

Fun with Macroinvertebrates



Arizona Rivers

Teacher Training Workshops

2009



What are aquatic macroinvertebrates?



- **Aquatic** means they that live in water (at least part-time)
- **Macro** means they can be seen without the aid of a microscope or other magnifying device
- **Invertebrates** are animals without backbones

Why care about aquatic macroinvertebrates?



- Macroinverts are valuable indicators of the health of aquatic environments because they are benthic.
- Benthic means they are typically found on the bottom of a stream or lake and do not move over large distances
- Thus, they cannot easily or quickly move away from pollution or other environmental stresses
- So...?

So.....

- Different macroinvert species react differently to environmental stressors like
 - Pollution
 - Sediment loading
 - Habitat changes



- Quantifying the diversity and density of different macroinverts at a given site can create a picture of the environmental conditions of that body of water

Intolerant vs. tolerant macroinverts

- If exposed to an environmental stressor (pollution, warming due to low flows, low dissolved oxygen due to algal blooms, etc.):
 - Intolerant macroinverts may die
 - Tolerant macroinvert species often inhabit spaces vacated by intolerant organisms,
 - The result is an entirely different population of organisms!



Macroinverts in healthy water bodies

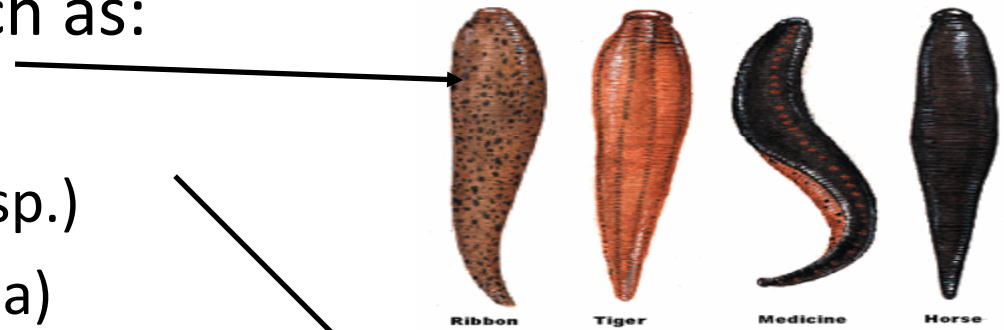
- A healthy water body will typically contain a majority of intolerant macroinverts such as:
 - Mayflies (Ephemeroptera)
 - Stoneflies (Plecoptera)
 - Caddisflies (Tricoptera)



Macroinverts in stressed water ecosystems

- A body of water under environmental stress will contain a majority of macroinverts that are tolerant of these conditions, such as:

- Leeches (Hirudinea)
- Tubifex worms (Tubifex sp.)
- Pouch Snails (Gastropoda)



Bioassessments of Macroinverts

- Bioassessments of Macroinverts:
 - Help biologists and others trying to help determine the health of a river;
 - Use inexpensive equipment;
 - Are scientifically valid when done correctly;
 - **Can be conducted by students!**
 - Provide benchmarks to which other waters can be compared;
 - Can be used to define rehabilitation goals.



How do I conduct a Bioassessment?

- Collect, identify and quantify macroinverts;
- Use simple formulas to calculate relative water quality based on diversity and quantity of sampled organisms
- These formulas, called **metrics**, relate the numerical diversity and density of organisms to a water quality rating



Common macroinvert metrics

- The most common metrics are :
 - The EPT/Midge ratio
 - The Pollution Tolerance Index