

LONG TERM EXPOSURE TO MERCURY DUE TO FISH CONSUMPTION AND ITS EFFECTS ON RIPARIAN AMAZON COMMUNITY IN THE WESTERN BRAZILIAN REGION

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Introduction

Subsistence communities living along the banks of the Amazonian Rivers depend heavily on fish as the main protein source in their diet. Because of their heavy dependence on fish, Amazonian riparian women and their children are exposed to fish–methylmercury exposure. These communities consume fish on a daily basis, more than one fish meal and depend on it as their main animal-protein source.

A study of health impact of mercury on the riparian communities is being carried out before the studied hydroelectrical power plant starts to operate in the Madeira river. This power plant may change the ecosystem dynamic and increase the bioavailability of Hg in the food chain.

This study aims to assess the relationship between fish eating habits, riparian Madeira communities mercury levels in hair and some effects on health before the hydroelectrical power plant floods the areas downstream in the Madeira river.

Methods

The hydroelectrical power plant is located approximately 10 km from Porto Velho, the capital of the state of Rondonia, Brazil. Porto Velho has a population of 382,830 inhabitants. It is the third largest capital of the North region (www.ibge.gov.br, http). It will have a reservoir of 271 km², with a capacity of 3,150 MW. The difference of this power plant in relation to other hydropower plants in Brazil is the proportion of the reservoir in relation to the capacity of power generation plant, which requires a relatively small flooded area (Magalhães, 2008). The Madeira river, the second largest and the main tributary river in the Amazon, is one of the great rivers of sediment load in the world. Its basin covers an area of 1.5 million km² and about one fourth of the Brazilian Amazon (Garcia, 2008).

A longitudinal study was conducted covering 400 households and 460 individuals in different communities and 155 kilometers of the banks of Madeira river (Figure.1). An extensive socioeconomic survey was conducted with the community, including questions about their diet, cultural habits, exposure history and the self perception about their health. About 176 fish species were analyzed and 460 hair and blood samples were collected and analyzed. The Hg analyses for fish and hair samples were performed by cold vapor atomic absorption.

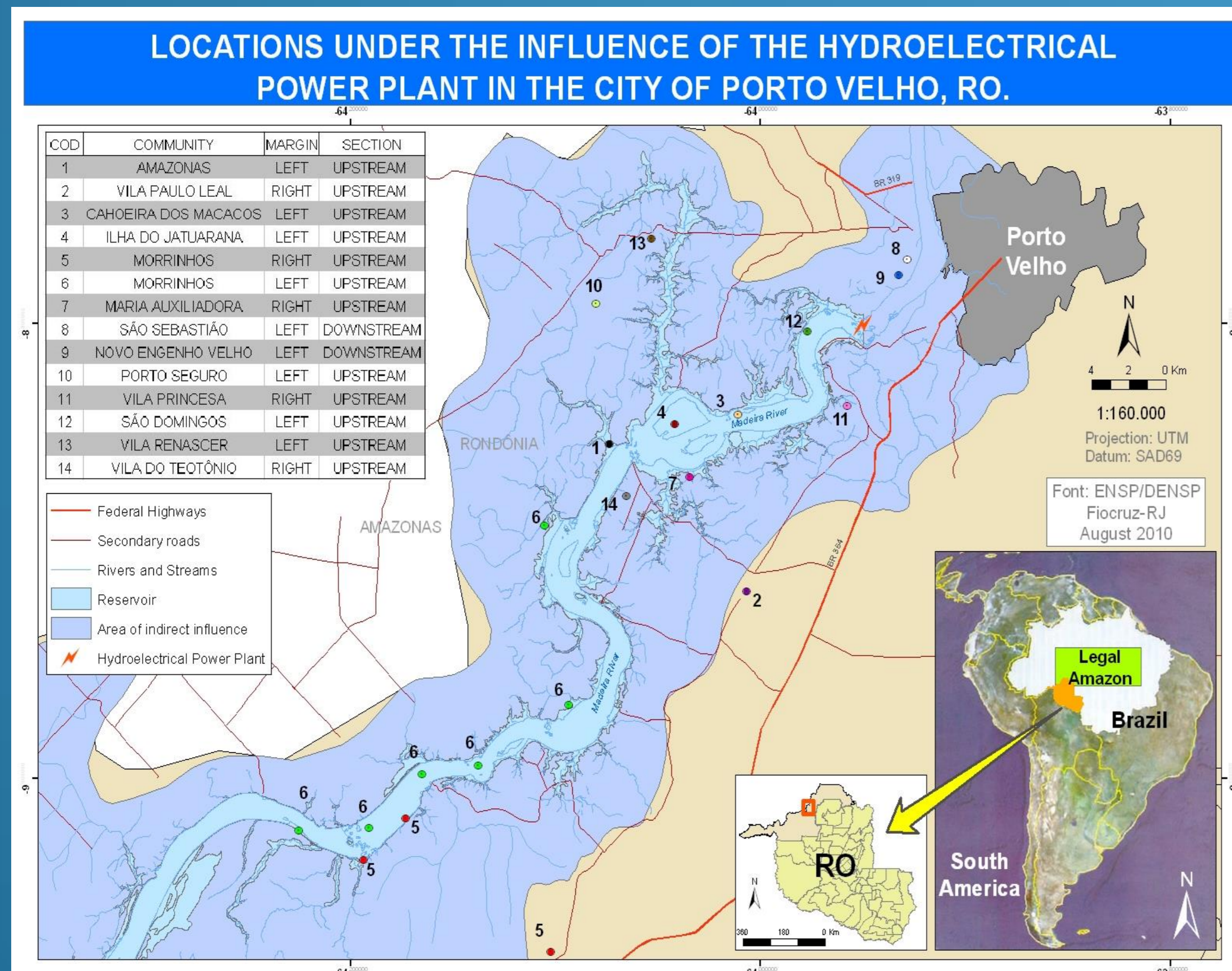


Figure 1: Area of Study of the Health Impact of Mercury Contamination in Madeira River

Results

The study is being conducted on both banks of the Madeira River. In the left margin, some communities do not have energy, neither have access to health services, schools, and local commerce. The housing is rudimentary with no water supply system or sewage treatment. They live in isolated places with difficult access. The communities on the right bank have access to address major social needs, but they do not have sanitation system and the access to the health services is very deficient.

Figure 2: Frequency of fish and types of foods consumed by Madeira riparian communities.

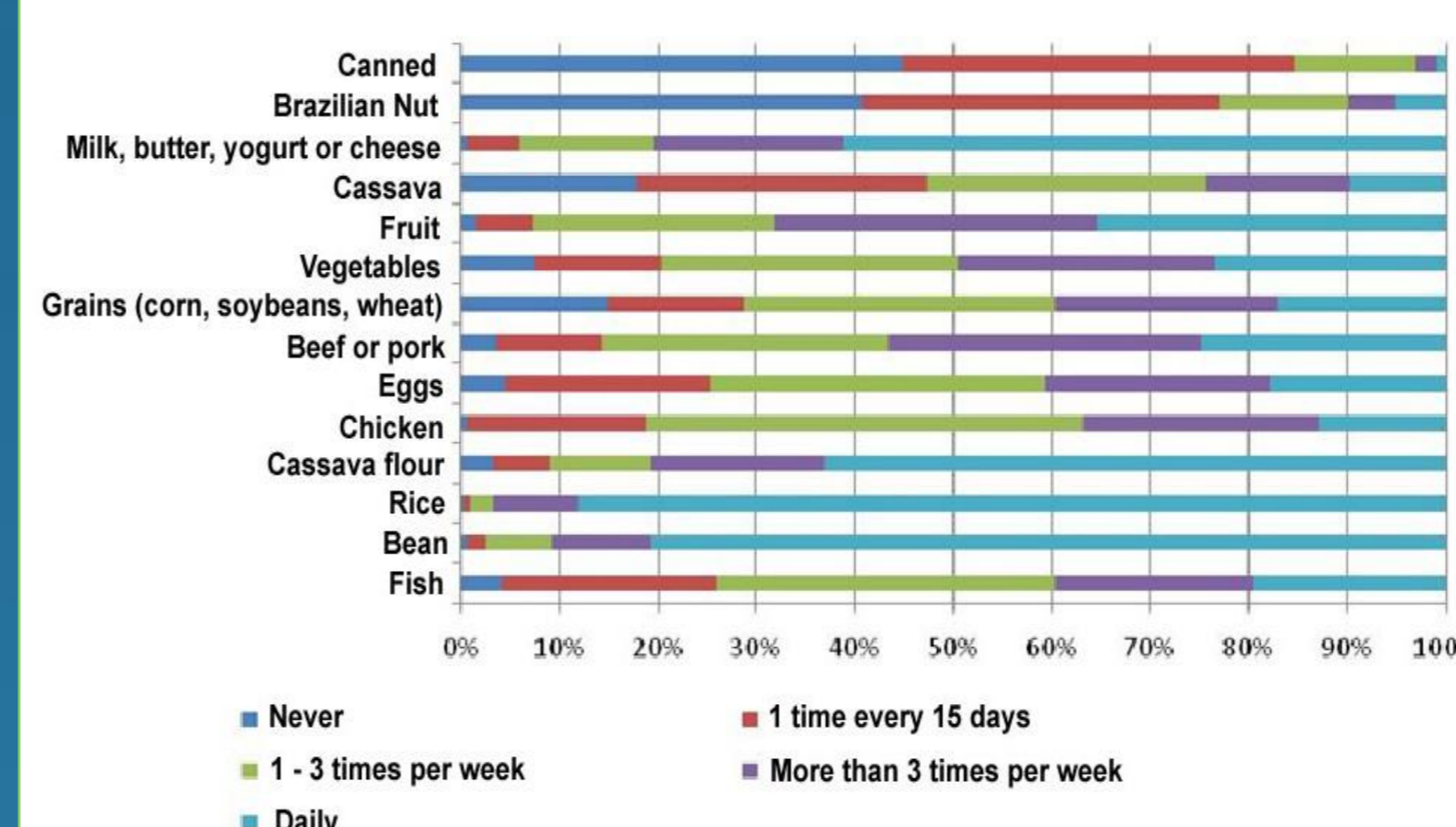


Figure 3: Mercury levels in fish species consumed by the Madeira river communities.

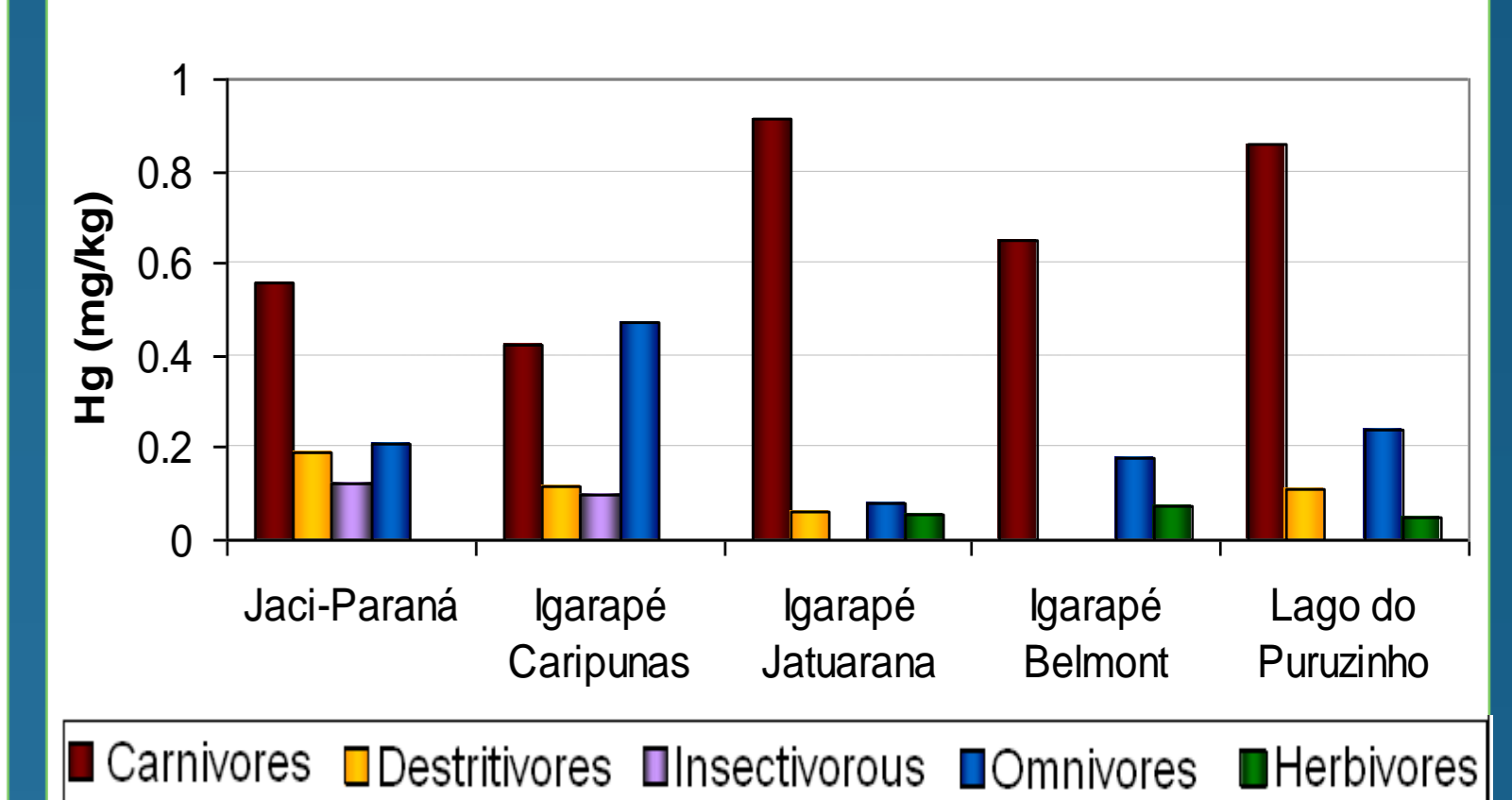


Table 1: Distribution of Hg concentrations in hair in both banks of the Madeira River- Amazon.

Hg levels	Bank				Total	
	Right		Left			
	n	%	n	%	n	%
< 2 ppm	53	20,1	35	17,7	88	19
2.1 to 6 ppm	82	31,1	57	28,8	139	30
≥ 6 ppm	129	48,9	106	53,5	235	51
Total	264	100	198	100	462	10

Figure 4: Distribution of mercury levels in hair and frequency of fish meals of the Riparian communities in the Madeira river.

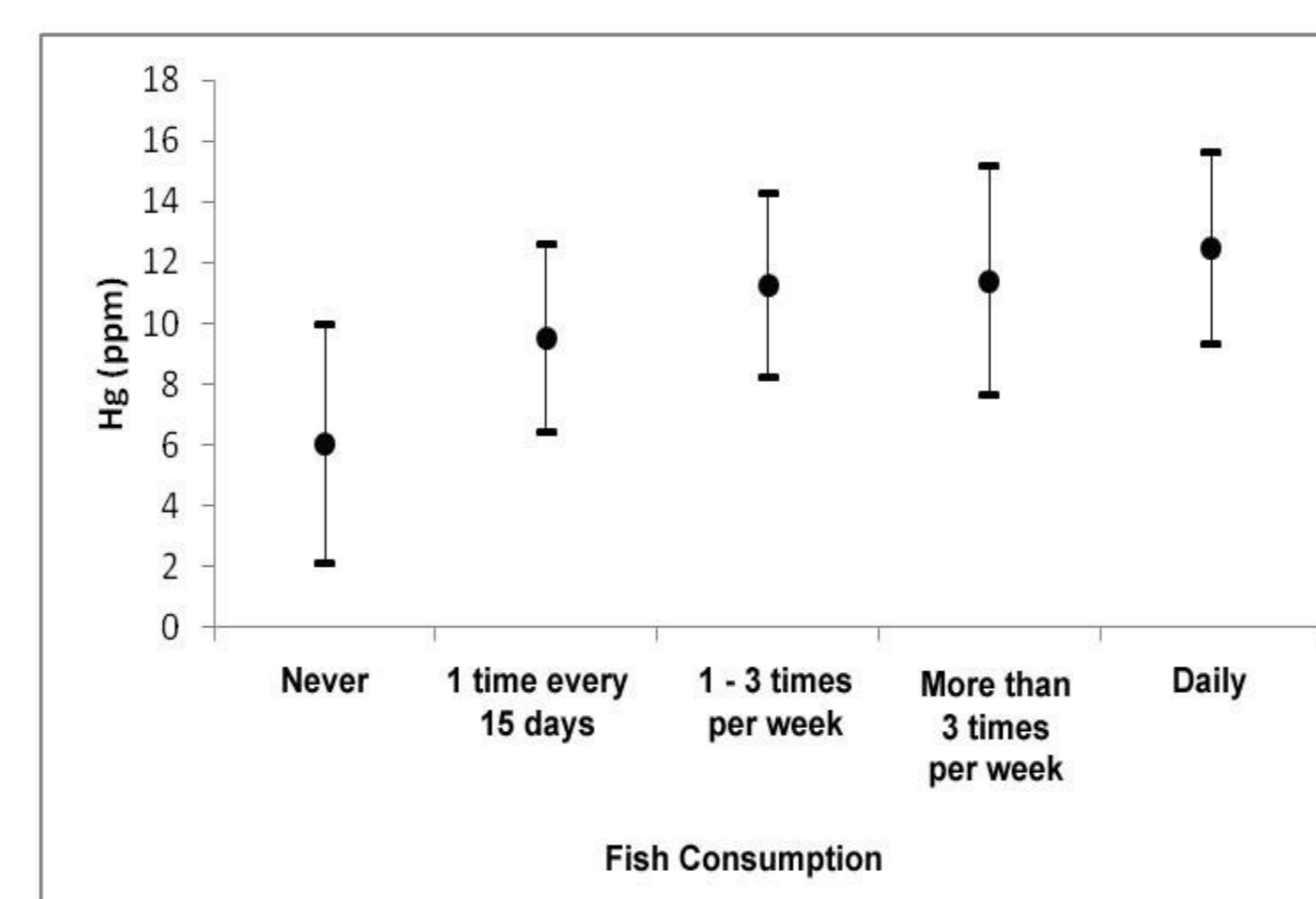
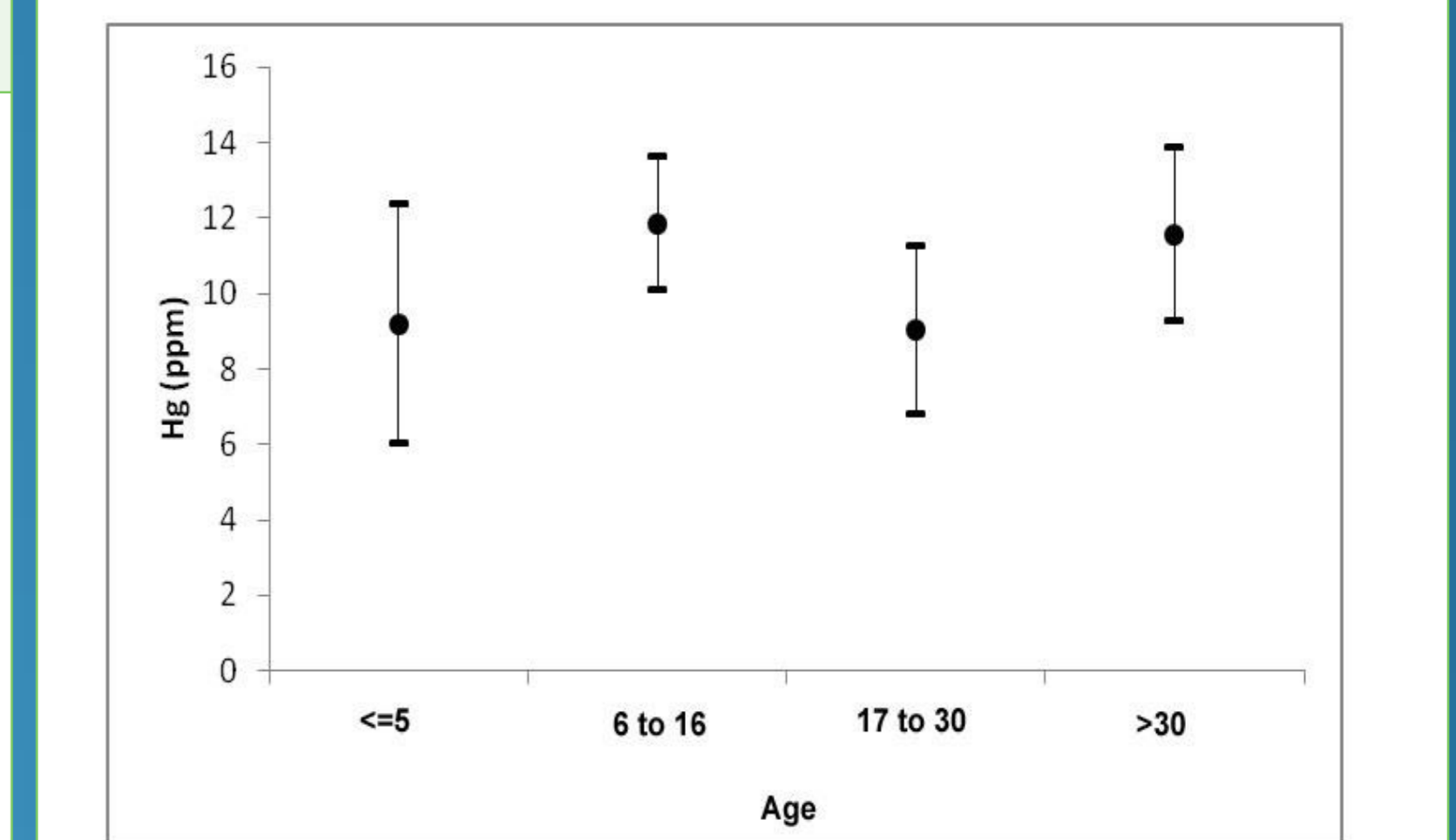


Figure 5: Distribution of mercury levels in hair by age in riparian communities in the Madeira River.



Conclusions

In comparing the partial results of mercury in hair samples from the Madeira river communities in the area of influence of the hydroelectric plant with hair samples collected along the Madeira River in 2004, we found that in 2004, about 33% of the individuals had mercury levels below 2 ppm, within the level of normality. In 2009 the levels of mercury in hair in the riparian communities reached 177mg/kg. However, the great amount of the results of mercury levels in hair remains in the range of 6 to 15.3 mg / kg, with 25% of the sample varying from 15.30 to 177 mg/kg. Despite high fish consumption and MeHg exposure during pregnancy and throughout life, there are no well established neurological effects associated with fish– MeHg in these communities. During physical and clinical examination, no salient neurological alteration was observed in children of the school groups up to now.

