CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)

Jacqueline R. Sly

Project Number

S0230

Project Title

The Efficiency of Fin Shapes of Members of the Scombroidei Sub-Order as Modeled by Mechanical Analogs

Abstract

Objectives/Goals

The purpose of this project was to determine the effect of fin shape on the speed of members of the Scombroidei sub-order This project explored the application of fin shape in underwater locomotion as well as the mechanical aspects required. It was believed that the fin shape modeled after the Thunnus thynuus would be the most efficient in consideration to speed. This fin shape is the most streamlined of the three fin types. It was believed that this streamline fin design would be the deciding factor in the overall speed of the mechanical analog.

Methods/Materials

A mechanical analog representative of all three species was designed and constructed. The analog can be divided into three parts: the circuit board, the motors and the body shell. The mechanical analog was outfitted with plastic fins modeled after the fins of each of the three species. The manipulated variable was to be dorsal fin shape, while the responding variable was efficiency in consideration to speed. Ideally, the time trials would have been run and speeds would have been recorded. However, the mechanical analogs suffered a number of failures and malfunctions that prevented the trials from being completed.

Results

The mechanical analog suffered various failures and malfunctions, both in and out of the water, and the timed trials were unable to be completed. Instead, an in-depth study of the failures and malfunctions was completed to determine the reasons that the mechanical analog failed. Several conclusions were drawn at the end of this investigation process.

Conclusions/Discussion

The data collected did not support my original hypothesis, nor did it oppose my original hypothesis. Due to irreparable malfunctions, the data collected was not based on the speed of mechanical analogs outfitted with various fin shapes. Instead the data collected was based on those malfunctions. Overall, the mechanical model was unable to create enough momentum to move forward and the stiff, hard plastic created a choppy motion that did not resemble the fluid motion of a fish. A successful mechanical analog would need stronger servos and a new design that utilized flexible materials such as rubber and thin silicon tubing.

Summary Statement

My project explored the application of fin shape in underwater locomotion as well as the mechanical aspects required for such underwater locomotion through the design and construction of a robotic fish.

Help Received

Father helped with circuit board debugging process and mother helped with grammar/spelling corrections.