

MTFA-Springfield  
Midge Life History and Fly Fishing  
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Midges (Chironomids) by sheer numbers are the most common life form in many aquatic environments. At Taneycomo, the midge dominance as a natural food is only challenged by the scuds (Amphipods). When we fly fish with midges, the only character we have been imitating are their size. They are tied on a size 20 hook, not much bigger than a 12 point "e", 3/16". We have fallen to factoids and believe them because they seemingly work.



I have found that midges, like all aquatic insects, have gills that provide their oxygen. But we have never put them into our tying patterns because we have failed to return to the source for our information. We have been prisoners of factoids.

I started investigating the biology of midges and was surprised by their complexity despite their small size. Several days prior to our fly fishing club meeting, a friend and I were at Mountain Springs Trout Park and noticed midges hatching. We scooped several bottom samples with rocks and vegetation. I have a cheap plastic half-gallon aquarium I used in my previous scud study. The next week midges were hatching. I assured my wife that midges do not have functioning mouths as adults. I spent a great amount of time explaining that the larva eat and store reserves for the adult stage of life. Adults live for two days, mate, deposit eggs and die.

The story of the midges begins with the egg sac. For most midges, the sac is either a ribbon or mass resembling a sausage. Each dot is a fertile egg. One female may potentially start the next generation with 500 – 2000 eggs. Imagine!!!!





Notice the right half of the egg mass is farther along in development indicated by the darker individual eggs. Another possibility is an infertile area on the left. This egg mass was at least 15 hours old when the photos were taken.



This is a close up of the fertile area. The division within the eggs immediately took me. Occam's Razor provided by Steve Jensen, retired aquatic entomologist, was the obvious answer; the embryo and yolk sac. As I was processing this photo another dilemma was presented, three divisions. Is this a monozygotic identical twin midge? Will one yolk sac be sufficient for both embryos? Or could this be a situation of

incomplete egg separation in development resulting in one fertile embryo and one sterile egg? Mammals are not alone in having inconsistencies during embryonic development.

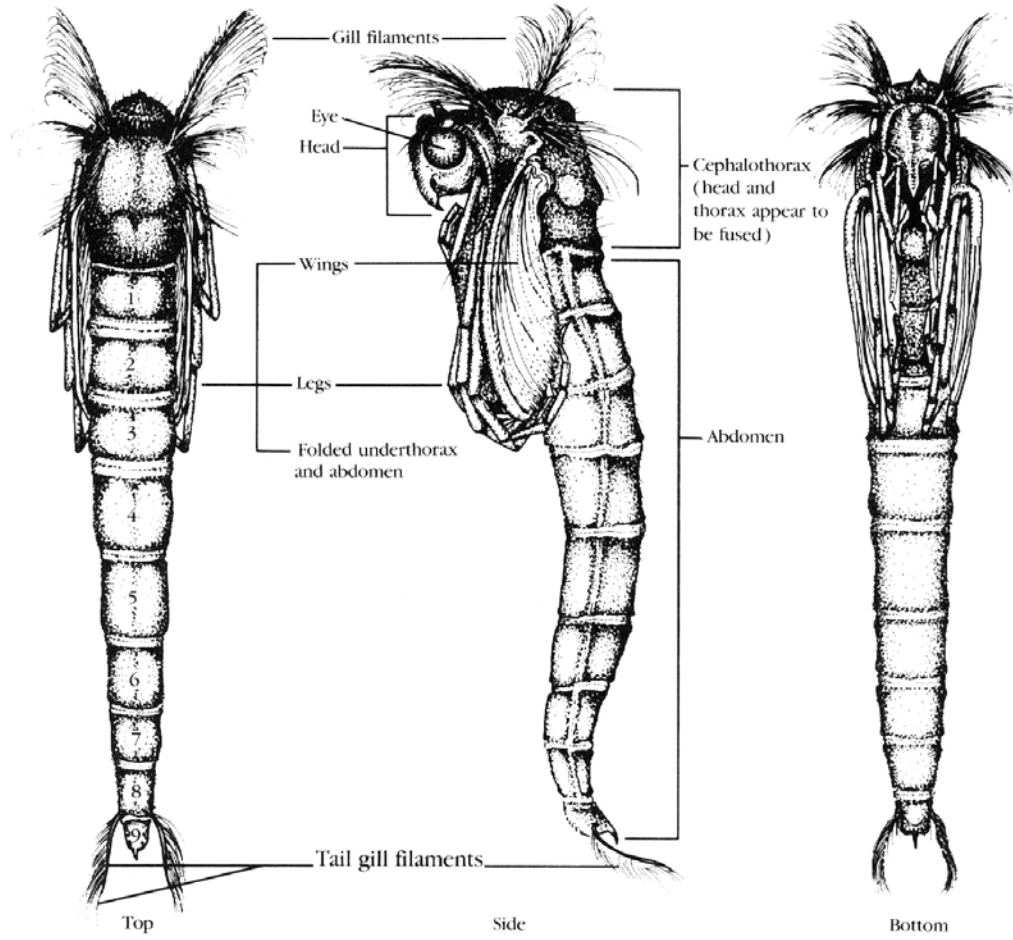
Midges can reproduce 3-4 generations during a summer. These egg masses develop into larva that are the only eating component in their life cycle. Bacteria and detritus are their primary food sources. They can survive a near absence of oxygen due to their high concentration of hemoglobin. Mistakenly, they are called bloodworms. They have 3-5 instars, moltings prior to the pupa stage. The exoskeleton prevents growth once the volume capacity is maxed. Most midges reduce their body size as the larva transitions through the instar molting. Internally, organs are maturing while the cuticle of the exoskeleton thickens. This sets up the progression to develop a pupa. The thick cuticle of the pupa prevents carbon dioxide dissipating into the surrounding water. Gills continue to absorb oxygen and food is metabolized, organs mature and gases continue to inflate the pupa. The gills are located at the curvature of the thorax that appears at the top of the pupa.



## Guide to Aquatic Trout Foods

### Dave Whitlock 1992

Characteristics of midge  
(Chironectidae) pupa



The photo below was taken of a green midge stuck in the biofilm on the side of the aquarium. Literature states that midges prefer mud or sand bottoms. This midge stuck in the biofilm. Midges are most successful if they can ascend up the water column unimpeded by the biofilm on rocks and vegetation. It is our impression that they prefer mud. Mud and sand is where they can complete the life cycle. It is not that their instinct guides them to the appropriate substrate. Some are fortunate to have been placed in water without obstacles. In Taneycomo, there are many obstacles. Unseen by fishermen are many dying midges that are available for fish.

This midge is stuck in the aquarium biofilm and the gases have expanded the cuticle. The gills are separated from the thorax and lost function. The midge cannot rise to the water surface to breathe air and dies (drowns). Midges rise with the expanding gases trapped in the cuticle. The bursting bubble allows the midge to escape through the ruptured surface film. Timing is everything.





In the above photo, you can see the gills and sheen of the expanded cuticle. The photo below demonstrates the adult midge escaping through the bursting bubble and disrupted surface film.



This midge shuck has a gas bubble still attached by surface tension. You can see the wing pad cuticle to the left of the bubble.



This is a photo of a female midge. Her antennae have small extensions. A male midge has large filaments similar to male moths. These filaments detect mating pheromones and guide the male to the female. It must be a strenuous effort for the male to fly into the wind with the drag produced by his antenna.





Pheromones are hormones produced by either sex to attract the opposite sex for mating, or claiming territory to exclude the same sex. Think about dogs in heat or tomcats squirting. The female midges produce pheromones that are detected by males. The males fly toward increasing concentrations of the hormonal stimulants. Keep in mind this is life below 3/16ths of an inch. This photo is the first confirmation that the thread color we have been using is the correct hue for the Harvester. The iridescence of her wings is outstanding. This was the only one that escaped the aquarium cover. If you were concerned, midges do not eat as adults. They live a few days to reproduce and die. Her compound eyes are prominent in the view below. Notice the absence of mouth parts.





For years this photo was a conundrum. I took it in January at Montauk State Park. Recently, I understood the situation. One midge couple in the lower right corner is mating. The other seven midges (yes, there are seven) are positioning themselves to concentrate their pheromones in an effort to increase their chances of attracting a male midge. I recall a cloud of midges hovering above this scene. This is advanced behavior for a small insect. The area of this photo is the size of a half dollar.



This is the view of the Harvester midge pupa from the underside. You can see a faint expansion of the cuticle, especially in the area of the head. At first I was not sure if the gills have deteriorated or if their absence/reduction was their natural condition. I am now confident this midge pupa was trapped in the biofilm on the aquarium side and did not escape to emerge. The gills have broken off as the cuticle ruptured.





The top photo is a Harvester Midge tied without a coating representing the cuticle. Dennis Stead's Harvester midge is a perfect representation of the cuticle prior to emerging. Dennis has been experimenting with silicone tubing to represent the cuticle. Another option is UV resin to represent the cuticle. Our fishing experience tends to demonstrate gills should be half the size of the bead. Gilled midges seem to attract fish the same as an un-gilled bead head midges. The advantage of the gill is catching larger trout.

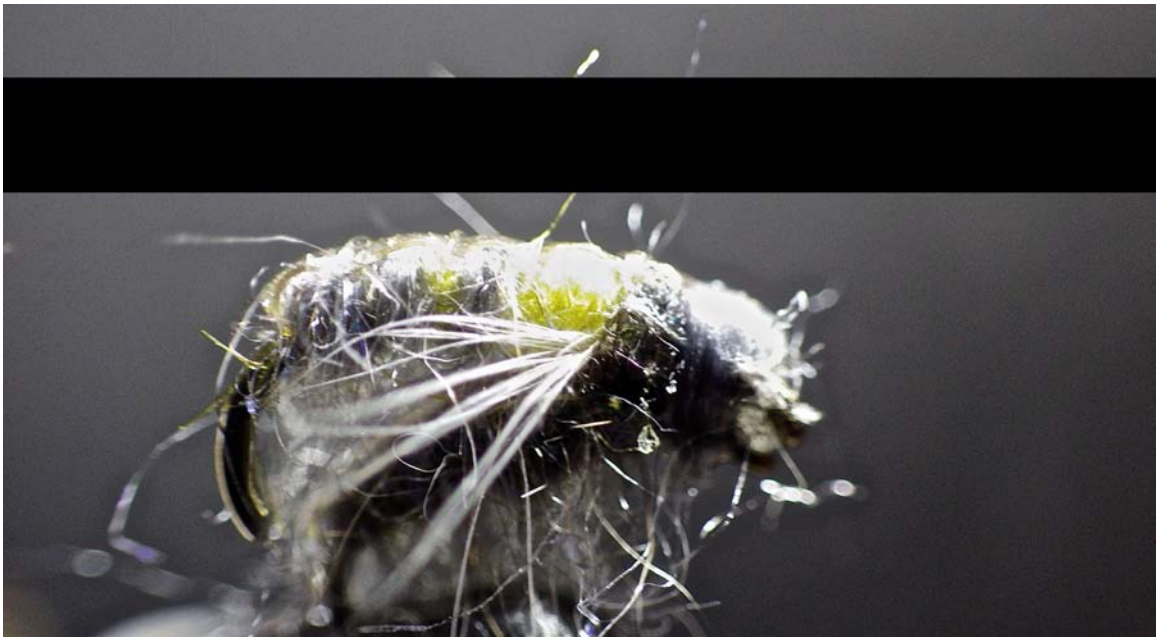
David Tucker tied this Harvester midge. He used UV glue to create a wing case. UV glue is similar to the dentist' UV cured fillings. All three of these midge flies could fit inside a dime with room left over.



Our quest continues. The green midge is not been represented in any fly box. We have tied several and they need testing. If successful, we get to name it. When we test a new or improved pattern, it may seem unsuccessful one day and be the rage the next week. The complete metamorphosis of midges is largely a larva event. Pupa and adults are infrequent stages. Pupa and Adults are important to fly fishermen. Seeing trout concentrating on midges is an exciting day. We are collecting data on the success of different midge patterns over a year period. If there is a pattern of emergence for some midges, we may have determined the life span of one species of midge. Then again, it may not occur as a pattern again as rain, water temperatures, sunlight levels, phases of the moon, oxygen levels and other environmental variations affect development. Midges may be good indicators of global warming after years of data are gathered.

I was able to photograph another outstanding aquarium event. A scud pair was in amplexus, preparing to mate. They were temporarily stuck in the biofilm. Scuds are larger than midges and have the strength to escape. These scuds are a16(male)-

18(female) hook size. The glass aquarium provides better viewing. I need to observe samples from other fishing areas. Below is a fly fishing representation of scud amplexus.



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