

Ethnomycological Notes from Papua, New Guinea

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Abstract

The literature on the use of psychotropic fungi in the Western Highlands of Papua New Guinea has been reviewed. An attempt has been made to evaluate whether the previously reported “mushroom madness” still exists in the Waghi Valley. Interviews with the local population indicated that most of the indigenous knowledge about the psychotropic effects of fungi has been lost.

Key words: Ethnomycology, *Russula*, *Boletus*, *Heimiella*, Papua New Guinea

Psychotropic Fungi in Papua New Guinea

THE FIELD OF ethnomycology was established in the 1950s and '60s, mainly through the studies of Wasson and Heim (Wasson & Wasson, 1957; Heim & Wasson, 1958; Wasson, 1968). Wasson and his collaborators had traveled extensively to most parts of the globe in order to study how mushrooms are used by various cultures on several continents and what role mushrooms play in the respective cultures. Wasson's results and those of his collaborators indicate that especially mushrooms with hallucinogenic properties play a significant role in many cultures around the world (Wasson et al., 1986; Riedlinger, 1990).

Ethnomycological information became available to a wider audience beyond the mycological community when Wasson published an article in a popular magazine describing the use of hallucinogenic *Psilocybe* species for religious purposes in Mexico. It was therefore inevitable that the early reports about a so-called “mushroom madness” in Papua New Guinea (Reay 1959, 1960) would attract ethnomycologists to explore the phenomenon in more detail.

Mushroom madness in New Guinea describes a behavior in which the affected men, apparently under the influence of previously consumed mushrooms, run amok and continuously terrorize, chase, and attack members of their own clan

or neighboring clans with spears or other weapons (Reay, 1959, 1960). Their irrational behavior may last for several hours or even up to two days. Other effects are shivering, double vision, and intermittent aphasia. The behavior of the affected women differs strongly: they ask their husbands to decorate them, seize their husbands' weapons, and start dancing, an activity that is normally forbidden to married women, giggle, flirt with several men, and boast about all sorts of sexual adventures they allegedly had (Reay, 1959, 1960).

The earliest available account about the mushroom madness was published by the missionary Ross (1936), who had studied the Mogeï tribe near Mount Hagen. Much more detailed are the reports by the Australian anthropologist Reay (1959, 1960), who had lived among the Kuma people in the Waghi Valley of the Western Highlands for an extended period during the fifties. Her comprehensive account of the life and culture of the Kuma, which included the mushroom madness, raised the curiosity of the ethnomycologists and led to the expedition that Heim and Wasson undertook in August and September 1963 into the same village where Reay had lived about a decade earlier (Heim & Wasson, 1964).

According to Reay (1965) the Kuma refer to the mushroom madness as “Komugl tai” if men are affected while they use the term “ndaadl” if women are affected. Both the compulsive dancing of the women and the aggressive displays of the men were usually tolerated by the other members of their communities. In general, no attempt was made to restrain the affected person, and most villagers would evade the aggressive men

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A typical village with traditional roundhouses in the Highlands of Papua New Guinea.

by hiding; it was even reported that, from a safe distance, women and children would encourage the mad persons in their behavior (Reay, 1959).

Heim & Wasson (1965) also reported a mushroom called Kirin which caused a similar mushroom madness among the Sina-Sina people of Chimbu. In addition, Heim (1973, 1978) reported the discovery of a comparable mushroom madness by the American anthropologist Hal Nelson among the Kaimbi in the Nebilyer Valley.

Mushrooms have played a considerable nutritional role for the people, and all community members were eating them throughout the year. Remarkably, however, not all persons eating mushrooms were affected. In a community of 313 members, only 39 were reported to be susceptible to Komugl tai or ndaadl (Reay, 1959). The Kuma believe that susceptibility to the effects of the mushrooms is hereditary and that usually only one family member of the same generation is affected (Reay, 1960).

It should be also noted that minor injuries

as a result of the Komugl tai have occurred, but no person has been reported seriously wounded (Reay, 1960).

Reay was a brilliant anthropologist with no mycological background. She tried to obtain descriptions of the mushrooms from the locals, and her enquiries produced a list of four mushrooms that were allegedly responsible for the Komugl tai and ndaadl (Reay, 1960). Reay's original list of local mushroom names was later extended and revised by Heim (1972) to include a total of twelve species from two completely different groups of basidiomycetes. During Heim and Wasson's visit in the Western Highlands in 1963 and with the aid of their ensuing correspondence with Reay, Heim was able to find a total of about 400 mushroom species in the area. He succeeded in identifying or describing those species that were thought to cause Komugl tai and ndaadl (Heim, 1965, 1972) and matching them with their local names. Accordingly, the mushrooms considered as responsible for the mushroom madness include

some boletes (order Boletales) and some species of the genus *Russula* (order Russulales). Among the boletes were *Boletus manicus* Heim, *B. reayi* Heim, *B. kumaesus* Heim, *B. nigerrimus* Heim, *B. nigroviolaceus* Heim, and *Heimiella anguiformis* Heim. *Boletus flammus* Heim was included as a species with doubtful effects. According to the locals those boletes caused both Komugl tai and ndaadl. In contrast to the boletes, the five species of *Russula* included in Heim's list are all thought to cause exclusively ndaadl and therefore would only affect women: *Russula maenadum* Heim, *R. nondorbingi* Singer, *R. pseudomaenadum* Heim, *R. agglutinata* Heim, and *R. kirinea* Heim.

Chemical analyses have been conducted with only one of these species, *B. manicus*. Chromatography performed by A. Hofmann from samples sent by R. Heim revealed that the species contained three indolic substances (Heim, 1965), compounds that frequently give evidence of hallucinogenic properties. Heim consumed a tiny amount of dried *B. manicus* material on three occasions, and in one of these he reported about luminous, brightly colored visions in a subsequent dream.

Regardless of those results, both the anthropologist (Reay, 1965) and the mycologists (Heim & Wasson, 1965) involved soon expressed their doubts about the causality of the mushroom madness as being merely a result of the ingestion of mushrooms. They assumed, especially in their later publications, that a great deal of the mushroom madness is more often a theatrical play than actual effects caused by the consumption of certain mushrooms (Clarke, 1965; Reay, 1977).

Considering the earlier reports by Reay (1959, 1960), mushroom madness must have occurred frequently at one time throughout the Waghi Valley. Yet, by the mid sixties it seems to have all but disappeared (Heim & Wasson, 1965). Only some of the older reports (Reay, 1960) still give a detailed witness account of those events.

Concerning the origin of the mushroom madness, there can be no doubt that one or more species of mushrooms are indeed the root cause of the phenomenon. The available reports from various independent sources (Ross, 1936; Reay, 1959; Heim, 1973) provide reasonably strong evidence of mushrooms as the main reason of the unusual behavior called Komugl tai and ndaadl. According to Reay (1965), mushroom madness

regularly occurred in the Waghi Valley during the '50s and earlier. Regardless of the described origin, however, it seems that in those villages where the mushroom madness had occurred regularly, the outbreaks may have become institutionalized (Reay, 1977). The villagers, as keen observers of the behavior displayed under the influence of mushrooms, may soon have discovered that pretending to be under the influence of the mushrooms might provide a similarly welcome diversion to village life even without the mushrooms playing a large role. Reay (1977) stated in her later papers that a complex mushroom ritual as a theatre play may have developed in which the mushrooms themselves were not necessary any more. In fact, Reay (1965, 1977) went as far as stating that mushrooms were not causing Komugl tai and ndaadl.

The ritualization of the mushroom madness and the question of how many generations ago it had developed remain the subject of anthropological considerations that are beyond the scope of this paper. Regardless of those deliberations, the central question remains to be resolved: which are the mushroom species that caused Komugl tai and ndaadl in the first place? It would seem rather doubtful that all the twelve species of *Boletus* and *Russula* included in Heim's (1965, 1972) list would have a psychotropic effect. Apart from the identity and efficacy of the concerned mushrooms, many other questions remain open. Why would only certain individuals be affected by the mushrooms? The explanation of a hereditary nature of the phenomenon, described in the literature seems more than unlikely, as there are no known cases of hallucinogenic mushrooms affecting only particular individuals. Likewise, the notion of certain mushrooms only affecting women and not men appears equally implausible.

From a mycological point of view, the central question about the identity of the active mushrooms remains open, despite the publication of Heim's (1972) preliminary list. The large majority of higher fungi that have hallucinogenic or other mind-altering properties belong to two main groups. The Amanitaceae, especially *Amanita muscaria* which played a significant role in the culture of many regions of the northern hemisphere, especially in Europe and Siberia, contain ibotenic acid and a few related substances as the active prin-

cept. The second major group of hallucinogenic fungi is centered around psilocybine as the active compound, and it comprises species of *Psilocybe* (Strophariaceae), *Panaeolus* (Copriniaceae), *Conocybe* (Bolbitiaceae) and *Inocybe* (Cortinariaceae). None of the mushrooms in Heim's list belong into these two categories. Nonetheless, a psilocybine containing species, *Psilocybe kumaenorum*, was mentioned by Heim (1978) as growing in the Waghi Valley (Kobi Tourrum), but it was not identified by the locals as a psychotropic species.

Heim included two major taxonomic groups in his list from the Western Highlands: Russulaceae (*Russula*) and Boletaceae (*Boletus* and *Heimiella*). Neither of these two families have previously been reported to contain hallucinogenic fungi, except for a publication by Singer (1958) in which he described *Russula nondorbingii* Singer from a herbarium specimen as a new species from New Guinea. His information about the hallucinogenic properties of the species was based on information from Australian sources who were not mycologists. According to Heim and Wasson (1965), *R. nondorbingii* is not identical with any of the species that were thought to cause ndaadl.

In summary, it seems that most of the information concerning the identity of the mushrooms causing ndaadl or Komugl tai is somewhat ambiguous. It is too late now, and it may well have been during the mycologists' visit in the '60s, to obtain reliable information from the villagers about the identity of the mushrooms causing the psychotropic effects. Nonetheless Heim and Wasson's studies and their mushroom lists are an invaluable foundation upon which more information can be sought.

Use of Mushrooms in the Highlands Nowadays

An attempt has been made here to investigate whether, 40 years after the detailed accounts by the anthropologist Reay and the mycologists Heim and Wasson, the so-called "mushroom madness" is still a part of the native culture in the Western Highlands of Papua New Guinea. One of us (W.A.) visited the village of Kondika in the Waghi River Valley, Western Highland Province of Papua New Guinea. This village is situated approximately two km from Kondambi, the village where Reay, Heim, and Wasson carried out their

ethnomycological studies. The choice of Kondika rather than Kondambi was taken because of easier access and also for safety reasons. Ample communication and exchange of information between adjacent villages in the Highlands is common; therefore, it appeared acceptable to do the interviews in Kondika. Interviews were held on October 22, 2002, and on April 19, 2003. A total of five people, aged between 50 and 90 years were interviewed. Interviews were held in Pidgin and the local language (tok ples), with the help of a translator. An attempt was made to record the local names of the mushrooms and reproduce them as closely as possible to their phonetic use; in some instances the spelling was adjusted according to the available literature (Heim & Wasson, 1964, 1965; Heim, 1972). Some descriptions of individual species were obtained from the villagers, but they are of limited mycological value. Attempts to collect some of the mushroom species involved were unsuccessful at the time of the interviews.

Some children and elderly people in the Waghi Valley are still collecting mushrooms today, but the amount gathered is only a fraction of what was once collected. Mushrooms are traditionally prepared as part of a mumu, with the food wrapped in leaves and covered by heated stones. Another method of preparation is to put the food into bamboo shoots before heating. Less esteemed mushrooms are simply roasted over the open fire. This traditional way is increasingly being replaced by the use cooking pots, which are readily available. Mushrooms are usually mixed with a variety of vegetables such as *Amaranthus*, *Pandanus* flowers, cooking bananas, or sweet potatoes (kaukau). It is important to note that mushrooms are always eaten as a mixed meal in which several species are lumped together.

Usually there are two to three mushroom seasons per year in Kondika. According to the villagers, those seasons are now inconsistent, as compared to a few decades ago. Our sources report that the rainy and dry seasons may occur at odd times of the year and are no longer as predictable as they used to be. Similar statements were obtained from people in other parts of the Highlands.

As in many other parts of the world where mushrooms are collected, villagers in Kondika reported about many telltale signs that would

indicate that the mushroom season has started: the song of male birds of paradise, the ripening of marita (red *Pandanus*), and the appearance of fresh leaves with a reddish hue in a variety of plants (for which only local names [kapkap, bopas, yamba] or Pidgin names [mosong kumu] were given).

Current Status of Komugl Tai and Ndaadl ("Mushroom Madness")

The following is an account of information provided by some villagers of Kondika in the Waghi Valley of the Western Highlands about mushrooms and the so-called mushroom madness:

There were no recent occurrences of Komugl tai and ndaadl in the Waghi Valley. According to the villagers, the last incidence of Komugl tai was in the early or mid '80s. Nonetheless, most of the older persons still remember the events and the circumstances that are connected with the mushroom madness and some still recall the visits of the mycologists and the anthropologist in the sixties. According to our sources, only two species of mushrooms are associated with Komugl tai; one is called Ngam Ngam, and the other one Ngam Kindkants. It was stressed by our sources that the mushrooms were never sought in order to experience mind altering effects. In fact, mushrooms were collected for their value as a food source, and side effects occurred as a coincidence if certain species were part of the meal. It is our sources' belief that only a small number of villagers, due to heredity, were susceptible to the effects of those particular mushrooms. Only one child in a family would inherit the susceptibility trait from their parent. The effect of the mushrooms on men, women, and children was described as follows:

After eating the mushrooms, a male person affected by Komugl tai would enter a different world. He might see some of his dead ancestors and might actually walk to their graves. Sometimes he would see the mushrooms or witches, ghosts, and spirits. Occasionally, the affected persons would see so-called little people trying to harm or tease other persons. The dreamer might then try to chase the little people away but in reality would inadvertently hurt the person the little people were trying to harm or tease.

When a man is experiencing Komugl tai, he is dangerous. People are scared and try to avoid

him. His behavior appears crazy, and he may become violent. People have been hurt, and a small number of people have reportedly died from attacks of people with Komugl tai.

Women are not dangerous when affected by ndaadl. Under the influence of the mushrooms, they get together and start dancing. Effects on children vary from those on men and women; they become rather drowsy and their skin may pale. Their parents would closely monitor them and in many cases would tie their legs together to prevent them from running away and seriously hurting themselves under the influence of the mushrooms.

An old man, probably in his nineties, reported his experience under the influence of the mushrooms: He saw tiny people with mushrooms around their faces. They were teasing him and he was trying to chase them away.

The mind-altering effect of the mushrooms was reported to last from 24 hours to a whole week. The first effects were said to occur only several hours after eating the mushroom meal. However, the affected persons may have a few sleepless nights after the main effects have passed.

One way to get rid of Komugl tai, according to the villagers, was to heat bamboo shoots in the fire. When enough pressure builds up, the bamboo shoots explode with a loud bang that would clear the person's ears and eyes. This is apparently linked to the belief that a person under the influence of Komugl tai would be temporarily deaf (his ears are closed).

Apparently, many other beliefs had previously been associated with the Ngam Ngam mushrooms: Komugl tai had been associated with the masalai (spirit) who would be able to move into the collector and cause Komugl tai once the mushroom is touched. From a large group of Ngam Ngam mushrooms, it was customary to pick only a few fruitbodies, in order to avoid offending the masalai and subsequent suffering from Komugl tai. It was also reported that snakes were sometimes found close to the Ngam Ngam mushrooms. There is also a belief that the oily, resinous substance on the surface of the mushroom stipes—a feature that can be found on many boletes—may cause the Komugl tai.

When asked about the possible reasons why there are no more incidences of Komugl tai, villagers expressed the belief that the associated

spirits have lost their power, since the people no longer believe in them.

Names of the Mushrooms

According to our sources there are only two mushrooms that used to cause Komugl tai: Ngam Ngam and Ngam Kindkants.

We also inquired about some other selected mushroom names that were reported by Heim and Wasson (1964, 1965). All of those selected names were still known by a few people. In the following we give a list of the mushroom names that were confirmed by the villagers:

Nonda. The general term for mushrooms.

Mushrooms that have effects like Komugl tai and nadaadl:

Ngam Ngam. According to Heim (1972) this mushroom is *Boletus reayi*. This bolete species blues on bruising. This seems to be the species that the villagers associate with the state of Komugl tai, which means it has mind-altering properties which are manifested after eating the mushroom. It is said to grow mainly in open grassland areas with only few scattered trees. Ngam Ngam used to be highly estimated and rare and was always prepared in a mumu, never roasted over the open fire like other less-valued mushrooms.

Ngam Kindkants. According to Heim (1972) this mushroom is *B. kumaeus*. A completely orange brown mushroom, flat, small, growing in abundance in grassland, it was known only to one old man in Kondika.

Mushrooms without effects like Komugl tai and nadaadl:

Nonda Gegwants. Heim (1972) identified this bolete as *B. manicus*. According to our sources this mushroom that is too bitter for consumption; however roasted it over the fire, it would lose its bitter taste.

Nonda Mos. This widespread and abundant fungus was described by Heim as *Russula maenadum*. Our own sources claimed that the fungus that they call Nonda Mos has a latex which would

indicate that it is a milky cap (*Lactarius*). It grows in forests on leaf litter, and can be found fairly close to the village. Nonda Mos is an esteemed mushroom.

Nonda Mbolbe (in Kondika known as **Bolbe Du**). This bolete is identical with *Heimiella anguiformis* (Heim, 1972). This is a common mushroom with a long stipe growing in grasslands. It has a bitter taste and is rarely eaten.

Koobl Tourrum. The scientific name of the mushroom is *Psilocybe kumaenorum* Heim (Heim, 1978). According to the villagers this species doesn't grow around Kondika but in the vicinity of Kondambi. It is a grassland species growing along rivers and creeks, is not known to cause Komugl tai, and, unlike the previously mentioned mushrooms, wasn't included in Heim's (1972) list.

Conclusion

When Reay visited the Kuma people of the Western Highlands of Papua New Guinea in the '50s, she could still glimpse a world in which Komugl tai and nadaadl were a vibrant part of the local culture. Fifty years later a few old people are the last witnesses of the inaptly named "mushroom madness."

Most of our sources' accounts are in complete agreement with the reports given by Heim and Wasson. Some of the information from the villagers in Kondika however, deviates from the earlier accounts given by Heim (1972): compared to the twelve species previously documented, villagers in Kondika recently indicated only two species, Ngam Ngam and Ngam Kindkants, as having the described effects. These two species were described by Heim (1965) as *Boletus reayi* and *B. kumaeus*, respectively, and they were also included in his list of active species. Surprisingly, another fungus, *B. manicus* (Nonda Gegwants), which is considered by Heim as the main candidate for causing the madness (Heim, 1978) and is the only species that has undergone both chemical testing and some limited self trials by Heim (1965), is not considered as a mushroom that causes Komugl tai or nadaadl by the villagers of Kondika. Our sources claim that it has a bitter taste, but that after roasting over fire, it can be consumed without any

effects. One of the five *Russula* species (Nonda Mos = *R. maenadum*), which according to Heim (1972) is considered as causing ndaadh in women without having any effect on men, is likewise not considered as having any effects at all (neither Komugl tai nor ndaadh) by the villagers of Kondika. The latter claimed that the fungus called Nonda Mos has a latex, which would indicate a milky cap (*Lactarius*). However, without examination of collections of these fungi, no conclusions as to their identity can be made here. Also, given the small number of people who are still knowledgeable about mushroom names, it appears likely that the information on mushrooms that was still widely available in the villages during the '60s is becoming less accurate.

It seems puzzling that it is so difficult to pinpoint the mushrooms that are the root cause of Komugl tai and ndaadh. A likely explanation might be our observation that mushrooms are always eaten as a mixed meal consisting of several species that have been found on a particular collecting trip. Also, the preparation method used, usually in bamboo shoots, may have contributed to a situation in which only a small number of the villagers may have ingested one particular species. Such a scenario would result in only a limited number of villagers being affected, depending on the amount of active mushrooms in the mixed meal.

It will be hard to establish the reasons why mushroom madness is no longer encountered in the Waghi Valley. The villagers confirmed that mushrooms, although still collected, don't play such a significant role for human nutrition anymore as they did previously. The likelihood of extraneous hallucinogenic fungi being ingested would therefore also decrease. Another possible explanation may be the fact that all the suspected active mushrooms in Heim's (1972) list are either Boletaceae or Russulaceae and therefore ectomycorrhizal fungi. Deforestation of woodland which has accelerated in the Highlands over the last decades, may well have contributed to a decline of the associated fungi.

With the vanishing of mushroom madness from the Waghi Valley, and due to the fact that most people who had an intimate knowledge of the mushroom species are no longer alive, future studies need to focus on obtaining plentiful collections of the mushroom species included in

Heim's list of active species. Those collections can form the basis for some chemical analyses of the compounds that might have led to the described effects.

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