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The horsehair worm -- all tied up in the early history of science. © Don Blegen

A twisted tale

Horsehair worms appeared from nowhere and posed a tangled history of mystery.

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A long lineage and a knotty history

Two fishermen, father and son, sit anchored on a northern lake over a concentration of walleyes whose appetite could be a lot heartier. The younger fisherman, Josh, is getting a bit bored. He spots an off-white, spaghetti-like strand in the water and dips it out with the tip of his spinning rod.

He swings the rod tip toward his dad.

"What is that thing?" he asks his father.

"Oh, it's just a piece of string or thread or something."

"But Dad, it's alive!"

The thread-like object was indeed alive, wrapping itself around the rod, with the other end waving slowly back and forth in the air. The anglers had stumbled across a creature that has puzzled countless others when they encountered it in lakes, ponds, puddles, springs, watering troughs and even toilet bowls.

The horsehair worm (or *Gordius* worm) is widely distributed with at least 80 species worldwide. Most are from 10 to 14 inches long but only about 1/25 inch in diameter. They are called horsehair worms because they look like hairs from a horse's mane or tail. They even come in the horselike colors of white, tan, brown, and black. People once thought the worms were horsehairs come alive. When you find them in watering troughs where they didn't exist the previous day, what other conclusion would you come to?

Sometimes horsehair worms form groups of a couple dozen, wrapped together in an intricate tangle on the bottom of a spring or pond. Sometimes they are free swimming near the surface thrashing in slow motion like the one Josh snagged. On cold fall mornings they may be spotted on leaves

of ragweed, covered in dew. Closer to home, they might create an early morning surprise in Fido's water dish or your toilet.

Horsehair worms are harmless to people, pets, and plants. They start life as a larval parasite in a cockroach, beetle, cricket or grasshopper. Some may also infect snails and slugs. The worms we see in water are adults lucky enough to have made their way from their host to water. Those that can't reach water, like those living in grasshoppers perched on the ragweed on a cold September night, die quickly of dehydration. After leaving the host, the adults are no longer parasites. They do not eat --- but live for months, mating in tangled masses and laying eggs--millions of them.

What happens next is the subject of some debate. Some sources say the larvae hatch out and bore their way into aquatic insects like mayfly nymphs. When the nymphs become adults, the mayflies fly to land, mate, and die. The flies are also land insects that become infected with the horsehair worm larvae. Other sources say the eggs end up near water's edge where they are swallowed by thirsty cockroaches, crickets, grasshoppers, or beetles.. However they enter their host, it is certain that the larva often grows in these land insects into a sinuous, skinny parasite that saps its host's vitality and hastens its early death.

How do the worms manage to get in ponds, lakes or springs when the larvae live in land insects? Good question. Contact with cold water apparently triggers the parasite into abandoning its host from the nearest orifice. If the cold temperature is from standing water, the worms escape to a life of sensuous ease (up to six months) as a free-living adult without eating (because they lack mouths!). If the worm’s exodus is triggered by cold dew, like that condensing on a grasshopper, the evacuated worms will be fried and dried by sunlight and be dead by day's end. This is the fate of most worms. The odds are very much against them completing their life cycle. How then do they manage to be so numerous? Fertility. One mated female may lay several million eggs to neutralize the formidable odds against survival.

How do horsehair worms appear in toilet bowls or water dishes? You need to view your house from the worm’s perspective.

Grasshoppers and other insects serve as hosts for the horsehair worm. © J. Baker

A house is a desert environment. Insects in houses are desperate for water. They head for sinks, toilet bowls, and other in-house water sources, often while we are sound asleep. A lady I know, a very fastidious housekeeper, was disturbed one night by the song of a cricket that had the gall to sing in her house! She located it, and, Kleenex in hand and nerves steeled, captured it and threw it in the toilet bowl. Cold water! Almost instantly, to her horror, a writhing white worm struggled out of the cricket's body. She flushed them both with great enthusiasm. What she had seen often happens in the dead of night without a witness, as house insects seek water from the toilet or a pet's water dish, fall in and prompt the worm’s "great escape."

What about the worms in the horse troughs, appearing overnight? Same thing. Crickets and nocturnal beetles seeking water from the trough contact cool water and the worm evacuates the host, coming to rest on the trough bottom or swimming lazily near the surface by morning's light.

The horsehair worm is harmless, even beneficial, because it shortens the life of several insect pests and reduces their populations by drastically cutting into their reproductive rates. It played a role in the early history of science and its scientific name is rooted in Greek history and mythology. .

A long lineage and a knotty history

Horsehair worms were used in the late 1700s and early 1800s as an argument to support abiogenesis, the idea that life could spring from nonliving things on a constant and ongoing basis. Meat broth left standing would spoil and produce countless creatures that could be seen with the recently invented microscope. Frogs were

believed to come from mud, maggots from rotting meat, mice could supposedly be produced by putting sweaty clothes in a box for 21 days, etc. And horsehairs dropped in water became living worms. Just common sense, some folks claimed.

Others, more scientifically- minded, doubted that nonliving material could automatically produce living things. A series of scientists including Francisco Redi, Lazzaro Spallanzani, and the brilliant Louis Pasteur finally demonstrated that all of these creatures, including even microbes, came from pre-existing living things and were not, despite appearances, coming from nonliving materials. This idea, called biogenesis, is a core idea of modern biology.

The horsehair worm gets its scientific name, *Gordius*, from Greek legend. Gordius was the father of Midas, and attained royalty by being lucky enough to enter the marketplace with a chariot pulled by a team of oxen right after an oracle predicted that the next king of the Phrygians would enter the marketplace pulled by a team of oxen. He was immediately made king, and in celebration tied his yoke to his lucky chariot with a humongous knot. The well-secured yoke and chariot remained there as an object of veneration. Upon Gordius' death, his son, the legendary Midas, became king. He attained great wealth, but produced no heirs. The priests proclaimed that the next king would be he who managed to untie Gordius' knotted yoke from his chariot. Many tried, but all failed. Until Alexander the Great came along on one of his expeditions and learned of the priestly prediction. He couldn't untie it, either, but, being a very practical man, he put his sword to work and cut the yoke loose. Some of the earlier contenders complained loudly that this drastic solution wasn't fair. The priests looked at Alexander, surrounded by his army; and, being practical men, they decided that it was fair--and Alexander became the new king, adding Phrygia to his empire.

Ever since, a "Gordian knot" has been a metaphor for an intractable problem. And "cutting the Gordian knot" has been a figure of speech for a brilliant, pragmatic, or unconventional solution. When scientists became aware of these peculiar worms that mate in intricately knotted masses, it was only natural to name them after Gordius, that lucky, knotty charioteer of ancient Phrygia.

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