

## PhD Dissertation Defense

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**Title:** The Shark Trade in Costa Rica: Genetic, Mercury Contamination and Human Dimensions and the Implications for Conservation

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### ABSTRACT

In the past two decades shark populations have declined as a direct result of increased demand for shark products. Despite this, within Costa Rica there is still a lack of: species-specific catch data for sharks in both artisanal and industrial fisheries, contamination levels of shark products, and information on the type of shark conservation measures that would potentially be supported by Costa Rican fishermen. Therefore, the objectives of this research were to attempt to fill some of these information gaps by determining: 1) artisanal fishermen's knowledge of sharks, their perceptions of local fisheries impacts on shark populations, and levels of potential public support for various conservation measures (i.e. MPAs); 2) species composition and abundance in artisanal and industrial fisheries using DNA barcoding; and 3) mercury (Hg) contamination levels in shark meat being sold for human consumption at markets. Using social surveys within two artisanal fishing communities we determined that support for new shark conservation measures was high (97%). However, support declined, to between ~60 to 6%, as proposed legislation potentially obstructed the fishermen's ability to continue their current use of their fishing grounds. Within these artisanal fisheries, we identified seven species of shark (*C. falciformis*, *C. porosus*, *C. limbatus*, *Mustelus lunulatus*, *Nasolamia velox*, *Rhizoprionodon longurio*, *S. lewini*) and one ray (*Dasyatis longa*), with the scalloped hammerhead (*S. lewini*) accounting for ~75-80% of all sharks landed. We also found that at least nine species of shark (*Alopias pelagicus*, *C. falciformis*, *C. obscurus*, *C. porosus*, *M. lunulatus*, *N. velox*, *R. longurio*, *S. lewini*, *S. zygaena*) and one ray (*D. longa*) were being sold in local markets, with the silky shark

representing ~80% of samples tested. Within these markets total Hg concentrations in for all shark species tested exceeded US Environmental Protection Agency (EPA) Hg limits of 0.3 ppm. Using previously established equations we were able to estimate THg concentrations (ppm dry wt.) for the livers of these sharks using the known muscle concentrations. *Sphyrna zygaena*, which is listed as “vulnerable” by the IUCN - had the highest estimated mean THg liver concentrations ( $4.67 \pm 1.03$  ppm dry weight). Thus, the consumption of shark products being sold in the Costa Rican markets not only poses a potentially serious health risk to consumers, but also potentially negatively impacts the health and conservation status of these species. It is apparent that new conservation measures are needed to protect elasmobranchs in Costa Rica, particularly the scalloped hammerhead in artisanal fisheries and the silky shark in pelagic fisheries. Despite the potential human health risk associated with the consumption of elasmobranch products, the level of contamination could prove to be a useful tool in reducing demand for elasmobranch products, and thus aid in the conservation of threatened species.