Louisiana Universities Marine Consortium

Bayouside Classroom

Parameter Information and Procedures for Temperature & Salinity

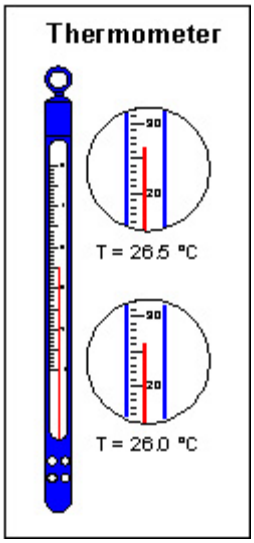
Prepared for Coastal Roots Teachers
Winter Workshop 2010

Louisiana Universities Marine Consortium
8124 Highway 56
Chauvin, LA 70344

www.lumcon.edu
(985) 851-2800

Temperature

Temperature is a measure of heat content of a sample; specifically it is a measurement of the kinetic energy of the molecules in the sample.



The temperature of a given body of water is determined by the local climate (air temperature, solar radiation), by the volume of water, and by other processes that can add heat (e.g. industry) to the system.

Temperature influences a variety of biological and physical processes such as photosynthesis and respiration, the solubility of dissolved gases, and the sensitivity of aquatic organisms to disease, pathogens or parasites. Temperature dictates the life history of aquatic animals by controlling metabolic rates and reproductive timing. For example, many organisms are adapted to live within a certain range of temperatures. If the temperature varies outside of this range for prolonged periods, then certain organisms may not survive.

Use a simple glass thermometer to measure water temperature in the study area. The temperature of the sample will start to change as soon as it is collected, so make sure to measure and record the temperature reading as quickly as possible.

Procedure for Measuring Temperature:

- Once the sample is collected, immediately immerse the thermometer in the sample for 30-60 seconds. It is important not to let the thermometer touch the sides or the bottom of your bucket or sampler while you wait.

- Read the temperature directly from the thermometer (match the top of the red line to the nearest 0.5 degree C) **while it is still in the water**. This ensures that the temperature reading reflects the temperature of the sample site, not the air temperature. To obtain the most accurate reading possible, get as close to eye level as you can manage to read the thermometer. If you read the thermometer at an angle, the scale will look different; this is called parallax error.

- Record the temperature in degrees Celsius on the datasheet.

- Thermometers do not need to be rinsed unless you are sampling in a saltwater area.

***Note:* Thermometers are fragile and should be handled gently. Because they can break, it is preferable to use thermometers filled with alcohol or kerosene (usually dyed red), rather than mercury (silver liquid metal), which is highly toxic.**

Salinity

Salinity is the total of all the salts dissolved in the water, measured in parts per thousand (ppt). If a sample of water were divided evenly into 1,000 buckets, one of those buckets would be 1 ppt. So if one of our sites has a salinity of about 5 ppt, that means of the 1,000 buckets, 5 would be filled with salt, and the remainder would be water and other chemicals. Salinity will vary from place to place and from time to time. In an estuary freshwater from rain, runoff and ground water seepage combines with the salty water of the ocean brought in by tides, wind, and currents. Ocean salinity is approximately 35 ppt, while freshwater is 0 ppt.

The amount of salt dissolved in the water controls which types of organisms can live in the estuary, and also affects its ability to be used for drinking and industry. Salinity controls the types of plants and animals able to inhabit a given environment. Most animals and plants are adapted to either freshwater or saltwater. In an **estuary**, however, with a wide range of salinities plants and animals have special adaptations that allow them to survive in both low and high salinity water.

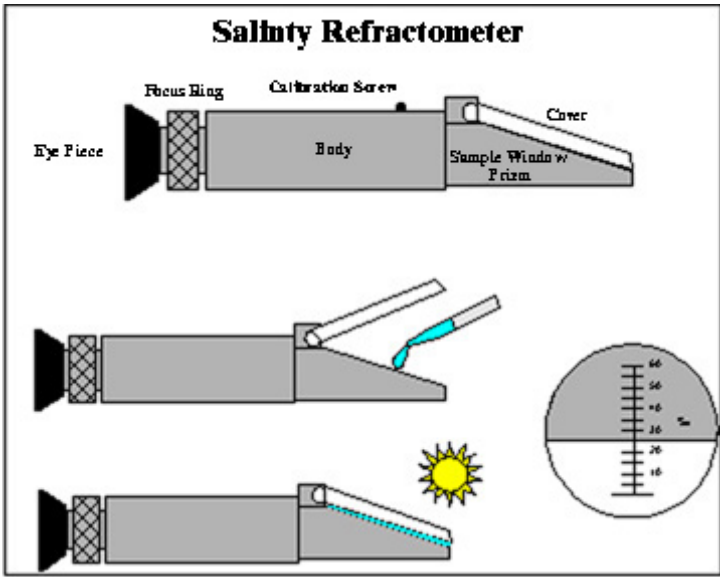
Natural and **anthropogenic** (man-made) factors can affect the salinity of water. Saltwater intrusion is the movement of salt water into a freshwater environment, such as our freshwater marshes. This intrusion may be the result of a natural process such as a storm surge from a hurricane. Man-made navigation channels or pipeline canals can result in saltwater intrusion because these canals provide straight, deep channels that allow salt water to move more freely into freshwater marshes than natural meandering channels. Irrigation runoff can raise also raise the salinity in fresh waterways, as can municipal and industrial effluents, sewage effluent and urban runoff.

You will be using a refractometer to measure salinity. A refractometer takes advantage of the fact that light bends as it passes through different materials. In water, the amount of bending (refraction) is related to how much salt is dissolved in the water. When using a refractometer, a sample is placed on an optical prism. As light shines through the sample, it is bent according to the salinity of the water, and casts a shadow on the scale that is visible through the eyepiece. Prior to using the refractometer it should be checked to make sure that it is reading properly. It should be calibrated if it is not. Follow the manufacturer's instructions to calibrate your refractometer. If no calibration is necessary, you are ready to measure the salinity of your sample.

Procedure for Measuring Salinity:

- Using water from your collected sample, rinse disposable pipette by filling and emptying the pipette 3 to 4 times. Do not contaminate your sample by putting water back into the sample. All rinse water should be emptied on the ground.

- Next, rinse the optical prism (the blue oval) and the plastic flap on top of the refractometer using water from the sample 3 times.
- Once both the pipette and prism are rinsed three times each, fill the pipette with water from your sample one more time. Holding the refractometer place several drops of sample on the prism. Make sure the water does not run off the prism while you add the water. Keep adding drops until you have a large puddle of water covering the prism.



- Close the plastic flap over the puddle of water, removing all air bubbles.

- Hold refractometer upright in the direction of a strong light source (e.g. the sun) and look through the eyepiece. **Never look directly into the sun!**

- Turn the focus ring until the scale is clearly visible. There will be two scales, make sure that you read the scale on the right hand side of the circle. This scale will be 0-100 in whole numbers. Care should be used in reading the result as the lines on the scale are very small. The number 0-100 represent the salinity.

- Read salinity in parts per thousand (ppt, the scale on the right) where the horizon created by the blue section (top) and the white section (bottom) crosses the scale.

- Record the salinity measurement on the data sheet.

- Rinse the prism and the plastic flap with fresh water three times, and gently wipe sample window with soft tissue or lens paper.

References:
International Project WET. 2002. *Healthy Water Healthy People Testing Kit Manual.* The Watercourse.

Louisiana Universities Marine Consortium. 2001. *Bayouside Classroom Program Manual.* Retrieved on February 27, 2009, from the website: http://www.lumcon.edu/bayousideclassroom

Keener-Chavis, P., L.R. Sautter. 2002. *Of Sand and Sea: teachings from the southeastern shoreline.* National Oceanic and Atmospheric Administration, Office of Sea Grant.