State of Mercury 2024

Caribbean Region

Mercury Monitoring Network

Caribbean Region

Creating a Hub for Regional Mercury Monitoring

Why a Mercury Monitoring Network?

Laboratory networks for mercury and other contaminant analyses in areas throughout the world, especially in mercury hotspots, will provide important information for the assessment of risk—to humans, wildlife, and ecosystems—in these regional environments.

Building a Mercury Monitoring Network in the Caribbean Region

Under the leadership of the government of Antigua and Barbuda, an integrated network of laboratories will be established to assist in the assessment of mercury in the environment and the food that people depend on, and to guide policies to address mercury risks. The Department of Analytical Services in Antigua and Barbuda serves as the primary toxicology laboratory in the region for this initiative. Saint Kitts and Nevis, under the Bureau of Standards Multipurpose laboratory, may serve as a secondary laboratory in the region to help with future interlab calibration needs and to build stronger regional capacity.

Biodiversity Research Institute (BRI) assisted with initial laboratory training, calibration and standards, sampling design, and workshop needs. Standardized biotic sampling across regional labs will help meet national and regional interests for mercury monitoring. This regional mercury monitoring network will also help many Caribbean countries meet the obligations of the Minamata Convention on Mercury.

The first workshop ***Facilitating Capacity-Building for Managing Mercury in the Caribbean*** was held virtually in 2021. Workshops conducted over the next two-year period consolidated expertise within the Region. A forum for communication and collaboration, these workshops served to connect regional laboratory directors and managers, relevant field personnel, and policymakers for Ministries related to environmental monitoring, international trade, commerce, and human health.

Beyond the project timeline, the Department of Analytical Services in collaboration with BRI will continue to build the regional network.

Monitoring mercury in fish and wildlife provides important information about the environmental health of a region.

Island nations that rely on fish as a major protein source are especially vulnerable to the risks of mercury in their food.

Meeting Minamata Convention Requirements

This Mercury Monitoring Network is critically important for helping the many Caribbean countries that have ratified (or plan to ratify) the Minamata Convention to meet its obligations and effectively implement its provisions.

The development of an integrated network of laboratories will:

- Help facilitate countries with limited resources to be more efficient in evaluating the effectiveness of the Convention.
- Provide a way for countries to coordinate their activities toward understanding the risks of mercury to human and environmental health.
- Help with better response to regulatory needs by the European Union (EU) about seafood mercury concentrations (e.g., assist countries with sustainable economic activities related to seafood resources).
- Provide assistance and help build capacity for relevant Ministries to make independent assessments to protect human and ecological health.

Network Partners

Governments of:

- Antigua and Barbuda*
- Bahamas
- Barbados**
- Belize
- Dominica
- Grenada
- Guyana
- St. Kitts and Nevis
- St. Lucia
- St. Vincent and the Grenadines
- Suriname
- Trinidad and Tobago**

*Lab focal point
**Countries with existing labs equipped with mercury analyzers

Biodiversity Research Institute
Harvard University

Fish mercury concentrations provide important information on the potential for human exposure through their consumption from freshwater, estuarine, and marine ecosystems. This is of particular importance to vulnerable populations including children, pregnant women, and indigenous communities that rely on fish as a major protein source.

Fish and wildlife also serve as important bioindicators of the environmental impacts of mercury pollution and potential risks related to human and ecological health.

Young fish (<1 year) can reflect rapid changes of environmental mercury loads, while long-lived predatory fish, commonly consumed by humans, are of greater significance for human health. These bioindicators can also be used to assess impacts to piscivorous wildlife.

Target Bioindicators

Fish

Yellowfin Tuna

Tuna, a popular fish group for exporting to the EU, may have elevated mercury levels.

Mahi Mahi

Mahi mahi is a popular food item for local consumption and younger individuals tend to have safe mercury levels.

Barracuda

While the barracuda is a common species, it's popularity as a local food item is dictated by the incidence of ciguatera fish poisoning. Barracuda regularly have elevated mercury levels.

Red Snapper

Red snapper are abundant and widespread. They have relatively low mercury levels and are regularly used for local consumption.

Birds

Kingfishers

The five species of kingfishers are good bioindicators of fresh and saltwater ecosystems.

Resident Songbirds

Wood wrens and other wrens often forage on invertebrates with elevated methylmercury levels (e.g., spiders).

Seabirds

Seabirds are at great risk of consuming high levels of mercury that build up in marine food webs. Slow molt patterns and slow rate of reproduction limit opportunities to reduce their mercury burden.

Migrant Songbirds

Certain species of neotropical migrants that breed in the U.S. and Canada, such as this Hooded Warbler, can have elevated blood mercury levels (which reflect on-site dietary uptake of methylmercury within the prior few days of sampling).

Mammals

Bats

Bats are good bioindicators of mercury in the invertivore food web for freshwater systems.

Neotropical River Otter

Otters are good bioindicators of freshwater systems based on the fish food web.

Pilot Whale

Pilot whales are good bioindicators of marine ecosystems and are sometimes related to human health.

Toxicology Laboratory

The toxicology laboratory provides analysis of tissue samples for total mercury using a Milestone Direct Mercury Analyzer-80. Laboratory development will emphasize building on current laboratory capacity in Antigua and Barbuda, as well as establishing new capacity in other countries.

Develop a Mercury Biomonitoring Plan

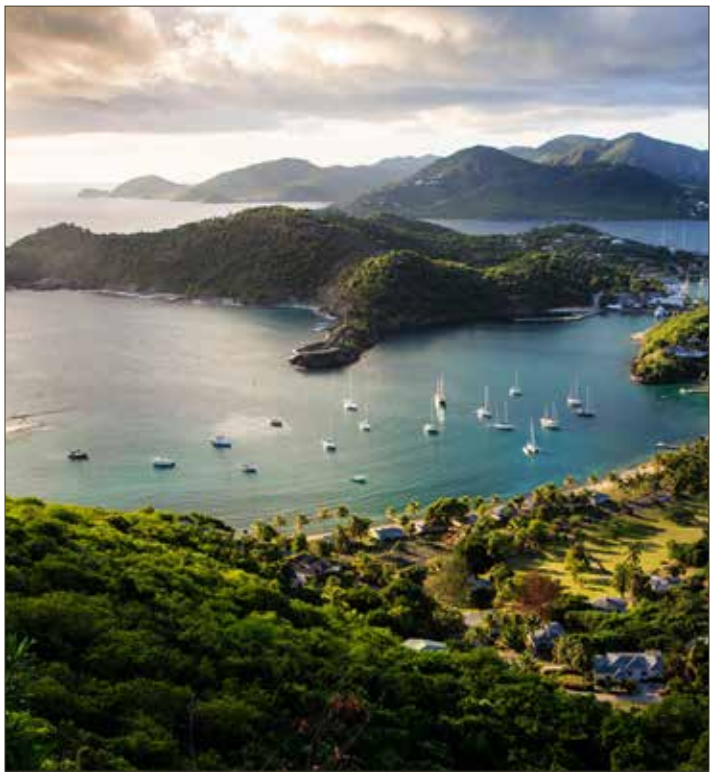
Based on the integrated network of laboratories and the participating countries developed during the Networking Workshop, participants will establish a mercury biomonitoring plan for countries of interest. Participants will represent each country that has an interest and abilities related to laboratory procedures, field sampling, and policy.

STEP 1 Select Target Species (for each country)

Biomonitoring activities in the region have included mercury analysis for:

- Shellfish and fish sampling in Antigua and Barbuda, Saint Lucia, and Trinidad and Tobago
- Bird sampling in Antigua and Barbuda and Belize
- Bat sampling in Antigua and Barbuda
- Cosmetic sampling in Antigua and Barbuda and Trinidad and Tobago
- Humans (with Ethics Committee approval) in Antigua and Barbuda and Grenada

Further capacity building for biomonitoring may be conducted elsewhere in the region.



Biomonitoring efforts follow results and interests from Minamata Initial Assessment projects conducted by BRI and Basel Convention Regional Centre-Caribbean for 10 countries in the region.

STEP 2 Collect Samples (permits required)

Fish/Marine Mammals

Fish sold at market; marine mammal muscle tissue (collected through nonlethal biopsies).

Birds

Bird tissue samples (nonlethal collection): blood (for short-term exposure); adult feathers (long-term exposure); and eggs.

Humans

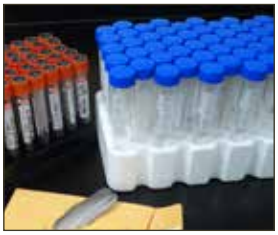
Hair is an easy and effective tissue type to test for mercury exposure.

Mercury-added Products: skin lightening creams and cosmetics.

Standard operating procedures have been developed by BRI in close coordination with Antigua and Barbuda and other countries. To download copies of these sampling protocols (as well as information about passive air sampling), please visit:

www.briwildlife.org/sampling

STEP 3 Prepare Samples — Transport/Storage



Proper labeling and storage of samples is imperative to ensure quality results. Researchers should adhere to protocols that may vary according to sample type and national permits.

STEP 4 Analyze Samples in Toxicology Labs

Participating countries will ship biotic samples to regional laboratory hubs (e.g., Antigua and Barbuda) and to BRI's mercury lab to compare interlab calibration.

STEP 5 Analyze and Manage the Data

Analysts should strive for the highest quality in data preparation and standardization, ensuring quality control of data processing and management. An integrative approach that includes field-based measures and data synthesized from disparate databases on mercury concentrations helps to improve confidence in findings.

STEP 6 Report Results — Translate the Science

Science communications pieces and web pages translate findings into succinct, clear language that engage readers who are not experts in the field; photography and infographics help convey complex scientific topics.

STEP 7 Public Outreach

Outreach materials, such as science communications, presentations, and websites, serve as a foundation for:

- local workshops tailored to the specific country or region
- policy development workshops
- legislative hearings
- public events
- press conferences
- awareness raising videos (e.g., Caribbean mercury monitoring video)

Meeting Minamata Convention Obligations

An important provision of the Convention is to monitor and evaluate the effectiveness of the adopted measures and its implementation. There are many ways that the scientific activities in this **Mercury Monitoring Network** can help countries, especially with Articles 14, 16, 17, 18, 19, and 22. For more information, visit: **www.minamataconvention.org**

Convention Effectiveness and Evaluation

BRI's Global Biotic Mercury Synthesis (GBMS) database of published mercury data on wildlife includes more than 550,000 data points detailing each organism sampled, its sampling location, and its ecological profile. This long-term data helps to understand patterns of mercury concentrations in wildlife across time and space, useful in identifying species and ecosystems most at risk. Mapping risk helps improve efforts to reduce the impact of mercury pollution on people and the environment.

Open-ended Science Group

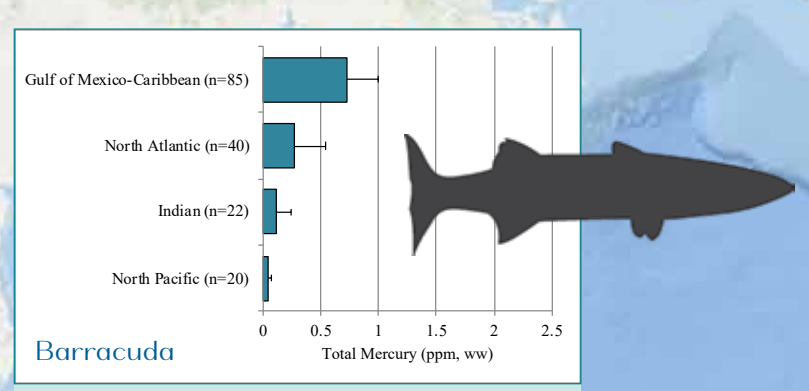
In addition to the GBMS database, the Secretariat of the Minamata Convention has initiated an Open-ended Science Group (OESG) to support an evaluation of the Convention's effectiveness in meeting its objectives.

Comprised of one representative from each Party as well as technical experts, this group will contribute, analyze, and synthesize data, both published and unpublished, pertaining to mercury emissions and releases and monitoring in air, wildlife, people, and other matrices.

BRI is developing protocols to standardize and harmonize data originating from various sources so that the information is presented in a clear and accessible format.

For more information on the OESG, contact:
mark.burton@briwildlife.org

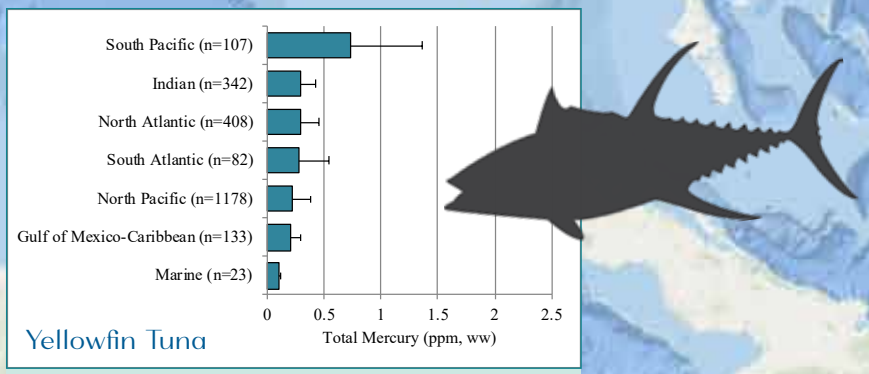
Monitoring Mercury in Fish and Birds in the Caribbean Region



Barracuda

Mercury levels in barracuda in the Caribbean Sea are highest compared to global data (although, sample sizes are small and data are not normalized for size).

Generally **NOT SAFE** *for human consumption.*



Yellowfin Tuna

Caribbean Sea populations of yellowfin tuna tend to be comparatively low based on global mercury data.

Generally **SAFE** *for human consumption.*

Newly Published in Ecotoxicology

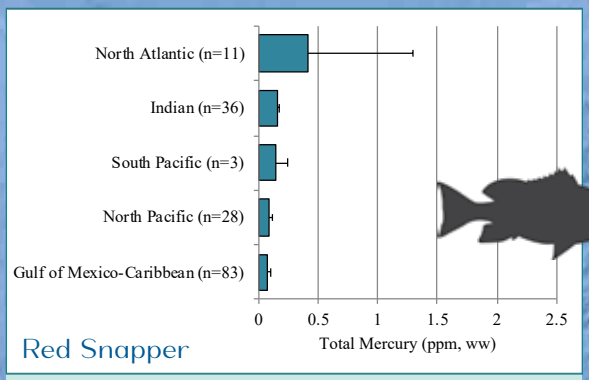
In the study entitled ***An evaluation of fish and invertebrate mercury concentrations in the Caribbean Region***[1] researchers synthesized more than 1,600 fish mercury concentrations that now serves as a baseline. This long-term effort aims to inform environmental management and public health policies, identifying high-risk areas and taxa for further monitoring and investigation.

Highlights:

- Fish mercury concentrations in island countries are especially important to document because of strong community dependence.
- Four species including: great barracuda, mahi mahi, red snapper, and yellowfin tuna are identified as long-term bioindicators.
- More than10 countries are now part of the CRMMN.

[1]Christian, L.D., Burton, M.E.H., Mohammed, A. et al. 2024. An evaluation of fish and invertebrate mercury concentrations in the Caribbean Region. Ecotoxicology 33, 397–414.

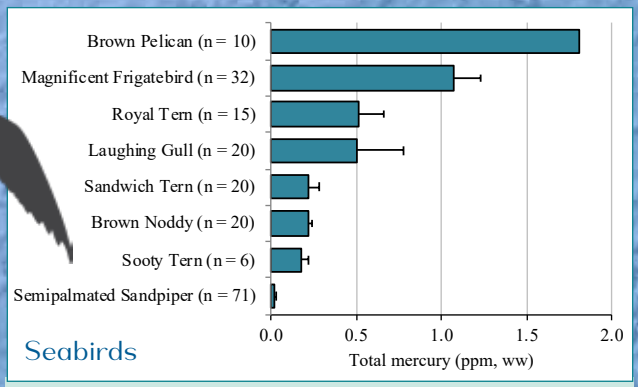
0 250 500 Km



Red Snapper

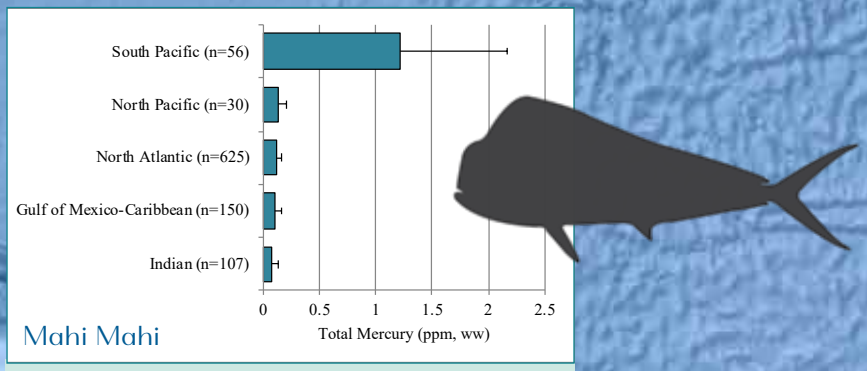
Mercury levels in red snapper are comparatively low in the Caribbean Sea.

SAFE *for human consumption.*



Seabirds

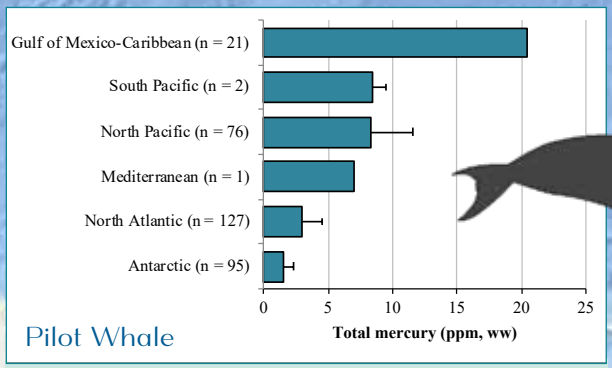
Seabirds of greatest interest for understanding potential elevated levels of mercury in a system tend to be the largest species, such as the Brown Pelican and Magnificent Frigatebird (pictured).



Mahi Mahi

Caribbean Sea populations of mahi mahi tend to be comparatively low based on global mercury data.

Generally **SAFE** *for human consumption.*



Pilot Whale

Mercury levels in pilot whales in the Caribbean Sea are high compared to global data.

NOT SAFE *for human consumption.*

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Credits

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