

DE PLANTIS TOXICARIIS E MUNDO NOVO  
TROPICALE COMMENTATIONES II

THE VEGETAL INGREDIENTS OF THE MYRISTICACEOUS SNUFFS  
OF THE NORTHWEST AMAZON

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I.

The botanical sources of the sundry intoxicating snuffs of the New World tropics has long been uncertain or, in some instances, unknown. One of the most recently identified snuffs, prepared from the resin of various species of the myristicaceous genus *Virola* and employed by a number of Indian tribes in the northwestern part of the Amazon, is now relatively well understood as a result of interdisciplinary investigations of the past thirteen years.

It seems to be an appropriate time to appraise and integrate the numerous reports concerning the botanical ingredients of the myristicaceous snuffs and to summarize what we now know about this problem. It would appear, furthermore, an advantageous opportunity to offer such a summary, in view of current interest in the phytochemistry and pharmacology of the resin of *Virola* and related genera.

This paper is the second in a series dedicated to the study of poisonous plants of the New World tropics. The first paper in this series was published in the *Botanical Museum Leaflets, Harvard University* 21 (1967) 265-284.<sup>3</sup>

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## II.

The sources of narcotic snuffs employed by natives of South America have long been clouded in mystery. It has been too widely assumed that all such snuffs were prepared either of tobacco or of *Anadenanthera peregrina*, more commonly known as *Piptadenia peregrina*. Reference to Cooper's map (7) purporting to show the distribution of the snuffing of *Anadenanthera* powder convinces the investiga-

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examination of a number of species of *Virola* and related genera. Our studies on the snuffs encompassed botanical, ethnobotanical, phytochemical and toxicological investigations and, viewed and interpreted against a background of what has previously been done, seem to lay a foundation for more intensive and extensive research along sundry avenues. Having the excellent laboratory facilities of this ship so near the scene of our field studies made it possible to carry out chemical observations that might have been out of the question in laboratories as far away as Europe or the United States. Detailed results of the phytochemical investigations will be published in a subsequent paper.

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Our gratitude must, likewise, be extended to the Instituto Nacional de Pesquisas da Amazônia in Manaus and its officials, especially to its director, Dr. Djalma Batista, and agronomist, Sr. Vivaldo Campbell de Araujo; to the Instituto Agrônômico do Norte in Belém do Pará, especially to Dr. João Murça Pires.

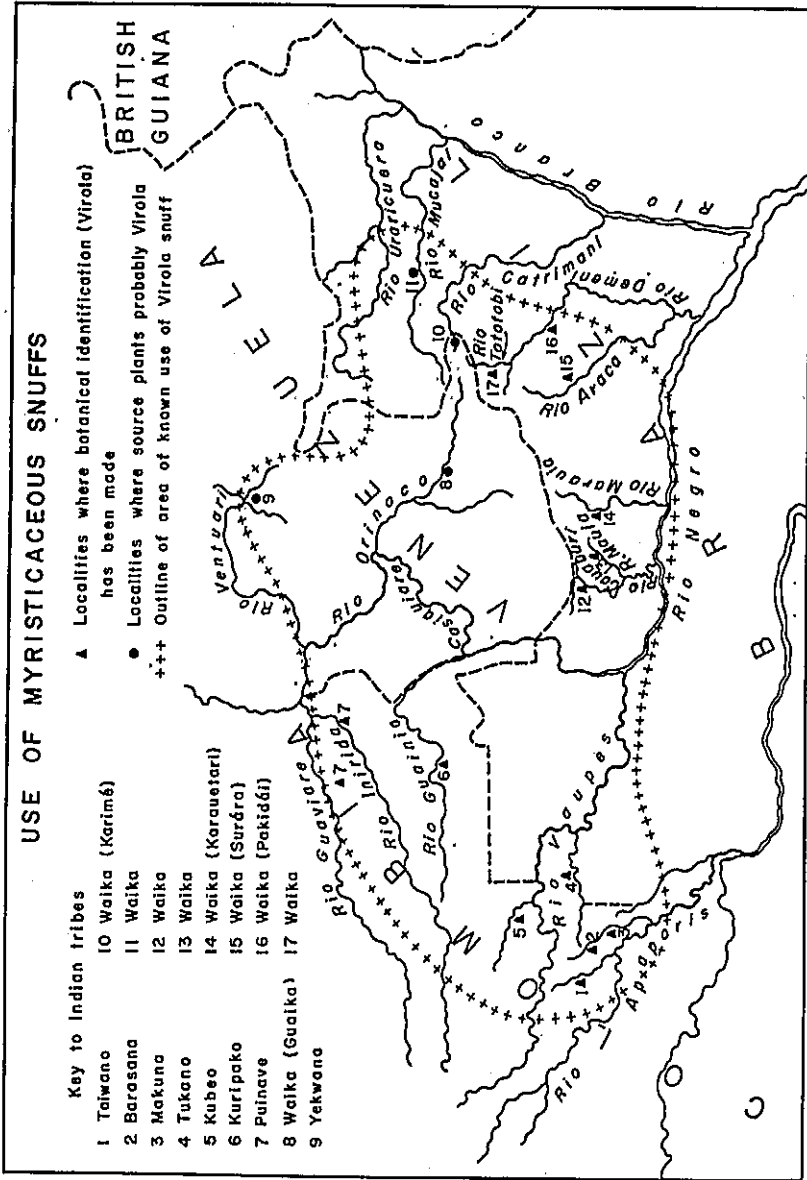
It is, furthermore, a pleasure to thank our good friends Padres José and Francisco of the Salesian Mission at Maturacá on the Rio Canaburf and the Rev. Keith Wardlaw and Sr. Francisco Becerra de Lima of the New Tribes Mission at Tototobi. We are deeply indebted to Mr. Eldon Larson, pilot for the Mission Aviation Fellowship in Boa Vista, Brazil, for his kindness in making available to us air mobility at critical periods in our field research.

tor how uncertain the total picture is at the present time. Even a superficial study of Wassén's meticulous six-page legend to his map (38) showing the distribution of snuffing in South America will indicate how complex and how poorly understood are the sources of these sundry narcotic powders. Suffice it to say here that 1) *Anadenanthera* is employed as the source of a narcotic snuff on a geographically much more limited scale than the literature references generally would indicate; and 2) there are still botanically unknown snuff preparations in use in several parts of South America (28).

To the best of our knowledge, references to the myristicaceous snuffs are all found in comparatively recent literature. The older reports of snuff from the northwestern part of the Amazon and the upper Orinoco seem to be referable either to tobacco or to the seeds of *Anadenanthera peregrina*. Humboldt, Spruce and other early travellers and explorers in this vast region appear never to have encountered the preparation of a snuff from the bark of a tree; this is an especially interesting circumstance in the case of Spruce who devoted much attention to myristicaceous trees and who actually described a number of new species in this family.

What seems to have been *Viola*-snuff was first noticed and reported by the famous German ethnologist Dr. Theodor Koch-Grünberg (15), who lived amongst and studied Indian tribes in the Rio Negro basin and the upper Orinoco during the early years of the present century. While Koch-Grünberg failed to specify the botanical source of the narcotic, there seems, in the light of later investigations, to be little doubt that he was reporting actually the manufacture of a snuff from *Viola*.

Writing of the Yekwaná (Yecuaná) tribe (Karib-speaking Indians related to the Makiritare) of the Río Ventuari in Venezuela, Koch-Grünberg made the following observations: "Of an especial magical importance are the cures, during which the witch-doctor inhales *hakúdufha*. This is a magical snuff used exclusively by the witch-doctors and



prepared from the bark of a certain tree which, pounded up, is boiled in a small earthenware pot, until all the water has evaporated, and a sediment remains at the bottom of the pot. This sediment is toasted in the pot over a slight fire and is then finely powdered with the blade of a knife. Then the sorcerer blows a little of the powder through a reed (*kuratá*) into the air. Next he snuffs, whilst, with the same reed, he absorbs the powder into each nostril successively. The *hakúdufha* obviously has a strongly stimulating effect, for immediately the witch-doctor begins singing and yelling wildly, all the while pitching the upper part of his body backwards and forwards."

In connexion with this postulated identification of the Yekwana Indian bark-snuff as *Virola*, it should be borne in mind that Dr. John Wurdack (43), after field experience in the Río Ventuari in recent times, has written: "While Schultes believed, from Koch-Grünberg's description of a Ventuari narcotic, that *Virola* bark-exudate was used in the Ventuari drainage, we have found no such present-day evidence. Don Melisio Pérez of San Juan de Manapiare, who is the docent for Ventuari Indian lore, knows of no tribes in this drainage using bark-exudate." The Piaroa now inhabiting the same river do, according to Wurdack, prepare a snuff from beans of *Anadenanthera peregrina*. Living in a deeply forested area where *Anadenanthera peregrina* does not occur, these Indians make a long annual pilgrimage to secure seeds of this legume for snuff-making.

In 1961, Dr. Helmut Fuchs of Caracas carried out field studies in the upper Río Ventuari. He mentioned (40) two snuffs, one of which has definitely, through botanical specimens, been determined as *Anadenanthera peregrina*. Of particular interest here, however, is his confirmation of Koch-Grünberg's statement concerning *hakúdufha*. In a letter to Dr. Henry Wassén (October 24, 1961), Fuchs wrote: "The crushed bark of *ai'yulca* (*Piptadenia peregrina*?) (in the Venezuelan vernacular called 'yopo') is known as *a'ku:duwaha* in the powdered form. In addition, the fruits of another plant are likewise consumed with

*a'ku:duwha*, which, judging from explanation by Makiritare Indians, might also be a *Piptadenia*. There are, furthermore, two other plants employed in the elaboration of the snuff: a broad-leaved one (*ai'yuku*), the bark of which is ground up with the *a'ku:duwha*, and a small-leaved one (unknown to me), the fruit of which is crushed. These two plants are found only in the highest mountains, for which reason the natives could not, unfortunately, bring me specimens. I agree with you that it seems as though the designations *ai'yuku* and *a'ku:duwha* have a generic meaning".

If these data be accurate, they appear to indicate — beyond the implication that these native terms are generic for snuffs — that the powdered bark, as well as the seeds or fruits, of *Anadenanthera peregrina* are employed.

Although the literature usually indicates that it is the bean of *Anadenanthera* that is employed in snuff-making, there would seem to be no chemical reason why the bark should not also be used since, like the seeds, it contains several psychoactive tryptamines (12). The possibility that *Anadenanthera*-bark may be so employed is a consideration that must constantly be borne in mind in our attempts at "identification" without botanical material of the plant sources of snuffs. One is likewise tempted to ask whether or not the broad-leaved plant described in Fuchs' letter might be a species of *Virola*.

The first definite association of a snuff with *Virola* was made in 1939 by the great Brazilian student of the Amazonian flora, Dr. Adolfo Ducke (8). In his monographic treatment of the Leguminosae of the Brazilian Amazon, Ducke wrote, in a footnote to a discussion of *Piptadenia peregrina*, that: "Martius and other writers attribute to this species the source of the narcotic *parica* employed by certain Amazonian Indians (the powder of the crushed seeds is inhaled through the nostrils). Notwithstanding, according to information which I obtained from the natives themselves in two localities in the upper Rio Negro, the *parica*-powder comes from leaves of species of *Virola* of the Myristicaceae." All of the recent intensive research has not been able to

substantiate the statement that the leaves are used: all ethnobotanical field work and all recent reports of those who have observed the preparation of *Virola*-snuff coincide in indicating that the resin from the bark is the part of the tree employed by the natives.

When one of the writers (Schultes) first went into the northwestern Amazon in Colombia — a region where he carried out continual field work in botany and ethnobotany from 1941 to 1953 — he fully expected to meet with the extensive use of yopo snuff prepared from the beans of *Anadenanthera peregrina*. The anthropological literature quite generally ascribed all narcotic snuffs of the Amazon not obviously prepared from tobacco to this leguminous tree. Amongst many tribes of the Colombian Amazonas and Vaupes, he met with the use — often excessive use — of tobacco snuff and, in several tribes, of a snuff made from coca (*Erythroxylon Coca*). He never met with any snuff called yopo or niopo nor with a snuff prepared from beans of a tree; furthermore, he failed to encounter, wild or cultivated, a single tree of *Anadenanthera peregrina*.

During the course of explorations in the Río Apaporis in Amazonian Colombia in 1951 and 1952, Schultes had, as assistants, several Puinave Indians from the Río Inírida: The Inírida is the highest Colombian affluent of the Orinoco, and it represents an area where the floras of the Río Negro-Vaupés and the upper Orinoco floras blend. Consequently, the Puinave helpers, from whom he first learned of the myristicaceous snuff, were familiar with many of the plants found in the Apaporis basin. They indicated two species of *Virola* — *V. calophylla* Warburg and *V. calophylloidea* Markgraf — from the resin of which a highly intoxicating snuff, called *yá-tee* in the Puinave language, could be elaborated (21, 22, 23).

During 1951, the almost wholly uninhabited Río Apaporis was opened up at several points for tapping wild *Hevea* rubber, and natives from sundry tribes of the Colombian Vaupes and even from the Río Uaupés of Brazil were transported into the area by air. Schultes had, consequently, an

unparalleled opportunity of studying the preparation of the narcotic by natives of tribes normally isolated from one another by great distances, and his field investigations disclosed that a number of tribes knew of *Virola*-snuff, the use of which was restricted to their witch-doctors: the Puinaves of the Río Inírida<sup>1</sup>; the Kuripako of the Río Guainía; the Kubeo of the Río Vaupés and Río Papurí; the Barasana and Makuna of the Río Piraparaná; and the Taiwano of the Río Kananari. Reports indicated that its use was known amongst Indians, especially the Tukano, of the Río Uaupés in Brazil, and indirect evidence placed it likewise amongst the several tribes living on the Río Issana.

*Virola*-snuff is called *yá-lee* in Puinave, *yá-to* in Kuripako. Amongst the Tukano and linguistically related tribes, it is known as *pa-ree-ka*, a loan word from the Nheêngatú or Lingoa Geral, a Tupí-Guaraní language once widely spoken in the northwest Amazon, especially of Brazil; this is the term by which snuff from *Virola* and from *Anadenanthera* are known today by the civilized inhabitants of the Río Uaupés — Río Negro area of Brazil.

In the Colombian Vaupés — its westernmost area of use — *Virola*-snuff is prepared rather simply. Schultes saw it prepared by Puinave, Tukano, and Kuripako Indians, and descriptions of its preparation from members of the Kubeo, Barasana, and Makuna tribes indicated no appreciable deviation from the process. In all cases, the same species were pointed out as sources of the snuff, although the possibility that other species of the genus could be used was indicated.

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<sup>1</sup>What almost certainly indicates the use of *Virola*-snuff by the Puinave of Laguna Negro on the lower Río Inírida in Colombia is a passing reference (19) to a snuff called *ya-to*, prepared from the inner bark of a vine known also as *ya-to*, resembling *yasé* [yaje?], and the ashes of a tree called *mature*. Both are boiled, then dried and pulverized. How much reliability can be placed upon the botanical statement that a vine is the source of the snuff is open to question. *Virola* species, of course, are all trees, never vines, but was the source plant actually observed or is this report merely the uncritical repetition of a native's statement? We can say, however, that the vernacular name of the snuff in Puinave is *ya-lee*, not *ya-to*, which is the term applied to *Virola*-snuff by the neighboring Kuripako Indians (22).

The Indians strip the bark from the trees usually in the early hours of the morning, before the sun has begun to penetrate the forest canopy to heat up the trunk. Large strips of the bark, which peels easily from the cambium, are torn from the trunk and tied into loose bundles. Almost immediately upon separation of the bark from the tree, a profuse exudation or "bleeding" of a thick reddish resin-like liquid, which soon becomes viscous, oozes forth from the inner surface of the bark in small drops. The active principle is contained in this exudation — called *oom* (latex), or, specifically referring to these species of *Virola*, *há-oom-tee-ēt* or *yá-kee-oom*, in Puinave. According to the natives, this exudation is greatly reduced in quantity and is weaker in its narcotic effects when the trunk of the *Virola* tree has received the warmth of the sun's rays.

The bundles of bark are brought in and placed in water for about half an hour. They are then taken out, and the soft inner layer, on the surface of which the red exudation has congealed, is rasped off with a knife or machete. The shavings or raspings (*yá-kee-tao* in Puinave) are thrown into a large earthenware pot or enamel tray, and the rest of the bark is discarded. When enough shavings have been accumulated, a small amount of water is added, and the mass is thoroughly kneaded and squeezed by hand. The water becomes muddy and assumes a brownish or tan hue. This turbid liquid is strained several times, usually through a piece of finely hammered bark-cloth (prepared from *Olmedia* or *Poulsenia*), into a small-mouthed earthenware pot. The residual shavings, when as much of the water has been expressed as possible, are thrown away. Enough water is added to the strained liquid to fill the pot, which is then set to simmer over a slow fire. From time to time, a sordid foam, which rises to the surface, must be scraped off with a piece of bark. The boiling is allowed to continue for three or four hours, more water being added if evaporation is too rapid, until nothing remains except a thick, dark brown syrup at the bottom of the pot. This syrup must not be dried rapidly over a fire; the pot is set in the sun, and the syrup

is permitted to solidify slowly. When nothing but a dry, brown crust is left, the residue is scraped free from the pot and is ground into a fine powder with a water-smoothed stone as a pestle, and the pot or an enamelware tray as a mortar. It is then ready to be mixed with ashes which have been made from the bark of a small wild cacao tree (*Theobroma subincanum* Martius). Usually, equal amounts by volume of ashes and *ya-kee* powder are used. When they are thoroughly mixed, the product is put into a small bag made of finely hammered bark or cloth and is sifted through the bag by means of a gentle beating against the side of a small-mouthed receptacle. The resulting dust is the finished snuff. It is kept either in a small glass bottle, tightly corked, or else, more traditionally, in a type of jar made from a large snail-shell to which a hollow bird-bone tube has been fixed with pitch (usually from *Symphonia* spp. or *Moronebea* spp.). This tube is stoppered with a plug of feathers glued together with pitch at the basal end to form a tight-fitting stopper.

Amongst all the tribes of the Colombian Amazon, the consumption of *Virola*-snuff is limited to the medicine-men and is, therefore, small. Since it is said to lose its intoxicating properties rather rapidly, even when in a tight container, it is made in small amounts and frequently.

The next reference (2) to what seems to be the same myristicaceous snuff is found in an extraordinary article on the culture of certain Waiká Indians,<sup>5</sup> mainly those living

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<sup>5</sup>In view of the extreme confusion in terminology in current anthropological literature and in line with a more popular usage of terms, we intend, for the ethnobotanical purposes of this study of snuffs, to employ the term *Waiká* generically for many groups of Indians, apparently closely related, who dwell in southernmost Venezuela and northwesternmost Brazil, in the headwaters of the Orinoco and on northern affluents of the Rio Negro, respectively. The final classification of peoples, naturally, lies with the anthropologist. Pending, however, a clearer classification for the area in question, specialists in other disciplines — such as ethnobotany — must have a simple nomenclature, and, consequently, we are faced with the necessity of choosing one for use in this paper, pleading the while for a more logical, meaningful and standardized treatment of what are obviously closely

related, sometimes even identical, peoples. Present knowledge of the snuffs of South America seems to support a suspicion that the Waiká (in our sense of this term) form the center of today's most intensive use of the myristicaceous snuffs and may even represent the area of origin of the use of these preparations. It is this consideration that has made imperative our search for a simple terminology for use in the present summary.

The Indians in question, who live in isolated hamlets or single communal *malocas*, are sometimes referred to inclusively as Yanonami, although the generic term Waiká is likewise very often employed to designate this large and dialectically somewhat heterogeneous group of natives. Actually, Waiká or variants of it represents the oldest term, having been first employed in the literature in 1779 (4). Some specialists have spoken of the Waiká and the Shirianá, although the name Shirianá (Xirianá) has also been used for groups in the Parima Mountain area of British Guiana and along the Ríos Uraricapará and Uraricoera in the uppermost Orinoco drainage-area. Koch-Grünberg (14) was apparently the first to conclude that the Waiká (Guai-cá), Kirishaná, Guaharibo and Shirianá, all of the Parima region, were probably one group of people. Métraux (17) considered the Shirianá and the Waiká as distinct. Zerries (47, 49) referred to the Waiká, Guaharibo and Shirianá Indians, which apparently may form "an identical group inhabiting the headwaters of the Orinoco of Venezuela and adjacent parts of Brazil" and used Waiká for the entire group called Yanomamö by later workers. Becher (3), who employed the term Yanonami, distinguished several sub-groups living along the Ríos Aracá and Demini, tributaries of the middle course of the Rio Negro, as the Surára and Pakidái. Seitz (31) followed Becher in considering the Waiká as belonging to the Yanonami or Yanoama, although one of the groups that he visited on the upper Rio Marauíá he called the Karauetari tribe. Salathé (20) referred to the Karimé, culturally related to the Waiká and living in the headwaters of the Rio Caterinani in Venezuela. Barker (2), a missionary with many years of experience with these several peoples in the upper Orinoco, stated that the ". . . Guaiká [Waiká] tribe inhabit the upper Orinoco and its tributaries . . . and also extends to Brazilian territory, occupying the headwaters of various affluents of the Ríos Branco and Negro" and that the Waiká and Guaharibo ". . . speak the same language, but with dialectical differences." The Guaharibo, he reported, refer to themselves as the Shidishaná and Shirianá. Migliazza (18) did not accept Becher's inclusive use of Yanonami or Yanoama but preferred to speak of the "linguistic family Xirianá," living in a circular area the center of which is the Parima Mountain on the boundary of Brazil and Venezuela. They number, he stated, some 5000, divided into small groups of from 30 to 200 or more individuals; these groups, each generally with its own dialect, are

usually known as Shirianá, Waiká, Shamtari, Parahurí, Yanamani, etc. Wilbert (41), who has offered perhaps the most detailed treatment of the classification of these peoples, considers the Waiká as one sub-group of the Yanoama, suggesting that they are descended from very ancient inhabitants of South America. He considered the Surára-Pakidái (Sumatari or Samatari), Waiká, Karimé, Shirishaná (Casaparé), Warema (Sanema, Pubmatari as all related and belonging to the Shirishana or Guaharibo family. Most recently, Chagnon (5, 6) has accepted the term Yanomamö for "... a tribe in Venezuela and Brazil who practice a slash-and-burn way of horticultural life," a term that he employed "in a linguistic-cultured sense to define the tribe. The word, he maintained, "means true human begins" since "their conception of themselves as the only true 'domestic beings' . . . is demonstrated by the contempt with which they treat non-Yanomamö who . . . are 'wild.' In addition to meaning 'people,' Yanomamö also refers to the language . . . Sub-Yanomamö groupings are based on language differences, historical separation and geographical location". We should point out parenthetically that tribal designations amongst South American Indians very commonly, in fact almost as a rule, mean only "human beings", "proper people", etc., to differentiate them from other linguistically non-accepted groups; it is not peculiar to the Waiká or Yanomamö. He asserted that "the Indians referred to themselves as Yanomamö, which at once defines their mode of life, language, origin and includes all people who share this mode of life, language and origin". He considered the Sanema, Shamatari and Waiká as "local groups". Two of these distinguishable groups, he pointed out, are the Waiká and Shamatari, both speaking nearly the same dialect but distinguished because of their separation and Shamatari "differentiation" from the Waiká in the past seventy-five years: those moving "to the south side of the Orinoco came to be called Shamataris by those living on the north side, and the term is now applied to any village in this area, whether or not it can trace its origin to the first supporters of Shamatari" (a kind of hero who, following intra-tribal fights, led his followers south to the Orinoco). Chagnon's map (5), shading in the Yanomamö area of southern Venezuela and northern Brazil, shows that his term is equivalent to what we prefer to call Waiká. He estimates their population to be up to 10,000, over 7,000 of them in Venezuela.

It may be significant that none of the several contributors to the *Handbook of South American Indians* (9, 13, 15, 16, 17, 32, 42) who have had occasion to refer to these Indians have employed the terms Yanomamö or Yanonami. They have used Waiká, often however distinguishing between the Waiká and the Shirianá.

These examples from the divergent opinions of the several anthropologically oriented specialists who have worked with and/or written about these Indians illustrate the dilemma that faces the botanist

near the mission station of El Platanal or Mahekodotedi on the uppermost Orinoco in Venezuela, not too distant from the area where Koch-Grünberg reported the bark snuff of the Yekwana tribe. In 1953, Barker, an American missionary with long experience in the region, offered a brief but telling sentence concerning the source of Waiká snuffs: "Different kinds of 'yopo,' of distinct strengths, are prepared from leaves, bark and ashes of bark." It should be noted that he made no mention of a *bean* or *seed*, thus, it would seem, ruling out the possibility that these people elaborated their snuff from *Anadenanthera peregrina*.

A year later, in 1954, the German anthropologist Dr. Otto Zerries (45, 46, 47, 48) began to publish a series of articles on the same and allied Indians: the Waiká of the village of Mahekodotedi and their relatives and neighbours whom he calls the Shi dishána of the Cantinama region of southern Venezuela. He wrote in great detail on the use and cultural significance of the narcotic snuff. His reference to the botanical sources of the snuff are, unfortunately, somewhat confused and often indecisive.

Zerries referred to "yopo-snuff" as "a characteristic feature of Waiká culture". This snuff, which the natives called *ebéna* and use "to be intoxicated and establish contact with the *hekula*, spirits of rocks and waterfalls", appeared "to be made of the seeds of *Mimosa acacioides* or of a *Piptadenia* species", a plant known to these Waiká as *hisioma*. Since Zerries worked with the same Indians on which Barker had based his report, one wonders, in view of Barker's explicit enumeration of "leaves, bark and ashes of bark" and his omission of "seeds", whether Zerries actually observed the use of *seeds*. By Zerries' acceptance of Cooper's distribution map detailing the use of *Anadenanthera (Piptadenia) peregrina* for snuff, it would appear that realizing that in certain parts of the upper Orinoco drainage-area, *Anadenanthera* seeds formed the prime source of a narcotic snuff commonly called *yopo* or *paricá*,

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and pharmacologist. We trust that, under the circumstances, our course of action will be understood.

he may conveniently have extended this generalization to his own group of Waiká. It is quite apparent that Zerries' identifications were not based on voucher botanical specimens. A botanist, had there been material to submit to a plant taxonomist for determination, would most certainly have known that the binomial "*Mimosa acacioides*" is merely a synonym of *Piptadenia peregrina*. Consequently, by extrapolation, it seems wholly probable that this "identification" of the source of *ebéna* was neither made by a botanist nor based upon voucher specimens. In late papers, Zerries asserted that the "yopo" of these Waiká is prepared basically from this leguminous tree.

It may be interesting, if only to illustrate the complex role that these intoxicating plants play in Waiká philosophy, to quote more fully one of Zerries' discussions of certain ethno-botanical aspects of the sources of the narcotic snuff of the Waiká. "The snuffing of yopo-powder during which persons sitting in juxtaposition, snuff each other through a tube half a meter long, is an indispensable prerequisite for invoking the spirits, for only then can the *hekula* enter the medicine man's chest and allow him to see the spirits in his yopo-intoxication. Sometimes, he is overcome with the drug and his own imagination and, more or less, loses his senses. This may sometimes be immediately manifest in a kind of seizure by the spirit that has laid hold of him, so that the medicine man cannot be exorcised by his colleagues. Now and then, he loses consciousness, a condition that the Waika revealingly call by the word for 'dying'. This effect is produced presumably by the alkaloid of a plant resembling a *Mimosa*, *Piptadenia peregrina*, and which is one of the numerous vegetal ingredients of the snuff. The plant *hisioma*, . . . from which this ingredient of the yopo-powder comes, . . . is subordinate to two *hekula* spirits, the *ihamaliwa* and *kuhidiliwa*, the lords of the sloth and of an unknown bird, who had, in primeval times, allowed the soul of the *hisioma* to come down and thus create the plant itself . . . Another ingredient, *mashohara*, derived from a species of *Piperaceae*, is also called *yauardi-*

*hena* ('leaves of the forest spirit') . . . A further snuff powder which, unfortunately, cannot be botanically identified, is called *bolek-hena*, signifying 'leaves of the spirit of the dead'; this plant is subservient to *hayacowardi*, a female demon in the form of a wildcat . . . Whoever . . . is rubbed with this plant will always . . . be at the mercy of this female demon."

A most revealing statement in this regard was made by Zerries in 1954(44). In speaking of other ingredients of *ebéna*, he mentioned *masho-hara* or *yauardi-hena*, which he described as the leaves of a piperaceous plant cultivated in the garden plots for this purpose and a powder made from an unknown plant known as *bolek-hena* ("leaves of the death spirits"). "The strongest ingredient is *yacoana*, the inner bark of a wild tree, which is dried, often toasted. I presume," he wrote, "that it is a species of *Mimosa* (*Mimosa acacioides*), which contains an alkaloid." Here Zerries asserted that the strongest ingredient of the snuff is the inner bark of a wild tree, not a "seed". Notwithstanding his presumption that it is *Anadenanthera peregrina*, there can be little doubt that this "wild tree" is a *Virola*: the inner bark is the part of *Virola* that is employed, and *Virola* is called *nyakwana* in other Waiká groups.

There are several other considerations in connection with possible identification of the plant ingredients of the Waiká snuff. These Waikás are forest-dwelling Indians, and *Anadenanthera peregrina*, definitely not a jungle tree, is found characteristically in open semi-savannah country. Zerries' descriptions and photographs of the snuffing equipment, snuffing ritual and physical effects of the narcotic are, in every detail, identical with those observed for *Virola*-snuff in other groups of these same peoples.

Consequently, it is obvious that we are left with extreme uncertainty, insofar as the botany is concerned, by Zerries' writings on the snuff. There are several possibilities: 1) that the snuff is prepared from seeds of *Anadenanthera peregrina*; 2) that it is elaborated from the inner bark of a

species of *Virola*; 3) or that there are several kinds of snuffs made by the Waiká — one basically active because of *Anadenanthera*, the other, basically active because of *Virola*. In view of the later anthropological and botanical field work, we believe that the second possibility is the more probable and that the *ebéna* of these Orinoco Waiká is a myristicaceous snuff.

In 1960 the German anthropologist, Dr. Hans Becher (3), referred to the use of an intoxicating snuff, especially in connexion with adolescent initiation rites and endocannibalistic ceremonies, by the Surára and Pakidái living on northern affluents of the Rio Negro in Brazil. These groups employ only two narcotics: tobacco, used hedonistically; and *epéna*-snuff, used ceremonially. The narcotic *epéna*-snuff, he reported, is, like *yopo* or *paricá*, prepared from a number of ingredients. It is made, according to this reference, from the roasted and powdered *paricá* seeds (*Anadenanthera peregrina*) to which the ashes of the bark of a "wild species of *Mimosa*", *hekurahihena*, and the piperaceous *mazahara* are added. He suggested that the wild mimosoid plant might be "*Mimosa acacioides*", apparently not realizing that this binomial is a botanical synonym for *Anadenanthera peregrina* or *Piptadenia peregrina*. In one point in his discussion, Becher equated the "piperaceous" *mazahara* with the *mashoraha* reported by Zerries from the Waiká of Venezuela. There is no indication that botanical specimens formed the basis of the identification of these plant sources, and one wonders whether or not Becher relied upon the identifications earlier published in Zerries' papers.

A recent popular article by Dr. Napoleon Chagnon (6) on the Waiká and related Shamatari failed to refer to the preparation of their snuff, mentioning the narcotic only in a caption under an illustration showing a group of Indians snuffing: "In preparation for duels, the Indians take their hallucinatory drug, *ebene* . . .". In his unpublished doctoral thesis Chagnon (5) likewise did not consider the snuff.

In 1960 Mr. George Seitz (29), who with his wife had, in 1957, visited a group of Waiká and others whom he calls

Shamatari and Araraibo on the Rio Maiá, a tributary of the Cauaburi, published a book on his trip to these people. He described the taking of snuff by these Waiká but, as he wrote, "as regards the powder snuff, we could find out nothing. He [the Indian] said that it was prepared from the bark of a shrub which grows only in the montains. His description, however, was so general that we could not identify the plant." Later, in a letter to Wassén (April 19, 1961), Seitz added significant data concerning the preparation of the snuff, called *epéna* by these people: "The snuff, the elaboration of which we saw more than once, consists of the following ingredients: 1) The bast of the bark of a tree (called *epéna-kési*). This bast is dried, toasted and then powdered. 2) The outermost bark of young stems of an *Acacia*-like plant (called *ama-asita*). It is dried completely and burnt to ashes (called *jupi-uschi*). An herb about 30 cm. tall (called *mashi-hiri*) is dried and powdered and mixed with both of the other ingredients." Subsequent to this letter, Seitz added even more data in several articles (30, 31) and has produced an excellent motion picture showing the preparation and use of *epéna*-snuff amongst the Waiká of the Rio Maturacá. This more recent information has been supported by botanical specimens that have been submitted to taxonomists for identification and prepared snuff-power that has been studied chemically and toxicologically (12). In 1965, Seitz (30) published observations on the use and effect of *epéna* in which he summarized what he then knew concerning the plant ingredients of the snuff. He recognized two different snuff preparations.

One was, as he had previously stated, prepared from three ingredients: 1) the bast of a tree; the small leaves of the herbaceous *mashi-hiri*; and the ashes of the outermost bark of an *Acacia*-like species called *ama-asita*. Botanical material of the first and apparently principal ingredient was identified by Dr. Eberhard Schmidt who "... came to the unequivocal conclusion that the specimen was *Virola*, fam. Myristicaceae. To my great content, I afterwards found the following statement: *Engler-Prantl*,

Die natürlichen Pflanzenfamilien, 2. Aufl., Band 17 a II, p. 193. The bark from *Virola calophylla* Warburg and *V. calophylloidea* Markgr. — gives a narcotic snuff powder (*yá-ka, yá-lo*) used by various Indian tribes in the Amazon region and in Colombia". Seitz did not offer botanical determinations for the second ingredient. The third, he remarked, resembled an *Acacia*.

We have had an opportunity of examining Seitz' botanical material. Some of it comprises small pieces of bark and twigs that do not lend themselves to easy or exact identification, but some of the specimens are very adequate. Of the principal ingredient, we have one twig (*Seitz 1b*) and several pieces of bark (*Seitz 1c*) collected on the Rio Marauiá. They seem definitely to be referable to the Myristicaceae. These specimens, together with a photograph of a sterile branch of the *epéna* plant, allow us to identify the principal ingredient as *Virola*. Seitz has identified it in his papers as *Virola calophylloidea*, but the photograph looks to us more like *V. theiodora*. He submitted no specimens of *mashi-hiri*, the second ingredient. Of the third plant, *ama-asita*, we have seen several small bark samples (*Seitz 1h*) and a small transverse section of a branch (*Seitz 1i*), both of which are definitely leguminous; and a dried, pressed leaflet and a photograph of a branch, both of which we would refer to the genus *Elizabetha*.

Seitz (31) reported of *ama-asita* that it "is a tall tree . . . it seems to be a *Trichilia species* . . . and seems to be rare."

Powder prepared from these three ingredients was analyzed by one of the writers (Holmstedt), using both bioassay and conventional biochemical techniques, with especially significant results from gas chromatography (10). The main component is 5-methoxy-N, N-dimethyltryptamine, but smaller amounts of N, N-dimethyltryptamine and 5-hydroxy-N, N-dimethyltryptamine (bufotenine) were likewise found in it.

Amongst the Waiká in the Marauiá drainage-area, Seitz learned of several other ingredients of snuff, but nothing is

known of their botanical identification. "There is also used another snuff powder which contains, besides the above mentioned three ingredients, the other vegetables: 1) the leaves of a plant called *poschi-have-moschi-hena* (*hena* means 'leaf'); 2) the leaves of another vegetable called *ai-amo-hena*. In the villages we visited, the Indians either could not or did not want to show us these two plants. They always said that they only grew in the higher region of the mountains and not nearby. For this reason, the powder compound of the five ingredients was not at hand. In my opinion, it is the same compound whose snuffing we saw in our first expedition and whose effect was described as noxious for health . . . I cannot at the moment say more about this powder. Neither the missionary with whom I am corresponding and who lives in continued contact with several tribes, nor myself, saw in our other expeditions a similar effect again, and in no other visited tribe were we able to get this powder."

There are, further, several very interesting and possibly significant Seitz collections from the Cachoeira Guirapajé on the Rio Maraujá. One (*Seitz 4b*) consists of a small piece of a branch of *Anadenanthera peregrina*. The other (*Seitz 4*) is a very adequate herbarium specimen in fruit of this same species. Excellent photographs of the tree from which these specimens came were published by Wassen (36): one, an unmistakable trunk of *Anadenanthera peregrina* with the characteristic mammilose projections; the other, leaves and pods of the same tree. Seitz nowhere indicates that the Waiká employs this tree in preparing a snuff. His collections and photographs do, however, establish the presence in this part of the Rio Negro of *Anadenanthera peregrina*. This area is deeply and uninterruptedly forested, and *Anadenanthera peregrina* does not occur there naturally. It is obvious that these Waiká must have imported seeds of this tree from rather distant localities of semi-open savannah, such as parts of southern Venezuela or the Boa Vista area of the Rio Branco of Brazil, where *Anadenanthera peregrina* grows sponta-

neously. The question remains, nonetheless: why are these Rio Marauiá Waiká cultivating *Anadenanthera peregrina*?

Seitz (31) has given further valuable data on the myristicaceous snuffs. In the town of Tapurucuara, a large village on the main course of the Rio Negro above its confluence with the Rio Branco, Seitz witnessed the preparation of a snuff by a Tukano medicine-man originally from the Río Papurí on the Colombo-Brazilian boundary. This powder was called *paricá*. The medicine-man still used the snuff in his practice. In its preparation, according to Seitz, he employed: ". . . the same raw material as the Waiká Indians — the inner layer of the bark from *Virola calophylloidea* Markgraf, but he prepared the powder in a very different way".

Scraping off the inner layer of the bark, he cast the pieces into a pot of water, kneaded them and squeezed until the water was reddish brown and muddy. Then the liquid was evaporated over a slow fire. In several hours, there was a hard crust left; this was scraped off with a knife and ground finely with a smooth stone. This powder, without any further admixture, was the snuff.

We have examined four herbarium specimens collected by Seitz in Tapurucuara in August, 1965, as representing the species employed by the Tukano medicine-man as his source of *paricá*. They appear to us to represent, like the material gathered in the Waiká village on the Rio Marauiá,

*Virola theiodora*.

During the summer of 1967, we were able to pursue our studies of myristicaceous snuffs in two widely separated Waiká villages in the Rio Negro drainage area of Brazil: Maturacá, on the uppermost Rio Cauaburí, an affluent that enters the Negro above Tapurucuara and the rises in the Sierra Neblina land mass on the Venezuelan-Brazilian boundary; and Wayhana-oo-thle, a very small village on the Rio Tototobí, a headwaters tributary of the Rio Deminí, a northern affluent that empties into the Negro slightly above the town of Barcellos.



Plate 1373. Foliage and flowers of *Virola theiodora*, Manáos, Brazil.

The natives at Maturacá are closely related to those contacted by Seitz on the Rio Marauíá, a river that parallels slightly to the east, the Cauaburí. Understandably, their method of preparing the snuff is very similar to that described by Seitz. The natives on the Tototobí, on the contrary, elaborate their snuff quite differently.

The Maturacá Waiká store *epéna* in a large bamboo tube hanging from the house beams, and it is employed by any adult male singly or in groups at any time as well as during festivals. The tube is kept full, and the snuff, consequently, is always available for use. Every now and then, an Indian



will take the snuff, become intoxicated, dance and sing all alone, with the rest of the village going about its usual chores and not paying any heed to him. As Seitz noted in the neighbouring Karauetarí village on the Rio Marauiá: ". . . there is no system for the snuff ceremony . . . there were Indians who took *epéna*-powder every day at any time in the afternoon; there were others who practiced the ceremony only once in a fortnight. Seldom did we see any formal motive for taking the snuff, such as curing a sick person, invoking success in the hunt or thanksgiving for a successful hunt".



Plate 1374. Waiká Indian collecting resin from heated pieces of bark of *Virola theiodora*. Rio Tototobí, Brazil.

The ingredients of the *epéna*-snuff at Maturacá are three plants: *Virola theiodora*, *Justicia pectoralis* var. *stenophylla* and *Elibabetha princeps*.

Bark is stripped from trees of *Virola theiodora*. A young tree (height about forty feet, diameter fifteen inches) is preferred, although older and larger trees may be used. The natives assert that the younger trees have a "stronger blood", but more probably the choice of the young tree is dictated by easier stripping of the bark. The strips are bundled and brought into the village. The soft, inner layer is carefully scraped off; the shavings are dried — first in the sun, then by gentle toasting over a slow fire — and stored until needed. When a new batch of snuff is to be made, these crisp shavings are pulverized by grinding them between the palms of the hands, the hands being held firmly between the knees while the grinding motion is in process. The ground shavings drop from the hands onto a banana leaf. The crudely ground shavings are collected from the leaf and placed in a hollow lecithydaceous fruit as a mortar (*Bertholettia excelsa* H. & B.) and triturated with a heavy wooden pestle until the material is almost completely pulverized. This powder is then sifted through a small basket to remove fibres, pieces of wood and other undesired refuse. The resulting powder is very fine, homogeneous, chocolate-brown and highly pungent.

Next, a powder of the leaves of a plant called *mashi-hiri* is prepared. This twelve- or fifteen-inch herb, cultivated in dense patches near the edge of the village, is the acanthaceous *Justicia pectoralis* var. *stenophylla*. It is kept hanging in bunches from the house-beams and is, consequently, usually quite dry when needed. The whole plant is crushed between the hands, the powder is sifted to remove bits of the stem and other refuse, and the resulting fine greenish dust is added to an equal amount of the brown *Virola*-powder. The *Justicia* plant is pleasingly aromatic as it hangs drying, and the prepared powder is even more highly aromatic. The natives assert that it is added to "improve the smell" of the final *epéna*-snuff and that it is

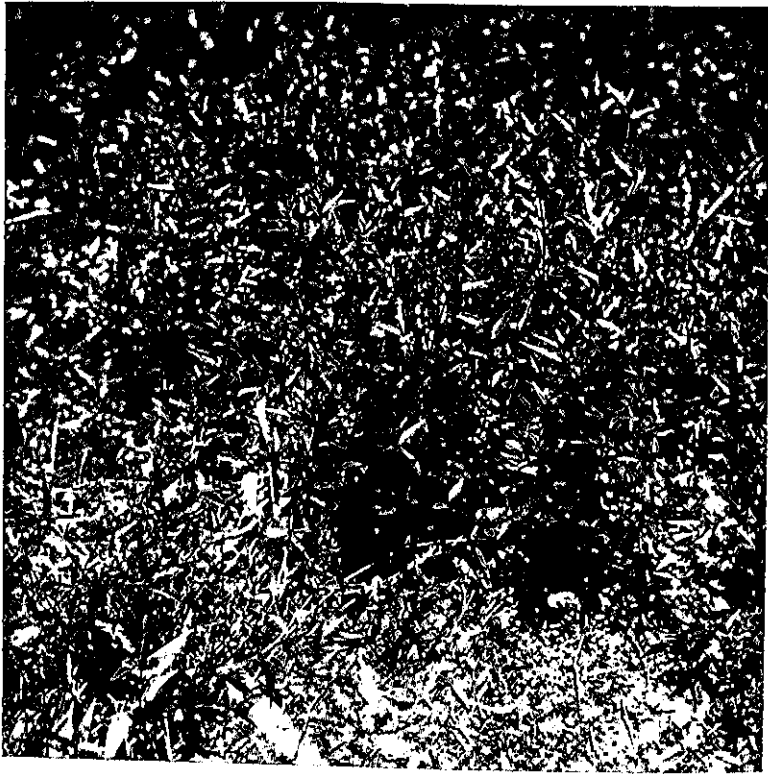


Plate 1375. *Justicia pectoralis* var. *sphenophylla* growing at the edge of a cultivated plot. Maturacá, Rio Cauaburi, Brazil.

not active. While it is true that other groups of Waiká prepare a potent *Virola*-snuff without the *Justicia*, preliminary chemical investigation of this acanthaceous plant suggests that we may be unwarranted in assuming that it is wholly inert ingredient devoid of pharmacological activity.

Seitz found that the Karauetarí did not add *mashi-hiri* to the snuff, whilst the Indians of the Marauiá did. He remarked of *mashi-hiri*, which undoubtedly is the same *Justicia* called *mashi-hiri* by the Waiká of Maturacá, that in "another Waiká village, near the Maturacá-channel, we saw that a third ingredient was added: the little leaves of a herbaceous plant, called *mashi-hiri*, like the *epéna*-scrap-

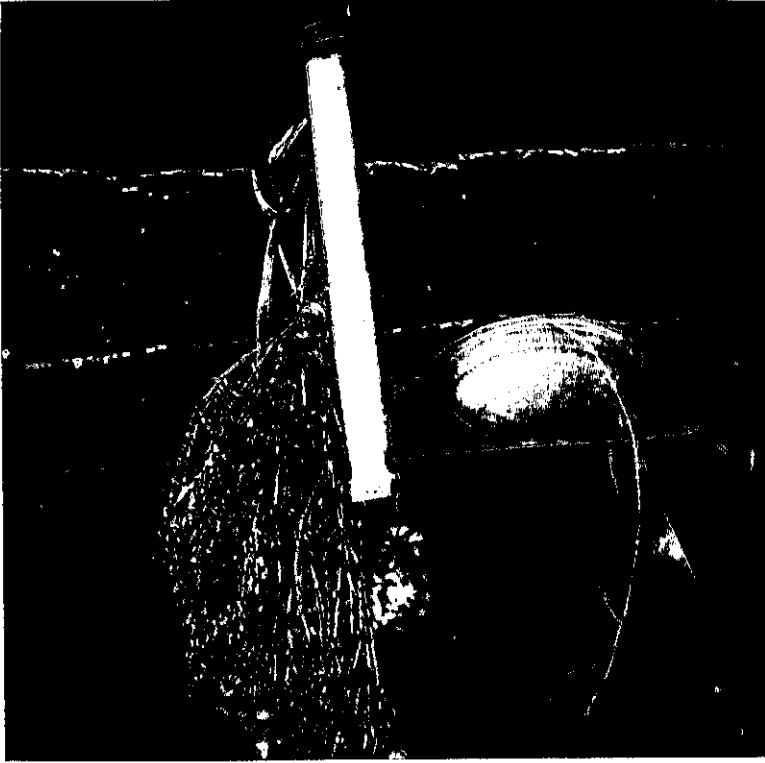


Plate 1376. *Justicia pectoralis* var. *sphenophylla* hanging to dry, together with a bamboo tube of *Virola*-snuff and the woven basket used to sift the prepared snuff. Maturacá, Rio Cauaburi, Brazil.

ings, dried and powdered. These leaves, however, have no intoxicating effect. The Indians say they are merely aromatic. I don't know why the Karauetari didn't use the plant. Perhaps it was not available at the moment, or the Indians in the Marauriá River liked another flavour."

A number of years ago, a missionary working amongst the Waiká in the headwater regions of the Orinoco in Venezuela handed one of the authors (Schultes) a partially rotted, matted roll of plant material that he claimed to be the source of a narcotic snuff of these Indians (28). The condition of the material was very poor, and it disintegrated



Plate 1377. Waiká Indian about to grind to a fine powder crushed and dried leaf material of *Justicia pectoralis* var. *sphenophylla* for mixing with the powdered resin of *Virola* and ashes of *Elizabetha*. Maturacá, Rio Cauaburi, Brazil.

upon study, but it seemed to represent a species of *Justicia*, an identification that was corroborated by the late Dr. E. C. Leonard, specialist on the Acanthaceae. With the unsatisfactory preservation of the material, Schultes' inability to visit the region personally, and the failure of other botanists who had worked in the general area to report it, Schultes more or less dismissed *Justicia* as a serious contender for inclusion in our list of hallucinogenic plants. We now realize that it is definitely a common ingredient of the myristicaceous snuffs of the Waiká.

There is a further piece of field information that may now have a bearing upon this general topic. *Justicia pectoralis* var. *stenophylla* has been collected frequently, especially near cataracts, in the Río Apaporis drainage-area of Colombia. One of the collections (*Schultes & Cabrera 15244*) from the Río Pacoa, an affluent of the middle course of the Apaporis, bears an annotation that the name of the plant in Puinave is *ya-ka-yoó*. Since the Puinave name for *Virola*-snuff is *yá-kee*, one might well wonder if this similarity of native epithets could indicate some connexion in use of the *Virola* and the *Justicia*. Schultes never, with the numerous collections that he made of *Justicia pectoralis* var. *stenophylla*, was given any data that might suggest that Indians of the Colombian Amazon employed the plant as an admixture with *Virola*-resin. Yet the coincidental similarity between the names *yá-kee* and *ya-ka-yoó*, viewed in the light of what we know amongst the Waiká, is provocative of conjecture.

The third ingredient of the *epéna*-snuff of Maturacá is the ash of the bark of *Elizabetha princeps*, known in Maturacá by the Waiká name *a-má*. This tree is undoubtedly the same as that reported by Seitz as *ama-azita* on the Rio Marauiá. Bark is stripped from the trunk of this rather large and majestic tree. The inner, soft part of the bark is scraped off and thrown away. The hard grey outer bark is chopped into small pieces and set in a glowing fire. When they themselves begin to glow, they are removed, set aside and allowed to reduce to ashes. The ashes, which are nearly white, are carefully gathered up when cool, inspected critically for possible contamination in the form of sticks, bits of leaves or other extraneous material. The ashes that pass this inspection are then mixed, in approximately equal amounts with the *Virola-Justicia* powder. The resulting *epéna* snuff is greyish and extremely fine. We have every reason to believe that this ash may be an inert ingredient, although it may serve as a means of drying, to free the alkaloids more easily from the resin, to keep the snuff from deteriorating rapidly when stored in the

bamboo tubes, or merely for mechanical purposes.

The manufacture of the narcotic snuff amongst the Waiká of the Rio Tototobí is most interesting and very different from the methods described for other groups of these Indians. The resin of *Virola theiodora* is employed alone, without any admixture.

The bark of *Virola theiodora* is stripped first from the base of the tree with the tree standing, then, after felling, the entire trunk is stripped. As at Maturacá, relatively young trees are preferred. If more bark is needed for the batch of snuff required, additional trees are felled. Our visit, fortunately, coincided with the annual endocannibalistic festival and a large supply of snuff was needed: three trees were felled and completely stripped. The Tototobí Waiká, unlike the Maturacá group, apparently do not usually keep a large quantity of the snuff available at all times, nor is the use of the snuff, it appears, so frequent and casual.

The natives assert that the bark on the lower four or five feet of the trunk is richer in resin than higher up on the tree. When the lower bark is stripped and used, and prior to the felling of the tree, an Indian boy climbs to the top of the trunk, to the first main branch, with a circle of stout vines into which he has placed his feet. He then repeatedly slides down the trunk, scraping the bark vigorously with the vine-loop each time with his whole weight. This operation, they believe, causes the resin in the bark to "loosen" and, later, to flow more readily when the bark has been stripped from the tree. Occasionally this same scraping operation is carried out with the back of a machete before the lower bark is removed.

The pieces of bark that are stripped off measure two feet in length and five or six inches across. All of the preliminary preparation of the snuff is done in the forest where the tree is felled. A fire is made in the path, these strips are laid over the slow fire with the inner surface of the bark facing up. The gentle heating of the bark causes a very copious "bleeding" of the red resin, so copious that



Plate 1378. Pulverized dried resin of *Virola theiodora*, ready for use as snuff, together with an unground piece of the resin. Rio Tototobí, Brazil.

large drops flow together, and soon the inner surface of the bark is covered with the liquid. Then the Indian in charge of this operation picks up the strips, one by one, holding each piece vertically over a small clay pot. He lets the resin flow down and drop into the pot, running his index finger down the inner surface of the bark to scrape off every drop of the resin. The bark is once again laid over the fire and reheated. More resin appears. This is done several times before the Indian throws the bark away because the resin in it has been exhausted. A large number of these strips are treated in this way, unhurried care and meticulousness

marking the whole operation. The amount of resin extracted when we witnessed this work amounted to about two teacups full and was the result of "bleeding" three trees. One of the trees was about seventy feet in height and measured fourteen inches in diameter; the other two were smaller.

When enough resin has been gathered, the Indian gradually heats the pot, and the resin boils slowly and is allowed to boil until it becomes thick enough to carry back to the house without its slopping out of the pot during walking. By this time, most of it has, upon cooling, crystallized into a beautiful, bright amber-red resin. Once the Indians have returned to their house, the crystallized resin is scraped from the sides of the clay pot with a sharp-edged stone and is then pulverized finely by grinding the powder accumulated in the bottom of the pot with the same stone as a pestle. Once it is deemed sufficiently fine, the powder is removed and placed on a banana leaf. It is a light coffee colour. The native begins a meticulous scraping of the carbonized resinous material from the sides of the interior of the pot and the grinding, as before, of this very dark blackish brown powder until it, in turn, is deemed fine enough.

When the whole operation of grinding had begun, certain lumps of very thick resin that had not crystallized were removed from the pot and put onto a small stick. This stick was put over a fire and hardened, then pressed out on a heated surface over the fire and allowed to carbonize. The carbonized lump was then added to the similar blackish brown powder in the pot and completely reduced to a fine powder.

At this point, the first brown powder and the second blacking brown powder were united and fully mixed to prepare the final snuff. Either one of these two powders,

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<sup>6</sup>The authors, in self-experimentation, inhaled the second, carbonized powder.



Plate 1379. Waiká Indians picking out stem material from *Justicia pectoralis* var. *sphenophylla* prior to drying the leaves for use in the *Viola*-snuff. Rio Tototobí, Brazil.

however, has the potency and may be used alone as snuff.<sup>5</sup> This snuff — as well as the tree from which the resin is extracted — is known by the Waiká of the Tototobí as *nya-kwá-na*<sup>6</sup>.

At Tototobí, *nyakwána*-snuff is made usually without any admixture. Ashes are, according to our information, never

<sup>5</sup>Although we are not anthropologists, we feel constrained to call attention to the curious s'milarity between the name of a tribe and linguistic group of Karib-speaking Indians on the Río Ventuari in the uppermost Orinoco basin of Venezuela-Yekwana and one of the Waiká names for the myristicaceous snuffs *nyakwána* (the other Waiká name being *epéna*). This may be coincidental, but it should be pointed out, so that linguistically oriented specialists may consider whether or not there may be any significance to this observation.

added. These people know and do cultivate *Justicia pectoralis* var. *stenophylla*, which they call *masha-hára-hanak* (*hanak* means "leaf"). There is another name for this *Justicia* at Tototobí: *boo-hanáak*. The Indians know that it can be used as an aromatic mixed with the *Virola*-resin dust, and they very occasionally do use it in this way, but it is the exceptional, not the usual, method of preparing *nyakwána*-snuff.

Interestingly enough, the Tototobí people do not know the custom of mixing ashes of *Elizabetha* or of any other plant with the *Virola*-powder. What may be even more significant is that they do not use *Anadenanthera peregrina* in preparing a snuff. In fact, several of these Tototobí Waiká knew vaguely of the snuff made from seeds (*Anadenanthera peregrina*) amongst the Makiritare far to the north and northeast and affirmed that they themselves had never employed seeds or beans to make snuff. We saw no cultivated trees of *Anadenanthera peregrina* in or near their village, and they assured us that the tree was unknown in their area.

### III.

There is still an extraordinary facet to this study of *Virola* amongst the Waiká—its use as the source of an arrow-poison. Salathé (20) reported that the Karimé, culturally and geographically close to the Waiká of the upper Orinoco region, use as a poison for hunting monkeys and birds ". . . *jakuana*, which is extracted from the bark of a tree"; the term *jakuana* is, obviously, related to if not the same as *nyakwana* employed for *Virola* by the Waiká of the Tototobí. In discussing the Waiká (Surára) of the Rio Arará, Becher (3) reported: "The third kind of arrow-poison is the weakest. It is prepared from the snuff powder *epéna* by mixing it with water and letting it boil. This method is likewise known to the Pakidái and Shirianá." Becher unfortunately could not witness the preparation of this poison. Since it seemed to be a closely guarded secret, his knowledge of it was only from hearsay.

This information is, ethnopharmacologically speaking,

extraordinary. It is the first time that *Virola* has been indicated as the basis of an arrow-poison. Since we could not understand what constituent of *Virola* might be responsible for the toxic effects when employed on arrows or darts, and realizing that Becher had not witnessed the actual preparation of the poison, we were constrained to suspect an error in ascribing the source to *Virola* or to its being the same tree from which the *epéna*-snuff was made.

During our visit with the Tototobí Indians, however, we fully substantiated Becher's statement. Arrows were poisoned with the resin from *Virola theiodora*. Furthermore, they were poisoned with resin from the very same trees from which the snuff was being made. And what is even more surprising, the arrows were poisoned without any prior preparation of the resin.

These Indians state that they use no other kind of arrow-poison than this *Virola-resin* which is called simply *nyak-wána-hoó-soo* (*hoó-soo* meaning "latex" or "resin"). They know that other Waiká groups prepare arrow-poison "from a vine" and indicate (with hand motions) a large liana with roundish leaves and a stem diameter of eight or nine inches.<sup>7</sup>

The poisoning of arrows in the Tototobí group is interesting. During the operation in the forest of heating the pieces of stripped *Virola* bark and scraping off the warm resin into the clay pot, an Indian occupies himself solely with the poisoning of arrows. Running his index finger up and down the exposed trunk from which the bark has been stripped, he gathers the slime and paints bamboo arrow heads with it repeatedly. He then heats the arrow-heads slowly over the fire to liquefy the resin slightly, spreading it more evenly with his finger. The heads are slowly turned in the smoke of the fire. When they have cooled and the preliminary smearing has completely hardened, the Indian

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<sup>7</sup>The Waiká at Maturach pointed out to Schultes several menispermaceous vines that they employ as the basis of their arrow-poisons.





Plate. 1380. Waiká Indian preparing arrow-points smeared with resin of *Virola theiodora*. Rio Tototobí, Brazil.

begins to apply pure resin to the tips—resin that he scrapes from the heated strips of bark or that he takes from the accumulation in the pot. There are twenty or thirty applications of resin to the arrow heads, each application followed by a slow heating in the smoke. Then, finally, our Indian wraps a knot of palm leaves around the top of a stick, inserting the arrow tips in this knot—like pins in a pin cushion—and sets the stick in the ground in the sun to dry slowly. This represents the whole process of poisoning arrows or darts, an exceedingly simple one compared to most of the elaborate curare preparations of South America.

It is significant to note that during the annual endocannibalistic festival, when these Waiká ran out of the snuff that they had prepared for the occasion, they took several bamboo tube cases, in which they had packed the newly prepared arrow tips, scraped the *Virola*-resin from the arrow points and used the resulting powder as snuff during the dance. It had the same effect as the snuff that they had been using and which had been exhausted, and, inasmuch as both the arrow-poison and the snuff had been prepared in almost identical procedures from the same trees, there is no reason why it should not be interchangeable.

We do not yet know which chemical substance in this *Virola*-resin that, injected into the blood stream, could have properties making it valuable as an arrow-poison. It could also be possible that the hallucinogenic properties of the indoles of the *Virola*-resin act in the manner of an incapacitating substance. It may be of some significance that the Waiká refer to this as a slow-acting arrow-poison and that the hunter must follow the animal, after shooting it, through the forest and wait until the poison has had its effect.

#### IV.

##### MYRISTICACEAE

*Virola*, a rather natural genus of trees or rarely shrubs, comprises under forty-five species distributed in the American tropics, mainly in the Amazon Valley and adjacent humid tropical regions. It is relatively well understood primarily through the monographic works of Warburg and of A. C. Smith, both of which are cited below.

*Virola calophylla* Warburg in Nova Acta Leop. — Carol. 68 (1897) 231; Smith in Brittonia 2 (1937) 474.

Distributed in the Amazonia regions of Colombia, Peru and Venezuela and the western half of the Brazilian Amazon.

One of the most beautiful species of *Virola* with unusually large leaves with well spaced lateral veins.

*VIROLA*  
*calophylla*  
Warburg





Type of *Virola calophylla* (Spruce 3207) collected along the Casiquiare in Amazonian Venezuela.

COLLECTIONS BASIC TO THIS WORK:

COLOMBIA: COMISARÍA DEL AMAZONAS, Río Apaporis, Soratama. "Small tree about 35 feet tall; diameter 8-9 inches. Bark exudes inside a reddish resin when ripped off tree. Externally reddish brown, pebbled. Puinave=*yá-kee*. Source of narcotic snuff. In flood-forest. June 26, 1951. R. E. Schultes & I. Cabrera 12855. — Same locality. "Large columnar tree. Source of *yá-kee*-snuff. Flood forest. August 16, 1951, Schultes & Cabrera 13587.

*Virola calophylloidea* Markgraf in Repert. Sp. Nov. 19 (1923) 24; Smith in Brittonia 2 (1937) 475.

Distributed in the Amazonian basin of Colombia and the Amazonas of Brazil.

Type of *Virola calophylloidea* (Ule 8846) collected near Manáos in Amazonian Brazil.

Smith reported this species as rare in 1937, but since that time it has been shown to be relatively abundant, especially in the Colombian Vaupés and Amazonas. It can be distinguished from *Virola calophylla* by its shorter and more compact inflorescences and usually smaller leaves, amongst other characters.

COLLECTIONS BASIC TO THIS WORK:

COLOMBIA: COMISARÍA DEL AMAZONAS, Río Apaporis, Soratama. "Small tree along flood-bank. Flowers brownish. Puinave name=*yá-kee*. Source of narcotic snuff. July 3, 1951. R. E. Schultes & I. Cabrera 12872.

*Virola theiodora* (Spruce ex Bentham) Warburg in Nova Acta Acad. Leop. — Carol. 68 (1897) 187; Smith in Brittonia 2 (1937) 470.

*Myristica theiodora* Spruce ex Bentham in Jour. Bot. & Kew Misc. 5 (1853) 6.

Distributed mainly in the western Amazonia of Brazil and Colombia and probably adjacent Venezuelan territory. Especially abundant in the Rio Negro drainage-area.

Type of *Myristica theiodora* (Spruce 1444) collected near Manáos in Amazonian Brazil.

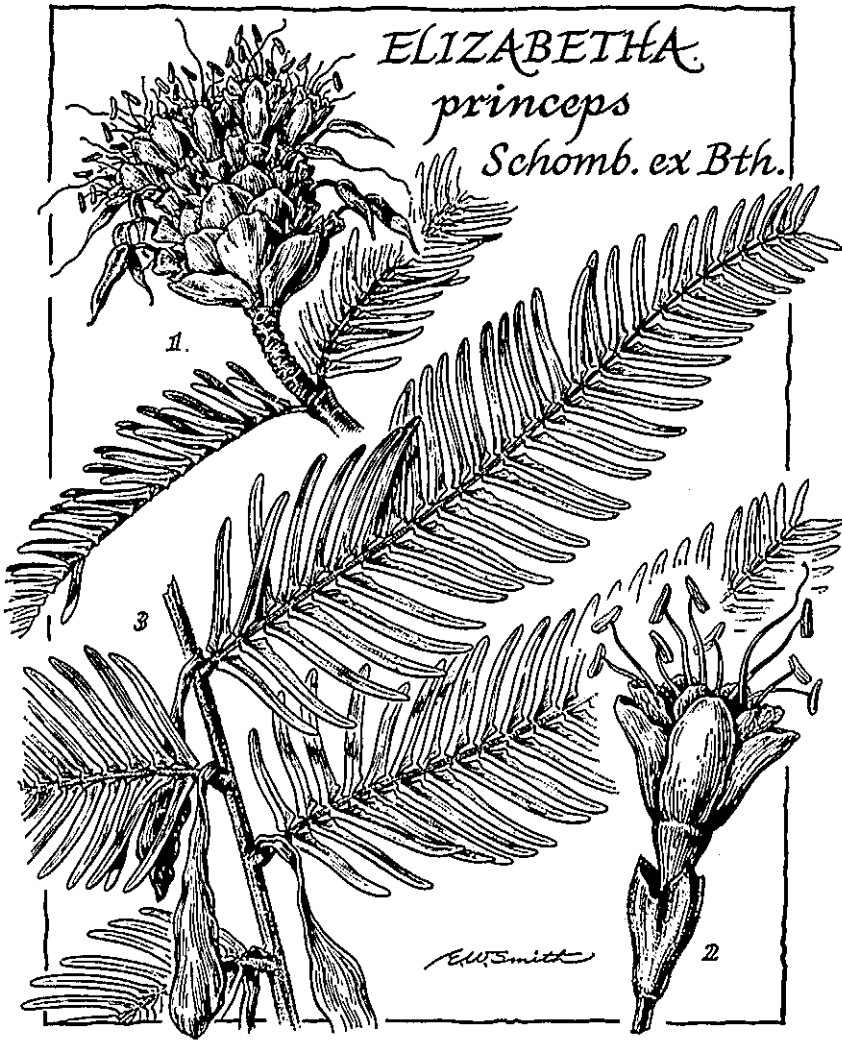


In Smith's monograph of 1937, *Virola theiodora* is placed in synonymy under *V. elongata* (Spr. ex Benth.) Warb. There can be no misgiving about its relationship to this species but I have preferred to maintain it as distinct because of the ease by which it can be distinguished in the field. When Bentham published *Myristica theiodora*, based on a fruiting specimen, and stated that it seemed to be close to *M. sebifera*, he wrote: "I should nevertheless in the absence of flowers, have considered it a mere variety of that species [*M. sebifera*], had not Mr. Spruce assured me that it is perfectly distinct. The leaves, when drying, are said to emit a strong odour of tea". The crown of *Virola theiodora* appears to be conspicuously denser and more compact than that of what I take to represent *V. elongata*, which has a more freely branching looser crown. The bark of the former seems usually to be thinner and less corky than that of the latter. *Virola theiodora*, furthermore, has, as Smith pointed out, thicker leaves and more prominent lateral veins, and the leaf bases are rounded or subcordate. In addition, the leaf blades in life are lightly but conspicuously sinuous near the margins, a character which my field observations indicate may be more or less peculiar to this species-concept. It is a character recognized by the Waiká Indians who more than once have pointed it out to me whilst we were searching the forests for a *Virola*-tree from which they could extract the resin for preparing snuff.

COLLECTIONS BASIC TO THIS WORK:

BRAZIL: ESTADO DO AMAZONAS, Rio Cauaburi, Maturacá. "Tree 60 feet tall; diameter small. Bark resin red. Bark ingredient of narcotic *epéna*-snuff. Waika=*epéna*. Alkaloid very positive. July 5-August 12, 1967 (R. V. Alpha Helix Expedition Amazon-1967). R. E. Schultes 24574. — Same locality and date. "Small tree. Bark resin red. Ingredient of Waika *epéna*-snuff. Schultes 24575.

TERRITORIO DO RORAIMA, Rio Tototobí, Waika Indian village of Wayhana-oo-thle. "Medium sized tree, 60 ft. tall. Bark resin very abundant, reddish brown. Waika=*nyá-kwana*. Used for preparing snuff and for smearing on arrows". Alkaloid positive. August 6, 1967 (R. V. Alpha Helix Expedition Amazonas-1967). R. E. Schultes 24626.



## LEGUMINOSAE

*Elizabetha*, a genus of some ten species, some of extraordinary beauty, is known only from the northern Amazon and the forests of the Guianas. It is one of the least known South American genera of this family, partly because of the rarity of specimens in herbaria.

*Elizabetha princeps* Schomburgk ex Benth in Hooker Journ. Bot. 2 (1840) 92; Ducke in Trop. Woods No. 37 (1934) 26; Ducke (1939); Ducke in Bol. Técn. Instit. Agron. Norte 18 (1949) 93.

Distributed in upland forests of the upper and middle parts of the Rio Negro and in the Territory of Roraima in Brazil and in the southern part of British and Dutch Guiana. A beautiful tree of up to ninety feet in height, this species has a very hard and durable wood. The drawing published in this paper is apparently the first time that the species has been illustrated, notwithstanding the fact that it is the type-species of the genus. In fact, no illustrations of any species of *Elizabetha* (with the exception of a flower of *E. Duckei* Huber published in a morphological paper), in spite of the great beauty of these trees and the fact that the genus has been known now for more than a century and a quarter. Type of *Elizabetha princeps* collected by Schomburgk on the upper Parima River near the boundaries of British Guiana, Brazil and Venezuela.

The collections cited below are, unfortunately, sterile. The drawing published in this paper is a composite—leaves of *Schultes 24578* and flowers and inflorescence of *Ducke 328*.

## COLLECTIONS BASIC TO THIS WORK:

BRAZIL: ESTADO DO AMAZONAS, Rio Maraujá. "Ama-azita." April 1965. *Georg Seitz 1i*. Estado do Amazonas, Rio Cauaburi, Maturacá. "Bark burnt for ashes to mix with epéna snuff. Tree 40 feet. Bark, petioles alkaloid-negative. Waika—a-ma. July 5-August 12, 1967 (R. V. Alpha Helix Expedition Amazon-1967). *R. E. Schultes 24578*.



## ACANTHACEAE

*Justicia*, a pantropical genus of some three hundred species of herbs or slightly woody plants, has a number of trivial uses in folk-medicine. The leaves of one Asiatic species — *Justicia Adhatoda* — are recognized as having antispasmodic and expectorant properties. *Justicia pectoralis* of tropical America, known in the West Indies as "Jamaica garden balsam" since it is pleasantly fragrant when dried, is employed in South America in the preparation of a pectoral tea, the origin obviously of its specific epithet.

*Justicia pectoralis* Jacquin var. *stenophylla* Leonard in Contrib. U.S. Nat. Herb. 31 (1958) 615.

This variety, which grows together with *Justicia pectoralis* is distinguished primarily by its very narrow leaves and may be merely a form of heavy nitrogenous soil near habitations where growth is unusually fast due to an excess of refuse. It is known from the Rio Negro basin of Brazil and from the Colombian Vaupés. In the Rio Negro basin the Indians assert that the herb never flowers.

There are preliminary indications that *Justicia pectoralis* var. *stenophylla* may possess alkaloidal principles.

## COLLECTIONS BASIC TO THIS WORK:

BRAZIL: ESTADO DO AMAZONAS, Rio Cauaburí, Maturacá. "Herb. Weed. Used as ingredient of narcotic epena snuff. Alkaloid negative. Waika=*mashihiri*". July 5-August 12, 1967 (R. V. Alpha Helix Expedition Amazon-1967). *R. E. Schultes* 24573.

Territorio do Roraima, Rio Tototobí, Waika Indian village of Wayhana-oo-thle. "Occasionally added dried and pulverized to Waika snuff". August 6, 1967 (R. V. Alpha Helix Expedition Amazon-1967). *R. E. Schultes* 24627.

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