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An Investigation into The Effect of Polluted Bodies of Water on the Food Source of Shore Birds

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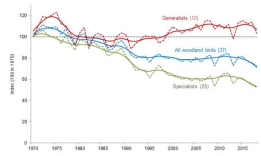
Background Information

- There are approximately 217 shorebird species world wide 52 of which can be found in the United States (O'Brien et. Al, 2006).
- Almost 100 percent of these shore birds have been found to interact with pollution at some point in their life.
- Many studies have stated that the United States and China lead the world in total pollutants.
- The pollutants causing the most damage is said to be heavy metals which is being found in a majority of shorebirds tested (Pandiyan et. Al, 2020).
- Heavy metals like lead have been found to negatively affect shorebirds livers and bones (Kim et. Al, 2007).

Expected Results

- At least 75% of food sources will be contaminated with heavy metal pollution
- Shore birds that are specialists will see a shift in diet
- Specialist will see approximately a 60% decrease in population size over the next 30 years



Specific Aim

- The goal or specific aim of this research is to gain better knowledge into how big of an effect heavy metal pollution is having on the not only the environment but also shorebird species and their food source. Shorebirds are a great climate change indicator and with this new knowledge we can show why they need to be protected even more.

Relevance

- Pollution has been on of the biggest causes of shorebird deaths which can be attributed to humans (Newman et al. 2007)
- The United states and china both find around 50 species of shorebirds along their coasts which is equivalent to almost 25% of the world populations of shorebirds.

Proposed Methods

Capture/take sample of most common food sources of shorebirds across the United States such as fish and other aquatic invertebrates

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Draw blood/swab for heavy metal contaminants such as lead and cadmium

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Measure population decrease in these food sources such as fish by finding out the amount of fished counted in the the area/distance traveled and dividing the two

↓

Run ANOVA test for comparison between heavy metals and food source abundance

Current Literature

- **Quantitative Data on Water Pollution**
  - China on average in the 1990's dumped approximately 300 - 400 tonnes of pollution (Daoji, Daler, 2004).
  - Trace elements of heavy metals can reach up to 40 km away from the original contaminant site (Cain et. Al, 1992).

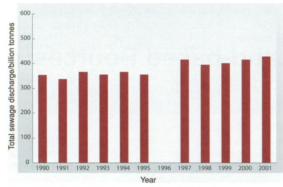
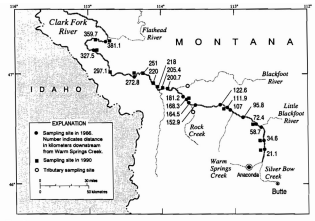


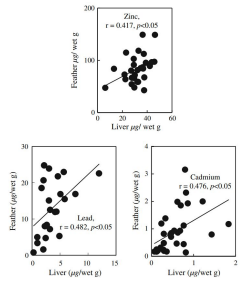
Figure 1. Total sewage discharge variations in China from 1990 to 2001 (Township enterprise discharge were not included in the data from 1990 to 1995, because they were not surveyed before 1996) (5–16).



Clark Fork River drainage basin in Montana, USA. Station locations are designated by distance in river kilometres downstream from Warm Springs Creek.

- **Heavy Metals on Shorebirds**
  - Heavy metals such as lead have been found in the feathers of many shore birds and is even shown to be positively correlated to lead in the liver (Kim et. Al, 2008).
  - Heavy metals were found to affect the reproductive success of the offspring (Hargreaves et. Al, 2010)

Species	Reproductive success			Toxicological sampling			
	Nests found	Nests hatched	Non-viable eggs	Eggs	Females	Males	Complete families
Black-bellied plover	15	4	1	13	7	5	5
Ruddy turnstone	29	20	4	27	21	15	10
Semipalmated plover	8	6	1	6	6[a]	6	6



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