



**CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY**

Name(s) Sophie H. Klimcak	Project Number J1912
Project Title Electrolocation by the Black Ghost Knifefish: Navigation through a Maze in Complete Darkness	
Abstract Objectives/Goals My objective was to test the hypothesis that a Black Ghost Knifefish could navigate an underwater maze in complete darkness using its electrolocation ability to detect metallic landmarks in the maze that guided the fish to its exit. Methods/Materials Two Black Ghost Knifefish were trained to swim through metal and plastic hoops in a dividing wall inside an aquarium in complete darkness. One fish was rewarded with food when it swam through the metal hoop; the other was rewarded when it swam through the plastic hoop. I assessed their learning progress daily and continued their training until each fish made the correct choice more than 85 % of the time. Each fish was subjected to over 2000 trials over a 45 day period where one trial corresponded to the fish swimming through a hoop and either receiving or being denied food. The fish were then separately allowed to navigate a maze in complete darkness that contained metal hoops placed in locations that would guide a fish to the exit of the maze. The amount of time that it took for each fish to successfully navigate to the exit of the maze was measured in 30 trials conducted with each fish. Results Both fish learned that they would obtain food when they swam through the hoop for which they were trained. The fish that had been trained to swim through the metal hoop traversed the maze in approximately half time as the fish that was trained to swim through the plastic hoops. Conclusions/Discussion The Black Ghost Knifefish is known to be capable of detecting electrically conductive objects (larvae) in complete darkness by sensing the disturbance that the object makes in the electric field produced by the fish. Since the experiments were conducted in complete darkness, then the fish must have been using its electrolocation ability to navigate through the maze. The fish that was trained to swim through metal hoops used this ability to locate the metal hoops and find the exit to the maze faster than the fish that was trained to swim through the plastic hoops.	
Summary Statement Two Black Ghost Knifefishes were trained to swim through conductive (metal) and non-conductive (plastic) hoops to determine if their electrolocation ability would allow them to navigate an underwater maze in complete darkness.	
Help Received My father helped me purchase and set up the aquarium, locate and email scientists who had expertise on the Black Ghost Knifefish, read and understand scientific papers about this fish, assemble the training wall and mazes, and helped me record infrared movies of the fish.	