

## ANIMALS IN THE NAMBIQUARA DIET: METHODS OF COLLECTION AND PROCESSING

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**ABSTRACT.**—This study reports items of animal origin observed to be consumed in two Nambiquara Indian villages and describes how these foods were obtained and processed. The Alantesu village (A) is located in the forest of the Guaporé Valley and Juina (J), in the cerrado (savanna) of the Chapada dos Parecis, both in the state of Mato Grosso, western Brazil. Although similar methods were used to obtain and process animal items, the two villages presented clear differences in the taxonomic composition of these items (A, more fishes; J, more insects and birds, for example) and the total number of species (A: 69 spp. vs. J: 90 spp.) observed in the diet. Qualitative and quantitative differences in the fauna in the neighborhood of each village largely explain the dietary differences. The methods by which items were obtained and processed by the two populations did not differ much, not only because they shared the basic southern Nambiquara culture, but also because the behaviors of the major food species are similar. The cerrado group possessed special techniques for gathering grasshopper nymphs and winged termites whereas the forest group used a wider variety of fishing techniques; each technology is associated with the greater availability of the animals being targeted.

**RESUMO.**—Este estudo relata os itens de origem animal cujo consumo foi observado em duas aldeias indígenas Nambiquara durante períodos padronizados de observação e descreve como estes alimentos foram obtidos e processados. A aldeia Alantesu (A) localiza-se na floresta do Vale do Guaporé e a Juina (J), no cerrado da Chapada dos Parecis, ambas no estado do Mato Grosso, Brasil. Embora os índios usem métodos semelhantes na obtenção e no processamento dos itens animais, as duas aldeias apresentaram diferenças claras na composição taxonomica destes itens (A, mais peixes; J, mais insetos e aves, por exemplo) e no número total de espécies (A: 69 spp. vs. J: 90 spp.) observadas na dieta. Diferenças qualitativas e quantitativas na fauna dos arredores de cada aldeia explicam amplamente as diferenças na dieta. Os métodos usados na obtenção e no processamento dos itens pelas duas populações não diferem muito, não só porque eles compartilham a cultura Nambiquara do Sul básica, como também porque os comportamentos das espécies principais de alimentação são semelhantes. O grupo do cerrado apresentou técnicas especiais para coleta de ninfas de gafanhotos e cupins alados enquanto o grupo da floresta usou uma maior variedade de técnicas de pesca; cada tecnologia está associada com a maior disponibilidade dos animais alvo.

RÉSUMÉ.—Cette étude relate les éléments d'origine animale mangés par les Indiens Nambiquara de deux villages pendant des périodes d'observation standardisées et décrit comment ces aliments ont été obtenus et préparés. Le village Alantesu (A) se trouve dans la forêt de la vallée du Guaporé et la village Juina (J) dans le cerrado (savanne) de la Chapada dos Parecis, tous deux dans l'État de Mato Grosso, Brésil. Quoique des méthodes similaires aient été employées pour obtenir et préparer ces aliments, les deux villages ont présentés des différences nettes dans leur composition taxonomique (A, plus de poissons; J, plus d'insectes et d'oiseaux, par exemple) et dans le nombre total d'espèces consommées (A: 69 spp. vs. J: 90 spp.). Les différences qualitatives et quantitatives de la faune aux environs de chaque village expliquent largement ces variations alimentaires. Les méthodes employées par les deux populations pour obtenir et préparer ces éléments ne diffèrent guère, non seulement parce que elles partagent la culture de base Nambiquara du Sud, mais aussi parce que les comportements des espèces principales de l'alimentation sont similaires. Le groupe du cerrado a présenté des techniques spéciales pour la récolte des nymphes de sauterelles et des termites ailés, tandis que le groupe de la forêt a utilisé une plus grande variété de techniques de pêche; chaque technologie correspond à la plus grande disponibilité des animaux recherchés.

## INTRODUCTION

American Indians in the course of 13,000 years or more of living in America (Guidon and Delibrias 1986), have developed an intimate knowledge of their environments and their natural products. The number of products used by Amerindian groups is known to be extensive but taxonomic data remain scanty. Detailed description of wild food resources and their indigenous utilization are rare for Brazil. Recent studies (e.g., Patton *et al.* 1982, Berlin & Berlin 1983; Posey 1983a, b; Prance & Kallunki 1984) have begun to compile and interpret these kind of data. Information on animal resources is critical to the interpretation of cultural awareness of the biological environment (Patton *et al.* 1982), efficiency of exploitation of energy and nutrient sources ("optimal foraging," Hames and Vickers 1982; Setz 1989) and questions concerning nutrient limitation on population size (Meggers 1954; Gross 1975). The present study focuses on two Nambiquara Indian villages, one in tropical forest and the other in savanna, and records dietary items of animal origin and describes how they are obtained and processed.

The Nambiquara Indians are a small, differentiated linguistic unit, consisting of three languages (Price and Cook 1969), restricted to the southwestern portion of the State of Mato Grosso and southern portion of Rondônia, Brazil (Fig. 1). Villages are distributed across upland habitat in a region of vegetation ranging from natural fields and savanna in the Chapada dos Parecis to tropical seasonal forest in Guaporé Valley. In the Guaporé Valley forest, contact between the Nambiquara and non-Indians first occurred in the first half of the 18th century with slaves fleeing from gold mining areas in the mountains around Vila Bela da Santíssima Trindade. In the cerrado areas of the Chapada dos Parecis, contact was established in 1907 with Marechal Rondon's expedition (Rondon 1947). In 1960, the construction of BR-364 highway opened the Guaporé Valley to ranching

and agroindustry. In the 1980s a new roadbed built through the Valley (see Fig. 1) intensified outside contact with the Nambiquara Indians in the area. The Nambiquara linguistics and geopolitical organization were studied by Price (1987, 1978). The ethnography of the Nambiquara agriculture is reviewed by Aspelin (1979a),

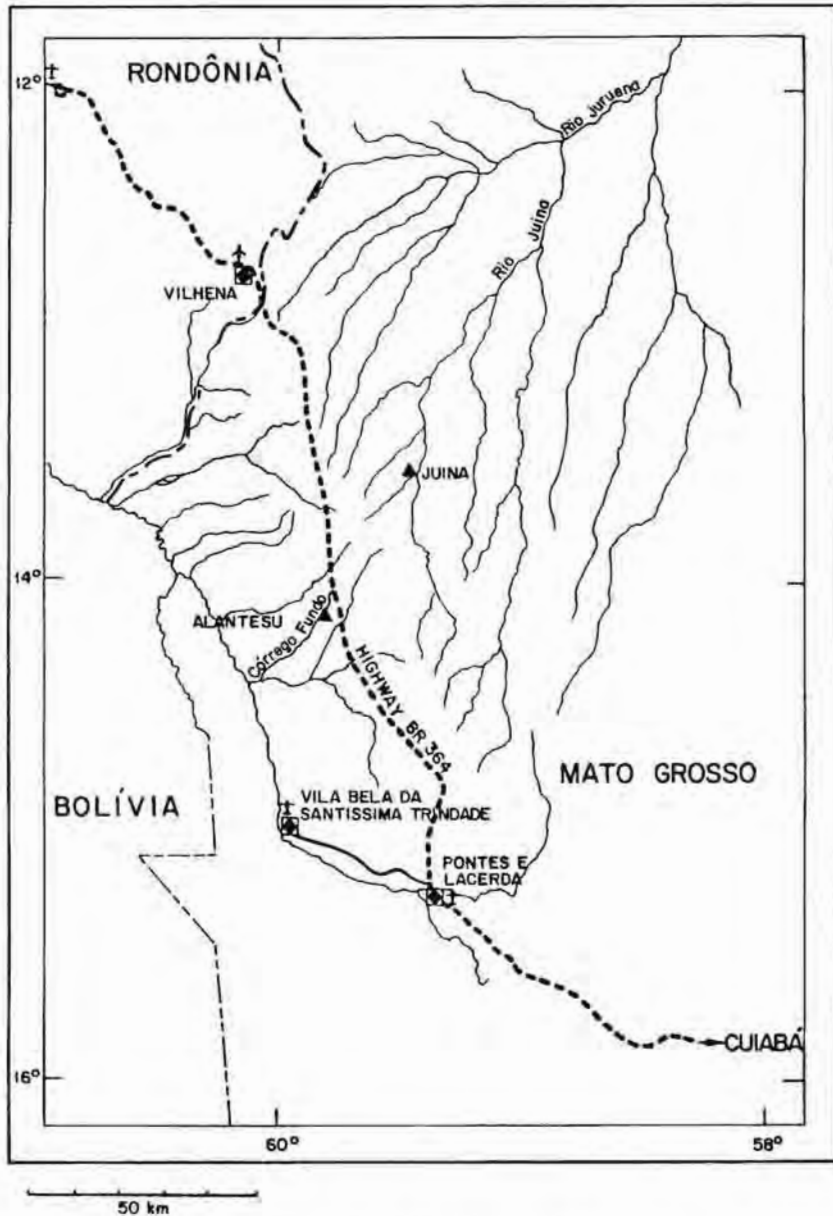


FIG. 1.—Map showing location of the Nambiquara villages (Alantesu and Juina) where the study was undertaken. The BR-364 highway had not been constructed at the time of the study.

which studied the food distribution and social bonding of the Mamaindê Nambiquara (Aspelin 1979b).

Differences in topography and elevation result in small variations in the warm and humid climate over the region (Nimer 1977). About 70% of the rainfall occurs from November to March (rainy season). Information on geology and vegetation of the Guaporé Valley and Chapada dos Parecis is found in Hoehne (1923, 1951) and in RADAMBRASIL Project (Brasil 1979).

Reports treating the Guaporé fauna are very scarce. Johann Natterer collected animals, seeds and minerals along the Guaporé River in 1829-1830; birds were studied by Pelzeln (1871) and Streseman (1951) and mammals by Pelzeln (1883). Information on the fauna of the Chapada dos Parecis is found in Miranda-Ribeiro (1914) and Roosevelt (1924). During Roosevelt's 1908 expedition, George Cherrie and Leo Miller collected vertebrates, among which were discovered many new species. Naumburg (1930) treated the birds collected by Cherrie together with other birds from Mato Grosso. Information on mammals collected by Miller is given by Allen (1916). Miranda-Ribeiro (1914) also gives an account of the mammals of the Chapada dos Parecis.

## METHODS

Two Nambiquara villages 50 km apart were selected for study. The Alantesu village is situated on the "Córrego Fundo", a forest creek in Guaporé Valley, (14° 10'S, 59° 50'W). The other, Juina, is next to the Juina River in the cerrado (edaphic savanna) of the Chapada dos Parecis (13° 40'S, 59° 25'W). The two villages had similar number of inhabitants (in the range of 30 to 40 individuals) such that the total food demand of each group under observation was approximately equal. Villages of similar sizes were chosen to facilitate comparisons between groups in similar cultural and demographic settings in contrasting environments.

All dietary items of animal origin obtained by villages as well as the techniques used in their capture and preparation for eating were recorded during visits totaling approximately 10 months with the Alantesu and the Juina in 1978 (preliminary visit), 1979 (dry season) and 1981 (wet season). A total of 74 data collecting days (Oct, Aug-Sept, Dec-Jan) were spent with the Alantesu and 74 days (Nov, Sept-Oct, Jan-Mar) with the Juina.

Insect specimens were preserved in 70% alcohol: adult specimens were later mounted on pins. Whenever possible, freshly killed vertebrates were photographed and measured (total length of the specimen). Feathers of birds were collected and portions of the skin of reptiles were dried. Heads or whole fish specimens were preserved in 10% formalin. Mammals were measured (head and body length, tail length, external ear length and internal ear length) and the sex was noted. Skulls of primates and rodents were cleaned and dried. Skulls of small vertebrates were often broken during roasting, making identification impossible. The antlers of deer were preserved. When it was possible to obtain the skin of an animal, it was scraped, treated with borax and dried. Skins were tanned for permanent storage upon returning from the field. Collections were identified with

the help of experts.<sup>1</sup> Vouchers were deposited at the Museu de Zoologia of the Universidade de São Paulo, São Paulo (Coleoptera) and Museu de História Natural, Universidade Estadual de Campinas, Campinas, São Paulo (other insects and the vertebrates).

The Nambiquara names for many items were recorded as part of an effort to learn the Nambiquara language. The transcriptions follow Kroeker (1980).

## RESULTS AND DISCUSSION

*Dietary Items of Animal Origin.*—In the Alantesu, ten species of bees were observed to provide honey, larvae and pupae and in the Juina eleven, giving a total of 18 bee species eaten and providing honey (Table 1). The abundance and diversity of bees furnishing honey in the Chapada dos Parecis was noted by Roquette\* Pinto in 1912 (1975) and Lévi-Strauss in 1938/39 (1979).

Unspecified insects have been previously mentioned as components of the Nambiquara diet (Véllard 1941). Roquette-Pinto (1975) observed Brassoliniæ caterpillars being consumed. Beetle grubs ("corôs") and grasshoppers ("tucuras") are cited repeatedly. Hoehne (1951) and Roquette-Pinto (1975) call attention to the abundance of grasshoppers in the Chapada. Grasshoppers were not observed to be eaten in the Alantesu village and are probably rarer in the forest. Hoehne (1951) comments that the forests that surround the Chapada restrict the distribution of the grasshoppers. Insects, mainly grasshoppers and grubs, are consumed more by the Juina during the rainy season; this is probably related to the seasonality of these insects. Lévi-Strauss (1948) observed the Nambiquara's eating of spiders.

Insects appear commonly in the diets of native groups from the Americas [Shoshone (Steward 1938 *apud* Dyson Hudson & Smith 1978), Yukpa (Ruddle 1973), Yanomam (Chagnon 1968)], Africa [Tongwe (Kakeya 1976)] and from Oceania [Tsembaga (Rappaport 1971)]. Coimbra (1984) reviews the use of Coleoptera larvae by Brazilian Indians.

Of 17 fish species recorded (Table 1) 16 were eaten by the Alantesu and eight by the Juina. The Nambiquara literature does not specify types of fish consumed. The difference in number of fish species consumed may be explained ultimately by differences in the ecology of the two drainage basins. The Juina, like the Tapajós of which it is a tributary (Sioli 1967 *apud* Goulding 1979), is a clear water river, almost free of sediments and seems poor in nutrients necessary for the development of extensive aquatic macrophytic communities (Goulding 1980). In contrast, the "Córrego Fundo" Creek is turbid, has a considerable sediment load and has abundant vegetation along its margins where the fishes are found and collected. In the Juina River, in addition to its apparently low productivity, the transparency of the waters makes fishing difficult (Véllard 1965 *apud* Aspelin 1979). All fish caught were eaten except for one ray (*Potamotrygon* sp.) with young at the Alantesu village. Its sting, however, was preserved by the Indians.

Lizards and snakes are mentioned as food items in the literature without indication of genus or species (Pyreneus de Souza 1920; Lévi-Strauss 1948). There is one reference to an iguana (Price 1981a), one to a coral-snake (Pyreneus de

TABLE 1.—Animal items used in the diet by the Alantesu village, in the forest (F), and the Juina village, in the cerrado (C), on the visits: previous (p), dry season (d) and rainy season (r).

Scientific name Order	Family	Species	Nambiquara name	Place/season	Stage or part used
INSECTS					
Orthoptera	Romaleidae	<i>Titanacris albipes</i>	—		Cr adults
		<i>Tropidacris collaris</i>	Kwādsu		Cr adults
		<i>Lophacris</i> sp.	—		Cd Cr
	Acrididae	<i>Rhammatocerus</i> sp.	Tukururatakkisu, Takkatasu		Cd Cr nymphs
		<i>Schistocerca</i> sp.	Katinketatakisu, Katinkatakakisu		Cr adults
Isoptera	Termitidae	<i>Syntermes</i> pr. <i>spinosus</i> (not collected)	Kairu Sauānkisu		Cr soldiers Cp alates
Hemiptera	Indet.	(not collected)	Haieru		Cd nymphs
Lepidoptera	Nymphalidae	<i>Brassolis sophorae</i>	Yaitenauhsu	Fd	
	Sphingidae	undet. 1	Alanauhsu		Cr
		undet. 2	Waisenauhsu		Cr
		undet. 3	Unrenauhsu		Cr larvae
	undet.	undet.	—	Fd	
Coleoptera	Cerambycidae	undet. 1	Kluraitenauhsu		Cr
		(not collected)	Wakehautenauhsu	FR	larvae Cr adults
	Curculionidae	<i>Rhinostomus barbirostris</i>	Anauhtsu (larva), Hakalāinsu (adult)		Cr
Hymenoptera	Formicidae	<i>Atta laevigata</i>	Sawendsu, Sawendu		Cp Cr
		<i>Atta sexdens sexdens</i>	Sauāikisu	Fr	soldiers
	Vespidae	<i>Polybia (cylindroeca)</i> <i>dimidiata</i>	—	Fr	
		<i>Polybia occidentalis</i> complex	—		Cd

Apidae	<i>Pseudopolybia vespiceps</i>	Ainanedundesu			Cr	larvae
	<i>Apoica (apoica) pallens</i>	Weweretasu, Wewehru			Cd Cr	pupae
	<i>Epipona quadrituberculata</i> (not collected)	—		Fr		
	(not collected)	Yanahtasu	Fd			
		—	Fd			
	<i>Trigona branneri</i>	Walatsu	Fd		Cd	
	<i>Trigona hypogea</i>	Waruatusu, Waraasu	Fd		Cd	
	<i>Trigona dallatorreana</i>	Ahatasu			Cr	
	<i>Trigona (pisania) cilipes</i> <i>pellucida</i>	Kaliāhatasu			Cr	
	<i>Geotrigona leucogastra</i> <i>cf. chiriquiensis</i>	—	Fd			
	<i>Scaptotrigona nigrohirta</i>	Jinotasu, Yusu	Fd			
	<i>Scaptotrigona polysticta</i>	—		Fr		honey
	<i>Scaptotrigona xanthotricha</i>	—		Fr		stocked
	<i>Cephalotrigona femorata</i>	—			Cd Cr	pollen
	<i>Oxytrigona obscura</i>	—	Fd	Fr		larvae
	<i>Oxytrigona f. tataira</i>	Tehaneisu (Tehaneneisu ?)			Cd	pupae
	<i>Melipona interrupta</i> <i>grandis</i>	Senehantesu	Fd			
	<i>Partamona ? cupira</i> (new sp. ?)	—		Fr		
	<i>Duckeola ghilianii</i>	Wanesidisu				Cr
	<i>Tetragona quadragula</i>	—				Cd
<i>Tetragonisca angustula</i> <i>angustula</i>	Waisu (?)			Cp Cd Cr		
<i>Lestrimellita limao</i>	Yacadensu, Ariausu (?)				Cd Cr	
<i>Apis mellifera</i>	?? Sanehante kwiritesu	Fd	Fr		Cr	

TABLE 1.—Animal items used in the diet by the Alantesu village, in the forest (F), and the Juina village, in the cerrado (C), on the visits: previous (p), dry season (d) and rainy season (r). (continued)

Scientific name Order	Family	Species	Nambiquara name	Place/season			Stage or part used		
FISHES									
Characiformes	Characidae	<i>Astyanax bimaculatus</i>	Ayekalosu	Fd	Fr		Cr	meat	
		(not collected)	Kain Herisu				Cr		
		<i>Serrasalmus</i> sp.	—			Fr			
	Erythrinidae	<i>Hoplias malabaricus</i>	Haiuru (C.)	Fp	Fd	Fr	Cd	Cr	
		<i>Hoplias</i> sp.	Ainatsu				Cp	Cd	Cr
		<i>Hoplerethrinus unitaeniatus</i>	—		Fd				
		<i>Erythrinus erythrinus</i>	—		Fd				
Anostomidae	<i>Leporinus</i> sp. ( <i>maculatus</i> group)	—				Cd			
Gymnotiformes	Electrophoridae	<i>Electrophorus electricus</i>	Amkurisu			Fr			
Siluriformes	Pimelodidae	<i>Rhamdia</i> cf. <i>quelen</i>	Nenduhsu (?), Waiutsu	Fd	Fr				
	Callichthyidae	<i>Callichthys callichthys</i>	—		Fd				
		<i>Hoplosternum thoracatum</i>	—		Fd				
	Loricariidae	<i>Pterygoplichthys</i> sp.	—		Fd	Fr			
Perciformes	Cichlidae	<i>Crenicichla lepidota</i> (?)	Unkalisu	Fd	Fr				
		<i>Aequidens</i> sp.	—	Fd	Fr	Cd			
undet.	undet.	(not collected)	—			Fr			
	undet.	(not collected)	Kouritsxu			Fr			
	undet.	(not collected)	—				Cr		
	undet.	(not collected)	Kananguesu				Cr		



AMPHIBIANS

Anura	Bufo	<i>Bufo</i> sp.	Wxisu				Cp		meat
	undet.	(not collected)	—					Cd	
	Leptodactylidae	<i>Leptodactylus labyrinthicus</i>	—						Cr

REPTILES

Testudines	Testudinidae	<i>Geochelone</i> sp. ( <i>denticulata</i> or <i>carbonaria</i> )	Yutaunsu, Yataunru, Yutaunru	Fp	Fd	Fr			
	undet.	<i>Podocnemis</i> sp. (not collected)	—						Fr
			—						Fr
Sauria	Iguanidae	<i>Hoplocercus spinosus</i>	Yanuhsu, (Yanunsu ?)						Cd Cr
	Teiidae	<i>Tupinambis teguixin</i>	Nutatu (F)	Fp	Fd				Cd
		<i>Tupinambis rufescens</i> (?)	Yawaru ?						Cd Cr
		<i>Cnemidophorus lemniscatus</i> (?) (not collected)	Yanasu (F), Kadihsu (C)	Fp	Fd		Cp		Cd Cr
			—						Cd
Serpentes	Boidae	<i>Boa constrictor</i> (?)	Disxu						Cd

BIRDS

Rheiformes	Rheidae	<i>Rhea americana</i>	Auhlu						Cd	meat
Tinamiformes	Tinamidae	<i>Tinamus tao</i>	Hohsu	Fp	Fd	Fr			Cd	
Falconiformes	Accipitridae	<i>Accipiter bicolor</i>	Dantesu	Fp						
		undet. 1	Tkatkasu						Cd	
		undet. 2	Halunwairu (?)					Cp	Cd	
Galliformes	Cracidae	<i>Mitu mitu</i>	Alasu	Fp						
		<i>Penelope</i> cf. <i>jacquacu</i>			Fd				Cd	
Gruiformes	Cariamidae	<i>Cariama cristata</i>	Wanunktasu (F) Kwalxatsu (C)						Cd	
Columbiformes	Columbidae	undet.	Kwasxasu						Cd	

TABLE 1.—Animal items used in the diet by the Alantesu village, in the forest (F), and the Juina village, in the cerrado (C), on the visits: previous (p), dry season (d) and rainy season (r). (continued)

Scientific name Order	Family	Species	Nambiquara name	Place/season				Stage or part used
Psittaciformes	Psittacidae	<i>Ara ararauna</i>	Aratsu	Fd	Cp	Cd	Cr	meat
		<i>Ara chloroptera</i>	—	Fd	Fr			eggs
		undet.	—				Cr	
		<i>Amazona</i> sp. 1	—		Fr			
		<i>Amazona</i> sp. 2	Tatlaketsu	Fd				
Strigiformes	Strigidae	<i>Amazona</i> sp. 3	Äuchru, Ähuhru			Cd		
		undet. 1	Waiededensu, Waiedisu			Cd		
		undet. 2	Yetisu			Cd		
Caprimulgiformes	Nyctibiidae	undet. 3	—	Fp				
		<i>Nyctibius</i> sp. (prob. <i>griseus</i> )	—			Cd		
Piciformes	Bucconidae	undet.	Suhlu, Tucaluhlu, Tucaruru			Cd		
	Ramphastidae	<i>Ramphastos tucanus</i>	—	Fd				
Passeriformes	Picidae (?)	<i>Ramphastos</i> sp. 2	—		Cp			
	Hirundinidae	undet.	Jujutta (Jujuttsu)			Cd		
	undet.	(not collected)	Tanenetsu			Cd		
	undet.	(not collected)	—		Fr		Cr	
MAMMALS								
Marsupialia	Didelphidae	<i>Didelphis albiventris</i>	Yawala (su), Yawaru			Cd	Cr	meat
Chiroptera	Phyllostomidae	<i>Desmodus rotundus</i>	Kaluhtesu	Fd				
		<i>Glossophaga soricina</i>	Kaluhsata (su)			Cd		
		<i>Tonatia silvicola</i>	—				Cr	

Primates	Cebidae	<i>Cebus</i> sp. ( <i>apella</i> and/or <i>capucinus</i> )	Hotsu	Fp	Fd	Fr			meat
		<i>Pithecia irrorata</i>	Kaulisu			Fd			
		<i>Alouatta seniculus</i>	Elhu	Fp		Fr			
		<i>Alouatta caraya</i>	Ilhu					Cd	
		<i>Alouatta</i> sp. ( <i>caraya</i> or <i>belzebul</i> )	—			Fr			
		<i>Ateles paniscus</i>	Hotasu	Fp		Fr			
Edentata	Callithricidae	<i>Callithrix argentata</i>	Takisu					Cr	
	Myrmecophagidae	<i>Myrmecophaga tridactyla</i>	Tikakisu					Cd Cr	
		<i>Tamandua tetradactyla</i>	Wäisu, Wäisxu (C)			Fr			
	Bradypodidae	<i>Choloepus hoffmanni</i>	Alaitsu	Fp					
	Dasypodidae	<i>Dasypus septemcinctus</i>	Nundsu (Ninsxu)				Cp	Cr	
		<i>Dasypus novemcinctus</i>	Ahratasu, Aarlu			Fd	Fr	Cr	
		<i>Euphractus sexcinctus</i>	Sanäisu				Cp	Cd Cr	
		<i>Priodontes maximus</i>	Waruru	Fp			Cp	Cd Cr	
	Rodentia	Echimyidae (?) undet.	<i>Cabassous tatouay</i> (?)	Ahlutsu					Cd
			( <i>Ctenomys</i> sp. ?)	—					Cr
(not collected)			Alutsu (?)					Cd	
Dasyproctidae		(not collected)	—						Cr
		<i>Cuniculus paca</i>	Nutasu (F), Walutsu (C)					Cd Cr	
		<i>Dasyprocta</i> (prob. <i>punctata</i> )	Duhsu	Fp					
Carnivora	Procyonidae	<i>Dasyprocta</i> (prob. <i>aguti</i> )	Durlu					Cr	
		<i>Hydrochaeris hydrochaeris</i>	Unsu			Fd			
	Mustelidae	<i>Procyon cancrivorus</i>	—			F*			
		<i>Eira barbara</i>	—			Fd			
Perissodactyla	Felidae	<i>Felis concolor</i>	Yanala, Yanalatasu					Cd	
	Tapiridae	<i>Tapirus terrestris</i>	Hanuntsu (F), Alüsu (C)	Fp	Fd				
Artiodactyla	Tayassuidae	<i>Tayassu pecari</i>	Yacatasu, Yakatatu		Fd	Fr		Cr	
		<i>Tayassu tajacu</i>	Yakisu, Yahtsu		Fd			Cd	

TABLE 1.—*Animal items used in the diet by the Alantesu village, in the forest (F), and the Juína village, in the cerrado (C), on the visits: previous (p), dry season (d) and rainy season (r). (continued)*

Scientific name Order	Family	Species	Nambiquara name	Place/season	Stage or part used
	Cervidae	<i>Ozotoceros bezoarticus</i>	—		Cr
		<i>Mazama americana</i>	—	Fr	
		undet. 1	Kwhiditxu, Kwhitxisu	Fd	
		undet. 2	Yatahlu		Cd

Fp = Oct 78, Fd = Aug-Sept 79, Fr = Dec 79 Jan 80, F\* = Sept 85, Cp = Nov 78, Cd = Sept-Oct 79, Cr = Jan-Feb 80.

Souza 1920) and one to an anaconda (Lévi-Strauss 1948); consumption of these animals was not observed by me. Hugo (1959) reports the capture and dividing up of a two-meter-long alligator in 1944 (no alligator was observed in this research). Price (1981) mentions a large turtle; the turtles I observed were small and were unidentified as to species.

Giant anteater, tapir, puma, capybara, tayra, agouti, and collared peccary are confirmed as Nambiquara prey animals (Aytai 1981; Lévi-Strauss 1948; Roquette-Pinto 1975). Other animals with less precise identification such as armadillos, bats, deer, monkeys, rats, pigs and birds, are also mentioned by these sources as Nambiquara food. The bats referred to in this paper (Table 1) include a blood-feeding species (Setz & Sazima 1981, 1987). The rats (Rodentia) I observed were not identified, in part because of the poor material obtained, in part because of the scarce reference material from the Chapada dos Parecis region. Spines from the tropical porcupine *Coendou prehensilis prehensilis* were used for adornments and I suppose that the animal was eaten.

The Alantesu diet included 18 species of insects, 16 fishes, five reptiles, 11 birds and 19 mammals during the stay at this village. The Juina diet included 28 species of insects, eight fishes, three amphibians, six reptiles, 24 birds and 21 mammals during equivalent periods of observation (A: 69 spp., J: 90 spp.). The Juinas mentioned that they also eat "15 kg-armadillo"—probably the soft-tailed armadillo [*Cabassous unicinctus* (L. 1758)]. In another village, Campos Novos, at the Chapada dos Parecis the Nambiquara hunted a woolly monkey [*Lagothrix lagotricha* cf. *cana* (Humboldt 1812)] for food. In 1985 in a short visit with the Alantesu, I observed a racoon (*Procyon cancrivorus*) being prepared for consumption.

The use by the Juina of a larger variety of species may be the consequence of a lower average abundance of each species, therefore requiring less selectivity to obtain a given quantity of food within a reasonable span of time (Setz, in preparation). In addition, peccaries (*Tayassu* spp.) and capuchins (*Cebus* spp.), principal Alantesu items, are social animals that can frequently be harvested in groups. In contrast, larger savanna animals such as the giant anteater (*Myrmecophaga* sp.), the teiú lizard (*Tubinambis* spp.), the armadillos (Dasypodidae) and the deer (Cervidae), are generally solitary, or live in pairs, which diminishes the yield of these species per hunt. Although the RADAMBRASIL Project (Brasil 1979) mentions migratory birds for the region from October to December, the increase in bird species in the September-October Juina menu includes only four possibly migratory bird species (L.O. Marcondes Machado, pers. comm.).

Pets and domesticated animals are considered by the Nambiquara Indians as relatives and are not eaten. Alantesu villagers had one pet coati (*Nasua nasua*), two agoutis (*Dasyprocta* sp.), an infant black spider monkey (*Ateles paniscus*), a sub-adult howler monkey (*Alouatta seniculus*) and a young marmoset, possibly the pygmy marmoset (*Cebuella pygmaea*), as well as young Amazon parrots (*Amazona* spp.). The children also kept toads (*Bufo* spp.) for their amusement. Observations elsewhere in the Chapada dos Parecis revealed a pet titi-monkey (*Callicebus moloch*) at Cabeceira Village, a South American fox (*Dusicyon* sp.), as well as young amazon parrots (*Amazona* spp.), and unidentified young owls

(Strigidae) at Aldeia Branca Village. Lévi-Strauss (1948) reported a pet juvenile woolly monkey (*Lagothrix* sp.) and Allen (1916) a pet white nosed bearded saki monkey (*Chiropotes albinasus*) at other Chapada sites.

*Collection and Processing of Foods of Animal Origin.*—Insects, when abundant, can provide a valuable food source. However, because of their small size and peculiar behavioral characteristics, capture efficiencies can be dramatically increased by adopting specific capture techniques.

When a swarm of grasshopper nymphs (*Schistocerca* sp.) is detected by the Juina, usually in the rainy season, the gathering party is called together. Some of the women collect dry palm leaves and make bundles for torches. Surrounding the swarm, they beat the vegetation singeing the grass and nymphs. Other women dig a trench of about 30 cm wide and 120 cm long and 80 cm deep. Grasshoppers are herded so as to jump into the hole, from which they have difficulty escaping and can be gathered and put into baskets. Adult grasshoppers (*Rhammatocerus* sp.) are difficult to grab but may be knocked down with a switch. In the cool of early morning, big grasshoppers (*Tropidacris collaris* and *Lophacris* sp.) are encountered on trees and can be easily captured by hand, or by swatting with a stick when they are too high on a tree. The grasshoppers are toasted directly in the ashes of a cooking hearth (Fig. 2). They can be stored for two or three weeks in baskets, if kept dry. They are eaten without additional preparation or crushed into a flour, which can be mixed with fruit juice or added to crushed manioc bread ("beiju") and eaten in handfuls.



FIG. 2.—A Juina woman toasting grasshoppers (*Schistocerca* sp.) in the ashes of a cooking hearth.

When the Juina sight a swarm of winged termites (Isoptera) in the evening, they give an alarm which mobilizes the entire village. Some pick dry palm leaves and others containers with water; everybody goes to the spot where the flight was seen. They set fire to the palm leaves and shake them in the air among the flying termites. Dropping termites are gathered and put into the containers with water, from which they are unable to escape. The insects are subsequently toasted among hot ashes, freed from the ash by sifting, and eaten.

Coleoptera and Lepidoptera larvae are much used as food in both villages. When clearing a new garden, cut palm trees are left to provide substrate for developing beetle grubs. The decaying pith attracts adult beetles that lay eggs in the decomposing heap. Jaracatia-grubs (Cerambycidae), much appreciated by the Alantesu, are gathered by women and children who beat cut stumps of *Jaracatia* sp. (Caricaceae) and then listen and sniff attentively. If there is evidence of grubs, they dig into the stump; a single stump can yield up to 50 larvae. The gathering ends only after careful inspection of all the stumps. The Alantesu collected colonial *Brassolis* caterpillars from a palm heap lying in the garden; these probably developed on the fronds of the living palm. Cerrado *Tabebuia* sp. (Bignoniaceae) trees with *alanauhsu* caterpillars (Sphingidae) were recognized by their defoliated state. Two saturniid larvae that were subsequently eaten were gathered from tree trunks in the Juina River riparian forest. Caterpillars and grubs are disemboweled by biting them behind their heads and removing the head and attached digestive tract with a quick pull. The prepared larvae are wrapped in wild banana leaves (*Heliconia* sp., Musaceae) and baked among hot ashes (Fig. 3).



FIG. 3.—Jaracatia grubs (Cerambycidae) and fermented manioc cake ready for eating.

Near both villages, as well as on the hunting grounds of the Juina, ants are harvested at well known leaf-cutting ant mounds (*Atta* spp., see Table 1). Ant gathering is practiced by women and children. Water containers and manioc bread are carried to the ant mound. On the way, a branch about 2 cm in diameter is selected and twigs and leaves are removed to make a smooth stick. This is thrust into the mound and the hole widened with a circular movement. When soldier ants climb about two thirds up the stick, it is held upright over the container and the ants stripped into the water. The stick is returned to the hole and the whole process repeated until a sufficient quantity of ants is collected. Some ants may be eaten raw on the spot, with pieces of manioc bread, discarding only the heads. At the village or camp, the ants, raw or toasted, are crushed in a mortar with manioc or corn bread for eating. Both the Alantesu and the Juina gathered ants in the rainy season.

Wasp larvae and pupae are almost always given to children to eat. They are collected with the aid of burning palm leaves and eaten alive one by one from the combs.

Bee honey is gathered by Alantesu men who make a firm scaffolding with branches to reach hives higher up. After smoking out the adult bees, stocked pollen, larvae and pupae are eaten without further preparation. Honey pressed manually from the combs is diluted in water and drunk. At the Juina, both men and women gather honey. Adult bees are driven away by the smoke from bundles of burning palm leaves (Fig. 4). Afterwards, still with smoke protection, a hole



FIG. 4.—Two Juina women using torches to drive adult bees (*Lestrimellita limao*) away from their nest.



is cut in the tree trunk with an axe and the honey combs and stocked pollen put into a basket. In a case involving a tree more than 10 m tall, the procedure became more complicated. Women provided bundles of dry palm leaves, and a man climbed a neighboring tree using a climbing ring made of fibrous tree bark and carrying a bundle of palm leaves on his back. As he drove the bees away with the burning bundle, two companions felled the nest-tree. At the same time women prepared more palm-leaf bundles to drive bees away when gathering the stocked pollen and honey from the fallen tree. The use of honey and stocked pollen is identical to the Alantesu.

Various methods of fishing were observed. The Alantesu deposit tree trunks on the bottoms of creeks and lakes. Diving and examining these trunks regularly, they hand-gather fishes taking shelter there. In another type of fishing practiced by women, baskets are moved through the water in a group pattern to capture fish (*Hoplosternum thoracatum*, *Pterygoplichtys* sp.) dislodged from creek or lake margin vegetation. Both Alantesu and Juina men hunt fish, especially *Hoplias malabaricus*, with bow and arrow, using an arrow with a barbed point. Arrow caught fish are usually cut into pieces and used as bait in hook and line fishing. Coconut beetle larvae, earthworms, discarded parts of game animals and leafhoppers are also used as bait. Fishes may be attracted with fresh corncobs or corn husks thrown into the river. The men sometimes leave one or more baited lines in the creek or river overnight, and check them for fish the following morning. Women accompanied by children catch baitfish by walking in a creek where fish are corralled with a basket and picked up. Younger children help by beating the water surface, herding the fish, which are then caught easily. A method used by Alantesu children which gives more pleasure than food is "mud fishing." Children remove mud blocks from the bottom of small ponds and throw them onto the banks. Fishes living in the mud become dislodged (*Hoplerythrinus uni-taeniatus*, *Aequidens* sp., *Erythrinus erythrinus*, *Callichthys callichthys*, *Hoplosternum thoracatum*) and are put into baskets. The Juina tell of fishing with ichthyotoxic plants (*Serjania* sp., Sapindaceae) in flood-plain ponds and small creeks. Neither the Alantesu nor the Juina make or possess boats. Both scaled fishes and armoured catfishes are baked whole on ashes. Unarmored catfishes are roasted wrapped in wild banana leaves. Afterwards, they can be peeled and mashed with cake in a mortar, or eaten as they are. The Juina preserve fish by smoking, and before eating them, cook them with sweet manioc or rice.

Various vertebrates which live in burrows underground e.g. lizards such as spiny-tailed iguana (*Hoplocercus spinosus*) and puffbirds (unidentified *Bucconidae*) are collected by digging. In the case of deep-nesting puffbirds two women may cooperate. The gallery is normally marked by threading a thin stick into the hole so as not to lose it in case of a cave-in. The pepper-frog (*Leptodactylus labyrinthicus*) and a yellow toad (not collected) were gathered in the same way. When an occupied armadillo burrow is found, one person listens by holding one ear close to the ground while another jumps to frighten the animal. When the armadillo moves, the listener detects its position and indicates where to begin digging. This is repeated until the animal is caught. Sometimes the person who listens also beats the ground and digs, and often someone else comes to help. If the digging takes a long time, the diggers and listeners alternate tasks.

In the cerrado, hollows in trees are examined in the search of opossums (*Didelphidae*) and nests of parrots and owls. Their occupants (eggs and adults) are valued items in the Juina diet. When a hollow tree with bats (*Chiroptera*) is found, both the Alantesu and the Juina use fire to dislodge them. Bats falling to the ground are caught and later roasted (Setz & Sazima 1981, 1987).

Many mammals are obtained by hunting. The Indians hunt with bow and arrow of two types. One, made from a wild cane, has a lanceolate bamboo blade with sharp edges for bigger game, and the other having a point consisting of a wooden knob is used to stun monkeys and birds. The effectiveness of the lanceolate arrows is considerably improved by curare, a plant derived poison, (see Vellard 1965). They also hunt with rifles. Bullets are made by melting and casting lead from sinkers. The Alantesu hunt in groups of five to nine men who patrol the forest during daylight, looking for tracks on the ground, signs on the vegetation, odors and feces, and for trees with ripe fruit on which game animals feed. They cautiously approach animals until they are near enough to shoot. The Alantesu also hunt from ambush ("caçada de espera"). In this case, men set out at sunset for some wallow and stay there all the night waiting for capybaras and tapirs to come by. The Juina baited for game. Around a spot having agouti tracks, a hunter makes a little clearing and places food on the ground. He returns over a number of days until he can shoot the animal. In a previously burned area of cerrado with sprouting grass (cf. Setz 1983c), the men look for deer tracks. When recent tracks are seen, women and children are called in to help track and surround the prey, which is then killed. When someone sees recent tracks of a giant armadillo or giant anteater, he calls several people to help track and capture the prey. The peccaries consumed by the Juina in the dry season were obtained by "garden hunting" (Linares 1976). The Juina let the peccaries come to feed in their fields for a few days and then kill many of them.

No type of trap was observed or reported to be used in either Nambiquara village. When the hunter catches an animal, he calls someone who is nearby to pick the animal up and transport it to the camp. If the animal is big, it is cut up in two or more parts, which are carried separately back to the camp or village. When many peccaries were killed, they were piled in a heap in one place, the village notified and women sent to bring them in.

The game processing is done at camp or in the village. First, the fur is burned off and the skin scrapped until very clean. The viscera are removed, cleaned and baked separately. The animal's body is tied using plant fibers, making a round package, and put among the hot ashes to roast. Nambiquara refuse to eat meat that is still bleeding; everything is roasted until well done. When well cooked, most of the meat (without skin and with some bones) is crushed in a mortar with corn cake, manioc bread or baked sweet manioc. It is separated into balls having a volume from about one to two handfuls, and distributed for eating. Very big prey (tapir, for example) are brought in pieces and distributed throughout the village, and each household roasts its portion. Birds are plucked clean, wrapped in leaves and roasted. Armadillos, tortoises and turtles are roasted in their own shell. Tortoises not consumed at once are kept alive. They are tied by their shells and hung from the roof. Eggs, in general, are eaten baked. A little puncture is made in the shell of the egg before it is placed among hot ashes.

The Juina participate in hunting treks, and during these they store the best parts of the game for eating upon return to the village. First, they prepare charcoal in a pit near the camp for roasting pieces of game. This roasting can take all night, and is taken care of alternately by two or three men. Afterwards, the roasted meat is preserved by smoking day and night on a rectangular grill over a fire at each camp.

No type of seasoning (salt, or other) was used in the preparation of any food consumed by the Nambiquara. Lévi-Strauss (1963) mentions that the Nambiquara "cannot bear to eat salt, which they do not know to prepare, or pepper, which they do not cultivate." He describes however the use as a condiment of a type of "cumaru" bean (*Dypterix* sp., Leguminosae) which give a strong, bitter almond taste.

### CONCLUSIONS

Although similar methods are used to obtain and process animal items, the two villages (A and J) presented clear differences in the taxonomic composition of animal foods (A, more fishes; J, more insects and birds, for example) and the total number of species (A: 69 spp. vs. J: 90 spp.) observed in the diet during standardized observation periods. Qualitative and quantitative differences in the fauna of the two environments may largely explain the dietary differences and the cultural fixation of particular hunting, fishing and collection methods.

The methods by which the animals or animal items are obtained and processed in the two villages were similar not only because the two populations showed the same basic culture but also because of the similarity in behavior of the animals available for consumption.

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### NOTES

<sup>1</sup>Orthoptera (grasshoppers)—C. Carbonell, Museu Nacional, Rio de Janeiro, RJ; Isoptera (termites)—E.M. Campelo, Museu Zoologia da Universidade de São Paulo (MZUSP), São Paulo, SP; Lepidoptera (butterflies)—C.F.S. Andrade, Universidade Estadual de Campinas (UNICAMP), Campinas, SP and M.M. Dias Filho., Universidade Federal de São Carlos, São Carlos, SP; Coleoptera—T.M. Lewinsohn (UNICAMP), U. Martins and S. Vanin (MZUSP); Hymenoptera (ants)—H.C. de Moraes, Universidade Nacional de Brasília, Brasília, DF, (wasps)—P.J. Moure, Universidade Federal do Paraná, Curitiba, PR, (bees)—J.M.F. Camargo, Universidade de São Paulo (USP-RP), Ribeirão Preto, SP and P.J. Moure; Fishes: I. Sazima (UNICAMP) and H. Britski (MZUSP); Amphibians and Reptiles—I. Sazima; Birds—L.O. Marcondes Machado, J. Vielliard (UNICAMP) and Werner Bokermann, Fundação Parque Zoológico de São Paulo, São Paulo, SP; Mammals

in general—C.T. Carvalho, Instituto Florestal da Secretaria da Agricultura de São Paulo, São Paulo, SP; bats—I. Sazima; Callithricidae—M. Becker, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis, Florianópolis, SC; Cebidae—M. De Vivo (USP-RP).

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## BOOK REVIEW

**Le Riz en Asie du Sud-est. Atlas du Vocabulaire de la Plante.** Nicole Revel with the collaboration of Alexandra Laclau, Marie-Claude Lortic, Catherine Zacharoupoulou. Editions de L'École des Hautes Etudes en Sciences Sociales, Paris. 1988. Fr. 550.

This monumental contribution to our knowledge of the world's most important grain—rice—will be of extraordinary interest to ethnobotanists working in southeast Asia, and it is destined to be a valuable tool for the Rice Institute of the Philippines. The great amount of field and literature research represented in this publication is difficult even to envisage.

In tabular form, the various terms connected with rice are set forth for 21 groups of languages with numerous languages and dialects in these linguistic or geographic groups. For each linguistic entry there are terms applied to rice in various forms: the plant itself; unhusked rice; husked rice; the cultivated plant; rice soup; glutinous rice; non-glutinous rice. The main volume of this publication consists of 53 pages of tables with these terms.

This volume is accompanied by 78 supplementary maps indicating the areas of use of the many terms outlined in the principal tabular offering, including the several terms for the seven aspects of rice and its characteristic uses.

It would be difficult to point out any similar study on any economic plant for any other part of the world. The many researchers must be congratulated for producing a highly praiseworthy contribution to science.

Richard Evans Schultes  
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