**The Effect of Temperature on Metabolism of Aquatic Animals**

**Overview**

Fish living in estuarine environments frequently must cope with dramatic fluctuations in temperature and other environmental variables. In this lab, students will study the physiological response of fish to rapid temperature change, and then discuss how this might impact their growth rates and ecology.

**Alignment with NGSS**

##### Performance Expectations

**MS-LS1-5** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. *Students will conduct an experiment in which they measure the relationship between an environmental variable (temperature) and metabolic rate. They will discuss the role of metabolism in the lives of organisms, including the effect of metabolic rate on growth, and come up with a prediction for how environmental temperature might influence growth.*

##### 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, and also on the class dataset.*

**Engaging in Argument from Evidence**: *Based on their results, students will generate predictions about how they think short-term and long-term temperature change might affect growth rates and other metabolic processes in fish populations.*

##### Crosscutting Concepts

**Cause and effect: mechanism and explanation** *Students will determine the effect of temperature on respiration, and therefore all metabolic processes.*

**Scale, proportion, and quantity** *Students will extrapolate their data to generate hypotheses regarding greater variation in temperature, and its effect on smaller or larger organisms.*

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

**Stability and change** *Students will discuss how changes in temperatures over short and long timescales impact the growth rates and population dynamics of ectothermic organisms.*

##### Disciplinary Core Ideas

**MS-LS1-A Structure and Function** In the multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. *Students will study how gills are used for respiration, and how respiration drives other metabolic processes.*