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Welcome to IFLScience – The Big Questions, a series where we ask experts some of the most pressing mysteries of science, technology, and humanity. I'm your host, Rachel Funnell, Writer and Social Editor for IFLScience. Today, I'm going to be speaking with Dr Barney Long, who is the Senior Director of Conservation Strategies for Re:wild, an organisation which is very familiar with species extinction having launched the Search for Lost Species programme, which targets a 25 most wanted list of lost species to science. In five years they've pinned down eight of these, demonstrating that species aren't always as lost as they first seem.

I: Barney, it's a pleasure to speak with you, and thank you so much for joining us for today's episode. I guess a decent place to kick off the conversation would be how is a species declared extinct and who makes the decision?

R: Well, firstly, thank you so much for having me today. How a species is declared extinct is surprisingly difficult, and who makes it is also not that easy to clarify. Firstly, the people that need to make the decision on whether a species goes extinct, there are two different things to think about here. One is at the global level. At the global level the most appropriate body to do this is the red list authority of the IUCN species survival commission specialist groups. These are the groups that assess the species conservation status under the IUCN red list of threatened species. And so it's that body that will look at all of the evidence from across the world to decide whether that species is extinct or not. Under the guidelines of the IUCN red list, a species needs to have no reasonable doubt that the last individual has died, that there's been extensive surveys in all known or expected habitat at the appropriate time, i.e. whether it's during the day or at night, the right season, annually, etc, and also throughout its entire historic range. That's a pretty high bar to cross and that's, I think, very sensible because we don't want to call a species extinct too soon, because if there is any animals still out there or plants or fungi still out there, then we need to put conservation actions in place to prevent that extinction, so it's very deliberately a very high bar.

Now that's at the global level. At the national level, countries might make their own distinctions about a species being extinct within the range of the species that falls within that country. There was some press a couple of months ago about the US making a load of species extinct in the US. One example there was the ivory billed woodpecker, the US government has declared that extinct in the US. However, globally it is not yet declared extinct because there is still a slight chance that the species hangs on in Cuba. That's who makes the decision and how it's linked into all of that, again, you need to do all of those surveys at the right times, at the right places, the right effort to really show that there are no individuals left of that species.

I: Okay, great. Talking on a kind of national and then global scale, are there occasions where we've got it wrong and a few years down the line we've been surprised by finding out that a species is in fact still around?

R: There are some examples of this. I think because there is such a high bar set for declaring a species extinct, it's not as regular an occurrence as you would think. Actually, most of the species that have been declared extinct and have been rediscovered are actually primarily species that were extinct long ago and thought to be in the fossil record, the famous example being the coelacanth or the Mallorcan midwife toad. These were found as fossils and then the actual species was found alive. Most of these examples are that side of the conversation. Off the top of my head, I can't actually think of any that have been declared extinct through the red listing process and then have come back. There might be one or two examples. I'm sure we have got it wrong at some time, but we really do try as best as possible not to declare something extinct before we really now for sure that it is.

I: One of the projects centred around species and their extinction that Re:wild is known for is your Search for Lost Species programme. I was wondering if you could tell me a bit about your work with this and what brought you to the project.

R: The Search for Lost Species was started in 2019. It came out of a programme that one of our team, Robin Moore, had been working on for many years, which was the Search for Lost Frogs. This was a really successful project that rediscovered many species of frogs thought potentially to be extinct. We at Re:wild really like to focus on the species that are forgotten and overlooked by conservation. This just seemed the perfect opportunity to try and broaden that search out from frogs to all species of animals, plants, and fungi and try and create a global movement to look for species that have become lost and to put in conservation actions for species once they are rediscovered. We're really excited about the idea of taking species that are forgotten and actually turning them into flagships for conservation. That kind of reversal of roles, I think is really exciting to take these underdog species, or under-frog species, as we like to call them, and turn them into champions of specific regions or groups of species to say, hey, listen, there is hope out there. These species can be found. They can be recovered if we put the effort into it and get people focusing on these species rather than the bigger more charismatic more well-known species.

I: I think that's such a nice idea of the reversal of roles from once a sad story to kind of a victory. As I understand it, thanks to breeding programmes, it's possible that species can go extinct in the wild but there will still be captive populations. In these instances, is there anything that can be done to try and return those species back to the wild?

R: Absolutely. I think that's what gives us hope for the Lost Species programme, not just because of captive breeding programmes, but also just the fact that we are able now to bring species back from the brink when they've got down to very, very low numbers. Whether it's in the wild or under human care where they get down to extremely low levels and are brought into human care, then those breeding programmes have been responsible for the conservation and recovery of multiple species of plants and animals. Some of the more famous examples are the Arabian oryx, the European bison, the Californian condor. These are species that were extinct in

the wild, but there were enough animals brought into captivity to breed them and eventually put them back in the wild.

This is a really growing body of work within conservation where you have this what we call the one plan approach, where you're working with plants and animals under human care and recovering their populations, creating a sustainable population, and then eventually having excess individuals in captivity that can be put back into the wild. This idea of linking in situ with ex situ conservation approaches but having a single approach for a species, so it's not an isolated zoo or botanic gardens working in one location and in situ field conservation organisations working in another. How do we bring these two groups together to have a single approach where you're reducing the threats in the wild, you're improving the societal acceptance of that species coming back within the human population, and then you're working with those individuals under human care to breed them up and have enough individuals that it's safe enough to take the out of human care and put them back into the wild. There are multiple examples and a growing list every year of where species are brought back to the wild and start to be recovered in the wild because of captive breeding.

I: Great. I guess it applies for both captive and wild populations, but one of the tricky aspects is as their numbers reduce, you've got an increased chance of closing the gene pool. I was wondering if you know what ways there are of trying to maintain that genetic diversity among dwindling populations?

R: Yes. Like you say, this is relevant to both captive populations and wild populations, and there are multiple different things we can do here. One is to move animals around, so wild to wild translocations, to get different gene types into populations. The idea is, historically, you have very large populations spanning larger areas than they're currently in, so you have very wide genetic diversity. As populations fragment, either due to loss of animals or loss of habitat, you start to get these fragmented populations and within there you have restricted diversity of genetic make-up of the individuals. Over time, if you start getting inbreeding, that genetic diversity can further decrease. But what it might be doing is it's happening in two or three isolated locations, so by moving individuals between those isolated locations you can increase the genetic diversity within each subpopulation.

Where you have captive populations, you can obviously be a lot more controlled as to which individuals breed with which individual. Therefore, you can manage the growth of genetic diversity within your captive population. Then you can use your captive population to take that genetic diversity out into the wild again by releasing animals and have them breed. Similarly, you can bring individuals from the wild into a captive population to increase their genetic diversity. Again, it's really important that we have this one plan approach that I mentioned earlier where in situ and ex situ conservation efforts are working in tandem and looking not just at increasing the number of individuals but increasing that genetic diversity as well. There are more and more ways to do this as technology evolves as well and as our definitions or concepts of species and subspecies evolve as well, so there's a growing body of work looking at increasing genetic diversity and genetic health of populations across the world with multiple different taxa, so it's a really exciting growing body of work in conversation to maintain and enhance that genetic diversity amongst very critically endangered species.

I: Great. I think as well quite often when we talk about species extinction, some people tend to lean towards animals, famous stories like the dodo and rhinos. I know that at Re:wild you're focused on the other kingdoms of life as well. I was wondering if you could tell us why it's so important that we also keep searching for lost species of plants and fungus, and can finding them help us with environmental issues too?

R: Sure. I think fundamentally the life on planet earth works as an interconnected system. The building block of that interconnected system are species. Whether it's an animal, a plant, or a fungi, it has a very specific role in that interconnected environment in which we live in. Losing any individual might not have a massive impact, but when you start to lose multiple species within an environment, the way that environment and interconnected web of life works can start breaking down, and for some species they are the lynchpin in that web of life. If you take that central species out, the whole web can start to fall apart. It's absolutely critical that each individual species is given equal weight when looking at conservation and avoiding extinction. It doesn't matter how small or hard to find or how cryptic it is, it's still important.

I think one of the key things we're focusing on in the search for lost species is that every species out there is charismatic. We talk about charismatic mega fauna, but the smallest ant or the strangest fungi is charismatic in its own right. We are choosing to put certain species on this pedestal as being more emotive, but I don't feel that's the case when you tell people stories about some of the strangest creatures out there that you've never heard of, people still get an emotional attachment to them. I think it's really important that we value every species for what it is, whether it's a spider or a fungus or a small cryptic plant, they're playing an important role. Maybe not one that we understand yet, but they are important, so we need to work on all of them to ensure that we have a healthy functioning ecosystem, and therefore a healthy functioning planet which we call home. If our home starts cracking and falling apart at its foundations, then pretty soon we won't have a home that we can live in. I always like to use the analogy of a house and every time you're losing a species, you're taking one brick out the foundation of that house and pretty soon if you take enough bricks out, your house will fall down. The planet is a house and species are the individual building blocks of that foundation.

I think it's really important that we look for these lost species and when we rediscover them, all conservation efforts possible are put into saving them. Whether they're rediscovered species or just critically endangered or endangered species, each of those species deserves conservation attention in their own right, but also if we are being clever as a human race, we really need to think about those foundational bricks of our house and make sure that we are looking after each individual species.

I: Yeah. I think that's a really good message and something that was definitely reflected in the diverse range of species in your most recent Search for Lost Species 25 Most Wanted. Thank you very much for that and thank you for your time today, Barney, and that dive into species extinction. It was great to speak with you.

R: Thank you so much for having me today.

Thanks for listening to IFLScience – The Big Questions. Head over to iflscience.com and don't forget to sign up to our newsletter so you don't miss out on the biggest stories each week. Until next time.

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