

**GAME HUNTING BY RUBBER TAPPERS OF THE TEJO RIVER BASIN,  
ACRE STATE, BRAZIL**

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*Key words:* Amazonia, Acre State, Brazil, Game Hunting, Rubber Tappers.

*Extrativismo animal por seringueiros na Bacia do Rio Tejo, Estado do Acre, Brasil.*

**RESUMO.** Neste estudo entrevistamos 55 seringueiros chefes de famílias na Bacia do Rio Tejo, Acre, sobre a atividade extrativista animal conduzida por eles no ano de 1988. O extrativismo animal é conduzido mais intensamente em certas espécies ou grupos de espécies. Os tinamídeos (Tinamous e Crypturellus) e a paca (Agouti paca) foram indicados como os animais mais caçados ( $\bar{x} = 4.72$  e  $\bar{x} = 3.38$  por família/mês, respectivamente). Setenta e cinco por cento dos seringueiros entrevistados indicaram estes animais como os mais frequentemente vistos por eles durante suas caminhadas rotineiras. Cutias (Dasyprocta) e macacos (Pithecia) também são caçados frequentemente ( $\bar{x} = 3.92$  e  $\bar{x} = 2.18$  por família/mês, respectivamente) apesar de terem sido indicados como ocasionalmente vistos por 95% dos seringueiros entrevistados no primeiro caso e 53% no segundo caso. Noventa por cento dos seringueiros entrevistados indicaram micos (Saguinus) como frequentemente vistos mas no entanto não são caçados. Outros animais (Panthera, Puma, Leopardus, Herpailurus, Myrmecophaga, Tamandua, Bradypus e Choloepus) foram indicadas como ocasionalmente vistas e aparentemente também não são caçadas. A anta (Tapirus terrestris), a capivara (Hydrochaeris hydrochaeris), o queixada (Tayassu pecari) e macacos (Chiropotes, Cacajou, Lagothrix, Callicebus) foram indicadas por mais de 69% dos seringueiros como nunca vistos. Estimamos que o extrativismo animal na Bacia do Rio Tejo pode fornecer aproximadamente 276 g de carne para ser consumida diariamente por pessoa. Sugerimos que esta quantidade de carne consumida diariamente indica que a fauna ainda não foi severamente explorada, mas esforços devem ser feitos para que se iniciem programas de manejo e conservação de animais silvestres em pequena escala nesta região.

## INTRODUCTION

Game hunting is a common practice of most Brazilian rural populations. Nevertheless, conservation biologists have given little attention to the environmental consequences of this activity to the wild animal's population dynamics.

Rubber tappers of the State of Acre, located in the western portion of the Brazilian Amazon along the border with Peru and Bolivia (Fig. 1), have occupied this area for the last 100 years. Their agricultural practices are limited and most of the protein is obtained by fishing and hunting wildlife.

Recently, there was a strong environmental movement focusing on the sustainability of the rubber tappers' system of production (Fearnside, 1989; Schwartzman, 1989), but there were no quantitative measurements on the game hunting activity conducted by them.

The traditional system of production of Acre rubber tappers is called "colocação", a unity formed by a group of families that gather nontimber products from the forest (e.g., rubber), plant, hunt and fish. Rubber tappers maintain a direct exchange system (rubber X basic supplies) with a patron, which is the owner of the "seringal" (rubber estate containing a group of "colocações"), to acquire basic supplies such as ammunition, soap, salt, etc. In this patron/client relation of debt peonage, money seldom enters into the exchange and keeps rubber tappers under a slavery system (Schwartzman, 1989). In the early seventies, the opening of roads in the State of Acre brought several types of investors from the South (e.g., cattle ranchers) to this area. This, generated land conflicts between cattle ranchers and rubber tappers, mainly because the latter group has rights to claim land under the Land Statute of Brazil (Schwartzman & Alegretti, 1987).

In the last few years, the escalation of these conflicts has created a rubber-tapper grass-root movement that caught the attention of several national and international environmental organizations pressing the Brazilian government to implement Extractive Reserves in Acre State. Extractive Reserves are defined as protected areas inhabited by resident human populations who are granted 30 year usufruct rights to forest resources which they collectively manage (Schartzman, 1989). The implementation of these reserves reflects a unique opportunity to conciliate economic development with environmental conservation in the Amazon region. The reserves grant legal protection to human populations which have



occupied the area for approximately a century and that traditionally practice vegetal extractivism as their main economic activity.

The aim of this study is to initiate a report on the game hunting activities of Tejo River Basin rubber tappers.

## **MATERIALS AND METHODS**

### **Study Area Characteristics**

The Tejo River Basin is located in the region of the "Alto Juruá" (State of Acre), in the "Cruzeiro do Sul" county (9° latitude S; 72° longitude W) with approximately 4,200 Km and 4,000 habitants (Almeida in press). The area is covered by inundated and non-inundated forests, bamboo formation ("tabocal") and open fields ("campina"), totaling 13 plant unities (Miranda et al., in press). These plant formations are distinct and of great importance when characterizing the spatial partition of wild animal communities.

The seasons are marked by the rain, resulting in a short dry season and an annual precipitation of approximately 2200 mm. The mean annual temperature is a little less than 25° C.

The soils are Eutrophic Cambisols and Podzolics, with specks formed by reddish Brunizen and also Vertisols, which represent a relatively strong potential for exchange of cations (Brasil, 1977). This condition seems to be truly exceptional in tropical forests, because they often lack soil minerals due to extreme lixiviation.

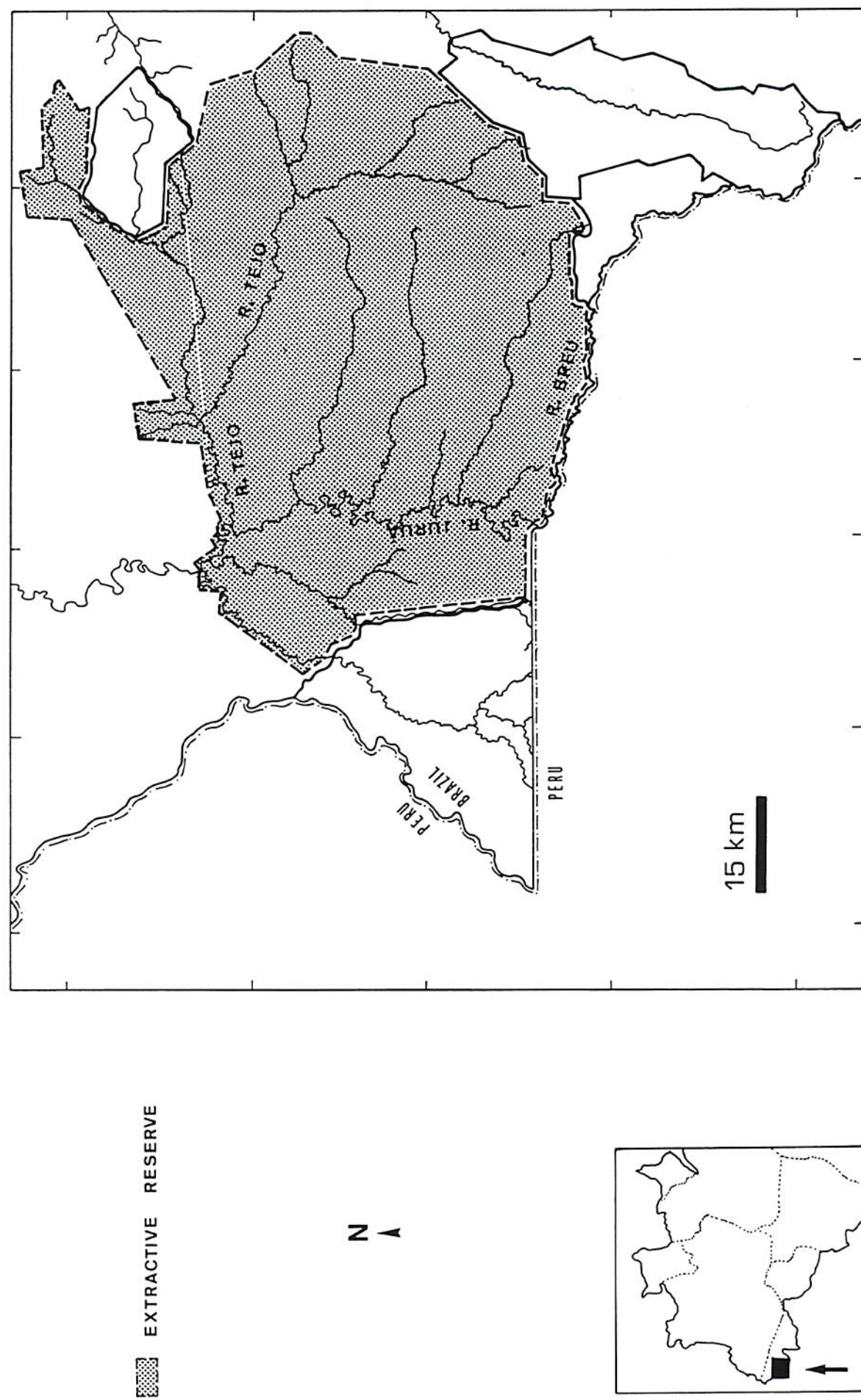


Figure 1. The location of Acre State and the Tejo River Basin, showing the limits of the Alto Jurua Extractive Reserve.

## **Sampling Techniques and Data Sheet**

This study was conducted while researchers of the Environmental Monitoring Center (NMA/EMBRAPA) were conducting an ecological characterization of the Tejo River Basin (Acre State). The ultimate goal of this field trip was to define the boundaries of the first Extractive Reserve in the area.

The research team was divided in two groups. One group has walked approximately 100 Km in the forest from the mouth of Jordão River (located in the Tarauacá River Basin) to the "Restauração Colocação" (located near the watershed of Tarauacá and Tejo River Basin). The other team went from "Marechal Taumaturgo", located in the margin of Juruá River, to "Restauração Colocação" by boat along the Juruá and Tejo Rivers. From "Restauração Colocação" each researcher covered an area of the Basin ("Igarapé Dorado", "Igarapé Moreira", "Igarapé Manteiga", "Igarapé Riozinho", "Igarapé Machadinho" and "Igarapé Camaleão").

A total of 55 head of rubber tapper families were interviewed along this route. The data sheet consisted of a list of regional common names of large terrestrial vertebrate species (approximately 54 species) probably occurring in the area. This list was made with the help of books and field guides (Dunning, 1982; Sick, 1985; Walker, 1975).

The interviews lasted approximately an hour and addressed questions regarding the past year's (1988) hunting activity in the area where they live and conduct rubber tapping activities. The questions addressed were as follows: 1. The frequency in which terrestrial vertebrate species (or species group) were seen (frequently, occasionally and never); 2. How often were those animals hunted by them; 3. If the animals were used as food consumption.

## **Estimation method**

The mean weight of each game species hunted was estimated by using a mean value of the weight range given by Emmons (1990). Half of this value and half of the weight given by J.C. Guix were both considered fresh mean weight of edible meat (Ojasti, 1986).



## RESULTS

### Frequently Seen Wild Animals

Approximately 90% of the interviewed rubber tappers indicated mustached-tamarins (Saguinus sp.) and white tamarins (Saguinus sp.) as the most frequently seen primates. Black mantled tamarins (Saguinus nigricollis) and common squirrel monkeys (Saimiri sciureus) were indicated by 55% of the interviewed rubber tappers as the second most frequently seen primates. The third one was the capuchin monkey (Cebus sp.) (38%). Other mammals frequently mentioned in this category were: nine-banded armadillos (Dasypus novemcinctus) (80%), pacas (Agouti paca) (75%), and opossums (Didelphis marsupialis) (56%). The bird species mostly seen were tinamous (Tinamous major, Crypturellus sp.) (75%) and guans (53%) (Penelope sp.).

### Occasionally Seen Wild Animals

Jaguars (Panthera onca), pumas (Puma concolor), ocelots (Leopardus pardalis), margays (Leopardus wiedii) and the South American coati (Nasua nasua) were mentioned by more than 47% of the interviewed rubber tappers as occasionally seen. However, jaguarundis (Herpailurus yaguarondi) was mentioned by 73% of them as the most seen wild animal in this category. Among the Xenartra group, 71% indicated the giant anteater (Myrmecophaga tridactyla), 67% indicated the collared anteater (Tamandua tetradactyla), 60% indicated the tree-toed sloth (Bradypus variegatus), 58% two-toed sloth (Choloepus sp.), 56% naked-tailed armadillo (Cabassous unicinctus). The agouti (Dasyprocta sp.) (95%) and the Brazilian porcupine (Coendou prehensilis) (71%) were the most frequently mentioned rodents, on the other hand, collared peccarys (Pecari tajacu) (42%) and deers (Mazama sp.) (51%) were the most mentioned artiodactyls. Among the primates, 55% indicated the howler monkey (Alouatta sp.), 53% saki monkey (Pithecia sp.), 49% night monkey (Aotus sp.) as occasionally seen wild animals. In the reptile group, the tortoise (Chelonoidis denticulata) was mentioned by 67% of the interviewed rubber tappers, followed by the spectacled caiman

(Caiman crocodilus) (53 %) and the black caiman (Melanosuchus niger) (42 %). Only macaws Ara sp. (64 %) were mentioned in the birds group for this category.

### Never Seen Wild Animals

The following primates were mentioned by more than 80% of the interviewed rubber tappers as never seen: bearded saki monkeys (Chiropotes sp.), uakari monkeys (Cacajou sp.), common woolly monkeys (Lagothrix sp.) and titi monkeys (Callicebus sp.). On the other hand, spider monkeys (Ateles sp.) were indicated by only 49% rubber tappers as never seen. The terrestrial mammals that were never seen by the great majority of the interviewed rubber tappers includes: tapir (Tapirus terrestris) (87%), white-lipped peccary (Tayassu pecari) (84%) and capybara (Hydrochaeris hydrochaeris) (69%). Turtles (Podocnemis expansa) (56%) and iguanas (Iguana iguana) (58%) were also reported as never seen.

### Hunted Animals

Tejo River Basin rubber tappers hunt a great variety of vertebrate species (Table 1). The tinamou and agouti were indicated as the most hunted species in terms of numbers per month. The mean number of animals hunted per month per rubber tapper family is 4.72 (SD = 10.40; N = 34) for the former species and 3.92 (SD = 3.20; N = 37) for the latter species. Agoutis can provide more monthly mean weight (6.86 Kg) of fresh edible meat than tinamous (2.27 Kg). The second most hunted species are paca and saki monkeys, with a mean number of 3.38 pacas (SD = 2.92; N = 35) and 2.18 saki monkeys (SD = 7.75; N = 26) hunted per month per family of rubber tapper. The former species can provide approximately a monthly mean weight of 15.21 Kg of fresh edible meat in this category while the later species can provide only 2.57 Kg.

The monthly mean number of animals hunted per rubber tapper family was modest for the following species: naked tailed armadillo ( $\bar{x}$  = 1.88; SD = 2.47; N = 18), nine-banded armadillo ( $\bar{x}$  = 1.73; SD = 1.96; N = 16), squirrel monkey ( $\bar{x}$  = 1.50; SD = 1.85; N = 17), guan ( $\bar{x}$  = 1.40; SD = 1.17; N = 30), coati ( $\bar{x}$  = 1.26; SD = 2.17; N = 26),



spider monkey ( $\bar{x} = 1.25$ ;  $SD = 1.06$ ;  $N = 14$ ), howler monkey ( $\bar{x} = 1.24$ ;  $SD = 1.33$ ;  $N = 28$ ), Brazilian porcupine ( $\bar{x} = 1.12$ ;  $SD = 2.54$ ;  $N = 23$ ). Table 1 shows the species that provide the greatest monthly mean weight of fresh edible meat in this category: spider monkeys with 6.06 Kg, and howler monkeys with 4.65 Kg.

The monthly mean number of animals hunted per family of rubber tapper, were reduced for the following species: macaws ( $\bar{x} = 0.98$ ;  $SD = 2.15$ ;  $N = 13$ ), night monkeys ( $\bar{x} = 0.97$ ;  $SD = 0.96$ ;  $N = 17$ ), tortoises ( $\bar{x} = 0.91$ ;  $SD = 0.91$ ;  $N = 33$ ), deer ( $\bar{x} = 0.91$ ;  $SD = 1.12$ ;  $N = 36$ ), collared peccarys ( $\bar{x} = 0.81$ ;  $SD = 1.48$ ;  $N = 30$ ), capuchin monkeys ( $\bar{x} = 0.80$ ;  $SD = 1.15$ ;  $N = 12$ ), caimans ( $\bar{x} = 0.77$ ;  $SD = 1.04$ ;  $N = 14$ ), opossums ( $\bar{x} = 0.68$ ;  $SD = 0.74$ ;  $N = 21$ ). Table 1 shows the species that provide the greater monthly mean weight of fresh meat in this category: deer with 13.42 Kg.

We estimate that the total monthly mean weight of fresh edible meat available per rubber tapper family is 82.82 kg, which will give approximately 276 gr day/person.

Table 2 shows the percentage of the interviewed Tejo River Basin rubber tappers that hunt each game species. Agoutis, pacas and deers were indicated by more than 90% of the interviewed rubber tappers. The second group of species indicated by more than 80% of the interviewed rubber tappers were tinamous, tortoises and collared peccarys. The third group of species indicated by more than 70% of the interviewed rubber tappers were guans and howler monkeys.

Table 1. Mean number of game animals hunted per month per rubber tapper family, half of the mean weight of each species (or species group) and the monthly fresh game meat available per rubber tapper family (approximately 10 persons per family).

Common Name of Game	Monthly Mean Game Hunted	Mean Weight (Kg)/2	Monthly Mean Available (Kg)
Tinamous	4.72	0.48*	2.27
Agouti	3.92	1.75	6.86
Paca	3.38	4.50	15.21
Saki Monkey	2.18	1.18	2.57
Naked-Tailed Armadillo	1.88	1.60	3.01
Nine-Banded Armadillo	1.73	2.25	3.89
Squirrel Monkey	1.50	0.50	0.75
Guan	1.40	0.43*	0.60
Coati	1.26	2.55	3.21
Spider Monkey	1.25	4.85	6.06
Howler Monkey	1.24	3.75	4.65
Porcupine	1.12	2.10	2.35
Macaw	0.98	0.56*	0.55
Night Monkey	0.97	0.50	0.49
Tortoise	0.91	2.00*	1.82
Deer	0.91	14.75	13.42
Collared Peccary	0.81	11.75	9.52
Capuchin Monkey	0.80	1.75	1.40
Caiman	0.77	5.00*	3.85
Opossum	0.68	0.50	0.34
		<b>TOTAL</b>	<b>82.82</b>

Note: Mean body weights follows Emmons (1990). Other values (\*) were given by J.C. Guix (pers. comm.).

Table 2. Percentage of Tejo River Basin rubber tappers that hunt each game species or species group.

Common Name of Game	Percentage of Rubber Tappers
Tinamous	83.64 %
Agouti	96.36 %
Paca	90.91 %
Saki Monkey	58.18 %
Naked-Tailed Armadillo	41.82 %
Nine-Banded Armadillo	38.18 %
Squirrel Monkey	56.36 %
Guan	78.18 %
Coati	69.09 %
Spider Monkey	47.27 %
Howler Monkey	70.91 %
Porcupine	41.82 %
Macaw	45.45 %
Night Monkey	47.27 %
Tortoise	83.64 %
Deer	90.91 %
Collared Peccary	81.82 %
Capuchin Monkey	52.73 %
Caiman	43.64 %
Opossum	41.82 %



## DISCUSSION

Apparently, Tejo River Basin rubber tappers do hunt more frequently certain game species (Table 1). This is probably due to a combination of factors that we did not address in this study, such as the difficulty to capture an animal, species low abundance, species not palatable, etc. For example, tamarins were often seen but not hunted. Other species (wild cats, anteaters, tree-sloths) were occasionally seen, but never hunted. In this study, some game species indicated by rubber tappers as frequently seen species such as tinamous and pacas were among the most frequently killed species.

These species are often long lived, slow breeders with reduced productivity. The hunting activity of Tejo River Basin rubber tappers on species with those characteristics is a slow but continuous process which eventually may lead to the depletion of some game populations. This is the case of some large game species such as the tapirs, capybaras, and white lipped-peccarys which were reported mostly as never seen in the area, probably due to overhunting.

The great majority of the interviewed rubber tappers kill wild animals for food consumption. The only exception, opossums, were indicated to attack chickens and that was why they were killed.

Tejo River Basin Rubber tappers hunt in an opportunistic manner. While gathering latex, they often carry a rifle to hunt wild animals that eventually cross their way. Occasionally, they use dogs and traps to capture game species such as agoutis and pacas.

Apparently, meat from wild animals (we did not ask about fishing activities) is the main protein source for rubber tappers in this area. Usually, this contribution varies depending on the ecological characteristics of the area and on the type and size of human settlements. Dourojeanni (1985) summarized literature information on daily ingestion per capita of fresh meat from wild animals in different locations in Brazil and Peru. He concluded that the areas with greatest per capita consumption of fresh meat per day, Pachitea river in Peru (460.0 g) and Tapajós National Forest in Brazil (246.0 g) correspond to areas of low human population density and recent human occupations. On the other hand, areas with the lowest per capita consumption per day, Coco Chato (6.6 g) and Nova Fronteira (25.9 g) in Brazil, correspond to areas occupied for greater lengths of time, where hunting

and other human activities have driven the fauna away. The daily ingestion of fresh meat from wild animals in Tejo River Basin is comparatively high suggesting that the fauna is still abundant and that it has not been severely exploited. However, with the delimitation of extractive reserves in this area, a small scale wildlife management program initiative should start. In this way, rubber tappers may in the future continue to enjoy the benefit of an abundant faunal stock, through implantation of fauna management and conservation methods.

In Brazil, some species of subsistence and commercial importance such as the Amazon turtle Podocnemis expansa (Alho & Padua, 1982a, 1982b, 1982c) and the capybara Hydrochaeris hydrochaeris (Alho, 1986; Lavoretti, 1989; Neto, 1989) have been extensively studied for wildlife management purposes. Other species, such as pacas, agoutis, peccarys, tapirs, armadillos and deers (Nogueira-Neto, 1973; Deutsch & Puglia, 1988) have been studied for captivity raising. Thus, there is undoubtedly sufficient information from research initiatives to start a small scale wildlife management program in the region.

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## REFERENCES

- Alho, C.J.R. & Pádua, L.F.M. 1982a. Reproductive parameters and nesting behavior of the Amazon turtle Podocnemis expansa (Testudinata: Pelomedusidae) in Brazil. Can. J. Zool. 60 (1): 97-103.
- Alho, C.J.R. & Pádua, L.F.M. 1982b. Sincronia entre o regime de vazante do rio e comportamento de nidificação de Podocnemis expansa (Testudinata: Pelomedusidae). Acta Amaz. 12: 323-326.
- Alho, C.J.R. & Pádua, L.F.M. 1982c. Early growth of pen-reared Amazon turtle Podocnemis expansa. R. Bras. Biol. 42: 641-646.
- Alho, C.J.R. 1986. Criação e manejo de capivaras em pequenas propriedades rurais. Dep. de Difusão de Tecnologia, Brasília, DF-EMBRAPA. 33p.
- Almeida, M.B. de (in press). Seringais e trabalho na amazônia o caso do Alto Juruá. Anuário Antropológico. Universidade de Brasília .
- Brasil. Projeto RADAMBRASIL. Rio Breu. Folha SC 18 X-D. Rio de Janeiro, DNPM. 1977. Esc. 1:250.000.
- Deutsch, L.A. & Puglia, L.R.R. 1988. Os Animais Silvestres: Proteção, Doenças e Manejo. Publicações Globo Rural, Rio de Janeiro.
- Dourojeanni, M.J. 1985. Over-exploited and under-used animals in the amazon region. In Amazonia. pp. 419-433. (Eds. G.T. Prance and T.E. Lovejoy). Pergamon Press, New York.
- Dunning, J.S. 1982. South American Land Birds. Newton square: Harrowood Press.
- Emmons, L.H. 1990. Neotropical Rainforest Mammals: A Field Guide. The University of Chicago Press, Chicago.
- Fearnside, F.M. 1989. Extractive reserves in Brazilian Amazonia: an opportunity to maintain tropical rain forest under sustainable use. BioScience 39 (6): 387-393.
- Lavorenti, A. 1989. Domestication and potential for genetic improvement of capybara. Revista Brasileira de Genética, 12(3): 137-44.
- Miranda, E.E. de, Batistella, M., Coutinho, A.C., Dorado, A.J. (in press). Estruturação de uma base de dados informatizados sobre recursos naturais para o estado do Acre, apoiada em sistema de informações geográficas.



- Neto, P.B.S. 1989. Alimentação e manejo de capivaras *Hydrochoerus hydrochaeris* L. 1766) em cativeiro. Universidade de São Paulo. Tese de mestrado.
- Nogueira-Neto, P. 1973. A Criação de Animais Indígenas Vertebrados. Tecnapis, São Paulo.
- Ojasti, J. 1986. Wildlife management in Neotropical moist forests: Overviews and prospects. Pp. 96-115. In Wildlife management in Neotropical moist forest. Conseil International de la Chasse et la Conservation du Gibier & Fondation Internationale pour la Sauvegarde du Gibier (Synposium International, Manaus, Brasil). Paris, France.
- Schwartzman, S., Alegretti, M.H. 1987. Extractive production in the amazon and the rubber tapper's movement. In The Social Dynamics of Deforestation: Processes and Alternatives (S. Hecht and J. Nations, eds.). Cornell University Press, Ithaca.
- Schwartzman, S. 1989. Extractive reserves: the rubber tappers' strategy for sustainable use of the amazon rain forest. In Fragile Lands of Latin America: Strategies for Sustainable Management (J. Browder, ed.). Westview Press.
- Sick, H. 1985. Ornitologia Brasileira, uma Introdução. Vol. I. Editora Universidade de Brasília, Brasília, D.F..
- Walker, E.P. 1975. Mammals of the World. Vol. I and II. The Johns Hopkins University Press, Baltimore and London.