

A Tale of Two Nearly Extinct Giant Salamanders

Trying to save amphibians native to Japan, herpetologists may rescue a species in China.

By RACHEL NUWER

KYOTO, JAPAN — In Japanese rivers, if you're very lucky, you might find unusual amphibians that grow up to five feet long and look like strange cartoon dinosaurs. They are giant salamanders.

"Salamanders are big, and they're cool," said Sena Ishikawa, a master's student studying the animals at Kyoto University. "I just love them."

Such passion for the slippery species, which Japan has designated a "special national treasure," prompted Ms. Ishikawa and two other students to set out on an unseasonably cold evening in March along the Kamo River in Kyoto, wearing headlamps, waterproof overalls, knee-high rubber boots and neon yellow safety vests, and carrying what looked like oversize butterfly nets.

The three students weren't just looking to capture any large salamander: Their goal was to find a purebred Japanese giant salamander.

For those who know where to look, it's not difficult to find giant salamanders in Japan. But they typically are not the large amphibians native to the country. The unplanned release in recent decades of giant salamanders from China has resulted in a rising number of hybridized animals of Japanese and Chinese descent. These blended animals have become a bane for Japanese conservationists who wish to protect the genetic integrity of their endemic species, which is considered to be vulnerable to extinction.

No good estimate exists for how many purebred Japanese giant salamanders still exist in the wild, but the species is losing ground, said Kanto Nishikawa, a herpetologist at Kyoto University who leads the lab where Ms. Ishikawa and colleagues are conducting research. "Some rivers are now filled with hybrids," he said.

Along the Kamo River, Ms. Ishikawa scrambled down the steep bank and eased into the clear, frigid water. She and the other students expertly scanned the edges of vegetation for the spotted, bulbous face of salamanders that could lay concealed among the slick rocks. Within five minutes, they found their mark: a two-foot-long salamander that, with some gentle prodding, swam straight into their net.

Would it turn out to be a Japanese salamander, or yet another hybrid? Ms. Ishikawa was holding out hope for the "treasure" native species, but they'd have to take it back to Dr. Nishikawa's lab to find out.

From Farm to Plate

While Japan's often elusive giant salamander species is under threat, the country may end up helping China preserve some of its giant salamanders, which face troubles of a different form.

Unlike Japan, which has a single giant salamander species, China has several species of the animals. But they have nearly disappeared in the wild because of poaching and habitat loss.

Dr. Nishikawa and his colleagues reported in the journal *Scientific Reports* this year that they had discovered two purebred South China giant salamanders — a critically endangered species that can grow to nearly six feet — living at aquariums in Japan. That means salamanders that are considered invasive species in Japan could potentially aid the comeback of the species in China.

"We want to use these individuals to help keep the species from going extinct," Dr. Nishikawa said. "Time is running out."

Giant salamanders are considered "living fossils" that have survived in East Asia for some 170 million years. Their undoing began only recently, when humans developed a taste for their meat.

Japanese traders started importing live giant salamanders from China in the 1960s as a novelty food item. As demand grew, so did concern that this new culinary penchant



PHOTOGRAPHS BY CHANG W. LEE/THE NEW YORK TIMES



could lead to poaching of protected Japanese giant salamanders.

In 1973, the Japanese government asked restaurants to voluntarily stop serving giant salamander. Most complied, and the trade ground to a halt. With no options for selling their remaining animals from China, some Japanese traders chose to release them into the wild rather than kill them.

Those original Chinese giant salaman-

Top, Sena Ishikawa, left, a master's student at Kyoto University, and Kanto Nishikawa, a herpetologist at the university, with a giant salamander they caught during a daytime hunt. Above, Ms. Ishikawa, left, with Saki Anan, a fellow master's student at Kyoto, preparing a sample for testing. Left, a giant salamander at Sunshine Aquarium in Tokyo.

ders interbred with local Japanese ones. Today, their hybrid descendants are found in waterways in much of the southern half of the country's main island, Honshu.

"It's such a difficult problem," Dr. Nishikawa said. "The hybrids are constantly expanding their range."

That concern is mirrored in China, where people continue to consume giant salamanders as a luxury food. There, millions of the animals live on farms. Nearly all in captivity are a genetic hodgepodge of the country's different species, though, and escapes pose a genetic risk to the remaining wild salamanders.

Big (Discoveries) in Japan

Saving the Japanese giant salamander from extinction by hybridization requires

up-to-date information about where purebred animals can still be found. During an earlier phase of their research, from 2007 to 2015, Dr. Nishikawa and his colleagues searched the Kamo River in Kyoto, as well as aquariums and backyard ponds around the country, for purebred individuals.

They analyzed 58 salamander samples and found that 23 were of the purebred Japanese species.

To their surprise, they also discovered four purebred South China giant salamanders.

"We never expected to find one of the rarest amphibians in the world," Dr. Nishikawa said.

One was a preserved specimen that had died some time ago. Another was being kept as a pet in Okayama Prefecture, but it recently died. Two males at aquariums in Tokyo and Hiroshima, however, are still alive.

Hiroki Sakiyama, a chief fish keeper at the Sunshine Aquarium in Tokyo, said he and his colleagues were "very surprised and proud when we heard the news about our salamander."

The aquarium, which is on the top floors of a popular shopping mall, acquired the salamander in 1999 from a pet shop. The animal resides in a private tank in a back room that it shares with jellyfish, tropical fish and a Hilaire's side-necked turtle. It has no name, Mr. Sakiyama said, "just 'giant salamander.'"

"We had no idea that we've been doing conservation by accident for the past 25 years," he added. "There's no hybridization up here, and no poachers at the top of a building in Tokyo."

Someday, a Breeding Program

South China giant salamanders were suspected of being extinct in the wild until about five years ago, when Jing Che, a herpetologist at the Kunming Institute of Zoology, discovered several populations at the Zhangjiajie National Forest Park in Hunan Province.

Because the populations are so small, "a reintroduction project is necessary," she said.

Dr. Nishikawa and his colleagues' "extremely exciting and important" discovery of the two purebred Chinese salamanders has inspired hope that such reintroductions could be soon possible, said Samuel Turvey, a conservation biologist at the Zoological Society of London, who was not involved in the research.

"These individuals have the potential to act as founders," he said.

Ideally, Japanese and Chinese scientists would work together to save the South China giant salamander from extinction by creating a breeding program, said Jianping Jiang, a herpetologist at the Chengdu Institute of Biology, who was not involved in the research.

But for now, he added, "the most important thing is to keep these two individuals alive."

Giant salamanders can live for about 60 years, Dr. Nishikawa said, and the two South China males in Japan seem to be around 40 to 50 years old.

Funding does not currently exist to support moving the two males to China, or setting up a breeding program. But Dr. Nishikawa hopes that it might be possible to find other South China giant salamanders, preferably females, that are left over from the restaurant trade.

If they do exist, they could be one of the last hopes for their kind.

"People may be secretly keeping them as pets," Dr. Nishikawa said. "There might be more out there."

Back in his lab, the hunt for more purebred Japanese giant salamanders would have to continue. Genetic testing of the animal Ms. Ishikawa and her colleagues pulled out of the river confirmed a week later that it was yet another hybrid.

The researchers humanely euthanized the salamander, which they then put into storage for scientific study — adding the hybrid to the thousands of others plucked from Japan's rivers with the hope of saving what remains of the country's amphibious national treasures.