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ASGM and LSGM Site: Paso Yobái in Paraguay

ARNIKA

Report by
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IPEN Mercury-Free Campaign Report

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Introduction

In 2009, the Governing Council of the United Nations Environment Programme (UNEP GC) decided to develop a global legally binding instrument on mercury to reduce risks to human health and the environment (UNEP GC25/5). The UNEP GC noted that mercury is a substance of global concern due to its long-range transport, persistence, ability to bioaccumulate, and toxicity. Its conclusions were based in part on the 2002 UNEP Global Mercury Assessment which noted that mercury is present in fish all over the globe at levels that adversely affect humans and wildlife (UNEP 2002). Mercury is present in different forms but the organic form of mercury, methylmercury, is especially toxic to humans and wildlife because it is readily absorbed by the body and accumulates in blood and tissue.

This report focuses on the surrounding of the town Paso Yobai, where both the Large Scale Gold Mining (LSGM) and the Artisanal and Small-scale Gold Mining (ASGM) take place. This report is based on analyses of mercury levels in fish.

Materials and methods

National NGO Alter Vida conducted sampling of fish in cooperation with local fishermen using protocols developed by BRI (2011). Eight fish samples were taken in the district Paso Yobái from river Tebicuarymí and three fish samples for comparison in Mariano Roque Alonso (on the north side of the capitol city Asunción) from river Paraguay for this study. Biodiversity Research Institute (BRI) measured mercury levels (total mercury content = THg) in fish samples in their laboratory in Gorham, Maine, USA. Alter Vida characterized the site and provided information about its history and presumptive mercury sources.

Gold mining in Paso Yobái district

Until recently the production and processing of yerba mate was the dominant economic activity in the district of Paso Yobái. It was replaced by gold mining. The gold mining activity in the study area began in the year 1996 by a small group starting with ASGM. Different quarries or mines which extract stones and gold-rich lands are mostly in the San Antonio area.

Besides the small miners, from 2007 the concessionaire Latin American Minerals Paraguay SA (LAMPA) began prospecting and exploration activities in Paso Yobái gold in an area of 15,331 hectares. Over time they were selling their concessions to the Canadian company.

The ASGM activity involves some 2,000 people and no official data is available on the volume of gold production, nor the amount of waste disposed of.

Mercury pollution is caused by ASGM using mercury to extract gold from the dirt mainly in the San Antonio area of Paso Yobái District. Mercury wastes are dumped untreated directly into the channel of Gasory Stream water, which in turn flows into the Tebicuarymí River. There were published data about increased levels of mercury in sediments at www.ultimahora.com in 2011 (see map at Picture 1); (Gutiérrez 2011).

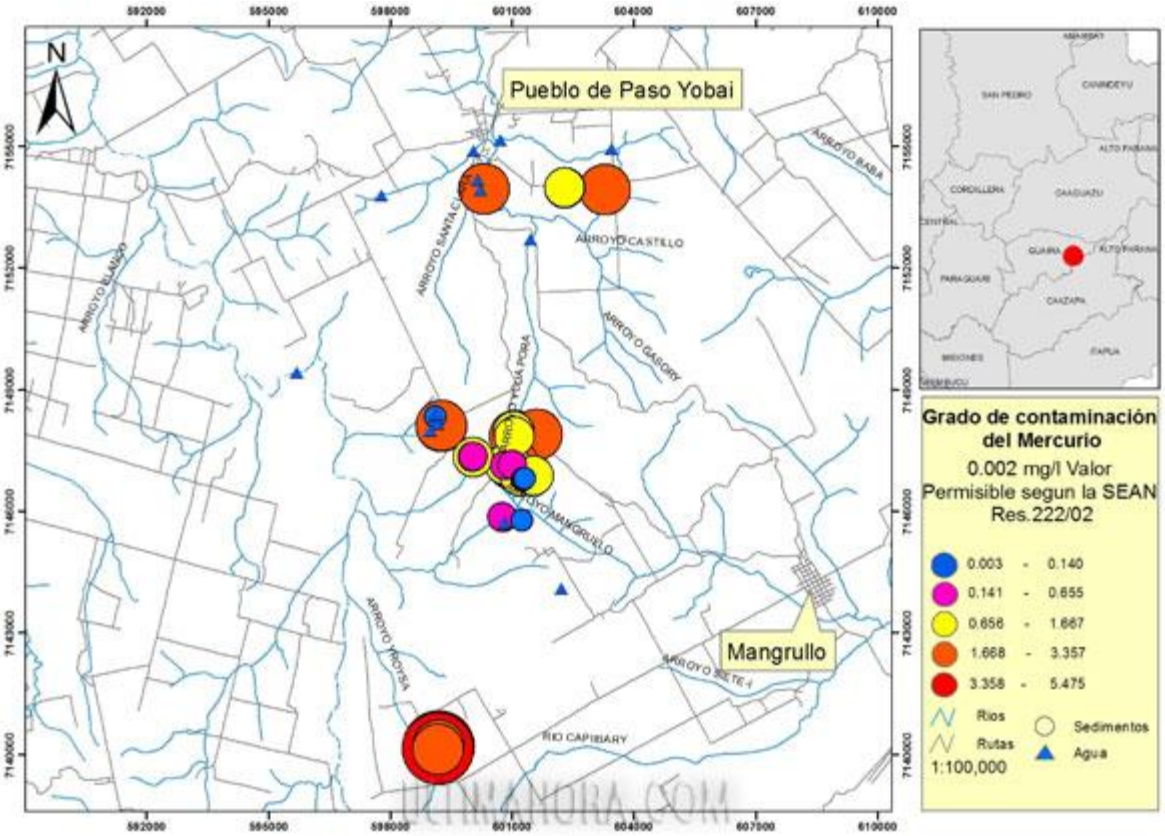

Figure 1: Map of Paso Yobái area, Paraguay with measured levels of mercury in sediments. Source: http://www.ultimahora.com (Gutiérrez 2011).

Results and discussion

For this study, eight fish samples of four species were sampled from the river Tebicuarymí in Paso Yobái district and three fish samples of two different species from the river Paraguay in Mariano Roque Alonso. Table 1 shows list of fish species, number of samples and information about length of sampled fish.

Table 1: List of sampled fish species in Paraguay for this study

Site and river	English name	Spanish name	Species latin name	Number of samples	Length (cm)
River: Tebicuarymí, site: Paso Yobái	Spotted pim	Mandi'i sayjú	Pimelodus maculatus	3	10.5 – 15.0
	Marbled swamp eel	Mbusú	Synbranchus marmoratus	3	41.5 – 48.0
	Twospot tetra	Piky Verá	Astyanax bimaculatus	1	5.0
	Tiger fish	Tareyi	Hoplias malabaricus	1	19.5
River: Paraguay, site: Mariano Roque Alonso	Barred sorubim	Surubí manchado	Pesudoplatystoma fasciatum	2	54.0 – 72.0
	Spotted	Surubí rayado	Pseudoplatystoma	1	79.0

	sorubim		corruscans		

Table 2 shows that average mercury levels in fish from Tebicuarymí river were significantly higher than those in fish from Paraguy river sampled near Asuncion. Maximum mercury level was found in tiger fish caught in the Tebicuarymí river near Paso Yobái and was more than four times higher than US EPA reference dose. This reference dose was exceeded in all samples of spotted pim and marbled swamp eel, both caught from the Tebicuarymí river. Mercury level was low (0.037 ppm) in very small twospot tetra sampled from Tebicuarymí river.

Table 2: Mercury content of fish sampled in Paso Yobái, Tebicuarymí river and in Mariano Roque Alonso, Paraguy river in ppm wet weight.

	Sample Size	**Hg Average (ppm, ww)**	**St Dev**	**Min Hg (ppm)**	**Max Hg (ppm)**	**Reference dose[a] (ppm)**	**Fraction of samples over Ref. Dose**
Spotted pim	3	0.430	0.098	0.324	0.518	0.22	100%
Marbled swamp eel	3	0.263	0.047	0.213	0.305	0.22	100%
Barred sorubim	2	0.187	0.172	0.066	0.309	0.22	50%
Tebicuarymí river – all samples	8	0.380	0.263	0.037	0.921	0.22	75%
Paraguy river – all samples	3	0.250	0.163	0.066	0.374	0.22	66%
All fish samples	11	0.344	0.239	0.037	0.921	0.22	82%

Abbreviations: Hg, mercury; ppm, parts per million or mg/kg; ww, wet weight; min, minimum; max, maximum

There is no data available about mercury levels in fish from Paraguay in scientific literature, however it is known that the Paso Yobái district is contaminated by mercury as it is visible on mercury levels in sediments at map on Picture 1 published by Gutiérrez (2011).

Hylander, Pinto et al. studied mercury in fish in large wetland, flood plain Pantanal, Brazil and published their results in 2000 (Hylander, Pinto et al. 2000). Levels of THg in fish were as follows:
barred sorubim (P. fasciatum) range 0.091 – 1.114 ppm (median 0.263 – 0.429 ppm)
spotted sorubim (P. corruscans) range 0.041 – 0.812 ppm (median 0.076 – 0.403 ppm)
pirambebas (genus of piranhas; *Serrasalmus* spp.,) range 0.048 – 2.048 ppm (median 0.082 – 0.475 ppm).

More recent study found similar levels of mercury in fish from Pantanal wetland: THg concentrations in Pygocentrus nattereri, however, varied from 0.044 µg.g-1 to 0.468 µg.g-1, indicating recent mercury contamination in sampled places with potential danger to human health (Ceccatto, Testoni et al. 2011).

[a] Figure derived from the reference dose used as U.S. EPA consumption guidelines for fish (0.2 mg.kg^{-1} methylmercury) based on the presumption that methylmercury counts for 90% of THg levels, limit value used by Canada is similar . Japan and/or UK use 0.3 reference dose. Source: US EPA (2001). Water Quality Criterion for the Protection of Human Health: Methylmercury. Final. EPA-823-R-01-001, Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency Washington, DC**:** 303.

Hylander, Pinto et al. (2000) link contamination of fish in Pantanal wetland to mercury *„emissions from some upstream gold mining areas and recent findings of high natural Hg levels in tropical oxisols“*.

Maurice-Bourgoin et al. who studied mercury contamination due to ASGM activity in Beni river, Bolivia found the concentration of mercury ranged in carnivorous fish of 0.7-1.8 ppm (average, 1.1 ppm); (Maurice-Bourgoin, Quiroga et al. 1999).

Conclusions and recommendations

All above presented results show that ASGM in South America in general causes significant contamination of the environment by mercury. High mercury levels were found in fish in different parts of continent close to ASGM areas. Also mercury contamination influence on human population was demonstrated in areas with ASGM activities (Lebel, Mergler et al. 1998). Levels of mercury in fish from gold mining hotspot in Paso Yobái district shown in this study as well as results of other studies from South American ASGM areas provoke questions about how the mercury treaty might mandate actions to eliminate mercury pollution of the environment and its harmful effects on human health at ASGM sites.

ASGM is the single largest intentional use of mercury and causes extreme mercury pollution. In areas where ASGM is practiced, it is recognized as a significant source of human exposure to mercury, and contributes to high levels of methyl mercury pollution of fish in waterways nearby and downstream of ASGM sites (Castilhos, Rodrigues-Filho et al. 2006); (Eisler 2004); (Limbong, Kumampung et al. 2003); (Ikingura, Mutakyahwa et al. 1997); (Malm 1998). IOMC report stated that *“In the Amazon, from 70 to 170 t of Hg are discharged annually. The extent of biota contamination is also more widespread.”* (IOMC 2008)

Mercury emissions from ASGM are the second largest source of global atmospheric mercury pollution (UNEP Chemicals Branch 2008). However, considering its significance as a source, there are very few mandatory controls on ASGM according proposed text of the treaty (UNEP (DTIE) 2013).

Also, to address the mercury pollution caused by ASGM in such sites as Paso Yobái, funding and technical assistance will be needed by developing and transition countries, to shift from mercury to non-mercury methods and clean up the contaminated hotspots. However, since the treaty links compliance with funding and action on contaminated sites is not obligatory, it is likely that no funding will be available through the treaty’s financial mechanism to address contaminated sites left after the gold mining closed or terminated (IPEN Heavy Metals Working Group 2013).

Taken together, the current treaty text raises serious concerns over whether it will reduce mercury emissions from ASGM, or even permit increased emissions after the treaty enters into force. There is a strong need to address the restriction and phase out of mercury trade, supply and distribution in ASGM sector. To prevent continuous mercury pollution caused by using mercury in ASGM and to stop harm to communities settled around ASGM sites like e.g. San Antonio in Paso Yobái district it is necessary to prevent further use and releases of mercury from the gold mining activities both ASGM and LSGM. Until this problem is addressed, mercury will continue to harm people and ecosystems at both local and global level.

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