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CUTTINGS OF ETHNOICHTHYOLOGY IN RURAL COMMUNITIES OF TEFÉ, AMAZON, BRAZIL

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Abstract: There are few studies focused on the branch of ethnoichthyological research, but this result has been changing as the importance of research in this area is recognized, taking into consideration, the high cultural and biological diversity that involves this theme. In this sense, the main objective was to investigate the ethnoichthyological knowledge of a traditional riverside community. From the investigation, we sought to understand the meanings that the research subjects had about fish, the main species present in the community's lakes, use in food and production of medicines. The methodological path constitutes the type of ethnobiological research based on qualitative research. The research field was the community of Bacuri, in Tefé-AM, with the community fishermen as subjects. The results indicate that studies directed to Ichthyology/Ethnoichthyology are rare, and much less directed to the nutritional and protein value of fish species present in the rivers and lakes of the Middle Solimões.

Keywords: Ethnoichthyology, Natural Sciences, Science Education.

INTRODUCTION

Traditional ethnobiological resources are those of plant or animal origin. Very useful within a given cultural group, they originate locally and pass from generation to generation.

Ethnoichthyology, in turn, as a branch of Ethnobiology, seeks knowledge, generally from fishermen, about the migration, reproduction, feeding and defense of fish.

However, even though it is a shared practice that crosses generations, knowledge about species, characteristics and the lives of people who live in rural communities and who develop fishing activities, their popular techniques of creation and management, have gradually changed. These changes are possibly linked to climate, environmental, educational and production changes manifested over time.

Bearing in mind that considerations on freshwater fish are still rare in the educational setting of Tefé/Amazonas – that is, textbooks and pedagogical proposals present little or almost no information about species in the region –, research in this area will be well welcome, especially those that can reflect conservation actions that help production and also the need to delimit areas of greater importance for the conservation of aquatic and riverside species. Thus, the central problem of the research unfolded in knowing: What is the traditional knowledge of the population of fishermen involved in the study of fish and contributions to STS Education in the teaching of Natural Sciences.

For this purpose, ethnoichthyological knowledge was investigated and the traditional ethnoichthyological knowledge of people from a rural community in Tefé/Amazonas was recorded on the main species present in the community's lakes, use in food and production of medicines.

KNOWING BETTER THE FISH

Regardless of the environment in which the fish live, they are very sensitive to changes in this environment. They are the most evolved groups of animals that depend exclusively on water.

A fish can be defined as an aquatic vertebrate, with gills, also called gills, through which it uses the oxygen dissolved in the water. Depending on its shape, it is called whether it swims on the surface or on the bottom. Leather fish, such as the piraíba (*Brachyplatystoma filamentosum*) and the surubim (*Pseudoplatystoma corruscans*), move around the bottom, while the scales move around the surface, like the pacu (*Myleus rubripinnis*), sardine (*Triporthus elongatus* spp.) and tambaqui (*Colossom a macropomum*)

Freshwater fish can be divided into two

major groups: river and lake. The so-called river fish have a body adapted to swimming in current and fast waters and tend to be more resistant due to their muscular anatomy. They use up a lot of oxygen, since they usually swim and jump in rivers with great unevenness. They spawn in places favorable for reproduction.

Lakers prefer shallow lakes that can be natural or artificial. They have calm habits, are not good swimmers, need little oxygenation and resist waters rich in mineral salts and organic matter. Some of these lakes survive for a long time during the dry season by burying themselves in wet mud and mud.

The migratory movement of fish where reproduction occurs is called piracema, in which fish swim upstream to spawn. The word piracema originates from Tupi, and means "fish climb". This is an essential process for reproduction, as the physical effort of the fish when swimming against the current increases the production of hormones.

For Harold & Mooi (1994), even when areas of endemism are conceived as historical entities and not a simple distributional congruence of organisms, knowledge of the species existing in certain spaces is important. The areas where they are distributed and the knowledge of the species that live there are aspects that must be worked together with a view to raising efficient policies to protect the environment.

In the Amazon there are hundreds of species of fish, each one of which clusters in a certain region delimited by its habitat depending on food, spawning location, water temperature and absence of human movement.

THE ETHNOICHTHOLOGY

Studies related to this theme only emerged in the early 1950s, at Yale University (USA), in the wake of Cognitive Anthropology, new Ethnography or Ethnography, as a scientific reference, is considered new (DIEGUES;

ARRUDA, 2001)

We understand, however, that interdisciplinary ethnoscientific/ethnoichthyological studies focused on the "man/nature" dynamic do not only help ethnographic research, which consists of knowledge and innovation of theoretical and methodological aspects, as stated by Pasinato (2003), but studies of this nature can also be effective in enriching the curriculum content of other sciences, such as Natural Sciences.

Bearing in mind that fishing constitutes an important source of commercialization, food and leisure for a significant number of people in the Amazon context - especially those communities close to aquatic environments that use fishing activity both for their subsistence and as a source of income from the sale of fish (SANTOS; SANTOS, 2005) - this local characteristic can be used to mediate Science content in formal teaching environments.

STS EDUCATION IN THE TEACHING OF NATURAL SCIENCES

The teaching of Natural Sciences in the school space addresses discussions and contents regarding man's knowledge of the world, its environment and its transformations. There are many educational models that have emerged over time in pedagogical practice, and a model that is currently gaining prominence is the Science-Technology and Society (STS) model, which encompasses the formation of citizens seeking to work with students on content that discusses its reality, being a pedagogical practice that depends on the teacher and the student.

The STS approach promotes connecting the science content to the student's daily life, bringing their understanding of their environment, thus seeking a greater view of science, a broad view of the contents, provoking discussions about science, its

benefits and harms today in society. Given this perspective, Lorenzetti highlights:

Increasing the level of public understanding of Science is now a necessity, not only as an intellectual pleasure, but also as a necessity for man's survival. It is a cultural need to expand the universe of scientific knowledge, considering that today Science, Technology and their artifacts coexist more intensely (2001, p. 49).

Science has contributed a lot to the evolution of society and the world, but knowing how to question, discuss and clarify some answers that Science offers becomes a benefit of the CTS model. The teacher in the classroom makes little use of the CTS model, and tries to use the traditional model only to transmit updated information.

Working scientific content in a contextualized way, seeking the student's social context, is a methodology referring to this model, in which activities are passed on in a group way, as such content is discussed with the class, in order to investigate and critically analyze the contents involving science and society. According to Krasilchik:

It is a fact, however, that science teaching at school has always fluctuated between a more academic concern, focused on content and concepts, and a more utilitarian one, centered more on citizen training. Several reflections have already accumulated, not only on how to promote improvements in the teaching of this area, but also on the positive experiences and challenges found in schools for their development (2007, p. 19).

The teaching of natural sciences, therefore, not only has the function of approaching scientific concepts, but also transforming the subject into a literate citizen, as he will understand scientific concepts, their benefits and harms in their everyday reality. In view of this, Lorenzetti highlights: "If the school cannot provide all the scientific information that citizens need, it must, throughout schooling, provide initiatives so that students

know how and where to seek the knowledge they need for their daily life" (2001, p. 51).

Non-formal spaces are equally important in the students' learning process, as they also allow for the expansion of knowledge. These spaces outside the classroom become more significant for the students and the teacher must emphasize that science is not worked in a fragmented way, thus associating the content with the student's reality.

METHODOLOGICAL PROCEDURES

This study consists primarily of a review of the specialized literature, carried out between August and October 2017, in which books and journals present at "Universidade Estadual do Amazonas" (UEA) - "Centro de Estudos Superiores de Tefé", were consulted. and in scientific articles selected through a search in the SCIELO database. The search in the databases was carried out using the terminologies registered in the Descriptors of the Acta Amazônia created by the Virtual Library. The keywords used in the search were ichthyology, ethnoscience and ethnoichthyology.

The inclusion criteria for the studies found were the ethno-scientific approach and comparative studies between this and Science teaching.

The methodological path consists of the type of ethnobiological research, with data collection on the main species of fish and the way of preparing food and medicine, from the community under study, from the perspective of a "data generating methodology".

In general, the more open the question, that is, the less restrictive, the greater the freedom left to the informant to answer according to his own logic and concepts. Better said, the fewer questions, the better it will be. Therefore, a "data generating methodology" is recommended. That is, as the informant

proposes topics and explanations, there is less risk of damaging the information (POSEY, 1987, p. 24).

In this type of research, the essential thing is to leave the informant at ease and, based on his answers, ask questions based on the answers obtained, asking him to talk about the subject. It is also important for the researcher not to underestimate the informants and their beliefs and let them guide the conversation.

The research field was the Bacuri Community, located in the rural area of the municipality of Tefé-AM, on the left bank of Lake Tefé. In this Amazon space, the dominant climate type is tropical, hot and humid, the annual temperature fluctuates between 25° and the relative humidity is always high due to the high rainfall in the Amazon Basin. In the region where the Bacuri community is located, there are also drier periods, in which the rains are less frequent and which is known as “summer” by the local population, while the rainy season is called “winter”.

It is precisely because of these climate changes that occur every year, with floods and droughts, that the water level of the Solimões River suffers fluctuations, causing changes in the daily life of the community, in their housing, food, locomotion, among other factors.

During the trip to the field in the Bacuri community, the questions that generated ethnographic data on the community's ethnoichthyological resources were elaborated.

The data from the questionnaire applied to the community members and organized from the content analysis, starting with the Pro-analysis, were directed through the following questions:

- a) Tell me about the fish you catch here in the community.
- b) Tell me about the types of fish most present in your diet.

c) Tell me about how these fish are prepared.

d) Is there anything else you usually prepare using fish? Tell me about it.

The answers concerning these questions are summarized in the table below, in which it is understood that community members will be represented by (C) and the numbers 1, 2, 3,... correspond to the number of subjects interviewed.

From this we move on to the second stage, the Exploration of the Material, in which, based on the responses found, new themes emerged through the analysis of the responses in Table 1, separating by similar responses, the following data were obtained, represented in Table 2, below:

RESULTS

From the previous stages of the research, the treatment of results and interpretations were then carried out, in which analyzes were made of the themes that emerged and then the elaboration of new categories.

The table below identifies the fish most caught and consumed by the community, indicating their nutritional value.

Fish is one of the healthiest foods that are part of the population's diet, especially in the Amazon region. White meat has a very low fat content, lowers cholesterol, and is a source of vitamins (A, E and D).

It can be noticed, observing Table 3, that all the species highlighted here show high protein content, as they present results above 15 and 20%. According to Stansby (1961), these values are considered high. In fact, fish from the Middle Solimões is a rich source of animal protein.

Fish from the Amazon region often appear on the table of the people of the Amazon, whether they are baked, boiled or fried. And especially for traditional communities that fish for subsistence, whose food menu is based

mainly on this type of food.

In the Community of Bacuri, where the research was carried out, there was a large amount of fish in the food menu of the community members. The most consumed fish, according to the survey, is the jaraqui (*Semaprochilodus insignis*), “Gordinho” as it is called by the community, which, according to Table 3, has an excellent protein value and low amount of fat. Although the community members consume a lot of white meat, it is possible to notice an insufficiency of more species in the research region, this is mainly due to climate changes in the region, the flood or drought cycles are the reasons why, depending on the season, food with the fish it varies, sometimes leading to feeding with a few species. According to the author:

Considering the large size and the different geographic gradients that make up the basin, it turns out that these phases or seasons occur at different times throughout its coverage area. It is, therefore, an additional and important factor for the complexity of ichthyofaunistic diversity, as well as fish behavior and fishing dynamics (SANTOS; SANTOS, 2005, p. 171).

This process of rising and falling waters occurs every year and goes through the flood (flood) and ebb (dry) phases. In the Amazon regions, piracema, the time when the fish go up the rivers to spawn, occurs during the flood period, which is “when most species form shoals and undertake migrations to spawn in the mouths of streams or on the banks of rivers” (SANTOS ; SANTOS, 2005, p. 171). It is known that during this period, fishing for fish is prohibited precisely because it is their breeding season, which is called the “Defeso” season.

Data collection in the Bacuri Community was carried out during the flood season, which may have resulted in information on just a few species on the food menu of the community members. According to Table 3,

the fish consumed by the community are scale fish, precisely because of the location of the lake where they fish. However, according to Witkoski (2010), the consumption of scaled fish is due to the fact that Amazonian peasants have always preferred eating scaled fish to leathery/smooth fish. One of the most used arguments to explain this preference is based on the fact that the meat of leathery/smooth fish is creamy. Reimosos fish,” according to the world view of Amazonian man, in general, and the inhabitants of the várzea in particular, are carriers of rhyme – a substance that damages the blood, causes the unpleasant sensation of itching, is harmful to the body, etc., and, therefore, they must be avoided” (WITKOSKI, 2010, p. 301-302).

Besides, in Bacuri there were reports of community members who preferred fish with scales precisely because the flat fish is king. But despite this preference, flatfish fishing in lakes close to the community still exists, because of the size and ease of commercialization, but this occurs on a small scale.

In addition to the number of species in the community, the way in which the fish is prepared was also analyzed, noting the need for greater use of vegetables in the diet. The most cited ingredients were chicory, chives, head onion, garlic, sweet pepper and parsley. These vegetables are taken from the planting of the community itself, in which most have the profession of agriculturist. Thus, the community has few options of vegetables to prepare food, and it is known that a food menu based on various types of vegetables has a greater source of nutrients.

As shown in Table 1, the community members of Bacuri use fish for food, but there is no variability in the types of dish, only roasted, boiled and fried. And a few, such as hake (*Plagioscion squamosissimus*) and traíra (*Hoplias malabaricus*), are used to make home remedies.

SYNTHESIZED ANSWERS (Pro-analysis)				
	QUESTION A	QUESTION B	QUESTION C	QUESTION D
C1	All kinds of fish, jaraqui, aracu, pacu.	The jaraqui, pacu, aracu.	Baked, boiled and fried. I use onion, chicory, parsley, sweet pepper.	For feeding.
C2	I only fish the jaraqui mermo, Cará.	Those are the ones from there, the jaraqui and the yam.	Baked, boiled and fried. It has spice inside, fragrant pepper, onion.	For feeding.
C3	Of all quality, jaraqui, curimatá, of these white girls. Aracu, pacu, tucunaré.	They are the same, jaraqui, curimatá, branquinha, aracu, pacu, tucunaré.	Fried, boiled and baked. With greens.	For feeding.
C4	When it's full, it's the aracu, jaraqui, bafuti, the arrowhead, the crybaby and the little braquinha, right?	Are the same.	Stewed, sometimes roasted. With greenery.	For feeding.
C5	Here we only catch small fish: jaraqui, curimatá, aracu, Chorona.	For those times it's more like the jaraqui.	Fried, boiled and baked.	For feeding.
C6	hake, jaraqui. Just that.	Those are the ones right there, jaraqui and hake.	Boiled and fried.	For feeding.
C7	Fish that the boys catch the most here is mapará, aracu, in the flood season the jaraqui.	Here we eat aracu more.	Boiled and fried. Add onion and chicory.	For feeding.
C8	Hake, mapará and jaraqui.	The jaraqui.	Fried or boiled, baked.	For feeding.
C9	These jaraquis, sometimes these little guys, hake.	The jaraqui, carazinho, which they call carapixuna, bararuá and pescada.	Boiled and fried. With vegetables, onions, those spices there, garlic.	For food and medicine.
C10	What we fish the most is jaraqui, curimatá and yam.	Those are the ones right there, jaraqui curimatá and o cara.	Boiled, roasted and fried.	For feeding.
C11	Carazinho and jaraqui.	The ones I mentioned.	Baked, boiled. The jaraqui is fried.	For feeding.
C12	Here, we found all kinds, right? Jaraqui, yam, hake and traíra.	Jaraqui and cará.	Boiled, fried and baked. In the stew I use fragrant pepper, straw onion, head onion and chicory.	For food and to make medicine.
C13	It is jaraqui, curimatá and aracu.	It's jaraqui and tucunaré.	Fried, baked and boiled. Season with onion and garlic.	For feeding.
C14	Jaraqui, some cards too, carauaçú.	It's the jaraqui.	Really cooked, with onion, chicory, cabbage, parsley and sweet pepper.	For feeding.
C15	Jaraqui, yam too, aracu, matrinchã.	Those right there, jaraqui and cará.	Baked, boiled and fried. To season chives, green smell and chicory.	For feeding.

Table 1- Pro-analysis. Outline of the questions and answers of the Community Members' questionnaire

Source: Prepared by the author after an ethnoichthyological interview

THEMES RAISED FROM THE ANSWERS (Exploration of the Material)		
QUESTION	COMMUNITY	RAISED THEMES
A	C-1, C-3, C-4, C-9, C-10.	Consumption of three or more species of fish.
B	C-1, C-2, C-3, C-4, C-5, C-6, C-8, C-9, C-10, C-11, C-12, C-13, C-14, C-15.	The consumption of jaraqui fish (<i>Semaprochilodus insignis</i>) as a highlight in the food menu.
C	C-1, C-2, C-3, C-5, C-8, C-10, C-11, C-12, C-13, C-15.	Use of the 3 preparation modes: boiled, fried and roasted.
D	C-12, C-9.	The use of fish for consumption and to make medicine.

Table 1 - Profile of generating themes

SOURCE: Elaborated by the author

NUTRITIONAL VALUE OF FISH				
Common name	Scientific name	Protein(g)	Lipids (g)	kcal
Jaraqui	<i>Semaprochilodus insignis</i>	20,10	5,4	129
Aracu- comum	<i>Schizodon fasciatus</i>	19,3	10, 0	159,3
Acará-açu	<i>Astronotus ocellatus</i>	22,0	6,0	142,0
Pescada	<i>Plagioscion Squamosissimus</i>	19,4	1,8	89,3
Curimatã	<i>Prochilodus nigricans</i>	19,7	20,7	250,7
Pacu- branco	<i>Myleus rubripinnis</i>	17, 0	24,9	292,10
Branquinha	<i>Potamorhina altamazonica</i>	21,0	16,4	217,2
Tucunaré	<i>Cichla monoculus</i>	22, 0	6, 0	142, 0
Mapará	<i>Hypophthalmus edentatus</i>	18, 9	3,8	115, 0
Matrinxã	<i>Brycon amazonicus</i>	20,4	11,8	187,8

Table 3 - Community fish

SOURCE: Acta amazônica, 1982 - Protein, fat and energy composition of 100 g of the edible part of some Amazonian fish

The traíra is a carnivorous fish very found in the lakes and streams of the Amazon, it has soft and oily meat. It prefers places where there is a lot of aquatic vegetation and where it can hide and feed.

Traíras can reach 60 cm to 80 cm in length and weigh more than 3 kilos, their meat is one of the most delicious and appreciated. A yellowish fat is removed from the traíra, which is used by the community of Bacuri-AM to treat swelling, and is applied to the external parts of the body.

Hake was another fish cited as a species used to prepare medicine. A stone located on its head is removed from this fish (formed by calcium carbonate and proteins deposited in bands, the number and thickness of which are associated with the periods of growth of the fish). These stones, called otoliths, form the system responsible for the balance of the fish, preventing it from turning sideways or belly up. In the context of the research, the community members of Bacuri use these crushed stones to make a tea with which they treat kidney pain.

CONCLUSION

Although we found some works published on Ethnoscience, as well as on Ethnoichthyology, we did not find any work that articulated a discussion between Ethnoichthyology and Ichthyology in traditional communities of the Middle Solimões. However, we can reaffirm the importance of discussing the issue in question, since fishermen and, more specifically, those from the municipality of Tefé/AM, have important empirical knowledge that must be used in establishing reorientations and projections regarding their conduct in relation to the environment.

The final data of the survey do not point to major problems related to the quantity of fish species found, but to the consumption of greens and vegetables. The species vary

according to the rise and fall of the waters of the lakes and the amount of protein in the fish meat has average values, the caloric consumption is also low. However, a balanced diet is necessary, with the presence of more vegetables and innovations in the preparation of fish, as well as its use in the production of medicine and other spices.

Through research, it was possible to expand knowledge about the diversity of fish in the Amazon, as well as to perceive the rich cultural and biological diversity that the subjects of traditional communities have about the most varied fish, knowledge that gains meaning as they are taught and at the same time experienced by them. We point out, therefore, the need to try to integrate into the curriculum of school subjects this representativeness arising from the knowledge of these subjects and the place where they are inserted. Therefore, when working with the teaching of Natural Sciences, it is necessary to discuss the STS model, such that it discusses the importance of knowing how to understand contexts and, through this, (re)signify the subjects that science encompasses, always seeking to investigate, knowing that science is not neutral, thus seeking to act responsibly, distancing itself from ethnocentric conceptions by mediating knowledge in diverse contexts, in addition to highlighting the importance of the survival of species in the community, based on behaviors that demand more sustainable actions of how to deal with ichthyological resources.

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