

# A bioassessment of the fish populations in the Ohio River near Zimmer power plant

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## Abstract

The primary objective of this annual study was to determine the potential impacts of the Zimmer coal-burning power plant on the Ohio River ecosystem. Physiochemical and biological data were collected from upstream control sites and downstream experimental sites. Fish, as bioindicators, were collected by the use of electrofishing, hoop nets, and gill nets. The modified Ohio River Fish Index (mORFIN) was calculated. Data collected downstream and upstream were comparable in terms of abundance, biomass, and the mORFIN. The physiochemical data were within acceptable water quality standards. The physiochemical data were similar across all sites and followed the typical seasonal pattern for the River. Overall, the results suggest that the Zimmer power plant has had no significant impact on these areas of the Ohio River.

## Introduction

- The Ohio River has historically served as an important resource for transportation and the development of the interior United States. Currently, it serves as a major navigation route for commercial products, such as coal and grain (Figure 1)
- Over the past 150 years, the Ohio River has undergone degradation from coal mining that occurs near the riverbank (Moore 1971).

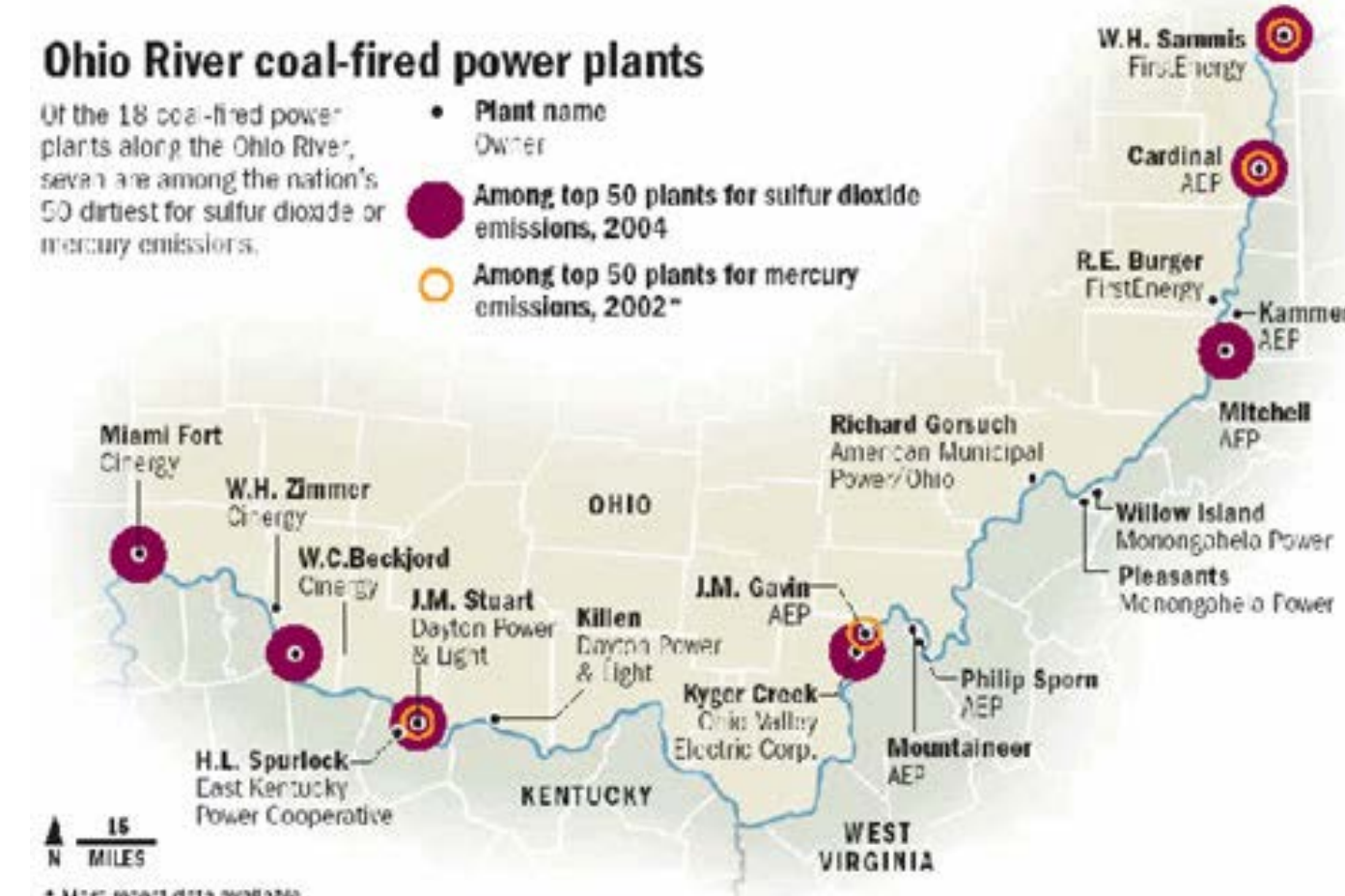


Figure 1. Map of Ohio River coal-fired power plants.

- Long term monitoring of the Ohio River, specifically surrounding the 49 power plants along its banks is important for influencing best management practices to improve or maintain water quality (Lohner and Dixon 2013).
- The results from this study were combined with the previous years to assess the status of the Ohio River and document any long-term changes and trends.
- The main objective of this research was to collect and assess physiochemical variables and quantify fish populations to determine potential impacts of the power plant on the Ohio River.

## Study Area

- The Zimmer power plant is located on the East bank of the Ohio River (RM 444) in Clermont County, Ohio.

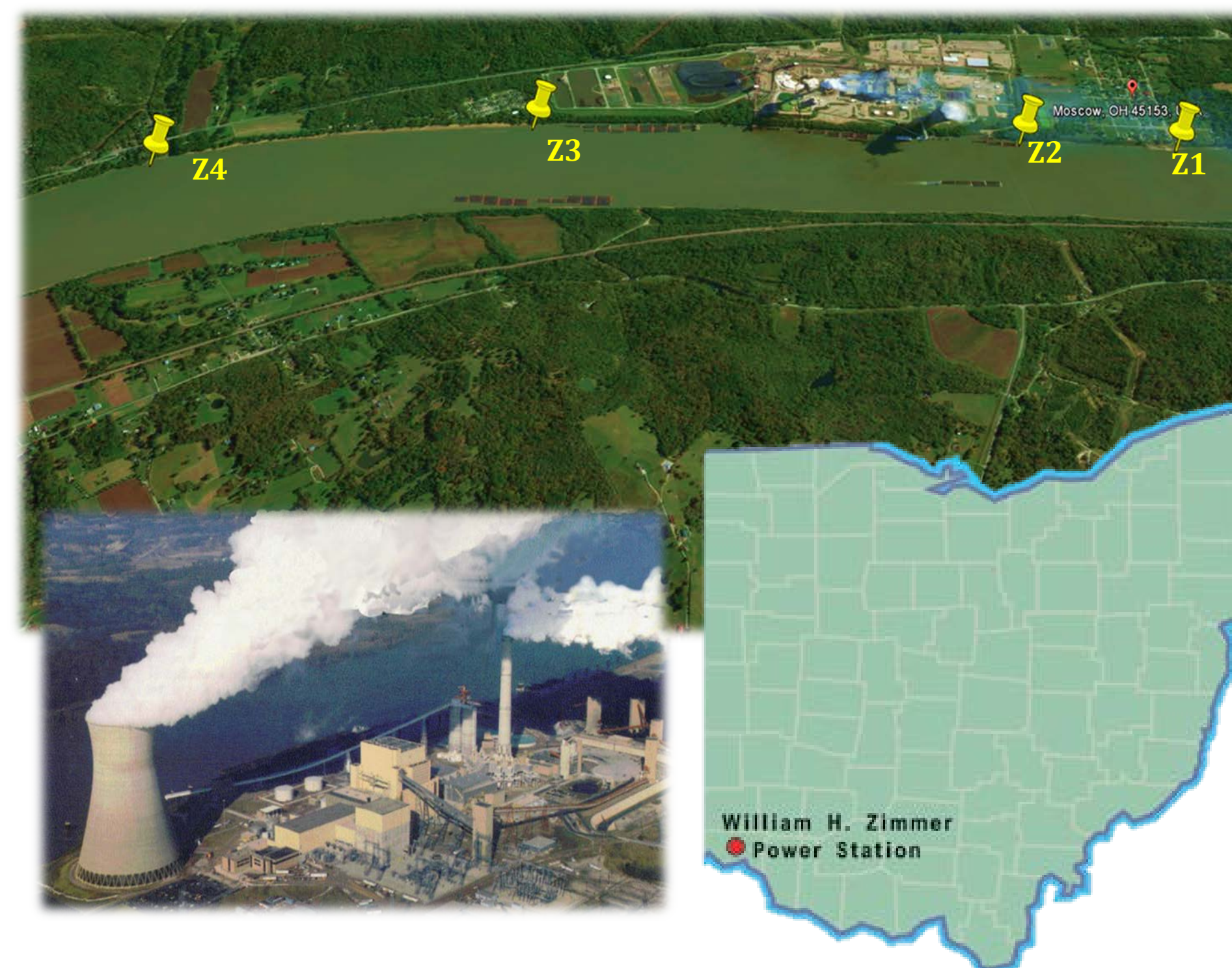


Figure 2. Zimmer Power Plant and surrounding study sites. Z1 & Z2 are upstream and Z3 & Z4 are downstream.

## Methods

**Physiochemical:** parameters including conductivity, dissolved oxygen, pH, water temperature, air temperature, and Secchi depth were measured twice daily at each of the four sites (Table 1). The Ohio River stage levels (ft) were also recorded twice daily, provided by the National Weather Service.

**Gill nets:** Four gill nets, 25 feet in length, were set parallel to the shoreline at each site on a weekly basis and checked twice daily, once in the morning and once at night.

**Hoop Nets:** Two hoop nets, small and large sizes, were set at each site on a weekly basis and checked twice daily, once in the morning and once at night.

**Electrofishing:** Occurred once at each site throughout the sampling season, starting at ~10:00pm (Figure 3). The DC method was used, and an amplitude of 8.0 was maintained. The sampling lasted 45-60 minutes during which time the boat moved parallel along the shoreline, covering a 500 meter area. All boat accessible habitats were sampled.



Figure 3. Sampling fish populations on the Ohio River via electrofishing.

## Results

- Conductivity was significantly higher in downstream sites ( $n = 62, p < 0.05$ ).
- Secchi depth was significantly lower in the furthest downstream site ( $n = 59, p < 0.05$ ).

Site	Air Temp (°C)	Water Temp (°C)	Dissolved Oxygen (mg/L)	pH	Conductivity (µS/cm)	Secchi Depth (cm)
Z1	25.1	24.9	7.6	7.6	345.9	73.2
Z2	24.9	24.9	7.7	7.6	384.4	74.4
Z3	24.8	24.9	7.4	7.6	365.0	62.9
Z4	24.3	25.0	7.1	7.6	379.3	71.1

Table 1. Physiochemical data for study sites.



Figure 4. Paddlefish caught in a gill net

- The fish population data had no observable difference between upstream versus downstream sites (Figure 5).
- Longnose Gar (*Lepisosteus osseus*) and channel catfish (*Ictalurus punctatus*) were the most abundant species caught during the sampling period (Figure 5).

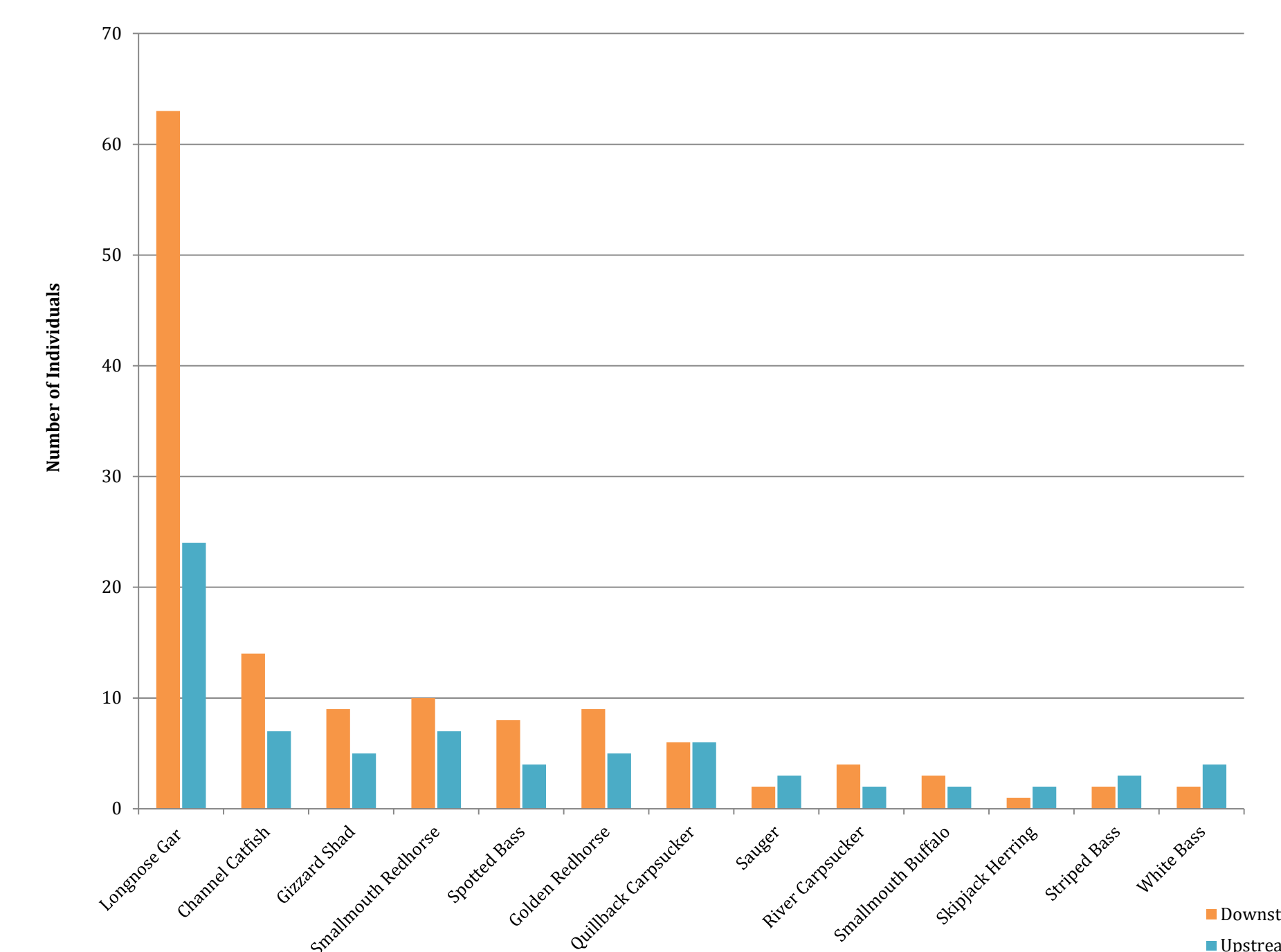


Figure 5. Gill net species abundance around Zimmer Plant.

## Conclusions

- Similar to previous years, no significant impacts to the Ohio River were detected.
- The significant difference in conductivity and Secchi depth was most likely due to the power plant effluent near Z3 and increased barge traffic.
- The ORFIN scores indicated a "good" rating of the Ohio River and demonstrates drastic improvements of water quality based compared to historical data (Tables 2, 3).

Rating	ORFIN Score	Site	ORFIN Score	mORFIN Score	Rating
Poor	13-30	Z1	57.78	36.22	Good
		Z2	53.74	34.92	Good
Average	30-40	Z3	54.83	29.74	Fair
		Z4	58.21	33.63	Good

Table 2. ORFIN index Table 3. ORFIN scores and rating index

- Because there are few large rivers, there is a great need to not only protect them, but to understand the complex biological interactions and the effects human activity may be having on them.
- Future studies will consider collecting GIS data and incorporate spatial analysis techniques to analyze ecological variances related to proximity to power plants.

## Literature Cited

- Lohner T. and Dixon D. 2013. The value of long-term environmental monitoring programs: an Ohio River case study. *Environ Monit Assess.* 185: 9385 – 9396.
- Moore, B. 2006. The distribution of Pennsylvanian-age coal particles in recent river sediments, Ohio River, Kentucky, as age and sediment rate indicators. *Sedimentology.* 17: 135 – 139.

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## For further information

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