

## Segment Transcript

RACHEL FELTMAN: is Science Friday. I'm Rachel Feltman.

Eels have fascinated humans for thousands of years, captivating big thinkers like Aristotle and Freud, and they still make their way into pop culture even now.

SPEAKER 1: (SINGING) I said, ooh, girl

Shock me like an electric eel

Baby girl

RACHEL FELTMAN: Here's a fun eel fact for you. Electric eels not actually eels, not even a little bit. And vampire squids aren't vampires or squids, and also a Brazil nut is technically a seed, not a nut. And anyway, what was I saying? Right, eels.

So despite having been on planet Earth for about 200 million years, eels are still rather mysterious creatures. For instance, scientists still aren't sure exactly how they spawn. But all of those unanswered questions haven't stopped humans from wanting to eat them, and a lucrative criminal underworld has risen up to poach baby eels from the wild for exactly that purpose.

Joining me now to talk all about her journey into the wild world of eels is my guest, Ellen Ruppel Shell, author of *Slippery Beast—A True Crime History with Eels*. She splits her time between Bremen, Maine, and Somerville, Massachusetts. Ellen, welcome to Science Friday.

ELLEN RUPPEL SHELL: It's great to be here. Thanks so much, Rachel.

RACHEL FELTMAN: Thanks so much for coming on. So I'll start with the most obvious question to ask someone who wrote a book all about eels, which is why eels.

ELLEN RUPPEL SHELL: Well, that's a simple question and a complicated question. So the short answer is I didn't find eels. Eels found me. Would you like to know the story behind that?

RACHEL FELTMAN: I would love to know the story behind that.

ELLEN RUPPEL SHELL: OK. Well, quite a few years ago, as you mentioned, I spend about half the year on the coast of Maine, and one year my husband and I decided we needed some help with home repairs. So we hired a guy who in the book I call Sam. Sometimes he come in quite early, come to my kitchen with a four-pack of cider, and just want to talk.

And he'd tell me stories about his family and especially about his grandson, who he said he wanted to teach to fish as soon as he got the money together to buy a boat. And I said, well, Sam, why don't you mix business and pleasure and buy yourself a commercial fishing license to go with that boat? And he said, well, I did do that and I would do that but the eels.

And I said what. What are you talking about, the eels? You're afraid they're going to bite you or what? And he said, no, I'm not talking about eels big enough to bite you. I'm talking about the little eels, the ones the size of your pinky finger, the ones we call the glass eels or the elvers, the baby eels?

Ever since the price of those eels went through the roof, it's been dangerous down by the river. And I said what do you mean the price went through the roof. And he said, well, they're about \$2,500 a pound.

Well, as you can imagine, that got me curious about the eel. And Sam left, years went by, I couldn't get the eel out of my mind, and I started looking into it. And I found not only were the price— was the price through the roof, but the eel was a most remarkable animal. And the natural history of this animal paralleled the history of science, and I got pulled into this story as do so many people who encounter the eel. And it just wouldn't let go.

RACHEL FELTMAN: Yeah. Well, there are so many absolutely fascinating eel facts in your book, but let's start with some very basic stuff. Can you give us a quick overview of the eel life cycle and why it confused scientists for so long?

ELLEN RUPPEL SHELL: Yeah, the eel is such a mysterious animal. No one knew how it reproduced. So, Aristotle, about 2,000 years ago, he started things going with this idea that eels reproduce by spontaneous generation, and he held this theory as did people for almost 2,000 years, this idea that eels just reproduced out of the mud. They did not sexually reproduce, but they reproduced out of the mud.

And the reason for that is because eels were everywhere and no one had ever seen an eel mating. No one had ever seen an eel egg. No one had ever seen a pregnant eel.

RACHEL FELTMAN: So, yeah, how and where eels breed has, of course, long been a mystery to scientists. Remind me what do we know and not know about where they spawn.

ELLEN RUPPEL SHELL: OK. Well, it is thought today that the Atlantic eel, that is the European eel and the American eel, both spawn in the Sargasso Sea south of Bermuda. Again, it is thought. No one has ever spotted a mature— sexually mature eel in the ocean or a mature eel in the ocean, and no one has ever spotted an eel egg in the wild. So we're not absolutely sure of this, but it is thought that they spawn in the Sargasso Sea.

In the case of the American eel, which is the eels we were talking about in Maine, it is spawned in the Sargasso Sea, and then it grows into a larval stage. And that larva, which is maybe 3 to 5 inches long, travels all the way from the Sargasso Sea up through the eastern seaboard, in the case of the Maine eels, up to the Maine coast.

And as it crosses toward the coast, it becomes what we call a glass eel. They look like little transparent toothpicks. And then as it comes, it tends to come into the freshwater area. As it starts to do that, it becomes an elver. It becomes pigmented.

And some eels stay in the ocean, and some continue up the rivers and settle down into lakes or other places, other waterways, where it just eats. It becomes a yellow eel, and it just eats and eats and grows and grows. And it can stay there for as long as up to 40 years.

And then after it reaches a certain point, somehow it knows to return to its spawning place in the Sargasso Sea. It becomes what we call a silver eel. That's the last stage in its development, and it retraces its steps all the way back to its spawning ground, where it spawns once or maybe twice—we're not sure—and then dies. And that's the life cycle of the eel. So you can imagine how difficult it was for ancient scholars to have any idea of how the eel reproduced.

RACHEL FELTMAN: Wow. Yeah. And as you were just describing, eels have to migrate thousands of miles. Do we know how they do that navigation?

ELLEN RUPPEL SHELL: Oh, wow. Well, that was such a controversial question. Some folks thought—some scientists thought it was olfaction because eels have an incredible sense of smell. Some felt that they were following the gravitational forces from the moon. There were all different theories. Most recently, it's been thought that they have a magnetic sense, that they have particles around their nose area, the front of their face that are magnetically sensitive and that they're drawn by the magnetic fields toward their destination.

This, again, is controversial. I went to Norway to discuss this with a scientist who was most closely associated with this theory. Her name is Caroline Durif. She's an amazing scientist, and she has a laboratory there where she did the experiments that resulted in this conclusion. It seems to be probably the most likely theory. They have a certain magnetic sense—eels do—that draws them to their destinations in both directions, both from the Sargasso Sea and back to the Sargasso Sea.

RACHEL FELTMAN: Wow. So personally I had the pleasure, dubious honor, of helping to catch some wild eels for research back when I was an undergrad, but I think most folks these days have their first eel encounter when they see maybe unagi at a Japanese restaurant or maybe at the Feast of the Seven Fishes, if you have a particularly ambitious Italian grandma. But like other types of seafood, they've been over-fished. So what are the statuses of the three populations of eels— the American, European, and Japanese eel?

ELLEN RUPPEL SHELL: Well, exactly. So there are about 820 different species of eels. The ones that we think about, the freshwater eels, there are maybe 18 different species, and the most commercially viable ones are the Japanese eel, the American eel, and the European eel. Now all those eels have

declined in number dramatically since the 1970s. It's thought that the Japanese eel has declined by as much as 95%, the European eel by as much as 95%, and the American eel by about 50%.

So as you can see, the Japanese and European eel are both critically endangered. The American eel is not classified as critically endangered, but many scientists believe that it's on the verge of becoming quite endangered. It's certainly under threat.

RACHEL FELTMAN: Yeah. Even going into your book as something of an eel enthusiast, one thing that really blew my mind was your deep dive into the international wild eel trade. So how is it that baby eels or elvers from Maine end up on eel farms in China?

ELLEN RUPPEL SHELL: Yeah. So there's an elver season. So elvers are baby eels. There are about 2,500 of these eels to a pound to give you some idea of how small they are. These eels are caught in the estuaries generally or in the rivers of Maine in the case of the Maine eel. The only legal place to catch elvers in the United States is the state of Maine. There's a very small fishery in South Carolina, but it's really not significant. So the only significant elver fishery in the United States is the state of Maine.

So they're caught on the coast during elver season, which starts in March and usually ends in June. And then they are shipped—by and large, they are shipped to farms in Asia, generally China, to be grown up to market size. It takes six months to a year to grow them to market size, after which they are slaughtered and prepared and sent back to the United States for sale. So it has the supply chain for the American eel in the United States is circuitous and dramatic really as the lifecycle chain of the American eel.

And in that process, as you can imagine, there's lots of room for slippage, poachers, all sorts of things. International cartels are involved in this, criminal cartels, organized crime. It is the most costly wildlife crime on the planet. It's hard to imagine this that elvers, not tiger paws, not ivory from elephants, elvers are the world's costliest wildlife crime.

RACHEL FELTMAN: Wow. And can you say a little bit more about what it is about the eel industry and the supply chain that lends itself to criminal enterprises?

ELLEN RUPPEL SHELL: Really what it comes down to is money. Our other big product in Maine, of course, is lobster. Elvers are about 400 times the value of lobster. It's very, very valuable and quite relatively easy to ship and smuggle and so unlike an elephant. Elvers are very, very small so that has really brought in all sorts of criminal elements into this industry. It's— as everyone told me, eels are a dirty business, always have been, but since the price went through the roof, it's gotten very dangerous as well as dirty.

RACHEL FELTMAN: And speaking of eel crime, you interviewed a notorious eel kingpin named Bill Sheldon for the book. Can you tell me more about Operation Broken Glass?

ELLEN RUPPEL SHELL: Bill Sheldon is such an interesting guy. He's literally an expert on the eel— on the American eel. He has a degree in wildlife management. He's also a grandfather. He's not a young man. And Bill is— was the biggest eel dealer in the state of Maine.

And unfortunately, as Bill himself will admit, he got greedy, and he got involved in a poaching ring that involved six states up and down the east coast that encouraged the illegal fishing of eels, elvers— and let's make sure we understand this it's the baby eels that were interested in— illegal fishing in states where it was not legal to fish elvers. And the elvers were then laundered through the state of Maine with Bill's help.

And this Operation Broken Glass was a four-year federal investigation that ended in April of 2014 with the arrest of about 110 criminals up and down the east coast. 22 people were imprisoned including Bill Sheldon, who I interviewed about a month and a half after he got out of the state penitentiary. So unfortunately with prices that high, even people with expertise and long experience of honest fishing of elvers got pulled into the trap of illegal activities.

RACHEL FELTMAN: But I'm sure some folks are wondering why don't we just catch and eat adults instead? But as you share in the book, wild caught adult eels actually taste pretty bad. Can you explain why?

ELLEN RUPPEL SHELL: Yes. Well, eels as I've mentioned can live a very, very long time. The ideal weight for eel, especially in something like sushi, which is what the preparation that Americans prefer,

those eels are small, relatively small, and you have to catch them at just the right time to get them that size. That's virtually impossible. You really can't time that in the wild.

The other factor is as I said they do live a long time and they're bio accumulators. Eels are very, very fatty, and they store all sorts of things in that fat. And many river bottoms where they are nocturnal animals during the day, they burrow in the mud and absorb all sorts of toxins and unhealthy materials from that riverbed. Not only are you exposed to those toxins, but it doesn't taste very good. So many Americans do not like the taste of wild eel.

And I had the opportunity to taste it myself in Norway. I did taste wild eel. I'm a big fan of domesticated eel and cultivated eel. I was really shocked at the taste of wild eel. I describe it as almost like a wet sponge taste. It's really, really not something that many of us would really enjoy.

RACHEL FELTMAN: Yeah.

ELLEN RUPPEL SHELL: Now I've spoken to people who really do like it. There's various countries certainly have a tradition of eating wild eel, but it really depends very, very much on where you get it, how old it is, all these factors that you really can't control. So cultivated eel is what the vast majority of eel eaten around the world is. It's not wild eel.

RACHEL FELTMAN: Right. And given everything you learned about the bad actors in the eel trade and the threats that eels face, should people just avoid eating eel altogether?

ELLEN RUPPEL SHELL: That is such an interesting question and a complicated one. And many scientists told me people should not avoid eating eel because if we lose it as a commercial product, we're going to lose interest in it altogether. They would prefer that people continue to eat eel in moderation but know where it comes from and be mindful of where it comes from just like so many things we think about eating.

If we can do that, if we can balance our concerns—our environmental concerns with our hunger for eel, we'll be better off than if we just simply stop eating it.

RACHEL FELTMAN: Ellen, thank you so much for joining us today.

ELLEN RUPPEL SHELL: Thank you very much, Rachel.

RACHEL FELTMAN: Ellen Ruppel Shell is the author of Slippery Beast– A True Crime History with Eels. She splits her time between Bremen, Maine, and Somerville, Massachusetts. If you want to read an excerpt of the book, go to [sciencefriday.com/eels](http://sciencefriday.com/eels). That's [sciencefriday.com/eels](http://sciencefriday.com/eels).

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