



## A taxonomic analysis of miscellaneous fungi collected from Burma

Thaung MM<sup>1,2</sup>

<sup>1</sup> 5482 Los Robles, La Verne, CA 91750-1643, USA. [mmthaung@verizon.net](mailto:mmthaung@verizon.net)

<sup>2</sup> University and Jepson Herbaria/Botany, 1001 Valley Life Sciences Building # 2465, University of California, Berkeley, CA 94720-2465

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### Abstract

Records of fungi from Burma are updated to align with their current taxonomic nomenclature and classification. The update has generated a classified list of 58 contemporary species assigned to 27 families in 14 orders and 7 classes. This analysis aims at fungal taxa reported in world literature on Burma with a view to annotating and adding them to the local inventory for further enrichment and refinement.

**Key words** – aloewood – amber – biodiversity – Myanmar – systematics – truffle

### Introduction

Fungi have been living in Burma in freedom since some 100 million years ago when a few of them had the misfortune of being entombed alive in Early Cretaceous Burmese amber (Poinar & Buckley 2007). Their ancestors watched in silence as the dinosaurs roared, roamed, and ruled the earth. While some still remain entrapped in amber outside the plant (Poinar et al. 2014), others entered the wood and remained embedded to help generate rich fragrance for the world (Kurz 1877). At the other end of the spectrum, there lies hidden close to the roots, as little eggs or balls, a local truffle (*Kaing-U* or *Kaing-Oo*) in association with tall elephant grass (*Pennisetum purpureum* Roem. & Schult. or *Saccharum arundinaceum* Retz. = *Kaing*) in the tidal forests or in the Irrawaddy Delta (Troup 1913, Rodger 1936, Thaung 2007). This study also presents a supplement to an earlier work on macromycetes of Burma (Thaung 2007). The objective was to contribute to building capacity for contemporary mycodiversity information of the territory.

### Materials & Methods

The main target of this investigation was the 19th Century Kurz and Mason collections of Burman fungi initially identified by Kurz and subsequently by Currey (Currey 1875, Mason & Theobald 1883). Their specimens are hardly accessible or traceable for traditional verification. However, they are long overdue for a systematic review and proper disposition following modern databases ([www.indexfungorum.org/](http://www.indexfungorum.org/) and [www.mycobank.org/](http://www.mycobank.org/)). Therefore, these fungi are now reclassified and resubmitted below together with their original data to provide a contemporary and comparative taxonomic information.

### Results

The records were reviewed and are enumerated below in alphabetical and hierarchical order.

## Agaricomycetes, Basidiomycota

### Agaricaceae, Agaricales

1. *Agaricus campestris* L. 1753. On ground, Moulmein.
2. *Cyathia intermedia* (Mont.) V.S. White 1902 (= *Cyathus intermedius* (Mont.) Tul. & C. Tul. 1844) On ground, Moulmein.
3. *Lycoperdon brasiliense* Fr. 1829. Nakawa, Ton-kye-gat.
4. *Lycoperdon pusillum* Fr. (legitimate, year not available). Lower Pegu.

### Marasmiaceae

1. *Marasmius parishii* Cooke (legitimate, year not available). On herbaceous plants and petioles of palm leaf, Moulmein.

### Psathyrellaceae

1. *Psathyrella candolleana* (Fr.) Maire 1937 (= *Agaricus candolleanus* Fr. 1818 = *A. appendiculatus* Bull. 1789, recorded inaccurately as *A. (Hypholoma) appendiculatus* Fr.). Moulmein.

### Tricholomataceae

1. *Pseudoclitocybe cyathiformis* (Bull.) Singer 1956 (= *Agaricus cinerascens* Batsch 1786). Pegu Yoma.

### Auriculariaceae, Auriculariales

1. *Exidia auricula-canis* (G. Mey.) Fr. 1822 (recorded as *Hirneola auricula-canis* Fr.). Northern Yoma, Pegu.

### Incertae sedis

1. *Guepinia ramosa* Curr. 1876. Arakan State.

### Paxillaceae, Boletales

1. *Paxillus involutus* (Batsch) Fr. 1838 (= *Agaricus contiguus* Bull. 1785 for *Agaricus continuus* Berk. 1847, illegitimate name). Moulmein.

### Hymenochaetaceae, Hymenochaetales

1. *Hymenochaete adusta* (Lév.) Har. & Pat. 1903 (= *Stereum adustum* Lév. 1844). Southern Yoma, Pegu.
2. *Inonotus splitgerberi* (Mont.) Ryvarden 1972 (= *Polyporus splitgerberi* Mont. 1841). Nat-taung, Toungoo.
3. *Polystictus persoonii* Fr. Moulmein, Nakawa, Pegu, Ton-kye-gat.

### Phallaceae, Phallales

1. *Phallus daemonum* Rumph. ex Fr. 1823. Moulmein, Pegu Yoma, Evergreen Forest

### Fomitopsidaceae, Polyporales

1. *Fomitella rhodophaea* (Lév.) T. Hatt. 2005 (= *Polyporus cinereofuscus* Curr. 1876). Nakawa, Pegu, Ton-kye-gat.
2. *Fomitopsis rubida* (Berk.) A. Roy & A.B. De [as 'rubidus'] 1996 (= *Polyporus rubidus* Berk. 1847). Pegu.
3. *Laetiporus sulphureus* (Bull.) Murrill 1920 (= *Polyporus rubricus* Berk. 1851). Pegu.

### Meruliaceae

1. *Podoscypha elegans* (G. Mey.) Pat. 1900 (= *Stereum elegans* (G. Mey.) Fr. 1838). Lower Pegu.

## Polyporaceae

1. *Lentinus badius* (Berk.) Berk. 1847 (= *Lentinus inquinans* Berk. 1854). Kyi-myin-dine, Rangoon.
2. *Lentinus coadunatus* Hook. f. 1851. Pegu Yoma Range.
3. *Lentinus exilis* Klotzsch 1836. Nakawa, Pegu, Ton-kye-gat.
4. *Lentinus irregularis* Curr. 1876. Karen Area, Pegu Division, Pine Forests.
5. *Lentinus kurzianus* Curr. 1876. Pegu Yoma Range.
6. *Lopharia papyrina* (Mont.) Boidin 1959 (= *Stereum papyrinum* Mont. 1842). Pegu, Timeokee.
7. *Microporus xanthopus* (Fr.) Kuntze 1898 (= *Polyporus xanthopus* Fr. 1818, *Polyporus florideus* Berk. 1854). Bookee, Karen Hills, Moulmein, Nakawa, Pegu Yoma, Sittang Valley, Ton-kye-gat.
8. *Panus neostrigosus* Drechsler-Santos & Wartchow 2012 (= *Lentinus capronatus* Fr. 1838), Myo-dwyn, Pegu.
9. *Polyporus amboinensis* Fr. 1821. Pegu, Karen Area.
10. *Polyporus appianatus* (Pers.) Wallr. 1833 (not Fr. which does not exist). Evergreen Forest, Pegu, Ton-kye-ghat, Toungoo.
11. *Polyporus crassipes* Curr. 1876. Pegu Yoma.
12. *Pseudofavolus polygrammus* (Mont.) G. Cunn. 1965 (= *Hexagonia polygramma* (Mont.) Fr. 1838). Pellowa, Ton-kye-gat.
13. *Pycnoporus sanguineus* (L.) Murrill. 1904 (= *Polyporus sanguineus* (L.) Fr. 1821). Moulmein.
14. *Trametes palisotii* (Fr.) Imazeki 1952 (= *Lenzites palisotii* (Fr.) Fr. 1838). Pegu, Seven-Pagoda Village (Toungoo), Ton-kye-gat.
15. *Trametes umbrina* Fr. 1845 (= *Trametes umbrinus* Curr. 1874, illegitimate name). Evergreen Forests, Nakawa, Pegu, Ton-kye-gat.
16. *Trametes villosa* (Sw.) Kreisel 1971 (= *Polyporus pinsitus* Fr. 1828). Nat-Taung, Toungoo.

## Bondarzewiaceae, Russulales

1. *Amyloporus campbellii* (Berk.) Ryvardeen 1977 (= *Polyporus campbellii* Berk. 1854, *P. anthelminticus* Berk. 1866 = bamboo agaric (*Wa-hmo*), worm mushroom (*Than-hmo*), on the culms of bamboo near the ground. *Tin-wa* (= *Cephalostachyum pergracile* Munro 1868) or *Kyatthaung-wa* (= *Bambusa polymorpha* Munro 1868) in Tharawaddy and Pegu Forests (Brandis 1903).

## Lachnocladiaceae

- 1 *Dichostereum granulosum* (Pers.) Boidin & Lanq. 1977 (= *Grandinia granulosa* (Pers.) Fr. 1838). Pegu, Pellowa, Ton-kye-gat.

## Peniophoraceae

1. *Peniophora violaceolivida* (Sommerf.) Masee 1890 (= *Corticium violaceolividum* (Sommerf.) Fr. 1838). Pegu Yoma.

## Stereaceae

1. *Stereum cyathiforme* (Fr.) Fr. 1838 (recorded as *Stereum cyathiforme* Curr. 1876, illegitimate name). Bookee Ridges, Karen Hills, Pegu.
2. *Xylobolus subpileatus* (Berk. & M.A. Curtis) Boidin 1958 (= *Stereum scytale* Berk. 1854). Bookee Ridges, Karen Hills, Pegu.

## Fossil Agaricomycetes, Basidiomycota

### Incertae sedis, Agaricales

1. *Palaeoagaricites antiquus* Poinar & R. Buckley [as '*Palaeoagaracites*'] 2007 (Holotype No. Buckley AB-368, MycoBank # MB510456 and MB510465) in Early Cretaceous Burmite. Hukawng Valley, SW of Maingkhwan, Kachin State. Oldest agaric in the world.
2. *Mycetophagites atrebora* Poinar & R. Buckley 2007. As mycoparasite on pileus of host fungus, *Palaeoagaricites antiquus* Poinar & R. Buckley 2007, in amber from Early Cretaceous Burma.

3. *Entropezites patricii* Poinar & R. Buckley 2007. As hypermycoparasite inside hyphae of host mycoparasite, *Mycetophagites atrebora* Poinar & R. Buckley 2007, in Burmite.

#### Sclerodermataceae, Boletales

1. *Palaeogaster micromorpha* Poinar, Alfredo & Baseia 2014 (MycoBank # MB 801127). In early-mid Cretaceous amber. Collected in 1999 by an unknown amber miner (*s.n.*) from Amber mine in the Hukawng Valley, SW of Maingkhwan, Kachin State.

#### **Pezizomycetes, Ascomycota**

##### Sarcoscyphaceae, Pezizales

1. *Cookeina tricholoma* (Mont.) Kuntze 1891 per Lockwood (2013).

##### Tuberaceae

1. *Kaing-U* or *Kaing-Oo* (unidentified truffle). Around the roots of elephant grass in rainy season. Delta Area.

2. *Tinyu/Tinshu-U* (unidentified truffle). Around the roots of pine trees (*Pinus khasya* Royle). Shan State and Chin State.

#### **Sodariomycetes, Ascomycota**

##### Togniniaceae, Diaporthales

1. *Phaeoacremonium parasiticum* (Ajello, Georg & C.J.K. Wang) W. Gams, Crous & M.J. Wingf. 1996 (Anamorphic *Togninia*). Presumably inside the wood of *Aquilaria agallocha* Roxb. (agarwood, aloeswood, *Ah-kyaw*, eagle-wood) plants, inducing fragrance or incense production. Martaban hills east of Toungoo and Tenessarem forests.

##### Hypocreaceae, Hypocreales

1. *Hypocrea variabilis* Curr. 1876. On living leaves of bamboo, Pegu Yoma.

##### Diatrypaceae, Xylariales

1. *Diatrype phaselina* (Mont.) Rappaz 1987 (= *Sphaeria phaselina* Mont. 1855). Nakawa, Ton-kye-gat.

2. *Diatrype rugosa* Curr. 1876. On hardwood, Yoma, Pegu.

##### Xylariaceae

1. *Annulohypoxyton annulatum* (Schwein.) Y.M. Ju, J.D. Rogers & H.M. Hsieh 2005 (= *Hypoxyton marginatum* var. *marginatum* (Schwein.) Berk. 1860). Pegu.

2. *Hypoxyton sublimbatum* (Durieu & Mont) P.M.D. Martin 1967 (= *Sphaeria sublimbata* Durieu & Mont. 1848). Kambala Taung.

3. *Poronia pileiformis* (Berk.) Fr. 1851. Moulmein.

4. *Xylaria flagelliformis* Curr. 1876. On earth, Pegu, Sittaung Valley, Yoma Range.

5. *Xylaria guianensis* (Mont.) Fr. 1851. Evergreen Forest, Pegu, Ton-kye-gat.

#### **Incertae sedis, Ascomycota**

1. *Fumago salicina* Tul. & C. Tul. 1863. Pegu Yoma, Wa Choung.

#### **Chytridiomycetes, Chytridiomycota**

##### Rhizophlyctidaceae, Rhizophlyctidales

1. *Rhizophlyctis reynoldsii* Dogma 1974. On chitin bait in leaf litter, Rangoon.

2. *Rhizophlyctis variabilis* Karling 1968 (= *Rhizophlyctis variabilis* var. *burmaensis* Dogma 1974). On chitin bait in soil, Rangoon.

#### **Myxomycetes, Myxomycota**

Arcyriaceae, Trichiales

1. *Arcyria umbrina* Schumach. 1803 (recorded as *Arcyna umbrina* Fr. which does not exist). Evergreen Forests, Pegu, Pellowa, Ton-kye-gat.

### Discussion

The Kurz and Mason collections were obtained largely from the Pegu Yoma region with Toungoo in the north and Rangoon and Moulmein in the south. This area was then very sparsely populated, heavily wooded, and almost pristine and untouched by human activities. The fleshy fungi abound there due to heavy monsoon rains for a greater part of the year. The forays yielded several new species including *Diatrype rugosa*, *Guepinia ramosa*, *Hypocrea variabilis*, *Lentinus irregularis*, *L. kurzianus*, *Marasmius parashii*, *Nectria eugeniae*, *Polyporus cinereofuscus*, *P. crassipes*, *P. peguanus* and *Xylaria flagelliformis*.

Moreover, the oldest agaric in the world resides within Early Cretaceous Burmite together with its mycoparasite and the hypermycoparasite (Poinar & Buckley 2007). A bolete also remains confined inside of another amber from early-mid Cretaceous Burma (Poinar et al. 2014). Based on its unique location, association, infomercial data, and distinctive properties, agarwood fungus, *Phaeoacremonium parasiticum*, is suspected in the native wood of *Aquilaria agallocha* Roxb. (*Ah-kyaw* = vernacular name) (Kurz 1877, [http://www.paradiseparfumes.com/agarwood\\_from\\_fungus\\_to\\_fragrance](http://www.paradiseparfumes.com/agarwood_from_fungus_to_fragrance)). It was thus presumed present without further ado. Three truffles join this medley, *Tuber indicum* Cooke & Masee 1892 and two others known for over a century by local names only – *Kaing-U/Kaing-Oo* and *Tinyu/-Tinshu-U* (Troup 1913, Thaug 2007). A bamboo fungus (Brandis 1903), a myxomycete and two chytrids (Dogma 1974) complete this snapshot of the day for miscellaneous fungi of Burma. And the mycoscape will be more interesting when the identities of the two truffles become available.

This paper provides a glimpse of Burma's rich tapestry of fossil, fragrance and food fungi for mycodiversity information.

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