MERCURY LEVELS AND TROPHIC INTERACTIONS AMONG SHARKS OF THE COLOMBIAN PACIFIC AND RISKS TO HUMAN HEALTH

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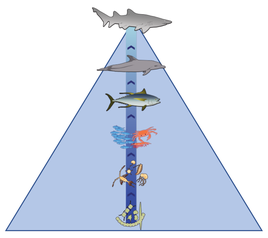
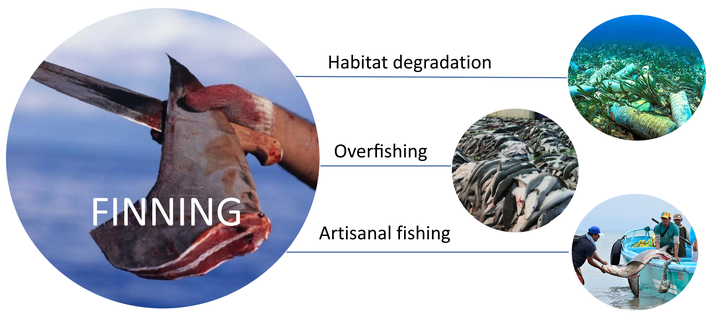
INTRODUCTION

- Sharks are the top predators of marine ecosystems and are responsible for regulating the TOP-DOWN processes (Baum and Worm, 2009).

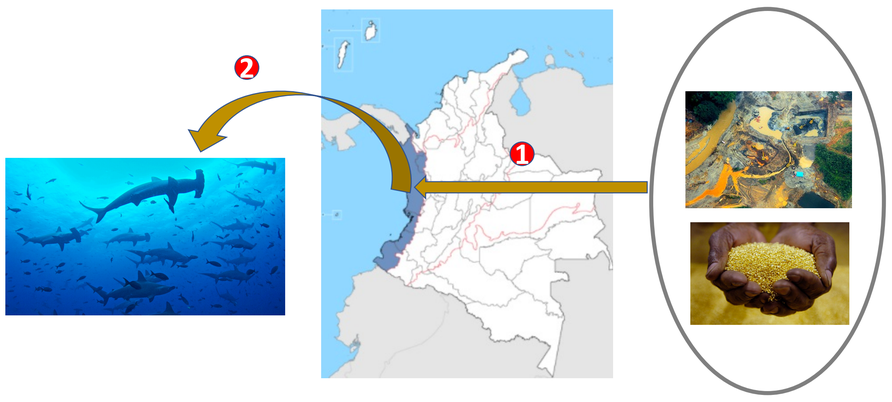


- Main threats of sharks populations (Dulvy et al., 2014):



- Fins have a high cost and strong demand in the Asian markets, specially in Hong Kong, whose traditional dish is the shark fin soup (Clarke, 2004).

- Colombia is the 3rd country that emits more Hg to the ocean mainly by gold mining activities in the Colombian Pacific coast (1), which can contribute to the bioaccumulation and biomagnification (2) of this metal in the tissues of sharks (Trystam, 2017).



OBJECTIVES:

1) Identify the concentrations of mercury in fins and muscle, and the differences between tissues.
2) Identify if there is any risk to human health by consuming the fins of these species.
3) Analyze the trophic ecology using stable isotopes $\delta^{13}C$, $\delta^{15}N$ and Hg.

METHODS

PHASE 1: Sampling

Sampling: Collected by Malpelo Foundation in the port of Buenaventura, Colombia

- Confiscation of illegal caughts
- 130 fins and 45 muscles
- 2009-2013

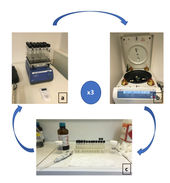
7 species of sharks

- *Alopias pelagicus*
- *Carcharhinus porosus*
- *Mustelus henlei*
- *Mustelus lunulatus*
- *Sphyrna corona*
- *Sphyrna lewini*
- *Sphyrna tiburo*

PHASE 2: Laboratory

Total mercury (THg) Analysis (Atomic absorption spectrometer AMA-254)

Samples preparation: dried, pulverized and delipidated



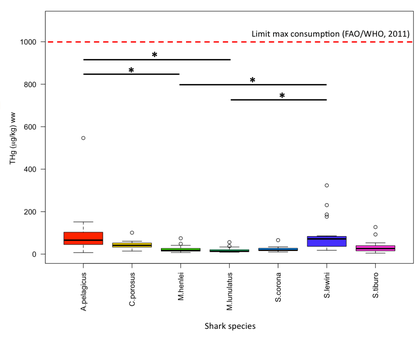
Isotopic Analysis (Isotopic mass spectrometer + Elemental analyzer)

PHASE 3: Analysis of data

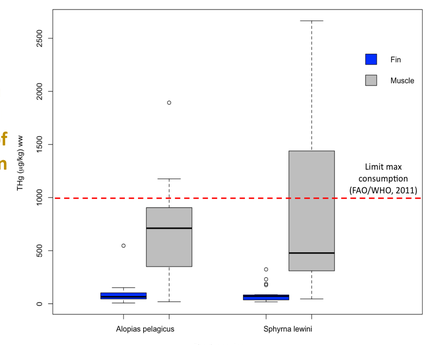
- **Conversion dw - ww**
- **One way ANOVA** (Differences between species)
- **Two way ANOVA** (Differences between tissues)
- **Risk Evaluation: PTWI and THQ**
- **Ellipses SIBER** (niche space overlap)
- **Trophic Position** TP15N

RESULTS AND DISCUSION

[THg] in fins of the seven shark species



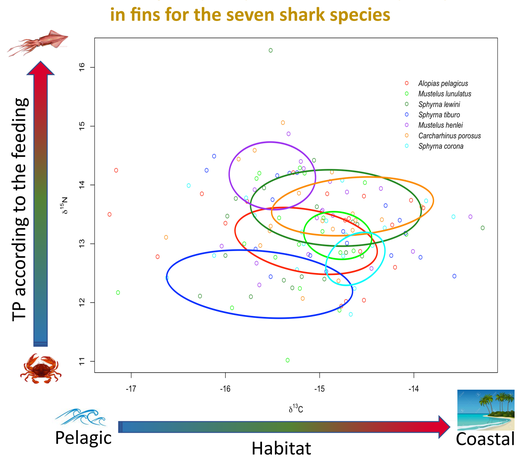
[THg] in fins and muscle of the seven shark species



- *A. pelagicus* and *S. lewini*, being the most threatened species in the Colombian Pacific (Caballero et al., 2012), have the highest [Hg] in fins.
- $[Hg]_{muscle} > [Hg]_{fins}$

  Muscle contains Tiol, which binds strongly with Hg. (Pethybridge et al., 2010)

Standard ellipses (SEAc) of $\delta^{15}N$ and $\delta^{13}C$ (in ‰) in fins for the seven shark species



- High overlap in coastal habitats due to the high carbon values. It seems that most of these sharks are juveniles.
  - Coastal habitats contain higher values of $\delta^{13}C$ than pelagic habitats (Chouvelon et al., 2012).
  - *A. pelagicus* and *S. lewini* tend to be pelagic in their adult stage (Holland et al., 1993).
- Low trophic levels for all the species in comparison of its adults stages suggests also that the individuals are juveniles.

Evaluation of risk in human health:

			Limit max Hg consumption (FAO/WHO, 2011)	EWI (Estimated weekly intake) (WHO/2006)	THQ (Target Hazard Quotient) (US EPA, 2000)
Fin	Children	*Alopias pelagicus*			Risk
		Sphyrna lewini			Risk
	Adult	*Alopias pelagicus*			Risk
		Sphyrna lewini			
Muscle	Children	*Alopias pelagicus*	Risk	Risk	Risk
		Sphyrna lewini	Risk	Risk	Risk
	Adult	*Alopias pelagicus*	Risk	Risk	Risk
		Sphyrna lewini	Risk	Risk	Risk

No risk / Risk

- There is a risk when consuming fin and muscle of *A. pelagicus* and *S. lewini.*
- Children are the most vulnerable when consuming these shark tissues.
  - They consume 3-4 times more food in proportion to their body size rather than adults (USEPA, 2008).
- Muscle is the tissue that presents the greatest risk for human health.

CONCLUSIONS

- ✓ Concentrations of Hg vary according to species and tissue.
- ✓ The consumption of any of the tissues of *A. pelagicus* and *S. lewini* can be harmful to human health.
- ✓ These results suggest that species were captured in coastal areas and fed of low trophic level preys.

RECOMMENDATIONS:

- ➢ Avoid the consumption of these predators since the consumption of both muscle and fins can generate risks for human health.
- ➢ Have extra variables such as sex or the size of the individual.
- ➢ Identify the exact location of each individual's extraction.

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