Lecture 3: Water as an environment

I. Introduction

A. Physical, chemical, and biological properties are interrelated

B. Diversity of aquatic habitats

C. Remarkable water

II. Physical properties of water

A. Density

1. Specific gravity

a. Relationship to air

b. Freshwater vs. saltwater

2. Movement of fish in water

a. Vertical – maintain neutral buoyancy

i. swimbladders

ii. low density tissue

b. Horizontal – viscosity creates resistance

i. strategies for locomotion

ii. strategies for drag reduction

3. Surface tension

a. Permits capillary action

b. Allows communities to exist at surface

B. Temperature

1. Stability

a. High specific heat

b. Acclimation

2. State conversion

a. Latent heats of melting and evaporation

b. Natural ranges of temperature

3. Temperature / density interaction

a. Water is the only substance not heaviest as a solid. Why?

b. Implications for ice formation

c. Temperature stratification

C. Light in water

1. Importance

2. Fate of solar radiation

3. Attenuation of colors

4. Visual acuity of fishes

III. Chemical properties of water

A. High solvency

1. Disassociation into H+ and OH-

2. Excellent transfer medium

B. Dissolved solids

1. Saltwater

2. Freshwater

a. Hardness

b. Trace nutrients

C. Dissolved gases

1. Nitrogen

2. Oxygen

a. Necessity for respiration

b. Problems of too much

c. Problems of too little

3. Carbon dioxide

a. Necessity for photosynthesis

b. Role in determining buffering capacity

c. Alkalinity vs. pH as index of productivity and stability

IV. Conclusions