Mercury Monitoring in the Caribbean Region

The Antigua & Barbuda Coordination

Facilitating Capacity Building with Technical Assistance and Technology Transfer for Managing Mercury in the Caribbean

16th International Conference on Mercury as a Global Pollutant

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The Caribbean Region Mercury Monitoring Network (CRMMN)

Establishing an integrated network

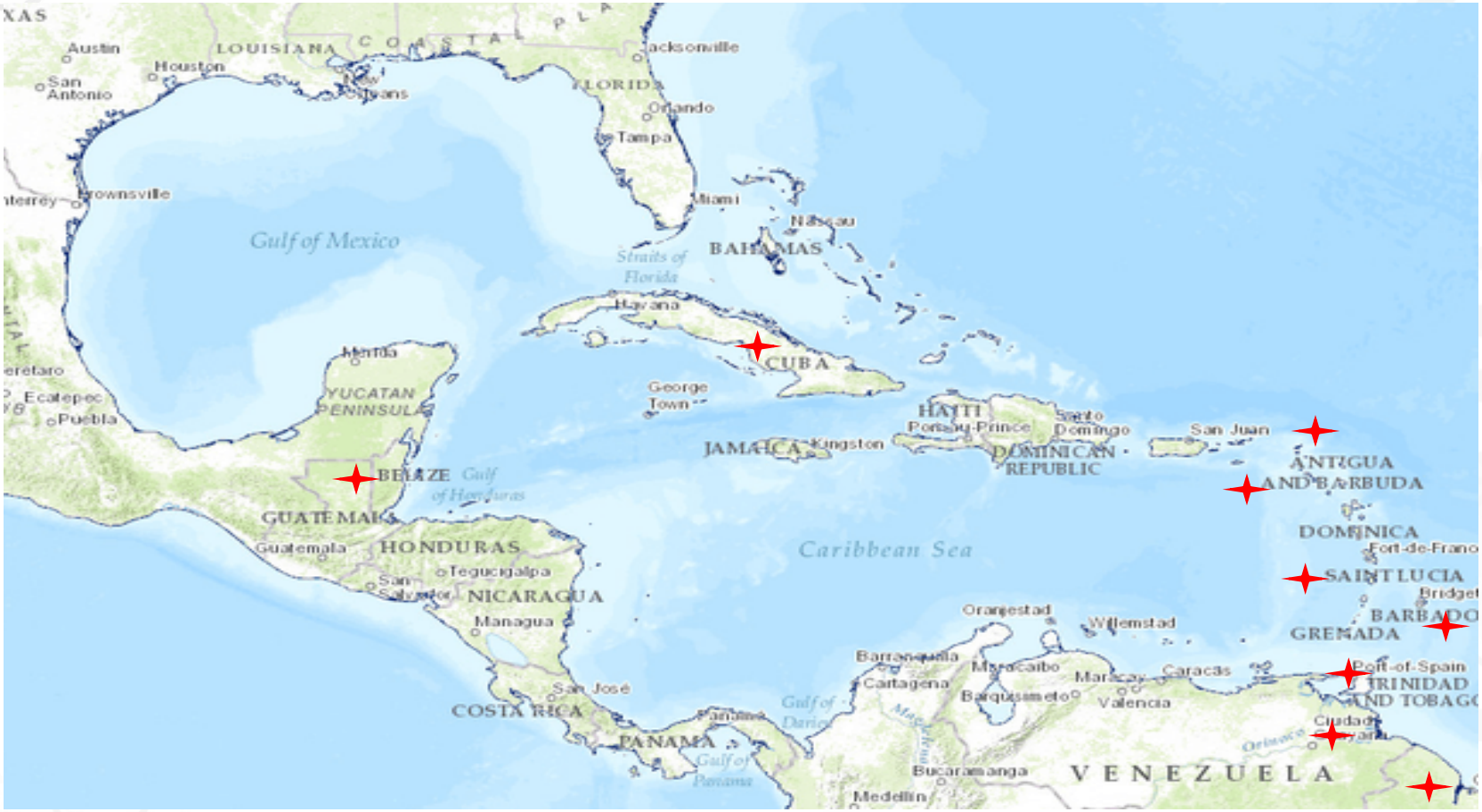
- Improve mercury data sets in the region
- Engage in technology transfer
- Benefits derived from shared experiences and capacity
- Improved implementation of the Minamata Convention
- A stepping stone to greater collaboration

Mercury Monitoring Network
Caribbean Region

Antigua and Barbuda as Admin Coordinator and Central Lab

- Based on the SIP project goal to establish a sub-regional network
- QA/QC considerations and data comparability
- Coordination of sampling and testing
- Information dissemination and awareness raising
- Address the sustainability of the network

Scope of the Network

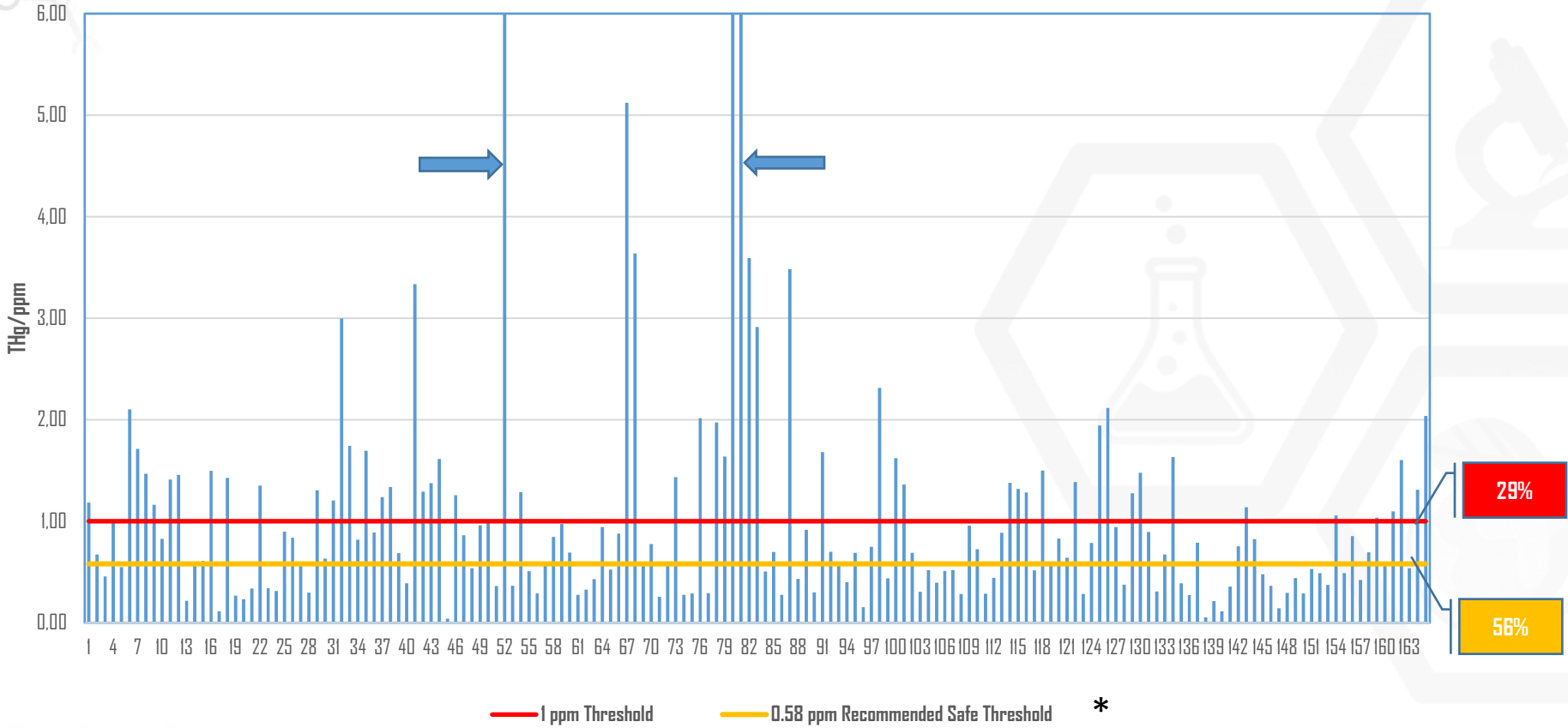


Regional Expression of Interest

Country	Air (PAS)*	Fish	Birds	Cosmetics	Hair	Sargassum	Soil	Sediment	Bats	Turtles
Antigua and Barbuda	X	X	X	X	X	X			X	X
Belize	X	X						X		
Cuba										
Guyana	X	X		X			X	X		
St. Kitts and Nevis	X			X						
St. Lucia	X			X						
Suriname	X	X		X						
Trinidad and Tobago	X	X	X	X		X				

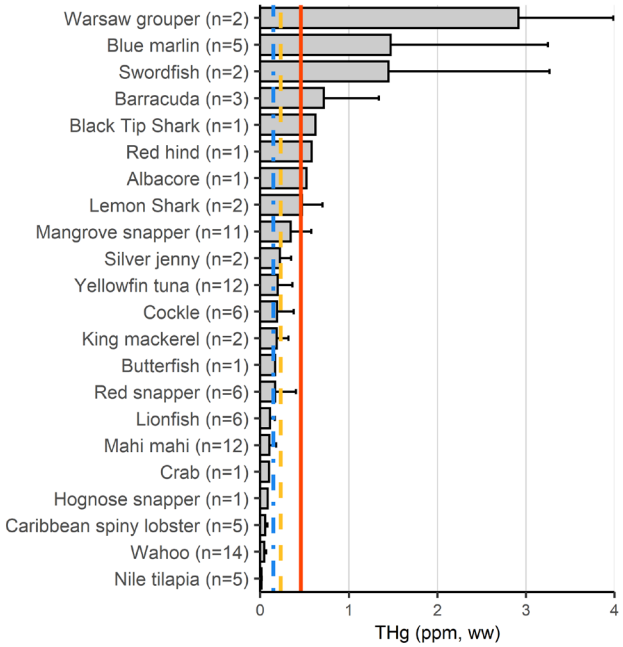
*PAS will be provided for each country by the project for their use to establish baseline air Hg deposition patterns for the region.
*5 sites supported by Environment and Climate Change Canada

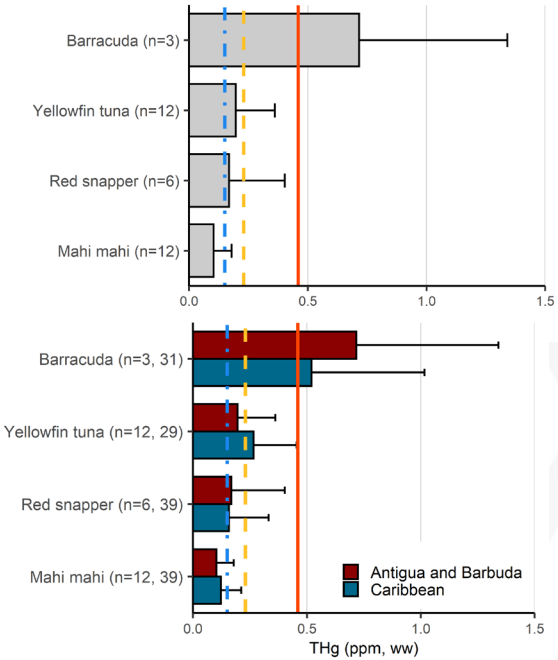
Human Biomonitoring Data (Hair)



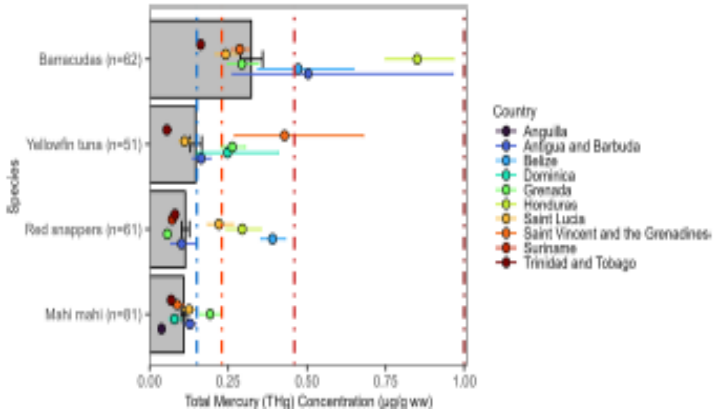
*Bellanger *et al.* 2013

Fish Biomonitoring Snapshot





Country	Barracudas	Mahi mahi	Red snappers	Yellowfin tuna
Anguilla	–	1	–	–
Antigua and Barbuda	3	32	6	19
Belize	16	–	9	–
Dominica	–	10	–	5
Grenada	7	8	5	8
Honduras	5	–	2	–
Saint Lucia	13	10	5	7
Saint Vincent and the Grenadines	8	8	–	2
Suriname	–	–	8	–
Trinidad and Tobago	10	12	26	10
Total	**62**	**81**	**61**	**51**



Cosmetics Screening

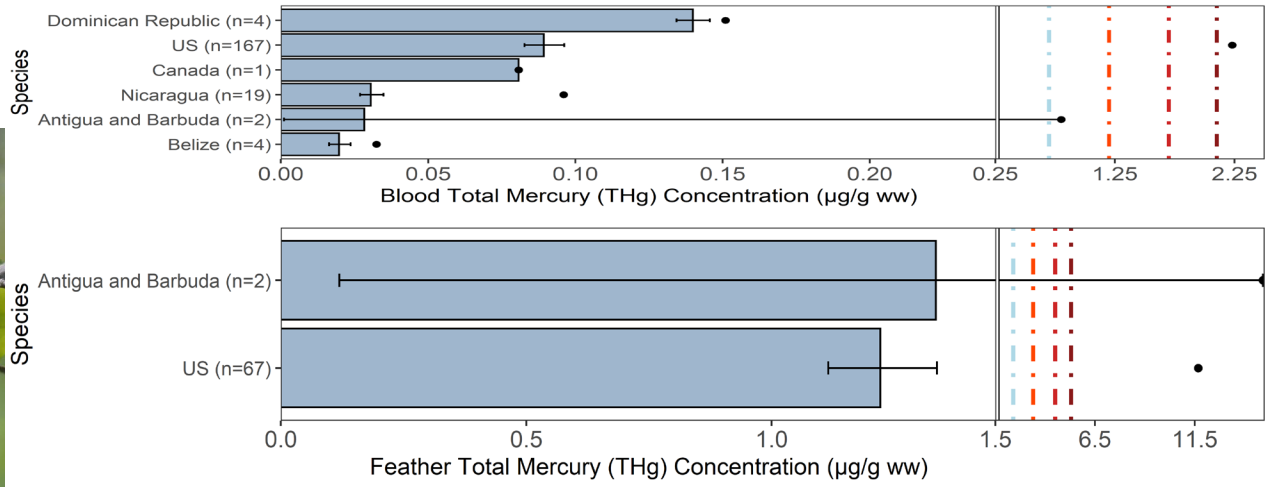
Packaging	Product Name	Country Purchased	Country Manufactured	Mercury (ppm)
	Maxi Bright S1 Brightening Cream	Antigua and Barbuda	France	5
	H20 Jours Lightening Cream Fast Action	Antigua and Barbuda	Cote d'Ivoire	91
	Deluxe Silken Bleaching Cream	Antigua and Barbuda	Jamaica	5,899
	Veet Gold Facial Whitening & Spot Removing Cream	Antigua and Barbuda	USA	1,435
	Glutawhite White Me Up Facial Whitening & Spot Removing Cream	Antigua and Barbuda	USA	1,246

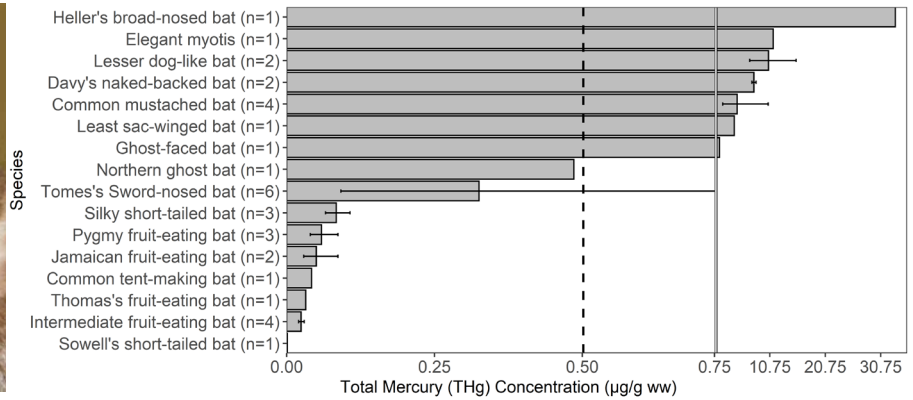
Packaging	Product Name	Country Purchased	Country Manufactured	Mercury (ppm)
	Skin Light	Antigua and Barbuda	Cote d'Ivoire	2
 *Note: Packaging of Night Cream not shown here.*	Nomarks Fair Lady Spot Free Day Cream	Antigua and Barbuda	Nigeria	845
	Nomarks Fair Lady Spot Free Night Cream	Antigua and Barbuda	Nigeria	20

Additionally, several brands of skin-lightening cream samples (n=154) exceeded 1000 mg/kg with maximal values exceeding 5000 mg/kg

Bird and Bat Biomonitoring

Total Hg levels in **Yellow Warbler:**
All sites including U.S. Superfund sites (n=67)





38 bat fur samples from **Belize**

Four species exceed the 7ppm fur Hg effects threshold

Bat samples have been taken in Antigua and Barbuda

- Antillean fruit-eating bat
- Jamaican fruit bat
- Mexican fruit bat

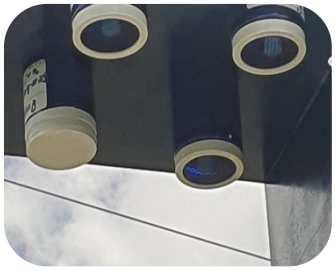
Passive Air Sampling

Nevis

St Kitts

Antigua

St Lucia

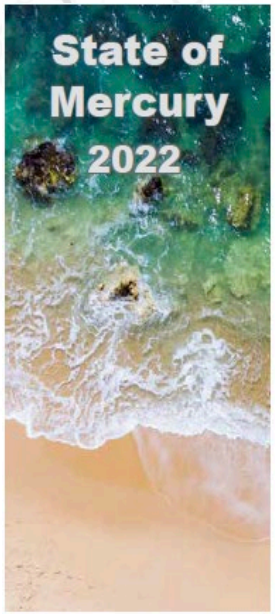


Suriname

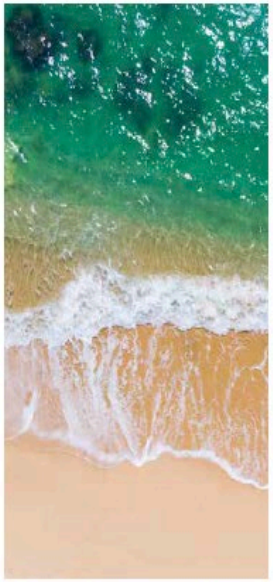
Trinidad

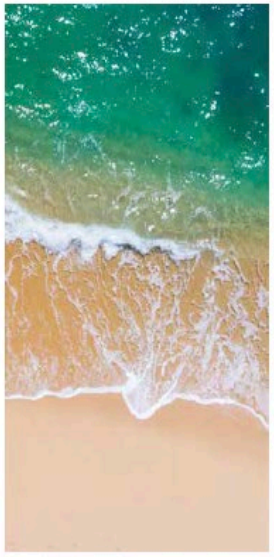
Belize

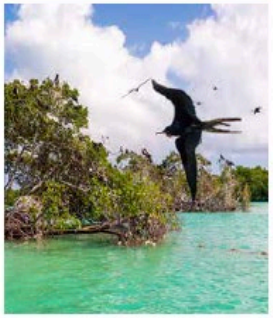
Communication and Outreach

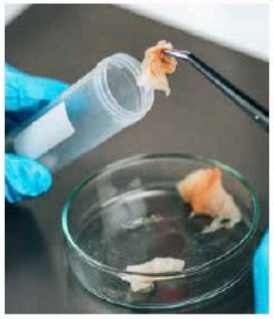


Caribbean Region









Mercury Monitoring Network
Caribbean Region

Ecotoxicology
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An evaluation of fish and invertebrate mercury concentrations in the Caribbean Region

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Abstract
Mercury is a ubiquitous pollutant of global concern but the threat of exposure is not homogenously distributed at local, regional, or global scales. The primary route of human exposure to mercury is through consumption of aquatic foods, which are culturally and economically important in the wider Caribbean Region, especially for Small Island Developing States (SIDS). We compiled more than 1600 samples of 108 unique species of fish and aquatic invertebrates collected between 2005 and 2023 from eleven countries or territories in the wider Caribbean Region. There was wide variability in total mercury concentrations with 55% of samples below the 0.23 µg/g wet weight (ww) guideline from the U.S. FDA/EPA (2022) for 2 or 3 weekly servings and 26% exceeding the 0.46 µg/g ww guideline consistent with adverse effects on human health from continual consumption, particularly for sensitive populations. Significant relationships were found between total mercury concentrations and taxonomic family, sampling country, fish length, and trophic level. The data analyzed here support the need for further sampling with concrete geospatial data to better understand patterns and mechanisms in mercury concentrations and allow for more informed decision making on the consumption of fish and invertebrates from the wider Caribbean Region as well as supporting efforts to evaluate the effectiveness of national, regional, and international mercury policies.

Global Health Trade-off for Mercury and Omega-3 in Seafood

Milligrams of Omega-3 Fatty Acids/4 Ounces of Cooked Fish →

Meal Frequency Recommendations (based on 4 oz or 113 g fish portion)	<500 mg	500-1,000 mg	1,000-2,000 mg	> 2,000 mg
Best Choices 3 Servings per week (≤ 0.15 µg/g)	Atlantic Cod, Butterfish, Catfish (temperate waters), Clams, Crab* (most species), Haddock, Lionfish, Lobster, Parrotfish, Scad, Scallops, Shrimp, Tilapia*	Atlantic Pollock, Ballyhoo, Blue Mussels, Pink Salmon, Sockeye Salmon, Squid,* Wahoo	Atlantic and Pacific Mackerel, Coho Salmon, Oysters	Anchovies,* Herring, Sardines
Good Choices 2 Servings per week (0.15 - 0.23 µg/g)	Pacific Cod, Cockle, Croaker, Grenadier, Flounders, Hake, Scad, Snapper, Sole	Jacks, Mahi Mahi,* Mullet, Octopus, Skipjack Tuna (light canned tuna)	Atlantic Horse Mackerel, Bonito, Chinook Salmon*, European Sea Bass, Rays, Skates, Trout	Atlantic Salmon
Good Choices 1 Servings per week (0.23 - 0.46 µg/g)	Catfish* (tropical waters), Red Fish, Seabreams	Bluefish, Croaker, Halibut, Tilefish, Trevally, White Marlin, Yellowfin Tuna	Albacore Tuna (white canned tuna[1]), Chilean Sea Bass, Spanish Mackerel	*Mercury concentrations vary widely across shark species.*
Choices to Avoid (US EPA) (> 0.46 µg/g)	Bonefish, Groupers, Orange Roughy	Amberjack, Barracuda, Bigeye Tuna, Black Marlin, Sailfish	Atlantic, Pacific, and Southern Bluefin Tuna, Blackfin Tuna,* Cero, King Mackerel, Swordfish	
Choices to Avoid (WHO) (> 1.0 µg/g)	Warsaw Grouper	Blue Marlin*	Dogfish, Ground, and Mackerel Sharks	www.briwildlife.org

Total Mercury in Muscle Tissue µg/g (ww) ↓

Healthier Choices

Riskier Choices

*Species Pictured

Next Steps in Data Collection

- Further deployment of passive samplers
- Coordinate sampling activities and logistics
- Coordinate scientific visits as necessary
- Analytical training
- Sample analysis
- QA/QC coordination
- Public awareness
- Continued engagement of countries to develop the network
- Assessment of the contribution of the network to the Minamata Effectiveness evaluation process