Histopathology of Brown Bullhead (Amietius nebulosus), Smallmouth Bass (Micropterus dolomieu), and Yellow Perch (Perca flavescens) in Relation to Polychlorinated Biphenyl (PCB) Contamination in the Hudson River

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ABSTRACT

From the 1940s through 1977, at least 566,000 kg of polybrominated biphenyls (PCBs) were released into the Hudson River from General Electric manufacturing plants in Hudson Falls and Fort Edward, New York, USA. In 1984, the U.S. Environmental Protection Agency (EPA) identified a nearly 132 km section of the Hudson River as PCB Superfund Site. In this study, we describe a Fish Health Assessment study, part of the Natural Resource Damage Assessment (NRDA), evaluating the prevalence of histopathologic lesions in resident lake- and river-dwelling species, specifically brown bullhead (Amietius nebulosus), smallmouth bass (Micropterus dolomieu), and yellow perch (Perca flavescens) in the Hudson River. Twenty-five sites were selected from a list developed by the Nature Conservancy and the International Joint Commission (IJC) for riverine and lake sites. Fish were collected in May 2019 at each site using a minnow seine from a 10-meter-long boat. Fish were measured and weighed, and tissue samples were collected from the liver, kidney, and muscle of each fish. Gross lesions were evaluated using a light microscope. Histopathologic lesions, defined as lesions that were present at the time of death or during life, were classified based on previous studies.

METHODS

Field work

Field work included electrofishing and trip setting for four sites (Fig. 1).

1. Federal Dam Pool (FD) – 1560 kg of PCBs were released into the Federal Dam Pool, Glen Falls, NY, above the plants. This site was used as a reference location for studies of the more severe contamination associated below FD.

2. Thompson Island Pool (TP) – from Federal Dam (FD) to Thompson Island Dam (TD), about 120 km in length. This site was used as a reference site for TP.

3. Silverpoint Dam (ST) – 292 kg of PCBs were released into the Silverpoint Dam, a high-contamination area.


RESULTS AND DISCUSSION

Data analysis

U.S. Environmental Protection Agency (EPA) estimated that from 1940s through 1977 at least 566,000 kg of polybrominated biphenyls (PCBs) were released into the Hudson River from General Electric (GE) PCB-releasing manufacturing plants in Hudson Falls (River Kilometers (RK) 14 to 25) and Fort Edward (RK 54 to 61). The Natural Resource Damage Assessment (NRDA) is the process of assessing, compiling, and analyzing information, statistics, or data through probative methodologies to determine the damage caused to natural resources or the release of a hazardous substance or debrisage of oil. The goal of NRDA is to restore injured natural resources. The Hudson River (NRDA) is being conducted by the Hudson-River Natural Resource Trustees, the National Oceanic and Atmospheric Administration (NOAA), the US Department of Interior (DOI) and the New York State Department of Environmental Conservation (NYSDEC).

HIWTRs are conducting a NRDA to identify the extent of natural resource injuries, methods for restoration, and the type and scope of restoration. In 2001, a Fish Health Assessment study (HIWTR) compared contaminated sites to reference sites to identify potential histopathologic lesions in fish from Hudson River areas. HIWTRs conducted a Health Assessment Study to determine the prevalence of histopathologic lesions in or associated with general development is associated with PCB exposure.

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