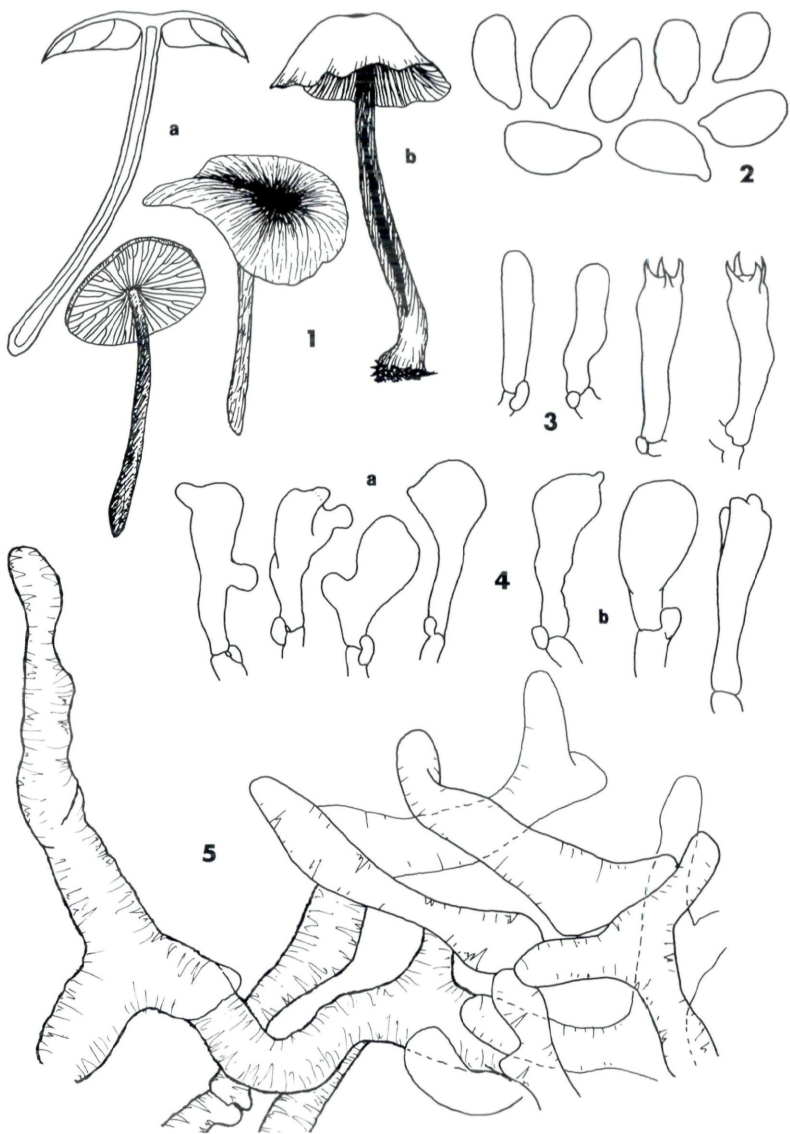


Plate 3. *Gymnopus bicolor*. – 1. Basidiomes (a. Holotype: AWW 116 – b. AWW 43). – 2. Basidiospores (AWW 116). – 3. Basidia and basidioles (AWW 43). – 4. Cheilocystidia (a. AWW 43 – b. AWW 116). – 5. Pileipellis (AWW 43). – Bar: 2 = 5 μ m; 3–5 = 10 μ m.

clamped. – *Stipitipellis* hyphae cylindrical, smooth to incrusted, clamped. – *Caulocystidia* 49.5–68 × 5–6 µm, sparse, cylindrical, smooth, hyaline, clamped.

Habit, habitat and distribution. – Gregarious on leaf litter. Bali.

Material examined. – INDONESIA: Bali: Bedugul, Bali Botanical Garden, S8°16.3' E115°9.3', elev. 1375 to 1400 m, 17 Jan. 2000, Wilson 43 (BO, SFSU); same location, 19 Jan. 2001, Wilson 116 (Holotype, BO; Isotype, SFSU).

Gymnopus bicolor is distinguished from other members of sect. *Levipedes* by a pileus colored brown on the disc and beige on the margin that fades overall to beige, by white and crowded lamellae, a reddish brown, furfuraceous stipe, relatively small basidiospores, and by broadly clavate to subsphaeropedunculate cheilocystidia that often have a few broad, knobby outgrowths. The cheilocystidia of *G. bicolor* are similar to those produced by *G. aquosus* (Bull.: Fr.) Antonín & Noordel. but the latter species differs in forming larger basidiomes with a yellow to ochre pileus, a yellow, glabrous stipe lacking caulocystidia, and the species is known with assurance only from Europe (Antonín & Noordeloos, 1997). None of the *Gymnopus* species placed in *Marasmius* by Corner (1996) are reminiscent of *G. bicolor*. The new Balinese species is easily recognized in the field by its hygrophanous, beige pileus contrasting with a red stipe.

4. *Gymnopus indoctoides* A. W. Wilson, Desjardin & E. Horak
sp. nov. – Plate 4: 1–6.

Pileus 25–45 mm, convexus dein applanatus, glabrus, translucenter striato-sulcatus, pallide cremeobrunneus pallidior marginem versus, hygrophanus. Lamellae adnexae, distantes, ad aciem integrae, argillaceae. Stipes 50–95 × 3–5 mm, cylindricus, fistulosus, flexilis, pruinosis vel pubescens, aurantiobrunneus, aetate pallide roseus at apicem. Caro gelatinosa, pileo concolor. Odor saporque nulli. Basidiosporae 4.8–6.4(–8.8) × 2–3.2 µm, ellipsoideae vel guttiformes, leves. Basidia 21–24 × 3.5–5.5 µm, clavata, 4-spora. Cheilocystidia 24–32 × 3.5–5 µm, clavata, rariter lobata ad apicem. Pleurocystidia nulla. Caulocystidia 44–73.5 × 4.5–5 µm, subclavata, interdum surculis cylindraceis instructa. Pileipellis ex hyphis cylindraceis cutem formantibus (*G. dryophili* similis), 3.5–8 µm diam., membrana sublobulata glabra vel subincrustedata instructis. Trama lamellarum regularis. Ad frustula dejecta in silvis latifoliis tropicalibus. Indonesia (Bali). Holotypus: Lake Brattan, trail to Mt. Catur, 21 Jan. 2001, Wilson 125 (BO).

Pileus 25–45 mm diam, convex to applanate, glabrous, translucent-sulcate, moist, brownish cream (7C-E8) at center becoming pallid (4A2) at margin, hygrophanous becoming pallid upon drying, margin entire to eroded. Context thin to narrow (1–2.5 mm), gelatinous, concolorous with pileus. – Lamellae adnexed, distant (18–22) with 2–3 series of lamellulae, sometimes anastomosing, broad

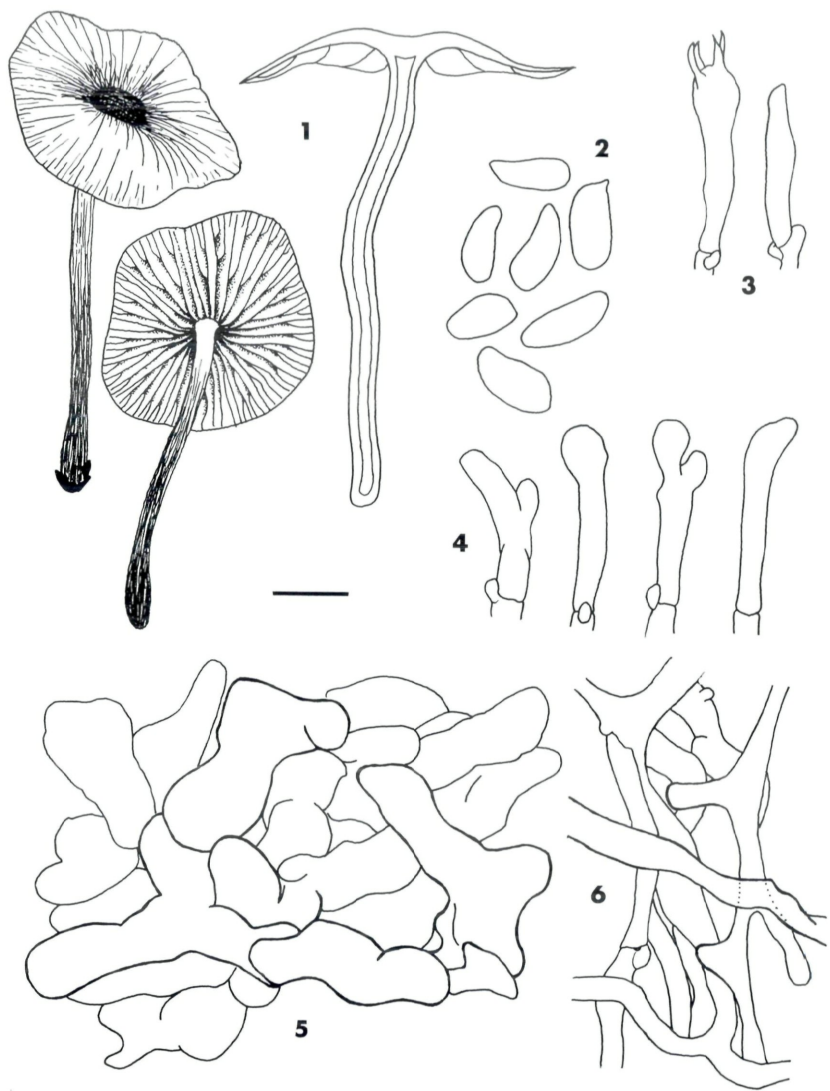


Plate 4. *Gymnopus indoctoides* (Holotype: AWW 125). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidium and basidiole. – 4. Cheilocystidia. – 5. Pileipellis. – 6. Hypodermium. – Bar: 2 = 5 µm; 3–6 = 10 µm.

(5.5 mm), beige (4A2-3), edge entire. – Stipe 50–95 × 3–5 mm, cylindrical, fistulose, pliant, glabrous when moist becoming pruinose to pubescent upon drying, pale orange-brown (6B-D8) overall becoming pale pinkish white (5A2-3) in upper quarter. – Odor and taste indistinct. – Basidiospores 4.8–6.4(–8.8) × 2–3.2 µm [\bar{x} = 6.18 ± 0.82 × 2.84 ± 0.39 µm; Q = 1.75–3; \bar{q} = 2.21 ± 0.36; n = 20

spores per 1 specimen], ellipsoid-lacrymoid, smooth, inamyloid, acyanophilic. – Basidia $21\text{--}24 \times 3.5\text{--}5.5\ \mu\text{m}$, clavate, 4-spored, clamped. – Basidioles clavate and subaceros, clamped. – Pleurocystidia absent. – Cheilocystidia $24\text{--}32 \times 3.5\text{--}5\ \mu\text{m}$, clavate, sometimes lobed, clamped, smooth, lamellar edge sterile. – Pileipellis a *dryophila*-structure of inflated, loosely interwoven hyphae, $3.5\text{--}8\ \mu\text{m}$ diam, smooth to weakly incrustated, with a few knobby outgrowths. – Pileocystidia $20\text{--}30 \times 5\text{--}8\ \mu\text{m}$, cylindrical, erect to repent, scattered, clamped. – Hypodermium of narrow, cylindrical, interwoven, branched, and clamped hyphae. – Pileus trama of cylindrical hyphae, $4\text{--}12\ \mu\text{m}$ diam, pinched at the septa, thin-walled, smooth, inamyloid, clamped. – Lamellar trama parallel. – Stipitipellis of cylindrical, smooth to weakly incrustated, clamped hyphae. – Caulocystidia $44\text{--}73.5 \times 4.5\text{--}5\ \mu\text{m}$, cylindrical-clavate, sometimes with finger like projections at apex, smooth, clamped.

Habit, habitat and distribution. – Gregarious on leaf litter. Bali.

Material examined. – INDONESIA: Bali: Lake Brattan, trail to Mt. Catur, 21 Jan. 2001, Wilson 125 (Holotype, BO; Isotype, SFSU).

Gymnopus indoctoides is characterized by a pale cream-brown, pellucid-sulcate pileus, distant and broad, pallid lamellae, a glabrous, pale orange brown stipe, relatively small basidiospores, cylindrical to clavate cheilocystidia, and a *dryophila*-structure with erect pileocystidia. The new species is similar to *Marasmius indoctus* Corner, a taxonomically misplaced species described recently from Singapore. The latter species differs from *G. indoctoides* in forming more numerous (26–50) lamellae, larger basidiospores ($7\text{--}8.5 \times 3.7\text{--}4.5\ \mu\text{m}$), and a pileipellis of numerous, erect, coralloid (lobulate, coiled and curved) terminal cells not resembling a *dryophila*-structure (Corner 1996). Corner's (1996) Plate 13a shows a strong resemblance to *G. indoctoides*. *Gymnopus indoctoides* keys to *Marasmius rufisulcatus* Corner (1996), but the latter species differs in forming a disrupted hymeniform pileipellis of clavate-sublobate cells, has a rufous colored pileus, a shorter stipe (10–25 mm), and is lignicolous.

5. ***Gymnopus sepiiconicus*** (Corner) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 5: 1–5.

Bas.: *Marasmius sepiiconicus* Corner, Beih. Nova Hedwigia 111: 95. 1996.

Type: Solomon Islands, Guadalcanal, Nuhu, 4 Nov. 1965, Corner RSS 1729 (E).

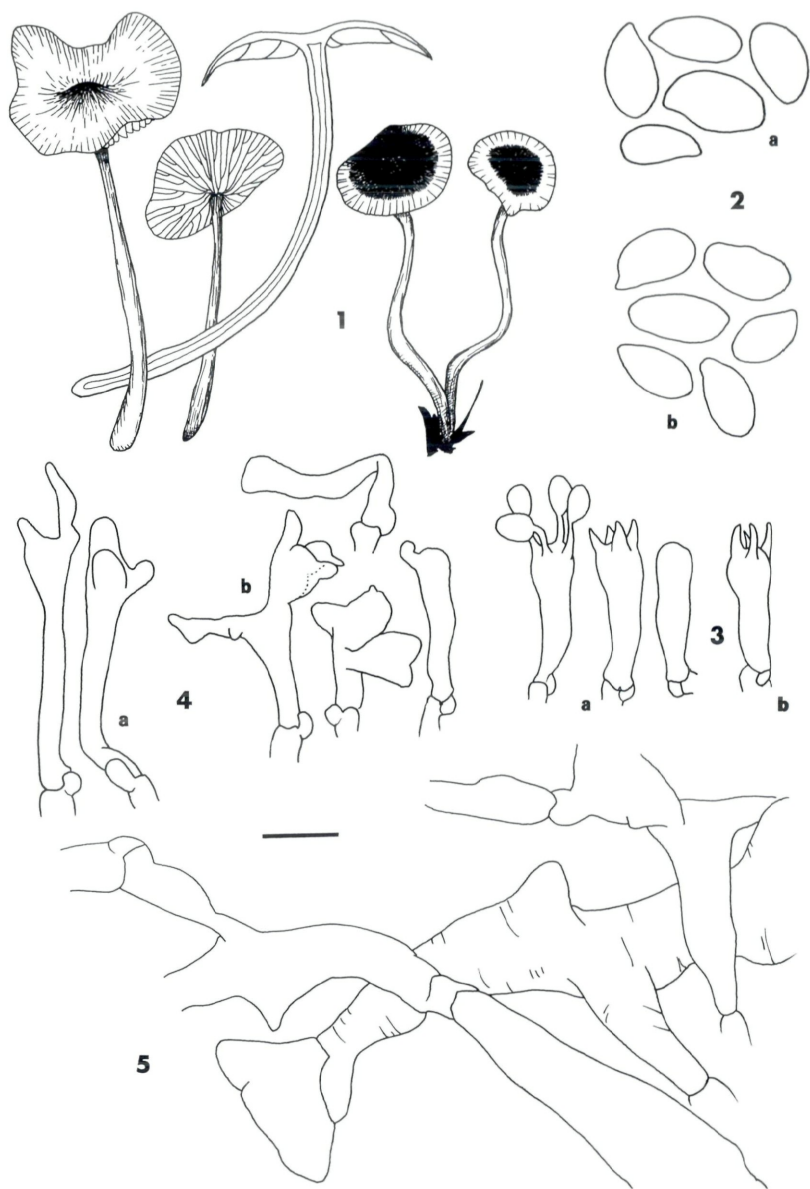


Plate 5. *Gymnopus sepiiconicus*. – 1. Basidiomes (AWW 117). – 2. Basidiospores (a. AWW 117 – b. AWW 126). – 3. Basidia and basidioles (a. AWW 126 – b. AWW 117). – 4. Cheilocystidia. (a. AWW 126 – b. AWW 117). – 5. Pileipellis (AWW 126). – Bar: 2 = 5 μ m; 3–5 = 10 μ m.

Pileus 10–44 mm diam, obtusely conical when young, becoming plano-convex to concave or depressed, subumbonate to broadly umbonate, glabrous, moist, margin entire to slightly lobed, translucent-striate, straight to reflexed, disc brown to dark brown (7–8E–F8) with a beige yellow (3–4A1–2) to white margin in age, hygrophanous, becoming pale grayish brown to grayish beige with moisture loss. Context thin to narrow (1.5–3 mm), gelatinous, concolorous with pileus. – Lamellae subfree to adnate, crowded (28–35), multiple series of lamellulae, moderately broad (2–3 mm), edge straight to concave, entire, white. – Stipe 40–52 × 1–2 mm, central, cylindrical to compressed, equal, fistulose, pliant, fibrous, glabrous, brownish orange to brown (6–7B–D7–8), or creamy buff (2–4A1–2) with a orange beige (4–5A3–5) apex, basal tomentum buff to beige. – Odor and taste indistinct. – Basidiospores 4.8–6.4 × 2.4–4.4 µm [$\bar{x}_r = 5.5\text{--}5.9 \times 3.1\text{--}3.2$ µm; $\bar{x}_m = 5.74 \pm 0.25 \times 3.15 \pm 0.08$ µm; $Q = 1.4\text{--}2.5$; $\bar{q}_r = 1.7\text{--}1.9$; $\bar{q}_m = 1.83 \pm 0.09$; $n = 20$ spores per 3 specimens], ellipsoid, smooth, hyaline with some oily intracellular contents, inamyloid, acyanophilic. – Basidia 17–22.5 × 4.5–6.5 µm, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 20–44 × 3–7 µm, irregularly cylindrical to obtuse-clavate, contorted, lobulate, hyaline, clamped. – Pileipellis a *dryophila*-structure of interwoven hyphae, inflated, diverticulate, smooth to incrustated, clamped. – Pileocystidia absent. – Pileus trama of two types of hyphae: 1) cells inflated, diverticulate, and 2) cells 2.4–12 µm diam, cylindrical, clamped, both types interwoven, smooth or with brown annular or granular incrustations, mostly inamyloid with some weak dextrinoid cells scattered. – Subpileipellis with brown intraparietal pigmentation, subhymenial layer hyaline. – Lamellar trama of parallel, cylindrical hyphae, 2.5–13 µm diam, smooth, hyaline, inamyloid, sometimes with scattered dextrinoid cells, clamped. – Stipitipellis of cylindrical hyphae, with annular incrustations, clamped. – Caulocystidia rare, cylindrical, clamped.

Habit, habitat and distribution. – Gregarious to scattered on leaf litter. Bali.

Material examined. – INDONESIA: Bali: Bedugul, Bali Botanical Garden, S8°16.3' E115°9.3', elev. 1375 to 1400 m, 19 Jan. 2001, Wilson 117 (SFSU); Lake Tamblingan, 20 Jan. 2001, Wilson 121 (BO, SFSU); Lake Bratan, along trail to Mt. Catur, 21 Jan. 2001, Wilson 126 (SFSU).

The Balinese material matches quite well with that reported in the protologue based on a single specimen from Guadalcanal in the Solomon Islands. The type specimen differs primarily in forming darker pigmented basidiomes ('fuscous sepia': Corner, 1996).

Although Corner (1996) reported the basidiospores as “possibly faintly vinaceous amyloid” and suggested that the species was “*Mycena*-like,” the material from Bali has inamyloid basidiospores and represents a species of *Gymnopus* sect. *Levipedes*. It is characterized by a small, dark brown pileus that dries pale grayish brown, has crowded, relatively narrow and pallid lamellae, a glabrous, brown stipe, small basidiospores, a *dryophila*-structure pileipellis, and irregularly cylindrical cheilocystidia.

6. *Gymnopus vitellinipes* A. W. Wilson, Desjardin & E. Horak, sp. nov. – Plate 6: 1–5.

Pileus 9–53 mm, primo hemisphaericus dein planoconvexus, glabrus, ad marginem translucenter striatus, ad apicem fuscus, argillaceoluteus marginem versus, aetate subaurantiacus, hygrophanus. Lamellae subliberae vel adnexae, confertae, ad aciem integrae, pallide aurantiobrunneae vel pallidiores. Stipes 20–65 × 2.5–6 mm, cylindricus, aequalis, subincrassatus basim versus, fistulosus, flexilis, glabrus, pileo concolor. Caro gelatinosa, tenax. Odor nullus. Sapor nullus vel subfarinaceus. Basidiosporae 7.2–10.4 × 3.2–5 µm, ellipsoideae, leves, hyalinae. Basidia 23.5–30.5 × 4–5.5 µm, clavata, 4-spora. Cheilocystidia 25.6–44 × 10–14.5 µm, late clavata vel subsphaeropedunculata, rariter surculis sparsis ad apicem instructa, hyalina. Pleurocystidia nulla. Caulocystidia rara, clavata, surculis diverticulatis instructa, hyalina. Pileipellis ex hyphis irregularibus cutem formantibus (*G. dryophili* similis), bifurcatoramosis, pigmento parietali vel incrustato brunneo instructis. Trama lamellarum irregularis. Fibulae praesentes. Ad frustula dejecta in silvis latifoliis tropicalibus. Indonesia (Bali). Holotypus: Bedugul, Bali Botanical Garden, 22 Jan. 2001, Wilson 127 (BO).

Pileus 9–53 mm diam, hemispherical when young to plano-convex at maturity, glabrous, smooth, moist, margin entire to eroded, translucent-striate, dark brown (7–8F8) on disc with a beige yellow (3–4A3–4) margin, hygrophanous, beige orange (5A3–4) with moisture loss. Context 1.5–2 mm thick, moist, gelatinous in appearance, firm, concolorous with the pileus. – Lamellae subfree to adnexed, close-crowded, broad (2–3.5mm), edge entire, straight to concave, orange to orange-brown (4–5A–C5) with a paler yellowish orange (4A3–4) edge. – Stipe 20–65 × 2.5–6 mm, central, more or less equal at upper 2/3rds then broadening at base, cylindrical to compressed, fistulose, pliant, glabrous, yellowish orange (4A5–6) overall, concolorous basal mycelium. – Odor indistinct. – Taste indistinct to slightly farinaceous. – Basidiospores 7.2–10.4 × 3.2–5 µm [$\bar{x}_r = 8.3\text{--}9.3 \times 4\text{--}4.4$ µm; $\bar{x}_m = 8.7 \pm 0.6 \times 4.2 \pm 0.2$ µm; $Q = 1.7\text{--}2.7$; $\bar{q}_r = 2\text{--}2.2$; $\bar{q}_m = 2.1 \pm 0.1$; $n = 20$ spores per 3 collections], ellipsoid, smooth, inamyloid, acyanophilic. – Basidia 23.5–30.5 × 4–5.6 µm, clavate, 4-spored, clamped. – Basidioles clavate, sometimes with a bulbous apex, clamped, thin-walled. – Pleurocystidia absent. – Cheilocystidia 25.5–44 × 10–14.5 µm, abundant, broadly clavate to subsphaeropedunculate, rarely with finger-like projections at the apex, hyaline,

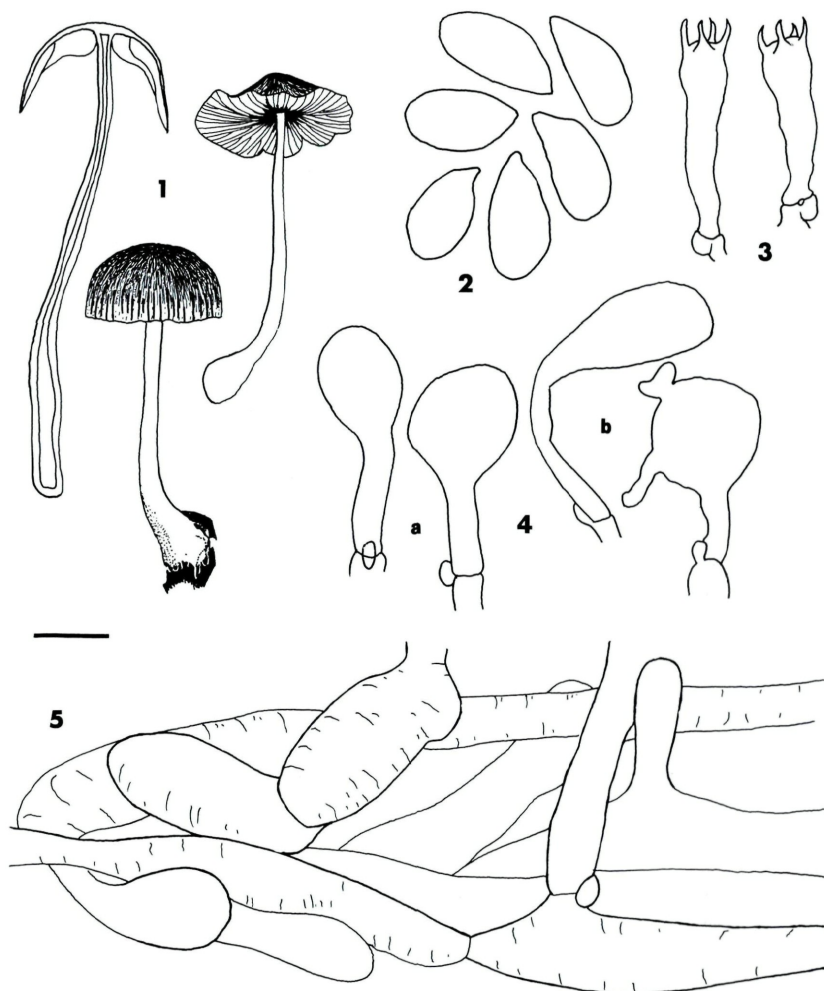


Plate 6. *Gymnopus vitellinipes*. – 1. Basidiomes (Holotype: AWW 127). – 2. Basidiospores (AWW 128). – 3. Basidia. – 4. Cheilocystidia (a. AWW 115. – b. A. W. Wilson 128.). – 5. Pileipellis (AWW 127). – Bar: 2 = 5 µm; 3–5 = 10 µm.

clamped. – Pileipellis a poorly-developed *dryophila*-structure of irregularly shaped and swollen hyphae, highly branching, interwoven, with brown intraparietal pigmentation. – Pileus trama hyphae of two types: 1) cells large, inflated, diverticulate, bifurcating, and 2) hyphae 5–12 µm diam, cylindrical, clamped, both types smooth or with weak annular incrustations, trama hyphae adjacent to pileipellis with yellowish pigmentation, becoming pale to hyaline in lamellar trama. – Pileocystidia absent. – Lamellar trama interwoven, hyphae cylindrical. – Stipitipellis of cylindrical

hyphae, smooth or with weak annular incrustations, clamped. – Caulocystidia rare, $73 \times 3.5 \mu\text{m}$, clavate with lobes and some diverticulations, hyaline, smooth, clamped.

Habit, habitat and distribution. – Gregarious on leaf litter (native plants) in Botanical Gardens. Bali.

Material examined. – INDONESIA: Bali: Bedugul, Bali Botanical Garden, S8°16.3' E115°9.3', elev. 1375–1400 m, 19 Jan. 2001, Wilson 115 (BO, SFSU) and Halling 8075 (NYBG); same location, 22 Jan. 2001, Wilson 127 (Holo-type BO; Isotype, SFSU) and Wilson 128 (BO, SFSU).

Gymnopus vitellinipes is characterized by a dark brown, pellucid-striate pileus with yellow margin, close pale orange-brown lamellae, a glabrous, yellowish orange stipe, broadly clavate to sphaeropedunculate cheilocystidia, a *dryophila*-structure pileipellis lacking pileocystidia, and growth on leaf litter under mixed broad-leaved trees.

Gymnopus vitellinipes is similar to *G. hybridus* (Kühner & Romagn.) Antonín & Noordel., but the latter species differs in a paler brown pileus with nearly white margin, a stipe with white upper region usually lacking in yellowish orange tones, irregularly cylindrical and often lobed cheilocystidia, and fruits in association with *Quercus* in thermophilous forests in central and western Europe. The new Balinese species keys close to *Marasmius naucoriiformis* Corner (1996), a taxonomically misplaced species described recently from Borneo, but the latter species differs in lacking yellowish orange pigments in the basidiome, and in forming a pileipellis anatomy indicative of members of *Gymnopus* sect. *Vestipedes*.

Gymnopus Sect. *Vestipedes* (Fr.) Antonín, Halling & Noordel., Mycotaxon 63: 363. 1997.

Bas.: *Agaricus* subtribus *Vestipedes* Fr., Epic. Syst. Mycol. 90. 1838.

Syn.: *Collybia* sect. *Marasmioideae* Kauffman, Agar. Michigan 1:775. 1918.

Marasmius tribus *Collybiae* Fr., Epic. Syst. Mycol. 373. 1838.

Marasmius sect. *Collybiae* (Fr.) Quél., Mém. Soc. Emul. Montbéliard, sér. II, 5: 219. 1872.

Marasmius subtribus *Scortei* Fr., Epic. Syst. Mycol. 376. 1838.

Marasmius sect. *Peronati* Kühner, Le Botaniste 25: 85. 1933.

Type species: *Gymnopus confluens* (Pers.: Fr.) Antonín, Halling & Noordel.

7. *Gymnopus allegetii* (De Seynes) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 7: 1–5.

Bas.: *Clitocybe allegetii* De Seynes, Recherches Hist. Nat. Champ. Congo Franç. 1: 7, t. 2, figs. 21–24. 1897.

Syn.: *Collybia allegetii* (De Seynes) Pegler, Kew Bull. 23: 242, fig. 7/2. 1969.

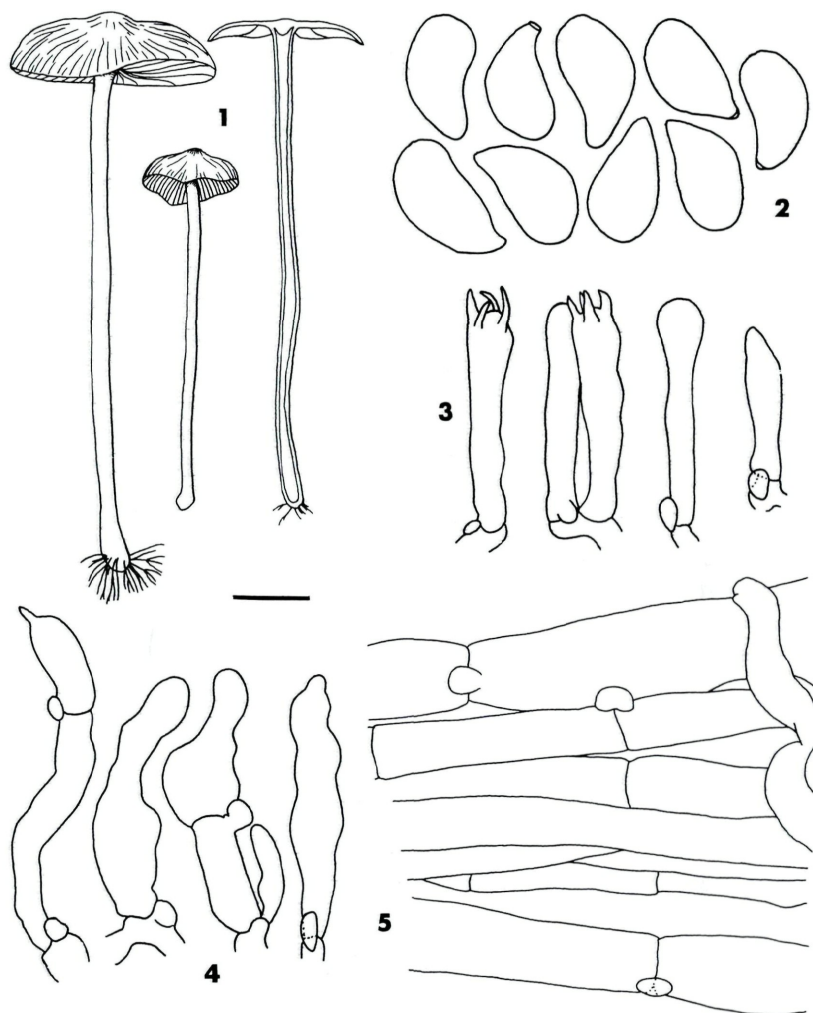


Plate 7. *Gymnopus allegetii* (AR 121). – 1. Basidiomes (x0.5). – 2. Basidiospores. – 3. Basidia and basidioles. – 4. Cheilocystidia. – 5. Pileipellis. – Bar: 2 = 5 μ m; 3–5 = 10 μ m.

Pileus 13–47(–96) mm diam, convex when young becoming plano-convex with a broad umbo, plicate-striate, glabrous, margin inflexed, light brown, hygrophanous, becoming pale yellowish brown with moisture loss. – Context thin (1 mm), concolorous. – Lamellae adnexed, subdistant (20–24), with 2–3 series of lamellulae, moderately broad (2–3 mm), buff to pale cream. – Stipe 55–150 \times 3–5 mm, cylindrical, equal, fistulose, pliant, fibrillose to pubescent, non-insititious, light brown to brown, basal tomentum of coarse rhizomorphs present. – Odor indistinct. – Taste slightly bitter. – Basidio-

spores $7.2\text{--}9.6 \times 3.6\text{--}4.8 \mu\text{m}$ [$\bar{x} = 8.08 \pm 0.74 \times 4.26 \pm 0.42 \mu\text{m}$; $Q = 1.64\text{--}2.44$; $\bar{q} = 1.91 \pm 0.18$; $n = 20$ spores per 1 specimen], ellipsoid in side view, amygdaliform in face view, some oily contents, smooth, hyaline, inamyloid. – Basidia $20\text{--}29 \times 4\text{--}6.5 \mu\text{m}$, clavate, 4-spored, clamped. – Basidioles clavate to subacrose, clamped. – Pleurocystidia absent. – Cheilocystidia $33\text{--}46.5 \times 6.5\text{--}10 \mu\text{m}$, irregularly cylindrical to clavate or narrowly ventricose, sometimes digitate, sometimes in chains of 2 to 3 cells, hyaline, thin-walled, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged cylindrical hyphae, smooth, clamped. – Pileus terminal cells $28\text{--}30 \times 4\text{--}6.5 \mu\text{m}$, repent, rare, cylindrical to clavate, clamped. – Pileus trama hyphae $4.5\text{--}9 \mu\text{m}$ diam, cylindrical, smooth, hyaline, inamyloid, clamped. – Lamellar trama interwoven, hyphae $2.5\text{--}6.5 \mu\text{m}$ diam, cylindrical, smooth, hyaline, inamyloid, clamped. – Stipitipellis composed of loosely interwoven caulocystidia, arising from repent, cylindrical, hyaline to pale yellowish brown, smooth hyphae. – Caulocystidia abundant, $60\text{--}87 \times 6\text{--}7 \mu\text{m}$, clavate to cylindrical, weakly flexuous, occurring in chains of up to 3 cells, thin-walled at stipe apex, thick-walled at stipe base, clamped.

Habit, habitat and distribution. – Gregarious to caespitose on soil and dicot leaves. Java.

Material examined. – INDONESIA: Java: Bogor, Cibodas Botanical Garden, $S6^{\circ}44.59' E107^{\circ}00.38'$, elev. 1450 m, 11 Jan 1999, Retnowati 121 (BO, SFSU); same location, 22 Jan. 1999, Retnowati 148 (BO, SFSU).

We are tentatively identifying the specimens collected from Java as *Gymnopus allegretii*. This species is currently known only from material collected in Africa (Pegler, 1977), which differs slightly from that reported here from Java. Our specimens are characterized by relatively large basidiomes with convex-umbonate, plicate-striate, pale yellowish brown pilei up to 47 mm or more in diameter, subdistant, moderately broad lamellae, and a long (up to 150 mm), pubescent stipe. Macromorphologically, the Javanese and African material are a good match. Micromorphologically, the Javanese basidiomes form slightly broader basidiospores (mean width $4.3 \mu\text{m}$), and have cheilocystidia and caulocystidia that are less nodulose-forked than those reported by Pegler (1977) for African basidiomes. Amongst Indonesian *Gymnopus* species, *G. allegretii* is morphologically similar to *G. gibbosus* and *G. tamblinganensis*, differing primarily by the characters reported in the key.

It is possible that what we are here tentatively identifying as *G. allegretii*, actually represents *Collybia subconfluens* Henn. The latter species was described from material collected at the same site, Cibodas Botanical Garden (Tjibodas), but unfortunately original

material of Henning's species is not extant. He reported the pileus as flavido and the lamellae as "confertissimis, angustis, ca 1 mm latis," and the spores as "4–4.5 × 3 µm" (Hennings, 1900). Our specimens have light brown to yellowish brown pilei, subdistant and broader lamellae, and the basidiospores measure 7.2–9.6 × 3.6–4.8 µm. Until further material of this intriguing species is collected to evaluate the range of morphological variability, we are reluctant to resurrect the epithet *C. subconfluens*.

8. *Gymnopus brunneigracilis* (Corner) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 8: 1–5.

Bas.: *Marasmius brunneigracilis* Corner, Beih. Nova Hedwigia 111: 39. 1996.

Type: Singapore, Bukit Timah, 4 Sept. 1940, Corner s.n. (E).

Pileus 28–53 mm diam, plano-convex to convex, subumbilicate to umbilicate, moist, glabrous, rivulose, margin inflexed to involute, irregular to eroded, striate-sulcate, disk dark reddish brown (8-9F7-8) otherwise, rusty reddish brown (7-8E8), hygrophanous, becoming light brown (6-7D4-5) with moisture loss. Context thin (1 mm). – Lamellae emarginate, at times with a small decurrent tooth, distant, with 3 series of lamellulae, sometimes forked near the margin, broad (3–6 mm), edge entire, creamy gray (5B2). – Stipe 36–50 × 2–5 mm, cylindrical, tapering, narrower at base, terete to subcompressed, cartilaginous, becoming stiff when dried, fistulose, longitudinal striate, subglabrous, subinsititious, ochraceous tawny (6C-D5), darkening to dark reddish brown (6-8F8) upon drying. – Odor fungal. – Taste slightly bitter to indistinct. – Basidiospores (8)–9–12.8(–13.6) × 4–6.1 µm [\bar{x} = 10.99 ± 1.46 × 5.06 ± 0.56 µm; Q = 2–2.78; \bar{q} = 2.7 ± 0.19; n = 19 spores per 1 specimen], elongate-ellipsoid in side view, amygdaliform in face view, smooth, hyaline, inamyloid, acyanophilic. – Basidia 24–32 × 6–7 µm, subclavate, 4-spored, clamped. – Basidioles subclavate to subaceroise, clamped. – Pleurocystidia absent. – Lamellar edge sterile, composed of repent hyphae with cheilocystidia terminal cells. – Cheilocystidia 45.5–57.5 × 7–9 µm, irregularly cylindrical to clavate or narrowly ventricose, smooth, hyaline, clamped. – Pileipellis a cutis of radially arranged hyphae, cylindrical, annular-incrusted, clamped. – Pileocystidia absent. – Pileus trama consisting of interwoven hyphae, 3–12 µm diam, cylindrical, smooth, hyaline or with pale brown intraparietal pigments, clamped. – Lamellar trama interwoven, hyphae cylindrical, 2.5–13 µm diam, branching, smooth, clamped. – Stipitipellis of cylindrical hyphae, smooth, clamped. – Caulocystidia scattered, 28–80 × 3–5.5 µm, cylindrical-flexuous, smooth, clamped.

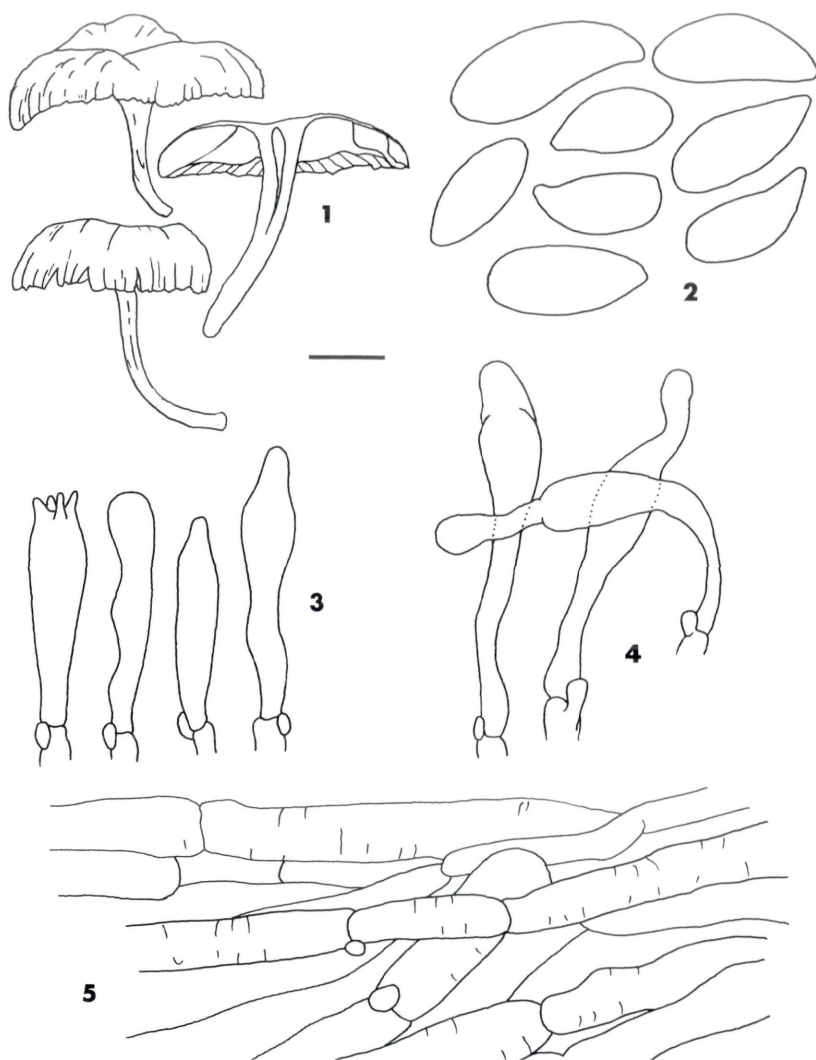


Plate 8. *Gymnopus brunneigracilis* (AWW 01). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidium and basidioles. – 4. Cheilocystidia. – 5. Pileipellis. – Bar: 2 = 5 μ m; 3–5 = 10 μ m.

Habit, habitat and distribution. – Scattered on woody debris. Java.

Material examined. – INDONESIA: Java: Bogor, Bogor Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 6 Jan. 2000, Wilson 01 (BO, SFSU).

Gymnopus brunneigracilis is distinguished by basidiomes with plano-convex, umbilicate, sulcate-striate, reddish brown pilei, dis-

tant, emarginate, broad, relatively thick and tough lamellae, and a cartilaginous, ochraceous-tawny stipe that is subsinititious on woody debris. Micromorphologically, it forms relatively long basidiospores, and has a sterile lamellar edge formed from repent, irregularly cylindrical to ventricose cheilocystidia. The Javanese specimen differs only slightly from the description of type specimen collected in Singapore in that our material forms more robust basidiomes with pilei up to 50 mm diam, and basidiospores up to 13.5 μm long.

Gymnopus diminutus (Berk. & Broome) A. W. Wilson, Desjardin & E. Horak, **comb. nov.**

Bas.: *Agaricus diminutus* Berk. & Broome, J. Linn. Soc. Bot. 11: 251. 1871.

Syn.: *Collybia diminuta* (Berk. & Broome) Sacc., Syll Fung. 5:240. 1887.

Type: Sri Lanka, Kandy Distr., Peradeniya, on dead twigs, Thwaites 1147 (K).

9. ***Gymnopus diminutus*** var. ***clavatus*** A. W. Wilson, Desjardin & E. Horak, **var. nov.** – Plate 9: 1–6.

Differt a typo cheilocystidiis clavatis, surculis absentibus. Pileus 2.5–6 mm, albus. Basidiosporae 4.8–6.4 \times 2.8–4 μm , ellipsoideae vel amygdaliformes, leves, hyalinae. Cheilocystidia 17.5–64 \times 5–16 μm , clavata, surculis nullis instructa. Ad ramos in silvis latifoliis tropicalibus. Indonesia (Java). Holotypus varietatis: Mt. Halimun National Park, 7 Jan. 1999, Retnowati 099 (BO).

Pileus 2.5–6 mm diam, hemispherical to broadly convex, smooth to pruinose, dry, hygrophanous, margin straight to slightly incurved, entire, pale orange-white overall. Context thin, concolorous. – Lamellae adnate, close (34), with 2 series of lamellulae, waxy, entire, narrow, concolorous. – Stipe 4–16 \times 0.5–1 mm, central, equal with a small disc at base, solid, smooth to pruinose, non-insinititious, concolorous. – Odor and taste not distinct. – Basidiospores 4.8–6.4 \times 2.8–4 μm [\bar{x} = 5.51 \pm 0.44 \times 3.33 \pm 0.4 μm ; Q = 1.44–2; \bar{q} = 1.67 \pm 0.16; n = 9 spores per 1 specimen], ellipsoid in side view, amygdaliform in face view, hilar-appendage distinctive in some spores, smooth, hyaline, inamyloid. – Basidia 20.5–23 \times 4–5 μm , clavate, 4-spored, clamped. – Basidioles, clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 17.5–64 \times 5–16 μm , clavate, hyaline, clamped, lamellar edge sterile. – Pileipellis composed of slightly radially arranged to weakly interwoven, smooth or sparsely diverticulate hyphae, 5.5–8 μm diam, cylindrical to inflated, non-gelatinous, smooth or roughened, inamyloid, clamped. – Pileocystidia absent. – Pileus trama consisting of cylindrical hyphae, 4–5.5 μm diam, smooth or a few diverticulate, branched,



Plate 9. *Gymnopus diminutus* var. *clavatus* (Holotype: AR 099). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidioles. – 4. Cheilocystidia. – 5. Caulocystidia. – 6. Pileipellis. – Bar: 2 = 5 μ m; 3–6 = 10 μ m.

clamped. – Stipitipellis and stipe trama consisting of cylindrical hyphae, smooth, clamped. – Caulocystidia 12–70 \times 4–14 μ m, common, clavate to cylindrical, arising as outgrowths from stipitipellis hyphae.

Habit, habitat and distribution. – Gregarious on twigs.
Java.

Material examined. – INDONESIA: Java, Mt. Halimun National Park, 7 Jan. 1999, Retnowati 099 (Holotype, BO; Isotype, SFSU).

Diagnostic features of *Gymnopus diminutus* var. *clavatus* include: a small, pale orange-white pileus, close, white lamellae, a small, non-insititious, pruinose, white stipe on dicotyledonous twigs, small basidiospores, clavate cheilocystidia and caulocystidia, and a pileipellis composed of slightly radially arranged to interwoven, sparsely diverticulate hyphae. The Javanese material matches quite closely Sri Lankan specimens determined as *Collybia diminuta* (Berk. & Broome) Sacc. differing only in cheilocystidia shape. Cheilocystidia of *C. diminuta* are sinuose-cylindric and irregularly nodulose (Pegler, 1986) whereas those of the Javanese specimen are clavate, lacking any nodulae. Because of this difference, the Javanese specimen is described as a new variety.

10. *Gymnopus gibbosus* (Corner) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 10: 1–6.

Bas.: *Marasmius gibbosus* Corner, Beih. Nova Hedwigia 111: 55. 1996.

Type: Singapore, Cluny Road, 22 Oct. 1939, Corner s.n. (E).

Pileus 12–40(–52) mm diam, hemispherical to plano-convex to concave, subumbonate, rugulose, translucent-striate when moist, glabrous to radially appressed-fibrillose when dry, margin entire to crenulate-eroded, straight to inflexed, disc dark brown (6–7E–F7–8) with streaks of brown (7D8) extending to ochraceous tawny (6C5) or cream (4A3) at the margin. – Lamellae adnexed to sinuate, ventricose, entire, close (25–30), with 2–3 series of lamellulae, intervenous at base of lamellae, moderately broad (1–5.5mm), white to light yellow (1–3A2). – Stipe 16–62 × 1.5–5 mm, central, equal, hollow, pliant, fibrous, longitudinally striate, glabrous to pruinose, light beige (3–5A–B2–4) throughout, sometimes darkening to dark chocolate brown (6–8F8) towards base, white basal tomentum present. – Odor and taste indistinct. – Basidiospores $6.8\text{--}11.8 \times 3.6\text{--}6.4\ \mu\text{m}$ [$\bar{x}_r = 8\text{--}9.4 \times 4.2\text{--}5.2\ \mu\text{m}$; $\bar{x}_m = 8.7 \pm 0.6 \times 4.6 \pm 0.4\ \mu\text{m}$; $Q = 1.2\text{--}2.6$; $\bar{q}_r = 1.8\text{--}2.1$; $\bar{q}_m = 1.9 \pm 0.1$; $n = 17\text{--}20$ spores per 4 collections], broadly ellipsoid to amygdaliform in side view, smooth, hyaline, inamyloid, acyanophilic. – Basidia $25.5\text{--}33 \times 5.5\text{--}9\ \mu\text{m}$, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia $30\text{--}65.5 \times 5.5\text{--}11\ \mu\text{m}$, numerous, clavate to ventricose, sometimes nodulose, sometimes occurring in chains of up to 2–3 cells, clamped,

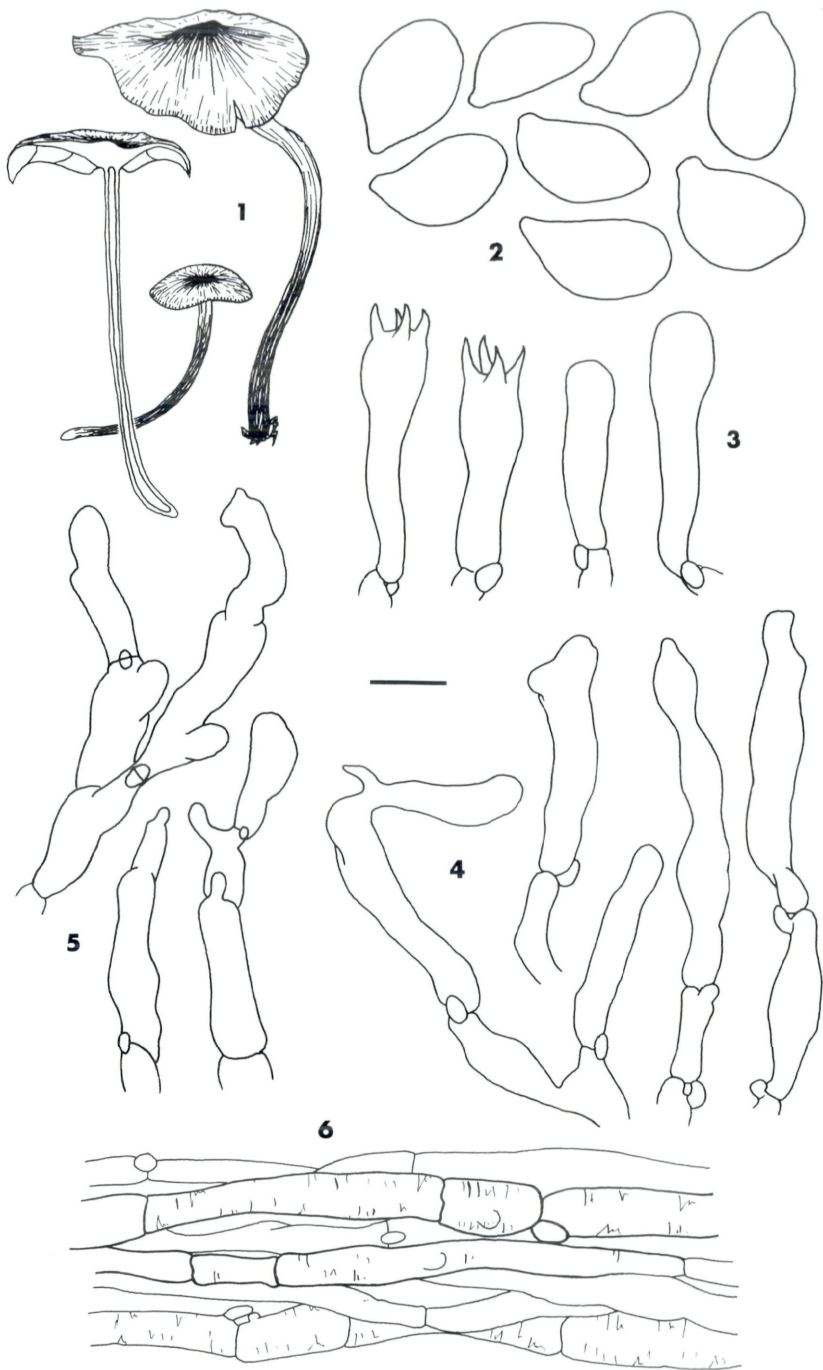


Plate 10. *Gymnopus gibbosus*. – 1. Basidiomes (AWW 112). – 2. Basidiospores (AWW 95). – 3. Basidia and basidioles. – 4. Cheilocystidia. – 5. Pileocystidia (AWW 112). – 6. Pileipellis. – Bar: 2 = 5 μ m; 3–6 = 10 μ m.

lamellar edge sterile. – Pileipellis a cutis of radially arranged, cylindrical hyphae, 2.5–9 μm diam, non-diverticulate, with coarse brown annular incrustations, bifurcate with short terminal cells, clamped, embedded in a thin gelatinous matrix. – Pileocystidia abundant, 27–46.5 \times 5–7 μm diam, clavate to flexuous, nodulose, hyaline, clamped. – Pileus trama of cylindrical hyphae, 2.5–13 μm diam, smooth, mostly hyaline or with brown intraparietal pigments, inamyloid with some scattered dextrinoid cells, clamped. – Lamellar trama parallel, hyphae 3–11 μm diam, cylindrical, smooth, hyaline, inamyloid to sometimes dextrinoid, clamped. – Stipitipellis of cylindrical hyphae, 3–12 μm diam, clamped, matted with caulocystidia. – Caulocystidia 32–77 \times 5.5–8 μm diam, clavate to flexuous, occurring in chains of 3–4 cells, smooth, hyaline, clamped.

Habit, habitat and distribution. – Gregarious on soil or amongst dicot leaf litter. Java.

Material examined. – INDONESIA: Java: Bogor, Bogor Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 8 Jan. 2000, Wilson 12 (BO, SFSU); same location, 9 Jan 2001, Wilson 66 (SFSU); same location, 13 Jan 2001, Wilson 95 (SFSU); same location, 17 Jan 2001, Wilson 112 (BO, SFSU).

Although described as a *Marasmius* by Corner (1996), the pileipellis anatomy of this species indicates that it is better placed in *Gymnopus* sect. *Vestipedes*, and the molecular sequence data from our specimens determined as *G. gibbosus* support this transfer. *Gymnopus gibbosus* is characterized by forming relatively large pilei with a dark brown disc and paler brown, striate margin, close moderately broad lamellae, and a tough, longitudinally striate, pallid stipe. Corner (1996) compared his material to *Collybia nephelodes* (Berk. & Broome) Sacc., and he suggested that *M. gibbosus* may only represent a variety of the latter. Our interpretation of *Collybia nephelodes* (sensu Pegler, 1986) is that *C. nephelodes* differs from *G. gibbosus* in forming crowded, very broad (–10 mm) lamellae, cylindrico-fusoid basidiospores (mean length 11 μm), and cheilocystidia that do not occur in chains. *Gymnopus gibbosus* differs subtly from *G. allegretii* and *G. tamblinganensis* by the features presented in the key.

11. *Gymnopus indoctus* (Corner) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 11: 1–6.

Bas.: *Marasmius indoctus* Corner, Beih. Nova Hedwigia 111: 60. 1996.

Type: Singapore, Singapore Botanic Garden, 8 Aug. 1940, Corner s.n. (E).

Pileus 10–45 mm diam, convex to concave-infundibuliform, subumbilicate to umbilicate, striate to rugulose-striate, glabrous,

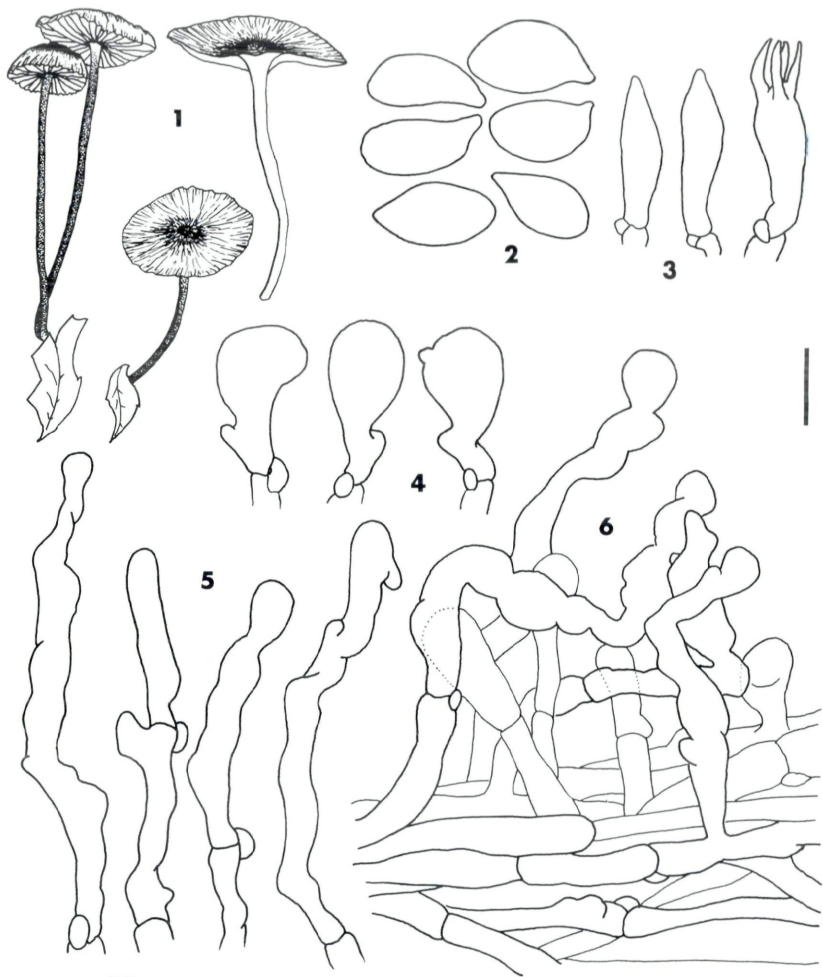


Plate 11. *Gymnopus indoctus* (AWW 17). - 1. Basidiomes. - 2. Basidiospores. - 3. Basidium and basidioles. - 4. Cheilocystidia. - 5. Caulocystidia. - 6. Pileocystidia and pileipellis. - Bar: 2 = 5 μ m; 3-6 = 10 μ m.

moist, margin translucent-striate, straight to reflexed, wavy, entire to eroded, brownish beige (5-7D5-7) at disc becoming creamy beige (4-5A-B2-4) to white at margin, hygrophamous turning creamy orange (5-6A-B4) with moisture loss. Context thin (1 mm), white. - Lamellae adnate to emarginate, sometimes with a decurrent tooth, close to subdistant, with 2-4 series of lamellulae, narrow to moderately broad (1-3 mm), edge even, entire, creamy peach (4-6A-B2-3) to white. - Stipe 25-96 \times 1-3 mm, central, cylindrical, equal, hollow to fistulose, pliant, apex squamulose, base fibrillose, or fibrillose over-

all, yellowish brown to pale orange-brown or light brown (5-6C-E5-8) below with the apex lighter creamy peach (3-5A-B2-3), basal tomentum of matted hyphae and rhizoids. – Odor indistinct. – Taste indistinct to slightly bitter. – Basidiospores $6.4\text{--}9.6 \times 3.2\text{--}5\text{ }\mu\text{m}$ [$\bar{x}_r = 8.2\text{--}9.1 \times 4\text{--}4.2\text{ }\mu\text{m}$; $\bar{x}_m = 8.6 \pm 0.5 \times 4.1 \pm 0.1\text{ }\mu\text{m}$; $Q = 1.4\text{--}2.5$; $\bar{q}_r = 2.0\text{--}2.2$; $\bar{q}_m = 2.1 \pm 0.1$; $n = 20$ spores per 3 specimens], ellipsoid, smooth, inamyloid, acyanophilic. – Basidia $16\text{--}21.5 \times 5.5\text{--}10.5\text{ }\mu\text{m}$, clavate, 4-spored, clamped. – Basidioles clavate to subacerosus, clamped. – Pleurocystidia absent. – Cheilocystidia $26.5\text{--}35 \times 9\text{--}12\text{ }\mu\text{m}$, clavate to broadly clavate, at times bifurcate, smooth, hyaline, clamped. – Lamellar trama of interwoven hyphae, cylindrical, smooth, clamped. – Pileipellis a cutis of radially arranged hyphae, smooth to weakly incrustate, cylindrical, clamped. – Pileocystidia abundant, $13.5\text{--}48 \times 5\text{--}7\text{ }\mu\text{m}$, cylindrical-flexuous, strangulate, sometimes occurring in short chains, clamped. – Pileus trama monomitic, hyphae $3\text{--}8\text{ }\mu\text{m}$ diam, interwoven, cylindrical with some inflated cells, smooth, clamped. – Lamellar trama interwoven, hyphae $3\text{--}6.5\text{ }\mu\text{m}$ diam, cylindrical, smooth, clamped. – Stipitipellis of cylindrical hyphae, smooth, clamped. – Caulocystidia abundant, $46.5\text{--}57.5 \times 3\text{--}5\text{ }\mu\text{m}$, cylindrical-flexuous to strangulate, sometimes occurring in short chains, clustered, smooth, clamped.

Habit, habitat and distribution. – Gregarious to scattered on leaf litter. Java

Material examined. – INDONESIA: Java, Bogor, Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 6 Jan. 2000, Wilson 03 and 04 (SFSU); same location, 9 Jan. 2000, Wilson 17 (SFSU); same location, 12 Jan. 2001, Wilson 32 (SFSU).

Gymnopus indoctus was described originally from material collected in the Singapore Botanic Garden under rattan palms (Corner, 1996). In the field our specimens appeared like a pale *G. menehune*, with a rugulose-striate, umbilicate pileus and close to crowded narrow lamellae. Basidiomes are distinguished by their brownish to creamy beige pileus with a white margin, the broadly clavate to vesiculose cheilocystidia in combination with contorted to lobate, erect pileocystidia. Corner (1996: Plate 13a) provided a good color plate of the type specimen.

12. *Gymnopus johnstonii* (Murrill) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 12: 1–6.

Bas.: *Marasmius johnstonii* Murrill in Pennington, N. Amer. Fl. 9: 269. 1915.
Syn.: *Collybia johnstonii* (Murrill) Dennis, Trans. British Mycol. Soc. 34: 437, pl. 21/9, fig. 15. 1951.

Type: Puerto Rico, Rio Piedras, 25 May 1913, Johnston 912 (NY !).

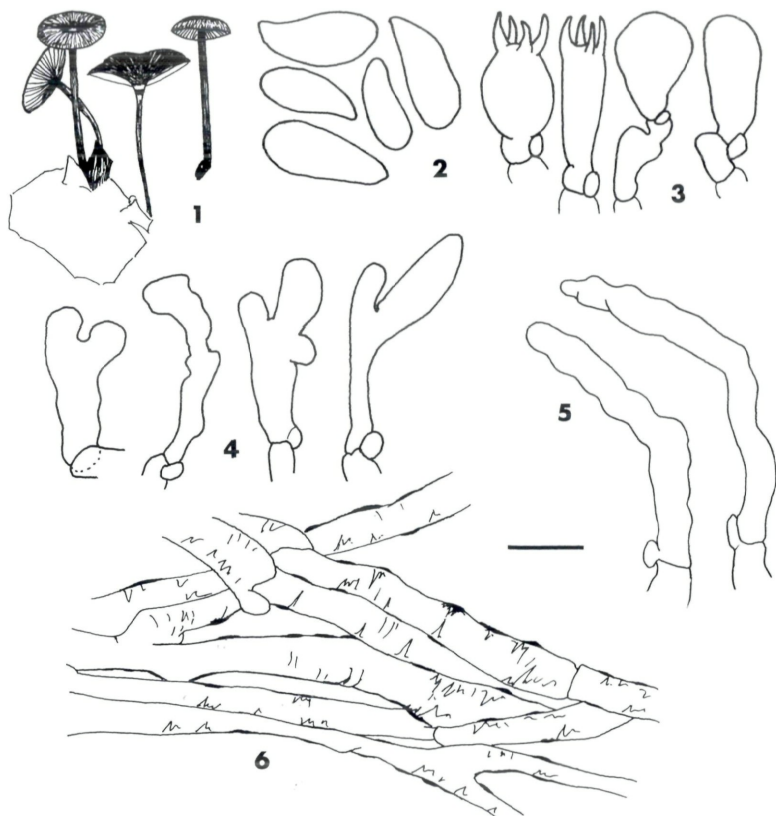


Plate 12. *Gymnopus johnstonii* (AWW 16). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidia and basidioles. – 4. Cheilocystidia. – 5. Caulocystidia. – 6. Pileipellis. – Bar: 2 = 5 μ m; 3–6 = 10 μ m.

Pileus 8–14 mm diam, applanate to subconvex, umbilicate, moist, glabrous, margin entire, translucent-striate, splitting radially from edge upon drying, straight to minutely deflexed, disk dark brownish gray (7F6) lightening to brown (6C–D7) at margin. Context very thin (<1 mm), concolorous. – Lamellae adnate, close, with 2–3 series of lamellulae, edge entire, even, narrow (1 mm), whitish cream (2A1–2) becoming orange (3–A6) to yellow (2–3A3) upon drying. – Stipe 20–24 \times 0.5–1 mm, cylindrical, terete, pliant, fistulose, pruinose at the apex, tomentose at the base, brown (5–6E4–5) to light gray brown (5–6D3) turning dark brown (5–6F5) at apex, basal tomentum of matted hyphae. – Odor and taste indistinct. – Basidiospores 6.4–9.6 \times 2.4–4.8 μ m [\bar{x} = 8.04 \pm 0.79 \times 3.44 \pm 0.57 μ m; Q = 1.82–3.14; \bar{q} = 2.38 \pm 0.35; n = 18 spores per 1 specimen], elongate ellipsoid, smooth, hyaline, inamyloid. – Basidia 12–17.5 \times 5.5–

10.5 μm , clavate becoming broadly clavate to subovoid toward the pileus, 4-spored, smooth, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 21.5–28 \times 5–8 μm , clavate to contorted, bifid or with a few lobes, clamped. – Pileipellis a cutis of radially arranged hyphae, 2.5–5.5 μm diam, cylindrical, non-diverticulate, with dark brown annular incrustations, clamped. – Pileocystidia absent. – Pileipellis trama of cylindrical hyphae, smooth with some black annular incrustations, clamped. – Lamellar trama interwoven, hyphae cylindrical, 2.5–5.5 μm diam, smooth, clamped. – Stipitipellis hyphae cylindrical, 3.5–7.5 μm diam, clamped. – Caulocystidia 45.5–74 \times 3–6 μm , abundant, occurring in clusters, cylindrical to strangulated or flexuous, occurring in chains of up to 3 cells, thin-walled, branched, hyaline, clamped.

Habit, habitat and distribution. – Gregarious on rotting leaves. Java.

Material examined. – INDONESIA: Java: Bogor, Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 9 Jan. 2000, Wilson 16 (BO, SFSU).

We are tentatively identifying the Javanese specimen as *Gymnopus johnstonii*, a species described originally from Puerto Rico (Murrill in Pennington, 1915), and later reported from the Lesser Antilles (Pegler, 1983) and East Africa (Pegler, 1977). The Javanese specimen is characterized by forming small basidiomes with dark brownish gray, umbilicate pileus, close, cream-colored lamellae, and a pruinose, pale grayish brown stipe. The pileipellis is composed of cylindrical, brown, coarsely-incrusted hyphae, the cheilocystidia are clavate to bifid, and caulocystidia are cylindrical-flexuous and thin-walled. Pegler's descriptions of this species differ markedly from each other (cf. Pegler, 1977, 1983), and suggest that the Old World African specimens may represent a different species. The Javanese material matches the protologue and differs only subtly from the description of Lesser Antilles specimens provided by Pegler (1983). We suspect that the species was introduced into the Bogor Botanical Garden along with plants from the Caribbean region.

13. *Gymnopus melanopus* A. W. Wilson, Desjardin & E. Horak, sp. nov. – Plate 13: 1–4.

Pileus 8–34 mm, hemisphaericus dein convexus vel applanatus, subfibrillosus, rivulosus, translucenter striatus, apicaliter fuscus, subaurantiacus vel argillaceus marginem versus, hygrophanus. Lamellae adnatae vel adnexae, distantes, ad aciem integrae, subrosaceae dein griseo-cinnamomeae. Stipes 21–55 \times 0.5–2.5 mm, cylindricus, subattenuatus basim versus, pruinosis, fistulosus, flexilis, subinsititius, apicaliter pallidus deorsum subbrunneus, atratus ad basim. Odor nullus. Sapor subamarus. Basidiosporae 7.2–10.4 \times 3.2–5.6 μm , guttiformes vel ellipsoideae, leves,

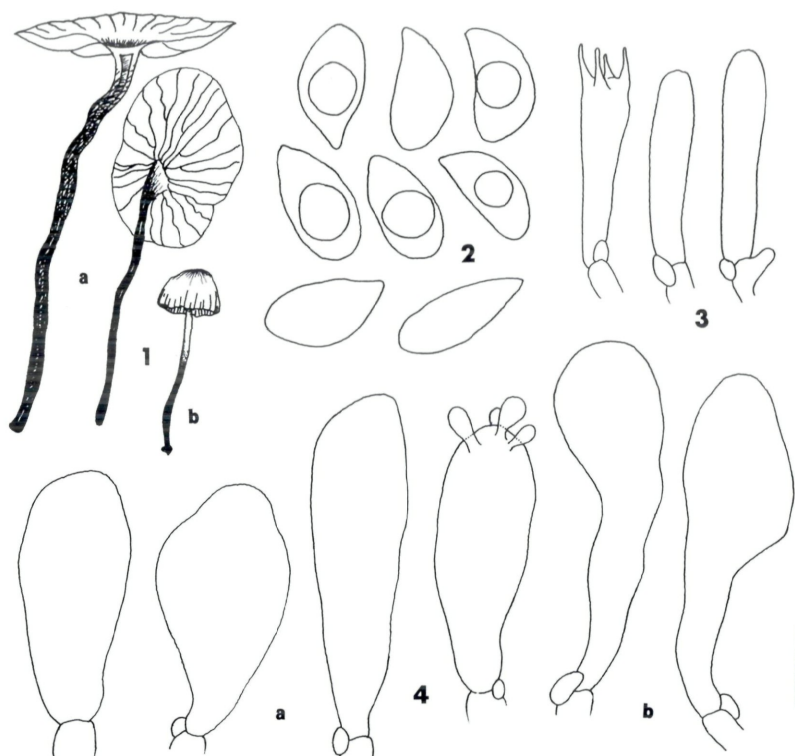


Plate 13. *Gymnopus melanopus*. – 1. Basidiomes (a. AWW 54 – b. Holotype: AWW 50). – 2. Basidiospores (AWW 50). – 3. Basidium and basidioles. – 4. Cheilocystidia (a. AWW 54 – b. AWW 50). – Bar: 2 = 5 μ m; 3, 4 = 10 μ m.

hyalinae. Basidia 23–30 \times 4.5–8 μ m, clavata, 4-spore. Cheilocystidia 32–56 \times 9.5–16.5 μ m, late clavata vel obovoidea, rariter ad apicem surculis instructa. Caulocystidia 20–76 \times 4–12 μ m, cheilocystidiis similia. Pileipellis ex hyphis cylindraceis cutem formantibus, 5–8 μ m diam., interdum apicaliter diverticulatis, pigmento brunneo incrustatis. Trama lamellarum irregulare. Fibulae praesentes. Ad lignum putridum in silvis latifoliis tropicalibus. Indonesia (Java). Holotypus: Bogor, Bogor Botanical Garden, 20 Jan. 2000, Wilson 50 (SFSU).

Pileus 8–34 mm diam, hemispheric when young to applanate-convex at maturity, matted-fibrillose, translucent-striate, moist, rivulose, margin undate-entire, straight, dark brown (7E8) to light brown (7D7–8) on the disc, to grayish orange or beige (6B3–4) at the margin, hygrophanous, becoming beige peach (5–6A3) with moisture loss. – Lamellae narrowly adnate to adnexed, distant with 2 series of lamellulae, narrow, edge even with the pileus, beige peach (5–6A3) when young, darkening to grayish orange (7C5–4) at maturity. – Stipe 21–55 \times 0.5–2.5 mm, central, cylindrical, tapering slightly toward bottom, sometimes compressed, pruinose, fistulose-stuffed,

pliant, subinsititious, black at base becoming brown (7C-D7) to white beige (3A1-2) at apex. – Odor indistinct. – Taste slightly bitter. – Basidiospores $7.2\text{--}10.4 \times 3.2\text{--}5.6\ \mu\text{m}$ [$\bar{x}_r = 8.3\text{--}8.5 \times 3.8\text{--}4\ \mu\text{m}$; $\bar{x}_m = 8.4 \pm 0.1 \times 3.9 \pm 0.1\ \mu\text{m}$; $Q = 1.6\text{--}3$; $\bar{q}_r = 2.1\text{--}2.3$; $\bar{q}_m = 2.2 \pm 0.1$; $n = 14\text{--}20$ spores per 2 collections], lacrymoid to lacrymoid-ellipsoid in face view, smooth, inamyloid. – Basidia $23\text{--}30 \times 4.5\text{--}8\ \mu\text{m}$, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia $32\text{--}56 \times 9.5\text{--}16.5\ \mu\text{m}$, abundant, broadly clavate to ellipsoid-obovoid, rarely with small finger-like to knobby outgrowths at the apex, smooth, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged hyphae $5\text{--}8\ \mu\text{m}$ diam, cylindrical, with brown annular incrustations, rarely weakly diverticulate but mostly non-diverticulate, clamped. – Pileipellis trama of interwoven cylindrical hyphae, hyphae $4\text{--}11\ \mu\text{m}$, smooth, clamped, not turning green in 3% KOH. – Lamellar trama interwoven, hyphae cylindrical, smooth, clamped. – Stipitipellis consisting of cylindrical, smooth, clamped hyphae. – Caulocystidia $20\text{--}76 \times 4\text{--}12\ \mu\text{m}$, broadly clavate to subcylindrical, thin-walled, hyaline, inamyloid, similar to the cheilocystidia.

Habit, habitat and distribution. – Gregarious on wood chips. Java.

Material examined. – INDONESIA: Java: Bogor, Bogor Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 20 Jan. 2000, Wilson 50 (Holotype, SFSU); same location, 5 Jan 2001, Wilson 54 (BO, SFSU).

Gymnopus melanopus is characterized by basidiomes with the following features: small convex to plano-convex, striate pileus colored brown to dark brown with a paler margin, distant, pale grayish orange lamellae, pruinose stipe with a black base, relatively large basidiospores, large elongate-clavate cheilocystidia forming a sterile lamellar margin, a cutis-type pileipellis of non-diverticulate, pigment-incrusted, cylindrical hyphae, thin-walled hyaline, clavate caulocystidia, and presence on woody debris. The species is similar to *Collybia coracicolor* (Berk. & M. A. Curtis) Dennis from Cuba, and *Marasmius rubiicolor* Corner from Singapore. *Collybia coracicolor* differs from the new species in forming a pileus described as rugoso-sulcato depresso vel umbilicato rufo, and a stipe rufescente glabro (Berkeley & Curtis, 1868), and forms smaller basidiospores ($5.5\text{--}8 \times 3\text{--}4\ \mu\text{m}$; Pegler, 1983). *Marasmius rubiicolor* differs from *G. melanopus* in forming a subumbonate to subumbilicate madder brown pileus, crowded lamellae (20–27 with 3–5 series of lamellulae), a madder brown stipe with a white strigose villous base, and grown on leaves (Corner, 1996). The black stipe base and large, clavate cheilocystidia are diagnostic for *G. melanopus*.

Gymnopus melanopus resides basal and sister to all of the Indonesian *Gymnopus* species included in the ITS analyses. It appears to rest outside of sect. *Vestipedes* and *Levipedes*, although its micromorphology would place it in sect. *Vestipedes*. Until further taxa are added to the analysis, we tentatively accept *G. melanopus* in sect. *Vestipedes*.

14. *Gymnopus menezhine* Desjardin, Halling & Hemmes, *Mycologia* 91 (1): 173. 1999. – Plate 14: 1–7.

Type: Hawai'i: MacKenzie Beach State Park, 3 Aug 1993, Desjardin 5866 (SFSU !).

Pileus 12–50 mm diam, convex to concave, umbilicate, glabrous to radially appressed-fibrillose, moist, margin translucent-striate to striate, entire to eroded, splitting radially with age, wavy to even, inflexed to reflexed, dark chocolate brown (7F7–8) to dark burgundy brown (7–8F8) at disc, brown (6C–E7) to peachy beige (6A–B3) at margin, hygrophanous becoming light beige to light pink (5A–B3) upon drying. Context 0.5–2 mm thick, concolorous with pileus. – Lamellae adnate, densely crowded, multiple series of lamellulae, narrow (0.5–2 mm), edge entire, parallel, white to beige peach (5–6A2) to light beige (4–5A2). – Stipe 15–110 × 0.5–3(–4.5) mm, central, equal, sometimes compressed with a cleft, fistulose, fibrous, pliant, apex glabrous to minutely pruinose, pruinose-floccose elsewhere especially upon drying, dark chocolate brown (6–8D–F7–8) below, apex sometimes light grayish brown (5–6D3) to creamy beige (5A–B2–3), basal tomentum with wiry mycelium present. – Odor indistinct or sometimes having a fishy mushroom odor. – Taste indistinct or sometimes slightly bitter or slightly acrid. – Basidiospores 6.4–12 × 2.4–5 µm [$\bar{x}_r = 7.1\text{--}10.1 \times 3.5\text{--}3.9$ µm; $\bar{x}_m = 8.2 \pm 1.1 \times 3.7 \pm 0.2$ µm; $Q = 1.5\text{--}3.4$; $\bar{q}_r = 1.9\text{--}2.6$; $\bar{q}_m = 2.2 \pm 0.3$; $n = 10\text{--}20$ spores per 7 collections], elongate ellipsoid to lacrymoid, smooth, inamyloid, acyanophilic. – Basidia 15.5–29 × 3–7 µm, clavate, 4-spored, clamped. – Basidiales clavate to subcylindrical, sometimes subacrose, clamped. – Pleurocystidia absent. – Cheilocystidia 20–51 × 3–9 µm, abundant, clavate-contorted, lobed, diverticulate, sometimes with broad finger-like projections, hyaline, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged hyphae, 2.5–6 µm diam, cylindrical (not a *dryophila*-structure), more or less parallel, rarely diverticulate, with few or numerous annular brown incrustations, clamped. – Pileocystidia scattered to abundant, 13.5–47 × 2.5–6.5 µm, erect or repent, clavate to cylindrical, contorted, bifurcate or lobed, non-incrusted, hyaline, clamped. – Pileus trama hyphae 3–11 µm diam, cylind-

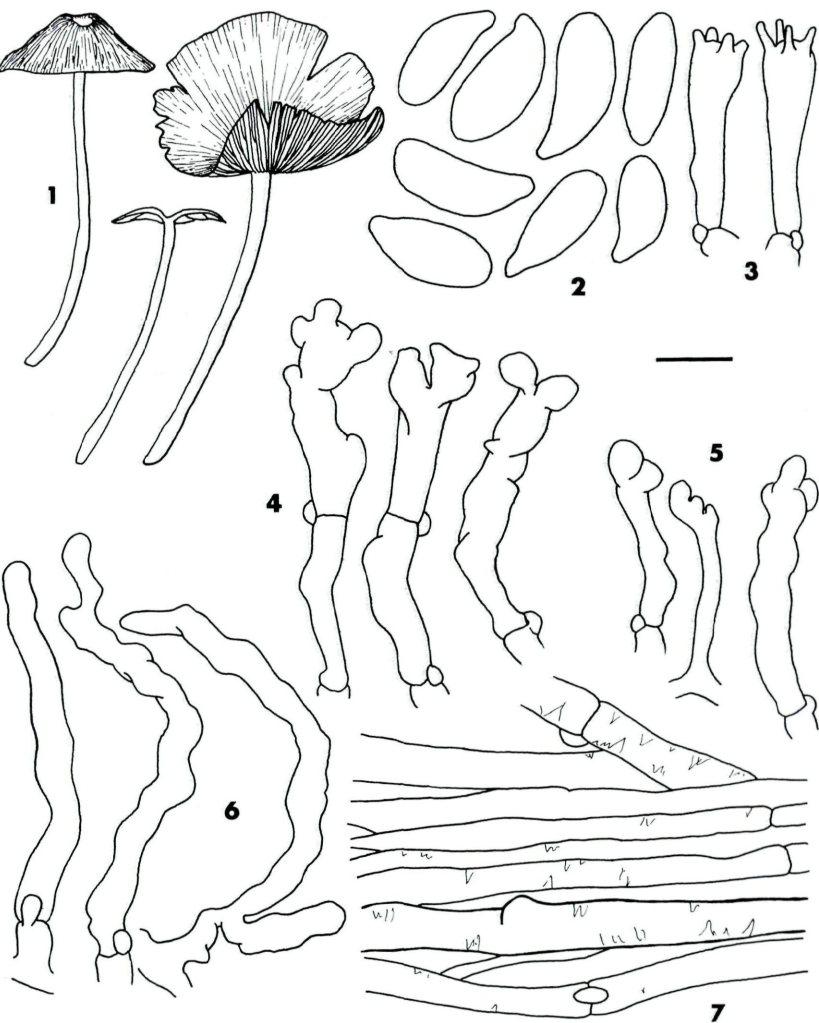


Plate 14. *Gymnopus meneshune*. – 1. Basidiomes (DED 6919). – 2. Basidiospores (AWW 14). – 3. Basidia (DED 6919). – 4. Cheilocystidia. – 5. Pileocystidia. – 6. Caulocystidia. – 7. Pileipellis. – Bar: 2 = 5 µm; 3–7 = 10 µm.

rical, with brownish yellow annular incrustations, dark brown in younger specimens, inamyloid, clamped, not staining green in 3% KOH. – Stipitipellis hyphae cylindrical, parallel, smooth, hyaline, clamped. – Caulocystidia 25.5–76 × 3–5.5 µm, abundant, occurring singly or in small clusters of 2–8 cells, cylindrical, contorted, smooth or weakly diverticulate, sometimes in chains of 2–3 cells, hyaline, thin-walled, clamped.

Habit, habitat and distribution. – Gregarious to caespitose on leaf litter. Java.

Material examined. – INDONESIA: Java: Bogor, Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 12 Jan. 1999, Desjardin 6919 (BO, SFSU); same location, 6 Jan. 2000, Wilson 02 (BO, SFSU); same location, 7 Jan. 2000, Wilson 07 (BO, SFSU); same location, 8 Jan. 2000, Wilson 14 and 15 (BO, SFSU); same location, 9 Jan. 2000, Wilson 20 (SFSU); same location, same date, Wilson 21 (BO, SFSU); same location, 5 Jan. 2001, Wilson 52 (SFSU); same location, 13 Jan. 2001, Wilson 87 (BO, SFSU).

Gymnopus menehune was described originally by Desjardin & al. (1999) from Hawai'i. It is characterized by small gregarious to caespitose basidiomes with a brown to dark brown, striate, umbilicate pileus, densely crowded, narrow, pale beige to white lamellae, and a brown, pruinose, sometimes compressed stipe. Microscopically, *G. menehune* has elongate-ellipsoid basidiospores, numerous clavate-contorted and lobed cheilocystidia, and cylindrical caulocystidia that occur singly or in small clusters. Pileipellis and stipitipellis analysis indicates that this species belongs in sect. *Vestipedes*, subsect. *Vestipedes*. Similar taxa include *Gymnopus subcyathiformis* (Murrill) Desjardin, Halling & Hemmes, which differs in lacking abundant cheilocystidia and by the absence of diverticulate branches on the pileipellis hyphae, and also *Gymnopus collybioides* (Speg.) Desjardin, Halling & Hemmes, which differs in forming a subpruinose stipe and having a highly contrasting white umbilicus upon drying.

Gymnopus menehune was first discovered in Hawai'i associated with plants introduced to the islands. As a result, Desjardin & al. (1999) hypothesized that this species represented an introduced species, possibly of Australasian origin. These populations found in Java seem to confirm these initial assumptions, because the specimens were only found in the Botanical Garden in Bogor where they were generally associated with trees native to Australasia and Malesia.

15. *Gymnopus* aff. *menehune* Desjardin, Halling & Hemmes, *ibid.* – Plate 15: 1–6.

Pileus 10–31 mm diam, convex to plano-convex, umbilicate, circular to lobed, glabrous to radially appressed-fibrillose, moist: margin striate, entire to eroded, even to wavy, black to dark burgundy brown (7–8F8) to light brown (5–6D8) at disk, burgundy brown to beige (4A2) at margin, hygrophanous, becoming beige orange (4–5A2–3) upon drying. Context 1–2 mm thick, concolorous with pileus. – Lamellae subfree to adnate, densely crowded, multiple series of lamellulae, 0.5–1.5 mm wide, edge entire, parallel,

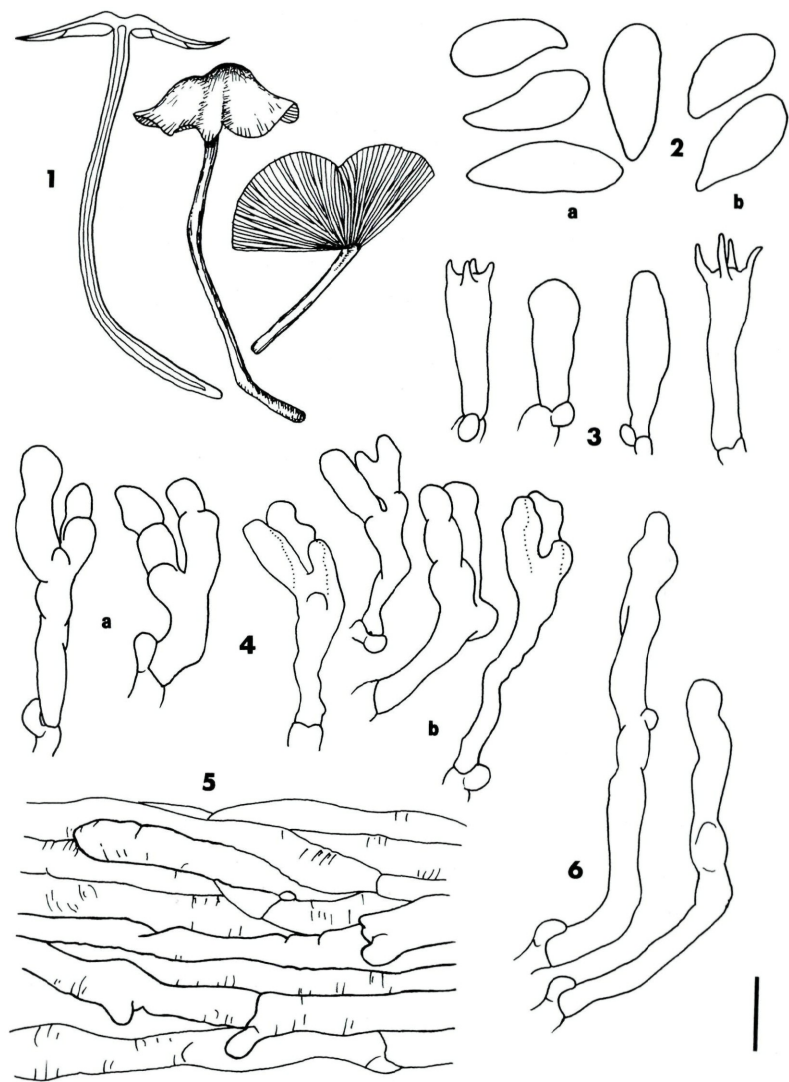


Plate 15. *Gymnopus* aff. *menehune*. – 1. Basidiomes (AWW 130). – 2. Basidiospores (a. AWW 130 - b. AWW 114). – 3. Basidia and basidioles (AWW 130). – 4. Cheilocystidia (a. AWW 130 - b. AWW 113). – 5. Pileipellis (AWW 130). – 6. Caulocystidia (AWW 113). – Bar: 2 = 5 µm; 3-6 = 10 µm.

white. – Stipe 23-80 × 1-4.5 mm, central, equal to compressed or cleft, fistulose, fibrous, pliant, apex densely short-hirsute, floccose below especially upon drying, apex light brown (6C4) to cream beige (4-5A2), base brown (6-7D-F6-8), ornamentation drying to a beige white (3-4A1-2), basal tomentum of beige (4A2-3), wiry mycelium. –

Odor indistinct. – Taste indistinct to slightly bitter. – Basidiospores $6.4\text{--}9.6 \times 3.2\text{--}4.8\ \mu\text{m}$ [$\bar{x} = 7.98 \pm 0.82 \times 3.52 \pm 0.38\ \mu\text{m}$; $Q = 1.8\text{--}3.14$; $\bar{q} = 2.29 \pm 0.29$; $n = 20$ spores per 1 specimens], elongate ellipsoid to lacrymoid, smooth, inamyloid, acyanophilic. – Basidia $19\text{--}23 \times 5.5\text{--}7\ \mu\text{m}$, clavate, 4-spored, clamped. – Basidioles clavate or subacrose, clamped. – Pleurocystidia absent. – Cheilocystidia abundant, $26.5\text{--}37 \times 3.5\text{--}8\ \mu\text{m}$, clavate-contorted, lobed, diverticulate, hyaline, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged hyphae, cylindrical, sometimes weakly diverticulate, smooth or with coarse brown annular incrustations, clamped. – Pileocystidia $22.5\text{--}43 \times 4\text{--}8\ \mu\text{m}$, clavate-contorted, sometimes lobed, clamped. – Pileus trama consisting of cylindrical, smooth, clamped hyphae. – Stipitipellis of cylindrical hyphae, parallel, smooth, clamped. – Caulocystidia $43\text{--}75 \times 4\text{--}7\ \mu\text{m}$, abundant, occurring in agglutinated, erect clusters of 10–20 or more cells, cylindrical, contorted, lobed, smooth, hyaline, clamped.

Habit, habitat and distribution. – Gregarious on leaf litter. Bali, Java.

Material examined. – INDONESIA: Bali: Bedugul, Bali Botanical Garden, $S8^{\circ}16.3'$ $E115^{\circ}9.3'$, elev. 1375–1400 m, 19 Jan. 2001, Wilson 113 (BO, SFSU) and Wilson 114 (SFSU); same location, 22 Jan. 2001, Wilson 130 (BO, SFSU). – Java: Cibodas Botanical Garden, trail to Gunung Gedeh, 23 Jan 1999, Desjardin 6986 (BO, SFSU).

The specimens here called *Gymnopus* aff. *menehune* are nearly indistinguishable morphologically from the specimens identified as *G. menehune* from the Bogor Botanical Garden (see above). They differ only subtly from *G. menehune* in having a more densely ornamented stipe apex composed of agglutinated clusters of numerous caulocystidia. All other features are indistinguishable. However, based on ITS sequence data, the Balinese specimen AWW 113 is sister to a clade containing *G. menehune* + *G. indoctus* + *G. tamblinganensis*. Constraining AWW 113 to a position sister to *G. menehune* makes the tree significantly worse. Hence, we conclude that *G. aff. menehune* is a taxon distinct from *G. menehune*. We refrain from describing *G. aff. menehune* as a new species until more specimens belonging to the *menehune*-group are collected and analyzed.

16. *Gymnopus* aff. *moseri* Antonín & Noordel., Libri Bot. 17: 50. 1997. – Plate 16: 1–6.

Pileus 30–45 mm diam, subcampanulate to plano-concave, subumbonate, translucent-striate, rivulose, appressed-fibrillose, moist, margin straight to reflexed, entire to eroded, pale orange-

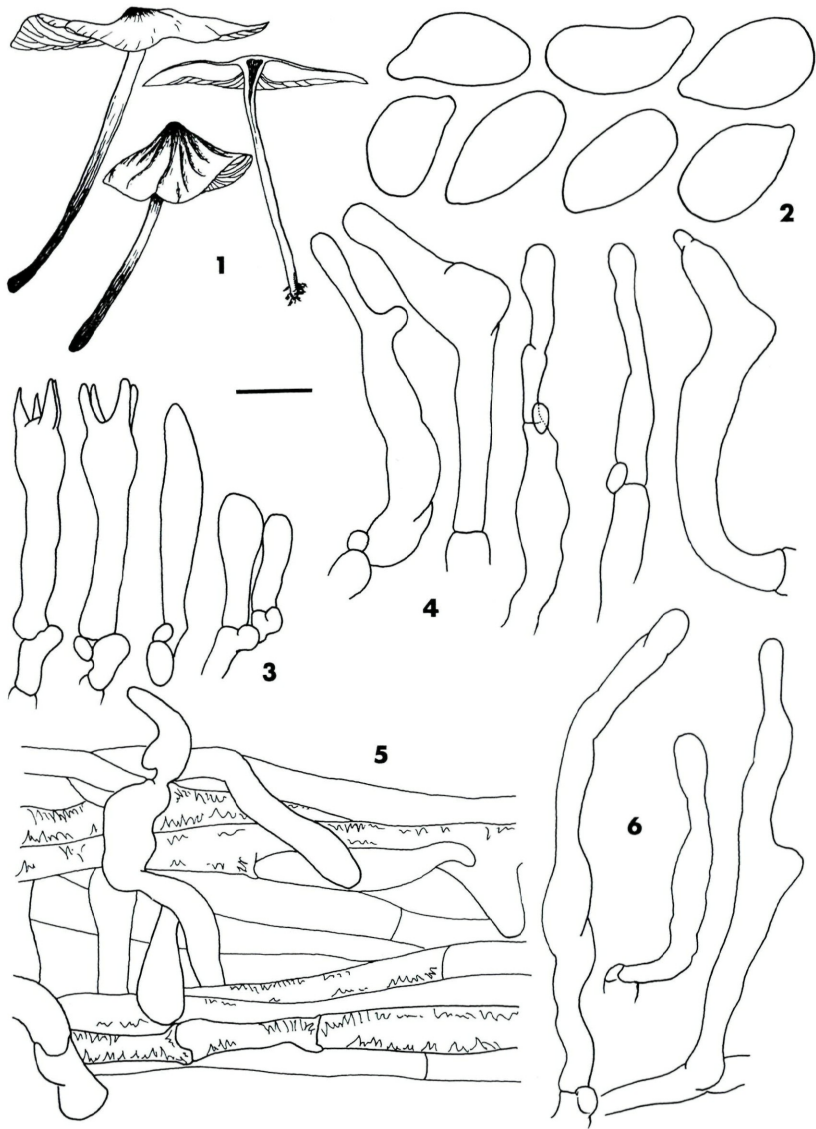


Plate 16. *Gymnopus* aff. *moseri* (AWW 10). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidia and basidoles. – 4. Cheilocystidia – 5. Pileipellis. – 6. Pileocystidia. – Bar: 2 = 5 μ m; 3–6 = 10 μ m.

white to pinkish white (4-6A2), streaked with brown (6E-F8). – Lamellae adnexed to emarginate, subventricose, close to subdistant, with 2-3 series of lamellulae, edge entire, light pinkish white (6A2). – Stipe 40–70 \times 2–3 mm, cylindrical, terete to compressed,

longitudinally striate, cartilaginous, stuffed, matted-fibrillose, pale orange-white to pinkish white (5-6A2) at the apex, to light grayish brown (6C-D3-4) at the base, streaked with dark brown (6F5), non-insititious with pallid rhizomorphs at base. – Odor and taste indistinct. – Basidiospores $8-10.4 \times 3.2-5.6 \mu\text{m}$ [$\bar{x} = 9.18 \pm 0.56 \times 4.88 \pm 0.6 \mu\text{m}$; $Q = 1.57-2.5$; $\bar{q} = 1.9 \pm 0.22$; $n = 20$ spores per 1 specimen], ellipsoid, smooth, hyaline. – Basidia $17.5-33 \times 5-7 \mu\text{m}$, clavate, 2 to 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia $49.5-56 \times 5.5-7 \mu\text{m}$, irregularly cylindrical to ventricose or flexuous, sometimes occurring in chains of 2–3 cells, hyaline, smooth, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged hyphae, $3.5-7 \mu\text{m}$ diam, cylindrical, annular-incrusted, hyaline to pale yellowish brown, inamyloid, clamped. – Pileocystidia abundant, $37.5-73.5 \times 5-9 \mu\text{m}$, cylindrical to clavate, rarely lobed, hyaline, clamped. – Pileus trama hyphae cylindrical, smooth, hyaline but some with beige orange pigmentation, inamyloid, clamped. – Lamellar trama interwoven, hyphae cylindrical, $2.5-9.5 \mu\text{m}$ diam, smooth, branching, hyaline, inamyloid, clamped. – Stipitipellis hyphae cylindrical, clamped. – Caulocystidia $34-46 \times 4-6 \mu\text{m}$ diam, abundant, cylindrical, clamped.

Habit, habitat and distribution. – Gregarious on needles of (planted) *Pinus merkusii*. Java.

Material examined. – INDONESIA: Java, Bogor, Mt. Salak, Curug Nangka, 8 Jan. 2000, A. W. Wilson 10 (SFSU).

We have collected only one specimen of this interesting species, represented by three basidiomes. It shows many similarities to *Gymnopus moseri*, a species described recently from material collected in Sweden. However, there are distinct differences between the Javanese specimen and the European species, so until further material is collected associated with an autochthonous pine in Java, the specimen described herein will be provisionally identified as *G. aff. moseri*. Distinctive features of specimen AWW 10 include the following: a pale orange-white to pinkish, brown-streaked pileus that is translucent-striate, close to subdistant, pinkish white lamellae, a matted-fibrillose stipe, pinkish white at the apex and grayish brown at the base, basidiospore range $8-10.5 \times 3-5.5 \mu\text{m}$, a sterile lamellar edge composed of irregularly cylindrical to flexuous cheilocystidia, a pileipellis of radially arranged, incrusted hyphae that give rise to numerous cylindrical pileocystidia, numerous cylindrical caulocystidia, and growth associated with needles of *Pinus merkusii*. The unusual pileipellis anatomy of the Javanese specimen, in combination with cheilocystidial morphology indicate placement in sect.

Vestipedes subsect. *Vestipedes*, near *G. putillus* (Fr. : Fr.) Antonín, Halling & Noordel., *G. terginus* (Fr.) Antonín & Noordel., and *G. moseri* Antonín & Noordel. The pine association of the Javanese material suggests an affinity with *G. putillus*, but the latter species differs in forming a darker, more evenly pigmented and non-umbo-nate pileus, a more densely tomentose stipe, and lobulate cheilocystidia. *Gymnopus moseri* shows the most similarities with the Javanese material but differs subtly in developing reddish brown pigments on the pileus disc and stipe base, forming some coralloid to moniliform terminal cells on the pileipellis hyphae, and association with *Betula* and *Salix* in Europe and North America (Antonín & Noordeloos, 1997).

***Gymnopus nonnullus* (Corner) A. W. Wilson, Desjardin & E. Horak, comb. nov.**

Bas.: *Marasmius nonnullus* Corner, Beih. Nova Hedwigia 111: 76. 1996.

Type: Singapore, Bukit Timah, 8 Dec. 1929, Corner s.n. (E).

17. *Gymnopus nonnullus* var. *attenuatus* (Corner) A. W. Wilson, Desjardin & E. Horak, comb. nov. – Plate 17: 1–7.

Bas.: *Marasmius nonnullus* var. *attenuatus* Corner, Beih. Nova Hedwigia 111: 76. 1996.

Type: Singapore, Bukit Timah, Nov. 1940, Corner s.n. (E).

Pileus 5–32 mm diam, plano-convex to concave, subumbonate to slightly depressed, rivulose, glabrous, silky, dry, margin straight or enrolled, crenulate to eroded, splitting radially upon drying, dark chocolate brown (7E-F4-6), hygrophane, becoming light brown (7C-D3-4) to grayish brown (7E3-4) with moisture loss. Context thin (<1 mm), white. – Lamellae adnate to adnexed, subdistant to close, with several series of lamellulae, edge straight or eroded-fimbriate, subbroad (1–3 mm), white to rusty gray (8C3), sometimes staining brown. – Stipe 10–30 × 0.5–2 mm, cylindrical, terete to compressed, hollow, pliant, pruinose to furfuraceous or subsquamulose, subinsititious, dark reddish gray (10E3) to dark chocolate brown (6-8F5-6), context white. – Odor and taste indistinct. – Basidiospores 7.2–9.6 × 3.2–4.8 μm [$\bar{x}_r = 7.9-9 \times 3.8-3.9 \mu\text{m}$; $\bar{x}_m = 8.5 \pm 0.7 \times 3.9 \pm 0.1 \mu\text{m}$; $Q = 1.6-3$; $\bar{q}_r = 2.1-2.3$; $\bar{q}_m = 2.2 \pm 0.1$; $n = 20$ spores per 2 specimens], elongate-ellipsoid, smooth, hyaline with some oily contents, inamyloid, acyanophilic. – Basidia 23–32 × 5.5 μm , clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 37.5–60 × 5.5–7 μm , narrowly

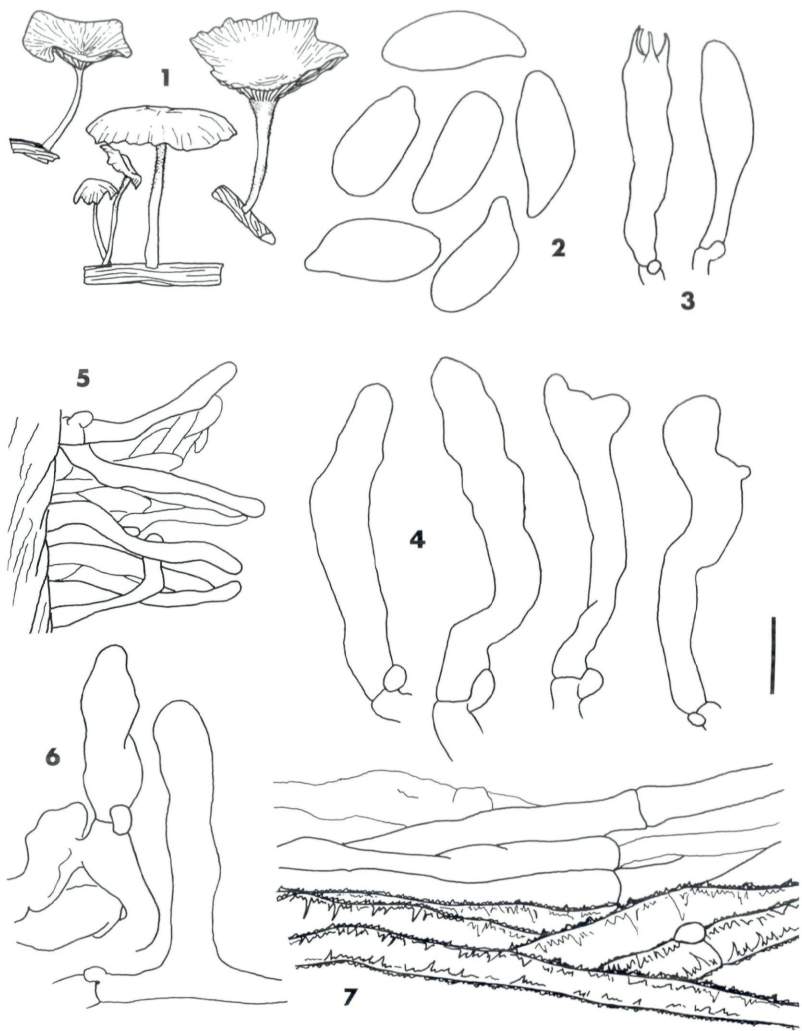


Plate 17. *Gymnopus nonnullus* var. *attenuatus*. – 1. Basidiomes (AWW 05). – 2. Basidiospores (AWW 55). – 3. Basidium and basidiole – 4. Cheilocystidia – 5. Caulocystidia (x500) (AWW 05). – 6. Pileocystidia. – 7. Pileipellis (AWW 55). – Bar: 2 = 5 μ m; 3–7 = 10 μ m.

clavate or irregular in outline, very rarely with short digital projections, clamped. – Pileipellis a cutis of radially arranged hyphae 4–8 μ m diam, cylindrical, non-diverticulate, with dark brown annular incrustations, clamped. – Pileocystidia 23–36 \times 5.5–8 μ m, rare, clavate to cylindrical, smooth, clamped or occurring as outgrowths from pileipellis hyphae. – Pileus trama hyphae cylindrical, 4–10.5 μ m diam, smooth to weakly incrustated, with brownish yellow

pigments, inamyloid with some scattered dextrinoid cells, clamped. – Lamellar trama interwoven to parallel hyphae, 1.5–15 μm diam, cylindrical, smooth to weakly annular-incrusted, concolorous with pileus trama hyphae, inamyloid with some dextrinoid cells, clamped. – Stipitipellis hyphae 3–5 μm diam, cylindrical, with coarse brown annular incrustations, clamped. – Caulocystidia abundant, 39–50.5 \times 2.5–7 μm , cylindrical, smooth, sometimes occurring in chains of 2 or more cells, hyaline, thin-walled, clamped.

Habit, habitat and distribution. – Gregarious to scattered on sticks and twigs on the forest floor. Java.

Material examined. – INDONESIA: Java, Bogor, Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 6 Jan 2000, Wilson 05 (SFSU); same location, 5 Jan 2001, Wilson 55 (SFSU).

Gymnopus nonnullus var. *attenuatus* is characterized by a dark brown, convex to depressed, striate pileus, subdistant, white lamellae that sometimes stain brown, and a dark brown, pruinose, sub-insititious stipe that grows on woody debris. This species belongs in sect. *Vestipedes* where in the ITS trees it resides sister to the *G. menehune*-group. Micromorphologically, *G. nonnullus* var. *attenuatus* is distinguished by its narrowly clavate to irregular and non-lobulate cheilocystidia. *Gymnopus menehune* differs in having more crowded lamellae, umbilicate pilei, lobulate cheilocystidia, and does not grow on woody debris.

Gymnopus nonnullus var. *attenuatus* is one of five varieties of *Marasmius nonnullus* Corner (1996). The other four varieties differ from *G. nonnullus* var. *attenuatus* in a number of features presented in a key published by Corner (1996: 76).

18. *Gymnopus tamblinganensis* nom. prov. – Plate 18: 1–7.

Pileus 28 mm diam, obtusely conical, becoming plano-convex, subumbonate, margin sulcate to plicate, entire, surface glabrous, hygrophanous, disc and striae dark brown (6F6–8), becoming lighter brown (8C–D4–6) toward the margin, fading to pale orange-white (5–6A2) with moisture loss, with areas between lamellae remaining darker. – Lamellae narrowly adnate, distant (18–20), with 2 series of lamellulae, narrow (1–2.5 mm), edge even, entire, brownish gray (6E4–5) toward pileus turning white at lamellar edge. – Stipe 54 \times 2 mm, cylindrical, terete, broadly fistulose, pliant, pruinose, creamy beige to grayish orange (4–5B4), rhizoids present at base. – Odor fungal. – Taste indistinct. – Basidiospores 8–9.6 \times 3.2–5 μm [\bar{x} = 8.9 \pm 0.58 \times 3.97 \pm 0.47 μm ; Q = 1.6–3; \bar{q} = 2.27 \pm 0.3; n = 20 spores per 1 specimen], ellipsoid-lacrymoid in side view, oblong in frontal

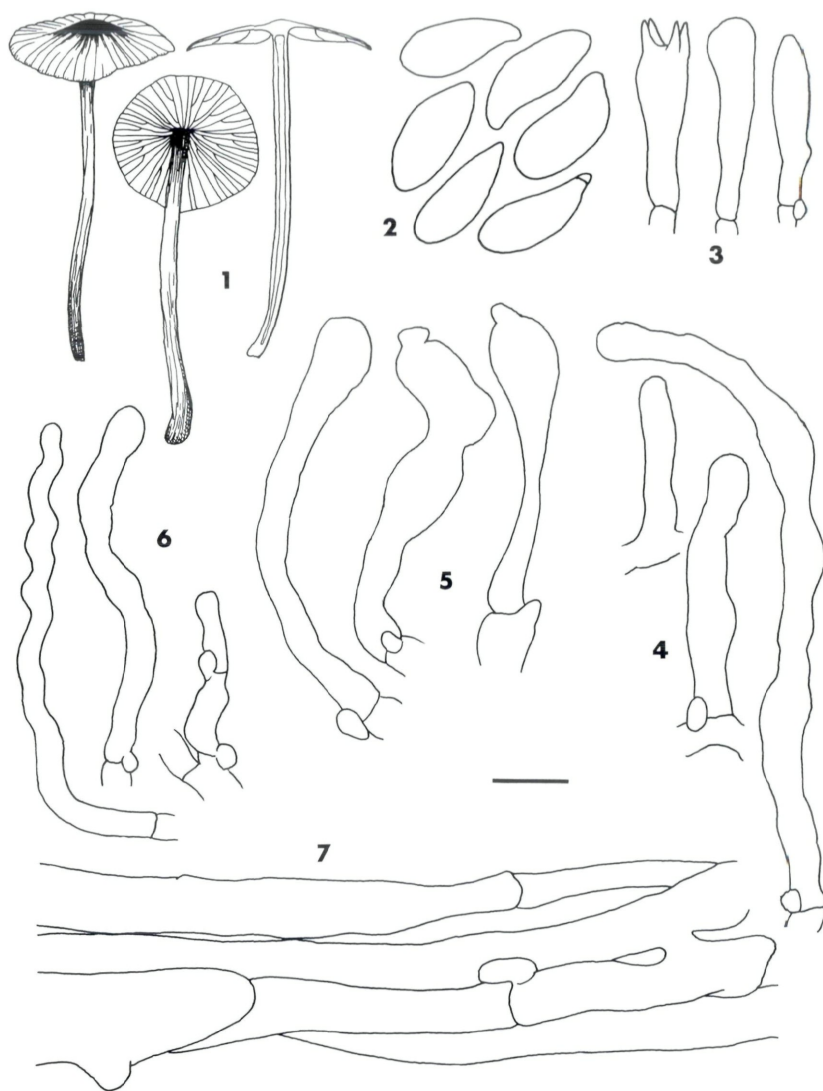


Plate 18. *Gymnopus tamblinganensis* (AWW 39). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidium and basidioles. – 4. Pileocystidia. – 5. Cheilocystidia. – 6. Caulocystidia. – 7. Pileipellis. – Bar: 2 = 5 μm ; 3–7 = 10 μm .

view, smooth, hyaline, inamyloid. – Basidia 21–24.5 \times 4.5–7 μm , clavate, 4-spored, clamped. – Basidioles clavate to subacrose, clamped. – Pleurocystidia absent. – Cheilocystidia 36.5–56 \times 8–9 μm , clavate to contorted, clamped. – Pileipellis a cutis of radially arranged, cylindrical hyphae, 2.5–7 μm diam, smooth or with brown incrustations, clamped. – Pileocystidia 17–81 \times 4–5 μm ,

subclavate to cylindrical, clamped, sometimes arising as outgrowths of pileipellis hyphae. – Pileus trama of cylindrical hyphae, 3–9.5 μm diam, smooth, with light brown intraparietal pigments, inamyloid, clamped. – Stiptipellis hyphae cylindrical, smooth, clamped. – Caulocystidia 23–54.5 \times 3–5 μm , clavate-contorted to cylindrical-flexuous, clamped.

Habit, habitat and distribution. – Solitary on leaf litter. Bali.

Material examined. – INDONESIA: Bali: Lake Tamblingan, 15 Jan 2000, Wilson 39 (SFSU).

Gymnopus tamblinganensis is represented by a single basidiome collected near Lake Tamblingan on the island of Bali. Until more specimens of this taxon are collected, a precise identification will not be possible and hence we are proposing the species epithet provisionally. Descriptive characters for specimen AWW 39 include the following: a plano-convex, subumbonate, sulcate pileus that is dark brown on the disc with concolorous radial striations extending to a lighter brown margin, narrowly adnate, distant, brownish gray lamellae, a pruinose, grayish orange stipe with rhizomorphs at the base, elongate-ellipsoid basidiospores with mean approximately 9 \times 4 μm , clavate-contorted, unlobed cheilocystidia, and a cutis-type pileipellis of radially arranged, smooth, cylindrical hyphae. The pileipellis anatomy suggests that the species belongs in sect. *Vestipedes*. *Collybia coracicolor* (Berk. & M.A. Curtis) Dennis, from the Lesser Antilles (Pegler, 1983), is similar to *G. tamblinganensis*, but this New World species has crowded lamellae, smaller spores, and incrusting pigments on the pileipellis. *Gymnopus tamblinganensis* differs from *G. allegretii* by the features presented in the Key.

19. ***Gymnopus trogioides*** A. W. Wilson, Desjardin & E. Horak, **sp. nov.**
– Plate 19: 1–5.

Pileus 4–22 mm, hemisphaericus vel convexus, papillatus, translucenter striatus, glabrus vel minute sordidus, striatus, hygrophanus, apicaliter cinnamomeus, pallide aurantiacus marginem versus. Lamellae adnato-adnexae vel arcuatae, distantes, ad aciem integrae, pallide argillaceae. Stipes 9–39 \times 2–3 mm, cylindricus, teres, flexilis, longitudinaliter striatus, fibrillosus, albidus vel argillaceus ad apicem, fuscus ad basim, insititius. Caro submembranacea, cartilaginea. Odor saporque nulli. Basidiosporae 10.4–16 \times 3.2–4 μm , subfusiformes, leves, hyalinae. Basidia 25–31 \times 5–6.5 μm , clavata, 4-spora. – Cheilocystidia 36–75(–82) \times 7.5–11 μm , cylindrica vel clavata. Pleurocystidia et caulocystidia nulla. Pileipellis ex hyphis cylindraceutem formantibus, 4–12 μm diam., membrana hyalina vel pigmento stramineo incrustatis, haud diverticulata. Trama lamellarum irregularis. Fibulae praesentes. Ad lignum putridum in silvis latifoliis subtropicalibus. Indonesia (Java). Holotypus: Bogor, Bogor Botanical Garden, 20 Jan. 2000, Wilson 51 (BO).

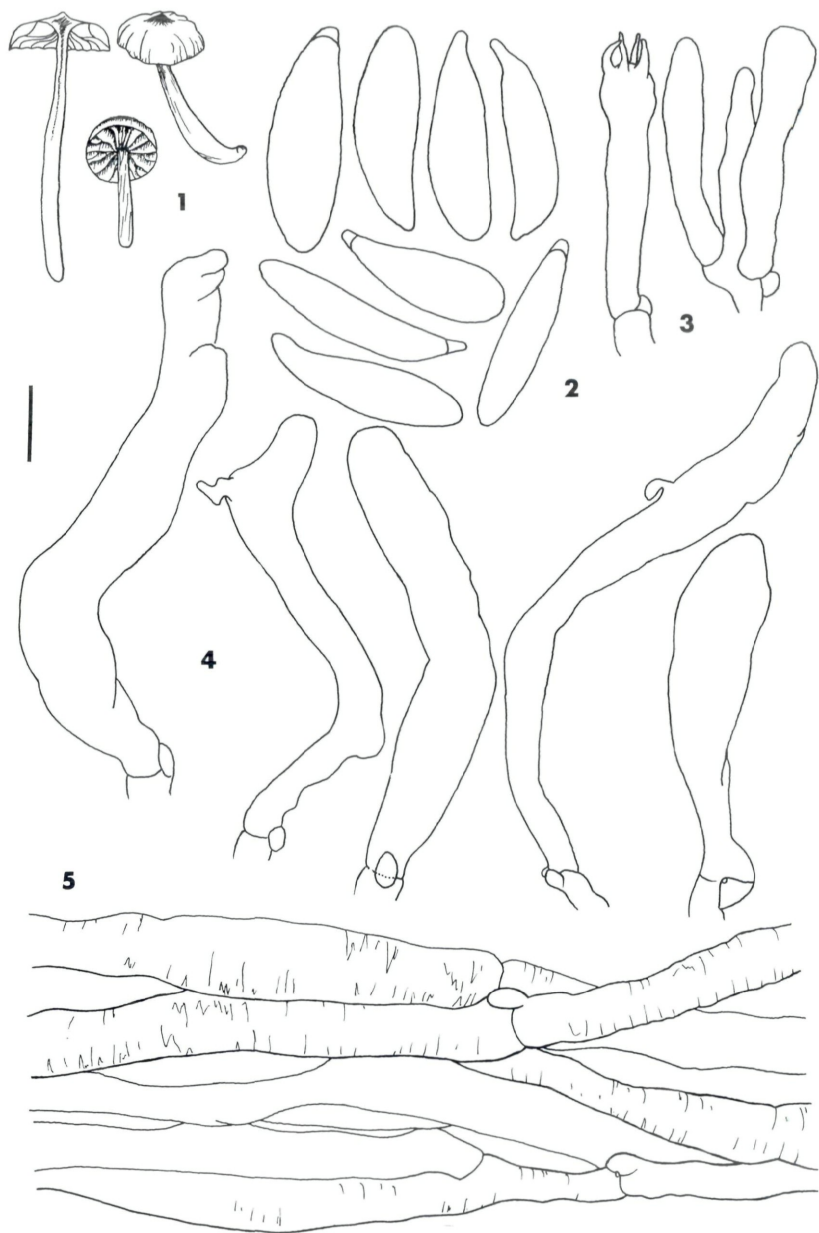


Plate 19. *Gymnopus trogioides* (Holotype: AWW 51). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidium and basidioles. – 4. Cheilocystidia. – 5. Pileipellis. – Bar: 2 = 5 μ m; 3–5 = 10 μ m.

Pileus 4–22 mm diam, convex to hemispherical, papillate, translucent-striate, rivulose, glabrous to minutely felted upon moisture loss, margin undulate, striate, exceeding the lamellae, hygrophanous, light brown (6D-E5-6) on the disc to creamy grayish orange (5B4-5) at the margin. Context very thin (<1 mm), concolorous, texture tough, pliant. – Lamellae narrowly adnate-adnexed or arcuate, distant, with 2 series of lamellulae, narrow to moderately broad (1–2 mm), edge entire, pallid (3-5A1-2). – Stipe 9–39 × 2–3 mm, cylindrical, terete, broadening slightly toward base, stuffed, pliant, longitudinally striate, glabrous becoming fibrillose upon drying, pallid (4A2) at apex to dark brown (6F7-8) at base, insititious on wood. – Odor and taste indistinct. – Basidiospores 10.4–16 × 3.2–4 µm [\bar{x} = 13.12 ± 1.61 × 3.72 ± 0.38 µm; Q = 2.8–4.5; \bar{q} = 3.56 ± 0.59; n = 10 spores per 1 specimen], subfusiform, smooth, hyaline, inamyloid. – Basidia 23–31 × 5–6.5 µm, clavate, 4-spored, clamped. – Basidioles clavate to subacrose, clamped. – Pleurocystidia absent. – Cheilocystidia 36–75(–82) × 7.5–11 µm, cylindrical to clavate, hyaline, rarely in chains of 2–3 cells, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged to slightly interwoven hyphae, 4–12 µm diam, cylindrical to minutely inflated, incrustated, non-diverticulate, hyaline to pale yellowish brown, inamyloid, clamped. – Pileocystidia absent. – Pileus tramal hyphae similar to pileipellis hyphae but non-incrustated. – Lamellar trama interwoven, hyphae cylindrical, 5.5–9.5 µm diam, smooth, clamped. – Stipitipellis hyphae cylindrical, 2–6 µm diam, clamped. – Caulocystidia absent, occasionally with erect clusters of agglutinated terminal cells scattered over stipe surface.

Habit, habitat and distribution. – Gregarious to caespitose on wood. Java.

Material examined. – INDONESIA: Java: Bogor, Bogor Botanical Garden, S6°35.93' E106°47.73', elev. 250 m, 20 Jan. 2000, Wilson 51 (Holotype, BO; Isotype, SFSU).

Gymnopus trogioides is characterized by basidiomes that are reminiscent in shape and texture of some Asian *Trogia* species ss. Corner (1991). The striate pileus of *G. trogioides* is convex-papillate with a light brown disc and grayish orange margin, the lamellae are adnate, distant, broad and white, the subinsititious stipe is glabrous, cartilaginous, white above and dark brown at the base. Micro-morphologically, the new species is distinct because of its subfusiform basidiospores, cylindrical to clavate cheilocystidia, cylindrical to inflated, incrustated, non-diverticulate, radially arranged pileipellis hyphae, and absence of pleurocystidia and caulocystidia. None of the species described by Corner (1996) in *Marasmius* nor in *Trogia* (Corner, 1966, 1991) comes close to *G. trogioides*.

20. *Gymnopus virescens* A. W. Wilson, Desjardin & E. Horak, **sp. nov.**
– Plate 20: 1–5.

Pileus 18–22 mm, applanatus dein depressus, rugulosus, striatus, subhygrophanus, apicaliter rubro-brunneus, pallidior vel subcinnameus marginem versus. Lamellae adnatae, confertae, angustatae, ad aciem integrae, pallide aurantiacae. Stipes 55–60 × 1 mm, cylindricus, teres, appresse pubescens vel subvelutinus, flexilis, fuscus vel castaneus, haud insititius. Caro 3% KOH ope virescens. Odor subrancidus. Basidiosporae 7–10 × 3–6 µm, ellipsoideae, leves, hyalinae. Basidia 19–24 × 4–7 µm, clavata, 4-spora. Cheilocystidia et pleurocystidia nulla. Caulocystidia 20–89 × 3.5–4.5 µm, cylindrica vel clavata, glabra, hyalina vel pallide brunnea. Pileipellis ex hyphis cylindraceutem formantibus, 6–9 µm diam., rariter ramosa, pigmento brunneo, in 3% KOH viridi incrustata. Trama lamellarum irregularis. Fibulae praesentes. Ad frustula et lignum putridum in silvis latifoliis tropicalibus. Indonesia (Java). Holotypus: Mt. Halimun National Park, Loop trail from Cikaniki, 6 Jan. 1999, Desjardin 6869 (BO).

Pileus 18–22 mm diam, applanate-depressed, rugulose-striate, moist, subhygrophanous, dull, margin wavy-irregular, disk dark reddish brown (8F6–8), grading outward from reddish brown (8E6–8) to light brown (7D4–5), to light gray (6C3) at the margin, turning green in 3% KOH. Context very thin (<1 mm), concolorous. – Lamellae adnate, crowded, 3–4 series of lamellulae, very narrow (<1 mm), entire, even, pale gray orange (6B2). – Stipe 55–60 × 1 mm, central, terete, cylindrical, appressed pubescent to subvelutinous overall, pliant, dark brown to dark reddish brown (7–8F7–8) overall, non-insititious with a few coarse rhizomorphs at the base. – Odor slightly rancid. – Taste mild. – Basidiospores 7–10 × 3–6 µm [\bar{x} = $7.88 \pm 0.67 \times 3.53 \pm 0.68$ µm; $Q = 1.33$ – 2.67 ; $\bar{q} = 2.28 \pm 0.32$; $n = 20$ spores per 1 specimen], ellipsoid, smooth, hyaline, inamyloid, acyanophilic. – Basidia 19–24 × 4–7 µm, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia and cheilocystidia absent, lamellar edge fertile. – Pileipellis a cutis of radially arranged to slightly interwoven (especially on the disc) hyphae, 6–9 µm diam, cylindrical to inflated, seldom branched, with brown annular incrusting pigments that turn olivaceous in 3% KOH, inamyloid, non-gelatinous, clamped. – Pileocystidia absent. – Pileus trama of cylindrical hyphae, 1.5–6 µm diam, smooth to roughened, hyaline, thin-walled, clamped. – Lamellar trama interwoven, cylindrical hyphae 3–5 µm diam, clamped. – Stipitipellis consisting of cylindrical hyphae, 5–8 µm diam, with brown incrusting and intraparietal pigments that turn olivaceous in 3% KOH, clamped. – Stipe tramal hyphae cylindrical, smooth, pale brown, clamped. – Caulocystidia 20–89 × 3.5–4.5 µm, cylindrical to clavate, smooth, thin-walled, hyaline to pale brown, clamped.

Habit, habitat and distribution. – Scattered on leaf litter and rotten wood. Java.

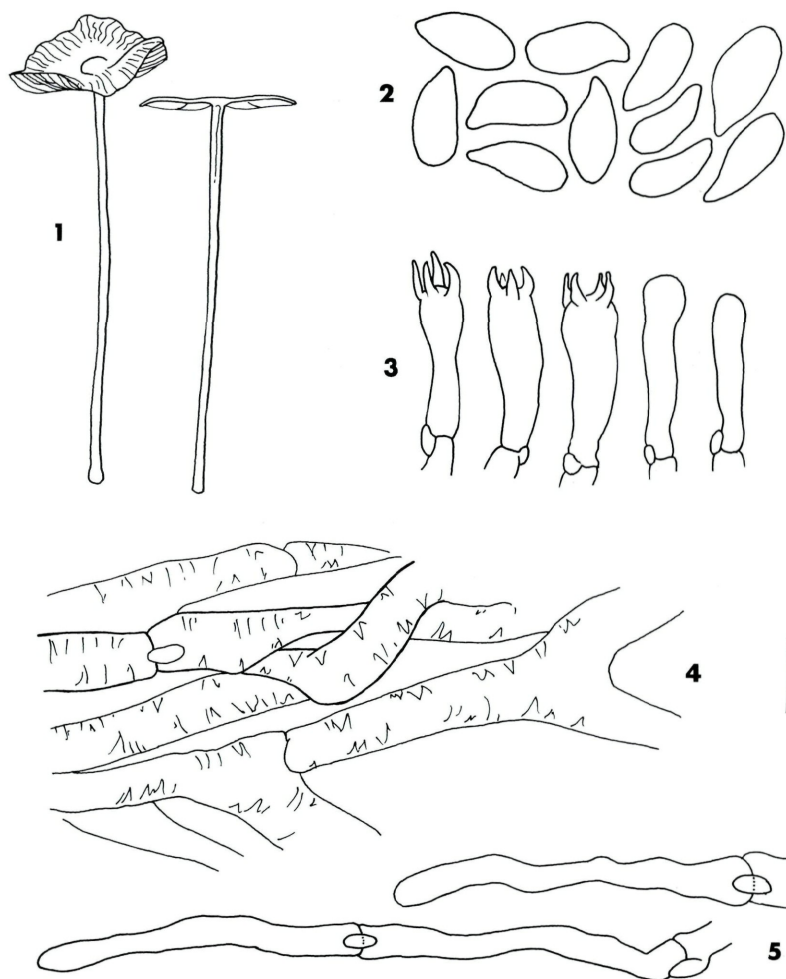


Plate 20. *Gymnopus virescens* (Holotype: DED 6869). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidia and basidioles. – 4. Pileipellis. – 5. Caulocystidia. – Bar: 2 = 5 μ m; 3–5 = 10 μ m.

Material examined. – Java, Mt. Halimun National Park, Loop trail from Cikaniki, S6°44.79' E106°32.3', elev. \pm 1000 m, 6 Jan. 1999, Desjardin 6869 (Holotype, BO; Isotype, SFSU).

Diagnostic features for *Gymnopus virescens* include appanate-depressed, rugulose-striate, dark reddish brown pileus that turns green in KOH, adnate and crowded, very narrow lamellae, dark brown, subvelutinous stipe with few coarse rhizomorphs, fertile lamellar edge lacking cheilocystidia, pileipellis composed of radially arranged to weakly interwoven, annular-incrusted hyphae (not a

dryophila-structure), slightly rancid odor, and green alkaline reaction in all tissues. Because of green KOH reaction, this new species suggests a relationship with the *G. fuscopurpureus* (Pers. : Fr.) Antonín, Halling & Noordel. species group of sect. *Levipedes*. Unlike members of sect. *Levipedes* where the pileipellis is a *dryophila*-structure, *G. virescens* has a pileipellis of radially arranged to weakly interwoven, cylindrical hyphae suggesting placement in sect. *Vestipedes*. The subvelutinous stipe of *G. virescens* also suggests an alliance with members of sect. *Vestipedes*. Macromorphologically, *G. virescens* is similar to *G. menehune*, but microscopic and chemical characters for these two species are distinct. *Gymnopus austrosemihirtipes* also has a green alkaline reaction, but differs from *G. virescens* in having a *dryophila*-type pileipellis on a much paler pileus, basidiole-like cheilocystidia on a sterile lamellar edge, and an indistinct odor. In addition, in *G. austrosemihirtipes* the green KOH reaction occurs only on stipe tramal tissues. We were unable to obtain an ITS sequence for *G. virescens* thus placement in sect. *Vestipedes* is only tentative.

21. *Gymnopus purpureicollus* (Corner) A. W. Wilson, Desjardin & E. Horak, **comb. nov.** – Plate 21: Figs. 1–4.

Bas.: *Marasmius purpureicollus* Corner, Beiheft Nova Hedwigia 111: 89. 1996.

Type: Malaya, Pahang, Tembeling, 16 Nov. 1930, Corner s.n. (E).

Pileus 15–25 mm diam, plano-convex to plane-concave, sub-umbonate, glabrous, dull, moist, margin translucent-striate, entire to eroded, straight to reflexed, brown (6-7E8) at disk to pale orange-brown (6C-D6-7) at margin, hygrophanous fading to light peach (4-5A2) to white. Context thin, concolorous with pileus. – Lamellae subfree to adnate with decurrent tooth, crowded, several series of lamellulae, narrow (1 mm), edge even with the pileus, beige to yellowish white (3-5A1-2). – Stipe 25–35 × 1–2 mm, central, cylindrical, equal, fibrillose to glabrous, solid, pliant, brownish gray (6E4-5) or white due to an abundance of fibrils, a distinctive dark brownish gray (6-7F5) at top 2 mm of stipe, a basal tomentum of rhizomorphs present, or simply inserted into substrate. – Odor somewhat rancid as of a sewer. – Taste rancid or rotten. – Basidiospores 4.8–6.4 × 2.8–4 µm [\bar{x} = 6 ± 0.56 × 3.3 ± 0.27 µm; Q = 1.5–2.3; \bar{q} = 1.86 ± 0.23; n = 20 spores per 1 specimen], ellipsoid in face view, smooth, hyaline, inamyloid, acyanophilic. – Basidia 17.5–29 × 5–6.5 µm, clavate, 4-spored, clamped. – Basidioles clavate and subacerosus, clamped. – Pleurocystidia absent. – Cheilocystidia absent, lamellar edge sterile but composed of basidiole-like cells. – Pileipellis an ixocutis of interwoven hyphae, cylindrical,

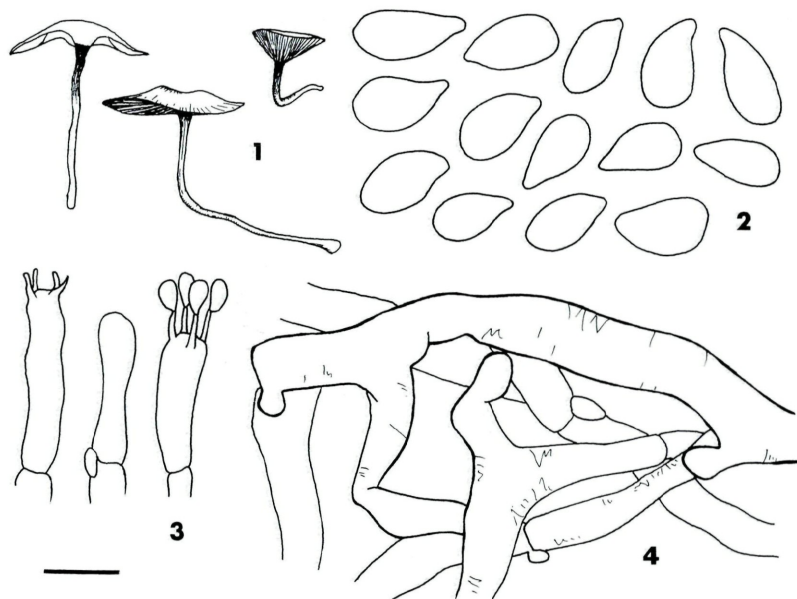


Plate 21. *Gymnopus purpureicollis* (AWW 11). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidia and basidiole. – 4. Pileipellis. – Bar: 2 = 5 μ m; 3, 4 = 10 μ m.

3–9 μ m diam, highly branching with many terminal diverticulations, with weak annular incrustations, clamped. – Pileus trama consisting of loosely interwoven hyphae, cylindrical, 3–11 μ m diam, hyaline, inamyloid, clamped. – Lamellar trama of interwoven hyphae, cylindrical, 1.5–6 μ m diam, weakly incrustated, hyaline, inamyloid, clamped. – Stipe context consisting of cylindrical hyphae, 3–9.5 μ m diam, smooth, clamped, stipitipellis like a trichodermium of strongly interwoven clusters of caulocystidia. – Caulocystidia 20–64 \times 3–5.5 μ m diam, claviform, contorted, weakly incrustated, sometimes occurring in chains of 2 or more cells, clamped, arising from the stipitipellis hyphae.

Habit, habitat and distribution. – Gregarious on needles of (planted) *Pinus merkusii*. Java.

Material examined. – INDONESIA: Java: Bogor, Mt. Salak, Curug Nangka, 7 Jan. 2000, Wilson 11 (BO, SFSU).

Gymnopus purpureicollis has been collected only once in Indonesia and is represented by only a few basidiomes. It is characterized by producing small brownish gray fruiting bodies on pine needles with a distinct dark brownish gray region at the top 2 mm of stipe. Distinctive cheilocystidia are absent but the lamellar edge is sterile,

composed of cells indistinguishable from basidioles. Corner (1996) described this species from Malaya as a *Marasmius*, but its pileipellis structure indicates that it is better accommodated in *Gymnopus*. The protologue reports cheilocystidia (basidiole-shaped) and the substrate as rotten wood in the forest. All other features of the Javanese specimen are indistinguishable from those reported in the protologue, including the distinctive grayish brown-purple zone at the top of the stipe. Similar species include *G. acervatus* (Fr.) Murrill which differs by forming caespitose clusters, somewhat larger spores, and sometimes forming cheilocystidia. *Gymnopus salakensis* occurs in the same region, but lacks the purple brown zone at the top of the stipe and also forms distinctive cheilocystidia.

22. *Gymnopus salakensis* nom. prov. – Plate 22: 1–6.

Pileus 17 mm diam, subconvex, subumbilicate, glabrous, moist, margin entire, incurved to straight, translucent-striate, disc light yellowish brown to clay colored (5C-D3-5) becoming beige (3-4A2-3) toward margin, hygrophanous turning pale beige to white (4A1-2) overall. – Lamellae subfree to emarginated or arcuate, crowded, with 3 series of lamellulae, very narrow (0.5 mm), edge entire, white. – Stipe 26 × 2 mm, cylindrical, terete, fistulose, pliant, glabrous, light grayish beige (4B2-3) at top to chocolate brown (6E7-8) at base, basal tomentum of hyphae. – Odor of mushroom. – Taste bitter. – Basidiospores (4.8–)5.6–8 × 2.4–4 μm [\bar{x} = 6.33 \pm 0.72 × 3.25 \pm 0.40 μm ; Q = 1.6–2.33; \bar{q} = 1.96 \pm 1.24; n = 17 spores 1 specimen], ellipsoid, smooth, hyaline, inamyloid. – Basidia 11–21.5 × 3.5–6.5 μm , clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 17.5–32 × 4–7 μm , clavate-contorted, nodulose, sometimes with short digital projections, laying repent on lamellar edge, clamped, lamellar edge sterile. – Pileipellis a cutis of radially arranged to weakly interwoven hyphae, 4–8 μm diam, cylindrical, hyaline with hyaline to light brown annular incrustations, smooth or with rare knobs, branched, clamped. – Pileocystidia absent. – Pileus trama composed of cylindrical hyphae, 3–5.5 μm diam, smooth, clamped. – Lamellar trama interwoven, hyphae 1.5–6.5 μm diam, cylindrical, smooth, clamped. – Stipitipellis hyphae cylindrical, 1.5–3 μm diam, smooth, clamped. – Caulocystidia 20–24 × 4–5.5 μm diam, clavate-contorted, arising from stipitipellis surface.

Habit, habitat and distribution. – Found solitary on needles of (planted) *Pinus merkusii*. Java.

Material examined. – INDONESIA: Java, Bogor, Mt. Salak, Curug Nangka, 11 Jan 2000, Wilson 29 (SFSU).

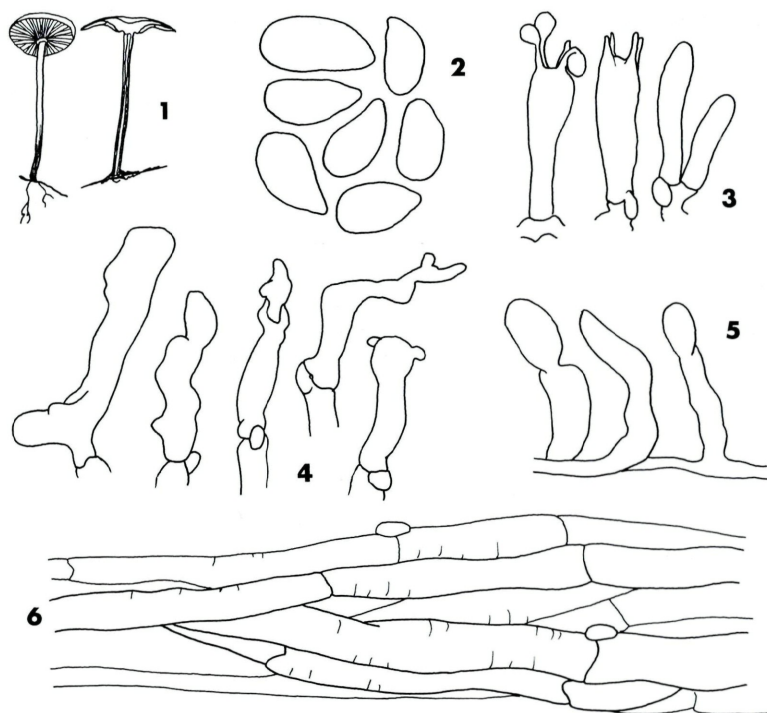


Plate 22. *Gymnopus salakensis* (AWW 29). – 1. Basidiomes. – 2. Basidiospores. – 3. Basidia and basidioles. – 4. Cheilocystidia. – 5. Caulocystidia. – 6. Pileipellis. – Bar: 2 = 5 μm ; 3–6 = 10 μm .

Only a single basidiome of this taxon was collected among needles of *Pinus merkusii* on Mt. Salak, West Java. This *Gymnopus* is characterized by a convex-subumbilicate, hygrophanous pileus colored light yellowish brown to clay color with paler margin, by densely crowded, very narrow, white lamellae, and by a small, glabrous stipe colored beige above and chocolate brown below. This provisionally named taxon is distinct from any known southeast Asian taxon. Micromorphologically, it is indistinguishable from *Gymnopus acervatus* (Fr.) Murrill, a common North Temperate species associated with coniferous forests. *Gymnopus acervatus* differs, however, in forming densely cespitose basidiomes with reddish brown pilei, fewer and broader lamellae, and much longer stipes. Until further specimens of this unusual pine-associated taxon are collected in Indonesia, its identification will remain uncertain.

In the ITS trees, *Gymnopus salakensis* is sister to a clade containing members of sect. *Vestipedes*. Based on morphology, its position is inexplicable.

23. *Gymnopus spissus* A. W. Wilson, Desjardin & E. Horak, **sp. nov.** – Plate 23: 1–7.

Pileus 7–28 mm, convexus dein applanatus, subumbonatus, radialiter fibrillosus, hygrophanus, translucenter striatus, primo brunneus dein pallide griseo-brunneus ad discum, albidus vel argillaceus marginem versus. Lamellae adnatae, confertae, ad aciem integrae, angustae, albae. Stipes 28–52 × 2–4 mm, cylindricus, fistulosus, longitudinaliter striatus, appresse pubescens, cremeus. Caro alba. Odor saporque nulli. Basidiosporae 4–5.6 × 2.4–3.6 µm, ellipsoideae, leves, hyalinae, inamyloideae. Basidia 15.5–17 × 3.7–5 µm, clavata, 4-spora. Cheilocystidia 25–38.5 × 4–5 µm, subclavata. Pleurocystidia nulla. Caulocystidia 29–41 × 4–5.5 µm, versiformia, clavata, tenuitunicata, hyalina. Fibulae praesentes. Pileipellis ex hyphis cylindraceis levibus hyalinis cutem formantibus, 3–7.5 µm diam. Cellulae terminalia cylindricoclavatae, membrana levi vel brunneoincrustedata instructae, 43–53.5 × 3–5 µm. Trama lamellarum irregularis. Ad frustula dejecta in silvis latifoliis tropicalibus. Indonesia (Bali). Holotypus: Bedugul, Bali Botanical Garden, 22 Jan. 2001, Wilson 129 (BO).

Pileus 7–28 mm diam, convex to applanate, subumbonate, radially fibrillose, moist, smooth, hygrophanous, margin entire, smooth or striate at maturity, translucent-striate, brown (7D-E6-7) when young, light gray brown (6D5-6) at disk turning beige white (5A1-2) toward margin. Context thin (1 mm), white. – Lamellae adnate, even, crowded (28–40), with 4–6 series of lamellulae, narrow (1 mm), edge entire to eroded, white. – Stipe 28–52 × 2–4 mm, cylindrical, fistulose, pliant, longitudinally striate, appressed-pubescent, cream (4A3-4). – Odor and taste indistinct. – Basidiospores 4–5.6 × 2.4–3.6 µm [$\bar{x} = 4.88 \pm 0.44 \times 2.82 \pm 0.35$ µm; $Q = 1.33$ – 2 ; $\bar{q} = 1.75 \pm 0.24$; $n = 20$ spores per 1 specimen], ellipsoid, smooth, hyaline, inamyloid, acyanophilic. – Basidia 15.5–17 × 3.5–5 µm, clavate, 4-spored, clamped. – Basidioles clavate, clamped. – Pleurocystidia absent. – Cheilocystidia 25–38.5 × 4–5 µm, basidiole-like, subclavate, somewhat contorted, clamped, absent in older specimens, lamellar edge sterile. – Pileipellis a cutis of radially arranged hyphae, 3–7.5 µm diam, smooth, hyaline, inamyloid, clamped. – Terminal cells repent, typically agglutinated, 43–53.5 × 3–5 µm, cylindrical-clavate, smooth, clamped. – Pileus trama of loosely interwoven, irregularly inflated and cylindrical hyphae, (5)–8–17 µm diam, smooth or more often with brown incrustations, hyaline to pale brown, inamyloid, clamped. – Lamellar trama interwoven, hyphae similar to those in the pileus trama but non-incrusted. – Stipitipellis composed of interwoven hyphae with suberect to erect, numerous caulocystidia. – Caulocystidia versiform, 29–41 × 4–5.5 µm, clavate, cylindrical or irregular in outline, hyaline, thin-walled, smooth, clamped.

Habit, habitat and distribution. – Gregarious on leaf litter. Bali.

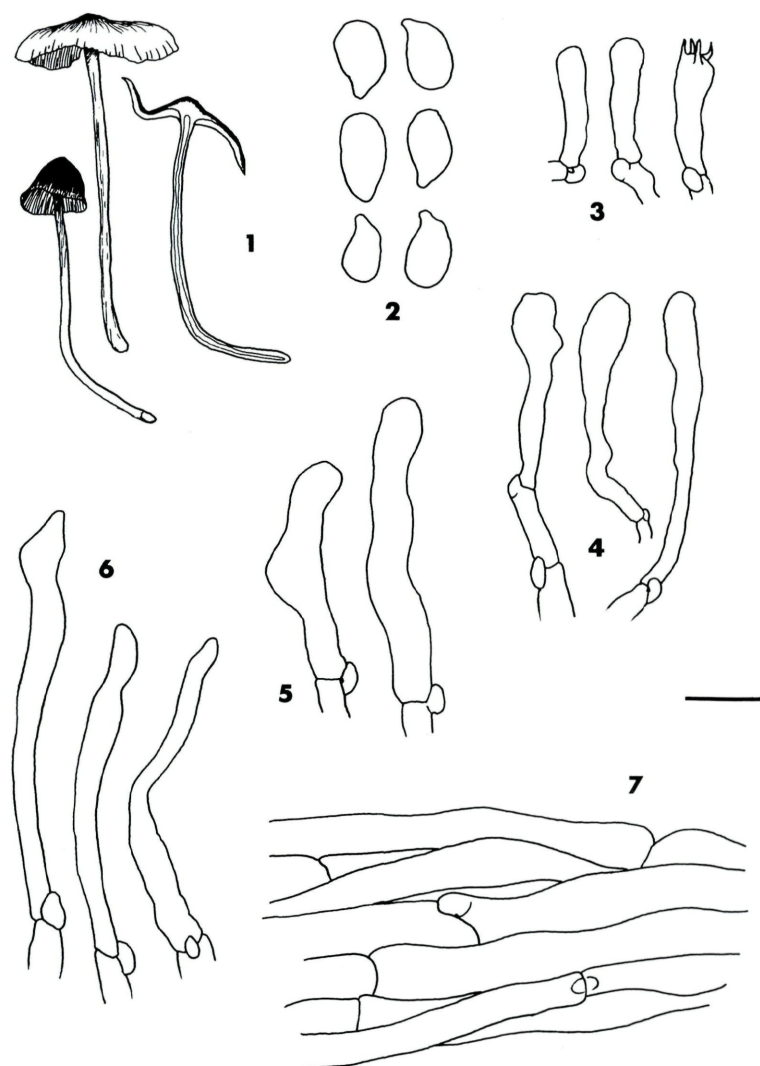


Plate 23. *Gymnopus spissus* (Holotype: AWW 129). – 1. Basidiome. – 2. Basidio-spores. – 3. Basidium and basidioles. – 4. Cheilocystidia. – 5. Caulocystidia. – 6. Pileipellis terminal cells. – 7. Pileipellis. – Bar: 2 = 5 μ m; 3–7 = 10 μ m.

Material examined. – INDONESIA: Bali: Bedugul, Bali Botanical Garden, S8°16.3' E115°9.3', elev. 1375–1400 m, 22 Jan. 2001, Wilson 129 (Holotype, BO; Isotype, SFSU).

Diagnostic features of *G. spissus* include radially appressed-fibrillose, subumbonate pileus colored pale greyish brown on the disc with white margin, very crowded, narrow, white lamellae,

cream-colored, longitudinally striate stipe, small basidiospores, sterile lamellar edge with cylindrical to clavate cheilocystidia, pileipellis composed of agglutinated, narrowly cylindrical hyphae overlaying tramal tissue composed of loosely interwoven, much broader and brown pigmented-incrusted hyphae, and stipitipellis of interwoven, numerous caulocystidia. In the field, the narrow and crowded lamellae in combination with pileus coloration are suggestive of *G. menehune* but these two taxa are micromorphologically quite different. *Gymnopus menehune* differs in forming much larger basidiospores, nodulose to bifid or lobulate cheilocystidia, and a different pileipellis and pileus trama anatomy.

Gymnopus spissus is sister to *G. termiticola* in the ITS trees, in an undetermined infrageneric group.

24. *Gymnopus termiticola* (Corner) A. W. Wilson, Desjardin & E. Horak, *comb. nov.* – Plate 24: 1–7.

Bas.: *Marasmius termiticola* Corner, Beiheft Nova Hedwigia 111: 101. 1996.

Type: Singapore, 12 April 1931, Corner s.n. (E).

Pileus 8–120 mm diam, obtusely conical to campanulate when young to paraboloid with depressed to umbilicate center at maturity, rugose-sulcate from center to margin, surface dry, glabrous, dull, margin wavy, eroded with age, gray red (7B3–4) to gray orange (6B3) when young, becoming brown to dark brown (7E–F8) with age, hygrophanous, fading with moisture loss to pale white-yellow (4A1–2). Context thin (<1 mm), tough, pliant, concolorous with the pileus. – Lamellae adnate with a short decurrent tooth, distant, 2–3 series of lamellulae, wavy, broad (3–6 mm), grayish orange (6B3). – Stipe 50–155 × 1.5–7.5 mm, central, equal, fistulose, tough, pliant, twisted, longitudinally striate, fibrillose to glabrous, when young gray brown at base (7D–E3–4) to white at apex 5 mm, older specimens dark gray brown (7F5–6) with white fibrils at base to beige gray (4–5B2) at apex, rising from a white basal tomentum. – Odor absent, or of rotting fish. – Taste indistinct. – Basidiospores 7.2–10.6 × 3.2–5.6 μm [$\bar{x}_r = 8.3\text{--}9.3 \times 4\text{--}4.4$ μm; $\bar{x}_m = 8.7 \pm 0.6 \times 4.2 \pm 0.2$ μm; $Q = 1.7\text{--}2.7$; $\bar{q}_r = 2.0\text{--}2.2$; $\bar{q}_m = 2.1 \pm 0.1$; $n = 20$ spores per 3 specimens], ellipsoid to amygdaliform in face view, inequilateral in side view, smooth, hyaline, inamyloid, acyanophilic. – Basidia 21–38.5 × 5.5–6.5 μm, clavate, 4-spored, clamped. – Basidioles clavate to subaceros, clamped. – Pleurocystidia 48–62.5 × 5.5–11 μm lanceolate, thin-walled, clamped, rising from the hymenophoral trama, conspicuous, hyaline. – Cheilocystidia 24–69 × 4–7.5 μm, abundant, sometimes appressed, cylindrical to ventricose with acute tip to clavate and lobed, some occurring in chains of 3–4 cells, hyaline,

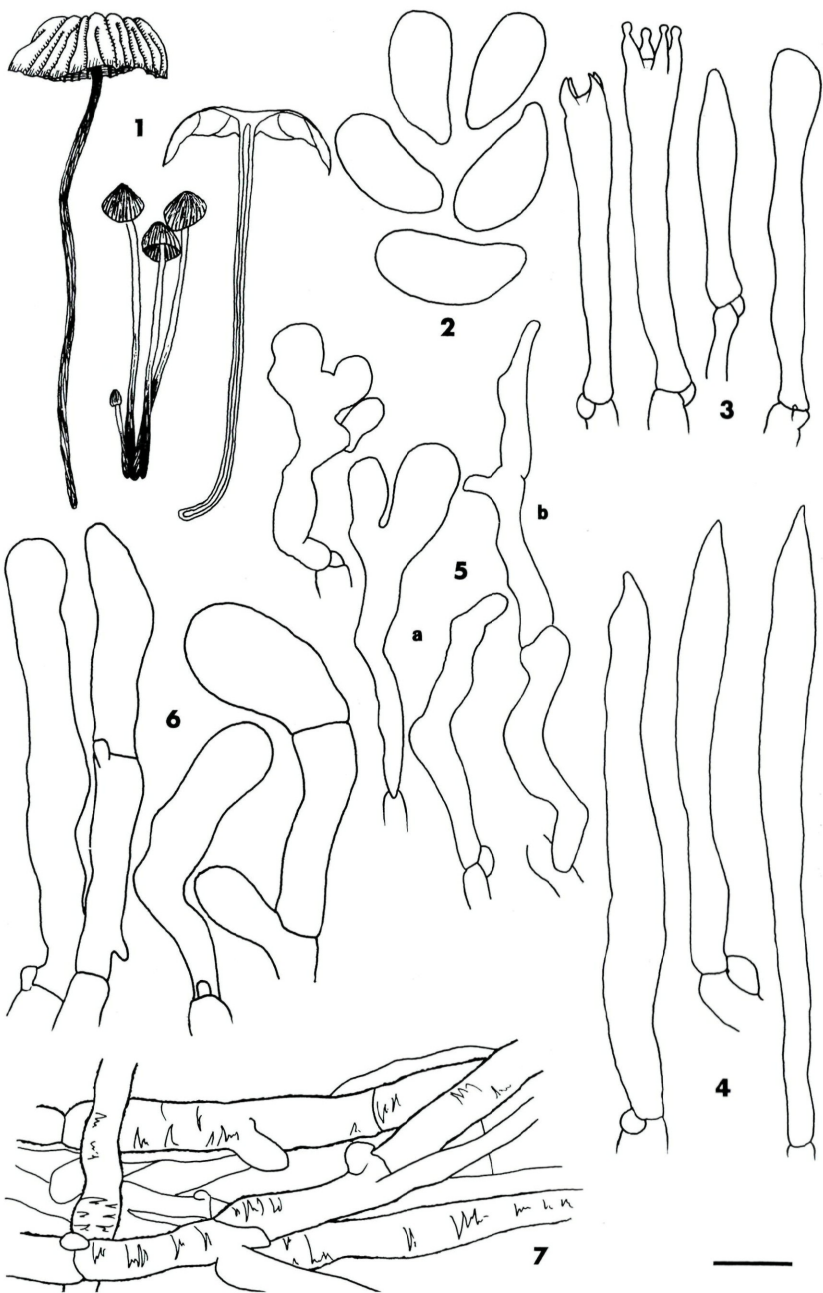


Plate 24. *Gymnopus termiticola*. – 1. Basidiomes (x0.5) (AWW 106). – 2. Basidiospores (DED 7264). – 3. Basidia and basidioles. – 4. Pleurocystidia. – 5. Cheilocystidia (a. AR 156 – b. DED 7264). – 6. Pileocystidia. (AR 156). – 7. Pileipellis (DED 7264). – Bar: 2 = 5 μ m; 3–7 = 10 μ m.

lamellar edge sterile. – *Pileipellis* a cutis of radially arranged, cylindrical hyphae 4–8.5 μm diam, smooth to weakly annular-incrusted, not *dryophila*-structure, clamped. – *Pileocystidia* 16–48 \times 2.5–4.5 μm , scattered, erect, clavate, sometimes in chains of 2–3 cells, hyaline, smooth, thin-walled. – *Pileus trama* monomitic, densely interwoven, cylindrical hyphae, 3–12.5 μm in diameter, thin-walled, smooth, non-gelatinous, clamped, hyaline, mostly inamyloid with some distinctly dextrinoid hyphae. – *Lamellar trama* interwoven, hyphae similar to that of *pileus trama*, smooth or weakly incrusted, hyaline to pale brown, strongly dextrinoid tissues tending to occur with the more pigmented hyphae and located within and closest to the subhymenium. – *Stipitipellis* consisting of cylindrical, clamped, annular-incrusted hyphae. – *Caulocystidia* 37.5–67 \times 3–7.5 μm , clavate with few lobes or nodular projections, hyaline, clamped, arising from repent hyphae on stipe surface.

Habit, habitat and distribution. – Gregarious to caespitose on rotting leaves and wood over old termite nests. The majority of our collections occurred under *Dipterocarpaceae*. Java.

Material examined. – INDONESIA: Java: Bogor, Pangrango National Park, Gunung Gedeh, trail to Cibereum Waterfall, 23 Jan. 1999, Retnowati 156 (SFSU). – W of Bogor, Haurbentes Dipterocarp Forest, S6°32.65' E106°26.26', elev. 300 m, 16 Jan. 2001, Wilson 106 (SFSU); same location and date, Desjardin 7264 (SFSU).

This species can be identified easily by its strongly rugulose-sulcate pileus, and association with old termite nests. Young specimens are reddish-gray in color, but in age become more brownish-gray with a white margin. Its long slender stipe is longitudinally striate and basidiomes often occur in caespitose clusters. *Gymnopus termiticola* is also one of the few species within the genus exhibiting pleurocystidia. These cells are lanceolate and conspicuous. Originally described as a *Marasmius* by Corner (1996), the *pileipellis* formed as a cutis of cylindrical, non-diverticulate hyphae places it more accurately within *Gymnopus*. Corner (1996) links it to *M. carneicolor* Corner, another species with pleurocystidia, but the latter has a smaller overall habit, reddish brown colored pileus, smaller spores, and different cheilocystidia and caulocystidia.

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