

Cumberland County Aquatic Insects

No. 24

Obed Watershed Community Association

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*Read this fact sheet while you view the aquatic insects pictures at the OWCA website:
www.obedwatershed.org*

Coleoptera (Beetles)

Researchers estimate that half of all animal species alive today are beetles which means about three million beetle species. The word *Coleoptera* means sheathed-wing. Beetles have two pairs of wings, but the first pair has been enlarged and thickened into a pair of hard sheaths that cover the delicate hind wings.

Family Elmidae (Riffle Beetle) occurs worldwide and is well represented except in the high polar regions. Worldwide the family is represented by about 145 genera and 1,308 species. Adult elmids are totally aquatic and obtain their oxygen by diffusion through an air bubble that they hold to their undersurface. The air bubble can appear as a silvery layer in live beetles. Larvae are totally aquatic, breathing by means of gills. Northern Hemisphere elmids have short flight periods before re-entering the water as adults. Elmids feed on waterlogged wood, decaying vegetation, algae, moss or fine detritus. Adults and larvae occur together in various running water habitats. Elmids are extremely sensitive to even mild pollution and quickly disappear from degraded streams. In general, the presence of elmids is considered diagnostic of clean, well-aerated water conditions.

Family Hydrophilidae (Water Scavenger Beetle) comes in a wide range of sizes and is generally brown or black. While the adults usually feed on decaying matter, the larvae are predaceous. To breathe, water scavenger beetles hold an air bubble on the undersurface of the body. These beetles come to the water surface head first. About 34 genera and 225 species are found in North America.

Family Psephenidae (Water Pennies) larvae very much resemble pennies from one side. Their whole bodies are an excellent suction cup, and their legs are strong for clinging to rocks. Psephenids are somewhat translucent and extremely well camouflaged. The result is a well-adapted fast-water insect. Adult females crawl into water and deposit eggs on undersides of stones. The adults are not truly aquatic and can be found on emergent rocks in riffles. The beetle larva feeds primarily plant debris such as algae and diatoms. Their presence indicates ample supply of oxygen, and fast flow of water.

Diptera (Flies)

The order Diptera includes all true flies. These insects are distinctive because their hind wings are reduced to small, club-shaped structures which vibrate during flight and work much like a gyroscope to help the insect maintain balance. All Dipteran larvae are legless. Approximately 10% of all dipteran species are aquatic in their larval stage. Adults are always terrestrial. Some species are herbivores, but most feed on dead organic matter or parasitize other animals, especially vertebrates, molluscs, and other arthropods.

Family Chironomidae (non-biting midges, lake flies) account for most of the macroinvertebrates in freshwater environments. In many aquatic habitats this group constitutes more than half of the total number of macroinvertebrate species present. The family is the most widely distributed group of insects, having adapted to nearly every type of aquatic or semiaquatic environment. Larvae are an extremely important part of aquatic food chains, serving as food for many other insects and fish. Chironomids feed on diatoms, detritus, and other small plants and animals. Most adults do not feed.

Family Empididae (the Dancing Flies) is a large group of predaceous flies, including a few that feed on flower nectar. Adults are often found in stream riparian areas, feeding on other smaller insects. Empidid adults are important natural and biological control agents of various pest insect species. Larvae are generally

found in moist soil, rotten wood, dung, or in aquatic habitats and also appear to be predaceous on particularly other Diptera larvae. In mating swarms, males fly up and down in a sort of dance. Males offer to females an insect they have captured and wrapped in silk. Females choose the male with the most enticing prey offering.

Family Simuliidae (Black Flies) are bloodsuckers and vectors of certain parasitic organisms. Larvae are aquatic filter feeders, attaching themselves to submerged stones or other objects in flowing waters. Adult females are relentless in their pursuit of vertebrate blood. The outlets of ponds and lakes are particularly favored habitats.

Family Tabanidae (Horse Flies) as adults feed on nectar and sometimes pollen. Females require a blood meal for reproduction, mainly feeding on mammal blood. Horse flies are most active mostly in summer and autumn during the daylight hours. Most species also prefer a wet environment, which makes it easier for them to breed. The female lays eggs on vegetation overhanging moist soil. The larvae hatch and drop onto the soil, where they feed on smaller organisms until pupation. The bright, colorful, often iridescent eyes are perhaps the most obvious feature of the adult. The family is distributed worldwide, and about 2,000 species have been described.

Family Tipulidae (Crane Flies, Mosquito Hawks) do not prey on mosquitoes as adults, nor do they bite humans. Adult crane flies feed on nectar, or they do not feed at all as adults, living only to mate and then to die. The long legs are an adaptation to allow the fly to alight in grassy places. Crane flies occur chiefly in damp situations with abundant vegetation. Larvae are aquatic or semiaquatic, feeding on decaying vegetable matter.

Ephemeroptera (Mayflies)

Family Baetidae is the largest family of mayflies in North America with 140 species with an extremely wide range of running water habitats. Nymphs are found in shallow flowing water, commonly in riffles, on or under stones.

Family Caenidae (Small Squaregill Mayflies) is comprised of four genera consisting of 26 individual species. They are found throughout North America. They can be found in quiet and even stagnant water and are often overlooked because they are so small. Their gills are specially adapted for silty environments. Adults usually emerge from May to September. Unlike other mayflies, squaregills can be found in degraded conditions and are not a reliable marker for undisturbed conditions.

Ephemerellidae (Spiny Crawler Mayflies) are known in eight genera consisting of a total 90 species and distributed throughout North America. They are found in all sizes of flowing streams on different types of substrates where there is reduced flow. They are even found on the shores of lakes with waves. They move by swimming and are very well camouflaged. Most species have one generation per year. They are mostly collector-gatherers. If threatened by a predator, the larva will raise its three tails in a "scorpion posture" to appear larger. It will then project its tails in front and poke the enemy. Most species are sensitive to pollution.

Family Heptageniidae (Stream Mayflies) has 500 described species. They breed mainly in fast-flowing streams. The nymphs have a flattened shape and are usually dark in color. They use a wide range of food sources with herbivorous, scavenging and predatory species known.

Family Isonychiidae has only one genus, *Isonychia*, which has 17 species. It is common and widespread across the United States. They are active swimmers that swim into brisk currents and filter algae and diatoms from the water using the long setae on their fore legs. They may also eat smaller nymphs or larvae.

Megaloptera (Dobson Flies)

Corydalidae Family (Dobson and Fish Flies) contains the insects known as dobsonflies and fishflies.

Adults often have long filamentous antennae and four large wings. The dobsonfly larvae inhabits the more oxygenated waters of riffles and possess only tufted gills for respiration. The fishfly inhabits the quieter waters of pools and still water. The larvae are active and armed with strong sharp mandibles. When full sized they leave the water and spend a quiescent pupal stage on the land before metamorphosis into the sexually mature insect.

Plecoptera (Stone Flies)

Perlidae Family (Common Stonefly) has 15 genera with a total of 72 species. They can live for as long as three years. Perlid adults emerge in the summertime. Larvae live in cool, clear medium to large streams and sometimes in larger, warm rivers that carry silt. They are crawlers and can move quickly. The larvae consume all types of invertebrates. Very young larvae are collector-gatherers. They are usually very sensitive to changes in environment.

Perlodidae Family (Springflies) is composed of approximately 30 genera and more than 103 species. The perlodids are found throughout North America. The majority of perlodid stoneflies have one generation per year. Usually, adults emerge from April to June. The perlodids generally live in flowing streams or pools that contain sediments, vascular plants, and detritus. They are most often found in cool, clear streams with rocky bottoms. They are found under rocks and also in coarse particulate organic matter. The larvae are generally considered to be clingers as can be seen by their wide stance for gripping substrates. The perlodid larvae are mostly predators that engulf their prey; although, there are a few species of scrapers and collector-gatherers. They will eat a variety of small invertebrates, but they are also known to eat plant matter, especially when young.

Taeniopterygidae (Winter Stoneflies) has 35 species in six genera and are found throughout the United States and Canada where the water conditions are right (in warmer areas, usually at high elevations). Nymphs develop in cold, clear running water, usually in large streams and rivers. Adults are often attracted to bridges over streams. Some species rest on fence posts and snow on warmer days of late winter. They are usually described as shredders, which means they eat more-or-less whole living or dead plant material, or detritivores, which means they eat pieces of broken-down organic matter. Adults and nymphs are plant feeders. Nymphs climb out of the water and shed their skins to become adults. This is usually in late winter. The adults live just long enough to mate and lay their eggs. The nymphs hatch shortly and feed for a while before going into diapause (a hibernation-like state) from mid-spring until fall. Their main period of growth and activity is fall and winter. The defining need of winter stonefly nymphs is for very high levels of oxygen in the water. Warm temperatures, excessive organic matter, and many pollutants all reduce oxygen levels. The result: they are only active in the coldest part of the year and are very sensitive to pollution.

Tricoptera (Caddis Flies)

Brachycentridae (Humpless Casemakers) larvae live in streams and build cases which are either 4-sided like a log-cabin or are cylindrical. Larvae creep around, often clinging to woody debris in the stream. Some larvae occur in cold sandy streams. Adults are terrestrial, with four hairy wings that give them a moth-like appearance. Brachycentrid larvae either spin small silk nets that collect detritus out of the stream current, or they shred leaves for food. Adults feed on nectar. Larvae are very intolerant of nutrient pollution and are good water quality indicators.

Glossosomatidae (Saddle or Turtle Casemakers) larvae live in fast current streams and build tortoise-like cases of tiny rocks held together with silk. Larvae carry these cases with them as they crawl about on stream rocks. Adults resemble moths and can be found in vegetation alongside the stream. Larvae scrape algae and detritus off of stream rocks. Adults feed on nectar. Because Glossosoma cases are built to a fixed size, the larvae have to abandon them and build new ones as they grow. In the process they may accidentally or deliberately end up drifting downstream for a while. Larvae are very intolerant of nutrient pollution and are good water quality indicators.

Family Helicopsychidae (Snail-shell Caddisflies) has seven species in one genus in North America. The spiral "snail shell" shape of the larval case is diagnostic as is the strongly curved "J" shape of the larva. Larvae usually live in fast-flowing streams and rivers, but some are found in shallow areas of lakes, thermal springs, and deep within the streambed. Larvae often live clustered together on rock surfaces. The nocturnal adults are found near larval habitat. Larvae scrape diatoms and detritus from underwater surface of substrate

Hydropsychidae (Netspinners) is the main family of net-spinning caddisflies. Instead of building cases to live in, they build small silk nets over crevices in rocks and logs. The current brings their microscopic prey into these traps. One larva may build and tend to more than one net. Larvae are omnivorous and will eat smaller animals if given the chance. Larvae are very common in rocky streams where currents are medium to fast. Adults resemble moths and are commonly found flying near streams during the warmer months. Most species are moderately tolerant of nutrient pollution, but a few are sensitive to pollution

Leptoceridae has 115 species in eight genera in North America.. The larvae build cases from a variety of materials including sand, rock, silk, plant fragments, and freshwater sponge spicules. The shapes and sizes of these cases vary considerably. The larval case of some species are a "log cabin" type made from twigs; in some other species, the case is made from leaf and stem sections. Adults rest during the day on vegetation near streams and lakes and fly after sundown. Larval caddisflies in general feed on aquatic vascular plants, algae, diatoms, crustaceans, and immature aquatic insects such as midge and blackfly larvae.

Family Molannidae larvae live in still water and make shelters with flat grains of sand with a "hood" that covers the head of the insect, resembling a cobra head. They live in lakes, sloughs, slower streams with sandy or muddy bottoms. Adults fly from late May to early September, with a peak in July. The larvae are omnivores, eating diatoms, filamentous algae, vascular plant tissue and small invertebrates.

Family Philopotamidae (Fingernet Caddisflies) has 47 species in three genera in North America. Larvae live in fast-flowing portions of rivers and streams, while the adults live on nearby vegetation. Larvae are filter-feeders, eating small particles of plant and animal matter plus algae such as diatoms that become trapped in the meshes of their nets. Larvae spin very fine-meshed nets, usually grouped together on the undersides of rocks near the upstream edge.

Family: Polycentropodidae (Trumpet-net and Tube-making Caddisflies) larvae live in small creeks to large rivers. Larvae are predacious filter feeders.

Family Rhyacophilidae (Freeliving Caddisflies) are one of the few caddisflies that do not build cases or spin nets, making them more vulnerable to fish predation. The often-green larvae live in cool streams and crawl about actively through stream rocks and debris. Adults are moth-like and found along stream margins. The larvae are active predators, crawling along the stream bottom in search of prey. The larvae are moderately intolerant of nutrient pollution.

The Obed Community Association has as its purpose community appreciation and volunteer involvement in ongoing appreciation for our natural and cultural heritage of the Obed River watershed within Cumberland County. Louise Gorenflo, OWCA community educator, produced this fact sheet. Those wanting to join this membership organization or more information may contact OWCA at 484-2633 or at 185 Hood Drive, Crossville, TN 38555.