Monitoring Polychlorinated Biphenyls (PCBs) and Pesticides in Small Forage Fish from the Anacostia River Watershed

2018-2019

The Anacostia River Sediment Project (ARSP)

Since 2015, the District of Columbia Department of Energy and Environment (DOEE) has been investigating contamination through the Anacostia River Sediment Project (ARSP). The study area is the nine-mile tidal Anacostia River, Kingman Lake, and Washington Channel. Elevated concentrations of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and pesticides present in sediments pose a risk to aquatic wildlife and people. The project is on track for a 2020 Interim Record of Decision (ROD) that will identify and start a provisional cleanup remedy for 11 Early Action Areas (EAAs) within the study area (anacostiasedimentproject.com/).

PCBs, a mixture of chemicals no longer produced in the U.S. but still used in electrical equipment, are the major contaminants of concern. PCBs are probable cancer-causing agents (atsdr.cdc.gov/toxfaqs/tfacts17.pdf). The public is exposed mainly by eating contaminated fish or shellfish. Based largely on PCBs, a Public Health Advisory warns people to avoid or limit their consumption of certain fish caught from District of Columbia waters (doee.dc.gov/sites/default/files/dc/sites/ddoe/service_content/attachments/Fish%20Advisory%202-2-2016.pdf).

PCBs continue to enter the study area from tributaries and sewer outfalls. The three highest tributaries in terms of sediment load *(amount of material carried by a stream)* are Northwest Branch (50 percent of all tributaries), Northeast Branch (33 percent) and Lower Beaverdam Creek (14 percent).

Photos: Fred Pinkney/USFWS

Figure 1. A: Mummichog (left-female, right- male) B: Banded killifish (left male, right female)

In terms of PCB load, however, Lower Beaverdam dominates, contributing about 75 percent of the tributary load. This is due to higher concentrations of PCBs (data from 2017; pubs.usgs.gov/sir/2019/5092/sir20195092.pdfin).

The U.S. Fish and Wildlife Service Monitoring Study

The U.S. Fish and Wildlife Service, Chesapeake Bay Field Office (CBFO) teamed with DOEE for this monitoring program. Mummichogs *(Fundulus heteroclitus)* and banded killifish *(F. diaphanus)* **(Figure 1)**, were chosen because they spend their lives within home ranges of less than one half mile. Their lifespan is usually only 3 years. Therefore, the fish we sampled were exposed close to where they were caught and the contaminants that built up in their bodies are a measure of the past 2 or 3 years. Commonly eaten fish species were not included in the study due to their larger home ranges. For instance, blue catfish likely move between the Potomac and Anacostia Rivers; in one study Potomac River blue catfish moved from 15 to 70 miles.

Our main goal is to measure PCBs, chlordane and other pesticides in these fish before the cleanup starts. In 2018 and 2019, using traps and seines **(Figure 2),** we collected these

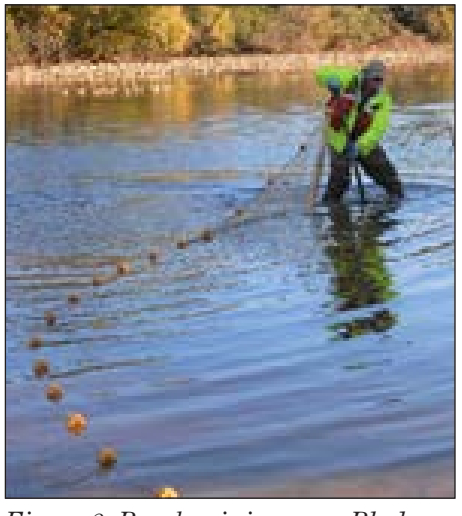

Figure 2. Beach seining near Bladensburg Waterfront Park

fish species across the length of the Anacostia River, in Kingman Lake, and in the five major tributaries **(Figure 3-next page)**. The target species were not found in Washington Channel. For each composite sample, we pooled similar-sized individuals to get about 20 grams of whole-body tissue for chemical analysis. We also collected from the Potomac River between Key and Chain Bridges as a reference (or background) location. This area was previously used as background for sediments in the ARSP Remedial Investigation.

Findings

We compared median concentrations of PCBs **(Figure 4)** and chlordane across locations.

PCBs: **(Figure 4)**
Highest: Both Lower Beaverdam Creek locations had far higher PCBs **(719 to 1055 ppb)** than the other tributaries **(48 to 273 ppb)**; statistics described in report.
Moderate: Most mainstem Anacostia River locations and Kingman Lake **(77 to 460 ppb)**
Low: Northwest and Northeast Branches, Potomac River: **(29 to 90 ppb)**

Chlordane:
Highest at Poplar Point **(278 ppb)**, may reflect high concentrations in nearby sediments

Other mainstem Anacostia and Kingman locations:
44 to 127 ppb
Tributaries: **51 to 156 ppb**
Lowest in Potomac River:
29 to 37 ppb

Conclusions

- Lower Beaverdam Creek has far higher PCB concentrations than any other location. This is consistent with other studies showing that it is a major current source of contamination.
- Chlordane is more evenly distributed among the tributaries. The highest concentration at Poplar Point (A1) may reflect nearby sediment contamination.
- The Potomac River above Key Bridge is a suitable reference area.
- ***Monitoring these fish species is key to evaluating the success of the ARSP cleanup. Monitoring can be applied at Early Action Areas, Potential Environmental Cleanup Sites (PECS), and tributaries. Future surveys will be coordinated with the timing of clean-up actions.***

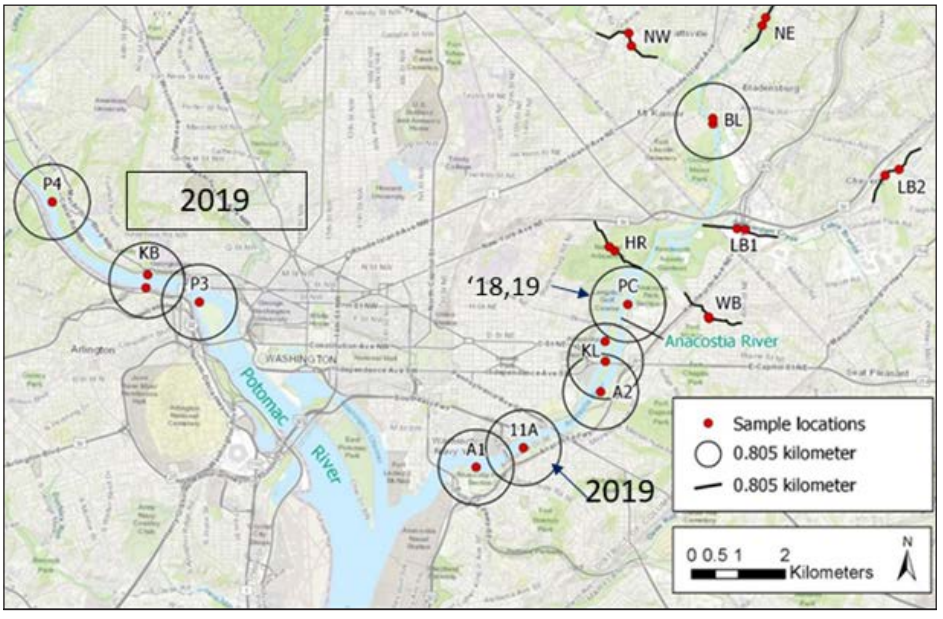

Figure 3. Sampling locations: ***Tributaries:*** *NW Northwest Branch, NE Northeast Branch, LB Lower Beaverdam Creek, HR Hickey Run, WB Watts Branch;* ***Mainstem and Kingman:*** *BL Bladensburg, PC Pepco Cove, KL Kingman Lake, A2 Above CSX, 11A Between 11th and Sousa, A1 Poplar Point;* ***Potomac:*** *P3 Theo. Roosevelt Island, KB: Above Key Bridge, P4 Fletcher's Cove*

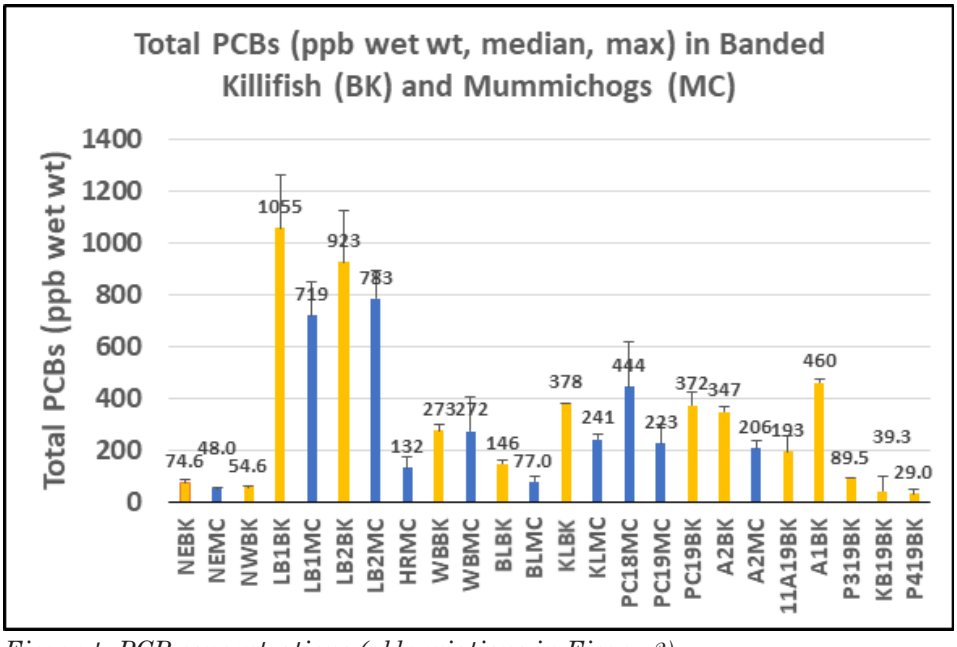

Figure 4. PCB concentrations (abbreviations in Figure 3)

Plans for 2020

CBFO will collect and analyze about 100 more composite samples of these species for the same contaminants. We will sample from most of the current locations, including Key Bridge as background, to provide a 3-year precleanup baseline. We will also determine if fish health can be evaluated by studying the microscopic structure of organs such as liver and gonads. We will analyze whether the contaminant residues are associated with organ damage that may harm fish.

For More Information:

Pinkney, Alfred E. and Elgin S. Perry. 2020. *Polychlorinated Biphenyls and Organochlorine Pesticide Concentrations in Whole Body Mummichog and Banded Killifish from the Anacostia River Watershed: 2018-2019.* U.S. Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD. CBFO-C20-01. (anacostiasedimentproject.com/library)

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