Appendix I
How to Demonstrate the Effect of Dissolved Carbon Dioxide on pH

Materials

- Drinking straw
- 100 ml of distilled water
- 100 ml of seawater (natural or artificial)
- Glass jar or beaker, about 200 ml capacity
- Bromothymol Blue Indicator Solution, 0.04% aqueous

Procedure

1. Pour approximately 100 ml of distilled or tap water into a clean, transparent container. Add 15 drops of bromothymol blue indicator solution.

2. Pour approximately 100 ml of seawater (artificial or natural) into a second clean, transparent container. Add 15 drops of bromothymol blue indicator solution.

3. Blow steadily through a drinking straw into the water in the first container, and record the time required for the color to change from blue to yellow-green.

4. Repeat Step 3 with the water in the second container. Note that it is possible to blow through two straws simultaneously, and if this is done there is no need to record elapsed time.

5. Discuss the following:
   - Blowing through the straw bubbles carbon dioxide through the liquid in the containers.
   - Carbon dioxide dissolves in water to form a weak acid (carbonic acid).
   - Bromothymol blue is blue in basic solutions, and yellow in acidic solutions. The color change happens in the approximate range of pH 6.0-7.6.
   - A buffer is a solution that tends to resist changes in pH.

Ask students to apply one or more of these facts to explain the results of the demonstration. Do these results suggest that seawater may act as a buffer?