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FISH CONSUMPTION IN THE LOWER TELES PIRES RIVER REGION, MATO GROSSO, SOUTHERN AMAZON

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Maísa de Oliveira da Costa[1], Letícia Maria Albuquerque Conceição[2], Solange Aparecida Arrolho da Silva[3] and Liliane Stédile de Matos[4]

ABSTRACT

The present research aimed to carry out a diagnosis of fish consumption, identifying problems and solutions to promote fish consumption in the lower Teles Pires River, state of Mato Grosso. The electronic questionnaire was composed of 16 questions, being made available through a link (Google Forms) in virtual environments (emails, Facebook, Instagram, and WhatsApp) during July to September 2021. Descriptive analyses and graphic representations were used. We obtained the participation of 130 interviewees from Alta Floresta, The results found reflect an n-sample of interviewees who have access to the internet and the habit of using e-mail, factors that excluded part of the population from the research area. In our research, the main factors for low fish consumption were: the cultural factor (preference or custom to consume other meats), the high price (28%), difficulty in preparation (presence of scales and bones), and food insecurity (contamination by heavy metals and parasites). The amount consumed was 5.52 kg/person/year in 2021 for the inhabitants of Alta Floresta, well below the average consumption in Brazil in 2020 (10.2 kg/person/year of fish) and the amount recommended as the ideal amount from a nutritional point of view by the Food and Agriculture Organization of the United Nations (FAO) (12 kg/person/year). Given the need to increase fish consumption in the local,

[1] State University of Mato Grosso-UNEMAT,
University Campus of Alta Floresta,
Faculty of Biological and Agrarian Sciences-FACBA,
Email: maisadeoliveira123@hotmail.com
LATTES: http://lattes.cnpq.br/5118583814241720
[2] Graduate Program in Animal Science-PPGZ,
Federal University of Grande Dourados-UFGD.
E-mail: leticia.maria.albuquerque@gmail.com
ORCID: https://orcid.org/0009-0007-8090-4462
LATTES: http://lattes.cnpq.br/4518874303719028
[3] Professional Master's Program in National Network in Water Resources Management and Regulation (ANA/UNEMAT),
State University of Mato Grosso-UNEMAT,
Alta Floresta University Campus, Mato Grosso, Brazil,
Email: Solange.arrolho@unemat.br
LATTES: http://lattes.cnpq.br/3155418992318872
[4] Graduate Program in Environmental Sciences-PPGCAM,
Tropical Ichthyology Laboratory-LIT,
Federal University of Mato Grosso-UFMT,
Sinop University Campus,
Email: lilistedile@hotmail.com
ORCID: http://orcid.org/0000-0002-7268-7097
LATTES: http://lattes.cnpq.br/5491044827262596

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regional, and national context, it is urgent to carry out social intervention work to promote initiatives to increase fish consumption.

Keywords: Freshwater fish consumption. Eating habits. Sustainable Development Goals (SDGs). Consumer profile. Online questionnaire.

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INTRODUCTION

Fish meat is an important item in the human diet in several countries, with low percentages of carbohydrates, fat, high proportions of moisture, and crude protein (Gonçalves & Passos, 2003; Ogawa, 1999). In fish meat, the percentage of crude protein is similar to beef and poultry meat in general, but has greater digestibility (Contreras-Guzmán, 1994; Pereira, 2003). In native fish, the rich profile of unsaturated and essential fatty acids is also highlighted; the implementation in the human diet brings benefits, helping to lower cholesterol and reducing the risk of cardiovascular diseases (Medeiros et al., 2019).

In 2024, world fish consumption was estimated at 20.7 kg per capita/year, which represents 15% of the animal protein needed for the human diet, according to the recent edition of the State of the World Fisheries and Aquaculture 2024 report (FAO, 2024). In Brazil, per capita consumption of fish was around 10.5 kg in 2021, below the FAO recommendation, which is 12 kg/inhabitant/year (SEA FOOD BRASIL, 2021). In the Brazilian central-west region, where the state of Mato Grosso is located, the per capita consumption of fish is even lower, about 4 kg/inhabitant/year, according to data from the 2017/2018 Household Budget Survey (IBGE, 2020a).

These differences in fish consumption are related to the availability and cost of fish, family income, socioeconomic and cultural factors, food traditions, tastes, demand, seasons, infrastructure, food security, health, and marketing (FAO, 2014 and 2024). Beef, for example, is highly consumed, due to the strong influence of European colonization in Brazil (Ribeiro & Carção, 2013). However, in 2024, chicken was the most consumed animal protein in Brazil (46 kg/inhabitant/year), due to its more affordable price (ABPA, 2024). In addition to the cultural factor, the high price of fish when compared to other types of protein of animal protein is among the main reasons for the low consumption of fish in Brazil (Vasconcellos et al., 2013). Other factors that influence the low consumption of fish are the presence of bones and difficulty in preparing the dish, as consumers are increasingly looking for semi-ready or ready-made products that bring practicality to their daily lives (Bombardelli et al., 2005).

Fish consumption plays a crucial role in food and nutrition security, and is recognized by the Food and Agriculture Organization of the United Nations (FAO) as essential for healthy and sustainable diets. The present study is aligned with the Sustainable Development Goals (SDGs), mainly: SDG 2 (Zero Hunger and Sustainable

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Agriculture): Highlights the deficiency in the consumption of high-quality protein in the region studied and suggests strategies to promote fish farming; SDG 3 (Health and Well-Being): Emphasizes the health benefits of fish, including the prevention of cardiovascular diseases; and SDG 12 (Responsible Consumption and Production): Discusses challenges in the fish production chain and the need for sustainable solutions to expand access to the product. SDG 14 aims to conserve and sustainably use marine resources, but the preservation of freshwater ecosystems is also essential for aquatic life. In addition to being home to rich biodiversity, these environments ensure access to high-quality protein and boost the economy of communities that depend on fishing.

The state of Mato Grosso has great potential for fish farming, being bathed by three hydrographic basins (Amazon Basin, Platina Basin, and Tocantins Basin), with availability of products for the feed industry and favorable climate (Leandro et al., 2018). In 2023, Mato Grosso was the 2nd largest producer of native fish in Brazil, with a production of 40,500 tons, second only to Rondônia (PEIXEBR, 2024). In the lower Teles Pires River region, fish farming is a growing activity, mostly semi-intensive, in excavated tanks, using family labor, requiring greater technical and financial support to have access to technologies and expand fish production (De Luca et al., 2019). However, for the full growth of the fish industry, there are several bottlenecks and challenges to be solved (for example: the organization of the productive sector of fish farming, development of technologies, incentives for producers...) (Kubo, 2014). Among these challenges is the consolidation of the fish industrialization processes, which, in addition to adding value, will promote its popularization in a similar way to what occurred with the chicken production chain (Borghetti et al., 2003).

Given the great potential for fish farming in the region of the lower Teles Pires River, and the anthropic activities that are impacting the fishing resources of this basin, it is necessary to collect information on the consumption of fish in this region to support public policies to promote fish farming. Given the above, the present study carried out a diagnosis of fish consumption in the region of the lower Teles Pires River in the extreme north of Mato Grosso, investigating the demands of fish consumers. We hypothesize that the vast majority of participants do not have the habit of consuming fish meat monthly due to the price, the presence of bones, and difficulty in preparing the dish.

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METHODOLOGY

The present research was developed during July to September 2021, through data collection using an online electronic questionnaire applied to the population of the municipality of Alta Floresta, in the region of the lower Teles Pires River in Mato Grosso. The data collection method adopted consisted of qualitative and quantitative approaches. The application of this questionnaire aimed to develop a scientific reference on fish consumption (eating habits, frequency and preference of consumption, problems and suggestions), as a basis for the implementation of public policies to promote the consumption of fish and fish farming in the municipalities involved. The questionnaire (Supplementary Material 1) was prepared with 16 questions, of which 13 thirteen) were closed questions and 03 (three) were open questions.

The questionnaire for the diagnosis of fish consumption was sent for consideration and authorization by the Ethics Committee for Research Involving Human Beings through the Plataforma Brasil website, according to Resolutions No. 466/2012 and No. 510/2016. The research is approved by the Ethics Committee of the State University of Mato Grosso, according to Consolidated Opinion No. 4.682.691, under registration No. CAAE 45614121.8.0000.5166 on Plataforma Brasil. The target audience was people over 18 years of age (of legal age), and those invited to participate were duly informed of the objectives, risks, benefits and confidentiality of the information of this research, for those who agreed to answer the online electronic questionnaire, the Informed Consent Form - ICF was presented, a document that expresses voluntary participation.

To carry out the data collection with the participants, a structured electronic questionnaire (Supplementary Material 1) was used regarding the proposed theme. The questionnaire was generated by the free *online tool Google Forms* (GOOGLE, 2021), and was sent together with the ICF, prepared according to the rules of the Ethics Committee and built with the tool itself. Through this system, the participants' answers were automatically submitted to the researchers, being temporarily stored on the *Google Drive platform* and later on an external hard drive.

The results of this research reflect an n-sample of respondents who have access to the *internet* and the habit of using *e-mail*, as this research was carried out with *an online* questionnaire, factors that excluded part of the population from the research area. The present study was carried out during the Covid-19 Pandemic, aiming at the protection of those involved, an *online* questionnaire distributed through social networks was used,

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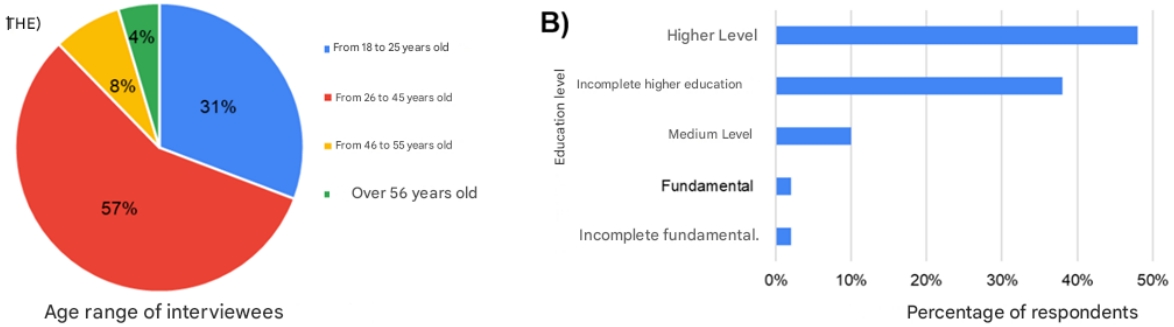
which generated a non-probabilistic sample. Although this approach limits the generalization of the results, it allows an initial diagnosis of fish consumption among groups with internet access. Other researchers also found difficulties in using this method during the Covid-19 pandemic (e.g., Schmidt et al., 2020; Pedroso et al., 2022). To minimize biases, the data were analyzed considering socioeconomic profiles and the results were compared with national and regional publications.

The data obtained from the interviewees were stored in a Microsoft Excel database (Office 2010). The data were explored through descriptive analysis (mean and error) and presented graphically. All analyses and graphs were performed with Microsoft Excel (Office 2010).

RESULTS AND DISCUSSION

We obtained the participation of 130 (one hundred and thirty) interviewees from Alta Floresta, 75% of the female gender (97 people) and 25% of the male gender (33 people). The age group of the interviewees was mostly (57%) between 26 and 45 years old and the minority (4%) over 56 years old (Fig. 1.A). Regarding the level of education of the interviewees, the vast majority declared themselves to have completed higher education (48%) and only a small portion with incomplete elementary education (2%) (fig.1.B). According to data from the last survey carried out by the IBGE, in Alta Floresta in 2010 approximately 5% of the population had completed higher education (IBGE., 2010). This high percentage of participants with complete higher education may be a reflection of the profile of the interviewees who have access to the *internet* and the habit of using *email*.

Figure 1. Age group (A) and (B) Educational level of the interviewees in the municipality of Alta Floresta/MT in 2021.



Regarding the number of people per household, the vast majority (32%) declared three people in the same household, and 22% declared two people. These data confirm the

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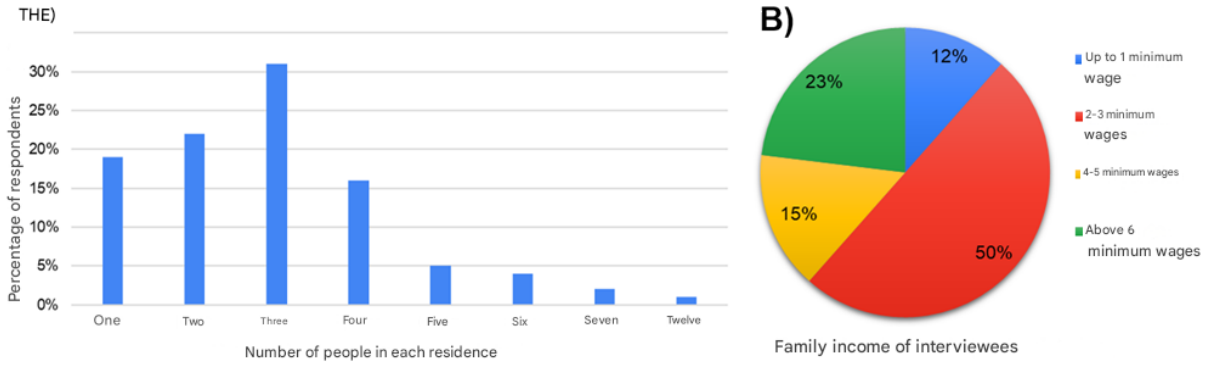
information from the IBGE (IBGE, 2015), that in the Brazilian Midwest region there is an average of 3 inhabitants per household (fig. 2.A). Regarding purchasing power per household, the majority (50%) reported being in the range of 2 to 3 minimum wages, and the minority (12%) in the range of up to 1 minimum wage (Fig. 2.B). It is worth mentioning that at the time of this survey the minimum wage in Brazil was in the amount of R$ 1,100.00 (One thousand and one hundred reais), and it is currently in the amount of R$ 1,518.00 (One thousand five hundred and eighteen reais) (LAW No. 15,077 of 12/27/2024). However, during the Covid-19 pandemic there was a huge economic crisis, resulting in the loss of 21% of purchasing power for Brazilians, mainly affecting low-income families who spend most of their budget on food (Chiara, 2022). With the increase in the cost of food, there is a greater demand for ultra-processed foods (*nuggets*, *hamburgers,* bologna, etc.) that are cheaper, harming the nutritional quality of Brazilians' diets (Vilarino, 2021).

Figure 2. Number of persons per household (A) and (B) Household income of respondents in the municipality of Alta Floresta/MT in 2021.



Among the survey participants, 88% declared that they consume fish and 12% do not. Participants who do not consume fish pointed out the cultural factor as the main reason (43%), that is, they have a preference or habit of consuming other meats. In addition, the high price (28%), the difficulty in preparation – presence of scales and bones (17%), food insecurity – contamination by heavy metals and parasites (7%), were also pointed out as negative factors for the consumption of fish (Fig. 3.A). The northern region of Mato Grosso was colonized by settlers from the southern region of Brazil, mainly from the state of Paraná (Tafner Junior & Silva, 2016), where there is a strong influence of European culture and a high consumption of red meat. Probably this preference for red meat has lasted until today, and is also strongly influenced by the practicality in its preparation when compared to fish (scales and bones). According to the Brazilian

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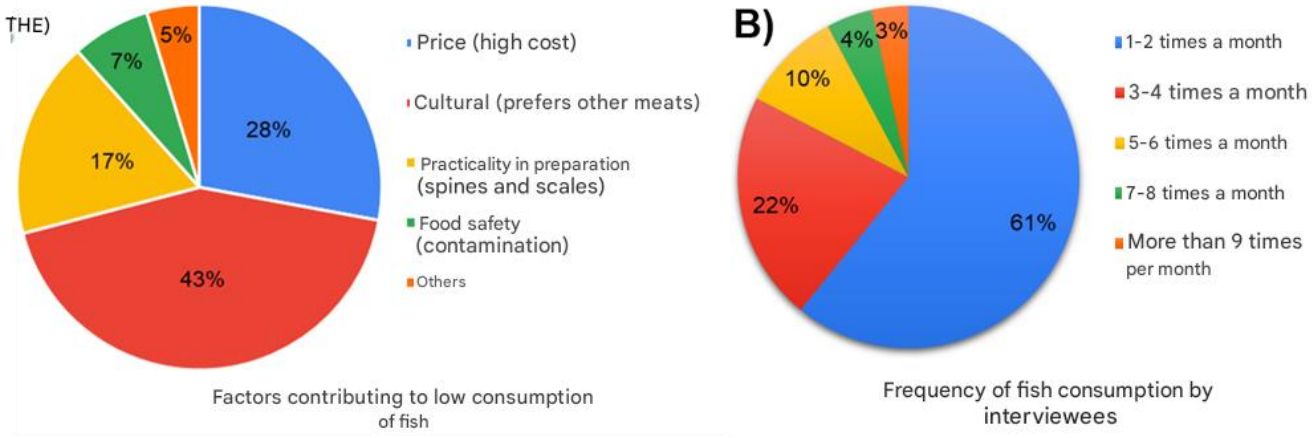
Association of Animal Protein-ABPA, due to the rise in meat prices, eggs (35%) were the most consumed animal protein in the country in 2021, followed by chicken meat (34%) and pork (4%) (CANAL RURAL, 2021). Fish, which was already considered a high-priced meat, during the economic crisis intensified during the pandemic, did not increase consumption.

Figure 3. Factors that contribute to the low consumption (A) and (B) frequency of monthly consumption of fish by the interviewees in the municipality of Alta Floresta/MT in 2021.



Among the interviewees who consumed fish, 61% had a frequency of consumption of 1 to 2 times per month, and only 3% reported the consumption of fish more than 9 times per month (Fig. 3.B). Regarding the amount of fish consumed per month by the interviewees, the majority (29%) consumed from 501 g to 1 kg, and only 6% consumed from 2.1 kg to 3 kg (Fig. 4.A). With the primary data of the average amount of monthly consumption of fish and the total number of people per household who consume fish, the monthly per capita consumption of fish in Alta Floresta is approximately 460 g. Projecting fish consumption in 2021 for the inhabitants of Alta Floresta, it results in approximately 5.52 kg/person/year, well below the average consumption in Brazil in 2020 (10.2 kg/person/year of fish), considering that according to the Food and Agriculture Organization of the United Nations (FAO) the ideal amount from a nutritional point of view is 12 kg/person/year (SEAFOODBRASIL, 2021).

Adopting a healthy and nutritious lifestyle (SDG 3) depends on the wide availability, accessibility and affordable prices of healthy foods, such as fish and fish products. However, these essential factors for development are often overlooked, compromising long-term food security, especially in low-income countries (Sarkodie & Owusu, 2023). In rich countries, fish consumption is higher as it is associated with a healthy lifestyle that contributes to the reduction of diet-related morbidity and mortality. In poorer economies, on

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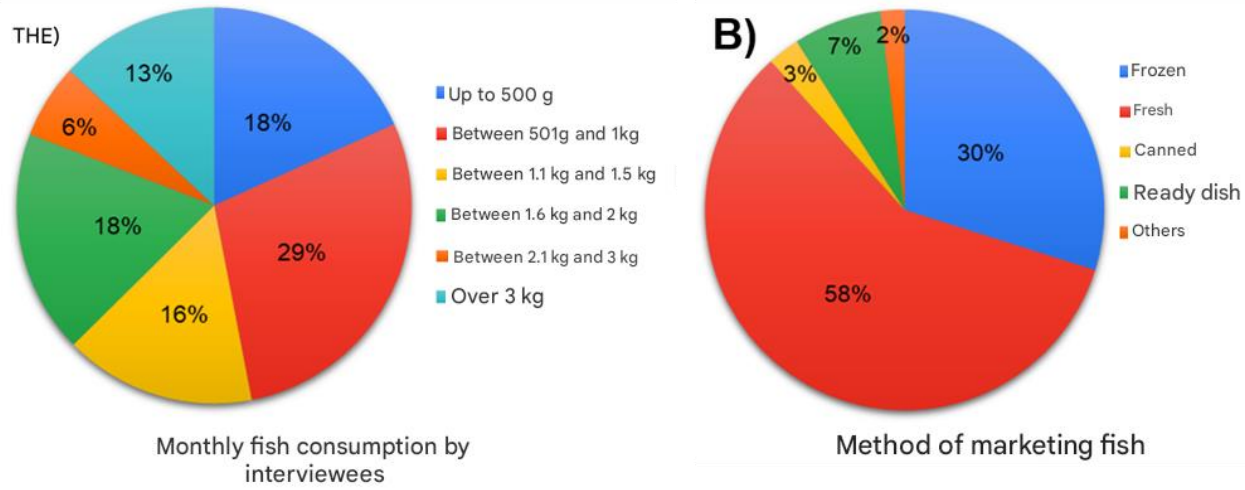
the other hand, fishing resources are often used as a more affordable alternative to meat and its derivatives, whose cost is higher (Hirvonen et al., 2020). This reality applies mainly to coastal and riverine regions, where it is easy to acquire some species at more affordable prices, in this survey 28% of respondents pointed to "high cost" as one of the factors that hinder consumption.

Figure 4. Quantity (kg) of monthly consumption of fish (A) and (B) forms of commercialization of fish in the municipality of Alta Floresta/MT in 2021.



The world's population is projected to reach 9.7 billion by 2050 (United Nations, 2019) and the global demand for animal proteins could increase by up to 88% (Cottrell et al., 2018). However, the increase in meat consumption from terrestrial animals implies the acceleration of climate change, deforestation and pollution of terrestrial and aquatic ecosystems (Springmann et al., 2018). Agriculture and livestock dominate decisions about the development of the global food system, while aquatic foods, which are highly nutritious with a smaller environmental footprint than other animal-based foods, are slowly paving the way for high-level food-related decision-making (Bennett et al., 2021). The summary statement made during the launch of the 2021 UN nutrition report clearly emphasizes this importance: "There can be no transformation of the global food system without aquatic food" (G. Johnstone, Worldfish, 2021). Given the above, promoting the consumption of fish produced in fish farms in the Alta Floresta region would be mainly meeting SDG 2 (Zero Hunger and Sustainable Agriculture) and SDG 12 (Responsible Consumption and Production).

Still on the consumption of fish, it is worth mentioning that in 2024 in Mato Grosso, Law No. 12,434 (03/01/2024), popularly known as the "Zero Transport" law for fishing in

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Mato Grosso, came into force, which establishes the list of 12 species of native fish prohibited from transport, storage and commercialization in five years. There are no published data yet, but this law may have affected the consumption of fish in Mato Grosso, because: it prohibits the fishing of 12 species of fish, which are important for the subsistence of fishermen; it may have left families and individuals without income; may have caused economic and social damage to fishing communities; and for indigenous people who fish outside the delimitation of their indigenous land, and after capture bring the fish to the villages, they are in a situation of illegality (MATOS et al., 2024).

Regarding the places where the interviewees frequently purchase fish for consumption, the place "supermarket" was the option that obtained most of the indications with 49%, followed by the option "I fish/cultivate myself" with 22%, and the least indicated option was "I buy directly from the fisherman/producer" with 5%. As previously mentioned, because this research was carried out via electronic questionnaire (*online*), the N-sample was composed largely of the academic community. Thus, the preference for purchasing fish in supermarkets may be due to the lack of knowledge of the academic community of places such as street markets or fishmongers that sell fresh fish. However, in a survey carried out in Sinop/MT, in person (printed questionnaires) in places with an intense daily flow of people, the supermarket was also the preferred place to buy fish (Leandro et al., 2018).

When asked about the reasons that lead them to consume fish, the options "Taste and habit" and "Menu variation" had greater relevance (38% and 34% respectively), and "healthier meat option" with 20%. For fish consumers in the municipality of Sinop/MT (near Alta Floresta), the reasons that lead to fish consumption are: flavor, healthy meat, nutritional value and menu variation (Leandro et al., 2018). The concern with consuming healthier foods produced without the use of chemicals has contributed to an increase in demand for the so-called white meat, the group to which fish belong (Silva et al., 2021). The interviewees from Alta Floresta prefer to purchase fish in the following forms: fresh (58%), frozen (30%) and ready-to-eat (7%) (fig. 4.B). These results show that there is concern about the quality of the fish consumed, since there is a greater preference for fresh products.

Among the interviewees who consume fish, 75% answered that they have no preference for scale or leather fish and consume both equally. 16% have a preference for scale fish and 10% for leatherfish. Among those who prefer scale fish, the following

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reasons were listed: more pleasant flavor, healthier, fewer parasites, due to religion, and more options to buy in frozen form. And those who prefer leather fish listed: Better flavor, fewer spines, more practical to prepare as it has no scales and ideal for children to consume. Religions that prohibit the consumption of leatherfish claim that they are impure and bring the impetus of aggression, among them are: Judaism (*Kosher* religious law); Adventist; Tibetan Buddhists do not eat any type of fish; and Candomblé (Souza, 2014). In Brazil, children represent the age group with the lowest consumption of fish, and it is important to develop intervention strategies to encourage fish consumption, in the family and school settings (Souza et al., 2021). As for the presence of intramuscular Y spines in scale fish, this is one of the current technological bottlenecks, and the development of techniques and equipment for processing and genetic improvement is urgently needed (Pedroza Filho et al., 2016).

The vast majority of consumers want fish with meat free of bland *taste*, and in this theme comes the discussion about the preference for the consumption of "wild" and "farmed" fish. In our survey, among the respondents who consume fish, 70% answered that they consume both farmed and wild fish, 20% prefer wild fish and 10% prefer farmed fish. Those who prefer wild fish pointed out the following reasons: more pleasant taste, healthier, likes to fish, low fat content, does not have an *off-flavor* characteristic of fish farmed in fish farms. And those who prefer farmed fish (fish farming) pointed out: more pleasant flavor, due to the decrease in fishing resources and environmental importance, food safety (less contamination and parasite infestation). *Off flavor* is that taste of "clay", "insecticide", "mold", which is often identified in the consumption of fish, occurs due to the presence of cyanobacteria and eventually streptomycetes triggered by erroneous management in fish farming (e.g., leftover feed in the tanks; water quality; density of the tanks, etc.) (Carriero, 2020). But it is worth mentioning that the vast majority of respondents did not show a preference and consume both wild and farmed fish, which is very important given the numerous health benefits.

From the results found, we can conclude that our hypothesis was partially overturned, because unlike how we had predicted, the vast majority of participants consume fish meat monthly. However, the amount consumed is 5.52 kg/person/year in 2021 for the inhabitants of Alta Floresta, well below the average consumption in Brazil in 2020 (10.2 kg/person/year of fish), emphasizing that according to the Food and Agriculture Organization of the United Nations (FAO) the ideal amount from a nutritional point of view

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is 12 kg/person/year. In our research, the main factors for low fish consumption were: the cultural factor (preference or custom to consume other meats); the high price; difficulty in preparation (presence of scales and bones) and food insecurity (contamination by heavy metals and parasites).

CONCLUSION

Given the need to stimulate the consumption of fish in the local, regional and national context, it is essential to implement strategies that encourage the inclusion of this food in the population's diet. The deficiency in the consumption of high-quality proteins in the region studied highlights the importance of promoting fish farming as a sustainable alternative to ensure food and nutritional security, in line with the goals of SDG 2 (Zero Hunger and Sustainable Agriculture).

In addition, considering the benefits of fish for human health, especially in the prevention of cardiovascular diseases, it is essential to expand access to this resource and raise awareness among the population about its nutritional value, contributing to SDG 3 (Health and Well-Being). Initiatives such as the introduction of fish in school meals and educational campaigns can play a crucial role in this process, promoting healthier eating habits from childhood.

Finally, challenges in the fish production chain, such as irregular distribution and high marketing costs, highlight the need for sustainable solutions to expand access to the product responsibly. Strengthening more efficient and environmentally appropriate practices in the production and consumption of fish is essential to meet the guidelines of SDG 12 (Responsible Consumption and Production) and SDG 14, which seeks to conserve aquatic ecosystems and ensure the sustainability of biodiversity in water, ensuring that this resource is accessible without compromising the sustainability of aquatic ecosystems.

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REFERENCES

1. Brazilian Association of Animal Protein-ABPA. 2024. Annual Report 2024. Available in: https://abpa-br.org/wp-content/uploads/2024/04/ABPA-Relatorio-Anual-2024_capa_frango.pdf Accessed in: 01/09/2025

2. Bennett, A., Basurto, X., Virdin, J., Lin, X., et al. 2021. Recognize fish as food in policy discourse and development funding. Ambio, 50, 981–989. https://doi.org/10.1007/s13280-020-01451-4

3. Bombardelli, R. A.; Syperreck, M. A.; Sanches, E. A. 2005. Current situation and perspectives for consumption, processing and adding value to fish. *Archives of Veterinary Sciences and Zoology of Unipar*, v. 8, n. 2, p. 181-195. Available at: https://revistas.unipar.br/index.php/veterinaria/article/view/57. Accessed on: 24 mar. 2025.

4. Borghetti, N. R. B. et al. 2003. *An overview of the production of aquatic organisms in Brazil and in the world*. Curitiba: Integrated Group of Aquaculture and Environmental Studies. 128p.

5. Canal Rural. 2021. Animal protein consumption is present in 98% of Brazilian households. https://www.canalrural.com.br/noticias/consumo-proteina-animal-98-lares-brasileiros/ Accessed on 03/01/2022.

6. Carriero, R. 2020. Technologies to avoid/eliminate *off-flavor* in fish. Food Technology. https://news.certifee.com.br/artigo/Tecnologias-para-evitar-eliminar-o-off-flavor-no-pescado Accessed on 03/01/2022.

7. Chiara, M. 2022. Brazilians have lost 21% of their purchasing power in three years. https://www.terra.com.br/economia/brasileiro-perdeu-21-do-poder-de-compra-em-tres-anos,b79bc1f63203ecc199682d3f1eb67d038y2iqd61.html Accessed on 03/01/2022.

8. Contreras-Guzmán, E. 1994. *Biochemistry of fish and fish products*. Jaboticabal: FUNEP, 1994. 409 p.

9. Cottrell, R. S., Fleming, A., Fulton, E. A., Nash, K. L., et al. 2018. Considering land-sea interactions and trade-offs for food and biodiversity. Global Change Biology, 24, 580–596. doi10.1111/gcb.13873

10. De Luca, A.S.; Silva, F.L. & Silva, G.M.S. 2019. *Diagnosis of Family Fish Farming Management Practices in Alta Floresta and Paranaíta-MT*. Final report Public Notice No. 037/2018 PROPES/IFMT. IFMT- Alta Floresta Campus. 18p. Available at: http://alf.ifmt.edu.br/media/filer_public/26/b8/26b8e5e8-ec65-4048-bb8d-9e1efb115308/relatorio_alexander_edital37_2018.pdf. Accessed on 02/28/2021.

11. FAO - Food And Agriculture Organization. 2014. *The State of World Fisheries and Aquaculture*. FAO Fisheries Department. Rome: Italy. Available at: http://www.fao.org/3/a-i3720e.pdf Accessed in: 02/26/2021.

Revista ARACÊ
ISSN: 2358-2472

12. FAO- Food And Agriculture Organization. 2020. *The State of World Fisheries and Aquaculture 2020.*

13. In brief. Sustainability in action. Rome. https://doi.org/10.4060/ca9231en Accessed on 02/26/2021.

14. FAO- Food And Agriculture Organization. 2024. *The State of World Fisheries and Aquaculture 2024* – Blue Transformation in action. Rome. https://doi.org/10.4060/cd0683en

15. FAO, IFAD, UNICEF, WFP and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. https://doi.org/10.4060/ca9692en.

16. Gonçalves, A. A.; Passos, M. G. 2003. Use of the enzyme transglutaminase in the elaboration of a restructured fish-based product. *Revista Nacional da Carne*, São Paulo, v. 28, n. 317, p. 123-132.

17. GOOGLE, 2021. Google Docs. [internet]. Available at: https://www.google.com/intl/pt-BR/forms/about/ Accessed on 03/01/2021.

18. Hirvonen, K.; Bai, Y.; Headey, D.; Masters, W.A. 2020. Affordability of the EAT–Lancet reference diet: a global analysis Lancet Glob. Health, 8(1), pp. e59-e66, 10.1016/S2214-109X(19)30447-4

19. IBGE – Brazilian Institute of Geography and Statistics. 2010. *Level of education of the population of Alta Floresta/MT.* https://cidades.ibge.gov.br/brasil/mt/alta-floresta/pesquisa/23/22957 Accessed on 03/01/2022.

20. IBGE – Brazilian Institute of Geography and Statistics. 2015. *Population Estimates.* https://www.ibge.gov.br/estatisticas/sociais/populacao/9103-estimativas-de-populacao.html?=&t=o-que-e Accessed on 03/01/2022.

21. IBGE – Brazilian Institute of Geography and Statistics. 2020a. *Household budget survey: 2017-2018: analysis of personal food consumption in Brazil* / IBGE, Coordination of Work and Income. https://biblioteca.ibge.gov.br/index.php/biblioteca-catalog?view=details&id=2101742 Accessed on 02/26/2021.

22. IBGE – Brazilian Institute of Geography and Statistics. 2020b. https://www.ibge.gov.br/cidades-e-estados.html?view=municipio Accessed on 02/26/2021.

23. IBGE – Brazilian Institute of Geography and Statistics. 2022 https://www.ibge.gov.br/cidades-e-estados/mt/alta-floresta.html Accessed on 01/09/2025

Revista ARACÊ
ISSN: 2358-2472

24. Kubo, E. 2014. Fish and fish products. *In:* MADI, L. F.; REGO, R. (Org.). *Sustainability and sustaining food production in Brazil: food agroindustry*. Brasília: CGEE, 2014. v. 4. Chapter 5, p. 75-84.

25. Leandro, S. V.; Oliveira, S. S.; Andrade, P. S. M.; Otani, F. S. 2018. Profile of fish consumption and consumption in the municipality of Sinop, Mato Grosso. *Agroecosystems,* v.10, n.1, p.73-98, ISSN online 2318-0188. http://dx.doi.org/10.18542/ragros.v10i1.5190

26. Mato Grosso. Law No. 12,434 of March 01, 2024. Amends Law No. 9,096, of January 16, 2009, which provides for the Fisheries Policy of Mato Grosso and provides for other provisions. Cuiabá: Legislative Assembly; 2024.

27. Matos, L. S.; Riul, A.; Carvalho, R. C.; Carvalho, L.N. 2024. Fisherwoman's story: how a fisherwoman from the south of the country became the president of the largest fishing colony in the north of Mato Grosso. *Bulletin of the Brazilian Society of Ichthyology*, Altamira, PA, p. 23 - 36, 02 set. 2024.

28. Ogawa, M. 1999. Fish chemistry. Restraint. *In*. OGAWA, M.; MAIA, E. L. *Fishing manual: science and technology of fish.* São Paulo: Varela, 1999. p. 27-72.

29. Pedroso, G. G., Ferreira, A. C. V. V., Silva, C. C. da, Silva, G. A. B., Lanza, F. M., & Coelho, A. C. O. 2022. Data collection for online quantitative research in the COVID-19 pandemic: experience report. Revista de Enfermagem da UFSM, 12, e13. https://doi.org/10.5902/2179769267023

30. Pedroza Filho, M. X., Rodrigues, A. P. O. & Rezende, F. P. 2016. Dynamics of the production of tambaqui and other round fish in Brazil. *Aquaculture Assets* Bulletin. Year 2 - Issue 7 - January 2016. https://www.aquamat.com.br/wp-content/uploads/informativos-tecnicos/livros-e-boletins/Dinamica-da-producao-de-tambaqui-e-demais-peixes-redondos-no-Brasil.pdf

31. PEIXEBR, 2019. *Brazilian Yearbook of Fish Farming PEIXE BR 2019*. https://www.peixebr.com.br/anuario-peixe-br-da-piscicultura-2019/ Accessed on 02/26/2021

32. PEIXEBR, 2020. *Brazilian Yearbook of Fish Farming PEIXE BR 2020*. https://www.peixebr.com.br/anuario-2020/ Accessed on 02/26/2021.

33. PEIXEBR, 2021. *Brazilian Yearbook of Fish Farming PEIXE BR 2021*. https://www.peixebr.com.br/anuario-2021/ Accessed on 02/26/2021.

34. PEIXEBR, 2024. *Brazilian Yearbook of Fish Farming PEIXE BR 2024*. https://www.peixebr.com.br/anuario-2024/ Accessed on 01/27/2024.

35. Pereira, A. J. 2003. *Development of technology for the production and use of silver carp meat pulp (Hypophthalmichthys molitrix) in the elaboration of restructured products: "fishburger" and "nugget". 2003.* 57 f. Dissertation (Master's Degree in Food

Revista ARACÊ
ISSN: 2358-2472

Technology) - Department of Food Technology, Federal University of Paraná, Curitiba, 2003.

36. R CORE TEAM, 2021. *A: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

37. Ribeiro, C. S. G.; Corção, M. 2013. Meat consumption in Brazil: between sociocultural and nutritional values. *DEMETRA: Food, Nutrition and Health*, v.8, n. 3, p. 425-438.

38. Sarkodie, S. A.; Owusu, P. A. 2023. Assessment of global fish footprint reveals growing challenges for sustainable production and consumption, Marine Pollution Bulletin, 194, (A), https://doi.org/10.1016/j.marpolbul.2023.115369.

39. Schmidt, B.; Palazzi, A.; Piccinini, C. A. 2020. Online interviews: potentialities and challenges for data collection in the context of the COVID-19 pandemic. Revista Família, Ciclo de Vida e Saúde no Contexto Social, 8 (4): 960 – 966. Available at: https://www.redalyc.org/articulo.oa?id=497966365017

40. SEA FOOD BRAZIL. 2021. Do you know how much fish Brazilians really eat? https://www.seafoodbrasil.com.br/voce-sabe-quanto-o-brasileiro-realmente-come-de-pescado Accessed on 03/01/2022.

41. Silva, B. S.; Silva, M.A.P.; Barros, J.C.; Carvalha, B.S.; Brazil, T.A.; Santos, P.A. 2021. Meat consumption habits: An analysis applied to consumers at the Federal Institute of Goiás- Rio Verde Campus GO. *I Congress of Research and Graduate Studies of IFGoiano,* v.1, p.1-3. https://www.conhecer.org.br/enciclop/2015b/multidisciplinar/consumo%20de%20pescado.pdf

42. Souza, M. M. M.; Morte, E. S. B.; Cardoso, R. C. V. 2021. Fish in school meals in Brazil: scenario, advances and challenges. *Research, Society and Development,* [S. l.], v. 10, n. 3, p. e2210312919. DOI: 10.33448/rsdv10i3.12919. Available at: https://rsdjournal.org/index.php/rsd/article/view/12919. Accessed on: 6 apr. 2022.

43. Souza, P. R. 2014. *Religion and Food: How food practices in the religious context help in the construction of man*. Master's thesis in Religious Sciences. Pontifical Catholic University of São Paulo. São Paulo/SP. 181 p. https://tede2.pucsp.br/bitstream/handle/1924/1/Patricia%20Rodrigues%20de%20Souza.pdf

44. Springmann, M., Clark, M., Mason-D'Croz, D., Wiebe, K., et al. 2018. Options for keeping the food system within environmental limits. Nature, 562, 519–525. https://doi.org/10.1038/s41586-018-0594-0

45. Tafner Junior, A. W. & Silva, F. C. 2016. Alta Floresta: a colony of Ariosto da Riva in Mato Grosso. *Novos Cadernos NAEA* v. 19, n. 3, p. 205-232. https://periodicos.ufpa.br/index.php/ncn/article/view/2527/4091

Revista ARACÊ
ISSN: 2358-2472

46. United Nations. 2019. World population prospects. https://www.un.org/development/desa/pd/news/world-population-prospects-2019-0.

47. Vasconcellos, J. P.; Vasconcellos, S. A.; Pinheiro, S. R.; Oliveira, T. H. N.; et al. 2013. Individual determinants of fish choosing in open-air street markets from Santo André, SP/Brazil. *Appetite*, 68(1): 105–111.

48. Vilarino, C. 2021. Rising poverty boosts consumption of ultra-processed foods. https://revistagloborural.globo.com/Noticias/Economia/noticia/2021/04/aumento-da-pobreza-impulsiona-consumo-de-alimentos-ultraprocessados.html. Accessed on 03/01/2022.

49. Worldfish. 2021. Plenary speech at the launch of the UN Nutrition paper on "The role of aquatic foods in sustainable diets." Webinar, May 7, 2021.

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SUPPLEMENTARY MATERIAL 1 - QUESTIONNAIRE

1. You currently reside in the municipality:

Alta Floresta ( )

Others ( )_____

2. Sex:

Male ( )

Female ( )

Prefers not to declare ( )

3. Age group:

From 18 to 25 years old ( )

From 26 to 45 years old ( )

From 46 to 55 years old ( )

Over 56 years old ( )

4. Schooling?

Illiterate ( )

Incomplete elementary school ( )

Complete Elementary School ( )

Incomplete high school ( )

Completed High School ( )

Incomplete higher education ( )

Higher education ( )

5. How many people live with you (in the same household)?

_____

6. Family Income (sum of the salary of each of the people who live with you)?

*Currently the minimum wage is worth R$ 1,100.00.

Up to 1 minimum wage* ( ).

2-3 minimum wages ( ).

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4-5 minimum wages ( ).
Above 6 minimum wages ( ).

7. Is fish meat consumed in your residence?
Yes ( )
Do not ( ) Justify:_____

8. If you answered yes to the previous question, how often is it consumed in your home?

1-2 times a month ( )
3-4 times a month ( )
5-6 times a month ( )
7-8 times a month ( )
Above 9 times per month ( ).

9. Based on your frequency of consumption, approximately how much fish is consumed per month in your household?
Up to 500 grams ( )
Between 501 grams and 1 kilogram ( )
Between 1 kilo and 1.5 kilos ( )
Between 1.5 kilos and 2 kilos ( )
Between 2 kilos and 3 kilos ( )
Other ( ) Specify:_____

10. Is there a preference for scale or leather fish in your home?
No, we consume both ( )
Yes, we prefer scale fish ( ) Why?_____
Yes, we prefer leather fish ( ) Why?_____

11. Is there a preference for wild fish (from river fishing) or farmed fish (from fish farms or ponds) in your home?
No, we consume both ( )
Yes, we prefer wild fish ( ) Why?_____

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Yes, we prefer farmed fish ( ) Why?_____

12. Where do you usually buy fish?

Supermarket ( )

Grocery stores and street markets ( )

Direct from the fisherman/producer ( )

Fishmongers ( )

I fish/grow myself ( )

I get fish from other people ( )

13. What are the reasons that lead them to consume fish?

Menu variation ( )

It is a healthier meat option ( )

Taste or habit ( )

Other ( ) Specify:_____

14. What is the way of marketing the fish that you prefer?

Fresh ( )

Frozen ( )

Canned ( )

Salted ( )

Ready Dish ( )

Other ( ) Specify:_____

15. What are the reasons that lead you to consume less fish?

Answer:_____

16. Leave any comments about this research below (optional).

Comment:_____