

THE ETHNOBOTANY OF AMAZON INDIANS: A RAPIDLY DISAPPEARING SOURCE OF BOTANICAL KNOWLEDGE FOR HUMAN WELFARE

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ABSTRACT

The Amazon Indians are a rich source of botanical information. Some 200 tribes each have their own unique botany with many different plant recipes for their common needs e.g. arrow poisons, narcotics, foods and fibers. Examples from several tribes are given of the variety of arrow poisons, fish poisons and hallucinogenic drugs which are used in Amazonia. The Indians have had thousands of years of management of the Amazon ecosystem. However, the rate of acculturation and extinction of tribes is accelerating even faster than the 90 tribes which have gone extinct in the 20th Century. Information of great potential use to human welfare about unexploited plants and management of the forest ecosystem is rapidly becoming lost. A review is given of this destruction of the Indians and their forest and habitat and it is suggested that there is an urgent need to study these people and for biologists to be active in the efforts which are being made to protect the Amazon Indians.

The Indian tribes of South America are an important source of ethnobotanical information. Each tribe has its own unique sources of medicines, narcotics or foods. The Amazon Indian is dependent upon the plants of the forest, and has learned to use many of them. It is interesting to take a sample area of forest and ask the Indians about the uses of each plant species found in that area. Invariably the Indian will have uses for more than fifty percent of the plants encountered. He will have a name and use for each one. Plants serve as building materials, ropes, glues, canoes, medicines, drugs, foods, contraceptives, bedding, cooking utensils, pottery hardeners, dyes and countless other minor uses. Since the material used varies considerably from tribe to tribe it is most important to catalogue as quickly as possible this information of potential use to all people of the world. In the course of my field work among fourteen different Amazonian tribes, I have seen many interest-

ing uses of plants. A few from different tribes are briefly described below, but I am most concerned here to report on the present precarious situation of many Indian tribes. As they become acculturated or extinct much useful information is permanently lost. It is urgent for ethnobotanists to mount a concentrated effort to gather information before it is too late and also to fight for the protection of the rights of the Indians.

ETHNOBOTANICAL EXAMPLES

i) The Jamamadi curare

The Jamamadi is a small Arawak group that inhabits the mid-Purus river basin. The Indians have long been in contact with westerners and gather and sell rubber and Brazil nuts as a source of income. However, they are only partially acculturated and retain many of their traditional plant uses including their curare arrow poison, which is a mixture of seven plant ingredients (see

Table 1). They use the stem bark of all the trees or vines with a machete, is placed in a pottery vessel where it is mixed with water. It is then boiled and concentrated to a sticky but still liquid residue that is

Table 1
The Jamamadi arrow poison ingredients

Indian Name	Scientific Name	Family	Herbarium Voucher
Ihá	<i>Strychnos solimoesana</i> Krukoff	Leguminosae	P21254
Bicafa	<i>Curarea toxicofera</i> (Wedd.) Krukoff & Barneby	Menispermaceae	P21256a
Bicafa	<i>Abuta splendida</i> Krukoff & Moldenke	Menispermaceae	P21256b
?	<i>Guarea carinata</i> Ducke	Meliaceae	P21260
Barafa	<i>Guarea grandifolia</i> C.DC.	Meliaceae	P21257
?	<i>Picrolemma sprucei</i> Benth.	Simaroubaceae	P21259
Boa	<i>Duguetia asterotricha</i> Diels	Anonaceae	P21255



Fig. 1: Jamamadi Indians removing the bark from the stem of *Strychnos solimoesana*.

used to coat arrow tips and blow gun darts. The wet darts are passed through a fire to dry the poison. *Strychnos* and *Curarea* are well known as arrow poison ingredients (see for example Kurkoff and Smith, 1973b, Krukoff and Barneby, 1970). The species *Strychnos solimoesana* has been reported as an ingredient of arrow poisons of several different tribes. Its chemistry has been studied by Marini-Bettolo et al. (1957) who reported the presence of 40 alkaloids in the stem bark. This species, as a base poison, is said to be one of the most powerful and effective paralyzing curares. The Menispermaceae are also important admixtures. *Curarea toxicofera* was mentioned as an arrow poison ingredient in Krukoff and Barneby (1970), and Barneby and Krukoff (1971). It is also rich in curare alkaloids. It is interesting to note that four other plants from three different families are also added to the poison. It is these as well as the use of many different species of *Strychnos* and *Curarea* that gives each tribe a different recipe for curare.

In order to use the poison for hunting a large number of other plants are involved in the Jamamadi weapons. For example, they make their arrow points from a bamboo (*Bambusa* sp., P21164). The shaped points are always smoked in the wood smoke of

Duguetia asterotricha, one of the poison ingredients. The Indians are most definite that the poison arrows are more effective after this treatment. The blow gun darts are made from the vascular strands of the palm *Socratea exorrhiza*, and their flights from the cotton of the seeds of *Ceiba pentandra* (Bombacaceae). The blow gun is made from the wood of a treelet of a species of *Iryanthera* (Myristicaceae) which is split open to make the bore hole and bound together with the fibrous bark of an Annonaceae tree glued with the resin of a *Protium* (Burseraceae). It is therefore apparent that a large number of plant species in many families are involved in the simple process of hunting.

ii) The Maku fish poisons

All tribes which I have visited have at least one fish poison. This is used to poison the water of small streams. Techniques vary, but in all cases it is an effective way of obtaining quantities of fish (see for example, Killip, 1931; Krukoff and Smith, 1937a). The greatest variety of fish poison I have found was in the Maku Indians which inhabit the upper Rio Negro region. This group use at least five different plants for fish poisons (Table 2), and their technique varies with

Table 2

The Maku fish poisons

Species	Family	Herbarium Voucher
<i>Caryocar glabrum</i> (Aubl.) Pers.	Caryocaraceae	P15576
<i>Glibadium sylvestre</i> (Aubl.) Baill	Asteraceae	P15555
<i>Euphorbia cotinifolia</i> L.	Euphorbiaceae	P15554
<i>Lonchocarpus urucu</i> Killip & Smith	Fabaceae	P15573
<i>Phyllanthus brasiliensis</i> (Aubl.) Poir.	Euphorbiaceae	P15556

each plant. Some plants are used only in very small creeks which are dammed up during poisoning, others in larger streams which are allowed to continue to flow, and one plant is recommended for small fish while another is used for larger fish.

Euphorbia cotinifolia is cultivated in their fields and the leaves collected into large back packs. These are taken and placed on a log bridge over a stream. The Indians beat the leaves with sticks and throw water over the beaten leaves to wash the plant juices into the river. At the same time the women stand upstream and agitate the river to stir up as much mud as possible. The fish are poisoned

by the effect on their gills which causes suffocation. They are collected from the water surface for about 300 meters downstream until the poison becomes too diluted. When they use *Caryocar glabrum* they collect the fruit from under a tree, grind up the pericarp and mix it with mud a few days prior to a fishing party. In the case of the *Lonchocarpus* vine, the stems are beaten open with a hard stick and then thrown into the stream. Both the *Caryocar* and the *Lonchocarpus* are collected from the forest, and not cultivated like the *Euphorbia* or the *Clibadium* poisons. The Maku generally collect and eat all fish including the smallest.



Fig. 2: Maku Indians beating a heap of *Euphorbia cotinifolia* branches to extract juices into river to poison fish.

Some tribes leave small fish to revive as they are carried downstream away from the concentrated poison. Fish is an important part of the Maku diet, but they are extremely careful not to fish too frequently in the same stream. They will often travel for miles through the forest to a stream in which they have not recently used poison.

iii) The Shiriana hallucinatory snuff

Most tribes have a strong narcotic of some sort, and in most cases it is hallucinogenic. The Yanomamo Indians are a large group which inhabit the northwest corner of

Amazonia in Brazil and Venezuela. I have collected their snuffs and hallucinatory plants in several different villages, including that of the Shiriana at Tototobi in Amazonas, Brazil, where it was also described by Schultes and Holmstedt (1968).

The Shiriana use the myristicaceous tree *Virola theiodora* (Spruce ex Benth.) Warb. as their basic ingredient. The bark is stripped from the tree and placed over a fire on a wooden framework. The heat causes much of the resin to ooze out. It is collected into a gourd, dried and then pulverized. The resultant powder is then mixed with the pulverized leaves of the acanthaceous



Fig. 3: Yanomamo Indians in a ceremony under the influence of their hallucinogenic snuff made from *Virola theiodora*.

species *Justicia pectoralis* Jacq. which they cultivate in their fields. The snuff with its two plant ingredients, is used by the Shamans to go into a trance before treating a patient. They were observed to use it daily. It is also used in various tribal rituals especially ceremonies involving funerals and the arrival of visitors.

The snuff is rich in 5-methoxy N, N-dimethyltryptamine, N, N-dimethyltryptamine as was pointed out by Schultes (1969), Schultes and Holmsted (1968) and various other workers. The *Justicia* does not appear to have an active hallucinogenic substance, although the Indians claim that it is essential. Various other tribes use *Virola* without *Justicia* (e.g. the Sanama described in Prance, 1970). The Shiriana also claim that

by using *Justicia* there is much less irritation to the nasal passages.

The *Virola* resin without other admixtures is also used by many Yanomamo groups as an arrow poison, but the mechanism of this poison is not yet fully understood.

iv) The edible fungi of the Sanama

In general mushrooms are not important to Amazonian Indians. There are no reports of their use as hallucinogens, and few about their use as a food. Prance (1973) and Fidalgo and Prance (1976) have reported on the extensive use of edible fungi by the Sanama group of the Yanomamo at Auaris, Brazil. This is also true of the Shiriana whose arrow poison I have described above.

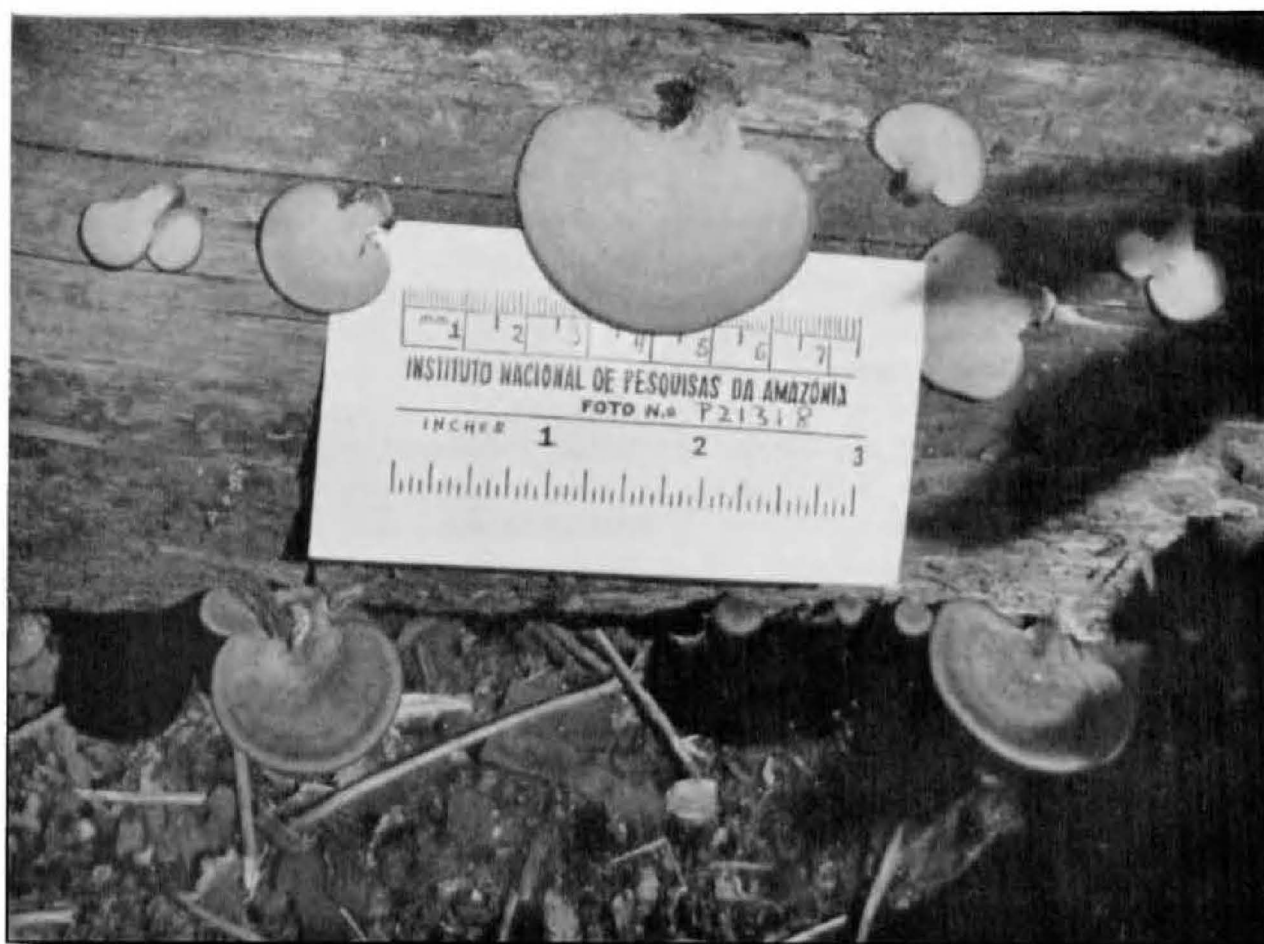


Fig. 4 : *Favolus brunneolus* Berk & Curt. one of the preferred edible fungi of the Sanama Yanomamo who call it *Adabamo*. It grows on charred logs in their banana plantations.

Fidalgo and Hirata (1979) reported that the Txicao Indians use two edible fungi and that the Txucarramae use four species but only in cases of extreme hunger.

The Yanomamo are certainly the most important users of edible fungi. Table 3 lists twenty one species of fungi given 25 different names by the Sanama. The fungi form a daily and often regular part of the Indian diet. The women gather them in the fields when they are tending to the agriculture. We watched women returning to the maloca each day with palm or banana leaves full of fungi, especially of *Favolus brasiliensis* their favorite. The mushrooms grow in abundance on rotting logs in the fields where they cultivate *Manihot*. The Indians are therefore, inadvertently cultivating a very useful second crop, the fungi. Most fungi are boiled or roasted before eating, but the large watery *Polyporus aquosus* is eaten raw. Since the Indians eat fungi frequently they are an important supplement to their diet.

These four examples serve to show the diversity of the ethnobotany of the Amazon Indians. Further examples can be found in many places. I have described some in Prance (1970, 1972a, b and 1978). A most detailed account of the hallucinatory plants can be found in Schultes & Hofmann (1979) and other publications of the same author. This leaves little doubt that the botany of the Amazon Indians deserves further study.

The Indian situation today

The statistics connected with the Indians of Brazil are frightening. During the twentieth century ninety tribes have gone extinct. That is more than one a year. As I prepare this in 1981, there are 24 tribes listed as threatened by invasion by settlers, miners, ranchers, etc. The Director of the Brazilian Indian Foundation (FUNAI) has recently stated that "It is necessary to prepare Indians for the inevitable combat with the white community because the explosion

of the economic frontier is irreversible." A statement which already admits defeat. The Indians in Brazil are in fact in a virtual state of siege at this time, as a few examples will show.

The Indians with which I have spent the most time, the Yanomamo, have until recently been relatively isolated and unspoiled in their remote territory in the Brazil-Venezuela frontier region. However, on the Brazilian side many things have now changed for the Yanomamo nation as their peace is being threatened by the building of a highway (the Perimetral Norte), the discovery of uranium and cassiterite or tin ore on their territory and a gold rush. In the northeastern part of the Yanomamo territory at Santa Rosa in Brazil near the Venezuelan frontier, about six hundred Indians live in several villages. On paper they are protected since an area was reserved for Indians in May 1978 (by Portaria 505/N). During 1980 gold was discovered in this region and the government of Roraima has allowed it to be mined which has led to an enormous gold rush. Three thousand prospectors were in the Indian territory in November 1980, and five hundred new prospectors were arriving daily in the regional capital of Boa Vista until there were 6,000-10,000 outsiders there, which was extremely damaging to the Indian culture.

The Indian youth are inevitably hired by the prospectors and the women are forced into prostitution. It was estimated by the local health authorities that sixty percent of the miners are carriers of malaria and/or hepatitis. These and many other diseases, often fatal to the natives, are introduced, and their population is decimated, repeating an event that has happened countless times to tribal people around the world. The Santa Rosa gold rush is only part of the threat to the Yanomamo. Combined with the plans to mine tin and uranium, and the route of the Northern Perimeter Highway, many other villages are in danger, and the

Table 3
The Edible Fungi of the Sanama Indians

Sanama's fungus (Portuguese phonetics in brackets)	Etymology	How eaten B-boiled R-roasted C-raw	Scientific names	Collector's numbers (Prance, Fidalgo et al.)
ADABAMO			<i>Favolus brunneolus</i> Berk. & Curt.	21318
ATAPA-AMO		B	<i>Hexagona subcapitata</i> Murr.	20082, 21329
COINI-AMO	coini = hairy + amo	B	<i>Lentinus crinitus</i> (L. ex Fr.) Fr.	20024, 21315, 21355
COROBAMO	corob = chest + amo	B	<i>Polyporus tricholoma</i> Mont.	21313
COROBO-AMO				
COTOPO-AMO				
HAMIMAMO-	hami = pepper, which burns like pepper + amo	B	<i>Lentinus</i> sp.	
HAMIMAMO-AMWAI	hami = pepper, which burns like pepper + amo	B	<i>Pleurotus</i> sp.	20085, 21326
(HAMIMAMO-AMUAI)	+ wai = small		<i>Lactocollybia</i> <i>aequatorialis</i> Singer	21414
HASSAMO	hassa = deer + amo	B	<i>Polyporus</i> sp.	21332, 21447
			<i>Favolus striatulus</i> Ellis & Ev.	21501
HIWALAMO	hiwala = porcupine + amo	B	<i>Pleurotus</i> sp.	21330, 21510 (v. HASSAMO- HOLICHI)
I-NISHI-AMO	nichi = small + amo	B	<i>Pholiota bicolor</i> (Spreng.) Singer	21322
I-NISHI-MI-AMO (i-nichi-mi-amo)				
NAI-NAI-AMO		B, C	<i>Lentinus glabratus</i> Mont. in Sagra	20084, 21328
PIDA-PIDA-LHAMO			<i>Gymnopilus</i> <i>hispidellus</i> Murr	21550
(uncertain whether eaten, some Indians say yes, others no)				
PLO-PLO-LEMO-AMO	plo-plo = toad	B	<i>Pleurotus concavus</i> (Beck.) Singer	20088, 21331
PLO-PLO-LE-AMO				
PO-PO-LEMO-AMO	(onomatopoeia) + amo			
PO-PO-LE-AMO				
SAMA-SAMA-IAMO	sama-sama = sting ray + amo	C	<i>Polyporus aquosus</i> Hennings	21316
SHI-KIMO-AMO	shi-kima = a small parrot + amo	B	<i>Coriolus zonatus</i> (Nees) Quélet	21398, 21416
SHI-KIMO-AMO-QUE	shi-kimá = a small parrot + amo-qué	B	<i>Hydnopolyporus palmatus</i> (Hook. in Kunth.) O. Fid.	20083, 21397, 21576
(chi-quimó-amo-qué)				
SHI-KEMA-AMO-QUE				
(chi-quema-amo-qué)				
SHIO-KONI-AMO	shio = anus	B	<i>Panus rudis</i> Fr.	20016, 21327, 21333
	+ coini-hairy	B	<i>Lentinus crinitus</i>	20015, 21334
	+ amo	B	<i>Lentinus velutinus</i> Fr.	20016, 21392
WAIKASSAMO	waika = waika + amo	B, R	<i>Favolus brasiliensis</i> (Fr.) Fr.	20014, 21314, 21317
(uaicassamo)				

very existence of this 12,000 strong nation is threatened. There have been many international pleas for a Yanomamo Park to be created in the territory, but these have been ignored because of the "need" to develop the resources of the area. In fact the thirteenth proposal for a Yanomamo Park was brought to the Brazilian government in April 1980.

The Yanomamo situation is still uncertain as plans for the Roraima region change almost daily. The latest plan calls for a federal park that would include an ecological reserve, a forest reserve and an Indian park. However, this idea is being fiercely debated within Brazil, and an inter-ministerial decree of January 15, 1981 declared that "mineral exploitation will be authorized for strategic minerals which are necessary for security and national development." As a result of the decree troops were sent in to remove unauthorized gold prospectors from Yanomamo territory and most of them have already been sent away. On the other hand the decree means that the gold, uranium and cassiterite in the region will eventually be mined regardless of whether it is in the middle of the Yanomamo territory or even if it occurs in an ecological reserve. The future of the Yanomamo people of Brazil does not look good.

The case of the Nhambiquara Indians also in Brazil is probably worse since they are a smaller group and do not have their people in another country like the Yanomamo do in Venezuela. The Nhambiquara with their interesting tri-tonal language are utterly simple in their material culture. They are the exact opposite from the materialistic developers that now threaten their very existence. They like the Yanomamo are threatened by the relocation of a highway, BR 364 from Cuiabá the capital of Mato Grosso to Porto Velho the Amazonian capital of Rondônia.

Many settlements have now been established in what was clearly Nhambiquara territory.

FUNAI have issued negative certificates, which state that there are no Indians on the land, for ones that do have Indian villages. With a negative certificate companies or individual settlers are authorized to move into the territory, encouraged by large tax incentives for their role in development. In areas where FUNAI admitted the presence of Indians, villages have been relocated to other areas. A quick glance at the soil maps prepared so elegantly by Brazil's radar survey of the region, Projeto RADAM, shows that these Indians have been moved from fertile lands to areas with poor soils which they have been unable to cultivate. The use of the much debated and cancer causing agent orange has been definitely established on Nhambiquara territory. The road which is being re-routed through Nhambiquara territory is being financed by the World Bank which is largely foreign capital. The road could certainly be routed away from Indian lands. The lands which these Indians occupy is particularly important to them for many cultural reasons. They make pilgrimages to various sacred places within their territory as part of their rites. This is becoming progressively impossible as their sacred trees are being felled. The survivors of the Nhambiquara inevitably are losing their culture.

The Jê speaking Kayapó-Gorotire Indians have recently been in the news, even in North American news magazines because of their recent resistance to oppression. On September 8, 1980, one hundred and three Indians, painted black, and armed with bows, war clubs, and even a few rifles, invaded the Espadilha ranch in the State of Pará, and killed twenty people including women and children. This event caused much local indignation and many false reports in the local press. These Indians have a vast reserve, in the valley of the Rio Xingu, which was demarcated in 1972. The area of their reserve is rich in minerals, wood, fish, and other natural resources essential to



Fig. 5: A common sight in Amazonia, recently felled rain forest in the *Orbignya* palm zone of Pará, Brazil. The Indians too are disappearing as fast as the forest.

the survival of the Gorotire. The Gorotire were a large nation in Pre-Colombian times certainly exceeding 100,000 in number, but by 1952 had been reduced to a population of about 500. The creation of a reserve was a hope that they would now survive. Development has been near to the reserve for some years as the 160,000 hectare ranch of the Volkswagen Motor Company lies south of the reserve, but not in it and to the north the even larger 400,000 hectare ranch of the Andrade-Gutierrez Construction Company is located. However, other small ranches began to encroach on the Indians' territory

and so the Indians began to meet the rancher peacefully in order to reclaim their territory. Sometimes the settlers moved out after such contacts, but they or replacements always returned into the reserve. Four days before the Indian attack on the Espadilha ranch, the managers informed the Indians that 1,800 labourers would be coming into the region to cut down the forest in the reserve. In addition each time the settlers returned to the reserve they burned the few belongings of the Indians. The situation became explosive and the Indians reverted to war. Many false reports about this incident have

been circulated. However, the Indians were certainly deeply provoked and did not go into the attack lightly. A local bush pilot informed us that some of the ranchers requested a flight to drop firebombs on the Kayapó village. It is not surprising that as their reserve was being taken away the Indians were provoked enough to retaliate.

Another case which recently reached the international press is the interesting one of the Xavante Indian chief Mario Juruna. This man, chief of the Namucurá Xavante, has for some years been a spokesman for Indian rights. As a consequence he was invited in September 1980 to take part in the Bertrand Russell Tribunal in Holland. Mario Juruna applied to FUNAI for permission to travel but his application was turned down with the reasons that "Indians do not usually pronounce or speak in the name of other Indians." Juruna took his case to the minister in charge of FUNAI, the Minister of the Interior, who also turned down his request.

The interesting and encouraging outcome of this case was that several Brazilian congressmen supported Juruna and took his case to the Supreme Court. This, the highest body of justice in Brazil, was meeting while the meeting in Holland had begun. Juruna was elected President "in absentia" of the Bertrand Russell Tribunal and shortly afterwards the Brazilian Supreme Court rules 15-9 in favor of Juruna. He immediately left for Holland to arrive in Rotterdam towards the end of the conference and receive a five minute standing ovation when he walked into the auditorium. During the last day of the Congress he was able to present many of the facts about the present situation of the Indians in his presidential address.

These are a few examples to illustrate what the general plight of the Indians is today. Many other cases could be cited, but this is enough to indicate that we may soon no longer have this field of ethnobotanical study available for research.

CONCLUSION

I have tried to show the great botanical interest of the Indian tribes and also their present threat of extinction. The contrast is made to emphasize the need for action on the part of all interested people. There are two lines of action that are necessary. Firstly, and probably of most importance to this gathering, there is the need to accelerate our ethnobotanical study of primitive people. This aspect of research is often difficult to fund because botanists tend to think of it as anthropology while the anthropologists regard it as botany. Ethnobotany in itself is a distinct discipline for which we must urgently seek greater funding for work in the tropics among primitive people. Secondly, is the need for us to lobby for the rights of the Indians. Let us join some of the strong voices from within Brazil such as Darcy Ribeiro and José Lutzenberger by showing our concern for the future of the Indians, and the preservation of their culture. The threat to the Indians is caused equally by outsiders as by the Amazonian countries. It is the developed countries who cause much of the pressures by seeking an unlimited supply of natural resources at low prices. It is therefore also possible for us to take a stand against what is happening to the Indians.

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