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Environment

Museographic transposition of the exhibition in the Água Branca aquarium, São Paulo – Brazil

A transposição museográfica da exposição no aquário Água Branca, São Paulo - Brasil

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ABSTRACT

Public and private aquariums are important educational tools. However, their exhibits are often characterized by disconnected and disorganized information, making it difficult for the public to understand key aspects of particular species, as well as their entire ecological context. With this in mind, the present study aimed to analyze the museographic transposition processes that occurred in the *Água* Branca Aquarium involving knowledge related to the sustainability of fishing and aquaculture. To accomplish this, species files were surveyed, together with the content of the information boards present in the *Água* Branca Aquarium. Using these data, it was possible to generate a conceptual map composed of the information obtained in the form of keywords. This conceptual map, together with the products derived from it, forms the foundation for modernizing exhibits presented at the *Água* Branca Aquarium for all content covered in the exhibition and knowledge related to the environment, fisheries, and aquaculture. Such modernization will make the *Água* Branca Aquarium a more dynamic space for the dissemination of knowledge, providing scientific knowledge in a more didactic, but easy-to-understand, way.

Keywords: Fish; Museology; Conceptual map

RESUMO

Os aquários públicos e privados são importantes ferramentas educacionais. No entanto, suas exposições são frequentemente caracterizadas por informações desconexas e desorganizadas, dificultando ao público a compreensão de aspectos fundamentais de determinadas espécies, bem como de todo o seu contexto ecológico. Com isso em mente, o presente estudo teve como objetivo analisar os processos de transposição museográfica ocorridos no Aquário da Água Branca envolvendo conhecimentos relacionados à sustentabilidade da pesca e da aquicultura. Para isso, foram levantados

os arquivos das espécies e o conteúdo dos painéis informativos presentes no Aquário da Água Branca. Com esses dados, foi possível gerar um mapa conceitual composto pelas informações obtidas na forma de palavras-chave. Esse mapa conceitual, juntamente com os produtos dele derivados, constitui a base para a modernização das exposições apresentadas no Aquário da Água Branca para todo o conteúdo abordado na exposição e o conhecimento relacionado ao meio ambiente, à pesca e à aquicultura. Essa modernização tornará o Aquário da Água Branca um espaço mais dinâmico para a disseminação do conhecimento, proporcionando conhecimento científico de forma mais didática, porém de fácil compreensão.

Palavras-chave: Peixe; Museologia; Mapa conceitual

1 INTRODUCTION

The Instituto de Pesca, founded in 1969, is a scientific and technological research institution that develops projects in the areas of Fisheries, Aquaculture and Limnology. It aims to obtain and transfer technologies and build and share knowledge directed toward improving fish agribusiness and environmental quality. It was the first research organization in the country focused on the study of aquatic ecosystems and the biology of marine and continental organisms. The Institute manages two spaces for communicating and disseminating institutional actions aimed at science, education and culture. These are the Museu de Pesca, located in Santos for over 70 years, and the Água Branca Aquarium.

Zoos, museums and public and private aquariums play an essential role as promoters of science and culture through the conveyance of information to the public. This is accomplished through exhibits, making use of materials for dissemination and even displays of live animals. According to Salgado and Marandino (2014), the multidisciplinary interaction between aquariums and oceanariums affords the public the opportunity to expand their knowledge, combining different communication resources, such as written text, audiovisual programs and live fish exhibits, all informative to preschoolers through university students.

However, spaces, such as museums, aquariums and zoos, may often present both information and displays in a disconnected and disorganized manner, making

it difficult for the visiting public to understand in a coherent way concept about fish species, their habitat and their overall ecological importance. To address this, Novak and Canãs (2008) reported that the elaboration of concept maps has been a successful strategy in the teaching-learning process. Researchers have used it to develop new knowledge. More specifically, through the correlation of different subjects addressed in these spaces, it is possible to understand how different bits of information fit into a whole picture in a given area. The present study will put this theory into practice by analyzing the museographic transposition processes that occurred in the Água Branca Aquarium involving knowledge related to the sustainability of fishing and aquaculture, resulting in a greater appreciation and visibility of this historic space in the city of São Paulo, as well as a much more accessible and valuable source of information for students and the public at large.

The history of public aquariums in Brazil begins with the creation of the Jacques Huber Aquarium. It was founded in 1911 to integrate the research and study complex of the Zoobotanical Park at the Museu Paraense Emílio Goeldi. The space was designed by the botanist Jacques Huber who ran the institution with the support of the designer Ernst Lohse. It contains fish and reptiles of cultural and economic importance for the Amazon, currently bringing together about 40 species (FUNDEP 2017). Considered the second oldest aquarium in Brazil and the oldest in the State of São Paulo, the Água Branca Aquarium was built in 1930 and is considered an important instrument for disseminating cultural and scientific content to the population. It is a space with a very impressive public visitation. According to Rojas and Kubo (2021), the space reopened in 1998 and received a total of 77,199 visitors, but 174,873 in 2003. A total of 30 (thirty) tanks are distributed in the structure, allowing visitors to become familiar with the variety of fish that are part of the aquaculture and fishing areas of the country, as well as species native to Brazil, exotic and hybrid (São Paulo 2021).

Thus, this work aimed to systematize and standardize all the information contained at the Água Branca Aquarium, which is managed by the Fisheries Institute

of the Paulista Agency for Agribusiness Technology, an organ of the Secretary of Agriculture and Supply of the State of São Paulo State. It aimed to improve the structure and organization of the space, communicating its role to interested users, whether they come from science, education or the public at large.

2 MATERIAL AND METHODS

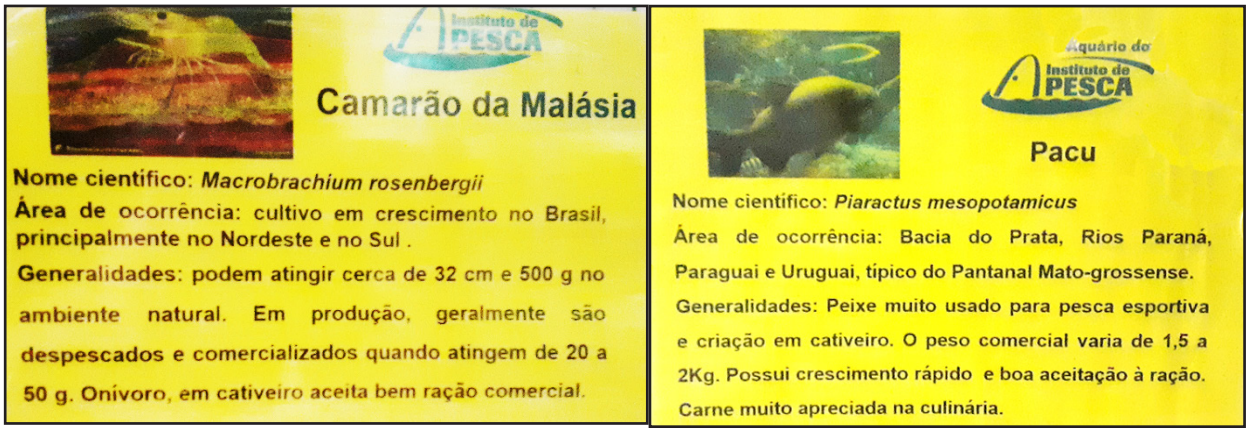
We visited Água Branca Aquarium for the purpose of collecting all bibliographic information on each aquatic species on display. We obtained this information from species description sheets and information boards available in corridors. From this collected information, it was possible to create the following:

- general conceptual map: proposed in the main objective of the project, which addresses the terms in the different exhibits;
- species diagrams: details current species on exhibit and those that have been exhibited, highlighting regions of origin and habitats of coexistence;
- table of commercial segments, representing the use of species in different commercial segments.

The methodology used in this work was inspired by the work developed by Mortensen (2010), who used concept maps to analyze terms of reference in texts of academic works, producing a curatorial document for the creation of an immersion exhibition.

The method for structuring the process of this study began with a physical visit to the space, followed by informational content research, which included 109 (one hundred and nine) photos of the species found in the space's tanks and aquariums; 38 (thirty-eight) photos of the files that identify the origin and location where most animals were found; 10 (ten) photos of visual communication pieces, contained in the physical structure, with information about fishing, aquaculture, biology, environment and curiosities of the aquatic universe.

Figure 1 – Communication boards



Source: Gabriela de Oliveira Pereira/ Gabriela' private collection (December, 2020)
Caption: Examples of communication boards present in the Água Branca Aquarium exhibition

The information contained in the photographic material was transcribed into two documents, which served as an informational repository for the creation of a third, with the terms used in the description of the entire exhibition of the Aquarium, and, with that, a conceptual map was prepared.

This content was then separated into two different Word documents using a Notebook Positivo Premium Core i3. The first document was entitled "FICHE OF EACH SPECIES IN THE AQUARIUM", aimed at organizing photos and descriptions obtained from the identification sheets of each species present in the Aquarium. The second document was named "INFORMATIVE BOARDS IN THE AQUARIUM", in which the photos of the visual communication boards distributed throughout the physical structure of the Aquarium were organized, as well as the description of the information contained in each of them.

Using these data, still another Word document was created, entitled "LIST OF USED TERMS". This document organized all terms in the exhibition sheets, by keywords, followed by their meanings, with a total of 72 (seventy-two) terms found in the whole exhibit.

These three documents formed the basis for elaborating the main conceptual map, named "CONCEPTUAL MAP OF DESCRIPTIVE INFORMATION OF THE ÁGUA BRANCA AQUARIUM" (Figure 2). The conceptual map relates terms present in species

records with information tables, conforming to the most commonly used approach. A total of 13 diagrams were also created, aiming to organize the main species of the aquarium, according to their place of origin.

Conceptual maps and diagrams were created using Canvas software, which, according to Gehred (2020), is a tool created for graphic design professionals. A total of 72 (seventy-two) terms were made available for the creation, with 12 groups in which two or more terms come from a term located at the extremes of the conceptual map.

Using the Google Spreadsheet, it was also possible to create a table that organized aquarium species according to their commercial use and origin: native, exotic or hybrid.

3 RESULTS AND DISCUSSION

The elaborated conceptual map is shown in Figure 2. The central term of the map is Fish, representing current and past animals exhibited at Água Branca Aquarium. All other information from the exhibit was linked to this term by a series of keywords, forming groups, such as biology, with terms, such as Food Habit, Natural Habitat and Respiratory System, and Commercial Production, with terms such as Commercial Segments, Fisheries and Aquaculture.

Two or more terms originating from the same term, which are part of the same theme of the conceptual map, were called groups. The location of most of these groups remains on the edge of the created conceptual map. So that the visualization of each of the groups and their theme could be differentiated from the other nearby groups, different colors were applied to each one (Figure 2).

The “CONCEPTUAL MAP OF DESCRIPTIVE INFORMATION ON AGUA BRANCA AQUARIUM” has a total of 77 (seventy-seven) “arrow” symbols to connect terms, and it contains 22 (twenty-two) linking words located next to the “arrow” symbols. The use of linking words is intended to indicate the type of connection between two or more terms.

As shown in Figure 2, starting from the central term “Fish”, the term “Respiratory System” originates, also giving rise to the terms “Atmospheric Air”, “External gills” and “Swallowing bubbles” to define the different terms related to the Fish Breathing System. With the origin of the same central term, the term “Classification” also appears, resulting in the terms “Skin Structure” and “Body Structure”.

The term “Skin Structure” generates the terms “Leather Fish” and “Scale Fish”, indicating the division of fish species based on the structure of the skin. “Body Structure” refers to the different body structure of fish, such as “Bone Fish” and “Cartilaginous Fish”, as the two different terms generated.

In the Conceptual Map, the term “Fish” also gives rise to “Food Habit”, which gives rise to 5 (five) different terms, described below:

Herbivore corresponds to the terms “Plants”, “Seeds” and “Algae”, referring to plant-based fish food;

Omnivore has two arrows pointing to the terms “Herbivore” and “Carnivore”, suggesting that the feeding of Omnivores is based on both the feeding of Herbivores and Carnivores;

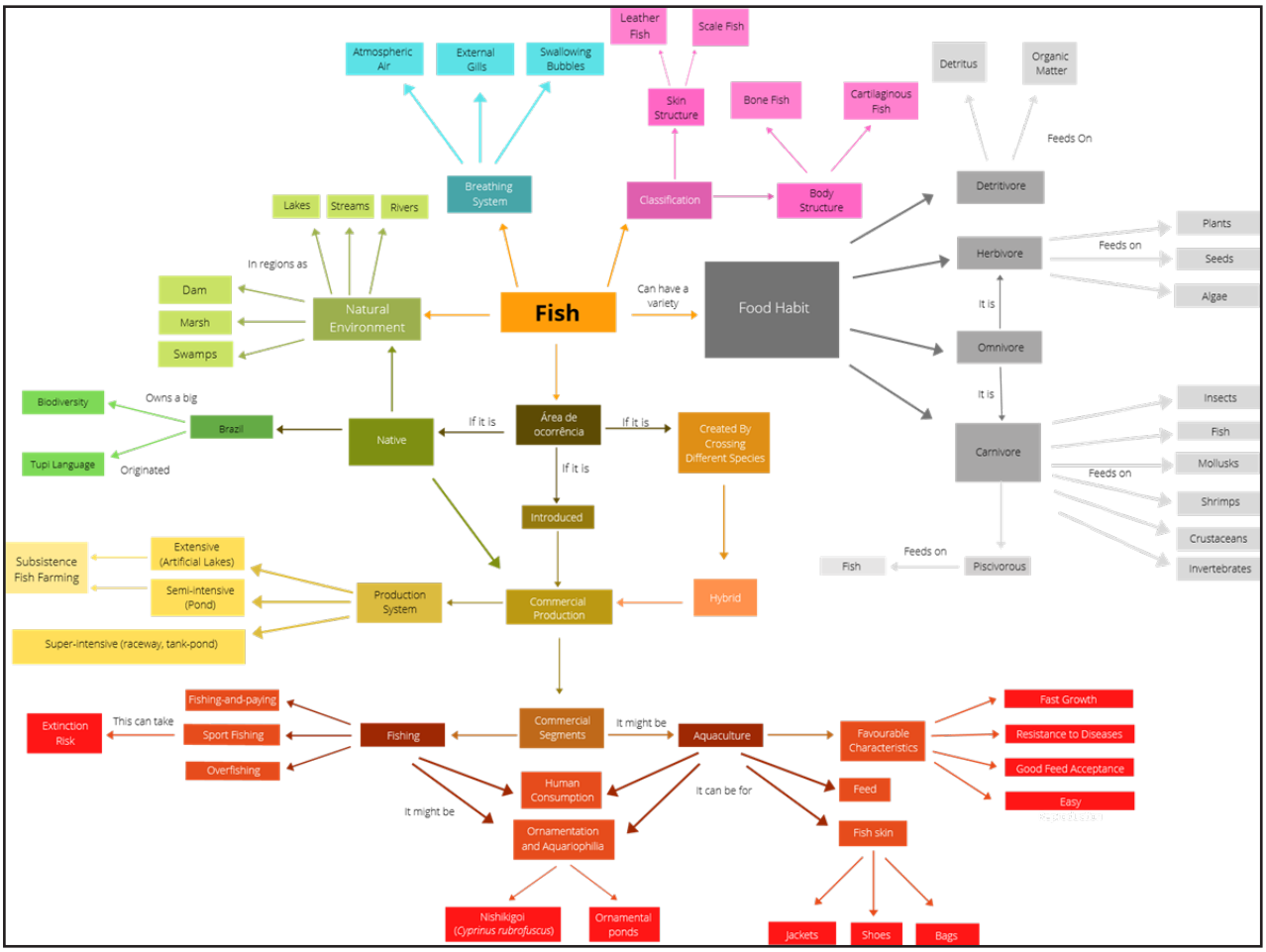
Carnivore gives rise to 2 (two) arrows, one containing 6 (six) different terms: “Insects”, “Fish”, “Mollusks”, “Shrimps”, “Crustaceans” and “Invertebrates”, with different eating habits of animal origin;

Piscivore, different from other terms, refers to other groups of fish that feed on other fish;

Detritivore corresponds to a diet based on “Detritus” and “Organic matter”.

On the left side of the Conceptual Map is the term “Natural Environment”, starting from the central term “Fish”, which generates another 6 (six) terms: “Rivers”, “Streams”, “Lakes”, “Dam”, “Marsh” and “Swamps”, referring to different locations and natural environments of fish.

Figure 2 – Conceptual Map



Source: Gabriela de Oliveira Pereira/Gabriela's private collection (December, 2020)
Caption: Conceptual map of the descriptive information of the Água Branca Aquarium

Still on the left is the term "Area of Occurrence" which originates from the term of origin, "Fish," and generates, in turn, the terms "Native", "Introduced" and "Created by Crossing Different Species", which describe the means of origin of a particular species of fish. From the term "Created by Crossing Different Species," the term "Hybrid" is generated, naming the process of crossing fish of different species. The terms "Hybrid", "Introduced" and "Native" determine the term "Commercial Production", suggesting that the creation of native, hybrid and introduced fish gives rise to commercial fish production.

From "Natives" comes the term "Brazil" and then the terms "Biodiversity" and "Tupi Language", indicating that native fish come from Brazil with its biodiversity and that some names of different species have Tupi origin.

From the term “Commercial Production” comes the term “Production System”, which in turn generated the terms “Extensive (Artificial Lakes)”, “Semi-intensive (Pond)”, and “Super-intensive (raceway, tank-pond)”. The terms “Extensive (Artificial Lakes)” and “Semi-intensive (pond)” together created the term “Subsistence Fish Farming”, suggesting different commercial production systems in both extensive systems – in which artificial lakes are used – and the semi-intensive and super-intensive systems, which are used for subsistence fish farming.

From the term “Commercial Production” comes the phrase “Commercial Segments”, and from this, the terms “Fishing” and “Aquaculture” are born, both, in turn, triggering the terms “Human consumption” and “ Ornamentation and Aquariophilia”, showing different commercial segments in the commercial production of fish (Fisheries and Aquaculture) and the objectives of this production, i.e., human consumption, ornamentation and aquarism.

From the term “Fishing,” 3 (three) terms are created: “Fishing-and-paying”, “Sport Fishing” and “Overfishing”, and from the latter comes the term “Extinction Risk”, thus suggesting that the commercial segment of fishing gives rise to both overfishing, which can put fish at risk of extinction, and fishing, which can also give rise to Fish-and-Pay and Sport Fishing. With the term “Ornamentation and Aquariophilia”, originated from the terms “Fishing” and “Aquaculture”, come the terms “Nishikigoi (Cyprinus rubrofuscus)” and “Ornamental ponds”, indicating that both Nishikigois and ornamental ponds are used in ornamentation and aquarism.

In the lower region of the Conceptual Map, we see 5 (five) terms from the term “Aquaculture”: “Human Consumption”, “Ornamentation and Aquariophilia”, as previously presented, and the terms “Feed” and “Fish skin” which also fall under the term “Favorable characteristics” within the commercial segment for providing human consumption, ornamentation and aquariophilia, as well as the production of fish feed and skin, hence favorable characteristics.

From the term "Fish Skin" originate the terms "Jackets", "Shoes" and "Bags", indicating that through fish skin it is possible to produce these items. With the term "Favorable Characteristics", which emerged from the term "Aquaculture", comes the terms "Fast Growth", "Resistance to Diseases", "Good Feed Acceptance" and "Easy Reproduction", proposing that among the favorable characteristics to produce fish in aquaculture are fast growth, disease resistance, good feed acceptance and easy reproduction.

3.1. DIAGRAMS OF SPECIES ORIGINS OF THE ÁGUA BRANCA AQUARIUM

The 13 species origin diagrams are shown in Figure 3. Three groups of species were obtained according to origin: the grouping of Native species, for species exclusive to Brazil, and Exotic species, for species that originate in foreign countries. Then, in each division, other divisions were created:

for Native grouping, species are divided among those from the Amazon Basin, Southeast region, Midwest region, North and South regions;

for the Exotic grouping, species are divided among those from North America, Central America, African Continent and Asia.

The third grouping was carried out with the hybrids because they did not participate in the division in the conceptual map by region of origin, since they did not originate from the natural environment.

3.2. BUSINESS SEGMENTS TABLE

Table 1 shows the commercial segments that use the different species on display at the Água Branca Aquarium. The uses of the different species were separated into 3 (three) commercial segments: Aquaculture, Fisheries and Ornamentation. For a better understanding, the species were also subdivided into 3 (three) groups related to their origin: Native Species, Exotic Species and Hybrids.

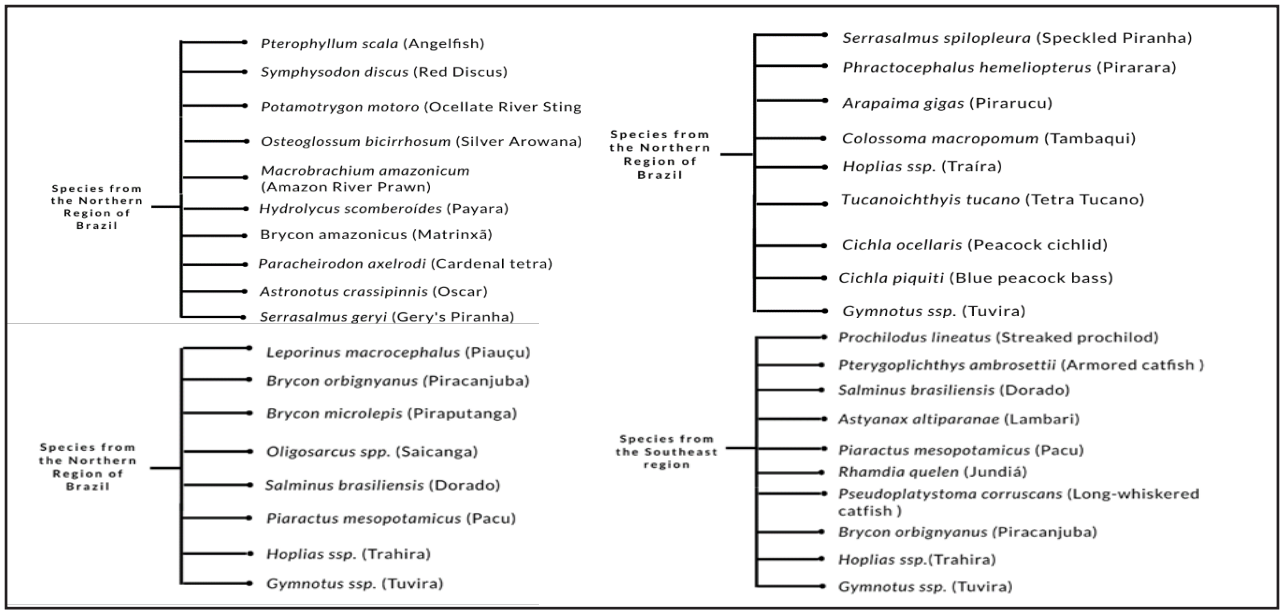
The use of the conceptual map has become crucial for the organization of the information present in the Água Branca Aquarium exhibition, connecting elements and

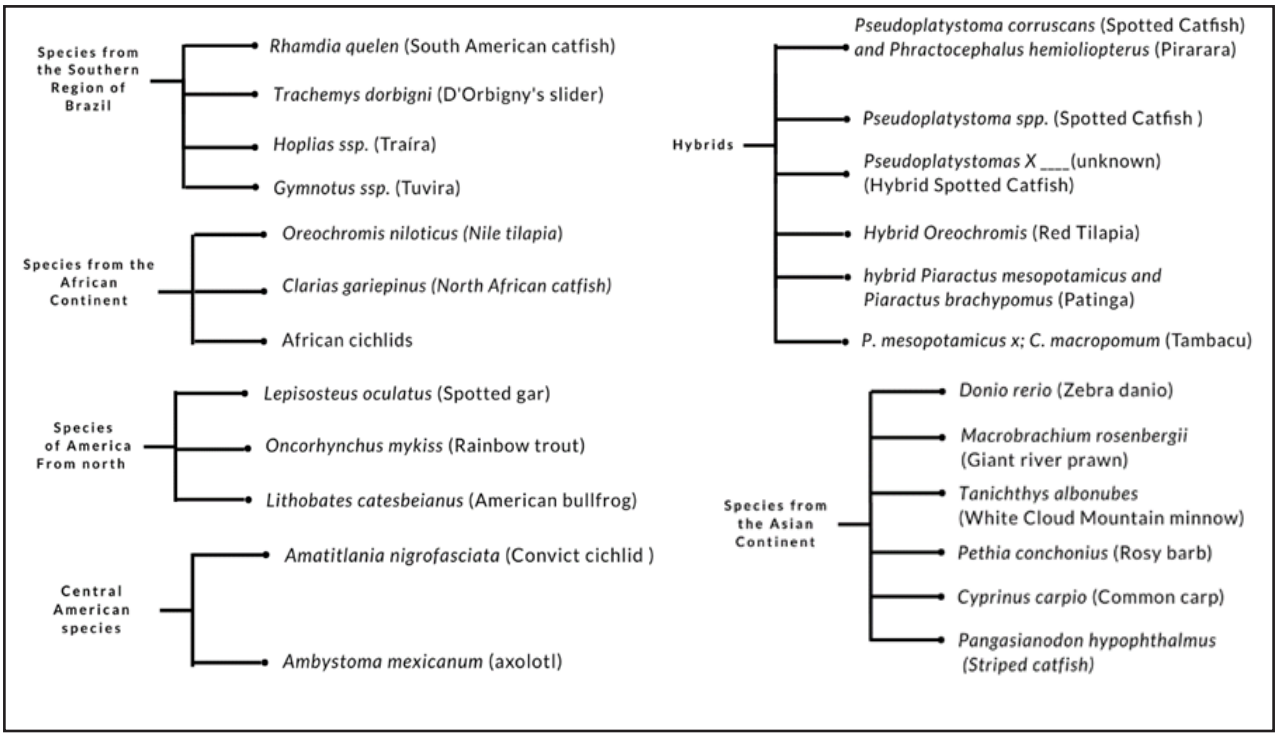
data in the descriptions of the species and information boards so that visitors will have a holistic impression of species in exhibits. This type of organization is also essential for the creation of exhibits aimed at professionals who appreciate a conceptual approach to data (Salgado 2011).

Mattos (2011) used the conceptual map methodology, not only to analyze knowledge of reference in academic works, but also analyze terms of reference present in the descriptive texts and in the dynamic expository elements of the exhibition of the Ubatuba Aquarium (SP).

Conservation policies have been debated for years. One way to reconcile differences is through strengthening environmental education in such spaces as aquariums and oceanariums. For example, according to Holanda (2016) campaigns carried out within zoos and aquariums seek to promote environmental education with the message that life is fragile and interdependent on this planet.

Figure 3 – Diagram of Species





Source: Gabriela de Oliveira Pereira/ Gabriela' private collection (December, 2020)
Caption: Diagram of the origin of native, exotic and hybrid species o at the Água Branca Aquarium

According to Salgado and Marandino (2014), aquariums and oceanariums can expand knowledge for the visiting public through clarifying the inter-relationships among such disciplines as zoology and taxonomy when animals share tanks in exhibits. Indeed, the tank environment can represent its natural environment and demonstrate how the animal interacts in its habitat, thus addressing elements of ecology and ethology.

For Packer and Ballantyne (2010), zoos and aquariums should allow the visitor's interest to guide him/her through exhibits, provoking such interest along the way. For example, the exhibition of a thematic space with garbage found in rivers and oceans highlights the importance of protecting marine and freshwater environments, considering that they harbor a large part of the planet's biodiversity.

When building their exhibition spaces, the creators should elaborate narratives with clear purposes of teaching and disseminating knowledge about marine and continental ecosystems and organisms and, perhaps, change behavior in relation to preservation of the environment (Salgado and Marandino 2014).

Figure 4 – Species of Different Commercial Segments

Classification By Origin	Popular Name	*Scientific Name*	Fishing	Consumption	Ornamental
Exotic Species	Convict cichlid	*Amatitlania nigrofasciata*			X
	North African catfish	*Clarias gariepinus*		X	X
	Axalotle	*Ambystoma mexicanum*		X	
	Common Carp	*Cyprinus carpio*		X	X
	Zebra danio	*Donio rerio*		X	X
	Giant River Prawn	*Macrobrachium rosenbergii*		X	
	African Cichlids				X
	Striped Catfish	*Pangasianodon hypophthalmus*		X	X
	American Bullfrog	*Lithobates catesbeianus*		X	
	Nile Tilapia	*Oreochromis niloticus*	X	X	
	Rainbow Trout	*Oncorhynchus mykiss*	X	X	
Hybrids	Pintarara	*Pseudoplatystoma corruscans (Spotted Catfish) and Phractocephalus hemioliopterus (pirara)*		X	
	Amazon Spotted Catfish	*Pseudoplatystoma spp.*		X	
	Hybrid Spotted Catfish	*Pseudoplatystomas X ____(unknown)*		X	
	Red Tilapia	*Hybrid Oreochromis*		X	
Native Species	Oscar	*Astronotus Ocellatus*	X	X	X
	Twospot Astyanax	*Astyanax bimaculatus*	X	X	X
	Matrinxã	*Brycon amazonicus*	X	X	
	Piracanjuba	*Brycon orbignyanus*	X	X	
	Cará	*Geophagus brasiliensis*	X	X	
	Payara	*Hydrolycus scomberoides*	X		
	Cascudo	*Hypostomus affinis*	X		X
	Piauçu	*Leporinus macrocephalus*	X	X	
	Amazon River Prawn	*Macrobrachium amazonicum*	X	X	
	Silver Arowana	*Osteoglossum bicirrhossum*	X		X
	Pirapitinga	*Piaractus brachypomus*	X		
	Pacu-guaçu	*Piaractus mesopotamicus*	X	X	
	Ocellate River Stingray	*Potamotrygon motoro*	X?	X	X
	Streaked Prochilod	*Prochilodus lineatus*	X	X	
	South American Catfish	*Rhamdia quelen*	X	X	
	Dorado	*Salminus brasiliensis*	X	X	
	Gery's Piranha	*Serrasalmus geryi*	X		X
	Speckled Piranha	*Serrasalmus spilopleura*	X	X	X
	Swamp Ghost Crab	*Ucides cordatus*	X	X	
	Piraputanga	*Brycon microlepis*	X	X	
	Pirarara	*Phractocephalus hemeliopterus*	X	X	X
	Pirarucu	*Arapaima gigas*	X	X	X
	Tambaqui	*Colossoma macropomum*	X	X	
	Wolf Fish	*Hoplias malabaricus*	X	X	X
	Butterfly Peacock Bass	*Cichla ocellaris*	X	X	X
	Peacock Bass	*Cichla piquiti*	X	X	X
	Banded Knifefish	*Gymnotus carapo*	X	X	X

Source: Gabriela de Oliveira Pereira/ Gabriela' private collection (December, 2020)
Caption: Use of aquatic species and organisms in different commercial segments in the Água Branca Aquarium exhibition

Together with the information used in the descriptive text of species sheets, as in the information plates, it is possible to transmit information aimed at environmental education. For Salgado (2014), aquariums and zoos become remarkable the moment they adopt this type of premise which holds that raising public awareness will lead to a greater reflection of adopting sustainable measures on a day-to-day basis. Reflecting back on his study of the Ubatuba Aquarium, Salgado explains that the display of garbage in rivers accompanied by communication in diagrams, figures and illuminated panels

reveals an explicit concern to share information about ecology, zoology and, mainly, conservation with the visiting public, as well as promote environmental education.

In addition to raising awareness and educating the population about the importance of carrying out sustainable measures for the planet, aquariums and zoos have should promote the conservation of biodiversity through research and ex-situ conservation. (IUDZG 1993). With conservation, it is necessary to keep the welfare of animals as high as possible, with the objective of establishing viable populations for conservation, as well as sharing with the visitor the importance of species conservation (Penning et al. 2009).

According to the IUCN (International Union for Conservation of Nature) (2002), there is a need to create conservation programs with ex-situ management, focusing on the recovery of species critically endangered or already extinct in nature. Conservation aims to maintain existing genetic diversity and sustain populations of all taxa in nature, and the term ex-situ is defined as the preservation of biodiversity conducted outside its natural habitat. In the same guidelines, the IUCN cites the importance of adopting a form of conservation that considers the needs and situation of the taxon, whether endangered species or not.

The World Zoo Organization and the Captive Breeding Specialist Group of IUCN (IUDZG and CBSG 1993) mention the necessity of reducing the risk of domestication and the loss of genetic variability, using ex-situ conservation in a complementary way, instead of an in-situ conservation strategy, as well as using broadly defined recommendations and carrying out cooperative management among institutions that conserve populations in captivity. For Zacariotti (2013), the conservation of a species must be carried out within its natural habitat with a focus on long-term preservation because, in this way, there are no unnecessary financial expenses and the number of animals in captivity decreases.

Água Branca Aquarium has also undertaken an approach related to environmental education through a tank with objects representing the degradation of the marine environment, seeking to raise visitor awareness. Rojas and Kubo (2021) present in

proposals for the revitalization of the Água Branca Aquarium, in 2004, the "Espaço Poluição", composed of a 1,000 liter aquarium with inorganic waste, fish trapped in a "pollution prison" and illustrative panels.In addition to this approach, the Aquarium also presents the themes of fishing and aquaculture, placing on exhibit several species used in sport fishing and aquaculture and informative posters with themes related to fishing and aquaculture. Because of this, the Água Branca Aquarium stands out from other existing aquariums and zoos.

With the conceptual map created for the exhibition, other elements related to the fishing and aquaculture sector can be included for a better immersion of the visitor, such as instruments used in fishing, larger-scale photos of different types of aquaculture farming systems, schemes on the development of hybrid fish, map tables with the locations of Brazil's main tributaries and main species used in fisheries and aquaculture.

With the material obtained and organized in documents, conceptual map, spreadsheet and diagrams, it is expected that they will be inputs for the creation of educational, cultural and scientific actions and projects aimed at the Água Branca Aquarium, collaborating even more to achieve its mission: to be an instrument for cultural and scientific dissemination for society.

4 CONCLUSIONS

The collection of information from the Água Branca Aquarium, managed by the Instituto de Pesca, and the creation of a conceptual map based on this information prove to be quite effective for understanding the exhibition, as well as all the themes presented. This organization of information allows for a deeper understanding of the concepts in the different areas involved, making it possible to assess aspects that can be improved as well as other tools that can be created using the information from the exhibition.

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