The Washington Post
Democracy Dies in Darkness

The cicadas are coming, and some may become 'flying saltshakers of death'

This year's double emergence will be a gold mine for scientists trying to unravel the many mysteries of periodical broods

By Jason Bittel

April 20, 2024 at 6:00 a.m. EDT

This spring and summer, people in parts of the American Midwest and South will get to experience a numerically magnificent wildlife event: a rare double emergence of periodical cicadas. With the arrival of Brood XIX and Brood XIII, trillions of harmless, baby-carrot-size insects will be singing their hearts out from Wisconsin to Louisiana, Maryland to Georgia, and many places in between.

The last time these broods co-emerged, the year was 1803, Thomas Jefferson was president, and the Louisiana Purchase had just been completed — which means many of the states where cicada love songs will soon fill the air were not even officially part of the nation yet.

As impressive as that is, this year's entomological phenomenon will be extra-special for researchers hoping to unravel the evolutionary mysteries of bugs that only crawl out of the ground in roughly 13-year and 17-year intervals.

Source: The Cidada Project at the University of Connecticut

TIM MEKO / THE WASHINGTON POST

Broods are not the same thing as species, and each brood can contain multiple cicada species that can emerge in different places. In 2024, all seven cicada species will be represented, a coincidence that won't happen again until 2037.

That means this year's emergence will be a data-collecting gold mine.

One of the more unusual mysteries scientists hope to investigate involves a parasitic fungus that attacks adult cicadas, turning them into what one expert calls "flying saltshakers of death."

"So it's pretty spectacular, from the standpoint of a scientist that's interested in cicadas," said Matt Kasson, a mycologist at West Virginia University.

A life spent underground

Cicadas are true bugs in the insect family Hemiptera. Famous for their repetitive courtship calls, cicada adults are large, loud and highly conspicuous. But most of a cicada's life is spent below ground as a nymph.

Cicada nymphs are probably among the most underappreciated forest herbivores, since most of the time they're out of sight, making a living by sucking juices out of the roots of trees and other plants. They emerge in the spring or summer, when the soil about a foot below ground reaches 64 degrees. Nymphs then climb up the nearest vertical object and molt into their adult form. Those winged adults spend their brief but riotous lives mating and, for the females, laying eggs.

Cicadas can be broken into two general types: annual cicadas, which tend to have black or green eyes and can be heard every year, and periodical cicadas, which usually have red eyes and only emerge in 13-year or 17-year intervals.

While they are nymphs, these long-lived insects must escape the cold by burrowing down below the frost line. In some parts of their range, such as Wisconsin, that can mean living at depths of more than five feet beneath the surface.

This makes every emergence important for scientists. If a researcher studying a species of zebra or puffin wants to take genetic samples, they may have to endure hostile environments or treacherous journeys, but at least those animals are almost guaranteed to be present in any given year. The same is not true for a given cicada species. They may technically be there, but they are too deep underground to find easily and to access without causing significant harm to the animals. (Kasson said he has tried, and he came up empty.)

In addition, cicada broods don't usually sync up; it's been nine years since such a thing last took place. And when they do overlap in time, they tend to be spread out in space, with emergences happening several states away from each other.

This means some questions can only be investigated in certain places at certain times, depending on which broods are on deck that year and which species they contain.

This year, though, cicadas from Brood XIX and Brood XIII will butt right up against each other, mostly in Illinois. And this is where things get scientifically exciting.

A sprinkling of spores

Kasson hopes to study a cicada-afflicting parasite known as Massospora. When this fascinating fungus infects an adult cicada, it floods the insect with amphetamine and psilocybin, each of which appear to influence its behavior.

For instance, although the fungus has taken over the lower-third of its body, replacing its abdomen and genitals with fungal tissue, the cicada appears to feel no pain. Instead, infected cicadas seem to want to party.

"There are some hypersexual behaviors," Kasson said. "The males pretend to be females to get other healthy males to come and attempt to mate with them. And that's probably a strategy by the fungus to increase the number of individuals that the fungus is able to infect."

The parasite typically affects less than 5 percent of a given cicada population. But once infected, those chalky white abdomens sprinkle spores everywhere they go.

Kasson is trying to conduct genetic work to learn more about how the fungus persists in animals with such unusual and disjointed life cycles. This year he will be able collect contemporary samples from a 13-year brood for the first time — old, archived specimens have been used in the past — which could yield some interesting results.

“Although we have limited data, some of the DNA sequence data from the 13-year broods are somewhat different from the 17-year broods, and it makes me wonder if there’s actually some genetic differences in the strains,” he said.

Researchers are also interested in the fungus as a source of new medicines, Kasson added. It has been used as a traditional form of medicine for inflammation among cultures in China and New Zealand’s Maori.

Time-shifted cicadas

Because Brood XIX and Brood XIII overlap in very few areas, it’s unlikely that any locale will experience twice as many cicadas as usual. (With several million cicadas emerging per acre, a doubling of that would be, well, intense.) It’s also unlikely most people will notice a difference between broods in areas where the two are adjacent.

“They look identical. They sound identical. And genetically, they’re pretty much identical,” said Chris Simon, an evolutionary biologist at the University of Connecticut.

This is not always the case. For instance, *Magicicada neotredecim* is a 13-year cicada that will emerge this year as part of Brood XIX in Illinois. That species is nearly twice as large as *Magicicada septendecula*, which will also emerge as part of Brood XIII, appearing a little to the north in Illinois, as well as in Iowa and Wisconsin.

For scientists like Simon, the real opportunity is in much less obvious distinctions. She wants to learn more about how cicada broods count the years, something she’s trying to understand by sequencing whole genomes and looking for genes or groups of genes that control whether a cicada follows the 13- or 17-year cycle.

“One of the most interesting things is we thought that the year classes, or broods, were reproductively isolated, because we thought they had an exact life cycle, and the adults would never see each other,” Simon said. “But it turns out, it’s not exact, and sometimes they come out four years early, or four years late.”

This means that the different broods can still exchange genes with each other, likely to be driving further evolution of the species.

“When 13- and 17-year cicadas come out in the same year, you can actually do hybridization experiments,” Simon said. The last time she had a chance to do such work was in 2015, and 1998 before that.

Simon added that inexactitude in cicada timing is thought to be on the rise due to climate change, which is elongating the nymphs' growing season underground. Similarly, climate change can affect their distribution, as evidenced by Brood VI becoming more established in the Washington area in recent years, she said.

Sometimes, over the course of hundreds of thousands of years, 17-year cicada broods turn into 13-year cicada broods.

Other scientists want to better understand how cicadas affect the plants they prey upon, as well as how trees defend themselves against the herbivores. Some studies show reduced growth in tree rings, for example, as well as lower yields in orchards, where cicadas are present.

However, cicada emergences have ecological benefits, too, providing a smorgasbord of protein for predators, as well as boosts in phosphorus and nitrogen for plant life, thanks to trillions of decaying insect bodies. According to a study from 2005, cuckoos have more offspring in years following cicada emergences, while other bird species, such as crows, seem to fly away from the emergences, presenting yet another ecological enigma.

If you're out during this year's emergence and your dog or toddler happens to gulp down a cicada or three, don't worry about it, said Maureen Turcatel, collections manager of insects at the Field Museum in Chicago. Cicadas can't bite or sting, and they are perfectly edible.

"It's going to be loud," Turcatel said, "but especially for the 13-year and 17-year cicadas coming out in Illinois, it's going to be a once-in-a-lifetime experience."