

Parasite Drives Host To Attempt Suicide

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Natural Selections (appeared October 2, 2009 in the Boulder Camera)

On an August day when Englishmen and mad dogs were seeking shade, I hiked to Tunnel Slot in the Grand Staircase-Escalante National Monument. Tunnel is a short slot canyon, only 150 feet long, but it is so narrow at the top that it appears to be a solid ceiling with just a few crevices admitting shafts of light. The continual shade allows rainwater to persist, and this day the Tunnel had one to two feet of clear water.

I peered into the water to see if there were any creatures, perhaps tadpole shrimp, fairy shrimp, or tadpoles. More than a dozen robust spadefoot toad larvae were wriggling about, but there was something else in the water, something ominous.



Six long, narrow worms moved slowly in the shallow water. Each was six to ten inches long and about one sixteenth of an inch wide. They lacked any discernible head or tail structures and were not segmented. Yet they were alive, for they were coiling, uncoiling and moving about. I did not know what they were, but I have never heard of dangerous parasites in slot canyons, so I took some photos and stepped over them to enter Tunnel Slot.

Horsehair worms are rare but are found on all of the continents; approximately 300 species are known. Their common name comes from their regular occurrence in horse troughs centuries ago. They have no association with horses, but are brought to horse troughs by hapless insects. When the worms are mating, they form a tight, intertwined ball that seethes in slow motion. A mating ball suggests a Gordian knot and inspired the scientific name of the most common horsehair worm in the west, *Gordius robustus*.

Adults are aquatic and free living and are between six and fifteen inches long. Females lay between 200,000 and 27 million eggs, with fecundity increasing with the female's length. The microscopic larvae are obligately parasitic on insects, but they are too small to penetrate the chitinous exoskeletons of vastly larger insects such as beetles and crickets. When an insect comes to water to drink, it inadvertently swallows larvae, which burrow out of its gut and into its body cavity. Larvae spend the next several months growing and eating the host while it goes about its business.



Insects parasitized by horsehair worms may wander great distances from the pool where they were infected, indeed, far from any pools or streams. But if the horsehair worm is to complete its life cycle, it must convince the insect to return to water. While the precise mechanism is not known, experimental evidence has clearly shown that the horsehair worms manipulate the behavior of their hosts. As the worms are beginning to mature inside the insect, they induce it to wander erratically. When its aimless staggering brings the insect close to water, the worms then drive the insect to jump into the water.

By this time, the worms have eaten most of the insect's muscles, all of its reproductive system and parts of the remaining organs. Given its diminished capacities, this plunge into water is essentially a suicidal leap.

A few seconds after the insect hits the water, one to several worms stream from the struggling insect. It is a chilling sight to see foot long worms emerging from a two inch Mormon cricket.

Horsehair worms parasitize only insects. They have no interest in mad dogs, Englishmen, spadefoot toads or curious naturalists.