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THE CHAÎNE OPÉRATOIRE OF THE FLINT AXES OF THE MYKY INDIGENOUS TRIBE (MATO GROSSO, BRAZIL)

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This paper presents the results of ethnoarchaeological research carried out among the Myky tribal group in Brazil. The intention of this research is to document the chaîne opératoire of the flint axes used by this indigenous group in the past. The Myky were first contacted in 1971, and knapped and used different stone tools in their daily life up until that point. This paper explores some of the reasons why the Myky used flint axes and how this allowed them to develop a horticultural economy without having a sedentary way of life. The principal value of this research is to document a specific element of this group's cultural heritage, as well as its past material culture. These are critical aspects to document, since they are likely to disappear in the space of one or two generations. Presented here are a unique set of observations of stone tool manufacture activities by a group that has not been previously studied.

KEYWORDS: *Lithic ethnoarchaeology, flint axes, chaîne opératoire, Myky people, Brazil*

1. INTRODUCTION

For a significant part of human prehistory, the primary material record of human activity consists in lithic material. In this context of reconstructing the past, ethnographic information about groups that still use stone tools can prove helpful (McCall 2012). For prehistoric archaeologists, the possibility of witnessing first-hand how these stone implements are made, used and cease to be useful within a living society is a unique opportunity and stimulus.

A main issue for archaeologists and prehistorians centers on how to apply this opportunity to their current research area. They must first take into account the significant differences between ethnographically observed and archaeologically reconstructed practices. Today, it is widely accepted that comparative ethnography—defined here as interpretative reasoning based on the similarity between objects in present and past contexts—forms a key basis of our understanding of the past (David and Kramer 2001; Fernández 1994; Gándara 1990; Gonzalez Ruibal 2003; Hernando 1995; Lemmonier 1986).

Currently, the view put forward by most scholars debating the use of ethnographic information is that of adopting the comparative method as a way of obtaining information. Once we accept

that each cultural context is unique, ethnoarchaeology and ethnographic analogy can be considered heuristic procedures and empirical sources of hypotheses (Alcina 1989; Coudart 1992; Gándara 1990). The working models or hypotheses provided by the ethnographic record can offer us new perspectives of the archaeological record. Moreover, ethnoarchaeology serves to help us understand behaviors—ideological, social, economic, and technological—that are not well known in western culture, as some researchers (Hernando 1995; Politis, 2002) have pointed out. These can alert archaeologists and prehistorians to the problems and inadequacies of certain classification methods and forms of interpretation used in the archaeological domain.

This paper presents the results of ethnoarchaeological fieldwork carried out as preliminary research for a PhD thesis documenting the *chaîne opératoire* of flint axes made by the Myky people of the Brazilian Amazon. I examined existing ethnographic sources about the Myky tribe, as well as a number of neighboring groups. In addition, I compiled information through personal interviews with specialists in indigenous populations as well as public figures who have worked with this particular group for many years. I analyzed and documented different flint

axes made by the Myky since they were first contacted in 1971. Some of these samples were given to the Rondon Museum in Cuiabá and the offices of the OPAN (Operação Amazônia Nativa). Others were collected by the author from the Myky people during the fieldwork.

Finally, I attempt to define the most important characteristics of this lithic tradition in order to establish a cultural context. To accomplish this, I will compare the techniques used by the Myky in making their flint axes with those used by neighboring indigenous groups.

2. LITHIC ETHNOARCHAEOLOGY IN SOUTH AMERICA

There are very few societies around the world who still practice flint knapping, and perhaps none still use lithic instruments in their daily lives. Most of these groups are located, as Sillitoe and Hardy (2003) and McCall (2012) describe, on the island of Papua New Guinea (Pétrequin & Pétrequin 1993), in Central America (Clark 1991; Lévi 1998), and in Australia (Binford and O'Connell 1984; Gould 1980).

Despite receiving only scarce mention in the existing literature (David and Kramer 2001; Sillitoe and Hardy, 2003), South America and specifically Brazil are territories that offer enormous potential for carrying out ethnoarchaeological studies to analyze a lithic technology within the society that created it. In certain indigenous groups that have only been contacted relatively recently (1950s–1970s), some of the older members of the group who used and made lithic instruments in their daily lives are still alive. Among these we could mention the Enawenê Nawê or the Myky peoples (Mato Grosso, Brazil), but also groups such as the Rikbatsa or the Panará (Mato Grosso, Brazil). Furthermore, it is worth highlighting that significant ethnographic studies have already been carried out among some of these groups, such as the first two mentioned here, by the Instituto Anchieta de Pesquisas and the OPAN. The detailed information provided by these studies could complement any fieldwork carried out to document this lithic technology, and could be used to help define the lithic tradition of each one of these groups.

It is interesting to note that many ethnologists in Brazil have shown an interest in lithic technology, mainly regarding the cultural and social issues surrounding it (Metraux 1959; Schaden 1969). The area of research that has so far been most explored relates to the impact that the introduction of iron

has had on indigenous peoples and their universe, and the many different aspects of change it brings about in their societies as soon as it appears. These studies documented how in Brazil, similarly to in other cultures around the world (Salisbury 1962; Strathern 1969), stone tools are normally the first objects of indigenous material culture to be abandoned. In fact, metal knives, axes, and machetes were, and still are, the primary exchange good traded by expeditions making first contact with indigenous groups.

What is clear is that iron has had and continues to have an enormous, and in many ways decisive, impact on indigenous cultures in the South American subcontinent. This is primarily due to its technological superiority as a working material. Thus, French ethnologist Alfred Metraux (1959) talks of the “axe revolution” to describe how the discovery of iron radically changed the living conditions and lifestyles of different indigenous groups. He highlights the key role iron played in the success of the Jesuit missions and expeditions to convert indigenous peoples to their cause. Egon Schaden maintains that with the arrival of the European colonizers, the indigenous cultures of Brazil entered a new period of their history, which he terms the “Iron Age” (1969:179). Roquette-Pinto describes how, for the tribes of Mato Grosso, their “gold” was iron ([1916] 1950:170). Other ethnographers, such as Barandiarán (1967), have stressed the importance of iron as a significant *casus belli* or motive for fighting with, and organizing raids on, other tribes in order to gain possession of the metal.

Within the field of archaeological research in Brazil, however, relatively little ethnoarchaeological fieldwork has been done on lithic technology. Such studies seem to be limited to those carried out among the Hetá, an indigenous group contacted in 1949 in the state of Paraná. In general, these studies focused on two main aspects: first, on understanding and recording how the Hetá made their flint axes (Kozák 1972; Kozák *et al.* 1981; Laming-Emperaire 1964), and second, in less detail, on their knapping techniques and use of the knapped material—mainly flakes—to produce other objects such as bows and arrows (Laming-Emperaire *et al.* 1978; Miller, 1979).

3. HISTORY OF THE MYKY

The Myky people were first contacted on 13 June 1971 by the Brazilian priests Adalberto Holanda Pereira and Thomáz de Aquino Lisboa, and the

Spanish priest Vicente Cañas, members of the Operação Anchieta (López y Carrión 2002). These priests were accompanied by two Münkü Indians, Tapurá and Tupsí (Lisboa 1979). The Myky at that time were made up of only 23 individuals, 12 men and 11 women. According to Thomáz de Aquino (Lisboa 1979), the meeting was highly emotional. It was facilitated by the fact that the two Münküs who went with the expedition were able to communicate with the Myky.

The Myky were originally part of the Münkü tribe but became separated from it after a bloody massacre that took place in 1900 in the area of the Tapuru stream (Rondon, 1946:88–89). The attack was carried out by *seringueiros*, workers who were extracting natural latex from trees, on the orders of a local landowner (Rinaldo S. V. Arruda 2003). While the Münkü remained in contact with Brazilian society—to their detriment—after this event, the Myky escaped into the forest. For the next several decades they lived in a constant state of fear, moving around and never settling in the same place for long.

Seventy-one years later, when the priests entered into contact with the Myky accompanied by the two members of the Münkü, these two groups found each other again for the first time and the event was celebrated by a ceremony of lament. Münkü is the name this group gives itself (Moura e Silva 1960:5), though they are also known as the Irantxes—a name used in ethnographic research (Figure 1; Moura e Silva y Pereira 1975:1).

The first contact was preceded by a series of expeditions that had been following the trail of the Myky since 1970. They proved elusive, partly because of their traumatic split from the Münkü tribe at the start of the twentieth century. They had also been attacked by other, more aggressive indigenous groups, such as the Beços de Pau and the Rikbatsa, also known as Canoeiros. In addition, they had begun to feel the pressure of the advancing destruction of the rainforest by Brazilian settlers. Faced with this situation, the Myky had retreated some 150 km to the northwest, jumping from one river source to another, until they reached their current location.

In comparison with other indigenous groups, for whom first contact with modern society between 1960 and 1970 had catastrophic consequences, both the Myky and the Enawenê Nawê had relatively fortunate experiences. Whereas the

population of other groups fell drastically due to diseases introduced by outsiders and the destruction of traditional indigenous ways of life, the contact made by the missionaries of the Operação Anchieta with the Myky and the Enawenê Nawê was carried out with great care and respect (Lisboa 1979, 1985)—so much so that the population of the Myky actually increased after their first contact. This contact was rendered necessary, indeed unavoidable, due to the brutal advance of deforestation in the area. In order to establish contact, the missionaries from the Operação Anchieta left metal axes, knives and machetes as gifts. After a few attempts, the Myky finally responded by leaving a stone axe in exchange (Lisboa 1979).

Currently the Myky are established in a single settlement located within the Menkü indigenous area, which extends over 47,094 hectares. There they continue practicing a traditional economy based mainly on hunting, gathering, and horticulture. Since the 1980s, this has been increasingly complemented by the consumption of consumer goods purchased in the surrounding towns. Other foods such as fish are now part of their diet, though this was not the case pre-contact (Lisboa 1983).

The area belonging to the Myky is located in the Parecis basin. The geology of the area is dominated by sandstone and is abundant in iron material, as well as flint of varying quality. The territory is set within an Amazonian *cerrado* landscape.

4. FIELDWORK METHODOLOGY

The fieldwork reported here took place over 10 days during April 2006, in the only village inside the Menkü indigenous reserve in the northwestern part of Mato Grosso state, Brazil. Elizabeth Aracy Rondon Amarante, Alan Cesar Bortoleto, and Thomáz de Aquino Lisboa—members of the Conselho Indigenista Missionario (CIMI)—facilitated my visit. Notably, Thomáz de Aquino Lisboa was a member of the expedition that first contacted the Myky people in 1971. In addition to and independently of the CIMI, the Myky also showed interest in my presence and the study I chose to carry out with them.

The fieldwork initially consisted in making contact with the Myky and familiarizing myself with their culture. For this reason I chose to adopt the role of observer rather than playing an active part in directing the proceedings. The only

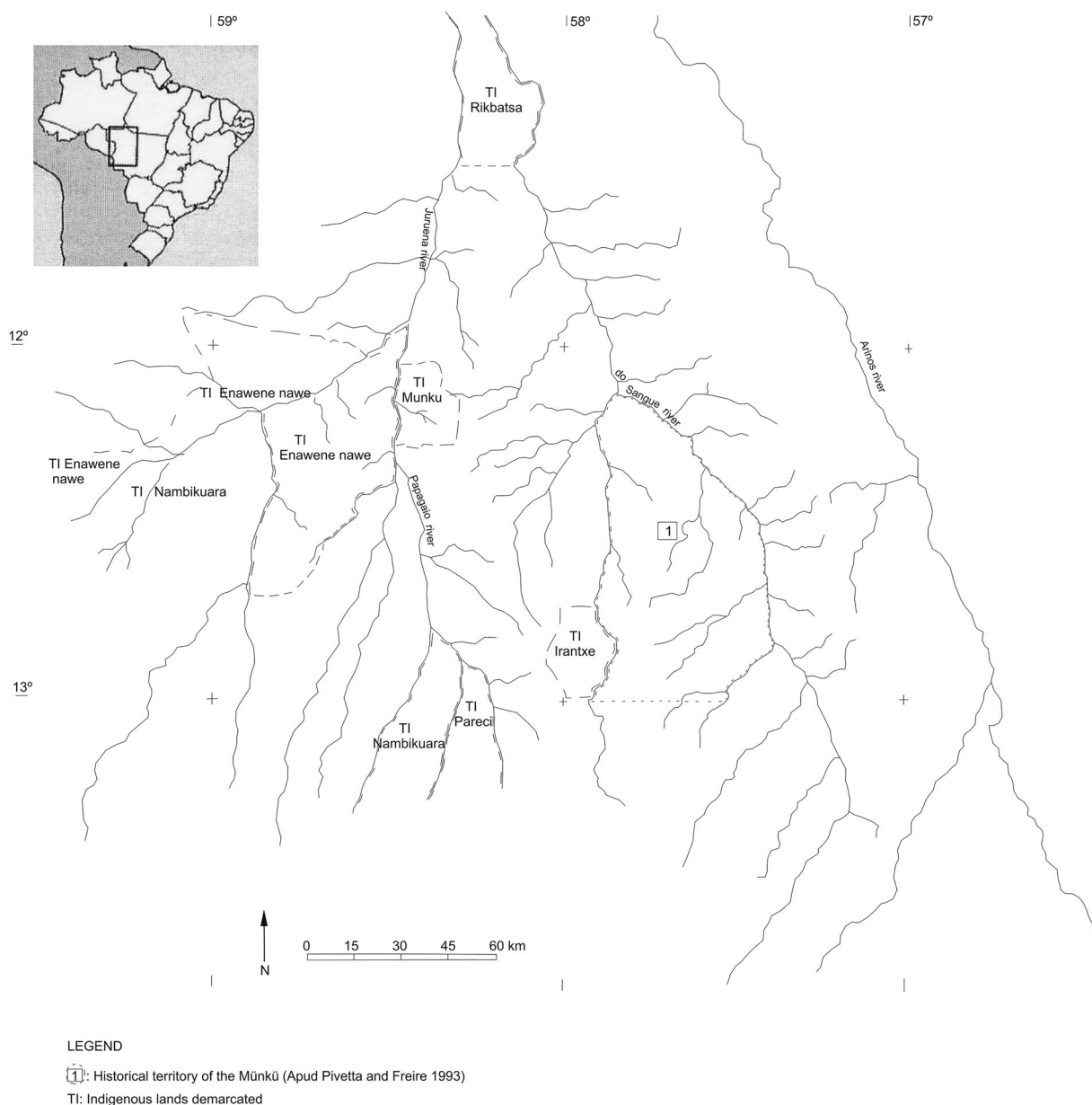


FIGURE 1 Map of the area under study. © Carlos Fernández González.

measure I took was to present myself to the village upon arrival and explain my purpose for being there, that is to say, to document how they made their stone axes. By allowing them to show me this process and explain it to me, without interfering unnecessarily with questions, I was able to witness actions and gestures that were—as far as possible—highly spontaneous and natural. On the whole, the Myky offered us the information regarding the *chaîne opératoire* of their stone axes freely and quite spontaneously, without the need for me to ask many questions. Some questions were asked after I had observed the whole *chaîne opératoire*, however.

The Myky abandoned use of stone axes in their daily lives after the appearance of steel axes. Nowadays they do still make stone axes—though generally of inferior quality—which they sell as part of their traditional handicrafts. These stone axes are mainly manufactured using sandstone cobbles, though they also sometimes use flint flakes of different sizes. At the time that this fieldwork was carried out, there were only six remaining Myky men who had made and used stone tools in their daily lives before the tribe was first contacted and who still remembered this period well. (It should be noted that working lithic material and using flint axes are exclusively

TABLE 1 FIELDWORK INFORMANTS AND APPROXIMATE AGE, ACCORDING TO INFORMATION FROM THOMÁZ DE AQUINO LISBOA AND ELIZABETH A. RONDON AMARANTE. INEVITABLY, ALL OF THESE DATES OF BIRTH ARE APPROXIMATIONS

Informant	Date of Birth
Xinũi	1910 (died in 2008)
Wajakuxi	1933
Mãty'y	1954
Xinũxi	1955
Janãxi	1955
Kiwuxi	1959

male activities in Myky society.) These people are listed in Table 1.

During the fieldwork, I collected four stone axes (see Table 2). Nevertheless, the whole process of making a flint axe was only observed for one of the samples, a stone axe made by Janãxi, the chief of the tribe, using a sandstone cobble. The other three samples were brought to me already made and the *chaîne opératoire* was described directly by the Myky men who made them. In addition, it is important to mention that the process of knapping the flint cobbles was only witnessed during the sourcing of the raw material.

5. CHAÎNE OPÉRATOIRE OF THE AWYPJATÁPA OR FLINT AXE

5.1. SOURCING AND SELECTION OF THE RAW MATERIAL

To make their stone axes, the Myky must first source the raw materials: flint (or sandstone), beeswax (which they use as an adhesive), vegetable fibers (used as string), and the wood for the handle.

In the present day, the Myky obtain their lithic raw material from a stream close to their hamlet. During my fieldwork, most of the Myky men who were adults at the time of first contact went to collect their flint from this "Stone Stream" or *Aomje'y*, their term for a small river. These senior Myky members were Mãty'y, Xinũxi, Janãxi, and Kiwuxi. The sourcing of the raw

material was, on this occasion, a spontaneous activity which many of the young Myky members came to witness as a new event.

When we arrived at the stream, the Myky elders started to pick up the nodules and flint fragments from the bottom and the banks of the river. Those they liked were placed all together in a pile. This phase of the operational sequence lasted about 40 to 60 minutes (Figure 2).

The lithological base of the riverbed is made up of numerous sandstone pebbles and flint nodules. Essentially, I was able to distinguish three qualities and types of flint: one had frequent grading and numerous geodes, joints and fissures, making it very difficult to knap. Another had less grading and fewer natural flaws. Finally, the third type was characterized by its good quality and varied tones and colors, ranging from pink to toffee and grey-blue. From a morphological point of view, this flint appears in nodules of different shapes. These constitute part of the geological bedrock of the territory.

Normally the selection of raw material follows a fixed pattern, with the Myky elders looking for flint nodules or pieces that are preferably already triangular or oval in shape. Once they have found a correctly shaped flint nodule or fragment, they test it by removing flakes to determine its suitability.

Despite the fact that the Myky clearly distinguish the qualities of the different kinds of

TABLE 2 CHARACTERISTICS OF THE STONE AXES COLLECTED DURING THE FIELDWORK

Flint Axe	Length	Weight	Lithic Material	Axe Head Dimensions	Polished
Mãty'y	61 cm	–	Flint	15 × 10 × 6 cm	All edges
Xinũxi	70 cm	–	Flint	20 × 11 × 7 cm	All edges
Janãxi	55 cm	670 g	Flint	11 × 8 × 4 cm	Not polished
Janãxi	71 cm	–	Sandstone	22 × 12 × 7 cm	Not polished



FIGURE 2 Sourcing of flint raw material in the “Stone Stream” or *Aomje’y*. © Carlos Fernández González.

lithic material they collect, I did not find that they showed a preference for any one of the different varieties. In general, they tended to select the second, “intermediate” type of flint, which was the most abundant throughout the stream, although they were well aware that the third category of flint was of superior quality. When I showed them a sample of the latter they always



FIGURE 3 Knapping position adopted by Xinūxi during the process of selection and initial testing of flint raw material. © Carlos Fernández González.

replied, saying: “That is good.” Notably, the Myky have a specific taxonomy for flint in their language, distinguishing it from any other kind of stone. Flint is referred to as *awypja*, while the term for stone in general is *aóu*.

Generally, in this phase of the *chaîne opératoire* the Myky knapped the flint nodules while standing—as shown in Figure 3—or in a squatting position. It appeared that they did not have a very accurate knowledge of stone fracture mechanics, at least from what I could observe during this phase of the *chaîne opératoire*. They repeatedly carried out striking actions without actually knapping the material. In any case, this phase seemed to be designed to simply strike the nodule or fragment in order to evaluate whether or not it was valid for use.

The hammers used for this task were made from the same material: flint nodules and sandstone cobble. The Myky did not pay particular attention to the selection of the hammer stone. Usually, they selected hammer stones of the same size as or even larger than the nodule that was to be knapped.

As previously mentioned, the Myky traditionally use beeswax as an adhesive, and they call it *Ikamã* o *Tapu*. They obtain it from the beehive made by the *borá* bee (*Tetragona clavipes*). This native species makes beehives inside the trunks of trees, so it is necessary to open a hole in the trunk in order to obtain the beeswax. In the past, the Myky used a stone axe to carry out this action, whereas now they use a steel machete. In this instance, they took 20 minutes to open a shaft in the tree trunk with the steel machete.

Regarding the vegetable fibers that are used as string or cord, these are obtained from certain palm trees in the area, essentially *buriti* (*Mauritia flexuosa*) and *tucum* (*Artrocaryum chambira*).

Finally, the axe handle is made from any soft wood species that can be easily found in the forest around the hamlet and is easy to cut. In fact, for the Myky, the quality of the wood does not seem to be an important factor in the efficiency of the flint axe, or, at least, in the axe that Janāxi made for me he did not assign any particular importance to it. During this fieldwork the Myky elders tended to use the trunks of small trees approximately 5–10 cm in diameter. The name they give to the axe handle is *amjakje’y*.

5.2. THE MAKING OF THE FLINT AXE

During this fieldwork, I collected four flint axes from the Myky, one made by Xinūxi, another

made by Măty'ý and, finally, two more made by Janăxi. As mentioned, the complete manufacturing process of a stone axe was only witnessed for one of the axes made by Janăxi. In that case, the artifact was made using a sandstone cobble that was not knapped or ground.

With regards to the techniques employed to shape the stone, the Myky knapped and polished the flint, and in some cases they pecked it. On the whole, they considered the polishing of the cutting edge to be the most important factor in the process. They mentioned that flint knapping was seen by them as being less important than polishing the material.

It seems that the Myky's knowledge of flint fracture mechanics may have been more developed in the past; no doubt some of this knowledge was lost simply because they did not need to use it anymore. As mentioned, the Myky have continued manufacturing axes for sale as handicrafts, but in most of these specimens they just insert a cobble in the handle straight from the riverbed, without knapping it.

In fact, their flint knapping techniques are well demonstrated in two of the axe samples themselves. The axe used by Janăxi to chop down two trees was made using the percussion technique. This artifact presents five flake scars which resulted, possibly, from the use of a sandstone hammer (see Figure 4). In fact, the negatives of the flakes show a low prominent bulb scar. In addition, the flint axe head shows a blade scar with the edges running almost parallel, as well as a very faint bulb scar on the bevel.

By contrast, Măty'ý explained to us that he knapped his flint axe head using a metal hammer. Despite this, it was very interesting and quite surprising to observe that it had been manufactured using bifacial flaking all around the axe head.

The Myky never employed, either in the past or in present times, any kind of wood hammer to knap flint. In most cases, they only knapped flint in order to produce a cutting edge. They did not carry out flaking in other parts of the stone, except in the interesting case of the flint axe head made by Măty'ý. Măty'ý and Xinūxi mentioned that they also used the technique of pecking, essentially to remove the cortex and concretions on the nodules.

The Myky use the technique of grinding to polish their flint axes. They do this using sandstone cobbles. Nowadays, the Myky polish and sharpen their flint on a large sandstone boulder.

It is the only one in the area surrounding their settlement and it appears that they have been using it since they established themselves in the area in the 1970s. This is located about an hour's walk from the hamlet, close to the small stream *Aomje'y*. Here the Myky grind the flint against the abrasive sandstone, using water as a lubricant. Of the samples given to me, both the flint axes made by Măty'ý and Xinūxi had been intensively polished (Figure 5).

The Myky traditionally placed enormous importance on the grinding and polishing of the flint axe head. Polishing not only increased the mechanical strength of the artifact but also allowed the head to penetrate the surface of the wood more easily. Moreover, a finely polished edge avoided grains and resin sticking to the lithic surface. In short, the polishing of the flint axe head made the axe much more effective as a workable tool (Figure 6).

Hafting the axe is a relatively straightforward process. Once a small tree has been felled, the elders cut the narrow trunk lengthwise into two parts in order to make two possible axe handles. They then prepare the middle part of the shaft to be bent in half. The Myky call this action of bending the handle *tykatakury*. On the occasion of this fieldwork, Janăxi made the handle on the spot, straight after felling the tree. He made short cuts in the middle of the piece of wood in order to make it easier to bend in two. Usually, however, this is done back in the hamlet. Once the short incisions have been made, the middle part of the piece of wood is wrapped in freshly cut leaves (for example, banana leaves) in order to protect it from direct contact with the fire. This part of the handle is then held over a dying fire and is covered up with embers. As a result, the wood heats up and can be more easily bent. Finally, the bark is removed (see Figure 7) and the two halves of the handle are tied together at the bottom with vegetable fibers in order to maintain the correct shape.

It is worth noting here that this handle system is not exclusive to the Myky—it is well documented in several indigenous tribes of South America. To begin with, axes with a bent handle working as a peg were observed by Pedro Alvares Cabral among the Tupinambá when he first arrived in Brazil in 1500 AD (Schaden 1969:179). This feature is also registered among the Tupari (Rostain 1990:219), the Huari (Lévi-Strauss, 1948) and some of the groups neighboring the Myky, such as the Nambikuara (Rondon

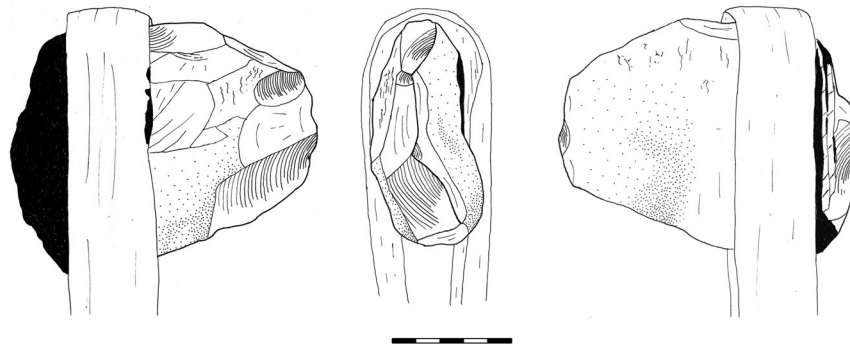


FIGURE 4 Flint axe in detail knapped by Janãxi. © Carlos Fernández González.

1946:57; Roquette-Pinto [1916] 1950:226) and the Enawenê-Nawê.

One of the reasons why the Myky flint axes are so effective as tools is the adhesive applied in their manufacture. This is made by mixing the propolis and beeswax collected from the *borá* bee. The resultant adhesive is highly ductile and flexible, and is used together with the cord in order to fix the axe handle and axe head in place. The cord is made by interweaving several strings of vegetable fiber obtained by pounding the leaves of the *buriti* or *tucum* palm tree. Unfortunately, this activity was not directly observed during the fieldwork, but was described orally to me by the Myky elders.

The final stage in the *chaîne opératoire* is the hafting of the flint axe head. The first step here is to heat up the beeswax adhesive and cover the butt of the flint axe head with it. Next, the butt is wrapped with the vegetable fiber cord. This helps to fix the axe head securely within the handle. Finally, the axe head is fitted into the gap at the top of the handle where the piece of wood is bent in two. The Myky use a piece of wood to press the flint axe head in place while gripping the handle.

This technique—of fixing the flint axe head into the handle by covering the butt in adhesive and then wrapping cord around it before inserting it—has also been documented among the

neighboring Nambikuara. As Marshal Rondon and the ethnographer Roquette-Pinto pointed out, the Nambikuara used cords made of cotton wrapped around the lithic axe head (Rondon 1946:57; Roquette-Pinto [1916] 1950:275). The Enawenê-Nawê axes mentioned earlier were also made using the same technique.

Once the head is firmly in place, the flint axe—called *awypjatápa* by the Myky (*awypja* means flint and *tápa* means axe)—is now complete and ready for use (Figure 8).

5.3. PRACTICAL USE OF THE AWYPJATÁPA

As reported by the Myky elders, in the past they used to make flint axes when they were going to cut down and burn trees to cultivate the land (“slash-and-burn” agriculture). They also used them, as mentioned, to open up shafts in tree trunks in order to obtain honey, propolis and beeswax from the beehive within. These stone tools were primarily used, therefore, in the cutting of wood.

During the fieldwork, I was invited by Janãxi, the chief of the Myky, to walk with him into the forest. He wanted to show me which tree they commonly use to make the axe handles and where they get it from. Alan Borboleto, member of the CIMI, also came with us. I took with me the flint axe that Janãxi had given me two days



FIGURE 5 Flint axe head in detail made by Măty'ý. © Carlos Fernández González.



FIGURE 6 Kiwuxi sharpening and polishing an axe head by grinding it on the sandstone rock. © Carlos Fernández González.

previously. Once we had gone some distance from the hamlet along one of the numerous footpaths in the forest, Janãxi approached a small tree and felled it with his machete. Next, he cut the narrow trunk lengthwise into two parts, selected one part of it to make into a handle and started preparing it.



FIGURE 7 Janãxi and Măty'ý in the process of bending the wood in order to make an axe handle. There is a completed handle lying on the ground. © Carlos Fernández González.



FIGURE 8 Janãxi inserting the flint axe head into the handle. © Carlos Fernández González.

Suddenly, after answering some of my questions about how they made their axes, he took the flint axe out of my hands and started to use it to cut down a tree as a demonstration. The tree was a soft wood specimen of approximately 30 cm in diameter. The process lasted around 12 minutes and during that time Janãxi only stopped once to relocate the flint axe head, which had shifted slightly in its handle. It was astonishing to witness how quickly he felled the tree and the precision and rhythm of his chopping technique. As if this were not enough to prove the validity of the Myky flint axes as highly effective cutting tools, Janãxi then proceeded to fell another tree, in this case with a trunk of approximately 15 cm in diameter. It took him three minutes to complete this process (Figure 9).

6. DISCUSSION AND CONCLUSIONS: THE MYKY LITHIC EXPERIENCE

The ethnoarchaeological research presented here helps us to understand the economic possibilities of a particular type of flint material. The experience of the Myky people of Brazil demonstrates how a group whose subsistence relies on horticulture can develop this kind of economy with the help of flint tools.

The effectiveness of the Myky flint axes for slash-and-burn land clearing, particularly felling trees, is one of the most interesting aspects revealed by this fieldwork. This observation highlights that it is problematic to relate the rise and development of horticulture and agriculture to the appearance of highly polished or ground stone axes made from igneous rocks. As we have seen here, the case of the Myky axes shows us



FIGURE 9 Illustrations and photographs of the “Awypjapá” used by Janãxi to fell the trees. © Carlos Fernández González.

that knapped flint is a viable tool for the development of slash-and-burn agriculture.

The use of flint axes is documented in the world archaeological record, especially in the Neolithic context in Britain (Edmonds 1995). During this period of prehistory, large axes, called “roughout axes,” were made from flint nodules by chipping out a rough shape and then finely polishing them.

It is important to mention that horticulture held and still holds a remarkably important place in the Myky economy: they traditionally cultivate maize, manioc, beans, sweet potato, cará, and peanuts. This was the case even before first contact in 1971. Thomáz de Aquino Lisboa, one of the members of the first contact expedition, mentioned this in his early accounts (Lisboa 1979, 1983). Consequently, it is evident that the development of slash-and-burn horticulture and agriculture took place among the Myky with the help of flint axes, well before the appearance of steel tools, such as machetes, in their society.

One interesting question that arises from this is why the Myky originally decided to use flint as a raw material for making their axes, when igneous rock is both harder and more durable, and therefore often favored as a lithic material for making tools. It seems probable that they

chose flint because it is the only suitable raw material available in their current territory, or even in the wider area they inhabited in the past. There are no igneous rocks documented in these areas. Therefore, flint was the next best material available to them.

Even if in the distant past the Myky ancestors may have used igneous rocks for tool-making, the elders I spoke to during this fieldwork did not recognize it as a raw material used by their tribe. I showed Janãxi a photograph of a polished stone axe deposited in the Rondon Museum of Cuiabá that was made of diabase and had belonged to the Enawenê Nawê tribe. Notably, he did not recognize it as belonging to the Myky or their ancestors and said that it was of Paresí manufacture, another indigenous group who traditionally inhabit a territory south of the Menkü indigenous area. The evidence would therefore suggest that although the Myky do recognize axes made from igneous rocks, they have never favored that material themselves, perhaps quite simply because it was not available to them.

As we have seen, the *chaîne opératoire* for the Myky flint axes is not an especially complex process and, on the whole, is characterized by its immediacy. The Myky do not store their lithic material or finished axes. If a flint axe becomes blunt, they try to sharpen it through polishing. If they believe that it is no longer useful, they simply discard it and go to their source of raw material to find a flint nodule and make another one. It appears that traditionally the Myky have tended to place more importance on their axes being relatively rapid and straightforward to manufacture, and small and light enough to be portable, rather than on the durability of the tool. Therefore, these flint axes could be seen as “disposable” tools—quick and convenient to make, and easily replaced when worn.

A key consideration here is how the Myky tribe was forced to live in the period from 1900 to 1971. For most of the twentieth century this group was obliged to flee inland, deeper and deeper into the forest, far from the main rivers and their tributaries. They were constantly on the move due to pressure from Brazilian settlers and attacks from other indigenous groups, as well as loggers, cattle ranchers, and *seringueiros*. I would argue that the Myky tribe came to depend so heavily on flint because they needed an immediate source of raw material due to their forced semi-nomadic lifestyle. This could explain why they developed such a quick method of manufacturing their flint

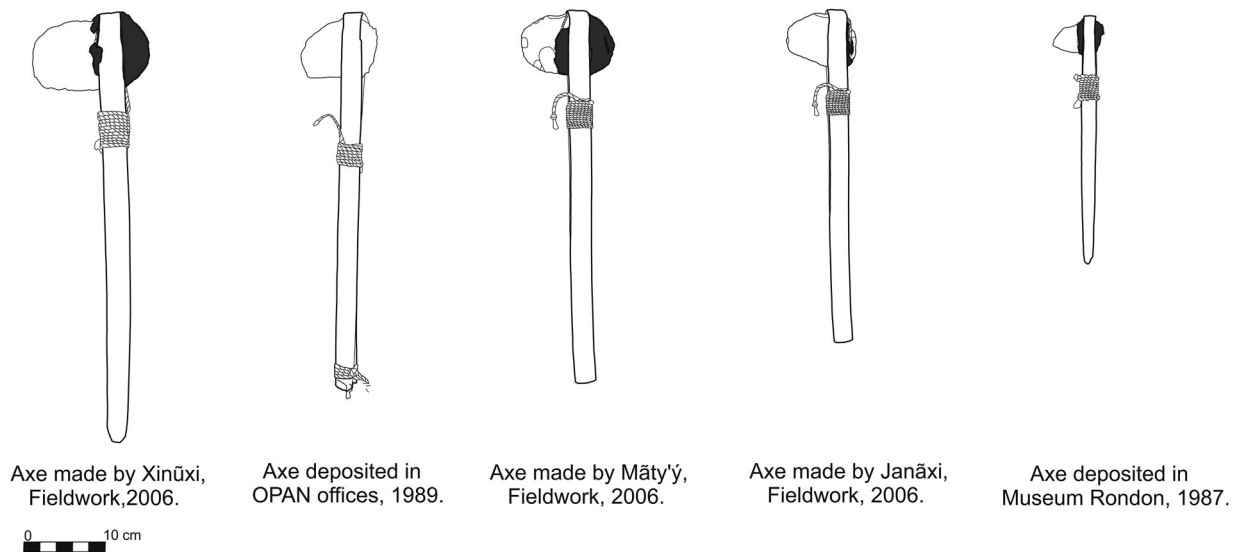


FIGURE 10 Five flint axes made by the Myky. The tags show the person who made each one (where this is known), the place the tool was first recorded, and the year in which it was made. OPAN: Operação Amazônia Nativa. © Carlos Fernández González.

axes; they effectively created a portable material culture.

It is still too soon to clearly establish the archetypal shape of a Myky flint axe head. The sample the author collected here was not large. However, in a general sense, it could be defined as a more or less symmetrical piece of oval- or trapezoidal-shaped flint, knapped and polished along the bevel. In addition, the Myky also hafted small flakes of flint (see Figure 10, the axe deposited in the Rondon Museum) that were sometimes polished and could be considered small axes.

The flint axes were traditionally used for various purposes, though almost always involving wood, for example felling trees or accessing beehives. During this fieldwork, the Myky elders also mentioned how flint axes or flakes were employed in the past to pare and smooth off the wood when making bows for hunting. In addition, a younger member of the Myky has carried out a project recently in which he describes how very small stone axes used to be made as toys for the children of the group (Myky 2015:15). Future fieldwork might help us to establish more precisely the different kinds of lithic tools employed by the Myky in the past, and their functionality.

One of the great issues of archaeological science is to determine what cultural links we can infer by looking at material culture. In the present case, flint axes are not found, either knapped or polished, among the tribes neighboring the Myky (though there are similarities in some other

features of their stone axes; for example, the handle system). The present study therefore represents a first step in defining the lithic tradition of the Myky culture through the study of its most characteristic tool, the flint axe. The analysis here has been complemented by comparison with existing documentation about lithic technology among neighboring indigenous groups.

Before its permanent loss to world heritage and Myky society, we have been able to record a case in which people were using lithic tools until recently—surely one of the very few places on the planet where it is possible to see this. Moreover, the present research has filled a gap in international ethnoarchaeological literature related to lithic technology (David and Kramer 2001; Sillitoe and Hardy 2003). Until very recently (McCall 2012), South America was not mentioned in these important studies, despite the enormous possibilities that the subcontinent presents for research of this kind (Politis 2002, Fernández González 2004), as demonstrated by the present study.

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