Biodiversity Research Institute

# Science for Sustainable Fisheries

## Fisheries Science Expertise

Biodiversity Research Institute (BRI) biologists are experienced in the implementation and execution of field and analytical fisheries projects.

- Field projects include the sampling, inventory, tracking, and collection of fish and/or their tissues.
- Analytical projects focus on the strategic design and implementation of biomonitoring frameworks. By interpreting multi-dimensional data, we evaluate the intersections of fish biology, public health, and ecological connections.

**BRI's fisheries work focuses on:**

- Fish sampling and community inventories
- Electrofishing
- Mainstem and tributary surveys
- eDNA sampling
- Spawning surveys
- FERC Compliance surveys
- Fish passage studies
- Contaminants monitoring and analyses
- Toxicology analysis and interpretation
- Biotelemetry
- Mapping fish movements and habitat use

## Fisheries & Contaminant Monitoring in New England

BRI has conducted long-term fisheries and contaminant monitoring across New England for more than two decades, supporting federal and state regulatory compliance, hydropower licensing, and public health decision-making.

Our work includes extensive fish mercury monitoring under Federal Energy Regulatory Commission (FERC) licenses in Maine, New Hampshire, and Vermont, including the Fifteen Mile Falls Project and multiple Maine hydropower reservoirs. Through repeated, standardized sampling of key sport and forage fish species, BRI documents temporal trends in mercury exposure relevant to both ecological and human health.

### State, Community, and Human Health Applications

BRI also collaborates closely with the Maine Department of Environmental Protection to assess mercury and PFAS in fish across lakes statewide, expanding the scientific basis for fish consumption advisories issued by the Maine CDC. These datasets support trophic transfer modeling and the use of avian bioindicators to evaluate contaminant exposure across aquatic food webs.

In parallel, BRI works directly with Tribal communities to assess mercury exposure risks in fish harvested from traditional lands, ensuring that consumption patterns and health risks not captured by conventional monitoring are better understood and communicated.

**While rooted in New England, BRI's work extends globally. Through the Global Biotic Mercury Synthesis (GBMS) and international partnerships, we support mercury monitoring and fish sampling across 30 countries in South America, the Caribbean, West Africa, and the South Pacific—connecting local fisheries to global environmental health.**

*Hypostomus spp. (Cucho Tigre) sampled in Colombia as part of BRI's global fish monitoring efforts.*

## Skills and Expertise

### Laboratory and In-Situ Toxicity Testing

- ✔ Design and implementation of laboratory toxicity studies for fish and aquatic organisms
- ✔ Engineering and deployment of in-situ exposure and toxicity monitoring systems
- ✔ Extensive experience evaluating contaminant effects under environmentally relevant conditions to support injury assessment and causation analysis

### Fish Habitat and Population Modeling

- ✔ Development of habitat-based models to estimate fish carrying capacity and population response
- ✔ Experience applying GIS and spatial datasets to predict fish distribution and habitat suitability
- ✔ Prior and ongoing collaboration with federal, state, and tribal agencies

### Fish Kill Investigation and NRDA Support

- ✔ Technical support to federal, state, and tribal trustees investigating injury to fisheries resources associated with hazardous substance releases
- ✔ Assistance with determining likely causes, pathways of exposure, and affected life stages
- ✔ Integration of field observations, laboratory data, and ecological context to support Natural Resource Damage Assessment (NRDA) and restoration planning

# Featured Fisheries Projects

## Sockeye Salmon Research & Monitoring

**Location:** Bristol Bay watershed, Alaska
**Partners:** Biodiversity Research Institute, University of Calgary, University of Alaska Fairbanks, Colorado Parks and Wildlife, University of North Texas, Montclair State University

Since 2012, BRI has conducted long-term fisheries research in Alaska's Bristol Bay watershed, which supports the largest sockeye salmon fishery in the world. This work spans multiple river systems draining to Lake Iliamna and focuses on understanding habitat conditions and environmental factors that influence salmon and trout populations.

BRI has led field and laboratory studies examining how copper and other stressors affect sockeye, Chinook, and coho salmon, as well as rainbow trout. This research helps evaluate potential risks to fish populations from proposed mining and other development activities in the region.

Current work focuses on how water temperature affects the development of sockeye salmon eggs and larvae within gravel nests (redds). BRI developed and deployed in-situ monitoring systems that collect continuous temperature data and images of developing embryos across multiple spawning areas. These data, along with respirometry data on developing embryos, improve predictions of hatch and emergence timing. Methods developed through this work are also being applied to support bull trout reestablishment efforts in collaboration with the University of Calgary (Dr. Benjamin Barst).

*Dr. Jeff Morris (BRI) and collaborators working with salmon monitoring set up (top) and salmon eggs close up (below).*

*Documenting size and condition of lake trout during tagging and monitoring informs adaptive fisheries management.*

## Lake Trout Population & Tagging Study

**Location:** Moosehead Lake, Maine
**Partners:** Maine Department of Inland Fisheries and Wildlife; Biodiversity Research Institute; Brookfield Renewable

BRI is supporting a lake trout tagging and monitoring study led by the Maine Department of Inland Fisheries and Wildlife to inform long-term, science-based fisheries management on Moosehead Lake. The project focuses on evaluating lake trout population dynamics and their interactions with other coldwater gamefish species.

Mature lake trout are captured, tagged with Passive Integrated Transponder (PIT) tags, and released. Each implanted tag contains a unique identifier, enabling individual fish to be recognized upon recapture through creel surveys and seasonal netting efforts.

Data generated through this program support assessment of population size and density, movement patterns, habitat use, and long-term carrying capacity. Study findings directly support adaptive fisheries management decisions aimed at maintaining a balanced, resilient coldwater fishery and provide a robust scientific foundation for ongoing monitoring and management actions.


For more information, contact:

Jeff Morris, Ph.D.; Freshwater Fisheries Lead
jeff.morris@briwildlife.org

Katrina Zarrella Smith, Ph.D.; Marine Fisheries Lead
katrina.smith@briwildlife.org

276 Canco Road | Portland, Maine 04103

www.briwildlife.org