

## ***Additional Information***

### **Notes on Pond Invertebrates**

Adaptations to insects living in water involve: respiration; movement; getting food; and anchorage, among other activities.

5 adaptations to breathing while living in water:

1. **a spiracle tube for piercing the surface film** – example = mosquito larva – have respiratory tube or siphon, to break surface tension of water – mosquito larva can get enough oxygen this way to allow submerging for 10 minutes – when taking in oxygen, to remain at surface, mosquito larva have hairs that spread out on the film of surface water
2. **a device for carrying air on the outside of the body** – insect must first come to surface and break the film – water boatmen do this with their head; giant water bugs with flaps at end of abdomen; some beetles with unwettable clubs of antennae or with tip of abdomen – air then drawn in through any spiracle (tube-like opening) and channeled to spaces under the wings or on belly side (ventral side) of body where held in place by minute hydrofuge hairs coating body with silver sheen – acts as physical lungs or air gill – oxygen exchanged between this “physical lung” and body, going from highest concentration to lowest, similarly, can also absorb oxygen from water (higher concentration) into physical lung (also called plastron) then into insect’s body – allows some insects to stay below for up to 20 minutes, some for hours, or weeks
3. **tracheal gills** – these are thin-walled cutaneous outgrowths that contain many air-filled trachea – oxygen diffuses in and CO<sub>2</sub> diffuses out – gills are present on mayflies on their abdomen and they also have tail gills (this gives some indication of them living at the bottom where oxygen levels can be low) stoneflies have tracheal gills under their appendages on their thorax – dragonfly and damselfly nymphs, and caddis larvae have rows of tracheal gills in their anal area (lining of their rectum)
4. **blood gills** – these are thin-walled outgrowths of the larval body that are continuous with the blood cavity – occurs in some caddis larvae – insect blood contains haemoglobin for carrying oxygen – insects with blood gills usually live in waters of low oxygen
5. **chewing or piercing plants for oxygen in their tissues** – some insect larvae have a body part for piercing into plants and taking the oxygen from the tissues

## SSI Conservancy Stewards in Training Program

### Moving in water:

- ✧ streamlined bodies
- ✧ body may be keeled, and boat shaped, may have smooth slippery outer surface
- ✧ antennae sometimes folded back into grooves on sides of head
- ✧ 1 or more pairs of legs flattened and fringed with long hairs
- ✧ legs of some bugs have a segment expanded into oar-like shape
- ✧ jet-propulsion – dragonfly and damselfly larvae – suck in water through anal opening and shoot it out

### Anchorage:

- ✧ air-filled trachea mean insects would have tendency to float to surface – so many have claws to cling to vegetation
- ✧ some have flattened bodies
- ✧ caddisfly larvae are held down by the weight of their cases – to make their case they first spin a silken tube, in this they weave their building material – if using vegetation many of the bits will have been especially cut to size and laid end to end or parallel for woven pattern or spiral – some species use pebbles to build their cases

### Getting Food:

- ✧ water tiger (larva of predaceous diving beetle) attack insects, tadpoles, snails, etc – use sharp dagger-like jaws to grasp victim, then inject juices into victim that digest its body and water tiger sucks up meal
- ✧ dragonfly and damselfly larvae are voracious predators, feeding on insects, sometimes tadpoles and small fish – they have a large lower lip (labium) that flips out instantaneously to catch its prey, grabbing hold with tiny teeth along the lip
- ✧ mayfly nymphs feed on diatoms (phytoplankton) and other microscopic plant organisms, or chew tissues of higher plants
- ✧ caddisfly larvae – are omnivorous – eating diatoms, algae, small bits of plant material, but also eat small crustaceans (gammarus or scuds), insects and worms