= Gila monster =

The Gila monster (Heloderma suspectum , / ?hi?l? / HEE @-@ l?) is a species of venomous lizard native to the southwestern United States and northwestern Mexican state of Sonora . A heavy , slow @-@ moving lizard , up to 60 cm (2 @.@ 0 ft) long , the Gila monster is the only venomous lizard native to the United States and one of only two known species of venomous lizards in North America , the other being its close relative , the Mexican beaded lizard (H. horridum) . Though the Gila monster is venomous , its sluggish nature means it represents little threat to humans . However , it has earned a fearsome reputation and is sometimes killed despite being protected by state law in Arizona .

= = Description , taxonomy and etymology = =

In this species , the largest extant lizard native to North America north of the Mexican border (non @-@ natives like green iguanas are larger) , snout @-@ to @-@ vent length is from 26 to 36 cm (10 to 14 in) . The tail is about 20 % of the body size and the largest specimens may reach 51 to 56 cm (20 to 22 in) in total length . Body mass is typically in the range of 350 to 700 g (0 @.@ 77 to 1 @.@ 54 lb) , with 11 males having been found to average 468 g (1 @.@ 032 lb) . Reportedly , the very heaviest , largest specimens can weigh as much as 2 @,@ 300 g (5 @.@ 1 lb) .

The Gila monster has one close living relative , the beaded lizard (H. horridum) , as well as many extinct relatives in the Helodermatidae , the evolutionary history of which may be traced back to the Cretaceous period . The genus Heloderma has existed since the Miocene , when H. texana lived , and fragments of osteoderms from the Gila monster have been found in late Pleistocene (10 @,@ 000 ? 8 @,@ 000 years ago) deposits near Las Vegas , Nevada . Because the helodermatids have remained relatively unchanged morphologically , they are occasionally regarded as living fossils . Although the Gila monster appears closely related to the monitor lizards (varanids) of Africa , Asia and Australia , their wide geographical separation and the unique features not found in the varanids indicate the Gila monster is better placed in a separate family .

The name " Gila " refers to the Gila River Basin in the U.S. states of New Mexico and Arizona , where the Gila monster was once plentiful . Heloderma means " studded skin " , from the Ancient Greek words helos (????) , " the head of a nail or stud " , and derma (?????) , " skin " . Suspectum comes from the describer , paleontologist Edward Drinker Cope , who suspected the lizard might be venomous due to the grooves in the teeth .

= = Distribution and habitats = =

The Gila monster is found in the Southwestern United States and Mexico , a range including Sonora , Arizona , parts of California , Nevada , Utah , and New Mexico (potentially including Baja California) . They inhabit scrubland , succulent desert , and oak woodland , seeking shelter in burrows , thickets , and under rocks in locations with ready access to moisture . In fact , Gila monsters seem to like water and can be observed immersing themselves in puddles of water after a summer rain . They avoid living in open areas such as flats and farmland .

= = Ecology = =

Gila monsters spend 90 % of their time underground in burrows or rocky shelters . They are active in the morning during the dry season (spring and early summer) ; later in the summer , they may be active on warm nights or after a thunderstorm . They maintain a surface body temperature of about 30 ° C (86 ° F) . Gila monsters are slow in sprinting ability , but they have relatively high endurance and maximal aerobic capacity (VO2 max) for a lizard . They are preyed upon by coyotes and raptors .

= = = Diet = = =

The Gila monster eats small birds , mammals , frogs , lizards , insects , and carrion . The Gila monster feeds primarily on bird and reptile eggs , and eats infrequently (only five to ten times a year in the wild) , but when it does feed , it may eat up to one @-@ third of its body mass . It uses its extremely acute sense of smell to locate prey , especially eggs . Its sense of smell is so keen , it can locate and dig up chicken eggs buried 15 cm (6 in) deep and accurately follow a trail made by rolling an egg .

Prey may be crushed to death if large or eaten alive if small , swallowed head @-@ first , and helped down by muscular contractions and neck flexing . Unusually , after food has been swallowed , the Gila monster immediately resumes tongue flicking and search behavior , probably as a result of a history of finding clumped prey such as eggs and young in nests . Gila monsters are able to climb trees and cacti in search of eggs .

= = Venom = =

= = = Pioneer beliefs = = =

In the Old West , the pioneers believed a number of myths about the Gila monster , including that the lizard had foul or toxic breath and that its bite was fatal . The Tombstone Epitaph of Tombstone , Arizona , wrote about a Gila monster that a local person caught on May 14 , 1881 :

This is a monster , and no baby at that , it being probably the largest specimen ever captured in Arizona . It is 27 inches long and weighs 35 lb . It was caught by H. C. Hiatt on the road between Tombstone and Grand Central Mill and was purchased by Messrs. Ed Baker and Charles Eastman , who now have it on exhibition at Kelley 's Wine House , next door above Grand Hotel , Allen Street . Eastern people who have never seen one of these monsters should not fail to inspect his Aztecship , for they might accidentally stumble upon one some fine day and get badly frightened , except they know what it is .

On May 8 , 1890 , southeast of Tucson , Arizona Territory , Empire Ranch owner Walter Vail captured and thought he had killed a Gila monster . He tied it to his saddle and it bit the middle finger of his right hand and wouldn 't let go . A ranch hand pried open the lizard 's mouth with a pocketknife , cut open his finger to stimulate bleeding , and then tied saddle strings around his finger and wrist . They summoned Dr. John C. Handy of Tucson , who took Vail back to Tucson for treatment , but Vail experienced swollen and bleeding glands in his throat for sometime afterward .

Dr. Handy 's friend , Dr. George Goodfellow of Tombstone , was among the first to research the actual effects of Gila monster venom . Scientific American reported in 1890 that " The breath is very fetid , and its odor can be detected at some little distance from the lizard . It is supposed that this is one way in which the monster catches the insects and small animals which form a part of its food supply ? the foul gas overcoming them . " Goodfellow offered to pay local residents $ 5 @.@ 00 for Gila monster specimens . He bought several and collected more on his own . In 1891 he purposefully provoked one of his captive lizards into biting him on his finger . The bite made him ill and he spent the next five days in bed , but he completely recovered . When Scientific American ran another ill @-@ founded report on the lizard 's ability to kill people , he wrote in reply and described his own studies and personal experience . He wrote that he knew several people who had been bitten by Gila monsters but had not died from the bite .

Goodfellow published articles about rattlesnake and Gila monster bites in Scientific American and Southern California Practitioner .

= = = Delivery = = =

The Gila monster produces venom in modified salivary glands in its lower jaw , unlike snakes , whose venom is produced in the upper jaw . The Gila monster lacks the musculature to forcibly inject the venom ; instead , the venom is propelled from the gland to the tooth by chewing . Capillary

action brings the venom out of the tooth and into the victim . The teeth are loosely anchored , which allows them to be broken off and replaced throughout life . Gila monsters have been observed to flip over while biting the victim , presumably to aid the flow of the venom into the wound . Because the Gila monster 's prey consists mainly of eggs , small animals , and otherwise " helpless " prey , the Gila monster 's venom is thought to have evolved for defensive rather than for hunting use . A defensive use would explain the Gila monster 's bright warning coloration .

= = = Toxicity = = =

Although the venom is a neurotoxin as toxic as that of a coral snake , H. suspectum produces only small amounts . The Gila monster 's bite is not fatal to healthy adult humans . No reports of fatalities have been confirmed after 1939 , and those recorded prior to that year are possibly iatrogenic , or resulting from attempts to treat the bite itself . The Gila monster can bite quickly (especially by swinging its head sideways) and hold on tenaciously and painfully . If bitten , the victim may need to fully submerge the attacking lizard in water to break free from its bite . Symptoms of the bite include excruciating pain , edema , and weakness associated with a rapid drop in blood pressure .

More than a dozen peptides and other substances have been isolated from the Gila monster 's venom , including hyaluronidase , serotonin , phospholipase A2 , and several kallikrein @-@ like glycoproteins responsible for the pain and edema caused by a bite . Four potentially lethal toxins have been isolated from the Gila monster 's venom , including horridum venom , which causes hemorrhage in internal organs and exophthalmos (bulging of the eyes) , and helothermine , which causes lethargy , partial paralysis of the limbs , and hypothermia in rats . Most are similar in form to vasoactive intestinal peptide (VIP) , which relaxes smooth muscle and regulates water and electrolyte secretion between the small and large intestines . These bioactive peptides are able to bind to VIP receptors in many different human tissues . One of these , helodermin , has been shown to inhibit the growth of lung cancer .

The constituents of the lizard 's venom that have received the most attention from researchers are the bioactive peptides , including helodermin , helospectin , exendin @-@ 3 , and exendin @-@ 4 . Exendin @-@ 4 has formed the basis of a class of medications for the treatment of type 2 diabetes , known as Glucagon @-@ like peptide @-@ 1 agonists . Exenatide was the first product in the class to reach the market and was launched in 2005 .

= = = Drug research = = =

In 2005 , the US Food and Drug Administration approved the drug exenatide (marketed as Byetta) for the management of type 2 diabetes . It is a synthetic version of a protein , exendin @-@ 4 , derived from the Gila monster 's saliva . In a three @-@ year study with people with type 2 diabetes , exenatide led to healthy sustained glucose levels and progressive weight loss . The effectiveness is because the lizard protein is about 50 % identical to glucagon @-@ like peptide @-@ 1 analog (GLP @-@ 1) , a hormone released from the human digestive tract that helps to regulate insulin and glucagon . The lizard protein remains effective much longer than the human hormone , helping diabetics keep their blood sugar levels under control . Exenatide slows the emptying of the stomach and causes a decrease in appetite , contributing to weight loss . The saliva of the Gila monster contains many chemicals which can be deadly . One of these has been shown to affect memory . Several companies have been researching the abilities of this chemical to help memory loss due to various diseases such as Alzheimer ? s disease , schizophrenia , and ADHD . Gilatide , derived from exendin @-@ 4 , has been shown to dramatically heighten memory in a study with mice . Gilatide is likely to be researched further to provide help to Alzheimer ? s patients .

= = Life history = =

The Gila monster emerges from hibernation in January or February and mates in May and June . The male initiates courtship by flicking his tongue to search for the female 's scent . If the female

rejects his advances , she will bite him and crawl away . When successful , copulation has been observed to last from 15 minutes to as long as two and a half hours . The female lays eggs in July or August , burying them in sand 5 in (13 cm) below the surface . The clutch consists of two to 12 eggs : five is the average . The incubation lasts nine months , as the hatchlings emerge during April through June the following year . The hatchlings are about 16 cm (6 @.@ 3 in) long and can bite and inject venom upon hatching . The juveniles typically have larger bands of pink scales than adults , although the banded Gila monster (H. s. cinctum) has a tendency to retain the band pattern . H. suspectum sexually matures at three to five years old . After egg @-@ laying , adult Gila monsters gradually spend less time on the surface to avoid the hottest part of the summer (although they may be active in the evening) , eventually starting their hibernation around November .

Little is known about the social behavior of H. suspectum , but they have been observed engaging in male @-@ male combat , in which the dominant male lies on top of the subordinate one and pins it with its front and hind limbs . Both lizards arch their bodies , pushing against each other and twisting around in an effort to gain the dominant position . A wrestling match ends when the pressure exerted forces them to separate , although bouts may be repeated one after the other . These bouts are typically observed just before the mating season . Those with greater strength and endurance are thought to win more often and enjoy greater reproductive success . Although the Gila monster has a low metabolism and one of the lowest lizard sprint speeds , it has one of the highest aerobic scope values (the increase in oxygen consumption from rest to maximum metabolic exertion) among lizards , allowing them to engage in intense aerobic activity for a sustained period of time . Males have been observed to have higher aerobic scopes than females , presumably because of sexual selection for a trait advantageous in prolonged combat . The Gila monster may live up to 20 years in the wild , or 30 in captivity .

= = Conservation status = =

Urban sprawl and habitat destruction has adversely affected Gila monster numbers . In 1952 , they became the first venomous animal to be given legal protection . Gila monsters are listed as Near Threatened by the IUCN . In 1963 , the San Diego Zoo became the first zoo to successfully breed Gila monsters in captivity .

= = = Relationship with humans = = =

Though the Gila monster is venomous , its laggard movement means it poses little threat to humans . However , it has earned a fearsome reputation and is often killed by humans because of fear . Among Native American tribes , the Gila monster had a mixed standing . The Apache believed its breath could kill a man , and the Tohono O 'Odham and the Pima believed it possessed a spiritual power that could cause sickness . In contrast , the Seri and the Yaqui believed the Gila monster 's hide had healing properties . The Gila monster has even starred as a monster in a B movie , The Giant Gila Monster (though the titular monster was actually portrayed by a Mexican beaded lizard) . It played a minor role in the motion picture The Treasure of the Sierra Madre . Myths about the animal include that the animal 's breath is toxic enough to kill humans , that it can spit venom and that it can leap several feet in the air to attack . Another myth held that the Gila monster did not have an anus and therefore expelled waste from its mouth , the source of its venom and " fetid breath " . The official mascot of Eastern Arizona College located in Thatcher , Arizona is Gila Hank , a gun @-@ toting , cowboy hat @-@ wearing Gila monster . A similar character as an old western outlaw was seen in 2011 animated film Rango , called Bad Bill ; the character was voiced by Ray Winstone .

= = Gallery = =