

TEN YEARS OF BREEDING *LIASIS MACKLOTI MACKLOTI*

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INTRODUCTION

When examining herpetological breeding-reports one can conclude over and over again, that these mostly consist of one-time breeding-success reports of extremely rare species, or specific details of a single reproduction. This is certainly important, because this way information on the reproductive biology of these species can be obtained, which can be used later.

The snake-keeper then has the possibility to closely follow the directions, which may lead to successful reproduction in his animals as well. Unfortunately, the story usually ends after the report of the first reproduction. Only, a description of several years, and if possible, several generations of breeding, however, can present generally applicable information on care and breeding conditions of certain species.

I personally published a report on the reproduction of *Liasis mackloti*, in 1984. This article dealt with the first reproduction of this python species in Germany. In the following report, the results of keeping and breeding this species, from the year 1983 until 1992, will be presented and discussed.

DISTRIBUTION AND SYSTEMATICS

The species *Liasis mackloti mackloti* has first been described from a specimen from the island Timor. The distribution range of *Liasis mackloti mackloti*, however, comprises Indonesia, New Guinea and parts of Australia. One should bear in mind that the animals which stem from 'parts of Australia', were formerly known as *Liasis fuscus fuscus*. McDowell (1975) stated in his work that *Liasis fuscus* does not differ from *Liasis mackloti*. This opinion is shared by Smith (1981). The underlying reason is, that both animals hardly differ in scalation characteristics and only a little in coloration. This opinion is not shared by me. Both 'species' have been kept by me for over ten years. It is definitely correct that these species hardly show any variation in scalation, however, substantial differences concerning body-shape, pattern and behavior, do exist. The following short list of differences will enlighten this.

	<i>Liasis mackloti</i>	<i>Liasis fuscus</i>
Body shape	Head clearly distinct from neck. Head medium large, approximately 6 cm in adults. Body slim. Adult females up to 2.8 m, males 2.5 m total length.	Head slightly distinct from neck. Head relatively small, approximately 4 cm in adults. Body slim. Adult females up to 2 m, males 1.7 m total length.
Pattern	Head brown, dorsum middle to dark gray with brown spots. Anterior third of venter yellow, rest of venter grayish-white.	Dorsal and head pattern uniform olive-brown. Venter bright yellow to egg-yolk-yellow.
Behavior	Usually calm and peaceful behavior, but there are some exceptions. Voracious feeders.	Extremely aggressive behavior.

The differences are also clearly visible in the pictures. To my opinion, identification of the two separate species calls for further research (e.g. comparison of hemipenis structure). To the snake keeper it is important to make a distinction between both species, to prevent intermixing during breeding. Additionally, one should take into account that apart from the nominate race, another subspecies, *savuensis*, is imported occasionally, since 1993. These animals stay considerably smaller than *Liasis mackloti mackloti*, and are easily distinguished from the nominate race by their aberrant head pattern (see also picture of *L. mackloti savuensis*). Based on their origin, breeding and housing conditions are probably similar to those of *Liasis mackloti mackloti*.

KEEPING AND BREEDING THE PARENT ANIMALS

The parents were obtained in 1977 (male) and 1981 (female). Both animals were caught in the wild. At the time of purchase, the animals were sexually mature but not full-grown (male 140 cm, female 167 cm). Both animals were accommodated in a terrarium that measured 100 x 55 x 100 cm (lxwxh). Illumination took place by means of an 18 W fluorescent tube, heating by a 40 W heating-cable. At this time the animals are still housed in the same terrarium.

Throughout the years, several substrate materials have been tested (peat, peat/sand, expanded clay, litter for small pets). Dust-free granular litter for small pets appeared to be the most suitable.

Temperature inside the terrarium reaches 34°C in summer, and 28°C in winter. During the night, temperature drops to 22 and 18°C, respectively. Humidity varies only slightly, and reaches approximately 50% year round.

Although the name 'water python' refers to a semi-aquatic way of life, these animals are actually often afraid of water. In contrast with *Liasis fuscus*, which frequently stays in the waterbasin for longer periods, I never observed *Liasis mackloti* bathing. One time, when one side of the terrarium was kept wet to provide the female with a suitable place

to deposit her eggs, this immediately resulted in mouth-rot. Despite the very dry conditions, under which these snakes normally were kept, no problems with ecdysis have ever been observed.

Feeding and moulting of both parent animals were subsequently recorded. After comparing the data of several years, it appeared that the male continuously refused to eat, during winter months. In other Boidae, a similar refusal of food is one of the signs of the onset of mating activities. The female did not exhibit such a discontinuity in her feeding behavior. The same behavior could also be seen in specimens that were obtained later, offspring as well as animals on loan.

On the average, males were offered 15-18 adult rats a year, and females 25-30. Normally the prey was offered dead. Out of safety considerations, the animals were separated during feeding.

At the end of 1992, the parent animals have attained the following sizes and weights:

1,0 (♂)	2.42 m 3200 gr
0,1 (♀)	2.53 m 5100 gr

BREEDING

Breeding the above mentioned animals occurred successfully for the first time in 1983. On the 4th of April, a total of 9 eggs were laid, of which 6 were fertilized. From these eggs 6 snakes hatched, after 87 to 89 days in an incubator, at a temperature of approximately 29 °C. For more detailed information on this reproduction, refer to the article of Bulian & Bröer (1984). In the following years, animals that were loaned to me as well as offspring, could be incorporated in the breeding. The original female deposited ten clutches, during the years 1983 to 1992, which comprised 113 fertile eggs and 5 infertile ones. From these, 102 juveniles hatched. Breeding other females, resulted in a total of 151 juveniles.

PREPARATION FOR BREEDING AND MATING

As is widely known, changes in environment, temperature, humidity, etc. often induce mating in reptiles. For this reason, males of *Liasis mackloti* are separated from the females for two months, starting in October. The males are transferred to weakly heated terraria (20-23°C at daytime, and at night 18-20°C). These terraria are not artificially illuminated, but they do receive natural daylight from the room they are located in. During this period the snakes are not fed. In October, most males usually start refusing food anyway. Formerly, both animals were administered multivitamin-preparations, and the males also vitamin E. It is now clear, however, that this does not affect the breeding results in any way. Therefore no more vitamins are used to increase fertility or to encourage mating.

The housing conditions of the females are not changed. At the beginning of December, the males are re-introduced in the terrarium of the females. In this procedure, only one male is joined with one or more females. Introduction of several males leads to rivalry combats, in which the males sometimes inflict bite wounds to each other. Since there is no escape possibility for the weakest male, the rivalry combats consist of entwining the bodies in the typical snake style. Introduction of several males is also disadvantageous in that they are constantly occupied by rivalry combat, so the desired mating does not take place. Alternately introducing the different males to the females, seems to encourage mating. The remaining scent of another male appears to stimulate mating activity. After joining

the male with a female, often spontaneous matings take place, however, only 1 or 2 times maximum. After that, a three to four week inactivity period follows. After the joining of the sexes on the first of December, the actual mating activity normally is commenced between the 24th and 25th of December. This pattern was constant over the past ten years. From that date on, the snakes copulated every three or four days. The females' willingness to mate is evident from the lifting of the tail and opening of the cloaca. It has even been observed a couple of times, that females actually tried to shove their bodies under that of the male. This behavior has also been observed once by *Liasis maculosus*.

The mating season lasts until the end of February. Mating also takes place with females that are apparently not sexually mature yet. This was demonstrated by a full-grown male that tried to copulate with a female that was 21 months old. This female measured 138 cm at that time, and weighed 860 gr.

It is interesting to note that males do not randomly mate with any female, but show an apparent preference for a particular female once more females are present. Sometimes this is carried so far that mating only takes place with one certain female. Mating with other females only occurs when the first one is removed from the terrarium. In the animals that are available to me, it is obvious which male prefers which female. This leads to an arrangement of the amount of interest a male shows in the different females. Surprisingly, not all males prefer the same female. Males sometimes had to choose out of three or four females. The reason for this behavior is not known to me. However, it is not unusual in the *Liasis mackloti*, kept by me.

For several years I owned a group of 1,3 *Epicrates cenchrina maurus*, in which the male could not be induced to mate. A newly acquired male immediately mated with the females. The afore mentioned male had a liking for females of *Epicrates cenchrina cenchrina*, with which he immediately tried to copulate. Among snake keepers this phenomenon should be taken into consideration more often. To provide a better chance of success, breeding-groups should not contain 1,1 or 1,2 but at least 2,2 animals.

GESTATION

After a successful mating, females are no longer fed to prevent damage to the developing eggs. This period of fasting does not harm the animals, since they possess a sufficient fat reserve after having received ample food in the previous period. Approximately 6 to 8 weeks before depositing the eggs, it is clearly visible that the female is pregnant, from the increase in girth of the posterior part of the body. Simultaneously, an increase in temperature requirements occurs. The snakes now start frequenting the floor heating. Additionally, the 'turning over' with the posterior part of the body, which is typical for pregnant pythons, is frequently visible. Also, wavelike muscle-contractions in the entire body occur at irregular intervals, in this period. No conclusive statement can be given on the exact duration of the gestation period, although my snakes deposited a total of 23 clutches of eggs. In the original female, the gestation period lasted for 101-127 days (starting from the first copulation, regardless of some earlier copulations in the beginning of December, and until deposition of the eggs). In two other specimens, that were placed at my disposal by the vivarium Darmstadt, gestation lasted from 57 to 115 days. The idea that the length of the gestation period is influenced by terrarium temperature is not proven. Even when animals that have already mated are placed in other terraria, this does not influence the duration of gestation.



Foto 1: *Liasis mackloti mackloti*, half volwassen mannetje.
Semi-adult male.
Foto: J. Bulian.



Foto 2: *Liasis fuscus fuscus*.
Foto: J. Bulian.

Year	Date	Number of eggs (infertile)	Hatching date
1983	4-4	8 (3)	28-6 / 30-6
1984	18-4	11	15-7 / 23-7
1985	18-4	13	7-7 / 9-7
1985	19-3	18 (7)	12-6
1985	11-4	14	4-7 / 6-7
1986	14-4	14	28-6 / 4-7
1986	21-3	20 (20)	-
1986	1-4	15	15-6 / 22-6
1987	27-4	10	11-7 / 14-7
1987	25-3	25	11-6 / 14-6
1987	15-4	15	29-6 / 2-7
1988	27-4	14	11-7 / 14-7
1988	25-2	19 (9)	13-5 / 15-5
1988	18-4	13	5-7 / 9-7
1989	25-4	13	6-7 / 10-7
1989	20-3	16	8-6 / 12-6
1989	23-4	18	10-7 / 13-7
1990	27-4	12	10-7 / 14-7
1990	28-4	17	14-7 / 19-7
1991	24-4	17	8-7 / 13-7
1991	15-3	16	29-5 / 30-5
1991	25-4	10 (5)	8-6 / 11-6
1992	20-4	10 (2)	5-7 / 8-7

DEPOSITION OF THE EGGS AND INCUBATION

Deposition of the eggs took place between the 25th of February and the 28th of April. Following clutch-sizes were observed (see Table). The fertilized eggs had an average size of 6 x 4 cm, weight varied between 50 and 80 gr. The unfertilized eggs measured 4.5 x 3.5 cm, average, and weighed between 26 and 38 gr. Almost all eggs were deposited in the evening or at night. The whole procedure usually lasted no longer than two to three

the evening or at night. The whole procedure usually lasted no longer than two to three hours. As a rule, one can say that the deposition of the eggs happens quicker when the female increases in age. While depositing the eggs, the female does not lay down quietly, but circles around the eggs once in a while, probably to correctly position the eggs. After oviposition, the female forms the breeding-cone around the eggs, which is typical of the pythons. *Liasis mackloti* is one of the brooding species, as has been described by previous authors. This means that the female can actively raise the temperature in the brood, by muscle contractions. These contractions were also visible in my animals. They did not always start immediately after depositing the eggs, but sometimes only after one or two hours. This is definitely not caused by the fact that the terrarium was at a sufficient incubation temperature at the time of oviposition, since it was under 30°C. Measurements on the temperature of the brood have not been done, because the eggs were transferred to an incubator as soon as possible. Removing the eggs was no problem at all. The females could be lifted off the eggs without difficulty. All eggs were incubated separately, i.e. the eggs that were stuck together were separated. When one works carefully, this can be done relatively easy and without damaging the eggs. Turning the eggs does not seem to harm the embryos either.

After removing the eggs, the females repositioned themselves in the brooding posture after a short period of time, although the body was coiled more loosely than before. The muscle contractions were performed as well. This brooding care, without the eggs, lasted for approximately two to three weeks. During this period, the female was offered food, which was accepted immediately.

After deposition, the eggs were transferred to plastic boxes. For incubation, different methods were tested. The eggs were incubated in boxes filled with either a mixture of sand and peat, or vermiculite. Additionally, some of the eggs were incubated buried in the substratum, while another part of the brood was incubated on the surface of the substratum. Another method used, was the incubation on a piece of screen, over a layer of water. The incubator used was a home-made engine incubator with ventilation, construction conformed to one Bröer and Horn (1985) described. In general, a higher hatching rate is accomplished when the eggs are incubated on top of the substratum or on a screen. This is probably caused by the fact that in the buried eggs, the lower part of the eggs became too humid. Incubation temperature was an average of 31 °C, but because of the size of the incubator (115 x 39 x 59 cm, lwxh on the inside) a temperature difference of 1°C could be measured on some places, when the incubator was completely filled. This partly accounts for the 1 or 2 days variation in hatching-date of the different clutches. The eggs of 1983 and 1984 where incubated by a temperature of 29°C, this resulted in a longer incubation time.

HATCHING AND REARING THE YOUNG

A few days before hatching, the eggs clearly show indentations. The juveniles of *Liasis mackloti* cut the egg-shell with their egg-tooth, in the typical python way: with parallel cuts. The actual hatching can sometimes take another two days. Some of the young stick their head, or only the tip of their nose, out of the egg-shell for several hours, ready to withdraw them on the first sign of disturbance.

Preceding the first moult, the juveniles do not yet have the speckled dorsal pigmentation, typical for *Liasis mackloti*. The head in newborn juveniles is brown, and their back has a uniform gray color. It is only after the first moult that they start to develop their color pattern. After approximately one year, they have acquired the normal (adult) pattern.

Hatchlings have an average weight of 31 gr and an average length of 43 cm. After the first moult only a proportion of the animals accept food. However, in some years all young of a clutch will eat spontaneously. The snakes are fed with small hairy mice. These should be big enough that they are able to move around in the terrarium. Juvenile *Liasis mackloti* are extremely aggressive in their first months, in contrary with the adults, and bite at every moving object in the terrarium that disturbs them. Other juveniles that inhabit the same container are bitten and strangled as well. After some of these cannibalistic actions, several attempts to resuscitate already swallowed young were taken. After removing the victim from its brothers or sisters stomach, it is tested for any sign of life (breathing, heartbeat, reaction of the pupil to light, reflex after pinching the tail). In all cases, breathing and heartbeat had already ceased. Often, no pupil reaction was visible either. However, in almost all cases a reflex could be seen after pressing the tip of the tail with a fingernail. As long as this reflex was present, a successful reanimation could take place. After my own experience, a reanimation can be effective until approximately half an hour after the victim is swallowed. Reanimation is performed in the following way: The needle of a 2 ml syringe is inserted approximately 1 cm into the trachea of the snake. Next, all the air from the syringe is pressed into the animals lungs. The lung is visibly inflated after this procedure. By manually pressing the snake, next, the air is expelled from the lungs. Simultaneously, the heart muscle (anterior of the lung clearly palpable with a fingertip) is stimulated once a minute, by briefly rubbing it. Usually, the heart starts beating again after a couple of minutes. Occasionally it stops however, and the procedure needs to be repeated then. Resuming the respiratory functions usually takes a little longer, approximately 20 to 30 minutes. During this period, artificial respiration should be sustained. Preceding the self-employed breathing, a spasmodic convulsion



Foto 3: *Liasis mackloti savuensis*.

Foto: J. Bulian.

of the animal takes place. After that, the snake, which is placed on its back for the ease of treatment, rolls over and resumes its normal position. The whole procedure is accompanied by a rapid and intense breathing. After a couple of minutes the animal starts to crawl again, and behaves normally thereafter. These animals showed no signs of impair. They ate normally and developed just like their brothers and sisters.

As stated before, not all young voluntarily eat mice from the beginning on. Therefore some of them have to be forced two or three times. Usually, pushing a pre-killed mouse in the snakes' mouth (headfirst, just until past the frontlegs) is sufficient. The snake then swallows the mouse by itself. Whether a food-animal is eaten or not, depends on the smell and movements of the prey. For example, my juvenile *Liasis albertisii* refused to eat small laboratory-mice, but readily accepted many-nippled mice (*Mastomys couchi*). *Liasis mackloti* behaves in a similar way, but here it is the scent of small chickens that is preferred. For this reason, small mice are dipped in the egg-yolk of newly hatched chickens and presented to the snakes. Later, rubbing a mouse over a small chicken for a short period of time, usually suffices to give the mouse a chicken-scent. The snakes can be fed chicken-wings and -legs, alternatively. Attempts to feed the snakes eggs, on the other hand, did not prove to be successful. Sometimes the scent of blood has a stimulating effect. In general, rearing juvenile *Liasis mackloti* is not problematical. The growth and weight increase data for 1.5 years, of two 1983 juveniles, is presented below.

SEXUAL MATURITY

Sexual maturity in *Liasis mackloti* is reached in 3-4 years by males, and in 4-5 years by females. Naturally, this is also depending on the size of the snake. If females are fed intensively, sexual maturity can be reached after three years occasionally. It is interesting to note that an offspring female that was donated to an acquaintance, produced two clutches of eggs every year, one in february, and one at the beginning of summer. Only a few individuals of the offspring that have been produced the last few years could be maintained because of the lack of space. However, these animals have reproduced in other snake keepers' collections, as well. At the time of writing, I have already received the first record of an F3 generation.

REFERENCES TO BREEDING LITERATURE

Because of the formerly valid difference between *Liasis mackloti* and *Liasis fuscus*, determining if the animals concerned originate from either Australia or Indonesia, is easily established from old literature. Peters (1977) and Boos (1979) describe breeding the Australian animals. The incubation periods lasted 62 to 64 and 57 to 61 days, respectively. Boos' report might concern *Liasis olivaceus*, since the common name 'Brown Rock Python' is applied to the animals, the author, however, uses the scientific name *Liasis fuscus*. Ross and Larman (1977) describe the breeding of *Liasis mackloti* from Indonesia. In this report, incubation lasts 56 to 58 days, at 32°C. Orlow (1982) describes breeding *Liasis mackloti* from New Guinea, with an incubation period of 69-77 days, at different temperatures. Murphy et al. (1981) reports about the reproduction of these animals, originating from Australia or New Guinea. In this case, incubation lasted 76 days. Swaak (1988) describes the breeding of *Liasis mackloti* by v.d. Pols. The extremely large female of 2.85 m and a weight of 9 kg laid 26 and 27 eggs, on the 7th of June and the 21th of May, respectively. The young

hatched 62 to 72 days later, at an incubation-temperature of 28-34°C. Mating occurred in January and February.

date	Male		Female	
	length (cm)	weight (g)	length (cm)	weight (g)
280783	50.0	29	55.8	42
191283	61.5	55	77.0	120
090184	68.0	70	80.0	135
120284	69.0	105	87.0	165
090384	69.0	96	89.0	186
100484	78.0	130	94.5	195
100584	83.0	140	98.0	230
110684	87.0	160	100.0	250
120784	91.5	190	107.0	280
110884	98.0	220	109.0	300
110984	101.0	260	111.0	380
101084	106.0	310	113.0	430
101184	110.0	465	121.0	560
111284	118.0	560	125.0	730
130185	124.0	620	132.0	800
120285	124.0	740	132.0	800

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