

Successful keeping and breeding - the Collared lizard (*Crotaphytus collaris*)

RICHARD HARLING

6 Cobham Way, Merley, Wimborne, Dorset BH21 1SJ, U.K. E-mail: harling@xaltmail.com

CROTAPHYTUS *collaris* are medium-sized lizards, with a long round cylindrical tail with a broad head and fairly blunt snout. They measure approximately 25cm in average length, of which just under two thirds is tail. There is quite distinct sexual dimorphism, with the males often being spectacularly coloured, with bright blues on the dorsal and lateral body parts, and yellow on the head, depending on the subspecies. Females tend to be a more fawn colour, with white spots. Both sexes are usually white ventrally, except for their throats which may have diffuse banding and in males may be yellow. In my females a few black spots develop after egg-laying. Sometimes the males have yellow bands across the back. A pair of black 'collars' are always present just below the neck and are the characteristic after which the common name is given. In the wild there is great variation in coloration, depending on the subspecies.

The juveniles tend to adopt the general female coloration until they are sexually mature, even so far as having some orange bands and spots which may imitate gravid females. This could be helpful in reducing adult male aggression and predation (Husak *et al.*, 2004). Collared lizards will eat almost anything that is small enough to overcome, adult lizards easily taking fully grown locusts, and apparently in the wild may include smaller lizards in their diet. When hungry they will rush headlong, leaping if necessary, at anything that moves, including any fingers that are holding food. I find them not very keen on giant mealworms and the babies and juveniles I have bred are reluctant to eat normal mealworms, though they will occasionally. However, at least captive bred lizards are not aggressive in captivity; in fact they are exceptionally tame, yet pleasingly alert and lively. They sit and bask without fear and do not jump around or become startled when people move near the vivarium, except to press against the glass if they are hungry, which they are most of the time,

especially the females when gravid. They will even jump out of their vivarium to catch a locust from the pot used to put vitamin powder on them, then dutifully hop back in to the vivarium to sunbathe. After the breeding season is over, they become much less hungry and more secretive, hiding under bark much more often, as well as eating less often. At this time I have lowered the temperature a little to compensate for their lack of food intake, so they can preserve their fat reserves. Last year the male went into hibernation looking slightly thin, but he was fine. In my opinion they meet many criteria for the perfect lizard 'pet', being more active and interesting than the ubiquitous Leopard gecko and having more attractive colours than most Bearded dragons, as well as having interesting behaviour, and not losing their tails under most conditions, nor being apparently stressed by captivity. They are able to be handled without being traumatised, feed ravenously and are easy to keep healthy and seem to be easy to breed in principle, thus reducing pressure on wild stocks. The only reservation I have is that they have some reputation for not feeding and then entering a downward spiral. I must say that I have not had this except for the adults reducing their food intake after breeding (it is September as I write and they have are at this stage now). I have read on the internet, that in the wild adults will do this and it may be to reduce adult predation on the youngsters.

Captive care, housing and feeding

I keep them in a 90 cm vivarium, using cat litter or vermiculite as substrate to absorb the liquid part of the faeces. The faeces are copious and can be smelly especially if the crickets and locusts are gut loaded with dandelions and other vegetable matter. The cat litter has helped to keep down the smell and also helped keep the humidity down, but it is not infallible. Approximately 15 cm from one end there is an ordinary 100W spot lamp hanging from the top, under which is a small pile of limestone for

Clutch laid (incubation temperature)	Hatched	Number hatched
1 st April (29°C)	21 st May (7 weeks)	10 out of 11
6 th May (29 then 26°C)	9 th July (9.5 weeks)	10 out of 10
16 th June (26°C)	29 th August (11.5 weeks)	9 out of 10
	Total hatched	29 out 31

Table 1. Dates of egg-laying (+ hatching).

to take any chances with the opposite problem. The fact that I have achieved nearly 100% hatching success suggests that my regime is working and has done so well for two years now.

basking. There is also a UV light (which was used last year as well, so it is not a new bulb) inside the vivarium, so that the lizards are rarely more than 25 cm away from it. The temperature does get quite high, around 40°C at times surrounding the spot light. I have not used a thermostat to regulate the temperature, merely ensured that there is a temperature gradient, and pieces of cork bark on the floor to provide refuge at the end opposite the light. This has worked out very well and the lizards have thrived. I have a container of water in the vivarium at all times, but I have never observed the adults drinking from it, nor do they appreciate being sprayed as is suggested by some keepers; they tend to run away from the spray. They will lick water off a human finger if offered, or from a syringe, but seem to gain plenty of moisture from their food. Their faeces are moist which suggests there is no problem, and their successful breeding doubly suggests that they manage to hydrate themselves from their food.

The lights are set come on at 09:00 h and to go off at 19:00 h. I usually find they have retreated well before this time.

I feed the lizards every day and they will often eat two or three full sized locusts, or numerous crickets at one sitting. The male will tend to eat the equivalent of one locust plus a couple of full sized black (African) crickets each day. The female is usually ravenous, especially when she is gravid, which she has been for most of the time since March (as noted earlier it is now September as I write). I dust the crickets with Nutrobal for every feed. As previously mentioned, I also feed the locust and crickets on dandelion, but also any spare vegetable matter from the kitchen. I have read that over calcification or vitamin problems may occur with frequent use of powders, but the female has laid so many eggs, that I did not want

Breeding

Between November 2005 and January 2006 I placed the adult pair in our shed over a period of eight weeks. During this time I placed them into a glass aquarium, which was packed with loosely scrunched up balls of newspaper, with folded newspaper on the floor and around the walls of the aquarium. I placed a bowl of water inside in case it should be needed and inspected the pair once a week, finding them to be very torpid, but they showed no signs of weight loss. I was somewhat anxious that this desert species may be too cold, but it did not turn out to be the case and this is the second year they have been hibernated. Last year (2004 to 2005) I only hibernated them for six weeks, as the male was only in his first year. When I brought them out of hibernation, the male began to court the female a few days after switching the lights back on, but she showed no apparent interest, evading his mating attempts by twisting her body round and inflating her throat. However, she did lay one clutch of eggs, but they all failed probably due to a problem with my incubator (since corrected) – this was the only clutch she laid. After this I decided to increase hibernation to at least eight weeks, to increase availability of food and to check the eggs and incubator much more regularly, as well as making sure there was always a pot of damp vermiculite in her vivarium.

In the middle of January 2006 I brought the pair out of hibernation and placed them back in their vivarium, without the lights on, with just a heat mat. They were soon reasonably active and I turned on the lighting. After reading articles about them on the Internet, I expected that the lizards would become interested in breeding very rapidly, but found that although the male was quickly head bobbing and trying to grab the female, she took until the end of February to allow his advances to



Figure 1. Adults (male left, female right); they often gape when under the heat lamp.

be successful. Mating was a pretty typical lizard affair of chasing and the male gripping the female's neck, while twisting his tail under hers. There was also a large amount of head bobbing by the male. If she was willing to mate, she was fairly placid (though didn't seem exactly happy). If she was not ready, she would twist her body round to make it impossible for mating to occur, when he let go she would swell up her throat and stand on extended legs while making her body vertically large, but thin (a bit like a chameleon's body) and he would lose interest for a while. I think it is helpful that the female is bigger than the male, who is at least one year younger than the female. His attentions are therefore less of a problem to her. With a more equal-sized pair, I suspect a pair of females would help them to get respite from the male's amorous advances.

Figure 3. At 28°C, the first clutch took 7 weeks to hatch (laid 1st April 2006, hatched 21st May 2006).



Figure 2. Eggs within incubation chamber.

The female began to swell up like a balloon, and I found it very difficult to feed her enough food to get her full for longer than a few hours during the day. She then developed bright orange spots on her flanks and between her black collars (Figure 1). Baird (2004) suggests that female coloration is a stimulus to mating. In the experience I have had over the past few years, the male needs little encouragement, so long as he has hibernated, and the female has not developed any sort of breeding coloration until after mating and until just before egg laying. She retained this coloration for much of the year thereafter until August, always becoming especially bright a few weeks before egg laying.

Finally two days before the end of March, she would not eat anymore. She just looked too fat to fit anything in, though she did occasionally lunge at a locust, and then lose interest.

Figure 4. It took two full days for all the hatchlings to emerge.





Figure 5. Hatchlings at 2 days old.

In the centre of the vivarium I had placed a round, plastic sweet pot that was 13 cm in diameter and 12 cm deep that was half full of damp vermiculite (6 cm depth). I laid a piece of bark up to it and occasionally put the female into the pot, so that she knew there was a source of damp substrate. She often would go to the top of the bark, occasionally jumping into the pot. On 1st April, she laid her eggs, which took a couple of hours. Once she began to cover them, I removed them from the vivarium and made sure that most were exposed so that I could monitor their progress. The female's behaviour was interesting, as she kept trying to cover the eggs, despite their removal. She pushed substrate from the bottom of the vivarium in the place where the container had been, with her forelegs and kept doing so until there was quite a pile and some disturbance to the arrangements of the vivarium.

The eggs in their container were placed into a large homemade polystyrene box incubator (Figure 2). Inside I put a heat mat on the base, and put a wire grid on it that I made out of some wire mesh from a garden centre. Onto this wire grid I placed the egg pot and covered it with loosely fitting plastic lid, with a few holes in. The heat mat was controlled by a Habistat unit, which controlled the temperature very accurately. At all times the lid of the pot had some condensation on it (not too much, but a good few drops mostly) and the vermiculite did not dry out at all so I did not need to add any more water. I checked the eggs once or twice a week and ensured that the air was fresh. One egg went off within two days, smelling of mushrooms,

so I removed it. The others had an almost antiseptic smell, and though turning very yellow and unhealthy looking, swelled up and seemed to be developing fine (Figure 3). By the last three weeks, the eggs were quite dark inside and it seemed obvious there was life developing, though "candelling" the eggs did not show much, and not having kept collared lizards before, I was unsure whether this was normal. However by the end of incubation, before hatching, the babies could be easily seen through the shells of the eggs.

By the time the first clutch had been incubating for some weeks, the female was again swelling up like a balloon and she laid a further clutch of 10 eggs on 6th May.

Finally, on 21st May, the first clutch of eggs began to hatch (Figures 4 and 5). It took two days for the last lizard to emerge, after the first head appeared out of the first egg. I thought that there were nine eggs in total (eight not including the one that went mouldy), but in fact I got 10 babies, finding that there were two eggs buried deeper in the vermiculite that I had not noticed and thus not able to expose for checking.

The babies seemed very large compared to the parents, with large heads. They did not eat for two or three days, but once started they began literally throwing themselves onto crickets with gusto. They grew rapidly and could eat quite large crickets very early on. I have kept the babies in much the same way as the adults.

On the 16th June a third batch of eggs was laid. Nine eggs were visible, two buried in the vermiculite, another seven I gently exposed so that they could be monitored (when they hatched it transpired that there had been 10 eggs).

On 9th July the second batch of eggs hatched. The first clutch were now over 15 cm long and very sturdy, eating ravenously, often gripping each other's heads in their excitement. No permanent damage being inflicted, though occasionally some blood was spilt early on. All injuries healed very quickly.

What turned out to be the third and final clutch of the year hatched on 29th August. One egg did not hatch, and when opened there was a fully formed baby, with some yolk, indicating that it probably died a week or so before the clutch hatched. This probably indicates some calcium deficiency after three clutches, but the other babies were very healthy, with no deformities and all fed well.

Final comments

The lizards I obtained seemed to have very easy requirements. They were healthy when I bought them and always fed well, barring at the end of the season. If they are feeding they are warm enough and healthy, other than a definite slow down in the Autumn, no matter what heating and lighting regime is adopted. I would recommend that the adults are hibernated due to their relative reluctance to feed in the Autumn. The secret to keeping them successfully at this point seems to be to cool them down, to ensure they do not use up their food reserves, rather than turning up the heat and trying to stimulate them to feed – they will not feed and then will just shrivel away.

Overall they seemed to be prolific ('r Selected' having three clutches or so with multiple eggs?) as well as being very suited to and at ease with human interaction.

I have bred Ibizan wall lizards (*Podarcis pityusensis*), anoles (*A. carolinensis*) and day geckoes (*Phelsuma* spp.) before, but I must say that these are the easiest I have ever had to keep, breed and rear, as well as being much more rewarding for my children. When they sit on your hand they look at you, in much the same way as a Budgerigar or a tame mouse might, then may suddenly dart off, but they rarely try and evade capture, stopping periodically to look around. They can, if they want to, run on just their hind legs, such is the speed that they can achieve. Their back legs are reminiscent of frogs hind legs and they can leap ably. Considering that they are a desert species, they seem quite easy to provide with UV light and to ensure no problems with rickets or calcification of eggs. All the babies have grown healthily so far with no signs of crooked tails or other signs of deficiency.

Footnote – March 2007

I had an experience with the third batch of baby Collared lizards, which may be of interest as a footnote to this article.

I introduced two fairly large garden spiders as food for the babies, as a bit of variety. Soon afterwards, I noticed that one of them was dead, despite looking well fed and healthy. Later I found another that was alive, but, though breathing and with its eyes open, could not move very much. I placed the baby into an incubator and kept it alive for a week. Unfortunately it eventually died,

occasionally moving slightly but in a very uncoordinated and lethargic way. I found another baby in a similar state the next day. I did not immediately make the connection. At first I thought there must be some effect of having so many babies from one female, probably due to lack of calcium. Maybe it was an end of season slump that collared lizard babies were prone to?

I then realised that the symptoms were similar to being paralysed and removed the spiders which had not been eaten after a week.

Since this point this I have lost no other babies from the third batch (as I write this footnote it is March 2007, some months later) and had lost none at all from the previous two batches of babies. The remaining five babies which I have retained, are now, as I write this footnote, half grown, are all extremely healthy, feeding voraciously and have even undergone a hibernation for 9 weeks in the garden shed with no ill effects.

I will be very wary of feeding garden spiders to lizards again. A number of years ago I gave a full grown House spider to a male Common lizard (*Zootoca viviparous*) and it managed it with no problem and I have given small garden spiders to *Podarcis pityusensis* babies with no problem before.

Although I did not have the dead babies checked, it seems that they could well have been bitten and poisoned by the garden spiders, unless there was some other highly coincidental factor that has not affected the previous two batches of lizards, or the remaining half a dozen from the third batch of babies.

The third batch of babies also had an unfortunate tendency when lunging at food to grab other lizards' tails. This has resulted in one or two babies with half tails. Despite the fact that autotomy does not occur in this species, the tails are now showing signs of regrowing.

REFERENCES

- Husak, J. F., McCoy, J. K., Fox, S. F. & Baird, T. A. (2004). Is coloration of juvenile male collared lizards (*Crotaphytus collaris*) female mimicry? An experimental test. *J. Herpetol.* **38**, 156–160.
- Baird, T. A. (2004). Reproductive coloration in female collared lizards, *Crotaphytus collaris*, stimulates courtship by males. *Herpetologica* **60**, 337–348.