Pollutant Exposure in GTM sharks

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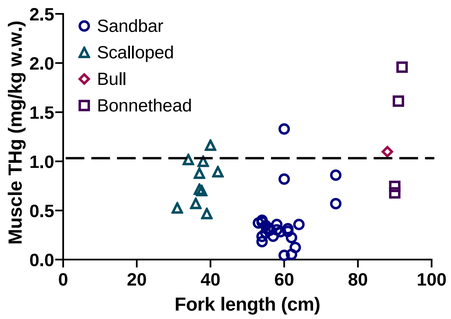
Background, Goals, and Objectives

- As demonstrated by the results of a now, 14-year University of North Florida survey on shark populations in the Tolomato River, portions of the GTM Estuary serve as critical habitat for newborn and juvenile sharks from several ecologically and commercially important species, including two Florida species of greatest conservation need, the sandbar shark (*Carcharhinus plumbeus*) and the scalloped hammerhead (*Sphyrna lewini*) .
- Because of this, it is important to evaluate the risks of potential human-related stressors on shark populations in the GTM estuary.
- The **goal** of the present study was to examine how one human-related stressor, marine pollution, may impact GTM sharks.
- The specific **objectives** of this project were to examine concentrations of two important marine pollutants in GTM sharks, the toxic non-essential metal mercury (Hg) and the widely-used water- and oil-repelling chemicals, the per- and polyfluoroalkyl substances (PFAS).

Methods

- Sharks were collected from the Tolomato River and other First Coast sites using bottom longline fishing.
- Blood and muscle biopsies were collected using non-lethal approaches.
- If live upon capture, sharks were tagged and released for long-term studies on movement patterns.
- Total Hg (THg) was measured in muscle using a Direct Mercury Analyzer (Milestone DMA-80).
- PFAS were measured in clarified blood plasma using UHPLC-MS.

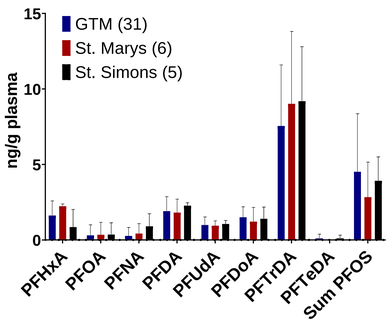
Results – Hg analysis



Site	n	THg (mg/kg w.w.)
GTM	22	0.34 ±0.27
St. Marys River	6	0.25 ±0.03
St. Simons Sound	3	0.26 ±0.06

- Muscle THg concentrations were high in GTM sharks but only 18% of samples exceeded global thresholds for human dietary purposes and fish health effects (1.0 mg/kg w.w., see line)
- The results from preliminary comparisons indicated that muscle THg concentrations in first-year sandbar sharks did not differ significantly between samples from the GTM and other First Coast estuaries.(ANOVA, p = 0.6193).

Results – PFAS analysis



Site	PFOS (ng/g)
GTM sandbar sharks	ND – 14.95
Caloosahatchee bull sharks	ND – 6.5
W. Indian manatee (Brevard)	4.26 – 166
IRL Bottlenose dolphin	69.2 – 3,620
SJR American alligator	3.41 – 10.2
Kemp's ridley sea turtle (FL/SC)	13.8 – 60.2

- Plasma PFAS concentrations were low to medium in GTM sandbar sharks and did not differ significantly from those in samples from other First Coast estuaries (ANOVA, p>0.05 for all)
- Plasma PFOS concentrations in first-year GTM sandbar sharks were comparable to those in other FL sharks and some other FL east coast marine vertebrates. However, they were lower than those in other aquatic carnivores.

Conclusions

- Hg contamination in GTM sharks is largely below predicted thresholds for toxicity. However, 75% of levels were still elevated compared to most fishes (>0.3 mg/kg, EPA fish tissue-based criterion). Therefore, special populations (e,g., pregnant women) should exercise caution in consuming shark meat from recreationally-targeted species from this site.
- Levels of long-chain PFAS are low to medium in GTM sharks, suggesting long-term persistence of these chemicals. Still, concentrations of PFAS were lower in sharks than those in several other marine vertebrates and appeared to be below toxicological thresholds.
- Future work will examine food web transfer of these and other toxicants in GTM wildlife, as well as the potential for transfer to humans.