

THE FORGOTTEN MUSHROOMS OF ANCIENT PERU

DR. PETER TRUTMANN

GUARDAMUNT MOUNTAIN CENTER

Global Mountain Action, Via Corridore 17, 6644 Orsilina, Locarno, Switzerland

ptrutmann@globalmountainaction.org www.globalmountainaction.org

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ABSTRACT

Evidence is presented to demonstrate extensive use of mushrooms in pre Hispanic Peru. Mushroom images were found on ceramics, metal objects and textiles from a range of important cultures from the north and south, as well as coastal and highland Peru. The objects range in age approximately between 1200-200 BCE to the time of European conquest. Most abundant, vivid images of mushrooms were found from art of the Moche/Mochica culture, although other in cultures mushroom representations were also clear. Mushrooms, (realistic or abstract) were associated with what appear to be personalities of high authority, to shamans/curanderos and sacrificial victims. Realistic images of mushrooms commonly found associated with shaman like figures were often of high quality and allowed identification of some mushrooms to at least genus level. Identified were *Calvatia* species, *Morchella* species, *Amanita muscaria* and *Psilocybe* species. Some mushrooms could not be identified, because current knowledge of mushrooms of Peru and its neighbors is limited. The identified mushrooms have various characteristics: *Morchella* and *Calvatia* species have both culinary and medicinal properties. Others, like *Amanita muscaria*, and *Psilocybe* species have spiritual as well as medicinal properties rather than culinary uses. Since *A.muscaria* has not been confirmed growing in Peru and its traditional hosts are northern hemisphere trees one hypothesis is that the mushroom were a trade item with countries lying further north or Meso America where *A.muscaria* has been shown to have been deeply engrained into the religious cultures. The implications and importance of the findings are discussed for understanding of Peruvian cultures and the ancient mind and history. Various suggestions are made to advance archaeological research by integrating better mycological expertise to improve understanding of these remarkable ancient peoples.

INTRODUCTION

Humans have ancient connections to mushrooms. Our ancestors in every inhabited continent on earth used mushrooms. Why? It appears that they were aware of and used the power of mushrooms medicinally, nutritionally and spiritually. Curiously, fungi are probably the most wholesome product that combine nourishment with medicine. They combine high digestable protein, deep mineral and organic essence of the earth with defense and sometimes neurological compounds that are of use to us due to the phylogenetic closeness of fungi to us. Mushrooms are in essence a medicinal food tailored to humans.

The oldest known representations of mushrooms have been found in Africa on petroglyphs from as early 9000 BCE, suggesting that already then they played an important part in human rituals (Samorini G. 1992). The 5000 year old iceman found in Italian alps a few years ago also was carrying mushrooms probably for medicinal reasons, or as fuel. The Romans and Greeks used mushrooms for various purposes including food: *Amanita caesarina* was a favorite food in Roman times (Phillips R. 1981). Ling-Zhi, Reishi (*Ganoderma lucidus*) is known from 2000 year old Chinese medicinal documents as their most valued medicine, the herb of eternal life (Hobbs C. 1986).

That said, fungi, unlike ancient crops or medicinal plants, have received little attention in archaeological or

anthropological studies. The most written about ancient fungi have been those connected with entheogenic species like *Amanita muscaria* and *Psilocybe* species (Schultes 1939, Wasson & Wasson 1957, Borhegyi de 1961, Allegro 1970, Furst 1972, McKenna 1992, Gartz 1995, amongst others.). Wasson & Wasson (1957) believed, the use of entheogenic mushrooms spread over most of Eurasia and the Americas, and as Stone Age Man emerged into the light of proto-history fungi may well have been the primary secret of his sacred mysteries and the development of religion. The reasons for the scarce coverage of the role of fungi in human history maybe the lack of mycological knowledge in archaeological circles, and probably stigma associated with such of research. The result being that in most cases mushrooms in ancient art have been interpreted in almost amusingly erroneous ways (Samorini G. 1992).

In line with the global archaeological and historical trends mushrooms have been rarely mentioned in archaeological literature of Peru. A few authors noted their presence, but their suggestions fell mainly on deaf ears by the academic community (Schultes 1972, Morgan 1995, Borhegyi de 2010). Most notably though, (Poma de Ayala 1615, p282-5) a famous indigenous writer in the 'Nueva Cronica y Buen Gobierno' [apparently either using information principally from the remarkable mestizo, legally dead, Jesuit priest Blas Valera, or was his alibi (Hyland 2011)] in passing mentions the significance of mushrooms (Kallampa) in dreams of death in Inca times in the chapter on rituals and ceremonies. He also denotes the month March as the month where mushrooms for food are plentiful in March (p. 1137/8) and notes their importance as food in the Inca diet.

In contrast to the few references in Peru on mushroom use there is substantial mention in the literature of plants and of hallucinogenic plants like *Banisteriopsis* spp. and species of the genus *Psychotriatha* that produce the DMT containing entheogen 'Ayahuasca', as well as of San Pedro (*Echinopsis pachanoi* syn. *Trichocereus pachanoi*), and of Coca (*Erythroxylum coca* and *Erythroxylum novogranatense*). To illustrate the point, an amazon.com search quotes at least 69 books on Peru and ayahuasca, 70 books on San Pedro and Peru, and of course 468 books on Coca and Peru. In contrast, the www.amazon.com search comes up with nine (9) books on mushrooms and Peru, all are related to modern cooking. The San Pedro cactus is well described in art and objects from the Chavin, Nasca to the Mochica cultures, and Ayahuasca is represented in Chavin art. Coca Is well known from Inca times and the early chroniclers. Morgan (1995) summarized a number of the ancient entheogens in Peru and surrounding countries, including the use of San Pedro and Coca and other commonly used plant based entheogens like those used referred to as vilca, or huila in Peru from the leguminous tree *Anadenanthera colubina* var. *cebil* and *Nicotina rustica* that were commonly used as snuff.

Considering the paucity of information on mushrooms in Ancient Peru, this study aims to begin to illuminate the role of fungi in ancient Andean societies. The objectives of this study are:

1. To document evidence that mushrooms were used in pre Hispanic Peru .
2. To begin to determine which cultures used mushrooms and to establish and make a first estimate of a time line.
3. To determine where possible the likely identity of mushrooms and their use.

It is hoped that this preliminary study will stimulate further interest to better understanding of ancient and indigenous Peruvian people, to revalue the role of mushrooms in society, and stimulate new and further work on this neglected subject, since we now better understand not only the high nutritional and medicinal value but also the crucial ecological role of fungi in the maintenance of life. I apologize from the beginning to colleagues in various fields, particularly in archaeology and anthropology for my inadequate coverage of the impressive amount of literature on history and cultural knowledge of Peru. In not doing so I have left much of their work unacknowledged. However, I believe that it is important to bring out the information on mushrooms in ancient Peru earlier rather than later for it to be available in the overall efforts to better understand the history and use of its biological diversity of this remarkable country that has played a central role in the history of humanity.

MATERIALS AND METHODS

Materials

For the analysis ceramics, textiles and stone work were visually examined for mushroom representations. The base materials were derived mainly from the Museo Larco, Lima, who kindly provided me with access to their full online collection. Other material was obtained from various museums in Peru and around the world and the internet. Other material was collected directly in the field by the author. Sources of information are acknowledged when used.

Identification of mushrooms

To identify mushrooms the shape, color, representational details of ancient artists, as well as the relative size to the known usually human features were observed. These were compared with known mushrooms from Peru, and the world, using various sources. A major limitation with identification of the mushrooms was the limited documentation of mushrooms in Peru. Major identification sources were (Pavlich 1976, Arora 1986, Stamets 1996, Pavlich 2001, Wright & Albertó 2002, Mata et al. 2006, Holgado et al. 2007 and collections in 2001 and 2012 see www.globalmountainaction.org)

RESULTS AND PRELIMINARY DISCUSSION

Mushrooms in Ancient Peruvian Cultures

The first step in evaluating the importance of mushrooms was to document their use through time by different cultures. In the past Peru had many cultures that flourished and disappeared. We know of most only through archaeological evidence and names retrieved through folklore, or attributed to them by those studying them, since no form of pre-conquest writing is yet known to have existed or has survived. The findings that follow result from a limited survey of ceramics, textiles and other art and are not meant to be exhaustive, but rather preliminary. The purpose of this section is to demonstrate the presence of mushrooms in various cultures over time.

Coastal Cultures

Cupisnique Culture (1200-200 BCE)

Cupisnique culture on the north coast existed from around 1200–200 BCE and declined at a time when the Moche or Mochica culture was gaining in strength. A beaker in the Metropolitan Museum (Fig. 1), depicts a mushroom tree, probably a tree of life. The mushrooms are being shown in cross section. Initial finds at the recently found Cupisnique Callud temple, around Lambyeque also show themes associated often associated with mushrooms in other cultures, such as feline images and decapitated heads (Orozco 2008), although the connection, if any, with a spider deity is unclear. The presence of mushrooms in Cupisnique culture suggests mushrooms in Peru were known and used as long as in the oldest Meso-American societies, like the Olmec, who have been shown to have used mushrooms.



Figure 1. Cupisnique mushroom beaker. Source: Metropolitan Museum 1978.412.113

Paracas Culture (800 –100 BCE)

Paracas culture prominently features mushrooms in its textiles and ceramics. Some may be taken for Tumi's (mushroom shaped ritual knives) and perhaps the duality was an intended part of the symbolism. In other cases it is clear the images represented are mushrooms. The textiles in figures 2 (a and d) show shamanic beings in flight with a mushroom shaped structures in either one or both hands (an unlikely tumi scenario). Flight was a shamanic ability brought about by the use of entheogens, which here may be represented by the yellow mushrooms. The 'google' eyed image in figure 2b holds two yellow capped mushrooms on a staff like structure in the right hand (also an unlikely Tumi scenario). On the head there also appears a mushroom like image. The ceramics in figure 2c, show a spider like creature in a trance holding a conical capped structure and one on its head, characteristic of *Psilocybe* mushrooms. The representation of mushrooms in the Paracas culture may indicate their role in the transformation, since through transformations it is believed shamans were able to communicate and even battle with spirits and thus heal illnesses or become clairvoyant.

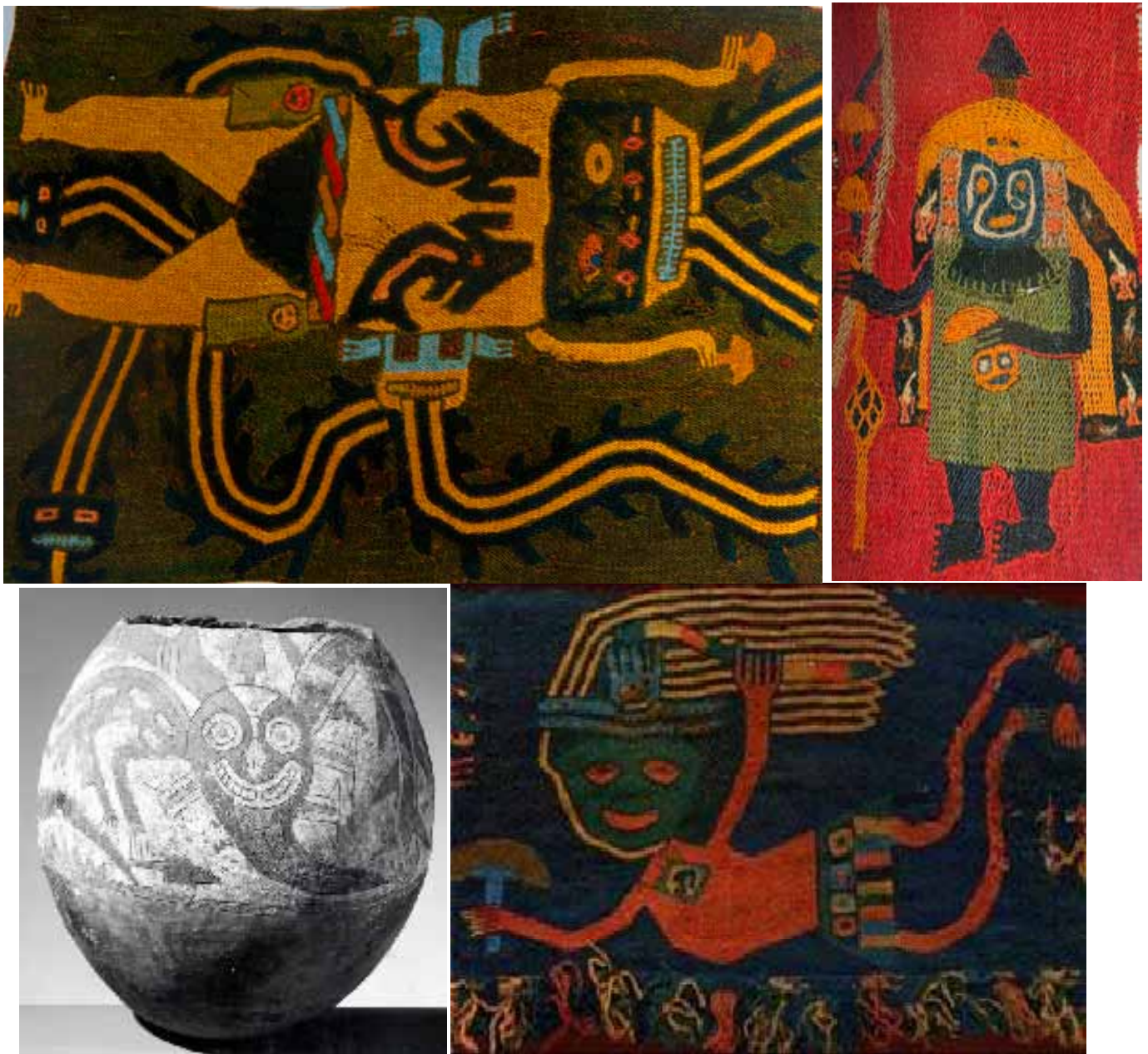


Figure 2. a) shamanic figure in flight with mushroom images in both hands b) Image with mushroom on head and attached to a staff like structure, and holding a trophy head. c) Anthropomorphic figure with mushroom symbol on head and either tumi or mushroom in hand. d) Flying shamanic figure with mushroom in hand. Sources: a) Metropolitan Museum 1979.206.751, b) Norbert May rock Collection NM237 c) Metropolitan Museum 1979.206.751 d) from Berhagyi 2010.

The Moche (Mochica) culture (100 BCE-800 EC)

The Moche, a well known culture for its ceramics and spectacular archaeological finds ((Bawden G. 1999), (Quilter J. 2011)), produced ceramics with unmistakable representations of mushrooms. As a society they share many similarities with the Tumaco-La Tolita and Valdivia culture of Ecuador and Colombia (Errázuriz J. 1980). They provide the most expressive, varied and the most clear evidence of all the Peruvian cultures that mushrooms were used and played an important part in ancient Peru. They developed highly realistic representations of people and daily life. As such, Moche art provides a window into the minds and rituals of its people unequalled in other culture. Through it, there is a unique chance to better understand the role of mushrooms in the ancient Peruvian world.

To begin, there appear to be three different forms of mushroom representations in Moche society. The first, there are unmistakable, large realistic representations of mushrooms (Fig 3). The second, subtle 'hidden' representations of mushrooms that are easily missed if one is not looking for them, but clear when one has found them. The third form is an abstract symbolic or iconographic representation of mushrooms or uses with which they were associated. Only, the direct representations will be discussed here.

The Moche represented mushrooms clearly enough to enable us to begin to identify some of the species at least to Genus level and thus begin to relate them to current knowledge about the fungi associated with the Moche.



Figure 3. Moche ceramic figures with mushrooms protruding from their heads, representing medical and perhaps spiritual use of mushrooms. Sources: a. Borhagyi 2010, b) Peabody Museum 16-62-30/F729 c. Symbol of the Foro Medicina Traditional Peru. d) Museo Larco ML000136

Each of the highly realistic, individualized busts of Moche personalities is loaded with iconography and symbols including mushrooms. The images (in figure 3) have unmistakable mushrooms either on top, or on the side of the head, and figure 4d has both. The image (Fig.3a) has a mushroom growing over his head, with the gills and mycological characteristics of the mushrooms clearly shown. The mushroom appears to have free, light gills that are terminal split or at least appear split to an observer. The stipe is brown and has no annulus. The precise nature the image is presented alone demonstrates profound knowledge of the Moche of mushrooms. The image on the lower left (fig. 3c) is clearly what would today be called a curandero. The individual is kneeling above a child who is evidently ill. On his head there is a prominent mushroom. It is an example of medicinal use of mushrooms in ancient Peru. The image on the top right (Fig 3b) has a unmistakable red capped mushroom with white dots. The examples carry mushrooms known for food, medicine as well as religious use. (For more detail see the identification section). They demonstrate that the Moche had various uses for mushrooms. It should be interesting to check mushroom definitions in early dictionaries of the now extinct Moche language.

The extent to which mushrooms are represented in Moche society, especially from ceramics from particular areas such as the Virú valley suggests mushrooms may have been more important in some places than others. Moche images will be presented in various sections of this paper to demonstrate associations of mushrooms in ancient Moche and some Peruvian society.

The Chimú culture (900-1470 CE)

The Chimú culture became dominant in northern Peru after the decline of the Moche societies with whom it was linguistically and culturally closely associated. The culture lasted until they were integrated into the Inca Empire around 1462-1470 AD. There is clear evidence of mushroom representations in Chimú art and thus of the continuation of mushroom knowledge from one time period to the next. On the bottom left (Fig 4), we see a Chimú textile with a figure (Schindler 2000). On his head we see a mushroom like crescent, not unlike that seen in important personalities of Moche societies, and perhaps symbolic of spiritual and earthly power. The stipe of the mushroom is unlike a typical tumi, it is shaped with what looks like a volva typical of *Amanita* species. We see a similar image in Borhergyi (2010) where the Chimu image is standing above a mushroom (without volva) growing from the ground. On the bottom right (Fig.5) we see a textile of a priestlike figure also holding a mushroom with volva in his right hand. with a mushroom cap whose spots are reminiscent of the genus *Amanita*.

On the top right (Fig.6) there is an example of the association of mushrooms with Tumis in Chimu society. The tumi, a religious sacrificial knife, not only is mushroom shaped by has a long neck with birds and a head out of which mushrooms are growing.

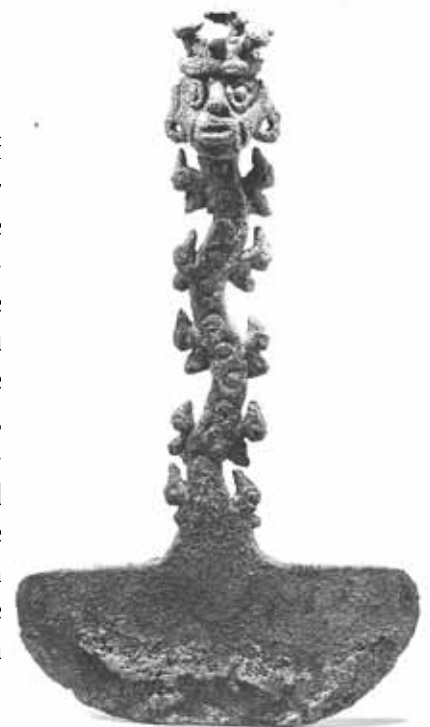


Figure 6. Chimú tumi with mushrooms
Source: Metropolitan Museum Number:



Figure 4. Personality with mushroom with volva on head.
Source: Norbert Mayrock Collection NM297



Figure 5. Priest with *Amanita muscaria* mushroom. Lambayeque 900-1300 CE (Chimu?) Source: Metropolitan Mu-

Highland Cultures

Pukará Culture (1200 BCE – 400 CE)

The Pukará culture was of profound formative importance in the region for the Tiahuanaco and Wari cultures that succeeded it. Some indigenous groups like the Callawaya still speak a language based on a mixture of Ayamara and Pukará. The Pukará site built under a rock formation with looks like a feline, probably a puma.

Few Pukará ceramics have been evaluated to date, however there is strong visual evidence that mushrooms were used ritually. In figure 7a, a ceramic feline representation of the Pukará culture has red mushroom cap shaped ears attached to a what appear to be mushroom stipes of slightly darker color. The feline has 'google' eyes, suggesting a trance state. This image can be found repeated in numerous similar ceramics. It is a curiously similar design to that found of the Wari culture where the anthromorphic feline, has undisputable mushrooms instead of ears (see Figure 11).

The Pukará culture also produced mushroom shaped stones (Fig.7b). Their caps appear more like young mushrooms, but with clear deliniations of stipe and cap. They may also have phallic symbolism, but lack an orifice as well as a realistic phallic head shape suggests the principle intent was to represent a mushroom. Certainly they are not just wights (pesas) as indicated in the museum.



Figure 7.a) Jaguar with with mushroom ears b) mushroom shaped stones . Source: a & b. Museo de Pukará

The 'Mushroom stones' of Chucuito, Lake Titicaca

On the North west side of lake Titicaca, in the town of Chucuito, there are stones, finely carved from volcanic and other rock, in the shape of mushrooms (Figs. 8 & 9). The age of the stones is not known. They may be from Inca times or earlier. The Chucuito mushroom stones, although less elaborate, have similarity to those found in Mexico and Guatemala (Borhegyi, 1961) whose original purpose also is not yet known.

The pre-columbian temple, which now houses the stones, was studied and verified as an Inca structure in 1950 by Harry & Marion Tschopik (Kummer L.J. 2006). However, it appears no serious studies have yet been conducted to better understand the context of these stones. The stones bear little resemblance to sculptures at Tiahuanaco on the other side of lake Titicaca, but do have striking similarity to the mushroom stones of the Pucará culture in the north (Fig 7b). Some of the sculptures may have some similarity to Inca stonework, although no Inca mushrooms sculptures appear to have been found at other sites. For the purpose of this study the culture will be referred to as the Chucuito Culture, a culture which appears to have had connection to the Pucara and Inca cultures.



Figure 8. Inka Uyo, with the collection of mushroom and ordinary roof bearing stones found in and around Chucuito
Source: Peter Trutmann©2011

The origin and purpose of the mushroom stones remains a mystery. There has been an unfortunate confusion created by a decision by the town in the 1970s to bring together in the genuine late Inca temple structure called Inka Uyo, all mushroom stones found in and around Chucuito to create a tourist attraction as a temple of fertility for which it is now famous (Figure 8). In a New Times article Kummer (Kummer 2006) questions the authenticity of the temple of fertility, and whether the stones truly represent phallic stones. Incredibly, neither he nor the anthropologists he consulted touched the possibility of the stones representing mushrooms,

or their deeper symbolism. One Peruvian archaeologist considered the mushroom stones to be roof beam baring stones of Inca buildings (ibid). It is true that of the over seventy stone structures at the temple only 14 are mushroom shaped. The rest are classic Inka roof baring stones (Fig.10a). These are straight stone cylinders on a square base that were implanted into the wall of the buildings like those common of Inca structures found in other parts of Peru (10c). Of the mushroom stones, those with clear caps (fig. 9), only one has clear dual phallic features (Fig 9c). Its dimensions much larger than the other mushroom stones. It is the only one with



Figure 9. a- f. Mushroom shaped stones with stipe of various lengths and clearly defined caps. 9f. Dually symbolic mushroom/phalus stone with apical orifice but clear mushroom cap, rather than phalus head shape. The orifice could also represent the entrance to the underworld as could the v shaped stone in 9d.

an apical cleft.

Over half of the mushroom shaped stones in the temple could also have functioned as roof bearing stones with special mushroom symbolism (Fig. 9 b). Although these mushroom stones are more finely worked, they have shafts of similar length that could have carried beams. They also have a base similar to the ordinary roof bearing stones that could have been lodged within a stone wall (Fig. 10a,b,c). They are all almost identical in form, suggesting they were manufactured for the same structure or official use. Perhaps, they were used to decorate the top of a temple that used mushroom or their symbolism? That symbolism may have included fertility.

The other mushroom stones found in Chucuito have shafts of shorter lengths (Fig.9c-e). These shafts are so short they would never have been useful to secure a roof beam. or so large (as in the case of the phallic mushroom stone shaft and cap measure 1.2 m) that it is unlikely that its original use was to bear beams. It suggests that these mushrooms were intended to be placed on the ground.

Using the findings, there is a strong case that in ancient times around ancient Chucuito mushrooms were considered with sufficient reverence to carve stones and images of them. The mushrooms fit into evidence of pan Peruvian use in pre Hispanic times. Although we cannot yet identify the mushrooms represented at chucuito with certainty for lack of mycological knowledge of the region, or know their exact use, it is likely that one association was associated with fertility and/or feline transformaton related rituals, since Chucuito also is associated with the Puma.



Figure 10 a) A roof bearing stone b) A collection of roof bearing stones in a backyard in Chuquito. c) Inca house at Machupichu with roof bearing stones implanted in the wall. Source; Peter Trutmann©2006 and 2011

Wari culture (500 to 1000 CE)

The Wari (or Huari) Culture was a highland culture, which dominated most of present day Peru. It occupied Pacacamac, a major religious site and Andean mecca, although it retained much autonomy, and took over much of the territory formally occupied by the Moche. They are believed to have made major technological and organizational breakthroughs such as development of an extensive road structure as well as the use of terracing for Agriculture.

The Wari culture also incorporated elements of earlier Tiahuanaco culture, including representations of the personalities of the gate of the sun in Tiahuanaco, as well as elements of Nasca style art. The ceramics often depict realistic, rather than abstract, images with symbolism, much like the Moche societies, that enable easy identification of mushrooms. For example, the vase below (Fig 11 a) contains a painted anthropomorphic image reminiscent of the Pucará puma with fungal structures reminiscent of Pucará ceramics. The feline fungal ears differ in that those of Pucará represent mushroom caps, whereas those of the vase are the form of puffballs.



Figure 11. a) Anthropomorphic image with puffball mushroom ears Source: Caceres j. 2004.

Mushrooms and the Incas (1200 –1532 AD)

Little material was studied from the Inca period. Nevertheless, considering that the Chimu culture connected chronologically directly to both the Moche, Wari and to the Inca cultures, it is very probable the Incas knew of mushrooms. The Inca were known to incorporate other religions and worship into their own as seen in Pachacamac and other sites of conquered peoples. Certainly, we know from Poma de Ayala (Poma de Ayala F.G. 1615) that in Inca times mushrooms were part of the indigenous diet. Furthermore, Inca mythology and language is highly suggestive of an association with mushrooms (Delgado Diaz del Olmo 1996).

There are pieces from the Machu Pichu collection returned by Yale and now housed in the Museo Machupichu that show the Incas produced images of mushrooms in gold (Fig.12). The pendant contains an cross-sectional image of a convex to broadly parabolic mushroom cap, the shape of some neotrophic mushrooms. There are also mushroom shaped earplugs. From what remains of the color, they were clearly painted red with what faintly appears like white dots. Coming from Machu Pichu, a sacred site, it would not be far fetched to suggest that sacred mushrooms may have been part of ritual life and symbolism in such a richly forested region filled with some of the greatest biodiversity in the world?



Figure 12 Mushroom shaped Penant. Source: Museo Machupichu, Casa Concha, Cusco. Photo: petertrutmann©2012

Cultures of the Selva and Amazon Basin

Information about pre-Hispanic mushroom use in the Selva and Amazon basin is limited. Gartz (1996) mentions:

*“Jesuits of the 17th and early 18th centuries who had traveled to the western Amazon (Peru) reported that the Yurimagua Indians habitually prepared a potentially intoxicating potion derived from a tree-dwelling mushroom. The mushrooms appeared on fallen trees as a kind of reddish growth with a spicy taste. The potion was said to be so potent that nobody who swallowed three mouthfuls of the brew was able to resist its effects. The mushroom was considered to be *Psilocybe yungensis* Singer & Smith. However, since *Gymnopilus* species are reddish in color and tend to colonize dense tree trunks, those strange tree-dwelling mushrooms were most likely a *Gymnopilus* species”.*

There are few studies of current mushroom diversity in the Peruvian Amazon. The most complete study document substantial diversity of mushrooms including consumption of over 30 species for food by indigenous groups (Prance 1984 , Door & Abad 1990, Espinoza 2003, Mata et al 2006). Ethno-mycological reports of sacred mushroom use by Amazonian groups near Peru were made by Schultes and Reichel-Dolmatoff (Davis 1997). Although *Psilocybe cubensis* and other *Psilocybe* species have been reported from the Peruvian Selva (Pavlich 1976, Guzmán 2009), there is no ethno-mycological association as yet with these fungi. Mushroom use is known by present day shamans practicing ayahuasca rituals from the Pucalpa and Iquitos regions. They do not use mushrooms, but know about them. Their belief is that mushrooms are from down below, associated with the underworld, and prefer to leave them alone. (Trutmann 2009).

It is clear from these studies that in the Amazon basin some indigenous groups used mushrooms in religious rites and today still use substantial diversity of mushrooms for food and for religious rites. Perhaps these groups will be able to provide insights into their significance and use by ancient Peruvian societies.

Identification of mushroom species

One of the Mushrooms found represented clearly in Moche (Fig. 13b) and Chimu societies (Fig. 5), containing volva, a red cap and/or with dots undoubtedly are representations of the famous *Amanita muscaria* (Fig. 13a) . It may be represented in more abstract terms in the art of other cultures such as the Paracas, and Incas. Some scholars believe *A. muscaria* to have been associated with humanity since formative period of religion by ancient peoples from Europe to Asia in the old world and Meso America of in the new world (Wasson 1972). In his writings Wasson provides evidence to suggest that the 'Soma' of the Indo Europeans was in fact *A.muscaria*. Borhegyi (2010) describes its use in Mesoamerica. It has to date never been reported as used in ancient Peru.



Figure: 13 a) *Amanita muscaria* mushroom. b) Moche figure with *A. muscaria* mushroom c) Dried *A. muscaria* Sources: a) PeterTrutmann©2011 b) Peabody Museum 16-62-30/F729 c)

The *Amanita* enigma

Amanita muscaria, belongs to the genus *Amanita*, a group of white spored basidiomycetes with a universal veil that covers the young fruiting structure. *A. muscaria* is characterized by red caps with white dots that are remnants of the torn universal veil. The stipes (stems) have a bulbous base called a volva and an annulus or ring. It is an ectomycorrhizal fungus that forms symbiotic relationships with a wide variety of trees, including pine, spruce, fir, birch, and oak that are principally northern hemisphere trees. Only oaks have as southern limit the northernmost part of the Peruvian Selva (Bush & Flenley 2007). From this perspective it is not surprising that *A. muscaria* has in modern times not been recorded in Peru. How then can it be that *A. muscaria* representations were found in Moche figures that are more than a thousand years old? The first possibility is that it has to date not been carefully and extensively looked for in Peru. This remains a likely possibility, since as mentioned, Peru remains relatively unexplored from a mycological perspective. It may be found in the most northern part of Peru to which northern cultures would likely have had access. There is also the possibility that *A. muscaria* uses other tree hosts in Peru. Many *Amanitas* in South America from southern Brazil northward and east of the Andes are symbionts of leguminous or polygonaceous plants and few *Amanitas* of the region (as well as many in the continent's southern "cone") may not require a mycorrhizal partner (Tulloss R. 2006). Information from Australia, a southern hemisphere country, indicates that *A. muscaria* is able to form new associations with southern beech and now is considered as a weed. It is also invading native rainforest in Australia, where it may be displacing native species. There are also reports of its association with *Eucalyptus* in Portugal. Thus, it is likely that in ancient times *A. muscaria* had already adapted to other host trees common to the Andes in areas where its normal hosts no longer grew.

The other option could be that *A. muscaria* used by Peruvians did not originate from Peru but was imported. Since trade is known to have been extensive in pre conquest times, it may be that dried *A. muscaria* was a prized trade item with northern lying countries, especially in Central America. Dried mushrooms would appear a perfect trade commodity due to their light weight and probably high commercial value (Fig. 13c). Curiously, it is also in the dried form that *A. muscaria* was most commonly used in many cultures, because as such it had a higher potency and had less gastrointestinal toxicity particularly if parboiled. It is noteworthy that Wasson et al (1986 p.48) quoting work of Robert Laughlin of the Smithsonian with Tzotzil speaking Mayas in Chiapas, who use the term for *A. muscaria*, 'tzajal yuy chauk' meaning red thunderbolt's yuyo. The fly agaric is still called the 'yuyo de raya', a latinized version. Astoundingly, the origin of the word 'Yuyo' appears to be Quechua. How would such a word have entered into the Mayan language? If true, there must have been substantial contact between the peoples pre Hispanic times probably up to the Spanish conquest. The word 'yuyo', which today in Quechua has meanings such as 'wild herb' must have been used intensely enough to have displaced a local word in the local vocabulary, where it stayed as a reminder. Without (or with little) native *A. muscaria* frequent trips from the Peruvian coast, where large trading rafts were documented at the time of first arrival of the Spaniards, could have shipped this highly valued item from Meso American shores where *A. muscaria* grew and people knew how to prepare them for use probably by the Peruvian elite who might have controlled its use.

It will be a challenge to prove the origin of ancient *A. muscaria* in Peru, whether it was a trade item or whether it was collected locally. If the mushroom is found in Peru it may have been introduced with northern host trees, like pines, since the European invasion. Molecular genetic studies will be required to compare isolates with known isolates from across the world to provide information on similarity. The best avenue to start might be to search for fungal residues in ancient ceramics. If *A. muscaria* spores were to be found comparison could be made of the ancient DNA with known strains since molecular studies of the taxonomic status have been conducted (Geml et al 2008). *Amanita* from Chiapas or Guatemalan highlands or other places in the world should have a different DNA fingerprint to a native Peruvian *A. muscaria*.

Calvatia and other Lycoperdon based Puffball species

Mochica and Wari ceramics often have globular, or semi globular, structures with or without some element of a base that are broader at top than base (14a,b), and with or without spots on the upper surface (Fig.14a,b). The colors range from white to dark brown. These structures growing out of heads have in the past often been classified as war-clubs (pora). To mycologists these structures, like other mushrooms already described, are clearly fungal. At first glance contenders look like either young fly agaric specimens, or Puffballs of the Order Lycoperdon. *A.muscaria* can be ruled out due to the white to brown, rather than red, representation *A.muscaria* (See Fig.13b), and the inverse conical nature of their stem like structures rather than more or less cylindrical stipes with caps.



Figure 14. a) Mochica shaman or 'curandero' with *Calvatia cynthiformis* affinis on head b) Wari bowl with anthropomorphic figure with young *Calvatia* species probably *C. cynthiformis* ears. Sources: a) Museo Larco, Lima b) Caceras J. 2004. c) *Calvatia cynthiformis* mature d) *Calvatia cynthiformis* immature. Photos: c & d Peter Trutmann©2011.

The candidates that best fits the description of both coloration, overall shape and basal attachment are members of the large puffball genus, *Calvatia*. Various *Calvatia* species grow in the Andes and may have been used. *Calvatia cyathiformis* and related species, are the most likely candidates (Pavlich M.R. 1976). since they are commonly found in the savannas of the Andes. Its outer peridium or skin is either smooth, as in white specimens (Fig.14d), or warty as in darker, older specimens (Fig.14c), showing a distinct mosaic pattern that resembles the dots on the Moche structures (Fig 14 a,c). The short stalk like sterile base is thin at the bottom and broad at the top similar to ceramic representations.

We are only beginning to discover the traditional uses of *C. cyathiformis* and related species in Peru. *Calvatia* is consumed by local especially Quechua speaking people when young and tastes like cheese. It has high in protein value reportedly of the order of 50%. *Calvatia* species have found widespread use in the folk medicines of various cultures, especially as a haemostatic (styptic) to stop bleeding and wound dressing (Baker 1989). With this in mind, could it be that it as used as such in pre Hispanic times as such in Peru? Some Moche images suggest that they may have been used to stop bleeding (scarring) of wounds. For example, figure 15 shows a warrior with a *Calvatia* like fungi strapped to his head. Could it have been used as a battle wound dressing? In the figure *C. rubrotincta*, a redish *Calvatia*, might be represented. Although it has not yet been recorded in Peru it is characterized by red spots when young and is very similar to *C. cyathiformis* (Arora 1986 p.687). Could it be the Moche were representing in these ceramics persons injured in warfare with the dressing of wounds? In the Andes of Argentina *C. cyathiformis* is known as “polvillo del diablo” and still used for the scarring of wounds (Martínez and Luján 2011).



Figure 15. Moche warrior with two *Calvatia* species with red dots on head.

Calvatia has been used to treat a variety of other ailments such as leucorrhoea, pneumaturia, inflammation, diarrhea in calves, etc. and has anti-cancer properties (Coetzee and van Wyk 2009). *C. cyathiformis* and other puffballs may also have had use in spiritual rituals. Evidence for this comes from Colombia. Reichel-Dolmatoff, the renowned anthropologist archaeologist described the use of a blue puffball in ritual use of psychoactive mushrooms among the Kogi, the descendents of the Tairona (Reichel Dolmatoff 1977 p. 285). *C. cyathiformis* is known to have purple spores when aged, and can turn bluish. It may be the fungus described by Reichel Dolmatoff

Psilocybe species.

There is clear evidence that *Psilocybe* species were used by the Moche and other societies like the Paracas where conical shaped mushrooms were represented in textiles. Below a Moche shaman or priest is shown with a head dress that look remarkably like young *Psilocybe* species (Fig.16) similar to *Psilocybe semilanceata* or even *Psilocybe cubensis* (Fig.17). Many other Peruvian examples of mushrooms with curled cap cross-sections such as those of the Cupisnique and Inca cultures are likely also to represent *Psilocybe* species since it is a characteristic of various and have been used as such in Mesoamerican cultures (Borhegyi 2010). Even in Inca mythology there association of golden conical caps and lightning, with the origin myths and the founding of Cusco (Delgado Diaz del Olmo 1996).

To date only a few *Psilocybe* species have been reported in Peru (Pavlich M.R. 1976, Guzman et al 2000, Guzmán G. 2009). These include *P. cubensis*, *P. yungensis* and *P. zapotecorum*. *P. cubensis* is thought to have been introduced later after the European conquest with livestock that reached the Andes through the Caribbean. However, this is but speculation. It is just as likely that the species rep-



Figure 16 Moche personality with young *Psilocybe* featured on the back of his head. Source: Museo Larco, Lima



Figure 17 Young *Psilocybe cubensis*.

resented in the ceramic was already present in Peru though the movement of populations, Andean livestock and trade. If so it may well have been *P. cubensis* that was represented in the ceramic.

Psilocybe species were used as an entheogen in Meso America, and documented in Mayan and surviving Aztec texts such as the Popol Vuh. In the middle of the last century their use was rediscovered. Wasson brought these rituals to the attention of the world (Wasson R.G. 1957) documenting veladas of the local curandera, Eva Menéndez (Maria Sabina). Mexico is now known as a centre of diversity for *Psilocybe* species. Guzman et al (2000) list over 50 species of *Psilocybe* species from Mexico alone. In comparison, probably due to indifference or taboo, the discovered species in Peru seem few, as do the number of species collected in neighboring countries.

Morchella Species

One stunning Moche ceramic has three mushrooms on its head (Fig18 a&b). Two of the mushrooms are sculpted on the side of the head with a light stipe, without annulus or volva. The brain-like cap appears oval to conical with light edges and darker interior grooves. The representations most conform to specimens of the genus *Morchella* (Arora 1986), most probably *M. elata* (Fig.18 c) or *M. esculenta* (Fig.18d). Both species have been found in the highlands of Peru (Pavlich M.R. 1976, Franquemont et al 1990, Holgado et al 2010). Although there are dots painted on the fungi this is most probably not an *Amanita* due to the absence of a universal veil and its morphology. Instead, the fungus has the shape and the dots are likely to represent the darkened gaps between of the web-like spore-bearing tissues of the cap.

Morchella spp. are prized edible mushrooms by Quechua speakers around Cusco (Holgado 2010). Although we do not yet know its medicinal use in the Andes, *Morchella* species are used in other continents for medicinal purposes. For example, in traditional Chinese Medicine they are used to treat indigestion, phlegm, croup, and shortness of breath ((Ying et al. 1987). Recent studies have also shown *M.esculenta* has anti cancer and oxidant properties. Stamets (2005) further mentions a *M. galactomannan* that illicit a positive immune response to macrophages.

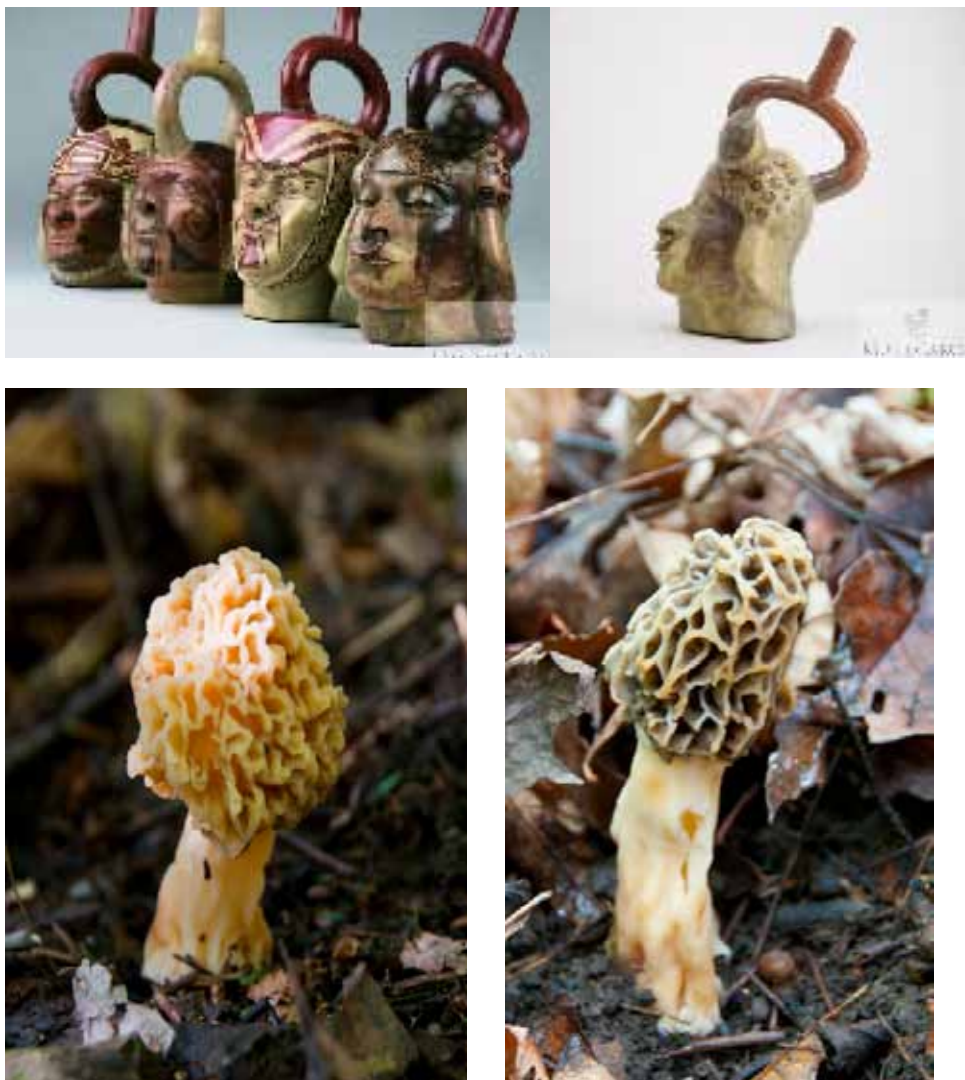


Figure 18 a & b) Mochica with Mochella like fungus on two sides of the head c) *M. esculenta* d) *M. elata*,
Sources: a & b) Museo Larco ML000136, c & d) petertrutmann©2010)

Uncertainty: a *Psilocybe* or a Plutenoid mushroom

Figure 19 (a) shows a man with two mushrooms on his head. The one on the side of his head with a broad light stipe and dark brown enclosed cap appears to be a *Morchella* elata described previously (Fig. 18 d). The second mushroom with an inverted cap (Figs 19 a&b), provides a splendid insight into the craft and knowledge of ancient Peruvians of mushrooms species. Through the intricate representation of the picture we are told that the fungus in question has a cap appears flat conical, and lepitoid from this angle. The mushroom is sizable, about 5-10 cm wide with a stipe 10-15cm. This is a large mushroom. The gills are white or light colored, terminally bifurcate, and free or almost free from the stipe. Classical for free gilled fungi is that a portion of the pileus can be seen as a small ring at the top of the stipe as seen represented by ancient artists often presented as in a classic description of free gilled fungi (Largent 1974 p28). The stipe is slender brown without annulus ring, and we cannot see a volva. From its size, the mushroom looks may be young or mature. If it is young it could be either light or dark spored at maturity as do some *Psilocybe* species such as *P. semilanceata* (Fig 19c). If it is a mature specimen, the spores are most likely light colored. Few known *Psilocybe* species are so big or have brown stipes. It may be an as yet unidentified pluteotoid fungus. The lack of volva or annulus and brown stipe rules out it being an *Amanita* or a *Lepiota* species. It may still be a *Volvariella* species, which although it has a volva conforms to size and shape and more or less the color, and lacks an annulus (Fig. 19d). These have been found in the Andes (Pavlich 1976, Trutmann et al 2012). The original ceramic would have to be examined for a better diagnosis.



Figure 18. a) Moche figure with mushroom showing gills protruding from head. b) Close up of mushroom. c) *Psilocybe semilanceata* d) A plutinoid species of the genus *Volvariella* from Cusco. Sources: a & b) Museo Larco c) Stamets 2001 d) Peter Trutmann©2012

Uncertainly: A mushroom with brown decurrent gills: Cortinoid ?

An other fascinating mushroom structure found in Moche ceramics is the trumpet like mushroom, similar to the chanterelles, or *Cortinarius* species, such as *C. magnivelatus* (Fig.19a&b). There are a number of other possibilities. The mushrooms are characterized by an uplifted cap with brown, possibly decurrent or at least attached gills. It suggests the fungus has brown or dark spores). It has a short, robust brown stipe, perhaps with a ring. It is interesting that the two examples shown have dark brown caps decorated with symbols: either a hooked loop, or white spots reminiscent of the fly agaric. Both symbols suggest ritual religious use associated with sacred properties associated with *A.muscaria*. For these reasons it is presumed the fungus is entheogenic. However, its identify remains a mystery and reinforces the need for further study of macro fungi in Peru.



Figure 19. a and b) Moche ceramic figures with brown gilled mushrooms with upturned caps protruding from their heads. Sources: Museo Larco, Lima

GENERAL DISCUSSION

Evidence that mushrooms were used in pre Hispanic Peru

Although the scope of this study was limited, substantial evidence has been collected to demonstrate that ancient Peruvians extensively used mushrooms medicinally, religiously as well as mushrooms of high culinary value. We now know Peruvian ancestors were highly expressive in representing mushrooms in ceramics, textiles and sculpture representing them either realistically, or stylistically and symbolically. The extensive use of mushrooms in ancient Peru is in stark contrast to the mycophobia and apparent stigma that dominates modern Peruvian society and expressed by the virtual absence of literature on the subject in the country. Recent scientific advances have demonstrated the critical role fungi play as food, medicine and for ecosystem function (Stamets 2005). In hindsight, the change from a mycophilic to mycophobic society after the conquest may have had consequences on the wellbeing of the society as a whole and contributed to environmental degradation due to the devaluation of natural resources such as fungi. The extensive forests were cut or burned for pasture, building materials and fuel (Herreria A 2009) and indigenous peoples and their customs became slandered (Delgado Diaz del Olmo 1996). Even today many an indigenous person will only reluctantly tell you they eat mushrooms. Combining both the scientific evidence of the importance of fungi to human and environmental health with evidence of their historic importance in Peru will perhaps begin to revalue mushrooms. The discovery of the use in ancient Peru of mushrooms connects South American cultures with other cultures in the new world and old world, and to an ancient pan human belief system of which today we still find remnants (Wasson et al 1986). Their rediscovery as such reconnects Peru again to a long human tradition.

Cultures and initial timelines of mushroom use in Peru

It is highly likely that ancient Peruvians brought the knowledge of mushrooms with them as they migrated from the northern hemisphere, including the knowledge of edible, medicinal and sacred mushrooms. In this preliminary search evidence was found that as early as 1200 BCE they were important enough to be represented in the ceremonial and ritual art of the Cupisnique culture (1200-200 BCE) and Pucará cultures (1200 BCE -400 CE). Earlier petroglyphs representations have not been studied, evidence of mushroom use may be found caves. It places earliest Peruvian mushroom representations in the same timeline as early Meso American mushroom images of the Olmec 1000 BC (Borhegyi 2010). One can also trace mushroom use through a continuous dateline of cultures from 3000-2200 years ago to at least 1532 and geographically from the north to the south of the country through the Cupisnique, Pucará, Paracas, Moche, Wari, Chimú through to and finally the Inca cultures. With the destruction of Inca and indigenous societies after European contact, particularly their religion, representations of mushrooms by indigenous peoples virtually disappeared. New information shows that at least culinary use continues in some indigenous societies (Holgado et al 2010, Trutmann and Luque 2011). The ancient power of mushrooms and symbolism however, remains embedded in indigenous myth and languages such as Quechua and Aymara. The root base of words are linked to power and the supernatural (Delgado Diaz del Olmo 1996). Words that identify specific mushrooms today and their relation to their use in pre-Hispanic times remains to be investigated. Evidence from the few studies done independently suggest that similar nomenclature remain in indigenous languages (Franquemont et al. 1990), (Holgado Rojas M.E. et al. 2010, Trutmann and Luque 2011). However, none of the names of mushrooms commonly used seem to refer to the ancient sacred mushrooms. Yet, both Aymara and Quechua languages root words such as 'Calla' are derived from words that are derived from mushrooms that bestowed power. What happened to the use of these mushrooms and why were the names even forgotten or hidden? The ethno-mycology of Peru requires urgent study to enable better understanding of what remains of local knowledge of mushrooms and how it relates to historic knowledge and to better use it to help optimize the positive effects of fungal resources in Peru for wellbeing and better ecosystem function in an age of global change in mountains.

Identity of Ancient Mushrooms

The pre-Columbian mushroom representations were at times so realistic that they are able to be identified to genus and even species level. Thus far, those identified are *Amanita muscaria*, *Morchella species*, (probably *M.elata* or *M. esculenta*), *Calvatia species* (including *C. cyathiformis*) and one or more *Psilocybe species*, including one similar to *P.cubensis*. However, impressive as the mycological knowledge of the artist in pre Hispanic times was through the detailed representations of the mushrooms, often there are no known mushrooms to associate them to. Too little is known of the mushrooms that exist in Peru. This is due to the limited information on the extent and identity of mushroom in Peru. To date, largely due to resources, only a relatively limited number of mushrooms have been collected and identified in Peru and neighboring countries with similar ecosystems and very little ethno-mycology work has been conducted. Mycology in South America is only recently emerging beginning to be valued mainly due to commercial factors but also slowly, because of interest in the rich biodiversity of the region.

An other reason why it may be difficult to determine the identify the mushrooms found in ancient ceramics may be due to changes in the Peruvian landscape and traditions since Pre Hispanic days. There is evidence that human activity had great impact on vegetation even from the Holocene period (about 10,000 years ago) through burning and deforestation. (Bush et al. 2007, Bush & Flenley 2007 p45, Hansen et al 1994) suggests that without human intervention the upper Peruvian Andes would have been forests of *Polylepis* up to 4000 m in the wet and 5000 m in dry areas. That said, it is known that in early colonial times there were still great expanses of forest in this sierra and altiplano (Hyland 2004) and there was a great effort to reforest in Inca times. The destruction of forests was devastating in colonial times onward for firewood, construction and for pasture of imported livestock that denuded the altiplano and the lowlands and destroyed soils & natural pasture through overstocking and erosion. The actions had and are having great effects of the ecology, the fertility of the landscape and probably on fungal communities as they did in the coastal lowlands. (Beresford-Jones 2004 Chapter 7). At least some of the fungi represented in ceramics, like *A. muscaria* and *Morchella species* are symbionts on trees or grow in woods. *Psilocybe* or *Panaeolus* spp. and *Calvatia species* are grassland species. However, some of the unidentified species may have been tree associated mushroom fungi that grew that may now be very rare or extinct.

Use of mushrooms in ancient Peru.

It hard to divide mushroom use into single defined categories of use, since a single mushroom can be culinary, medicinal and can have 'spiritual' properties. Furthermore, to many indigenous groups there is little or no distinction between medicinal and spiritual. The more we find out about fungi the more we discover about their important properties and functions to humanity and environment.

Culinary

A number of mushrooms represented in ceramics are known culinary delicacies. Most notable are the species of the genus *Morchella*, (Franquemont et al. 1990, Holgado et al. 2010) and *Calvatia cyathiformis* (Holgado et al. 2010), Trutmann P. et al. 2012). Early colonial writings also show that mushrooms played an important and esteemed part in the lives of Pre Hispanic Inca society. Poma de Ayala (Poma de Ayala 1615) probably basing his writings on the knowledge of the 'legally dead' Jesuit friar Blas Valera (Nyland 2011) lists the Quechua names for types of mushrooms, 'callampa', 'concha' and 'Paku' as food. 'Paku' are large puffballs, including *Calvatia cyathiformis* represented in ceramics of various cultures. The local ethno-mycological knowledge and words are only now being collected. The above mentioned names are relatively generic, but they do provide a first order of categorization. Poma de Ayala, lists various mushrooms as part of the varied diet of people from the age of 30 during the Inca reign.

Medicinal

Shamanic like figures are commonly seen associated with mushrooms in artwork of the Paracas, Chimu and Moche. In the Paracas culture textiles we see spirit-like beings holding either mushrooms of various colors, or symbolic mushroom/tumis, often in shamanic flight. The flight associates them with entheogen use. They often also hold head trophies, which may associate them to the ritual of transformation, death and resurrection, perhaps to the Venus cults also found in Central America (Borhegyi 2010). In Moche culture we see mushrooms and symbols also associated with Lords and higher theocracy. The Lord of Sipán does not have mushrooms overtly growing out of his head, but the mushroom related symbolism is overwhelming, through his mushroom headdress, tumi, and symbols on his clothes, and ornaments with mushrooms. Other Moche representations show subjects with 'google' eyes indicative of trances, sometimes with facial expressions of fear.

It is still unclear from association of mushrooms with shamanic/curandero ceramic what the purpose was of representing some species. For example, morels were commonly represented. Yet, today morels are regarded in most cultures as a culinary delicacy rather than a medical herb. Still, there is information of their medicinal properties. Morels such as *M. esculenta*, are used to regulate the flow of vital energy, and have properties against tumors, expectorant, and gastrointestinal tonic (Hobbs 1986). Puff balls such as *Calvatia* spp. were used as an anti bleeding remedy, to soothe burns and itching and were anti-inflammatory agents (ibid). In fact, *Calvatia* species were regarded as magical by many indigenous groups in North America, and had many uses. *A. muscaria* for example had both visionary as well as medical properties, inhibiting tumors, epilepsy, and even eliminating ringworm (ibid). Current ethno-mycological information points to continued use of puffballs of *C. cyathiformis* and green spored *Lycoperdon wrightii* for medical purposes in Peru (Trutmann and Luque 2011).

Spiritual

What spiritual & religious role did mushrooms play in ancient Peru? In reality all that is known at this moment is that both *A. muscaria* and *Psilocybe* species appear to have been used since they are the only clearly known entheogens represented. Yet, it is also known that these, and other as yet uncharacterized mushrooms, were consumed and used as entheogens since they associated with ancient flight of shamans and classic 'google' eyes of images. The ritual religious use of mushrooms by the theocratic class of Moche society is also implicated by use of mushroom symbols carried by high priests like the Lord of Sipán, eluding to ownership of power of these objects and thus properties of mushrooms.

To begin to answer the question of spiritual use of mushrooms in Andean society we need to refer to studies in other countries and continents. The nearest cultures studied were in Mexico and Guatemala, principally Maya and Aztec societies. It has been shown through representations by the Aztecs in the few documents surviving Spanish destruction (see the Vienna Codex) that at least *Psilocybe* species were used. *A. muscaria* is implicated in other representations. *Psilocybe* species were until recently still being used in various parts of Mexico in places such as Huautla de Jimenez, Oaxaca (Wasson et al. 1986). They were 'secret' rites that were not normally discussed with outsiders. The principle use of spiritual mushrooms in such rites is to enable the connection to "the god within".

Wasson (1972) noted: "*The bemushroomed person is poised in space, a disembodied eye, invisible, incorporeal, seeing but not being seen... In truth, he is the five senses disembodied, all of them keyed to the height of sensitivity and awareness, all of them blending into one another most strangely, until, utterly passive, he becomes a pure receptor, infinitely delicate, of sensations*". "*It (the mushroom) permits you to see, more clearly than our perishing mortal eye can see, vistas beyond the horizons of this life, to travel backwards and forward in time, to enter other planes of existence even as the Indians say, to know God*".

How the spiritual use of mushrooms was used by ancient individuals, cults and religions is still unclear. In the case of *A. muscaria*, Borhegyi (Borhegyi 2010) proposed its central use in the veneration of Venus. He writes: "*The ideas thus generated included concepts of an alternate world with rebirth after death based on observation*

of the constant cycle of death and rebirth in nature. This included the predictable cycles of the sun and moon and veneration of the dualistic planet Venus based on its equally predictable cycle of death and rebirth as the Morning Star and the Evening Star. By the time the first native Mesoamerican religious texts appeared, whether in pictorial codices or, at the urging of various Spanish priests and chroniclers, in Spanish or one of the indigenous languages, there is evidence that this religion was identified with a supreme creator deity. This deity, seen early on as a double-headed serpent with bird and feline attributes, was known by different names at different times and in different indigenous languages and culture areas.”

Even if his hypothesis is correct, is not clear if all ritual mushroom use, or certain species, especially *A. muscaria*, were associated with Venus veneration, but much of the Pre-Columbian art associated with mushrooms also contain symbolism of what Borhegyi (2010) would regard as the Venus cult. For example, one finds the hook symbol, the fives, the double star associated with Venus (the morning and evening star), symbols of transformation, death and resurrection. Although, other variants can't be ruled out for the time being Borhegyi's proposal it is a reasonable hypothesis, particularly since it explains and provides meaning to the symbolism of many ceramics and textile representations that thus far are missing.

It appears that changes did take place in the preference of entheogens in ancient Peru. As societies like the Paracas culture changed over time to one like the Nasca, other entheogenic agents appear to have become more represented than mushrooms. At least, identifiable mushroom symbolism appears much reduced in the Nasca art. Similarly, it clearly changes took place in Moche society, from one where mushrooms were vividly represented to one predominated by realistic representations of San Pedro and where only symbolic or Iconographic symbols of mushrooms like the golden crescent and tumi are found. Either mushrooms were substituted in later phases of societies, or mushrooms went out of common use into the exclusive hands of the elite who replaced it for commoners with a common plant, the San Pedro cactus. Inca society used Coca as its holy plant. Its production was strictly controlled by the elite, but made available to the commoner. Coca rather than mushrooms are mentioned by the Spanish chroniclers. Yet, golden mushrooms earrings are found in the Yale Collection from Machu Pichu. Furthermore, Inca myths point to conical golden and other red mushrooms, suggesting that perhaps spiritual mushrooms use was the realm of the elite theocracy and groups like the 'Callawara'. The legendary Inca bearers.

The changes that favored entheogen use between societies over time could also have been associated with the rise and fall of trade with Meso America, where entheogenic mushrooms like *A. muscaria* grew. As mentioned earlier, *A. muscaria* has not as yet been collected and identified in Peru, and the range of its common tree-hosts are limited mostly to the northern hemisphere. We know that there was substantial trade with Meso America, although we do not know how consistent this trade was over time. Perhaps, there were times when trade was limited that other entheogens were preferred such as San Pedro, ayahuasca and to a lesser extent coca? The topic requires more research for clarification.

CONCLUSIONS

This preliminary study on the use and importance of mushrooms in ancient Peru has illuminated fascinating areas of the lives of people that are now forgotten, neglected or devalued by the bulk of the Peruvian population now living in cities the lowlands. The study has implications for the rest of South America, insofar that it is evident that indigenous peoples in other parts of South American used mushrooms. Velandia (2008) already wrote of mushroom symbolism in Colombia. Snuff boxes with mushrooms have been found in Argentina (Torres 1996), and symbols are found on vases and information about the Mapoche exist from Chile. These make it clear that ancient people in other parts of south America were acquainted sufficiently with mushrooms, and associated symbolism to represent their ceramics. In the future, studies should extended to explore not only to explore Peruvian mushrooms further, but be extended to include other South American countries. In this manner a holistic understanding can be constructed of their importance to the lives of ancient Americans.

There is a need to more thoroughly look at each Peruvian culture and even look at pre-ceramic sites to obtain

a better timeline of mushroom use. For example, changes in Moche mushroom use and symbolism should be studied using not only the IV phase ceramics often used (Castillo et al. 2007)). Using this study as a base, there is a need to look for a direct link between ceramics and actual identification of mushrooms from archaeological sites. In other words to not only evaluate ceramic bowls for plant material and pollen but also for fungal remnants and spores. If fungal material can be found then it may be possible to further identify fungi and to explore genetic similarities using molecular techniques. In addition, there is an abundance of symbolism associated with mushrooms. Global Mountain Action (2011) has begun to document this aspect and will publish these results in a second publication in this series.

The question of what happened to mushroom use in Peru in post conquest times requires elucidation in order to better understand the current state of disinterest. What happened to the knowledge and mushroom use and why did it happen? It is known that catholicism and colonial politics were important factors in Meso America that devalued mushroom consumption and demonized its use there (Wasson 1972, Borhegyi 2010). Did the same happen in Peru? Global Mountain Action (2011) has begun a rapid survey and will publish this base material as part of this series. It is hoped the information will stimulate more in depth studies.

Just as botanical input has greatly influenced the advances in field of archaeology more mycological input is urgently needed to obtain a more accurate understanding of the ancient Peruvian world. There is also a great urgency to use mycology to understand better current and in post conquest use and knowledge of mushrooms in Peru. A few studies have been reported on these themes. Franquemont et al (1990) reported names of a few mushrooms in Quechua and identity in a study in Chinchero, close to Cusco. More recently, Holgado et al. (2010) and have published an article on the identity and Quechua names of some local mushrooms around Cusco and local culinary use. These studies are beginning to shed light on the rich knowledge and the place that mushrooms have in indigenous communities that hitherto were forgotten in national or international assessments for food security and research needs, with exception of the United Nations Food and Agriculture Organization that conducted a worldwide study that included Peru (Boa 2004). The FAO study although commendable in its worldwide scope, is of questionable value for Peru, other than exposing the paucity of information, and confusing due to highly questionable list of references. For example, Remotti C.D. and Colan, J.A. 1990, Identification of wild edible fungi in Dantas Forest, Huanuco. Revista Forestal del Peru 17: 21-37 does not appear to have been printed in this journal but has been used by various authors, and Diaz (2003 pers communication) seems a questionable reference to commercial use of *Boletus edulis*, since only *Suillus luteus* from introduced Pine plantations has thus far been used commercially.

More broadly, there is a fundamental need in Peru to invest more in research on fungal diversity to collect, characterize fungi and mushrooms to obtain a clearer picture of the roles in the Andean environment. Without knowledge of the current diversity ancient fungal material will not be able to be classified and placed into context. Present knowledge of genera and species is still limited despite commendable efforts of the few fungal taxonomists in Peru and surrounding countries. Most of the Peruvian Andes, the Selva and the lowlands have not been systematically studied. Only two major studies exist of fungi and these were concentrated principally in the selva and Amazonian basin (Pavlich M.R. 1976, Espinoza M. 2003, (Mata et al. 2006). There has been little interest in mycology and taxonomic studies in national institutions due to limited potential of funding from national and international sources. The neglect of mycological studies by national and international agencies is surprising since extensive funding has been made available for studies under the umbrella of the documentation of genetic diversity for plants and animals in Peru in what is regarded as one of the most genetically diverse countries in the world. Due to the key role of fungi for human and environmental health and wellbeing especially in mountain regions, Global Mountain Action (2011) has made this the theme a priority.

Bringing together knowledge of Ancient use of mushrooms with present local and scientific knowledge should help further understanding of the culinary, medicinal and spiritual properties of mushrooms. In a time of worldwide reflection on the sustainability of western lifestyles and the dire state of the extreme consumerism driven economic models, out of control financial opportunism with severe global environmental consequences, a better understanding of ancestral holistic use of mushrooms in diets and rituals may be of value in itself to bring life again in equilibrium with the environment and provide meaning. Peru has already become a spiritual Mecca for many seeking ancient Andean knowledge.

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