THE TORTOISE AND THE MONSTER

By Mark Browning

While conducting research on desert tortoises in the Rincon Mountains of Arizona, herpetologists Josh Capps and Bruce Weise came upon a riveting sight. At the mouth of a tortoise burrow, a Gila monster and desert tortoise were engaged in a physical battle. At one point, the tortoise pinned the large lizard under its plastron; at another, it shoved the Gila monster further down the burrow. Meanwhile, the Gila monster was doing everything it could to get around its attacker.

The reason for the scuffle? The tortoise's newly laid eggs. The big orange-and-black lizard had consumed at least one already and was searching for more. Capps and Weise watched as the bigger, heavier tortoise attempted to thwart the nest raider by pushing the venomous lizard away from her eggs, to no avail: The Gila monster succeeded in eating the entire clutch.

Several researchers have witnessed such conflicts, and because both animals are highly secretive, spending much of their time underground, biologists believe such interactions occur much more often than observed.

The desert tortoise (*Gopherus agassazii*) and Gila monster (*Heloderma suspectum*), two giants of the Sonoran and Mojave

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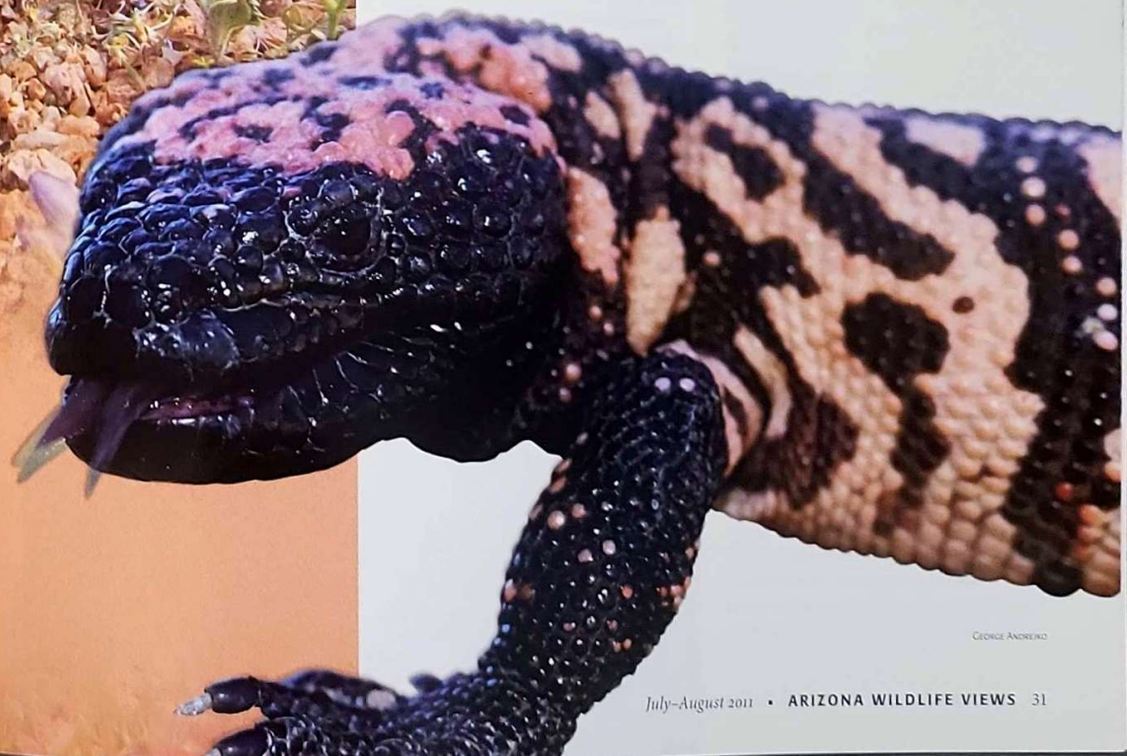

George Andrejko

ONE OVERARCHING CHARACTERISTIC OF TORTOISE BIOLOGY IS THEIR EXTRAORDINARY LONGEVITY. LIVING 50–80 YEARS, THEY ALSO TAKE AT LEAST 15 YEARS TO MATURE.

Because each clutch of eggs is important, female desert tortoises will fight to defend them.

deserts, are related in many respects. They are both large, charismatic creatures. They share much the same habitat — scrubland and succulent desert; their ranges in Arizona are almost identical. Because of their size and sensitivity to their environment, both are flagship species — animals biologists monitor to assess the overall health of an ecosystem.

Desert tortoises play a highly important role in the regions they inhabit. With elephantine limbs and strong claws on the front legs, weighing as much as 15 pounds and measuring up to 14 inches long, desert tortoises are virtual tanks, excavating numerous burrows in the desert floor. In the Mojave Desert they dig two types, depending on the burrow's purpose. Winter dens, located on upper slopes, are dug 8–30 feet horizontally into the sides of banks and washes. In contrast, lower-altitude summer dens are dug down vertically 3–4 feet to escape the desert heat. In the Sonoran Desert, tortoises excavate shallower burrows in summer and tend to use natural rock shelters to escape winter's cold.

These underground retreats greatly enrich the biodiversity in the deserts that tortoises inhabit. Numerous species of animals including insects, snakes, lizards, horned larks, cactus wrens, roadrunners, rodents, rabbits and skunks find safe haven in tortoise dens during blistering summer days.

One overarching characteristic of tortoise biology is their extraordinary longevity. Living 50–80 years, they also take at least 15 years to mature. Breeding takes place anywhere from early spring to late summer in a ritual in which the male butts, bites and pushes the female prior to mating. The gravid female excavates an egg cavity at the mouth of a burrow with her hind legs. On average, three to eight eggs are laid, which hatch in three to four months. The young emerge the size of silver dollars and extremely vulnerable to predation by a host of animals.

Considering the length of time for sexual maturation and the high early mortality in desert tortoises, each clutch of eggs is that much more important. This lends justification to the battles and risks that female desert tortoises engage in with Gila monsters.

The Gila monster, which lives for as long as 30 years, has its own dynamic biology. It is an animal driven to an extreme lifestyle by desert conditions. Cecil Schwalbe, an ecologist with the U.S. Geological Survey at the Sonoran Desert Research Station in Tucson, points out that the genus *Heloderma* (which also includes the Mexican beaded lizard, the Gila monster's only other living relative) evolved in moister environments of tropical desert scrub and deciduous forest. "Lab research has demonstrated that Gila monsters experience water loss many times greater than that of the chuckwalla and the desert iguana — which are true desert species. This is why the lizard spends almost 95 percent of its life underground. Here in Arizona, they emerge in April and May. By June they are underground again."

This gives the Gila monster a small window of time to conduct its annual quest for nutrients. The lizards cruise the desert floor using a serpent-like forked tongue and highly developed olfactory senses to track down the nests of rabbit, quail, tortoise and other animals. When food is discovered, the Gila monster gorges. Dubbed a "binge eater," the lizard, up to 2 feet long, can down an entire brood of young rabbits or clutch of eggs in a single meal. The resulting fat is stored mainly in the sausage-like tail, allowing the animal to descend to a burrow and remain inactive for long periods of time — another adaptation for avoiding the summer heat.

Randy Babb, a biologist with the Arizona Game and Fish Department, addresses the nature of a Gila monster diet. "One research project examined 200 Gila monster stomachs and found no remains of adult animal bones, indicating as suspected that Gila monsters feed primarily on the eggs and young of ground-dwelling birds and reptiles, and the young of rodents and rabbits. And we do know that they have good success in robbing tortoise nests of eggs."

Such success has a lot to do with effective stalking. Chris Gienger, a researcher

A nest-raiding Gila monster succeeds in bypassing a female tortoise standing guard to protect her eggs.

Fun Facts About Gila Monsters

Biologists classify the venom of Gila monsters as a "defensive venom" because it is used to ward off attackers rather than for killing prey. This theory is supported by the Gila monster's orange and black warning colors.

Despite its dangerous and painful attributes, the venom of Gila monsters is now helping millions of people with diabetes. One of the peptides secreted by the animal's poison glands has been shown to be a dramatic controller of glucose and insulin levels after a meal. The Food and Drug Administration approved in 2005 a synthetic version for use by diabetics.

Gila monsters use energy in a highly efficient way. When at rest, the lizards have one of the lowest metabolic rates of any known reptile — yet when hunting food or mates, the lizards have been known to walk steadily for miles, expending a relatively phenomenal burst of energy.

Gila monsters have good memories. One lizard was recorded returning to the same wintering den 17 years in a row.

with the University of Nevada who has witnessed such interactions more than once in the Mojave Desert of Nevada, found that Gila monsters only occupied desert tortoise shelters that contained female desert tortoises, and only during breeding season. It is unclear whether the Gila monsters — with their highly developed olfactory senses — are able to detect and follow pregnant tortoises or whether they merely detect the eggs from a distance.

Gienger deems tortoise eggs an important food source for Gila monsters. "I think that in the parts of their ranges where the species overlap, Gila monsters may use tortoise eggs extensively," he says. Gienger points out that a single meal of tortoise eggs can provide the Gila monster with a large and important part of its annual energy intake.

The stakes are high for both animals in such confrontations. For the Gila monster, the discovery of the nest might be the culmination of a month-long hunt, and the food consumed will provide an important portion of its yearly needs; for the tortoise, the clutch of eggs might represent an entire year's reproductive effort. So the fact that the two animals spar is no surprise.

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Gienger sums up his observations of desert tortoises and Gila monsters this way: "The agonistic (combative) interactions that I have seen between Gila monsters and tortoises always end one way. The Gila monster gets the eggs of the tortoise.

"Female tortoises always attempt to block the Gila monster from entering a burrow by using their body as an obstruction. But, Gila monsters are relentless and they keep trying and trying to enter the burrow. The female tortoise usually chases the Gila monster out of the burrow, and sometimes they bite the lizard on the tail and legs.

"Interestingly, Gila monsters never seem to fight back, they simply retreat, regroup and launch another attempt. I have seen Gila monsters get chased out of burrows four or five times before being able to get around the tortoise and into the nest chamber of the burrow. Once a Gila monster discovers a tortoise nest, the result seems somewhat inevitable."

These recent observations of Gila monster/desert tortoise interactions illustrate how such dramas can play out virtually unseen by humans. Despite the fact that no researchers report having witnessed instances in which a desert tortoise thwarts a nest-raiding Gila monster, who is to say that occasionally a particularly aggressive tortoise doesn't make it easier for the Gila monster to choose a nearby quail nest to raid instead? Such rare outcomes might justify the desert tortoise's maternal defense of her eggs and explain why the tortoises persist despite the Gila monster's frequent successes.

Gila monsters are effective stalkers and can be relentless in pursuit of food.

Although Gila monsters may take significant numbers of tortoise eggs, desert tortoises have absorbed predations by Gila monsters for thousands of years. On the other hand, numerous more modern threats include improper use of off-road vehicles, illegal collecting, housing developments and an increase in ravens that prey on young and eggs. Some researchers believe the Gila monster, more secretive, is somewhat less vulnerable than the desert tortoise. The big lizard has been protected in Arizona since 1952. However, these two fascinating animals share similar habitat over much of their ranges, and their fates, like their life histories, remain intertwined.

• Mark Browning is a freelance writer who has worked for the Carnegie Museum, National Aviary and Pittsburgh Zoo as an animal specialist and researcher. His work has appeared in numerous journals, newspapers and magazines.