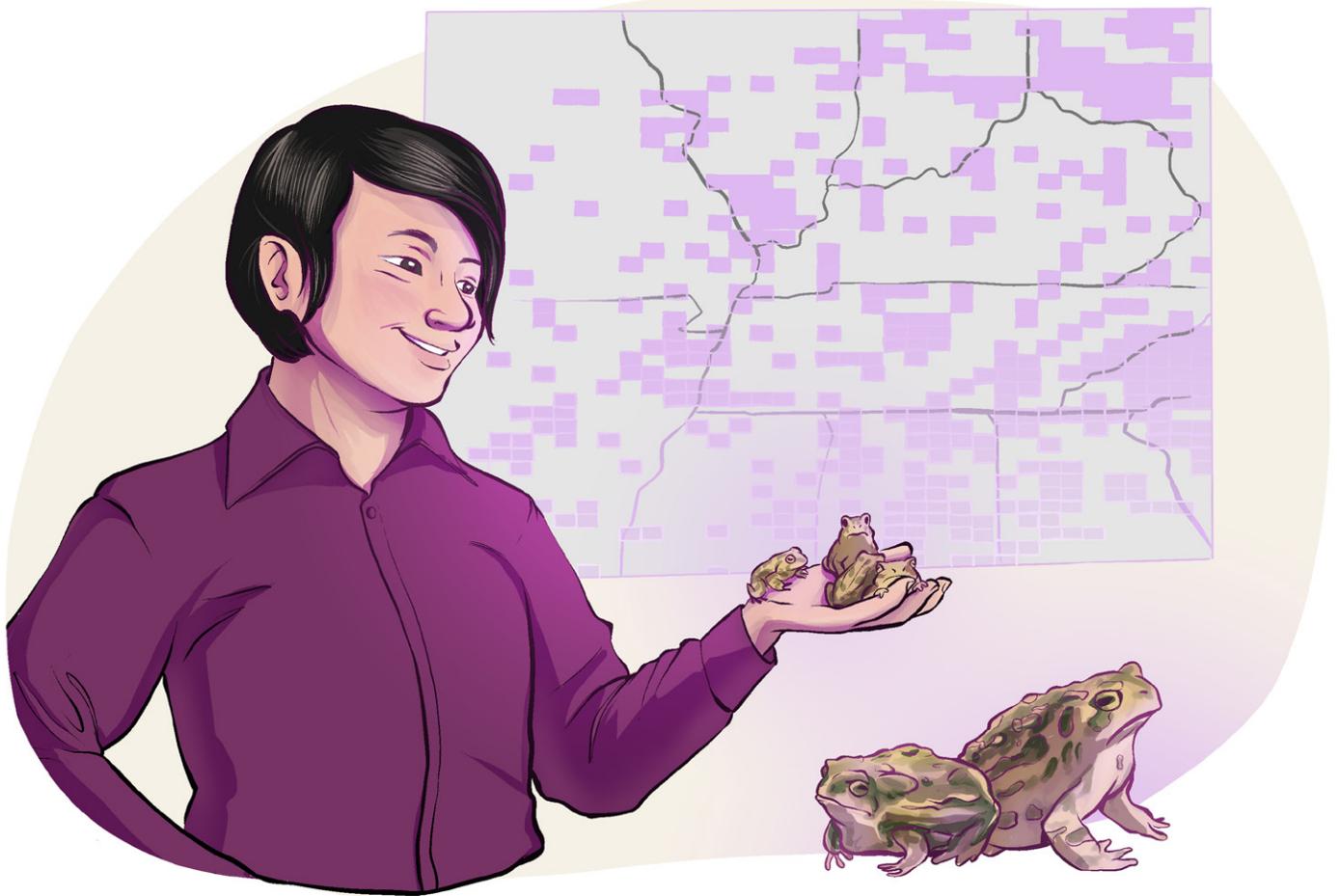


# Saving Endangered Species

## with Sinlan (Sheila) Poo



### Learning Objectives:

- Explain the role of biodiversity data in applied conservation
- Access publicly available biodiversity data through AmphibiaWeb
- Analyze and interpret publicly available biodiversity data from your local area
- Consider taxonomy when selecting a proxy species for study
- Discuss the practical considerations of study design
- Explore potential applications and limitations of biodiversity data from zoo collections



### Meet the scientist:

My name is Sinlan (Sheila) Poo and I was born in Taiwan. I received, I would say, a pretty traditional, dogmatic education through primary and secondary school. After high school, I decided to come to the US for college because there seemed to be more choices, potentially, in terms of majors and subjects. So I applied to a few schools and decided to go to Boston University.

Then in undergrad, I had to pick between being a history major or a biology major. I realized that history in the States is taught from a very different point of

view than history that I had been brought up with in Taiwan. In a very simple sense, when I talk about world history I'm thinking about the West... and when people in the States talk about world history, they're thinking about the East. It seemed very subjective. And so I decided to stick with biology, where I thought I could just translate the nouns. A frog is a frog. That's not to say science isn't ever subjective, but it was my understanding at the time and I thought it would be a better fit for me.

After college I got a job in California where I worked as a field biologist monitoring threatened and endangered species for a few years. Wanting to explore a new region, I then decided to go to the National University of Singapore to pursue my PhD. For my dissertation research, I did field work around South-east Asia, with my primary study site being based in Thailand. After I got my doctorate, I taught field courses in Sri Lanka for a couple of years. And then I got a job in Tennessee at the Memphis Zoo.

The zoo is very much interested in **applied conservation**. Which basically means, "what can we actually do to help endangered species?" A lot of my work now is thinking about the theory behind practical actions.

Mostly I work with amphibians. We have captive colonies of threatened or endangered species that we breed and release into the wild to help boost existing wild populations or establish a new population. As part of that I do sperm cryopreservation, or biobanking. I also do a fair amount of primary research and ask questions about ecology, evolution, and behavior to make sure these approaches make sense. For example we found out that amphibian offspring from biobanking tend to be smaller than their naturally bred counterparts. How does that impact their survival in the wild? Does the smaller size correct itself after a generation, or is it hereditary? These questions have big implications for how we proceed with conservation efforts.

### Tell me about a time biodiversity data surprised you.

Something that was really surprising to me when I started working for the zoo, is that zoos have collection management software just like libraries and museums do. This includes all of the data on current animals that are alive— that are still in our collections, so to speak. These software were built primarily for people taking care of animals to note what their weight is each year, how many eggs are laid or offspring

birthed, their nutritional needs, medical records, and genealogical lineages for tracking captive breeding programs. It's very valuable data, and most scientists don't realize it's there.

I wasn't involved in it, but there was a study that came out in 2019 that looked at this data and looked at all the holes in data we have on IUCN (International Union for Conservation of Nature) for threatened and endangered species. It turns out you can increase our basic knowledge of demography (things like lifespan and number of offspring) by eightfold if you just include the data that we already have from zoo collections. But in general people who work at zoos don't really talk to scientists enough, and the scientific community doesn't really realize that this data exists. This is one of the reasons I co-founded the ZooMu Initiative, which aims to address this issue by increasing collaborations between zoos, natural history museums, and the larger scientific community.

### **How do you use biodiversity data in your work?**

I use the data from the zoo collections to make decisions regarding our captive breeding programs, especially to make sure we're maintaining as much genetic diversity as possible in those populations. I also use data from online resources like AmphibiaWeb and data that I gather myself in the field.

I have worked in a number of regions, in the Neotropics, Southeast Asia, and different parts of the US. Every time I move to a new place I feel like I have to start from scratch in terms of learning all the local species and figuring out where I can find them. When I moved to Memphis, I had to figure out what amphibian species were around me. And then within those, what species are common enough that I can use them as study species.

This is because **sometimes we cannot conduct studies directly using the endangered species that we're trying to save**. The endangered population just is not large enough for statistically significant results, and it's not worth risking the possibility that we might lose or stress out any of the rare, remaining individuals. So we need a **proxy species** to test ideas and figure out how to best save the endangered species.

For a proxy species, I need something that's common, geographically near where I'm located, and hopefully something that is taxonomically close to the target species we're trying to save. For instance, I did a comparative study looking at different types of frog species and different types of toad species to see if standard sperm cryopreservation methods can be transferred. Does it work if it's in the same genus? What about if it's in the same family? What happens if it's in a different family? Does that work? What we found was that results were consistent across species, and fairly consistent across families, which meant we could use methods developed in common species and apply them to the endangered species we are focusing on.

And then there are the **practical considerations** when choosing a proxy species. How easy is this species to find? Can we keep them in large numbers in the lab? What conditions do they need to breed? There are some species that require 12 foot deep pools of water to breed, which is not exactly easy to recreate in a laboratory setting. On the other hand, some species will breed in a ziploc bag if given the chance.

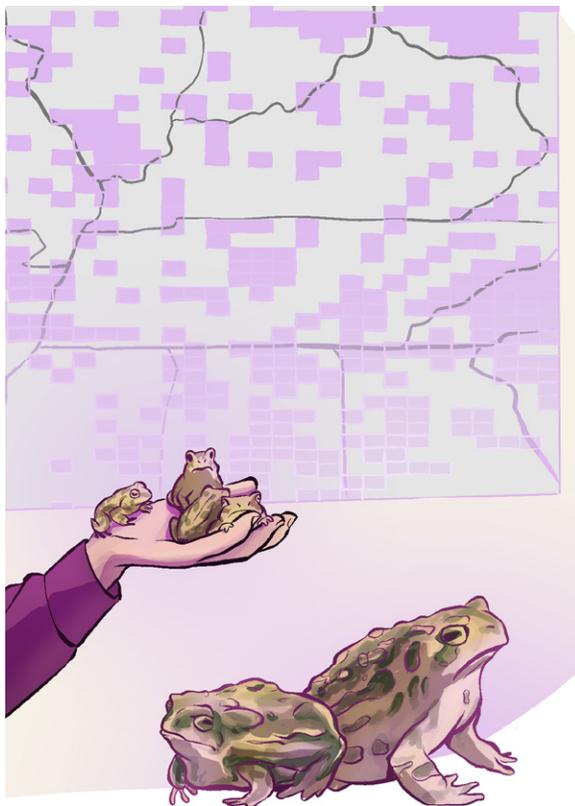
**Exercise 1:**

Come up with three ways a scientist might use zoo data about a species lifespan, clutch/litter size, and other demography data in their research.

- 1.
- 2.
- 3.

What caveats would need to be kept in mind when comparing data between animals in the wild and animals in captivity?

- 1.
- 2.
- 3.



**Exercise 2:**

You are on a team of scientists researching captive breeding techniques for the critically endangered Wyoming toad (*Anaxyrus baxteri*). In order to conduct your research, you must choose a proxy species in your area to stand in for the Wyoming toad.

1. Go to AmphibiaWeb, click “Search Geography” and search for frog species in your state or province.
3. Identify at least 3 species that are taxonomically close to *Anaxyrus baxteri* and have the status Least Concern. If there are no *Anaxyrus* species, look for species in the same family (Bufonidae).

Species 1:

Species 2:

Species 3:

4. Open each species page. Look at the Map of Life tab to see if their range is near your area.

5. Look at the Lannoo and AmphibiaWeb tabs to compare the lifecycles and habitat needs of your three selected proxy species

**Species 1:**

Habitat:

Lifecycle and breeding needs:

**Species 2:**

Habitat:

Lifecycle and breeding needs:

**Species 3:**

Habitat:

Lifecycle and breeding needs:

Discuss which of your three species might be the most suitable for use as a proxy species in studying *Anaxyrus baxteri*.

*Development of this module was supported by the National Science Foundation under DBI-1730526 RCN-UBE: Biodiversity Literacy in Undergraduate Education - Data Initiative (BLUE Data Network) and DBI-1746715 RCN-UBE: Engaging Underrepresented Populations in Biodiversity Sciences: A Series of Workshops for Undergraduate Students. Any opinions, conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.*

