

# ELECTROLOCATION

Geoff Derven / Wren Kominos-Marvell / Frank Sosa  
Reed College Bio342



HOW DO BG  
KNIFEFISH USE  
AN ELECTRIC  
ORGAN TO  
LOCATE FOOD  
IN THEIR  
ENVIRONMENT?

## BLACK GHOST KNIFEFISH

*Apteronotus albifrons*

- Objects with impedances that differ from the water cast 'images' on the fish's skin [1].
- Habituation and Dishabituation occur in electric fish [2].
- Electric fish are able to sense the electrical conductivity of objects [3].



*fish tank (with food path installed)*

## LEARNING PATHWAYS

**Hypothesis: The BG Knifefish will use electrolocation to associate metal cubes with the presence of food.**

### METAL CUBES ALTER THE UMWELT OF BG KNIFEFISH



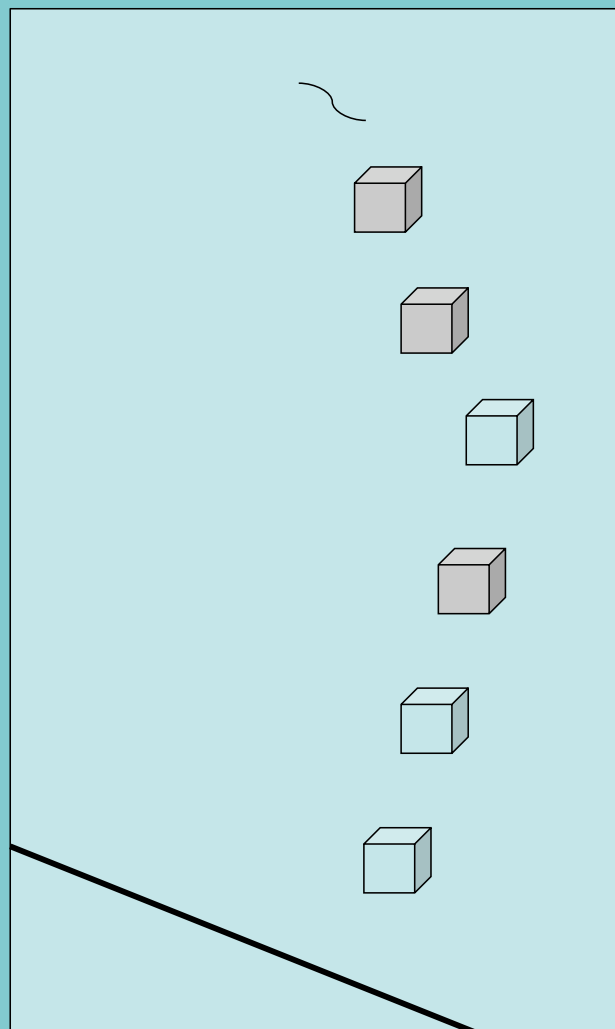
- 3 BG Knifefish placed behind starting gates in 3 separate tanks

- Tanks contain pathways of plastic and metal cubes with food located at end of paths.

- BG Knifefish released, timed for successfully locating food.

- Repeated trials run with continuous behavioral sampling.

- Once food-path learned, cubes were reversed, altering electrical field. Trials run again.



*overhead view of tank pathway model*

# NAVIGATION & METAL CUES

There was clear evidence of path learning, but no significant difference was found in switching the cube path. One BG Knifefish was observed to be much faster at finding the food *after* the path was reversed, while another BG Knifefish took much longer. These results point to the possibility of other sensory means as a factor in BG Knifefish navigation.

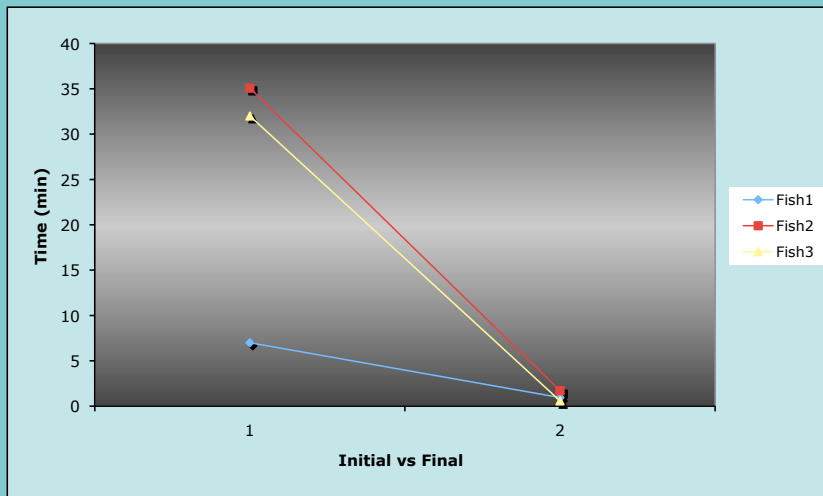
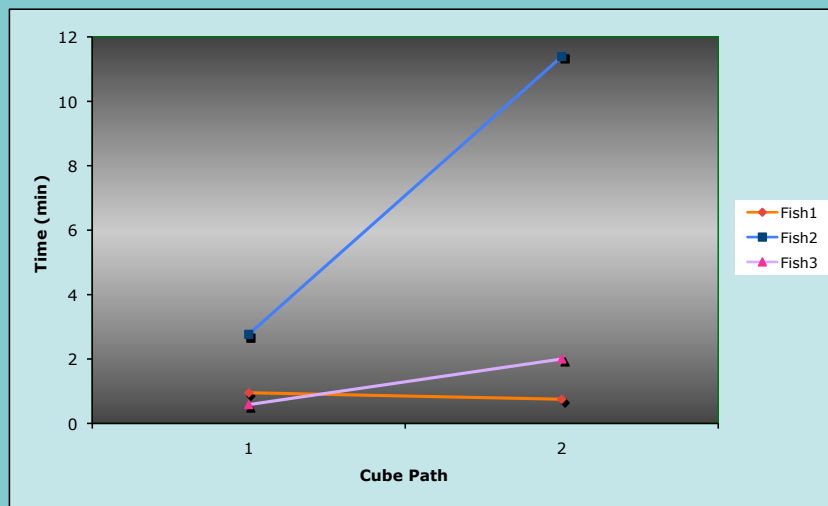


Figure 1:  
Control fish  
demonstrate  
decreased  
foraging time  
between initial  
and final trials.  
( $P=0.1153$ )

Figure 2:  
Learned fish  
do not  
demonstrate  
increased  
foraging time  
with respect to  
reversed cube  
path.  
( $P=0.350$ )



## UMWELT & BEHAVIORISM

BG Knifefish *do not* navigate their environment exclusively based on presence of metal.

The Black Ghost Knifefish in this experiment have shown to have quick associative learning in both pavlovian and operant conditioning. More work should go into analyzing the limitations and benefits of this electric sense through learning theory. This model organism will be a useful example to demonstrate that principles of learning in-fact generalize across all species. More experimentation in this area will show how the 'umwelt' of this organism interacts with learning theory.

### REFERENCES

- [1] Heiligenberg, (1977); Hopkins, 1983a; Zakon, (1983)
- [2] De Fazio (1979)
- [3] Hans Lissman and Machin (1958)

### IMAGES

- (a) <http://www.recipeapart.com/black-ghost-knife-fish/>
- (b) <http://fishindex.blogspot.com/2008/07/black-ghost-knifefish.html>

### ACKNOWLEDGMENTS

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