



lecture resources  
*...bringing ecology to life*

# THE ECOLOGY OF FRESHWATERS

***A complete freshwater ecology course on CD-ROM.***

***PowerPoint presentations showing the variety of freshwater types, the species you are likely to find and the techniques you need to understand their ecology***

## LECTURE 4

### ANIMAL LIFE IN FRESHWATERS

#### Part I - Invertebrates



Photography, text & design by Pisces Conservation

Animals can usually exist almost everywhere that liquid water is found.

They come from all the major groups of animals. To simplify our investigations they are often subdivided into the following basic categories:

Invertebrate (lacking a backbone)	Vertebrate (having a backbone)
Insects	Fish
Crustaceans	Amphibians
Mollusca	Birds
“Worms”	Mammals



## The animals dependent on freshwater may be:

- **Obligate aquatic** at **all** times, they spend their entire life cycle within the aquatic environment and are not able to leave it – e.g fish, plankton
- **Obligate aquatic** at **some** times, part of their life cycle requires the freshwater environment – e.g frogs, dragonflies
- **Facultatively aquatic**, utilising the resources of freshwaters, they feed on organisms in the water – e.g. birds, otters

While viewing these slides, think about how the physical characteristics of the water type influence the communities of animals depending upon it.



*Part I – INVERTEBRATE LIFE*



Invertebrates in freshwaters

## *The food chain*

*In its simplest form the food chain in open water systems is:*

*Top predator (carnivores) e.g. heron*

consumed by

*Middle predator (carnivores) e.g. fish*

consumed by

*Zooplankton (herbivores) e.g. copepod*

consumed by

*Phytoplankton (primary producers) e.g. algae*

*although the system is usually complicated by the presence of additional levels e.g. predatory fish such as pike, carnivorous zooplankton etc.*



## *The food chain*

*In benthic systems it has slightly different structure:*



*Again, additional levels introduce more complexity*



## *The food chain*

*The detritivores in a system are those animals that feed on the allochthonous or autochthonous inputs into a system.*

*Common detritivores include:*

*worms*



Many species  
Not easily identified

*amphipods*



Small crustacean,  
sometimes with no carapace

*isopods*



Small crustacean,  
flattened body,  
seven pairs of legs



*Detritivore*

*Crustacea, amphipoda*

*Laterally flattened body*

*Fast swimming*

*Grasping claws*





*Detritivore*

*Crustacea, isopoda*

*Dorsally flattened body*

*Walking, not swimming*

*No claws*



*Grazer*

*Mollusca, gastropoda*

The most important grazing animals in freshwater communities are the gastropod molluscs. With their rasping tongue, or radula they consume algal and bacterial films from many surfaces including plant leaves and rocks.



*Button snail*

*Planorbis sp.*



*Limnaea pereger*



*Bithynia sp.*



*Grazer*

Some gastropods are more mobile than others. Limpets tend to limit their movements to a small area whereas snails travel further afield.

*Mollusca, gastropoda*

5mm



*Filter feeder*

Filter feeders gather food items from the water column by pumping water over ciliated surfaces that move food particles to the mouth



*Mollusca*



*Carnivorous invertebrates*

*Insecta, trichoptera*



*Carnivorous invertebrates*

Many of the carnivores in freshwater are insects

*Insecta, odonata*



*Carnivorous invertebrates*

Some aquatic beetles are fast-swimming predators

*Insecta, coleoptera*

*Great diving beetle*  
*Dytiscus marginalis*

15



*Carnivorous invertebrates*



Dragonfly nymphs are ambush predators

*Insecta, odonata*





*Herbivorous/detritivorous  
invertebrates*

Freshwater fiddler crabs on the River Mattaponi,  
W. Virginia, USA



*Micro-predators*



*Hydra*



*Ciliate protozoan*



*Carnivorous invertebrates*

Bugs have piercing/sucking mouthparts for feeding on both plants and animals

*Insecta, hemiptera*



*Carnivorous invertebrates*

Some bugs are fast-swimming predators too



*Insecta, hemiptera*

7mm



*Carnivorous invertebrates*

Predators do not need to move fast to be successful.

*Class Hirudinea*



*Carnivorous invertebrates*

Some are very primitive.

*Phylum Platyhelminthes*

*Note light-sensitive cells around margin*



## *Body shape adaptation*

The shape of an animal is, to a very large extent, dictated by the medium in which it lives. In the freshwater environment, there are five main habitats:

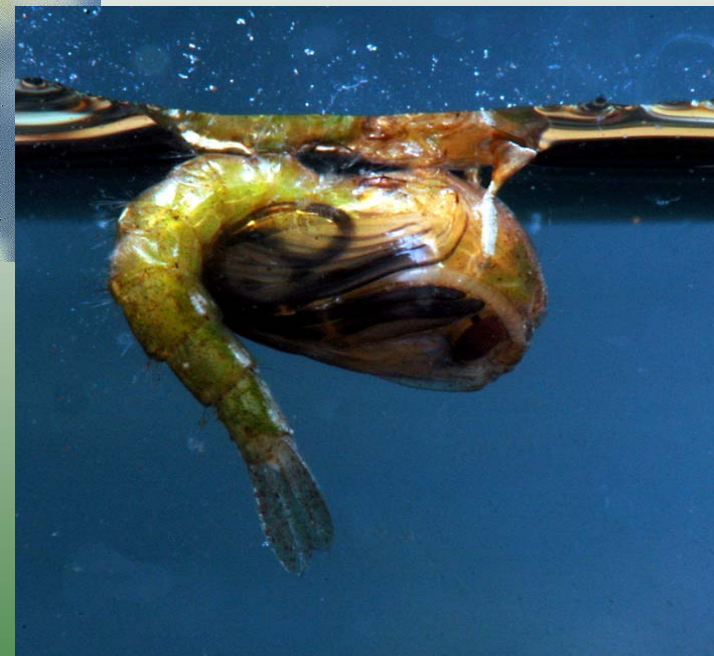
1. The surface film
2. Within the main water body
3. On hard substrates such as rocks
4. On, in or among vegetation
5. Within the sediment of the lake or river bed

Each requires modifications to body structure – the following slides will highlight a few of those adaptations:



*Surface film animals*

*Pond skaters sit above the film*

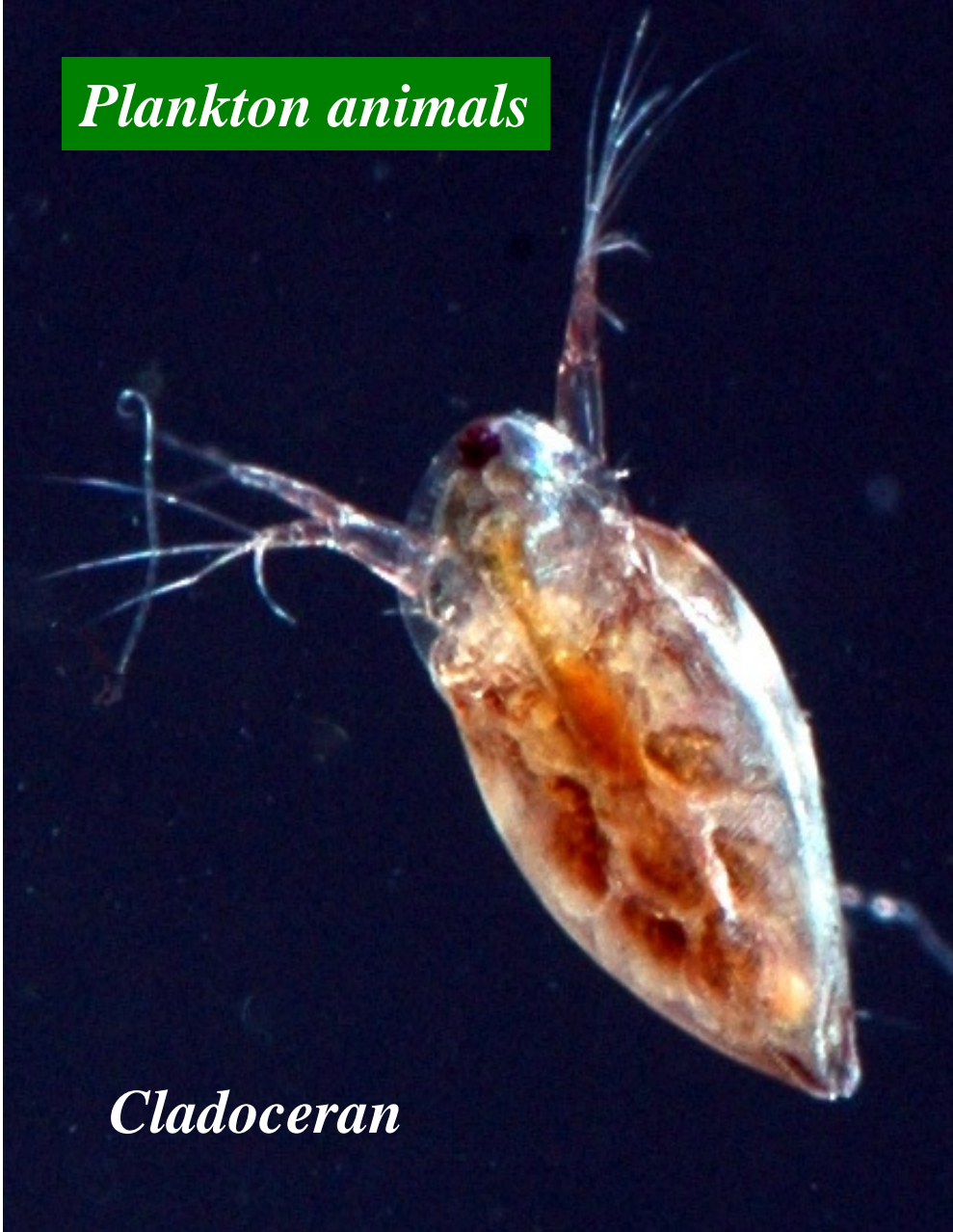


*Mosquito larvae hang beneath it*





*Plankton animals*



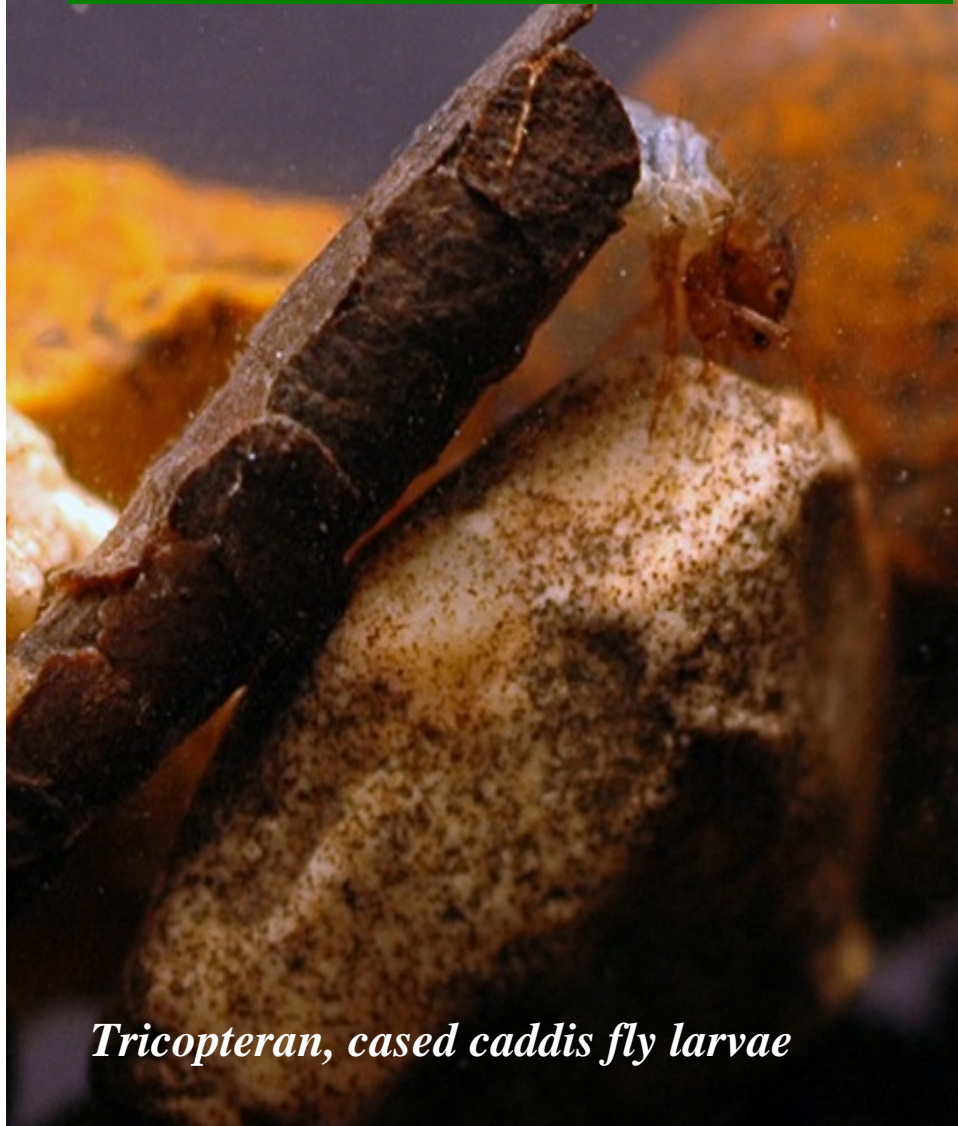
*Cladoceran*



*Copepod (female, with egg sacs)*



*Animals living on hard surfaces*



*Tricopteran, cased caddis fly larvae*



*legs to hold surface, gills on back*



*Animals burrowing within substrate*

*Ephemera danica*, note shovel-shaped head and strong legs



*Animals living on vegetation*



*Bithynia tentaculata*  
An operculate snail



*Ramshorn snail*  
*Planorbis sp.*



*Animals living on vegetation*



Invertebrates in freshwaters 21

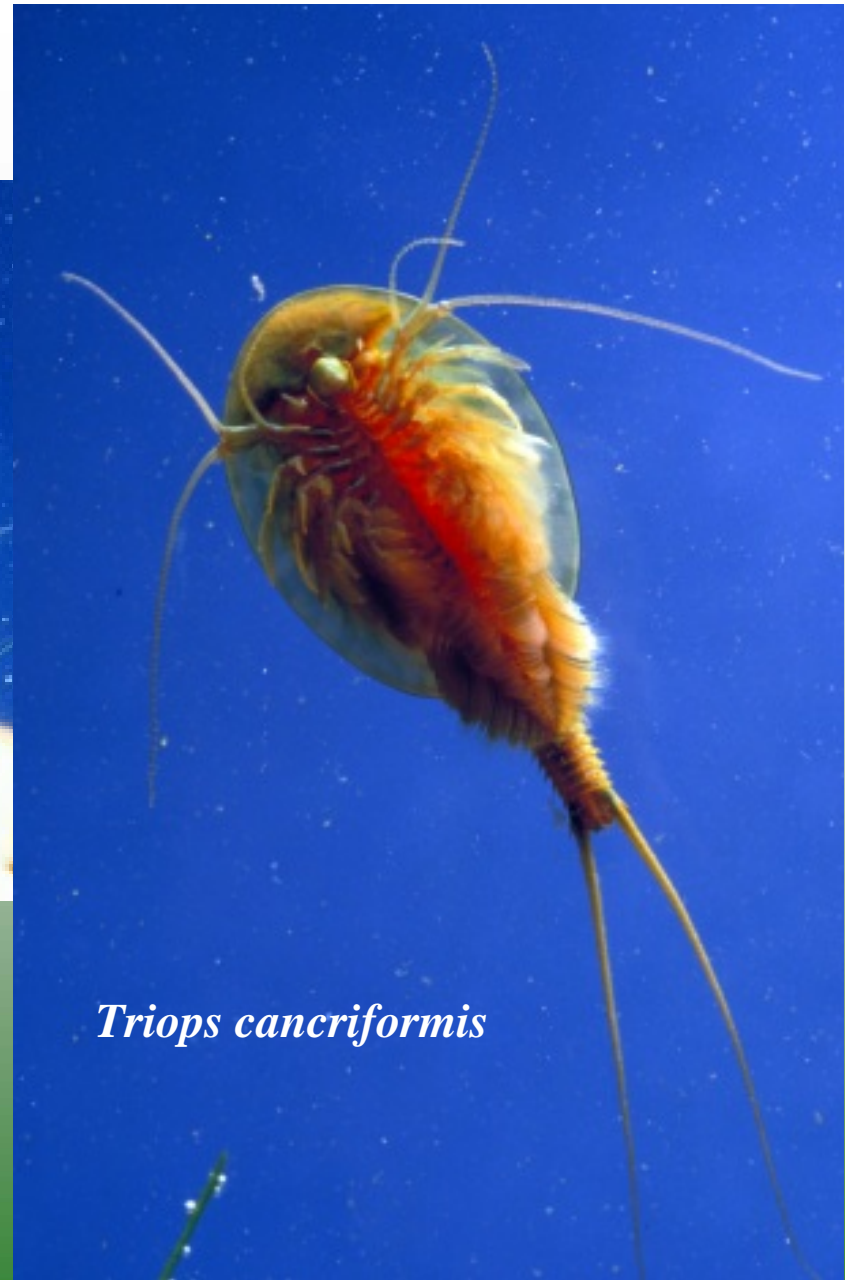
*Ramshorn snail*  
*Planorbis corneus*

## Animals living in temporary habitats



Fairy shrimp, *Cheirocephalus diaphanus*,  
has no carapace and swims back downwards

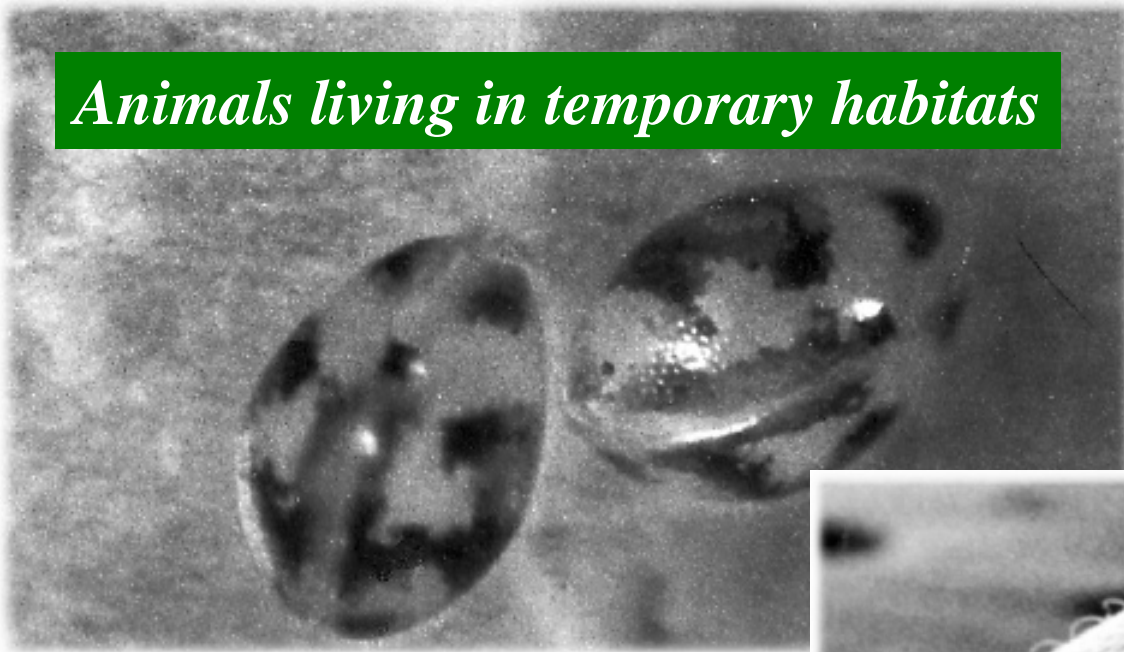
These animals occupy temporary pools because, having no fish, they offer a low risk of predation. They may also be eutrophic and develop algal blooms on which the animals feed. However these species must be able to cope with the constant risk of desiccation.



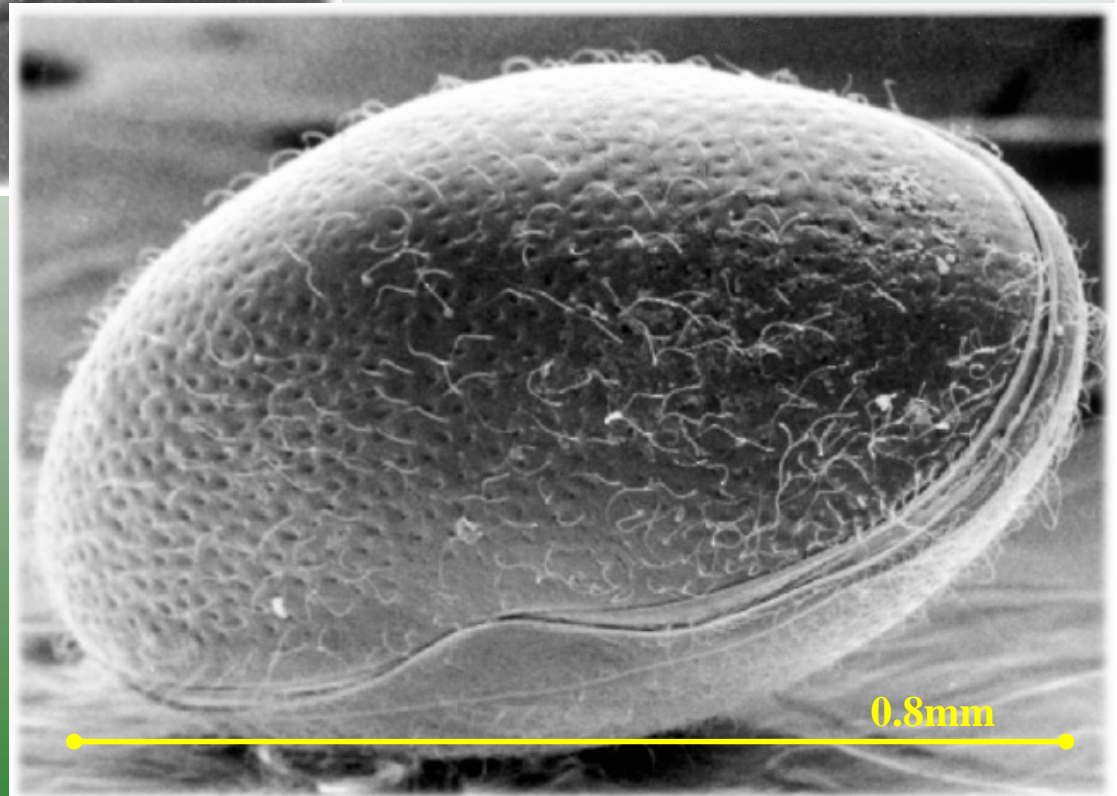
*Triops cancriformis*



*Animals living in temporary habitats*



*Ostracods are minute crustaceans, found particularly in temporary pools*



*Land and water meet....*





*Land and water meet*

