

This is part of an occasional series to help those doing cave monitoring, or cavers who are just interested in knowing what they are looking at to be aware of what they can and cannot realistically identify in the field within Missouri caves.

Of all the orders of animals that show up underground, the one you are almost certain to come across in any cave is the Diptera, or true flies. The vast majority of these are not conspicuously cave adapted, though we'll look at a couple of exceptions later. Most flies are not doing anything obvious in the cave, just hanging out and presumably sheltering before going back outside to feed, mate, etc., but they are an important component of the cave's ecosystem nevertheless.

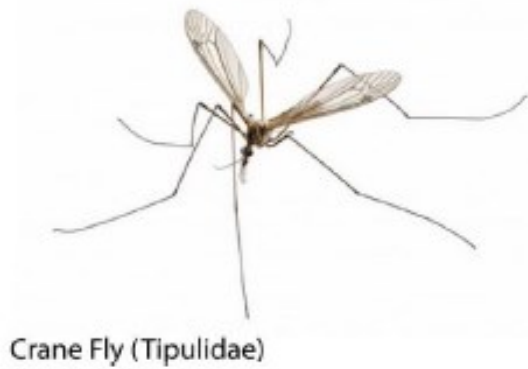
Not surprisingly, flies are most prolific in the entrance and twilight zones, where you will often see dense swarms of fungus gnats or mosquitos dancing around just under a ceiling or a ledge. But which? Superficially the swarms look similar, and fungus gnat swarms are often just assumed to be mosquitos. To be sure, you need to look more closely at one that's settled – a small hand lens and a stealthy approach are useful for this unless you have better visual acuity than I do! Note the much more prominent eyes and the thicker antennae and the shorter proboscis of the mycet compared to the



Left: Culex mosquito, right mycet fungus gnat (photo by Matt Bumgardner).

mosquito. The deeper into the cave, the more likely the swarm is to be of fungus gnats – mosquitos less commonly venture beyond twilight. Family Mycetophilidae (mycets) is as far as you can get with fungus gnats. There are two species that dominate and several more that turn up occasionally but a microscope is needed to distinguish them. For mosquitos, you should be able to distinguish larger Anopheles from smaller, mainly Culex species. As well as being larger, Anopheles also have much longer proboscises.

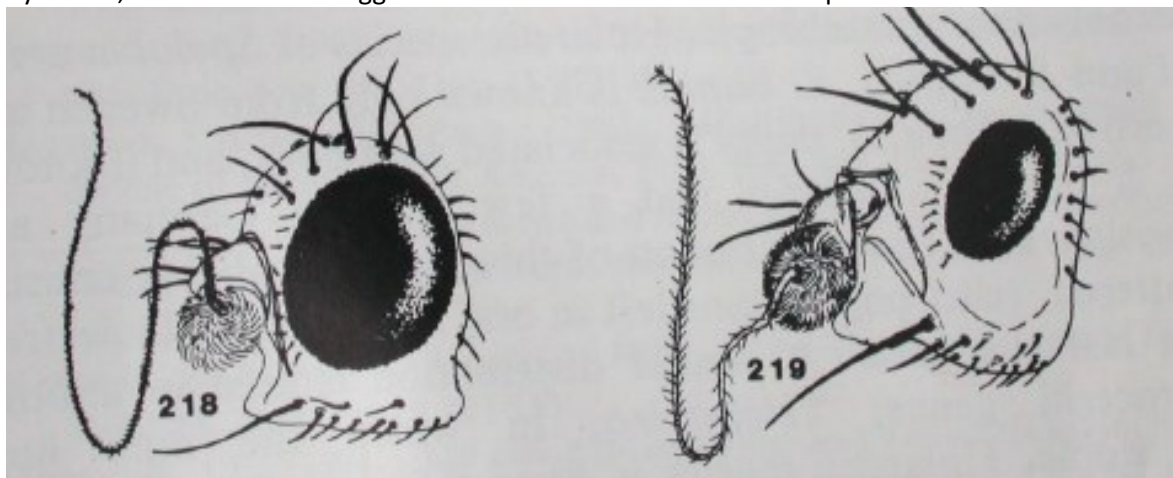
Incidentally, you don't need to bring out the deet - when sheltering in a cave mosquitos are not in feeding mode. The only time I've been bitten by a mosquito in a cave is when one followed me in from outside. Mosquitos are said to merely represent the mix of whatever species are in the local environment, but I'm not so sure. One species, the small Culex erraticus dominates. Only seven species in total have been recorded, and many of those are very sporadic. It would be interesting to sample the local culicid fauna to get a numeric assessment as to whether C. erraticus and a few others favor caves more than other species. Although mosquitos are generally pretty drab, an exception that occasionally shows up is Uranotaenia sappharina, which has patches of bright fluorescent blue scales on the thorax, visible with a hand lens.



Another group familiar to most and common in near-entrance settings are the crane flies (Tipulidae), aka daddy long-legs. Three species are quite common, others are more sporadic. They vary a good deal in size, but even the smallest species are noticeably larger than mosquitos or fungus gnats.

A lot of cavers are familiar with heleomyzid flies, rather large flies somewhat resembling house flies, which are commonly seen hanging out on cave walls and ceilings, often quite far into the dark zone. There are four species, two larger and two smaller, and although the larger *Scoliocentra defessa* is by far the most common, distinguishing the members of each pair requires microscope work. These flies contribute to the ecosystem by being a major part of the diet of cave and grotto salamanders.

Another much smaller fly, one you can reliably identify in the cave, is the cave dung fly *Spelobia tenebrarum*. The fly is widely distributed in caves throughout eastern North America. Missouri populations seem to be even smaller than most, around 2-3 mm. Look for this tiny black fly in its preferred milieu – bat guano, raccoon dung, or a juicy fresh corpse. The fly is the first creature to show up at such fresh, high energy food sources. So how do you identify such a tiny creature? Easy, just poke at the fly with a stick or the tip of your finger - if it takes off flying it's NOT *Spelobia*. If all it can muster is a vigorous hop, it's *Spelobia*. Although the fly has perfectly formed wings, its flight muscles are degenerate and it cannot maintain flight. And although it has functioning eyes, they are a good deal smaller than those of its surface cousins. If you look below the surface of the guano pile you may see the fly's larva, a slender white maggot with a characteristic black head capsule.



Not a pretty face: note the smaller eye of *S. tenebrarum* (right) compared with a Surface relative. There is some question as to whether the fly is a troglobiont, limited to caves, or a troglophile. The fly has on rare occasions been collected from surface environments, and although generally a dark zone animal, it is not uncommon to find the fly within the entrance zone. This and its wide distribution – unusual for a troglobiont – suggests that the fly is able to disperse overland between underground sites. There are at least two other somewhat cave adapted small flies that are also common on rich food sources, the humpbacked fly *Megaselia cavernicolum* and a sciarid gnat *Bradysia* sp., but these are harder to distinguish in the cave. Both of them readily take flight.



Finally, another one that anyone can identify, although it doesn't look like a fly! The well-known webworm *Macrocerella nabilis* is the larva of a mycet fungus gnat, a cousin of the fungus gnat swarms mentioned earlier but a different species. The adult has shown up in cave collections, but only as single individuals, and only rarely. The larva is a distant relative of the famous New Zealand glow-worms, and although bioluminescence is fairly common in larvae of this family, our Missouri example

is rather less conspicuous. Looks for it under ledges near rich food sources where it builds its characteristic horizontal silk track with sticky silk threads hanging down to entrap its food source - small gnats, springtails etc