Income classes in Brazil and apparent consumption of aquaculture and fishery products

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Abstract
This paper analyzed household consumption of aquaculture and fisheries for families living in Brazil and also specifically analyzed the Southeast region of the country, home to 42% of the population. This for six income classes: up to €424 [Class F]; €424 to €635 [Class E]; €635 to €1.272[Class D]; €1.272 to €2.120 [Class C]; €2.120 to €3.180 [Class B]; Above €3.180 [Class A]. Secondary data from the 2017-2018 Household Budget Survey of the Brazilian Institute of Geography and Statistics were used, which were studied by these authors using descriptive statistics and multivariate grouping techniques (Block Clustering). There was a preference to analyze data on freshwater fish consumption due to the recent expansion of aquaculture fish supply in Brazilian supermarkets. The results showed that there was no direct relationship between the income level and the consumption of the Fished Group in the country, unlike the Southeast region which presented a directly proportional relationship, but there was a directly proportional relationship in the consumption of Fish Fillets (Fresh and Frozen); Tilapia represented 33.5% of the total acquisition and in some income classes it reached 50% of river fish consumption, as well as Other Fish in Frozen Filet.
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1. Introdução

The results of the Household Budget Survey/POF 2017-2018 by the Brazilian Institute of Geography and Statistics (IBGE, 2020) showed that the annual per capita acquisition of fish for home consumption in Brazil would be around 2.8 kg/inhabitant/year . In the states of Amazonas, Acre, Amapá, Pará and Maranhão these per capita values varied between 9.5 and 14 kg/year.

The North Region and part of the Northeast have per capita household consumption rates much higher than the other federation entities, but with a larger population. The states of São Paulo and Minas Gerais, where 42% of Brazilians live, have per capita household purchase values of 1.45 and 0.93 kg/inhabitant/year, respectively.

Thus, with the exception of some Brazilian states, per capita purchase numbers of fish, although at home, are far from the 10.5 kg observed in Latin America and the Caribbean or the 12 kg recommended by FAO (2020). According to the institution, global per capita consumption of fish has been increasing by around 1.5% per year, jumping from 9 kg/inhabitant in 1961 to 20.5 kg/inhabitant in 2018.

According to Wagner et al. (2023) pointed out that we have few studies that seek to understand the determinants of fish consumption. When analyzing microdata from the 2017-2018 POF, the authors identified that the main household characteristics that favored the consumption of fish were: family income, presence of children and adolescents, men as heads of household, spending on physical activities, being located in rural areas, in coastal regions and in the North region of the country.

Firetti et al. (2013), analyzing data from the 2008 POF, observed a lower participation of fish in the Brazilian household diet when compared to other meats (beef, pork and poultry) and eggs. This difference increased when the Southeast, South and Midwest regions were analyzed. According to the authors, the State of São Paulo stood out from the others for the consumption of fresh fillets (in general) and codfish.

Brazil is experiencing a consistent expansion of the agri-food system of fish farming motivated by institutional or organizational changes that stimulated the increase in production and supply of

whole fresh Tilapia, in the form of fillets and other cuts, but also by the offer of different species, such as Tambaqui, Surubim or Pintado, Pacu and Patinga, Pirarucu, Trout and Pangasius. Although still far from its productive potential, the sector is making great strides towards reaching new levels of supply in the Brazilian retail market and in the international market, considering that it is currently the fourth largest Tilapia producer in the world.

That said, this work brings the first results of research funded by the São Paulo State Research Foundation (FAPESP) that analyzes the acquisition and home feeding of fish from the institutional and organizational changes of fish farming, product supply and preferences of consumers. In our first analyses, we sought to observe data from the 2017-108 Household Budget Survey carried out by IBGE, with special attention to the relative participation of Fish Products in the subgroups Fish from Saltwater; Freshwater Fish and Unspecified Fish according to six income classes in households in the Southeast Region.

2. Methodological Procedures

A survey was carried out on secondary data made available by the IBGE through the 2017-2018 Family Budget Survey (IBGE, 2020). The data and variables of the "Fished Group" were analyzed; Subgroups "Marine Fish", "Freshwater Fish" and "Unspecified Fish"; and other 42 Products present in the following POF tables: 2393 (Annual per capita household food purchase by groups, subgroups and products); and 8157 (Annual household food purchase per capita by total income classes monthly family equity change and groups, subgroups and products), which presents six classes, namely: up to up to €424 [Class F]; €424 to €635 [Class E); €635 to €1.272[Class D]; €1.272 to €2.120 [Class C]; €2.120 to €3.180 [Class B]; Above €3.180 [Class A]. Table 6977 of the 2017-2018 POF (Number of families and Average family size by total income classes and monthly family equity variation) was also consulted to compose the estimated quantities of fish purchased.

Such data were analyzed at the level of Brazil and for the Southeast Region, whose choice was motivated by representing about 42% of the Brazilian population.

To expand the scope of analysis, in some cases a simple grouping of products was carried out, in which the nature of the product specified in the POF 2017-2018 was respected. 04 new types of products were generated: Fresh Fish, Fillets (fresh and frozen), Fresh Fillet and Frozen Fillet.

The analysis results were obtained by tabulating original data and combining descriptive statistics (percentage relative frequencies) and multivariate (Block Clustering) techniques, as described in Sweeney et al. (2015) and Hair et al. (2009).

3. Results and discussion

The highest purchase rates for per capita consumption of Fish in Brazil are from Classes F; A and E; with respectively 3.36; 3.23 and 3.1 kg. Classes D and C had the lowest values for buying fish weighing 2.43 and 2.32 kg. These numbers demonstrate that, in Brazil, there is no direct and proportional relationship between the increase in income and the increase in the purchase of fish in kg/per capita/year (Table 1).

Families with income in Class A purchased larger quantities of products from the Saltwater Fish Group when compared to other classes; and the same occurs with Class F in relation to Fresh Fish.

There is a directly proportional relationship between the level of income and the quantities of products purchased in the form of Fillets (Fresh and Frozen) for family home consumption, in which Class F has a value of 0.11 kg and Class A of 1.10 kg/ per capita/year.

The consumption of Fresh Tambaqui[1] (*Colossoma macropomum*), and its hybrids stand out, a species native to Brazil (Amazon) and raised in captivity through aquaculture with complete feeds, usually in small and medium-sized fish farms. Families with income in classes B, E and F had household consumption of Fresh Tambaqui estimated between 0.20 and 0.23 kg/per capita/year. Digging deeper into the POF 2017-2018 regional data, it can be seen that this product was consumed in the North (1.182), Northeast (0.242) and Midwest (0.14).

However, this result should be praised, as according to Firetti et al. (2013), analyzing the 2008 POF, the purchase of the Fresh Tambaqui product was practically restricted to the states of Amazonas, Para and Maranhao. In the analyzes of acquisition by income class of families in Brazil, the authors found values below 0.1 kg/inhabitant/year.

Table 1. Annual household food purchase per capita by income class in Brazil*: Fished Group, Subgroups and Product Types.

	F	E	D	C	B	A
Fished Group	3.36	3.09	2.32	2.43	2.86	3.23
Marine Fish	1.50	1.38	1.20	1.53	1.72	2.18
Frehswater Fish	1.20	1.21	0.71	0.67	0.59	0.84
Unspecified Fish	0.66	0.50	0.41	0.23	0.55	0.21
Fresh Fish	3.09	2.79	1.99	1.98	2.34	2.25
Fillet (all)	0.11	0.18	0.24	0.38	0.60	1.08
Fresh Fillet	0.05	0.11	0.14	0.21	0.29	0.59
Frozen Fillet	0.07	0.07	0.10	0.17	0.31	0.50

*Where: up to €424 [Class F]; €424 to €635 [Class E]; €635 to €1.272[Class D]; €1.272 to €2.120 [Class C]; €2.120 to €3.180 [Class B]; Above €3.180 [Class A].
Data source: Adapted from POF 2017-2018 (IBGE, 2020); Search results.

By analyzing only, the Southeast Region, which concentrates 42% of the Brazilian population, it was possible to observe that the purchase and household consumption of the Fished Group increased proportionally to the increase in family income, as well as an increase in the consumption of Filets, Fresh Filets and Frozen Fillets (Table 2).

Table 2. Annual household food purchase per capita by income class in the Southeast region of Brazil*: Fished Group and Product Types

	F	E	D	C	B	A
Fished Group	0.87	0.82	1.06	1.64	2.61	2.75
Fresh Fish	0.53	0.50	0.64	0.89	1.81	1.02
Fillet (all)	0.20	0.19	0.24	0.44	0.65	1.23
Fresh Fillet	0.07	0.14	0.15	0.24	0.29	0.67
Frozen Fillet	0.14	0.05	0.10	0.20	0.36	0.55

* Where: up to €424 [Class F]; €424 to €635 [Class E]; €635 to €1.272[Class D]; €1.272 to €2.120 [Class C]; €2.120 to €3.180 [Class B]; Above €3.180 [Class A].
Data source: Adapted from POF 2017-2018 (IBGE, 2020); Search results.

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[1] named as "Red Pacu" in China.

When we deepened the scope of the analysis using the relative percentage frequencies and, later, Block Clustering, it was possible to verify the participation of the different Products in the acquisition and household consumption of the Saltwater Fish subgroups and, especially, Freshwater Fish, both for the total of sampled families as in income classes.

These results showed that Tilápia Fresca accounted for 33.5% of freshwater fish purchases in the Southeast region, and in classes C and D it obtained a share of 50.5 and 54.5% respectively (Figure 1).
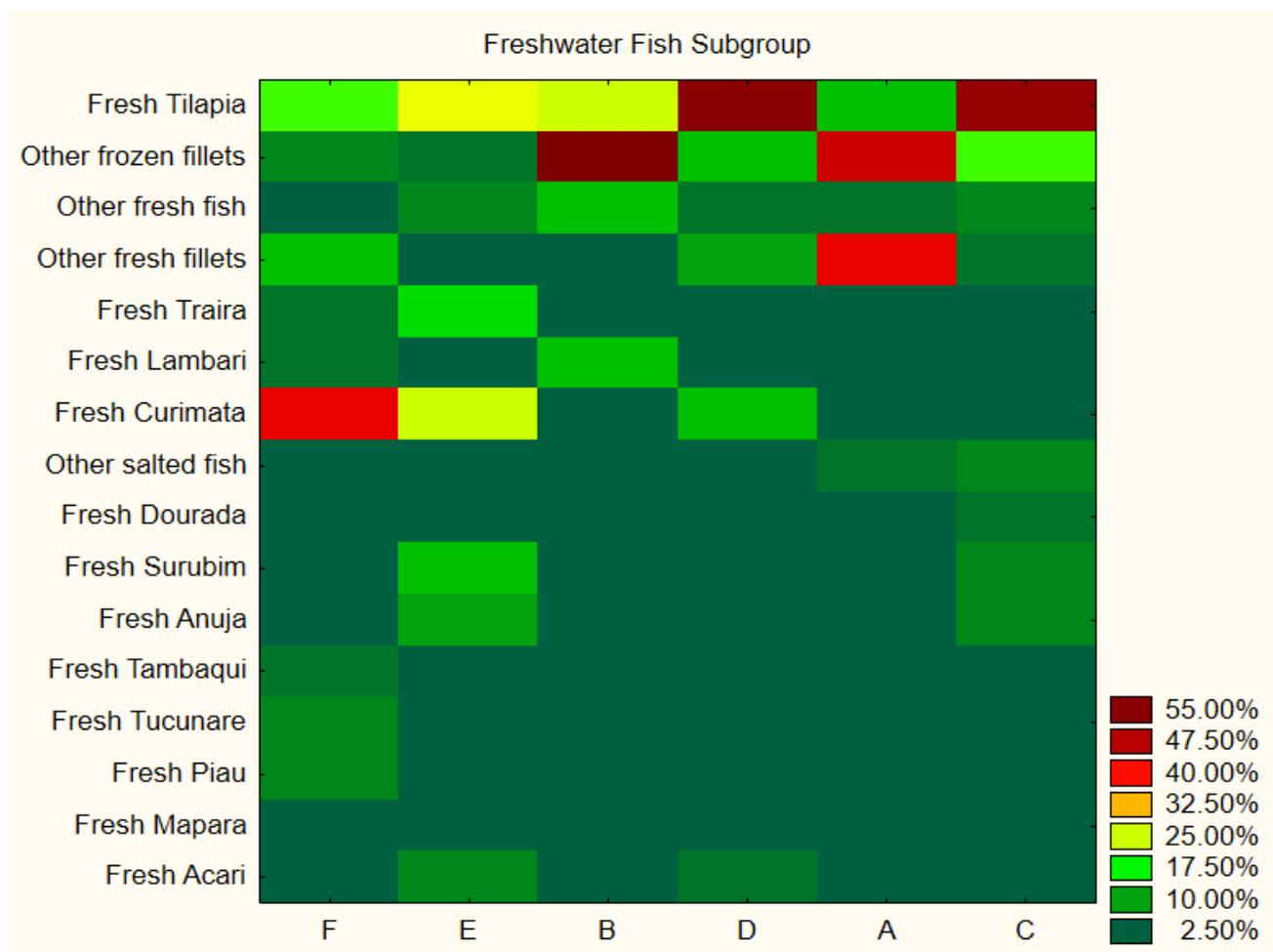

Figure 1. Block Clustering statistical grouping chart of percentage relative frequency of products from the Freshwater Fish Subgroup in the Southeast Region.
* Where: up to €424 [Class F]; €424 to €635 [Class E]; €635 to €1.272[Class D]; €1.272 to €2.120 [Class C]; €2.120 to €3.180 [Class B]; Above €3.180 [Class A].
Data Source: Survey Results.

It is important to point out that this is an excellent result and, in addition to these, Fresh Tilapia was an important freshwater fish consumed in the other income classes. Other observable points were the relative participation of Other Frozen Fillets and Other Fresh Fillets (between 40 and 47.5%) in the acquisition and household consumption of the Freshwater Fish Group, income classes A and B.

The Block Clustering graph in Figure 1 also allows us to observe the interesting representativeness of Fresh Curimata in class F (around 40%) which is formed by families with

monthly incomes up to up to €424 as well as Fresh Surubim (or Brasilian Cat-fish) in the households of class E families (€424 to €635) with a 10% stake in the acquisition of Fresh Water Fish.

4. Conclusion

In Brazil, there is no direct and proportional relationship between income and the purchase of fish, contrary to what is observed for Fish Fillets (Fresh and Frozen). Fresh Tambaqui is an important product purchased by families residing in the North, Northeast and Midwest regions.

In the Southeast region, both the acquisition of food from the Fished Group and that of Fillet products (Fresh and Frozen) are directly proportional to the families' income classes. Fresh Tilapia is the main product among freshwater fish consumed by families. The participation of Other Filets (Fresh and Frozen) stands out, representing from 40% to 56% of this Fish Group for income classes A and B.

5. Final considerations

The IBGE POF is a rich database on the behavior and characteristics of consumption at regional and state levels, especially when disaggregating income classes are used.

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