

The Effect of Lead on Fathead Minnow Reproductive Behaviors

Introduction

- The purpose of this project was to see how lead affects fathead minnow’s reproductive behavior.
- The first source used was, *Lead effects on the predictability of reproductive behavior in fathead minnows (Pimephales promelas)*, which gave an abstract about the same experiment. *“Previous research has found that Pb decreased the time spent in displaying specific reproductive behaviors in male minnows.”*
- The second source was a video of lead exposed minnows from the UWM. The video had an overview with information that helped support the hypothesis. *“Lead exposed minnows. Male has no vertical banding, small tubercles and little to no activity at the ceiling of the breeding chamber; female outside breeding chamber; male goes toward female and spends much time outside the chamber.”*
- The third source was *Lead at Superfund Sites: Human Health*, which gave a list of found effects of lead on humans. *“In adults, lead poisoning can cause..... reproductive problems (e.g., decreased sperm count.* The reason for doing this was to observe the effects of lead on fathead minnows.
- The hypothesis used was if the tank was exposed to lead, then the fathead minnows would show less reproductive behaviors. This would be because of the lead taking effect on the fish, causing them to become lethargic.
- The research done was to help with the study of lead poisoning.

Citations:

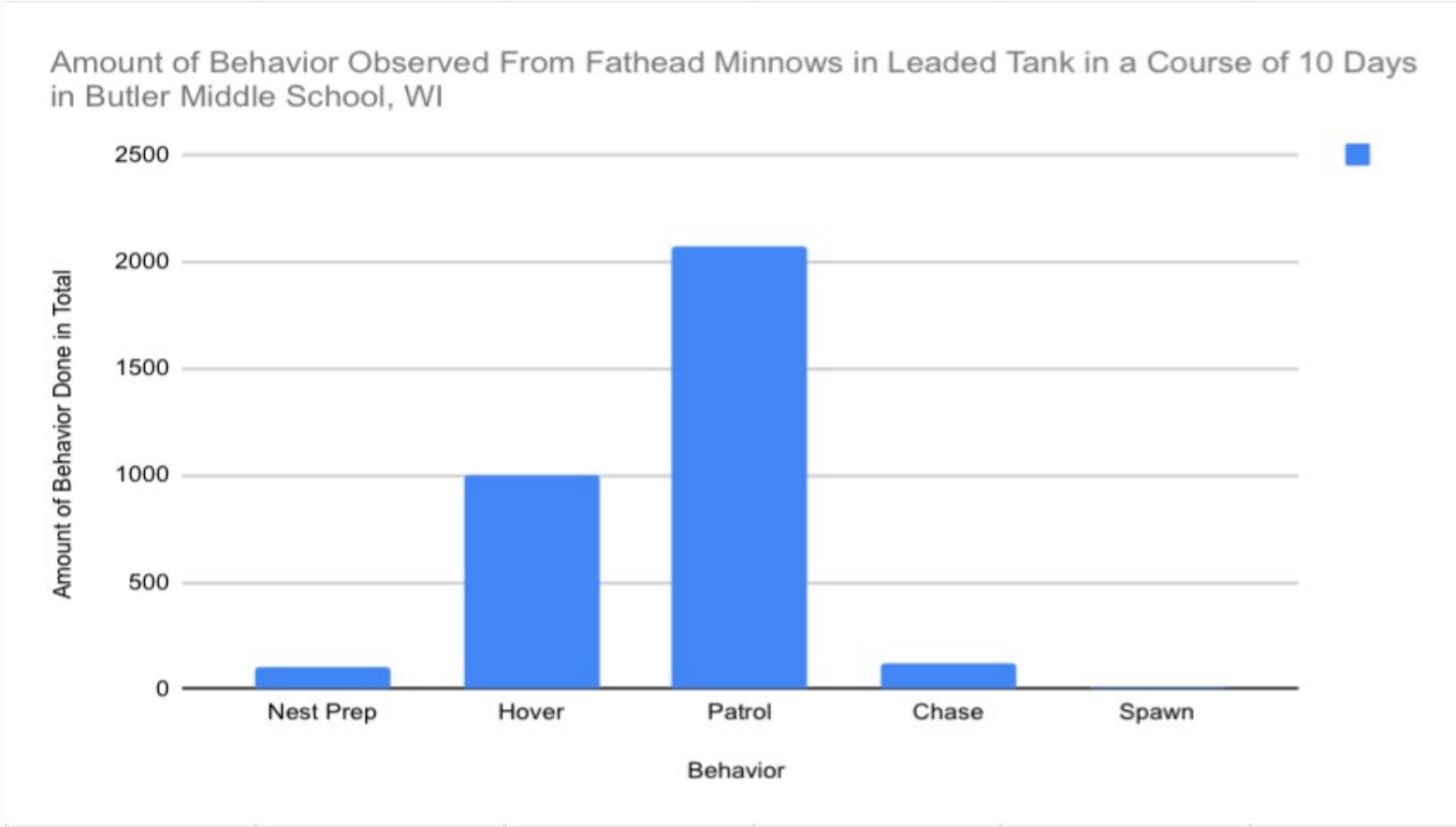
Alados, C. L., & Weber, D. N. (1999). *Lead effects on the predictability of reproductive behavior in fathead minnows (Pimephales promelas)*: A mathematical model. *Environmental Toxicology and Chemistry*, 18(10), 2392–2399. <https://doi.org/10.1002/etc.5620181038>

US EPA, O. (2015, March 26). *Lead at Superfund Sites: Human Health*. Retrieved from US EPA website: <https://www.epa.gov/superfund/lead-superfund-sites-human-health>

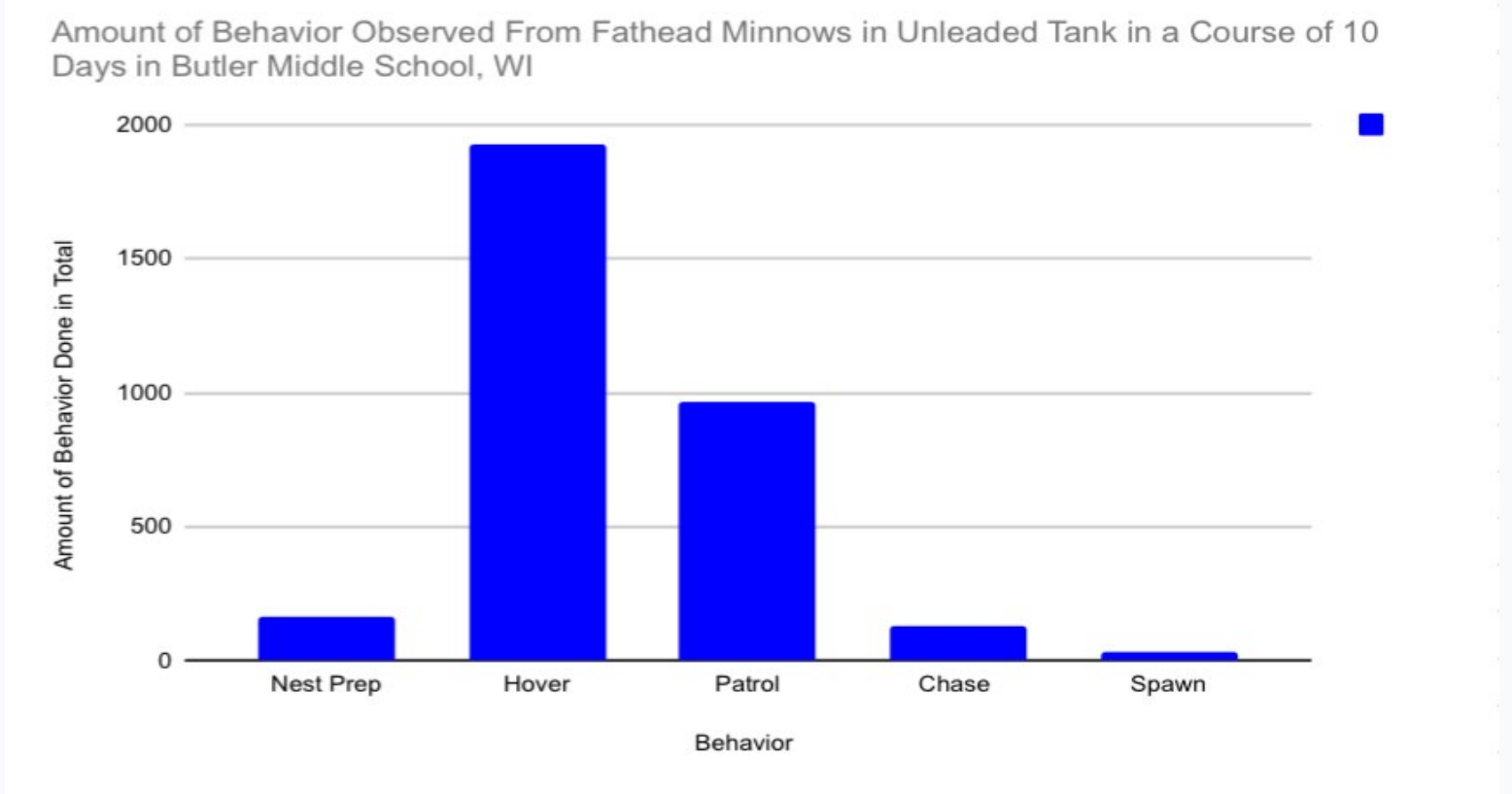
SEPA - rb - lead - lead exposed minnows from L&S @ UWM on Vimeo. (n.d.). Retrieved January 12, 2022, from player.vimeo.com website: <https://player.vimeo.com/video/47869281>

Results

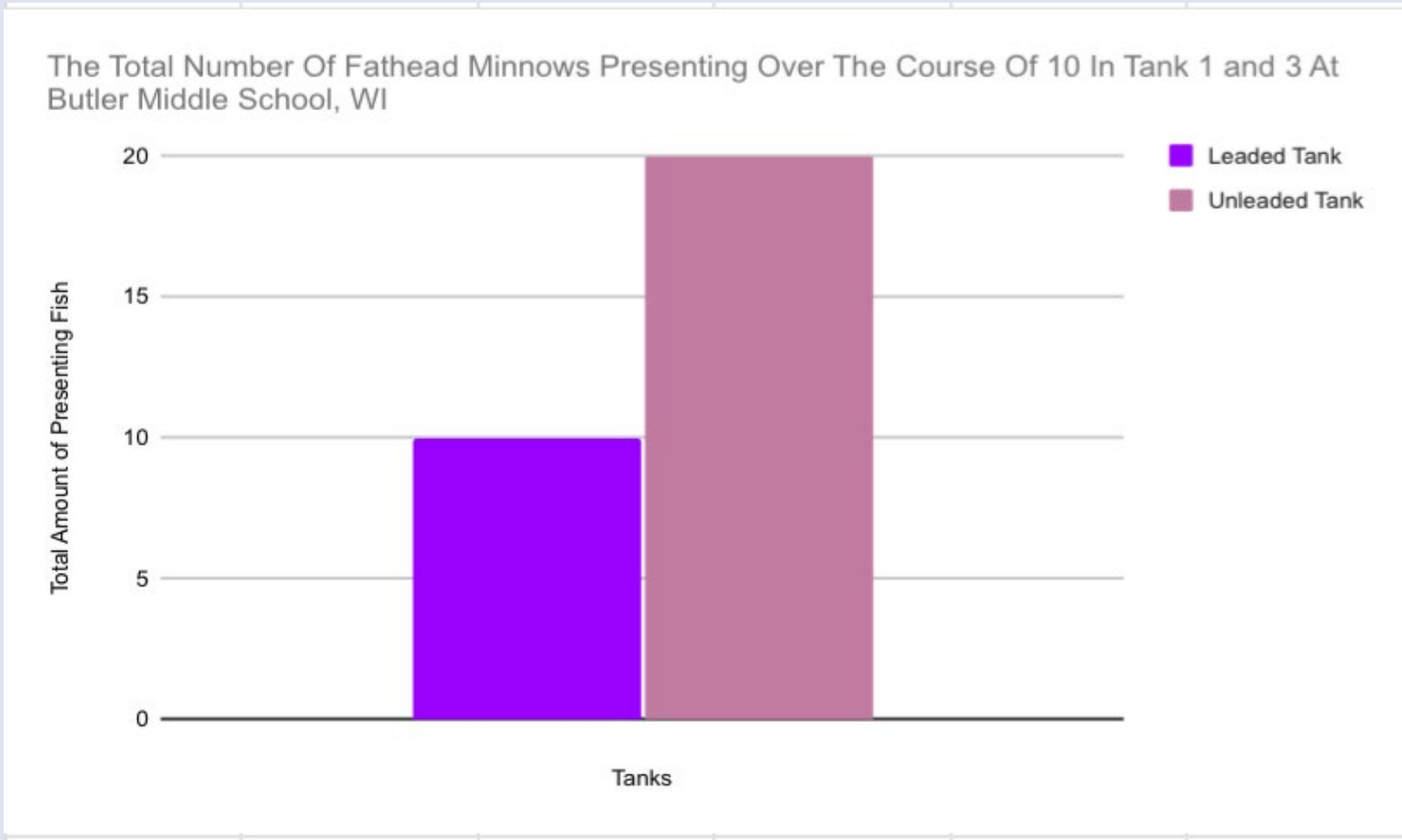
- The purpose of this experiment was to see the effects on Fathead minnow’s reproductive behavior when exposed to lead.
- There were two tanks observed, one with lead and one without. In the tanks there were two fish, one male and the other female, and the tank was split off into three sections.
- The independent variable was the lead the fish was exposed to. The dependent variable was the behaviors they showed.
- There were a few rules in place to ensure the safety of the fish and humans. Humans had to stay behind a taped line and stay quiet. These kept the fish from behaving abnormally.
- In this experiment there were many controlled variables such as; fish food, same type of fish, same type of tank, and same filter.
- Overall in the leaded tank, the male fish showed less reproductive behavior compared to tank 3(see graph 3
- Nest Prep: the leaded tank’s fish were observed doing that 104 times. In the unleaded tank they were observed doing that behavior 168 times.
- Hover: the leaded tank’s fish were observed doing that 1002 times. In the unleaded tank they were observed doing that behavior 1924 times.
- Patrol the leaded tank’s fish were observed doing that 2070 times. In the unleaded tank they were observed doing that behavior 963 times. That is a difference of 1107 and is the only behavior with a greater amount observed in the leaded tank than tank 3.
- Chase: the leaded tank’s fish were observed doing that 123 times. In the unleaded tank they were observed doing that behavior 128 times.
- Spawn: the leaded tank’s fish were observed doing that 8 times. In the unleaded tank they were observed doing that behavior 34 times.
- According to the T-Tests, the most significant behaviors observed were hover(0.00003372421753) and patrol(0.00005028662818).



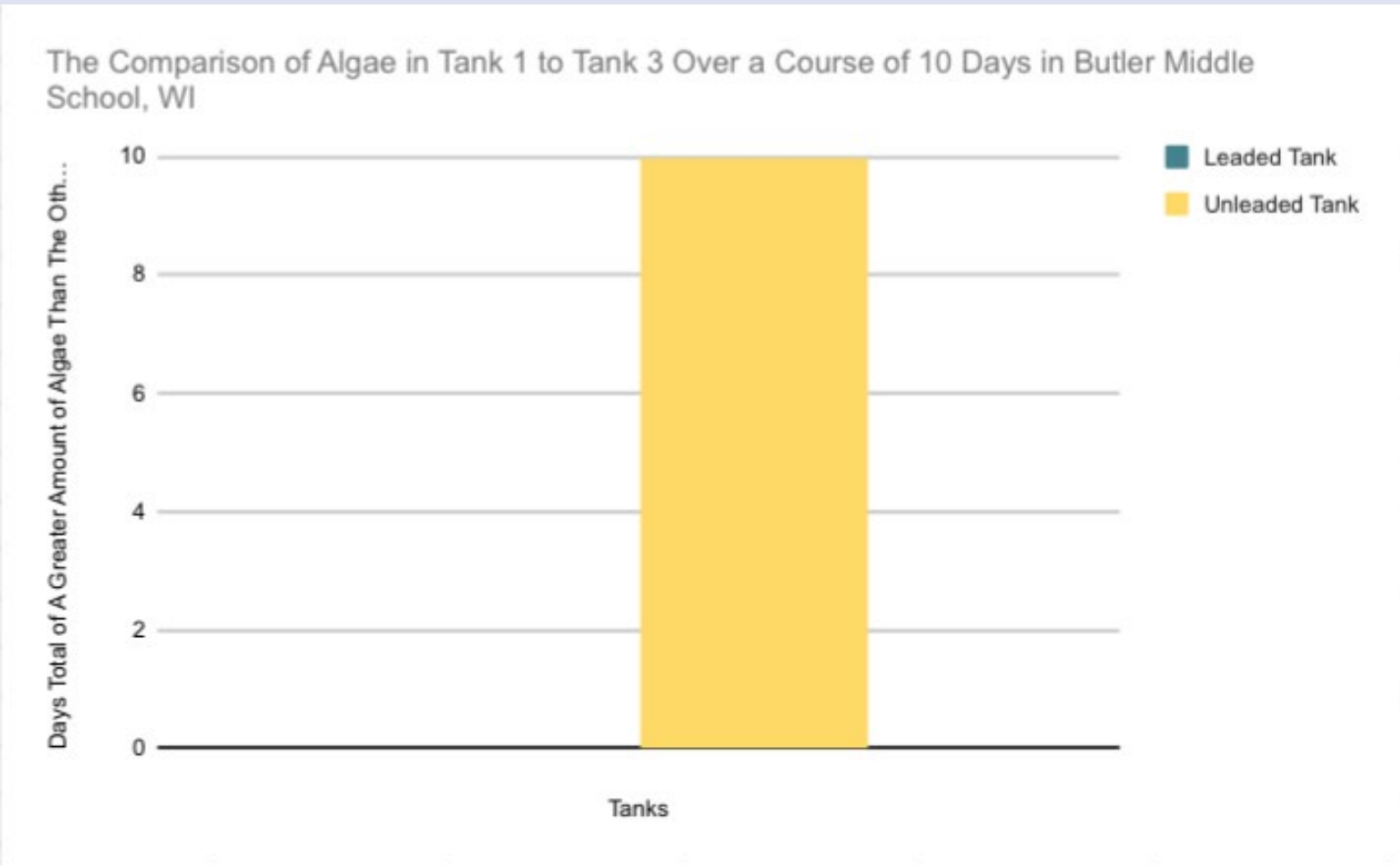
Graph 1: This graph shows the overall totals of the reproductive behaviors in the leaded tank over the course of 10 days.



Graph 2: This graph shows the overall totals of the reproductive behaviors in the unleaded tank over the course of 10 days.



Graph 3: This graph shows the overall totals of the presenting of males in the leaded tank and the unleaded tank over the course of 10 days.



Graph 4: This graph shows the comparison of algae in the leaded tank and the unleaded tank over the course of 10 days.

By: Kristen Ansley

Abstract

- The experiment conducted was testing the effects on lead.
- Out of the two observed tanks, one was exposed to lead. This experiment was made to observe lead affects fathead minnows compared to unleaded.
- Research previously found that humans and fish showed reproductive problems after exposure. (*Lead effects on the predictability of reproductive behavior in fathead minnows, Lead at Superfund Sites, and lead exposed minnows from L&S @ UWM on Vimeo*).
- Ten days were observed
- There was other data collected such as; algae growth and the amount of male fish presented.
- After data collection, the results showed that overall, the unleaded tank showed more reproductive behaviors (hover, patrol, nest prep, chase, spawn).
- The T-Tests showed that the significant data was hover and patrol.
- The unleaded tank also had a bigger comparison of algae growth than the leaded tank(see graph 4)
- The presenting data showed that the unleaded tank had double the presenting males as the leaded tank(see graph 3)
- The results provided have shown that the exposed fish lacked the will to reproduce.
- This data will help the environment because it shows how lead affects fish's ability or will to reproduce

Type of Behavior	T-Test Result	
	Hover	0.00003372421753
	Patrol	0.00005028662818
	Nest Prep	0.09125542678
	Spawn	0.2798145969
	Chase	0.9140442628

Discussion

- The previous research on the effects of lead contamination helped build the hypothesis. The research showed that humans get affected by lead and can have slowed reproduction.(*Lead effects on the predictability of reproductive behavior in fathead minnows, Lead at Superfund Sites, and lead exposed minnows from L&S @ UWM on Vimeo*).
- In the leaded tank, there was a smaller amount of reproductive behaviors.
- There was only one behavior that had a greater amount in the leaded tank than in the unleaded tank(see graph 1 and 2).
- There were a few recorded spawns, the unleaded tank had more than the leaded tank. This was true with the behaviors; patrol, nest prep, and chase.
- Another thing that was observed was the algae growth. Everyday the unleaded tank had more than the leaded tank (see graph 4). When there is a contaminant in an area, usually plants die off.
- The last piece of collected data was how many males were presenting. The unleaded tank had more than the leaded tank, which goes back to the humans reactions to lead(see graph 3).
- Many of the recorded hovers were when the fish was outside the chamber. This may have caused an error, but it proves the hypothesis right.
- Other errors may have occurred collecting data because working alone was difficult.
- The T-Tests that were conducted showed that hover and patrol were the most significant overall.
- The unleaded tank had more patrols than the leaded tank. The leaded tank overall had more observed hovers. It was observed that patrols also occurred when the fish was lazily laying out in the open. Hovering is in the breeding chamber, which is more reproductive than hovering.
- Overall, the collected data does prove that lead affects the reproduction with fathead minnows.