

## PROCEDURES IN THAI ETHNOMYCOLOGY

*Roger N. Hilton\* and Pannee Dhitaphichit\*\**

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### INTRODUCTION

In assessing biological resources of rural communities anthropologists have paid due attention to plants and to animals. The sciences of ethnobotany and ethnozoology are well-established. However, the third kingdom of living things, the Fungi, has been neglected. This is partly because its prominent members are more evanescent than plants and animals. But a contributing factor is the unfamiliarity of these organisms, so that untrained field investigators have no idea how to set about collecting and naming them. This paper is designed to give some of the uses to which fungi are known to be put, to explain how to collect them, and to draw attention to publications that may be used.

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\* Formerly Botany Department, University of Western Australia. Present address: 62 Viewway, Nedlands, W.A. 6009, Australia.

\*\* Department of Applied Biology, King Mongkut's Institute of Technology, Ladkrabang, Bangkok 10520

It could provide a background for looking into the references to fungi in the literature of Southeast Asia. An example of the sort of information wanted is given by ROLFE & ROLFE (1925), for the Northern Hemisphere, and by MORRIS (1984) and PEARCE (1981) for Africa.

Inspiration comes from the work of Ms Anong Chandrasikul (CHANDRASIKUL, 1977), which treats Thai larger fungi in systematic order. We intended to make this work better known to those who do not read Thai, and to extend it by emphasizing fungal use and by drawing on information available from neighbouring countries.

This paper is not an attempt at a review of the fungal taxonomic literature for Thailand any more than it is a review of anthropological writings on fungi. It is addressed to mycologists who may be helped by learning something of the state of knowledge of fungi among the Thai population, and to anthropologists who may be in a position to collect information on fungal use but do not know how to set about it.

### THE NATURE OF FUNGI

The fungus has been described as the multinucleate protoplasmic inhabitant of a network of chitinous or cellulose tubes, which it secretes, and in which it moves (GREGORY, 1952: p. 5). Although this catches the essence of the fungus beautifully, it is not a definition; it does not exclude certain filamentous algae and bacteria, for example, and at times or in certain species the inhabitant may be reduced to a single nucleus and occupy a cell rather than a tube. A fungus is a eukaryotic organism; it does not have the non-discrete nucleus of bacteria. As it is devoid of chlorophyll, and the plastids in which chlorophyll may form, it is separate from plants, including algae. Typically it lives within a chitinous wall, usually tubular. In the water moulds and their relatives the walls have cellulose. The tubes may branch and fuse to form a large fruit body. Reproduction is by spores produced in such a fruit body or by structures borne on the tubes. The result is something plant-like in that it stays in one place, animal-like in its chitinous walls and lack of ability to photosynthesize.

Thai people have always recognised that a mushroom, "het", is different from a plant, "peut". Moulds, "raa", are traditionally regarded as different from both. Nevertheless, published accounts in Thai have always classified fungi with plants. In this paper "mushroom" refers to any of the Larger Fungi", whether edible or not, as per MILLER (1979).

Amongst Malay-speaking Thai Muslims in South Thailand there appears to be clear recognition of a fungus as something different from a plant. The naming of the plant *Rafflesia hasseltii* as a fungus, cendawan matahari, gives support to this view as it is parasitic and devoid of leaves. One may have mouldy leather shoes referred to as "bercendawan" and Mouldy Rot of the tapping panel of the hevea rubber tree as "cendawan lapuk", *Ceratocystis fimbriata*. The agent of Pink Disease, *Corticium salmonicolor*, as "cendawan angin" is the only other fungus disease of hevea, for which a name has not been coined (HILTON, 1959).

The idea of fungi as filamentous organisms normally hidden within the substratum has important implications for the larger fungi in particular. They have to fruit to reveal

themselves. Mycologically and ecologically this can distort the true picture of fungal distribution. Ethnomycologically it is less important, as concern is with the fruit itself, not with the mycelium of the fungus. It has been suggested (MASEFIELD, 1940) that there are problems in collecting larger fungi in the tropics especially because of their reluctance to fruit. Masefield went so far as to suggest that they are rare. This provoked a rejoinder by CORNER (1940: p. 357), who pointed out that they are abundant but seasonal (CORNER, 1935). Larger Fungi are more readily studied in the monsoon parts of Southeast Asia, where seasons are strong and predictable, than in the equatorial parts, with their subtle and unpredictable seasons. The equatorial lowlands can be very disappointing for a collector. There is more scope in the mountainous regions, with their local variations of weather pattern, and CORNER (1964) was very successful in collecting fungi on Mount Kinabalu, Sabah.

### MYCOLOGICAL LITERATURE

Every investigator of larger fungi must be aware of the classical work of Rolf Singer. Although Singer himself did not work in Southeast Asia he had extensive experience in the tropics of the New World. The second edition of his book (SINGER, 1965) gives recognition to two pioneers of his method, one of whom, N.T. Patouillard, visited Southeast Asia and described a number of species (1890–1928) (CORNER, 1935). The method stresses the microscopic structure of the fungus, however large the fruit body may be. This is important to the nonspecialist investigator as it means technical descriptions can be replaced by colour photographs and other characters can be worked out later by specialists on carefully dried material. If workers in the region want to use a specialist text, they could well use that on the *Agaric Flora of Sri Lanka* by D.N. Pegler (PEGLER, 1986). Although Sri Lanka is outside Southeast Asia it has many of the same fungi. For the other great group of larger fungi, the Aphyllorphorales, one has to go farther west across the Indian Ocean and use the *Preliminary Polypore Flora of East Africa* by RYVARDEN & JOHANSEN (1980).

It may seem surprising that there are not more popular books on larger fungi of the tropics. One such, *Zoberi's Tropical Macrofungi* (1972), written in West Africa, is somewhat unsatisfactory (REID, 1973).

The object of the exercise is not to be able to identify species on the spot, but to have some idea of what the fungus is at the generic level in order to guide one in seeking further information. Also, in seeking to identify to genus, one will learn to recognise the fungus in question so that one does not duplicate investigation unnecessarily. The book by ORSON K. MILLER (1979) has fine colour photographs in natural surroundings that are backed up by a text explaining the basis of classification into families and genera. It is written for North America but many of the fungi described may be found in the tropics and southern hemisphere, even down to species level. MILLER'S book may be supplemented by PHILLIPS (1981), which has a larger number of studio colour photographs of superb quality, taken of European forms. They show what the investigator should attempt to emulate in recording fungi under study. PHILLIPS' book is a supplement to the technical descriptions by MOSER (1978).

## EARLY RECORDS

Some of the earliest records of larger fungi from Thailand come from the Danish Botanical Expedition to Thailand in 1900, reported on by ROSTRUP & MASSEE (1902). The expedition concentrated on the island of Koh Chang. The polypore types from this expedition are reviewed by RYVARDEN (1976).

Information from the neighbouring countries of Laos and Cambodia is useful for Thailand, particularly because of the cultural connections. Vietnam is culturally more distinct but geographically similar. BURKILL (1935: p. 61) quotes DEMANGE (1919) as writing on edible fungi of Tonkin (approximately the old North Vietnam). The distinguished French specialist on Hymenomycetes, N.T. Patouillard, wrote a number of papers on Tonkin fungi (1890–1928), recently brought together in microfiche.

## COLLECTING

### Information

An excellent example of an ethnomycological investigation is that of SATHER (1978), among the Iban people of Sarawak. But a number of the fungi may have to remain unidentified, showing the need for background information of the sort the present paper hopes to provide. CHIN (1981) has identified some of the edible and poisonous species. In Thailand, wild edible fungi are eaten and sold in fresh markets throughout the country, especially in the countryside where humid vegetation is abundant. Most of the fungi remain unidentified and even those identified should be confirmed for accuracy.

### Specimens

Detailed instructions for collecting plants are available, for example by VAN STEENIS-KRUSEMAN (1950), and HOWES (1974), but although the methods are well worth studying, fungi are not even mentioned. As with plants, one has the choice of wet or dry methods. The preservative recommended for fungi is Fungal Fix, with the following formula: ethanol (70%) 94 ml, formalin (full strength) 6 ml. E.J.H. Corner used this solution in building up his collections of tropical fungi.

Drying must be done sufficiently slowly so as not to cook, and sufficiently fast to prevent action of insects or bacteria. Dried material is very vulnerable to insect attack and must be packed with naphthalene and/or paradichlorobenzene.

Colour photography is an invaluable adjunct to either drying or pickling as both methods are destructive of colour and shape. The illustrations in PHILLIPS (1981) show what should be aimed for in terms of lay-out and quality. However, colour prints involve considerable expense if they are to render colours accurately and it is better to use colour slides. A piece of card to scale, say 5 cm x 1 cm, should be included in the picture with a number and date to match with the specimen. At least some of the specimens photographed must be preserved as vouchers.

## ROMANIZATION OF LOCAL LANGUAGES

The names applied locally to the material collected will normally be written down in Roman script. This presents little problem in most Southeast Asian countries, where officially accepted romanizations are almost universal. Thailand is an exception, despite the ROYAL INSTITUTE (1968), and a local informant would have to write in Thai, or Thai versions of tribal languages to give a worthwhile record. However, there are romanizations of Thai used for teaching/learning purposes, such that of the A.U.A. LANGUAGE CENTRE (1967), which are widely used. It copes with the problems of tones, and some facility would be needed in it for workers in Thailand, unless they were sufficiently specialized to be working with the Thai written language. The A.U.A. system is used for transliterating the Thai names in this paper.

## FUNGI AS FOOD

In Thailand there is an old saying about foods comparable with the English "fish, fowl, and good red herring". It is "pork, mushroom, duck, chicken". This indicates that Thai people are traditional eaters of mushrooms.

Activities such as the publication of the Mushroom Newsletter for the Tropics (INTERNATIONAL MUSHROOM SOCIETY FOR THE TROPICS, 1978) will in time confuse the issue as to what were traditional food fungi.

### Agaricales

*Agaricus* is a famous genus of mushrooms. In older, but not very old, works, such as BURKILL'S Dictionary (1935), the genus appears under *Psalliota*. Worldwide, the genus includes the best known of edible fungi, above all the common field mushroom *A. campestris* L.: Fr., and its cultivated form *A. bisporus* (J. Lange) Pilat var. *albida*. It is not, however, commonly recognised as edible in Southeast Asia (PEREGRINE & AHMAD, 1973). *Agaricus arvensis* Fr. and *Agaricus silvicola* (Vitt.) Sacc. have also been recorded for Thailand (CHANDRASIKUL, 1977).

*Amanita* is a genus more famous for its poisonous species, species that are all the more dangerous because of their resemblance to esteemed edibles of Europe like Caesar's Mushroom (*A. caesarea*), the Blusher (*A. rubescens*), and the Grisette (*A. vaginata*). The genus typically has a white spore print, cup or frill at the base, and a ring round the stem. Older books put species without the ring in the genus *Amanitopsis*. CHANDRASIKUL ET AL. (1986) list three species of *Amanita* as important edible mushrooms in Thailand: *Amanita vaginata* (Bull. Fr. ex Fr.) Vitt., *A. calyptroderma* Atkinson & Ballen, and *A. princeps* Corner & Bas.

*Boletus* is an important genus of pored mushrooms. The boletes are agarics, not polypores. They are mostly large and fleshy, potentially good as food, especially as few species are harmful. Many species turn blue on cutting, but this is not an indication of edibility. In Peninsular Malaysia at least, boletes are rarely encountered in the lowlands. CORNER (1964) emphasises that their fruiting is a feature of upland forests. The original

genus has had a number of genera segregated from it, for example *Tylophilus*, *Boletellus*, *Gyroporus* etc. according to which authority is accepted. CORNER (1972) provides the key work for the region and beyond. *Boletus phaeocephalus* Pat. & Baker is the species cited by CORNER (1972: p. 129) as most likely to explain the records of *Boletus edulis* for the region. CHANDRASIKUL (1977: p. 50) discussed a common Thai bolete under the name *B. edulis* but, provisionally, one must assume that it will prove to be *B. phaeocephalus*. Consistent with this is that she comments that the spores are  $15 \times 5\mu$  less elliptical than reported for *B. edulis* from Europe, and the taste not particularly pleasing.

*Coprinus* is the ink-cap genus, easily recognised by its whitish fruit-bodies dissolving (not decomposing) to a black ink on maturity. BURKILL (1935: p. 654) quotes that in Java any coprinus, big or little, is likely to be eaten. CHANDRASIKUL (1977) cited two edible wild species: *C. atramentarius* (Bull.), Fr. and *C. fimetarius* Fr. = *C. cinereus* (Schff.: Fr.) S.F. Gray.

*Clitocybe* is a genus of agarics characterised by a funnel-shaped cap with a central stalk, and a white spore print. Some are over-all white in colour and can be confused with species of *Lentinus* or *Pleurotus*. Specific recognition is important as some, e.g. the worldwide *Clitocybe dealbata* (Sow. ex Fr.) Kummer, are very poisonous. *Clitocybe infundibuliformis* (Schaeff.) Quél. is described by CHANDRASIKUL (1977: p. 12). It is in MILLER (1979) as *C. gibba*, edible. One of us (P.D.) has bought it in a Khon Kaen market.

*Lactarius* is an easily recognised genus because of the milky latex contained in all parts, and a brittle flesh with decurrent gills. One of us (RNH) was involved in a search for species of this genus in Peninsular Malaysia during 1950–60 because of research interest in the biochemistry of rubber biosynthesis. None were found. CHANDRASIKUL (1977: p. 66–71) records several for Thailand: *Lactarius flavidulus* Imai, *L. hygrophoroides* Berk. & Br., *L. piperatus* (Fr.) S.F. Gray, and *L. volemus* Fr. Of these, *L. volemus* has been found at 1300 m a.s.l. at Phu Hinrongkla National Park, and *L. flavidulus* and *L. piperatus* were purchased in a Khon Kaen market (P.D.)

The genus *Lentinus* is given modern monographic treatment by PEGLER (1983). *Lentinus edodes* (Berk.) Singer is the shii-take, widely cultivated all over Asia and North America. It is recorded for Thailand by CHANDRASIKUL (1977: p. 20) and found by one of us (P.D.) at Khaokhaw and by CORNER (1964) on Mt Kinabalu, Sabah. Correctly, it should be called *Lentinula edodes* (Berk.) (PEGLER, 1983). For *Lentinus polychrous* Lév., PEGLER (1983: p. 75) gives several records for Thailand and neighbouring countries. CHANDRASIKUL (1977: p. 21) records it for Thailand as *L. praerigidus* Berk., and HEIM (1977: p. 136) records it under the name *L. kurzianus* Currey as being sold on skewers in the Chiang Mai market. Recently it has been successfully cultivated by science students at Khon Kaen. *Lentinus sajor-caju* (Fr.) Fr. is notable for its Latinised Malay specific epithet, meaning the "vegetable from wood". This was a name recorded by Rumphius as used in Ambon Island (Moluccas) in 1750. It was widely used by Malays in Selangor in the 1950's. It was introduced into Australia for cultivation by Dr. Yip Cho, Department of Microbiology, Sydney University (ANON, 1981). PEGLER (1983: p. 82) gives three records from Thailand. BURKILL (1935: p. 1329) records *Lentinus squarrosulus* Mont. under the name *L. subnudus* Berk. as being eaten in Perak and Singapore. It is recorded for Thailand (PEGLER, 1983: p. 70). *Lentinus strigosus* (Schw.) Fr. is in CHANDRASIKUL (1977: p. 20) as *Panus rudis* Fr., a name widely used for it in Europe according to PEGLER (1983: p. 128), who

also gives one record for Thailand.

*Lepiota* (and *Macrolepiota*) is the genus of the Parasol Mushrooms, several species of which may be expected to appear in the market as food including forms similar to *L. (M.) procera* and *L. (M.) rhacodes*.

*Pleurotus djamor* (Fr.) Boedijn is a good edible (PEGLER, 1986: p. 43). Many species of *Pleurotus* are commercially cultivated in Thailand, for example *P. ostreatus* (Fr.) Quél., *P. cornucopiae* (Pers.) Rolland (CHANDRASIKUL, 1977) and several other species are commercially produced by Arunyik Mushroom Centre, the well-known mushroom farm in Thailand.

*Russula* is a genus like *Lactarius* but without the milk. Russulas are often brilliantly coloured. *Russula lepida* Fr. has been well characterised by HEIM (1962: p. 143) and is a popular Thai edible mushroom. One of us (P.D.) has bought in Khon Kaen market a species similar to *Russula delicata* Fr. Several other species of *Russula* mentioned in CHANDRASIKUL (1977) are commonly sold in markets in the North-East.

*Termitomyces* is a genus erected by the eminent French mycologist, Roger Heim, for pale-pink-spored flat-capped agarics arising from termite nests. They are invariably good to eat. See HEIM (1977), BELS & PATARAGETVIT (1982), and PIEARCE (1987). *Termitomyces fuliginosus* Heim is depicted in CHANDRASIKUL (1977: p. 40), who also names *T. schimperi* (Pat.) Heim and *T. microcarpus* (Berk.) Heim. The latter species, and *T. clypeatus* Heim, have been collected at Khon Kaen and Khaokhaw respectively. One of us (RNH) observed that *T. schimperi* was much prized by Tamil labourers on Selangor rubber estates. Where termite nests had been destroyed during clear felling of jungle the fungus fructifications would emerge amongst the young rubber and would be detected by their scent. BURKILL (1935: p. 638) deals with what is doubtless a *Termitomyces* under *Collydia*—a genus of similar shape but with white spores citing the Malay name: cendawan busut.

*Tricholoma* is the genus to which the blewits, edible fungi of Europe, belong. There are also poisonous species of *Tricholoma* known. As there are many species, it is important to be able to recognise the genus should it turn up in an ethnographic situation. One species, *Tricholoma crassum* (Berk.) Sacc., = *T. pachymeres* (Berk. & Br.) Sacc., is pantropical in distribution (PEGLER 1986: p. 91). CHAIWONGKEIT (1982) mentions that it is second only to *Termitomyces* in tastiness, and it has recently been commercially cultivated.

*Volvariella* is a genus defined by SINGER (1975) from the old *Volvaria*. It produces spores in a pink mass but not angular under the microscope, from a fruit body that has a prominent cup or volva at the base of the stem. *Volvariella volvacea* Fr. is the Padi Straw Mushroom, the most commonly cultivated of Southeast Asian mushrooms. BURKILL (1935: p. 2251) cites it as consumed in Java and the Philippines, but lacked evidence for it in the Malay Peninsula. However, Baker (1934) describes its cultivation in Seberang Perai (formerly Province Wellesley) and Penang, and SANDS (1935) describes it in Kedah. Indonesian methods are described by SUKARA (1981).

### Polyporales (better, Aphyllophorales)

*Polyporus* Fr. is dealt with under Medicinal Fungi, as the normally hard fructifications

are unsuitable for food. Nevertheless some species of the genus *Polyporus*, sensu strictu, as soft enough to be considered as food.

*Favolus* is an ill-defined genus of Polyporales characterised by the soft fruit body and large pore dimensions. *Favolus alveolaris* (D.C. ex Fr.) Quél. is cited for Thailand by CHANDRASIKUL (1977: p. 88) as of doubtful edibility. BURKILL (1935: p. 997) states that *Favolus spathulatus* Bresadola, a very common fungus of Indonesia, occurs freely in Singapore and may well be common in Malaya. It is eaten in Java according to VAN OVEREEM (1927: p. 68). RYVARDEN & JOHANSEN (1980: p. 495) warn of the ease of confusion of this species with *Polyporus grammacephalus* Berk. The *F. brasiliensis* Fr., common in the Malay Peninsula, is probably identical with the *F. alveolaris* and *F. spathulatus* cited above from neighbouring countries.

*Schizophyllum* is the "split-gill", a most distinctive genus with few species. *Schizophyllum commune* Fr. is a world-wide fungus, eaten in many countries including Thailand despite its toughness and small size. Burkill quotes Chinese and Javanese as eating it, and its Malay name as kulat sisir in Singapore, cendawan terkukur in Pahang. One of us (RNH) noted it as named cendawan kikir in Selangor and eaten by Malays. In the 1950s, when sodium arsenite was used to kill old rubber trees, warning notices had to be displayed to prevent Malays from collecting the abundant fruits of this fungus from the dead trunks, as the fungus absorbs arsenic compounds.

## FUNGI AS FOOD MODIFIERS

The fermented bean foods in Thailand are all from soya bean (+moulds), all of them of Chinese style:

1. soya sauce.
2. thow hu yee—red, salted soft bean cakes.
3. thow jeaw—salted bean paste, dark brown or black.

In Indonesia (HEDGER, 1978), they have tempeh soy bean (plus *Rhizopus oligosporus*), but this is not so popular in Thailand.

## POISONOUS FUNGI

Suspicious concerning fungi as a source of food because of the poisonous nature of some species are widespread in the region, even to the extent that wholesome species may be avoided. Medically, eight groups of poisoness forms are recognised (MILLER, 1979: p. 21).

*Amanita* is the genus that people immediately associate with illness or death from eating the fungus. In their study on Malayan *Amanita* species, CORNER & BAS (1962) adopted the idea of feeding specimens to monkeys. But they did not link this with any poisoning of human beings, nor did they record whether any species gave discomfort to the monkeys. Apes might have been more indicative, as being closer to man than monkeys. Rabbits can eat certain poisonous amanitas without being harmed (RAMSBOTTOM, 1953: p. 43).

*Amanita elata* (Masse) CORNER & BAS is often very abundant in Singapore, according to CORNER & BAS (1962). *Amanita frostiana* Peck is a North American species described in MILLER (1979: p. 36) and related to *A. flavoconica* Atk.; it is described by HEIM (1962: p. 149) from Thailand. *Amanita pudibonda* Heim. is a new species described by HEIM (1962) from Thailand. All the preceding are of suspect edibility. *Amanita verna* (Fr.) Qué. is known to be deadly and in 1982 several people died after eating it in Roi Et Province, about 100 km from Khon Kaen (CHANDRASIKUL ET. AL., 1986).

*Agaricus* has been dealt with above as the pre-eminent edible genus, even though not recognised as such over much of Southeast Asia. But any *Agaricus* which gives a yellow colouration on cutting should be avoided as being a Yellow Stainer, potentially poisonous (though not deadly) to some people.

*Galerina* is a genus of small agarics containing several poisonous and no known edible species. PEGLER (1986: p. 441) draws attention to the importance of *Galerina sulciceps* (Berk.) Boedijn. as a known Southeast Asian deadly fungus. BOEDIJN (1938) first described it, but as a *Phaeomarasmius*.

The Lepiotaceae are predominantly edible species, except for smaller members, all of which should be regarded as potentially poisonous. *Macrolepiota dolichaula* (Berk. & Br.) Sacc. is recorded as a poisonous fungus in Queensland. It is a common species throughout Southeast Asia, Australasia, and East Africa (PEGLER, 1986: p. 320, and recorded at Phuhinrongkla (P.D.)). *Chlorophyllum* has all the characters of the well-known genus of mostly edible agarics, *Lepiota*, but it has a pale-green spore powder. *Chlorophyllum molybdites* (Meyer: Fr.) Masse is a common garden fungus in Kuala Lumpur, where it grows from mould or lawn mowings heaped around the coconut husks so often placed on Vanda orchid beds. It is very common in Thailand and has been collected by one of us (P.D.) in the Ladkrabang district of Bangkok, Ayutthaya, and Khon Kaen.

## MEDICINAL FUNGI

Fungi, like plants, may accumulate substances which are physiologically active in the human body. A substance poisonous in high concentration may be medicinally useful at a lower concentration. The greatest concentration of alkaloids in any living entity is to be found in a fungus: the Ergot of Rye, *Claviceps purpurea*. BURKILL (1935) does not list any species of *Claviceps* for Malaysia, nor have we encountered a record for Thailand.

Over and above the pharmacologically based medicinal uses of fungi, there are magical uses. The pharmacology will gradually become more and more amenable to laboratory assessment, but study of the magical element will remain the province of the anthropologist.

*Dictyophora* was formerly used for the genus of stinkhorns that has a net-like skirt below the cap, now put in *Phallus*. *Dictyophora indusiata* (Pers.) Fisch. has been used for gout and epilepsy. In Indonesia this fungus is used for recalcitrant blood abscesses (BURKILL, 1935: p. 805). Burkill also reports that it is used by thieves in Thailand to stupefy their victims. In China the stalk and veil are eaten, incorporated into special dishes.

*Ganoderma* is a genus of polypore fungi with brown thick-walled spores and a hard fruit body that in several species has the appearance of having been lacquered. It is the

genus of the Ling Chih fungus. The Southeast Asian ganodermas are described by STEYAERT (1972). In Java *Ganoderma amboinense* Patouillard (*non Agaricus amboinensis* Lamarck) is dried and hung over doors to drive away evil influences. THREERAT (1988) has investigated Thai collections, and records the well-known *G. lucidum*. It has been cultivated for sometime in Japan and Korea and recently has been successfully cultivated in Thailand.

*Microporus* is a genus segregated from *Polyporus* by Beauverie. HEIM (1962: p. 131) calls *Microporus rhizomorpha* (Mont.) Heim pantropical; it is a form corresponding to 2 or 3 taxonomic species. WILLIAMS-HUNT (1957: p. 71) mentions the fungus skirts of women of the western Negrito groups, a precaution against the harmful effects of "hot rain".

*Polyporus* Fr. is a genus for non-putrescent pored fungi that has been whittled down in species number by the erection of many segregate genera: *Leucoporus*, *Lignosus*, *Microporus*, *Pycnoporus* and many more, according to the authority accepted. *Polyporus cocos* Weber is a prized ingredient of Chinese medicine but it is imported into the region from the Northern Hemisphere and is therefore of no ethnomycological concern. HEIM (1962) states that *Polyporus sacer* Fr., a *Leucoporus*, is sometimes found in the shop windows of pharmacies, in Bangkok for example. He collected it in the forest of Doi Sutep and devoted an article to it in the *Revue de Mycologie*, 1959. CHANDRASIKUL (1977: p. 82) deals with it in Thailand. BURKILL (1935) puts it under *Polystictus*. It is the prized susu rimau of peninsular Malays, the sclerotium of which is believed to be congealed tiger's milk. One of us (RNH) bought several from a hawker in Tanjong Malim in 1952. They consisted of orange caps on a stalk 10 cm long attached to similarly-coloured sclerotia. THOEN (1982: p. 299) gives the Chinese name as How Gui Kou. RYVARDEN & JOHANSEN (1980) put it under *Lignosus*. *Favolus alveolaris* (D.C. ex Fr.) Quél is not only an edible but is boiled up to serve as eye drops according to VAN OVEREEM (1927). BURKILL (1935: p. 1796) quotes a variety of medicinal uses for *Pycnoporus sanguineus* Murrill. No doubt these relate to its brilliant cinnabar red colour and its ready availability, for it is common and prominent on dead wood. It is included for Thailand by CHANDRASIKUL (1977: p. 92). *Fomes (Phellinus) rimosus* (Berk.) Cooke has been under study by the Pharmacology Department of Chulalongkorn University, it is used by villagers for relieving ear-pains and curing nettle-rash (CHANDRASIKUL, 1977: p. 89).

*Xylaria* is a genus of Ascomycetes unusual for that class of the fungi in being wood-attacking. It is closely related to *Daldinia*. BURKILL (1935: p. 2273) states that Malays are not known to use any *Xylaria*, but that in Indonesia the fluid obtained from the interior of one species (*X. tabacina* Berk.) is used as eye drops. For *Xylaria obovata* Berk., BURKILL (1935: p. 618) gives references to the Javanese pounding the fructification with coconut oil as a burn ointment. *Xylaria polymorpha* Grev. has been collected by students at Khon Kaen and Ladkrabang. *Daldinia* is an Ascomycete genus related to *Xylaria*. *Daldinia concentrica* Ces. & De Not., together with *Daldinia vernicosa* Ces. & De Not., are bun-shaped growths on dead wood with the Malay name cendawan jemput-jemput from a fancied resemblance to certain cakes if they be overcooked, according to BURKILL (1935: p. 756). This is reminiscent of the old English name "King Alfred's Cakes". In English folk-medicine a pair of fruit bodies, "cramp balls", in the pocket are said to ward off cramps. Cited Southeast Asian uses are more specific: a paste for skin itch in the Moluccas and its ash for a common head sore in Ternate.

## HALLUCINOGENIC FUNGI

One of the most interesting areas for ethnographic investigation is the use of drugs for mind-extending purposes. Unfortunately it is an area impinging on drug use or misuse and therefore legally dangerous for both investigator and informant. A study of the type that WASSON & HEIM (1957) undertook to elucidate the use of psilocybin-containing fungi amongst the Central American Indians would be impossible in present-day Southeast Asia. It is note-worthy that Heim himself did work in the region, in New Guinea.

*Copelandia* is a genus erected by Bresadola and contains but one species, from warmer areas (BOEDIJN, 1951). This is *Copelandia cyanescens* (Berk. & Br.) Singer. As the "Magic Mushie" of Bali, it is the hallucinogenic mushroom supplied to tourists. It has been well-known in Australia for at least 60 years as the "Giggle Mushroom" of Queensland and it would seem that here we are dealing with a cross-cultural influence. However, SCHULTES & HOFFMAN (1980: p. 67) recorded that it is used in "native festivals" in Bali. It is a common fungus in Java and Sumatra (BOEDIJN, 1951: p. 222). This, or a *Psilocybe*, must be the "het kee khwaay" reported by the *Thailand Daily News* of 5 May 1988 as being indirectly responsible for the death by drowning of a Western tourist on the island of Ko Samui. As pioneer in the study of species of *Psilocybe*, ROGER HEIM (1962: p. 155) reports on its non-indigenous use in Thailand. He treats it as a *Stropharia*.

*Heimiella* is a bolete genus erected by Boedijn. It is similar to *Boletus* but has winged and reticulated spores (BOEDIJN, 1951: p. 217). *H. angruiformis* Heim is one of the mushrooms believed by Heim to be involved in the group "mushroom madness" of the Kuma people of New Guinea. *H. retispora* (Pat. & Baker) Boedijn is closely related to the above and also believed by Heim to be involved in "mushroom madness" (HEIM, 1963; HEIM & WASSON, 1965). The Kuma madness needs re-investigation by workers trained in ethnography.

## FUNGUS STRUCTURAL MATERIAL

Fungi are completely devoid of the lignin and cellulose that make plants such a useful source of structural material. Their structure is made up of fine chitinous threads woven together as plectenchyma, which can give them considerable strength. Alternatively the fungal threads may be inflated and packed together to form a tissue, pseudoparenchyma, superficially like the parenchyma of plants when examined in section under the microscope. Dried masses of this material, as occur in the sclerotia of *Polyporus cocos* or *Polyporus mylittae* (the "Blackfellows' Bread" of Australia) are tough and heavy. One could imagine them capable of inflicting a heavy blow if used as a missile or weapon and, extraordinarily this is how *Lentinus tuberregium* has been used in New Guinea (PRICE, BALDWIN & SIMPSON, 1978).

The soft woven masses of plectenchyma that constitute certain polypore fruit bodies could be beaten out to create a fungus felt. This is known to be done in Rumania (THOEN, 1982: p. 307) but no record of the same use for Southeast Asia is known as yet.

Using the rhizomorphs of certain fungi to make a skirt like the "grass" skirt of Polynesia or the *Plectocomia* palm skirt of Bali (WHITMORE, 1973: fig. 88) has been well-documented for the aborigines of Peninsula Malaysia (BURKILL, 1935: p. 1895; WILLIAMS-

HUNT, 1952: p. 71).

### MISCELLANEOUS

A unique property in the context of certain fungi (eg. *Phellinus igniarius*, *Fomes fomentarius*, *Piptoporus betulinus* in Europe, *P. portentosus* in Australia) is the ability when dry and ignited to smoulder for hours and so retain the fire. This is the characteristic property of amadou, tinder, touchwood, or punk. Closely related species occur in the region but this use for them has not been recorded.

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## APPENDIX. Index of names of species of fungi referred to in this article.

		Page
<i>alveolaris</i> , <i>Favolus</i> honeycomb fungus	เห็ดรวงผึ้ง hèt ruang phĩng	82, 84
<i>amboinense</i> , <i>Ganoderma</i>		84
<i>angruiformis</i> , <i>Heimiella</i>		85
<i>arvensis</i> , <i>Agaricus</i>		79
<i>atramentarius</i> , <i>Coprinus</i> ink mushroom	เห็ดน้ำหมึก hèt nám mùk	80
<i>betulinus</i> , <i>Piptoporus</i>		86
<i>bisporus</i> , <i>Agaricus</i> var <i>albida</i> button mushroom European mushroom	เห็ดกระดุม hèt kĩa dum  เห็ดฝรั่ง hèt faràŋ	79
<i>brasiliensis</i> , <i>Favolus</i> (see <i>F. alveolaris</i> )		82
<i>caesaria</i> , <i>Amanita</i>		79
<i>calyptroderma</i> , <i>Amanita</i> conspicuous yellow mushroom yellow goose-egg mushroom	เห็ดระโงกเหลือง hèt raŋoák lĩaŋ  เห็ดไข่ห่านเหลือง hèt khày hần lĩaŋ	79
<i>campestris</i> , <i>Agaricus</i>		79
<i>cinereus</i> , <i>Coprinus</i> (see <i>C. fimetarius</i> )		80
<i>clypeatus</i> , <i>Termitomyces</i> pedestal mushroom termite mushroom (same names for all species of <i>Termitomyces</i> except <i>T. microcarpus</i> )	เห็ดโคน hèt khoan  เห็ดปลวก hèt plùak	81
<i>cocos</i> , <i>Polyporus</i>		84, 85
<i>commune</i> , <i>Schizophyllum</i> one-sided fungus gecko's foot fungus	เห็ดแครง hèt khleeŋ  เห็ดตีนตุ๊กแก hèt tiin túkkee	82

<i>concentrica, Daldinia</i>		84
<i>cornucopiae, Pleurotus</i>	เห็ดเป่าฮื้อ	81
abalone mushroom	hèt pǎwhǎn	
<i>crassum, Tricholoma</i>	เห็ดตับเต่าขาว	81
white turtle liver mushroom	hèt tǎp tǎw khǎaw	
palm blossom mushroom	เห็ดจัน	
	hèt jǎn	
rhinoceros foot mushroom	เห็ดตีนแรด	
	hèt tiin rêet	
<i>cyanescens, Copelandia</i>	เห็ดขี้ควาย	85
buffalo dung mushroom	hèt khǐi khwaay	
<i>dealbata, Clitocybe</i>		80
<i>delica, Russula</i>	เห็ดหล่มขาว	81
white marsh mushroom	hèt lòm khǎaw	
skin-scurf mushroom	เห็ดไคล	
	hèt khlay	
<i>djamor, Pleurotus</i>		81
<i>dolichaula, Lepiota, Macrolepiota</i>		83
<i>edodes, Lentinus, Lentinula</i>	เห็ดหอม	80
fragrant mushroom	hèt hǎw	
<i>edulis, Boletus (see B. phaeocephalus)</i>		81
<i>elata, Amanita</i>		82
<i>fimbriata, Ceratocystis</i>		76
<i>fimetarius, Coprinus</i>	เห็ดน้ำหมึก	80
ink mushroom	hèt nám mǐk	
<i>flavidulus, Lactarius</i>	เห็ดข่า	80
Chinese ginger mushroom	hèt khǎa	
<i>flavoconica, Amanita</i>		83
<i>fomentarius, Fomes</i>		86
<i>frostiana, Amanita</i>		83
<i>fuliginosus, Termitomyces</i>		81
<i>gibba, Clitocybe (see C. infundibuliformis)</i>		80
<i>grammocephalus, Polyporus</i>		82

<i>hygrophoroides, Lactarius</i> yellow-gold hog-deer mushroom	เห็ดฟานสีเหลืองทอง hèt faan sǐi hǎaŋ thooŋ	80
<i>igniarius, Phellinus</i>		86
<i>indusiata, Dictyophora, Phallus</i> network fungus	เห็ดร่างแห hèt rǎaŋ hǎe	83
<i>infundibuliformis, Clitocybe</i> stem of pampas grass mushroom	เห็ดชาง hèt saaŋ	80
<i>kurzianus, Lentinus</i> (see <i>L. polychrous</i> )		80
<i>lepida, Russula</i> red mushroom	เห็ดแดง hèt deeaŋ	81
<i>lucidum, Ganoderma</i> Lingchi fungus ten-thousand years fungus	เห็ดหลินจือ hèt lín jǐu เห็ดหมื่นปี hèt mǎn pii	84
<i>microcarpus, Termitomyces</i> small chicken termite mushroom	เห็ดปลวกไก่อ้น้อย hèt plùak kày nǒy	81
<i>molybdites, Chlorophyllum, Lepiota</i> light green-gilled shaggy-cap mushroom	เห็ดหัวกววดครีบเขียวอ่อน hèt hǔa kràat khriib khǐaw ǒn	83
<i>mylittae, Polyporus</i>		84
<i>obovata, Xylaria</i>		84
<i>oligosporus, Rhizopus</i>		82
<i>ostreatus, Pleurotus</i> oyster mushroom	เห็ดนางรม hèt naŋ rom	81
<i>pachymeres, Tricholoma</i> (see <i>T. crassum</i> )		81
<i>phaeocephalus, Boletus</i>		80
<i>piperatus, Lactarius</i> ginger mushroom	เห็ดขิง hèt khǐŋ	80
<i>polychrous, Lentinus</i> (see <i>L. praerigidus</i> )		80
<i>polymorpha, Xylaria</i>		84
<i>princeps, Amanita</i> birds' egg mushroom	เห็ดไข่นก hèt khǎy nók	79
<i>praerigidus, Lentinus</i> wind mushroom grind mushroom	เห็ดลม hèt lom เห็ดบด hèt bòt	80

hard mushroom	เห็ดกระด้าง hèt kradaaŋ	
brown log mushroom	เห็ดขอนสีน้ำตาล hèt khwǎn sǐi námtaan	
<i>procera, Lepiota, Macrolepiota</i> mast mushroom	เห็ดกระโดง hèt kradoaŋ	81
<i>pudibonda, Amanita</i>		82
<i>purpurea, Claviceps</i>		83
<i>retispora, Heimiella</i> horse lung mushroom	เห็ดปอดม้า hèt pǔod máa	85
<i>rhacodes, Macrolepiota, Lepiota</i> parosol shaggy-cap mushroom	เห็ดหัวกรวดร่มกระ hèt hǔa krùat rǒm kǎ	81
<i>rimosus, Fomes, Phellinus</i> Acacia siamensis fungus	เห็ดกระถินพืมาน hèt krathǐn phǐmaan	84
<i>rhizomorpha, Microporus</i>		84
<i>rubescens, Amanita</i>		79
<i>rudis, Panus</i> (see <i>Lentinus strigosus</i> )		80
<i>sacer, Polyporus, Leucoporus, Polystictus, Lignosus</i> tiger's milk fungus	เห็ดนมเสือ hèt nom sǔa	84
<i>sajor-caju, Lentinus</i> fairy mushroom	เห็ดนางฟ้า hèt naaŋ fáa	80
<i>salmonicolor, Corticium</i>		76
<i>sanguineus, Pycnoporus, Trametes</i> red-coloured log fungus	เห็ดขอนสีแดง hèt khwǎn sǐi deeaŋ	84
<i>schimperi, Termitomyces</i>		81
<i>silvicola, Agaricus</i>		79
<i>spathulatus, Favolus</i>		82
<i>squarrosulus, Lentinus</i>		80
<i>strigosus, Lentinus</i> hop-bush mushroom	เห็ดเพ็ก hèt pék	80
<i>subnudus, Lentinus</i> (see <i>L. squarrosulus</i> )		80
<i>sulciceps, Galerina, Phaeomarasmius</i>		83
<i>tabacina, Xylaria</i>		84

<i>tuberregium, Lentinus</i>		85
<i>vaginata, Amanita</i> (Bull. ex. Fr.) Vitt	เห็ดระโงกขาว	79
conspicuous white mushroom	hèt ráṅóak khǎaw	
white goose-egg mushroom	เห็ดไข่ฟานขาว	
	hèt khày hàan khǎaw	
<i>verna, Amanita</i>	เห็ดระโงกหิน	82
conspicuous stony mushroom	hèt ráṅóak hǐn	
<i>vernicoca, Daldinia</i>		84
<i>volemus, Lactarius</i>	เห็ดฟานสีน้ำตาลอมเหลืองทอง	80
brownish yellowgold hog-deer	hèt faan sǐi nám	
mushroom	taan ววม ฝ้าย thooṅ	81
<i>volvacea, Volvariella</i>	เห็ดฟาง	
straw mushroom	hèt faaṅ	
lotus mushroom	เห็ดบัว	
	hèt bua	