

Husbandry Guidelines

Gila Monster

(Heloderma suspectum)



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Table of Contents

	Acknowledgments	2
1.	General Description	4
	1.1 Taxonomy	4
	1.2 Short history	4
	1.3 Morphology	4
	1.4 The venom	6
	1.5 Maximum life span	6
	1.6 Field data	6
	1.7 Population status	6
2.	Behaviour	7
	2.1 Activity	7
	2.2 Locomotion	7
	2.3 Predation	7
	2.4 Social behaviour	7
3.	Health	8
	3.1 Parasites and diseases	8
	3.2 Egg binding	8
	3.3 Follicular stasis	8
4.	Maintenance in captivity	9
	4.1 Habitat requirements	9
	4.2 Temperature, Humidity and Lighting	10
	4.3 Hibernating	10
5.	Diet	11
	5.1 Feeding	11
	5.2 Water	11
6.	Social structure	11
7.	Reproduction	12
	7.1 Sexing techniques	12
	7.2 Sexual Maturity	12
	7.3 Breeding Season	12
	7.4 Sexual behaviour in the wild	12
	7.5 Breeding in captivity	13
	7.6 Pregnancy detection	13
	7.7 Oviposition	13
	7.8 Incubation	14
	7.9 Hatching	16
	7.10 Neonate care	16
8.	Handling and transport	17
	8.1 Handling	17
	8.2 Transport	17
	8.3 After a bite.	17
9.	References	19
10.	Bibliographies	20

1. General Description

1.1 Taxonomy

<i>Kingdom:</i>	Animalia
<i>Phylum:</i>	Chordata
<i>Class:</i>	Reptilia
<i>Order:</i>	Squamata
<i>Family:</i>	Helodermatidae
<i>Genus:</i>	<i>Heloderma</i>
<i>Species:</i>	<i>Heloderma suspectum</i>

1.2 Short history

The species was originally described by Cope in 1869.

He gave it the name *Heloderma suspectum*,

The general word *Heloderma* is from the Greek words *helos* and *derma*. *Helos* for stud and *derma* for skin, so *Heloderma* appropriately means studded skin. The species name, *suspectum*, was applied because Cope suspected, on the basis of its grooved teeth and reputation, that the lizard might be venomous.

1.3 Morphology

The Gila monster is one of only two species of venomous lizards. Both are of the family *Helodermatidae*. The other lizard is the Mexican Beaded lizard, *Heloderma horridum*, which is larger, and has yellow and black markings.

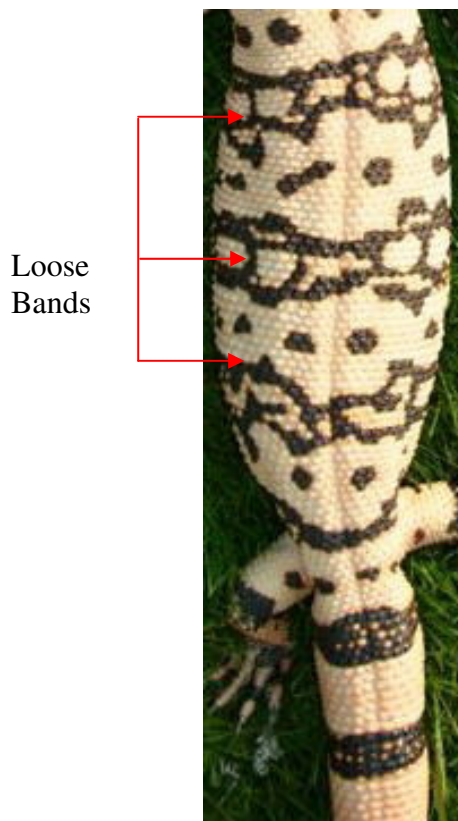


H. suspectum is recognizable by its rounded, beadlike osteoderms, covering the entire body. The robust skull shape, large jaw muscles and the venom glands in the lower jaw give the head a bulky appearance. They have a rounded black snout. The somewhat protuberant eyes are relatively small, the teeth are curved. Some of the teeth are modified with grooves that conduct venom on both front and back surfaces. The Gila monster has a thick black, forked tongue.

They have relatively short limbs. All the toes have strong and curved claws. The tails of the Gila monsters can differ in size, because the tail is used for storing fat reserves. The tail of a Gila monster doesn't regenerate if its lost.

An adult Gila monster can reach a snout-to-vent length of 30-36 cm, a total length of approximately 35-50 cm and a mean body mass of about 500 g. Wild individuals may rarely approach 55 cm in total length and weigh up to 1 kg, In captive raised individuals, this is however normal.

Gila monsters are divided in to two subspecies; both of them are living in the deserts of the south-western part of the North American continent. These are:
H.s. suspectum (Reticulated) - from the Sonoran and Chihuahuan deserts.
H.s. cinctum (Banded) from the Mojave Desert.



The coloration of the Gila monster is contrasted black with colours between pink, yellow and orange. There is an extensive variation in the appearance of Gila monsters throughout their range. At times there is no clear distinction between the two subspecies based on body pattern, because the Reticulated Gila monster has the light markings broken up to form a reticulated pattern. And the Banded Gila monster has light markings that generally form an unbroken band across the back.

1.4 The venom

The symptoms of envenomation by a Gila monster may include excruciating pain, oedema, faintness, perspiration, hypotension, tachycardia, respiratory distress, paralysis, convulsions, nausea and vomiting.

The venom contains strong neurotoxic components and can cause respiratory failure. However there have been only few reported deaths caused by the bite of a Gila monster.

1.5 Maximum life span

Gila monsters can live for approximately 20-30 years. Both sexes being reproductive well up into their 20ties.

1.6 Field data

The Gila monster lives in the Sonoran Desert of Arizona and northwest Mexico. It shares a small range with the desert tortoise and Gambel's quail. Outlying populations extend into the Chichuanchuan Desert of extreme southwest New Mexico and northward into Mojave Desert, in southwest Utah, southern Nevada and southeast California.

Elevations at which the Gila monster has been recorded range from as low as sea-level in Sonora to approximately 1500 m. in semi desert grassland and the lower parts of chaparral and oak woodland.

A big threat to the Gila monster today is the loss and degradation of their remaining habitat. E.g: the effects of agriculture, recreation, invasive plants, fire, livestock grazing, motorized vehicles and pets, mostly dogs. And even though extensive laws protect the Gila monsters in their range, poaching and illegal commerce also are significant threats.

1.7 Population status

Counting Gilas in the wild are very difficult, So not much is known about how many Gila monsters there are in wild and their population status.

Until a good method is discovered and there have been population studies done, the only thing that can be said is that the Gila monster is an unevenly distributed animal, relatively common in a few habitats but rare or absent in others.

The Gila monster is CITES Appendix II and listed on IUCN Red List as vulnerable. So the protection of its desert home is essential to insure its survival.

2. Behaviour

2.1 Activity patterns

Little is known about the Gila monster, is because they spend most of their life underground and out of sight. Gila monsters can be seen throughout the year, except from December to March when it is very rare to see them, because they are hibernating in that period and only occasionally leave the den to get a bit of warmth from the sun. Most of their above-ground activity occurs during a period of three months in the spring. The reproduction, feeding and even metabolic controls of the Gila monster are uniquely adapted to this short activity period.

In winter the Gila monster hibernates. It emerges from hibernation in spring to feed and mate. After this 90-days peak activity period they only rarely come to the surface. And even during this peak they are only active for short periods of time. They are mostly active during the day, in the morning and late afternoon, but from time to time they are also active during the night. The Gila monster will spend more than 99 percent of its life inactive in its moist and cool den underground.

2.2 Locomotion

The Gila monster is amongst the slowest of lizards. Their movement can be described as a slow waddle, under normal conditions. But when they are under pressure they can be very quick.

The Gila monster walks with its belly and tail above the ground, just like crocodiles. When a Gila monster is surprised or confronted its usual response, if it's not ignoring it, is walking backwards. If escape seems unlikely the Gila monster backs into a rock or other hard surface and rolls up into a semi circle. Here it holds ground by huffing and hissing with its mouth open.

2.3 Predation

It appears that humans are Gila monster's only serious enemy. . In the book of Brown & Carmony is written that the only case of an animal that had eaten a Gila monster was that of a black-tailed rattlesnake. The Gila monster was found in the stomach of the black-tailed rattlesnake and it was assumed, because the snake didn't had any visible injuries, that the Gila monster was already weakened or nearly dead before it was swallowed.

In the book of Beck is said that snakes are important predators of the Gila monster.

There are several mammals suggested to be possible enemies of the Gila monster. These include: coyotes, foxes, badgers, skunks, bobcats and mountain lions. But during several studies there wasn't found much evidence that mammals had preyed upon Gila monsters. The only thing that was found were remains of Gila monsters in droppings of three mountain lions (*Felis concolor*), these samples were collected over a period of several years.

It therefore appears that at least adult Gila monsters do not have significant natural predators.

2.4 Social behaviour

The Gila monsters are no social animals and would normally not be found together outside the breeding season. They will though congregate in hibernation dens together with rattlesnakes.

3. Health

3.1 Parasites and diseases

Little is known about parasites and diseases in wild Gila monsters. In captivity they appear surprisingly resistant to sickness and disease.

Urate deposits, have been known to happen, and can lead to gout, in the pericardium. internal helminth parasites and ectoparasites, are seen, but mostly in wild specimens.

3.2 Egg binding

Egg binding in lizards is a potentially very dangerous condition that must be treated early. If egg binding occurs in a (female) Gila monster it can happen because of stress, nutritional depletion, bad breeding condition of the female or the lack of proper egg laying sites. Excessive heat and, or low overall humidity might lead to dehydration and egg binding. To induce egg laying subcutaneous injections of the drug Oxytocin may be administered under the supervision of a veterinarian

3.3 Follicular stasis

If a female Gila monster suffers of follicular stasis, the follicles on the ovary will not develop completely but will remain there, growing in numbers and size. It often happens due to hormonal changes, stress, etc. A possible treatment is spaying.



4. Maintenance in captivity

4.1 Habitat requirements

Gila monsters like large enclosures especially if you want to keep a large group of animals. The absolute minimum recommended size of the enclosure can be calculated as.

Length of the largest individual in the enclosure x 3 = length
Length of the largest individual in the enclosure x 1,5 = depth
Length of the largest individual in the enclosure x 1 = height

For each extra individual in the enclosure double the results you got from the above

Example;

If your largest animal are 40 cm, your enclosure should at least be 120 x 60 x 40 cm

For three specimens the enclosure should be at least 360 x 180 x 120.

This is an absolute minimum and most zoos would only use this size for short term off exhibit holding.

Many different kinds of substrates can be used for the enclosure of the Gila monster, like quartz sand, bark chips, newspaper or other naturalistic substrate. Most keep off exhibit Heloderms on a woodchip substrate. It is important to supply the right humidity levels, which can be done through a plastic hide box filled with a moist bedding.



4.2 Temperature, Humidity and lighting

The Gila monster is less heat-tolerant and more cold-tolerant than most cold-blooded desert animals.

Bogert and Martin del campo (1956) exposed a Gila monster to the hot sun and the lizard became partially paralysed at a body temperature of 42,5 °C and even completely paralysed at 44.2 °C. This result suggest that the critical thermal maximum is around 44 °C and that Gila monsters are thermally conservative during activities in nature, avoiding body temperatures within at least 7 °C of their critical thermal maximum. Gila monsters lose the ability to crawl when their body temperature drop below 10 °C; The tongue can no longer be put out at body temperatures below 8 °C. This suggests that the critical thermal minimum is around 8 °C.

The animals usually maintain a mean body temperature from 24 °C to 37 °C, with a preferred temperature of 33°C.

Gila monsters are usually active when the air temperature is between 19 °C and 37 °C and when the temperature of the ground surface range from approximately 23 to 43 °C.

To maintain a comfortable temperature in the enclosure it is a good guideline to have one heating spot for each animal to avoid lower ranking animals getting no heat.

The ranking of animals in a Gila colony is only a problem when several adult males are housed together. The stronger male will be the one to choose! One heating spot is sufficient if the group structure is right.

UV light may be important for a diurnal animal and is appreciated by the species, especially by pregnant female, however good results without offering UV light are known.

4.3 Hibernation

It is recommendable to bring the Gila monster in hibernation for a period of about three months, from December 1st until March 1st.

From the first of December the temperature will be lowered. January will be the coldest month, with temperatures from 12-14°C. The other months will be 1-2°C warmer. From the first of March until the first of April the temperature will slowly increase again.

It is recommended to stop feeding the Gila monster at least two weeks before hibernation. This gives the Gila monster enough time to completely digest their last meal.

It is important that there is water available during the hibernation. It is recommended to provide the water in a bowl that can't be tipped over easily.

5. Diet

Gila monsters actively hunt and seek whatever foods are available. These slow-moving carnivores feed primarily on defenceless baby animals and eggs. They can detect and identify these eggs through chemical signals and odours picked up by their constantly flicking tongue. The tongue transmits the odour of the prey to a special olfactory organ in the roof of the mouth called the Jacobson's organ.

5.1 Feeding

In the wild the kind of prey depends on the time of the year and location. Diet of a Gila monster includes baby desert cottontails, round-tailed ground squirrels and the young of other rodents found in underground nests. Also Gambel's quail eggs, desert tortoise and other reptile eggs and the eggs and nestlings of doves and other birds are sometimes eaten by the Gila monster.

The prey provides the Gila monster not only with food but is its source of water. While Gila monsters drink water when it is provided, they do not search for water like some desert animals will.

In captivity the Gila monster eats almost every available food, most of the time this will be mice and rats. Almost every Gila monster will eat whenever the food is given to it. They will easily eat until they get obese.

The frequency of feeding will depend on the individual animal. Recommended feeding intervals:

Young animals are fed every four to five days with two mice pinkies.

Adults are fed 2 adult mice every second week. However it is recommended to feed every week during mating season and when females are producing eggs.



5.2 Water

Water should be provided in a bowl that can not easily be tipped over. If there is a large enough bowl put into the enclosure it's not unusual for Gila monsters to spend long periods of time in it. The water bowls should be cleaned daily.

6. Social structure

Gila monsters can be kept with other species. The species which have been successfully placed with a Gila monster are:

- Chuck walla (*Sauromalus obesus*)
- Spiny lizards (*Sceloporus spp.*)
- Collared lizard (*Crotaphytus collaris*)

Gila monsters have been kept with tarantulas and rattlesnakes. However, we have been unable to find reports about how this turned out, therefore it is not recommended.

7. Reproduction

7.1 Determining sex

One of the first problems you will run into when you are trying to breed Gila monster in captivity is determining the sex of the individual animals. A lot of techniques have been proposed and many have turned out to be of no or little use.

There are some differences in body form, but these differences are difficult to see and are not always expressed. Adult males typically have a stouter build and a broader head. If you compare the female with the male it has a smaller head and a more pear-shaped body. These trends are general so there are animals that appear in-between these things and are, therefore, difficult to sex from appearance.



Behaviour can also be used to determine the sex of Gila monsters. To use this technique it is best to have a known male and observe his reaction to other animals placed with him. Males will act aggressively to another male during the breeding season; this will be in a ritualized form of combat. Also these interactions can be misinterpreted, any combination of sexes can act aggressively towards each other at the first introduction.

At the moment the only simple, accurate and safe method available for determining the sex of Gila monsters is ultrasound examination. The testes in adult males are clearly visible on ultrasound. In the adult females follicles are visible in the ovaries regardless of the time of year the examination is made. But the best time to perform ultrasound is from fall until spring. In this period of time the developing female follicles are larger and easier to see.

7.2 Sexual Maturity

Most Gila monsters are sexual mature when they are about 3 years and weighing 700 g. or more. Sexual maturity is often reached at the age of 2 years for captive raised Gila monsters.

7.3 Breeding Season

The breeding season will begin when the Gila monsters emerge from hibernation. This is usually around the first of March.

7.4 Sexual behaviour in the wild

When the breeding season is approaching most males become aggressive towards each other. Scent marks are made, by rubbing their cloacae on rocks or other objects, as the search for females begins. Competing males will continue their combat until the weakest leaves the battlefield.

If the male found a female a courtship ritual begins. The mating involves a side-to-side embrace, in which the male's head is on top of the female's neck, with one hind leg over her pelvic area and the foreleg over her shoulder. The female Gila monster is assisting the male during the insertion by raising her tail. The copulation can last from several minutes to several hours and may continue after dark.



7.5 Breeding in captivity

In the end of April the males will be put with the females. Some breeders put their males together first for male-male ritual combat, so that only the strong male will mate, others will not, and it seems there is no significant difference in results.

Within the first 15 minutes after the introduction of the male, there will be a courtship and after an hour they will mate. The first days the male can stay with the female, during these days the mating can be repeated. After a week the male can be introduced to a new female and the process will start again.



7.6 Pregnancy detection

As far as known there are two ways of pregnancy detection. one is ultrasound examination, by doing the eggs inside of the female can be seen. The other option is palpating the abdomen of the Gila monster.

7.7 Oviposition

If a female is gravid she should be separated from her cage mates, if she is not already alone. This will prevent unnecessary stress to the female and it will prevent the other Gila monsters from eating her eggs.

Through close observation distinct changes in the behaviour of a female from copulation to oviposition can be observed. The first stage is marked by behaviour that can be characterized as 'quiet but alert'. The female will spend long periods of time motionless but very alert in a warm part of the enclosure. Some weeks before oviposition the female will become very active. Before this time her enclosure should be provided with a box, with peat moss in it, for a nesting place. A short time before oviposition the female will go into her nesting place and will remain relatively inactive.

Before the female lays the eggs she provides a good environment for the eggs, assuming she has an opportunity to regulate the heat. It is important to provide an environment, in the nesting place, that will be supportive to the developing eggs. This means the appropriate moisture and temperature. The nesting place shouldn't be too wet, but should be sprayed at least daily to maintain the uniform moisture. The



temperature of the nesting place should be the same as the incubation temperature, 27 – 28 °C is recommended for incubation of Gilas.

The time from mating to the oviposition appears to be 42-55 days. The Gila monsters can lay from 2-13 eggs, but usually they lay about 4-6 eggs. The eggs are leathery and have an elongate-shape. Each egg is about 6 cm long, 3 cm in diameter and weighs around 38 g.

Normally the eggs are laid over a period of several hours. If the eggs are laid over longer periods of time it is possible that they are infertile. However it is always recommended to incubate until the eggs are obviously infertile or definitely will not hatch.

7.8 Incubation

Incubation is best done by using the Hygroscopic Incubation Technique described below. This is the technique used by Seward.

There are three factors that have to be considered that effect the environment of the developing Gila monsters. These are temperature, moisture and oxygen tension. Maintaining the right temperature is easy with the use of an incubator. All most any incubator can be used, as long as it is able to maintain stable and accurate temperature. Any incubator that is appropriate for reptile eggs can be used for the eggs of Gila monsters. Placing the incubator is also important; it should be placed in a room which has a temperature below that of the incubation temperature (27-28 °C.).



The eggs prefer an environment with a high humidity and no contact with moisture.

These requirements can be reached by using the Hygroscopic Incubation

Technique. This technique contains an outer and inner container. The inner container holds the eggs and the outer container serves as a water reservoir and holds the inner container. This system will provide a constant humidity level and an appropriate oxygen tension for the developing eggs.

For the outer container a suitable box should be used. The box has to have a few ventilation holes. This is because; as the embryos develop they will have an increasing oxygen requirement. These holes provide enough ventilation for the entire incubation period, if there is enough air exchange between the incubator and the room it is in.

At the bottom of the outer box a layer of perlite or vermiculite of about 2,5 cm should be added. The purpose of the perlite is to provide a water reservoir that's taking care of the humidity in the system and it provides a large surface area to evaporate the water, this maintains the humidity level inside the box.



The water level should be below the top of perlite. If the water level completely covered the perlite, the advantage of the huge surface area of the perlite granules would be lost. Because of the ventilation provided in the outer box, the system will lose moisture and the level of water in the perlite will lower. As long as you can see standing water in the perlite the level of moisture evaporating from the surface of the perlite will remain the same. Water can be added at any time during the incubation period. It is best to use water which has the same temperature as the incubation temperature to avoid thermal shock to the developing embryos.

The inner container has to be smaller than the outer container and without a lid. The top of the inner box should be about 2 cm lower than the outer box. The bottom should be covered with a polyester batting. This provides a support for the eggs. It also allows the humidified air to circulate around the eggs.

The supports are holding the inner box from the perlite. Any material can be used as support as long as it can be used for wet conditions. Because of the supports the full surface of the perlite will be exposed to the air.

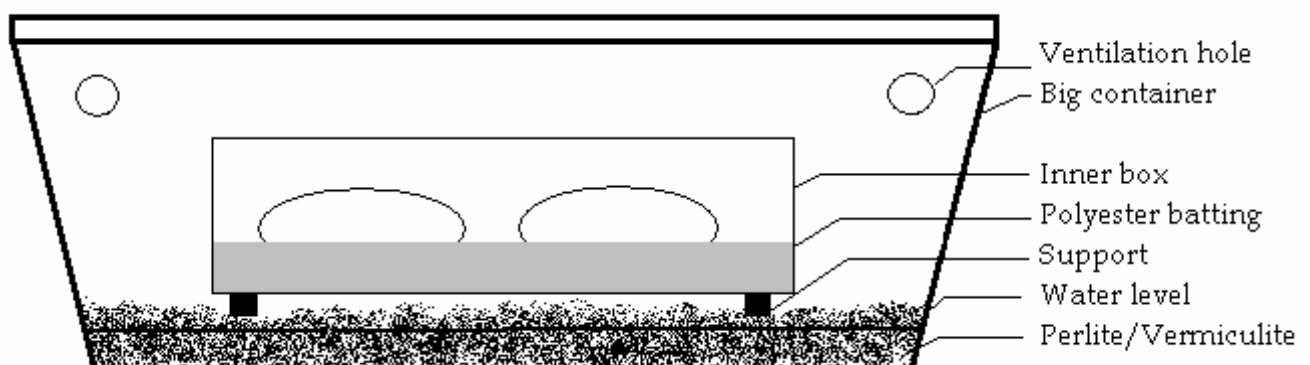
There shouldn't be any contact from the top of the inner box and the outer box; this allows good circulation of the air around the eggs.

It is important to make sure your incubator is well isolated. If it isn't there is the possibility that water, produced by condensation, will drip on the eggs, as this isn't good for the eggs. If this is a problem occurs you can prevent it by covering the inner container, make sure there are enough ventilation holes.

It is best to set up the incubation box a few days before. Because then the boxes will have the incubation temperature when the eggs go in.

It is recommended to keep the humidity level of the main chamber in the incubator around 90%. There are several ways to do this; one of them is to put two open pans with water in the bottom and top of the incubator. A fan in the top of the incubator makes sure the temperature inside the incubator stays the same. The fan will draw air over the pan; this is to help keeping the inside of the incubator humid.

If the incubator has no ventilation there has to be considered opening the incubator door once in while to provide air exchange to allow enough oxygen tension to the developing embryos.



7.9 Hatching

After approximately 124 to 150 days of incubation a young Gila monster will, with several biting motions, slice through the egg membrane and shell with its egg teeth. After this it usually takes a few days before they emerge from their eggs. During this time the little Gila monster will absorb the remaining yolk. Even after they are out of their eggs hatchling Gila monsters will return to the shell and eat all that remains in it. This is probably an adaptation to living in a harsh and dry environment.

The hatchling Gila monster is best left alone to exit the egg naturally. A normal and fully developed little Gila monster shouldn't have any problems exiting its eggs without any assistance. Unless the young are having obvious problems emerging, they should be left alone.



7.10 Neonate care

It is best to keep the hatchling Gila monsters in individual housing. This makes it easier to maintain and feed them. It is very important that the hatchlings have water at all time, because they dehydrate very easy when they are young. Feeding is done with mice pinkies every 4-5 days, they will usually start eating after a week of emerging from the egg, if they have refused the first couple of attempts to feed them you might try to cut open the pinkies head and press out the brain.

The size and number of food will change as the Gila monsters grow. Gila monsters are undemanding animals and will grow rapidly when they get enough food and correct temperatures.

8. Handling and transport

8.1 Handling

Gila monsters of all sizes can safely be handled by using a pair of leather gloves. Because Gila monsters don't have hollow fangs, like most venomous snakes, most of the venom would be absorbed by the gloves if they bite, even if the teeth went through the leather. Experienced Gila monster keepers often handle them without the gloves. With good experience and care this can be done safely.

To handle them the best way is to gently, but securely, take them around the neck, to control the movement of their head.

The body weight of the Gila monster can be supported with the other hand. Because Gila monsters are very strong animals and are capable of quick and powerful lateral biting movements, it is important to have a careful and secure grip.

It is recommended that the Gila monster is only handled for husbandry needs, for the safety of both the animal and the owner.



8.2 Transport

Gila monsters are transported as most venomous reptiles, there are no specific things to be aware of.

The Gila can be transported in either a bag or box, but you can also use both.

For air transportations please consult the IATA (International Air transport Association) guidelines.

8.3 First Aid if bitten

If a person is bitten by a Gila monster recommendations are:

1. Remove the Gila monster as quickly as possible. The longer the lizard has the chance to bite, the more venom it is able to put into the wound and the more likely the bite is producing serious symptoms. In mild bites, where only a fold of skin is bitten, it may be possible to simply hold the lizard behind the jaws and carefully pull it away; in cases where the jaws are more firmly attached, it may be necessary to put the Gila monster under water. A thin, flat lever inserted between the lower jaw and the flesh and turned 90 degrees may also work to quickly release the jaws.

2. Immediately remove any rings, bracelets, or other jewellery. These things may cause complications as oedema (swelling) develops.

3. The bitten part should be held still; a light bandage and mild pressure can be applied to control any bleeding.

4. The victim should be transported to medical care as quickly as possible.

5. Do not apply heat, or ice to the wound. And do not use tourniquets, constriction bands of any kind or make incisions to suck out venom.

One of the biggest dangers is shock, brought by a rapid fall in blood pressure. Pain normally peaks in 1 to 2 hours, but may last for days. Oedema normally peaks within 2 to 4 hours and resolves itself without special measures within 72 hours. Because it is largely subcutaneous, oedema has not been reported to cause compartment

syndrome or neurological problems. Most victims who are poisoned by a Gila monster are released from the hospital within 24 hours and recover completely within 2 weeks. More severe cases may require hospitalization up to 48 hours.

If wearing gloves, even thin leather or rubber gloves, the venom effects of a bite will decrease tremendously.

The pictures below are taken 45 minutes after a split second long bite from a 1,2 kg *Heloderma horridum*



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