

**Series 01 Episode 02**  
**Entomology**  
**Subject to Updates**

In this podcast, I discussed how your knowledge of insects will benefit your fly fishing.

Fish eat bugs because the bugs often come to them in the current, they don't have to go after them. Just as you can fill up on a bowl of popcorn, a fish can fill up on tiny insects.

**Insects**

- Small are small and their size is limited by their external skeleton. The larger it gets, the heavier it gets and they would not be able to support that weight.
- May occur in high population densities
- Live mostly in fresh water, Crustaceans are their saline counterpart
- Compost a major component of fish diets and are easy prey items
- Fish tend to sip smaller ones, gulp larger ones
- Composed of a complex carbohydrate classified as a protein called chitin
- Eating insects is metabolically efficient = the net gain of calories is greater than the amount of calories lost in the process of pursuing, chasing, etc
- In ecology terms, insects are considered under the term r-selection which means they tend to be:
  - Small size
  - Reach sexual maturity fast
  - Have a short gestation time
  - Produce high quantity of offspring which are generally left to fend for themselves
  - The theory being that the more offspring produced = greater chance some of those will survive to pass on their genetic information.

## **Anatomy**

- Insects have bilateral symmetry which means the left and right sides are equal in shape and size
- Their bodies are composed of:
  - Head
  - Thorax
  - Abdomen.

## **Head**

- Mouthparts
- Sensory organs
- Eyes for sight- some eyes form images, some don't.
- Brain.

## **Thorax**

- Wings ('ptera') and insects are only Invertebrates that fly
- Legs
- Associated musculature for locomotion
- Some breathing pits (spiracles) on terrestrial insects.

## **Abdomen**

- Contains organs for:
  - Digestion
  - Defecation
  - Respiration
    - Terrestrial insects have tiny pits or spiracles that open to the outside. Gas exchange inside to prevent desiccation
    - Some aquatic insects have filament like exterior lungs, (nymphs tend to hold in turbulent water which has more oxygen)
- Defense – stinger in bees is modified reproductive organ
- Tails
- Reproduction –ovipositors in some shaped based on where/how lay eggs.

## **Different Types of Life Cycles**

- Some live for a portion of their life in water and emerge from the water (by swimming or crawling out) for a terrestrial adulthood, returning to the water to mate and lay their eggs, making them an easy meal for fish
- Fish depend on these emergences or “hatches” for gorging themselves on food to pack on weight
- The emerging stage is quite vulnerable as trying to break through the water’s surface tension and get to safety while exiting their skin. This awkward stage makes them an easy target and a favorite food item for fish. Some insects don’t fully develop and die before this molting stage, they are known as cripples. Some insects can’t break out of the water and drown, these are known as stillborns
- Being able to identify different stages being consumed by fish and matching that stage with your fly is key to success.

## **The Life Cycle Stages**

- Egg
- Larva(e) – feeding & growing (nymph in fishing lingo)
- Pupa(e) – inactive, non feeding, protected like a mummy
- Adult – feeding & reproduction.

## **Two Types of Metamorphosis:**

1. Complete
2. Incomplete Complete Metamorphosis

### **Complete**

- Egg → larvae → pupae → adult
- 85% of insects
- Complex life cycle with several changes in body morphology
- Insect changes shape/morphology throughout life
- Larvae specialized for eating & growing
- Pupae are a unique stage to this type of metamorphosis
- Adult specialized for moving to new location & reproducing
- Larvae and adult eat different types of food (caterpillar eats leaves, moth eat nectar)
  - Reduces competition between individuals of different stages for resources
  - Allows them to take advantage of more than one habitat and food source at different life stages
- More important to the fly fisherman as we need to know different shapes, sizes, colors, etc to match these stages.

### **Incomplete Metamorphosis**

- Egg → nymph → adult
- 15% of insects
- All stages look the same but are different size or color.
- Nymph – feeding, non reproductive stage. All stages look like the adult but smaller and possibly different color
- Adult – reproductive stage
- You can have the same pattern fly but in a variety of sizes.

## Insect Orders

### Coleoptera

- “Shield wing”
- Beetles
- Most diverse species of insect
- Complete Metamorphosis
- For-wings are a heavy (wing closest to head) is a cumbersome shield to protect the delicate flying hind wings
- Clumsy fliers
- Often land in water with a splat
- Fun to use them to chum up trout
- Chemical compound defense – ladybug, blister which may be unpalatable to fish
- Examples: Scarabs (Japanese, scarab), predacious diving, weevil
- Flies should be round to oblong in profile from below and in a variety of sizes
- Vince Marinaro gluing coffee bean to hook
- Foam or deer hair. I prefer foam for buoyancy.



### Diptera

- “Two- wings”
- True flies
- Forewing for flying
- Hind wing (halter) is diminutive and used for balance
- Complete Metamorphosis
- Midges (family Chironomidae) are present in high density in winter
- Larvae are round, slim/slender bodied with defined head
- Pupae have more developed appendages as prepare for adulthood
- Fish simply opens mouth and gulps the pupae which are at floating at the mercy of the current as they struggle to hatch to adulthood
- Examples – house flies, horse flies, mosquito, crane fly, tiny flies aka midges, salmon maggots
- Larvae/Pupae – brassie, thread midge, crane fly larvae
- Adult – Griffith gnat, mosquito, black gnat.



## Ephemeroptera

- “Short lived”
- Mayflies
- Incomplete Metamorphosis
- Ancient order characterized by tails (caudal cerci) and additional molting stage as adult (sub-imago)
- Sometimes prolonged larval life of several years which negates their scientific name as only the adult stage is brief
- Larvae are usually streamlined, dorso-ventrally flattened (like pancake) which allows them to live in and around stream bottom detritus and debris with water moving smoothly over them
- Larvae are broader at head like tadpole and taper down with delicate tails
- Vulnerable as leave water state
- Adults have bulging eyes, large wings folded above body at rest due to a non wing-flexion mechanism
- Emergers on surface look like a sailboat regatta with wings as sails
- Short lived adult life, vestigial mouthparts = non feeding, goal is reproduction then die (spinner)
- Examples include drakes, sulphurs, blue wing olives (BWO)
- Larvae – hares ear, pheasant tail, Mike Mercer patterns
- Adult – Catskill style flies, Wulff style, bwo, tricos, sulphur, white millers, drakes.
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### **Lepidoptera**

- “Scale wing”
- Butterflies and moths
- Complete Metamorphosis
- Butterflies characterized by wings to side at rest = have a wing flexion mechanism
- Moth characterized by wings over back at rest
- Larvae lower themselves via silk into water or fall into stream (dropping as defense)
- Hairy caterpillars are in my experience are avoided by fish (urticating hairs)
- Examples include Monarchs, skippers, tiger swallow tails
- Green weenies, San Juan worms, deer hair caterpillar.





## Hemiptera

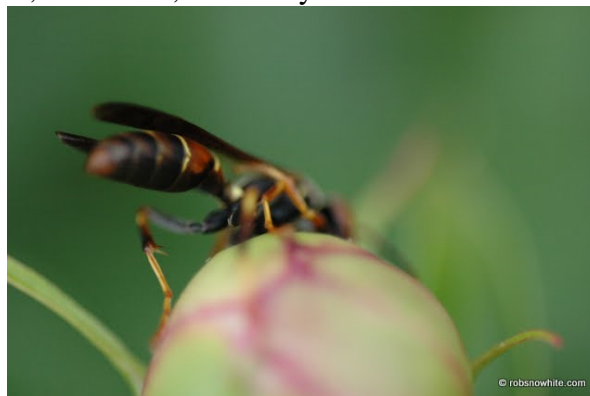
- “Half wing”
- True bugs
- Incomplete Metamorphosis
- Characterized by piercing mouthparts and wings forming an inverted triangle on back
- Variety of body shapes and sizes, often camouflage shaped body parts like bird poop, thorns, leaves, etc
- Excrete phloem out of but in drops (honeydew) which may have landed on you on a clear day thinking its raining
- Examples- leaf hoppers, leaf footed bug, water boatmen, stink bug, box elder bug, cicada, aphids (asexual – parthenogenesis -spontaneous reproduction of clones, relationship with ants)
- Vince Marinaro’s Jassid represents leaf hopper, my splat cicada, any small foam terrestrial should work.





## Hymenoptera

- “Membrane winged”
- Ants (Formicidae), bees (Apidae) wasps (Vespidae)
- Also known as the social insects for their complex societies
- Complete Metamorphosis
- Very thin wing if present (velvet ants have no wings)
- Wasps have a unique identifying characteristic which is a very narrow segment (pedicel) joining the thorax to abdomen
- Bee stinger is a modified female reproductive organ (thus male bees can’t sting you)
- Ants produce formic acid (thus family Formicidae) which may account for trout fondness for sipping ants
- Several non Hymenopteran insects mimic Hymenopteran color patterns for protection (Hover flies do not have a pedicel or black shield like eyes)
- carpenter ants, ‘picnic’ ants, honey bee, bumble bee (hairy but), carpenter bee (shiny but), cicada killers, yellow jackets, parasitic wasps such as ichneumon and cicada killer
- Cork bee, foam ant, thread ant, Chernobyl ant.



## Megaloptera

- “Giant wing”
- Dobsonflies, fish flies
- Complete Metamorphosis
- Larvae known as hellgrammite, nasty little critter
- A favorite of smallmouth bass.
- Long (several inches), dorso-ventrally flattened body with several pseudo legs separated by puffy white external lungs. Life under rocks and logs and amongst detritus
- Adult’s identifiable characteristics are large pincer-like mandibles on males, huge-veined wings extend past abdomen, long antennae
- Adults leave the water and can be found near gas station lights along the river in summer
- Females deposit white, velvety eggs mass on rocks above water
- Skilton hellgrammite, cicada fly will work, wooly bugger, zonker.

## Odonata

- “Toothy”
- Dragonflies and damselflies
- Incomplete Metamorphosis
- Dragonflies – wings horizontal when at rest. Fast fliers with incredible sight. Predatory larvae. Often see shucks on dock pilings.
- Damselflies – wings pulled back over back during rest. Slow flier. Nymph slowly swim in water makes for easy prey.
- Fish will jump out of water to eat adults
- Darners, skimmers
- Marabou damsel nymph, quick damsel nymph, dragonfly nymphs
- Foam damsel/dragon adult.





### **Orthoptera**

- “Straight wing”
- Hoppers and crickets
- Incomplete Metamorphosis
- Sub divided by antennae length, the short horn and long horn
- Characterized by large hind legs for jumping and noise making
- Fall off foliage or land in water – some swim or drift
- Great as lead fly when fishing tandem rigs
- Green tree hoppers, black crickets, katydids, grasshoppers
- Temperature based on stridulations per minute

Foam hopper, Dave’s hopper, Letort hopper, Scott Sanchez patterns.





## **Plecoptera**

- “Tent wing”
- Stoneflies
- Adult wing folded over thorax and abdomen
- Complete Metamorphosis
- Larvae similar to mayflies, dorso-ventrally flattened with shovel shaped head (to move throughout the substrate), pronounced legs protruding to side, one pair of prominently forked tails
- Tend to climb out of water on rocks and waders, climb up you and get on neck, sunglasses etc.
- Hatch throughout year with winter hatches producing feeding fish
- Large stoneflies are a whole meal in one gulp
- Yellow sally, salmon fly , golden stonefly, little black winter stone
- Larvae – Kaufmanns stone fly, Mike Mercer patterns
- Adults – Stimulator, Sofa Stone, foam stones





## Trichoptera

- “Hairy wing”
- Caddisflies
- Complete Metamorphosis
- Larvae live in and amongst rocks, logs, and detritus
- May or may not build housing depending on species
- Some housings made out of ‘silk’ which is used to attach sand, rocks, detritus etc
- Some housing attached to substrate, others are attached to body looking like a sleeping bag on their back and are thus mobile
- Larvae have round worm like body with pronounced head and legs, they swim to surface trailing skin and are vulnerable (emergers)
- Adults have an erratic flight pattern and swarm over water
- Adults hatch sometimes en-masse
- Black caddis, Grannon caddis, Mothers Day
- Larvae – green wire caddis, gummy caddis
- Emerger – Gary Lafontaine patterns,
- Adult – Elk hair caddis, Goddard caddis, Hemmingway caddis, small stimulator.





**Places to look for these bugs:**

- Car grill on summer days
- Outside house lights at night (put out a white sheet and black light)
- Gas station lights
- Put a white cloth under a plant and shake the branches
- Spider webs along streams
- Plants along the bank (see video of Dream Stream)
- Look under leaves- bugs will hide there from predators, weather, and the underside is easier for them to consume
- Turn over rocks and leaves in a stream

- Place a fine mesh net in the water below rocks or gravel and kick your feet around and inspect your net

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