Husbandry Guidelines

Beaded Lizard

(Heloderma horridum)

Terrarium Vissenbjerg

EEP Coordinator Klaus Dræby
&
Sandra Barten

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Note

These guidelines cover Beaded Lizards in general and the subspecies, *H. h. horridum* and *H. h. exasperatum* in particular, as these are the only subspecies kept in European zoos.

Acknowledgments

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Vissenbjerg, Denmark November 2006

Sandra & Klaus

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1. General description

1.1 Taxonomy

Kingdom:	Animalia
Phylum:	Chordata
Class:	Reptilia
Order:	Squamata
Family:	Helodermatidae
Genus:	*Heloderma*
Species:	*Heloderma horridum*

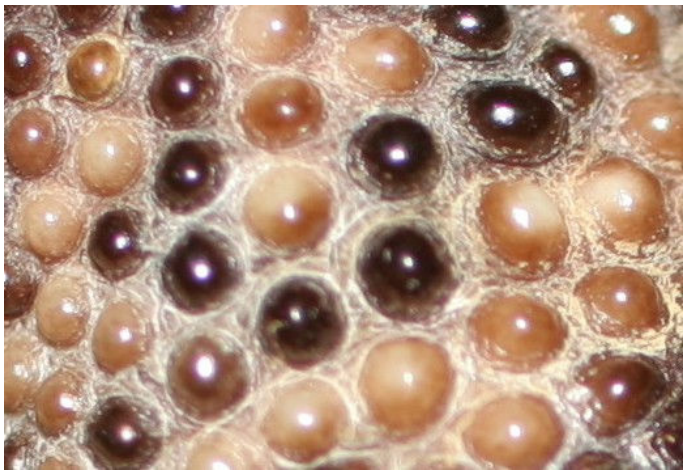
1.2 Short history

The Beaded Lizard is found in Mexico and Guatamala.
The scientific name *Heloderma horridum* means the terrible one with the studded skin. It was first described in 1829 by Wiegmann.
The Beaded Lizard was one of the first New World reptiles encountered by Europeans during the Spanish colonization of Mexico.

1.3 Morphology

An adult male Beaded Lizard can easily weigh 2-2,5 kilograms and have a total length around 80-90 centimetres. Females are usually smaller than males with a total length round the 80 centimetres and a weight of 1,5-2,2 kilograms.
Specimens more than a meter in length have been known to exist

The skin of a Beaded Lizards is black with yellowish-white areas but the head is black. Legs are dark and the tail is ringed with dark and yellow bands. Beaded lizards have a pink forked tongue. The skin of the lizard consist of osteoderms, beads which contain a piece of bone which gives *H. horridum* a kind of an armour plated skin.
The beaded lizard has a very robust skull architecture, large jaw muscles and venom glands in the lower jaw. Relatively small eyes with moveable eyelids. Curved teeth, some with venom conducting grooves (posterior and anterior).
The limbs of the lizard are relatively short and have four toes with curved claws. Fat is stored in the tail. The Beaded Lizard has two pairs of infralabials (enlarged chin shields) and no enlarged preanal scales. *Heloderma suspectum* has only one pair of infralabials and two enlarged preanal scales.



1.4 Maximum life span

Normal lifespan is about thirty years. There has been a reported case of a 38 year old *H. h. Alvarezi* in captivity.

1.5 Subspecies

The four recognized subspecies are:
H. h. horridum (Mexican Beaded Lizard)
H. h. exasperatum (Rio Grijalva or Rio Fuerte Beaded Lizard)
H. h. charlesbogerti (Rio Montagua Beaded Lizard)
H. h. alvarezi (Black Beaded lizard, Chiapan Beaded Lizard)

Becks book has some real nice pictures of the different subspecies.

1.6 Field data

The Beaded Lizard is distributed in tropical dry forest. The tropical dry forest of Mexico is one of the most endangered forests types of the world, with plants like vines, succulents, epiphytes, shrubs, grasses and herbaceous plants adapted to highly seasonal rain. This habitat is characterized by an annual rainfall of 500 to 1,500 millimetres per year, and several months of drought.
The majority of rain falls in the 4 to 6 month wet season starting from the beginning of June/July and last trough October/November.
The dry season can last 5 to 8 months and occurs during winter and spring from November through May or June. The variation of temperatures is very big during the day. The mean maximum temperatures range from 29 °C to 32 °C and the mean minimum temperatures range from 15 °C to 23 °C. Temperatures below 0 °C are very rare to nonexistent in the tropical dry forest.
Usually there are no periods with freezing temperatures in Beaded Lizard habitat, but on the rare occasion of frost, it will only be for one or two days.

The Beaded Lizard is found along the Pacific drainages from southern Sonora to Chiapas and south-eastern Guatemala. It is also found in two Atlantic drainages from central Chiapas, Mexico and also found in extreme south-eastern Guatemala.
H.h. horridum: the Pacific drainages of Mexico.
H.h. exasperatum: southern Sonora and northern Sinaloa
H.h. charlesbogerti: Rio Montagua Valley and eastern Guatemala.
H.h. alvarezi: Rio Grijalva depression of central Chiapas, Mexico and extreme western Guatemala.

1.7 Population status

The population numbers are unknown. In undisturbed places a population density of 18 Beaded Lizards per square kilometre is probably not uncommon.

Threats to the Beaded Lizard populations are:
Habitat lost, changing of habitats and human settlement.
The Beaded Lizard is listed as CITES, appendix II. (1975)
IUCN Red List as Vulnerable . (1994, 2001)
Mexico listed the lizard as Threatened under NORMA (Endangered Species Act). (2001)
All Heloderms are protected under provisions of the US Lacey Act, it is a federal crime to import, export, transport, sell, receive, acquire, or purchase any Helodermatid lizards, alive or dead.

Guatemala listed the *H.h. charlesbogerti* on the Guatemalan Lista Roja (Red list) as threatened. This supspecies are now concidred on the edge of extinction.

2. Behaviour

2.1 Activity

Mostly active during the daytime but from time to time they are also active during the night after summer rains.
The lizards usually have two active peaks a day, one in the morning and one in the afternoon. In the rainy seasons these peaks will be earlier in the morning and later in the afternoon. The seasonality of their natural habitat has a big effect on the time and the amount of activity. The lizards are probably more active during the rainy season (July) and very little (but mostly not at all) in the winter.
Even when they are active, Beaded Lizards spend only about one hour a day out of its den.

2.2 Locomotion

Beaded lizards appear to be very slow but be careful, their attack can be very fast.
The Beaded Lizard can't run very fast. Beaded Lizards may climb 5-7 metre high in a tree, thanks to their sharp claws and semi prehensile tail. They move slowly and deliberately, while they carefully investigate their environment with their forked tongues.
They are also very good diggers.

2.3 Predation

There have not been observations of natural predation on the Beaded Lizard. Snakes, coyote, foxes, owls, hawks and eagles could potentially be predating the Beaded Lizards.

2.4 Social behaviour

Not very much is know about the social behaviour of *H. horridum*.
Researchers found that shelters are used by more than one lizard, but usually not at the same time. Only *H.h.alvarezi* has been found to congregate in burrows.
In the period of sperm formation in late August to early October there is a lot of combat between the males as this is the period the lizards are finding mates. There have been some observations of male Beaded Lizards in powerfully, lengthy combat with one another. Overall females are more aggressive than males.

2.5 Feeding behaviour

When a Beaded Lizard catches its prey it will attack with one bite, holding the prey for a short time. Then the lizard will start to chew its venom into its prey. After some chewing it will start to swallow its prey. In captivity a Beaded Lizard will almost always want to eat and will be very active when food is offered in the enclosure. During the feeding a Beaded Lizard will be greedy and unpredictable.

3. Health

3.1 Parasites and diseases

Little is known about parasites and diseases in wild Beaded lizards. 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 ecto parasites, 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) beaded Lizards 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 together with Calcium may be administered under the supervision of at veterinarian.

3.3 Follicular stasis

If a female beaded Lizard 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. Enclosures

4.1 Substrate

Many different kinds of substrates can be used in the enclosure, quarts 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 de done through a plastic hide box filled with a moist bedding.

4.2 Furnishing

A Beaded Lizards needs a shelter in its enclosure. In nature a shelter is used for escaping high temperatures and predators. For creating a nice enclosure you can use rocks to create rocky slopes and boulders. These also give the animals an opportunity to climb and trim their claws. Rocks can also be used for holding the dishes for food and water, but these can also be put on the sand. Beaded Lizards are very good diggers, so make sure there won't be any rocks which can fall on the lizard while it's digging. All sorts of plants can be used, but then again, the lizard likes to dig so make sure the plant are big enough so it won't get destroyed.

4.3 Dimension

Beaded Lizards like large enclosures especially if you want to keep a large group of animals. The absolute minimum recommended seize 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 is 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 cm.
This is an absolute minimum and most zoos would only use this size for short term off exhibit holding.

4.4 Temperature, humidity and lighting

By rule of thumb; the temperature in the enclosure is recommended to be:
-around 20 ℃ on the cool side of the enclosure
-around 40 ℃ near the hotspot of the enclosure
At night the temperature should not be higher than 24℃.

However it is recommended for breeding that temperatures are regulated according to season. By lowering the temperature for hibernation in beginning of November until it reaches around 16 degrees centigrade around 1st of December, and again raising the temperature from the beginning of March.

The Beaded Lizards natural habitat is the dry forest, in captivity there is no need for humidity regulation as long as the mean humidity is around 60%.
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.
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.

Heloderma horridum enclosure at Zurich Zoo.

5. Social structure

In captivity the Beaded Lizard can be kept in pairs, alone and in groups. Be careful not to keep more that one male in the group, unless you have an extremely large enclosure.
Sometimes when you are keeping a group of lizards in one enclosure everything goes perfect and sometimes problems occur. It is recommended not to put males together after their hibernation, this is the breeding season and there could be a lot of male to male combat.
No data on mixed exhibits have been found, and is generally not recommended.

6. Diet and feeding

In the wild a Beaded Lizard eats: juvenile mammals, birds, reptiles and eggs. In captivity eggs can be offered, but with the risk of salmonella infection.
IT is Recommended is to feed rats and mice of appropriate size. Adult lizards can be fed, 1 small rat or 2 mice, every second week. Younger lizards can get fed every 4 to 5 days one or two small mice. Females who just laid eggs can get fed every week 3 to 4 mice or small rats. This might seem a lot but females can lose about a quarter of their body weight after they have laid their eggs.
Beaded Lizards will almost always eat, so be careful they won't get to obese. Some institutions use extra vitamins, some do not and have good results as well.
If a Beaded Lizard does not want to eat, feed it mice with a split head. The brain scent works well.
It is recommended to feed the Beaded Lizards with a pair of tongs. When you are feeding animals in a group, make sure the animals aren't to close to each other to prevent fights.
There has to be a dish with clean water at all times. If possible the Beaded Lizard might want to bathe in the water. The water needs to be changed every day.

7. Reproduction

7.1 Sexing techniques

Beaded Lizards are very difficult to sex. Females tend to have a pear shaped body where as males are overall slim. Males have a wider tail base and a hemipenal bulge can be seen. Females have a longer neck and the head is not as wide as in males. During the breeding season males are very aggressive to other males which is a very good indicator. A reliable technique is ultrasound examination, to observe the presence of either the hemipenis and testes or the ovaries with the follicles in it. This method will show the right result every time of year but from fall until spring the follicles are larger and easier to see. It must be used on the ventral surface of the tail, just above of the cloacae. With young animals ultrasound examination is more difficult because of a bone plate blocking the view of the upper cloacae region, this makes it difficult to find the hemipenis. Zurich Zoo has had good results by using endoscopy, but anaesthetics must be used.

7.2 Sexual maturity

The earliest age at first captive reproduction is 2,5 years. (It is estimated that the *H. horridum* can reproduce until the age of 29)

7.3 Breeding season

In September until October the male reproduction cycle begins. Depending on cycling they would generally start mating in August and September.

7.4 Reproductive manipulation

Hibernation is recommended for successful breeding. By lowering the temperatures you can get the lizard into hibernation. The hibernation can take place from December until the beginning of March. Do not feed the lizards until two or three weeks before, this way the lizard can digest its last meal completely. During the rather low temperatures in November it takes longer time to digest meals. (10-14 days). The last week before hibernation temperatures can be lowered gradually to 15,5-16,5 degrees.
The lights should be reduces as well and in the end of the week it must be completely dark in the enclosure. The animals will rest for a period of 6 to 7 weeks and will wake up in March when temperatures and light gradually are raised. Water should always be present in the enclosure during the hibernation, to prevent dehydration of the animals. The water can be used for drinking and to prevent dry air in the enclosure.

7.5 Mating

A reproduction cycle is finished every year, but in the wild it is more common for Beaded Lizards to mate once in two years. In some years the females do not have enough energy to produce eggs.
When the lizards are eating normally again after hibernation they can put together for mating. Some breeders use only the strongest males for mating. The bigger the female, the more eggs she can carry.
After introducing the male and female courtship will usually take place in the first 15 minutes. Before making contact, the female will try to flee for several minutes. When the male can get to the female, he will climb on top of her and start with rubbing and stroking the female's head with his chin. The female might try to flee again, carrying the male on top of her. The male will try to shift his tail under the female so their cloacae can get together. If he fails he will rub her head some more. When the female admits she will respond by raising her tail, the male will be leaning on one of his rear

feet while he uses his other leg to hold the female. As soon as the copulation starts the male will hold on to the female as firmly as possible. During mating the male might gently bite his partner in her neck and flick with his tongue. Within the hour the first copulation usually take place. The first attempt of copulation sometimes fails. When copulation is successful this can be noticed by a wet region round the females cloacae. The first days the male will stay with the female and it is possible they will mate some more. After a week a new female can be put with the male and it will all start again.

7.6 Pregnancy detection

With ultrasound examination it is possible to see the follicles in the ovaries. After a while of pregnancy you might be able to feel the eggs in the gravid lizard's body by the hind legs.

7.7 Gravid females

Gravid females will normally eat during the whole pregnancy. They will be basking a lot during the day and they will get bigger after a while. Three weeks before she will lay the eggs she will shed her skin. This is called pre-shedding. Normally Beaded Lizards shed their skin piece by piece, but during pre-shedding the skin will more or less come of in one piece. This is an indicator for isolating the female, to prevent the other animals in the enclosure from eating the eggs. In her own enclosure the female must have a hiding box with peat moss in it. She will dig in it until she is ready to lay her eggs in it. The first eggs are laid very clumsily. It is recommended to get all of the eggs out of the enclosure as soon as possible to prevent them from breaking. Of course be careful, it doesn't matter if you disturb the female briefly but if she notices you, she will become very aggressive. A female might need 24 hours to lay her eggs. However reports of a whole week are known. After the eggs are laid she will start to bury them, she will continue this even though all of the eggs are taken out. She will guard her own made pile most of her time.

7.8 Eggs, clutch size

The clutch size of the Beaded Lizard in captivity is 2 to22 eggs. Egg size varies from 28 millimetres to 50 millimetres wide and 64 to 90 millimetres long, eggs can weigh 48-52 grams.
Eggs are places in an incubator with a temperature between 26 and 29C. Jersey incubates with 26-28 night/day
The eggs will then hatch in 163-205 days

7.9 Hatching

In the wild: The young ones hatch in July the year after the eggs are laid. From the end of July until the beginning of September the eggs will start to hatch.
Beaded Lizards use an egg tooth to open the shells of eggs. It has also been suggested they use their claws to break the shells.
Hatchling can weigh about 36-43 grams. Hatchlings can have a total length of 19-23 centimetres and a snout-vent length of 12,4-14,7 centimetres. If the eggs did not hatch and the eggs were fertile there must be something wrong with the incubation technique.

7.10 Enclosure and diet of the hatchlings

Hatchlings should be places in a box/enclosure of their own, 26 to 31 ℃. The enclosure can be the size of a shoebox. The first day of their lives the hatchlings will eat everything that was left over in their egg shell. The hatchlings will probably not eat anything else the first days, maybe the first week. When they are 5-10 days old they can be fed mice pinkys. In the course of time the hatchlings will grow and can eat bigger pinkies and so on. Giving each hatchling an enclosure of it own will make it easier to feed and observe them. The first times of the feeding the hatchlings might

be afraid and open their mouth, not because they want to grab the mouse, still the mice can be dropped into their mouth. When the young once get older the fear goes away, just put the dead mouse with the lizard in the enclosure, unless there are more hatchlings in the enclosure. Of course patience is very important. Force feeding should be the last attempt only. The dishes with water should not be too big to prevent the hatchlings from drowning.

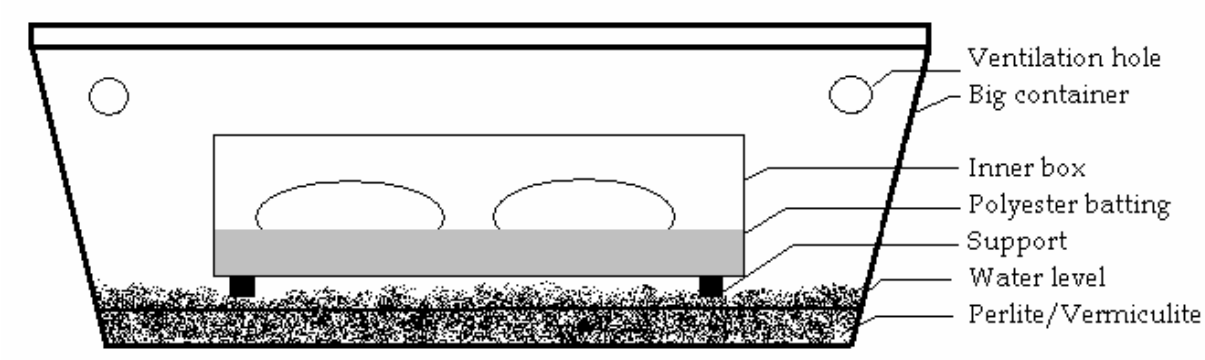
7.11 Incubation

There are three important factors for incubating developing beaded eggs. These are temperature, moisture and oxygen tense. Suggested is to have a temperature of 26-29,5℃ (80-85F) for the eggs. It has also been suggested that the temperature should not be higher than 29,5℃, because this will result in failure.

temperature of 25-26,6℃ (77-80F) and never higher than 26.6℃ for his Gila Monster eggs.
Beaded lizard eggs do good in an environment with a high humidity but little moisture contact.
Many breeders use vermiculite as incubation medium, but other substrates can also be used. Suggested is to have a water-vermiculite ratio of 1:1 to 1:4 by weight. To retain the right water-vermiculite ratio water has to be filled in during the incubation process. The water needs to have the right temperature and should not be filled in with the substrate but the eggs should be taken out so the water can be mixed with the substrate. This is also to prevent a temperature shock for the embryos. This is a successful technique but it also has it's disadvantages, it is difficult to maintain stable conditions.
Dr. Mark Seward has invented what he thinks, and what is now generally considered, the best technique for incubating his Gila Monster eggs. This technique is called the Hygroscopic Incubation Technique and is also successfully used by Beaded Lizard breeders. This technique makes it easy to manage the three important factors for incubating reptile eggs. For this technique a good incubator that has no problems with maintaining the right temperature is needed. The temperature of the environment of the incubator should be lower than the temperature in the incubator.
The Hygroscopic Egg Chamber is what makes the technique so very easy. This Hygroscopic Egg Camber is as following:

A plastic box/container with the measurements of around 30 x 18 x 10 centimetres with a lid. The box has four ventilation holes, one in each corner for the necessary ventilation for the developing embryos. The holes should have a size of about 0.3 centimetres. A lit is placed on the container. The container has a layer of 2,5 centimetres of perlite or vermiculite. Some institutions use perlite some use vermiculite. This perlite works as a reservoir for water which is needed for the right humidity. Because of the porous perlite granules the surface is bigger so more water can evaporate. This layer of 2.5 centimetres is sufficient for the whole incubation period.
The water level in the container should be below the 2,5 centimetres perlite. The water will wick up to the surface of the perlite and will evaporate. As long as the water level is visible the water does not have to be refilled. But because of the ventilation the water will disappear from this container and refilling is necessary. Make sure the water is the right temperature.

In this container a smaller plastic box is placed. This box has no lid and should have a maximum height of 5 centimetres because it should not reach to the lid of the other box. This smaller box has a layer of polyester batting which supports the eggs. When using this batting the air can circulate completely around the egg.
For a good circulation the small box should not be placed directly on the perlite layer in the big box. Therefore small supports of any kind of material can be used.
It might be possible that some condensation of water will occur on the lit of the big container. There is nothing to worry about if the water does not drip on the eggs. But if it does drip on the eggs it is possible to put something over the eggs. Something with ventilation holes.
The humidity in the main chamber of the incubator should be 90%. For an oxygen circulation in the incubator there should be ventilation holes in the incubator.
If some eggs in the incubator start to dent there is nothing to worry about but when the eggs start to collapse significantly before the end of the incubating period the humidity in the incubator is to low. But a few weeks before hatching it is not uncommon.
When eggs are placed in an incubator, the temperature must be 28,5 degrees. The eggs will then hatch in 163-205 days.



8 Handling and transport

8.1 Handling

The Beaded Lizard is not very venomous, a bite is not deadly but it is very painful. When handling a Beaded Lizard you can use thick gloves or not, this is your own choice. The teeth of the lizards can't get through the gloves. You can use a handling hook which you can put on the neck of the animal to make sure you have control of it. Then you can grab the neck, lose the hook and with your other hand you can reach out the grab the back of the body to support it.

8.2 Transport

Transport in air:
Please refer to IATA-standards, these standards can change continuously.
Other transport:
The lizard can be transported in a bag or a box or both. In the box there should be newspapers or other material to prevent the animal from sliding around in the box. The size of the box depends on the size of the animal. The box must have the appropriate size to fit the animal and the other material.

9. Venom

9.1 Venom system

The venom system of the Beaded Lizard does not work the same as the systems of snakes. Beaded Lizards have no hollow teeth and do not have glands above the upper eye. Beaded Lizards do not strike and release like some snakes do but strike and hold on to their prey.
The Beaded Lizards venom glands are located in the lower jaw (one on each side). The glands are visible from the outside as swellings below the lower lips. The venom is produced and saved in the multi lobed venom glands in the lower yaw. At the time of discharge the venom flows from the two venom glands into ducts at the base of the venom conducting teeth. When the Beaded Lizard is chewing there will be some tension on the glands and the venom will discharge and flow from the orifice into the grooves between the fourth and seventh pair of teeth (counting from the front). These teeth are specialized for piercing and venom delivery. Each tooth has two grooves and most of the time a smaller groove towards the rear. The biggest teeth are located in the lower jaw and are 6 millimetres long. During the Beaded Lizards bite the venom will flow from the teeth into the wound.
The amount of secreted venom depends on the size of the lizard, the degree of agitation and the length of time of the bite.

9.2 First Aid if bitten

If a person is bitten by a Beaded Lizard recommendations are:

1. Remove the beaded Lizard 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 lizard 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.

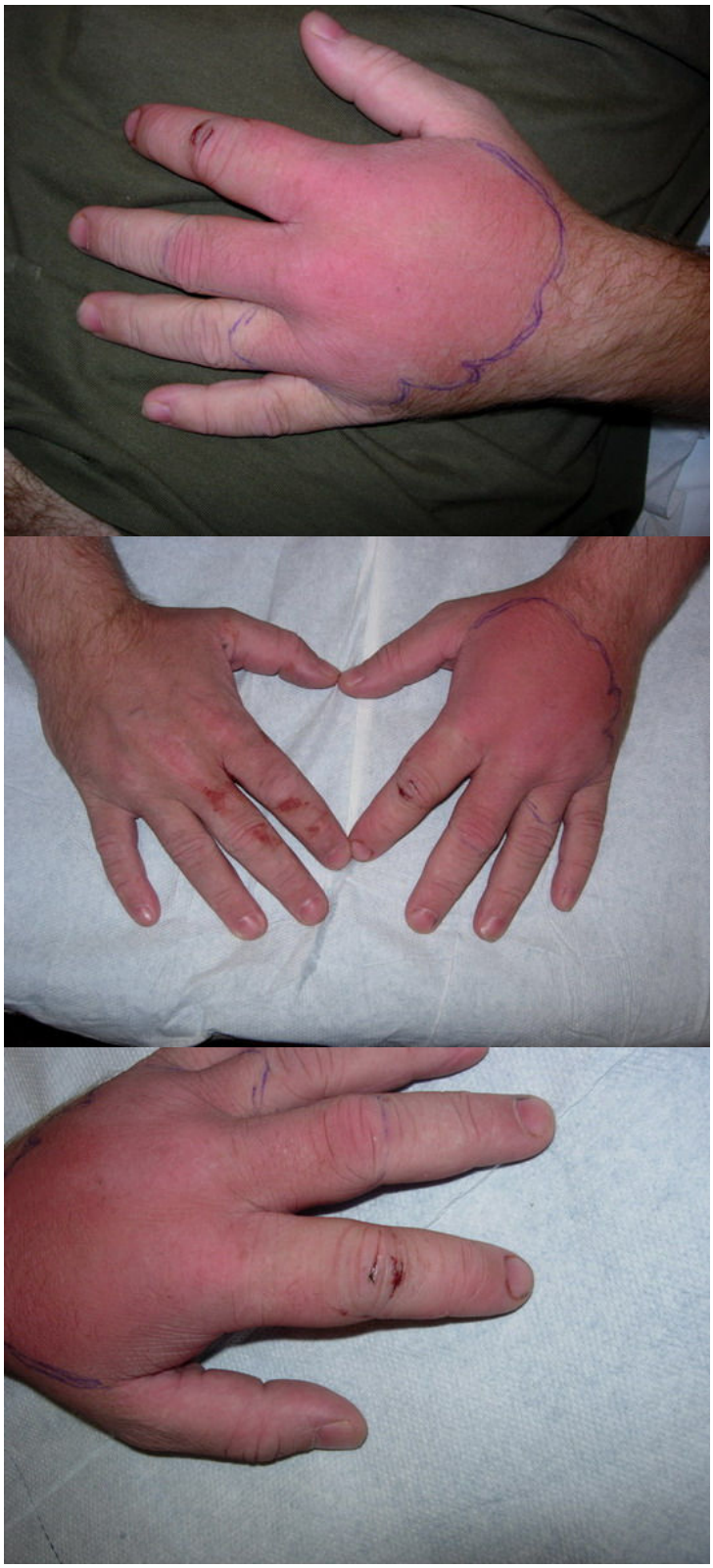
3. The bitten part should be held still; a light bandage and mild pressure can be applied to control any bleeding.

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 Beaded Lizard 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.



45 minutes after a split second long bite from a 1,2 kg *Heloderma horridum*

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