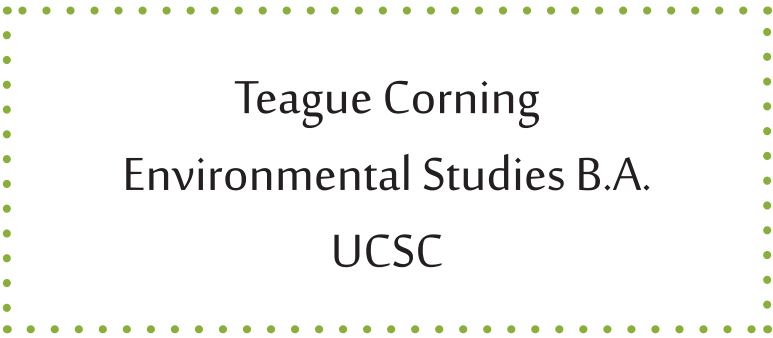
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Common Aquatic Insects of West
Marin County:
An Informational Booklet

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How to Use This Booklet



This booklet is intended to be referred to after spending some time looking at aquatic insects in a stream. The orders and families I have included in this booklet were selected for their high abundance in spring in the west Marin streams studied by PhD student Bronwen Stanford. The order section gives a brief description of the insect's physical characteristics. In the family section, each family's tolerance level, feeding method, habitat, and movement are explained. I hope this booklet educates and excites young naturalists about the wonderful world of freshwater ecosystems.

The Importance of Aquatic Insects

A quick and easy way to determine stream health is to examine the organisms living there. Aquatic insects are great indicators of how well or poorly a stream is functioning. Some freshwater insects can thrive in almost any type of environment, but there are others that need specific conditions in order to survive. Other insects are sensitive to stream chemical and biological conditions. When these insects are present, they signal that the stream is in good health. Each family is labeled with a number ranging from 0-9 that corresponds to its tolerance level to stream stress. Zero indicates a very low tolerance and nine indicates a very high tolerance to stressful conditions.

Besides being indicators of a stream's health, aquatic invertebrates serve an important role in the food web. Due to their very small size, they mostly eat and recycle the organic matter near the bottom of streams. **Scrapers** eat algae or diatoms off of rocks and logs, while **Collector-Filterers** gather and sort out the organic matter to eat. **Shredders** tear up decomposing plants that have fallen into the stream. **Collector-Gatherers** sift through organic matter accumulated at the bottom of a stream. **Predators** eat other living small invertebrates. Aquatic insects then get eaten by larger insects or small fish who get eaten by larger fish, birds, and amphibians. Aquatic insects form the base of most aquatic food webs.

Orders



Coleoptera (Water Beetles)

Larvae - Body shapes vary with family. Typically have leathery body plates, 3 pairs of segmented legs, and 1 or 2 claws at end of each leg.

Adult - Hard oval body with wings capable of flying, antaennae, 3 pairs of segmented legs, and 2 claws at the end of each leg.

Ephemeroptera (Mayflies)

They have abdominal gills, 1 or 2 sets of wing pads, 3 pairs of segmented legs with one claw at the end. Most have 3 tails, but some can have only 2.

Plecoptera (Stoneflies)

Some have single or branched gills under thorax with 2 sets of wing pads. Three pairs of segmented legs with 2 claws at the end. All only have 2 cerci.

Trichoptera (Caddisflies)

Most have soft bodies, but thorax is covered with 1-3 hard plates. All have 3 pairs of segmented legs with 1 claw at the end. A few families have gills under abdomen. Many families in the order make cases, a special enclosure they use to protect their bodies. Two hooks at the end of their prolegs attach to the inside of the case.

Diptera (True Flies)

Elongated worm-like bodies, some have prolegs under head or end of abdomen, and head is often small or absent.

Odonata (Dragonflies and Damselflies)

They have 2 pairs of wing pads, 3 pairs of segmented legs with 2 claws at end. Their very large head holds an extendable jaw.

Zygoptera (Damselflies) - long slim body with 3 broad tails

Anisoptera (Dragonflies) - large round body without tails

Non-Insects

Amphipoda (Scuds)

White/yellow colored body with 7 pairs of thoracic legs.

Acari (Water Mites)

Round body with 8 thin legs underneath.

Gastropoda (Snails)

Hard spiral shell containing a soft body .

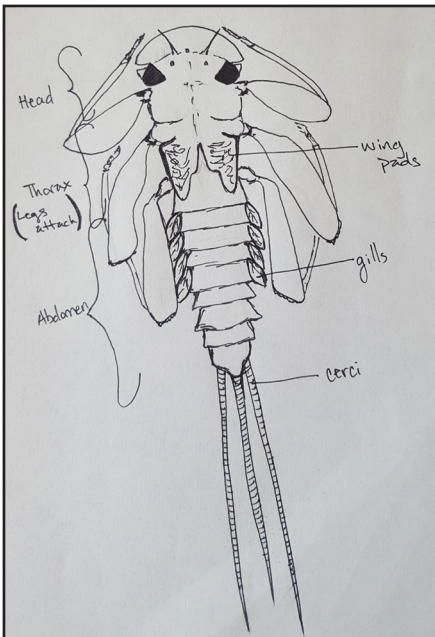
Hirundinea (Leeches)

Soft, ribbed, flat body.

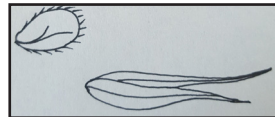
Turbellaria (Flatworms)

Flat and soft body; head shaped like an arrow.

Helpful Definitions



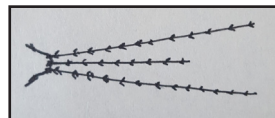
Gills - filaments or flat plates



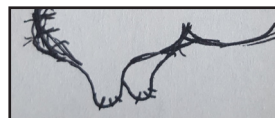
Wing Pads - developing wings



Cerci - tails at the end of an insect



Prolegs - small fleshy legs



Families

.....Ephemeroptera (Mayflies).....

Baetidae



Tolerance: 4

Feeding: Collector-Gatherer/ Scraper

Habitat: Typically found in low flowing stream beds under or on rocks. Also can be found on aquatic plants.

Movement: Climber, swimmer, and clinger.
Streamline body.

* Body coloration helps blend into the environment.

Ephemerellidae



Tolerance: 1

Feeding: Collector-Gatherer/ Scraper

Habitat: Typically found in fast moving water between rocks, also can be found in exposed plant roots.

Movement: Crawlers, movement stiff and slow. Their coloration provides camouflage in resting places.

* I call these little critters the scorpion dudes. When threatened, all three of their tails will flare up into “scorpion posture” to appear large. This defense protects their head if the intruder does not flee.

Ameletidae



Tolerance: 0

Feeding: Collector-Gatherer

Habitat: Typically found in fast moving streams near the bottom of stream bed amongst the pebbles.

Movement: Swimmers and clingers, ability to swim in very fast moving water helps them transition to slow moving water where they like to reside.

* Some are able to stay dormant in egg stage when a stream has dried out, then hatch when stream is revived.

.....Plecoptera (Stoneflies).....

Nemouridae



Tolerance: 2

Feeding: Shredder

Habitat: Typically found on stones and roots in fast-moving streams

Movement: Crawlers, can move quickly to catch prey.

* These fuzzy little critters have neck gills that look like tentacles under their mouthparts.

Perlodidae



Tolerance: 2

Feeding: Predator; eats other living macroinvertebrates

Habitat: Typically found in cold and fast moving streams with rocky bottoms. Can also be found among leaf litter as they wait for prey.

Movement: Crawlers, can move quickly to catch prey.

* As young larvae, they eat organic matter, but as they continue to grow, they begin eating other macroinvertebrates.

Chloroperlidae



Tolerance: 1

Feeding: Predator, eat other living macroinvertebrates and some eat freshly hatched salmon fry.

Habitat: Typically found in clean water that moves swiftly over rocks.

Movement: Crawlers

.....Trichoptera (Caddisflies).....

Hydropsychidae



Tolerance: 4

Feeding: Collector-Filterer, some are predators. They attach a net to their case that catches other small insects and eat them.

Habitat: Typically found attached to rocks in fast moving waters, best place for water to filter through their net. Their cases are mainly made of small debris they have glued together with the silk they are able to produce.

Movement: Clinger, attach themselves to

Philopotamidae



Tolerance: 3

Feeding: Collector-Filterer, distinct T-shaped upper lip scrapes off microbes caught on the fine mesh of its case.

Habitat: Typically found in the swift regions of a stream under rocks and logs. Produce fragile silk retreats they attach to logs and rocks.

Movement: Clingers, attach to their retreats.

Lepidostomatidae



Tolerance: 1

Feeding: Shredders, they eat decomposing leaves that have fallen into the stream.

Habitat: Typically found in slow moving parts of a stream where fallen leaves have accumulated. Build cases made up of small pieces of bark and pebbles.

Movement: Crawlers and climbers. Cases are portable and used to protect their soft body.

.....Diptera (True Flies).....

Chironomidae



Tolerance: Variable, typically not a good indicator of stream health.

Feeding: Variable, but most are Collector/Gatherers.

Habitat: Can be found in most parts of a stream.

Movement: Burrowers and clingers, worm-like bodies typically move freely.

* Body colors vary with type of substance they eat. They are very diverse and found in large quantities.

Simuliidae



Tolerance: 6

Feeding: Collector-Filterers

Habitat: Can be found in moving streams attached to rocks, debris, and vegetation.

Movement.: Clingers, able to produce a sticky silk substance to attach the end of their abdomen to a solid object.

* My favorite Diptera family for their tiny detailed wing pads on either side of thorax.

Why Are EPT Orders Important?

Three orders are great indicators of a healthy watershed. Ephemeroptera, Plecoptera, and Trichoptera (E.P.T.) are orders that contain families that are mostly very sensitive to pollution and stress. Some factors that cause stress in streams include high water temperatures, low dissolved oxygen levels, high acidity, pesticides, fine sediment, and too many nutrients. There are many other factors that can cause the environment to not be suitable for these orders to survive.

Streams with at least three families from each of the three orders are considered healthy, although some small streams might be healthy even if they have less family diversity. To fully determine how healthy a stream really is, one must sample to look for representatives of these important groups of aquatic invertebrates. Physical and biological factors must be measured and recorded, including identifications and counts of all the aquatic insects in an area of the stream to fully determine its health.

How Can YOU Help?



1. Clean up after yourself and others when near a stream.
2. Do not dump anything in stagnant or moving water.
3. Report any strange sources of liquid near or in a watershed.
4. Learn about your local watershed from local government and educational programs.
5. Teach others about the importance of aquatic insects and their benefits to a stream

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