

Report on Turtle Sampling in Watts Bar Reservoir and Clinch River, May 1997

.....
Site: Oak Ridge Reservation

Conducted by: Tennessee Department of Environment and Conservation

Time period: 1996

Study area: Watts Bar Reservoir and Clinch River
.....

Purpose

The purpose of this study was to investigate levels of contaminants—especially polychlorinated biphenyls (PCBs)—in snapping turtles in the Watts Bar Reservoir and Clinch River/Poplar Creek water systems. The results of this study were used to assess exposure levels of people who might use the turtles for food.

Background

For more than 50 years, the U.S. Department of Energy's (DOE) Oak Ridge Reservation released radionuclides, metals, and other hazardous substances into the Clinch River and its tributaries. Subsequent studies conducted by DOE and the Tennessee Valley Authority (TVA) documented elevated levels of PCBs in certain species of fish in the Watts Bar Reservoir and Clinch River. As a result, the Tennessee Department of Environment and Conservation (TDEC) issued several consumption advisories on fish. Although noncommercial fishermen are known to harvest turtles, as well as fish, from the Watts Bar Reservoir, TDEC did not issue any consumption advisories on turtles. Since little information was available on contaminant levels

in turtles and previous studies from other states indicated that snapping turtles have a tendency to accumulate PCBs (for example, in their fat tissue), the Agency for Toxic Substances and Disease Registry's (ATSDR) health consultation on the Lower Watts Bar Reservoir recommended sampling of turtles for PCBs.

Study Design and Methods

To evaluate levels of contaminants in turtles, TDEC collected 25 snapping turtles from 10 sampling stations in the Watts Bar Reservoir and Clinch River between April and June 1996. As recommended by the U.S. Environmental Protection Agency (EPA), the turtles were euthanized by freezing. Fat tissue and muscle tissue were analyzed separately, as were eggs when present. The samples were processed according to EPA guidelines.

Muscle tissue, fat tissue, and eggs were analyzed for PCBs using EPA methods. TDEC also conducted a PCB-congener¹-specific analysis on the muscle tissue of two large turtles. To compare contaminant levels in turtles to contaminant levels previously detected in fish, TDEC analyzed turtle muscle tissue for metals and pesticides. Mercury analysis was performed on 13 turtles according to EPA method 245.6, and the remaining metals were analyzed using EPA method 200.1.

Specific pesticides and organic compounds analyzed for included chlordane, DDE, DDT, endrin, hexachlorobenzene, lindane, methoxychlor, and nonachlor. Specific metals analyzed for included arsenic, cadmium, chromium, copper, lead, and mercury.

¹ PCBs are mixtures of up to 209 individual chlorinated compounds referred to as congeners. For more information, see ATSDR's toxicological profile for PCBs at <http://www.atsdr.cdc.gov/toxprofiles/tp17.html>.

Study Group

Levels of contaminants were measured in turtles only. Human exposure levels were not investigated.

Exposures

No human exposure was assessed in this study.

Outcome Measure

Health outcomes were not evaluated.

Results

PCB concentrations were highest in the fat tissue of snapping turtles. Levels in fat tissue, muscle tissue, and eggs ranged from 0.274 parts per million (ppm) to 516 ppm, 0.032 ppm to 3.38 ppm, and 0.354 ppm to 3.56 ppm, respectively. Mean values for fat and muscle tissue were 64.8 ppm and 0.5 ppm, respectively.

Ten PCB congeners considered of highest concern by EPA were identified in the two turtles analyzed for congeners. The distribution of congeners in the two turtles was similar, but the concentrations varied considerably. The turtle with the higher concentrations of PCB congeners was caught from Poplar Creek.

Mercury and copper were the only metals detected in muscle tissue. Mercury concentrations were below the U.S. Food and Drug Administration (FDA) guidance level of 1.0 ppm, and ranged from 0.1 ppm to 0.35 ppm. Copper concentrations ranged from 0.2 ppm to 2.6 ppm.

Of the pesticides studied, *cis*-nonachlor, *trans*-nonachlor, and endrin were detected. They were detected at low levels: 0.001 ppm to 0.036 ppm for *cis*-nonachlor, 0.003 ppm to 0.045 ppm for *trans*-nonachlor, and 0.043 ppm to 0.93 ppm for endrin.

Conclusions

Turtle consumption practices should be further investigated before conducting quantitative assessments to evaluate risks to human health. In particular, it is important to determine which parts of the turtle are most commonly consumed (for example, fat or muscle tissue), as well as the frequency of consumption.

While it appears that PCBs concentrate at higher levels in turtles than in fish, caution is advised in comparing fish results to turtles. Unlike the turtle studies, previous fish studies did not analyze muscle tissue and fat tissue separately.

When assessing potential human health risks related to PCBs, it is important to consider the uncertainty in the toxicity values for PCBs. Because there are no toxicity values for individual PCB congeners, uncertainty in the toxicity of PCB mixtures remains.