

An Introduction to the Taxonomy and Ecology of EPT Families

Prepared by Dave Penrose
North Carolina State University
Biological and Agricultural Engineering
Department
Soil & Water Environmental Technology
Center (SWETC)

Taxonomy


Etymology is based on the two Greek words

taxare – to rate, to place value on or to assess

nomos – a rational principle

What are benthic macroinvertebrates?


- Invertebrates (animals without backbones) that live on the stream bottom and are visible with the naked eye, such as aquatic insects, crustaceans, worms, clams, and snails



Aquatic Insects in NC

- Ephemeroptera – mayflies
- Plecoptera – stoneflies
- Trichoptera – caddisflies
- Odonata – damsel and dragonflies
- Coleoptera – beetles
- Megaloptera – Dobson and Alderflies
- Diptera – True flies
- Oligochaeta – Aquatic worms
- Crustacea – Crayfish, amphipods, Isopods
- Mollusca – Snails and clams

EPT



Classification of Life

Kingdom - Animalia
Phylum - Arthropoda
Class - Hexapoda
Order - Ephemeroptera
Family - Baetidae
Genus - Baetis
Species - pluto

Number of families of EPT in NC

(as noted in Brigham et.al. 1982)

- Mayflies, Ephemeroptera – 16
– 238 species in the southeast*
- Stoneflies, Plecoptera – 9
– 189 species in the southeast*
- Caddisflies, Trichoptera – 18
– 544 species in the southeast*

*Morse et al., Southern Appalachian and Other Southeastern Streams at Risk: Implications for Mayflies, Dragon and Damselflies, Stoneflies and Caddisflies.

“There is so much in a name. To find out what a thing is called is a great help. It is the beginning of knowledge; it is the first step”

John Burroughs, Riverby, 1894

“In the first place we usually start with attempting to name our specimens and it is extraordinary how easy this usually is to begin with and how difficult it becomes as we accumulate knowledge.”

F. Balfour-Browne, Concerning the Habits of Insects, 1925

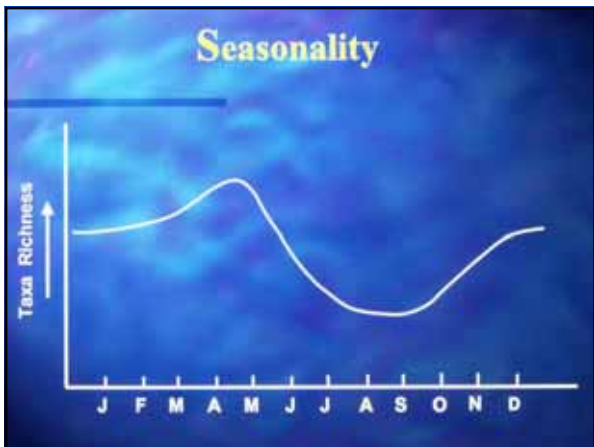
Why do scientists and regulators use Aquatic Insects?

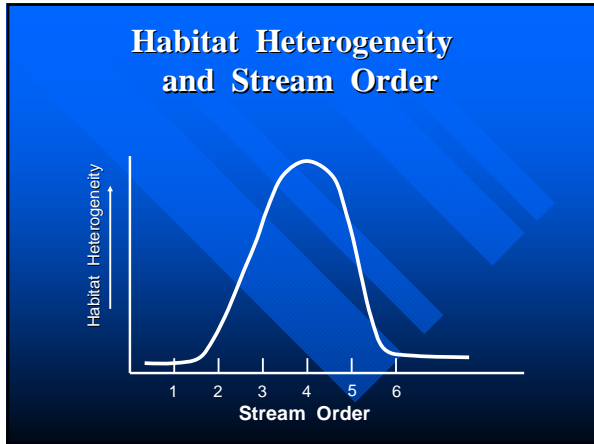
- Found in all aquatic habitats
- Easily and inexpensively collected
- Most life cycles are about one year in length in temperate stream systems
- Integrate a wide array of potential pollutant types
- Important in the diets of fish

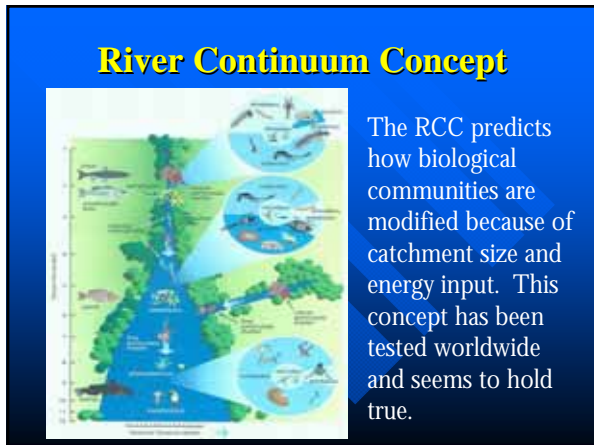


Sources of Variability in the Data

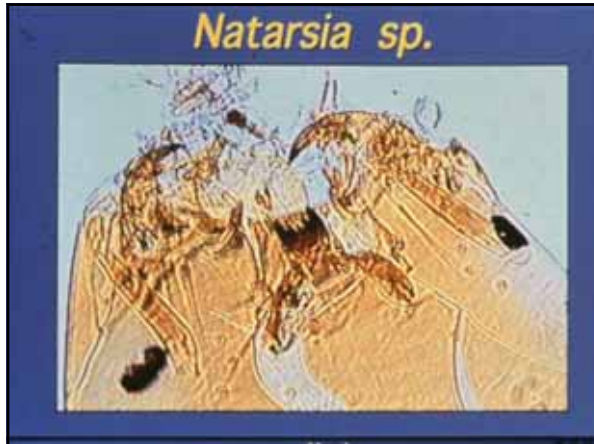
- Seasonality, spring vs summer collections
- Effects of stream size and continuum
- Effects of flow (point vs. nonpoint perturbations).
- Taxonomic consistency

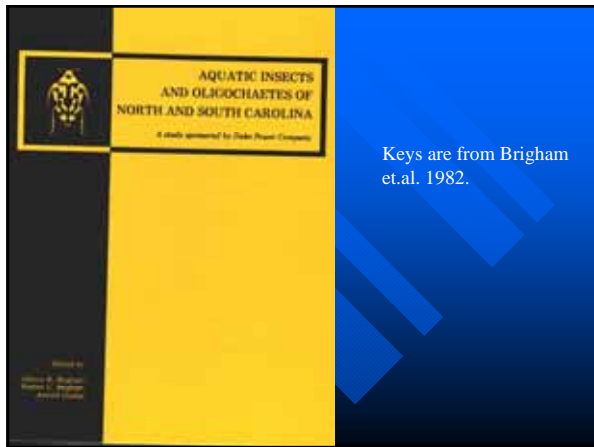


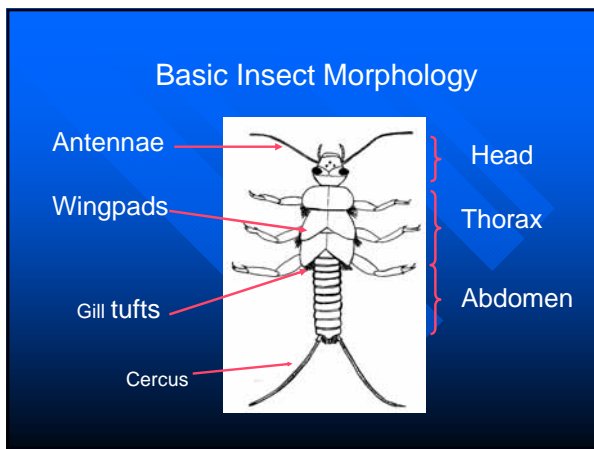




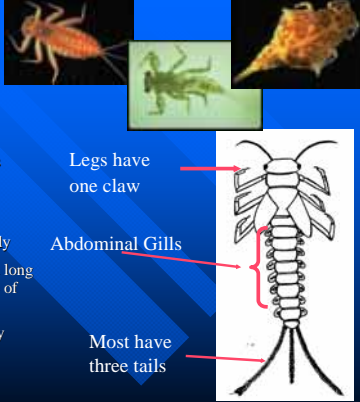








Ephemeroptera
Mayfly



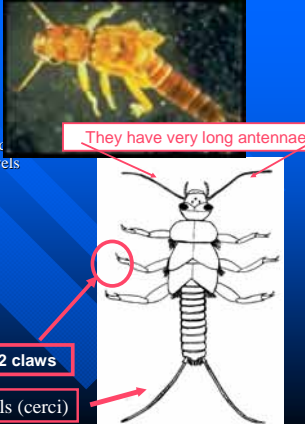
- Plate-like or feathery gills along the side of their abdomen
- 6 segmented legs on the middle section of the body
- Body can be up to 1 inch long (though there are a range of sizes)
- Has no gill tufts (no hairy armpits)

Legs have one claw

Abdominal Gills

Most have three tails

Plecoptera
Stonefly



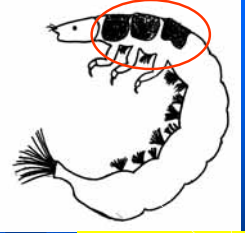
- Very sensitive to pollution; found in cool, clean streams with high levels of dissolved oxygen
- Have gill tufts (dark patches) found on either the thorax, abdomen, or legs—looks like hairy armpits
- Some look kind of like roaches
- Legs are spaced out

They have very long antennae

Legs end in 2 claws

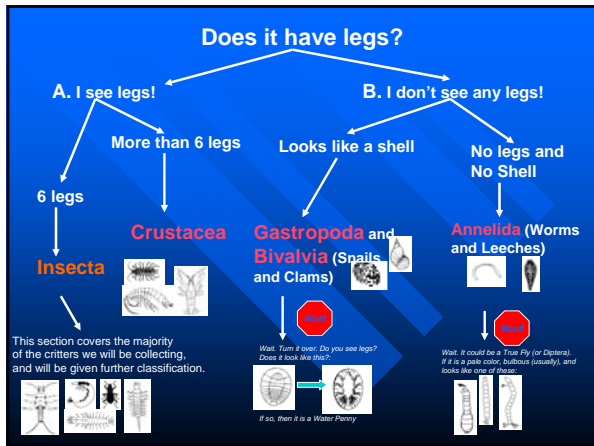
All have 2 tails (cerci)

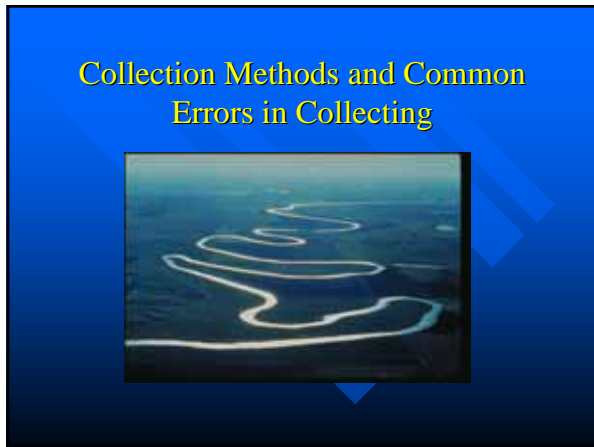
Trichoptera
Caddisflies



- Six segmented legs on upper middle section of body
- Two small, thick extensions at the end of the body and each has a single hook at the end
- Curved body with no obvious wingpads
- 3 hard shell plates (sclerotized) on thorax (for only this and one other family)
- Inconspicuous antennae

This is the **only** caddisfly that has brush-like gills on the underside of the abdomen and on its back end.






- When NOT to collect samples**
- Safety comes first, always!
 - » Electrical storms
 - » High flow wading
 - » Landowners
 - » Snakes
 - Immediately following high precipitation events, especially in unstable and/or urban streams

Division of Water Quality Collection Methods*

- Full Scale – streams must be at least one meter
 - 2 kick net samples from riffles
 - 3 sweep net samples from bank areas in flow
 - Leaf pack
 - 3 epifaunal collections (including sand habitats)
 - Visual
- Qualitative 4 and EPT methods
 - One kick net sample
 - One sweep net sample
 - Leaf pack
 - Visuals



*Refer to <http://h2o.enr.state.nc.us/esb/BAUwww/benthosop.pdf>

Methods for this Workshop

- Kick Net samples from riffles
- Sweep Net samples
- Leaf Packs
- Visuals

We will divide into groups of 4 or 5 people and maintain collections for each group. All samples will be picked in the field and specimens brought back to the lab for identification. The same groups will be responsible for identifications.

Common Collecting Errors

- Kick Net
 - › Proper Habitat Selection; flow and riffle types
 - › Keep the bottom of the net on the substrate; prevent the bedload transport of insects.
 - › Overflow and backwash of net
- Sweep Net
 - › Proper Habitat selection; bank full events
 - › Quantity of sweep material (too little or too much)

Common Collection Errors

- Leaf Packs
 - › Proper Habitat Selection
 - › Decomposing leaf material, not new material
 - › Careful Elutriation of leaf material
- Visual Collections
 - › Habitat selection – need to inspect stable habitat
 - › Transect entire stream
 - › Collecting experience

Field Methods

- Field pick all specimens and preserve them in alcohol.
- Try to pick only the EPT taxa, but if there are concerns about an insect – toast it. We'll be able to see if it's an EPT or not with the microscope.
- Refer to the On-Site Identification guides in your workbook if you have questions.

"If there's nothing else one ever learns about what to do when one comes upon a stream, one at least ought to know that the first thing to do is bend down, lift a rock, and inspect the damp, dark underside for signs of life. This is like lifting the hood of a car one is about to buy, or putting a melon up to one's nose. The first thing this does is put you right into the experience, be it car- or melon-buying or stream living. And to most of us, what we find under a rock in a stream is surely as mysterious as what we find under the hood of a car."

Bruce Stutz, Natural Lives, Modern Times, 1992
