

## Analysis of the Hygienic and Sanitary Conditions in the Fish Market of Capanema-PA

### Análise das Condições Higiênico-sanitárias no Mercado de Peixes de Capanema-PA

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#### Abstract

*Fish is an excellent source of protein and can be marketed in spaces, including open fairs and public markets, however, it is a product very susceptible to contamination, which can accelerate its deterioration process, besides causing diseases to consumers, bringing losses not only related to health, but also economic. Based on this, the objective was to evaluate the hygienic-sanitary conditions of the fish commercialized in the municipal fish market of Capanema-PA. The evaluation was done using a checklist based on the resolution RDC n° 216, from September 15th 2004 of the National Health Surveillance Agency. According to the percentage of attendance to the questions, the boxes were classified as good (75 to 100% attendance), regular (50 to 74.9%) or bad (0 to 49.9%). An informed consent form was presented to those responsible, aiming at clarifying the objectives and importance of the research, as well as the shopkeepers' authorization. The study site has 16 active boxes, of which seven owners authorized the evaluation of their establishments. In general, the boxes obtained between 54.2% and 70.8% of compliance with the legislation in force, and all of them were considered regular, still showing a distance to the acceptable benchmark, which is above 75% of compliance to hygiene and sanitation aspects. Through the results surveyed here, it was possible to detect irregularities in the hygienic-sanitary conditions of fish sales in Capanema-PA, which can compromise the quality of the fish and, consequently, offer risks to the local economy and consumer health.*

**Keywords:** Fish. Food Hygiene. Commercialization.

#### Resumo

Os pescados são uma excelente fonte proteica e podem ser comercializados em vários espaços, inclusive feiras livres e mercados públicos, porém, é um produto muito suscetível a contaminação, o que pode acelerar o seu processo de deterioração, além de provocar doenças aos consumidores, trazendo prejuízos não apenas relacionados a saúde, como também econômicos. Baseando-se nisto, objetivou-se avaliar as condições higiênico-sanitárias dos pescados comercializados no mercado municipal de peixes de Capanema-PA. A avaliação ocorreu utilizando-se um checklist baseados na resolução RDC n° 216, de 15 de setembro de 2004 da Agência Nacional de Vigilância Sanitária. De acordo com o percentual de atendimento aos quesitos, os boxes foram classificados como bom (75 a 100% de atendimento), regular (50 a 74,9%) ou ruim (0 a 49,9%). Foi apresentado aos responsáveis, um termo de consentimento livre e esclarecido, visando o esclarecimento dos objetivos e importância da pesquisa, bem como a autorização dos comerciantes. O local de estudo conta com 16 boxes ativos, dos quais, sete proprietários autorizaram a avaliação de seus estabelecimentos. De modo geral, os boxes obtiveram entre 54,2% a 70,8% de conformidade com a legislação vigente, e todos foram considerados regulares, mostrando ainda um distanciamento ao referencial aceitável, que é acima de 75% de conformidade aos aspectos higiênico-sanitários. Através dos resultados aqui levantados, foi possível detectar irregularidades nas condições higiênico-sanitárias da comercialização de peixes em Capanema-PA, o que pode comprometer a qualidade do pescado e, conseqüentemente, oferecer riscos à economia local e saúde dos consumidores.

**Palavras-chave:** Pescado. Higiene Alimentar. Comercialização.

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#### 1 Introduction

The fish consumption is characterized as an important source of protein, with considerable nutritional value (PAIVA *et al.*, 2018). According to Silva, Matté and Matté (2008), the way the fish are purchased can vary, ranging from grocery stores to supermarkets and street markets. The street market, despite being one of the most traditional places for retail food sales within urban areas (GOMES *et al.*, 2012) presents bigger fragility about food conservation (SILVA; MATTÉ; MATTÉ, 2008), and often, only one person is responsible for both handling the fish, money, and utensils (HOLANDA *et*

*al.*, 2013).

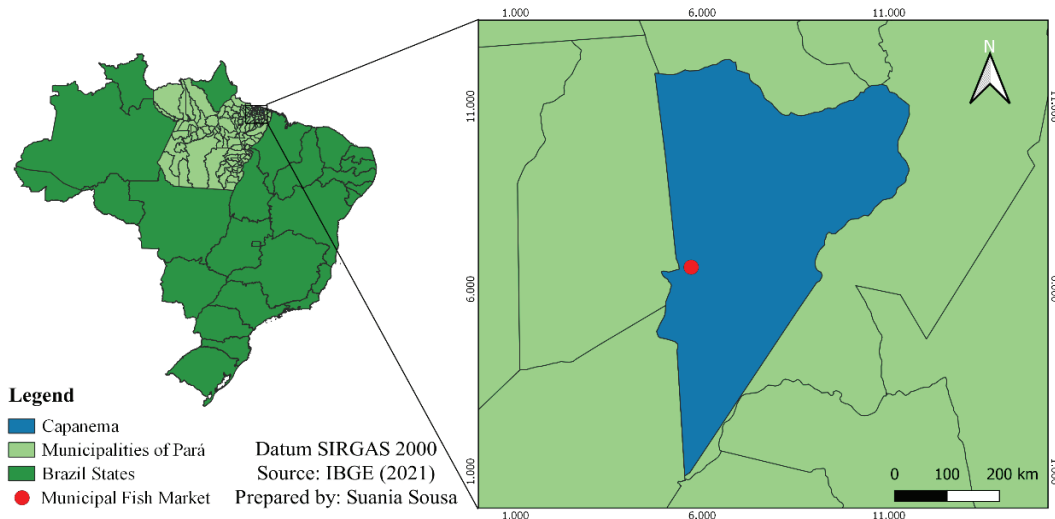
The Animal Source Foods (ASF) are subject to microbial contamination from various sources, as highlighted by Gomes *et al.* (2012). Factors such as inappropriate storage and refrigeration time, inadequate handling and preparation, can lead to contamination and/or acceleration of fish decomposition, enhancing the pathogenic microorganisms proliferation, contributing to the loss of quality and fish muscle degradation, in addition to the increased risk of food poisoning and infection in the population (FREIRE; SILVA; SOUZA, 2011; SILVA; MATTÉ; MATTÉ, 2008).

Paiva *et al.* (2018) point out that, although well-publicized and provided for by law, the implementation of good food handling practices proves to be deficient, especially in more informal marketing, which in general adds potential risk to the consumer health. As a result of this problem, this research is intended to evaluate the hygienic and sanitary conditions of fish sold in the municipal market of Capanema, Northeast Pará.

## 2 Material and Methods

This cross-sectional, exploratory, and qualitative study was carried out in October 2020 in Capanema, Pará, Brazil, located in the Northeast mesoregion of Pará. Capanema is located near the geographical coordinates: latitude 01°11'45" and longitude 47°10'51" (Figure 1). The municipality is approximately 621,483 km<sup>2</sup> in size and the estimated population in 2020 was 69,431 inhabitants (IBGE, 2020).

**Figure 1** - Location map of the municipal fish market in Capanema, Pará, Brazil



Source: IBGE (2020).

For each person responsible for the fish trade points of the fish market in Capanema, a Free and Informed Consent was presented, aiming to clarify the objectives and importance of the research, as well as the traders' authorization so that it could be carried out. The commercial points where those responsible agreed to sign the TCLE were evaluated through a checklist based on Resolution RDC No. 216, of September 15th, 2004, of the National Health Surveillance Agency (ANVISA), containing issues related to infrastructure (facilities, equipment, furniture, and utensils), cleaning of the place and handlers, vector and pest control, handling of fish and packaging, totaling 24 items for verification (Table 1).

**Table 1** - Steps and number of items used for the checklist assessment

| Phases | Hygienic and Sanitary Aspects | Number of Questions |
|--------|-------------------------------|---------------------|
| 1      | Infrastructure                | 8                   |
| 2      | Sanitation                    | 4                   |
| 3      | Manipulators                  | 5                   |
| 4      | Vectors and pests             | 3                   |
| 5      | Handling and packaging        | 4                   |
|        | <b>Total</b>                  | <b>24</b>           |

Source: Research data.

Data analysis was performed using Microsoft Excel®

2013 software, in which graphs and tables were generated. To calculate the adequacy means, the following formula by Kibret and Abera (2012) was used:

Where A is the service, S is the total of YES answers, T is the total of items and t is the non-applicable answers (NA).

Then, the establishments were classified according to the adequacy of the requirements: good (75 to 100%), regular (50 to 74.9%), or poor (0 to 49.9%).

## 3 Results and Discussion

In the Capanema Fish Market, there are a total of 25 boxes, however, only 16 (64%) were in operation during the research period. Of the active boxes, only seven (43.8%) of those responsible authorized the evaluation in their commercial establishments and signed the ICF presented, while the others (56.2%) refused to sign the term. The boxes, in which the survey was carried out, were identified from A to G.

The market space is a warehouse, open in the morning and afternoon, during business hours. The city hall is responsible for cleaning the area where people pass, while the boxes sanitation is the responsibility of each trader. As for infrastructure, the environment has good coverage, reducing the exposure of fish to sunlight, and has two large entrances,

which provide adequate ventilation to the air renew that circulates inside the market, minimizing the concentration of fish odors.

As for the walls, they are covered with tiles, however, it was possible to observe the walls deterioration, which present several cracks, making it difficult to completely clean the work environment n surfaces. The counters are made of concrete, which also allows food contamination, since the pores present are susceptible to the accumulation of dirt and fish residues. According to ANVISA (2004), the most suitable material for the countertops composition would be stainless steel, because it has a smooth and pore-free surface, which facilitates its cleaning. Rosa *et al.* (2021), based on their study in the municipal market of Icoaraci-PA, clarify that problems in structural conditions can be due to the absence or insufficiency of public actions aimed at periodic maintenance.

In all the bins there was at least one sink with running water, which was used for all the cleaning activities. On the other hand, not all boxes have an adequate place for cutting the fish, and most of the traders use a wooden stump as a support, which has several gaps in the surfaces, which is another factor that can cause the fish contamination. Furthermore, although there is hygiene of hands and utensils before starting the commercialization activities, during the commercial period there was no noticeable regular washing of hands, nor even of utensils such as cutting knives. The scales were all mechanical, containing an aluminum plate, which is used several times without any frequent cleaning action. Similar results were also observed by Silva, Matté, and Matté (2008) when conducting a survey in open markets in the city of São Paulo-SP, finding disorganization and lack of hygiene in fish stalls in all the places sampled, besides the use of poorly maintained and dirty utensils, such as knives and cutting surfaces, in 100% of the places observed.

Regarding the handlers, none of the traders wore caps and gloves, and although 85.71% were wearing white PVC aprons, complete and proper attire is necessary to minimize the risk of food contamination due to improper handling. Similar results were observed by Freire, Silva and Souza (2011), who, evaluating the economic and hygienic-sanitary aspects of the fish trade in the fair and municipal market of Bragança-PA, also did not observe the use of appropriate attire and instruments by the traders.

Regarding nail hygiene, all the vendors had short nails, as indicated by current legislation, since long nails can more easily accumulate microorganisms. In addition, none of them had visible diseases all over their body, which is also seen as positive when it comes to food handlers, but despite these positive points, another factor that can put the health of consumers at risk is the fact that there is no distribution of tasks among different people within each commercial establishment, and the same person responsible for handling the fish is also responsible for receiving money and taking care of all the utensils used, results also evidenced in the studies of

Holanda *et al.* (2013) and Silva, Matté and Matté (2008).

In the research conducted by Silva-Júnior, Ferreira and Frazão (2018) there was 100% of non-compliance regarding the handlers, who do not wear specific uniforms for this function, besides wearing adornments such as bracelets and rings. In addition, they also had the habit of smoking, which are inappropriate practices when working with food, which can increase the chances of product contamination.

During the handling process, the products remains, such as viscera and tail fins, are usually discarded on the floor of the respective boxes, and only at the end of each shift, that there is waste collection by the owners, being discarded in a container, which is located between the fish market and the municipal market. This container is used for disposal not only of the trash generated by the fish market, but also the other products sold in the municipal market, and the waste generated in an open market also located near the market. There is no separation of organic material from inorganic material, all waste is stored in the same place and has the same final destination, being collected for disposal in an open-air dump located in the municipality. Problems related to the disposal of fish waste were also found by Rosa *et al.* (2021) in the municipal market of Icoaraci-PA.

In none of the locations, there are freezers for better fish conservation, in some, there is only Styrofoam with ice stored below the fish, which does not guarantee the conservation of its quality or prevent its deterioration. Besides this, when the fish were not exposed on the concrete bench, they were found in sieves or plastic containers, which proved to be badly preserved.

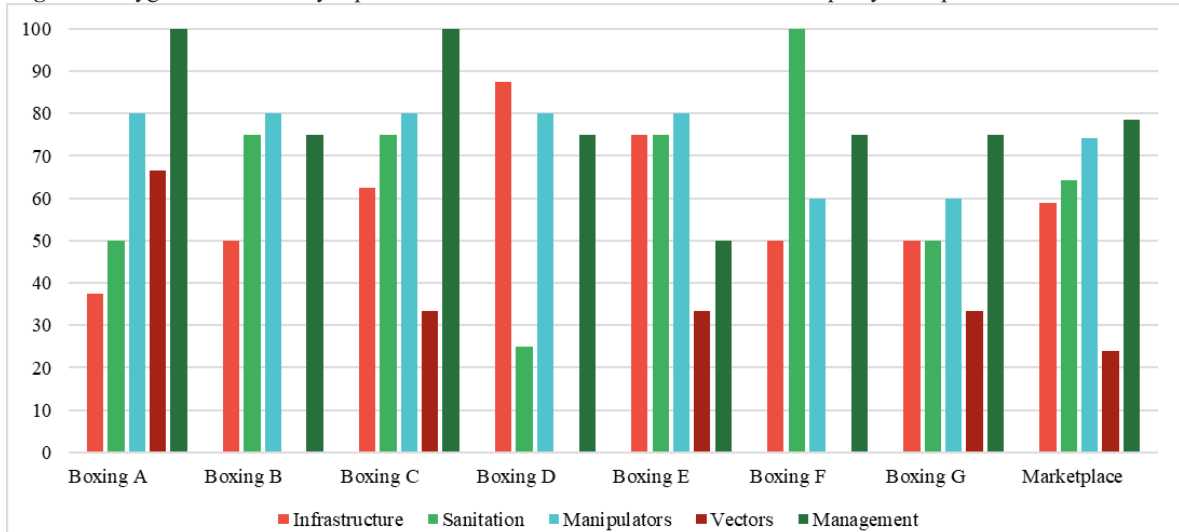
The problems reported here are frequently observed in public markets. In a survey by Holanda *et al.* (2013), for example, fish in 100% of the stalls were exposed to the environment, subject to contact with contaminated sources such as insects and dirt use of equipment and utensils in good condition. In the research conducted by Freire, Silva and Souza (2011), the fish sold in the form “in the wild” were stored on ice, but during the marketing period, they were exposed on benches at room temperature, which compromises the quality of the product, besides leaving it susceptible to contamination and accelerating its deterioration process.

Based on the observations made in this research, each box was evaluated individually, thus, in terms of hygienic-sanitary aspects, box D showed better results in the stage related to infrastructure, with 87.5% of the items met, being classified in this category as Good. As for the cleaning stage, the bin that best met the current legislation was bin F, reaching 100% of compliance for the requirements. As for the handlers' items, boxes A, B, C, D, and E reached 80% of compliance. As for the stage of vectors and plagues, the box A had the best result, with 66.7% of the items fulfilled, while the boxes B, D, and F, had 100% of non-compliance. As for handling and packaging, boxes A and C obtained 100% of compliance. Concerning the general market score,

i.e., taking into account the results obtained in the analysis of all the boxes, the stage that presented the most items fulfilled was Handling and Packaging, with approximately 78% of the

requirements fulfilled. The stage with the least satisfactory results was Vectors, with only 23.8% of compliance (Figure 2).

**Figure 2 - Hygienic and sanitary aspects in the fish commercialization in the municipality of Capanema-PA**

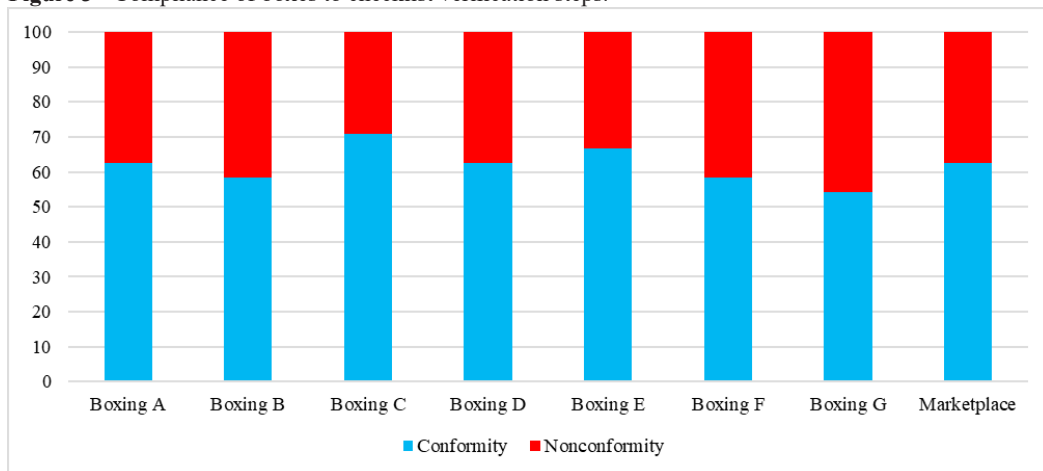


Source: Research data.

As for the compliance with the Resolution on all the items evaluated, the box with the best percentage of service was box C, reaching 70.8% of service, followed by box E, with 66.7%, boxes A and D with 62.5%, B and F with 58.3% and box G with 54.2%.

Taking into account all the boxes evaluated, the municipal fish market in the city of Capanema, Pa, obtained an average of 62.5% (Figure 3) by the legislation in force, thus, the market, as well as each box individually, were classified as being regular (Table 2).

**Figure 3 - Compliance of boxes to checklist verification steps.**



Source: Research data.

**Table 2 - Final classification of the boxes.**

| Boxes              | Compliance Level Classification |               |              | Situation |
|--------------------|---------------------------------|---------------|--------------|-----------|
|                    | 75 a<br>100%                    | 50 a<br>74.9% | 0 a<br>49.9% |           |
| A                  |                                 | 62.50%        |              | Regular   |
| B                  |                                 | 58.63%        |              | Regular   |
| C                  |                                 | 70.83%        |              | Regular   |
| D                  |                                 | 62.50%        |              | Regular   |
| E                  |                                 | 66.67%        |              | Regular   |
| F                  |                                 | 58.33%        |              | Regular   |
| G                  |                                 | 54.17%        |              | Regular   |
| <b>Marketplace</b> |                                 | 62.50%        |              | Regular   |

Source: Research data.

The results reported here corroborate the results of Santos, Moura and Baptista (2015), who, when evaluating the hygienic-sanitary conditions of the food trade in a fair in Recife-PE, found that 69.56% (16/23) of the evaluated establishments were classified as regular. Other similar studies demonstrate precarious situations regarding food market service in public stores. Silva-Júnior, Ferreira, and Frazão (2018), with a similar study conducted in the Rural Producer Fair in Buritizal-AP, obtained results of only 43.86% of compliance with current legislation; Campos *et al.* (2016), in the Municipal Market of Guarapari-ES had 40.28% of

compliance; Silva-Júnior, Barbosa and Monteiro (2016), in the Igarapé das Mulheres Fish Market, Macapá-AP, obtained out of the 66 fish marketing boxes, only 51.5% of compliance with the legislation in force.

Poor structural conditions, in addition to hygienic-sanitary inadequacies, are a very frequent problem in public fairs and markets in Northern Brazil (ROSA *et al.*, 2021). The data presented here point to the great possibilities of contamination of food sold in these environments, because the lower the adequacy index to the requirements proposed by ANVISA, the greater the risk of occurrence of foodborne diseases for the consumers.

#### 4 Conclusion

From the analyses performed, it is observed that the fish sold in the municipal market of Capanema, Pará is subject to several possible sources of contamination. All the boxes evaluated were classified as regular according to the evaluation criteria suggested by ANVISA. Thus, the data collected here indicate a high probability of risk of fish contamination and, consequently, the transmission of foodborne diseases to its consumers, which can pose serious problems to public health and also have consequences for the local economy.

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