Chapter 17

Quantitative Diet Analysis

17.2 Collection of fishes for study of diet.

- Should not use stressful methods eg.
  - Rotenone
  - Electroshocking
  - Overnight gill netting
  - Trawling at depth

Good collection methods for diet studies

- Seine
- Cast net
- Short time gill netting or trammel netting

Things to consider after capture

- Fish may regurgitate
- Digestion continues
- Fish may eat each other when confined

17.3 Sampling strategies -

- Amount and Type of Food
  - Diel cycle
  - Seasonal changes
  - Size of fish
  - Territoriality of fish
  - Differential digestion rates

Sampling strategies (cont.)

- maximum information attained

- Fish should be collected when the stomach is fullest

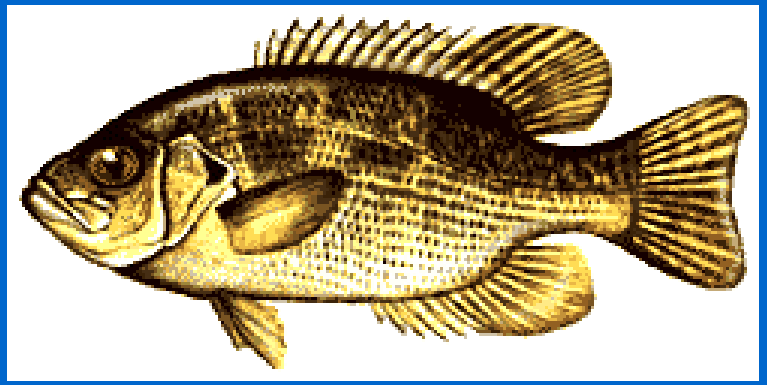
Sampling strategies (cont.)

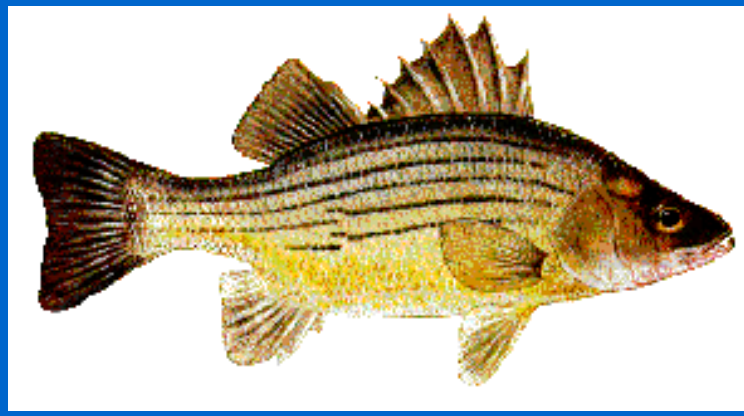
- Fish are sensitive to seasonal changes eg
  - Bluegill switch from invertebrates to algae at the end of the summer

  - Amazon river fish switch from invertebrates to detritus in the rainy season.
- Sampling should be frequent throughout the year.

Sampling strategies (cont.)

- Effects of fish size and territoriality
  - Diets vary with fish size and sex
  - As fish grow, they may switch from one prey type to another
  - Adult males and females may have different diets





Sampling strategies - Differential digestion rates

- Stomach contents may not accurately reflect diet. Why?

- Some prey, eg protozoans, are digested faster with little trace
  - Watch fish feeding in aquarium and compare with gut contents

Sampling strategies - Differential digestion rates

- Slowly digested prey may accumulate and thus be over represented in the gut
  - Collect fish at peak of daily feeding intensity

17.4 Removal, fixation and preservation

- Removal of gut contents

  - Flushing of stomach with one or more volumes of water
  - Insertion of acrylic tubing through digestive tract
  - Dissection

Collection from live animals works best on

- Perches
- Sunfishes
- Catfishes
- Trout

Dissection - Fish are killed as humanely as possible

- Anesthetic
- Sharp blow to head

- Severing spinal cord column (small fish)

Fixation and preservation of gut contents

- 10% formalin initially
- Wash and soak in water
- Preserve in 45-70% aqueous alcohol

- Wear plastic gloves
- Work in fume hood

If possible

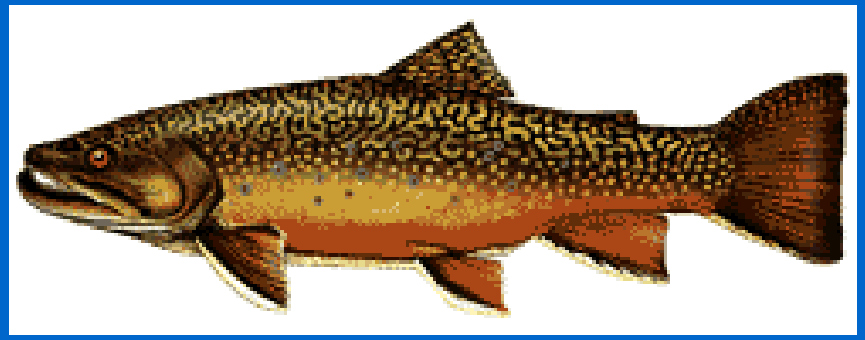
- Fix gut samples immediately after capture to avoid post capture digestion
- Hold fish in ice
- Slit the coelom to allow entry of formalin
- Inject formalin directly into the coelom

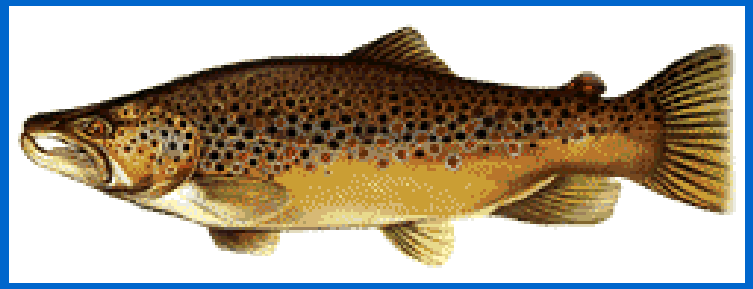
17.5 Identification - partly digested prey

- Made difficult by digestion
- Find part of organism that is easily recognized
  - Exoskeleton in invertebrates
  - Otolith count for fish
  - Sculpturing along edges of leaves for macrophytes
  - Algae is found intact

Level of identification.

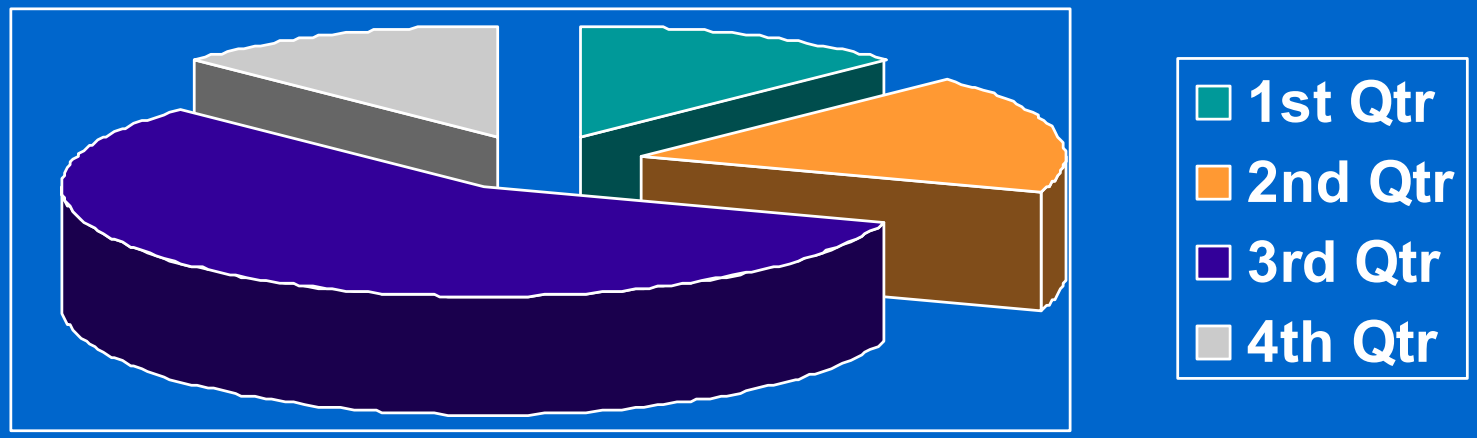
- Family
- Order
- Relative size





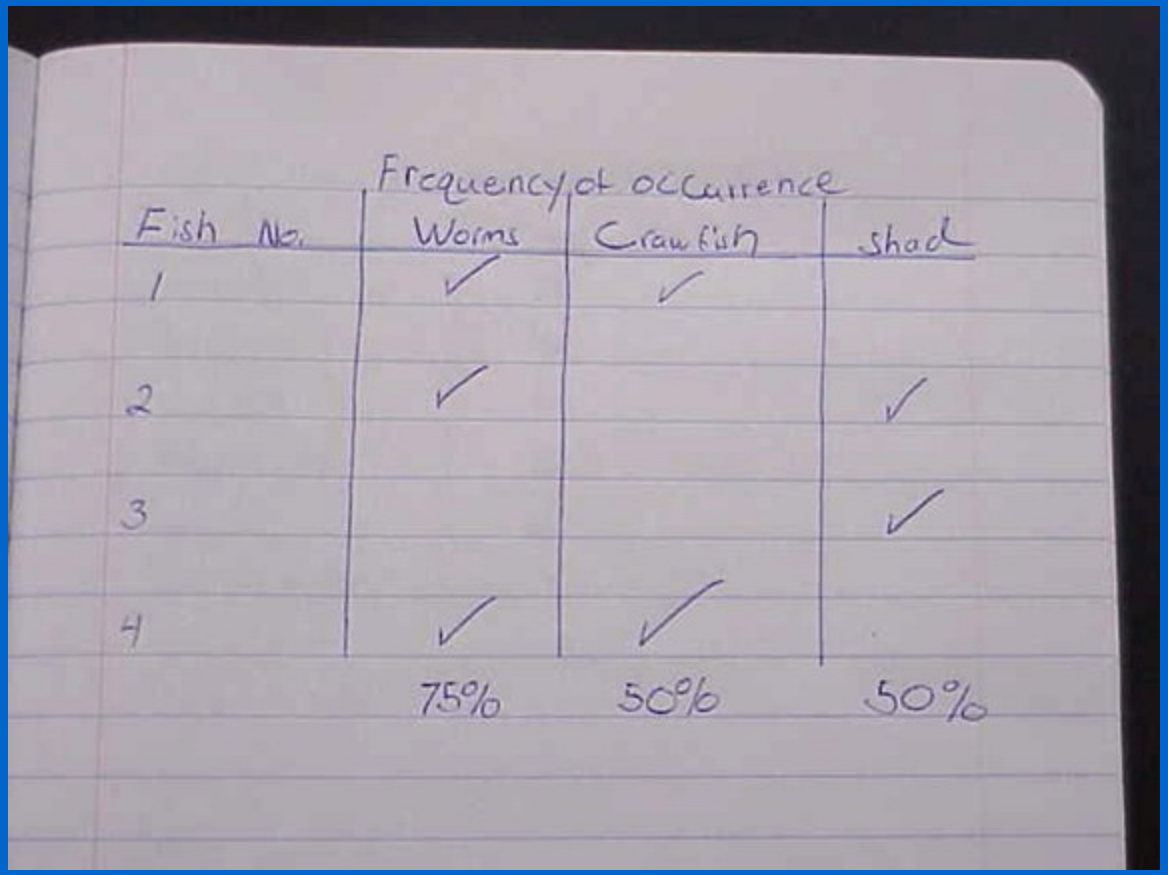
17.6 Quantitative description … 3 approaches

- Frequency of occurrence
- Percent composition by number
- Percent composition by weight



Frequency of occurrence

- Fastest approach to quantitative analysis of gut content

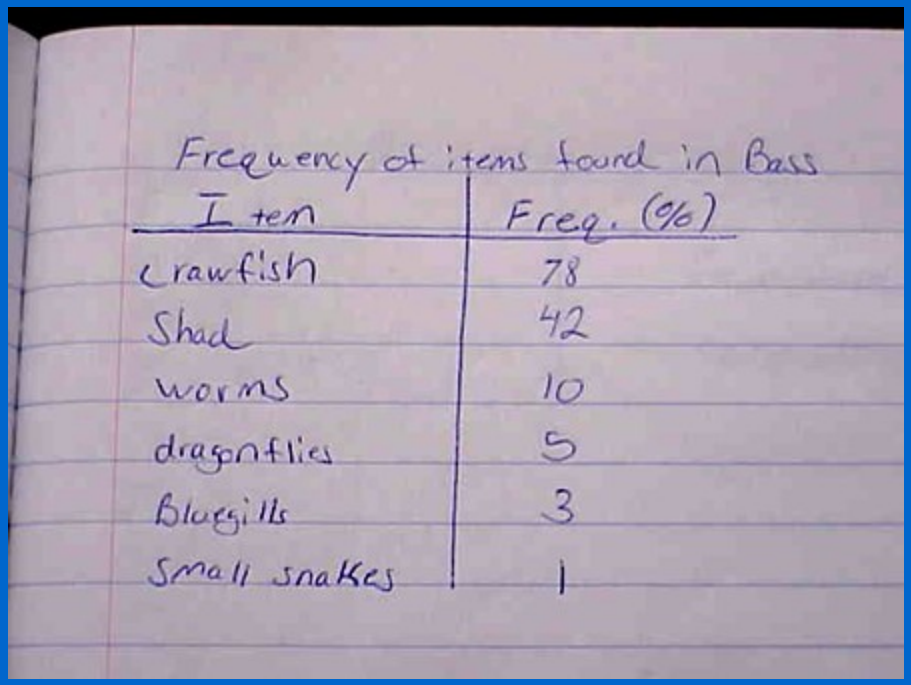


Frequency of occurrence

Fish No.	Worms	Crawfish	shad
1	✓	✓	
2	✓		✓
3			✓
4	✓	✓	
	75%	50%	50%

When examining gut samples from fish

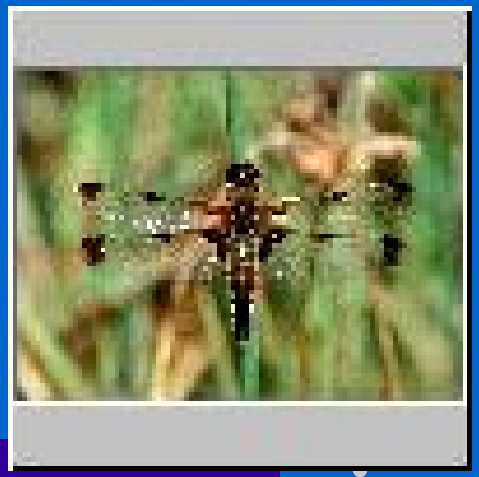
- Compile cumulative list of foods found
- Record presence or absence of each food for each specimen



- One or more of each food is calculated as the frequency of occurrence

This method gives valuable insights...BUT

- There are no limits to the information that it provides
- High frequency does not mean given food is of nutritional importance
- Does not give the importance of the various foods found



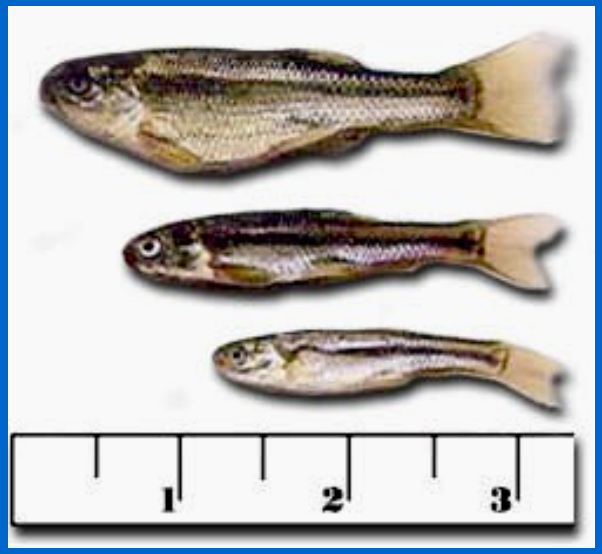
≠

Frequency of occurrence

- describes the uniformity with which groups of fish select their food
- does not indicate the importance of the various types of food selected.

Percent Composition by number

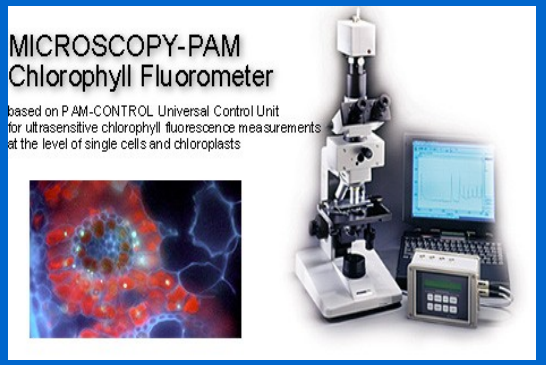
- Number of food items examined for each fish
- Metric is the percentage of each food item



Choose fragment found only once per prey

- Sub-sample for fish that eat smaller prey
- Sub-sample has to be smaller for fish that eat microscopic foods

- Epifluorescence microscope used for counting bacteria



Percent composition by weight

- Each food type expressed as a percentage of all food ingested
- Both wet and dry weights are used
  - Dry-weigh until you attain constant weight
  - Wet-blot fluid from surface and then weigh

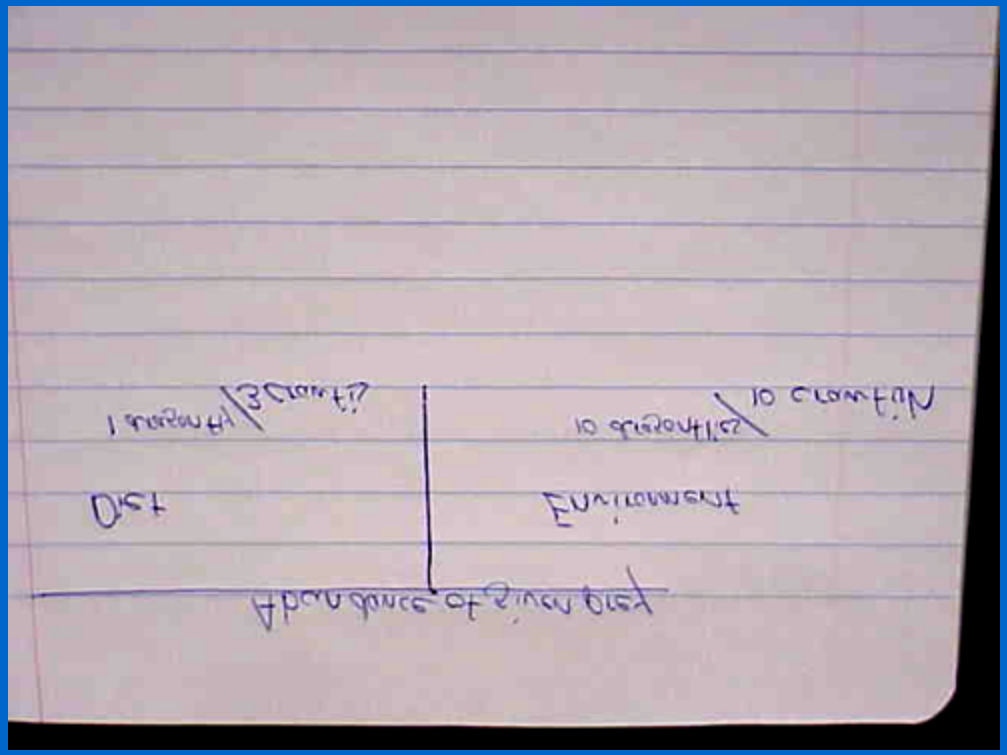
- Dry weights are more precise than wet weights

Percent composition

- Quantifies food types in directly comparable weight units
- Suggests relative importance of individual food types in the nutrition of fish

10  = 1 

17.7 Analysis & interpretation - Selectivity Indices



- Comparison of relative abundance of a given prey type in the diet vs relative abundance of that prey type in the environment
- Index used is the Strauss index calculated as
  - L= ri-pi4

Diet overlap indices

- Allow comparison of diets that are similar among species
- Uses Schoener's proposed equation (refer to text)
- Indices provides relative measures of the extent to which species use the same food resources
- Does not produce absolute measures of competition