



Encyclopedia of Life

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## Red-shouldered Soapberry bug Podcast and Scientist Interview

### *Jadera haematoloma*

In the lab at American University in Washington, DC, evolutionary biologist David Angelini and graduate student Stacey Baker are studying a snazzy red-and-black insect called the red-shouldered soapberry bug. These tiny insects with the big name are speedy and hard to catch—and speedy in other ways, too.

#### Transcript

**Ari:** From the Encyclopedia of Life, this is: One Species at a Time. I'm Ari Daniel Shapiro.

When you keep red-shouldered soapberry bugs, that's *Jadera haematoloma* – in the lab, it's only a matter of time before one's on the loose.

**Angelini:** Whoop. Great.

**Ari:** David Angelini moves vials and flasks to one side <Angelini: Come here...> as he corners a female soapberry bug who's scuttling away. Angelini's a biologist at American University.

**Angelini:** Here we go.

**Ari:** At last he picks up the thumbnail-sized bug and places her on what looks like a mini air hockey rink. Low levels of carbon dioxide pour outta the little holes, gradually anesthetizing the bug. Angelini adjusts the magnification on his microscope and I peer down at her. She's beautiful. Her wings are a glittery black.

**Angelini:** Yeah, it looks like asphalt after a rainstorm. It's very nice.

**Ari:** And right where her wings connect to her body – are two flashes of bright red – a red the color of the Coca Cola logo. Angelini's eager to show me her other side.

**Angelini:** We can flip her over. She won't object.

**Ari:** She's that same shade of red underneath. And she's got a lineup of little black appendages.

**Angelini:** The antennae, the legs, the genitalia, the mouthparts.

**Ari:** These mouthparts are called the beak, and it looks like a long straw.

**Angelini:** It looks more like an elephant trunk honestly.

**Ari:** Except that it doesn't extend out in front. The beak's tucked under a soapberry bug, pointing backwards. It works like a tiny syringe that can pierce the dark, round seeds of a plant called the balloon vine.

**Angelini:** That's *Cardiospermum*. A native vine in Florida and the US Southeast.

**Ari:** Before the balloon vine releases its seeds though, they grow inside these leafy capsules or pods shaped like little balloons.

**Angelini:** Exactly, the pod is full of air. It's just the covering keeping bugs away from the seeds.

**Ari:** Except that the pods don't keep a soapberry bug away. It just perches itself on the balloon, punctures the pod with its beak, and skewers the seeds inside. The beak's a perfect size to do the job – about 70% of the bug's total length. Or at least that's how big it was before 1950.

Angelini and his graduate student Stacey Baker walk me across campus towards the chemistry building.

**Baker:** So right outside of that building is where the goldenrain tree is.

**Ari:** The goldenrain tree, or *Koelreuteria peniculata*, is originally from Taiwan, actually. But around 1950, this tree – among others – was shipped to Florida for landscaping purposes. And the goldenrain tree – it's related to the balloon vine. It has the same kind of leafy capsules. It's got the same sort of dark round seeds. And it wasn't long before the soapberry bugs of Florida started dining on goldenrain tree seeds. In the last 60 years, goldenrain trees have been planted throughout the US – as far west as California and as far north as Washington DC – in backyards, in gardens and on college campuses. Like American University where Angelini works.

**Angelini:** When I first started this, I had no idea how prevalent goldenrain trees were. We started getting tips so we drove all over creation looking for them, and then we discovered this one right on our doorstep, so...

**Ari:** Sorry, was that one of them?

**Baker:** Yes, so this is a baby.

**Angelini:** The really large tree that's behind these hollies – that's a goldenrain tree.

**Ari:** You know, it's funny. They don't look out of place. They blend right in.

**Angelini:** I know, a Taiwanese tree, but here in DC, you'd never know it's anything special.

**Ari:** And as the trees have traveled the US, so have the soapberry bugs.

**Angelini:** So this sidewalk and down by the base of the tree is where we've actually collected most of the bugs that we used.

**Ari:** Used, that is, in his lab. You see, in the lab, Angelini studies evolution. And something remarkable's happened to the population of soapberry bugs feeding on goldenrain tree seeds. They've adapted. Fast.

**Angelini:** It was discovered that their mouthparts were now about 30% shorter, they were making more babies, their babies were living at a higher rate, and their flight muscles were also smaller. Basically all this evolutionary change had happened in about a hundred generations, so in about 50 years. And in evolutionary terms that's remarkably fast.

**Baker:** Very fast cause if you think about evolution we think millions of years, thousands of years. We can see it in a lifetime.

**Ari:** Baker and Angelini want to know which of the soapberry bug's 15,000 genes have made these evolutionary changes possible. But it's not only about this bug.

**Angelini:** I mean, it's easy to look around in the world and see biological diversity and that arises through evolution. And what we really want to do is we want to be able to understand at a fundamental, at a genetic level, what is producing this diversity that we see.

**Ari:** Darwin's theory of evolution relied on observing species that had already diverged from one another. But the soapberry bug is an example of evolution in action – in the wild. And inside the span of a single researcher's career. Angelini wants to know all the genetic differences between the two populations. That's the big dream.

But until then, he and Stacey Baker are still corralling thousands of soapberry bugs.

**Baker:** Got 'em.

**Ari:** Oop!

**Baker:** Oop, lost 'em.

**Ari:** At eol.org, you can see some great closeup photos of soapberry bugs. Our series, One Species at a Time, is produced by Atlantic Public Media in Woods Hole, Massachusetts. I'm Ari Daniel Shapiro.

## Meet the Scientist

Meet scientist David Angelini who you heard in the Red-Shouldered Soapberry Bug podcast



### **Where do you work?**

American University, Department of Biology

### **What do you study?**

My field of research is evolutionary developmental biology, which is concerned with how evolutionary changes are we can see is underlain by changes in development and genes. We are also interested in whether the connections among genes and developmental processes influence or bias the evolution of structures.

### **What are three titles you would give yourself?**

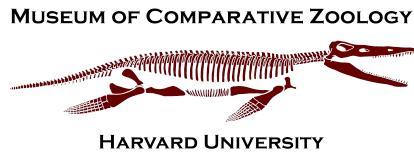
Biologist, Teacher, Hiker

**What do you like to do when you are not working?**

When I'm not working on things related to research or teaching, I'll be hiking with my wife, son, and dog.

**What do you like most about science?**

Life is full of complexity and beauty. Teaching and researching how organisms function allows you to be constantly reminded of biological complexity, diversity, and it hasn't stopped being interesting. There are also moments during long experimental projects, when you determine an answer to a question-- you are the first person to understand just one small part of how life operates. That is a wonderful feeling. And it makes you want to ask more questions.



The One Species at a Time podcast series is supported by the Harvard Museum of Comparative Zoology.