

Virtual Workshop

Antigua and Barbuda

27 July, 2021

CRMMN FISH AND BIRD SAMPLING

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MINAMATA
CONVENTION
ON MERCURY



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MONITORING MERCURY IN THE CARIBBEAN

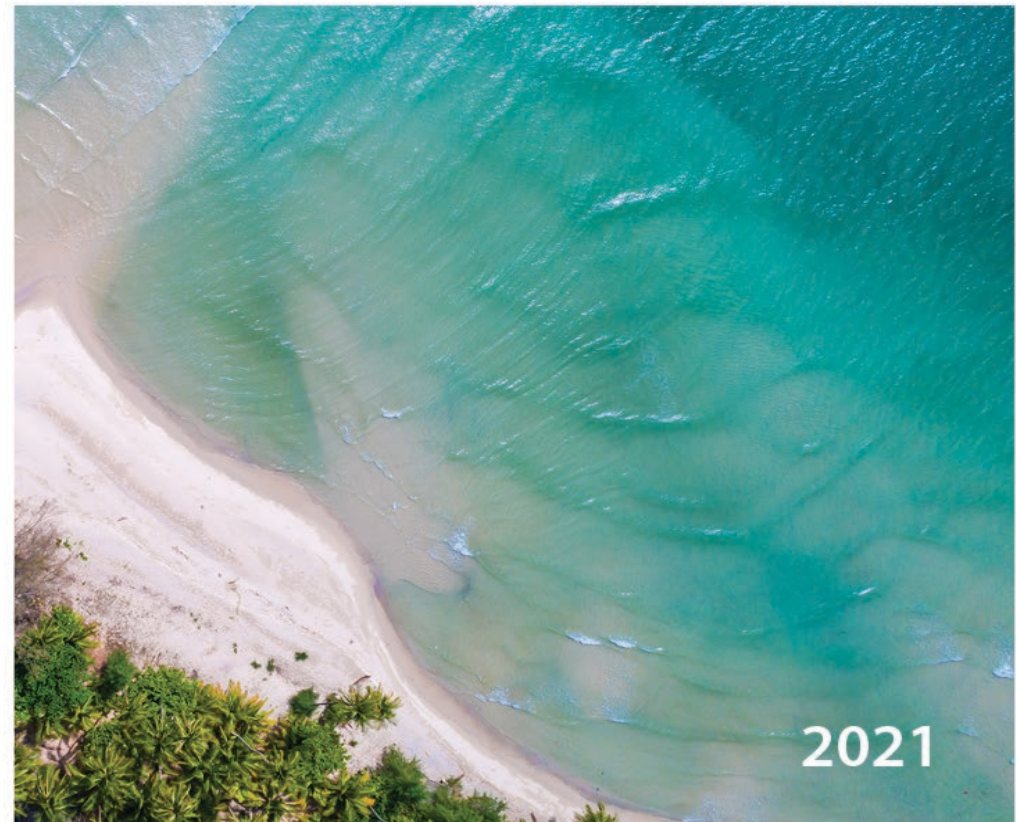
- ▶ Part of the project is to initiate an integrated mercury monitoring network for the Caribbean Region
 1. Use the platform developed by the MIA process for the region
 2. Further assist countries to develop Hg monitoring efforts
 3. Use standardized protocols for field sampling and lab analyses
 4. Link to obligations of the Minamata Convention
 5. Develop findings that assist national policy and regional interests
 6. Generate scientific publications that are policy relevant

A state of the region Hg report has been created for this workshop

- Will present some of the elements of the report in this presentation
- Options for the future include:
 - An annual regional report
 - Country-specific reports
- Could be presented to the regional and global COP meetings
- Report is available at:
<http://briwildlife.org/sampling>

Caribbean Region Mercury Monitoring Network

State of the Region



The Monitoring Process

1. Select target species for each country
2. Collect samples
3. Prepare samples – transport and storage
4. Analyze samples for toxicology lab
 - ▶ Antigua and Barbuda – Analytical Services Lab
 - ▶ Portland, Maine, USA – Biodiversity Research Institute
5. Analyze and manage the data
6. Report results – translate the science
7. Public outreach

Monitoring Components/Matrices

- ▶ Air – using Passive Air Samplers
- ▶ Biota – fish, sea turtles, birds, and marine mammals (per Article 19)
- ▶ Humans –
 - ▶ Dietary uptake – food items (hair)
 - ▶ Topical uptake – skin-lightening creams (urine)

Mercury monitoring matrix interests

Country	Air	Fish	Birds	Marine Mammals	Human -Hair	Human - Cosmetics
Antigua and Barbuda	X	X	X		X	X
Bahamas						
Barbados						
Belize						
Dominica						
Grenada						
Guyana						
St. Kitts and Nevis						
St. Lucia						
St. Vincent and the Grenadines						
Trinidad and Tobago						

Global connections with the Minamata Convention

- ▶ Article 16 – Health Aspects
- ▶ Article 18 - Public Information, Awareness and Education
- ▶ Article 19 – Research and Monitoring
- ▶ Article 22 – Effectiveness Evaluation

- ▶ Conference of Parties 4
 - ▶ Virtual meeting during the first week of November
 - ▶ Face-to-face meeting potentially the first quarter of 2022 (Bali, Indonesia)

- ▶ Decision on the Global Mercury Monitoring Guidance Document may be made at COP4
 - ▶ www.mercuryconvention.org/meetings/intersessionalwork/

Mercury monitoring matrix - Update

Country	Air	Fish	Birds	Marine Mammals	Human -Hair	Human - Cosmetics
Antigua and Barbuda	X	X	X		X	X
Bahamas						
Barbados						
Belize	MIA	MIA	MIA			
Dominica		MIA				
Grenada	MIA	MIA			MIA	MIA
Guyana		MIA				
St. Kitts and Nevis	X	MIA - X			X	MIA - X
St. Lucia (plants)		MIA				MIA
St. Vincent and the Grenadines		MIA		MIA		MIA
Trinidad and Tobago		MIA				MIA



Join the Global Effort to Understand Mercury Contamination in Seafood*

Why Use Fish as Bioindicators?

The world's oceans and waterways are key sources of mercury found in fish and wildlife. A variety of species are used as bioindicators to provide important information on the impacts of mercury pollution and potential risks related to human health. For example, young fish can reflect rapid changes of environmental mercury loads; long-lived predatory fish may indicate concern for human health.

What are the Risks to Human Health?

Consumption of seafood is the primary pathway for methylmercury exposure in humans. Methylmercury, the organic and more toxic form of mercury, is known to affect neurological development in children and is also linked to cardiovascular disease in adults. Many potential food items, especially certain fish and marine mammals species, contain mercury concentrations that exceed safe levels for human consumption. The importance to vulnerable populations, such as pregnant women, is particularly high.

Why Should Your Country Participate?

- To build capacity in your country to comply with biomonitoring efforts as outlined in Article 19 of the Minamata Convention, which lists those organisms that should be nonlethally monitored including fish, sea turtles, birds, and marine mammals.
- To include your country-specific data in a global database on mercury content of seafood and freshwater fish. By participating in this effort, your country's data will help toward understanding the global scope of mercury contamination in our food sources.
- To position your country for Next Steps in the global effort to monitor exposure to mercury (see back page).

Who Should Be Concerned?

- Ministries where there are vulnerable populations.
- General public and regulatory agencies responsible for seafood safety.

Quick Notes

- Focal taxa:
 - Local*—Barracuda, bluefish, croaker, grouper, mackerel, mahi mahi, shark, snapper, tuna, jack, wahoo, marlin
 - Imported*—Cod, flounder, haddock, swordfish, tuna
- Collaborative projects: BRI partnered with IPEN on *The Global Fish and Community Mercury Monitoring Project*, the first study of its kind, sampling fish from 29 countries to identify biological mercury hotspots around the world.

Learn How You Can Participate

Details about how you can participate are on the reverse side of this flyer.



Fish Sampling

OBJECTIVES FOR FISH Hg SAMPLING

Generate a Hg profile of:

- ▶ Regularly consumed seafood (primarily fish) and other food by local communities
- ▶ Seafood that is exported
- ▶ Seafood that can be compared with existing data or other countries in the region
- ▶ Seafood that can be used as a basis for linking with the global Hg monitoring guidance document that the Minamata Convention will be using



FISH SAMPLING: DESIGN DETAILS

- ▶ Market or field sampling works
- ▶ Need small sample of muscle tissue (biopsy or fillet)
- ▶ Data Needed:
 - ▶ Species
 - ▶ Size (e.g., length and/or weight),
 - ▶ Date and location (could make exceptions for market fish) – FADs help with specific coordinates, but bay or area are fine – especially for pelagics



Summary of fish Hg concentrations from countries sampled around the world (Buck et al. 2019, *STOTEN* 687:956-966.)

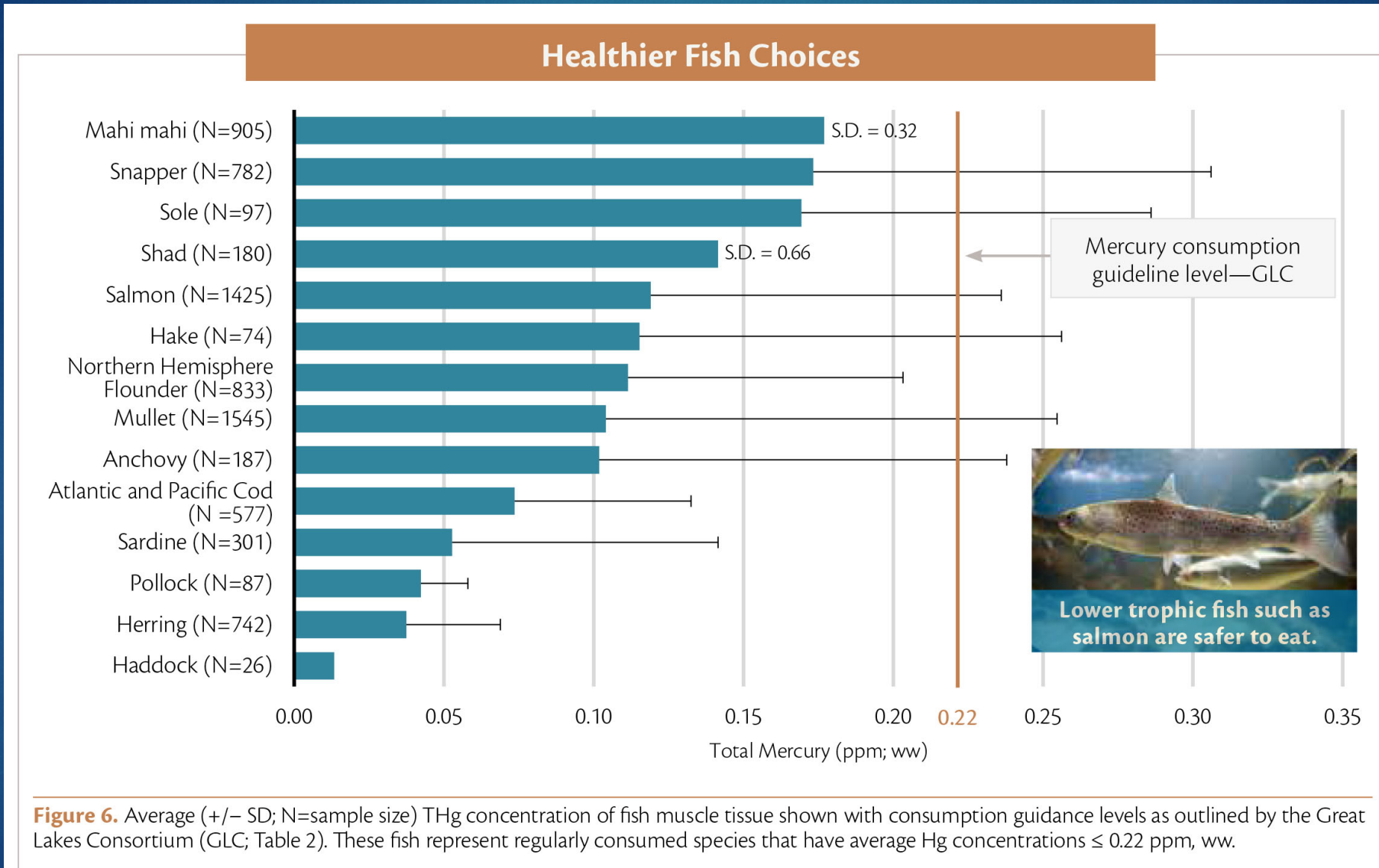
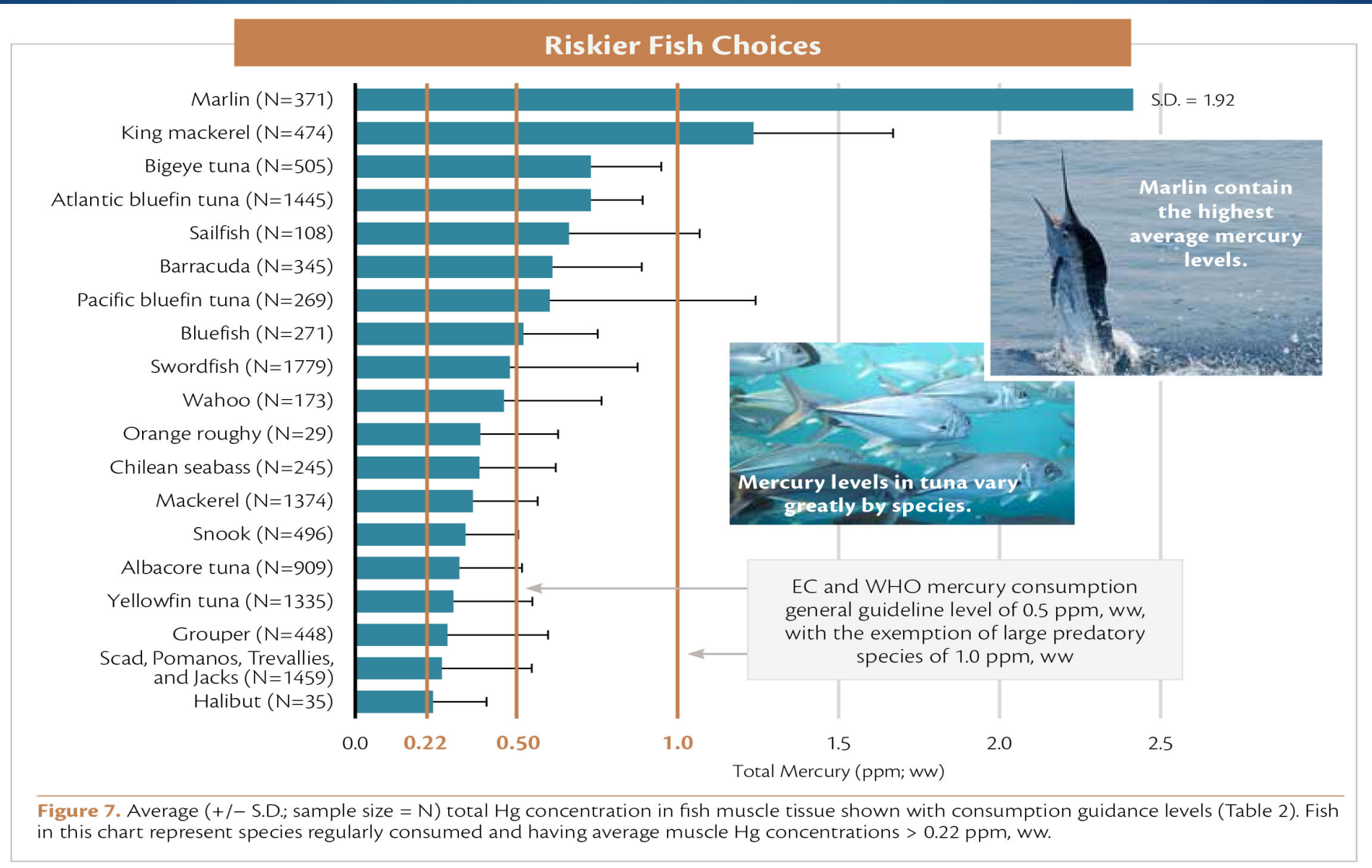


Figure 6. Average (+/- SD; N=sample size) THg concentration of fish muscle tissue shown with consumption guidance levels as outlined by the Great Lakes Consortium (GLC; Table 2). These fish represent regularly consumed species that have average Hg concentrations \leq 0.22 ppm, ww.

Summary of fish Hg concentrations from countries sampled around the world (Buck et al. 2019, STOTEN 687:956-966.)



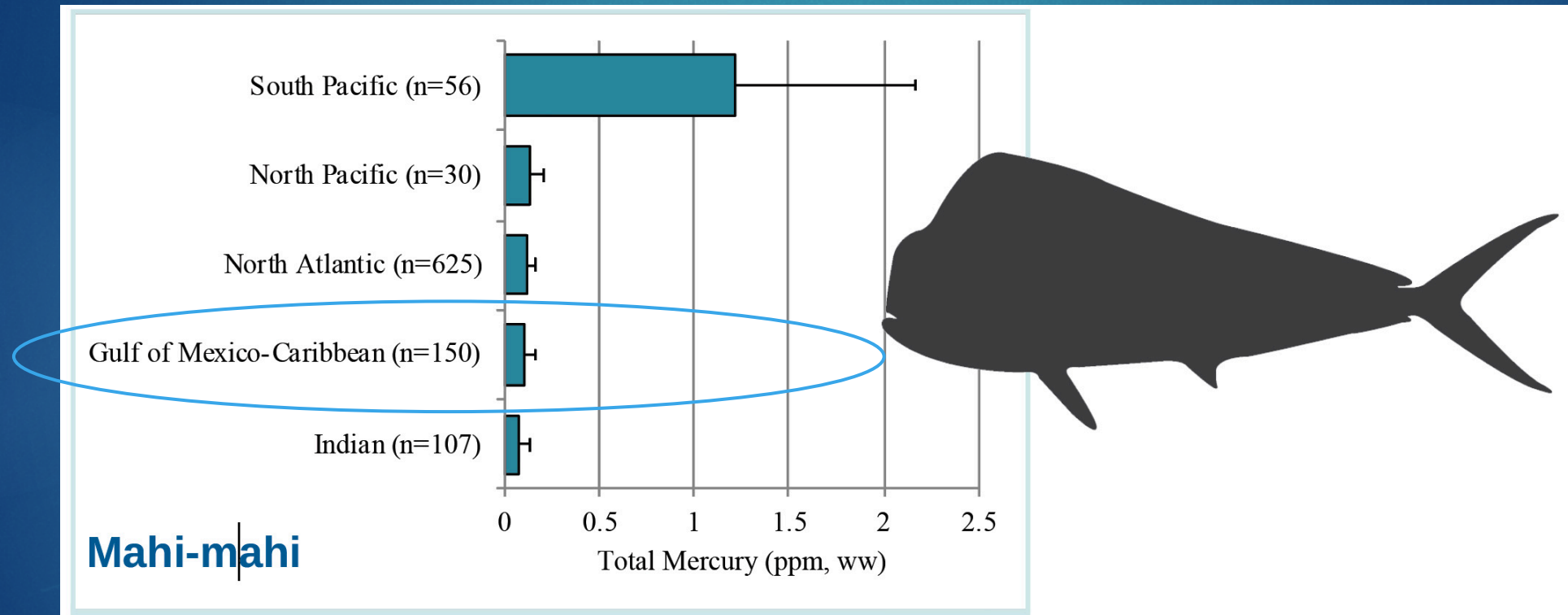
FISH SAMPLING: DESIGN FOR PELAGIC FISH

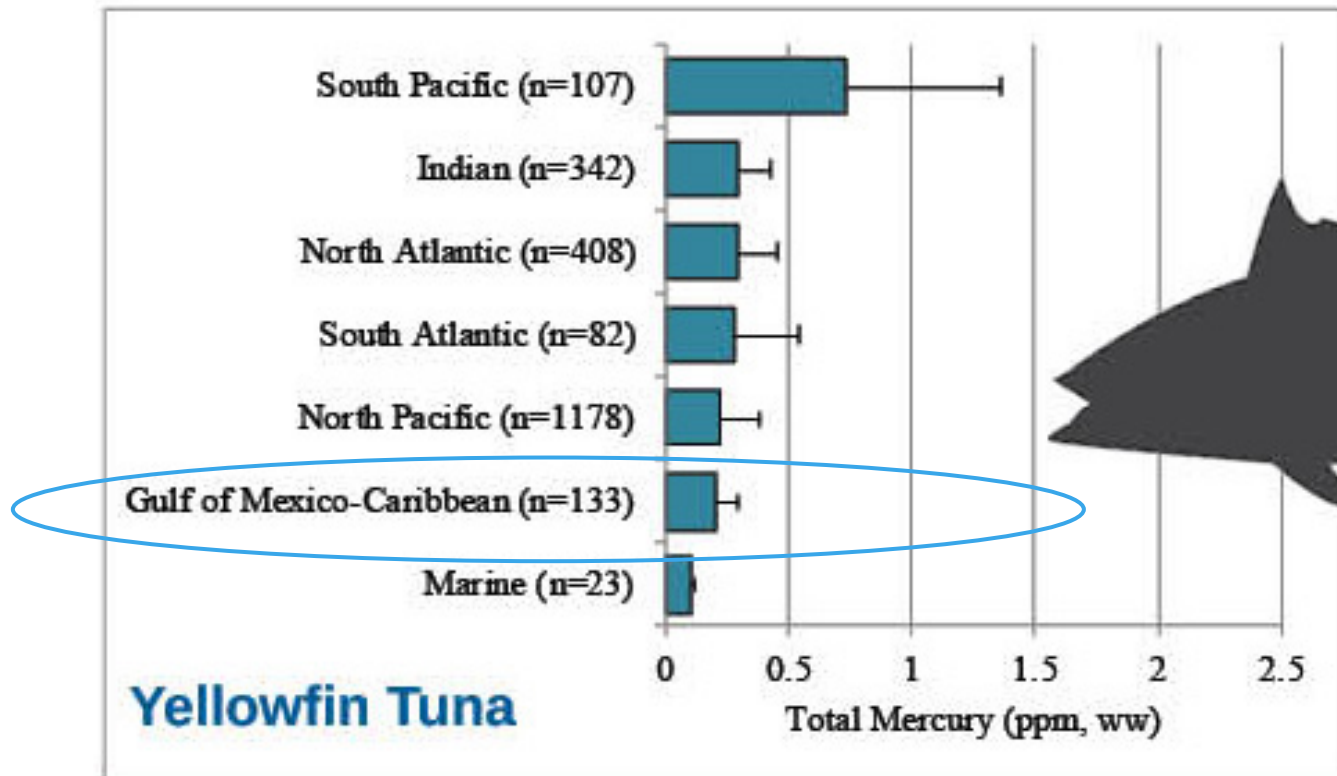
- ▶ ~ 5 species of pelagic fish (10-15 samples per species)
 - ▶ Yellowfin Tuna or Blackfin Tuna
 - ▶ Red Snapper
 - ▶ Mahi Mahi
 - ▶ Kingfish/Spanish Mackerel
 - ▶ Wahoo (Peto)
 - ▶ Billfish species always of interest (opportunistic)

- ▶ Target species will integrate regional and country interests

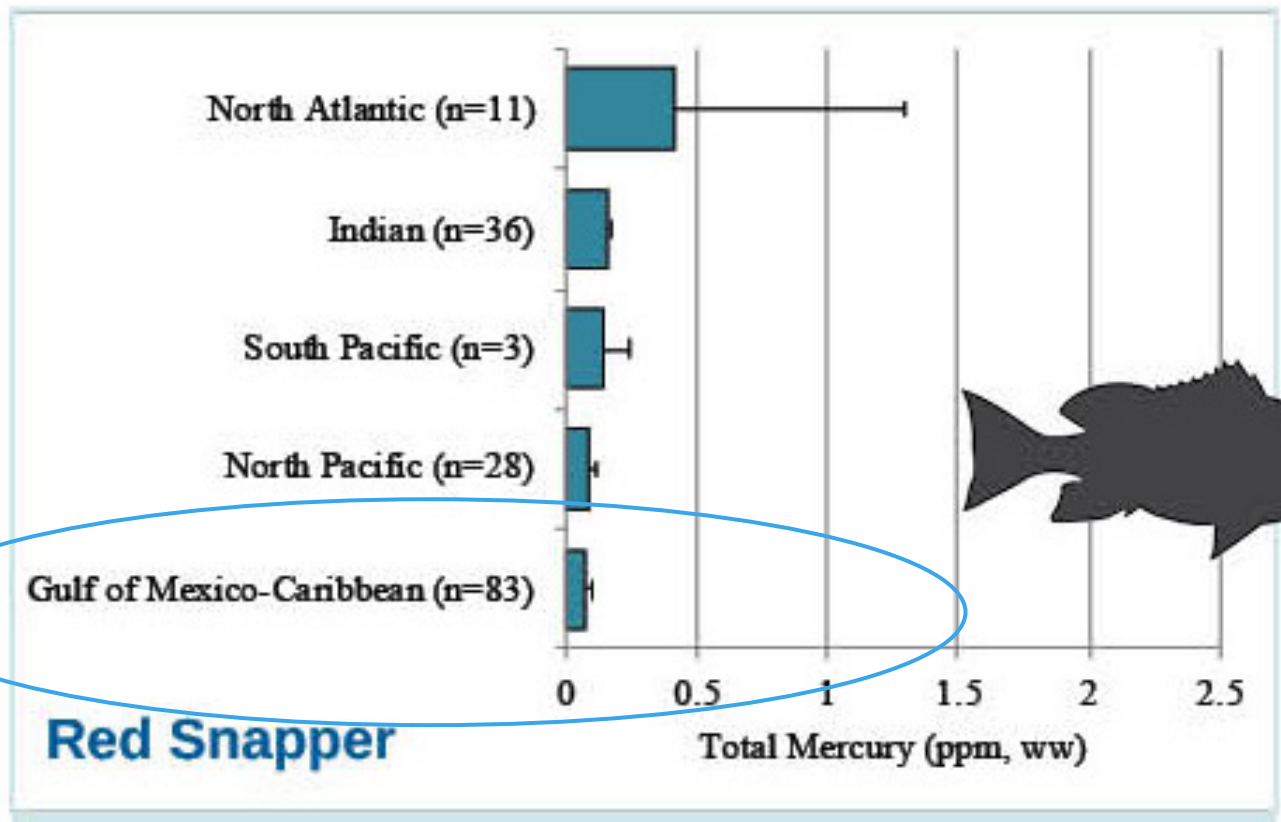
MYSTIC AMARA CHARTERS • FISHING CALENDAR												
Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Spt	Oct	Nov	Dec
Blue Marlin					■	■	■	■	■	■		
White Marlin	■	■	■	■								
Yellowfin Tuna	■	■	■	■	■	■	■	■	■	■	■	■
Blackfin Tuna	■	■	■	■	■	■	■	■	■	■	■	■
Wahoo	■	■	●	●	●	●	●	●	●	●	■	■
Dolphin					■	■	■	■	■	■	■	
Kingfish					■	■	■					
Best March through October										●		

Global mahi mahi Hg concentrations





Global Yellowfin Tuna Hg concentrations



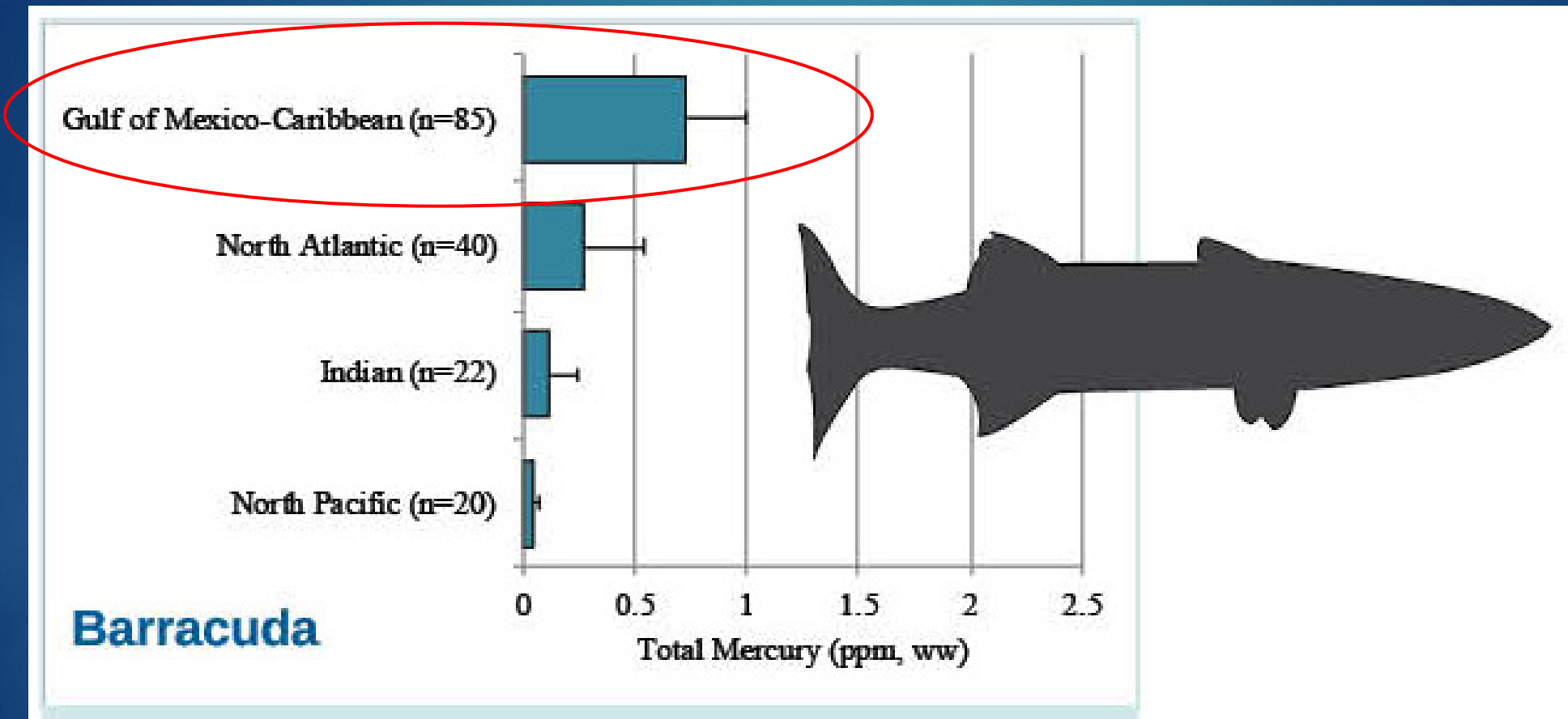
Global red snapper Hg concentrations

FISH SAMPLING: DESIGN FOR COASTAL/REEF FISH

- ▶ 5 species of coastal/reef fish (10-15 samples per species)
 - ▶ Barracuda
 - ▶ Groupers (e.g., Nassau and Black)
 - ▶ Bonefish
 - ▶ Tarpon
 - ▶ Permit
- ▶ Target species can include both regional and country interests – (e.g., croaker in Trinidad and Tobago)



Global barracuda Hg concentrations



FISH SAMPLING: DESIGN FOR FRESHWATER FISH

- ▶ 5 species of freshwater fish (10-15 samples per species)
 - ▶ Wolf fish
 - ▶ Catfish (of various species)
 - ▶ Snook
 - ▶ Others?

- ▶ Target species can include both regional and country interests – (e.g., snook in Belize)

Ecosystem Sensitivity Mapping

Belize



Why Map Ecosystem Sensitivity?

Mapping ecosystem sensitivity spots helps identify critical areas where mercury affects important human food sources or threatened and endangered fish and wildlife species.

Mercury emissions and deposition from contaminated sites are important, but explain only part of the spatial story of mercury pollution. Ecosystem sensitivity and food web relationships help further describe the actual risks to human and ecohealth.

Elemental mercury is converted to a more toxic organic form through the process of methylation, which occurs with the help of bacteria found primarily in wet areas. Variations in methylmercury (MeHg) concentrations may occur in different parts of the food web depending on the sensitivity of the ecosystem to mercury input.

Where methylmercury availability is elevated, fish and wildlife may exhibit harmful mercury concentrations and represent the places that will require the most attention by countries and global monitoring programs.

Minamata Convention on Mercury—A Global Effort

Participation in this project will help Belize comply with four Minamata Convention Articles, including:

Article 12: Requirements for identification and evaluation of contaminated sites

Article 16: Health aspects, which details requirements to develop strategies to identify and protect populations at risk and to promote health care services











Article 18: Public information and awareness, which outlines the need to develop outreach programs

Article 19: Research, development and monitoring, which outlines the need to develop inventories and assess impacts of mercury on human health and the environment.



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), Atlantic Croaker, Haddock, Lionfish, Scallops, Shrimp, Tilapia*	Atlantic Pollock, Blue Mussels, Mullet, Pink Salmon, Sockeye Salmon, Squid*	Atlantic and Pacific Mackerel, Coho Salmon, Oysters	Anchovies*, Herring, Sardines, Shad Healthier Choices
Good Choices 2 Servings per week (0.15 - 0.23 µg/g) 	Pacific Cod, Flounders, Grenadiers, Hake, Lobsters, Scads, Snappers, Soles	Mahi-mahi*, 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) 	Bonefish, Catfish* (tropical waters), Red Fish, Seabreams	Amberjack, Bluefish, Halibut, Jacks, Trevally, Yellowfin Tuna*, Wahoo, White Marlin	Albacore Tuna, Chilean Sea Bass, Spanish Mackerel	
Choices to Avoid (US EPA) (> 0.46 µg/g) 	Groupers, Orange Roughy	Barracuda, Black Marlin, Bigeye Tuna, Sailfish, Tilefish	Atlantic, Pacific, and Southern Bluefin Tuna, Blackfin Tuna*, Swordfish	Mercury concentrations vary widely across shark species. 
Choices to Avoid (WHO) (> 1.0 µg/g) 	Riskier Choices	Blue Marlin*	Dogfish, Ground, and Mackerel Sharks, King Mackerel	www.brioon.org/hgcenter

Total Mercury in Muscle Tissue µg/g (ww)

*Species Pictured

MERCURY IN THE GLOBAL ENVIRONMENT

Understanding Spatial Patterns for
Biomonitoring Needs of the
Minamata Convention on Mercury



Bird Sampling

BIRD SAMPLING: DESIGN DETAILS

- ▶ 5 or more species of birds (10-15 samples per species)
- ▶ Requires field sampling (generally)
- ▶ Various tissue types are feasible:
 - ▶ Small sample of blood,
 - ▶ Feathers and/or
 - ▶ Eggs
- ▶ Select species that are at greatest risk to Hg, considering habitat and trophic level

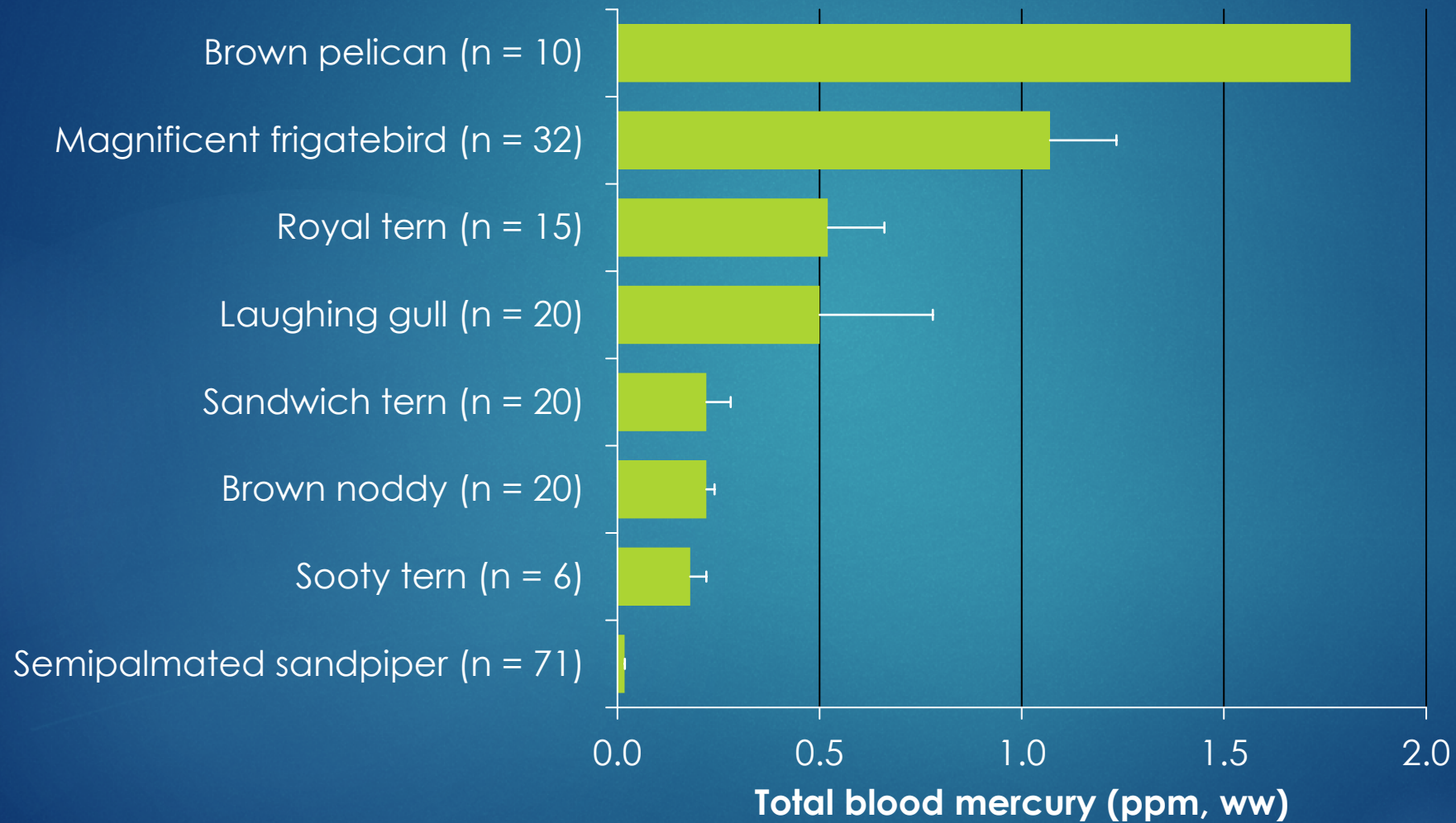


BIRD SAMPLING: DESIGN FOR TARGET SPECIES

- ▶ ~ 5 species of seabirds
 - ▶ Brown Pelican
 - ▶ Magnificent Frigatebird
 - ▶ Audubon's Shearwater
 - ▶ Tropicbirds
 - ▶ Terns/Noddies
- ▶ Landbirds are also feasible (and can connect with a new network for tropical birds and Hg – TRACE)
 - ▶ Tropical Research for Avian Conservation and Ecotoxicology (<http://briwildlife.org/tropical-program/trace-project/>)
- ▶ Target species will integrate regional and country interests



Published bird Hg concentrations for the Caribbean Region



MANAGING MERCURY SAMPLES AND DATA



- ▶ Website initially hosted by BRI (with a goal to transfer to Antigua and Barbuda)
 - ▶ Field SOPs available for sampling (air, fish, bird, human hair sampling, and cosmetics sampling)
 - ▶ In-field videos of relevant SOPs will also be available
 - ▶ Data and their interpretation can also be made available (with approval from each country)
- ▶ CRMMN website is: <http://briwildlife.org/sampling>

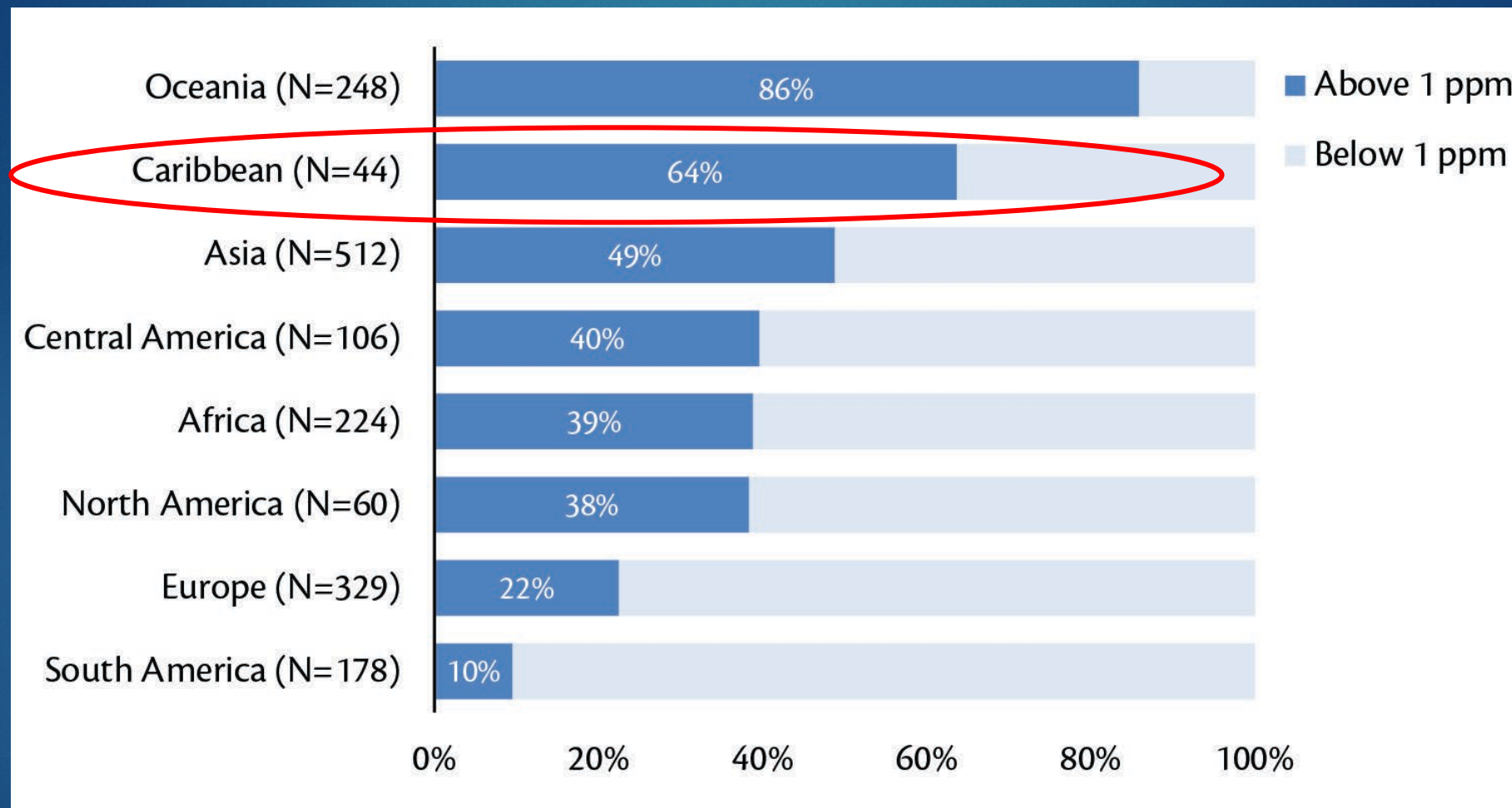


FOR MORE
INFORMATION
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Summary of human hair Hg concentrations from countries sampled around the world (Trasande et al. 2016 J. Environ. Mgmt. 183:229-235)





Quick Notes

- Minamata Convention requires items > 1 ppm mercury (Hg) banned.
- Potential concern in developing countries in the tropics.
- Many countries, such as the USA and those in the EU, are working toward mercury-free solutions.
- In collaboration with Zero Mercury Working Group, Biodiversity Research Institute is testing skincare products and cosmetics for mercury content; most do not list mercury on ingredient labels.

Why Should Your Country Participate?

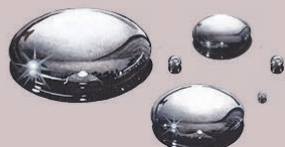
- To build capacity in your country to comply with Article 4 of the Minamata Convention on Mercury, which prohibits the manufacture, import, or export of specific mercury-added products after 2020.
- To include your country-specific data in a global database on mercury content of cosmetics. By participating in this effort, your country's data will help toward developing feasible solutions to this issue.
- To position your country for *Next Steps* in the global effort to reduce exposure to mercury (see back page).

Who Should Be Concerned?

- Ministries where there are vulnerable populations.

Learn How You Can Participate

Details about how you can participate are on the reverse side of this flyer.



Eliminating mercury in skin-lightening cosmetics on a global scale through regulation, training, and outreach activities

1. GEF Funding - pending
2. Implementing Agency – UNEP
3. Executing Agencies – WHO and BRI
4. Focal countries in 3 regions
 - ▶ Caribbean Region – Jamaica
 - ▶ Africa – Gabon
 - ▶ Asia – Sri Lanka

Join the Global Effort to Reduce Mercury in Consumer Products

What is the Issue?

Mercury is an ingredient used in skin lightening or anti-aging soaps and creams because mercury salts inhibit the formation of melanin, the pigment that gives human skin, hair, and eyes their color. Mercury is also added to some cosmetics, such as mascara, for its properties as a preservative, preventing the growth of bacteria and fungi. A wide range of mercury levels are found in these products and often the amount of mercury is not disclosed to the consumer.

What are the Risks to Human Health and the Environment?

According to the World Health Organization (WHO), the main health risk from mercury exposure is kidney damage, but the use of these products can also result in allergic reactions, skin irritation, or neurotoxicity (harm to the nervous system).

Objectives of
UNEP-WHO-BRI
GEF Cosmetics Hg
Project

1. **Promote regulatory action** by governments to phase out skin-lightening products in line with the Minamata Convention.
2. **Reduce consumer demand** for skin-lightening products through public awareness-raising:
 - Through advocacy campaigns at national level and a global campaign and training for health professionals to inform and educate patients and the community.

Objectives of UNEP-WHO-BRI GEF Cosmetics Hg Project

3. Identify global manufacture and supply chains for legal and illegal products and work with customs agents in countries to identify manufacturers and retailers of skin lightening products.

- Build capacity of customs agents with screening protocols and technology.
- Assist countries in testing of skin lightening creams available in their countries, which supports public awareness-raising, foster political support for action, and promote compliance with legislation.

4. Disseminate lessons learned through sub-regional workshops