The Gila Monsters (*Heloderma suspectum*) of Cajón Bonito and the southern Four Corners Area

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The lizard family Helodermatidae first appeared in the fossil record in the Cretaceous. They are covered with small, non-overlapping, bead-like scales with bony osteoderms on the upper part of their bodies, and are the only venomous lizards. The family is mostly new World, although a distant relative *Estesia mongoliensis* was in Mongolia in the Cretaceous and *Euheloderma gallicum* briefly reached France in the early Oligocene (31-33 mya, million years ago), probably through the Canadian Archipelago route through Greenland. The genus of *Lowesaurus matthewi* from the Oligocene of Nebraska (31-33 mya) was named in honor of Charles H. Lowe, University of Arizona herpetologist extraordinaire (Pregill et al 1986). Bhullar and Smith (2008) reported a fossil helodermatid from the early Miocene (23 mya) of Florida, that was interpreted to be morphologically between *Euheloderma* and *Heloderma.* An interesting *Heloderma* was reported from the Mio-Pliocene (4.5-7 mya) oak-hickory forest of Tennessee (Mead et al. 2012).

Figure 1. Gila Monster (*Heloderma suspectum*) from Guadalupe Canyon, New Mexico. July 1984. Photo by James C. Rorabaugh.

The modern genus *Heloderma* dates back to the early Miocene (23 mya) in the Big Bend of Texas, where a skull of an unusually small species was named *Heloderma texana* (Stevens 1977, Bhullar and Smith 2008). Before the uplifts of the Sierra Madres Occidental and Oriental formed the Mexican Plateau and resulting colder, drier climates, the area was more tropical. There are many biogeographical connections between the Chihuahuan Desert in Texas and the Mogollon Rim and lower Grand Canyon in Arizona. We suggest that *H. texana* descendants dispersed from the modern Chihuahuan Desert area to the north and west to become the Gila Monster (*H. suspectum*). Later, *Heloderma* disappeared from the mid-continent areas to the east, and the Gila Monster expanded southward from the modern Mohave Desert (formed only 1 mya!) area through the Sonoran Desert to southern Sonora. There in thornscrub-tropical deciduous forest transition the Gila Monster met its distant tropical relative, the Mexican Beaded Lizard (*H. horridum*). Early helodermatids were living in more mesic habits than modern *Heloderma*, although there is a record of a Beaded Lizard in the Sierra de Álamos in southern Sonora at 1,400 m elevation in pine-oak forest (Schwalbe and Lowe 2000), a relatively young habitat that developed with the uplift of the Sierra Madre Occidental in the early Miocene (Van Devender 2002).

Today, the Gila Monster occurs in the Mohave and Sonoran Deserts from southern Nevada south through Arizona and California to southern Sonora, with an isolated record near El Dorado, Sinaloa (Bezy et al. 2017). In Arizona, it occurs from the far northwestern corner of the state, southward through the western deserts to near Yuma, and eastward to the Mogollon Rim highlands. In the state, it has been found at elevations ranging from just above sea level near Yuma to over 1677 meters (Brennan and Holycross 2006, *http://www.reptilesofaz.org/Lizards-Subpages/h-h-suspectum.html*). It mostly lives on bajadas and lower mountains vegetated with desertscrub and thornscrub, ranging into desert grassland and marginally into lower oak woodland on the eastern side of its range (Beck 2005). Today it does not occur along the coast of the Gulf of California in the hyperarid Gran Desierto part of the Lower Colorado River Valley subdivision of the Sonoran Desert. However, a fossil *Heloderma* was reported from middle Pleistocene sediments (1.2 mya) from El Golfo de Santa Clara at the delta of the Colorado River (Mead and Shaw 2011).

The Madrean Discovery Expedition (MDE) program of *GreaterGood.org* documents the animals and plants of the Sky Island mountain ranges in northeastern Sonora Mexico on several large biotic inventories

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each year. The biotic observations are publicly available online in the MDE database (*madreandiscovery.org*), which is linked to various other databases and museum collections. This is the best source of biotic distributions for Sonora. Here, we present new Gila Monster records from northeastern Sonora and adjacent Arizona and New Mexico in desert grassland and woodland habitats from various sources. All of the records and images are available in the MDE database.

During the Second United States-Mexico Boundary Survey in 1892-1894, Director Edgar A. Mearns and biologist Frank X. Holzner collected amphibians and reptiles along the Arizona-Sonora border for the U. S. National Museum. In 1893, they collected Gila Monsters four times from Monument 73 at Guadalupe Canyon (now Rancho Puerta Blanca, Cuenca los Ojos Foundation) west to Dutch Charley's Ranch 20 km west of Agua Prieta-Douglas in the southernmost Mule Mountains. A specimen from '10 mi W of San Bernardino, Monument 82, Niggerhead Mountain' was from the modern Cerro Gallardo, 8.7 km east of Agua Prieta. The name of the mountain was probably a mistranslation of Cabeza Prieta (dark head, meaning a dark peak).

In July 1984, Rorabaugh saw a Gila Monster in Guadalupe Canyon in southwestern-most New Mexico (Fig. 1). The Gila Monster is an Endangered Species in New Mexico best known from the Red Rock area along the Gila River and Antelope Pass and Granite Gap in the Peloncillo Mountains. There is a spot for Guadalupe Canyon on the distribution map in the state species recovery plan (Bulger 2017; see also Degenhardt et al. 1996). In May 2012, Nicholas J. Czaplewski and Charles O. Minckley observed a Gila Monster crossing a dirt road about 23 km east of Douglas in Arizona. In October 2014, Doug Danforth saw a Gila Monster in Guadalupe Canyon in Arizona (Fig. 2) between Rorabaugh's New Mexico and Mearns' Monument 73 records.

Figure 2. Gila Monster (*Heloderma suspectum*) from Guadalupe Canyon, Arizona. October 2014. Photo by Doug Danforth.

In April 2007, Van Devender and Reina-G. were searching for the Cochise pincushion cactus (*Coryphantha robbinsorum*) in northeastern Sonora. Late one afternoon, they climbed Cerro la Bruja (Witch Hill) 16 km southeast of Naco. Worried about getting dark and a dense thicket of Chihuahuan whitethorn acacia (*Acacia neovernicosa*), they were hurrying down a steep slope when a Gila Monster emerged from a tubular hole in the bedrock! It retreated back into the hole, where it turned sideways, exposing only the bony head and the osteoderm-armored dorsal skin (Fig. 3).

In October 2016, Van Devender and Reina-G. visited Rancho los Ojos Calientes 50 km east-southeast of Agua Prieta. Owner Valer Clark said that she had seen two Gila Monsters near the ranch headquarters a month earlier. In March and April 2017 on MDE Cajón Bonito trips, six additional Gila monsters were seen in the same area (Figs. 4 and 5). This is 6 km south of the New Mexico border, 8.7 km southeast of Guadalupe Canyon, New Mexico, and 10 km east-southeast of Monument 73.

In this area, the coloration of Gila Monsters is mostly black with a pattern of variable pale pink blotches and bars. They were seen from 1257 to 1529 m elevation, mostly in shrub-dominated desert grassland. At the Cerro la Bruja locality, Chihuahuan desertscrub occurs on the limestone slope, with desert grassland below on deeper valley soils. The animal seen in Guadalupe Canyon in New Mexico was in oak woodland along an ephemeral stream. Not only are Gila Monsters present in desert grassland habitats in northeastern Sonora and adjacent Arizona and New Mexico, but they are apparently widespread and relatively common. Fossils from the 111 Ranch in the San Simon Valley, Arizona document its presence

Fig. 3. Gila Monster (*Heloderma suspectum*) on Cerro la Bruja, Sonora, April 2017. Photo by T.R. Van Devender.

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Figure 4. Gila Monster (*Heloderma suspectum*) from Rancho los Ojos. March 2017. Photos by Ana L. Reina-G.

in southeastern Arizona at least since the early Pleistocene (2.4-2.7 mya; Mead et al. 2015).

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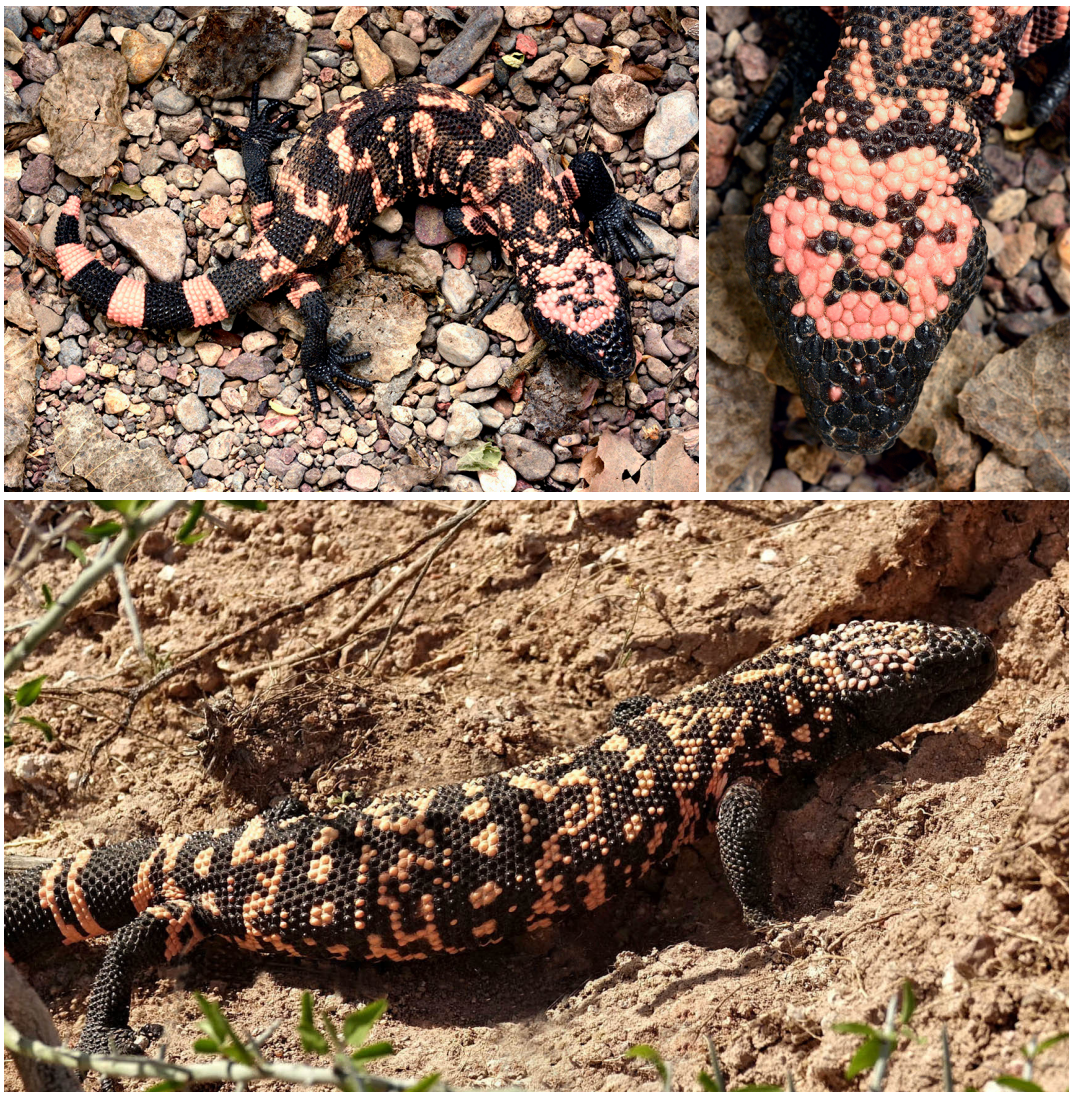

Figure 5. Gila Monsters (*Heloderma suspectum*) from Rancho los Ojos, April 2017. Photos by C. Hedgcock and J. C. Rorabaugh.

Tohono O'odham platter woven by Amelia Juan at Geawuk, 1984. Photo courtesy T.R. Van Devender.