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MONOPTERYX ANGUSTIFOLIA and ERISMA JAPURA:

Their Use by Indigenous Peoples in
the Northwestern Amazon¹

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The collection of wild vegetable foods is an integral part of the subsistence pattern of indigenous peoples in the tropical forest of South America. The role of these foods in the indigenous diet ranges from trail snacks and emergency foods to important sources of nutrients. Outstanding examples are palm fruits, palm hearts and Brazil nuts.

This paper is focused on two wild vegetable foods collected in the northwestern Amazon, the seeds of *Monopteryx angustifolia* Spruce ex Bentham and *Erisma Japura* Spruce ex Warming. Ethnobotanical information on these species is meager, but they are seasonally important food resources in the northwestern Amazon. The seeds of both are collected in large quantities, can be stored for long periods of time, and are available during the rainy season when animal protein is not particularly abundant.

¹ A preliminary draft of this paper, entitled "Vegetable Protein in the Diet of Indians in the Northwestern Amazon" by Darna L. Dufour, was presented at the sixth annual meeting of the Canadian Association for Physical Anthropology, Niagara-on-the-Lake, Ontario, November 1978.

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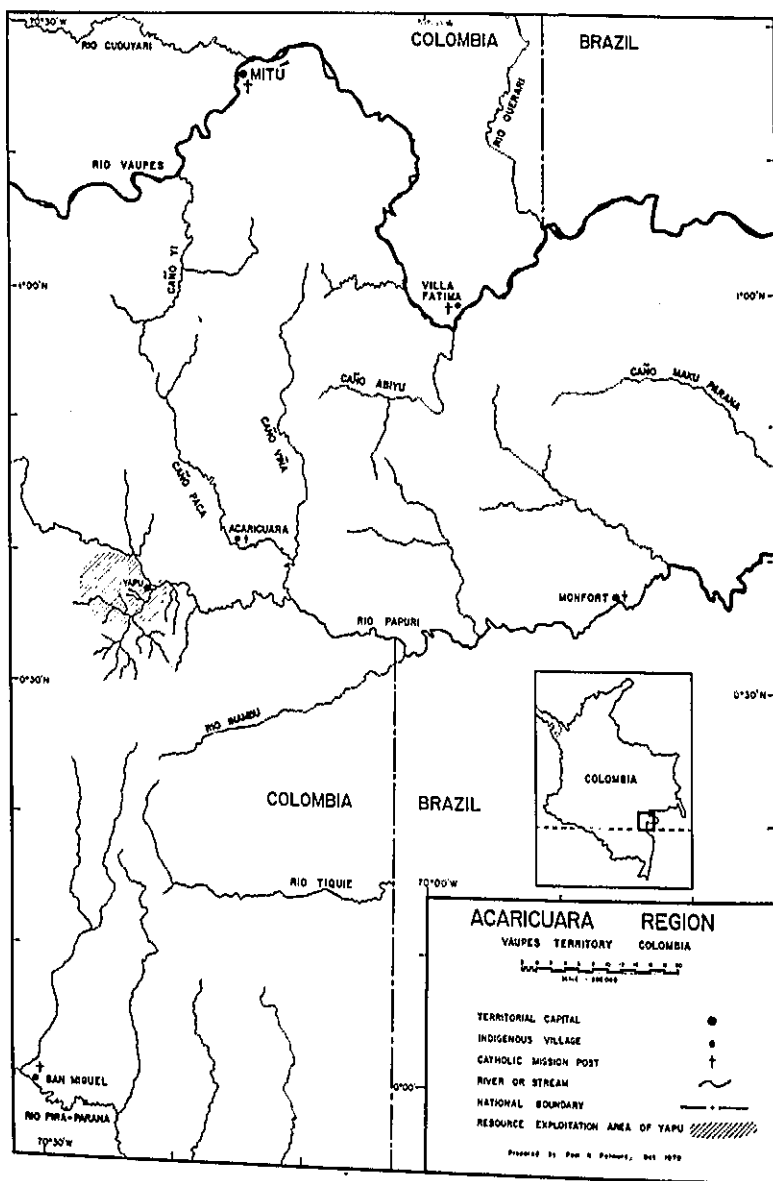


Figure 1. Map of the eastern Vaupés showing location of Yapú fieldsite.

The observations presented here are based on field work by the senior author with Tatuyo Indians living in the headwaters of the Papurí River at the village of Yapú, Vaupés, Colombia (figure 1).²

The Tatuyo³ are root crop horticulturists relying on bitter manioc, *Manihot esculenta*, as a caloric staple. Dietary animal protein is obtained from fish, and to a lesser extent from game. Insects and other invertebrates are minor sources of protein. The availability of animal protein shows a distinct pattern of seasonal variation. In general, fish and game are more abundant in the dry season and less so at the height of the rainy season.

A wide variety of fruits, nuts and other vegetable products are collected and make important contributions to the diet. In addition to *Erisma* and *Monopteryx*, these include *Caryocar* spp., *Caryodendron orinocense*, *Euterpe* spp., *Hevea* spp., *Inga* spp., *Jessenia Bataua*, *Mauritia flexuosa*, *Micrandra* spp. and *Poraqueiba sericea*.

The upper Papurí area is transitional humid to very humid tropical forest with patches of caatinga and savanna vegetation. The terrain is predominantly rolling plain with occasional hilly uplands breaking the monotony of the skyline. Mean annual temperature is relatively high at about 26° C. and rainfall abundant at 340 cm./yr⁴. Seasonal differences in temperature and rainfall are not well marked. There is, however, a dry season of slightly less rainfall and slightly higher mean daily temperature from November to February. The rainy season begins in March and reaches a maximum in July.

Both *Monopteryx angustifolia* and *Erisma Japura* are common in virgin forest of the upper Papurí but not evenly dispersed

² The field work in the upper Papurí region was done by the senior author between 1976 and 1978. The research was carried out in collaboration with the Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, and supported in part by an SSRC Dissertation Fellowship and NSF Grant BNS 75-20169.

³ Tatuyo is the Spanish name for one of the linguistically distinct, exogamous groups of Tukanoan Indians in the northwest Amazon. In this paper, we refer to the inhabitants of the village of Yapú as Tatuyo. This is somewhat of an oversimplification, as there are other language groups represented in the village as well. However, the core of the village is Tatuyo, and the site of the village is within their traditional territory.

⁴ General ecological and meteorological data from Instituto Geográfico "Augustín Codazzi" (1979:104), Bogotá, Colombia.

within it. *Monopteryx* is encountered most frequently on the banks of rivers, in areas not generally subject to inundation, and along small forest streams. *Erisma* is generally found away from the rivers on *terra firma*.

ERISMA, in the Vochysiaceae, is a genus of neotropical trees containing about sixteen species (Stafleu, 1954). The species are distributed from the Guianas to the Amazon basin. The genus is characterized by the fruits (see plates 16 and 17) which usually contain large wing-shaped calyx lobes. It was first described by Rudge in 1805 based on a collection by Martin from French Guiana.

The description of *Erisma Japura* Spruce ex Warming is based upon a large forest tree collected by Richard Spruce at Panuré [Ipanoré] on the Rio Uaupés, Brazil. Stafleu (1954) notes that the original material, *Spruce 2613*, consists of two separate collections: November 1852 (flowering) and February 1853 (fruiting). The specific epithet is derived from the local name for the tree. Spruce notes that "the kernels are pleasant eating", and that a "Japurá-butter" was made by the natives. Other species of *Erisma*, notably *E. calcaratum* and *E. uncinatum*, have been reported as sources of "Jaboty butter" or "Jaboty tallow" (Eckey 1954:562).

MONOPTERYX is a genus in the Leguminosae, tribe Sophoreae, which was described in 1862 by Spruce in Bentham's treatment of the family in Martius, *Flora Brasiliensis*. Spruce considered the genus to contain two species, *M. angustifolia* and *M. Uaucu*, both found in the northwest Amazon basin and upper Orinoco River area. Two flowering collections made by Spruce in the 1850's were the basis for the genus. Pittier in 1915 described *M. Jahonii* and provided a revised, although inaccurate, description of the genus. *Monopteryx Jahonii* is a synonym for *Fissicalyx Fendleri* Bentham (V. E. Rudd, pers. comm.).

Both *M. angustifolia* and *M. Uaucu* are large forest trees with characteristic buttresses. Spruce (1908:20) referred to these buttresses by the native word "sapopemas" [sapo, a root; pema, flat]. He gave the following account of *M. angustifolia* (1908:335): "The trunk of this tree is 4 feet thick and 80 feet high. It has

racemes of rose-coloured papilionaceous flowers. It grew on the rocky banks of the cataracts".

Recently a third species in the genus, *M. inpaie*, has been described by Dr. William Rodrigues from the region of Manaus, Amazonas, Brazil. (Rodrigues, 1975).

METHODS OF DATA COLLECTION

The data were gathered as part of an energy flow study of the village of Yapú. All foods brought into the village were routinely weighed on a spring scale, capacity 30 kg. The edible portion was determined as percent edible by weight, using a scale accurate to ± 1 g.

Collections of all important food plants were made in the general area of the village. Voucher specimens are deposited in the herbarium of the Instituto de Ciencias Naturales, Bogotá, Colombia (COL); a duplicate set is deposited in the Economic Herbarium of Oakes Ames, Botanical Museum of Harvard University, Cambridge, Massachusetts (ECON).

Foods of unknown nutrient composition were prepared in the field for later biochemical analysis in Bogotá. Indigenous methods of preservation, such as drying, smoking, and fermenting, were used when possible. In other cases, benzoic acid was used as a preservative at a concentration of 3% by weight.

Dietary surveys were conducted on randomly chosen subjects. The method used was a 24-hour weighed dietary survey. The observer accompanied each subject for a 24-hour period and weighed all food portions on a 500 g. capacity dietary scale accurate to 1 g. Food eaten at a site where the dietary scale was not available was weighed on a 16 oz. spring scale or carefully estimated from a table of mean weights of food portions.

OBSERVATIONS ON THE UPPER PAPURÍ

Erismia Japura is known in Tatuyo as "bati" and in Lingua Geral as "yapurá"⁵. Its pale yellow flowers appear in the dry

⁵ The name "japurá" by Spruce (1908:399) is probably a variant of the pronunciation or spelling of "yapurá" as the glide /y/ in Latin America alternates with the fricative /z/ (Pers. comm. Arthur P. Sorensen, Jr.).

season, and the fruits are ready for collection toward the middle of the rainy season⁶. The fruits are winged and roughly oblong in shape. The average weight per fruit is 14 g., most of which is the woody pericarp. The edible portion of the fruit is nut-like, reminiscent of a large cashew in color and texture and, when fresh, accounts for about 24% of the total fruit weight (see plate 20).

The fruits are gathered from the forest floor complete with woody pericarp. The Tatuyo are selective in their gathering and avoid malformed, worm-infested and sprouted fruits. In a sample gathered by the author, it was found that about 20% were deemed inedible by Tatuyo standards. The trees are dispersed in the forest surrounding the village, but there are well-known areas which have a somewhat higher frequency of trees than others.

Monopteryx angustifolia is referred to by the Tatuyo as "jimio" and by neighboring Tukano speakers as "simio". The tree flowers toward the end of the dry season in January and February and, like *Erisma Japura*, fruits toward the middle of the rainy season in May and June⁷. The fruit is a long flattened pod, approximately 18-20 cm. long with an average weight of over 50 g. (plate 21). The pod is cracked open by the heat of the sun, allowing the seed to fall free to the ground. In the forest during the heat of the day, one can hear the characteristic crack of the pod, followed by the sound of the pod and seed falling through the leaves overhead.

The pulse is a large flattened disk measuring approximately $4.5 \times 3.5 \times 1$ cm., with an average weight of about 7 g. The seed coat is usually slipped off as the seed is collected. Sprouted seeds, with sprouts of up to 3 or 4 cm., are acceptable and frequently collected toward the end of the harvest season.

As is also true of *Erisma*, the trees are not uniformly distrib-

⁶ Flowers were collected in January 1977. Fruits were collected from a different tree in late April 1977. In 1978, the Tatuyo said that the trees were not going to flower, and the first flowers located appeared in mid March.

⁷ Fruits were collected in April 1977. A late-fruited tree was spotted the first of August. As was the case with *Erisma*, the Tatuyo said that the trees were not going to flower in 1978. However, a flowering tree was located on March 21, 1978.

uted in the forest, and the location of prime collecting sites is well known by the Tatuyo.

SEED COLLECTION

In 1977, the harvest of *Erisma* and *Monopteryx* overlapped during an eight-week period toward the middle of the rainy season. Women collected small amounts of seeds as they traveled to and from their cultivated plots; and, during the height of the harvest, both men and women devoted entire working days to seed collection. Figure 2 shows the cumulative collection rates for both seeds from April 12 through June 12, 1977. The total amount of *Erisma* collected was 1311 kg. Considering that this seed has an edible portion of about 24%, this represents some 314 kg. of edible food. A total of 723 kg. of *Monopteryx* seed was collected during the same period. This is considered to be 100% edible as collected. During a period of intensified collection in the fifth week, some 310 kg. of *Erisma* fruits and 180 kg. of *Monopteryx* seeds were gathered by the men of the village as part of a traditional "Yurupari" ritual⁸.

SEED UTILIZATION AND STORAGE

Erisma. During the harvest season, small quantities of *Erisma* seeds are eaten raw or toasted. They have a pleasant although occasionally bitter taste. Eaten raw, they leave a thin film of wax-like fat on the roof of the mouth.

Collected in quantity, *Erisma* seeds are cooked and prepared for storage in the form of a "butter", referred to below as "batí-butter". The method of preparation is as follows: the fruits are boiled in water until the inner seed is cooked and the woody pericarp softened. The outer shell, or pericarp, is then easily removed, taking with it the thin skin covering the seed. The

⁸ "Yurupari" is used here as a general term for a type of dance festival/communal ritual common in the northwest Amazon involving the use of sacred trumpets and the exchange of forest fruits. Wallace (1889:241), who traveled the Vaupés River in the 1850's, was the first to describe these rites. A recent analysis of this ritual among the neighboring Barasana is provided by Hugh-Jones (1974).

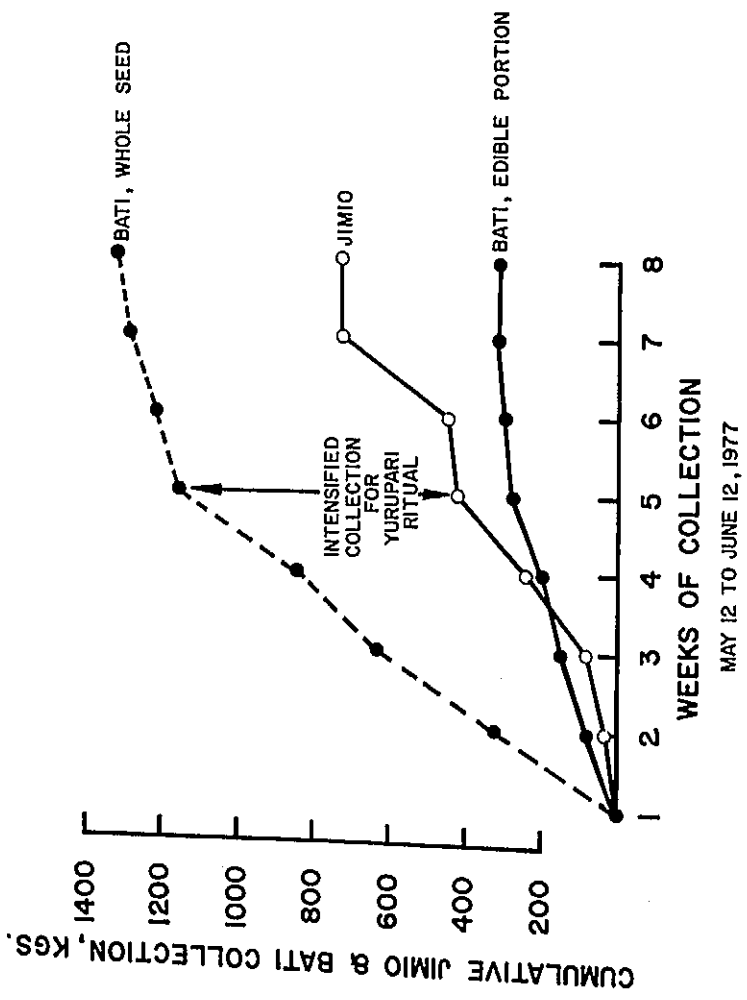


Figure 2. Cumulative collection rates for "jimio" (*Monopteryx angustifolia*) and "bati" (*Erismia Japura*) during the 1977 harvest at Yapú.

peeled seeds are washed thoroughly in a basket. Once washed, the seeds are reboiled until very soft (about 45 minutes) and then, while still hot, either pressed through a basket sieve or crushed to a butter-like consistency with a mortar and pestle. The crushing of the seeds is done quickly so that they are still warm when buried in a leaf-lined pit in the ground.

Storage pits used for bati-butter are dug neatly into the house floors in areas free from ants and other insects. The pits are about 30 cm. in diameter and of sufficient depth to allow the stored food to be covered with 6 to 8 cm. of soil. A typical pit is approximately 60 cm. deep. Once dug, the pit is carefully lined with the juvenile leaves of a tree tentatively identified as *Clathrotropis macrocarpa* (Leguminosae). This leaf, known in Tatuyo as "miapu", is commonly used to package food. The leaves are placed against the sides of the pit with the lower surface of the leaf toward the pit wall, petiole up, and the pointed apex bent to cover the pit floor. Additional leaves are bent in the pit to cover the pit floor thoroughly. When complete, the leaf-lining is 3-, or 4-leaves deep at all points and prepared in such a way that the inner leaves are lower in the pit than the outer ones. The bati-butter is placed in the pit and compacted. The leaves are then wrapped over it in a systematic manner, beginning with the inner leaves and finishing with the outermost ones. When complete, the entire leaf packet is covered with soil.

An estimated 85% of the *Erisma* collected in the period of observation was prepared as bati-butter and stored in leaf-lined pits in house floors. According to the Tatuyo, this butter can be stored for up to a year if proper care is exercised in changing the leaf-lining periodically and in securing insect-free storage pits. Under such anaerobic conditions, the butter ferments, developing a sharp taste and an odor not unlike a strong cheese. This odor is no doubt what Spruce referred to in his note on the Kew specimen: ". . . People who can get over its vile smell (which is never lost) find it exceedingly savoury."⁹ The Tatuyo do indeed relish the strong flavor it attains after prolonged storage. Bati-butter, either fresh or fermented, is prepared by cooking it with water into a thick dip or adding it to "puné", a fish and manioc

⁹ From Stafleu, 1954:474.

porridge¹⁰. As stored supplies of bati-butter decrease after the harvest, they become increasingly precious as food. It is then that women dig up portions of their supply for special occasions and as gifts.

One further use of bati-butter should be mentioned. The Tatuyo occasionally prepare a paste of bati-butter, charcoal, and the larvae of an unidentified species of wasp, which they use as a fish poison. The paste is fashioned into pellets which the fisherman throws into the stream as both bait and poison for "boteka" (*Leporinus alternus*¹¹), a much sought-after river fish.

In the latter part of the rainy season, in late August and September, the Tatuyo collect Lepidoptera larvae and pupae known as "batiya" (family: Noctuidae¹²) in great abundance from *Erisma* trees further downstream on the Río Papurí and in the area of Acaricuara¹³. The larvae are collected as they descend from the canopy to pupate in the forest floor. According to informants, these trees are identical in flower and fruit to the collections made at Yapú and are assumed to be *Erisma Japura*.

Monopteryx. During their harvest, *Monopteryx* seeds are occasionally eaten peeled and roasted, although they have an exceedingly bitter taste. The vast majority of the harvest, however, is prepared for consumption as follows: the flexible seed coats are removed if this was not already done when the seeds were collected. Each seed is then split neatly in half and the remaining paper-thin integument peeled off with the aid of a knife or fingernails. This peeling is tedious and is most often done by groups of women in the early evening. The split pulses are then softened by boiling in water for a considerable period of

¹⁰ Porridges of fish and manioc starch are very common dishes in the northwest Amazon. They are referred to in Spanish as "muñica". The general term in Tatuyo is "puné".

¹¹ Determined by Germán Galvis V., Unidad Ictiología, Sección Zoología, Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá. A voucher specimen is deposited at the same institution.

¹² Determined by D. M. Weisman of the Insect Identification and Beneficial Insect Introduction Institute of the United States Department of Agriculture.

¹³ The traditional spelling is Wacaricuara, but current usage is now Acaricuara.

time, up to three or more hours. As the pulses boil, a small quantity of a light green oily substance is liberated, forming a scum on the sides of the pot. The cooked pulses are edible but still very bitter. To remove the bitter taste, they are soaked in the river for two days. This soaking is done by emptying the cooked pulses into a large, loosely woven basket and placing the basket in the river so that the water circulates through it.

Prepared pulses are eaten plain or as "jimio janique", a drink made by adding mashed pulses to the boiled liquid removed from freshly grated manioc (*Manihot esculenta*).

Prepared pulses not destined for immediate consumption are mashed and buried in leaf-lined pits in much the same way as described above for bati-butter. Generally, however, the leaves of *Phenakospermum guyanense* (Musaceae) are used to form the leaf packet, and the pulses are not heated prior to burial. If proper care is exercised, *Monopteryx* can be stored in this manner for about six months. Under such anaerobic storage conditions, *Monopteryx* ferments, developing a sharp, pleasant taste. In the fermented state, it is occasionally eaten plain but most often prepared as "jimio janique". An estimated 50 to 75% of the total amount of *Monopteryx* seed collected during the 1977 harvest was stored for periods of time in the ground.

COMPOSITION OF SEEDS AND SEED PRODUCTS

In order to determine the composition of *Monopteryx* and *Erisma* seeds, samples of freshly cooked seed were prepared as for eating and preserved with benzoic acid. Duplicate samples of each were stored in leaf-lined pits as described above, until just prior to shipment, at which time they were removed to sterile glass jars and sealed with paraffin wax. The fermentation time of the pit-stored samples was four to six weeks. The results of food composition analyses of "jimio" and "bati" are shown in Table 1. The analyses were done on partially dry material by the Instituto Colombiano Agropecuario in Bogotá.

As indicated in Table 1, *Erisma* seed is high in fat (70.5g./100g.) and food energy (768 kcal./100g.). Fermentation increases the fat content (to 80.1g./100g.) and the energy value (to

TABLE 1
COMPOSITION OF BATI-BUTTER AND JIMIO, 100 GRAMS EDIBLE PORTION

FOOD	MOISTURE ^a %	FOOD ENERGY		PROTEIN g.	FAT g.	CARBOHYDRATE		ASH g.
		kcal.	(MJ)			Total g.	Fiber g.	
Bati-butter								
(<i>Erisma Japura</i>)								
Fresh cooked	(64) 2.3	768	(3.2)	9.4	70.5	13.3	1.8	4.5
Cooked, fermented	(54) 2.5	850	(3.6)	9.9	80.6	5.8	1.3	1.2
Jimio								
(<i>Monopteryx angustifolia</i>)								
Fresh cooked	(78) 5.7	554	(2.3)	12.6	23.2	53.0	3.4	5.5
Cooked, fermented	(76) 3.1	579	(2.4)	17.5	26.6	51.7	2.9	1.1
Nuts and oil seeds ^b	3.7	596	(2.5)	17.0	54.3	21.7	3.7	3.3
Pulses ^c	11.3	354	(1.5)	25.4	5.0	55.0	5.5	3.3

a. Value in parentheses is the percent moisture of food as prepared for eating. Analysis was done on partially dry material.

b. Mean value for 8 nuts and oil seeds. See note 14.

c. Mean value of 6 cultivated pulses. See note 15.

850kcal./100g.). In comparison with average values for eight cultivated nuts and oil seeds¹⁴, bati-butter is considerably higher in fat and calories and lower in protein. On a dry weight basis, the values for bati-butter are similar to those for pecans (*Carya illinoensis*) (Wu Lueng and Flores, 1961:68-71).

Monopteryx is moderately high in fat (23.2g/100g) and protein (12.6g./100g.). In a fermented state, it is slightly higher in protein (17.5g./100g.) and food energy (579 kcal./100g.). In comparison with average values for six cultivated pulses, *Monopteryx* is relatively high in fat and low in protein¹⁵.

The protein values reported here are for crude protein only. Although it is a question of much interest, the biological value of *Monopteryx* protein is not currently known. The oil composition of both *Monopteryx* and *Erismia* seeds is also of interest. The oil of *Monopteryx angustifolia* is not well known, but it has all the properties of a good edible oil (Mors and Rizzini 1966:27). Little is known of the oil of *Erismia Japura*, but two closely related species, *E. calcaratum* and *E. uncinatum*, have been shown to have oils of good quality (Pesce 1941:91-94).

CONSUMPTION PATTERNS

The consumption of *Monopteryx angustifolia* and *Erismia Japura* was measured during the 1977 May-June harvest period in the village of Yapú. The 24-hour weighed dietary survey method was used to record food intakes on a sample of eighteen adults. During the survey period, *Monopteryx* seeds were consumed freshly prepared as the main part of a meal and as a beverage. *Erismia* seeds were also eaten freshly cooked as the principal dish in a meal and, in two instances, as a dip made of fermented bati-butter.

In terms of the total food intake, the two seeds accounted for

¹⁴ Values shown are the average values for the following eight nuts and oil seeds: *Anacardium occidentale*, *Bertholletia excelsa*, *Corylus* spp., *Hellanthus annuus*, *Pinus cembroides*, *Prunus Amygdalus*, *Sesamum indicum*, and *Terminalia Catappa* (Wu Lueng and Flores, 1961:68-71).

¹⁵ The values shown are the average values for the following six cultivated pulses: *Cicer arietinum*, *Glycine Max*, *Phaseolus vulgaris*, *Pisum sativum*, *Lens* spp., and *Vicia Faba* (Wu Lueng and Flores, 1961:66-68).

about 9% of the mean daily caloric intake and about 10% of the protein intake. Of the two seeds, *Monopteryx* was consumed more frequently and in larger quantities. It accounted for about 70% of the total caloric and over 80% of the protein contribution of the two seeds.

There is a general tendency among the Tatuyo to use vegetable products gathered from the wild in order to supplement meals in which there is little or no animal protein. This pattern was clear in the consumption of fresh *Monopteryx* seed. Only six out of the eighteen adults surveyed during the dietary study consumed fresh cooked *Monopteryx* seeds as part of a meal. In all of those meals, animal protein was not only absent but unavailable in the household. The exception was one meal containing a small amount of roasted insects contributing less than 1 g. of animal protein. The mean per capita intake of these individuals, five women and one man, was about 300 g. of fresh cooked seed, giving them an average intake of about 370 kcal. (1.5 MJ) and 9 g. crude vegetable protein.

The highest consumption of *Monopteryx* in this group of six was one woman whose intake over a 24-hour period was 548 g. of fresh seed, and an additional 57 g. as "jimio janique", making the daily total 605 g. of fresh seed. The seed provided her with about 750 kcal. (3.1 MJ) and 17 g. vegetable protein. She explicitly stated that she was eating "jimio" because there was no fish or meat available.

The use of *Monopteryx* seed as a beverage (jimio janique) tends to be reserved for days of low animal protein availability. This is especially true of stored supplies of fermented "jimio" after the harvest. This investigator's carefully stored supply, set aside early in the harvest specifically for biochemical analysis, proved to be no exception. One dreary rainy morning when we had breakfasted without fish or meat, the family with whom we were living dug up the sample of fermented "jimio" and prepared it as "jimio janique" so that we would not be hungry.

Like *Monopteryx*, fresh *Erismia* seed is also consumed at meals in which there is little or no animal protein available. The dietary survey data, however, indicate a much lower consumption of these seeds. The mean per capita intake of the five out of the eighteen adults in the dietary survey who consumed freshly

cooked *Erisma* seed was 44 g. This provided them with approximately 125 kcal. (0.5 MJ) and 1.5 g. crude vegetable protein. Since both *Erisma* seed and batí-butter are very high in fat, they are more important as sources of calories than of vegetable protein.

The ability of the Tatuyo to store both *Monopteryx* and *Erisma* in a fermented state extends their availability. The harvest period lasts into the mid-rainy season when neither hunting nor fishing is very productive. Stored supplies of both seeds are important food resources at the height of the rainy season in July, when animal protein of almost any kind is difficult to obtain.

Stored supplies of "jimio" in the village were almost all exhausted by late August, two months after the harvest. One household held a supply for two additional months. Bati-butter is eaten in smaller amounts than "jimio" and stored supplies were stretched to at least six months in many households. Much of the bati-butter, however, was eaten during the height of the rainy season, even though it was explicitly stated by the Tatuyo that it was being saved to eat with fish porridge in October when fish are more abundant.

Our purpose here has been to describe and illustrate the use of two little-known food plants in the diet of indigenous peoples in the northwestern Amazon. By doing so, we suggest that closer attention be paid to collected vegetable foods. Although the caloric staple of these people is provided by cultivation, and animal protein is obtained from wild fauna, gathered vegetable foods are important supplementary nutritional resources.

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REFERENCES

- Eckey, E. W. 1954. VEGETABLE FATS AND OILS. Reinhold Publishing Corp., New York.
- Hugh-Jones, S. 1974. MALE INITIATION AND COSMOLOGY AMONG THE BARASANA INDIANS OF THE VAUPÉS AREA OF COLOMBIA. Ph.D. Dissertation, University of Cambridge, Cambridge, England.
- Instituto Geográfico "Agustín Codazzi". 1970. ATLAS BÁSICO DE COLOMBIA. Banco de la República, Bogotá, Colombia.
- Mors, W. B. and C. T. Rizzini. 1966. USEFUL PLANTS OF BRAZIL. Holden-Day Inc., San Francisco.
- Pesce, C. 1941. OLEAGINOSAS DA AMAZONIA. Revista da Veterinaria, Belém, Pará, Brazil.
- Pittier, H. 1915. On the characters and relationships of the genus *Monopteryx* Spruce. *Bull. Torrey Bot. Club* 42: 623-627.
- Rodrigues, W. A. 1975. Contribuição para o estudo do gênero *Monopteryx* Spr. ex Benth. (Leguminosae) da Amazônia. *Acta Amazonica* 5(2): 153-155.
- Spruce, R. in G. Benth. 1862. in Martius, *FLORA BRASILIENSIS* 15(1): 307 t. 122.
- Spruce, R. in E. Warming. 1875. in Martius, *FLORA BRASILIENSIS* 13(2): 109 t. 21 fig. 1.
- Spruce, R. 1908. NOTES OF A BOTANIST ON THE AMAZON AND ANDES. 2 Vols. A. R. Wallace, editor, Macmillan and Co., Ltd., London.
- Stafleu, F. A. 1954. A Monograph of the Vochysiaceae IV. *Erisma*. *Acta Bot. Neerl.* 3(4):459-480.
- Wallace, A. R. 1889. A NARRATIVE OF TRAVELS ON THE AMAZON AND RIO NEGRO. Second edition. Ward, Lock and Co., London.
- Wu Lueng, W. and M. Flores. 1961. TABLA DE COMPOSICIÓN DE ALIMENTOS PARA USO EN AMERICA LATINA. Instituto de Nutrición de Centro America y Panamá and Interdepartmental Committee on Nutrition for National Defense, U.S. Government Printing Office, Washington, D. C.

PLATE 16



ERISMA L Japura

Plate 16. Illustration of *Erisma Japura* Spruce ex Warming from Martius, FLORA BRASILIENSIS.

PLATE 17



Plate 17. Fruit of *Erisma Japura* Spruce ex Warming.

PLATE 18



MONOPTERYX *angustifolia*.

Plate 18. Illustration of *Monopteryx angustifolia* Spruce ex Bentham from Martius, FLORA BRASILIENSIS.

PLATE 19

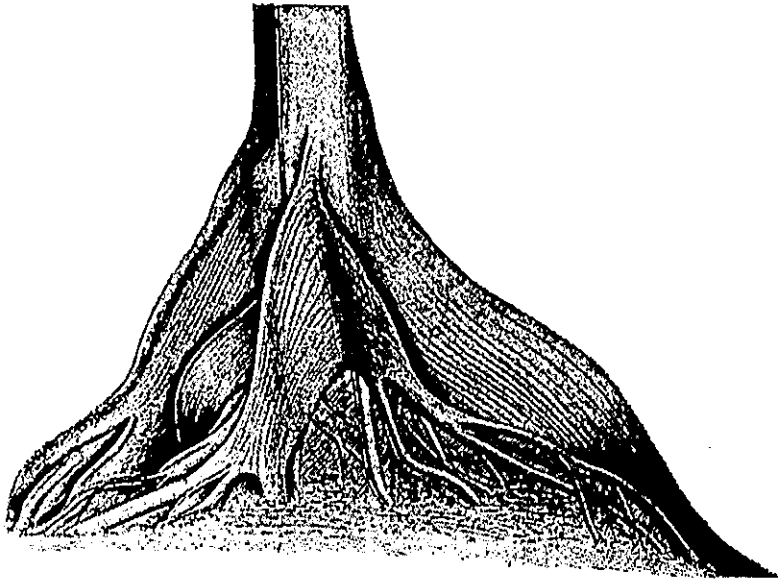


Plate 19. Buttresses of *Monopteryx angustifolia* Spruce ex Bentham from Spruce's NOTES OF A BOTANIST ON THE AMAZON AND ANDES, page 335.

PLATE 20



Plate 20. Freshly harvested leaves and fruits of *Erisma Japura*. One fruit toward the center of the group is split open to show the edible kernel. Photograph by Paul N. Patmore.

PLATE 21



Plate 21. Seeds and fruits of *Monopteryx angustifolia* Spruce ex Bentham. One pod has been opened to demonstrate the relative size and position of the seed. Photograph by Paul N. Patmore.

PLATE 22



Plate 22. Baskets of *Erisma Japura* and *Monopteryx angustifolia* gathered in preparation for the Yurupari ceremony. Photograph by Paul N. Patmore.