

Lacerta schreiberi in a Dutch outdoor terrarium

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INTRODUCTION

In this article I report on my experiences with *Lacerta schreiberi*. Apart from information on how to breed these animals, I will also review their characteristics, distribution, behaviour, feeding and housing.

CHARACTERISTICS



Lacerta schreiberi, juvenile.

Photo: H.A.J. in den Bosch

Lacerta schreiberi belongs to the group of green collared lacertids. Other species in this group are *Lacerta viridis* and *Lacerta agilis*.

The maximum total length of *Lacerta schreiberi* is approximately forty centimetres, but most individuals remain considerably smaller. Males and most females have a green body and a brown tail, although some completely brown females are known as well. The males have a more or less reticulated pattern of black spots on the back and sides. The spots on the back are almost invariably larger than those on the sides.

The females have large black spots on the back, which are generally close together and arranged in longitudinal rows and some speckles on their sides. There are no smaller spots or other markings between these rows. Males have a spotted belly, while females are more faintly spotted or have no markings at all. Like all other lacertids, males have a larger head, more strongly developed femoral pores and their tail base is wider than that of females.

Juveniles are greenish brown with white or yellow dark-outlined spots. These spots sometimes remain visible throughout the first few years in females.



Lacerta schreiberi, female.

Photo: H.A.J. in den Bosch



Lacerta schreiberi, male.

Photo: H. Biard

DISTRIBUTION

Lacerta schreiberi inhabits the northwest and central parts of the Iberian Peninsula.

Most localities are at elevations between 800-1800 meters (ARNOLD, 1980). This species is often seen near streams, but records exist of animals in dry habitats as well. For example, Piet Mantel (pers. comm.) has observed this species in a dry oak forest in the Sierra de Guadarama in Spain. At that site, the daffodils were still flowering during the time of observation (May 1986). The temperature was 22°C with a relative humidity of 67%. There was no open water to be found anywhere in the direct vicinity. The lizards live on the ground, between dry leaves, on walls and on rocks along the roadsides. In this habitat, *Psammodromus algirus* and *Podarcis hispanica* were also observed. At a different locality, 1600-1700 m (above the tree line in the Serra da Estrela), only males were seen. Here the animals were found along a brook strewn with large boulders. The lizards were seen on the bare rock near water. In this habitat *Podarcis muralis* was also found.

Mudde (pers. comm.) found *Lacerta schreiberi* in the Sierra de Cabrera in Spain. There the animals lived between grass, on rocks and in the bushes along a brook that ran through a small valley. *Podarcis hispanica* and *Timon lepidus* were also present in this habitat.

MALKMUS (1985) reports *Lacerta schreiberi* in the Serra da Estrela in Portugal occurring from an elevation of 1075 m and in sheltered areas up to 1800 m. In this locality, they are closely associated with water.

Personally I observed only one male individual in the Serra da Estrela during the blazing hot summer of 1990. It is possible that I went looking for them at a time that was not ideal, as it was the middle of the day. Contrary to what MALKMUS (1985) writes, I found the animal on a sun exposed dry wall. As far as I could determine there was no water in the vicinity.

In the same habitat, at an elevation of approximately 1000 m, I found *Podarcis hispanica* and *Podarcis bocagei*.

MALKMUS (1986) found *Lacerta schreiberi* in the Peñada-Geres national park in Portugal invariably in rocky, heavily vegetated areas near small brooks. The animals need to climb a great deal onto bushes or tree trunks to reach basking spots. In this area, these lizards are found even below 450 meter.

Virtually all observations reported in the literature indicate that *Lacerta schreiberi* occurs in the direct vicinity of brooks and streams. However, observations made by Mantel and myself show this to not always be true. Still, a certain relative humidity seems necessary for these animals.

THE OUTDOOR TERRARIUM

Since the middle of the 1980s I have kept *Lacerta schreiberi* in both indoor and outdoor terraria. For the outdoor terrarium, Dutch climatic conditions apply.

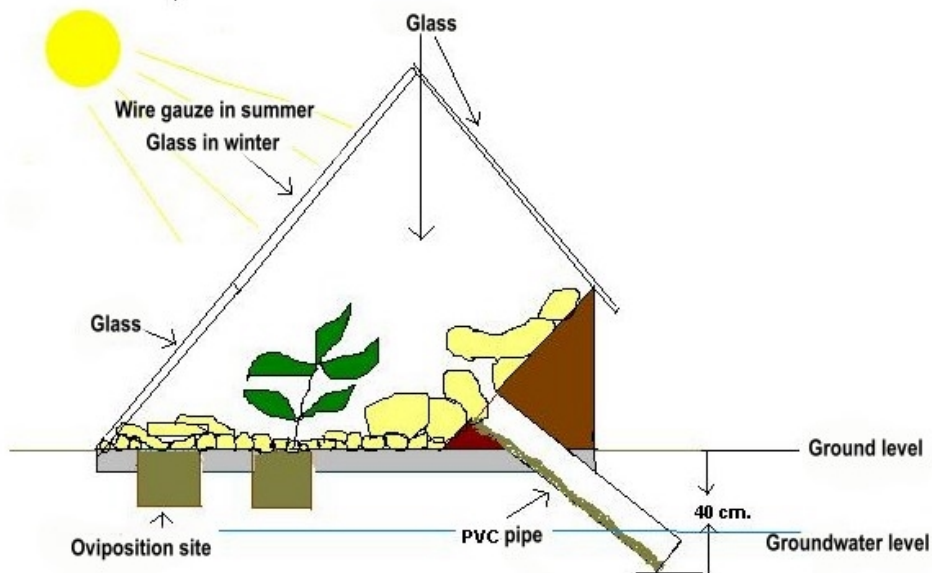
The first few years the animals were housed outside in a large greenhouse, which was divided into separate compartments by brick walls. At the end of the 1980s I disassembled this greenhouse and built several smaller outdoor terraria.

The lizards live in three of these terraria; two of which measure approximately 1.5x0.8x1.2 m, and one terrarium measuring about 2x1x0.7 m. The terraria, which are exposed to the south, consist mostly of glass. The glass can be partially removed during the summer so the animals can benefit from direct exposure to sunlight. The backs of the terraria slope gradually, in order to create inclines with a southern exposure. The floors of the terraria are made out of concrete with depressions for plants and places to lay eggs. These depressions also serve for draining excess rainwater. On top of the concrete I placed a layer of gravel and constructed some rock formations. The terraria are decorated with various plants, such as lavender, thyme, marjoram, laurel and vines (*Hedera*).

A few times a year I need to prune heavily, especially the vines, which would otherwise cover everything. The decoration is completed with some branches and logs. Because the floors are almost completely constructed out of concrete, the females are forced to deposit their eggs in the depressions. These depressions are approximately 10 cm deep and are filled with a mixture of peat, potting soil and sand, and covered with some pieces of flagstone. Because of these precautions it has not yet happened that I have been unable to find the eggs.

The winter shelters consist of PVC pipes, which are buried into the floor on an angle, to a depth of approximately 40 cm. The pipes are closed at the bottom end to prevent ground water from entering; in my garden this is of particular concern in the winter when the ground water level gets very high. The inside of each pipe is coated with metal screen and a cement mixture to obtain a rough surface. In a normal Dutch winter, this type of hibernation shelter does not cause any problems. In case of extreme cold (below -10°C) I cover everything with an additional 20 cm thick layer of straw, hay or leaves.

I currently have three adult males and five adult females in the three outdoor terraria.



Cross-section of the outdoor vivarium.

Drawing: H. Biard

FOOD



Lacerta schreiberi, juveniles.

Photo: H.A.J. in den Bosch

The food basically offers itself; in an outdoor terrarium something edible will fly or crawl in constantly. In addition, I feed the animals mainly mealworms, which in turn are being fed Gistocal, wheat germ and dog food. Sometimes I offer my animals crickets, but the main disadvantage here is that they crawl away instantly and only reappear at night.

The drinking water is enriched with 10.000 I.E. (250 μg) vitamin D_3 and 50.000 I.E. (15.000 μg) vitamin A per litre. Many years of experience has taught me that this combination offers the best results. Vitamin D_3 enables a healthy calcium metabolism, and vitamin

A ensures a heightened resistance against infectious diseases and eye disorders; it is also beneficial for a healthy skin and normal development.

Depending on the weather conditions, I refresh the drinking water in the basins on a daily basis whenever possible. Apart from that, I spray a considerable amount of vitamin-enriched water in the terrarium during early spring. This spraying is necessary because during this period the green houses are still completely closed and there is a large amount of condensation on the inside of the windowpanes. The goal here is to prevent the lizards from drinking the condensing water droplets as they contain no vitamins.

BREEDING *LACERTA SCHREIBERI*



Lacerta schreiberi, male.

Photo: H. Biard

Although I was already relatively successful at breeding *Lacerta schreiberi*, I decided to take things even more seriously during the 1990s. The breeding results of previous years appeared to me to be somewhat of a lucky shot. My experience up to then indicated that *Lacerta schreiberi* thrives in an outside terrarium. Outside, the animals are subject to a more natural environment, and are exposed to direct sunlight, a natural night-day cycle, a better relative humidity and they are also guaranteed to cool down at night. All these conditions are greatly appreciated by *Lacerta schreiberi*. In an indoor terrarium these conditions are almost impossible to reproduce. There also appeared to be fewer or no problems with sick animals in the outside terraria. Usually, there are no large numbers of parasites present. Luckily, my terraria are frequently 'visited' by ants, and, since parasites such as mites are prey items for ants, I love to see the latter visitors appear.

Another factor that, in my opinion, hinders successful breeding is moving the animals. I therefore decided to leave the animals in their terrarium as much as possible. Furthermore, I think it is necessary not to place many females in one terrarium: two really is the maximum, but it is even better to stick with one. If it is absolutely necessary to place several females together, it is important to keep an eye on the animals. Gravid females can be especially aggressive. It speaks for itself that one should never keep more than one male in a single terrarium; this is asking for bloodshed!

In February or March - depending on the weather conditions - the animals will wake up from their hibernation. Just like in nature, males will emerge first, followed a few weeks to a month later by the females. The "reason" males emerge first is related to the maturing of their sperm cells. During the first weeks after hibernation the animals are not very excitable. They are basking in the sun, and only later in the day when the temperature rises somewhat, will they become slightly more active. They also do not take much food during this time, though they drink often and in large quantities. It is therefore important to supply the animals with plenty of water, supplemented with the necessary vitamins! As spring progresses, the animals will become more active and will soon start to shed their skin. After moulting, the males develop a deep blue throat and head.

During this period, the male will rarely leave the female's side. When more than one female is present, the male usually shows a preference for a specific female. However, this does not mean that he will not mate with the other female.

Sometimes the male spends entire days courting the female; he crawls over her and nudges her flanks with his head. The female responds by drumming her legs and wiggling her tail. If the female is not susceptible to mating, she will try to deter her courtier by biting him.

After the mating activity subsides (depending on the weather conditions this may be as late as mid-May or early June) the males rapidly lose their bright colours. Spring is also the time of year when the females may be aggressive toward each other. My terraria are designed so that there are always plenty of hiding places for the 'lesser' female. In the outdoor terraria, *Lacerta schreiberi* will only oviposit once per year; the clutch size varies between 6-24 eggs with my animals. The number of eggs produced depends on the age of the animal; younger animals will lay fewer eggs. After the female has laid her eggs it is important to excavate the clutch as soon as possible. If the weather is rainy, the eggs may develop fungus and rot, whereas during warm weather they may dry out. Additionally, one should never exclude the possibility that some prey animals will see the lizard's eggs as treats.

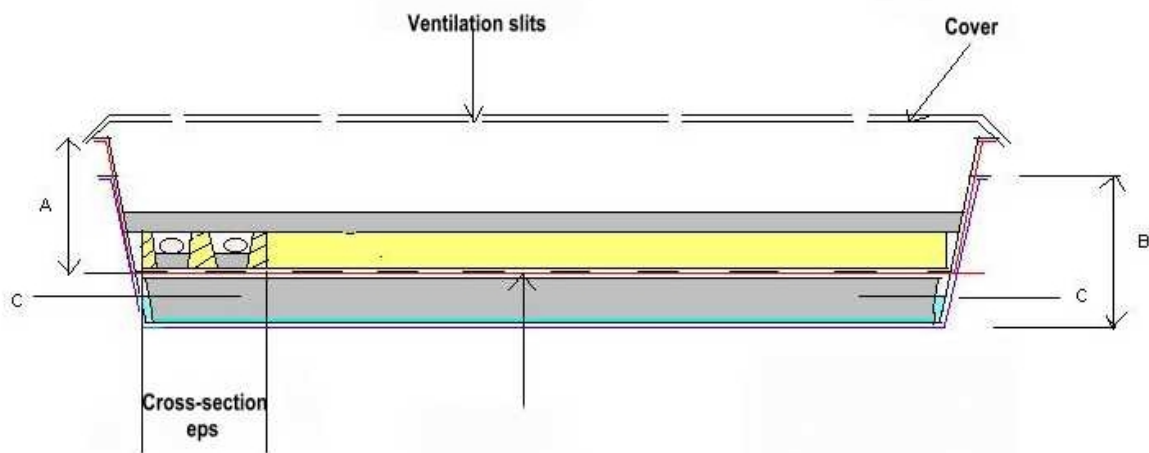
I have never observed *Lacerta schreiberi* eating its own eggs. This is in direct contrast to an observation of mine from several years ago when I saw a male *Podarcis milensis* eating the eggs of its own species.

CARE OF THE EGGS

Lacerta schreiberi displays a degree of parental care; it frequently happens that the female will attack me when I remove the eggs. Usually the female will try to restore the egg-laying site. I have observed one female that was still repairing her egg-laying site several days after the removal of the eggs.

I never clean the eggs, but if they are stuck together in a cluster, I will carefully separate them. This is a very precise job, unless performed with the greatest care the eggs may rupture. You can also leave the eggs attached.

Usually, it is possible to determine from the shape and colour of the eggs whether they are fertilised or not. They need to be firm and have a filled out shape; they can not have too many dents. If the eggs display a pinkish hue, you can be certain that they are fertilised.



Incubator. A=inner container, B=outer container, C=water level (approx. 2 mm). Yellow=expanded polysterene; grey=substrate.

Drawing: H. Biard

The eggs are placed in a plastic box that has parts of the bottom cut out. This plastic box fits perfectly inside another plastic box of the same type. The space that is formed between both bottoms contains a layer of water (essential!) and a substratum. The substratum is the filter from an air filter system. This material does not excrete any toxic substances, is permeable to water and is easily cleaned with some hot water. On top of the substratum I place sheets of Styrofoam that have concave circular depressions cut out. In these depressions I stuff little pieces of the substrate; in the remaining space I place the eggs. Each depression is marked with a number, so that I can determine which species, and which specific female produced the eggs. The entire set-up is covered with a layer of the filter material, and the box is closed with a lid that contains holes for ventilation.

The advantage of this method is that the eggs are not in direct contact with the water and proper ventilation is guaranteed. It is also possible to easily check on the eggs. The entire box is placed inside an incubator, which is heated by three 15 watt light bulbs. The light bulbs heat an iron drawer from below. The drawer contains some dowels on top of which the box with the eggs is placed thus creating a buffer preventing major temperature fluctuations inside the plastic box. The thermostat is set at 28°C. At this temperature, the eggs hatch after 37-50 days (see table). Sometimes there can be a large variation in the incubation period of a clutch, a phenomenon that I am unable to explain (though perhaps the temperature is less constant than I assume).

REARING THE YOUNG

The juveniles are transferred to an indoor terrarium directly after they hatch. Those terraria are made out of glass, and only contain a layer of sand mixed with garden mulch, or a comparable material, and a few pieces of flagstone. Contrary to my earlier attempts, I now keep the juveniles as dry as possible, meaning that save for a bowl of drinking water there are no wet spots inside the terrarium. The reason why I do this is because mites and ticks do not handle these conditions very well; now I rarely have juveniles that are infected with these unwanted guests. A 25 W spotlight heats the entire terrarium. The daylight length is 12 hours.

The animals are fed small crickets and buffalo worms, which are dusted with Gistocal first. If present, I offer them aphids as well. These prey animals are so small that even the smallest juveniles can eat them without problems. After several weeks they will also gladly accept recently moulted mealworms. Their drinking water is enriched with vitamins.

Sometimes the young can already be intolerant and bite off each other's tail tips. Often, putting some tufts of dry grass inside the terrarium will help because the animals can hide in there. After several months it is usually possible to recognise both sexes. Although I have quite extensive experience with *Lacerta schreiberi*, it is still possible to make mistakes. Nowadays, I look not only at the tail base and for visible femoral pores, but I also check for light spots between the eyes and on the upper jaws of the animals; in females these spots remain visible longer than in males. Also, females have a longer torso than males. Sexual dimorphism based on head scalation, as described by BOSCH (1990), appears incorrect and based on coincidence.

Once the animals become subadults, I move them outside or to a large indoor terrarium.

Depending on the number of animals, I decide whether they will go into hibernation or spend their winter in a warm environment. Both methods have something going for them; hibernation is more natural, but there is always the risk that the animals may die.

If the animals do not hibernate and thus are kept warm, they grow more quickly. They will mature sooner and may produce offspring earlier. It is convenient to have some nearly or even fully-grown animals present in the spring, in case something goes wrong with the parent animals that hibernate in the outdoor terraria. However, I doubt that this is beneficial for the general well-being of the animals. It seems like a disturbance of the animal's biorhythm that can not be beneficial for its health.

year	date of discovery*)	number of eggs	hatching date	number of young	incubation period in days
1993	26/05	24	08-10/07	10	44/46
1995	22/06	17	08-10/08	13	48/50
1996	09/06	15	22-23/07	15	44/45
1996	17/06	17	31/7-02/8	14	45/47
1997	21/05	6	08/07	2	49
1997	28/05	14	03-06/7	14	37/40
1997	28/05	14	06-11/07	12	40/45
1998	29/05	21	10-12/07	10	43/45
1998	29/05	19	09-12/07	19	42/45
1999	28/05	24	10/07	23	44
1999	22/05	10	04-07/07	10	44/47
2000	27/05	9	12-13/07	2	46-48
2000	30/05	20	12-17/07	19	44-49
2000	3/06	19	17-19/07	6	45-47
2000	8/06	14	20-24/07	12	43-47

Table: Overview of the breeding records of individual female *Lacerta schreiberi* arranged by year.

*) In general the date of discovery is also the date of oviposition.

SUMMARY

Lacerta schreiberi is a lizard that is especially suited to an outdoor terrarium. Provided that the necessary precautions are taken, this species is relatively easy to breed.

Females and males of this species can be distinguished easily by the pattern of spots on their back. The scalation of the head does not give conclusive information on the animal's sex. In nature these lizards are often found near water, but definitely not always. Under Dutch climatic conditions, these animals can be kept outside perfectly well. During the summer months my terraria are mostly open on the top, but in the winter they are covered again. The bottom substrate consists mainly of rocks, with only one suitable place where the animals can lay their eggs. There is a hiding place where the animals can retreat in winter, or during the summer when the conditions are unfavourable. The remainder of the decoration consists of some plants and logs. The lizards are mostly fed mealworms and their drinking water is enriched with vitamins A and D₃.

LITERATURE

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