

The Effect of Lead on Sexual Behaviors and Characteristics of Male Fathead Minnows

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Abstract

Lead can be found in many things like paint in old houses, drinking water, and jewelry. With this being said, anyone can be unknowingly exposed to lead. It is easier to see the effect of lead exposure in children because children's brains and bodies are still developing. However, this doesn't mean that adults can't have any side effects to lead exposure. The purpose of this experiment was to observe how exposure to lead affected male fathead minnows mating behaviors and sex characteristics. Overall, this experiment showed that lead exposure does have an effect on the mating behaviors and sex characteristics. These findings could possibly show the underlying effects lead has on humans.

Introduction

Lead is an element which is toxic to humans. Lead exposure can be especially harmful for children because they are still developing. People can be easily exposed to lead because found in many man made items, it is also found in the environment via soil, water, and air. On a test done on adult male mice, the weight of the seminal vessel decreased on the mice exposed to lead. This could suggest that the lead exposure caused a change in testosterone secretion patterns in the mice (2). It was also found that lead exposure decreased the formation of sperm and hormones in human males (1). Knowing the effects of lead exposure can help raise awareness to the problem. It can be hypothesized that lead exposure will decrease the frequency of mating behaviors and presence of sexual characteristics in male fathead minnows because it might decrease hormone production.

Sources

1. Kumar, Sunil. "Occupational and Environmental Exposure to Lead and Reproductive Health Impairment: An Overview." *Indian Journal of Occupational and Environmental Medicine*, Medknow Publications & Media Pvt Ltd, 2018,
2. Pinon-Lataillade, G., et al. "Effect of Ingestion and Inhalation of Lead on the Reproductive System and Fertility of Adult Male Rats and Their Progeny." *Human & Experimental Toxicology*, vol. 12, no. 2, 1993, pp. 165–172.

Materials and Methods

We observed the secondary sex characteristics and mating behaviors of male fathead minnows. This was a blind experiment, and we had no knowledge of which tank was exposed to lead. Before the fish were brought to us, half of them were in tanks with 1ppm of lead nitrate. After we obtained the fish, the lead exposed and controlled fish were separated into two tanks. The tanks were divided into three parts with each part having one male and one female. To mimic the underside of rocks and logs, where female minnows normally lay their eggs in the wild, PVC pipes were cut in half into a dome shape and placed into each part.. While observing, we would record if the presence of certain sex characteristics on the male. We then would watch the males behavior for five minutes and record what we saw. Data was collected and standard error of the mean was found to see if there was a significant difference between the lead exposed and controlled fish.

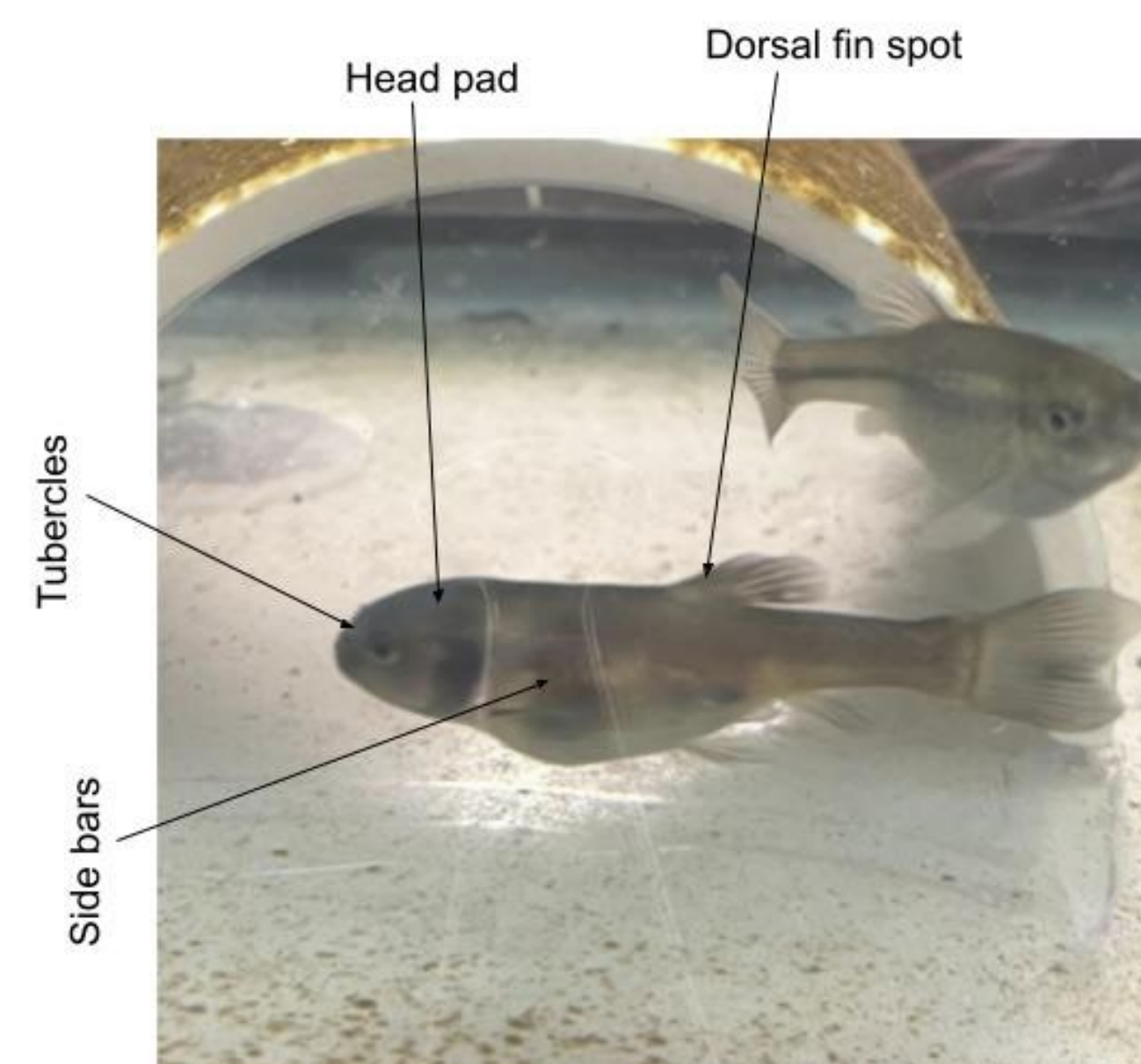


Figure 3: Control male 1A showing sex characteristics

Results

In figure 1, it shows the differences in mating behaviors between male fish exposed to lead and male fish not exposed to lead. Surprisingly, we observed that the lead tank had a higher amount of nest preps and hovers than the control tank. The control tank, however, did have higher amounts of patrols, chases, and spawns. The error bars showing the standard error of the mean don't overlap showing that the data is significantly different. Figure 2 shows the difference between the observed sex characteristics of the males. It can be seen that the male fish exposed to lead had less observable traits than the control group. The most noticeable difference is the number of males with side bars. In the control tank, all of the males showed that they had side bars. However, we observed that only one male in the lead tank had them.

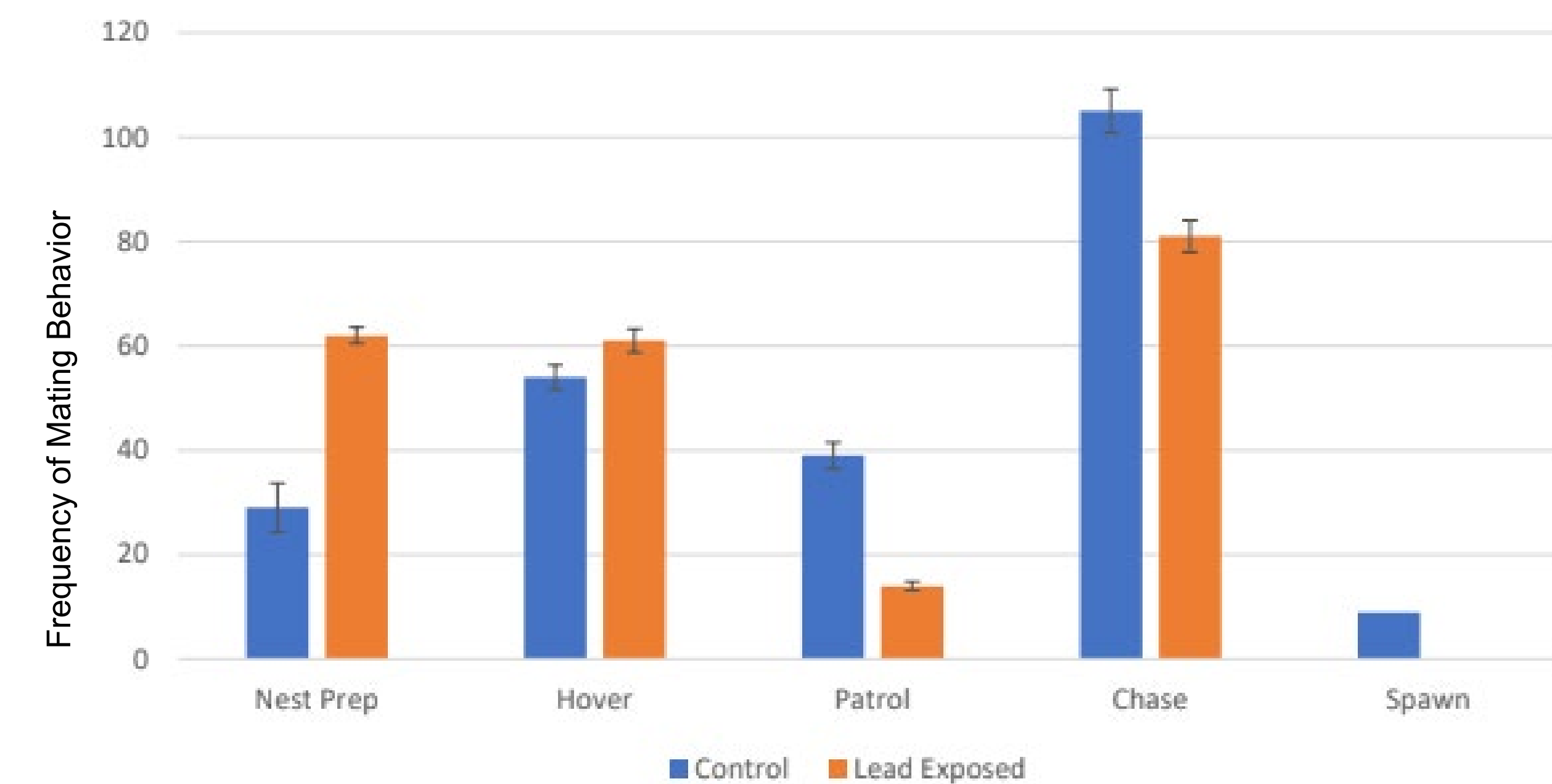


Figure 1

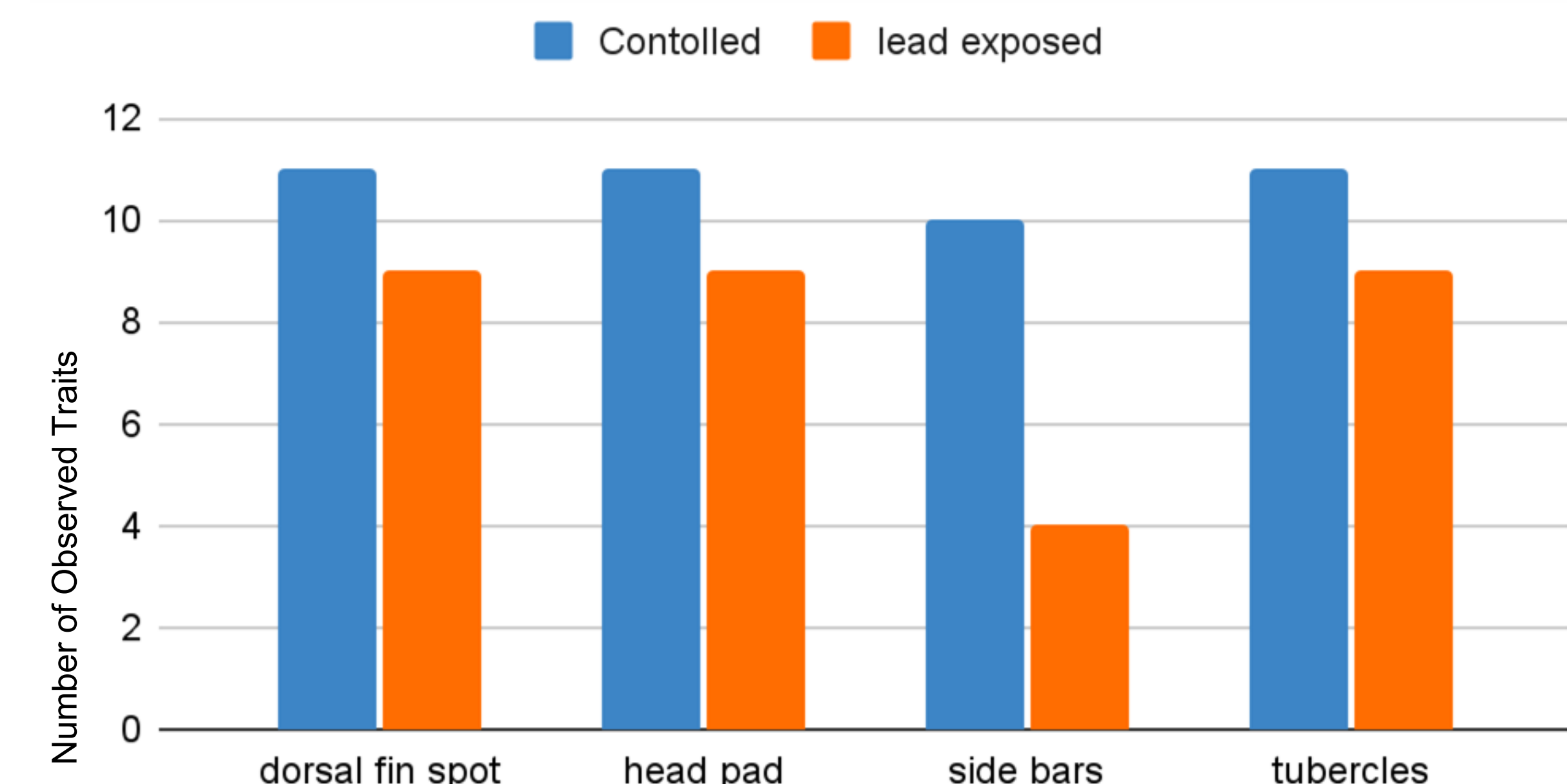


Figure 2

Discussion

Due to the data we collected, we reject our null hypothesis. It was shown that the male minnows in the lead exposed tanks expressed fewer sex characteristics than those in the control tank (figure 2). Along with that, lead exposed males, overall, showed less mating behaviors than those in the control tank (figure 1). This data helps add to existing research stating exposure to lead can decrease hormone production. It can also help us determine other effects lead exposure could have on humans. One thing that could have caused inaccurate results is not identifying a mating behavior correctly. We could have mistaken one thing for another occasionally. The next step in our research could be to observe the effects lead exposure has on younger fish and see how closely it relates to the effects lead exposure has on children.