Do PCBs have an effect on Atlantic and Shortnose Sturgeon populations in the Hudson River?

(Background Image: Billharz, 2020, Hudson Rive

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Background:

(Fisheries, NOAA, Atlantic Sturgeon)

The Hudson River is a lush aquatic ecosystem home to lots of amazing fish species and the two of them are the Atlantic and Shortnose Sturgeons, which are historic, but endangered creatures. Big industries like General Motors dumped tons of PCBs into the water in the mid to late 1900s. This was seen as a threat to the fish, because they have a much longer spawning interval than average, making their populations sensitive to any disruption. Therefore, much monitoring and testing of the fish populations must be done, since these precious fish species are so sensitive to not only the PCBs, but the dredging that occurs to get rid of the PCBs can affect the fish.

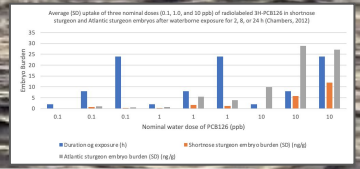
Method / Study Design:

(Fisheries, NOAA, Shortnose Sturgeon)

This research was conducted by esteemed scientists (Chambers, 2012) who took ten seven-day old embryos of shortnose sturgeon and ten five-day old embryos of Atlantic Sturgeon and placed them in separate beakers with various levels of PCBs in the water to observe the chemical's effects on the embryo. The hatched eggs were separated into different containers for individual imaging or group analysis. Figure A. is from the Chambers study that depicts hatchling survival rates as the concentration of PCBs rise. The A & B graph is for the shortnose sturgeon while the C & D graph is for the Atlantic sturgeon. This is key, because it allows for more comparing and contrasting between the two species and how they react to this chemical. Using more data from that study, I created a graph, Figure B., on how higher concentrations of PCBs cause more burden on the fish. This study is applicable to the Hudson River's situation because it uses various randomization techniques to prevent any outside variables from affecting the data, while providing unbiased results

Analysis:

Figure B.



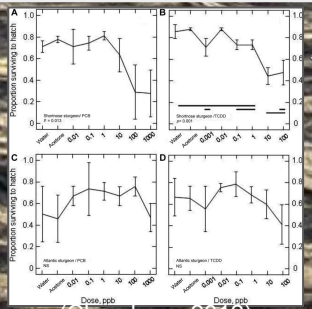
The independent variable is PCB concentration while the dependent variable is proportion of the embryos that hatch. Since both these variables are continuous, this means a Regression Statistical Analysis test is required to draw conclusions on any type of findings. Researchers must also analyze the morphological characteristics of these hatchlings after they grow up, as these traits could prove fatal to those growing populations, or allow for the fish to grow an immunity to PCBs effects. Overall, as the concentration of PCBs rise, the Sturgeon populations decline. Since this species of fish isn't acclimated to many habitats, it's important to analyze how their polluted homes could affect their dying populations and alter the environment forever. This analysis allows for a broader understanding of the Hudson River ecosystem and threat of possible anthropogenic effects, as a whole.

Hypothesis & Prediction:

I hypothesize that there is a relationship between PCB levels and Sturgeon fish populations.

I predict that as PCB levels increase, the Sturgeon fish populations will decrease, because the PCBs greatly affect their early-life stages. I also predict that the dredging done to decrease the PCB levels will also cause a decrease in Sturgeon fish population, because the dredging operation will damage the eggs and larvae of the fish, as well as their habitats.

Figure A.



(Chambers, 2012)

Citations:

Chambers, R. C., Davis, D. D., Habeck, E. A., Roy, N. K., & Wirgin, I. (2012, October). Toxic effects of PCB126 and TCDD on shortnose sturgeon and Atlantic sturgeon. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4051353/

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("Fish Toxicity" New York State Department of Conservation)