**Temperature, Metabolism, and Homeostasis in Aquatic Fish**

**Overview**

Fish living in estuarine environments frequently must cope with dramatic fluctuations in temperature and other environmental variables. Their bodies must respond to these environmental shifts to maintain internal stability (homeostasis). In this lab, students will study the physiological response of fish to rapid temperature change, and then discuss how this might impact their physiology and ecology.

**Alignment with NGSS**

##### Performance Expectations

**HS-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. *Students will investigate the metabolic response of fish to rapid environmental temperature changes. They will construct explanations for the response they observed based on their knowledge of fish metabolism and homeostasis.*

##### Science and Engineering Practices

**Plan and carry out an investigation** *Students will follow written and verbal instructions to carry out an investigation.*

**Analyzing and interpreting data**: *Students will collect empirical data on temperature and respiration rate, construct a graph, and interpret their results.*

**Constructing Explanations/Designing Solutions:** *Students will construct explanations for the physiological responses they observe based on their own data, the class dataset, and their knowledge of physiology and homeostasis.*

**Engaging in Argument from Evidence**: *Students will present their findings to the group, and argue for their explanations based on the evidence they collected.*

##### Crosscutting Concepts

**Cause and effect: mechanism and explanation** *Students will discuss cause and effect in the context of homeostasis.*

**Systems and Systems Models** *The students will discuss how metabolism interacts with body systems including the respiratory system, and how homeostasis in those systems is regulated by feedback loops.*

**Structure and Function** *Students will learn about form and function of fish gills.*

**Stability and change** *Students will explore how changes in environmental factors (temperature) trigger changes in metabolism to maintain homeostasis (internal stability).*

##### Disciplinary Core Ideas

**HS-LS1-A Structure and Function** Feedback mechanisms maintain a living system’s internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (through negative feedback) what is going on inside the living system. *Students will study how aquatic fish respond to external environmental change to maintain internal homeostasis**, through feedback mechanisms.*