The Meaning of "Tr
in Two Diffe
Tupí-Guaraní Langu
from Two Diffe
Neotropical For

The Meaning of "Tree" in Two Different Tupí-Guaraní Languages from Two Different Neotropical Forests

WILLIAM BALÉE

Tulane University, New Orleans, USA

MARILYN CEBOLLA BADIE

Universitat de Barcelona, España

Abstract

Data are presented to show whether the terms for 'tree' in two different but related languages, Ka'apor or Urubu-Ka'apor (henceforth, Ka'apor) and Mbya-Guarani (henceforth, Mbya), are in fact cognate terms in having the same intensional meanings. These terms are *myra* (Ka'apor) and *yvyra* (Mbya). Data gathered from freelisting exercises among the two groups are compared to knowledge of architecture and dynamics of trees, basal area of trees, and local forestry in the two habitats to determine whether psychological salience rankings of taxa listed in the freelists match features of the environment and of the flora. Psychological salience is inferred by Smith's S. The data indicate that philosophical and linguistic axioms regarding trees as "big and hard" tend to be supported statistically and ecologically with data from the two different languages in the two different forests of this study.

Keywords: tree terms, Tupí-Guaraní languages, philosophical deduction, psychological salience

Resumo

São apresentados dados para mostrar se os termos para "árvore" em duas línguas diferentes, mas relacionadas, Ka'apor ou Urubu-Ka'apor (daqui em diante Ka'apor) e Mbya-Guarani (daqui em diante Mbya), são de fato termos cognatos ao possuírem os mesmos significados intencionais. Os termos são *myra* (Ka'apor) e *yvyra* (Mbya). Dados obtidos através de exercícios livres de listagem ("freelisting") de termos entre os dois grupos são comparados para conhecimento da arquitetura e dinâmica de árvores, área basal ou dominância relativa das árvores e manejo de árvores em dois habitats para determinar se as posições de importância psicológica de cada espécie listada de maneira livre encontram correspondência no meio ambiente e na flora. A importância psicológica é medida pelo s de Smith (Smith's s"). Os dados indicam que axiomas filosóficos e linguísticos para referência a árvores como "grande e dura" tendem a ser suportados estatisticamente e ecologicamente com dados das duas línguas nas duas florestas que foram o foco desse estudo.

Palavras-chave: árvore, Tupi-Guarani, dedução filosófica, importância psicológica.

Résumé

Les données presentées montrent que les mots pour "arbre" dans deux langues différentes, Ka'apor ou Urubu-Ka'apor (desormais Ka'apor) et Mbya-Guarani (desormais Mbya) sont en fait des mots connexés dans le même sens déductif. Ces mots sont myra (Ka'apor) et yvyra (Mbya). Les données recueillies à partir des exercices de la liste-libre (freelisting) entre les deux groupes sont comparées à la connaissance de l'architecture et la dynamique des arbres, surface terrière des arbres et l'exploitation forestière locale dans les deux habitats afin de déterminer si les classements de importance psychologique des taxons inscrits dans les listes correspondent à des caractéristiques de l'environnement et de la flore. Importance psychologique est déduit par "Smith's s." Les données indiquent que les axiomes philosophiques et linguistiques en ce qui concerne les arbres comme "grands et dures" ont tendance à être soutenu par les statistiques et l'environnement des données de deux différents langues dans les deux forêts de la présente étude.

Mots clés: les mots pour arbre, les langues tupi-guarani, déduction philosophique, importance psychologique

"He who knows the essence really knows the thing as to what it is and by knowing what it is not" Aristotle, Book Beta, Metaphysics, p. 61

OBJECTIVE

The purpose of this paper is to determine whether the terms for 'tree' in two different but related languages, Ka'apor or Urubu-Ka'apor (henceforth, Ka'apor) and Mbya-Guarani (henceforth, Mbya), are truly cognate in having the same intensional meanings. The Ka'apor speak a Tupí-Guaraní language in eastern Amazonian Brazil. They number about 1600 persons living in 12 villages across an expanse of about one-half million hectares of forest. The Mbya of Misiones Province, Argentina also speak a Tupí-Guaraní language. They have a population of 4,083 persons (INDEC 2005) in Misiones Province, Argentina alone; they are also found in six Brazilian states as well as adjoining Paraguay (Jensen 1999) for a total population of about

20,000 (Assis and Garlet 2004). The Tupí-Guaraní family is divided into eight subgroups. Ka'apor is in subgroup 8 and Mbya is in subgroup 1 (Jensen 1999).

DIMENSIONS OF CONTRAST

The ethnobiological label 'tree' is basic to the folk labeling of the plant domain in the world's languages (Berlin et al. 1973, 1974; Brown 1984; Atran 1990; Berlin 1992; Witkowski and Brown 1980). At its most basic, it is a "brute" fact, as opposed to an "institutional" fact (Searle 1995, cited in Viveiros de Castro 2004: 13); rather, one could make the argument that trees are first of all nature not culture (see Viveiros de Castro 2004: 13). Linguistically, the term for tree in various languages is never marked. "Tree" terms are semantic "primitives" in the terminology of Friedrich (1970: 8). The basic notion of primitiveness of the concept is summed up in the Neolithic experience of people having had to deal hands-on with trees, and their physicality: "To a Proto-Indo-European hewing down a tree with a stone ax, the physical differences between an elm and a linden, or even an English and a live oak, would be obvious—often painfully so. He would tend to symbolize these differences, in words, probably roots . . ." (Friedrich 1970: 8). Folk botanical classification as we know it today is essentially unthinkable without a life form category 'tree' because all languages have the concept, though this may not always have been the case (Witkowski et al. 1981), for 'tree' as a life form label may be a relatively recent development from 'wood.'

In any event, according to Brown and Witkowski (1980), the world's languages do not encode any ethnobotanical system that does not first incorporate a life form 'tree.' After that, if a system has only two life forms, these would be 'tree' and 'grerb' (Brown and Witkowski 1980: 366). Brown (1984: 114) captured the 'tree' concept, in terms of size, in stating "**tree** is clearly the most distinctive primarily because it encompasses the largest and, hence, the most conspicuous plants in an environment. As a consequence of its exceptional natural salience, tree is unmarked vis-à-vis all other plant life-form classes" (boldface in original). Grerb is an invented term that denotes a small, mainly green, herbaceous and non-woody plant. It is a term designed to cover indigenous words used to contrast with tree. After grerb, the world's languages encode terms equivalent or roughly equivalent to bush, vine, and grass (Brown and Witkowski 1980: 366; cf. Brown 1984). Brown and Witkowski (1980) define tree essentially in a dialectical mode, emphasizing how it contrasts with grerb. The dimension of contrast, or what are oppositional characteristics, includes height, width, depth, and density. The poles of contrast along these dimensions, therefore, are tall vs. short, wide vs. narrow, deep vs. shallow, and hard vs. soft. These are the adjectival oppositions in terms of tree vs. grerb that for Brown and Witkowski (1980: 367) essentially encompass the contrasts in a deductive way.

In terms of height alone, as an example, Brown and Witkowski (1980: 367) note that the Delaware language

instantiates an adult human being as the touchstone by which to differentiate tree from grerb. A plant taller than an adult human is a tree; one smaller is a grerb. Perhaps more interesting is the universal linguistic observation noted by Joseph Greenberg (1975: 90, cited in Brown and Witkowski 1980: 361), regarding the zero-to-infinity principle. The relevance of this is to 'grerb' terms being marked and 'tree' terms being unmarked. By zero-to-infinity, we refer to the fact that along the contrast dimensions such as tall vs. short, wide vs. narrow, deep vs. shallow, and hard vs. soft, the marked item of the adjectival oppositional pair will be coupled to the zero point of the pertinent dimension, whereas the item that is unmarked will be connected to the 'infinite' end of the dimension. The unmarked term is primary and precedes in its psychological salience the marked term in representation of the entire domain, as Greenberg (1975: 90) noted on the question of antonymous pairs of such adjectives: "When the opposition is neutralized in such expressions as 'How wide is it?' or 'What is its width' the first member of each pair stands for the category as a whole."

The dimension of most substantive opposition in tree vs. grerb, of course, is size. The relevant adjectival opposition, therefore, could be summed up in terms of large vs. small (Brown and Witkowski 1980: 369; also see Tudge 2006: 6). Trees are simply big from a linguistic and philosophical perspective. Size is important as a feature for it allows for recursiveness. An archetypical tree, that is, one that is not a dwarf or otherwise aberrant, is in its mature stages undergoing multiple iterations of an underlying genetic pattern, *mutatis mutandis*, given environmental contingencies, that involve repetition of branches, leaves, flowers, fruits, seeds, and so on, continuously. This premise of recursiveness of the tree, unlike more diminutive organisms such as self-limited grerbs, is evident on top of an established structure that continues to add height to its overall dimensions (Lévi-Strauss 1966: 159-60). Apart from the underlying philosophical premise of trees as "big," however, one can, in fact, argue statistically that trees are big from a physical and material perspective, one that is simultaneously rooted in the two languages and two forests of this study. Such an argument, if proven, is *prima facie* evidence in support of the linguistic and deductive axioms of treeness. Bigness vs. smallness of trees is in fact a dimension that tends to encompass several of the others already mentioned, including tall vs. short, wide vs. narrow, and hard vs. soft in the domain of plants. We will see also that this deductive intuition appears to be a good fit with Ka'apor and Mbya freelisting data concerning the cognitive parameters of the life form label 'tree' in their two languages, respectively.

TREES AND PSYCHOLOGICAL REALITY

Do 'trees' as a life form taxon have psychological reality in these languages, or any languages for that matter? The question may be posed in a way parallel to though not in exactly the same way

as to whether the taxa of science have validity qua science, not psychology. The beautiful, rare gastropod called Junonia (*Scaphella junonia*) is sometimes called the pride of Sanibel Island, Florida, which is one of the showcase shell-collecting Meccas of the world, and were an out-of-towner to find one, s/he may well end up in a major feature in the local newspaper. Junonia is also found offshore in deep water from the Carolinas to Texas (Abbott 1984: 9). That gastropod has psychological reality to malacologists, perhaps some other zoologists, and certainly shell enthusiasts, but not really to anyone else. Junonia is a 'real' entity when defined by standard biological criteria, also, including sexual reproduction and closure as a species (Steussy 1990: 208). A problem with these criteria, of course, is they do not hold in all cases. Often botanical families seem less real than species in general (Steussy 1990: 208). On the other hand, occasionally certain families, such as mints (Labiatae) and carrots (Umbelliferae), which have been recognized since Theophrastus (BC 370-285) as being real, seem to be more so than their segregates (Steussy 1990: 208). The same is arguably the case for palms, where the concept of the genus is "nebulous" (Henderson 1995: 21) but the reality of the family is undeniable. In this regard, the dendrological approach can be most useful, even laudatory, as the reality of wood, leaves, branches, and architecture of large groupings of organisms seems to transcend smaller groupings; splitters would tend to approve of the approach we take here, and agree with the notion that "generic concepts have been more or less at the whim of particular taxonomists" (Gentry 1993: 1).Yet to not recognize scientific taxa above the level of the individual organism but beneath that of the family and genus, as we have argued (Balée and Moore 1991: 216-17), seems to be an exercise in futility, since clear groupings of organisms can be detected in nature even if taxonomic concepts themselves are not fully airtight due to hybridization and apomixes (Steussy 1990: 208).

Balée and Moore (1991: 216) were taken to task for arguing that plant species in their sample of five Tupí-Guaraní languages being compared were natural units, not products of mind. For purposes of understanding such comparison of plant names. Françoise Grenand (1995: 37) stated, by way of critique:

> "Botanical species, even those defined by the logic of an extinct and supposedly neutral language [i.e., Latin] are still the product of a classificatory concept that came from the human brain. . ."[1]

Balée would not disagree with that correction today, but merely at this point we would add that one needs both the science of systematic botany, however flawed, as well as the cognitive sciences, however imperfect, in order to construct better a descriptive model of linguistic and cognitive reality, to account for how people actually understand the landscapes they live in, and in some cases the landscapes they and their ancestors have created. We cannot escape our nature, which is not to say we are automatons, though to to some extent we are biased by our enculturation. Ev-

eryone has contingent pasts that have influenced their perception and classification of the landscape as well as the flora and fauna that make it up. People act as individuals in the environment but only within the constraints given by history and the group they originate in, even if they are people moving between different cultural loci.

We can, in fact, therefore concur with Grenand's (1995: 37-38) next statement fully:

> The synchronic comparison among languages or even the diachronic study of different stages of a single language puts into play scales of time and of space. Whereas the former allows one to understand survival of ancient behaviors, the remainder of an extinct social condition, the latter offers proof of the effects of intercultural contact, of the proximity or, in contrast, of the distance between human groups.[2]

Time and space—the raw material of historical ecology—do in fact influence what the landscape consists of. It is the landscape in the final analysis that holds the key to understanding the flora and fauna available to local human populations. These are the organisms, in principle, that local populations name and classify, not others (Berlin et al. 1973, Berlin 1992; Balée 2003). The rules of ethnobiological classification are general, but the flora and fauna that fall under any classification are ultimately local, and these contingent factors influence the definitional attributes of the taxa that are included in ethnobiological categories.

Let us return to Françoise Grenand's problem concerning the categorical reality of species. The question is phenomenological in integrative biology and one cannot escape it. Problematically, individual organisms of too many species manage to breed with other organisms of other species successfully, and these species are not just frogs! Hybrids among trees are well known among oaks, poplars, and willows. In England, and throughout temperate cities, one sees the hybrid London plane tree (*Plantanus x acerifolia*). Reputedly, it is a cross between the American sycamore (*Plantanus occidentalis*) and the Oriental plane tree (*Plantanus orientalis*), which hybridized in the Botanic Garden of Oxford University in the 1600s (Tudge 2006: 11). A vast number of domesticates and weeds, moreover, are hybrids, and many of these cannot reproduce by sexual methods because of a lack of matching chromosome pairs in the parental generation.

Questions of what constitute a species continue to be relevant to the broader though purely dendrological question of what is a tree if only because answers, in both cases, involve hedging and ambiguity. Trees have the essence of life: they are what Aristotle called "perishable sensible substances" as opposed to "eternal sensible substances" and "unchangeable substances" (Aristotle 1998: 3; see Atran 1985). They are finite, limited, and transitory, as is life itself. If for scientific species it is well enough to point out that "No biological concept is absolute; hence imperfections in viewing species as real must

be tolerated. . . " (Stuessy 1990: 167), it is equally germane, though somewhat logically, in terms of its derivation different, to observe, as does Tudge (2006: 6), that, "A tree is a big plant with a stick up the middle—*or could be if it grew in the right circumstances; or is very closely related to other plants* that are big and have a stick up the middle; or resembles a big plant with a stick up the middle" (emphasis added). Even if it were an aberrant tree, a broken tree, a bonsai or a dwarf, or tree that otherwise might have grown tall in the open sun but for contingency reasons did not (Tudge 2006), it is still a tree (Atran 1985).

Using the same definitional logic, whereas a "fake gun" is not a gun, a "black gun" is a gun and so too are a "broken gun" and an "inoperable gun" because by criteria that defines a "gun," these examples have the relevant motor activity properties or they were "originally . . . made to function like a gun" (Lakoff and Johnson 1980: 121). In the same way, the aberrant tree that did not reach the proper tree-like height is still a tree because it was originally supposed to be a tree by the logic of natural selection, most of the time. However odd in its particular life circumstances, a tree is a living thing and makes up part of an extenuated life form, usually identified in natural languages with some notion of prototypicality (Rosch 1978). By this, we specifically mean trees of high psychological salience, to be defined below.

Our data are from two languages, Ka'apor and Mbya. Although they are related by common membership in the same language family, these two languages are nevertheless different by fundamental subgroup criteria (Jensen 1999). They are also similar in terms of being historically located within Neotropical forest contexts, yet different by other temporal and spatial criteria. In terms of temporal criteria, one can expect the two languages to have experienced a deep wedge of time differentiation from the parent language, Proto-Tupí-Guaraní, because each is in a different recognized subgroup of Tupí-Guaraní (Mbya in subgroup 1, Ka'apor in subgroup 8) and they are far apart spatially (see Map 1).

In terms of spatial criteria, moreover, the two languages have interacted with fundamentally different Neotropical forests, the Ka'apor, on the one hand, have been since the late 19th century associated with pre-Amazonian (or Amazonian Maranhão) forests which are essentially similar to other forests of eastern Amazonia east of the Tocantins River (Balée 1994: 35-9) with a few exceptions. The Mbya in our sample have historically inhabited a subtype of Atlantic Coastal Forest called Selva Paranaense of Eastern Paraguay, Northern Argentina, and Southwestern Brazil which, although it shares many genera with Amazonia, shares few species with that region (Mori et al. 1983). The occupation of forests in Misiones Province by Guaraní-speaking people is firmly dated at 1200 years ago and 900 years ago in the Uruguay River basin, with likely occupation in the area dating from 2,000 years ago (Noelli 2004: 32). Both groups in this study, the Ka'apor and Mbya, are intimately

familiar, and over a long time period, with the forests they inhabit, and with the trees that occur in these forests. So in terms of space-time, or more generally, in terms of historical ecology, one can speak of controlled comparison in the domain of trees with regard to the Mbya and the Ka'apor, assuming we have a parallel concept to begin with, namely, that of 'tree.' Of course, if we begin with ethnobiological theory, and the deductive approach therein (as in Berlin 1990), we can assume from the outset that Mbya *yvyra* and Ka'apor *myrá* are cognate tree terms, or at least, are simply independent 'tree' terms.

TREES AND AESTHETICISM

Are trees really 'trees,' and do all persons see 'trees' as such? Are trees in essence big plants only? Recall that trees are "brute" not "institutional" facts (Searle 1995, cited in Viveiros de Castro 2004). On the other hand, some individuals would not see the trees for the flowers, so to speak. In other words, what evokes the plant world is not so much the distinction of bigness vs. smallness (treeness vs. grerbness) at the life form level, but rather, beauty vs. drabness. The renowned painter Margaret Mee had an eye for not the largest trees of the pre-Amazonian forest, when she visited the Ka'apor Indians in 1956, but rather for the "*pink and white blooms of Gustavia augusta* . . ." (Mee 1988: 36) [called jeniparana in Portuguese], a striking zygomorphic flower of a "*small* tree of old fallows and swamp forests" (Balée 1994: 291, emphasis added). Perhaps Mee's aesthetic, even exquisitely enchanted notion of the forests of Amazonia derives not from the trees it harbors, but from the flowers. This is not so far phenomenologically from some indigenous thought Balée collected in 2003 from one of the informants later used in the present study of free-listing, in 2008. The informant, a married female of about 60 years of age in 2008, upon being asked what she thought about the end of the land invasion of the Ka'apor reserve by loggers that had recently been resolved, replied that she regretted the loss of the purple flowers from *Tabebuia impetiginosa*, known as tajy or tajy-te in Ka'apor (called ipé roxo or pau d'arco roxo in Brazil). By Smith's s, tajy is the most psychologically salient tree in Ka'apor culture (see below). At the peak of the dry season, in September, tajy trees, which are one of the few deciduous trees of the forest, come into full purplish flower. As they fall, they cover the green forest floor under the parent tree with a majestic purple carpet and the winged seeds left on the branches are eventually blown by the wind to distant open fields where they may germinate. It is a volunteer species, and is a characteristic presence in fallow forests, where indigenous societies had villages and gardens in the distant past (Balée 1994). At the same time, it is a valuable timber species. In Paraguay and Argentina, its close relative, also with purple flowers, *Tabebuia heptaphylla* (called lapacho negro or lapacho rosado in Spanish), was driven to near extinction by the logging industry in the 1970s (Torres et al. 1989: 56). Both species qualify

both as 'big' and as 'beautiful', depending on perspective.

So is a tree, in its Aristotelian essence, an aesthetic or physical concept? What kind of a thing is it? If physical, it would logically need to have quantitative, objective, third-personal qualities as opposed to qualitative, subjective, first personal or immaterial attributes (Searle 2004: 116). A tree would have to present with a capacity for causality in order to have psychological reality in a universal, physical sense. Ghosts and rainbows (which are not material arches in the sky) lack that capacity because they are not quantifiable and causal, in contrast to solidity and liquidity (Searle 2004: 117). In that sense, trees, as physical objects that are big, wide, deep, and hard, take on aspects of reality and objectivity (Searle 2004), though they do not necessarily discard things like spirituality, magic, beauty, and immateriality.

We do not need merely to assume that trees exist by deduction, however, for we can prove that assumption now with freelisting data to be shown below. Still we have not shown all the potential exceptions to the taxon 'tree' that might exist in any given ethnobiological system of classification. What does one do with immature individuals? Living seeds, monocotyledons and dicotyledons of trees, upon germination can become growing tree seedlings of often shorter and in some cases less lignaceous trees than many mature grerbs. Does that make these individuals any less treelike? One can answer this by referencing indigenous languages that explicitly distinguish juvenile specimens from parent material. The Ka'apor do refer to tree seedlings, the 'young' adult, as the ta'yr of the plant, and to the seeds as ha'ĩ 'seeds.' They observe plants grow from seedling to adult individual in swiddens and in the forest, so obviously they see all life stages of a plant, unlike taxonomic botanists. The late New York Botanical Garden botanist Rupert Barneby expressed admiration to Balée about this, when saying he could not identify seedlings of Cecropia spp., so different were they from the mature specimens ordinarily pressed and submitted to herbaria for identification by professional botanists. These immature individuals had been collected as part of an inventory of the forest floor. These were real specimens, though they had not yet entered into scientific classification, nor would they. There was nothing to compare them to.

TREES, POLYSEMY, AND PERSPECTIVISM

Trees could be non-trees through their polysemic status, a widely noted feature of life form labels (Berlin et al. 1973, Randall and Hunn 1982: 837-38; Atran 1985; Balée 1994: 179). In Ka'apor, *myra* ('tree,' provisionally) also means 'wood'[3] and numerous finished wood products (Balée 1989: 6), such as stick, cane, rifle stock, pole. In the Mbya language, yvyra likewise denotes wood, stick, pole, and sundry related terms.

What came first—'tree' for trees in the forest, or 'tree' for cultural products? Although to answer this directly intro-

duces tautology, perhaps it cannot be helped—it's an example of an ineluctable imperfection in ethnobiological reasoning, as with inescapable flaws in integrative biology by a similar logic. The term 'tree' in a deductive, all purpose sense (Balée 1989) precedes these various cultural derivations because its scope of meaning at the next, descending rank (folk generic) is nothing less than vast (at least in Greater Amazonia) in reference to biological—not cultural—taxa, as we will see, and has already to some extent been demonstrated elsewhere (Balée 1989, 1994, Balée and Moore 1991). Finally, 'trees' might be other than what they seem.

If one adopts the 'multinatural' relativity of perspectivism as it has been used in reference to Amazonia (Viveiros de Castro 1998, 2004), not all beings are what they seem. Some living things are dynamic, and change form. Nothing in fact is what it seems, and all appearances are undergoing transformations into something else that escape definitional essences and congealed concepts. If humans drink manioc beer, jaguars drink human blood; when humans drink human blood, as in exocannibalistic feasts, they are (or become) jaguars. It bespeaks an underlying shamanic principle widespread in lowland South American thought, if not elsewhere in egalitarian societies. It cannot elude the sensitive reader who refuses to impose rigid Western naturalism onto what are essentially what Viveiros de Castro (2004) has sagaciously identified as multinatural categories of indigenous South American thought. In many cases, real creatures acquire human qualities while other human groups are conceptualized in animal terms. Some animals take on transitional forms (shape-shifting) (Slater 1994; Descola 1996; Viveiros de Castro 1998, 2004; Balée 2003). Many such transformations, as from noble human to white-lipped peccary among the Wari' peope of Western Amazonia (Conklin 2001), denote animal/human associations, not plant/animal associations. Yet plant/human associations are clearly known from the region.

The Mbya believe that all trees have a soul. The notion may be unique in lowland South America. In Mbya culture, the essential religious concept is the word of the soul "*ñe'ẽ*" which means 'soul-word.' In addition to having a soul, some trees also have a powerful, purifying power. *Ñe' êry* means the 'flowing soul-word.' *Yvyra ñe' êry*, hence, are "trees of the soul-word" (Cadogan 1970: 26); the concept here is that the soul flows out of these trees. They are the most sacred of trees (Cadogan 1992). The Mbya profess a belief in the sacredness of these species such that, in general, they must not be cut down or scored or cut or harmed in any way; the exception is the tropical cedar tree (see below), which is used in construction of the prayer house and in religious instruments also. They say these trees 'drip' or 'leak' because during a short period of time during the austral spring, they exude watery droplets that soak the ground beneath their vast canopies. The Mbya informants with whom the data were gathered explain that when this occurs, the drops of liquid that fall from the leaves' drip

tips form part of the soul of these trees, saying that the soul "climbs up and spills over" (Cebolla Badie 2005). This "water" is considered medicinal, analogous to holy water but more so, and in an indigenous way. The Mbya who rub their heads with the droplets of these sacred liquids claim to feel refreshed from the experience.

This mysticism that surrounds *yvyra ñe'ery* "the trees of the flowing soul-word" is not easy information to gather, for Mbya people do not wish to discuss it. According to their pioneer ethnographer, Cadogan, the profound religious connotations of this phenomenon are based on the Mbya belief that the origin of life is tied to the morning mist, fog, and water. In the bowels of the earth one is supposed to find the eternal waters that surge to the surface in the form of sacred springs, in one of which appeared *Ñande Jaryi* (literally, "our grandmother") the sacred founding grandmother of the Mbya, the mother of the solar hero *Kuaray* (Cadogan 1992) who, for his part, is a close associate of solar heroes found in Ka'apor mythology also, such as *Maír* (the name for the sun, incidentally, is *Waraby*, a cognate term evidently with the Mbya term).

Principal among these sacred trees of the *yvyra ñe'ery* 'the trees of the flowing soul-word' word is *ygary*, the tropical cedar tree (*Cedrela fissilis*), which is considered to be one that helped bring into being the original morning mist, and hence, is believed to be fundamental to the continuation of the forest and human life on earth as we know it [4]:

"In the first earth, *Yvy* tenonde, *Kuaray*, *Pa Pa Mirí* (a minor divinity in the Mbya pantheon), *Pa*, *Pa*, *Tenondegua* came to verify the earth. The first tree...[originated] from a little stick with leaves From this stick they planted the *ygary* (cedar)[1] to transform it in a tree. In the second place, they planted *aju'y atâ'i*[2] and then *aju'y chi*[3]. It was only these three trees that *Ñande Ru Pa Pa Tenonde*[4] raised up. And from the flowers of these three trees the forest was created. Those were what *Ñande Ru Tenonde* raised up for first time" (Cebolla Badie 2005).

1 Cedar tree (*Cedrela fissilis*).
2 Laurel tree (*Laureaceae*).
3 White laurel tree (*Ocotea acutifolia*).
4 Our father last-last first, the main divinity that is also termed *Pa Pa Tenondegua and Ñande Ru Tenonde*..

Another important tree in a Mbya-religious sense is the laurel, or Lauraceae family of trees in general. The concept of strength and hardness is called forth in this description of the indigenous concept of the tree at the mythical beginning of time: "*Aju'y* or laurel [conjures up] . . .an image of the indestructible column of wood created to support the earth; most [Mbya] say it is a miraculous tree created at the same time as the *ygary* or cedar" (Cadogan 1970: 23).

TREES AS ANCESTORS

The Ka'apor believe their ancestors came from a tree—*tajy*. Although the concept of people being descended from animals is perhaps more commonly acceptable in the totemic contexts, plants are not exactly inanimate but rather somewhere in between ani-

mate and inanimate (Reed 1988: 112) and modeling of human kinship principles on them is not inconceivable (e.g., Schuster and Carpenter 1996: 14-17). *Tajy* refers mainly to *Tabebuia impetiginosa*, the tree with the beautiful purple flowers. The Kuikuro people of the Upper Xingu basin, a Carib speaking society, ascribe spiritual value to *uengïfi* wood (called *kua-rup* wood in the Kamayurá language) from which founding ancestors, one of whom was the mother of the sun and the moon and wife to the ancestral Jaguar Chief, are believed to have been made by the culture hero, *Kwantingï* (Carneiro 1993: 428; Heckenberger 2007: 291). A similar origin of the sun and moon is told by the Kalapalo people, a closely related Carib society of the Upper Xingu (Basso 1987: 23-81), wherein the hero *Kwantingï* creates women from wood to give to the primordial Black Jaguar instead of giving him his own daughters, which in turn would lead to the births of the sun and the moon from one of them. The Kamayurá, a Tupí-Guaraní society also of the Upper Xingu, also consider *kuarup* wood to have been human ancestral material once; in both cases, Kamayurá and Kuikuru, the wood is used in graveposts underground, suggestive of its strength, though the species is not given in these sources. *Tabebuia* is also hard in its wood, as the Ka'apor claim their ancestors to have been: hardy people, more impervious and sturdy than they are today (Balée 1994: 7-8). Its heartwood is used to make bows throughout the Amazon basin and its local Portuguese name, pau d'arco, reflects this usage.

Ka'apor informants claimed their ancestors were different from the ancestors of other groups, such as whites and the Guajá hunter-gatherers, who were derived from softer trees. *Tajy* is perhaps not coincidentally the most psychologically salient tree species of the Ka'apor in terms of freelisting as reported herein. Another way of saying this is that *tajy* is, in some way, a prototypical tree. The question for this analyis remains, is its prototypicality due to its beauty (the beauty and showiness of its flowers), hardness, height, ancestral-hood, totemic value, or spirituality?

DATA FROM TWO LANGUAGES, TWO FORESTS

We collected freelisting data from two indigenous societies, the Mbya and the Ka'apor. Freelisting is a procedure well suited to the collection of ethnobotanical data, which is fairly restricted as to the definition of the domain (Quinlan 2005), though the amount of data in a tropical or even subtropical setting, such as Selva Paranaense, can be vast. Twenty adult Mbya—ten males and ten females—participated in the exercise. The Mbya were all located in a single settlement in the area of the community of Jejy, which is located in the biosphere reserve of Yabotí (Reserva de Biosfera Yabotî) in the northeast of Misiones Province, Guaraní Department, Argentina. The study was conducted in July 2007 and all data were collected in and around the settlement of Jejy. The Ka'apor in the sample were located in three different settlements. Twenty-four adult Ka'apor participa-

ted; they were 18 males and 6 females. The Ka'apor data were collected over a five-day period in August 2008 in a bus station in Santa Maria do Pará, in the settlement of Ximo-Rená, and in the settlement of Xie-pihun.

The procedure was fairly open ended. In both languages, each person was interviewed separately. Each was asked in his/her language, "Name all the trees you know in your language (in the human language)." In Ka'apor, the question is: "*Eme'u ihe˜ pe upa myra rer nde ukwaha nde pe*." (Tell me all the tree names you know).

In Mbya the question was the same and stated as: "*Eme' ê chevy pave yvyra kuéry réra eikuaavy*."[5]

Balée speaks competent Ka'apor and Cebolla Badie speaks competent Mbya and thus we were able to translate adequately this question into these field languages. The answers, these being the tree names each informant provided, were recorded as the informants spoke them. These were phonetic renderings that we later transcribed phonemically. Both languages have been phonemicized; in the tables, appendixes, and all text renderings of Mbya and Ka'apor terms herein, we use a consistent phonemicized orthography for both. The Mbya orthography, incidentally, shows morpheme boundaries, which is standard practice; the Ka'apor ethnography used here does not show these boundaries.

Independence of response was maintained with each informant. The data were not "contaminated" by preserving this aspect of the procedure (Quinlan 2005). The informants did not get "help" from others. The interviewers did not prompt them with hints, or requests to give more names and so on. The interviews tended to run about 20-35 minutes each. The data were "cleaned" up in terms of elimination of effects of free variation, dialect, idiolect and other sorts of obstacles to obtaining a clean list. We did not eliminate, however, sub-taxa. if an individual gave a folk generic name and several folk species of the same folk generic, all were included as separate entries, or 'names.' For example, an individual saying *tajy-te, tajy-pihun*, and *tajy-tawa* would have had all his/her entries recorded separately, even though these are all folk species of the same generic, *tajy*, which could have been entered separately also. This is widely considered to be one of the limitations of the method (Borgatti 1992), but our interest is not in determining exactly what items to exclude and which informants would be best for further exploration of a domain called 'tree.' Rather, our objective is comparison of the domain *myra* and *yvyra* in the two languages respectively. For that purpose, freelisting is an ideal way of determining the order of importance of items, regardless of their status inside folk-ordered hierarchies of ethnobiological classification, which again is not the objective of the analysis here.

The method of freelisting is based on the principle that the more culturally important or psychologically salient an item is, the higher on an individual's list that item will tend to be found. The

concept is similar to Zipf's law (Zipf 1949), which holds that the frequency of usage of a word is inversely proportional to its length—in other words, commonly used words, presumably of high psychological salience (that is, those readily accessible in common speech), tend to be shorter than infrequently used words. Ethnographers had earlier found that when Americans freelist kin terms, the word "mother" occurs about 97% of the time as the first item (Romney and D'Andrade 1964). Ranking of an item across different informants' (or respondents') lists is one factor in determining psychological salience across different minds in the same culture. Its frequency of appearance is another factor. "Mother" on a list of English kin terms is likely to be on nearly everyone's list, for kinship is not a large semantic domain (there are not a great many words in it) and motherhood is arguably an important status of personhood in Anglophone society, regardless of which one. In contrast, plant terms or, in a tropical forest, tree terms, have the potential to be unwieldy domains with a multitude of words. Ethnographer Jerry Smith (1993) introduced a method for weighting both rank and frequency of an item, in order to come up with an index of salience, now called *Smith's s*. An individual salience of an item would be as follows:

$$Sj = 1 - (rj / li)$$

Where Sj is the psychological salience of item j, rj is the rank of item j on the individual's list, and li is the length of the individual's list. If a person listed 20 tree names and "*tajy*" was 4th on the list, the rank of *tajy* would be $1 - (4 / 20) = 1 - (.2) = .8$. An item cannot have a psychological salience higher than 1.0. In order to determine the rank of any item j across a group of 20 informants, one simply sums the total psychological salience of all informants' responses and then divides by the number of respondents (20 in the Mbya case, 24 in the Ka'apor case). If tajy (*Tabebuia* sp.) does not occur on a list, it's salience is defined as 1 minus the total number of items divided by the total number of items (giving a zero).

Table 1
The Ten Most Salient Folk Tree Taxa in Ka'apor by Smith's s

Rank	Folk Taxon	Species	Smith's s	Coll. no. series Balée
1.	tajy	*Tabebuia* spp.	0.775	4349
2.	parawa'y	*Eschweilera* spp.	0.718	0010,0920,1072, 3031,4083,4308
3.	tajypo	*Tabebuia* spp.	0.635	2189,4182
4.	yrykywa'y	*Manilkara huberi*	0.474	2926
5.	tareka'y	*Bagassa guianensis*	0.467	2298
6.	akaju'y	*Anacardium* spp.	0.437	2282,0301
7.	jetai'y	*Hymenaea parvifolia*	0.408	0880

8.	jaxiamyr	*Lecythis idatimon*	0.398	0037
9.	tarapai'y	*Hymenaea* spp.	0.398	1000,4158
10.	yrapitang	*Brosimum rubescens*	0.356	0957

Because Smith's s incorporates the average both of order and frequency of items on lists, an item listed second on everyone s list would have a higher salience than the first item people listed if that item was different in all cases but everyone had the same item listed in second place. In the case of the trees, the 20 Mbya informants listed 135 different names of *yvyra* 'trees'and the 24 Ka'apor informants listed 290 names of *myra* 'trees' in 20-35 minutes each. The large difference of aggregate numbers of the total list lengths (290 vs. 135) is no doubt due to differences in species diversity of the two areas, with pre-Amazonian Maranhão simply being of greater tree species diversity than Selva Paranaense, at least in the area of Misiones, a fact due to a host of environmental gradients. The least salient items are those listed lowest on individual lists and lowest on the longest individual lists.

Table 2
The Ten Most Salient Folk Tree Taxa in Mbyá by Smith's s

Rank	Folk Taxon	Species	Smith's s	Coll. no. series Balée
1.	yvyra-pytã	*Peltophorum dubium*	0.568	--
2.	yvyra-pere	*Apuleia leiocarpa*	0.537	--
3.	kurupa'y	*Anadenanthera colubrina*	0.435	B&C 5305
4.	guavira	*Campomanesia xanthocarpa*	0.423	B&C 53023
5.	ygary	*Cedrela fissilis*	0.386	--
6.	aju'y	Lauraceae (various)	0.378	--
7.	yvyra-apyte-pytã	*Cabralea cangerana*	0.363	--
8.	guaporoity	*Plinia rivularis*	0.362	B&C 5308
9.	yvyra kachĩ	*Longchocarpus leucanthus*	0.356	--
10.	guajayvi	*Patagonula americana*	0.343	B&C 5311

These included terms in Mbya such as *guembe* (an epiphyte) [no. 134, Appendix 2] for the Ka'apor terms such as *kwereĩ* (a spiny, small palm) [no. 290, Appendix 1]. The status of these terms as trees, therefore, is questionable clearly in a quantitative sense though it is not our objective in this analysis to reject such terms, only to question their salience as prototypes. We might con-

sider these to be not trees were further tests, such as triad tests and consensus analysis, to be carried out systematically in the population, but that is not the issue here. We are specifically concerned with whether *psychological salience* actually matches or not the *physical reality* of the forest and the trees.

PSYCHOLOGICAL SALIENCE AND DOMINANT TREES IN THE FOREST

The results of freelisting exercises are found in Appendixes 1 and 2, respectively, of the Ka'apor and Mbya data, showing the rank by Smith's s, the Ka'apor or Mbya taxon, and the associated scientific taxon or taxa.[6] Tables 1 and 2 show, respectively, the top ten most psychologically salient tree taxa in the Ka'apor and Mbya languages, respectively, with their S values together with rank, folk taxon, and scientific taxon. All data analysis for this article was conducted using *ANTHROPAC* 4.983/x (© *Analytic Technologies* 1992). Although ten is an arbitrary number, we are using the top ten folk taxa of trees as the psychologically most salient members of the respective categories *myra* and *yvyra*, that is, 'trees,' in Ka'apor and Mbya, respectively. We did not incorporate, as noted above, triads and consensus analysis in our study; merely, we have begun to evaluate the comparative aspects of freelisting of an entire domain. It can be argued that the top items are the most psychologically salient based on Smith's s (Borgatti 1992; Quinlan 2005). Indeed, we would argue that these top ten, or some other high-level arbitrary figure in relation to the long lists of species given in Appendixes 1 and 2 (290 folk taxa for the Ka'apor, 135 in Mbya) represent the prototypes of the category "tree" in the two languages. "Prototypes . . . contain the attributes most representative of items inside

Table 3
Ranges of Meaning of the top ten folk terms in Ka'apor

Rank by Smith's s	Folk taxon	Species
1	tajy	Tabebuia impetiginosa
2	parawa'y	Eschweilera amazonica, E. apiculata, E. coriacea, E. micrantha, E. obversa, E. ovata, E.pedicellata
3	tajypo	Tabebuia serratifolia, Tabebuia sp. 1
4	yrykywa'y	Manilkara huberi, M. bidentata ssp. surinamensis
5	tareka'y	Bagassa guianensis
6	akaju'y	Anacardium giganteum, A. parvifolium
7	jetai'y	Hymenaea parvifolia
8	jaxiamyr	Lecythis idatimon
9	tarapai'y	Hymenaea courbaril, H. reticulata
10	yrapytã'y	Brosimum rubescens

Total No. Terminal Scientific Taxa = 20

and least representative of items outside the category" (Rosch 1978: 30). Table 3 shows specifically the range of meaning of each Ka'apor term from Table 1, for the Ka'apor terms have been more amply collected by us than the Mbya.

It is Table 4, however, that shows the exact relationship between the philosophical concept of 'treeness' and how it relates to the indigenous concept as well as the forest itself. Table 4 shows the basal area, or square meters of area, occupied by each folk taxon from eight hectares of inventoried forest in the pre-Amazonian forest of the Ka'apor habitat in extreme eastern Amazonian Brazil, carried out by Balée in the 1980s and 1990s and reported in appendixes 1 and 3 of Balée (1994). The relative basal area of a species is called its dominance. A dominant tree species, in other words, is a tree that occupies a lot more area than it would if it were randomly distributed in relation to other trees, or if it were of random size. The total basal area of the top ten folk taxa of trees of the Ka'apor by Smith's s, which in fact are 20 tree species (see Table 3), adds up to 40.2666 m^2. The total basal area of all taxa collected on all eight hectares of pre-Amazonian forest was 214.1755 m^2. The total number of botanical (scientific) species on these eight hectares in the sample was 589. This means that what the basal area for a species should be if basal area per species is randomly distributed is: 214.1755 /589 = .3636256366723 m^2. Instead, however, the analysis of our data shows that for the 20 species of trees denoted by the ten most psychologically salient tree taxa (determined by freelisting) in Ka'apor, the mean basal area per tree species is 40.2666/20=2.01333. This means that we have a group of species in these top ten folk taxa (namely the 20 botanical species) that are occupying 5.5 times more basal area than they should had size been left to chance. In other words, psychologically salient trees are statistically, in part, "big," and this is not an accident. Bigness in a statistical, ecological sense is cognitively incorporated into the indigenous concept of treeness in Ka'apor and, by extension, in Mbya, as one can determine from the large trees at the top of the Mbya list.

Table 4
Total basal area of top ten Ka'apor 'tree' taxa in 8 hectares of high forest and old fallow forest in Pre-Amazonia (inferred from appendixes 1 & 3 of Balée 1994)

Rank by Smith's s	Folk taxon	Total Basal Area Occupied on 8 Hectares (m2)
1	tajy	1.7787
2	parawa'y	24.9057
3	tajypo	2.2746
4	yrykywa'y	.7402
5	tareka'y	3.2134
6	akaju'y	1.7491

7	jetai'y	1.2164
8	jaxiamyr	4.2865
9	tarapai'y	.1018
10	yrapytã'y	0*

Total Basal area of top ten folk taxa on 8 ha: 40.2666 m2

Total Basal area of *all* taxa on 8 ha: 214.1755 m2

Total Number of Scientific Taxa denoted by 10 folk taxa: 20

Total Number of *all* taxa on 8 ha: 589

Interpretation: The above means that the average basal area per species should be, if basal area is randomly distributed:

214.1755 m2 ÷ 589 = .3636256366723 m2

Instead, as regards the 20 species found named by ten most psychologically salient 'tree' taxa, we have: 40.2666 m2 ÷ 20 = 2.01333 m2, or rather a group of species occupying 5.5 times more basal area than they should had their size been left to chance.

*The plant *Brosimum rubescens* did not occur on any of the inventory plots sampled.

DISCUSION

Although we cannot comment directly on the basal area of folk taxa at the top of the Mbya list as we can with the Ka'apor list of folk taxa, it does seem similar from the perspective of size of individual taxa as known from taxonomic botany that one is not merely dealing with organisms for their aesthetic, spiritual, and other immaterial values but rather for their sheer physicality. The evidence that bigness is an essential part of the definition of 'tree' in Ka'apor *myra* and Mbya *yvyra* is seen in the top ten trees on both lists (Tables 1 and 2) of the most psychologically salient folk taxa in the two languages. The two languages do not share a large number of taxa or species though clearly some terms, even for nondomesticated trees (cf. Balée and Moore 1991) are cognate (see Table 5). Some of these shared taxa are definitely large trees, such as *tajy*.

As for the Ka'apor top ten, from Table 1, tajy and *tajypo* are Tabebuia spp., a genus with showy flowers (they are called "big bang flowerers" for their habit of flowering at once in majestic beauty in the forest—Gentry 1993: 268). As we saw with the Mbya and Ka'apor, these are showy enough to be used as a calendar species; they also have tall, large crowns (Gentry 1992: 199). A tajy is no. 19 on the Mbya list (Appendix 2). The second folk taxon, *parawa'y* is the most common taxon in the forest. The most common scientific species in that taxon, *Eschweilera coriacea*, is a canopy tree "to 37 m tall" (Mori and Prance 1990: 205), which is significantly tall. Number 4 in psychological salience is *Manilkara huberi*, called *yrykywa'y*, and it is nothing less than a "massive tree" (Pennington 1990: 80). Tareka'y (*Bagassa guianensis*), no. 5 in psychological salience on Table 1, is an enormous tree of the high forest reaching 45 m in

Table 5
Folk Taxa in Common (similar terms, similar referents) from Appendixes 1 and 2, of the Ka'apor and Mbya[1] with plausible Proto-Tupí-Guaraní reconstructions

Ka'apor	Mbya	*Proto-Tupí-Guaraní (plausible reconstructions)	Referents
aju'y	*aju'y*	**aju'yß*	Lauraceae spp.
ama'y	*amba'y*	**ama'yß*	Ka'apor, *Cecropia spp.;* Mbya, *C. pachystachya*
apo'y	*guapo'y*	**guapo'yß*	Ka'apor, *Clusia* sp. *Coussapoa* sp, *Ficus* sp.*;* Mbya, *Ficus citrifolia*
ju'y	*ju'y*	**ju?yß*	spiny palms
*pakuri'y**	*pakuri*	**pakuri'yß*	Ka'apor, *Platonia insignis* (Clusiaceae)*;* Mbya, *Rheedia brasiliensis*[2] (Clusiaceae)
tajy	*tajy*	**tajy*	*Tabebuia* spp.
pinuwa'y	*pindo*	**pinu'yß*	Ka'apor, *Oenocarpus distichus* (Arecaceae)*;* Mbya, *Arecastrum romanzzofianum* (Arecaceae)
yrary	*ygary*	**ygary*	*Cedrela fissilis*
jenipa'y	*ñandyta*	**ñanipa'yß*	*Genipa ameriana*
para'y	*parapara'y*	**para'yß*	*Jacaranda* spp.
yŋa	*inga*	**yŋa*	Ka'apor, *Inga spp.;* Mbya, *Inga uruguensis*
kurumi'y	*yvyra kurundi'y*	**kurumi'yß*	*Trema micrantha*

[1] Some terms on one or the other list clearly have a corresponding cognate term in the other language which did not appear, however, on the other language's free list and for that reason, such terms are not listed on this table. An example would be guembe (no. 134 on the Mbya list) which refers to a species of Philodendron; the same genus in Ka'apor is called wame, a cognate by inspection, but a term that was not included in Appendix 1 because it was not elicited in freelisting of Ka'apor informants.

[2] Ka'apor has pakuri sõsõ'y for Rheedia brasiliensis (Clusiaceae) (no 65, Appendix 1) but because the term pakuri is unmarked and also in the same family as the corresponding Mbya word, we are using the principal Ka'apor term and its referent, Platonia insignis, as the evidence of the cognate.

height (Berg 2001: 69). The several *Hymenaea* spp. denoted by 7 and 9 are also large, especially no. 7, which is *Hymenaea courbaril* var. *courbaril* (jetai?y), which is "a large tree to 40 m tall in forests . . ." (Lee and Langenheim 1975: 81).

In terms of the Mbya, ygary (*Cedrela fissilis*) no. 5 on Table 2, which is the sacred tropical cedar tree that harbors the morning mist believed to be where the origins of life are found, has among its field characters height ranges of 30 m to 40 m (*Pennington* 1981, 366).The number 1 tree on Table 2, Yvyra pytã (Peltophorum dubium), at 20-35 m in height (Torres et al 1989), is a tall tree that is known for its yellow flowers. In the Mbya agricultural calendar, its flowe-ring indicates the beginning of *ára yma*, one of the three seasons in which they divide the year, and this corresponds to the end of the austral summer. At the flowering of *yvyra pytã*, the Mbya do their final planting of seeds before winter.

The second most psychologically salient tree by Smith's s on Table 2, *yvyra pere* (*Apuleia leiocarpa*), is also an enormous tree, at 20-45 m in height (Killeen et al.1993: 398; Torres et al. 1989: 92); although it is a different subspecies, in Balée (1994: 279), *Apuleia leiocarpa* ssp. molaris is referred to as a "large tree of the old fallow" in the eastern Amazonian habitat of the Ka'apor. The third psychologically most salient tree on the Mbya list from Table 2, kurupa'y (*Anadenanthera colubrina*) is from 18 to 30 m in height. Guavira (*Campomanesia xanthocarpa*) is the fourth tree in Table 2, and is only of medium height at 10-20 m; it is widespread in the area (Landrum 1986: 35). Its fruit is important in the well studied Mbya myth of the twins, a myth also present in almost all Guarani groups. The fruit was created to trick multiple evil spirits who had devoured the mother of the twins *Kuaray* (Sun) and *Jachy* (Moon), with the objective of taking them to a watercourse where they were to be drowned and from which a pregnant female escaped who would then turn into a jaguar.

The most important trees in a psychological sense (again using Smith's s as a proxy for what is psychologically important or salient) tend to be tall, big, and hard. What the Mbya and Ka'apor data suggest, therefore, is that the philosophical concept of "trees are big" actually has cognitive and statistical support in two non-Western languages of Neotropical South America. What trees are least psychologically salient? These include folk specific names contained already in generics (which is an instance of the question of redundancy, inherent in the method), such as Ka'apor *tajytawa* (no. 245 in Appendix 1, meaning 'yellow *tajy*'), a kind of *tajy* (no. 1, *Tabebuia* spp.) and Mbya *amba'y guachu* (no. 102 in Appendix 2, meaning 'large *amba'y*'), a kind of *amba'y* (no. 75, *Cecropia pacystachya*). Also included are plants that are of dubious status as 'trees,' and this would be clear no doubt were one to carry out triads and consensus analysis, such as *warumã* (no. 289 in Appendix 1), which an earlier sample of Ka'apor informants had classified as an herb (Balée 1994: 348), referencing the genus *Ischnosiphon*, which is used in making many basketry Items, including

the *tipiti* (manioc press) and sieve and Mbya *guembe* (*Philodendron* sp.), which is no. 134 in Appendix 2, used for sundry cordage purposes in Mbya technology as well as in Mbya ritual (its fruits represent human masculinity). It incidentally has no lignaceous properties or uses. These are not hard or large specimens of plants. The last 'tree' on the Mbya Appendix 2 list is a tiny treelet, *Trema micrantha*, *yvyra kurundi'y* ('wood-abcess'), which has a cognate in the Ka'apor language, in terms of similarity of sound and re-ferent, far down that list at no. 140 on Appendix 1, *kurumi'y* (literally, "*the boys' tree*"). Other folk taxa of low salience include introduced species. All of these are domesticates. They include mostly species from the Ka'apor list of Appendix 1: "mango" *mang'y* (*Mangifera indica*) [no. 168], "lime" *irimã'y* (Citrus aurantiifolia) [no. 270] "orange" (*Citrus sinensis*) [no. 276], and "gallego lime" *Citrus medica-acida* [no. 281]. The only traditional domesticate, *Theobroma cacao*, is at no. 280. Otherwise, traditional domesticates are excluded from the list of trees, which is in keeping with the concept that traditional domesticates do not constitute natural life forms (Balée 1989, 1994: 179-81). Mbya respondents did not even include a culturally most important tree, *ka'a*, on the list of trees once in the freelisting exercise, namely, South American holly or *yerba mate* (*Ilex paraguariensis*), from which an important stimulant is made. Arguably this is because it is a traditional domesticate of the region (e.g., Eibl et al. 2000), even though feral populations of it exist. On the other hand, the introduced paraíso (*Melia azedarach*), an ornamental also economically important in Misiones (Eibl et al. 2000), made its way onto the list, but at a very low rank, at no. 103, perhaps precisely because it is not a traditional nondomesticate.

There are many aspects of treeness to the Mbya and Ka'apor, including their material uses in subsistence and culture, aesthetic value, antecedence as human ancestors, spiritual condition as beings with souls, or receptacles of the origins of life and humankind. One definitional aspect of tree in both Mbya and Ka'apor cases seems primary, however, and it likely occurred before these other criteria. That is the combined attribute of bigness and lignaceousness or woodiness. As such, physicality, or primitiveness in Friedrich's terms, would seem to be indeed a universal attribute and a good starting point of the condition of treeness, and this is not just inferable by language comparison or philosophical deduction alone, but is evident also from the very nature of the referents and their relative dominance in the landscape. If Aristotle's definition (1998) of natural things in terms of substance as essence is provisionally correct, we can argue that the domain of Mbya and Ka'apor folk subconsciousness is actually as Western in philosophical outlook as anything civilization has ever devised, though their own conscious mythology concerning the origins of fauna, flora, and humanity are decidedly nonwestern.

ACKNOWLEDGEMENTS

We would like to acknowledge the Tulane University Stone Center for Latin

American Studies, and the Tulane University Research Enhancement Fund for support of research in 2007-08. Also we thank Irma Stella Insaurralde, Curator of the Herbario Universidad Nacional de Misiones, Facultad de Ciencias Exactas, Químicas y Naturales for determinations of several specimens of trees reported in Table 2. Finally, we are grateful to Rudy Sayas and Eliseo Sosa for various kinds of field assistance in the Mbya research and to Valdemar Ka'apor for logistical and other support in the Ka'apor research.

NOTES

[1] "Les espèces botaniques, même ainsi définies au travers d'une langue éteinte et supposée neutre, restent le produit d'une réflexion classificatoire issu du cerveau humain . . ."

[2] "La comparaison synchronique entre des langues ou encore la comparaison diachronique entre des états d'une langue, mettent en jeu des échelles de temps et des échelles d'espace. Tandis que les premières permettent d'appréhender les survivances d'activités antérieures, les rémanences d'un état social aboli, les secondes rendent compte des effets de contact, du voisinage ou au contraire de l'éloignement des groupes humains."

[3] Wood/tree polysemy is extremely common in the world's languages (Brown 1984: 60; Witkowski et al. 1981). Brown (1984: 61) suggests that the term for 'wood' preceded that of tree, ontologically. The idea is that society had uses for wood before it reached a scale of sophistication where it might require terms for life-form categories like 'trees.'

[4] Carlos Fausto (2007) has recently voiced skepticism over the longstanding scholarly emphasis on the originality of Mbya religion, including its separateness from whites and Christianity, and including its notion of what is sanctified and what is not. For the present analysis, what is important is the present, or synchronic Mbya belief in the existence of trees in the Selva Paranaense as genuine beings with souls, and their corollary belief that some of these trees are harbingers of the original morning mist, the sacred substance where life itself and all that is known in the world began, whether that complex of belief is syncretic and post-conquest history or not. In the same way, what is important to the present analysis is that the life form term yvyra refers to trees themselves first to the extent that the Mbya classify these first as organisms in nature so to speak, rather than as utilitarian objects (sticks, poles, and so on—see note i).

[5] The procedures described herewith were approved by the Tulane Office of Human Research Protection as IRB Study no. 08-00052U, Tulane Internal no. 14913. The Ministerio de Ecología y Recursos Naturales Renovables of Misiones Province, Argentina approved collections of voucher specimens used in this study (reported in Table 2), all of which were deposited at the Herbario of the Universidad Nacional de Misiones, Argentina, at Posadas, Argentina. Collections of voucher specimens and conduct of ethnobotanical and related research in the Ka'apor habitat reported in this article were approved by CNPq and FUNAI under a series of research authorizations granted to Balée in the 1980s and 1990s. Freelisting interviews conducted with Ka'apor informants in the summer 2008 were approved by Valdemar Ka'apor (President of the Associação Ka'apor do Rio Gurupi) and the regional office of FUNAI, Belém, Pará, Brazil. No biological collections of any kind were made in Brazil in summer 2008.

[6] Because the only operative numbers for the purpose of comparison between the

two languages were the results of the calculations that gave the Smith's s values from computation in ANTHROPAC, we did not think it necessary to include frequency and average rank data per species per language in Tables 1-4 and in Appendixes 1 and 2. These data can be made available, however, upon request to the corresponding author.

REFERENCES

Abbott, R.T. 1984. *Collectible Florida Shells*. St. Petersburg, FL: American Malacologists.

Alcorn, J.B. 1984. *Huastec Mayan Ethnobotany*. Austin: University of Texas Press.

Aristotle. 1998. *Metaphysics*. Trans. H. Lawson-Tancred. London: Penguin.

Assis, V. de and I.J. Garlet. 2004. Análise sobre as populações guarani contemporâneas: Demografia, espacialidade e questões fundiárias. *Revista das Índias* 64(230):35-54.

Atran, S.1985. The nature of folk botanical life-forms. *American Anthropologist* 87(2):298-315.

Balée, W. 1989. Nomenclatural patterns in Ka'apor ethnobotany. J*ournal of Ethnobiology*. 9(1):1-24.

____.1994. *Footprints of the Forest: Ka'apor Ethnobotany—The Historical Ecology of Plant Utilization by an Amazonian People*. New York: Columbia University Press.

____.2003. Native views of the environment in Amazonia, in *Nature across Cultures: Views of Nature and the Environment in Non-Western Cultures*, ed. H. Selin, 277-88. Manchester, UK: Kluwer Academic.

Balée, W. and D. Moore. 1991. Similarity and variation in plant names in five Tupí-Guaraní languages (Eastern Amazonia). *Bulletin of the Florida Museum of Natural History, Biological Sciences* 35(4):209-262.

Basso, EB. 1987. In Favor of Deceit: *A Study of Tricksters in an Amazonian Society*. Tucson: The University of Arizona Press.

Berg, C.C. 2001. Moreae, Artocarpeae, and Dorstenia (Moraceae) *with Introductions to the Family and Ficus and with Additions and Corrections to Flora Neotropica Monograph* 7. *Flora Neotropica Monograph* 83, 1-346. Bronx, NY: New York Botanical Garden.

Berlin, B. 1990. The chicken and the egg-head revisited: Further evidence for the intellectualist bases of ethnobiological classification, in *Ethnobiology: Implications and Applications (Proceedings of the First International Congress of Ethnobiology [Belém, 1988])*, vol.1, eds. D.A. Posey and W.L. Overal, 19-33. Belém: Museu Paraense Emílio Goeldi.

____. 1992. *Ethnobiological Classification: Principles of Categorization of Plants and Animals in Traditional Societies*. Princeton, NJ: Princeton University Press.

Berlin, B., D.E. Breedlove, and P.H Raven. 1973. General principles of classification and nomenclature in folk biology. *American Anthropologist* 75(1): 214-242.

____. 1974. P*rinciples of Tzeltal Plant Classification*. New York: Academic Press.

Borgatti, S. 1992. ANTHROPAC 4.983/x. Columbia, South Carolina: Analytic Technologies.

Brown, C.H. 1984. *Language and Living Things: Uniformities in Folk Classification and Naming*. New Brunswick, NJ: Rutgers University Press.

Brown, CH and S.R. Witkowski 1980. Language universals. Appendix, in *Toward Explaining Human Culture: A Critical Review of the Findings of Worldwide Cross-Cultural Research*, eds. A.D. Levinson and J. Martin Malone, 359-84. New Haven, CT: Human Relations Area Files.

Cadogan, L. 1970. Yvyra Ñe'ery, fluye del árbol la palabra. *Suplemento Antropológico* 5(1-2): 9-101. Asunción: Revista del Centro de Estudios Antropológicos de la Universidad Católica Nuestra Señora de la Asunción.

_____.1992. *Ayvu Rapyta. Textos míticos de los Mbya* – Guaraníes del Guairá, Biblioteca Paraguaya de Antropología, vol. XVI, Asunción: Fundación León Cadogan, CEADUC-CEPAG.

Carneiro, RL. 1993. Quarup: A festa dos mortos no Alto Xingu. In *Karl von den Steinen: Um século de antropologia no Xingu*, ed. V.P. Coelho. São Paulo: Editora da Universidade de São Paulo.

Cebolla Badie, M. 2005 *Ta'y ñemboarái. La miel en la cultura mbya-guaraní*, Master thesis, Programa de Doctorado en Antropología Social, Departamento de Antropología Social e Historia de América y Africa, Universidad de Barcelona.

Conklin, BA. 2001. *Consuming Grief: Compassionate Cannibalism in an Amazonian Society*. Austin:University of Texas Press.

Descola, P. 1996. "Constructing natures: Symbolic ecology and social practice," in *Nature and Society: Anthropological Pers-pectives*, eds, P. Descola and G. Pálsson, 82-102. London: Routledge.

Eibl, B., R.A. Fernandez, J.C. Kozarik, A. Lupi, F. Montagnini, and D. Nozzi. 2000. Agroforestry systems with *Ilex paraguariensis* (American holly or yerba mata) and native timber trees on small farms in Misiones, Argentina. *Agroforestry Systems* 48(1):1-8.

Fausto, C. 2007. If God were a jaguar: Cannibalism and Christianity among the Guarani (16th-20th centuries), *in Time and Memory in Indigenous Amazonia: Anthropological Perspectives*, eds. C Fausto and M. Heckenberger, 74-105. Gainesville: University Press of Florida.

Friedrich, P.1970. *Proto-Indo-European Trees: The Arboreal System of a Prehistoric People*. Chicago: University of Chicago Press.

Gentry, AH. 1992. *Bignoniaceae-Part II (Tribe Tecomeae). Flora Neotropica Monographs* 5. Bronx, NY: New York Botanical Garden.

____1993. *A Field Guide to the Families and Genera of Woody Plants of Northwest South America (Colombia, Ecuador, Peru) with Supplementary Notes on Herbaceous Taxa*. Washington, DC: Conservation International.

Greenberg, JH.1975. Research on language universals. *Annual Review of Anthropology* 75-94.

Grenand, F.1995.Le voyage des mots: Logique de la nomination des plantes: Exemples dans des langues tupi du Brasil. *Revue d'Ethnolinguistique (Cahiers du LACITO)*, 7:24-42.

Heckenberger M. 2007. Xinguano heroes, ancestors, and others: Materializing the past in chiefly bodies, ritual space, and landscape, in *Time and Memory in Indigenous Amazonia: Anthropological Perspectives*, eds. C. Fausto and M. Heckenberger, 284-311. Gainesville: University Press of Florida.

Henderson, A 1995. *The Palms of the Amazon*. New York: Oxford University Press.

Hunn, E.1982. The utilitarian factor in folk biological classification. *American Anthropologist* 84(4): 830-47.

INDEC (Instituto Nacional de Estadísticas y Censo) 2005 Encuesta Complementaria de Pueblos Indígenas, Instituto Nacional de Estadísticas y Censo, Argentina. Available at: http//: www.indec.gov.ar (Accessed: 13 October 2008).

Jensen, C.1999. Tupí-Guaraní, in *The Amazonian Languages*, eds. RMW Dixon and A.Y. Aikhenvald, 125-63. Cambridge: Cambridge University Press.

Killeen, T.J., E García E., S.G. Beck. 1993. *Guía de Arboles de Bolivia*. La Paz, Bolivia: Herbario Nacional de Bolivia, Missouri Botanical Garden.

Lakoff, G. and M. Johnson. 1980. *Metaphors We Live By*. Chicago: University of Chicago Press.

Landrum, L.R. 1986. *Campomanesia, Pimenta, Blepharocalyx, Legrandia, Acca. Myrrhinium, and Luma (Myrtaceae)*. Flora Neotropica, Monograph 45, 1-178. Bronx, NY: New York Botanical Garden.

Lee, Yin-Tse and J.H. Langenheim. 1975. *Systematics of the Genus Hymenaea L. (Leguminosae, Caesalpinioideae, Detarieae). University of California Publications in Botany*, volume 69, 1-109.

Lévi-Strauss, C. 1966. *The Savage Mind*. Trans. G. Weidenfeld & Nicolson, Ltd. Chicago: University of Chicago Press.

Mee, M. 1988. *In Search of Flowers of the Amazon Forests: Diaries of an English Artist Reveal the Beauty of the Vanishing Rainforest*. Ed. Tony Morrison. Woodbridge, Suffolk, UK: Nonesuch Expeditions.

Mori, S. A., B. M. Boom, A. M. de Carvalho and T. S. dos Santos.1983. Southern Bahian moist forests. *Botanical Review* 49: 155-232.

____ and G.T. Prance. 1990. *Lecythidaceae—Part II. The Zygomorphic-Flowered New World Genera (Couroupita, Corythophora, Bertholletia, Couratari, Eschweilera, & Lecythis). Flora Neotropica Monograph* 21 (II), 1-375.

Noelli, F.S. 2004. La distribución geográfica de las evidencias arqueológicas Guaraní. *Revista de Indias* 64(230): 17-34.

Pennington, T.D. 1981. *A Monograph of Neotropical Meliaceae. Flora Neotropica Monograph* 28, 1-470. Bronx, NY: New York Botanical Garden.

____. 1990. *Sapotaceae*. Monograph 52, 1-770. Bronx, NY: New York Botanical Garden.

Quinlan, M. 2005. Considerations for collecting freelists in the field: Examples from ethnobotany. *Field Methods* 17(3): 219-34.

Randall, RA and E.S. Hunn. 1984 Do lifeforms evolve or do uses for life? Some doubts about Brown's universals hypotheses. *American Ethnologist* 11:329-349.

Reed, E.S. 1988. The affordances of the animate environment: Social science from the ecological point of view, in *What is an Animal?* ed. T. Ingold, 110-26. New York: Routledge.

Romney, A.K. and R. d'Andrade. 1964. Cognitive aspects of English kin terms in transcultural studies in cognition. *American Anthropologist* 66(3):146-70.

Rosch E. 1978. Principles of categorization, in *Cognition and Categorization*, ed. E Rosch and B.B. Lloyd, 29-48. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Schuster, C. and E. Carpenter 1996. *Patterns that Connect: Social Symbolism in Ancient and Tribal Art*. New York: Harry N. Abrams.

Searle J.R. 2004. Mind: *A Brief Introduction*. New York: Oxford University Press.

Slater, C.1994. *The Dance of the Dolphin: Transformation and Disenchantment in the Amazonian Imagination*. Chicago: University of Chicago Press.

Stuessy T.F. 1990. *Plant Taxonomy: The Systematic Evaluation of Comparative Data*. New York: Columbia University Press.

Torres, E.O., L. Stutz de Ortega and R. Spichiger. 1989. *Noventa Especies Forestales del Paraguay. Flora del Paraguay*. Serie Especial, no. 3. Geneva: Missouri Botanical Garden.

Tudge, C. 2006. The Tree: *A Natural History of What Trees are, How they Live, and Why they Matter*. New York: Crown.

Viveiros de Castro, E. 1998. Cosmological deixis and Amerindian perspectivism. *Journal of the Royal Anthropological Institute*, n.s., 4(3):469-488.

____2004. Perpsectival anthropology and the method of controlled equivocation. *Tipiti: Journal of the Society for the Anthropology of Lowland South America* 2(1): 1-22.

Witkowski, SR, CH Brown, and PK Chase. 1981. Where do tree terms come from? *Man*, new series, 16(1): 1-14.

Zipf, G. 1949. *Human Behavior and the Principle of Least Effort*. Cambridge, Mass.: Addison Wesley.

Appendix 1
Ka'apor Tree Names by Freelisting, sorted by Smith's s

	Folk Taxon	**Scientific Taxon**	**Smith's *s***
1	*tajy*	*Tabebuia* spp	0.775
2	*parawa'y*	*Eschweilera* spp.	0.718
3	*tajypo*	*Tabebuia* spp.	0.635
4	*yrykywa'y*	*Manilkara huberi*	0.474
5	*tareka'y*	*Bagassa guianensis*	0.467
6	*akaju'y*	*Anacardium* spp.	0.437
7	*jetai'y*	*Hymenaea parvifolia*	0.408
8	*jaxiamyr*	*Lecythis idatimon*	0.398
9	*tarapai'y*	*Hymenaea* spp.	0.389
10	*yrapitang*	*Brosimum rubescens*	0.356
11	*pyky'a'y*	*Caryocar villosum*	0.302
12	*janiro'y*	*Carapa guianensis*	0.274
13	*kumaru'y*	*Dipteryx odorata*	0.261
14	*irayrupe'y*	?	0.259
15	*pinuway'y*	*Oenocarpus distichus*	0.249
16	*pakuri'y*	*Platonia insignis*	0.246
17	*akuxityrywa'y*	*Pouteria macrophylla*	0.243
18	*ywyry'y*	*Lecythis chartacea*	0.237
19	*paraku'y*	*Chimarrhis turbinate* *Aspidosperma cylindrocarpon*	0.237
20	*pytyminem'y*	*Couratari oblongifolia*	0.235
21	*jeju'y*	*Andira sp. 1* *Astronium lecointei*	0.225
22	*paju'ã'y*	*Couepia guianensis* ssp. *guianensis*	0.225
23	*makuku'y*	*Licania* spp.; *Ouratea* spp. *Hirtella racemosa* var. *racemosa*	0.213
24	*kupa'y*	*Copaifera* spp.	0.211
25	*akaú'y*	*Helicostylis tomentosa* *Pouteria bilocularis*	0.210
26	*japukwai'y*	*Lecythis pisonis*	0.203
27	*pytymy'y*	*Couratari guianensis*	0.199
28	*kyky'y*	*Newtonia* spp., *Pithecellobium comunis*	0.197
29	*wasai'y*	*Euterpe oleracea*	0.197

30	*para'y*	*Jacaranda* spp.	0.186
31	*wa'i'y*	*Pouteria reticulata* ssp. *reticulata*	0.173
32	*karã'tu'ã'y*	?'	0.170
33	*pyky'aran'y*	*Caryocar glabrum*	0.169
34	*ajã'kywa'y*	*Apeiba* spp.	0.165
35	*kupapa'y*	*Pouteria* spp.	0.165
36	*mamawiran'y*	*Jacaratia spinosa*	0.158
37	*jywojy*	*Minquartia guianensis*	0.156
38	*tajyran*	*Eugenia* sp., *Rauvolfia* sp.	0.148
39	*tamaran'y*	*Zollernia paraensis*	0.148
40	*ywatuju'y*	?	0.147
41	*ararakã'y*	*Aspidosperma* spp.	0.143
42	*waxyngy*	*Ceiba pentandra*	0.135
43	*ywyse'y*	*Simaruba amara*	0.133
44	*yraty'y*	*Symphonia globulifera*	0.132
45	*yrary*	*Cedrela fissilis*	0.131
46	*tukwãmi'u'y*	*Virola* spp.	0.129
47	*waruwa'y*	*Tetragastris* spp.	0.127
48	*kumaru'yxĩ*	*Apuleia leiocarpa* var. *molaris*	0.125
49	*sekãtã'y*	*Protium trifoliolatum*	0.124
50	*taxi'y*	*Tachigali* spp.	0.123
51	*paru'y*		0.122
52	*tapi'ipamyr'y*	*Sterculia pruriens*	0.122
53	x*ixirupe'y*	*Inga alba, I. brevialata*	0.120
54	*ynahu'y*	*Inga capitata, I. cinammomea*	0.118
55	*yrapitã'ran*	*Brosimum paclesum, Maquira guianensis*	0.117
56	*apa'y*	*Parahancornia* spp.	0.117
57	*mani'iran'y*	*Stryphnodendron polystachyum*	0.116
58	*yrykywaju'y*	*Manilkara bidentata ssp. surinamensi*	0.115
59	*wapini'y*	*Licania canescens, L. kunthiana*	0.113
60	*ynga'y*	*Inga* spp.	0.113
61	*pina'y*	*Duguetia* spp.	0.112
62	*kanei'y*	*Protium* spp.	0.111
63	*kupi'i'y*	*Goupia glabra*	0.110
64	*kypyhu'y*	*Theobroma grandiflorum*	0.108
65	*pakurisõsõ'y*	*Rheedia* spp.	0.107
66	*parawa'ywi*	*Eschweilera amazonica, E. micrantha*	0.104

67	*irayrupe'atu'y*	*Stryphnodendron guianensis*	0.101
68	*merahyhu'y*	*Byrsonima* sp.	0.101
69	*kakwiwran'y*	*Theobroma speciosum*	0.100
70	*jupu'y*	*Parkia pendula*	0.100
71	*meraypirã'y*	*Byrsonima laevigata*	0.099
72	*ywahu'y*	*Micropholis melinoniana*	0.099
73	*kuyer'y*	*Lacemella aculeata, Ambelania acida*	0.098
74	*kyryhu'y*	*Trattinickia* spp.	0.094
75	*kururu'y*	*Taralea oppositifolia*	0.092
76	*ama'y*	*Cecropia* spp.	0.091
77	*pywa'y*	*Rinorea pubiflora*	0.089
78	*aju'y*	Lauraceae spp.	0.088
79	*mytũpusu'y*	*Gustavia augusta*	0.086
80	*meraytawa'y*	*Byrsonima* sp.	0.084
81	*ynaperẽ'y*	*Inga auristellae, I. heterophylla, I. marginata, I. miriantha*	0.083
82	*ximo'y*	*Enterolobium* sp. nov., *Parkia paraensis*	0.082
83	*wariwa'y*	?	0.082
84	*panari'y*	?	0.081
85	*putuny*	?	0.079
86	*jawi'y*	*Xylopia nitida*	0.077
87	*yuwitã'y*	?	0.077
88	*inaja'y*	*Attalea maripa*	0.077
89	*ximoran'y*	*Senna sylvestris*	0.075
90	*kanaú'y*	*Himatanthus sucuuba*	0.072
91	*pani'y*	*Hymenolobium excelsum*	0.072
92	*panu'y*	?	0.066
93	*kyphyran'y*	*Pachira aquatica*	0.066
94	*ama'yrary*	*Pourouma mollis ssp. mollis*	0.066
95	*kuma'y*	?	0.065
96	*yratawa'y*	*Pouteria* spp.	0.063
97	*myratã*	*Erythroxylum citrifolium*	0.062
98	*jakuxiri'y*	Guarea spp. Trichilia spp.	0.062
99	*akajumena'y*	*Anacardium parvifolium*	0.061
100	*taperiwa'y*	*Spondias mombim*	0.061
101	*ka'ameri'y*	*Sclerolobium guianense, S. paraense*	0.060
102	*ape'y*	*Cordia* spp.	0.060

103	*aju'ywãtã'y*	*Ocotea rubra*	0.060
104	*jurupepe'y*	*Dialium guianense*	0.057
105	*wamangaputyry*	*Senna* sp.	0.057
106	*u'ytyma'y*	aff. *Myrcia* sp.	0.056
107	*tapixa'y*	*Erythroxylum cf. leptronerum*	0.054
108	*kurupixi'y*	*Croton matourensis*	0.052
109	*ma'ewapitaŋ*	*Eugenia patrissi*	0.052
110	*tekwerypihun'y*	?	0.050
111	*marari'y*	*Syagrus inajai*	0.050
112	*kuyeri'ypuku'y*	*Ambelania acida*	0.049
113	*jenipa'y*	*Genipa americana*	0.049
114	*tajyte*	*Tabebuia impetiginosa*	0.048
115	*yratyatã'y*	*Symphonia globulifera*	0.047
116	*api'a'y*	*Guazuma ulmifolia*	0.047
117	*ama'yãtã*	*Cecropia* sp.	0.047
118	*tarara'y*	*Cupania scrobiculata*	0.046
119	*kurupusan'y*	*Simaba* aff. *cavalcantei*	0.046
120	*kuyer'y'axĩ*	?	0.045
121	*waripy'a'y*	?	0.045
122	*pinahu'y*	*Unonopsis rufescens* *Duguetia surinamensis*	0.044
123	*arapuhatymakangwer'y*	*Calptranthes* or *Marlierea* sp *Eugenia* sp. *Myrcia* sp.	0.042
124	*taraku'ã'y*	*Fusaea longfolia*	0.042
125	*mururе'y*	*Brosimum acutifolium* spp *interjectum*	0.042
126	*tapi'irynga'y*	*Inga rubignosa*	0.041
127	*paruru'y*	*Sacoglottis* spp.	0.041
128	*karaipe'y*	*Licania apetala, L. membranacea, L. octandra*	0.040
129	*apari'y*	?	0.039
130	*uruku'y*	*Bixa arborea*	0.039
131	*tangwa'y*	*Margaritaria nobilis*	0.038
132	*merayrupe'y*	?	0.038
133	*u'ytymapiriri'y*	*Eugenia* sp.	0.038
134	*jaxipyta'y*	*Talisia* spp.	0.038
135	*merayte*	*Byrsonima* sp.	0.038
136	*marato'y*	*Schefflera morototoni*	0.037

137	*merayran*	?	0.037
138	*paraku'ypihun*	?	0.037
139	*mu'y*	*Bellucia grossularioides*	0.037
140	*kurumi'y*	*Trema micrantha*	0.037
141	*parara'y*	?	0.037
142	*kuyer'ypu'a*	*Lacmellea aculeata*	0.036
143	*araxiku*	*Annona paludosa, A. sericea, Duguetia marcgraviana*	0.036
144	*panari'ahu'y*	?	0.034
145	*meri'y*	?	0.034
146	*parawa'yhu*	?	0.034
147	*parani'y*	*Laetia procera*	0.034
148	*xiringi'y*	*Hevea guianensis*	0.034
149	*wa'iran'y*	*Pouteria penicillata Duroia* sp.	0.033
150	*myraran*	?	0.033
151	*myrawewi'atu'y*	*Pithecellobium jupumba*	0.032
152	*ko'y*	*Cocos nucifera*	0.032
153	*tareka'ypihun*	?	0.031
154	*yrykywaran'y*	?	0.031
155	*ajuran'y*	*Licaria debilis, Ocotea canaliculata, Ocotea* sp.	0.031
156	*arakanei'y*	*Protium altsoni*, *P. heptaphyllum* spp *heptaphyllum*	0.031
157	*ka'ame'y*	*Pourouma guianensis* ssp *guianensis*	0.031
158	*kupa'ypitã*	*Copaifera* sp.	0.030
159	*tukury*	*Guettarda divaricata*	0.030
160	*tajahumyra*	*Tapirira pekoltiana*	0.030
161	*kupa'ytunyr*	*Copaifera* sp.	0.030
162	*putunyhony*	?	0.030
163	*jetahu'y*	*Attalea speciosa*	0.029
164	*paxi'y*	*Socratea exorrhiza*	0.029
165	*kupa'ypihun*	*Copaifera* sp.	0.029
166	*apini'i'y*	?	0.029
167	*tarekaran'y*	?	0.029
168	*yrakĩ'ỹ*	*Aparisthmium cordatum*	0.029
169	*ja'irany*	?	0.028
170	*pakosarara*	*Phenakospermum guianense*	0.028

171	*janiro'yhu*	?	0.028
172	*jawi'ypihun*	prob. *Xylopia nitida*	0.027
173	*wariãkã'y*	?	0.027
174	*ywame'y*	?	0.026
175	*myrasawa'e*	?	0.026
176	*kywahu'y*	?	0.025
177	*kykany*	?	0.025
178	*kamoro'i'y*	?	0.025
179	*aju'iwate*	Lauraceae sp.	0.025
180	*tata'y*	*Guatteria scandens*	0.025
181	*mykupi'a'y*	*Iryanthera juruensis*	0.025
182	*kaxima'y*	*Mabea* spp.	0.024
183	*ynate*	*Inga* sp.	0.024
184	*sypotawa*	?	0.024
185	*ka'uwapusan'y*	*Siparuna amazonica*	0.024
186	*teremumyra*	*Anaxagorea dolichocarpa*	0.023
187	*aju'iwapu'a*	Lauraceae spp.	0.023
188	*pajangi'y*	?	0.023
189	*ajuwapihun'y*	*Ocotea amazonica, O. caudata*	0.023
190	*ynapihun*	*Inga* sp.	0.023
191	*aju'iwahu'y*	*Licaria brasiliensis*	0.023
192	*yrahu'y*	?	0.023
193	*myra'i'a*	?	0.023
194	*mirixi'y*	*Mauritia flexuosa*	0.023
195	*ynahowy*	*Inga nobilis*	0.023
196	*pariwa'y*	?	0.023
197	*jakuxiri'ypirã*	*Guarea guidonia*	0.022
198	*akwãnyrã'y*	?	0.022
199	*mikumyra*	?	0.022
200	*jakuxiri'ytunyr*	*Trichilia micrantha*	0.022
201	*jawamyrahy*	*Protium aracouchini*	0.021
202	*paxi'i'y*	?	0.021
203	*myrapu'am*	?	0.021
204	*waya'y*	*Psidium guajava*	0.021
205	*janaimyra*	*Dendrobangia boliviana*	0.020
206	*xamato'y*	?	0.020
207	*ju'iwaran'y*	?	0.020
208	*majahuwa'y*	?	0.020

209	*merayãtãhu*	*Byrsonima* sp.	0.019
210	*waruwaiwa'y*	?	0.019
211	tupijamyra'y	?	0.019
212	*merayhowy*	*Byrsonima* sp.	0.019
213	*myrwawak*	*Sagotia racemosa*	0.018
214	*araruwai'iran'y*	?	0.018
215	*yrakiãtã'y*	?	0.018
216	*ama'yte*	*Cecropia* sp.	0.018
217	*para'i'y*	?	0.018
218	*myraputyry*	?	0.017
219	*ararahukatãi'y*	*Eschweilera obversa*	0.017
220	*ka'aperan'y*	?	0.017
221	*awai'i'y*	*Canna indica*	0.016
222	*ju'y*	*Astrocaryum gyncanthum*	0.016
223	*janumyra*	*Eugenia omissa, Myrciaria pyrifolia*	0.016
224	*kururuju'y*	?	0.015
225	*tukumã'y*	*Astrocaryum vulgare*	0.015
226	*wayaran'y*	?	0.015
227	*akajupina'y*	*Anacardium giganteum*	0.014
228	*taxi'ypihun*	*Tachigali* sp.	0.014
229	*sawajamyra*	*Capparis sola* *Paypayrola grandiflora*	0.014
230	*taxi'ytunyr*	*Tachigali* sp.	0.014
231	*sapukaisaime'y*	?	0.014
232	*ŋgatãhu'y*	*Inga* sp.	0.013
233	*ju'ika'a*	*Aciotis purpurescens,* *Miconia ceramicarpa*	0.013
234	*jangwateka'a*	*Selaginella* sp.	0.013
235	*ama'ytunyr*	*Cecropia concolor, C. obtusa*	0.013
236	*wa'y*	*Pouteria reticulata* spp. *reticulata*	0.012
237	*jamyr*	*Piper* spp.	0.012
238	*owy*	*Geonoma baculifera*	0.012
239	*ywaju'y*	?	0.012
240	*maraja'y*	*Bactris maraja*	0.012
241	*eyri'y*	?	0.012
242	*kerejuru'y*	?	0.011
243	*karaijuru'y*	?	0.011
244	*myrawapihun'y*	?	0.011

245	*tajytawa*	*Tabebuia* sp.	0.011
246	*tayrŋa'y*	*Inga* sp.	0.011
247	*eyrihu'y*	?	0.011
248	*myrawatuwyr'y*	*Rauia resinosa*	0.011
249	*myrahowy'y*	Sapotaceae sp.	0.010
250	*pywahu'y*	*Rinorea flavescens*	0.010
251	*tajypihun*	*Tabebuia* sp.	0.010
252	*inamumyra*	*Excellodendron barbatum*	0.010
253	*pywate'y*	*Rinorea* sp.	0.010
254	*yraputyr*	?	0.010
255	*waxĩxĩ'y*	*Zanthoxylum rhoifolium*	0.009
256	*kanei'yte*	*Protium* sp.	0.009
257	ywãtã'y	?	0.009
258	*kanei'ytuwyr*	*Protium giganteum var. giganteum,* *P. palldium,* *P. spruceanum*	 ... 0.008
259	*myraky*	*Myrciaria tenella*	0.008
260	*amaruiwy*	?	0.008
261	*apo'i'y*	Clusiaceae	0.007
262	*tajyporan*	?	0.007
263	*wajangi'y*	*Vismia guianensis*	0.007
264	*paniran'y*	?	0.007
265	*myrawawaktuwyr*	?	0.006
266	*katuwa*	?	0.006
267	*tekwerituwyr'y*	*Cordia* sp.	0.006
268	*mang'y*	*Mangifera indica*	0.005
269	*tapirwariwa'y*	?	0.005
270	*irimã'y*	*Citrius aurantiifolia*	0.004
271	*pyky'apihun'y*	?	0.004
272	*asiwa'y*	?	0.004
273	*pa'imyra*	*Dodecastigma integrifolium*	0.004
274	*yrakãxĩ'y*	?	0.003
275	*yrawewei'iwatuk*	?	0.003
276	*narãi'y*	*Citrus sinensis*	0.003
277	*karaiperan'y*	?	0.003
278	*yŋapuku'y*	*Inga* sp.	0.003
279	*piri'a'y*	*Bactris setosa*	0.003
280	*kaka'y*	*Theobroma cacao*	0.003

281	*irimahu'y*	*Citrus medica-acida*	0.002
282	*ywapihun*	?	0.002
283	*apo'y*	*Clusia* sp., *Ficus* sp.	0.002
284	*tiwiwaran'y*	?	0.002
285	*jaxipyryta'y*	?	0.002
286	*aniranmixi'y*	?	0.002
287	*ywyrypihun'y*	*Lecythis* sp.	0.002
288	*mukaja'y*	*Acrocomia aculeata*	0.001
289	*warumã*	*Ischnosiphon* sp.	0.001
290	*kwere'ĩ*	*Bactris humilis*	0.001
	Total/Average: 1031 42.958		

Appendix 2
Mbya Tree Names by Freelisting, sorted by Smith's s

	Folk Taxon	**Scientific Taxon**	**Smith's *s***
1	*yvyra pytã*	*Peltophorum dubium*	0.568
2	*yvyra pere*	*Apuleia leiocarpa*	0.537
3	*aju'y*	Lauraceae (various)	0.433
4	*kurupa'y*	*Anadenanthera colubrina*	0.433
5	*guavira*	*Campomanesia xanthocarpa*	0.420
6	*ygary*	*Cedrela fissilis*	0.386
7	*yvyra apyte pytã*	*Cabralea cangeriana*	0.363
8	*guaporoity*	*Myrciaria rivularis*	0.358
9	*yvyra kachî*	*Lonchocarpus* sp.	0.353
10	*guajayvi*	*Patagonula americana*	0.342
11	*yvyra-pepe*	*Phytolacca dioica*	0.332
12	*yvyra ipy guachu*	*Phytolacca dioica*	0.324
13	*yvaro*	*Pterogyne nitens*	0.312
14	*yvyra ñechî*	*Balfourodendron riedellanum*	0.302
15	*yvyra pere mirî*	*Bulnesia sarmientoi*	0.291
16	*aju'y chî*	*Ocotea acutifolia*	0.269
17	*chimbo*	*Enterolobium contortisillquum*	0.258
18	*yvyra ovi*	*Helietta longifolia*	0.247
19	*tajy*	*Tabebuia* sp.	0.242
20	*yva'y*	*Chrysophyllum gonocarpum*	0.239
21	*añangapyry*	*Eugenia uniflora*	0.233

22	*yvyraũ*	*Albizzia niopoides*	0.232
23	*ychapy'y*	*Machaerium* sp.	0.225
24	*yvyra paje*	*Myocarpus frondosus*	0.224
25	*yvyra jakare*	*?*	0.224
26	*yvyra porã*	*Diatenopteryx sorbifolia*	0.221
27	*guaporu*	*Eugenia* sp.	0.214
28	*yvatái*	*?*	0.193
29	*ñandyta*	*Genipa americana*	0.162
30	*guaviju*	*Myrcianthes* sp.	0.159
31	*tajy chî*	*Tabebuia alba*	0.153
32	*guapoy*	*Ficus citrifolla*	0.149
33	*aracha*	*Psidium* sp.	0.148
34	*yvyra jepiro*	?	0.147
35	*arachiku*	*Rollinia emarginata*	0.142
36	*kachigua*	*Trichilia* sp.	0.128
37	*ychongy*	*Luehea divaricata*	0.127
38	*tembetary*	*Fagara* sp.	0.123
39	*jarakachia*	*Jacaratia spinosa*	0.120
40	*tajy pytã*	*Tabebuia* sp.	0.112
41	*uruvu retyma*	*Erithrina crista-galli*	0.108
42	*kurupikay*	*Sapium glandulatum*	0.107
43	*pindo*	*Arecastrum romanzzofianum*	0.106
44	*taruma*	*Vitex cimosa*	0.104
45	*pipi guachu*	?	0.102
46	*ychapy'y guachu*	*Machaerium paraguariense*	0.100
47	*apyterevi*	*Cordia trichotoma*	0.097
48	*avachingy*	?	0.092
49	*yvyra yvi*	*Chorisia speciosa*	0.091
50	*yvyra petái*	?	0.090
51	*pipi*	*Petiveria alliacea*	0.087
52	*yvyra paju*	*Aspidosperma australe*	0.081
53	*tajy ũ*	*Tabebuia heptaphylla*	0.073
54	*guajachimbo*	*?*	0.073
55	*ajuy vata*	*?*	0.072
56	*yvaéi*	*Eugenia* sp.	0.072
57	*parapara'y*	*Jacaranda micrantha*	0.071
58	*kachigua mirî*	*Trichilia* sp.	0.069
59	*inga*	*Inga uruguensis*	0.060

60	*ychapy'y mirî*	?	0.057
61	*yvyra rapo ju*	?	0.057
62	*ajuy mirî*	Lauraceae	0.057
63	*guaku*	*Allophylus edulis*	0.057
64	*ajuy joa*	*?*	0.056
65	*tapychavy guachu*	*?*	0.053
66	*tata jyva*	Moraceae	0.051
67	*mbogua ju*	*?*	0.049
68	*yvytau*	*?*	0.049
69	*pakuri*	*Rheedia brasiliensis*	0.049
70	*tarua poã*	?	0.048
71	*yvyra ita*	?	0.048
72	*yvyra karai*	?	0.048
73	*ajuy ju*	?	0.048
74	*yva ũ*	?	0.047
75	*amba'y*	*Cecropia pachystachya*	0.047
76	*karova yvy ramboa*	*?*	0.047
77	*akuchi apia'y*	*?*	0.045
78	*tapychavy mirî*	*?*	0.044
79	*yryvaja rembi'u*	*Schinus molle*	0.043
80	*ju'y*	Arecaceae sp	0.043
81	*guajayvi mirî*	*?*	0.042
82	*ape'y*	*?*	0.041
83	*guajayvy guachu*	*?*	0.041
84	*yva viju mirî*	*Myrcianthes* sp	0.039
85	*yvapu*	*?*	0.039
86	*yva viju guachu*	*Myrcianthes* sp	0.038
87	*yvyra ju*	*?*	0.039
88	*yvapo'i*	*?*	0.037
89	*yvyra po'i*	*?*	0.037
90	*yvyrapa*	*?*	0.037
91	*poã ro*	*?*	0.035
92	*guavira mirî*	*?*	0.035
93	*yvyra ryapu*	*?*	0.035
94	*yvyra yva chî*	*?*	0.034
95	*yvyra juky*	*?*	0.034
96	*aracha'i*	*?*	0.033
97	*yvyra piriri*	*?*	0.032

98	*yva pytã*	*?*	0.032
99	*aracha guachu*	*?*	0.032
100	*yvyra tai*	*?*	0.032
101	*yvay guachu*	*?*	0.031
102	*ambay guachu*	*?*	0.029
103	*paraíso*	*Melia azedarach*	0.027
104	*ambay rã*	*?*	0.027
105	*yvay mirî*	*?*	0.026
106	*yvyra ipire chî*	*?*	0.024
107	*yvyra ũ'i*	*?*	0.023
108	*kochi rembi'u*	*?*	0.020
109	*ka'a ñechî*	*?*	0.019
110	*yvyra tata jyva*	*Chlophora tinctoria*	0.019
111	*kuachingy*	*?*	0.018
112	*kurupa'y mirî*	*?*	0.018
113	*ju ovi*	*?*	0.018
114	*kurupa'y guachu*	*?*	0.017
115	*yvaéi mirî*	*?*	0.015
116	*aperea ka'a*	*?*	0.013
117	*guaika*	*Ocotea puberula*	0.012
118	*javorandi*	*Pilocarpus* sp.	0.010
119	*jate'y ka'a*	*?*	0.008
120	*tuja renapy'a*	Piperaceae	0.008
121	*yvyra ipire ro*	*?*	0.008
122	*ñerumi*	*Baccharis dracunculifolia*	0.008
123	*ñerumi para*	*?*	0.006
124	*mbopi rembi'u*	*?*	0.005
125	*rorochi*	*?*	0.005
126	*ka'i ra'anga*	*?*	0.004
127	*kurupa'y chî*	*?*	0.004
128	*poã ruvicha*	*?*	0.003
129	*pakuri mirî*	*?*	0.003
130	*yvyra chî*	*?*	0.003
131	*guembe rã*	*Casearia sylvestris*	0.003
132	*pakuri guachu*	*Rheedia* sp.	0.002
133	*yvyra pytãngy*	*?*	0.002
134	*guembe*	*Philodendrom* sp.	0.002
135	*yvyra kurundi'y*	*Trema micrantha*	0.001
	Total/Average: 532 28.000		