

Availability of Fish in Brazilian Households: Analysis of Data from the 2008-2009 Survey of Family Budgets

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Abstract

The objective this study was assessing the availability of fish for household consumption and survey the species preferred by the consumer. To meet these goals were used in this study: the Consumer Expenditure Survey data conducted by the Brazilian Institute of Geography and Statistics, with a probability sample of 68,373 Brazilian households between 2008 and 2009. These analyzes contemplated the North, Northeast, South, southeast and Midwest, plus the capitals of each state and the Federal District. The results indicated that the most consumed species in Brazil on this particular period were: hake, sardines, shrimp, tambaqui and curimatã. The study showed low fish consumption in some country towns however, in others household availability figures above the national average consumption. Therefore, it is understood that fish consumption can and should be encouraged in the country, through actions aimed at strengthening all links in the production chain, especially in fish distribution sectors.

Keyword: Fish consumption, Brazilian households, Availability

1. Introduction

Brazil produced in 2011, according to statistics from the Ministry of Fishing and Aquaculture (Brasil, 2013a), about 1.43 million tons of fish, with that total being 13.2% higher compared to the measured for the year 2010. In the South American context, for the year 2010, Brazil occupied the third position on the production, considering both the extractive fishing and aquaculture, being under the production of Peru (4.3 million t) and Chile (3.7 million t) (Brasil, 2013a). If we consider only the production from aquaculture in 2010, Brazil was the 2nd largest fish producer in South America, when it contributed for 18,1% of total production, only behind Chile, which in the same year, produced 27,1% of South America (FAO, 2012; Brasil 2013a).

Fish is the primary dietary protein source of many countries, contributing for a quarter of the world's animal protein supply (Santos, 2006). Many people, in developing countries, depend on fish for composing their diet, because this is a source of essential amino acids, usually absent in vegetable-based diets (FAO, 2009).

The increased interest in fish in recent years is linked to information about this food nutritional value and its association with improved health, highlighted by observation in populations with fish as its primary food source. Among the benefits, were identified reduction of cholesterol levels, incidence of strokes, heart diseases, and possibly Alzheimer's. The fish can heighten cognitive function in adults and prevent the birth of children with low birth weight and preterm birth (Burger, 2008).

In 1994, the *Committee on Medical Aspects of Food Policy* - COMA released several evidences of nutritional determinants that could increase the risk of developing heart disease. Among the preventive aspects, the benefit of fish consumption are highlighted, especially species rich in polyunsaturated fatty acids. Since then, several studies have been published demonstrating the health benefits offered by polyunsaturated fatty acids (Ruxton et al., 2004).

The global fish consumption is heterogeneous, ranging from less than 1 kg per capita in a country to more than 100 kg in another (FAO, 2008). Similarly, the reference sources to identify the consumption of fish demonstrate divergent data.

In 2011, it was noted that the apparent per capita consumption of fish in Brazil rose to 11.17 kg / capita / year, 14.5% more than the previous year. In ten years (2001-2011), the consumption of fish, among Brazilians, rose 57.83%, and only in the last two years (2010 and 2011) this growth was about 23.7% (Brasil, 2013b).

The global per capita consumption estimated for the year 2011 was 18.8 kg of fish per year. However, there is no significant difference between the amounts consumed per capita when data are sectorized. In a survey conducted in 2009, in developed countries or areas (Europe and North America), was observed consumption from 22 to 24 kg of fish / person / year; in developing countries or areas, 17 kg of fish / person / year; and in low-income countries with food shortages, 10.1 kg (FAO, 2012).

The assessment of food consumption is complex. It is known that for describing the dietary patterns of a population group, a direct investigation of individual food consumption is required. In this sense, the Brazilian Institute of Geography and Statistics (IBGE) made in Brazil a specific module that investigates the individual food consumption in a subsample of the total households in the Household Budget Surveys (Pesquisa de Orçamento Familiar - POF) (Levy et al., 2012).

The Household Budget Surveys - POF has been held regularly in Brazil; it is a household sample survey that investigates information on characteristics of households, as well as data that can be used to trace the profiles of household consumption (Brasil, 2010).

Although you can use POF data to investigate the indicators of food consumption, these data do not allow us to assess individual consumption (Levy-Costa, 2005).

It should be emphasized that the IBGE refers to the POF as a research dealing with food and beverage "acquired" for household consumption, excluding acquisitions with food away from home (Hoffman, 2010). However, these data are of paramount importance to understand part of this process and thus, promote the development of the fisheries sector.

The aim of this study was to identify the five species of fish that stood out for its national household availability, from the POF data 2008 - 2009 and see how these species are distributed among regions of the country.

2. Material and Methods

Data provided by the Household Budget Survey (POF) conducted between May/2008 and May/2009 by the Brazilian Institute of Geography and Statistics (IBGE) were analyzed.

The information of POF were obtained throughout the national territory, directly in private households previously selected. Data collection followed the IBGE methodology standardization, through interviews with its residents.

The stratification of the sample prepared by the POF was organized to ensure the participation of all the Brazilian territory; the duration of the research allowed data collection in all quarters of the year, in different geographic and socioeconomic strata.

Among other information relating to the budget structure of families, were investigated for the POF, the available quantities of food and beverages for consumption at home, by the major regions, rural and urban areas, in addition to ways of obtaining cash (payment by cash, check, credit card, etc.) and non-monetary (acquisitions from donations, own production, trade, etc.). Information regarding the purchase of food were obtained by POF through daily log for seven consecutive days, with detailed description (quantity, unit of measure, weight, volume) of each product purchased for consumption (Brasil 2010).

It is important to highlight that, for the present study, were considered information about household availability of fish in households and not effective household consumption, based on POF data from 2008 to 2009.

It is emphasized that the basic information of POF, referring to household food availability, includes food available at home for the consumer unit (family), for a period of seven consecutive days recorded with detailed product description, quantity purchased and the unit measure in addition to the amount paid (in Real- Brazilian currency), place of purchase and purchase order (monetary or otherwise) (Levy-Costa, 2005).

In the database of POF was possible to access information about the species of fish most often found in the surveyed households, taking into account the geographical regions of the country (North, Northeast, South, Southeast and Midwest).

After surveying these data, data analysis using the statistical software SPSS version 15.0 was performed.

3. Results and Discussion

The species of fish mentioned in the POF document are presented whit plus their scientific names.

Acará (<i>Geophagus spp.</i>)	Acari (<i>Loricaria spp.</i>)
Anujá (<i>Trachycrystes spp.</i>)	Cod (<i>Gadus spp.</i>)
Catfish (<i>Liposarcus spp.</i>)	Shrimp (<i>Penaeusspp; Litopenaus spp.</i>)
Corvina (<i>Micropogonias spp.</i>)	Curimatã (<i>Prochilodusspp</i>)
Dourada (<i>Brachyplatystoma spp.</i>)	Jaraqui (<i>Semaprochilodus spp.</i>)
Lambari (<i>Astyanax spp.</i>)	Mapará (<i>Hypophthalmus spp.</i>)
Hake (<i>Merluccius spp.</i>)	Whitefish (<i>Cynoscion spp.</i>)
Piau (<i>Leporinus spp.</i>)	Sardine (<i>Sardina spp.</i>)
Tainha (<i>Mugilplatanus spp.</i>)	Tambaqui (<i>Colossoma spp.</i>)
Tilápia (<i>Oreochromis spp.</i>)	Traíra (<i>Hoplias spp.</i>)
Surubim (<i>Pseudoplatystoma spp.</i>)	

3.1 Acquisition of Fish by Region

According to data gathered from the POF 2008-2009, estimates of average acquisition of fish in Brazil can vary greatly depending on the region studied (Table 1).

Table 1: Average Acquisition of Fish Per Capita in Brazil and its Major Regions, 2008-2009

Region	Annual kg per capita
Brazil	4.0
North	17.5
Northeast	4.9
South	1.6
Southeast	2.1
Midwest	1.6

Source: BRASIL (2010)

The available average per capita fish in Brazil was 4kg/inhabitant/year, especially the northern region, which has expressive values and that were close to the global average which was of 18.1 kg /inhabitant/ year (2009) , 18.6 kg / inhabitant / year (2010) and 18.8 kg /inhabitant/year (2011) (FAO, 2012).

The North-Northeast region of Brazil, presented according to data from the 2002-2003 POF, most household availability per capita, at the time being responsible for 60% of total consumption in the country (SONODA et al., 2012), with 24.6 kg / inhabitant / year. Comparing the results of that region in POF 2008-2009 and POF 2002-2003 there was a negative difference of 7.1 kg / inhabitant / year, a factor that should be examined, as the region of greatest consumption in the country appears to be making changes as purchasing habits and possibly consumption.

It is important to consider that, according to POF data 2008-2009, the five regions of the country have heterogeneous characteristics in relation to household food availability, for example, the share of rice in the Midwest, was twice the observed in the South and wheat flour exceeded six times the share in other regions, since the share of fish in the North surpassed by almost ten times that of the Midwest and South (Levy et al., 2012).

3.2 More Acquired Species by Brazilian Families

In POF 2008-2009 research, regarding the relation of the main species available by Brazilian families (Table 2), it is observed that there are notable differences between the results obtained in the different regions.

Table 2: Continental and Marine Species Available in Most Brazilian Regions - Ratio of Household Consumption in Kilograms, POF, 2008/2009

Brazil				
Freshwater	kg/inhabitants	Salt water	kg/inhabitants	Difference (Kg)
Tambaqui	0.147	Whitefish	0.302	-0.155
Curimatã	0.130	Sardine	0.262	-0.132
Jaraqui	0.113	Shrimp	0.164	-0.051
Tilápia	0.090	Corvina	0.127	-0.037
Acará	0.074	Mullet	0.105	-0.031
Total	0.554		0.960	-0.406
North Region				
Jaraqui	1.392	Whitefish	1.838	-0.446
Tambaqui	1.125	Mullet	0.703	0.422
Curimatã	0.853	Shrimp	0.582	0.271
Dourada	0.555	Catfish	0.544	0.011
Surubim	0.515	Sardine	0.518	-0.003
Total	4.440		4.185	0.255
Northeast Region				
Tilápia	0.251	Sardine	0.314	-0.063
Tambaqui	0.185	Corvina	0.286	-0.101
Acará	0.182	Whitefish	0.265	-0.083
Curimatã	0.174	Shrimp	0.184	-0.01
Traíra	0.112	Mullet	0.098	0.014
Total	0.904		1.147	-0.243
South Region				
Tilápia	0.058	Sardine	0.183	-0.125
Traíra	0.029	Shrimp	0.112	-0.083
Surubim	0.011	Mullet	0.107	-0.096
Lambari	0.01	Hake	0.083	-0.073
Acará	0.007	Whitefish	0.035	-0.028
Total	0.115		0.520	-0.405
Southeast Region				
Curimatã	0.027	Sardine	0.229	-0.202
Tilápia	0.024	Whitefish	0.163	-0.139
Traíra	0.023	Cod	0.115	-0.092
Acari	0.021	Hake	0.11	-0.089
Lambari	0.021	Shrimp	0.096	-0.075
Total	0.116		0.713	-0.597
Midwest Region				
Surubim	0.086	Shrimp	0.122	-0.036
Tambaqui	0.054	Sardine	0.12	-0.066
Piau	0.044	Whitefish	0.064	-0.02
Anujá	0.024	Hake	0.063	-0.039
Mapará	0.007	Corvina	0.014	-0.007
Total	0.215		0.383	-0.168

Source: BRASIL (2010)

We notice that the tambaqui is the freshwater species of greatest national household availability, despite not even be noticed in the south and southeast. Regarding saltwater species, the whitefish is the species with the highest availability at national level.

When considering only the national household availability of fish is observed that there is a higher average for saltwater species in relation to freshwater (0.960 vs. 0.554), the same applies to most regions of the country except the Northern region, where these values are higher for freshwater species (4.40) (tambaqui, curimatã and dourada) than for the cited seawater species (4.18) (mullet, shrimp and catfish).

These results can be explained in part by access to fish in the region, and the price charged by cultural habit, since these factors have been observed in other studies (Myrland et al., 2000; Maciel et al., 2012, 2013) as facilitators of household, and consequently the consumption of fish availability.

3.3 Species with Higher Household Availability

Seeking to list the species most available in Brazilian households, the grouping of the five species with the highest observed availability was conducted, regardless of their origin (marine or freshwater) (Table 3). Hake shows to be the most evident kind, reinforcing the idea that the price can be a barrier or a facilitator of consumption, since hake is a marine fish of relatively lower value compared to the others.

Table 3: Species of Fish with Higher Household Availability in Brazil and Regions, POF/2008-2009

Brazil		North Region		Northeast Region	
Species	Kg/Inhabitant/Year	Species	Kg/Inhabitant/Year	Species	Kg/Inhabitant/Year
Whitefish	0.302	Whitefish	1.838	Sardine	0.314
Sardine	0.262	Jaraqui	1.392	Corvina	0.286
Shrimp	0.164	Tambaqui	1.125	Whitefish	0.265
Tambaqui	0.147	Curimatã	0.853	Tilápia	0.251
Curimatã	0.130	Mullet	0.703	Tambaqui	0.185
South Region		Southeast Region		Midwest Region	
Species	Kg/Inhabitant/Year	Species	Kg/Inhabitant/Year	Species	Kg/Inhabitant/Year
Sardine	0.183	Sardine	0.229	Shrimp	0.122
Shrimp	0.112	Whitefish	0.163	Sardine	0.120
Mullet	0.107	Cod	0.115	Surubim	0.086
Hake	0.083	Hake	0.110	Whitefish	0.064
Tilápia	0.058	Shrimp	0.096	Hake	0.063

Source: BRASIL (2010).

Taking as a basis these results (Table 3) we note that the Sardine appears in second position, concomitantly, leading consumption in the South, Southeast and Northeast, still in second place in the Midwest Region.

The states of the Northeast Region are major producers of shrimp and tilápia, however, this region don't seem to be the biggest purchaser of these species, at least when considering the household availability. Only the South, Southeast and Midwest have the shrimp among the five species more available. This fact occurs, in part, by the large volume of shrimp that has been exported and the appreciation of the domestic product. According to the Brazilian Association of Shrimp Farmers, Brazil exported 2,154 tons of shrimp in 2010, and Rio Grande do Norte has accounted for 1,561 t (ABCC, 2011).

The tambaqui species leads the POF research in relation to freshwater fish and is placed second in the North, Northeast and Midwest, although it does not appear in the list of the five most consumed species in the South and Southeast, and even when assessed this perspective (Table 3), in the Midwest region. The curimatã species is the most prominent in North, Northeast and leads the household availability of freshwater fish in the Southeast. The species jaraqui leads consumption in the North, with 1.392 kg / inhabitant, and will not appear on the list of the five most significant species without comparison to other regions of the country. This observation reinforces the importance of this species as the national consumption.

POF data from 2008-2009 indicates that, when considering the form of food availability in domestic households, the rural area, in which non-cash purchases of food are relevant, the group of fish had higher household availability non-monetary to monetary, reinforcing the idea of production for own consumption.

The Northern Region with the highest average purchase of fish, also has the highest average for household availability of beef and pork (31.418 kg / inhabitant / year), above the national average (25.41 kg / inhabitant / year) (Brasil, 2010).

Taking into account the data based on the Brazilian capitals and the Federal District (Table 4) there is a heterogeneous distribution as the household availability of fish.

Table 4: Household Availability of Fish in the Capitals of Brazil (kg / Inhabitant / year), 2008-2009 POF

Capital	Total	Freshwater	Salt water
Manaus	16.49	14.52	1.13
Belém	12.15	3.21	7.39
São Luis	12.02	2.17	8.22
Macapá	9.93	4.24	2.88
Boa Vista	7.19	2.53	0.26
Vitória	6.85	0.12	6.52
Florianópolis	6.00	0.39	4.81
Aracaju	5.24	0.73	2.83
Teresina	5.11	2.37	1.52
Fortaleza	5.11	2.80	1.79
Natal	4.60	0.27	3.87
Rio de Janeiro	4.43	0.01	3.72
Rio Branco	4.33	3.62	0.22
Porto Velho	4.12	2.58	0.42
Recife	3.92	0.14	3.62
João Pessoa	3.82	0.37	1.95
Salvador	3.50	0.19	2.97
Maceió	3.31	0.18	1.99
Distrito Federal	2.70	0.34	1.54
Palmas	2.11	1.41	0.13
Cuiabá	2.10	1.40	0.57
Belo Horizonte	2.01	0.38	1.25
São Paulo	1.97	0.17	1.45
Campo Grande	1.77	0.38	1.22
Curitiba	1.59	0.07	1.32
Porto Alegre	0.95	0.27	0.67
Goiânia	0.95	0.37	0.42

Source:BRASIL (2010)

Among all studied capital, Manaus has the higher data of household availability of fish with 16.5 kg / inhabitant / year. This amount consists primarily of freshwater species, 14.5 kg / inhabitant / year. These data can be explained by fish represent the main source of protein for human consumption of the populations that inhabit the banks of rivers and lakes (Isaac and Ruffino, 2011).

São Luís holds a prominent position by acquiring high saltwater fish, 8.2 kg / inhabitant / year, contributing a large part of the total consumed in the capital (12.0 kg / inhabitant / year). Maranhão presents diversity of fish species and availability, and its fresh consumption is high (Silva and Fernandes, 2010).

Goiânia and Porto Alegre have smaller values as household availability of fish. Other capitals, as Palmas-TO, have much lower availability of other fish, although it is located in the region, the largest national household availability, Northern Region.

The per capita consumption of fish is influenced by household availability. Thus, the results presented here of household availability of fish and therefore the consumption are below the global estimates.

According to FAO (2012) the apparent consumption per capita worldwide is 18.8 kg of fish per year, data from the year 2011.

In addition, there is a discrepancy in value, when considering the different methodologies used, which makes the actual characterization of fish consumption by brazilians, and consequently the establishment of incentive stock for this increase.

The POF checks the household availability of fish while FAO is based on data production and marketing in the country. Thus, considering that household availability is directly proportional to the per capita household consumption of fish it appears that, based on data collected by the survey 2008-2009, the consumption can be estimated at 4 kg / inhabitant / year, if we consider the same period (2009), FAO reports a Brazilian consumption of 9.03 kg / person / year.

Another fact to be considered is that consumption is affected by different factors, including the climate and culture of the population, as in Montevideo or Chile, for example, where fish consumption is highest in winter and in Brazil where there is substantial increase in consumption during "Semana Santa" (Wiefels and Avdalov, 1997).

In Brazil, probably due to territorial extension and the cultural, climatic and political differences, is an expressive and clear differentiation of the amount per capita of fish purchased in different regions, to compare the different states or even different cities of the same State.

The range of fish species indicated by the survey, as well as the amount of fish available in the households of each region, shows a heterogeneous availability of fish in the country. Reinforcing the idea that fish consumption is influenced by several factors that should be better studied understood and therefore range from the formation of habits to access the local availability of the species.

However, it is believed that increased consumption of fish depends on improvements in all parts of the chain, from production to marketing, including the development of new products based on national fish by industries.

A limiting factor is that POF analyzes fish available in the homes of the families interviewed, regardless of what may have been consumed in other locations, such as restaurants, so it is data that does not portray the total per capita consumption of fish, but the fish available for consumption in Brazilian households.

4. Conclusion

There is need for investment to boost consumption campaigns across the country, focusing on the benefits of fish consumption on human health and its potential as an animal protein source. The lack of standardization of existing survey of the actual consumption of fish methodologies is a major difficulty in characterizing this situation and also to create actions that encourage increased consumption of fish in the country.

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