KNOWLEDGE AND USE OF FUNGI BY A MYCOPHILIC SOCIETY OF THE VENEZUELAN AMAZON[1]

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CONOCIMIENTO Y USO DE HONGOS DE UNA SOCIEDAD MICÓFILA DEL AMAZONAS VENZOLANO. *La investigación etnomicológica en la tierras bajas amazónicas suramericanas es notablemente escasa. La gran mayoría de los estudios disponibles acerca del conocimiento y las prácticas etnobiológicos de los grupos étnicos locales de esta región no incluyen a los hongos, o bien, señalan que estos no tienen valor económico, o son alucinógenos o peligrosos para el consumo humano. Este trabajo reporta sobre el conocimiento y usos dados a varios hongos por parte de los Hotï, un grupo de indígenas suramericanos recientemente contactados que ocupan la Sierra de Maigualida del Amazonas venezolano. Los Hotï consideran al menos 31 taxa de hongos estimados como fuentes de alimentos, poderosos medios de cacería, protectores contra la magia negra, agentes medicinales o bien como adornos corporales. Los datos presentados aquí sugieren que los Hotï constituyen una de las pocas y raras sociedades micófilas en el Amazonas venezolano, pese a que los resultados analizados no agotan el número total de especies conocidas y usadas por ellos. Es necesario profundizar la investigación para alcanzar una idea más completa de la complejidad de las relaciones hombres-hongos en este grupo étnico.*

Key Words: ethnomycology; Hotï; Venezuelan Amazon; fungi; mycophilic society; mushrooms.

The study and documentation of folk people's classification and use of the biological world has experienced phenomenal growth during the last quarter century (see Economic Botany; Journal of Ethnopharmacology; Journal of Ethnobiology; Berlin 1992; Posey and Overal 1990, among others). However, some important gaps remain, notably the folk knowledge and valuation of fungi, or ethnomycology. Although fungi are considered to be one of the most abundant and diverse groups of organisms on the planet (Levetin and McMahon 1996), with an estimated 1.5 million species existing in the world (Hawksworth 1991; Læssøe 1998), surprisingly the literature on ethnomycology is extremely thin. A recent bibliographic search focusing on empirical descriptive accounts of local knowledge and traditional human use of fungi among Native American societies turned up a meager handful of scientific papers. Most of the systematic research on this topic pertains to Central America (de Avila et al. 1980; González 1982; Hazlett 1986; Mapes and Caballero 1981; Moreno-Fuentes et al. 1994, 1996; Shepard 1997; Shepard and Arora 1992; Wasson 1995) or North Amer-

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ica (Blanchette 1997, 2001; Franck and Radcliffe 1957; Timbrook 1990). The shamanic use of fungi has been reported on every continent (Ott 1994; Wasson 1961, 1968), which may explain why much of the ethnomycological literature worldwide is concerned primarily with the ritual and religious uses of fungi. Furthermore, this focus may be due to the common association of this group of organisms with hallucinogenic experiences, as more than 95 species are believed to have psychoactive properties (Ott 1994).

The literature on the ethnomycology of the native peoples of the Amazonian-Orinoco lowlands is particularly sparse and fragmentary. Brief and passing references to fungi can be found in broader anthropological or biological studies in which the main objective is to generate inventories of local economic natural resources, document the ethnotaxonomic knowledge of plants or animals, or describe the food habits of past or present cultural groups (Balée 1994; Cooper 1946; Dufour 1983; Lévi-Strauss 1950; Milliken and Albert 1996; Morey and Morey 1980; Prance 1972). However, most of the works in which some mention of fungi does appear contain only isolated references to one or a few kinds of edible or medicinal species. The major exceptions are the papers by Fidalgo (1965, 1968), Fidalgo and Hirata (1979), Fidalgo and Prance (1976), and Prance (1984), which report on the fungi used by several indigenous groups in the Brazilian Amazon, among them the Sanema and Yanomami groups who consume a wide range of mushrooms and therefore may be regarded as rare mycophilic groups (see also the review of this and other relevant data in Iturriaga et al. 1991). However, documented examples of fungal use by native groups of the Venezuelan Amazon are almost nonexistent. Although the ethnobiologies and subsistence ecologies of several different groups in this region have been well studied, hardly any mention of fungi is made. We found just four reports which mention fungi being used or even acknowledged by the local people of the Venezuelan Amazon. Finkers (1986) provided 11 vernacular names of fungi which are collected in gardens and eaten by the Yanomami, but apparently he did not collect voucher specimens and did not give any scientific identifications. Iturriaga et al. (1991) reported that some of the fungi growing on fallen logs in swidden fields, especially Lentinus crinitus L. ex Fr., were eaten by Yanomami of the Ocamo River, whereas members of the Piaroa group at Paria Grande claimed not to eat any fungi themselves but had heard of other indigenous groups doing so. Delascio Chitty (1992) mentioned two species (*Auricularia mesenterica* and *Polyporus* sp.) eaten by the Yekuana of the Upper Orinoco. De Civrieux (1973) included one mushroom (Agaricaceae) in a list of plants and animals classified by the Kariña and Makiritare (Yekuana) groups. Thus with the possible exception of the Yanomami, the existing literature on the subject leaves the impression that most native human groups of the Venezuelan Amazon do not have much knowledge of or use for one of the most diverse biological groups found in this habitat.

What might be the cause of the relative lack of attention given to fungi in the ethnographic accounts of human-natural relationships in Amazonia? One reason might be the cultural mycophobia shared by many western researchers (Fidalgo 1968; Shepard 1997). Another explanation might be that few mycologists have carried out field research in this region, and the botanists who have worked there are not particularly interested in fungi. But it may also be an accurate reflection of the lack of interest or even outright avoidance on the part of Amerindians who perceive this group of organisms as useless or even dangerous. An example is provided by the Warao of the Orinoco Delta, who classify all fungi as *hebu bure anahoro*: food of the vulture bush-spirit. The Warao describe this spirit as a fearsome creature that preys upon human life and is one of nine different spirit manifestations that may confront an individual three to four times throughout the course of his or her lifetime. When such encounters do occur, the sequence of events, as recounted by Warao informants, closely mimics a short-lived audiovisual hallucination. W. Wilbert (1992, 2001, pers. comm.) hypothesized that a fungus with psychotropic properties was consumed in ancestral times, and the hallucinogenic experience induced by this event led to the ideological codification of this particular class of spirits as part of Warao lore and their perception of natural reality. When faced with a stressful situation, the predisposed individual could trigger an episode of altered states without the influence of chemical stimuli. A similarly antagonistic perception is expressed by the Piaroa. Although this group does exploit

one edible species, *Auricularia delicata* (Berk.) Ryvarden (members of this genus are widely consumed in other countries, such as China and Japan, see Iturriaga et al. 1991), all other fungi are labeled *awethæ ukwæ irisi,* which translates as ''food of the malevolent bush spirit,'' and are consciously avoided (S. Zent field notes). Extrapolating from these examples, one might adduce not only that mycophobia may be a recurrent phenomenon among the indigenous societies of the Venezuelan Amazon, but also that the current paucity of ethnomycological data is in fact an accurate reflection of the general lack of utilization of this biological group. Nevertheless, some authors (Fidalgo 1968; Iturriaga et al. 1991; Prance 1984) have suggested that the fungi of tropical environments may actually turn out to be an important food resource under ordinary as well as stressful circumstances, being a rich source of protein among other nutrients (Parent and Thoen 1978), and certainly the case of the Yanomami hints at this potential.

In view of this contrasting yet incomplete picture, we suggest the need to expand efforts to investigate human-fungi interactions in the region. The present article attempts to contribute to the scientific understanding of ethnomycological knowledge and use in the Amazon by reporting the use and knowledge of fungi by the Hotï, who may be considered one of the few mycophilic Indian groups in Venezuela.

The People, Habitat, and Subsistence Ecology

The Hotï are a relatively small, interfluvial-based group of Indians with a population of less than 1000 who inhabit the Sierra Maigualida, which forms the border between the states of Amazonas and Bolívar, Venezuela (Fig. 1). Sustained contact between the Hotï and western society was established in 1969 and although some cultural changes have inevitably resulted from this encounter, nevertheless, they remain a relatively unacculturated and economically independent group.

Habitat

The Sierra Maigualida is one of the largest mountain ranges in the Venezuelan Guayana. The geology, geomorphology, biology, and ecology of this vast region are poorly described but thought to be very diverse (O. Huber pers. comm.). Geologically, the mountains are dominated by granites, with lesser extensions of pyroclastic-acidic volcanic rock, amphibolitic gneisses, and metasedimentary green schists (MARNR-ORSTOM 1988). Altitudinal variation is great, ranging from 150 to 2400 m. The microclimate is characterized by two seasons based on rainfall. Annual precipitation is 2400 to 2700 mm with a long wet season (>100 mm/month) from April to November and a short dry season from December to March. The temperature regime is characterized by an annual isothermic pattern; the annual variation is less than the daily variation, with daily maximum and minimum temperatures averaging 31°C and 21°C respectively (Zent 1999). Relative humidity is highly variable, ranging from 21% to 99%. The dominant vegetation types are mostly semi-deciduous and evergreen, basimontane to montane forests (Huber and Alarcón 1988; Zent and Zent 2001).

The Hotï at the time of first contact were described as an interfluvial-based group with a very dispersed and nomadic settlement pattern and a primarily foraging subsistence economy. Contemporary groups retain these basic characteristics although some modifications of settlement mode and subsistence have occurred as a result of cultural contacts and influences from outsider groups, mostly affecting the two mission-based Hotï communities at Kayamá and Caño Iguana. Our observations of the Hotï during 1996–1999 confirm their previous characterization as a traditional trekker group that spends significant periods of the year (>50% among some groups) residing and moving between short-lived campsites. Contemporary settlements are nonetheless variable in terms of altitudinal range (from 150 to 950 m), size (4 to 300 people), house number (1 to 25), distance to nearest neighbor (half hour to several days), inter-ethnic contacts (none, other Indian groups, foreign missionaries), and ecogeographical zone (mountain forest, lowland forest, savanna-forest ecotone). Hotï subsistence behavior continues to emphasize hunting and gathering as the primary occupations although dedication to horticulture has increased in the more densely and permanently settled mission communities; fishing has become more important among the communities located in lowland habitats where fluvial resources are more abundant. Terrestrial mammals (tapirs, peccaries, pacas) are hunted with steel-tipped lances and arboreal mammals (mostly monkeys)

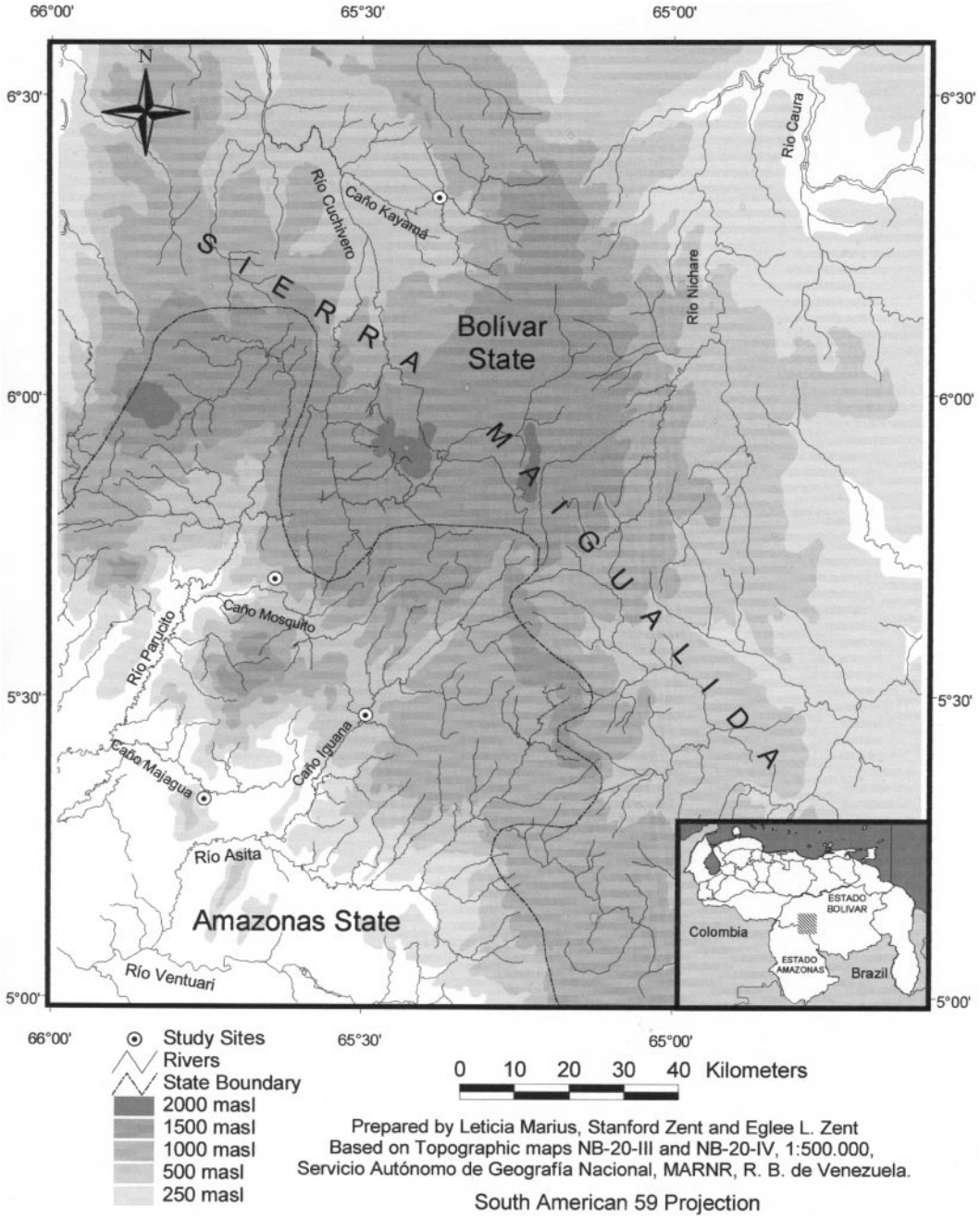

Fig. 1. Map of the study area.

and birds are shot with a blowgun and curare-tipped darts. A huge variety of wild resources such as fungi, palm larvae, honey, and numerous species of tree fruit are gathered as food items and as raw materials for making utensils, tools, ornaments, soaps, medicines, hunting magic, fish bait, firewood, and housing materials (Zent et al. 2001). More than 50 plant species are cultivated but six principal crops stand out as dietary co-staples: plantain/banana (*Musa* × *par-*

adisiaca L.), yams (*Dioscorea alata* L. and *D. trifida* L.f.), maize (*Zea mays* L.), sweet potato (*Ipomoea batatas* (L.) Lam.), and sweet manioc (*Manihot esculenta* Crantz) (Zent et al. 2001).

Research Sites and Methods

The data were collected during approximately twenty-one months of fieldwork between May 1996 and October 1999 and two follow-up visits in September 2001 and January 2002, by the first two authors. The fieldwork was mostly carried out in four Hotï communities: San José de Kayamá, Caño Iguana, Caño Majagua, and Caño Mosquito. Kayamá and Iguana are more acculturated, sedentary, mission-based settlements, whereas Majagua and Mosquito correspond to less acculturated, small and mobile, independent (i.e., nonmission) settlements. The research focused on Hotï ethnobotany and behavioral ecology and attempted to record both quantitative and qualitative aspects of their knowledge and interactions with plants and fungi. A variety of research methods were employed. The relevant ones for the present paper are the following: collection of herbarium voucher specimens, unstructured interviews about various ethnobotanical topics, participant observation of domestic and subsistence activities, and resource harvest accounting. A complete set of vouchers was deposited at the Ovalles (MYF) and the National Herbarium (VEN) in Caracas and many numbers were also sent to herbaria in Guanare, Venezuela (PORT) and St. Louis, Missouri (MO). The identification of the fungal specimens was performed by the third author. However, due to ethical considerations, the presentation of the scientific taxonomic information is intentionally imprecise. That is, in order not to violate the intellectual property rights of the Hotï that may derive from their traditional ethnomycological knowledge, we have chosen to refrain from disclosing the specific names of any fungi having local magical or medicinal significance and which therefore may be an indicator of bioactivity.

Ethnomycology: Classification, Edible Use, Hunting Magic, Personal Protection Charm, Human Medicinal, Ornamental

Classification

The rarity of ethnoclassifications of fungi in the scientific literature justifies their designation as the forgotten kingdom (Shepard 1997). Noteworthy exceptions include the works of de Avila et al. (1980), Mapes et al. (1981), Morris (2000), Shepard (1997), Shepard and Arora (1992), and Turner (2000), which show the significance of fungi to human society from biological, cognitive, and utilitarian perspectives. Although we do not claim to have exhaustively documented the entire range of fungal species known and used by the Hotï, we feel that we did record a sufficient amount of information to be able to provide a reasonably accurate outline of the Hotï ethnomycological classification scheme.

Among most groups whose ethnomycological classification systems have been well studied, such as the Tzeltal Maya, Shire, Sanema, Carajá, Nambiquara and Nahuatl (see the references cited above), the categorical dichotomy of edible vs. inedible poses the most fundamental criteria used to determine membership in a broadly-inclusive taxonomic grouping corresponding to the fungi in general, with inedible types generally being excluded from the segregate class. Viewed against this background, the Hotï case is especially interesting because the edibility of the fungus is not a segregative character. All fungi, whether considered useful or not, edible or not, are classified as being (*y*)*a*^{h}*kilo*,[2] a natural category recognized by the Hotï as being cognitively separate from the plant or animal domains by virtue of obvious perceptual discontinuities. Thus on one hand, *ã*^{h}*kilo* are defined as belonging to the *hai* or *hawa* noun classifier categories, similar to plants but different from animate beings (which are all classified as *hã*).[3] On

[2] Pronunciation of the term as *a*^{h}*kilo* or *y a*^{h}*kilo* appears to vary freely (i.e., without systematic patterning) according to different speakers, situations, and species, therefore we have chosen to represent the initial "*y*-" segment as optional at least for the time being. It should also be mentioned that *a*^{h}*kilo* refers to fungus in the singular whereas the plural form is (*y*) *a*^{h}*ki*. We have chosen to present the singular term as the categorical name in this paper because that is the most common term appearing in Hotï conversational usage.

[3] Noun classifier suffixes are a prominent grammatical design feature of the Hotï language and are common in many Amazonian languages (Dixon and Aikhenvald 1999). The classifiers categorize a given noun according to inherent properties such as shape, size, number, texture, material, and animacy. Similar to Piaroa (Zent 1992), a possibly related language, the noun classifiers are used in Hotï to designate morphologically related groups of natural organisms as well as artificial categories.

the other hand, most of the known mushrooms are characterized by two basic anatomical parts: *ba'ba* ''flat round disc'' in referring to the cap and *b^{h}lã* ''leg'' in referring to the stem (stipe) of the fungus, parts which are not attributed to any plant types. Furthermore, our Hotï collaborators and informants noted perceptual distance between *ã^{h}kilo* and plants and animals through various statements about their distinct morphological appearance, growth habit, or life cycle, such as (speaking directly about *ã^{h}kilo*) ''these do not have leaves, fruits, or flowers,'' ''some grow on the ground, others on trees, and others on both,'' ''it cannot move,'' ''it has no eyes,'' ''its parent is hidden/invisible,'' and ''many of them are born in the rain and die under the sun.'' Based on this evidence, we argue that the term *ã^{h}kilo* is a nonproductive lexeme that ostensibly refers to the Unique Beginner rank of a cognitively solitary fungi domain.[4] At a lower inclusive level, an unnamed distinction is made between *ã ^{h}kilo,* ''that grow on the earth,'' versus *ã^{h}kilo,* ''that grow on a tree or log.'' Though terminologically unmarked, these categories may be considered as covert life forms or intermediates (Shepard and Arora 1992). Meanwhile taxa at the generic level are clearly named through productive secondary lexemes which give information about the morphological appearance, use, ecological context, or symbolic association of the fungi being classified. Some of the common types of modifiers used to construct generic names refer to attributes of size (*hãlĩã^{h}kilo,* ''small fungus''; *uli ã^{h} kilo, ɨ,* ''large fungus''), color (*yãbo ã^{h}kilo,* ''white fungus''; *dɨelõ ã^{h}kilo,* ''red fungus''; *walea^{h}te ã^{h}kilo,* ''black fungus''), texture (*wãyo ã^{h}kilo,* ''soft fungus''), animal associations (*k^{w} ãi yo ã^{h}kilo,* ''spider monkey [*Ateles belzebuth*] fungus''; *^{h}tukuli y ã^{h}kilo,* ''hummingbird fungus''; *ib ã^{h}kilo,* ''howler monkey [*Aloutta seniculus*] fungus''; *ihko ã^{h}kilo,* ''snake fungus''), plant associations (*k^{h}aile ã^{h}kilo'k^{h}aile,* tree [*Micropholis melinoniana* Pierre] fungus), and spirit associations (*awelã a ã^{h}kilo,* ''female devil fungus''; *awelãɨ ol ^{h}Oka toto ã^{h}kilo,* ''devil earlobe fungus''). We recorded no unambiguous lesser inclusive taxa below the generic level (specific, varietal) but this result could change if research on this topic is extended.

Many fungi types are simply classified residually as *ã^{h}kilo* with no more specific designation given, indicating inclusion at the highest inclusive taxonomic level but no discrimination at lower inclusive levels. Application of the *ã^{h}kilo* term in that case serves to lump together in one broad residual taxon organisms that, due to their relative inconspicuousness or uselessness, do not have a more specific name. On occasion, for example when the local collaborator is pressed by an anxious researcher, these types of fungi may be further discriminated by referring to a salient character describing the momentary appearance of the individual, such as its color or host species, but such designations are inconsistently applied. This supports the claim that inconspicuous and useless species are perceived and categorized at the highest inclusive taxonomic level whereas only the conspicuous and useful species are discriminated at the lower inclusive levels. The ephemeral appearance and small size of some fungi might explain this sort of classificatory bias since there is a short time span in which to observe them in contrast to animals or plants, many of which are classified at lower inclusive levels despite having no known uses (Shepard and Arora 1992).

Edible Use

A common use of fungi by the Hotï is for dietary consumption. We recorded 11 edible species (see Table 1 and Fig. 2–5). These may be eaten raw, wrapped in Heliconia leaves and roasted on fire embers, or boiled in soups with other ingredients, such as grated plantain or mashed coroba palm fruit (*Attalea macrolepsis* Mart.). Different from Yanomami, Yekuana, and Piaroa mushroom harvesting habits, which take place mainly in swiddens, all fungi observed to be eaten by the Hotï are gathered in high forest

[4] Besides pointing out that such interpretation would put the Hotï in agreement with recent western scientific classifications of fungi as occupying a separate kingdom, we also consider it insightful to compare what some other authors have to say about the taxonomic status of fungi in the groups they have studied. For instance, Balée (1994) found among the Ka'apor (Brazil) that fungi cannot be easily classified as to life form and therefore its affiliation with the plant domain ''remains unclear.'' Hunn et al. (n.d.) contend that for Mixtec Zapotec (Mexico), mushrooms represent an unaffiliated life form, subsumed by neither plant nor animal kingdom. We found these interpretations to be strikingly resonant with our assessment of Hotï classification of fungi, which suggests the need for more comparative research aimed at testing the hypothesis that folk biologists across different cultures perceive and classify fungi as a distinct natural domain.

TABLE 1. UTILITARIAN FUNGI COLLECTED FROM 1996–2001 BY THE HOTÏ.

Latin name	Hotï name	Voucher number
Agaricus sp.	H*ŋ*ɨLIɨ*ŋ*ɨ*O*KLɨLOɨ	ZHMO–2037
Amauroderma cfr. *omphalodes* (Berk.) Torrend	*ŋ*WEL*ŋ*ɨ Y*ŋ*ɨ*O*KiɨLOɨ	ZHKA–2414
Amauroderma sp.	W*ŋ*LE*ŋO*TE (*ŋ*WEL*ŋ*ɨ HAI) Y*ŋ*ɨOKIɨLOɨ	ZHKA–2413
Auricularia delicata (Fr.) Henn.	*ŋ*WEL*ŋ*ɨ Y*ŋ*ɨ*O*KIɨLOɨ	ZP-0686-01
Auricularia polytricha (Mont.) Farl.	OLEOɨ*O*KA ILU*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2471
Datronia caperata (Berk.) Ryvarden	H*ŋ*ɨLIɨ *ŋ*ɨ*O*KIɨLOɨ	ZHMO–2036
Lentinus crinitus (L.: Fr.) Fr.	L*ŋO*LE TOTO *ŋ*ɨ*O*KIɨLOɨ	ZHKA–2473
Lenzites sp.	OLEɨ*O*KA TOTO Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2460
Lenzites acuta Berk.	*ŋ*WEL*ŋ*ɨ (OLEɨ*O*KA TOTO) Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2412
Lenzites acuta Berk.	L*εO ŋ*WEL*ŋ*ɨ *ŋ*ɨKIɨLOɨ	ZHKA–2468, 2475
Mycena sp.	*O*TUKULI Y*ŋ*ɨ*O*KIɨLOɨ	ZHMA–0820
Pleurotus sp.	ULU *ŋ*ɨ*O*KIɨLOɨ	ZHMO–0948
Polyporus sp.	L*ŋO*LE *ŋ*ɨ*O*KIɨLOɨ	ZHKA–1880
Polyporus tenuicolus Beauv.: Fr.	*O*KOLE *ŋ*ɨ*O*KIɨLOɨ	ZHKA–1881
Polyporus tenuicolus Beauv.: Fr.	ULI *ŋ*ɨ*O*KIɨLOɨ	ZHMA–0856
Pycnoporus sanguineus (Fr.) Murril	DUɨELOɨ *ŋ*ɨ*O*KIɨLOɨ	ZHMA–2183
Xylaria sp.	IL*OO*B*ŋ*BO *ŋ*WEL*ŋ*ɨ y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2417
Thamnomyces chordalis Fr.	*ŋ*WEL*ŋ*ɨ ABI*O*YE Y*ŋ*ɨKIɨLOɨ	ZHKA–2469
Xylaria sp.	H*ŋ*ɨLIɨ *ŋ*ɨ*O*KIɨLOɨ	ZHMO–2035
Macrocybe titans (H. E. Bigelow & Kimbr.) Pegler, Lodge & Nakasone	*ŋ*W*ŋO*TO Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2470, ZHKA–2476
	*O*KW*ŋ*YO W*ŋ*ɨY*ŋ*	ZHMO–1008
	*ŋ*WEL*ŋ*ɨ *ŋ*ɨ*O*KIɨLOɨ	ZHKA–2416
	*ŋ*WEL*ŋ*ɨ *ŋ*Uɨ *ŋ*ɨ*O*KIɨLOɨ	ZHKA–2391
	*ŋ*WEL*ŋ*ɨ IL*OO*B*ŋ* Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2417
	*ŋ*WEL*ŋ*ɨ Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2466, 2467
	H*ŋ*ɨLIɨ *γOKγO* Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2474, 2465
	I*O*KO *ŋ*ɨ*O*KIɨLOɨ	ZHMO–2018
	WE*O*TOLO K*ŋOKŋ* Y*ŋ*ɨ*O*KIɨLOɨ	ZHKA–2472
	KO*ŋ*ILEBOLAɨ *ŋ*ɨ*O*KIɨLOɨ	ZHMO–2070
	ULI *O*KW*ŋ*YO W*ŋ*Iɨ YE *ŋ*ɨ*O*KIɨLOɨ	ZHCI–2307
	ULI γɨKγɨ *ŋ*ɨ*O*KIɨLOɨ	ZHMA–2198

habitats. This is consistent with their ecological heritage as nomadic deep forest hunter-gatherers. The fungi eaten by the Hotï are collected opportunistically, often upon encountering them while engaged in other activities. The opportunistic circumstances of their exploitation also means that our specimen collections were also opportunistic and probably did not cover the entire gamut of species exploited. In favor of this conclusion is the fact that some ethnotaxa (e.g., *hãlĩ ãʰkilo* and *uli ãʰkilo*) actually encompass more than one scientific species and these broadly descriptive terms (''small fungus'' and ''large fungus,'' respectively) also serve as synonyms or alternative labels for certain types that are named otherwise (e.g., *hãlĩ ãʰkilo = Ohtukuli y ãʰkilo, uli ãʰkilo = ŋãwato y ãʰkilo*). A few examples illustrate this general point. One sample was collected when conducting a structured interview in an ethnobotanical forest plot. The female informant,who was also carrying her two year old son, spotted a patch of *hkole ãʰkilo* which had grown up overnight. She immediately interrupted the interview and proceeded to collect more than a kilogram of the fungi, wrapping them up in a bundle covered with leaves of *awe-*

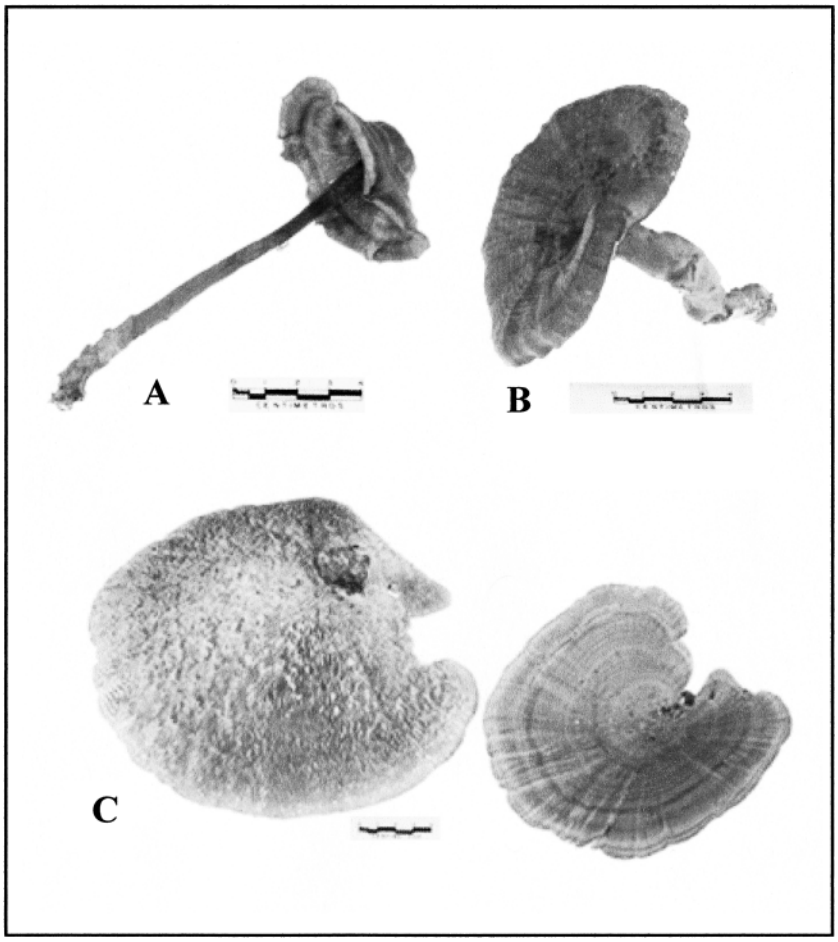

Fig. 2. Some commonly eaten Venezuelan fungi: **A.** *Amauroderma* sp. (Zhka-2413); **B.** *Amauroderma* cf. *omphalodes* (Berk.) Torrend. (Zhka-2414); **C.** *Lenzites acuta* Berk. (Zhka-2412).

la aiye (*Heliconia hirsuta* L.f.) which was tied with bark strips of *hãl ɨ lo Oʰkwe* (*Sterculia* spp.). She explained that *hkole ãʰkilo* is highly appreciated for its delicate taste and is used as an ingredient in soups or as a roasted snack. The day before, in exactly the same context, another woman collected 300 grams of *laʰ le ãʰkilo* which had also emerged since the previous night. This fungus is also eaten in soups as well as roasted. Two other species indiscriminately called *hãlĩ ãʰkilo* are similarly eaten by the Hotï raw or cooked whereas another species, *ʰtukuli yãʰkilo*, is preferred to be eaten raw. Some types of fungi (*ibu ãʰkilo, ɨkhãil boma ãʰkilo, ɨ duelõ ãʰklõ/ti ãʰkilo*) are said to be eaten by animals such as monkeys, armadillos, turtles, rats, and tapirs (Table 1). Meanwhile many *ãʰkilo* species are considered to be the staple food of the *awelã* which are described as spirit beings that inhabit the forest and are regarded as potentially harmful to humans. Both male and female, young and old people were observed to collect and consume edible mushrooms; thus no gender or age-related preferences were evident. However, one male informant claimed that women were more avid and knowledgeable collectors of such resources.

Hunting Magic

Another prominent use of fungi observed among the Hotï is as an ingredient in hunting magic concoctions (*au kwã*). More than one hundred folk biological taxa, including plants and fungi, were recorded as being agents or in-

Fig. 3. Woman holding child and specimen of *Polyporus tenuicolus* Beauv. (zhka-1881).

Fig. 4. Boy displaying fresh individual of Tricholomapaceae, Agaricales.

ductors of imperceptible powers that allegedly enhance and sharpen the skills of hunters seeking to capture game. Most of these species grow wild in the high forest habitat, including all of the fungi used for this purpose. Tree barks, leaves, roots, fungal bodies, hymenia, pilei, fungal flesh or fluids, and some ant species are the active materials employed by Hotï hunters to make explicit the intangible or only abstractly perceptible concatenating links of cause-effect among the human, animal, plant, and fungal domains. The magical potions are often prepared in a liquid form or involve water (*au*) as a key ingredient and the methods of administration include: baths (*au ib*), ablutions (*au dɛlɛ*), libations (*au wãi*), and inhalations (*au iyõkwa lãhãu*). The ritual procedure is invested with a sense of respectful spirituality that goes beyond a simple material rationality and makes behaviorally explicit the power and value of the plant and fungal spheres for the human and animal spheres. The effects apparently do not last long as the hunter must take the potion the day before or the same day as the hunt, sometimes even after the game animals have been spotted and pursued. Our collaborators explained that arboreal animals, especially monkeys and birds, sometimes ''do not fall'' after being shot with

Fig. 5. Man showing the edible mushroom, *Macrocybe titans* (H.E. Bigelow & Kimbr.) Pegler, Lodge & Nakasone (Zhka-2476), a well known species but previously unreported as being eaten by people.

curare-tipped darts. When that happens, the hunter will drink or sniff a bit of the magical potion in order to kill the animal or cause it to fall to the ground. The specific botanical or fungal species selected for the hunting magic depends on the hunter's knowledge and experience as well as the species of the targeted animal prey. In some cases, a particular magical species will be used because it is known to be effective for capturing a particular game species. Another set of fungi and plants, however, seems to act in a more general way, apparently being effective for hunting a broad spectrum of game animals.

The appeal to hunting magic in order to ensure a successful hunt seems to be associated with depurative rituals designed to restore the hunter's shooting aim or his favor with game animals that have been injured due to personal transgressions of one of the biotic spheres. Such transgressions include violating food taboos, eating meat in the company of pregnant or menstruating women, offensive social behavior, or inadequate handling of the *wãyã,* which is described as a yellowish green secretion or bile that is contained within the body of different, but not all, game animals (monkeys and tapir have it, but deer do not). The exact anatomical location of the *wãyã* varies according to the animal species but at least in mammals it is situated in or near the liver. The *wãyã* is considered to convey a very powerful magical force that somehow adheres to plants, fungi, animals, and people, affecting them at different levels. The adhesive component in the botanical or fungal sphere does not have a consistent location either and varies with the plant or fungus. In some species, it is concentrated in the sporangium or spores, barks, or roots, but in others leaves, fruits, or fruiting bodies are the bioactive agents that catalyze and trigger the attempted action. When hunted animals are butchered, the *wãyã* must be carefully extracted without spilling it and then carefully buried in the ground. When this is not done the hunter loses his hunting prowess and must then resort to certain magic-bearing species. One of the fungi specifically sought out for this purpose is the *uli kʰOwayo wãyã y ãʰkilo,* ''spider monkey bile fungus,'' which is said to resemble the color and form of the *wãyã* of the spider monkey (*A. belzebuth*). This example reveals that at least some of the magical species are chosen according to the logic of the doctrine of signatures: morphological resemblance between the plant or fungus species and the animal species is interpreted as a sign of mystical relationship. The complex of hunting magic practices and beliefs reveals that the human, animal, botanical, and fungal domains are dynamically interrelated in the Hotï view of nature. Dreams and songs, associated with successful hunting practices, draw a more complete picture of the multifaceted nature of Hotï hunting art. Through dreams certain species of animal prey are selected for planned hunting expeditions, songs are sung to attract the animals within the hunter's sensory field, and the hunting magic substances promote a productive outcome. The imagined or real effectiveness of these activities leads to the question: where does one draw the line between so-called objective universally valid knowledge and more subjective culturally relative understandings? A possible rational explanation for Hotï magic hunting habits may be similar to that found among the Matsigenka of the Peruvian Amazon. The Matsigenka hunters drink a potion of cultivated *Cyperus* spp. in order to sharpen the sensorial skills (sight, hearing, hand-eye coordination) they use for hunting, but in doing so they may really be taking advantage of the bioactive secondary compounds of fungi from the genus *Claviceps* which usually are present on the cultivated *Cyperus* (Shepard 1997, 1998). A synergistic interaction between the fungi and the *Cyperus* may be responsible for the medicinal properties attributed to the *Cyperus* spp. alone. The many wild plants used by the Hotï could potentially exhibit analogous phytochemical activity.

Personal Protection Charm

Several different mushroom species we encountered and collected are monotonously named as *awelãŋ ã ʰkilo,* ''devil fungus,'' or some variation thereof (*awelã ol ʰkatoto y ãʰkilo,* ''devil earlobe fungus''). As mentioned, the *awelã* are purported to be rarely seen, commonly feared forest creatures who are very dangerous and lethal towards human beings. The *awelã ãʰkilo* constitute one of the most significant vegetable foods of the *awelã,* and this trophic exchange is interpreted in Hotï cosmovision as implying a deep connection on spiritual as well as materialistic planes which can then be manipulated by humans through magical means. Thus people imbibe liquid potions (*au wãi*), including one or other of these fungi, in order to avoid a

fatal encounter with the deadly *awelã*. Moreover, the *awelã* are reputed to be common instruments for inflicting injury or death by enemy sorcerers. So the *awelã* are consumed to provide protection against the magical aggressions of enemy shamans. The *awelã ole^{k} toto y ã^{h}kilo,* so named because it resembles an *awelã* ear, is widely used for this purpose. The threatened person who consumes the fruitbody of this mushroom is able to ''communicate'' to the *awelã* and makes a plea for salvation from the bewitchment. The *awelã* is able to hear the person by virtue of their having consumed its ear and may be persuaded to do the person no harm and furthermore may even be convinced to turn back their homicidal tendencies onto the enemy who sent them in the first place.

Human Medicinal

A less conspicuous yet still important use of fungi observed among the Hotï was as medicine for physical or even spiritual ailments. One allegedly potent curative species is employed to alleviate the pain, discomfort, and weakness associated with fever, anemia, and arthritis. It is also reputed to be effective for ''returning safely'' to the human body a ''lost soul stolen by bush spirits.'' It is administered by burning it under the hammock of the ill person, who then inhales the smoke produced thereby. Another species (*uli k^{h}wayo wãyã ã^{h}kilo*) is reported to be sniffed to cure headache. It is interesting to note that some Yanomami subgroups of the Brazilian Amazon also use several fungal species for medicinal purposes. We expect that more medicinal species may be discovered if research on Hotï ethnomycology is expanded.

Ornamental

A beautiful dark purple fungus is used ornamentally by some women. It is collected fresh for this purpose and worn as earrings. This particular use might even have sexual connotations still to be explored.

Conclusions

The Hotï classification and use of fungi show the people to be one of the few mycophilic groups living in the Venezuelan Amazon and indicate that fungi represent a significant portion of the local biodiversity of their habitat. The data presented in this paper support the claim that fungi constitute an integral and dynamic sphere in the ideological and material environment of the Hotï. From a classificatory perspective, fungi are a clearly discriminated and segregated domain, different from plants and animals in the Hotï cognitive space, even though only a portion of the locally present fungi are differentiated by a generic name (the most common, conspicuous, frequently observed or used species). From a utilitarian standpoint, some fungi are appreciated for their flavor and texture and not just eaten as an emergency or famine food. Other species are also considered to be powerful aids in a complex set of magico-religious beliefs and activities designed to attain a successful hunt. Another set of fungi are consumed to provide personal protection from harm attributed to malevolent beings (*awelã*) or enemy sorcerers, while others are exploited for their therapeutic treatment of somatic ailments. One species was found to be utilized for bodily adornment. There could very well be other uses and meanings attached to fungi by the Hotï not reported here because we admit that our study, which was carried out opportunistically during the course of a larger ethnobotanical research project, did not set out to make an exhaustive examination of the topic.

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