

THE MAINTENANCE AND REPRODUCTION OF THE WESTERN
FOX SNAKE, *ELAPHE VULPINA VULPINA*, IN CAPTIVITY.

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INTRODUCTION

At the time of writing this article, August 1987, I have been maintaining three specimens of *Elaphe vulpina vulpina* for thirteen months on behalf of a friend, David Gales. In July of 1986 David asked me if I could look after these snakes, as due to his employment and studies he would be spending a considerable amount of time away from home. I agreed to look after the snakes for him, and on 14 July 1986 I took charge of one male, two females of *Elaphe vulpina vulpina*.

The trio of Fox snakes were introduced to a large terrarium measuring 125x60x37.5 cm (lhxhw).

DESCRIPTION

Adult Fox snakes are stout bodied snakes, unlike most other members of the genus *Elaphe*. The average adult size is 120 cm, and the hatchlings of this subspecies average 30 cm. The general colouration of mature specimens is typically dark ochre or grey-brown above, with an average of about 40 dark brown dorsal saddles. There are similarly coloured small blotches along the sides of the body, and still smaller markings where the dorsal

scales meet the ventrals. The head is usually a uniform brown colour, although some individuals may display faint markings of a slightly darker brown. The lips, chin and abdomen are yellow in colour, with numerous grey-brown checkers that run from the throat to the tip of the tail.

Sub-adult specimens are similarly marked, although the ground colour is much lighter, being a straw yellow (see plate 1). The hatchlings on the other hand are grey with black markings above, and white with grey checkers below. The head is heavily marked with a dark crescent on top which runs between the eyes, and then continues from behind the eyes to the rear of the mouth. The rear of the head is marked with a small forward pointing "V", followed by a triangle of spots that may join to form a "T"-shaped marking (see Figure 1).

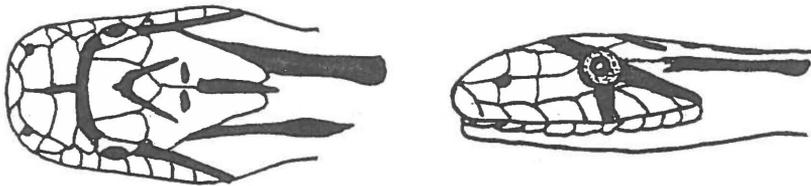


Figure 1. Head markings of juvenile *Elaphe vulpina vulpina*.

The scales are only faintly keeled, but they seem quite thick and give the Fox snake a coarse feel to its body. The dorsals number 25 rows; supra-labials 8, (4th and 5th enter the orbit of the eye); sublabials 11. I have not been able to find any information on the ventral and subcaudal scale range for *Elaphe vulpina vulpina*, so I can only conclude the scale counts for the three specimens in my care, and these are as follows. Male 193: ventrals, 66 pairs of subcaudals. Large female: 204 ventrals, 59 pairs of subcaudals. Small female:

199 ventrals, 60 pairs of subcaudals. Like other members of the genus the edges of the ventrals are keeled to some degree, and in cross section the body is in keeping with other *Elaphe* sp. and ssp. The anal plate is divided.

HUSBANDRY

All three Fox snakes share a terrarium measuring 125x60x37.5 cm (lhxhw). The terrarium is constructed from 15 mm thick melamine covered chipboard, with sliding glass doors. The terrarium is heated by a single light bulb, which can be switched on or off, but is not thermostatically controlled. During warm weather the terrarium can be heated by a 40 Watt light bulb to a temperature of 30°C near the light/heat source, and 23°C at the coolest part of the cage. It is turned off at night when the weather is warm. During cooler spells the 40 Watt bulb is replaced with a 60 Watt, and when the weather is continually cold the light is left on all of the time. This of course means that no set photoperiod exists, but this has not prevented these particular snakes from successfully breeding. The floor of the terrarium is covered by newspaper, and several large bricks are used to support three large, flat slates which provide shelter. A 25 cm diameter plant saucer with a section removed and turned upside down also serves as a shelter. The water bowl is a 20 cm diameter plant saucer, which means that the relative humidity is low. A large branch has recently been installed so that the snakes have the opportunity to climb.

They are very active snakes, and this caused me some concern when I first began looking after them. I have subjected them to a variety of conditions and terrarium sizes, but this has had no effect on the seemingly excessive amount of activity these snakes display. They are even active at very low

temperatures, (see 'Hibernation'). Being very active they are also hungry for much of the time. One feed per week of two to three mice does not satisfy their appetite, so these snakes are fed twice a week on five to six mice each. They will usually rest for a few days following a large meal, but are hungry as soon as this has been digested. The longest periods of inactivity other than hibernation occur when sloughing takes place, and this lasts for seven to nine days. Immediately after sloughing they become active again, constantly prowling up and down the terrarium until food is offered. All three snakes slough at fairly regular intervals of two months. In the thirteen months that I have been caring for these snakes the male has sloughed eight times, the large female seven times and the small female six times. During eight of these months, the male has consumed forty-six rodents, the large female fifty-five rodents and the small female forty-three rodents. The remaining five months were spent in hibernation.

HIBERNATION

The male was removed from the large communal terrarium to a small terrarium of 60x37.5x37.5 cm on 2 December 1986. The terrarium was lit and heated by a 25 Watt light bulb during the day to a temperature of 18°C, which fell to 15°C overnight when the light was switched off. On 3 January 1987, both females were placed in a separate terrarium of the same size, but without a light/heat source. The male's cage was no longer being heated and up until mid-January the temperature averaged 10°C, and all three snakes were still quite active during the day. On 12 January the temperature in the hibernation terraria fell to 3°C, and this rendered the snakes inactive. A deep layer of dry straw was added to both cages, but the temperature

rose the next day to a little over 40°C, and the snakes became active again. The cages remained unheated until mid-March, and the temperature fluctuated between 10°C and 15°C during the day, and 5°C to 12°C during the night.

From 16 March the cages were heated to a temperature of 22°C to 25°C during the day, falling to 13°C overnight. Two weeks later the male was introduced to the females, and all three snakes began "twitching" when they came into contact with each other, but no matings were observed. On 29 March the male entered a slough and so was separated from the females. The male's cage was not heated and it took eighteen days for the process of sloughing to be completed. The male was then returned to the females' terrarium for two weeks, during which time no matings were witnessed, and then both females went into a slough. The male was separated and the females left unheated, and the process of sloughing lasted seventeen days.

All three snakes were then returned to the large terrarium on 19 May, but the only activity observed was that of the snakes taking an interest in their new surroundings. A few days later they began feeding, and although some "twitching" was seen there was no evidence that mating would follow.

REPRODUCTION

As the snakes had fully emerged from hibernation and had commenced feeding, I decided that it was doubtful that these snakes would actually begin mating unless some competition was introduced. Not having another male Fox snake, and not knowing anyone else in the U.K. with an adult male, I decided to introduce the male Corn snake on 25 May. His presence had an amazing effect on the male Fox snake, who began courting the large female Fox

snake immediately. The Corn snake retired to a hiding place, but after an hour was removed as no matings were observed. The following day the process was repeated, but two female Corn snakes that were on breeding loan to me were also introduced along with the male. This resulted in the same activity between the Fox snakes, but still no matings were observed during the course of the day so all three Corn snakes were removed. The whole process was repeated for several more days until 30 May when the first observed copulation occurred between the male Fox snake and the larger of the two females. This copulation only took place after the small female Fox snake had been removed, as she was proving to be a distraction to the male. The copulation lasted for 25 minutes, and the small female was then reintroduced. The male still appeared to be sexually active, but no matings took place with the small female. The Corn snakes were removed overnight and then reintroduced the following morning. In the early evening the male Fox snake attempted to mate with the large female again, although copulation did not take place. All three Fox snakes were fed a few hours later, after the Corn snakes had been removed. The Corn snakes were reintroduced the following day, 1 June 1987, but were removed when it was obvious that the Fox snakes were showing no more interest in mating. The Corn snakes were not introduced again after this date, and on the evening of 5 June the male and large female Fox snakes were observed to be mating again. The male showed very little interest in the small female, and it is now thought that she is still immature.

On 7 June at 12.35 am the male was witnessed attempting to mate with the large female again, but she was resisting his advances vigorously. The male then began biting the female about the head, eventually gaining a grip on her neck in an

attempt to restrain her, but this proved to be ineffective as the female thrashed her tail from side to side, preventing the male from copulating with her. This violent activity continued until 2.05 am, but I became too tired to continue watching them at this point and went to bed. When I awoke in the morning I discovered their terrarium in an absolute shambles due to the frantic activity of the attempted mating. After this no further mating activity was observed and on 12 June both females entered a slough, and the male followed suit on 14 June. All three snakes had completed sloughing by 20 June and it was becoming increasingly obvious that the female was gravid. The snakes remained housed together until 28 June, but due to the gravid females increasing girth and restless behaviour the male and small female were removed to a separate terrarium. All three snakes continued to feed well, and the gravid female accepted what I considered would be her last meal before entering her pre-laying slough on 2 July. However I was to be proven wrong because the following day it became fairly obvious that egg-laying was imminent as the female had begun to coil around and around in the peat that was placed in a large plastic tray and which had been placed in the terrarium several days earlier. To allow the female some privacy the 25 cm plant saucer that served as a hide-box had been placed over the tray of peat, and a house brick was used to prevent the plant saucer from being misplaced. By late afternoon much of the peat had been pushed out of the tray onto the terrarium floor. At 19.20 hours the female was discovered coiled around an adherent clump of seven large white eggs and a single larger egg that was coated with peat lay at the females side. The average size of the seven adherent eggs was 50x22 mm, whereas the large single egg measured 60x25 mm. The eggs were removed to a

large (2 kg) margarine tub half filled with damp peat and placed in a terrarium that was heated from the light/heat source of two smaller terraria below. From the first witnessed mating to the time of oviposition is had only been 34 days, even though the female had been kept at an average temperature of 26⁰C.

The eggs continued to incubate for 36 days, at temperatures between 24 and 30⁰C (average 27⁰C), when two eggs on top of the adherent clump started to indent. I was confused by this as I did not consider the eggs to have been incubating long enough to start hatching, and the indentation of eggs on the top of the clump is usually a sign that hatching is about to start. The temperature was a little high, (32⁰C), but the humidity level was alright so I moved the container of eggs to a cooler part of the terrarium. The following morning at 8.20 am the eggs were checked, and one egg on the bottom of the clump had been slit open by the baby within, whose head was sticking out of the slit. I was amazed that the eggs had started to hatch after only 37 days of incubation. The temperature in the container was down to 24⁰C at this time, but thus rose gradually to 28⁰C during the course of the day. At 5.45 pm I discovered that a further two eggs had slit, and the babies heads were protruding from all three eggs. By 10.20 pm the first hatchling had left the egg shell, and considering the rather short gestation and incubation periods it was quite large, measuring 35 cm in length, and plump with a reserve of yolk from the egg. Over the course of the next four days all the eggs slit and subsequently hatched, and all of the babies are perfectly formed and measure approximately 35 cm in length.

REARING THE YOUNG

Once each newly hatched snake had left the egg-shell, it was removed from the incubation container and placed in a pre-sterilized transparent container measuring 180x100x50 mm (lwxh). These containers are normally used for the packaging of crickets, *Gryllus sp.*, that are purchased to feed to lizards, and are ideal for the rearing of small reptiles as they are well ventilated and have tight fitting lids. A single piece of newspaper is used for the substrate, but the young snakes have to be removed from the containers in order to be given a drink of water.

Once the eight hatchlings had sloughed, it was possible to take scale counts, (ventral and subcaudal), in order to determine the sex of each snake. The table below details these scale counts;

Table of scale counts.

Hatchling number	Ventrals	Pairs of subcaudals	Sex
1	197	67	Male
2	195	63	Male
3	203	54	Female
4	203	53	Female
5	200 ⁺	53	Female ⁺ (torn slough)
6	199	55	Female
7	195	63	Male
8	195 ⁺	65	Male ⁺ (torn slough)

Having no other information to work from other than scale counts taken from sloughs of the adult pair (1,1) and subadult female, the sexes stated above may be inaccurate, although I am fairly confident that these sexes are correct.

Two weeks after hatching, and three days after completing the neonate moult, no. 1, 2 and 4 ate one pink mouse each. Once the remaining hatchlings had sloughed they too were offered pink mice but refused to feed. A week later all eight hatchlings were offered pink mice, but only no. 1 fed. Food was offered again two days later when no. 1 and 2 fed. Several days later no. 1 and 2 entered the second slough, and the decision was taken to assist-feed No. 3 to 8 with a rear leg taken from adult mice. Three weeks later, after No. 6 and 7 had been collected by David Gales, the remaining six babies began to feed voluntarily on a regular basis, and are continuing to do so. No. 1 and 2 have now sloughed on three occasions, and no. 3, 4, 5 and 8 have sloughed twice.

The terrarium in which these snakes are kept, (in individual containers), is heated to 25 to 27°C during the day, falling to 23°C overnight.

SUMMARY

There is very little information regarding the reproduction of *Elaphe vulpina vulpina* available in the U.K., and Mattison (1982) states that no records of captive breeding could be traced, so I can only assume that this is the first captive breeding of *Elaphe vulpina vulpina* in the U.K. I had thought that the gestation period of 34 days, followed by the incubation period of 37-41 days, was rather short in comparison to other *Elaphe* species and subspecies. Information in Wright & Wright, Volume 1 (1970) indicates that 50 days gestation and 54 days incubation are more typical

for this subspecies. Anton van Woerkom has supplied me with information recently, (Zehr, 1969; Minton, 1972), that suggests that one month gestation and 36-37 days incubation are in fact normal for *Elaphe vulpina vulpina*.

REFERENCES

- Mattison, C., 1982. The care of Reptile and Amphibians in Captivity. Blandford Press, Link House, Poole, Dorset, England.
- Minton Jr. & A. Sherman, 1972. Amphibians and Reptiles of Indiana. Indiana Academy of Science, Monogr. no. 3: i-v, 1-346.
- Wright, A.H. & A.A. Wright, 1957. Handbook of Snakes of the United States and Canada, Vol. I and II. Comstock Publ. Ass., Cornell Univ. Press, Ithaca, 4th pr. Pp. i-xviii, 1-1105.
- Zehr, David, R., 1969. Mating, ejaculation, egg-laying and hatching of the Fox snake, *Elaphe vulpina vulpina*. J. Herpetology, Vol. 3: 180-181.

ADDITIONAL NOTES ON THE DEVELOPMENT OF *ELAPHE VULPINA VULPINA* BRED IN 1987

Of the eight babies that hatched between 6 August 1987 and 10 August 1987 the author has retained four, believed to be two pairs. These have been numbered according to the sequence that the eggs hatched, and the author has no. 1, 3, 4 and 8. The youngsters retained by the author did not all begin to feed voluntarily until the end of September 1987. No. 1 hatchling fed voluntarily as soon as the neonate slough was completed, and no. 4 hatchling fed voluntarily 'off and on'. Hatchlings



Foto 1. *Elaphe vulpina vulpina*. Foto: Kevin Hingley.

3 and 4 had to be assist-fed on the rear legs and tails of young mice until 29 September 1987 when they began to accept pink mice without any assistance. Hatchlings 1 and 4 would also feed on large pinkie heads if small pinkies were not available. From 29 September 1987 there has been no difficulties with the raising of these snakes. They are all feeding voluntarily on large pinkies that have developed fur, and on average they eat five pinkies each in a two week period. They are all very keen to feed, and on occasions if the pinkies are warm following defrosting they apply constriction, even though the pinkies are dead. They now measure on average 45 cm and have each sloughed seven times since they hatched, an average of one slough per month.

The above is dated 12 March 1988.