

Project Update: July 2017

RSG 1

First I want tell you that I received two invitations to participate in two congresses to show the results of my first part of my project, funded by the 1st Rufford grant. I will participate at 13th International Conference on Mercury as a Global Pollutant (16-22 July) for which I was awarded a travel award to ensure my participation. <http://mercury2017.com>



13th International Conference on Mercury as a Global Pollutant

Providence, Rhode Island | July 16-21, 2017

June 14, 2017

Laila Munoz
Universidad San Francisco
Diego de Robles y Via Interocéánica
Quito, Pichincha
170901 Ecuador

Dear Laila Munoz,

Please accept this letter as invitation to attend the 13th International Conference on Mercury as a Global Pollutant.

The conference will be held July 16th-21st, 2017 at the Rhode Island Convention Center located at 1 Sabin Street, Providence, Rhode Island, USA. Preliminary program details, registration fees, and accommodation information can be viewed on the conference website: www.mercury2017.org.

Please note this letter includes the offer of financial support for registration fees (\$650), accommodations (\$450), travel (\$1,000), and per diem (\$270) to attend ICMGP 2017. All expenses will be paid to the appropriate vendor on your behalf.

For further information regarding visa requirements, please visit the US Department of State website: <https://travel.state.gov/content/visas/en.html>.

If you have any questions about ICMGP 2017, please contact the Conference Secretariat at Mercury2017@agendamangers.com.

Sincerely,



Celia Chen & Charley Driscoll
ICMGP 2017 Co-Chairs

International Conference on Mercury as a Global Pollutant

ICMGP 2017 Co-Chairs • 2979 Oxford Street, Halifax, NS, Canada B3L 2W3 • PHONE: 902-422-1886

High concentrations of Mercury in yellowfin tuna (*Thunnus albacares*) from the Galápagos Marine Reserve and continental Waters, Ecuador

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ABSTRACT

Among the most traded fish species in yellowfin tuna (*Thunnus albacares*) Ecuador is the virgin (untouched) country in the world with the most marine fish of tuna caught. Fish meat is consumed by a large part of the world population and it is considered a source of nutrition that brings health benefits. However, the meat can also bring risks to animals because it contains trace amounts of heavy metals, including mercury, in fish and sea food in general. The objective of this study was to evaluate the concentrations of total mercury present in the red muscle of yellowfin tuna caught for different fisheries in the Marine Reserve of the Galápagos Islands and the continental coast of Ecuador. It was found that 9% of the tuna analyzed in this study were above the values for levels of mercury established by Food and Agricultural Association (FAO). The maximum value found was 0.81 µg/g (dry weight), one of the highest values of mercury reported for fish worldwide in the Pacific.

INTRODUCTION

Fisheries play an important role in the world since about 3 billion people use fish as their main protein source (FAO 2016). The demand for fish is very high and is mostly sustained by coastal fishing countries that export their fish (Froly and Coker 2015). One of the most exploited fish for commercial purposes in the world is the Pacific bluefin tuna, *Thunnus albacares* (FAO 2015). Tuna are top, opportunistic, omnivorous, planktivorous, herbivorous and omnivorous of waters in the world's oceans (Brett et al. 2007). The yellowfin tuna, *Thunnus albacares*, is among the most traded fish species. This species is also being exploited as a freshwater species according to KUN (2011). One of the developing countries that practices fishing for both subsistence and export is Ecuador (Chabot et al. 2016), according to both subsistence and export practices. The artisanal fishery is currently extremely important in the Ecuadorian economy because it represents the largest number of total production jobs (Barrero 2016) et al. (2015). Fish meat is considered a source of nutrition and health advantages (Chabot et al. 2016). However, it can also pose risks to humans, since high accumulations of heavy metals, including mercury, can be found in fish and sea food in general (Brett et al. 2007). The presence of metals in marine ecosystems causes problems both for the organisms that are there and for the humans that consume them (Chang and Castro-Macias 2015). Fish can show adverse effects in their growth and survival when exposed to high levels of mercury (Brett et al. 2007). The objective of this study was to measure the concentrations of total mercury (Tg) in the red muscle of yellowfin tuna caught for artisanal fisheries in the Galápagos Marine Reserve and Ecuador's continental coast.

METHODS

The collection of samples was conducted in the Galápagos Marine Reserve (GMR) and along the Ecuadorian coast. The GMR samples were obtained at two sites, the parts of San Cristóbal Island and Santa Cruz Island. On the Ecuadorian coast, the samples were taken in the port of Santa Rosa in the province of Santa Elena (Figure 1). The collection of samples was completed during the cold period of 2015 (June and August) and the hot season of 2016 (January and February). A total of 104 samples from the Galápagos and 68 samples from the continental coast were collected during the cold period (2015) and 130 from Galápagos and 93 from the coast during the hot season (2016). The samples were stored on ice at 0°C. Each individual individual was measured for fish length. Only the individuals from areas a certain number of capture were measured and analyzed (Figure 2). The samples were analyzed for total mercury analysis. Measurements of total mercury in tissues were performed on a Milestone 2000-AG mercury analyzer. Values were obtained in parts per million (ppm) of the weight, these values were converted to wet weight using a moisture percentage of 70% as reported by Yáñez et al. (2010) for yellowfin tuna. All the mercury found in these fish was assumed to be methylmercury, as it has been shown to be between 90% and 100% of the total mercury found in fish tissues, especially top predators, in the form of methylmercury (Brett et al. 2007).

RESULTS

Collaboration in this is an indicator of ocean pollution (Chen et al. 2016). Our study for the first time provides mercury concentrations in yellowfin tuna in the GMR and the continental coast of Ecuador. The results allow us to state that there are differences in the concentrations of mercury present in the muscle of the individuals from Galápagos and from the continental coast. Individuals captured on the coast had lower concentrations of mercury in their muscle. These results are similar to the findings of other studies that have been conducted in other parts of the world, where individuals from the continental coast have higher concentrations of mercury. The individuals captured in the GMR and on the coast were analyzed for total mercury (Tg) and methylmercury (MeHg) in their muscle. On the other hand, no differences were found in mercury concentrations between seasons, regardless that mercury concentrations in the regions are being distributed in the same way. The present study was compared with other studies in the same species. The mercury concentrations reported by this study are the highest reported in yellowfin tuna. An increase in mercury concentrations over time was observed. This is consistent with what was found by Chabot et al. (2016) who suggest that the concentration of mercury in yellowfin tuna increased from 1998 to 2008 in the north of their study coastal. High concentrations of mercury in their muscle and survival when exposed to high levels of mercury. Methylmercury fish are at high risk for being exposed to high levels of mercury concentrations found in fish. Effects on growth include neurological problems and developmental delays in the case of humans. According to IAC/IACM (2016) for an average person with 70 kg of body mass, the recommended intake is 0.3 µg/day. Using the range of the data found in this study it was estimated that an Ecuadorian with 70 kg of weight should consume approximately 233 grams of yellowfin tuna per week at a risk of contamination from mercury intake.

DISCUSSION AND CONCLUSIONS

The difference in values that are captured with the different fishing gears was observed in the red muscle of fish caught. The fishing gear related to the surface typically captures juvenile and smaller individuals, or exposed to deep sea fishing gear that captures adult and larger individuals (Zhang 2015). Coupling of juvenile mortality (growth) has major effects in the abundance of individuals in a population (Gentry et al. 2016).

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Letter from 13th International Conference on Mercury as a Global Pollutant & poster for conference.

Also I have been invited to the 12th SETAC Latin America Biennial Meeting (<https://sla2017.setac.org/>). Currently I am looking for possible grants to fund my participation in the conference.

Last year I presented the genetics results at Congreso Internacional de biotecnología y biodiversidad with an oral conference.



Email from 12th SETAC Latin America Biennial Meeting. Certificate from Congreso Internacional de biotecnología y biodiversidad

RSG2

Also, just a minor setback we experienced, two of the ships that bring goods to the Islands from the continent ran aground and failed to deliver their cargo on time which raised the general cost of living on the Islands. I had to restructure some expenses to cover the differences.

Finally, the field work is finished and we are now analysing the data. I am attaching photos of the field work.

