The Effects of Oil Exposure on the Behavioral Lateralization of Bicolor Damselfish (*Stegastes partitus*)

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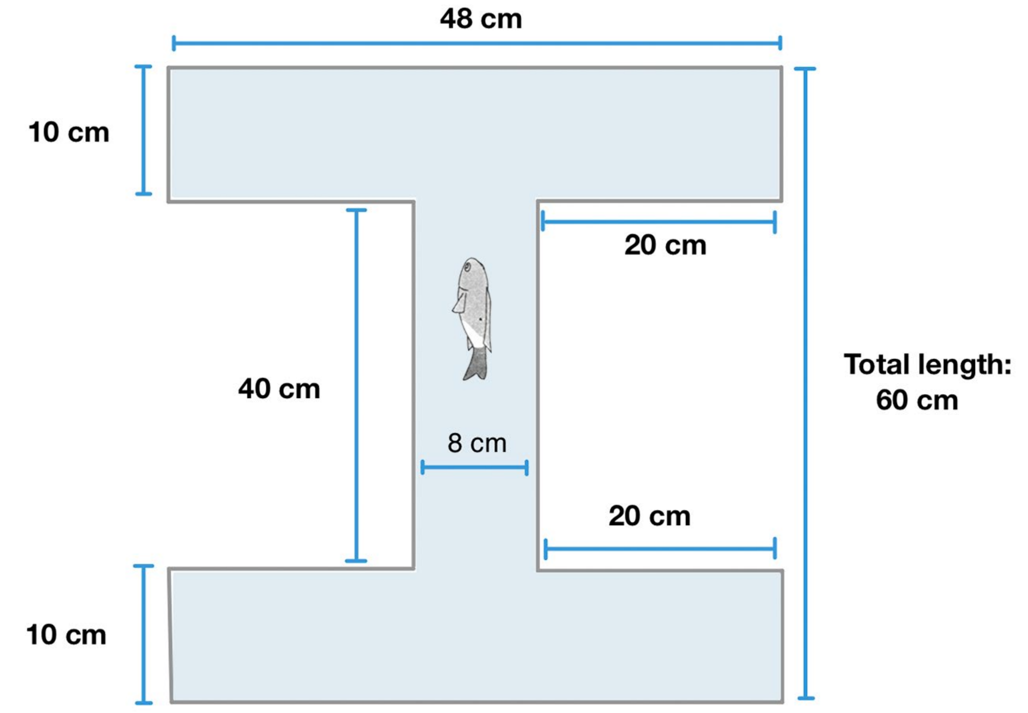
Introduction

- The *Deepwater Horizon* oil spill in April 2010 released over 4.9 million barrels of oil into the Gulf of Mexico[1,2]
- 31% of oil was integrated into the sediments where bottom-dwelling reef fish, such as bicolor damselfish (*Stegastes partitus*) live[3,4]
- Behavioral lateralization is when an animal shows a preference for one side of their body[5]
  - Such as right- or left-handedness in humans
- This study examines the effects that source crude oil exposure has on the lateralization of damselfish

Methods

- Bicolor damselfish were placed in an exposure tank 24 hours before testing
  - 1 g of unweathered crude oil was blended with 1 L of seawater to produce the high-energy water accommodation fraction (HEWAF)
  - Tanks contained a 0.75% HEWAF dilution in seawater (n=6) or control seawater (n=8)
- A detour test, consisting of a two-way T maze, was used to test behavioral lateralization to evaluate whether oil-exposure effects reflexive behavior[6]
- Fish were guided down the center runway and were forced to make a choice to turn left or right
  - This procedure was repeated 20 times

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Results

- Relative lateralization scores, L_R, allow for comparisons to be made about the overall turning bias of a population
- Absolute lateralization scores, L_A, evaluate turning bias on the individual level and show the strength of lateralization, disregarding the specific turn direction

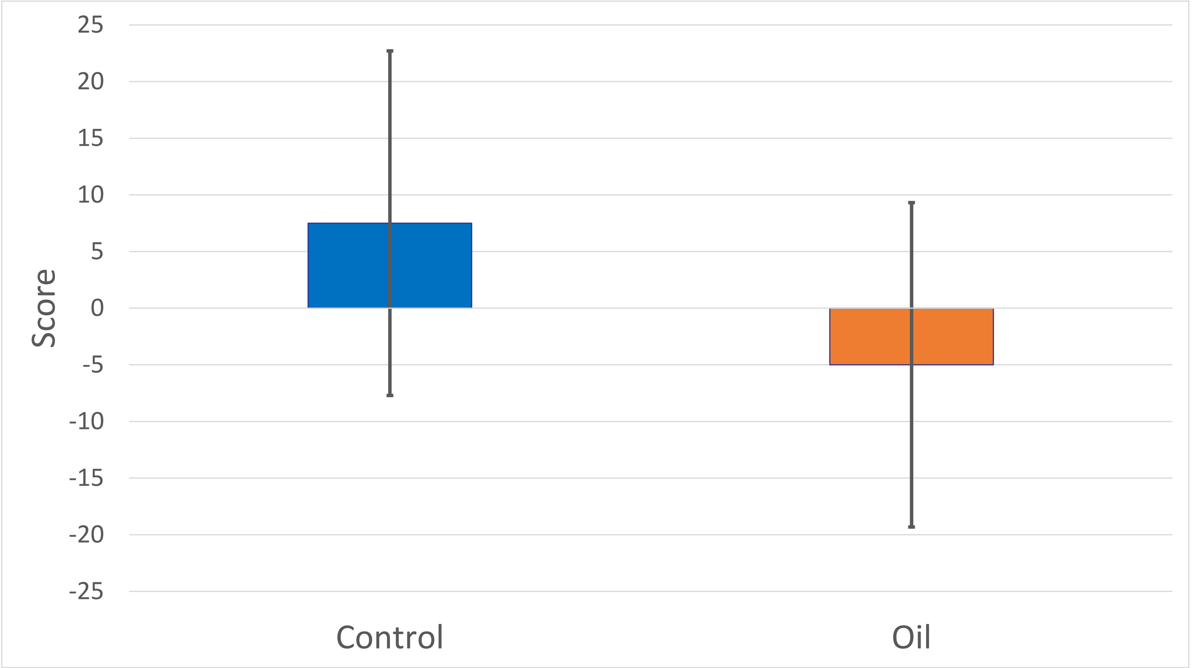

Figure 1: Mean relative lateralization scores with standard error bars.

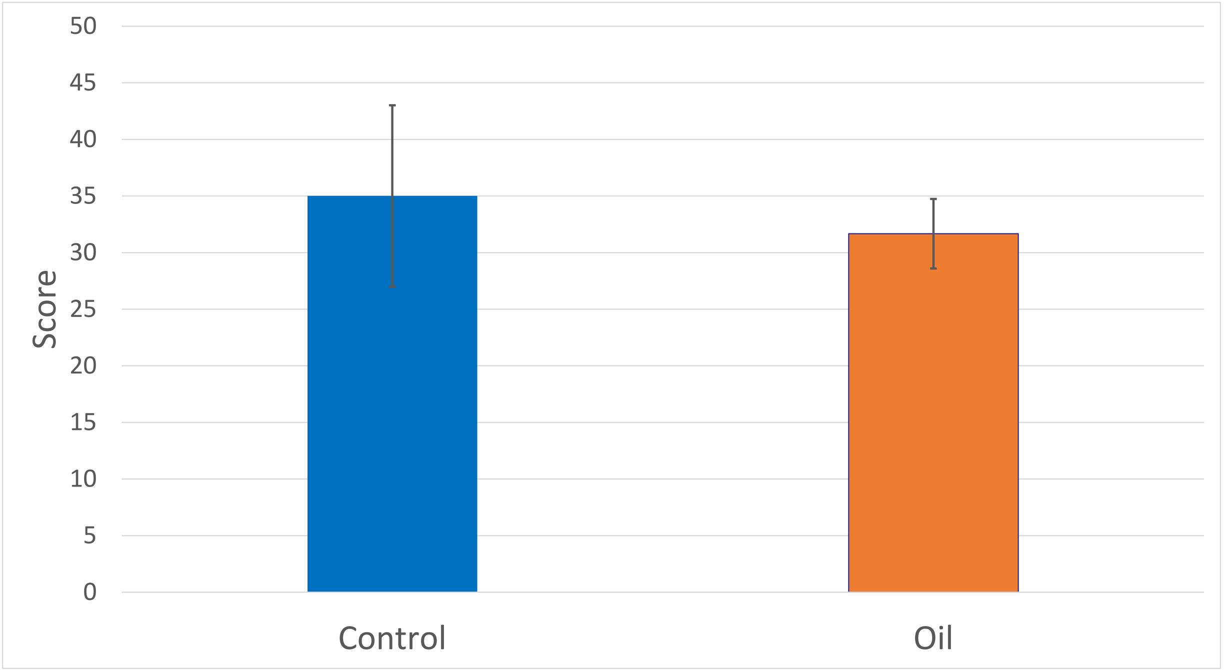

Figure 2: Mean absolute lateralization scores with standard error bars.

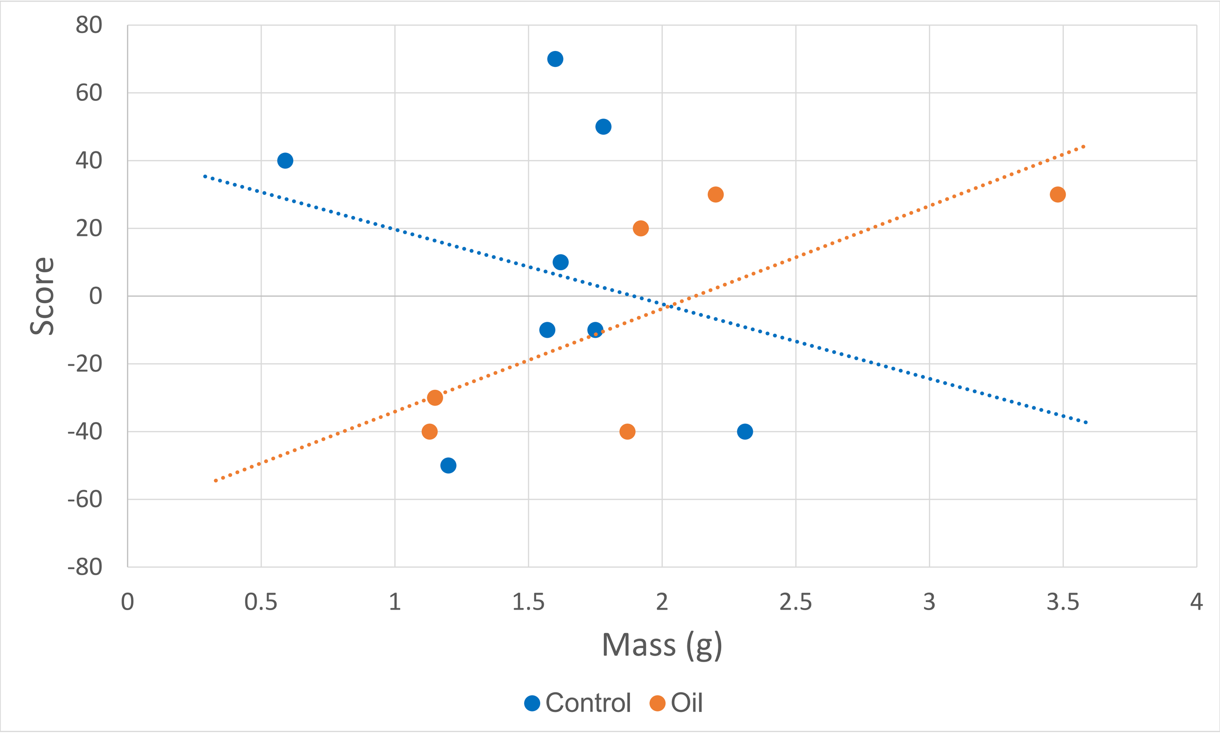

Figure 3: Plot of the mean relative lateralization scores vs the mass of each fish. The equation of the regression line for the control group was $y = -22.034x + 41.708$ with an R^2 of 0.0646. The equation of the regression line for the control group was $y = 30.368x – 64.47$ with an R^2 of 0.5582.

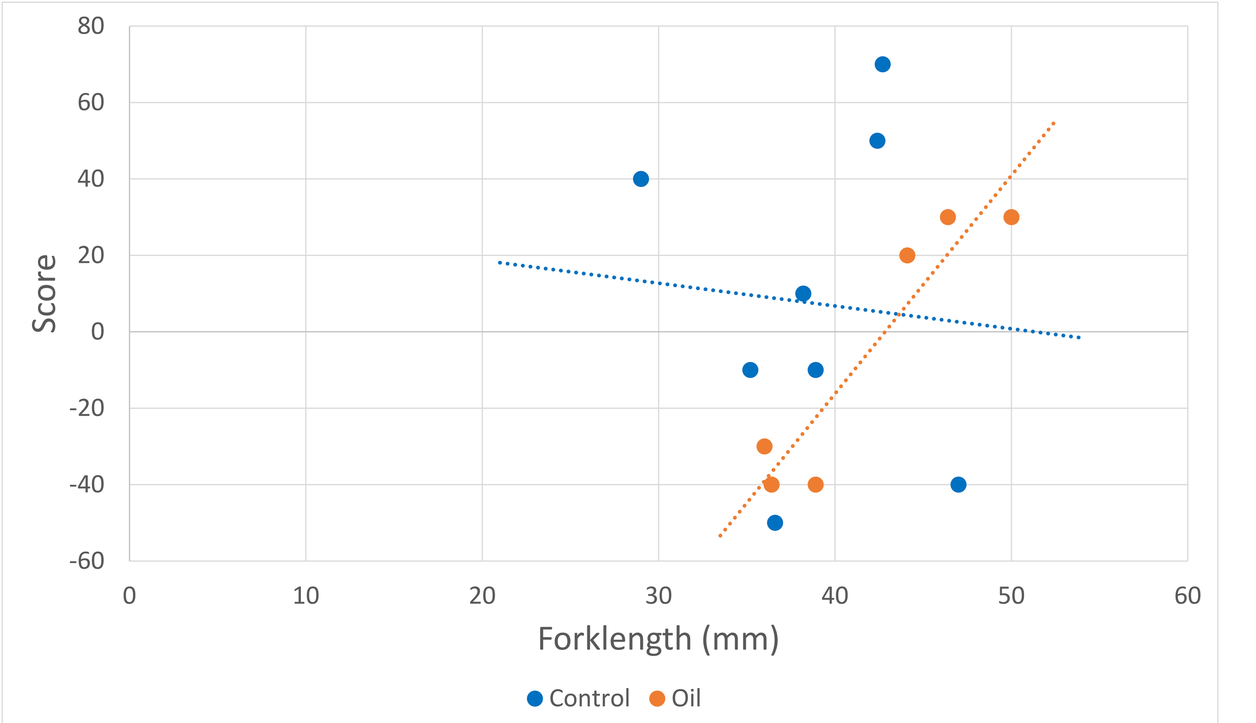

Figure 4: Plot of the mean relative lateralization scores vs the fork length of each fish. The equation of the regression line for the control group was $y = -0.5596x + 30.609$ with an R^2 of 0.0058. The equation of the regression line for the oil group was $y = 5.7123x – 244.72$ with an R^2 of 0.874

- Statistical analysis of the data found no significant difference in the relative or absolute lateralization of oil exposed fish from that in control fish

Conclusions

- Our results lead us to conclude that oil exposure has no effect on the behavior lateralization of this species
- Wild animals have been observed to show a wide range of lateralization scores; it is not uncommon to find little or no evidence of this behavior[7]

Future Directions

- To get a better representation of the behavior of a group, it is important to have a higher number of test subjects
- Future studies should further explore the effect of crude oil on the CNS and behavioral lateralization of bicolor damselfish with higher sample sizes

References

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8. Photo by Michael Schmale

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