CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)
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Project Number
J1908

Project Title
Migratory Magnetism

Abstract

Objectives/Goals
My objective was to prove that steelhead trout could detect magnetic fields. I wanted to train them to have a conditioned response between a 90-degree change in the magnetic field surrounding their aquarium and their feeding time. At the same time, I wanted to see if I could condition the fish to also connect feeding with a red light coming on. This way I could see if they could be trained in any way, if not to the magnetic field at least to the light. If I could prove that they can sense the magnetic field then that might mean that they use magnetic fields to migrate in the ocean.

Methods/Materials
I created a magnetic field around a 55 gallon aquarium that contained six one year old steelhead. I observed the steelhead through a web cam to see if they reacted to the magnetic field by moving to a feeding area in the tank as if they knew that food was coming. I also turned on a red light to see if they reacted to the light in the same way. Once I proved that they reacted to the red light, I used only the magnetic field.

Results
During the first thirty feedings the fish showed no clear reactions to turning on the magnetic field or the red light. During this period the only reaction would come when the food actually dropped into the water.

Starting at feeding 30 the fish showed that they associated the red light to feeding because of a territorial response. After feeding 35 fish actually moved into the feeding area regularly after the red light came on showing that they knew that when the red light came on they would get fed.
The fish showed no signs that they associated the magnetic field with feeding. There was no pattern of entering the feeding chamber or an increase in activity. This was true during the testing of the magnetic field with and without the red light.

Conclusions/Discussion
I was able to train the fish to associate the red light coming on with feeding but not the change in the direction of the magnetic field. Compared to the reaction that I got from the red light, the fish didn#t detect the change in the magnetic field at all. My hypothesis was wrong at least for the way I tested the fish. My testing indicates that at least one year old steelhead trout don't use a magnetic sense to migrate. This sense could develop in older life stages or my approach to testing didn't draw it out.

Summary Statement
I created a magnetic field around an aquarium and using steelhead trout I tried to prove that they could detect changes in magnetic fields.

Help Received
Dr. John Phillips helped me design the experiment. My Dad helped me set-up the aquarium and the magnetic field.