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USES AND TABOOS OF TURTLES AND TORTOISES ALONG RIO NEGRO, AMAZON BASIN

Juarez C. B. Pezzuti, Jackson Pantoja Lima, Daniely Félix da Silva and Alpina Begossi

Chelonians (turtles and tortoises) of the Amazon Basin have constituted a source of food for native populations since pre-Columbian times and have continued to be an important product for subsistence and cash income. Little is known about current levels of exploitation and pressure on natural stocks, despite observations of declining populations of the larger and most valued species. This study investigates how people living in the Negro River area use Amazonian chelonians, including issues of consumption, preferences, restrictions, segmentary taboos, harmfulness, medicinal use, and sale. We conducted interviews with fishing families in the city of Barcelos and in Jaú National Park, both located in the Rio Negro basin, in the state of Amazonas, Brazil. All chelonian species are used by these riverine people, especially for food. Peltocephalus dumerilianus *is caught year round, whereas the capture of other species is more frequent during the dry season. Terrestrial species are collected whenever found in the forest. Herbivorous species are preferred as food; omnivorous or carnivorous species are subject to food taboos. Two species are largely used as medicines, mainly to treat swelling and hemorrhages. Fat and epidermal scutes (scales) are widely used. At least four species are exploited commercially.*

Key words: *Ethnobiology, food taboos, chelonians, Amazon, Brazil*

*Os quelônios da bacia amazônica constituem um ítem alimentar desde antes da chegada do colonizador europeu, e um importante produto regional para subsistência e comercialização, desde o período colonial até os dias de hoje. Todavia, muito pouco se sabe a respeito dos níveis de exploração e pressão sobre os estoques naturais, embora o declínio populacional das espécies mais apreciadas seja evidente. Este estudo investiga as formas de uso dos quelônios amazônicos pela população ribeirinha do Rio Negro, incluindo consumo, preferências, restrições, tabus segmentares, periculosidade, uso medicinal e comercialização. Realizamos entrevistas com famílias de pescadores na cidade de Barcelos e no Parque Nacional do Jaú, ambos situados na bacia do Rio Negro, Estado do Amazonas, Brasil. Todas as espécies são utilizadas pelos habitantes, acima de tudo para consumo. Uma delas (*Peltocephalus dumerilianus*) é capturada durante o ano inteiro, enquanto que outras o são na estação seca. As espécies terrestres são coletadas ocasionalmente quando encontradas na floresta. As espécies herbívoras são as preferidas, sendo que as omnívoras/carnívoras estão sujeitas a tabus. Duas espécies são largamente usadas como zooterápico, principalmente contra inchaços e hemorragias. A gordura e os escudos epidérmicos são predominantemente usados. Pelo menos quatro espécies são comercializadas.*

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Introduction

Food taboos play a key role in human adaptive systems of the neotropics because, according to many researchers, protein acquisition is the main factor influencing or limiting human population distributions in Amazonia (Carneiro 1983; Lathrap 1968). McDonald (1977), Reichel-Dolmatoff (1976), and Balée (1985) have documented cases in which food taboos are concrete cultural rules that reduce hunting pressure on important game species. Balée also showed how this behavior improves prey availability near Ka'apor settlements in northeastern Amazonia. Basso (1972, 1973) reported that for the Kalapalo and other Upper Xingu indigenous societies in Mato Grosso State, central Brazil, almost all terrestrial game species are considered inedible.

Hill et al. (1987) pointed out that maximization of energy or protein acquisition is not enough to explain human foraging behavior. Thus, there are other aspects besides caloric gain that should be included in foraging models to make them more realistic. Begossi and Richerson (1992) analyzed the acquisition, consumption, and sale of fish on Búzios Island in southeastern Brazil using optimal foraging theory. This study showed that peoples' food choices not only reflected a concern for energetic returns, but also took into account variables such as individual preferences, fish boniness, market value, and availability. All of these factors determined if a fish species was consumed or sold.

In the Amazon basin, aquatic turtles have always been an important food item for the local inhabitants. The giant Amazon river turtle, *Podocnemis expansa* (***tartaruga***), originally one of the most abundant species, was often consumed. It was kept in wooden corrals in Indian villages, to be eaten during the wet season when river turtles and fishes were less available (Redford and Robinson 1991). Turtle eggs were, and still are in some places, an important source of protein for the local population. Gilmore (1986) suggests that the collection of this turtle species was the most important ethnozoological activity in the entire Amazon extending from early settlement of the basin through the present.

After the arrival of European colonists, this subsistence activity was transformed into a typical merchant capitalist production system. The main product in the new system was turtle egg oil, which was used for frying food and as fuel for lighting homes and streets. Turtle meat, however, remained important only for local consumption, supplying regional market (Bates 1892; Silva Coutinho 1868). At the beginning of the 20th century, turtle oil was no longer a commercial product, but eating adult turtles remains important, constituting a significant food resource for riverine peoples even now. As in the past, Amazon river turtles are still being captured, consumed, and sold in local markets (Johns 1987; Rebêlo and Lugli 1996; Vogt 2001). The consumption of aquatic turtles in the Negro River Basin can be explained by several factors including food preferences, taboos, medicinal uses, and market values (Rebêlo and Pezzuti 2001) and represent a significant source food, ranging from 7% in the wet season to more than 20% of the meals recorded in the dry season (Pezzuti et al. 2004). This study explores how these factors relate to use of the different chelonian species available in the Negro River.

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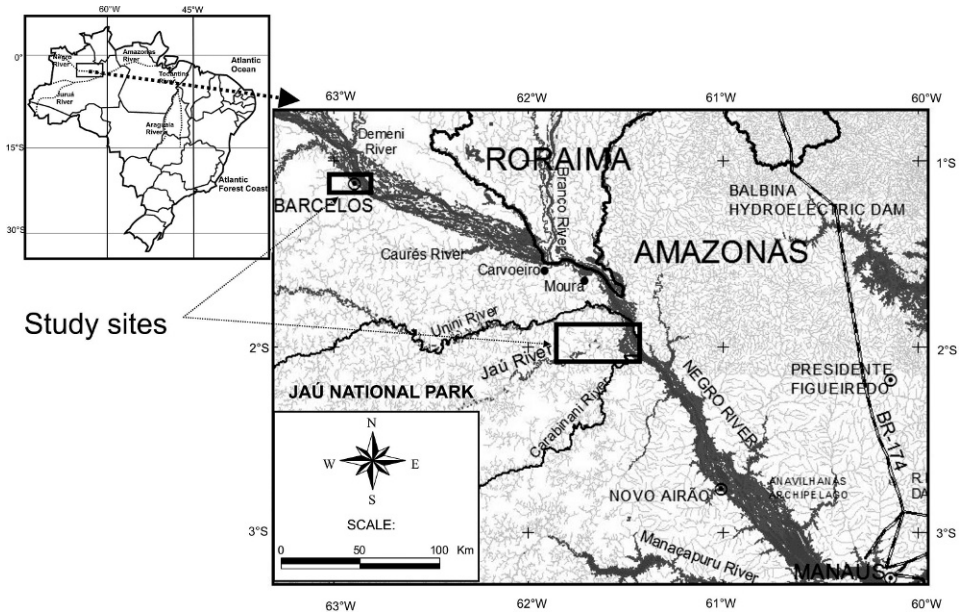


FIGURE 1. Study area in the Negro River Basin.

Study Area

Along the Negro River and its major tributaries, such as the Jaú River (Figure 1), the floodplain is inundated by black water (rich in the humic acids responsible for its dark, tea-like color) in the rainy season, extending from December to June. The floodplain is composed of a complex system of channels and lakes of all sizes and shapes, which are often difficult to distinguish from the main river channel, especially during the wet season. This complex ecosystem is highly dynamic due to seasonal variation in water level. Aquatic fauna are adapted to the annual cycle of rising and falling waters, which provide variation in habitat availability over the course of the year. Of special importance for turtles during the low water season is the availability of suitable sites for nesting and reproduction such as sandy and muddy beaches, or other dried and open habitats (Ayres 1995; Goulding 1990). We studied the use of chelonians in two areas along the Negro River: communities in the Jau National Park and neighborhoods in Barcelos, a city located on the river. In both places, river turtle consumption and trade have been a constant source of conflicts between people and Brazilian environmental authorities, since any use of wild animals in Brazil is forbidden by law since 1967. This study is part of a long-term investigation of turtles and their (illegal) use by Rio Negro families (Pezzuti et al. 2004; Rebêlo and Lugli 1996; Rebêlo and Pezzuti 2001; Rebêlo et al. 2006).

Created in 1980, Jaú is the second largest national park (25,350 km^2) in Brazil. Inhabited for centuries, the park is home to small settlements dispersed along the margins of the river. The park shelters at least eight species of aquatic chelonians, three of which are important as food sources (Rebêlo and Lugli 1996). One of the

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goals of the management plan for Jaú National Park is to involve the residents in determining the sustainability of faunal resource use.

Founded in 1728 as a Carmelite mission, the city of Barcelos was the capital of the state of Amazonas from 1758 to 1791 and from 1798 to 1803. It is the largest municipality in Amazonas State, and its population of 16,107 inhabitants (Prang 2001) descends from different indigenous ethnic groups, first Portuguese and later, northeastern Brazilian immigrants involved in rubber extraction (Machado 2001). The local economy is strongly linked to extractive activities such as ornamental fisheries (***piabas***), subsistence fishing, hunting, and fruit collection, especially from palm trees. Five species of podocnemidid turtles (*Podocnemis expansa*, *P. unifilis*, *P. erythrocephala*, *P. sextuberculata* and *Peltocephalus dumerilianus*) are used for food and trade. Two of them (*P. expansa* and *P. unifilis*) are generally bought to resell in the capital Manaus, but the other three are sold and consumed locally (Rebêlo and Pezzuti 2001).

Methodology

Fieldwork consisted of 13 trips to Jaú River between 2000 and 2002, and three trips to Barcelos in 2001 and 2002. Each trip lasted from one to three weeks during which time data were collected on turtle population biology and harvesting. In Jaú National Park, research was conducted among 32 families in the following communities: Boca do Jaú, Carabinani, Ataíde, Seringalzinho, Vista Alegre, Cachoeirinha, Cachoeira, Patauá, Miratucu and Capoeira Grande. On the Unini River, the northern boundary of the park, we visited a medium-sized community called Floresta in April 2000 where we interviewed 15 families. In the city of Barcelos, we interviewed individuals from 36 families from the neighborhood of Nazaré, which is largely inhabited by fishermen and their families, and we also interviewed fishermen from the neighborhoods of Aparecida, Santo Antônio, São Lázaro, Gruta, and in the municipal market.

At each house, we usually conducted more than one interview, though on different occasions and with one individual at a time. Our sample included all the fishermen of the household (adult men and children), and their wives if they were married. In addition, we interviewed some women who also fish for turtles. The first step in each interview was to ask about the chelonian species known in the area, without the aid of animal pictures or drawings. Later, we used questionnaires to characterize the different uses and restrictions concerning the species cited during the first interviews. Following the definitions of Basso (1978) and Colding (1998), we categorized ''avoided'' species as those not used under any circumstances, and ''tabooed'' as those not eaten under certain conditions. Species that even ill or convalescent people could eat were considered ''clean.'' A total of 61 interviews were conducted in Jaú (including Unini River) and 41 in Barcelos.

Results

Our informants mentioned ten vernacular names for chelonians (Table 1). Eleven chelonian species from three families are recorded in the area, and seven

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TABLE 1. Chelonian species known by interviewees from Jaú and Barcelos.

Species	Local Name	Number of Jaú Informants N=61	%	Number of Barcelos Informants N=41	%	Common Use (Mentioned by over 50% of Interviewees)
PODOCNEMIDIDAE						
Podoenemis unifilis	***Tracajá***	57	93.3	37	92.5	Food
Podocnemis expansa	***Tartaruga***	50	82.0	38	95.0	Food
Podocnemis erythrocephala	***Irapuca***	54	88.5	37	92.5	Food
Podocnemis sextuberculata	***Iaçá***	36	59.0	25	62.5	Food
Peltocephalus dumerilianus	***Cabeçudo***	61	100.0	40	100.0	Food
CHELIDAE						
Mesoclemmys raniceps and *Rhinemys rufipes*	***Lalá***	50	82.0	33	82.5	Tabooed food
Platemys platicephala	***Perema***	48	78.7	31	77.5	
Chelus fimbriatus	***Matamatá***	50	82.0	34	85.0	Medicine
TESTUDINIDAE						
Chelonoidis carbonaria and *Chelonoidis denticulata*	***Jaboti***	50	82.0	37	92.5	Food and medicine
KINOSTERNIDAE						
Kinosternon scorpioides[1]	***Peito-de-mola***	20	36.8	1	2.5	

[1] not yet registered

of these have a unique vernacular name. Two species (*Mesoclemmys raniceps* and *Rhinemys rufipes*) were included in the aquatic ***lalá*** group and two (*Chelonoidis carbonaria* and *C. denticulata*) in the terrestrial ***jaboti*** group. When the informants were asked about the existence of ''more than a ***jaboti*** quality'' (a procedure frequently adopted when interviewing experienced fishermen), they often referred to an exceptionally large animal (more than 20 kg), known as ***jaboti-açu***, probably a huge individual of *G. denticulata*.

The only species identified by our informants that is not recorded for the Jaú National Park is the ***peito-de-mola***. Informants describe the presence of a kinesis (an articulation between chest and abdominal shell bones) in the plastron as typical of ***peito-de-mola***, which means ''chest-of-spring.'' Their description fits a type of mud turtle, *Kinosternon scorpioides*, which rubber-tappers reported seeing many years ago in the Upper Jaú. So we believe this species still lives there. In Barcelos, even experienced fishermen do not know *K. scorpioides*. The only informant who mentioned observing this species is a fisherman from the Upper Amazonas River (Solimões) hundreds of kilometers before its confluence with the Rio Negro, who saw the animal in that area. In addition, Fachin-Terán (1999) captured an individual of *K. scorpioides* at Mamirauá (Amazonas State) in 1997. Our informants' knowledge of this small species of aquatic turtle whose distribution in the area has not been recorded by biologists demonstrates some fishermen's deep and detailed knowledge of the environment. This species is commonly found in the estuarine habitats near the mouth of the Amazon River, where it is locally known as ***muçuã*** (in Pará State) or ***jurará*** (in Maranhão State), and rarely exploited there. Indeed, the species can be considered rare in central Amazon, with few reported sightings (Pritchard and Trebbau 1984).

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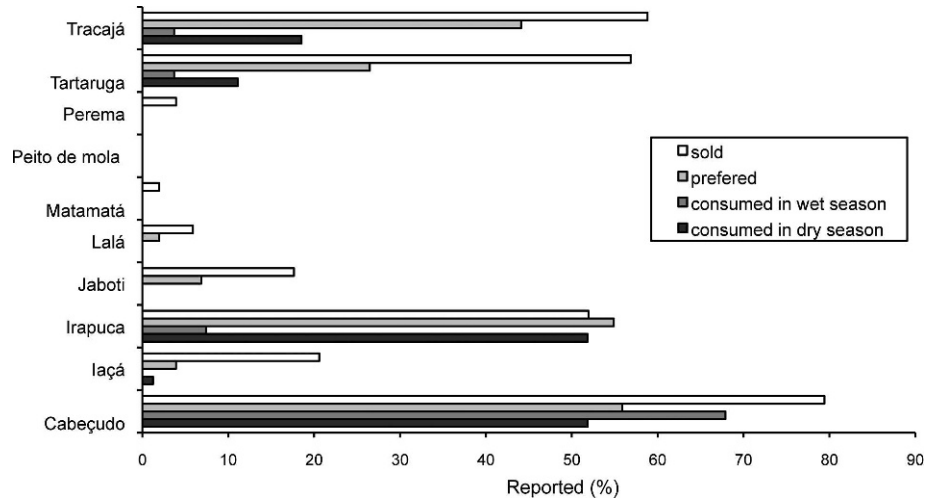


FIGURE 2. Percentage of interviewees from Barcelos and Jaú who mention the consumption, preference for, and sale of each of ten chelonian types (n=81 for interviews for consumed types, n=102 for preferred and sold types).

Consumption, Preference, and Trade

All chelonian species mentioned by the informants are used for food, except the ***peito-de-mola***. The ***cabeçudo*** (*Peltocephalus dumerilianus*) is by far the most important food species because it is caught and eaten year round; ***irapuca*** (*Podocnemis erythrocephala*), also a favorite in spite of its small size, is consumed seasonally. The other species mentioned as favorites for food are ***tracajá*** (*Podocnemis unifilis*) and ***tartaruga*** (*Podocnemis expansa*). The ***iaçá*** (*Podocnemis sextuberculata*) is consumed only in the lower Negro region, downstream from the mouth of Branco River, the largest white water tributary where it is a preferred food and the ***lalá*** (*Mesoclemmys raniceps*), and the ***peito-de-mola*** are rarely found or consumed. ***Jabotis*** are appreciated as food and easily sold, but they were not frequently mentioned for consumption. One plausible explanation is that they are solitary terrestrial animals and are only captured when they are found in the forest. Game mammals are more important than turtles and tortoises in the Jaú inhabitants' diet, and the consumption of ***jaboti*** is rare (Pezzuti et al. 2004).

Our results clearly indicate that with the exception of the ***cabeçudo***, the only species consumed as frequently in the dry as in the rainy season, chelonians constitute a seasonally available resource (Figure 2). Fishermen tend to prefer the ***irapuca*** during periods of low water. The ***tartaruga*** and the ***tracajá*** are also desired due to their higher market values; however, their consumption is low and restricted to the dry season.

Adult females of smaller species, such as ***irapucas*** and ***tracajás*** are also sold by Jaú River inhabitants, usually to residents of communities outside Jaú National Park near the mouth of the river. The preference for females may relate to their relative size and quality of their meat. Within pelomedusids there is an accentuated sexual dimorphism, the female being larger (Pritchard and Trebbau 1984). Furthermore, the meat of females is considered softer and, in the case of

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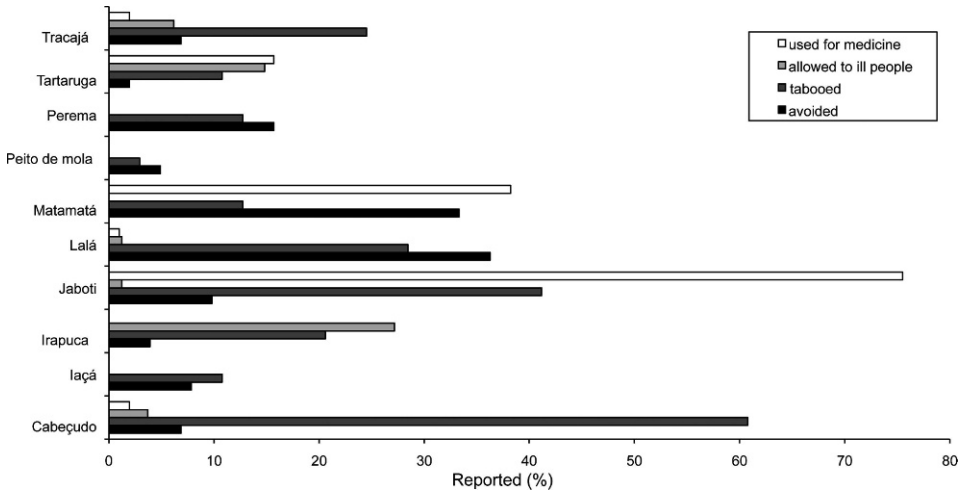


FIGURE 3. Percentage of interviewees from Barcelos and Jaú who mention if the chelonian types were avoided, tabooed, used for medicine, and allowed for ill people (n=102 for interviews for avoided, tabooed and medicinal types, n=81 for types allowed for ill people).

breeding ovigerous females, the eggs can also be consumed. ***Cabeçudos*** are an exception with males tending to be larger. Despite being the second largest aquatic turtle species in the Amazon Basin, its market value is always lower than that of the ***tracajá***, because ***cabeçudos*** are considered dangerous and aggressive (''it is a ferocious animal'') and feeds on dead animals. However, the ***cabeçudo*** is the favorite species among local people and is the most consumed and sold species. This preference, however, is restricted to small communities and families located in the Negro margins and differs from that of larger cities like Manaus and other great chelonian consuming markets in the State of Amazonas where ***tracajás*** and ***tartarugas*** are preferred (Rebêlo and Pezzuti 2001).

Some chelonians are used as medicines, in particular ***jaboti***, ***matamatá***, and ***tartaruga***. The ***jaboti*** was mentioned as having medicinal uses by more than 70% of interviewees (Figure 3). Interviewees mentioned especially the use of fat and epidermal carapace scutes of the ***jaboti*** for medicinal purposes (Figure 4). One household had a small amount of ***jaboti*** oil (fat), stored in a small flask. It is used for rheumatism, swellings, toothache and other inflammations, hematomas, and hemorrhages. Indeed, hemorrhage and swelling were the most frequently mentioned illnesses that could be healed using chelonian tissues (Figure 5).

Similar medicinal uses for chelid turtle tissues have been recorded in other parts of Brazil (Costa-Neto and Marques 2000; Marques 1995). Marine turtles are also considered of high zootherapeutic importance along the Brazilian Atlantic coast (Costa-Neto and Marques 2000). The fat is the main body tissue used from most of the animals mentioned on Ilha Grande (Seixas and Begossi 2001) and on Búzios Island (Begossi 1992). It is usually used to treat respiratory diseases, thorns in the skin, injuries and rheumatism. The use of animals as medicine could be related to the ease with which useful parts of the animal can be stored for long periods because fat is easily extracted and conserved at daytime temperatures.

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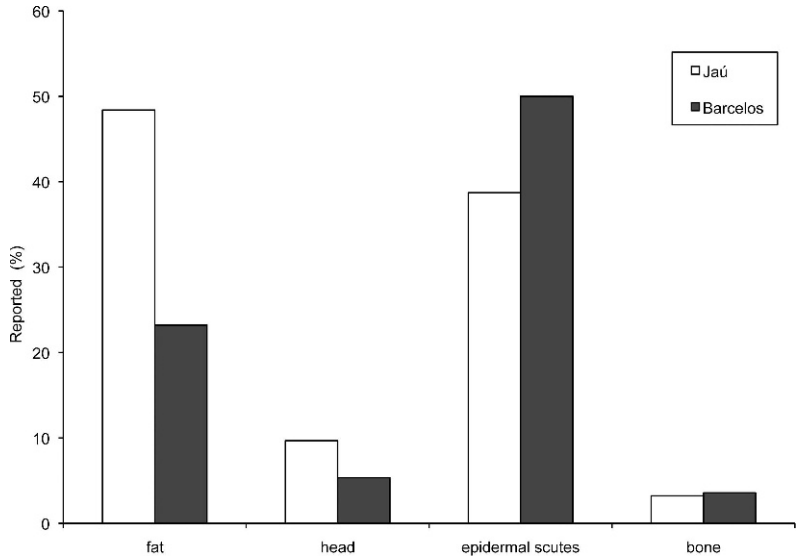


FIGURE 4. Percentage of interviewees from Barcelos and Jaú who mention the medicinal use of chelonian body parts and tissues (n=62 for Jaú and n=46 for Barcelos).

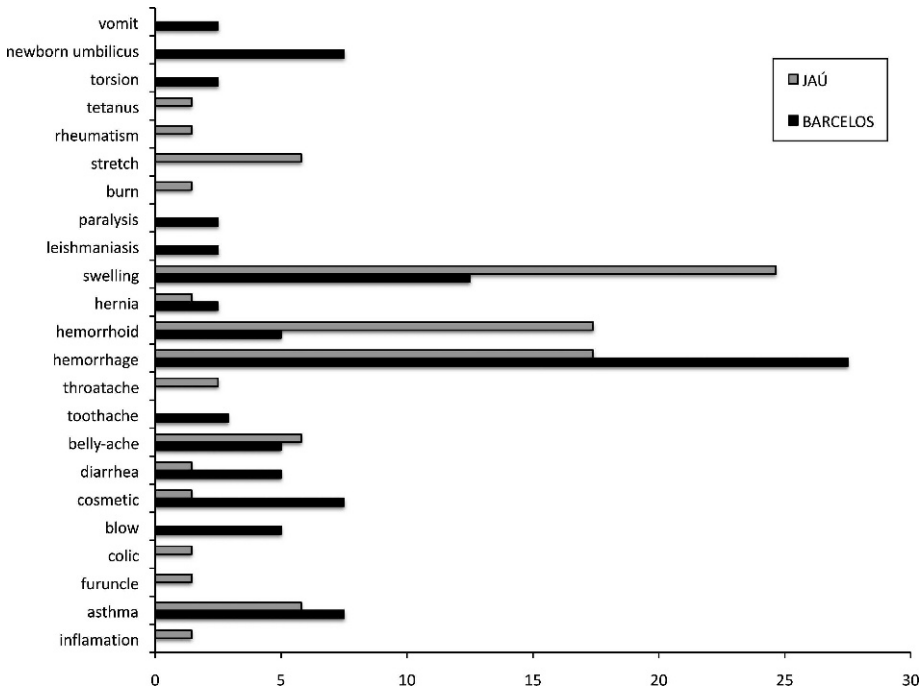


FIGURE 5. Percentage of interviewees who mention the diseases, wounds and infections mentioned as cured or treated using chelonian tissues by interviewees from Jaú and Barcelos, Negro River basin, Amazonas, Brazil (n=60 for Jaú and n=40 for Barcelos).

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TABLE 2. Average prices for chelonians paid by consumers within Jaú National Park, Amazonas State, Brazil.

Species	Price in US Dollars
Podocnemis unifilis	Females: $6.00 Males: $1.00–$3.00
Podocnemis expansa	Females: $40.00 Males: no information
Podocnemis erythrocephala	Females: $2.50–$3.00
Podocnemis sextuberculata	Females: $1.00
Peltocephalus dumerilianus	$2.00–$6.00
Chelonoidis carbonaria	No information
Chelonoidis denticulada	No information
Chelus fimbriatus	$17.00

Trade in chelonians can be lucrative. The market prices of the species studied here can reach the equivalent of $40 US dollars (Table 2). Some inhabitants of Jaú mentioned that merchants take small boats (locally called ***batelões***) upstream, selling urban goods to local inhabitants, and buying local products such as cassava flour, lianas, Brazil nuts, bananas, ***copaíba***, salted ***pirarucu*** (*Araipama gigas*, Osteoglossidae), salted game meat and living chelonians. The merchants pay half the price that they would in Novo Airão, a small city located between the Jaú River and Manaus (Figure 1). Shipping turtles downstream to Manaus generates the highest profits (Rebêlo and Lugli 1996).

On the Negro River, operators of large ferries (***recreios***) carry out commerce on a larger scale, illegally carrying hundreds of animals to Manaus for resale at a great profit. Fishermen from Barcelos and other small cities and communities sell ***tartarugas*** and ***tracajás*** to the ferry operators who, for example, can buy a large adult ***tartaruga*** weighing 50 kg or more for up to US $40, and then resell it in Manaus for up to US $200. The Brazilian authority responsible for suppressing the illegal trade in chelonians, the Instituto Brasileiro de Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA), periodically makes large seizures, and levies large fines on ferryboat owners for each animal found on board (about US $200). These measures, however, have no significant impact on the illegal trade of chelonians on Negro River or along the other major Amazon tributaries (Rebêlo and Pezzuti 2001; Vogt 2001).

Avoided and Tabooed Species

In the Amazon, food taboos seem to be cultural responses to defined illnesses. Segmentary food restrictions (called ***resguardos***) are well defined for specific situations, such as illness and injury. The restricted plants and animals are referred to as ***reimoso***, a term that covers a series of attributes such as strong and fatty meat, capable of causing inflammation in sick or injured people (Begossi and Braga 1992; Begossi et al. 2004; Morán 1974). Organisms labeled ***reimosa*** are subject to taboo. While the general ***reima*** concept, in its emic sense, was studied by Maués and Motta-Maués (1977), the inhabitants of the Jaú National Park define ***reimosa*** as any food that could be ''offensive'' for one who eats it (Table 3). Morán (1974) and Smith (1981) observed taboos against ***reimoso*** food among riverine Amazonian populations during illness, injuries, burns, pregnancy, nursing and menstruation.

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TABLE 3. Explanations given by the Jaú and Barcelos inhabitants for considering a taxon ***reimoso***.

Local Name	Place	Explanations Given by the Interviewees
Cabeçudo	Jaú	Male flesh provokes inflammation. Males cannot be eaten. A lot of people don't like it. Mainly the male's flesh is ***reimoso***. Eggs only eaten if they are cooked; they cause tumor. ***Reimoso***; the flesh burns our blood if eaten. Considered ***reimoso*** to protect (women). Only eat the female. Some woman eat it, others do not.
	Barcelos	I believe it is ***reimoso***; it eats everything, even snakes. It is almost all nibbled; it has to be well cooked. ***Tartaruga*** only eats fruit; ***cabeçudo*** eats everything. ***Cabeçudo*** meat burns the blood.
Iaçá	Jaú	It is ***pitiú*** (smells like urine).
Irapuca	Jaú	The male's flesh is not allowed.
Jaboti	Jaú	It is the most offensive. It is ***reimoso*** because of its feeding habits. Male and female are ***reimosos***. Only ***tracajá*** are allowed, even for children with growing teeth.
	Barcelos	Scratches; the eggs are also ***reimosos***. It is ***reimoso*** for wounded people. Jaboti for God sake!
Lala	Jaú	Eating it provokes itchiness and allergy; my son cannot eat it. It is harmful for the stomach. It is not allowed to anyone. Eggs provoke allergy. People who are allergic cannot eat it.
	Barcelos	It is from the same family as the ***cabeçudo***; it is the same food. My son cannot eat it because it provokes itchiness.
Perema	Barcelos	Its bite is poisonous.
Matamatá	Jaú	It is very horrible; I don't touch or eat it.
Tartaruga	Jaú	Males are not allowed.
Tracajá	Jaú	Females without eggs can be eaten without fear. The male is ***reimoso***.
	Barcelos	The ***tracajá*** is the worst. It causes scratches; it is bad.
Males	Jaú	Males of all types are ***reimosos***. The female are not ***reimosas***.
	Barcelos	The male's flesh is offensive, but the female's is not.
All	Barcelos	All chelonians are ***reimosos***. Everyone scratches; the animal that scratches is ***reimoso***.

Although many of these turtles and tortoises are eaten locally and sold in markets, none of them was totally free from dietary restrictions or taboos (Figure 3). On the one hand, the informants generally considered chelonian meat heavy and strong, labeling it ***reimoso***. Therefore the meat is subject to restrictions. On the other hand, chelonian meat is highly valued by fishermen, and no informant denied consuming it. The ***irapuca*** is the only species most informants claim is completely safe, without any dangerous component.

The ***cabeçudo***, besides being the preferred and most consumed turtle, also has the most taboos (Figure 3). Restrictions apply mainly to the sick or wounded,

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and women during menstruation and after childbirth. Interviewees considered the ***cabeçudo*** males more dangerous, ''offensive'' and ***reimosos***, than females. Twenty percent mentioned that females of ***irapuca***, ***cabeçudo*** and ***tracajá*** are not ***reimosas***. Thirty percent said that no chelonians should be consumed by people who are sick, injured or during menstruation and after childbirth as cited above (n=101).

There are a variety of reasons why eating these turtles and tortoises might be avoided or tabooed. The meat of the ***lalá***, besides being highly ''offensive'' and ***reimosa***, is capable of causing allergic reactions, a fact that is sharply noticed. ''It causes allergy in us and itchiness over the whole body and in the throat, and a red swollen patch on the neck.'' The ***matámatá*** is considered ''ugly,'' ''horrible,'' and ''disgusting'', so restrictions on eating it seem mainly related to its repugnant appearance (Table 3). Some informants state an aversion just to seeing the animal. ''It is ugly, causes fear, its head and neck seem like a snake.'' Those reactions to the ***matamatá*** and ***lalá*** suggest the existence of a different cultural aspect in the restriction of these species and, thus, a way of reinforcing a food taboo, so as to avoid temptation, as suggested by Harris (1977).

Discussion

Social restrictions, such as taboos, can provide protection for ecological communities, habitat patches, and populations of endangered species. Colding and Folke (1997) analyzed the role of taboos in protecting species listed as threatened by the World Conservation Union (IUCN 2001) and also for endemic and keystone species (species playing a fundamental role in the structure, dynamics and stability of an ecosystem). About 30% of the identified taboos forbid any use of a particular species. The authors suggest that several specific taboos are protecting threatened species effectively even though not intentionally and may be significant in ecological terms. Anthropological studies have shown the existence of complex ecological adaptations behind taboos (Begossi 1997; Harris 1977, 1985; Rappaport 1971). In a study of the effects of alimentary taboos in hunting, McDonald (1977) verified that food taboos have an impact on animal populations, and that impact is one of conservation. Food taboos can significantly reduce the intensity of resource utilization and are more frequent and stronger among tropical forest human groups' uses of large animals, which are among those most in need of conservation (Colding and Folke 1997). For example, Balée (1985) observed ritual tortoise hunting among the Ka'apor Indians of northern Brazil. Menstruating Ka'apor women, pubescent girls, and parents of newborns cannot eat meat of any kind except from the tortoise *C. denticulata*. As a consequence, the impact of hunting pressure on the main game species near Ka'apor settlements is restricted and productivity is unusually high.

The adaptive value and usefulness of food restrictions, or taboos, among Amazonian peoples have been studied. Several tabooed species are used as medicines. Begossi and Braga (1992) found a significant correlation between species subject to restrictions and those used for medicine in fishing communities of the Tocantins River. Begossi (1992) observed that the most important medicinal species on Buzios Island, the lizard *Tupinambis merianae*, was

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systematically avoided as a food. In this case, the taboo can mean protection and may be a way to assure the species' availability for future medicinal needs.

At Jaú, we observed the maintenance of live ***jabotis*** in small fenced enclosures at many houses. A ***jaboti*** of medium size (about 7 kg) can furnish a reasonable quantity of oil, which is easily kept in a small flask or an empty medicine bottle. The oil is easily obtained and widely used. Thus, there is no need to avoid consumption of this species to guarantee its availability for future use as a medicine. Nevertheless, its meat is considered ***reimosa*** and there is a specific taboo against its consumption in several situations (puerperium, menstruation, diseases, wounds, inflammations). Therefore, other factors should be investigated to better understand this food taboo. The ***matamatá*** was also frequently mentioned as source of homemade medicine (Table 3). The most common use is in the preparation of tea made from the skin, which is used against many diseases (Figure 4). Unlike the ***jabotis***, this species is not usually consumed, offering additional support for Begossi's ''drugstore'' hypothesis (Begossi 1992).

We can distinguish a reasonably well-defined pattern, in which the podocnemidids are widely accepted for food and trade, and the chelids are tabooed and used for making of homemade medicines. Chelids, generally tend to have a carnivorous diet, whereas the pelomedusids are essentially herbivorous (Fachin et al. 1996; Pritchard and Trebbau 1984). An exception occurs only with the locally tabooed ***cabeçudo***, which is omnivorous (Perez-Emán and Paolillo 1997) and considered by the Negro riverine inhabitants to be ***reimoso*** because it feeds on any type of meat (Figure 4). Nevertheless, it is the most consumed species in Jaú (Rebêlo and Lugli 1995) and Barcelos (Vogt 2001). It was also the only chelonian species considered to be dangerous and was mentioned by 86.5% of the interviewees as being a ferocious animal. Male individuals of the other species are also capable of inflicting painful bites on the incautious or distracted fisherman. Our interviewees also mentioned that adult female ***tartarugas*** and adult ***lalás*** can cause serious injuries.

Brazilians' avoidance of certain types of fish illustrates of the usefulness of some food taboos. Begossi (1992), studied food avoidance among fishing communities of the southeastern coast of Brazil where interviewees mentioned shape, appearance, bad smell, aggressive behavior, conspicuous teeth, absence of scales, ''strong'' meat (***reimosa***), habit of eating mud and presence of blood in the fish flesh as reasons for not eating certain fish. Most avoided species are carnivorous, and for Amazonian and Atlantic Forest fishes, food taboos were related particularly to piscivorous fish (Begossi et al. 2004). Secondary consumers, especially piscivorous fish, are frequently avoided as food, and primary consumers tend to be recommended during illnesses. The probability of acquiring toxins increases with the trophic level of the species that is being consumed because toxins accumulate in the higher levels (Begossi 1992; Begossi and Braga 1992; Begossi et al. 2004). Ciguatera is a widespread illness caused by the ingestion of fish containing ciguatoxin, which fish acquire by feeding on a toxic dinoflagellate (Lewis 1984). From this perspective, avoiding carnivorous fish can be considered to be adaptive.

Likewise, taboos on the consumption of some turtles elsewhere have adaptive value. All marine turtle species are hunted for their meat, eggs, hide, oil, cartilage, and shell (Carrillo et al. 1999; Cornelius et al. 1991; Frazier 1980; Lagueux 1991; Nietschmann 1972; Parsons 1964). Although all marine turtles

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consume cnidarians and tunicates, *Eretmochelys imbricata* and *Dermochelys coriacea*, are the most often avoided species by fishermen (Pritchard and Trebbau 1984). Pritchard and Trebbau (1984) suggested that the diet of *E. imbricata* makes its flesh almost unpalatable. Indeed, many cases of fatal poisoning after eating its meat have been recorded (Bhaskar 1981; Silas and Bastian 1984), although it is regularly eaten in Suriname and the Caribbean Islands (Carrillo et al. 1999; Pritchard and Trebbau 1984). *E. imbricata* is regarded as poisonous in many places, but still widely consumed around the Indian Ocean (Frazier 1980), as well as along the Atlantic (Carrillo et al. 1999). In most of the Indian Ocean, the meat of *Chelonia mydas*, an herbivorous species, is especially favored, but the carnivorous *D. coriacea* is rarely eaten. Among our informants, we observed the widespread acceptance of the herbivorous pelomedusids and strong restrictions on the consumption of carnivorous chelids, and our results tend to confirm the hypothesis that some food taboos may protect peoples' health.

Colding and Folke (2000) proposed that taboos, as local informal institutions, could be used as management tools for conservation, but official recognition by government authorities is essential. Restrictions on the consumption of species that can affect human health, as observed in the Atlantic rainforest and in the Amazon, could be used as the basis for automatic sanctions, in which the violation itself result in penalties for the consumer.

In conclusion, all chelonian species, with the exception of the smaller species restricted to small aquatic habitats in the lowland forest, such as ponds and streams, are exploited by the riverine peoples studied, mostly for food. This research indentified several notable aspects of human use of chelonians. ***Cabeçudos*** are consumed year round, but the ***irapuca*** are eaten only during the dry season. The Negro River communities near the Mouth of Jaú River eat ***iaçá***. The communities we studied avoid eating ***matamatá*** and ***lalá***, the latter because it is said to induce allergic reactions. ***Jaboti*** fat and ***matamatá*** epidermic scutes are used medicinally. Carnivorous species are tabooed and herbivorous are less subject to food restriction. These findings are in agreement to the pattern postulated by Begossi et al. (2004) for the incidence of food taboos for fishes and mammals in communities along the southeastern Brazilian Atlantic coast and Amazon River.

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