May 16, 2024 / CICADAS

[HALF SECOND OF SILENCE]

[BILLBOARD]

*REBECA: I do have a quick question. Cicadas. Are they insects or bugs or both?*

*BENJI: They're both.*

*REBECA: Ok, because I don't want to horrify any entomologists out there who are like, they're bugs, they're insects!*

*BENJI: I do feel like that happens but I would, I would not worry, like everyone knows them as bugs. They look like bugs. They're bugs.*

*SCORING IN <O come all ye faithful - BMC>*

REBECA IBARA (guest host): Cicadas. Billions, maybe even a trillion of them are emerging after more than a decade underground.

*<CLIP> CBS NEWS: The collective noise from the insects can be as loud as a jet engine. It is so loud that some residents from South Carolina call the police! We’ll see two broods co-emerge for the first time in 200 years.*

REBECA: And don’t even think about squashing them!

*BENJI: These are definitely not spotted lantern flies. They are native and they are very special insects in the US. So let it live. I don't think that's gonna fly in your face, but if it does you can swat it away.*

REBECA: They’re here to make babies! While they’re at it, they might transform entire ecosystems for years to come. That's coming up on Today, Explained.

**[THEME]**

REBECA: It’s Today, Explained. I’m Rebeca Ibarra, filling in as host today. I was delighted to meet Benji Jones, he’s an environmental reporter here at Vox, who thinks cicadas are spectacular. I asked him how much this event reminded him of the OTHER big natural phenomena in recent weeks.

*<CLIP> NBC: A rare total solar eclipse. In small towns and big cities,the sky suddenly going dark…*

*<CLIP> ABC: The northern lights had millions of people, possibly billions depending on how many people were looking at the sky last night, seeing something amazing.*

REBECA: and now we have something else??

BENJI JONES (vox reporter): We have a dual emergence of periodical cicadas, which in my opinion, is just as cool as these other phenomena, actually, maybe a little bit cooler.

REBECA: How so?

BENJI: What we will see is that in large stretches of the Midwest and the South, billions of cicadas, these these big insects that make really loud noises are going to literally erupt from the soil and then climb up trees and grass and start singing, and these particular groups of bugs that are emerging have been in the soil for 13 or 17 years just waiting to emerge.

REBECA: Wasn't something similar happening a few years ago, like I remember hearing about the cicada invasion?

BENJI: Yes, you are not wrong. So for those of us who live on the East Coast, especially around the DC region, Pennsylvania in 2021, in spring we saw brood X or brood ten emerge, which is the largest cicada brood.

*<CLIP> TIKTOK: Are y’all gonna continue to be outside with the insects that have risen from the ground?? And are leaving their exoskeletons behind on everything??!*

BENJI: They were in a really urban area, so you had a lot of people interacting with them, even if they didn't want to. But yes, brood ten was massive. And certainly the biggest brood in in memory for, for a lot of people.

REBECA: But this is different.

BENJI: What we're seeing right now is brood 13 and brood 19. And this is a group of periodical cicadas that emerges every 13 years and every 17 years. And what's especially cool is that these two separate broods that are on different cycles are emerging at the same time. And these two particular broods have not come out together for over 200 years. In fact, the last time they came out was when Thomas Jefferson was president.

*<CLIP> HAMILTON:*

*Thomas Jefferson: So what did I miss??*

BENJI: It's a really rare event. It's actually rarer than the total solar eclipse in the US.

REBECA: For those of us who haven't been, you know, lucky enough to encounter these spectacular insects… bugs, tell us a little bit about them.

BENJI: Yeah. So I know bugs are not for everybody. But when it comes to insects, I think these are among the coolest.

SCORING IN, MAMBO CICADAS, APM

BENJI: Periodical cicadas have a really, really unique life cycle. They are spending the vast majority of their lives underground, as what are called nymphs or basically baby cicadas. They don't have wings, and they're stuck to the roots of trees, sucking the sap of those trees. And that's how they grow underground. And so the bugs that are, that are about to emerge, they have been sucking the sap for 13 years. In the case of the bugs in the South that are about to emerge and 17 years underground, sucking the sap of roots. In the case of those in the upper Midwest like Illinois. And so they spend all of that time just growing underground, and then at that 13 or 17 year mark, when the temperature in the soil hits 64 degrees or so, they all just kind of know to come up. And at that point they crawl up to whatever point they can reach. So often it's the tree near them. Often it's someone's… the side of your house, often it's grass, and that's when they start the mating process. And so it's really unusual to see this kind of synchrony across the forest, where everything is emerging at the same time.

<<cicada scream>>

SCORING OUT

REBECA: And is their internal clock, you know, the way they count time, reliable?

BENJI: What scientists think is that when those nymphs are underground and sucking sap from trees, they're able to use annual fluxes in that sap to actually monitor the passage of time. So if you think of a tree going through the year, you have fall when the leaves start to fall off the trees and then spring, the leaves come out. And when the leaves are coming out of the trees, you start to see an increase in this flow of sap in the tree. And so every year there's kind of a predictable cycle of sap flowing through the trees. And scientists think that cicadas are actually able to detect those changes in the sap and, and, and use that to determine whether a year has passed. And you're totally right to your question about whether sometimes their math is bad. Yes, it can be. Although it's I don't know if it's bad or more. They're just adapting to changes in the environment.

REBECA: hmm!

BENJI: So if you have something like climate change, which is increasing temperatures, it actually is extending the growing season for trees. So it's changing the amount of time that cicadas have during a year when the sap is flowing. And so if they're able to suck sap for a longer period of time, they're able to they're able to grow more. And if they basically grow up too quickly, they might emerge before that 13 or 17 years.

REBECA: What do the cicadas do once they emerge?

BENJI: The number one goal of cicadas is to mate.

SCORING IN, LOVIN YOU, BMCC

So when the cicadas erupt from the ground, they crawl up trees. And then they molt, and they grow wings and then they harden, and then the males start calling for females. And that's the ode to the lovely, the lovely call for love.

<<male cicada sounds>>

REBECA: <<sighs>> Love.

BENJI: And they do that by, the males have these specialized organs called tymbals. And they're basically vibrating membranes and they're, they're essentially hollow. Their abdomen is like super hollow. And so the sound can become really, really loud in some cases. but, they start calling for, for the females and then…

*<CLIP> BBC:*

*Sir David Attenborough: The females reply with a quite different sound. A click made by flicking her wings… so that’s what the males are listening out for.*

BENJI: There's this great video, and I hope you can play some audio from it of David Attenborough, trying to attract a male cicada by mimicking the wing flip of the female.

*Attenborough: I can imitate the female’s wing flip with a slap of my fingers. And that causes them to follow me anywhere…*

They will mate, and then the females will lay eggs in the twigs of trees they like, cut little slits and deposit like 20 or so eggs. And then six weeks or so will pass. And then those eggs will hatch. They'll produce these little tiny, like two millimeter long white babies that I think look a little bit ickier, actually, because they, they look like, I don't know, very larval and kind of ghostly. And then they will walk around for a little bit and then jump off the trees. It's like a small effect because you have all these little white babies jumping off, and then they fall to the forest floor, burrow down into the soil and chill there for, yeah, 13 or 17 years.

SCORING OUT

REBECA: So how many cicadas, or as Sir David Attenborough says, cicadas, are we talking about how many come out?

BENJI: A lot. There was a study that basically showed the emergence in Illinois, which is a really big one, the one that's coming this spring. It's brood 13. They documented over a million cicadas in an acre. So it's like a really, really dense group of bugs. It's a lot. And then over, if you if you zoom out across parts of Illinois, parts of Iowa, going into Saint Louis, Tennessee, the Carolinas, Alabama, then we're talking about billions of bugs. And I asked, a researcher, John Lill, yesterday just in about how this emergence compares to brood ten from 2021 that everyone was so excited about, or bug lovers were so excited about. And he said that if you compare these two broods that are emerging together, they might rival what we saw with brood ten. So it's going to be among the biggest emergences of these bugs. It's going to be a lot of insects.

REBECA: My brain doesn't comprehend billions when it comes to money, like, let alone bugs.

BENJI: So it's a lot.

REBECA: It's a lot. Is there a scientific reason that explains why so many of them come out at the same time?

BENJI: Yes, there is very much a reason to emerge all at once. This is an evolved strategy. And scientists think it's it's really a strategy to avoid predators. So when you think about these billions or trillions of insects erupting all at once, like, yes, they are very much easy food for predators. They're really undefended. They're actually quite like stupid in terms of being able to run away and sort of and like, they're not very good fliers. They're really obvious to see they have these bright, they have these bright red eyes, and so everything wants to eat them. And if you erupt with, with like literally a billion of your roommates or your underground roommates all at once, there are just so many that they overwhelm the predators. They overwhelm birds like birds can only eat so many cicadas. And so you will basically fill the bellies of all these animals in the forest that want to eat them to the point where they're satiated. They're literally like, we're done. Like, this is Thanksgiving. We just finished the last course we're on, like the pie course or whatever, and then they can't go for any more. And then you'll have a few. Cicadas are actually lots of cicadas that are left over and alive still because of that, if you are like one of the first to emerge, it's like very much like the opposite of early bird gets the worm like the worm in this case is the cicadas. And if you're first, you are getting eaten.

SCORING IN, CICADA MAMBO

So you want to like time it right? So you come when like the bulk of the cicadas are out. And then hopefully just by being in such a high number like you're somewhat shielded.

REBECA: So being fashionably late pays off.

BENJI: Exactly. You don't want to show up early to this party.

SCORING BUMP

REBECA: Vox’s Benji Jones with advice for insects AND ALSO bugs. After the break… Benji is back to tell us all about how the cicadas could rewire entire ecosystems.

**[BREAK]**

**[BUMPER]**

REBECA: Okay, so the cicada emergence is more than just an unusual event for humans. It's actually one of these major natural occurrences that could potentially change the natural environment all around us, which is kind of crazy to think of. Can you explain why or how?

BENJI: This is one of my my, my favorite things about cicadas is that they emerge every 13 or 17 years for just a few weeks, and yet they can actually, like, rewire entire food webs, entire ecosystems, and it is just flooding the forest with a ton of food. And this pulse of resources, as scientists describe it, can really affect all kinds of things. So let's talk about the birds. So birds are one of the main predators for cicadas. And what researchers find is that when you have these emergences, basically every bird in the forest just stops what it's doing, and just is like…and just goes crazy for these books. Like, it doesn't matter if your typical diet is like ants or like plants or seeds or whatever. All the birds are like, I don't care. These things are in my face. I'm going to start eating them like in enormous numbers. And during the brood ten emergence in 2021, scientists were out in the field studying this, and they saw in some forests in Maryland, over 80 species of birds chewing down on cicadas. So really like this is a universal feast. And and it like it turns the forest animals into just like… they just go crazy for these bugs. And researchers have actually found that when you see this big pulse of cicadas in the forest, some species of birds are actually, like, able to produce more offspring. And so research has shown that even a year or even two years after these big emergences of cicadas, you’re seeing more birds of some species in the forest, so you’re literally like inflating the population of certain species. What's especially fascinating about all these birds eating the cicadas is that they're distracted from their normal food source. So, like so birds are normally eating lots of caterpillars. And when birds are so overwhelmed with this eruption of cicadas, they're eating way fewer of those caterpillars. They're literally just like, we're going to go for what's in our face, and we're going to avoid what we typically eat, which is the caterpillars. So these caterpillars are like living their best spring ever, because all of a sudden they don't have birds coming for them from all directions. So a very, very good time to be a bird. And also a very good time to be a caterpillar.

REBECA: Just a party in the forest.

BENJI: It is, it is. <<laughs>>

REBECA: I read about this like cicada eating fungus that takes over them, kind of like, you know, from a post-apocalyptic series on HBO.

BENJI: Maybe

REBECA: what happens? Is this true? But explain.

BENJI: So yes, there is a cicada zombie fungus, called Massospora cicadina. And it's basically the only species that we know of that actually specializes in attacking cicadas.

SCORING IN, DARKNESS DESCENDS

What's fascinating about this fungus is that it seems to kind of follow the life cycle of these periodical insects so it can lay dormant for, for more than a decade in like a spore form. So like the seed of this fungus is just chilling for 13 or 17 years. And then when the cicadas erupt from the earth, that spore which either is already on them or they pick it up kind of on their way out or on their way up trees, starts growing within the bodies of cicadas. And the most kind of insidious feature of this fungus is that it grows inside their abdomen and then bursts out. And in that process, actually knocks off like the back half of the cicada. And so you'll see these cicadas that are seemingly fine except for they're missing like, their entire butt, like their entire rear end. And they're just like walking on the force of this with this, like, white patch on them. And not only that, but when this fungus takes over the cicada and erupts from their…rear ends, it actually seems to be able to influence their behavior in some way. So, like, truly, it is like a zombie situation. What you see is that the males that are infected with this fungus not only are calling for females, they're making that very typical cicada buzzy noise, but they're also mimicking female calls. They're mimicking the wing flip of a female to try to draw in males to them.

REBECA: <<gasps>>

BENJI: And the point of this, scientists think, is, is really like the the genius of the fungus. It's to draw as many of these insects together so that they can infect each other. So the female or the male will try to mate with this, this infected male cicada. And then the spores will cross over to this other cicada and the fungus will spread from there. So fungus, genius. Really scary for these for these insects. And you should definitely check out these crazy videos of, of like, just cicada heads or cicada heads and a single wing, walking around with like, a fungus sprouting from their butts. So like, yeah, it's pretty…It's pretty wild.

<<Thriller laugh>>

SCORING OUT

REBECA: I feel like we all have to get used to the idea of, like, welcoming our zombie butt fungus overlords.

BENJI: For sure, for sure.

REBECA: So scientists don't get to study these emergences that often, right? It's every 13 years. Every 17 years. They must be very excited. What will they be studying during this emergence? What are they looking at?

BENJI: Yes, scientists – entomologists specifically – very excited. And many of them are traveling across the country to be able to witness this emergence and study it. One of the experiments that I recently heard about and I'm I thought was super interesting, led by, this researcher, Martha Weiss, and John Lill, they are looking at how this big emergence of cicadas in Illinois is going to affect ants. Now, ants we all know about, they enter our homes, whatever, you see them everywhere. They actually play a number of super important roles in the forest. So one thing that ants do that's super important is that they help flowers like wildflowers in the forest, many wildflowers disperse their seeds. So if you're a flower, you don't want to just drop your seeds right below you because then you're going to the babies are going to compete with the mom, and, potentially they'll be inbreeding or whatever. You want to spread your seeds as much as you can. You want to basically like colonize as much of the forest, spread out. And often plants rely on other things for help. So that's why you'll have seeds in like the fur of dogs. That's like their way of hitching a ride to go elsewhere. Ants also help distribute the seeds of many wildflowers, and then you'll actually see ant colonies like an anthill with a ring of flowers around it, because they have brought all of these plant seeds to their colony and then discarded them. What researchers are now looking at, or will be looking at is if the ants are so overwhelmed with cicadas as a food source, so like this could be when adults get killed by other animals and their carcasses are falling to the forest floor and they can eat. Those are during this kind of second emergence when all the babies start flooding the forest floor. Are ants going to be so distracted by this new food source that they're going to stop distributing the seeds of, of wildflowers so we could see some impacts on the spread of wildflowers. So I bring that up just to like, make the point that these ecosystems are so complicated and there are so many different things going on, ants playing these different roles when you all of a sudden, like, flood the forest with this new resource, that's that's not usually there, it just kind of sends these like ripples these way, these shock waves through the forests that really reach like all stretches of the food web.

REBECA: So we know birds love cicadas and caterpillars love cicadas in a way. Are cicadas bad for any species?

BENJI: We don't know for sure, but there certainly are some short term negative impacts of cicadas on trees. So there has been studies that show that the growth of trees will actually slow down during a cicada emergence and immediately following an emergence. And that could be because when those female cicadas are laying their eggs in trees, they can actually do damage to tree branches. So that's one potential negative. And similarly, scientists have also shown that during and immediately after these big eruptions of cicadas, oak trees actually produce fewer acorns. So they're basically these trees are like, okay, maybe it's not, a good time to release all of our seeds because the trees might be, sensing that they're going to be harmed in some way by these insects and delaying the production of acorns, which is like, takes a lot of energy from the trees. And so that also is a negative. But it's pretty remarkable how resilient plants and trees are. So even if you have two years of kind of stunted growth or a lot of, leaf damage from all those caterpillars, it is likely that the trees are recovering pretty quickly after that. So it's not like we're seeing a major, like loss of forests on the scale of like development or deforestation. It's probably like a temporary kind of dip in the productivity of trees.

REBECA: Do you think that this cicada emergence, you know, being as rare as it is, is bringing some people together the way like an eclipse does? You know, do other people view this event as magical the way you do?

BENJI: I think people find it hard to stop and appreciate something as strange as this, like just the pure wonder of a weird bug. And it's something that's really visible and affects many of us. I mean, so many of us know the sound cicadas make, whether it's the annual ones or the ones that are coming out now. And I don't know, I just find that, like any excuse to be paying a little bit more attention to what's happening outside and in our ecosystems is wonderful and I think helps build appreciation for these ecosystems. And I think that everyone should spend some time, I mean, especially if you're in some of these regions like get out, watch this happen because it's not going to happen again for another 200 plus years like this.

SCORING IN JAZZO FLUTE

REBECA: Vox’s Benji Jones. Lover of cicadas.

This show was produced by Victoria Chamberlin, edited by Miranda Kennedy, fact-checked by Laura Bullard and engineered by David Herman.

I’m Rebeca Ibarra and this is Today, Explained.

[10 SECONDS OF SILENCE]