DOCILE BUT DEADLY

Midget faded rattlers dwell in the sandstone cliffs at Flaming Gorge. Though hard to rile, they are one of the country's most lethal rattlesnakes but science is just beginning to understand their story.

STORY BY CHRISTINA SHORMA / PHOTOS BY JOSHUA PARKER

Midget faded rattlesnakes only den in crevices and sandstone outcrops. That is why the Green River Formation in southwest Wyoming is the snake's only home in the state.

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FIFTY MILLION years ago, three large basins spread across present-day southwest Wyoming, western Colorado and eastern Utah. As geological forces pushed the nearby land skyward to eventually create the Rocky Mountains, the basins filled with water. These ancient lakes were havens for many species of plants, fish, mammals, reptiles and birds. Over time, the lakes dried up and were covered in ice. Later wind, water and other agents of erosion began to wear away the ground to reveal a mosaic of rock formations.

Today, this area is known as the Green River Formation and it is renowned for its stunning variety and abundance of fossils from prehistoric inhabitants. Alongside these remnants of the past is a newer resident, the midget faded rattlesnake, which makes the Green River Formation its exclusive home in Wyoming.

"The only things they use are crevices and sandstone outcrops; they won't den anywhere else," Dr. Joshua Parker, professor of biology at Fresno City College in California, said about the midget faded rattlesnakes near Flaming Gorge. He studied this particular population for his doctorate at the University of Wyoming. "That is why the Green River Formation is so good for them. Even in Colorado, where you find them on the Western Slope, there are many other types of geological structures available to them but they are still using only sandstone."

Known for its diminutive size and pale pattern, midget faded rattlesnakes are the smallest of the Western rattlesnakes, growing to an average of just 24 inches. Their small size is matched by the small amount known about them, which is counteracted by the fact they are one of the most potentially deadly rattlesnakes in the U.S.

In 2000, when Parker began his doctoral work, almost no research had been done on the snake. But that is slowly changing as more studies are being done by state and federal agencies and nonprofit organizations in recent years.

"It's not too often you find a species no one has worked on," he said. "But there is a really strange draw to them. They are a neat little snake. They are so unique in so many different ways."

Once thought to be a subspecies of the prairie rattler and, later, of the Pacific rattlesnake, substantial DNA evidence found in 2016 elevated the midget faded rattler to full species status with the scientific name *Crotalus concolor*.

Their range in Wyoming is limited to the Flaming Gorge area, the northernmost stretch of the Green River Formation. Though they do inhabit lower elevations, they are more successful living at higher elevations than other snake species; they thrive from 5,000 to 7,200 feet.

Because of their preference for altitude, the snakes

Top left and bottom left: Midget faded rattlesnakes have been documented preying on lizards, small mammals and birds. Middle: The midget faded rattlesnake has a pale pattern and is the smallest of the Western rattlesnakes, growing to an average of 24 inches.

have a shorter active season than most others. Parker found the snakes only move away from the den area in July and August and begin returning in September. The dens house only dozens rather than hundreds of snakes, as is the case with prairie rattler dens.

One of the most deadly

The juvenile midget faded rattlers share one unique feature with adults: their venom makeup is identical. In other rattlesnakes, the venom of juveniles changes as they mature, likely due to the different types and sizes of prey that juveniles and adults pursue.

"That is unique to *concolor*," Parker said about venom continuity among different age groups. "That is not true for any other rattlesnake that we've studied."

All venoms are a mix of proteins and enzymes, with different combinations of hemotoxic and neurotoxic properties. Hemotoxic venoms cause damage to tissue and reduce blood clotting as the venom circulates in the body. Neurotoxic venoms attack the nervous system and can cause difficulty breathing, speaking, swallowing and in some cases, paralysis of the diaphragm.

Midget faded rattlesnake venom is particularly dangerous because it is primarily neurotoxic.

"They are tied for No. 1 for the most deadly rattlesnake in the U.S." said Parker. "Their venom is almost entirely neurotoxin, which is the most dangerous type of toxin to have in a venom. That is very unique in North America. In South America the rattlesnakes all have it, but in North America there are only two rattlesnakes that have almost entirely neurotoxic venom and that is the Mojave (of the southwest U.S. and Mexico) and midget faded."

Fortunately, this potent venom is coupled with a relatively docile nature. The midget faded is slower to defend itself than most other rattlesnakes including the prairie rattler which can become agitated quickly in a confrontation.

Parker has handled more than 800 midget faded rattlesnakes during his research, many on multiple occasions. He has never received a strike, though there have been close calls, including one that fell out of the plastic tube he uses for handling, into his lap.

"There are a few species of rattlesnakes that are just more defensive and more likely to strike," said Parker. "*Concolor* are definitely not like that. I would say the majority of them don't even rattle and you rarely see them strike."

Producing venom takes a lot of energy, for any venomous animal, including the midget faded rattlesnake. "They don't want to waste it on defense," added Wendy Estes-Zumpf, Game and Fish herpetological coordinator. "They want to conserve it to feed themselves. They don't want to waste it on something they can't eat."

Species of concern

With their very specific and limited habitat, midget faded rattlers face a combination of pressures on their population and are recognized as a Species of Greatest Conservation Need under Wyoming's wildlife management plan.

"What that classification means is that a species has been identified as one that warrants increased management attention and funding, as well as consideration in land use development planning," explained Estes-Zumpf. "Midget fadeds warrant concern due to a variety of factors, both external influences and life history characteristics that make them vulnerable to population decline. Because they are only found around Flaming Gorge, it is a very small, very restricted population in Wyoming. That means anything that happens in that area could potentially impact the species."

One vulnerability is their slow reproductive rate. Females do not reach sexual maturity until they are 5 or even 10 years old. And due to the significant energy requirements of pregnancy, in times of drought or other pressures that reduce access to prey, females may give birth only every two years or even less frequently.

"After being pregnant and giving birth, it takes

Joshua Parker, professor of biology at Fresno City College in California, left, extracts venom from a midget faded rattlesnake assisted by Stephen Spear of the Orianne Society. The snake's venom is one of the most deadly due to its nearly entirely neurotoxin makeup.
Photo by David Vardukyan

Orianne Society

The Orianne Society works to "conserve critical ecosystems for imperiled reptiles and amphibians using science-applied conservation and education." The society believes: "Reptiles and amphibians are often the bellwethers of habitat health. To see these species in the wild is to see a healthy, functioning landscape." Learn more at *oriannesociety.org*.

Unlike adults, juvenile midget faded rattlesnakes have strongly colored patterns, which can take at least 10 years to begin fading.

Joshua Parker releases several midget faded rattlesnakes. Parker studied the Green River Formation population of the species to earn his doctorate from the University of Wyoming. *Photo by Simone Brito*

a long time to recover their weight and handle another pregnancy," said Estes-Zumpf.

The snakes mate in July and August and females give birth in August or September of the following year. The snakes are ovoviviparous — incubating eggs internally and giving birth to live young. Corresponding with their small size, females give birth to two or three young in drought years and only five or six in non-drought years; half the average clutch size of other rattlesnakes.

In contrast to adults, juveniles have strongly colored patterns. The color begins to fade with age and each shedding of their skin. Parker said it takes at least 10 years for a snake's pattern to begin fading and he encountered a few snakes during his research that were almost completely washed out. He estimated them at 20 to 25 years old.

Estes-Zumpf said it would be difficult and costly to get detailed numbers on midget faded rattlers in Wyoming, but that she plans to monitor trends in the population.

"What we would like to do is have a subset of den sites and return to those regularly to keep track of the number of males and females and size distribution over time so we can watch changes in population numbers at those dens," she said.

Roads to success

Despite their dangerous venom, midget faded rattlers are often on the receiving end of predation. Parker has found evidence of predation by skunks, coyotes and raptors, but badgers appear to have developed a particular fondness for the small snakes.

"Badgers would be their biggest predator in a desert situation," said Parker. "You find badger diggings all over den areas. The pregnant females stay near the den, and I lost a lot of pregnant females with transmitters (implanted) to badgers."

However, a recent study found encounters with four wheels can be as deadly as those with four feet.

Parker and other researchers, working through the nonprofit Orianne Society, published a paper on how adult males suffered high rates of mortality compared to other members of the population. One major source of mortality was road kill.

The researchers found that Interstate 80 in Wyoming serves as a genetically impermeable barrier with little to no breeding between populations on the north and south side of the road. It's a barrier that could have a large impact on the population living north of the interstate.

"Genetics showed they had been cut off from the gene pool long enough for us to detect genetically," Parker said about the northern population. "There won't be any new gene flow between them and the other populations. That group is probably below their success rate and they may dwindle out and be gone."

But the paper and some of other recent studies on the species also point out insight that could prove helpful to the plight of these docile sandstone dwellers in the future.

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"The large males and nongravid females move farther from dens than gravid (pregnant) females or juveniles," said Estes-Zumpf. "They are covering a lot more land than other snakes and are more likely to cross roads, so road mortality is often very high. That is one way that land managers could guide development, in a way that would minimize impacts. The recent study by the Orianne Society had models that predicted den sites and foraging and gene flow paths. Land managers can use those models to put roads in areas that are least likely to impact these snakes."

—Christina Shorma is a freelance writer who resides in Dayton with her husband, two dogs, two cats and two horses.