Núcleo de Meio Ambiente
Universidade Federal do Pará
Rua Augusto Corrêa, 01, Guamá
Belém, Pará, Brasil
https://periodicos.ufpa.br/index.php/agroecossistemas

RIVERSIDE DWELLERS´ KNOWLEDGE THAT COMES FROM THE IGAPÓ: PLANTS CONSUMED BY CHELONIANS (*Podocnemis* spp.), IN THE ANDIRÁ RIVER, AMAZONAS, BRAZIL

Paulo Henrique Guimarães de Oliveira
Universidade Federal do Amazonas
phgoliveira@gmail.com

José Ferreira da Silva
Universidade Federal do Amazonas
jofersil1000@gmail.com

Paulo Cesar Machado Andrade
Universidade Federal do Amazonas
pcmandra@yahoo.com.br

Joari Costa de Arruda
Universidade do Estado de Mato Grosso
arruda.joari@unemat.br

Aldeniza Cardoso Lima
Universidade Federal do Amazonas
aldenizalima28@hotmail.com

Received: 2021-12-13
Evaluated: 2022-04-25
Accepted: 2022-05-17

ABSTRACT: Edible plants can represent around 90% of the diet of some species of aquatic turtles of the genus *podocnemis*. These plants are found in floodplain forests and igapós, the riverside dwellers as well as turtles´ home. These dwellers dominate the common knowledge of those plants. Thus 39 dwellers were interviewed between 2019 and 2021, at Granja and Piraí communities, Barreirinha, Amazonas, Brazil. And, the plants that turtles feed on were identified by means of the traditional knowledge of these riverside dwellers. Ethnobiology techniques as, qualitative and quantitative methods of data collection, used were: snowball sampling, free list with Smith index analysis and social network. Among the 83 plant ethnospecies cited, we cataloged 59 species, distributed in 55 genera and 29 botanical families. *Handroanthus barbatus* had the highest Smith´s Salience index, therefore it was the best known, followed by *Couepia paraensis*, *Bactris riparia*, *Myrciaria dubia* and *Astrocaryum jauari*. Fabaceae, Myrtaceae and Arecaceae families presented the greatest number of indicated species. Within the plants we cataloged, the previously described for *podocnemis* species in the literature belonged to 22 families (76%), 26 genera (47%) and 30 species (51%). So, 24% of species refer to the first record of these food items in Podocnemidídeos diet. The riverside dwellers´traditional knowledge the must be considered as priority information in the maintanance and restoration of riparian forests, to chelonians populations conservation, and may even lead to the development of legislation and technical to garantee the socialbiodiverse systems conservation by means of the cultural knowledge of the riverside dwellers.

KEYWORDS: Animal feeding, Traditional ecological knowledge, Turtles.

O CONHECIMENTO RIBEIRINHO QUE VÊM DO IGAPÓ: PLANTAS CONSUMIDAS POR QUELÔNIOS (*Podocnemis* spp.), NO RIO ANDIRÁ, AMAZONAS, BRASIL

RESUMO: alimentos vegetais podem representar mais de 90% da dieta das espécies de tartarugas aquáticas *podocnemis*. Grande parte desses alimentos vêm das florestas de várzea ou igapós, morada dos ribeirinhos que dominam o conhecimento das plantas, e também é habitat dos quelônios que as usam como alimento. Portanto, entrevistamos 39 ribeirinhos no período de 2019 à 2021, nas comunidades Granja e Piraí, Barreirinha, Amazonas. Com o objetivo de conhecer as plantas consumidas pelas tartarugas, através do saber tradicional dos ribeirinhos. Utilizando técnicas de pesquisa etnobiologica, usando métodos qualitativos e quantitativos de coleta dos dados: bola de neve, lista livre com análise do índice de *Smith* e rede social. Nas entrevistas foram indicadas 83 etnoespécies, catalogamos 59 espécies, distribuídas em 55 gêneros e 29 famílias botânicas. O capitarí (*Handroanthus barbatus*) apresentou maior índice de *Smith*, portanto foi a mais conhecida, seguido do tucuribá (*Couepia paraensis*), marajá (*Bactris riparia*), camu-camu (*Myrciaria dubia*) e o jauari (*Astrocaryum jauari*). Destacamos as famílias Fabaceae, Myrtaceae e Arecaceae por comtemplarem mais espécies indicadas. Dentre as plantas que catalogamos, as previamente descritas para as espécies de *podocnemis* na literatura pertenciam a 22 famílias (76%), 26 gêneros (47%) e 30 espécies (51%). Assim, 24% das espécies referem-se ao primeiro registro desses itens alimentares na dieta desses quelônios. Os conhecimentos tradicionais dos ribeirinhos devem ser considerados como informações prioritárias na formulação de estratégias de manutenção e restauração das florestas riparias, para conservação das populações de Podocnemidídeos, orientando as legislações para que garantam a conservação dos sistemas sociobiodiversos considerando tambémo saber do caboclo ribeirinho.

PALAVRAS-CHAVES: Alimentação dos animais, Conhecimento tradicional associado, Tartarugas.

CONOCIMIENTOS RIBEROS QUE PROVIENE DEL IGAPÓ: PLANTAS CONSUMIDAS POR QUELÔNIOS (*Podocnemis spp.)* EM RIO ANDIRÁ, BRASIL

RESUMEN: los alimentos vegetales pueden representar alrededor del 90% de la dieta da especies de tortugas acuáticas del género *podocnemis*. Estas plantas se encuentran en los bosques aluvial y los igapós, los habitantes de los ribereños y el casa de las tortugas. Estos habitantes dominan el conocimiento común de las plantas. Así fueron entrevistados 39 habitantes entre 2019 y 2021, en las comunidades Granja y Piraí,

Barreirinha, Amazonas, Brasil. Y, las plantas de las que se alimentan las tortugas fueron identificadas mediante el conocimiento tradicional de estos ribereños. Las técnicas de etnobiología como métodos cualitativos y cuantitativos de recolección de datos utilizados fueron: muestreo de bola de nieve, análisis de lista libre con índice de *Smith* y redes sociales. Entre las 83 etnoespecies de plantas citadas, catalogamos 59 especies, distribuidas en 55 géneros y 29 familias botánicas. Las especies con mayor índice de Smith, por lo tanto las más conocidas, son: *Handroanthus barbatus*, *Couepia paraensis*, *Bactris riparia*, *Myrciaria dubia* e o *Astrocaryum jauari*. Las familias Fabaceae, Myrtaceae y Arecaceae presentaron el mayor número de especies indicadas. Dentro de las plantas catalogadas, las previamente descritas para las especies de *podocnemis* en la literatura pertenecieron a 22 familias (76%), 26 géneros (47%) y 30 especies (51%). Así, el 24% de las especies se refieren al primer registro de estos alimentos en la dieta de Podocnemidídeos. Los conocimientos tradicionales de los ribereños deben ser considerados como información prioritaria en el mantenimiento y restauración de los bosques de *riparians*, para la conservación de las poblaciones de tortugas, e incluso pueden conducir al desarrollo de legislación que garanticen la conservación de los sistemas sociobiodiversos a través del conocimiento cultural.

PALABRAS CLAVE: Alimentación de animales, Conocimiento tradicional asociado, Tortugas.

Ethical and legal aspects: Brazilian Environmental permits for scientific research from Chico Mendes Institute for Biodiversity Conservation under SISBIO Numbers 72506-1 and 72506-2. Federal University of Amazonas´ Ethics Committee on the Use of Animals (CEUA), permit number 007/2020. And Brazil Plataform´s Humans Research Ethics Assessment, CAAE: 24348719,90000,5020, Reference Number: 3723.043/2019.

INTRODUCTION

The *várzea* and *igapó* forests of the Amazon harbor a rich biodiversity of plants and animals. Among their distinguished residents, the Amazonian aquatic turtles stand out. They belong to the Podocnemididae family, which use these floodplain forests as shelter and feeding areas (VOGT, 2008; ANDRADE, 2015; EISEMBERG et al., 2017; ANDRADE et al., 2022; GARCEZ, ANDRADE; SOARES, 2020), especially when the level of the rivers rises reaching its peak during the seasonal flooding (maximum water level).

Due to high levels of precipitation, unevenly distributed throughout the year, these Amazonian floodplain areas can remain submerged for a few days or even several months every year (JUNK et al., 2011). The floodplain is also home to the traditional riverside populations. Riverside dwellers have a specific way of life and a unique and deep relationship with nature and its cycles. In these populations, there is a constant transmission of knowledge, throughout the generations, as a way of perpetuating the group's identity (DIEGUES, 1996). The term "ribeirinho" refers to one who moves along the rivers, and the river constitutes the basis of survival of the riverine people (ELISABETSKY, 2002).

In the co-management of natural resources, riverside communities and partner institutions protect the aquatic turtles´ nesting beaches, providing co-benefits for other fauna species such as: aquatic birds, fish, reptiles and mammals that feed on turtle eggs and invertebrates. Therefore, it contributes to an extremely important environmental service for the aquatic-terrestrial transition ecosystems of the Amazon floodplain (CAMPOS-SILVA et al., 2018). It can also be seen that the knowledge acquired by the riverside dwellers working in turtles´ conservation activities, through observations and experiments, is added to the empirical knowledge inherited from the parents (ethnoknowledge), increasing the feeling of empathy and the interest in the management and conservation of aquatic turtles. (ANDRADE, 2017; LIMA et al., 2017).

Ethno-Biological studies have restored the popular value on the management of biodiversity and ecosystems, passed on in a transgenerational way, through speech, group, myths, practices and symbols (SOUZA, 1998; ELISABETSKY, 2002), which contributes for the dissemination of regional knowledge on the use and knowledge of natural resources. Among these biodiversity resources, we highlight, in this study, the plant species that are food for

turtles of the *podocnemis genus*, and that are part of the repertoire of the riverside dwellers´knowledge.

Most species of continental aquatic chelonians feed mainly on plant material (SANTOS-JUNIOR, 2009). Plant materials may represent more than 90% of the diet of *podocnemis expansa* and *podocnemis unifilis* (ALMEIDA et al., 1986; FACHÍN-TERÁN et. al., 1995), while animal material is usually found in small amounts (BALENSIEFER; VOGT et al., 2006; VOGT, 2008; GARCEZ; ANDRADE; SOARES, 2020). Studies in the natural environment show that the diet of *P. expansa* , *P. unifilis* , *P. erythrocephala* and *P. sextuberculata* has a strong tendency to herbivory (BALEMSIEFER; VOGT et al., 2006; SILVA, et al., 2007; VOGT, 2008; FACHÍ-TERÁN, 2014; LARA, 2015; CUNHA; BERNHARD; VOGT., 2020; GARCEZ; ANDRADE; SOARES, 2020).

We know very little about the diet of Amazonian chelonians in the natural environment. The studies, even being carried out in different locations, are still negligible (LARA et al., 2012). Understanding the natural diet of chelonian species of the genus *podocnemis* can favor the recognition of important food resources for individuals and allow the verification whether food is a restrictive resource for a given population (BALENSIEFER, 2003).

The food items ingested by the Podocnemididae may be related to the age and sex of the individuals, as well as the local and seasonal supply of food resources (FACHÍN-TERÀN et al., 1995; GARCEZ; ANDRADE; SOARES, 2020). Knowing the plant species that provide the food items that make up the diet of Podocnemidid chelonians can help us make decisions regarding the management and conservation of these animals´ populations, and the riparian flora from which these chelonians' food comes.

However, studies of plants consumed by chelonians in a natural environment, which take into account the knowledge of riverside dwellers

combined with the botanical identification of these species, are still scarce. We cite the studies by Almeida et al. (1986) and Portal et al. (2002), in the Brazilian Amazon, and the research by Figueroa, Fachín-Terán and Duque (2012), in the Colombian Amazon. This type of study is essential to better understand the relationship between local populations and fauna and flora, in order to ensure the sustainable management of natural resources (BARBOZA; PEZZUTI, 2014).

The Amazon riverside dwellers have a mindful perception of the floodplain environments and the biological and ecological characteristics of aquatic turtles (BARBOSA; PEZZUTI, 2014), and this knowledge is reflected in the indication of numerous ethnospecies (fruits, seeds, leaves, flowers, stems and roots) that are food for chelonians and are available in riparian forests of the Amazon.

Therefore, in this study, we sought to know the plant species that the chelonians Podocnemididae (*P. expansa*, *P. unifilis*, *P. sextuberculata* and *P. erythrocephala*) use as food in a natural environment, through the traditional knowledge (ethnoknowledge) of the riverside dwellers of the Andirá River, Amazonas.

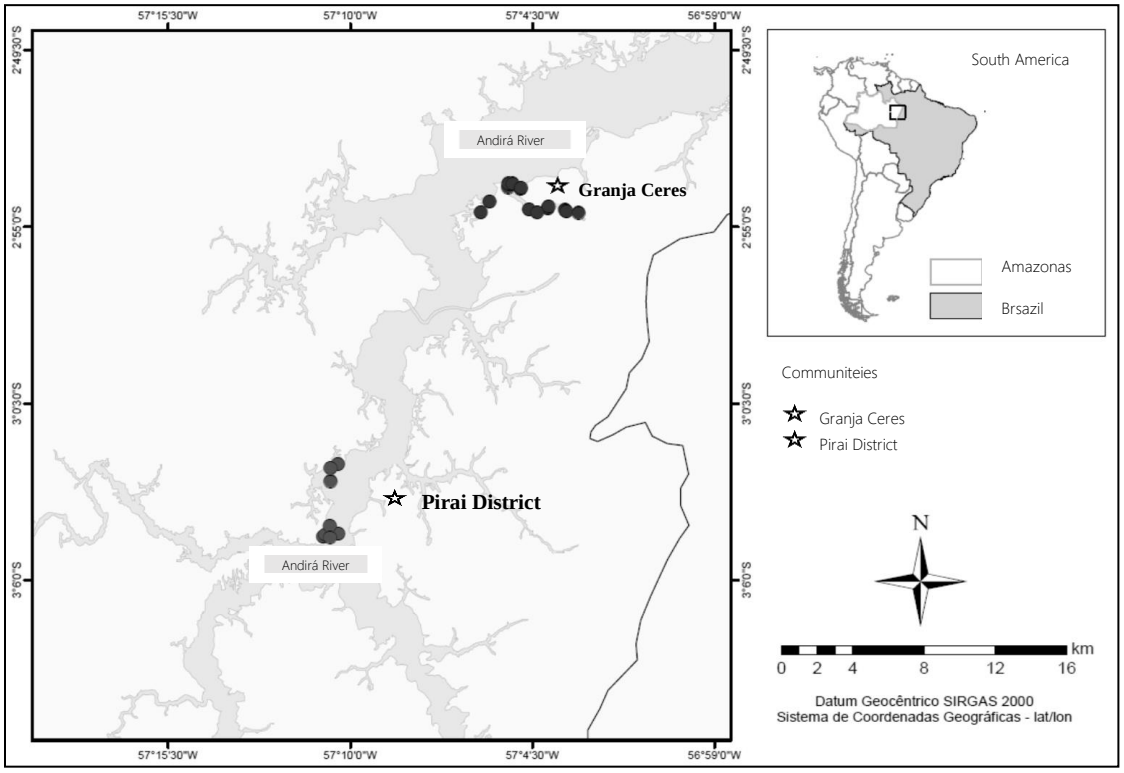
MATERIAL AND METHOD

The study was carried out in the physiogeographic zone of the Middle Amazon River, on the Andirá River, in the communities of Granja Ceres (S02º54'47.2" and W057º04'50.7") and Piraí District (S03º02'23.5" and W057º10'22.6") (Figure 1), located in the municipality of Barreirinha, Amazonas, Brazil. 18 and 120 families live in the two communities, respectively, and the main economic activities are agriculture and fishing.

The Andirá is a black water river, poor in nutrients, characteristic of rivers that originate in the Guiana Shield or in the sediments of the Amazon basin, whose relief is smooth (BALDISSERI, 2005). The climate of the region is of the Amw type (KÖPPEN, 1936), characterized by being: rainy,

humid and hot, with a higher incidence of rains from December to May and the averages of annual temperatures range from a low of 22.4ºC to a high of 33ºC (ANA, 2021).

Figure 1. Study area map, Andirá river, Barreirinha, Amazonas, Brazil.



Source: Prepared by the authors (2021).

Information was sought on what the four species of Podocnemidid chelonians consumed in the region: *tracajá* or yellow-spotted Amazon river turtle (*podocnemis unifilis*), *tartaruga-da-amazônia* or giant Amazon river turtle (*P .expansa*), *iaçá* or six-tubercled Amazon river turtle (*P. sextuberculata*) and *irapuca* or red-headed Amazon river turtle (*P. erythrocephala*).

Information on traditional knowledge of natural food for chelonians was collected using research techniques in ethnobiology and ethnobotany as qualitative and quantitative data collection methods. The techniques used were: Snowball Sampling, Free List and Social Network Analysis (BERNARD, 2006).

Data collection was carried out from 2019 to 2021, using forms, field notebook records, photographic records, "*in situ*" visits and georeferencing with GPS (*Garmin Etrex* 32x). The interviews were carried out with "ribeirinhos/caboclos" - this term refers to the sociocultural profile of *caboclo* groups that settled on the riverbanks (NETO; FURTADO, 2015): fishermen who know the plants that serve as food for chelonians in nature. This by means of community leaders and interviewees consent, through the Free Informed Consent Term (ICF), duly signed and approved by the National Ethics Council (CEP).

The selection of interviewees in this research was based on the qualitative sampling technique *Snowball Sampling* (BERNARD, 2006). In this technique, the figure of a key informant is sought in order to assist in field research. It is a person who knows a lot about their culture, the environment and the research object (chelonians), able to talk easily and who is willing to share their knowledge with the researcher (ALMEIDA; DA SILVA, 2011; ARRUDA, 2013). The key informant was nominated at meetings in the communities.

Following guidance from VOGL et al. (2004), the first interviewee is considered the key informant, and at the end of each interview, the indication of other people was asked. The nominees must be persons who know the environment and who have already observed the chelonians feeding *in situ* or detected, while butchering a turtle, a certain food in their stomach contents. These enabled us administering the questionnaires and elaborating the social knowledge network.

Thus, the sampling increased with each interview, as the interviewees indicated other riverside dwellers who knew the researched topic, and so forth with the following interviewees (BERNARD, 2006). Consequently, the social network was built. All indications were recorded in the field diary and later transferred to a presence (1) and absence (0) worksheet. The diagram with all the informants and their indications was presented with directional arrows, through the programs UCINET 6.403 and NETDRAW 2.210 (BORGATT, 2002). The nodes represent the interviewed riverside

dwellers, which were interconnected based on the indications (arrows). The nodes with the greatest number of lines in the social network were identified as local *experts*, *i.e.*, people considered experts on the subject by informants (BERTSCH et al., 2006). Each interviewee was represented by a two-letter capital code, e.g. RS.

The elaboration of the questions was based on the previous knowledge of the communities. We carried out visits, together with the key informant from each community (Granja and Piraí), to collect prior authorizations and structure the research. The object of interest of this research was the cultural domain, that is, the data reported by the informants (WELLER; ROMNEY, 1988). Therefore, in this work, the objective is to know the cultural domain over the plant species that turtles use as food in nature, in the riverside communities Granja and Piraí, on the Andirá River, Barreirinha, Amazonas.

In the research, the Free List technique was used to distinguish the cultural domain among the known plants in the diet of Podocnemididae. The most appropriate term was identified in informal conversation with the key informant. The answer was obtained through the following question: "what do shelled animals (turtle, tracajá, pitiu and irapuca) eat in the forest and in the river (fruit, seed, leaf and vine, etc.)?".

Based on this questioning, the following structured interview was used: 1- "What foods do you know that shelled animals eat in the forest (igapó or river)?". After the first list, the following information was added to the question: "2 - Is there any other food or food that the shelled animals consume in the flooded forests or in the river that you remember?". And the third time, the names from the free list were read to the interviewee, in the order mentioned, and we asked: "4 – Do you want to add any more names?". For the analysis of the free list, we used the Smith´s Salience index (Smith´s S), and the cultural consensus analysis (CCA) using the ANTHROPAC 4 program. In the analysis, the frequency of citations for each plant species was calculated, considering the percentage of the total number of respondents and the breaks that

correspond to the spacing between the list indices.

The botanical identification of the species was carried out to the lowest possible taxonomic level (family, genus and species) and had the help of specialists in the area (parabotanical technicians: UFAM and INPA) and the literature, from specialized websites, such as: https://plantidtools.fieldmuseum.org,https ://gbif.org and Brazilian Biodiversity nformation System (SiBBr), https://plantsofthewordonline.org, Manuals and books:Manual de Várzea Trees in Central Amazonia: *Taxonomy Ecology and Use* /INPA (WITTMAN et al., 2010). *Exsiccates of plant material* were collected and made, identified by the vernacular name and herborized. In addition, they were compared and deposited in the Herbarium (HUAM) of the Federal University of Amazonas (UFAM), in the city of Manaus-AM.

It was observed "*in situ*", when possible, the apprehension of food by the animals in the igapós, in the flooded forests, in different seasonal periods. Stomach contents were collected from chelonians consumed by riverside dwellers, as well as from captured individuals (98 chelonians of which 69 *P. unifilis*, 18 *P. sextuberculata* and 11 *P. erythrocephala*), with *trammel nets* in other studies by the authors.

A search of the plant species found in the digestive tract of Podocnemididae by other authors was carried out in the literature, in order to compare the information obtained through the traditional knowledge of the riverside dwellers.

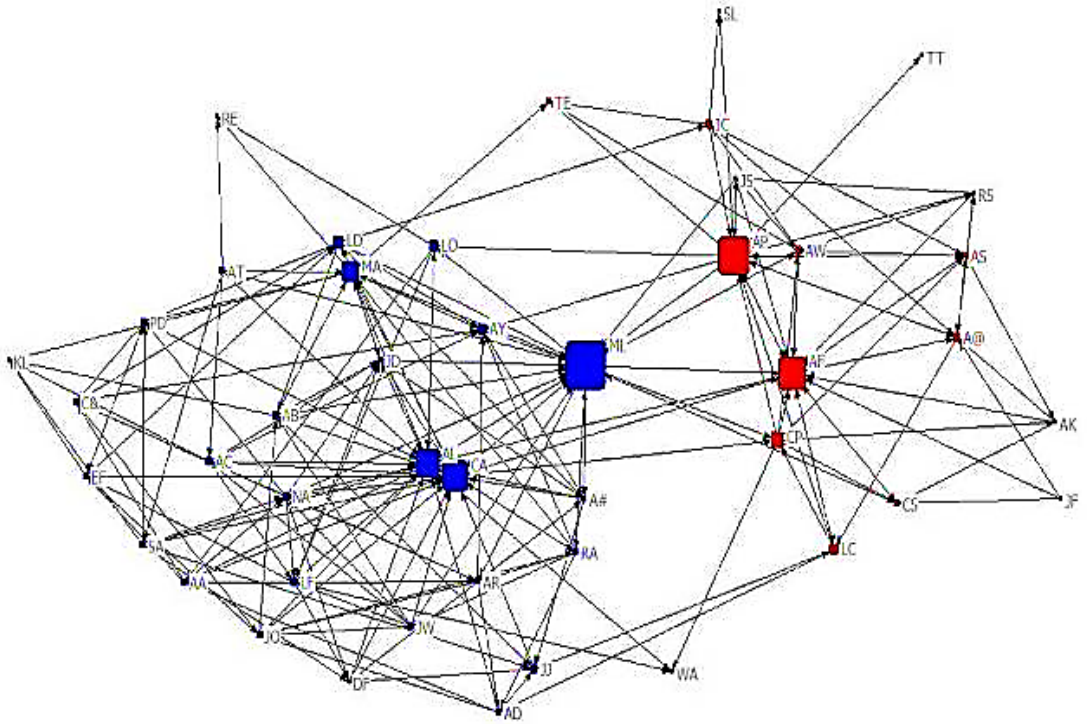
RESULTS AND DISCUSSION

In this research, 39 riverside residents of two communities (District of Piraí and Granja Ceres), on the Andirá River, Barreirinha, Amazonas, Brazil were interviewed.

The social network of this research was composed of 45 nodes, that is, 45 social actors. Of these, 39 were interviewed, being 3 female and 36 male. Of the 16 nominees in the Granja Ceres community (red), 13 were interviewed (Figure 2). Meanwhile in the community of the District of Piraí (blue), 26 individuals were

interviewed out of 29 indicated (Figure 2). The riverside dwellers interviewed indicated at least 2 and at most 11 community members, composing the relationship network of riverine community members, who know the natural diet of Podocnemidid chelonians of the two communities (Figure 2).

Figure 2. Social network of respondents and their informants.



Caption: The two capital letters represent the community members interviewed; the actors represented by the letters WA, SL, KL, TT, RE and TE were not interviewed; colors represent communities: Blue = Piraí and red = Granja Ceres.
Source: Prepared by the authors (2021).

The two interviewees AF and AP, highlighted in red (larger squares) in the network of relationships in Figure 2, are two brothers who have been working directly with the chelonian conservation program (Pé-de-Pincha) for over 20 years in the Granja Ceres community.

In blue, the most prominent interviewees (larger squares) were ML, CA and AL. One is a professional fisherman

and river trader (ML) and the other two (CA and AL) are communitarian beach agents, who have been collaborating in turtle conservation activities in the Piraí community, as beach monitors. In addition to being a monitor, AL promotes sporadically educational activities in other communities; this is due to his training as a teacher at the community school.

Through the methods used in this study, we were able to verify the cultural consensus in relation to the information compiled in the *free list* of plant species indicated as food for turtles (*podocnemis* spp.) among riverside dwellers. The free list of plant species used as food for turtles is the result of the ethno-knowledge of the residents of the communities of Piraí and Granja (Table 1).

Using Smith´s salience index, we identified three main ruptures (approximate index numerical sequences) in the free list of plants indicated as food for aquatic turtles of the genus *podocnemis*, and four groups separated by these ruptures. The first rupture was observed in the capitari species (*Handroanthus barbatus*), presenting the highest index (0.503) in relation to other food items (Table 1).

*Handroanthus barbatus (*capitari) represents one of the most important plant species as food for turtles, according to the ethno-knowledge of the Piraí and Granja communities, with the highest Smith´s S index, followed by *tucuribá* (*Couepia paraensis*), marajá (*Bactris riparia*), camu-camu (*Myrciaria dubia*) and the jauari (*Astrocaryum jauari*). And, ironically, the male individual of the giant Amazon river turtle (*podocnemis expansa*) is popularly known as "*capitari*", due to the similarity of the animal's tail to this fruit.

The second rupture observed in Table 1, regarding the Smith´s S index , occurred between food items (fruits) *tucuribá* (*Couepia paraensis*) and *marajá* (*Bactris riparia*) with 0.327 and 0.297 conversely; and the third rupture, between the *jenipapo* fruit (*Genipa americana*) and the teal grass or *capim-de-marreca* (*Paratheria prostrata*), with indices of 0.192 and 0.168 in the proper order.

Table 1. Free list of plant species used in the diet of Podocnemididae (*Podocnemis* spp.), indicated by the riverine inhabitants of Piraí and Granja, Andirá river, Barreirinha-AM, Brazil (breaks are indicated by underlined numbers).

No.	Vernacular names (ethnospecies)	Species	Number of citations	Frequency (%)	Ranking	Smith´s S index
1	*Capitari*	*Handroanthus barbatus* (E Mey.) Mattos	30	80	7.130	0.503
2	*Tucuribá*	*Couepia paraensis* (Mart. & Zucc.) Benth	19	49	5.840	0.327
3	*Marajá*	*Bactris riparia* Mart	22	67	10.230	0.297
4	*Camu-camu*	*Myrciaria dubia* HBK McVaugh	18	49	7.740	0.277
5	*Jauari*	*Astrocaryum jauari* Mart	15	39	6.200	0.255
6	*Jará*	*Leopoldinia pulchra* Mart	19	44	8.590	0.246
7	*Batatarana*	*Ipomoea asarifolia* (Desr.) Roem. & Schult.	16	41	7.690	0.236
8	*Taquari*	*Mabea speciosa* Müll. Arg.	17	44	8.880	0.233
9	*Arroz silvestre*	*Oryza grandiglumis* (Doell.) Prod.	21	51	10,050	0.217
10	*Piranheira*	*Piranhea trifoliata* Baill	20	49	11.000	0.205
11	*Araça vermelho*	*Myrcia* sp.	14	36	8.000	0.202
12	*Apéua*	*Peritassa dulcis* (Benth.) Miers	15	36	9.210	0.194
13	*Jenipapo*	*Genipa americana* L.	17	41	9.750	0.192
14	*Capim de marreca*	*Paratheria prostrata* Griseb.	13	33	9.230	0.168
15	*Acapurana*	*Campsiandra comosa* Benth	8	26	8.700	0.146
16	*Murici*	*Byrsonima japuraensis* A. Jus	12	31	10.580	0.145
17	*Mureru*	*Eichhornia crassipes* (Mart.) Solms	13	33	9.850	0.144
18	*Paracutaca*	*Swartzia polyphylla* DC	8	23	6.780	0.143
19	*Ingarana*	*Zygia latifóia* (L.) Fawc. & Rendle	13	30	11.000	0.142
20	*Ingá xixica*	*Inga alba* Willd.	13	31	11.420	0.140
21	*Muúba*	*Bellucia dichotoma* Cogn.	14	18	5.710	0.131
22	*Capim terra e água*	*Hymenachne amplexicaulis* Rudge	10	26	9.000	0.120
23	*Maracarana*	*Ruprechtia* sp.	11	28	9.180	0.119
24	*Socoró*	*Mouriri ulei* Pilg	12	28	10.000	0.119
25	*Juquiri branco*	*Solanum rugosum* Dunal.	11	28	11.270	0.117
26	*Braduega*	*Portulaca oleracea* L.	10	26	8.500	0.116
27	*Carauaçu*	*Symmeria paniculata*Benth.	7	18	8.000	0.116
28	*Araçá chumbinho*	*Myrcia* sp.	9	18	6.570	0.112
29	*Araçá de praia*	*Myrcia* sp.	9	23	9.220	0.110
30	*Purui*	*Duroia genipoide* Hook.	9	21	9.130	0.100
31	*Molongo*	*Malouetia tamaquarin*a (Aubl.) A. DC	7	18	12.290	0.090
32	*Tucunaré envira*	*Dalbergia inundata*Spruce ex Benth	7	21	11.500	0.088
33	*Sarabatucu*	*Heteropterys orinocensis* (Kunth) A. Juss	8	21	11.500	0.087
34	*Seringa da várzea*	*Hevea spruceana* (Benth.) Müll. Arg.	10	15	7.170	0.085
35	*Jacitara*	*Desmoncus orthacanthos* Mart.	7	18	12.710	0.071
36	*Caramuri*	*Pouteria elegans* (A. D.C.) Baehni	3	10	13.000	0.067
37	*Murta*	*Leandra* sp.	7	10	7.500	0.064
38	*Araça de várzea*	*Pisidium* sp.	6	10	7.500	0.060
39	*Piriquiteira*	*Buchenavia ochroprumna* Eichler	5	13	15.600	0.055
40	*Macacarecuia*	*Eschwerilera tenifolia* O. Berg.	3	8	6.330	0.055

No.	Vernacular names (ethnospecies)	Species	Number of citations	Frequency (%)	Ranking	Smith´s S index
41	*Caramurirana*	*Pouteria campanulata* Baehn	5	10	15.250	0.051
42	*Camapu*	*Pysalis angulata* L.	5	10	8.250	0.050
43	*Breu*	*Trattinickia rhoifolia* Willd	4	10	15.250	0.050
44	*Apeí*	*Nymphaea gardneriana*Planch.	5	13	11.200	0.049
45	*Pupunharana*	*Duckeodendron cestroides* Kuhlm	2	5	2.000	0.048
46	*cajurana*	*Simaba guianensis* Aubl.	5	15	14.170	0.046
47	*Araça de touça*	*Eugenia patrisii* Vahll	3	5	7.500	0.039
48	*Caimbé*	*Sorocea duckei* W.C. Burger	2	5	9.500	0.038
49	*Bacuri*	*Garcinia brasiliensis* Mart.	4	10	13.250	0.034
50	*Molongorana*	*Himatanthus attenuatus*(Benth.)	3	8	17.000	0.034
51	*Mari-mari*	*Cassia leiandra* Benth.	1	5	6.500	0.032
52	*Catauari*	*Crateva benthamii* Eichler.	2	3	34.000	0.007
53	*Goiabarana*	*Psidium acutangulum* DC.	1	3	15.000	0.007
54	*Abiorana*	*Pouteria glomerata* (Miq.) Radlk.	2	3	10.000	0.006
55	*Alface d`água*	*Pistia stratiotes* L.	1	3	13.000	0.006
56	*Araparí*	*Macrolobium acaciifolium* (Benth.) Benth	1	3	37.000	0.005
57	*Macucu*	*Aldina heterophylla* Spr.ex Benth.	2	3	38.000	0.005

Source: Prepared by the authors (2021).

In the first three group, out of the four identified, are the plant species of consensus in the local knowledge of the riverside dwellers interviewed, whose frequencies were between 40% and 80%. There was a greater degree of consensus among the interviewees during the indication of plant species through the Smith´s S index, which takes into account not only the highest number of citation and frequency, but also the citation order. This exposed the first memories of the interviewee, that is, the first plant species indicated in consensus.

83 ethnospecies of vegetables were indicated by the riverside dwellers; they are knowledgeable about the natural diet of chelonians. In this study, we cataloged 59 plant species that feed the Podocnemididae (*P. expansa*, *P. unifilis*, *P. sextuberculata and P. erythrocephala*), distributed in 55 genera and 29 botanical families (Table 2, Appendix II).

Within the most relevant studies that take into account the knowledge of riveside dwellers in the identification of plants consumed by turtles, we mention one by Almeida et al. (1986), in

the lowland forests of the lower Xingú River, in Pará, for the species *P. expansa*, *P. unifilis* and *P. sextuberculata* ; and the other by Portal et al. (2002) in the white water floodplain of the Pracuúba River, in Amapá, in the studies of plants consumed by *P. unifilis*, both in the Brazilian Amazon. And it is also important to highlight the indigenous knowledge reported by Figueroa, Fachín-Terán and Duque (2012) in the lowland forest on the lower Caquetá River, white water (várzea), in the Colombian Amazon studying the tracajá (*P. unfilis*). These studies cataloged 32, 35 and 34 plant species, respectively, and in this study, we identified 59 species from the igapó forest of the Andrirá River, with indications from residents of the Granja and Piraí communities.

Nineteen (32%) plant species indicated by riverside dwellers in the interviews were found in the stomach contents of *P. unifilis* captured for consumption by riverine dwellers, and in the stomachs of Podocnemididae examined in other studies by their authors. Of these, 14 were also found by other authors, they are: *Astrocaryum jauari* Mart. (ALMEIDA, et al., 1986; SANTOS-JUNIOR, 2009; GARCEZ, 2012; FIGUEROA; FACHÍN-TERÁN; DUQUE, 2012; FACHÍN-TERÁN, et al., 2012); *Handroanthus barbatus* (E.Mey.) Mattos (FIGUEROA; FACHÍN-TERÁN; DUQUE, 2012; CUNHA, 2013); *Myrciaria dubia* HBK McVaugh (CUNHA; BERNHARD; VOGT, 2020); *Genipa americana* L. (ALMEIDA et al., 1986; SANTOS-JÚNIOR, 2009; FIGUEROA; FACHÍN-TERÁN; DUQUE, 2012; CUNHA; BERNHARD; VOGT, 2020; VOGT et al., 2020); *Heteropterys orinocensis* (Kunth) A. Juss (CUNHA, 2013); *Couepia paraensis* (Mart. & Zucc.) Benth (ALMEIDA, et al., 1986); *Oryza grandigumis* (Doell.) Prod. (PORTAL, et al., 2002; SANTOS-JÚNIOR, 2009; FACHÍN-TERÁN; VOGT et al., 2014; CUNHA; BERNHARD; VOGT, 2020); *Pistia stratiotes* L. (BALENSIEFER, 2006; GARCEZ, 2012); *Bactris riparia* Mart. (SILVA, et al., 2007; GARCEZ, 2012; FIGUEROA; FACHÍN-

TERÁN; DUQUE, 2012); *Crateva benthamii* Eichler. (GARCEZ, 2012); *Eichhornia crassipes* (Mart.) (PORTAL et al., 2002; BALENSIEFER, 2006; ALMEIDA et al., 1986; GARCEZ, 2012); *Swartzia polyphylla* DC (ALMEIDA et al., 1986); *Macrolobium acaciifolium* (Benth.) Benth. (SILVA, et al., 2007; FIGUEROA; FACHÍN-TERÁN; DUQUE, 2012; CUNHA; BERNHARD; VOGT, 2020) sp.; GARCEZ; ANDRADE; SOARES, 2020) sp.; GARCEZ; ANDRADE; SOARES, 2020); *Mabea speciosa* Müll. Arg. (FIGUEROA; FACHÍN-TERÁN; DUQUE, 2012).

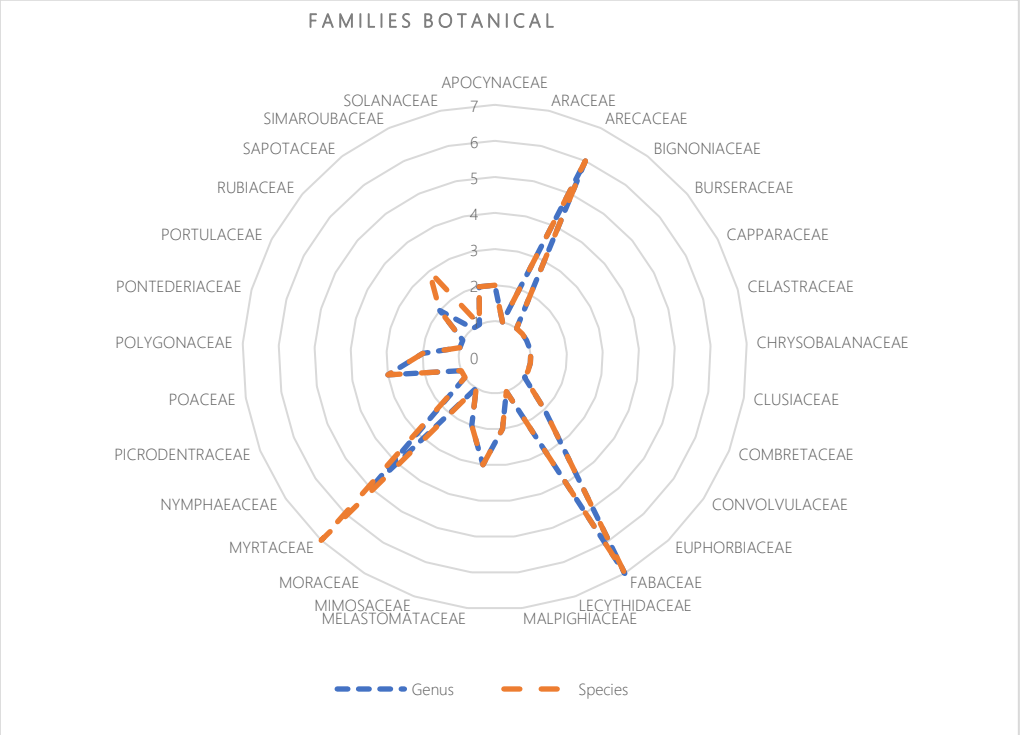
Out of the 29 botanical families indicated by the riverside dwellers from the two communities (Piraí and Granja), the Fabaceae (7 and 7), Myrtacea (7 and 4), followed by the Arecaceae (6 and 6) families, presented greater richness of genera and species, respectively, proving to be of great importance in the natural feeding of chelonians of the genus *podocnemis* (Figure 3).

The Fabaceae and Arecaceae families were also the most representative found by Almeida et al. (1986); Portal et al. (2002); Figueroa, Fachín-Terán and Duque (2012) and Garcez (2012) studying the species *P. expansa* and *P. unifilis* and Silva et al. (2007) and Santos-Júnior (2009) the species *P. erythrocephala*, and the family Myrtaceae by the authors Santos-Júnior (2009) studying *P. erythrocephala* and Balensiefer et al. (2006); Cunha et al. (2020); and Garcez, Andrade, and Soares (2020) *P. unifilis* and *P. expansa*.

In the literature, we found 22 botanical families, 26 genera and 30 plant species, that is, 76% of the families, 47% of the genera and 51% of the 59 species cataloged in this study. The aforementioned authors´reports presented real evidence through the analysis of stomach contents by the technique of gastric lavage (stomach pumping) as preconized by Legler (1977), or through examinations of the gastrointestinal tract of animals slaughtered for consumption by riverside dwellers, or specimens

sacrificed for research, of the four species of *podocnemis* that occur in the Brazilian Amazon (Table 3, Appendix II).

Figure 3. The diversity of botanical families, the result of the ethno-knowledge of riverside dwellers who know the natural diet of turtles, communities in Piraí and Granja, Barreirinha, Amazonas.



Source: Prepared by the authors (2021).

The botanical families with the highest occurrence in the diet of chelonians were: Fabaceae, Malpighiaceae, Myrtaceae and Poaceae for *P. unifilis*; Euphorbiaceae, Malpighiaceae, Myrtaceae and Poaceae for *P. expansa*; Myrtaceae and Poaceae for *P. erythrocephala* and *P. sextuberculata*. For the four species of turtles, the botanical families Myrtaceae and Poaceae have the highest number of species identified by the authors described in Table 3 (Appendix II).

Many of these fruit-bearing plants, which are food for chelonians, are also consumed by species of frugivorous

fish, mainly found in the diet of tambaqui (*Colossoma macropomum*). We mention some species: *Astrocaryum jauari* (*jauari*), *Handroanthus barbatus* (*capitari*) , *Myrciaria dubia* (*camu-camu*) , *American Genipa* (*jenipapo*) , *Bactris riparia* (*marajá*), *Hevea spruceana* (lowland syringe*), Sorocea duckei* (Caimbé*), Mouriri ulei* (*socoró*), *Duroia genipoide* (*puruí-preto), Mebea speciosa* (*taquari*), *Buchenavia ochropruma* (*piriquiteira*) and *Piranhea trifoliata* (*piranheira*) (LIMA; GOULENDING, 1998; MAIA, 2001; SILVA et al., 2003; GOMES et al., 2010).

We believe that chelonians play an important ecological role as seed dispersers, as intact seeds have already been found in the stomach contents of some species - Vogt (2008); Eisemberg et al. (2017) and Andrade et al. (2022), helping to repopulate the floodplains with fruit species, which contribute to the survival of other frugivorous fish species, such as tambaqui (*Colossomo macropomum*) and others.

Knowledge of the plants consumed by the Podocnemididae in the Andirá River can help us to preserve the chelonian populations and their habitats, in addition to contributing to the restoration and preservation of distinct floodplain habitats as *várzea* and *igapó* forests, reforesting dams, setting up nurseries, and nutritional enrichment, also increasing well-being of chelonians in captivity. And above all, it can serve as a basis for public policies for the management of *várzea* and *igapó*; stimulating the conservation of these environments through appropriate environmental legislation for these areas of permanent protection and assisting in the decision-making process of environmental managers.

CONCLUSION

The knowledge of the traditional people, ribeirinhos/caboclos, Amazonians of Andirá, about the biodiversity of the várzea and igapó forests, demonstrated in this study, is vast, due to the richness of plant species indicated as food for turtles of the genus *podocnemis*. The similarity between what riverside dwellers say

and what chelonians eat was very high (76% families and 51% species), and this ethnoknowledge tool can be used as an initial basis for chelonian feeding surveys in other river channels.

The best known species was Handroanthus *barbatus*, and the families were the Myrtaceae, Fabaceae and Arecaceae. Aiming at the maintenance and conservation of turtle populations (*P. expansa*, *P. unifilis*, *P. sextuberculata* and *P. erythrocephala*) and bearing in mind that the floodplain forests harbor a great diversity of food for turtles and ichthyofauna; the traditional knowledge of Andirá´s riverside dwellers must be taken into account as a relevant information in formulating riparian forests´conservation and restoration strategies and could serve to guide legislation and technical tools that guarantee the conservation of socio-biodiverse systems by means of the riverside dwellers´knowledge.

ACKNOWLEDGEMENT

To ICSEZ/UFAM (Instituto de Ciências Sociais, Educação e Zootecnia) da Universidade Federal do Amazonas for the license to study; CAPES Foundation (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) under the Brazilian Ministry of Education, for the scholarship; the Fundação de Amparo à Pesquisa do Estado do Amazonas for the research support; the Pé-de-Pincha Program of the Federal University of Amazonas for logistical support and research resources; to the Chico Mendes Biodiversity Institute (ICMBio) and Brazil Plataform for the authorizations. And last but not least, thankfull to the field assistant André de Souza Pedreno and the communities Granja Ceres and Pirai.

REFERENCES

AGÊNCIA NACIONAL DE ÁGUAS (ANA). Disponível em: www.hidroweb.ana.gov.br. Acesso em: 15 set. 2022.

ALMEIDA S. S.; SÁ, P. G.; GARCIA A. Vegetais utilizados como alimento por *podocnemis (chelonia)* na região do Baixo Rio Xingu Brasil-Pará. Boletim do Museu Paraense Emílio Goeldi, Botânica, Belém, v. 2, n. 2, p. 199-211, 1986.

ALMEIDA, M.A.; DA SILVA, C.J. As comunidades tradicionais pantaneiras Barra de São Lourenço e Amolar, Pantanal, Brasil. **História e Biodiversidade [recurso eletronico] / departamento de História, UNEMAT** – vol. 1, n 1. 2011.

ANDRADE, P.C.M. **Manejo Comunitário de Quelônios (Família Podocnemididae – *P. unifilis, P.sextuberculata, P.expansa, P.erythrocephala*) no Médio Rio Amazonas e Juruá**. Manaus, 2015. 336 f. Tese (Doutorado em Biologia de água doce) – Instituto Nacinal de Pesquisa da Amazônia, Manaus, 2015.

ANDRADE, P.C.M. Manejo participativo de quelônios por comunidades na Amazônia. In: MARCHAND, Guillaume; VELDEN, Felipe Vander (org.). **Olhares cruzados sobre as relações entre seres humanos e animais silvestres na Amazonia (Brasil, Guiana Francesa)**. Manaus: EDUA, p. 163-192, 2017.

ANDRADE, P.C.M.; OLIVEIRA, P.H.G.; LIMA, A. C.; VOGT, R. C. et al. Community-Based Conservation and Management of Chelonians in the Amazon. **Frontiers in Ecology and Evolution**, v. 10, p. 1–24, mar. 2022.

ARRUDA, J.C. de. Conhecimento ecológico, usos e manejo de palmeiras pelos quilombolas de Vila Bela da Santíssima Trindade-MT, Brasil. **Dissertação** (Mestrado Ciências Ambientais) – Universidade do Estado de Mato Grosso, Cáceres, p.112, 2013.

BALENSIEFER, D.C. **Dieta de *podocnemis unifilis* (Testudines, Pelomedusidae) no Período de Seca em uma Várzea do Médio Solimões, Amazonas**. Dissertação (Mestrado) - Instituto Nacional de Pesquisas da Amazônia, Universidade Federal do Amazonas, Manaus, 34 p., 2003.

BALENSIEFER, D.C.; VOGT, R.C. Diet of *podocnemis unifilis* (Testudines, Podocnemididae) during the dry season in the Mamiraua´ Sustainable Development Reserve, Amazonas, Brazil. **Chelonian Conservation and Biology**, n. 5, p.312–317, 2006.

BARBOZA, R. S. L.; BARBOZA, M. S. L.; PEZZUT, J. C. B. Estava pescando de malhadeira, vi na praia uns cascos brilhando, era luar, abeirei a terra e fui pegar: práticas de pesca de quelônios na várzea Amazônica (Santarém-PA). **Amazônica - Revista de Antropologia**, v. 5, n. 3, p. 622, abr. 2014.

BERNARD, H. Russell. **Research methods in anthropology**: qualitative and social mechanisms for build quantitative approaches. New York: Altamira Press, 2006.

BERTSCH, C.; VOGL, C.R.; DA SILVA, C.J. Ethnoveterinary medicine for cattle and horses in the northern Pantanal Matorgossense, Brazil Proceedings. **International Congress of Ethnobotany**, 4. th. (Iceb 2005), Yeditepe University, Istanbul, Turkey, 21-26 Aug. 2005.

BORGATTI, S. P. **ANTHROPAC. 4.0**. Methods Guide. Natick: Analytic Technologies, 1996.

BORGATTI, S.; PVERRETT, M.G. **Models of core/periphery**: Social Networks, 4. ed., p.375-395, v. 21, 2000.

CAMPOS-SILVA, J.V.; HAWES, J.E.; ANDRADE, P.C.M.; PERES, C.A. Unintended multispecies cobenefits of an Amazonian community-based conservation programme. **Nature Sustainability**, v.1, p.650–656, 2018.

CUNHA, F.L.R. **Dieta de quatro espécies do gênero podocnemis (Testudines, Podocnemididae) na Reserva de Desenvolvimento Sustentável Uatumã, Amazonas, Brasil**. Dissertação (Mestrado em Ciências Biológicas) – Instituto Nacional de Pesquisa da Amazônia, Manaus, 70 p., 2013.

CUNHA. F.L.R.; BERNHARD. R.; VOGT, R.C. Diet of an Assemblage of Four Species of Turtles (*podocnemis*) in the Rio Uatumã, Amazonas, Brazil, **Copeia** 108, n. 1, p. 103–115, 2020.

DIEGUES, A.C.S. **O mito moderno da natureza intocada**. São Paulo: Hucitec, 1996. 169 p.

DIEGUES, A.C.S.; ARRUDA, R.S.V.; DA SILVA, V.C.F.; FIGOLS, F.A. B.; ANDRADE, D. **Os saberes tradicionais e a biodiversidade no Brasil**. São Paulo: NUPAUB-USP, 2000.

EISEMBERG, C. C.; REYNOLDS, S. J.; CHRISTIAN, K. A.; VOGT, R. C. Diet of Amazon river turtles (Podocnemididae): a review of the effects of body size, phylogeny, season and habitat. **Zoology**, v. 120, p. 92–100, fev. 2017.

ELISABETSKY, E. Etnofarmacologia como ferramenta na busca de substâncias ativas, In: SIMÕES, C. M. O. et al. **Farmacognosia: da planta ao medicamento**. 4. ed. Porto Alegre: Ed. Universidade/UFRGS; Ed. da UFSC. p.91-103, 2000.

FACHÍN-TERAN, A.; VOGT, R.C.; Alimentación de *Podocnemis Sextuberculata* (Testudines: Podocnemididae) en la Reserva Mamirauá, Amazonas, Brasil, **Revista Colombiana de Ciência Animal – RECIA,** v. 6, n. 2, p. 285–298, 2014.

FACHÍN-TERAN, A.; VOGT, R.C.; GOMEZ, M.F.S. Food habits of an assemblage of five species of turtles in the Rio Guapore-RO, Brazil. **Journal of Herpetology**, v. 29, p.536–547, 1995.

FIGUEROA F. ILBA, C.; FACHÍN-TERÁN, A.; DUQUE, S. R. Componentes alimenticios de *Podocnemis unifilis* y *P. expansa* (TESTUDINES: PODOCNEMIDIDAE) En el resguardo curare-los ingleses, Amazonas, Colombia. **Revista Colombiana Ciência Animal**, v. 4, n. 2, p. 441–453, 2012. https://doi.org/10.24188/recia.v4.n2.2012.223

GARCEZ, J.R. Alimentação de tracajá (*P. unifilis*), iaçá (*P. sextuberculata*) e tartaruga-da-Amazônia (podocnemis expansa). 60 p. Dissertação **(Mestrado em Ciências Pesqueiras no Trópico) –** Universidade Federal do Amazonas, 2012.

GARCEZ, J.R.; ANDRADE, P.C.M.; SOARES, M.C.M. Composição da dieta de três espécies de quelônios (podocnemis spp.) no rio Juaruá, Amazonas. **Revista de Educação e Tecnologia do IFAM**, v. 14, n. 1, p. 60-72, 2020.

GOMES, J.B.M; LEEUWEN, J.V.; FERREIRA, S.A.N.; FALCÃO, N.P.; FERREIRA, C.A.C., **Nove frutos da várzea e igapó para aquicultura, manejo da pesca e recuperação de áreas ciliares**, INPA, Manaus, Ed. INPA, 2010. V.1, 32

JUNK, W. J.; PIEDADE, M. T. F.; SCHÖNGART, J.; COHN-HAFT, M.; ADENEY, J. M.; WITTMANN, F. A classification of major naturally-occurring Amazonian low land wetlands. **Wetlands**, v. 31, p.623–640, 2011.

KÖPPEN, W. Das geographische System der Klimate – KÖPPEN, W.; GEIGER, R. (Eds): Handbuch der Klimatologie – **Gebrüder Bornträger**, Berlin, v. 1, p. 1–44, part C, 1936.

LARA, N.R.F.; MARQUES, T.S.; MONTELO, K.M.; ATAÍDES, Á.G.; et al. A trophic study of the sympatric Amazonian freshwater turtles *podocnemis unifilis* and *podocnemis expansa* (Testudines, Podocnemidae) using carbon and nitrogen stable isotope analyses. **Canadian Journal of Zoology,** v. 90, p. 1394- 1401, 2012.

LEGLER, J. M. Stomach Flushing: A Technique for Chelonian Dietary Studies. **Herpetologica**, v. 33, n.. 3, sep., 1977. p. 281-284.

LIMA, A. C.; et al. Stakeholders in community management of turtle in Brazilian Amazon. In: **Recursos naturais em áreas úmidas: do Pantanal à Amazônia, Coleção Adolpho Ducke Museu Paraense Emílio Goeld**. [s.l: s.n.], 2017. p. 15–36.

LIMA, C.A.; GOULENDING, M., Os frutos do tambaqui, Ecologia, Conservação, e Cultivo na Amazônia. Tefé, Amazonas**, Sociedade Civil Mamirauá** – MCT-CNPq, v.4, n.5, p. 1-186, 1998.

MAIA, L.M.A. **Frutos da Amazônia: Fonte de Alimento para Peixes**. Programa de Desenvolvimento Empresarial e Tecnológico. Inpa/Sebrae, Manaus, Amazonas, Brazil, 2001, 143.

MARTIN, G.J. Ethnobiology and Ethnoecology. In**: Encyclopedia of biodiversity**, v. 1, p. 122/1-122/13, 2000.

MARTIN, G.J. Ethnobotany: a methods manual. **Chapman & Hall**, London, 1995.

NETO, F.J.; FURTADO, L.G.A. Ribeiridade Amazônica: algumas reflexões. **Caderno de campo**, São Paulo, n. 24, p. 158-182, 2015.

PORTAL, R.R.; LIMA, M.A.S.; LUZ, V.L.F.; BATAUS, Y.S.L.; REIS, I.J. Espécies vegetais utilizadas na alimentação de p*odocnemis unifilis*, Troschel 1948 (Reptilia, Testudinae, Pelomedusidae), Pracuúba-Amapá-Brasil. **Ciência Animal Brasileira**, v.3 (1): p.11-19, 2002.

SANTOS-JUNIOR, L. B. Dieta de *podocnemis erythrocephala* (Testudines: Podocnemididae) no Parque Nacional do Jaú. p. 29. Dissertação (Mestrado) - **Instituto Nacional de Pesquisas da Amazônia**, Amazonas, Brasil, 2009.

SILVA, J.A.; FILHO, M.P.; OLIVEIRA-PEREIRA, M.I. Frutos e sementes

consumidos pelo tambaqui (*Colossoma macropmum*) (Cuvier, 1818) incorporado em rações digestibilidade e velocidade de transito pelo gastro intestina. **R. Bras. Zootc**.v.32, n.6, p.1815-1824, 2003.

SILVA, V.A.; VOGT, R.C.; BERNHARD, R. Dieta de podocnemis erythrocephala no rio Aiuanã, Amazonas, Brasil. In: JORNADA DE INICIAÇÃO CIENTÍFICA, CNPQ/FAPEAM/INPA, 16. **Anais [...]**. Manaus, p.1-2. 2007.

SIOLI, H. **Amazônia Fundamentos da ecologia da maior região de florestas tropicais**. 3. ed. Petropolis, RJ: Editora Vozes, 1991. 72 p.

SOUZA, L. F. **Estudos etnobotânicos na comunidade de Baús**: o uso de Plantas Medicinais (Município de Acorizal, Mato Grosso). 212 p. Dissertação (Mestrado em Saúde e Ambiente) - Universidade Federal do Mato Grosso, 1998.

VOGL, C. R.; VOGL-LUKASSER, B.; PURI, R.K. Tools and Methods for Data Collection in Ethnobotanical Studies of Homegardens. **Field Methods**, v. 16, n. 3, p. 285- 306, aug. 2004.

VOGT, R.C. Tartarugas da Amazônia. Lima, Peru: **Wust Ediciones**, 2008. 104p.

WELLER, S.C.; ROMNEY, A. K. Systematic data collection. California: **Sage Publications**, (Qualitative Research Methods), v.10, 1988.

WITTMAN, F.J.; SCHOONGAR, T, J.M.; BRITO, A.O.; WITTMAN, M.T.F.; PIEDADE, P. PAROLIN; JUNK. W.J. **Manual de Arvores de Várzea da Amazônia Central**: taxonomia. Ecologia e Uso. Manaus: Editora INPA, Brazil, 2010.

ANEXO I

Tabela 2. Vegetais utilizados na dieta de quelônios (**Podocnemididae**; *Podocnemis* spp.), indicadas pelos ribeirinhos, resultado do etnoconhecimento, nas comunidades do Piraí e Granja, rio Andirá, Barreirinha-AM. Exsicatas depositadas no Herbário/HUAM-UFAM.

Família/Espécie	Nome vernacular (etnoespécie)	Hábito	Parte utilizada	Período de oferta	Espécie de Podocnemis	Registro Herbário
APOCYNACEAE						
Himatanthus attenuatus (Benth.)	Molongorana	Árvore	fruto	Fev-Jun	Ta, Tr, **Ir** e Ia	11624
*Malouetia tamaquarin*a (Aubl.) A. DC	Molongo	Árbusto	fruto e flor	Jan-Abr	Ta, Tr, **Ir** e Ia	11625
ARACEAE						
Pistia stratiotes L.	Alface d`água	Macrófita	folha e flor	Jan- Jul	Ta, Tr, e **Ir**	*
ARECACEAE						
Astrocaryum jauari Mart	Jauari	Estípe	fruto	Dez-Jul	**Ta** e Tr	*
Bactris riparia Mart	Marajá	Estípe	fruto	Dez-Abr	Ta e **Tr**	11633
Desmoncus orthacanthos Mart.	Jacitara	Estípe	fruto	Fev-Abr	Ta e **Tr**	11622
Astrocaryum acaule Mart.	Tucumã-í	Estípe	fruto	Fev-Abr		
Syagrus inajai (Spruce) Becc.	Pupunharana	Estípe	fruto	Maio-Set	Ta e Tr	*
Leopoldinia pulchra Mart	Jará	Estípe	fruto	Fev-Abr	Ta e **Tr**	*
BIGNONIACEAE						
Handroanthus barbatus (E. Mey.) Mattos	Capitari	Árvore	semente e flor	Fev-Abr	**Ta**, Tr, Ir e Ia	11635
BURSERACEAE						
Trattinickia rhoifolia Willd	Breu	Árvore	fruto	Mar-Jul	Ta e **Tr**	*
CAPPARACEAE						
Crateva benthamii Eichler.	Catauari	Árvore	fruto	Nov-Mar	**Ta** e Tr	*
CELASTRACEAE						
Peritassa dulcis (Benth.) Miers	Apéua	Árvore	fruto	Fev-Abr	Ta e **Tr**	*
CHRYSOBALANACEAE						
Couepia paraensis (Mart. & Zucc.) Benth	Tucuribá/uxirana	Árvore	fruto	Dez-Mar	Ta, **Tr**, Ir e Ia	11639
CLUSIACEAE						
Garcinia brasiliensis Mart.	Bacuri	Árvore	fruto	Jan-Mar	Ta e **Tr**	*
COMBRETACEAE						
Buchenavia ochroprumna Eichler	Piriquiteira	Árvore	fruto	Fev-Julho	Ta e **Tr**	11634

CONVOLVULACEAE						
Ipomoea asarifolia (Desr.) Roem. & Schult.	Batatarana	Liana	folha	Ano todo	Ta, Tr, Ir e **Ia**	*
EUPHORBIACEAE						
Hevea spruceana (Benth.) Müll. Arg.	Seringa da várzea	Árvore	semente	Jan-Mar	**Ta** e Tr	*
Mabea speciosa Müll. Arg.	Taquari	Árvore	fruto	Ano todo	Ta e **Tr**	11620
FABACEAE						
Aldina heterophylla Spr.ex Benth.	Macucu	Árvore	fruto	Jan-Jul	**Ta**	*
Campsiandra comosa Benth	Acapurana	Árvore	fruto e semente	Jun-Dez	Ta e **Tr**	11619
Cassia leiandra Benth.	Mari-mari	Árvore	fruto e semente	Jan-Jun	Ta e Tr	*
*Dalbergia inundata*Spruce ex Benth	Tucunaré envira	Arbusto	fruto	Dez-Jul	Ta, **Tr**, e Ia	11631
Inga alba Willd.	Ingá xixica	Árvore	fruto e semente	Fev-Maio	Ta e **Tr**	*
Macrolobium acaciifolium Benth.	Araparí	Árvore	fruto	Jan-Jun	**Ta** e Tr	*
Swartzia polyphylla DC	Paracutaca	Árvore	fruto e semente	Dez-Ago	**Ta** e Tr	*
LECYTHIDACEAE						
Eschweilera tenuifolia O. Berg.	Macacarecuia	Árvore	fruto	Dez-Jul	Ta e **Tr**	11628
MALPIGHIACEAE						*
Byrsonima japuraensis A. Jus.	Murici	Árvore	fruto e flor	Nov-Mar	Ta e **Tr**	*
Heteropterys orinocensis (Kunth) A. Juss	Sarabatucu	Liana	folha e fruto	Jan-Ago	Ta, Tr, **Ir** e Ia	11630
MELASTOMATACEAE						
Bellucia dichotoma Cogn.	Muúba	Árvore	fruto	Ano todo	Ta e **Tr**	11636
Leandra sp.	Murta	Arbusto	fruto	Mai-Ago	Ta, Tr, **Ir** e Ia	11623
Mouriri ulei Pilg	Socoró	Árvore	fruto	Jan-Jul	Ta, **Tr** e Ir	*
MIMOSACEAE						
Mimosa pudica L.	Juquiri vermelho	Arbusto	fruto	Ago-dez	Ta, **Tr** e Ir	*
Zygia latifóia (L.) Fawc. & Rendle	Ingarana	Árvore	fruto e semente	Fev-Abr	Ta, **Tr** e Ia	*
MORACEAE						*
Sorocea duckei W.C. Burger	Caimbé	Árvore	fruto	?	Tr	*
MYRTACEAE						
Eugênia patrisii Vahll	Araça de touça	Arbusto	fruto e flor	Mar-Jun	Ta, **Tr**, Ir e Ia	11626
Myrcia sp.	Araça vermelho	Arbusto	fruto e flor	Mar-Jun	Ta, **Tr**, Ir e Ia	*

Myrcia sp.	Araçá chumbinho	Arbusto	fruto e flor	Fev-Jun	Ta, **Tr**, Ir e Ia	*
Myrcia sp.	Araçá de praia	Arbusto	fruto e flor	Nov-Fev	Ta, Tr, **Ir** e Ia	*
Myrciaria dubia HBK McVaugh	Camu-camu	Arbusto	fruto e flor	Dez-Mar	Ta, Tr, Ir e **Ia**	*
Pisidium sp.	Araça verde/varzea	Arbusto	fruto e flor	Jan-Mar	Ta, Tr, **Ir** e Ia	11621
Psidium acutangulum DC.	Goiabarana	Arvore	fruto e flor	Out-Dez	**Ta**, Tr, Ir e Ia	*
NYMPHAEACEAE						
*Nymphaea gardneriana*Planch.	Apeí	Macrófita	folha e flor	Jan-Jul	Ta, Tr, e **Ia**	*
PICRODENTRACEAE						
Piranhea trifoliata Baill	Piranheira	Árvore	fruto	Fev-Jul	Ta e Tr	11637
POACEAE						
Hymenachne amplexicaulis Rudge	Capim terra e água	Erva (capim)	planta inteira	Mar-Jul	Ta, Tr, Ir e Ia	*
Oryza grandiglumis (Doell.) Prod.	Arroz silvestre	Erva (capim)	planta inteira	Mai-Jul	Ta, Tr, Ir e Ia	11632
Paratheria prostrata Griseb.	Capim de marreca	Erva (capim)	planta inteira	Nov-Jan	Ta, Tr, Ir e Ia	*
POLYGONACEAE						
Ruprechtia C.A.Mey.	Maracarana	Arbusto	fruto	Mar-Jul		*
Symmeria paniculata Benth.	Carauaçu	Arbusto	fruto	Fev-Abr	Ta, Tr, Ir e Ia	11627
PONTEDERIACEAE						
Eichhornia crassipes (Mart.) Solms	Mureru	Macrofita	folha e flor	Dez-Ago	Ta, Tr, Ir e Ia	*
PORTULACEAE						
Portulaca oleracea L.	Braduega	Erva	folha, caule e flor	Nov-Mar	Ta, Tr e Ia	*
RUBIACEAE						
*Duroia genipoide*Hook.	Purui	Árvore	fruto	Dez-Mai	Ta, Tr, e Ia	11638
Genipa americana L.	Jenipapo	Árvore	fruto	Abr-Ago	Ta, Tr, e Ia	*
SAPOTACEAE						
Pouteria glomerata (Miq.) Radlk.	Abiorana	Árvore	fruto	Jan-Jul	Ta, Tr, e Ia	*
Pouteria campanulata Baehni	Caramurirana	Árvore	fruto	Jan-Mar	Ta, Tr, Ir e Ia	*
Pouteria elegans (A. D.C.) Baehni	Caramuri		fruto	Jul- a cada 4 anos	Ta, Tr, Ir e Ia	*
SIMAROUBACEAE						
Simaba guianensis Aubl.	Cajurana	Árvore	fruto	Fev-Abr	Ta	11629
SOLANACEAE						
Physalis angulata L.	Camapu	Erva	fruto	Ano todo	Ta, Tr, Ir e Ia	*
Solanum rugosum Dunal.	Juquiri branco	Erva	fruto e flor	Dez-Abr	Ta e Tr	*

*Exsicatas ainda não depositadas no Herbário (HUAM/UFAM.). *Podocnemis:*Ta = tartaruga-da-Amzônia (*P. expansa*) Tr = tracajá (*P. uniifilis*), Ir = irapuca (*P. rythrocephala*) e Ia=iaçá (*P. sextuberculata*).

ANEXO II

Tabela 3. Espécies vegetais consumidas por quelônios aquáticos do gênero *Podocnemis (P. expansa, P. unifilis, P. erythrocephala e P.sextuberculata) j*ovens e adultos. I ribeirinhos (ir) e encontradas nos conteúdos estomacais desses animais em outros estudos pelos referidos autores.

Família/Espécie	Nome vernacular (etnoespécie)	Família (f)	Gênero (g)	Espécie (sp)	Preferencia alimentar/evidência	Parte consumida	Literatura Autor(s) / ano
APOCYNACEAE							
Himatanthus attenuatus (Benth.)	Molongorana	X	-	-	Px, Pu, Pe e Ps (IR e CE)	fruto	Figueroa, Fachín-Terán e Duque (2012) f.
ARACEAE							
Pistia stratiotes L.	Alface d`água	X	X	X	Px, Pu, e Pe (CE)	planta inteira	Balensiefer, D.C. (2006) sp. e Garcez, J.R. (2012) sp.
ARECACEAE							
Astrocaryum jauari Mart.	Jauarí	X	X	X	Px, Pe. (IR e CE)	fruto	Almeida, S.S. et al. (1986) sp; Santos-Júnior, L.B. (2009) g.; Garcez, J.R. (2012) sp. e Figueroa, Fachín-Terán e Duque , (2012) sp.
Bactris riparia Mart.	Marajá	X	X	X	Px e Pu (IR e CE)	fruto	Silva, V.A. et al (2007) g; Garcez, J.R., 2012 g e Figueroa, Fachín-Terán e Duque (2012) sp.
BIGNONIACEAE							
Handroanthus barbatus (E.Mey.) Mattos	Capitarí	X	X	X	Px, Pu, Pe e Ps (IR e CE)	semente e flor	Figueroa, Fachín-Terán e Duque (2012) f e Cunha, F.L.R. (2013) sp
CAPPARACEAE							
Crateva benthamii Eichler.	Catauarí	X	X	X	Px, Pu e Pe (CE)	fruto	Garcez, J.R. (2012) sp.
HRYSOBALANACEAE							
Couepia paraensis (Mart. & Zucc.) Benth	Tucuribá/uxirana	X	X	X	Px e Pu (IR e CE),	fruto	Almeida, S.S., et al. (1986) sp.
CLUSIACEAE							
Garcinia brasiliensis Mart.	Bacuri	X	X	-	Px e Pu (CE)	fruto	Garcez, J.R., (2012) g. e Santos, D.R. (2012) g.
CONVOLVULACEAE							

*Ipomoea asarifolia (*Desr.) Roem. & Schult.	Batatarana	X	-	-	Px, Pu, Pe e Ps (IR e CE)	folha e flor	Santos-Júnior, L.B. (2009) f e Figueroa, Fachín-Terán e Duque (2012) f.
EUPHORBIACEAE							
Hevea spruceana (Benth.) Müll. Arg.	Seringa da várzea	X	X	X	Px, Pe (IR e CE)	semente	Almeida, S.S. et al. (1986) g; Balensiefer, D.C., (2006) f. e Cunha, F.L.R. (2013) sp.
Mabea speciosa Müll. Arg.	Taquari	X	X	≠	Px e Pu (IR e CE)	*	Figueroa, Fachín-Terán e Duque (2012) g.
FABACEAE							
Inga alba Willd.	Ingá xixica	X	X	≠	Pe (IR e CE)	fruto e semente	Portal, R.da R. et al. (2002) g.; Santos-Júnior, L.B. (2009) f; Garcez, et al., (2012) g
Macrolobium acaciifolium (Benth.) Benth	Araparí/50 centavos	X	X	X	Px, Pu, Pe e Ps (IR e CE)	fruto e semente	Silva, V.S. et al. (2007) sp.; Figueroa, Fachín-Terán e Duque (2012) sp.; Cunha; Bernhard; Vogt (2020) sp.; Garcez,;Andrade;Soares (2020) sp.
Swartzia polyphylla DC	Paracutaca/Pitaica	X	X	X	Pu (IR e CE)	semente	Almeida, S.S., et al. (1986) sp.
LECYTHIDACEAE							
Eschweilera tenuifolia O. Berg.	Macacarecuia	X	X	-	Px e Pu (CE)	semente	Cunha, F.L.R. (2013) g
MALPIGHIACEAE							
Byrsonima japuraensis A. Jus	Murici	X	X	X	Px e Pu (CE)	fruto	Garcez (2012) sp.
Heteropterys orinocensis (Kunth) A. Juss	Sarabatucu	X	X	X	Px, Pu, Pe e Ps (CE)	folha e fruto	Cunha, F.L.R. (2013) g
MELASTOMATACEAE							
Bellucia dichotoma Cogn.	Muúba	X	-	-	Px e Pu (CE)	fruto	Santos, D.R. (2012) f.
MIMOSACEAE							
Zygia latifóia (L.) Fawc. & Rendle	Ingarana	X	-	-	Px e Pu (IR e CE)	fruto e semente	Figueroa, Fachín-Terán e Duque (2012) f.
MORACEAE							
Sorocea duckei W.C. Burger	Caimbé	X	X	-	Px, Pu e Ps (CE)	folha, flor e fruto	Balensiefer, D.C. (2006) f. e Garcez, J.R. (2012) g.
MYRTACEAE							
Eugênia patrisii Vahll	Araça de touça	X	X	≠	Px, Pu e Pe (CE)	fruto	Balensiefer, D.C. (2006) f.; Santos-Júnior, L.B. (2009) g; Santos. D.R.(2012) e Cunha, F.L.R. (2013) sp
Myrcia sp.	Araça vermelho	X	X	-	Px, Pu, Pe e Ps (CE)	fruto	Santos-Júnior, L.B. (2009) g.
Myrciaria dubia HBK McVaugh	Camu-camu	X	X	X	Px, Pu e Ps (CE)	fruto	Cunha, F.L.R. (2013) sp.
NYMPHAEACEAE							
Nymphaea gardneriana Planch.	Apeí/aguapé	X	X	≠	Px, Pu e Ps (IR e CE)	planta inteira	Almeida, S.S., et al. (1986) g.

POACEAE							
Hymenachne amplexicaulis Rudge	Capim terra e água/capim capivara	X	X	X	Px, Pu, Pe e Ps CE)	planta inteira	Balensiefer, D.C. (2006) f. e Garcez, J.R. (2012) sp. e Fachín-Terán, A. et al., (2014) sp.
Oryza grandiglumis (Doell.) Prod.	Arroz silvestre	X	X	X	Px, Pu, Pe e Ps (IR e CE)	planta inteira	Portal, R da R. et al. (2002) sp.; Santos-Júnior L.B. (2009) g.; Fachín-Terán, A. et al. (2014) sp. e Cunha, F.L.R. (2013) sp
PONTEDERIACEAE							
Eichhornia crassipes (Mart.) Solms	mureru/mururé	X	X	X	Px, Pu e Ps (IR e CE)	planta inteira	Portal, R.da R. et al. (2002) sp.; Balensiefer, D.C. (2006) g.; Almeida, S.S., et al. (1986) sp. e Garcez, J.R. (2012) sp.
RUBIACEAE							
Genipa americana L.	Jenipapo- Pepa de Pintura	X	X	X	Px, Pu, Pe e Ps (IR e CE)	fruto	Almeida, S.S., et al. (1986) g Santos-Júnior, L.B. (2009) f.; Figueroa, Fachín-Terán e Duque (2012) sp. e Cunha, F.L.R., et al (2020) sp.
SAPOTACEAE							
Pouteria glomerata (Miq.) Radlk.	Abiorana	X	X	X	Px, Pu, Pe e Ps (IR e CE)	fruto	Fachín-Terán, A. et al., (1995) g; Almeida, S.S., et al. (1986) g; Santos-Júnior, L.B. (2009) g.; Cunha, F.L.R., (2013) g. e Garcez, J.R., (2012) sp.
SIMAROUBACEAE							
Simaba guianensis Aubl.	Cajurana	X	X	-	Px e Pe (CE)	fruto	Santos-Júnior, L.B. (2009) g.

* (f) = família, (g) = gênero e (sp)= espécie. ** *Podocnemis*: Px = tartaruga-da-Amazônia (*P. expansa*) Pu = tracajá (*P. uniifilis*), Pe = irapuca ou calalumã (*P. erythrocephala*) e Ps = Iaçá ou pitiú (*P. sextuberculata*). **Locais dos estudos (rio, água, estado e país):** Almeida, et al. (1986) – rio Xingu, água branca, Pará; Brasil.; Fachín-Terán, A. et al. (1995) - rio Guaporé, água branca, Rondônia, Brasil; Portal, R. da R. et al. (2002) – rio Bracuúba, água branca, Amapá, Brasil; Balensiefer, D.C. et al. (2006) – rios Solimões e Japurá, água Branca, Amazonas, Brasil; e Silva, V. A. et al. (2007) – rio Aiuanã, água preta, Amazonas, Brasil.; Santos-Júnior, L.B. (2009) – rio Jaú, água preta, Amazonas, Brasil Garcez (2012) – rio Juruá, água branca, Amazonas, , Brasil; Santos, D.R. (2012) – Rio das Mortes, água branca, Mato Grosso, Brasil; Figueroa; Fachín-Terán; Duque. (2012) – rio Caquetá, Amazonas, água branca, Colombia; Fachín-Terán, A. et al. (2014) – Solimões, água branca, Amazonas, Brasil e Cunha, F.L.R. (2013) – rio Uatumã, água preta, Amazonas, Brasil.