

THE CORN SNAKE (*ELAPHE GUTTATA GUTTATA*) IN THE WILD AND IN THE TERRARIUM, PART II.

By: Ulf Olsen, Ørnevej 6, 4040 Jyllinge, Denmark.

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### ACQUISITION

Since they are regularly offered for sale, both as captive-bred and wild-caught animals, it is not difficult to acquire a corn snake. The advantages of captive-bred animals are several: they carry neither internal nor external parasites, the age is known, they do not have to get used to people, and wild stocks are not depleted. To avoid transfer of parasites and infectious diseases captive-bred animals should be physically separated from wild caught specimens. Indeed, a terrarium in which wild caught animals have been kept for some time must be thoroughly cleaned and disinfected before introducing captive bred stock. As a rule one will not encounter these problems when buying from a private individual and of course there are good dealers, but experience has shown that one should be careful. Visiting a shop on a frequent basis usually gives you a good idea about the way in which the animals are kept; whether the trader cleans and disinfects both his terrariums and their contents before he introduces new stock and also whether he takes care to prevent contaminating animals or terraria by regularly disinfecting hands and equipment.

## THE TERRARIUM

How should one build a suitable terrarium for corn snakes (and most other snakes)? Let us first have a look at the materials used to construct a terrarium. The most common and cheapest material that can be used is chipboard, but one could also use plywood etc. Apart from wood other sheet materials can be used, for example p.v.c.-sheet, acrylic-sheet and so on, metal-sheet, asbestos-cement (which is considered to be a very suitable material by many people, especially for humid terraria) or glass which has been joined together with silicon sealer. If you like, you can even construct a terrarium with bricks or concrete.

One of the ways to build a terrarium is to make a frame or skeleton first which is afterwards filled in with thin sheets of one material or another. The frame can be made of wood or if one has the possibility to spend more money the various forms of iron, stainless steel or aluminium frameworks will also do very well. If the materials used are thick, for example chipboard or plywood, the frame can be omitted and the sheets can merely be screwed and glued together.

When designing the terrarium one should take into account the fact that ease of access is important. This will subsequently make cleaning the terrarium an easy job. A hatch in the side of the terrarium and/or the possibility of opening the top do not provide an easy means of access. The best solution to this problem is to open the front of the terrarium. This can be done by means of a door-like construction (in which case the whole front opens) or by means of sliding doors (of glass or perspex) in which case one can choose which side one wants to open. When one chooses sliding doors one needs a double rail so that the windows can really slide. The most suitable rail is made of synthetic material and is available in the colours brown,

black, grey and white. It is glued to the terrarium by means of epoxy.

It is essential to put rails on all sides of the front of the terrarium, i.e. not only at the top and the bottom but also at the sides, because if one does not do this the fissure between the sliding door and the side of the terrarium will almost certainly result in the escape of snakes. When using glass all sides should be treated with sandpaper or alternatively bevelled, so that one will not cut oneself.

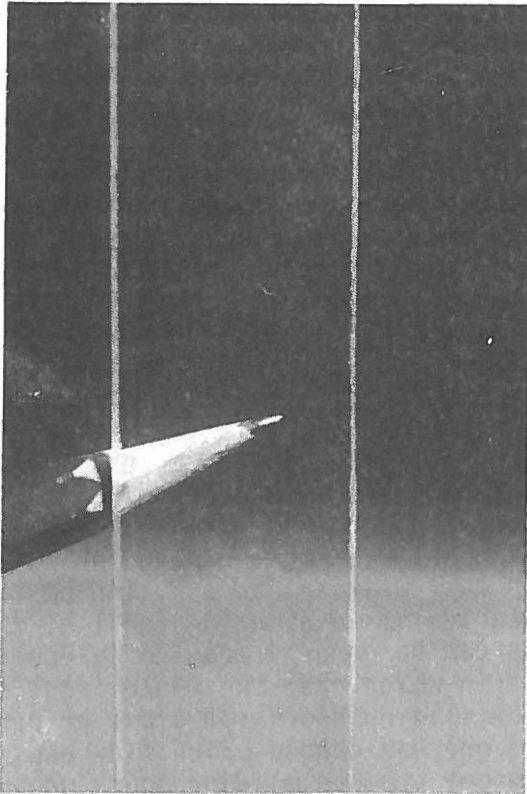


Foto 1. This picture shows how much space is left between the sliding doors when 3 mm glass is used in a so called 3 mm rail. Foto: Ulf Olsen.

## THE PREVENTION OF ESCAPES

The gap between the sliding doors in the middle of the terrarium where there is an overlap between the two panes is often used by snakes to escape from the terrarium. Therefore one should ensure that the windows are the correct thickness to fill the runners. In my experience 4 mm glass in a so called 3 mm rail will slide well provided that they are carefully glued to the terrarium and that they are straight. In the case of very small snakes it might even be necessary to close the

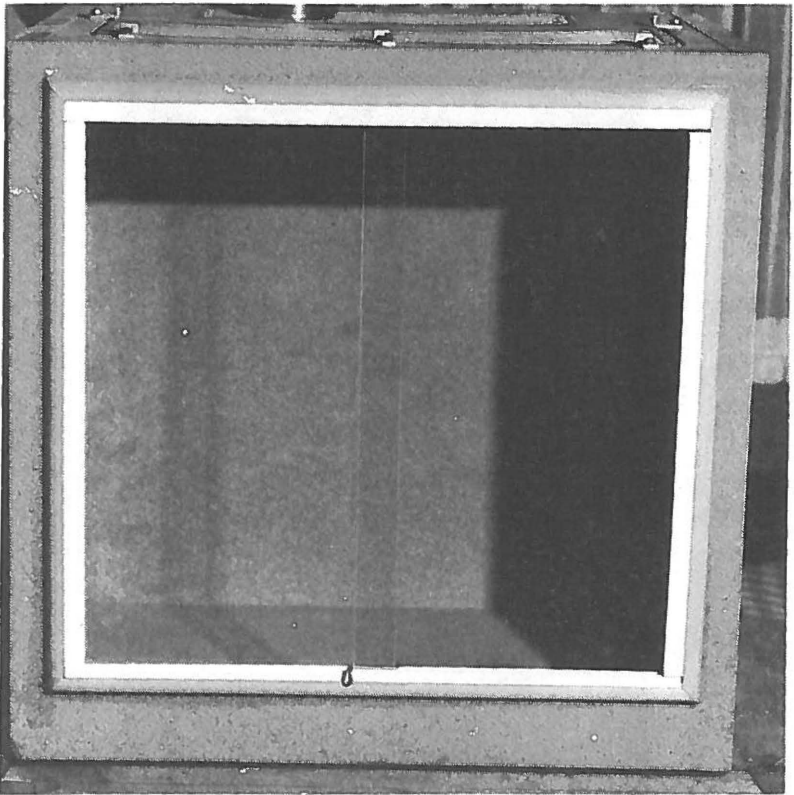


Foto 2. It is essential to put rails on all sides of the front of the terrarium. Foto: Ulf Olsen.

very small fissure that remains by means of some suitable material such as cardboard. In building a terrarium it is essential to try to minimise fissures and holes. Escapes are the result of thoughtlessness and should be avoided at all costs.

A mechanism to prevent the windows from opening should be installed if they slide easily. This can be done in a very simple way by means of inserting a wedge between the windows at the point where they overlap. A very ingeniously contrived type of locking is simply formed out of a piece of 1.5 mm thick wire, as shown on photographs 2 and 3. One

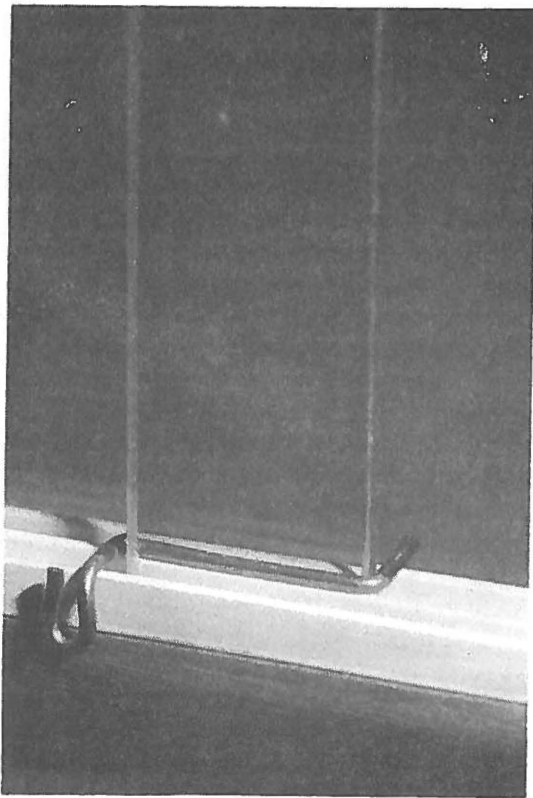


Foto 3. Mechanism to prevent the windows from opening. Foto: Ulf Olsen.

has to experiment a little to get the appropriate length.

## VENTILATION

In constructing a terrarium a ventilation grille should not be forgotten. It can be made in the top of the terrarium or at the top in the back. The opening should be about as long as the terrarium itself and the gap should be about 10-15 cm wide. If the terrarium is longer than 50-60 cm the opening should be divided in two with a space of 7-10 cm between (this increases stability).

Fresh air should enter the terrarium at the bottom preferably below the slide-windows or in one of the sides. Ventilation will be best if the opening at the bottom is about 5-10% of the dimensions of the opening at the top. One can also use an aquarium pump to get fresh air into the terrarium instead of a ventilation opening at the bottom. If one makes the air from the pump enter the terrarium through a water container the humidity in the terrarium will rise. Other openings can be made in the front of the top of the terrarium at the places where one wishes to install lighting etc. All openings will have to be covered by a small mesh wire-netting which has to be rather firm and which has to have openings of about 2 mm. There should not be any places in the terrarium that could harm snakes in any way.

## THE DIMENSIONS OF THE TERRARIUM

How big should a terrarium be? As a basic rule we take half of the snake's length which we multiply by twothird. In this way we will know the minimum floor space two or three snakes of that length need. For example, if a corn snake is 1.2 m long

the resulting floor space required is 0.4 m<sup>2</sup>. In case of quick, nervous snakes, that move much more, double this floor space might be necessary. Corn snakes are calm and do not require much space. They will flourish in a rather small terrarium, but since they will also do well in a large terrarium, it will not harm them to give them more space. They can thrive in both high and low terraria, but because they will frequently use the branches in a tall terrarium, such a terrarium is to be preferred. The terrarium in which I keep my snakes is 110x74x62 cm (hxlxw).

### FURNISHING

Of greater importance than size is the way in which the terrarium is equipped and of course, climate. In general snakes do not need large open spaces. On the contrary, they try hard, outside the mating season, to consume as little energy as possible. They try to find secluded places with a suitable microclimate, close to water and food, so that they do not consume too much energy in satisfying their primary needs. First of all these places should contain one or more hiding places, small enough to allow the snake to feel securely enclosed on all sides and should also satisfy temperature and humidity requirements. They also choose basking spots close to hiding places, so that they can retreat if they feel threatened.

### HIDING PLACES

Like most other snakes the corn snake shows preference for specific types of hiding places in nature and thus we can ascertain the preferred type of hiding space to provide within the terrarium. As the corn snake is a terrestrial snake des-

pite its climbing abilities it will need hiding places on the terrarium floor; these must be dark or semi-dark inside. A temperature between 23-25°C is recommended. Ideally one should offer two hiding places: one at 23-24°C the other 25-26°C so that the snake has a choice of temperature. Hiding places can also be constructed somewhat higher up in the terrarium in the branches; something corn snakes will surely appreciate.

Many objects can provide hiding spaces: turned-over flower pots, firm constructions of flat stones, a shell of a coco nut or a hollow tree trunk. Remember, however that they should be easy to clean. A very sophisticated way to create hiding places for bigger and stronger snakes is to make a false bottom, in which a drawer with a removeable lid, made of glass or acrylic sheet, is constructed. Openings both in the drawer and the false bottom will provide access for the snakes. To prevent the floor substrate from falling into the drawer, a piece of plastic tube of suitable diameter is glued into the opening in the false bottom so that it is 2-3 cm above the floor level. This can be camouflaged by a small tree trunk or any other natural material (see photo 5). To obtain the temperature necessary a weak heating-plate often has to be mounted underneath the drawer.

## RESTING PLACES

The next thing to consider is the provision of different resting places. Some of these should be formed as semi-hiding places for example sheltered areas amongst vegetation. Try to imagine the places you would choose to sunbathe on a beach - a small dip in the dunes surrounded by grass. Such a situation would be private but you would be able to follow what goes on in the surrounding area





Foto 4. *Elaphe guttata guttata* "The old mother".  
Foto: Ulf Olsen.



Foto 5. Terrarium met schuiflade / Terrarium with  
drawer. Foto: Ulf Olsen.

just by letting your eyes look through the vegetation. The same sort of situation appeals to most corn snakes when they are resting or basking outside their hiding places. Try for example to install half or three quarter coconut shells in the branches and surround them with leaves or straw. If your corn snakes find the temperature in this place sufficient, I am sure it will be a success. Forked branches arranged horizontally at various heights are also good resting places for corn snakes. It is preferable to screw the branches to the sides and back wall of the terrarium. The branches should be about as thick as a wrist. The four or five resting places provided should be at different heights in the terrarium, so that the temperature of the resting place next to the top (where lamps and other heat sources are placed) will be around 30°C and of course a little lower for each step you go down. In this way the corn snake can always choose the spot it prefers during its diurnal cycle. At night the temperature is lowered to 18-21°C.

## WATER

Water must be available at all times. In my own terrarium I built a tank which is large enough to permit the snake to bathe. Instead of bathing the snakes defecate in it so I also provide them with a drinking bowl. If corn snakes bathe for longer periods it is normally because they are too hot or are suffering from mites. This is true also for all other kinds of snakes which normally do not bathe. The solution to the first problem is to lower the temperature. The solution to the other problem is to suspend a piece of 'Vapona' strip in the terrarium for a period of three times three days with periods of four to six days in between. The ventilation openings should be covered

whilst the 'Vapona' strip is in situ. The 'Vapona' strip should be cut to a size that corresponds to the volume of the terrarium in  $m^3$  (see directions for use). It is suspended at the top of the terrarium in a small, perforated box so that the snakes cannot touch the material itself. Wash your hands carefully after handling the strip.

## SUBSTRATE

One can use all kinds of material for the floor substrate, but mixing humus, gravel and peat dust has proved to be suitable. Covering the floor with moss is very decorative, but will also result in a lot of extra work as it should be changed quite often. It cannot be cleaned properly to remove urine and faeces. Unfortunately Bornholm gravel (relatively smooth gravel without sharp edges) is getting scarce. Personally I think this material very good and decorative and I have used it to my satisfaction for years. This because it is easy to clean and because it does not hurt the snakes when they want to dig in it. Another advantage of this material is that the dimensions of the stones 3-8 mm guarantee that only very seldom a stone is consumed when the snake swallows its prey. Regarding substrate I shall remind readers that sand should only be used with true desert snakes; with other snakes this will go between their scales and irritate them or even cause infections. Chipped wood and newspapers can also be used, but they are not very decorative.

All substrates must be changed regularly to avoid bacterial build-up which will result in infection.

## MY TERRARIUM

The photograph shows the terrarium in which I



Foto 6. Terrarium of the author. Foto: Ulf Olsen.

house my corn snakes. There are three hiding places on the bottom, which are partly heated by a heating cable glued to the underside of an aluminium plate with epoxy. This heating plate is situated under the substrate. Under the half sewer pipe the temperature is  $26^{\circ}\text{C}$ , under the tree stump  $25^{\circ}\text{C}$  and behind the tree stump far back in the right corner it is  $24^{\circ}\text{C}$ . The tree stump stretches from the terrarium floor to the top and allows the snakes to reach the horizontal branches, where they can choose temperatures between  $26\text{-}30^{\circ}\text{C}$ . If they require a still higher temperature this is

offered by the thick branch at the top on the left which is heated from the inside: the choke-coil of the fluorescent lamp is placed inside this branch. The surface temperature on this branch is 40°C but the snakes very rarely use it (only when they have just fed and even then for short periods only).

The radiation heat in the terrarium is generated by a TL tube and a 60 Watt Elstein lamp which have both been constructed in a case on the top of the terrarium. Metal gauze prevents the snakes from touching the bulbs and getting burnt. An Elstein lamp is rather expensive but it will last a very long time. I have used one for ten years for about twelve to sixteen hours a day, and it is still functioning perfectly.

As a rule I also keep some plants in my terrarium. Currently I use a *Hoya carnososa*, which is suspended in a hollow coco nut. *Hedera helix* is also very suitable. The plants only last a few months, because they are maltreated by the snakes. If one has two or three of them one can change them so that the plants get time to recuperate. However, if one is prepared to accept plastic plants they are more convenient and just as acceptable to the snakes. One reason for using real plants is that it is one of the methods of raising the relative humidity in the terrarium: the more plants there are the higher the relative humidity will be. The relative humidity in my terrarium is between 50 and 60% which one may find rather low. However, as a rule snakes should be kept at the lowest possible degree of humidity that enables them to slough well. There are numerous reasons for this, the most important being that bacteria tend to grow better in humid atmospheres and this of course, is not good for the snakes. Apart from that the scales of the snakes tend to get infected if the terrarium is too humid.

In constructing and decorating a terrarium it is a fundamental rule that it first of all should be as practical as possible - and as the second priority as beautiful as possible. Why is this? Because if one gives beauty first priority the terrarium will be so filled up with plants and other decorative objects that one will only find a small proportion of the plentiful faeces produced by the snakes. Any terrarium has to be both nice and practical, i.e. easy to clean.

### RESTLESS SNAKES

If snakes are restless it may indicate that some of its requirements are not being met. Other possibilities are that it is ill, or that it is looking for a partner in the mating season, that it is a pregnant female looking for a place to lay her eggs or that it is very hungry. The above mentioned reasons for restless behaviour have nothing to do with the normal decoration and climate of the terrarium, but nevertheless one might often find the reason here. For example if the terrarium is too warm or too cold. Alternatively there may be too few hiding places and/or unsatisfactory temperatures in these places. If none of these factors apply, an alternative reason should be sought.

### THE FOOD

Almost invariably a healthy adult corn snake will eat mice. Mice constitute the main part of the diet for my corn snakes. Periodically I offer day old chicks, which are also avidly accepted. I always feed them on dead animals, which are readily taken when moved in front of the snakes, but if you care for your fingers use a pair of forceps! One

reason to offer dead food is that it is easier to keep an eye on feeding snakes when there is no live food in the terrarium. The more movement there is in the terrarium the greater the possibility that they will attack each other and each other's food. One should always watch the snakes until they are all finished and thus ensure that two animals do not start eating the same prey. It can be very difficult to persuade a snake to release its prey in order to separate snakes which have attacked the same prey. One possibility is to immerse them in cold water suddenly. If you do not separate them there is a great risk that one snake may be eaten by the other.

The digestion of the prey takes two to three days and immediately afterwards the snakes are ready to eat again, but take care that the snakes do not get too fat. An adult corn snake should eat one mouse a week on average. It is a fact that many snakes do not eat whilst shedding their skin but this does not always apply to corn snakes. They are not as active as usual but they will often eat the prey with the same enthusiasm as usual.

## VITAMINS AND MINERALS

It is essential to provide the animals that are fed to the snakes with the best food possible. They should be given the special foodstuffs for mice and rats because these contain the right amounts of vitamins and minerals. If one does this it is not necessary to offer extra vitamins to healthy snakes. However, if the prey is fed on poor foodstuffs this will result in a deficiency in the snakes. Then vitamin injections should be given to the snakes, intra-muscularly. Another solution is to inject the dead prey or to put vitamins into the drinking water. In the latter case it is hard to determine the necessary dose. If one



Foto 7. Dead prey is injected with vitamins. Foto: Ulf Otsen.

wants to provide one's snakes with precautionary vitamins one can give it to the snakes two to four times a year. The dose per kg animal should be about two to three times higher than the dose for mammals.

A deficiency of vitamins is the cause of two well-known diseases in snakes: mouth canker, which should be treated with antibiotics; and problems concerning the shedding of the skin. These diseases are not often seen with snakes that have been kept in captivity for some time, but we do see them in freshly imported wild-caught animals. It is evident that many wild-caught animals show a declining resistance because of a deficiency of vitamins, stress or an attack of endoparasites. They may also have problems concerning hormones and their metabolism. All this is caused by the often very bad and filthy conditions under which the snakes have been kept on the long journey from the catcher to export- and import dealers and



finally to the customer. A lower resistance will cause more infections by bacteria and viruses. So mouth canker and gastric and other internal infections might be the result. The snakes might even vomit partly digested animals. This is the reason why all freshly imported snakes should be treated with intra-muscular vitamin injections and if they show signs of diseases this treatment should be repeated two to three times at fourteen day intervals. Antibiotic treatment may also be necessary.

## ANTIBIOTICS

Antibiotics are only effective if a full course is given. Whether one will apply medicine for injection use, oral use or topical application is determined by the part of the snake that is infected. In the case of an injection or oral application of antibiotics a reduction of the natural and necessary intestinal bacteria not can be avoided. Therefore these methods should only be used when really necessary.

If the infection is not too serious and visible, one can use the simpler and less risky method of an antibiotic ointment, which is applied directly on the infected places. In cases of oral application or injection it is essential to consult an expert and to establish the necessary dose very carefully. If an overdose is given the snake will probably die and if the dose is not enough the bacteria which we want to kill will become resistant to the antibiotics. One should use the most effective antibiotic for the disease concerned. Specificity is important. If one does not know which bacterium one should obtain a sample for a veterinary surgeon to test for sensitivity to different antibiotics. Even so, more often than not *Pseudomonas* bacteria are the cause of the

problems so one should at least use an antibiotic which will kill these bacteria.

Do not use antibiotics too often. Some of them can have negative effects on among other things, the kidneys and liver of the snakes. One of the most effective antibiotics, Chloramphenicol, unfortunately has a very poor record as far as negative side-effects are concerned. In general, one should only use water-based medicines as oil-based medicines do not work very effectively in reptiles.

## ENDOPARASITES

Wild animals should be checked for endoparasites, because many of these, for example round worm, do not need an intermediate host in order to multiply themselves. So the thousands of eggs of the round worm are spread all over the terrarium when the snake defaecates and some of them will consequently be swallowed by all the other snakes, even if one tries to keep the terrarium as clean as possible. If one does not do anything about this progressing infestation the snakes will surely die after some time, suffering from a chronic gastric and intestinal infection caused by worms. Therefore a snake should be treated against such parasites while it is still in quarantine. However, do not be too quick to do this. First the snake must have regained some of its resistance to diseases. Whether or not a snake is suffering from endoparasites can be ascertained by looking at its faeces through a microscope. If the snake is ill one will find eggs of worms and in some cases the larval stages. If the first time one checks the snake's faeces does not show the snake is suffering from an infection caused by worms, one should repeat this check two or three times as eggs do not necessarily always occur in the faeces. Experience taught us that most wild snakes are

suffering from one worm infection or another, so it is necessary to treat most specimens. Most endoparasites can be satisfactorily controlled, however, one must be careful in treating snakes with antiworm medicines.

Nevertheless, if the medicines are used correctly the snakes will improve. After treatment, one should, of course, check the faeces again to see if all the worms are really killed.

## EPILOGUE

Many people have kept snakes for many years without thinking about the things that are said above. Usually only a few of their snakes have died. However, I think that too many snakes die within the first year following importation, and many of these could easily have been saved if the treatment had started in time. It is possible to learn a lot about the ways in which to fight diseases from articles in this and other magazines. Furthermore, a lot of books deal with these problems. One might also try to get help from veterinarians and fellow-herpetologists who are familiar with the subject.

Finally, if one buys captive bred or long-term captive specimens the risk of buying a sick animal is minimised.

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Translation: Astrid Gomes / Rob Bos.