Chapter 18

Underwater Observation

18.1 Introduction

- Versatile and cost-effective
- Collects information on
  - Composition
  - Distributio
  - Abundanc
  - Behavior

Introduction (cont.)

- Best when other methods not effective
- Only effective in clear water
- Limited to visibility eg, cannot tell weights

18.2 Underwater observation techniques and equipment

- **Snorkel**
  - Requires least equipment
  - One of simplest ways to observe organisms
  - Can be used in remote locations

Snorkel

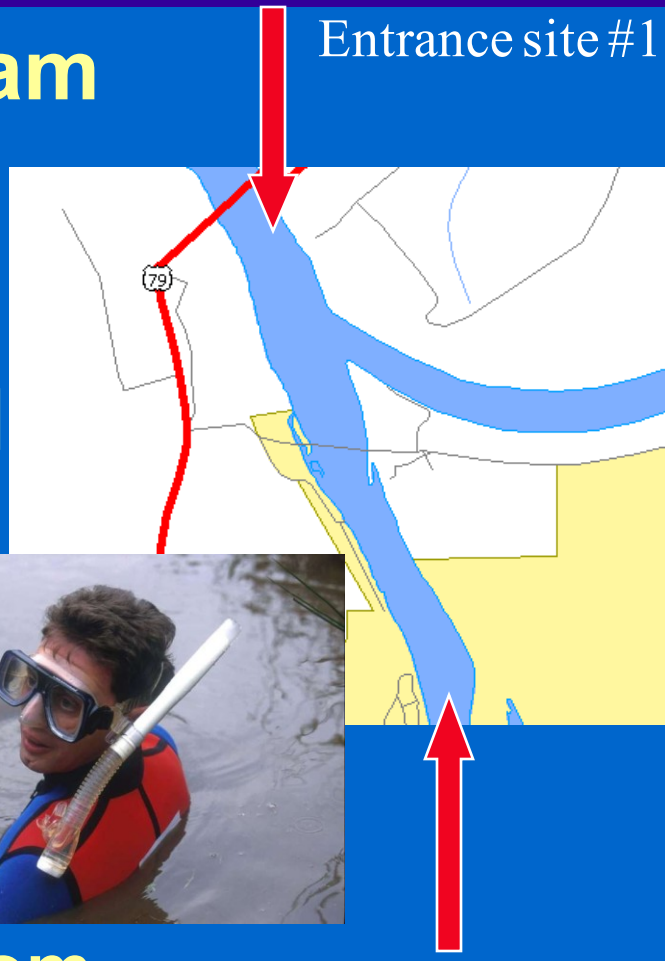
- Equipment includes
  - Mask
  - Snorkel
  - Wet or dry suit
  - Swim fins or wading boots

Snorkel especially useful for observing:

- Spawning
- Behavioral interactions
- Favored feeding
- Resting positions
- Movement
- Estimating numbers and sizes of populations

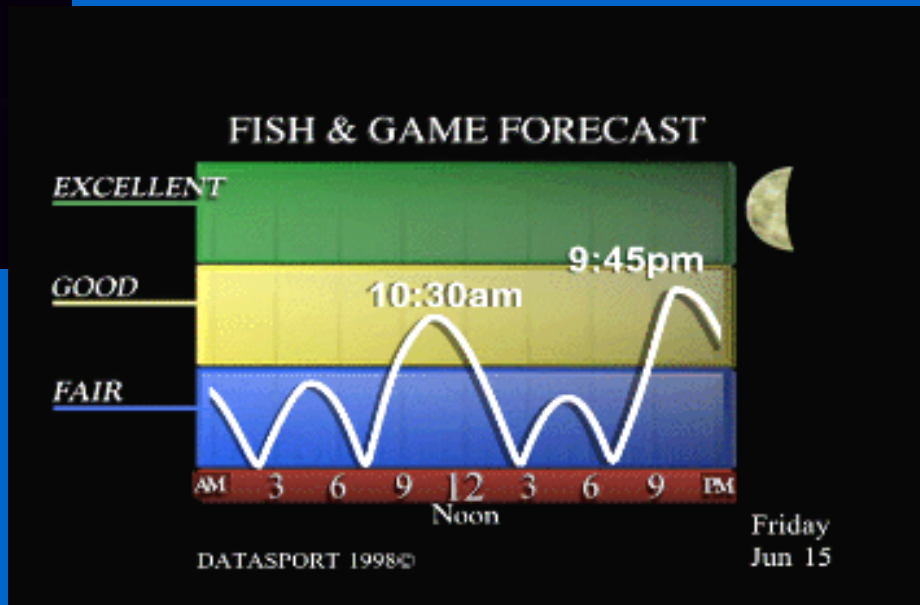
Snorkeling Protocol

- Divers enter up or down stream
- Short resting period to allow settling
- Divers in deep water proceed downstream
  - By floating
- Divers in shallow water proceed upstream
  - Pull themselves along the bottom



Consistency of data depends on

- Light conditions
- Time of day
- Differences in fish behavior



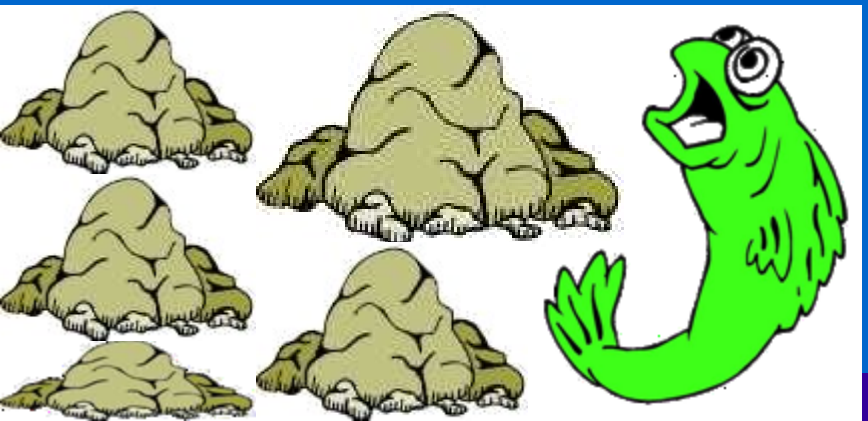
Scuba

- More specialized equipment required
- Divers wear tanks filled with compressed air
- Mouth piece to regulate air flow

Scuba (cont.)

- Equipment used
  - Depth and pressure gauges
  - Buoyancy compensator
  - Watch
  - Weight belt
  - Wet or dry suits
- Limited to easily accessible areas

Scuba (cont.)



- Remain submerged for long
- Protocol similar to snorkeling
- Longer resting periods required to acclimate divers
- Noisier than snorkeling and may frighten fish

Hookah

- Hookah…surface air supplied
- Popular for
  - Collecting aquatic organisms
  - Ship and oil rig maintenance
  - Suction dredging

Divers use hookah rings

- Air delivered through umbilical hose
- Divers range limited by umbilical
- Allows maximum time beneath the surface
- Clear voice communication possible
- Most useful in larger rivers, lakes and ponds

Alternative methods

- Use of underwater cameras
  - Take pictures at predetermined frequencies
  - Work at day or night
  - Expensive to buy and maintain
  - Should be used with other methods for best results

Record keeping

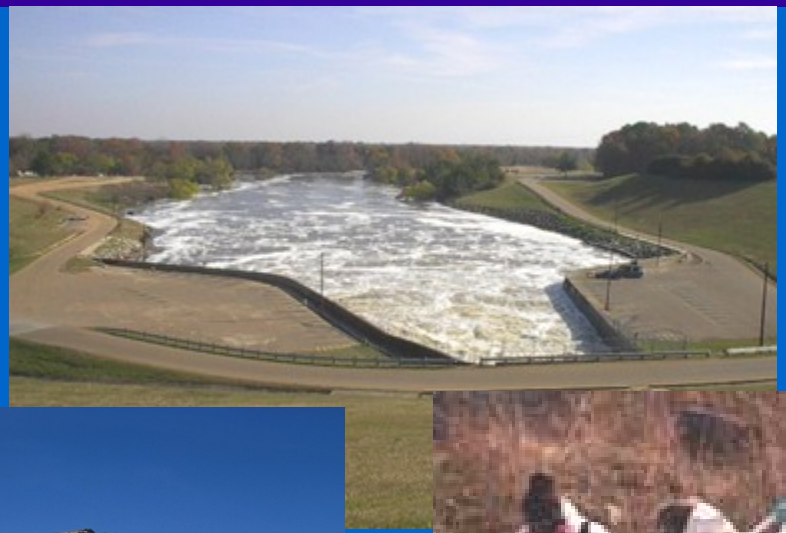
- Recorded by diver or communicated to assistant
- Use waterproof slates, cuffs, or scrolls
- Pencil attached to divers

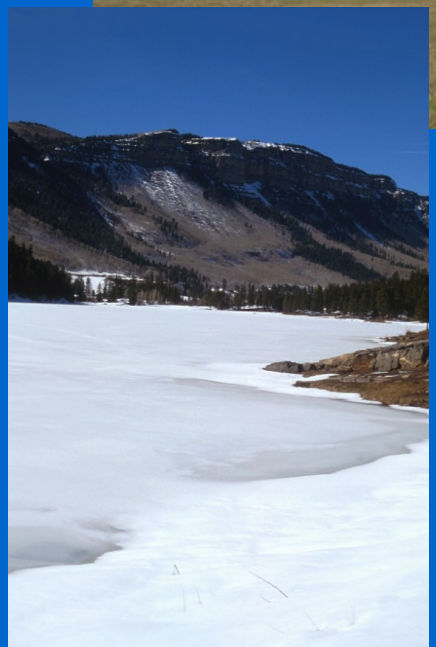
Alternatives for diver recording

- Sign language or verbal communication
- Electronic data recording devices such as radios, tape recorders, and cameras
  - Expensive

18.3 Safety and training

- **Hazards Include:**
  - Fast moving water
  - Cold water temperatures
  - Poor visibility
  - Physical obstruction
  - Environmental factors
  - Contaminants and dangerous organisms





Never dive alone!

- Have a partner
- Can be in or out of the water
- Assess potential hazards
- Check for water release times in regulated waters

Never:

- Attach ropes or lines to divers
  - In streams lakes or rivers with strong currents
  - In streams lakes or rivers with tidal changes
- Always avoid areas of extreme turbulence

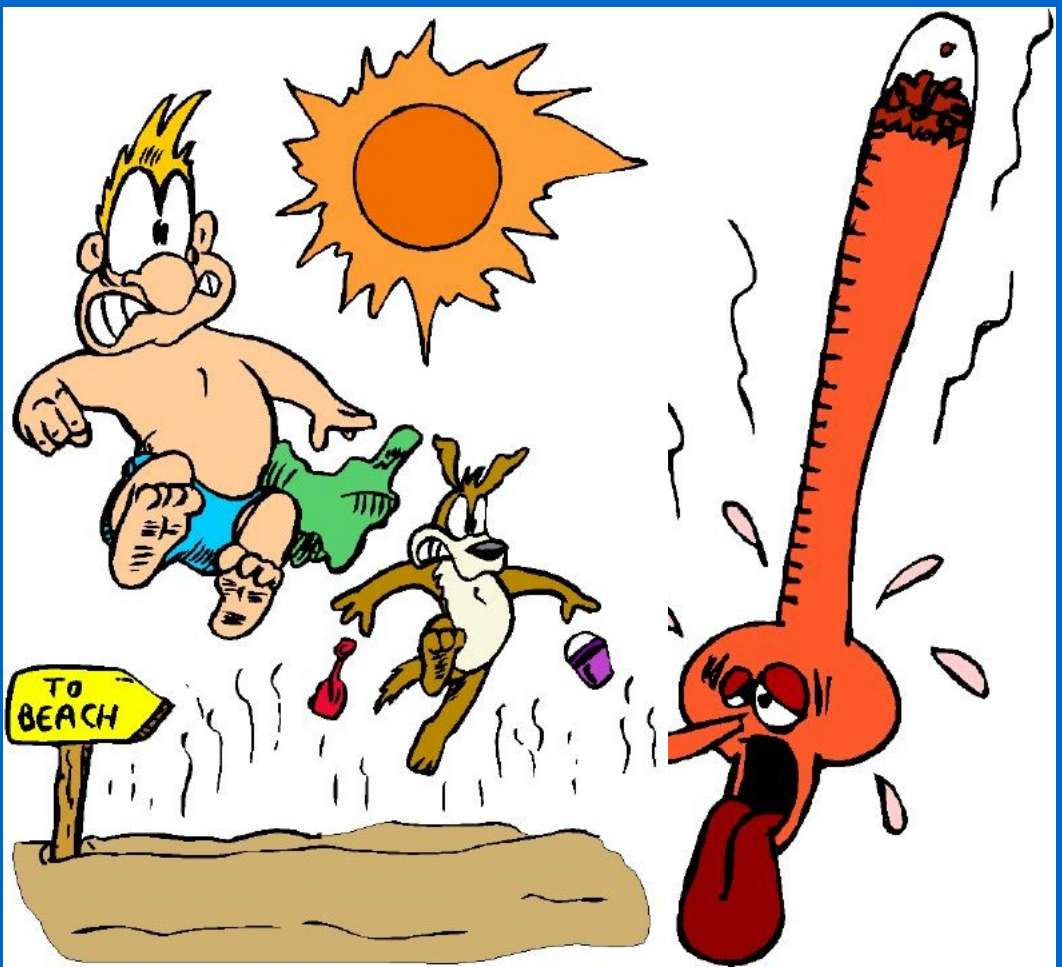
Hypothermia

- Potentially lethal below body temperature condition
- Night divers at highest risk
- Divers submerged for lengthy periods

To prevent hypothermia

- Wear appropriate protective clothing
- Eat high-energy foods
- Drink plenty of liquids
- Take periodic breaks
- Have first aid training

Hyperthermia



- Abnormally high body temperature
- Feel
  - Lightheaded and dizzy
  - General muscular weakness
  - Faint trembling sensations

Avoid hypethermia by

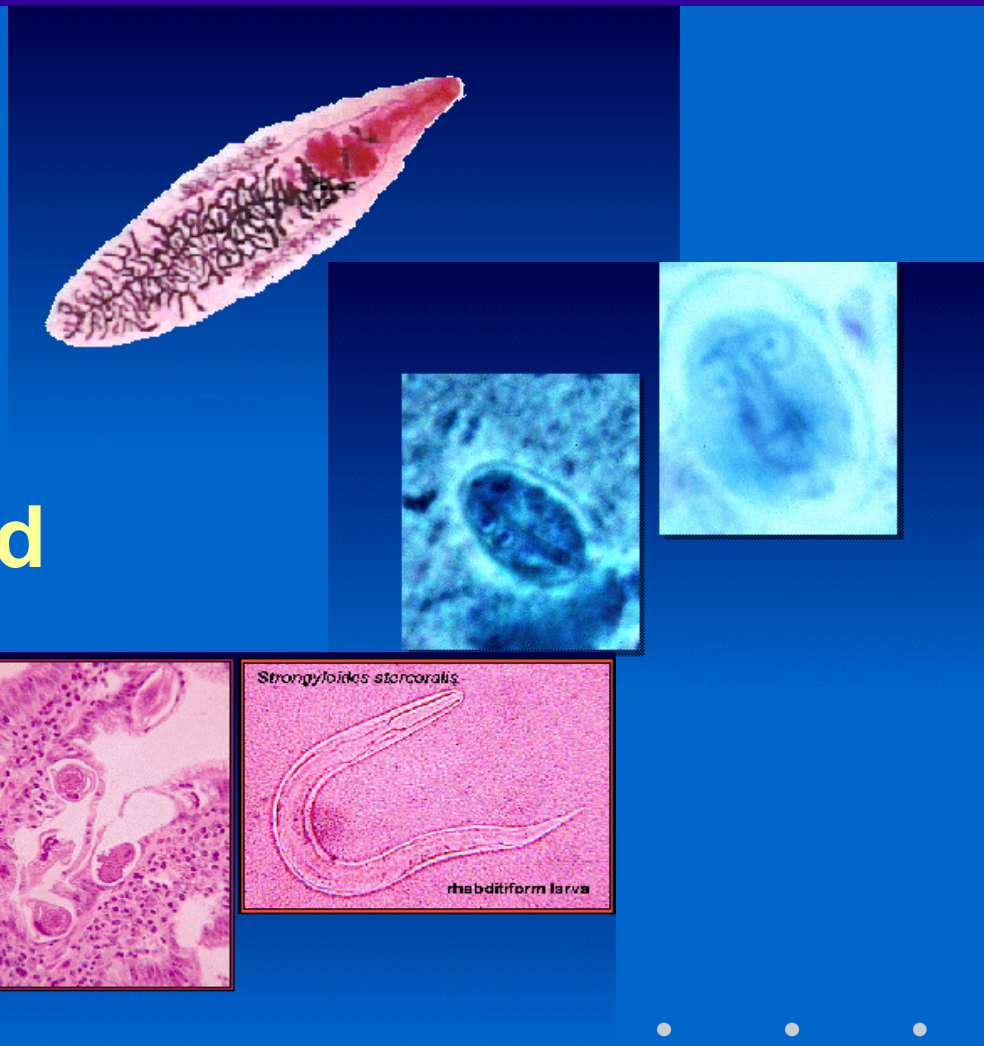
- Taking frequent breaks
- Being appropriately outfitted
- Drinking plenty of fluids

Other hazards

- Turbid water
- Underwater obstructions
- Chemical and microbial contaminants

Giardia lamblia

- Protozoan
- Causes giardiasis when ingested
- In freshwater throughout the world
- Avoid ingesting water that's not filtered



Marine environments

- Beware of dangerous organisms such as sharks

Training

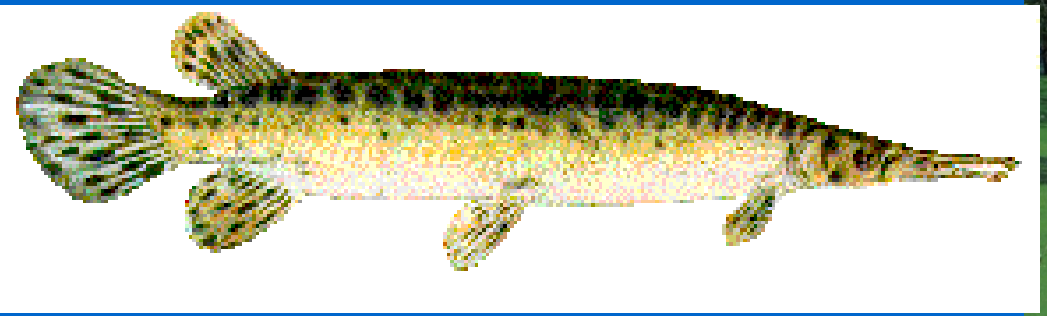
- Essential for success
- Helps ensure crew safety

Training should address

- Safety
- Equipment
- Observation techniques
- Data collection and recording

18.4 Environmental Influences

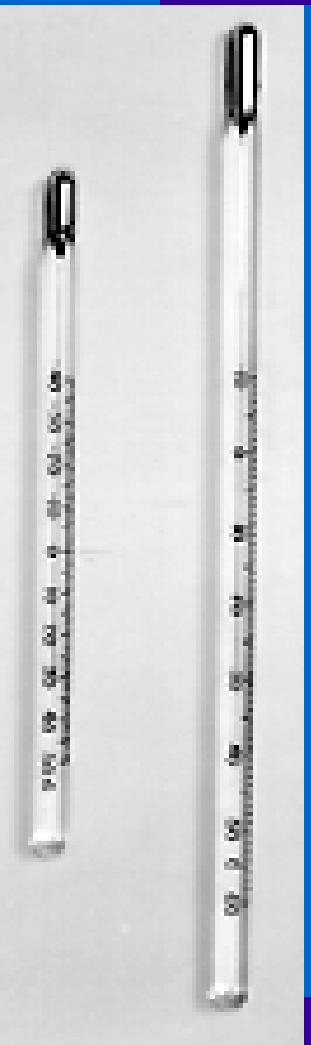
- Survey accuracy influenced by
  - species
  - environmental features



Depth

- Sufficient depth to submerge a mask
- Shallow-limit divers view
- Too deep-light and air limitations

Temperature



- Carry calibrated thermometer
- Measure before sampling and periodically
- Organism behavior may change with temperature

Visibility

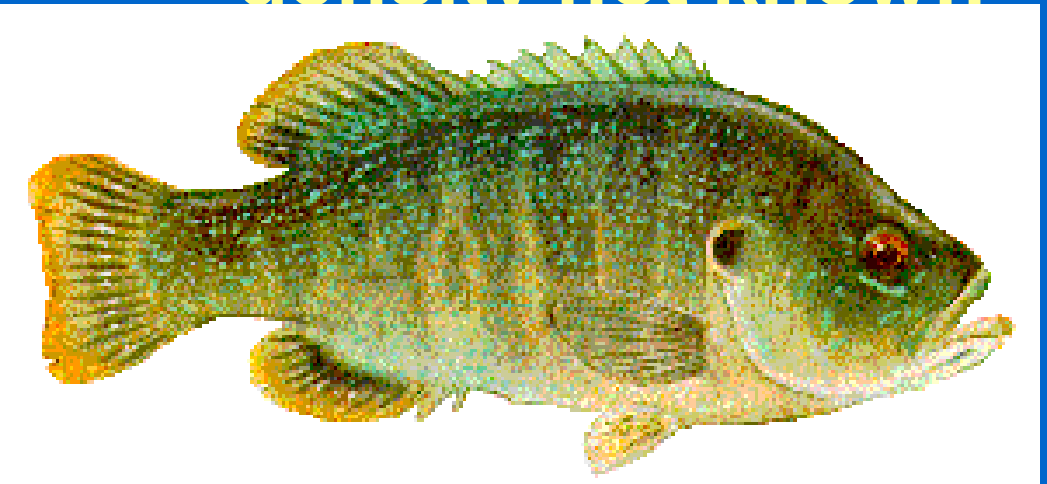
- Clarity can limit divers abilities
- Dependent on species
- Should be sufficient to
  - See the bottom
  - Identify species
  - See fleeing organisms
- Should not assume adequate without measurement

Cover

- Type and abundance can limit survey
- Less cover is better
- Describe and quantify cover in results

18.5 Applications - Precision and Accuracy

- Replicate counts-temporally or spatially
- Variation is typically small
- Accuracy difficult as population density not known



Population density

– ?

Underwater Survey Procedures

- In flowing waters, move upstream when possible
- Measure habitat features after fish counting

Direct enumeration

- Equal chance of being seen and counted
- Count all organisms in a single pass
- Precision evaluated by multiple passes

Pass#

1 - 20 clown fish
2 - 15 clown fish
3 - 25 clown fish
4 - 21 clown fish

Expansion estimates

- Total populations in individual habitats
- Partition sample into homogenous strata
- Randomly assigned lanes
- Density, variance and confidence intervals obtained

Basinwide Estimates

- If consistent relation between diver count and population
- Divers count fish in sample
- Crew determines true number of fish
  - Typically by electrofishing
- Equations of relation are founded

Mark -Recapture Estimates

- Marked with visible tags
- Recaptured
- Use marked and unmarked to get population estimates

Line Transect Estimates

- Divers travel along well defined line
- Multiple lines set
- Divers identify fish on either side of lines

Habitat Use Estimates

- If do not change behavior with disturbance
- Unbiased information on habitat use
- Can be used to study life stages
- Develop estimates of fish habitats