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ARTIGO

TRADITIONAL MEDICINES AMONGST INDIGENOUS GROUPS IN RORAIMA, BRAZIL: A RETROSPECTIVE

MEDICAMENTOS TRADICIONALES ENTRE GRUPOS INDÍGENAS EN RORAIMA, BRASIL: UNA RETROSPECTIVA

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Abstract:

Surveys of medicinal plants and fungi among five indigenous groups in Roraima, Brazil, were identified in 1993-95 in 11 communities by the author, but not published. Most of the 52 species reported here were unknown in the literature for the same medicinal purpose when the data were collected and have not been published due to intellectual property rights. However, 25 years later this has changed due to increased ethnobotanical surveys in Latin America. Some of the 'repeated' data were collected in Roraima, but most have been registered elsewhere in Amazonia. Most likely, some of the traditional ethnomedicine is already lost within the communities by now, with old informants not passing down their knowledge to younger generations. More work should be done on recording indigenous knowledge in Roraima about medicinal plants, preferably by indigenous people. Efforts to retrieve traditional knowledge through real participation from local communities will benefit culture, health, and means of subsistence amongst indigenous communities.

Keywords: Ethnobotany; Knowledge loss; Medicinal plants.

Resumo:

Pesquisas de plantas medicinais e fungos entre cinco grupos indígenas de Roraima, Brasil, foram identificadas em 1993-95 em 11 comunidades pelo autor, mas não publicado. A maioria das 52 espécies era desconhecida na literatura para o mesmo propósito medicinal quando os dados foram coletados, e não foram publicados devido a direitos de propriedade intelectual. No entanto, 25 anos depois, isso mudou devido ao aumento das pesquisas etnobotânicas na América Latina. Alguns dos dados "repetidos" foram coletados em Roraima, mas a maioria foi registrada em outro lugar na Amazônia. É provável que parte do conhecimento tradicional já tenha se perdido agora, com os informantes mais velhos não transmitindo seu conhecimento para as

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gerações mais jovens. Mais trabalho deve ser feito para registrar o conhecimento indígena em Roraima, preferencialmente pelos povos indígenas. Os esforços para recuperar o conhecimento tradicional, através da participação real com as comunidades locais, irá beneficiar a cultura, saúde e meios de subsistência entre as comunidades indígenas.

Palavras-chave: Etnobotânica; Perda de conhecimento; Plantas.

1. Introduction

Knowledge about medicinal plants by indigenous people in the Amazon remains important for healthcare, particularly within isolated communities. A survey of medicinal plants and pharmaceuticals in the Bolivian Amazon and the Andes showed that indigenous informants who are more distant from primary health care services or villages use more medicinal plants and have a greater knowledge about these plants (VANDEBROEK *et al.*, 2004). A study of the use of phytotherapies and biomedicine to treat fevers and malaria in French Guiana demonstrated that indigenous people use more medicinal plants to treat malaria than the other informants (Creoles, French, and Brazilians) (ODONNE *et al.*, 2021). Destruction of habitats and loss of knowledge of medicinal plants are significant and growing threats (CÁMARA-LERET *et al.*, 2019; SHANLEY AND LUZ, 2003). The loss of medicinal plant knowledge is a global problem, partly linked to the loss of indigenous languages (CÁMARA-LERET AND BASCOMPTE, 2021). Over 15 years, in Kenya, 40% on the medicinal species were no longer used, largely due to a change from nomadic to a more sedentary lifestyle (BUSSMANN *et al.*, 2018).

Transmission and modification of knowledge between generations and communities are complex, and planning interventions to mitigate it requires better understanding of the dynamic processes (ZENT, 2013). Integrating ethnobotany and ethnopharmacology can contribute to a more integrated framework for healthcare in underserved and minority communities, but this research should be designed for greater intrinsic value to the communities, health priorities, and perceptions, in a true partnership with local communities (VANDEBROEK, 2013).

Data were collected as part of a wider survey of medicinal plants used to treat malaria in Roraima, Brazil. As an example, up to 20% of the Yanomami people in Brazil were killed by malaria and other diseases between 1987 and 1990 (PELLEGRINI, 1996). Although most of the plant species have now been published for the same medicinal use, in many cases they are not used by the same people. Cross-verification of medicinal plants is now commonly used, and cited in academic papers, as a measure of the importance within the community. An alternative to this methodology is to measure the importance between countries/regions or separate peoples, possibly independently, to assess the likelihood of the species containing active medicinal compounds (BLETTER, 2007; HAWKINS AND TEIXIDOR TONEU, 2017; MILLIKEN *et al.*, 2021; SASLIS-LAGOUDAKIS *et al.*, 2011).

This paper discusses the data collected in Roraima, within the context of current published information in other regions in South America, as a means of cross-verification. It also discusses the importance and issues of maintaining traditional knowledge amongst indigenous peoples, and how ethnobotanists could play a better part in protecting and facilitating knowledge transfer to future generations through joint action and collaboration.

2. Material and Methods

The data published in this paper were collected with the Ingarikó, Macuxi (Makuxi), Taurepang, Wai-Wai, and Wapishana (Wapixana) people, between 1993 and 1995. This was part of a larger study that included all the indigenous peoples in Roraima, including the Ye'kwana and the Yanomami. The data were collected in Jatapuzinho (Wai-Wai), Manalai and Serra de Sol (Ingarikó), Bananal (Taurepang), Boca da Mata, Raposa, Maturuca and Sorocaima II (Macuxi), Araca, Malacacheta (Wapishana), and Mangueira (Figure 1).

The informants within the communities were identified through initial focus groups including knowledge holders. The project was explained to the community, during which community leaders gave permission to collect data. Further identified informants were recruited through the 'snowball' (non-probabilistic) technique (BERNARD, 2006). Medicinal plants, presented by male and female informants, were then recorded in individual discussions in the village, and then during 'guided' tours in the field (in Portuguese). For the individual interviews, there was only one question in the survey: "Do you use any plants to treat or cure malaria?". No other question was posed about other plant-based medicines. The only group discussion took place at a health meeting organized by the International Organization Médecins Sans Frontières, in Mangueira.

Voucher specimens were collected and are housed in the herbaria at Kew (K), Museu Integrado de Roraima (MIRR), Instituto Nacional de Pesquisas da Amazônia (INPA) and the New York Botanical Garden (NY). Some of the sterile specimens were not stored in the official herbarium collections, but a full set of specimens is maintained at Kew. In a very few cases, no specimen was collected when the plants were easily identified (Appendix 1). When the data were collected in the 1990s, the author was concerned about publishing information about certain species (due to intellectual property), unless the same species/use had been already published elsewhere. Data on antimalarial use had been published by MILLIKEN (1997) but other medicinal plants data had not. The data in this paper were collected by the same informants from the antimalarial project, in some cases for other medicinal uses of antimalarial plants, or from other (non-antimalarial) species collected during 'guided' tours in the field.

When the data were collected in the field, the authorization was given directly from CNPq, via the Universidade de Brasília (UNB). The responsible Brazilian researcher was Professora Alcida Rita Ramos. Permission to visit the communities was granted by FUNAI, rather than directly from the indigenous communities, but with assistance from the Conselho Indígena de Roraima (CIR) and the Associação dos Povos Indígenas de Roraima (APIR).

The plants were collected in the northern savanna (lavrado) and the tropical forest. The lavrado in Roraima is similar to the cerrado in Central Brazil, with a mosaic appearance, but with ecological and floristic differences, with fewer plant species (BARBOSA AND MIRANDA, 2005). In 2014, the Brazilian population of the tribes was 33,603 Macuxi, 9,441 Wapishana, 2502 Wai-Wai, 1488 Ingarikó, and 792 Taurepang (INSTITUTO SOCIOAMBIENTAL, 2018). All these people speak the Karib language, apart from the Wapishana, who speak Aruak. Apart from Roraima, most tribes are also present in

Guiana and Venezuela, but the Wai-Wai are also living in Pará and Amazonas, two Northern states in Brazil.

The indigenous names of the plants (Appendix 1) were written using two vowels in non-IPA symbols: ɨ refers to a close/tense, high central unrounded vowel, and ë refers to a mid-central vowel (like schwa/ɘ/vowel similar to the English word *cut*). These were based on previous work with the Yanomami (MILLIKEN AND ALBERT, 1996), and doubtlessly some of these names are slightly misspelled.

The species have been updated, to reflect Plants of the World Online taxonomy www.plantsoftheworldonline.org. In Appendix 1 the 'contemporary' uses of the same species for the same or similar purposes are shown. All the informants and their locations/indigenous peoples are cited in Appendix 1.

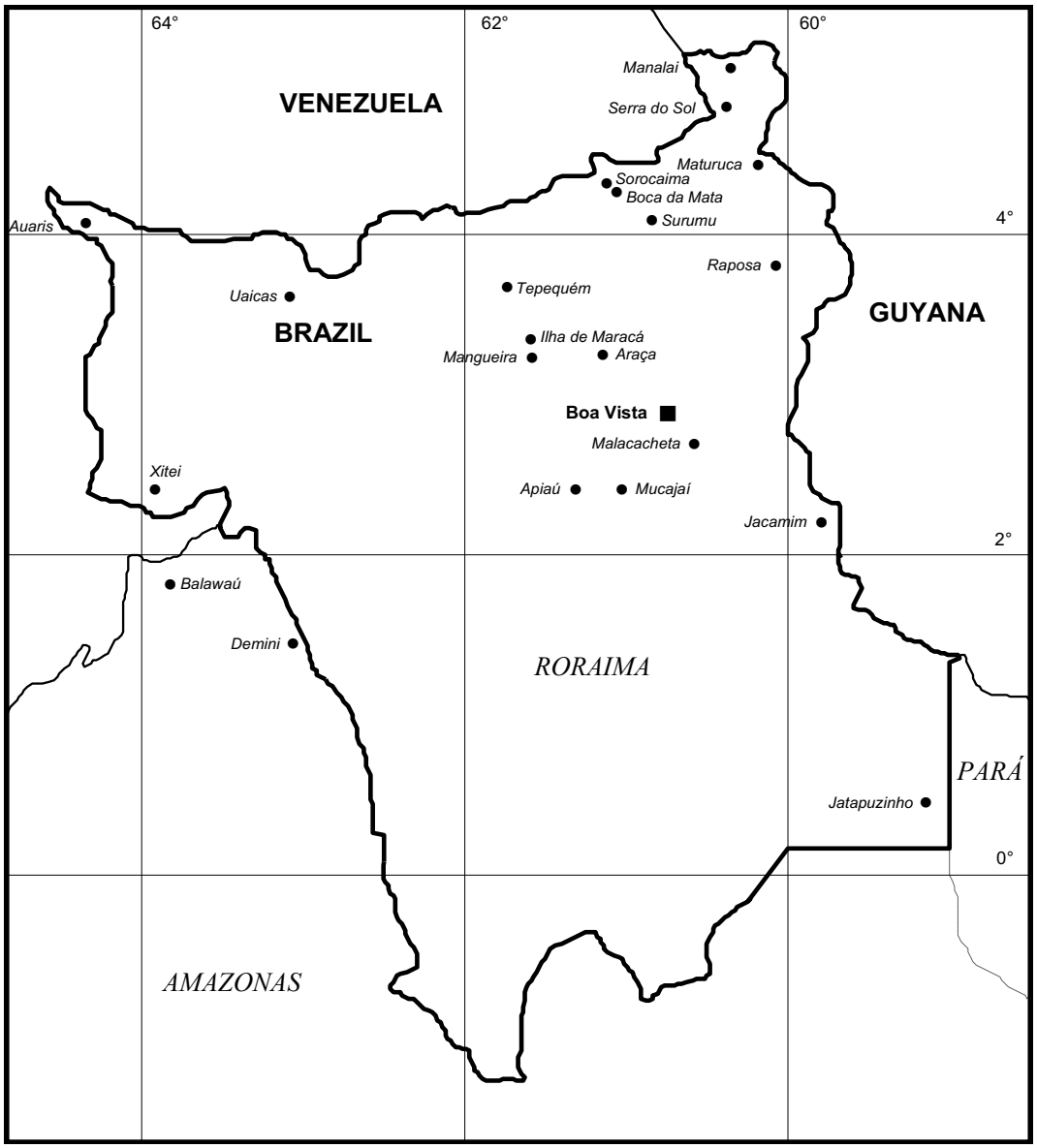

Figure 1: Approximate locations of the sites studied in 1993-5. Source: Milliken (1997).

3. Results

Fifty-one medicinal plant species and one fungus are cited here (Appendix 1), of which 7 were cultivated. This includes 17 species used to treat diarrhoea/stomachache/dysentery, 7 to treat skin diseases and thrush, 6 to treat wounds and sores, 6 to treat coughs/colds, and 4 to treat kidney/urinary problems. Most of the medicines are taken internally as infusions or decoctions (apart from one, as a bath for fevers), and as treatment for wounds, toothache, eye disorders, skin sores etc. This study, however, was not quantitative. Advances in ethnobotanical procedures have attempted to analyse the data in various forms (e.g. importance), but the prime interest in the original project was simply recording species used to treat malaria, collect samples for analysis (anti-plasmodial properties and toxicity), and then share the data with indigenous peoples, including through the Conselho Indigenista Missionário CIMI (MILLIKEN, 1995a). The main purpose was an attempt to mitigate the malaria outbreak caused by illegal gold miners (*garimpeiros*) in the 1990s, which now have another resurgence; the number of malaria cases in the state almost tripled between 2016 and 2018 (LOUZADA *et al.*, 2020). As the survey was not quantitative, it is not possible to compare accurately how many medicinal plants are used within the communities, or between indigenous groups, and likewise summarize accurately how the plants are used more broadly. However, this is further explained in the Discussion.

4. Discussion

4.1. Knowledge of medicinal plants

Of the plants cited here, 11 (21%) of the species were previously published as antimalarials (with the same informants) in MILLIKEN (1997). However, the information on non-malarial medicinal use was not cited in the former paper. The other species and their medicinal uses were found during 'guided' tours. However, as the focus was on antimalarial plants, the informant did not present all their knowledge of medicinal species. We cannot, therefore, determine which people know more about medicinal plants than others.

If one is looking for an antimalarial plant and, in the process, sees another medicinal species on the way, it could be used to treat anything. My experience with older informants in Amazonia is that once you start asking about plant use, they are keen to tell you about any plant properties, even if you are focused on a smaller sub-sample (malaria). For example, in the unpublished information on 113 species that I collected (in the same period) with the Ye'kwana indigenous people in Roraima, 30 were antimalarials and 83 had other medicinal uses. Of the 30 antimalarial species, 10 were also used to treat gastrointestinal problems.

4.2. Correlation with published surveys

In terms of the species cited in this paper, most are now known to be used for the same purposes elsewhere in Latin America. This is partly due to an increase in ethnobotanical surveys/publications in the Amazon over the last 25 years, including in Brazil (RITTER *et al.*, 2015), although the focus has been in the Northeast and Southwest, and in the Atlantic forest and caatinga. In Roraima, however, relatively few advances have been done since our data were collected. There were ethnobotanical surveys in

Boa Vista, the capital city (DA COSTA PINTO AND MADURO, 2003; LUZ, 2001), a review of medicinal plants and health in Boa Vista peripheral districts (77 spp.) (ARAÚJO, 2018), a study of three species used by the Macuxi (DE OLIVEIRA *et al.*, 2017a-b), an ethnobotanical survey (91 spp.) of the Macuxi and Wapishana in São Marcos (DE OLIVEIRA, 2016), and a survey of 119 medicinal species among the non-indigenous riverine communities on the border of Roraima and Amazonas (Jauaperi River) (PEDROLLO *et al.*, 2016).

Earlier studies (prior to this survey) included an unpublished list (51 spp.) of Macuxi medicinal plants (DOYLE, 1985) and a list of plants collected along the BR174 highway (VAN DEN BERG AND SILVA, 1988). However, no *thorough* survey of medicinal plants has been conducted with indigenous peoples in Roraima State.

Of the 52 species cited in this paper, there were 66 species/medicinal use combinations. Of these, 50 corresponding species/use combinations have been recorded in the literature. Of the 16 that are not published in the literature, 11 have the same use for other species in the genera. Among the species that appear not to be used for the same purpose, some have multiple medicinal uses for other purposes. *Bauhinia ungulata* L., for example, which is used by the Macuxi to treat tuberculosis, is widely used as a medicine in Latin America for diabetes, diarrhoea, pain, malaria, and wounds (BIESKI *et al.*, 2012; DE OLIVEIRA, 2016; MILLIKEN, 1997; RIBEIRO *et al.*, 2017). *Bauhinia vahlii* Wight & Arn. is used to treat tuberculosis in India and has antimicrobial activity (NGUYEN *et al.*, 2021).

In very few cases there are no known references to the species as a medicinal plant. For example, *Ayenia tomentosa* L., used by the Macuxi to treat grippe (influenza) is not cited in the literature as a medicine, although *Ayenia magna* L. is used to treat diarrhoea in Yucatán, Mexico (VERA-KU *et al.*, 2010). Likewise, *Leptolobium stirtonii* (Aymard & V.González) Sch.Rodr. & A.M.G.Azevedo has no medicinal references, but L. *nitens* Vogel has the same medicinal uses (headache and tooth decay) in Roraima (DE OLIVEIRA, 2016). *Macrolobium bifolium* (Aubl.) Pers., used to treat diarrhoea by the Ingarikó, is not cited in the literature but minor antimicrobial activity against *Staphylococcus aureus* has been demonstrated (ROVIRA *et al.*, 1999). *Heisteria scandens* Ducke, to treat burns by the Wai-Wai, is not known as a medicinal plant, but H. *acuminata* (Bonpl.) Engl. is used to treat wounds 'that will not heal' in Peru (AYALA, 1996).

Some species are widely used for the same purpose in Latin America, such as *Hymenaea courbaril* L. for treating coughs, *Dianthera pectoralis* (Jacq.) J.F. Gmel for pain, *Philodendron* spp. for ant stings and snakebite, *Byrsonima crassifolia* (L.) Kunth for diarrhoea, and *Phyllanthus* spp. for kidney infections. In a few cases, the same plants and their uses have been recorded previously in Roraima, such as *Himatanthus articulatus* (Vahl) Woodson and *Palicourea rigida* Kunth (kidney stones), *Carica papaya* L. (vomiting), and *Byrsonima verbascifolia* (L.) DC. (diarrhoea). Others were used in Roraima, but for other purposes, such as *Carapa guianensis* Aubl. for healing and influenza (ARAÚJO, 2018). The most important species used by the Macuxi and Wapishana, based on use value estimates, were *Himatanthus articulatus* and *Leptolobium nitens* (possibly *L. stirtonii*) (DE OLIVEIRA, 2016), and the most traded species in Boa Vista markets included *Hymenaea courbaril*, *Copaifera* sp. and *H. articulatus* (DA COSTA PINTO AND MADURO, 2003), all of which are cited in this paper.

Several species/use combinations are not known in Roraima but are recorded in other districts or countries. *Sagotia racemosa* Baill. is used to treat toothache among the Wai-

Wai, and earache by the Jivaro in Peru, which are often connected with toothache (KIM *et al.*, 2007). In a few cases, the informant described the illness, but it was difficult to classify it. *Senna obtusifolia* (L.) Irwin & Barneby, for example, is used by the Wapishana to cure 'skin disorders (red rash)'. Perhaps, it is a reference to measles, for which it is used under the same purpose in Peru (SANZ-BISET AND CANIGUERAL, 2011). Likewise, *Ampelozizyphus amazonicus* Ducke, which is used by the Wai-Wai for severe 'cough with blood', may refer to tuberculosis. This species is also used for treating tuberculosis elsewhere in the Amazon (STOREY AND SALEM, 1997).

The sample was relatively small, so it is not possible to evaluate 'shared' data between Carib-speaking indigenous people. However, in some cases, the only correlating species/use combinations within the literature were between the Ingarikó in Brazil and the Patamona in Guiana, e.g. the latex of *Aspidosperma excelsum* Benth. to treat eye infections and the grated nut of *Carapa guianensis* Aubl. to treat measles and chicken-pox (DEFILIPPS *et al.*, 2004). The Ingarikó, Patamona, and Akawaio people share their same common name (*kapon*) 'celestial people' surrounding Mount Roraima and are very closely related.

4.3. Loss of knowledge and research perspectives

Some of the data presented in this paper, provided by the older informants 25 years ago, may now have been lost. The medicinal plant data that were collected amongst the Ye'kwana indigenous people in Roraima in the 1990s are not published in this paper. In 2018 the author contacted Seduume (the Ye'kwana Association) and ISA (Instituto Socioambiental) regarding the possibility of collaborating to research Ye'kwana medicinal plants more broadly. Seduume agreed as they said that the information was not being passed down from older 'sábios' (knowledge holders) to younger generations and that their knowledge would soon be lost forever. Therefore, we set up a new (current) project, conducted by the Ye'kwana indigenous researchers, to catalogue their knowledge and produce an illustrated book in their own language for future generations.

Similarly, in terms of the medicinal plant knowledge of the Yanomami in Brazil (Amazonas and Roraima), we published data in the 1990s with similar uses in the literature (MILLIKEN AND ALBERT, 1996; 1997). Those that were not published elsewhere for the same purpose were excluded from these papers. Twenty years later we returned to the Yanomami and trained indigenous researchers to document their knowledge and publish a book in their own language and Portuguese (YANOMAMI *et al.*, 2015). It was evident that knowledge holders had not passed down their knowledge of medicinal plants to younger generations since it was first recorded.

As Justino, one of the Yanomami knowledge holders, said: "Here, people refuse the forest remedies because they don't know them, they don't use them for treatment, they prefer white people's medicine, even if I indicate for them how to do it. When the Kamakari 'being' eats inside the ear, I say you must roll cotton with bark from a tree and put it in the ear, but they don't pay attention to me; the old ones used cotton with the *nahara hi* bark (*Zanthoxylum pentandrum* (Aubl.) R.Howard) for this. I say these things, but they don't pay attention to me, because they don't know. Because they like white things better.... In the past, people were very smart because they spent time away on expeditions gathering and camping in the forest. People now no longer travel in the forest, that's why they don't know the medicines, they are always in the house, and

that's why they don't know! People spent a lot of time camping for collecting and went far on expeditions to hunt! Therefore, they really knew the remedies, they lived a long time in the forest; it was like this. Now, after we get close to the whites, we don't travel anymore, and young people no longer know these remedies. People no longer ask themselves: "Are we going to travel?". That's why they don't know!" (YANOMAMI *et al.*, 2015).

The loss of traditional knowledge will be the case for many other indigenous peoples in the Amazon, partly due to development, displacement, deforestation, and society degradation (CABALLERO-SERRANO *et al.*, 2019; REYES-GARCÍA *et al.*, 2013; WECKMÜLLER *et al.*, 2019). Research of traditional medicines among indigenous peoples, together with wider perspectives on ethnobotany and traditional knowledge, requires further work in the Amazon (CÁMARA-LERET *et al.*, 2014). In terms of publications, however, there have been significant changes. Many indigenous peoples in the Amazon now have established 'associations', such as Hutukara (Yanomami) and Seduume (Ye'kwana), who can decide how their knowledge should be recorded (and conveyed).

While training the Ye'kwana researchers to collect medicinal plant knowledge, I taught them to collect and prepare specimens for identification. At the end of the training, we had a meeting with the knowledge holders to discuss the final process and the outputs. The oldest 'sábio', with whom I had worked with in the 1990s (collecting his extraordinary knowledge and taking voucher specimens), decided that taking specimens away from the community might reduce the 'power' of the plants. He asked whether the original 1990s specimens, which are stored in the herbaria at K, MIRR, INPA, and NY, could be returned to the community. As a result of the discussion, the project was adapted, and identification of the medicinal plants is only done through photography.

To assess the loss of medicinal knowledge within indigenous communities is extremely hard to do without complete longitudinal surveys (with a gap of several years between each measurement). A broader analysis regarding the loss of ecological knowledge suggests that the highest loss is in medicinal and ethnobotanical knowledge, particularly amongst men (ASWANI *et al.*, 2018). However, the lack of longitudinal data remains a problem for estimating the impact over time. One study, among the Tsimane' adults in the Bolivian Amazon between 2000 and 2009, suggests that there was a net decrease of plant use from 9% (for women) to 26% (for people living close to cities) (REYES-GARCÍA *et al.*, 2013). Comparing the Macuxi and Wapishana data presented here with more recent surveys of the medicinal plants among those people, 38% of the species/use combinations were not previously recorded in the literature. But this does not mean that the data were necessarily lost, as the surveys are far from complete.

Collecting traditional knowledge now requires a signed Informed Consent Form, helping the informant decide how the information could be used, and for what purpose, before giving agreement. In Brazil, there are new laws relating to the transmission of indigenous knowledge (SILVA AND OLIVEIRA, 2018). The aim of these laws is to help ensure that possible financial benefits from that knowledge can be shared with the original owners. However, a study and analysis in Northeast Brazil suggested that residents did not understand the Informed Consent Form, and that the residents should be willing to participate in any return and extension activities, which requires planning from design phase to final completion (DE ALBUQUERQUE *et al.*, 2012).

Traditional knowledge of indigenous communities in Roraima requires more investment and research. The Wai-Wai, both within Roraima, Pará, and Guiana, have not been properly studied, and likewise the Taurepang and the Ingarikó. New projects, preferably led by indigenous researchers, should catalogue this knowledge before it disappears. In 1995 the author wrote that the malaria project needs careful consideration of the intellectual property rights of the people involved and illustrates a role for the ethnobotanist that has too rarely been realised up to this moment. Not as a medium to transfer potentially valuable information from indigenous peoples to the developed world, but as a medium for mutually beneficial transfer of information between indigenous peoples (MILLIKEN, 1995b). Has this happened since then?

There have been several efforts, such as the Acaté project in Peru, to document the knowledge of the Matsé healers and pass down the knowledge to younger generations. In the *quilombola* communities in the Atlantic forest in Brazil (RODRIGUES *et al.*, 2020), the Chacobo in Bolivia (PANIAGUA-ZAMBRANA *et al.*, 2018), and the Maya in Guatemala (HITZIGER *et al.*, 2016), local researchers were trained, and the development of the project was planned in collaboration with local communities. Engaging young researchers in the process is crucial, but this is not always easy. A study of Trio indigenous ethnomedicine demonstrated that simply collecting the data would not maintain indigenous self-sufficiency, but would require active practice (HERNDON *et al.*, 2009).

From our experience with the Yanomami (YANOMAMI *et al.*, 2015), young indigenous researchers were keen to participate, but when the project is finished and they develop new skills, there is no incentive to carry on with research. The long-term impact on the projects, in terms of maintaining the traditional knowledge for future generations, and its impact on healthcare, has not been properly researched. Nevertheless, in a study of the Chácobo in Brazil, the engagement of trained local interviewers elicited a large percentage of novel information (PANIAGUA-ZAMBRANA *et al.*, 2018)

It is recommended that informants should be co-authors in ethnobotany papers if they have played significant roles in the projects (RAMIREZ, 2007). The Nagoya Protocol for non-monetary benefits requires joint ownership of relevant intellectual property rights (CONVENTION ON BIOLOGICAL DIVERSITY, 2011). This paper, unfortunately, does not include indigenous authors here as the data were collected 25 years ago. Some of the informants have probably already passed away, and communicating with those still alive would be very hard (or even impossible). Most ethnobotanical surveys over the last five years still do not include informants as co-authors, although there are a few exceptions such as YANOMAMI *et al.* (2015); KFFURI *et al.* (2016); RAMÍREZ AND BLAIR (2017); ZAMBRANA *et al.* (2017).

Twenty-five years since the author first wrote an academic paper on medicinal plants in Brazil, there is still no online dataset of medicinal species and their uses. Comparing data cited in the paper with other uses (cross-verification) requires re-reading books and articles, and (now) scanning the internet for online publications. This is a substantial amount of effort, repeated by many other ethnobotanical contributors. In order to understand how data are transferred between people, how multiple references from different regions suggest investment in medical research, and how to promote and adapt ethnomedicine in healthcare will require better, organised, and accessible data (DE SOUZA AND HAWKINS, 2020). More importantly, returning data so they can be shared appropriately and comprehensibly amongst the people who need them requires greater research, technology, communication, and financing.

5. Conclusions

The data presented here on medicinal plant use amongst five indigenous peoples in Roraima have strong correlations with the use of these species by other peoples and indigenous communities within the Amazon. However, the research on medicinal plant use amongst these indigenous peoples is very far from complete. Traditional knowledge of indigenous communities, both within Roraima and more broadly in South America, needs to be recorded rapidly before it is lost forever due to acculturative, ecological, and behavioural changes and cultural transmission. For research to make a greater impact on the transmission of knowledge to younger generations will require new, developing ethnobotanical approaches. These include: greater engagement and collaboration of local communities through joint action and practice; training indigenous/community researchers in long-term projects; ensuring that the data are made available to the communities in an appropriate form; recognising the contribution of the knowledge holders; and a greater focus on health priorities, perceptions and impact to the communities. Improved, accessible datasets of all medicinal plants throughout South America would assist the research/analysis, the transfer of knowledge between and within the communities, and the potential development of novel medicines.

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Appendix 1. Medicinal plants in Roraima, Brazil. In the 'Common name(s)' column, a name in parentheses indicates its common use in Portuguese rather than indigenous names. The superscript numbers after the use (informant name and locality) are: [1] Raimundo, Sorocaima II; [2] Bento, Bananal; [3] Arlindo, Manalai; [4] Joachim, Raposa; [5] João, Raposa; [6] Totoari, Jatapuzinho; [7] Ines, Maturuca; [8] MSF meeting, Mangueira; [9] Virginia, Raposa; [10] Oreco, Araça; [11] Ilvaldo/Dulcimar/Martins, Maturuca; [12] Indet., Araça; [13] Martins, Manalai; [14] Alvino, Malacacheta; [15] Maria Lucia, Maturuca; [16] Narcisa, Clarenço, Serra do Sol; [17] Teresa, Boca da Mata; [18] João Sales, Manalai.

Family	Species	Common name(s)	People	Voucher
Acanthaceae	*Dianthera pectoralis* (Jacq.) J.F.Gmel.	(anador)	Macuxi	WM 2281
	Use: Headache and body pains – analgesic. Infusion of 3 leaves is drunk.[1]			
	Corresponding: Infusion for headache caused by blows to the head (DEFILIPPS *et al.*, 2004). Used to treat headache in Roraima (ARAÚJO, 2018) and body pains (DE SOUZA AND PASA, 2013). Analgesic (LEITE *et al.*, 1993).			
Annonaceae	*Anaxagorea dolichocarpa* Sprague & Sandw.	*kɨrabipɨ yekë*	Taurepang	WM 2274
	Use: Remedy for fevers. Cold-water infusion of crushed inner bark drunk (one gourd full). Causes vomiting and should be followed by drinking clear water.[2]			
	Corresponding: *A. acuminata* (Dunal) A.DC used by the Yanomami to treat fevers (MILLIKEN, n.d.).			
Annonaceae	*Duguetia* cf. *neglecta* Sandw.	*Arelyaekë*	Ingarikó	WM 2226
	Use: For coughs, the inner bark is chewed. and the bark is swallowed. For diarrhoea, a decoction of the roots is drunk.[3]			
	Corresponding: Used as a cough remedy among the Kurupukari, Guyana (JOHNSTON AND COLQUHOUN, 1996).			
Apocynaceae	*Aspidosperma excelsum* Benth.	porekayekë	Ingarikó	WM 2228
	Use: Remedy for eye infections. A drop of the latex is put into the eye.[3]			
	Corresponding: Bark juice applied to treat eye infections by the Patamona (DEFILIPPS *et al.*, 2004).			
Apocynaceae	*Himatanthus articulatus* (Vahl) Woodson	*e'guye*	Macuxi	WM 2210
	Use: Remedy for kidney stones. One seed is taken daily, crushed in a glass of water.[4] Remedy for spleen disorders and vermifuge. A decoction of the inner bark is drunk.[5]			
	Corresponding: Used to treat kidneys in Roraima (DE OLIVEIRA, 2016). Used as vermifuge (FLEURY, 1991; MORS *et al.*, 2000).			
Araceae	*Philodendron solimoesense* A.C.Sm.	*furuweto*	Wai-Wai	WM 1790
	Use: Remedy for ponerine ant stings and snake bite. Scrapings of the aerial roots are applied to the sting/bite.[6]			
	Corresponding: Exudate from aerial roots for scorpion stings (MILLIKEN AND ALBERT, 1996) and snake bite (PEDROLLO *et al.*, 2016). Other *Philodendron* spp. used for ponerine ant stings (SCHULTES AND RAFFAUF, 1990; MILLIKEN*et al.*, 1992; DEFILIPPS *et al.*, 2004) and snake bite (DAVIS AND YOST, 1983).			
Araliaceae	*Didymopanax morototoni* (Aubl.) Decne & Planch.	*ponayekë*[8], *kala'kɨlu*[6]	Ingarikó, Wai-Wai	WM 2230, 2243
	Use: Cough remedy. A decoction of the bark is used as an external bath.[3] Remedy for stomach-ache. Scrapings of the inner bark are boiled in water and the extract is drunk.[6]			
	Corresponding: Treat colds in Suriname (VAN ANDEL *et al.*, 2007) and respiratory affections (ARAMBARRI *et al.*, 2008).			
Asteraceae	*Bidens bipinnata* L.	*warumadã* (picão)	Macuxi	WM 2215
	Use: Remedy for liver disorders. A decoction of the roots (2 or 3 plants in 1 litre of water) is drunk (1 spoon 3x daily) until cured.[7]			
	Corresponding: Used to treat liver problems in Brazil (DI STASI *et al.*, 1994; OLIVEIRA *et al.*, 2015). *Bidens pilosa* L. is used in Roraima to treat hepatitis (ARAÚJO, 2018), and elsewhere in Brazil (ANTUNES MACIEL AND GUARIM NETO, 2006; BITENCOURT *et al.*, 2014; RIBEIRO *et al.*, 2017).			

Caricaceae	*Carica papaya* L.	*mapaya*	Taurepang	

Use: Vomiting and dysentery. An infusion of the roots is drunk.[2]

Corresponding: Treat diarrhoea in NW Guyana (DEFILIPPS *et al.*, 2004) and vomiting in Roraima (DE OLIVEIRA, 2016).

Cucurbitaceae	*Luffa operculata* (L.) Cogn.	(cabaçinha)	Macuxi	WM 2225a

Use: Remedy for sinusitis. A decoction of the fruit is poured into the nose when the patient is lying down. It loosens the obstructions in the sinuses.

Corresponding: Sold as cure for sinusitis in Boa Vista (LUZ, 2001). Commonly used for the same purpose in Latin America (CÁCERES, 1996; SILVA *et al.*, 2018), and shows antimicrobial activity against *Streptococcus* and *Staphylococcus* species (SCALIA *et al.*, 2015).

Dilleniaceae	*Curatella americana* L.	(caimbé)	Wapixana, Macuxi	

Use: Diabetes remedy. Decoction of bark is drunk.[8] Remedy for cuts and wounds. Scrapings of the inner bark are rubbed on the wound.[5]

Corresponding: Diabetes in Mato Grosso (DE OLIVEIRA *et al.*, 2015). Infusion of leaves as an astringent in French Guiana (DEFILIPPS *et al.*, 2004); for healing (DOYLE, 1985).

Euphorbiaceae	*Croton* cf. *parodianus* Croizat	*ipoye* (velame)	Macuxi	WM 2267

Use: Dysentery remedy. A tea made from the old yellow leaves is drunk.[9]

Corresponding: Several *Croton* spp. are used to treat dysentery in South America, Africa and Asia (SALATINO *et al.*, 2007).

Euphorbiaceae	*Croton pullei* Lanj.	*xixinatë*	Wai-Wai	WM 2244

Use: Remedy for cutaneous leishmaniasis. Scrapings of the inner bark are applied to the lesions.[6]

Corresponding: Bark/leaves are placed in fire and rubbed on leg sores by the Tiriyo in Suriname (DEFILIPPS *et al.*, 2004). Reduce protomastigote growth in *Leishmania amazonensis* (GUIMARÃES *et al.*, 2010).

Euphorbiaceae	*Hevea guianensis* Aubl.	*Oyosi*	Wai-Wai	WM 2255

Use: Remedy for botfly infestation of the skin. The latex is applied to the skin above the larva and left there until it dies and comes out.[6]

Corresponding: Latex is applied to kill parasitic botfly larvae by the Tiriyo in Suriname (DEFILIPPS *et al.*, 2004), the Waimiri Atroari (MILLIKEN*et al.*, 1992) and the Waorani in Ecuador (DAVIS AND YOST, 1983).

Euphorbiaceae	*Sagotia racemosa* Baill.	*tunalalu*	Wai-Wai	WM 2263

Use: Toothache remedy. The yellow liquid exuded from the petiole is put into the cavity; excessive use causes the tooth to crumble.[6]

Corresponding: Use to treat ear ache by the Jívaro in Peru (LEWIS *et al.*, 1987).

Fabaceae	*Bauhinia ungulata* L.	(mororo)	Macuxi	WM 2289

Use: Remedy for tuberculosis. An infusion of the leaves is drunk.[5]

Corresponding: *Bauhinia vahlii* Wight & Arn. is used to treat tuberculosis in India and has antimicrobial activity (NGUYEN *et al.*, 2021).

Fabaceae	*Copaifera* sp.	(copaiba)	Wapixana	

Use: Remedy for inflamed appendix. Bark decoction is drunk.[10]

Corresponding: Used to treat internal inflammations in Roraima (DE OLIVEIRA 2016; DE OLIVEIRA, ALMEIDA, *et al.*, 2017).

Fabaceae	*Dinizia excelsa* Ducke	*xirikomarifamtxi*	Wai-Wai	WM 2258

Use: Remedy for diarrhoea with blood. A decoction of the inner bark is drunk.[6]

Corresponding: To treat abdominal pain by the Wajãpi (DA MATA *et al.*, 2012).

Fabaceae	*Hymenaea courbaril* L.	(jatobá)	Wapishana	

Use: Remedy for wounds that will not heal, and for coughs & colds.[10]

Corresponding: Resin used to treat fresh wounds, and bark treat coughs and colds in NW Guyana (DE FILIPPS *et al.*, 2004). Also for coughs, colds and influenza in Brazil (DE ALBUQUERQUE *et al.*, 2007; HAJDU AND HOHMANN, 2012), and wound healing (BIESKI *et al.*, 2015).

Fabaceae	*Leptolobium stirtonii* (Aymard & V.González) Sch.Rodr. & A.M.G.Azevedo	*walaweri* (darura)	Macuxi	WM 2216

Use: Remedy for headache, and preventative for tooth decay. A decoction of the bark (approx. 5cm x 5cm in 1 litre of water), is drunk (1 spoon 3x daily). The bark is chewed to prevent tooth decay.[11]

Corresponding: *Leptolobium nitens* Vogel (darora) is used to treat headaches in Roraima and weak teeth (DE OLIVEIRA, 2016).

Fabaceae	*Libidibia ferrea* (Mart. ex Tul.) L.P.Queiroz	(jucá)	Wapishana	

Use: Remedy for bruising and dysentery. Bottled extract of the fruits (in water or alcohol) applied and drunk.[12]

Corresponding: To treat inflammations and broken bones in Roraima, Brazil (DE OLIVEIRA, 2016). To treat swelling, back pain, injury and fatigue in NE Brazil (DE ALBUQUERQUE *et al.*, 2007). Sold in Boa Vista markets to treat inflammations (DA COSTA PINTO AND MADURO, 2003). To treat dysentery in Brazil (DI STASI *et al.*, 1994) and diarrhoea among the Macuxi (DOYLE, 1985).

Fabaceae	*Machaerium floribundum* Benth.	*wayamë yexenakam*	Wai-Wai	WM 2254

Use: Stomach-ache and diarrhoea remedy. An infusion of the inner bark is drunk.[6]

Corresponding: Used for diarrhoea and haemorrhage in NW Guyana (DEFILIPPS *et al.*, 2004), and gastro-intestinal ulcers in Peru (ODONNE *et al.*, 2013).

Fabaceae	*Macrolobium bifolium* (Aubl.) Pers.	*mokeyekë*	Ingarikó	WM 2235

Use: Diarrhoea/stomach-ache remedy. A decoction of the inner bark is drunk.

Corresponding: *Macrolobium acaciifolium* (Benth.) Benth is used to treat diarrhoea (DUKE AND VASQUEZ, 1994).

Fabaceae	*Schnella guianensis* (Aubl.) Wunderlin	*wayamï kayinfwö*[6], *kapoyenkëma poyekë*[3]	Wai-Wai, Ingarikó	

Use: Diarrhoea remedy. An infusion of the stem is drunk.[6] Diarrhoea/stomach-ache remedy. The stem is crushed and mixed in hot or cold water, and the extract is drunk.[3]

Corresponding: Sap is used to treat diarrhoea in NW Guyana, and bark decoction drunk as an antidiarrhoeal, by the Patamona (DEFILIPPS *et al.*, 2004). Used by the Yanomami, the Chacobo and the Waimiri Atroari for diarrhoea (MILLIKEN *et al.*, 1992; MUNOZ *et al.*, 2000; YANOMAMI *et al.*, 2015).

Fabaceae	*Senna obtusifolia* (L.) Irwin & Barneby	(mata pasto)	Wapishana	WM 2209

Use: Remedy for skin disorders (red rash). Crushed plant is rubbed on inflamed skin.[14]

Corresponding: To treat measles in Peru (SANZ-BISET AND CANIGUERAL, 2011), and skin problems in Pará (MONTEIRO *et al.*, 2011).

Fabaceae	*Senna quinquangulata* (Rich.) H.S.Irwin & Barneby	*kataweriweri*	Wai-Wai	WM 2257

Use: Stomach-ache remedy. An infusion of the inner bark is drunk.[6]

Corresponding: This species contains quinquangulin, which is antibacterial (LI *et al.*, 2001).

Lauraceae	*Licaria guianensis* Aubl.	Iyilo	Wai-Wai	WM2246

Use: Stomach-ache remedy. A decoction of the wood is drunk.[6]

Corresponding: *Licaria camara* (Rob. Schomb.) Kostermans is used to treat bowel cramps, dysentery and diarrhoea in Guyana (DEFILIPPS *et al.*, 2004).

Lecythidaceae	*Cariniana micrantha* Ducke	*tu'ru*	Wai-Wai	WM 2259

Use: Remedy for cuts. The fibres of the inner bark are tied as a plaster around the cut, hastening healing.[6]

Corresponding: *Cariniana* spp. is used as an antiseptic (ALVES *et al.*, 2008) and general infection in Brazil (RIBEIRO *et al.*, 2017). Sold in the market in Boa Vista to treat inflammations (DA COSTA PINTO AND MADURO, 2003).

Lecythidaceae	*Lecythis* cf. *lurida* (Miers) Mori	*makwauru*	Wai-Wai	WM 2251

Use: Remedy for chickenpox. Scrapings of the inner bark are rubbed on the skin.[6]

Corresponding: *Lecythis* sp. is used to treat itching in Brazil (RIBEIRO *et al.*, 2017)

Malpighiaceae	*Byrsonima crassifolia* (L.) Kunth	*muriboyekë*[3], (mirixi)[13]	Ingarikó, Macuxi	WM 2234, 2223

Use: Remedy for diarrhoea and stomach-ache. A decoction of the bark is drunk.[3] Remedy for worms, and for bleeding umbilicus of new-born babies. The bark is chewed, and the juice is swallowed (worms).[13]

Corresponding: Inner bark decoction used as anti-diarrhoeal by the Patamona in Guyana (DEFILIPPS *et al.*, 2004). To treat gastrointestinal disorders and diarrhoea in Brazil and Nicaragua (DOYLE, 1985; BARRETT, 1994; AGRA *et al.*, 2008; DE OLIVEIRA, 2016). Powder from the underside of leaves applied to the cut end of the umbilical cord to prevent infection by the Patamona in Guyana (DEFILIPPS *et al.*, 2004). *B. japurensis* A.Juss. is used as a vermifuge in the Northwest Amazon (SCHULTES, 1983).

Malvaceae	*Ayenia tomentosa* L.	*parainspi pan-i*	Macuxi	WM 2213

Use: Remedy for grippe. A decoction of the stems is drunk.[15]

Marasmiaceae	*Rhizomorpha corynephora* Kunze	*karifamna*	Wai-Wai	WM 2260

Use: Remedy for urinary disorders - pain and difficulty urinating. An infusion of the fungus is drunk.[6]

Corresponding: Ingested for urinary conditions; rubbed on the abdomen of children with incontinence (DEFILIPPS *et al.*, 2004).

Meliaceae	*Carapa guianensis* Aubl.	*karapayekë*	Ingarikó	WM 2232

Use: Remedy for measles, chicken pox and diarrhoea/stomach-ache. The seeds are grated and rubbed on the skin. For diarrhoea and stomach-ache, the oil is extracted from the grated seeds and drunk in small quantities.[3, 13]

Corresponding: Grated nut, mixed with palm oil is used for measles or chicken-pox by the Patamona in Guyana, and to treat diarrhoea by the Kurupukati in Guyana (DEFILIPPS *et al.*, 2004).

Menispermaceae	*Cissampelos ovalifolia* DC.	*piripi*	Ingarikó	WM 2238

Use: Remedy for diarrhoea and stomach-ache. A decoction of the bitter rhizome is drunk.[16]

Corresponding: Used to treat stomach-ache in Minas Gerais (FERREIRA *et al.*, 2013).

Moraceae	*Maquira sclerophylla* (Ducke) C.C. Berg	*yan-ika*	Wai-Wai	WM 2249

Use: Remedy for wounds/sores and for head lice. The latex is applied to the affected area. For lice, the fruits are crushed into a fine paste and rubbed into the scalp.[6]

Corresponding: *M. coriacea* (Ducke) C.C.Berg is used as a healing treatment in Peru (ACOSTUPA *et al.*, 2016).

Myristicaceae	*Virola calophylla* (Spruce) Warb.	*kuutu*	Wai-Wai	WM 2245

Use: Remedy for oral thrush. A small piece of cotton wool is soaked in the resin from the bark and placed in the mouth.[6]

Corresponding: Exudate used in treatment of mouth sores and thrush in NW Guyana (DEFILIPPS *et al.*, 2004).

Myristicaceae	*Virola duckei* A.C. Smith vel sp. aff.	*mayawaru*	Wai-Wai	WM 2249

Use: Remedy for itching sores. Scrapings of the inner bark are rubbed on the affected area, or the resin from the bark is applied.[6]

Corresponding: Resin applied to skin infections by the Quichua in Ecuador (BENNETT AND ALARCÓN, 1994).

Myristicaceae	*Virola elongata* (Benth.) Warb.	*ayukë*[2], *kiyakwe yoso'muru*[5]	Taurepang, Wai-Wai	WM 2273, 2250

Use: Remedy for general body pains (including fever). Cold-water infusion of crushed inner bark drunk (one gourd full). Causes vomiting; should be followed by drinking clear water.[2] Remedy for oral thrush. A small piece of cotton wool is soaked in the resin from the bark and placed in the mouth.[6]

Corresponding: The Barasana boil leaves and twigs for swollen joints (arthritis) (SCHULTES AND RAFFAUF, 1990). Other *Virola* species are used to treat fevers (PRANCE, 1972; SCHULTES AND RAFFAUF, 1990). Exudate used for treatment of mouth sores and thrush in NW Guyana (DEFILIPPS *et al.*, 2004).

Myrtaceae	*Corymbia citriodora* (Hook.) K.D.Hill & L.A.S.Johnson	(eucalipto)	Macuxi	WM 2282

Use: Cold remedy. An infusion of 5 leaves in 0.5 litres of water is drunk, 1 cup 3x daily.[17]

Corresponding: Used in Mato Grosso to treat colds (BIESKI *et al.*, 2015) and in Amapá (RAMALHO *et al.*, 1991).

Myrtaceae	*Syzygium cumini* (L.) Skeels	(azeitona)	Macuxi	WM 2220

Use: Diarrhoea remedy. The inner bark is crushed in cold water and the extract is drunk.[5]

Corresponding: Bark and fruit used to treat diarrhoea in NW Guyana (VAN ANDEL, 2000). Used to treat dysentery in Brazil (DE OLIVEIRA, 2016; PEDROLLO *et al.*, 2016).

Olacaceae	*Heisteria scandens* Ducke	*wehtoyati*	Wai-Wai	WM 2248

Use: Remedy for burns. The sap is applied to the burn.[6]

Corresponding: *H. acuminata* (Bonpl.) Engl. is used to treat wounds that will not heal in Peru (AYALA, 1996), and healing in Ecuador (SALTOS *et al.*, 2016).

Phyllanthaceae	*Phyllanthus* sp.	(quebra pedra)	Macuxi, Wapishana	

Use: Remedy for urinary tract disorders (pain and difficulty urinating), and kidney problems.[5, 10]

Corresponding: *Phyllanthus* spp. are used to treat kidney infections in Peru (ACOSTUPA *et al.*, 2016), Brazil (DE ALBUQUERQUE *et al.*, 2007; AGRA *et al.*, 2008; BIESKI *et al.*, 2015; DE OLIVEIRA, 2016; ARAÚJO, 2018), and the Guianas (DEFILIPPS *et al.*, 2004).

Poaceae	*Coix lacryma-jobi* L.	*a'najiwaryekë*	Ingarikó

Use: Snake bite remedy. The seeds are burned, and the ashes are rubbed into the wound; also mixed with cold water and drunk.[3]

Corresponding: Used to treat snakebite in India (HOUGHTON AND OSIBOGUN, 1993).

Poaceae	*Saccharum officinarum* L.	*farantxi*	Wai-Wai

Use: Snake bite remedy. The juice from the stem is drunk regularly in place of water and is used to bathe the bitten area.[6]

Corresponding: Used to treat snakebite in NW Guyana (VAN ANDEL, 2000). Also used to treat snakebite in South-East Asia (HOUGHTON AND OSIBOGUN, 1993).

Rhamnaceae	*Ampelozizyphus amazonicus* Ducke	*xiwiriati*	Wai-Wai	WM 2264

Use: Remedy for severe cough (with blood). A hot or cold-water infusion of the inner bark is drunk. 'Burns' the throat.[6]

Corresponding: Used to treat tuberculosis in Amazonia (STOREY AND SALEM, 1997). Used to treat colds or flu ('resfriados') [Specimen C.A. Cid 4107].

Rubiaceae	*Capirona decorticans* Spruce	*yasufitxo*	Wai-Wai	WM 2262

Use: Remedy for wounds and sores. A decoction of scrapings of the inner bark is applied to the affected area.[6]

Corresponding: Bark in a maceration to treat furuncles and cutaneous eruptions by the Wayapi in French Guiana (DEFILIPPS *et al.*, 2004). Used by the Chácobo in Bolivia to treat wounds, cuts, skin, and subcutaneous tissue (ZAMBRANA *et al.*, 2017).

Rubiaceae	*Genipa americana* L.	(genipapo)[5], *mapada*[2]	Macuxi, Taurepang	WM 2276

Use: Asthma remedy. Pulp from the fruits is removed, and the remaining part boiled down into a syrup and drunk.[5] Stomach-ache remedy. An infusion of the bark is drunk.[2]

Corresponding: Used to treat asthma and as a purgative in Peru (ACOSTUPA *et al.*, 2016). The bark is used to treat diarrhoea (MORS *et al.*, 2000)

Rubiaceae	*Palicourea rigida* Kunth	*tratraye* (doradão)	Macuxi	WM 2224

Use: Remedy for 'dor de rins' (kidney problems, including kidney stones). A decoction of the leaves (3 leaves in 1 litre of water) is drunk (small cup 3x daily until cured).

Corresponding: Used to treat kidneys in Mato Grosso and Roraima (BIEKI *et al.*, 2012; DE OLIVEIRA, 2016). Also used to treat kidney and diuretic problems in Latin America (PINHEIRO *et al.*, 2018).

Siparunaceae	*Siparuna guianensis* Aubl.	*wataku'rang*	Taurepang	WM 2275

Use: Remedy for fevers. The leaves are boiled in water and used as a steam bath, or alternatively poured over the head and body.[2]

Corresponding: Decoction as a refresher and febrifuge in the Guianas (LACHMAN-WHITE *et al.*, 1987; DEFILIPPS *et al.*, 2004; GRENAND *et al.*, 2004). Also for fevers in Brazil (CAVALCANTE AND FRIKEL, 1973).

Urticaceae	*Cecropia sciadophylla* Mart.	*taratara*	Wai-Wai	WM 2010

Use: Remedy for eye infections. The watery fluid from the cut roots is dripped into the eyes.[6]

Corresponding: The Tiriyo in Suriname apply sap from crushed leaves to treat eye problems (DEFILIPPS *et al.*, 2004).

Verbenaceae	*Lippia origanoides* Kunth	(salva do campo)	Macuxi	WM 2268

Use: Pneumonia, catarrh, and other respiratory infections. The leaves are boiled (approx. 15g dry in 1l water), and 1/2 a cup is drunk 3x daily.[9]

Corresponding: Used in Brazil to treat lung problems (OLIVEIRA *et al.*, 2011) and in Central America and Colombia to treat flu, bronchitis, coughs and asthma (OLIVEIRA *et al.*, 2014). In Roraima, used to treat coughs and to clean the blood after pneumonia (DE OLIVEIRA, 2016). The oil has antimicrobial activity (DOS SANTOS *et al.*, 2004).

Zingiberaceae	*Curcuma longa* L.	kayiwonokë	Ingarikó	WM 2227

Use: Diarrhoea and stomach- ache remedy. The rhizome is grated into cold water and drunk.[18]

Corresponding: Used against intestinal and stomachic diseases in NE Brazil and Amazonia (AGRA *et al.*, 2008; BIESKI *et al.*, 2015)