EXPERIENCES IN KEEPING AND BREEDING OF THE GREEN TREE PYTHON, *CHONDROPYTHON VIRIDIS* (SCHLEGEL, 1872), NEGATIVE AND POSITIVE RESULTS.

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Contents: Introduction - Terrarium - Food and vitamins - Parasites and diseases (worms - mites - mouth-rot - respiratory infection) - Breeding results (mating activities - false hope - a successful copulation - eggs and incubation - hatching time) - Summary of the breeding results (brooding place - eggs - incubation) - Acknowledgments - References - Tables I-IV.

INTRODUCTION

Chondropython viridis belongs to the subfamily *Pythoninae* (pythons) of the family *Boidae* (constrictors). It is found on New Guinea, the Aru- and Schouten Islands, and the Cape York Peninsula (Australia). According to McDowell (1975), its occurrence on the Solomon Islands is doubtful. The genus *Chondropyhton*, with its only species *Chondropython viridis*, is supposed to be descendant of *Morelia spilotes* which colonized New Guinea from Australia. At present, due to later invasions, *Morelia spilotes* is also found on New Guinea and *Chondropython viridis* in Cape York (McDowell, 1975). The average length of *Chondropython viridis* is 140 cm, with a maximum length of about 200 cm. The habitat of this species consists of tropical rain-forest and humid mountain woods. They are found from sea level to at least 2000 m (De Rooij, 1917).
Despite being typical tree dwellers, they seem to

hunt for food on or near the ground rather than in the trees (McDowell, 1975).
Chondropython viridis is in fact only active in the evening and at night; during the day they rest, in their own characteristic way, on a branch, a firm plant or on the ground.
The author has kept *Chondropython viridis* since October 1978 (see tables). Ever since that time experiences have been with two adult males and two adult females, hereafter indicated as male 1, male 2, female 1 and female 2, according to the date of purchase.
The snakes are green with white scales, with female 1 having a blue irregular zig-zag pattern on her back.
For several years now, the green tree python has become popular amongst snake keepers in the Netherlands, but breeding results are poor. Since relatively few references on the keeping of *Chondropython viridis* exist and because this species is at present seldom offered for sale, the author wishes to inform the reader his positive, and his negative experiences with the keeping and breeding of *Chondropython viridis*. It may be of (some) advantage to others, and perhaps they will be encouraged to share their own experiences of the green tree python with other snake keepers.

TERRARIUM

After a quarantaine period of respectively 70 and 107 days, male 1 and female 1 were placed in a terrarium measuring 100x60x70 cm. This terrarium was standing on the floor and seemed to have unfavourable ventilation for tree dwellers. The pythons caught a cold over and over again so they were transferred to a wooden terrarium measuring 200x 80x120 cm, standing about 80 cm above the floor. The bottom of this terrarium was covered with a 5

cm layer of cat's litter. Furthermore it was fitted out with a warmed plateau (50x60 cm), a large water basin (44x65x15 cm), many horizontal branches without bark, and several potted plants.
The terrarium was lighted and heated by means of fluorescent lamps, bulbs and electric silicone-cable filaments. The electric circuit was controlled by means of time-clocks and a dim-installation that reacted to the natural light from outside with the aid of a light-sensitive cell. In this way the light period and temperature within the terrarium varied as our degree of latitude. Or in other words: inside the terrarium a day-night cycle and a seasonal cycle was accomplished. In practice this meant about 8 hours of "daytime" in December, increasing to a maximum of about 16 hours in July.
The temperature in the terrarium varied from 20 to 35°C during the day, and from 16 to 25°C at night. This variation was caused by the weather and the season of the year. The relative humidity reached a maximum of 100% just after sprinkling with water and would decrease to a minimum of 50%. Due to the many plants and the large water basin the average relative humidity was about 70%.
According to Ross (1978), *Chondropython viridis* may be exposed in at least some parts of its range to temperatures varying from 21 to 32°C within 24 hours. Murphy et al. (1978), kept young tree pythons at temperatures ranging from 27 to 36°C, with a relative humidity of 50%. Kratzer (1962 a; 1962 b) kept his tree pythons at 25-30°C, he sprinkled water every day and provided them with a large water basin. Finally, Van Riel (1981) reported temperatures inside his terrarium ranging from 24 to 33°C, with an average of 27°C. He lowered the temperature by 5 to 6°C in the months of January and February (courtship stimulus), and stated that this was not harmful since a temperature of even 14°C can be measured within the

humid mountain woods of New Guinea (see also Claessen, 1982 a).

FOOD AND VITAMINS

According to McDowell (1975), *Chondropython viridis* in their natural environment feed on skinks, rats and other small mammals, and may also eat bird's eggs. Murphy et al. (1978) supposed that besides marsupials of the family *Dasyuridae*, *Peramelidae* and *Phalangeridae*, birds and reptiles might also be captured by the green tree python. Kratzer (1962 a) reported that birds, tree frogs and marsupials might be eaten.
The tree python becomes active at twilight, which is the best time to feed them. The tables show how many prey items each python written about in this article consumed. In principle, the pythons were fed in the following way: every time when one or more individuals were hungry, judged by their active search and/or alert waiting for prey, a prey was held in front of each snake. Prey was never released in the terrarium.
Each python was offered as many prey as it would take at that time, the amount of prey available being the only limit. The next feeding was not until the pythons appeared to be hungry again usually 3 to 4 weeks later. If mice were hard to get or not available at all the normal period between two feedings would be prolonged by several weeks. The digestion rate and consequently the need for food are of course strongly dependent on the body temperature and the amount of activity of each individual snake. However, if one of the pythons became too fat and hardly moved about, that individual was knowingly fed less than the others. Consequently, thin, young or fast growing pythons were fed more.
Records were made of the number and kind of prey

eaten. Remarkable were the individual differences in the number of prey taken, for instance compare female 2 with male 1 or female 1 in the tables. It was preferable to give live prey, as this is a more natural circumstance. During strangulation, the secretion of saliva starts, this enables the python to swallow its prey more easily, and also the secretion of gastric juices is activated. However, the tree pythons accepted dead prey as willingly as live prey. Besides mice, young rats, gerbils, frozen chicks and Chinese pigmy quails were eaten. The author prefers to feed mice, as they are not as aggressive as rats or hamsters, easier to manipulate than birds and easy to obtain. Mice were obtained from a breeding centre of laboratory animals, at which they are being held in optimal conditions. Kratzer (1962 a; 1962 b) fed his three pythons young rats and mice, Van Riel (1981) gave them chicks and rats. Often certain individual snakes are specialist feeders (Van Riel, 1981), in that they show a (temporary) prevalence for one particular kind of prey, for instance hamsters or chicks, but it may even mean they only accept dark mice and not white ones. Despite the good condition of the mice used, the tree pythons were also given vitamins (see also Claessen, 1982 c). Up to 1981 the pythons were given vitamin B-complex and vitamin AD_3+E, and sometimes part of a Davitamon-30 tablet plus vitamin C tablets.
The above mentioned vitamins were given on the average every 4 or 5 months or more frequently if a snake was in indifferent health.
Frye (1973) mentioned a vitamin C deficiency in snakes and lizards and found that curing of infectious stomatitis (mouth-rot) was more quickly when ascorbic-acid (vitamin C) was added empirically to the antibiotic medication. However, Claessen (1982 c) stated that vitamin C is no vitamin for reptiles as they can manufacture it them-

selves. Consequently, avitaminosis C (or hypovitaminosis C), again according to Claessen (1982 c) would not occur in these animals.
The positive efficacy in curing mouth-rot might be because of the high acidity of ascorbic-acid, and perhaps of the immunity intensifying action. Adding vitamin C is certainly beneficial (Frank, 1982).
The German product Nekton-Rep has become available. It is specifically made for reptiles and contains, according to the leaflet, 12 different vitamins, 6 trace elements, 2 amino-acids, and 2 Calcium-compounds. A similar product is produced by Intervet (Bayer) and is called SA 37, but it is coarser and is made for dogs and cats though it may be used for snakes as well.
Since April 1983, the author has given Nekton-Rep to his pythons with no negative results so far. Due to the fact that the tree pythons seldom drink from the water basin, they are offered a Nekton-Rep solution in cold water in small glasses hung on branches in the terrarium, or in front of their snout.
To quench their thirst, the tree pythons used the drops of water that remained on their skin after sprinkling the terrarium, or from leaves or the terrarium walls.

PARASITES AND DISEASES

Worms

The author's first two tree pythons (female 1 and male 1) were bought from a reptile dealer. As with most snakes captured in the wild the chance of having parasites is almost 100%, so the faeces of the two pythons were sent to the veterinary laboratory of the University of Utrecht for investigation. The faeces appeared to contain larvae and eggs of Nematode parasites (roundworms). The

snakes were treated with 20 mg Mebendazole per kg body-weight (trade name: Telmin; Frank, 1982; Claessen, 1983).
This medication is available as pure small grains or as tablets, in the latter case one has to pay attention to the amount to be given, since a tablet may contain more chemicals than the desired medicine. Administration of the medicine should be orally, so the required dose may be put inside a dead prey (the method used here). For instance, after in incision in the scruff of the neck of a dead mouse, the large subcutaneous space on its back offers a very suitable place for medicines, vitamins or whatsoever.
Since the pythons would take such prey without problems, administration was no problem.
Two doses of Mebendazole appeared to be sufficient to kill the Nematodes, as one and a half months after the first treatment no eggs and larvae were found in the faeces. After the second dose only the faeces of female 1 showed an adult dead Nematode.
The other two tree pythons (male 2 and female 2) were purchased from fellow snake keepers. The faeces were not sent for investigation since they had been already treated by the former owners.

Mites
Several times the author's *Chondropython* suffered infestation of mites (blood mites). The only way to get rid of these mites was to take the snakes out of the terrarium and to empty the latter completely. Tree trunks, branches, stones, cork-bark and the bottom-covering were either disposed of or treated with Neguvon.
The concentration of the Neguvon solution to be used, should be 2 g per litre water (0.2 %; Frank, 1982; Claessen 1982 b and 1983).
The emptied terrarium was sprayed with the same solution. Special attention should be paid to chinks and rough surfaces. The snakes were put into

(linen) sacks, which were soaked in the Neguvon solution. They stayed there for several hours in a warm place. Another method is to sprinkle the snakes with the Neguvon solution, but one has to be very sure that they do not drink it.
The whole treatment should be repeated after about 5 days in order to kill newly hatched blood mites or those left behind the first time.
Infestation by blood mites may occur when new plants or other matters are introduced in a terrarium without disinfection or thorough cleaning. For this reason, branches were stripped of their bark before being put in the terrarium. In this way accumulation of blood mites underneath the bark is prevented

Mouth rot
In the beginning the tree pythons suffered mouth rot (infectious stomatitis), which showed as a yellowish, purulent substance on the oral tissues. Mouth rot has either a bacterial or fungal origin. It can be easily cured in the early stage (Claessen, 1983; Frank, 1982; Frye, 1973; Van der Pols, 1980).
The method used by the author was as follows: the inside of the snake's mouth was carefully cleaned with hydrogen peroxide (3% solution in water), after which, the mouth rot substance was removed as much as possible. Then, Terramycin was put on the oral tissues. After two such treatments, the early stage of mouth rot was cured. A frequent check of the inside of a snake's mouth is advised, to discover mouth rot as early as possible

Respiratory infection
As already mentioned, the tree pythons were catching a cold in their first terrarium. The signs were gaping, wheezing and sometimes producing gurgling sounds. They also showed a tendency to

vomit. Once, a python produced a thick, clear mucus mass (Claessen, 1982 b). A local vet recommended Mycosan and later Tylosin+. Both medicines were to be given orally, Mycosan two times a day in a dosage of three quarters of a teaspoon dissolved in water. Tylosin+ was to be given each day in a concentration of 7.5 g per 1-2 litre of water (Tylosin+ is intended for pigeons which drink quite a lot).
One of the pythons drank frequently so administration was no problem, the other got the required dose of medicine each day by means of a silicone-tube mounted on a syringe. Sometimes the snakes could be encouraged to drink, if a small glass with the dissolved medicine was put in front of their snout. The pythons readily accepted food just after administration of the above mentioned medicines.
Other medicines used by the author were:
Chloramphenicol (trade name: Chloromytecin; see also Frank, 1982). A cure consisted of 6 tablets (50 mg each) in a dosage of 1 tablet to be given every other day. The sick snake had to be kept warm, at least 25^{0}C. To dissolve the mucus, it was advised to place the snake in a small terrarium with a vapour remedy (Rhinocaps, of Duphar; Vicks). Care had to be taken to have good ventilation. After it appeared that this treatment was not totally successful, Colistine was advised (Claessen, 1982 b, 1983). The Colistine concentration used here was 200,000 IU per ml; The recommended dose being 40,000 IU per kg body weight, which is injected (intra-peritoneal) every two days with a total of 4 per cure. With a body weight of 700 g the sick python should be given 0.14 ml each time (Claessen, 1983). Unfortunately, the vet administered 1.25 ml in error. As a result the python had severe muscle-cramp at the spot of the injection, which lasted for two days. The python was visibly ill and hung on a branch with the hind part of its

body down. After a second injection (again too large a dose) with the same result, the treatment was stopped. One week later, the signs of the respiratory infection disappeared and the python was lying in a normal position on a branch.
Such treatments as described above, require some skill. Better results are obtained if two people work with the sick animals as it is important to keep the snakes calm so reducing stress.
The treatments used were successful each time, but the pythons still sometimes show the above described signs of a respiratory infection. One of the causes mentioned by Claessen (1982 b) may be a drop in temperature. With the terrarium heating system used by the author, this could be the case in wintertime and the cool months of autumn and spring. However, the signs occurred both in November-December as well as in June-July. It may be possible that short, temporarily drops of temperature (periods of bad weather) may have its influence on the tree pythons, because the signs sometimes appear and disappear within a relatively short time. The question remains however, how this can be harmonized with the statement of Van Riel (1981) that in their natural environment of damp mountain woods low temperatures of $14^{0}C$ occur.

BREEDING RESULTS

Determining the sex is often difficult with snakes. The use of a probe, if carefully applied, is the most certain.
The male tree pythons described in this article, have relatively long (4 mm or more), dark brown coloured spurs, while the females have short (2 mm) whitish spurs. The head of the female is oblong, that of the male of a more thick-set figure. These characteristics are in fact only of use if one can compare several adult individuals

with each other.
McDowell (1975) mentioned well developed spurs in both sexes, and stated that no sexual dimorphism occurred in the number of scale rows.
He gave the following numbers of subcaudal scales for 4 males and 10 females: the males vary from 88 to 97 (average 91.7), the females vary from 75 to 102 (average 90.3). De Rooij (1917) reported 68 to 129 subcaudal scales. The male tree pythons of the author (male 1 and male 2) have respectively 90 and 77 subcaudals, the females (female 1 and female 2) have respectively 80 and 99 subcaudals.
Several different methods can be used to stimulate captive snakes to copulate, either separately or in combination, Van Riel (1977, 1981, 1984), Ross (1978), Claessen (1982 a), and Orlov (1982).
In February 1979, soon after the first couple of *Chondropython* were obtained by the author, the terraria were connected to the earlier described dim installation. As a result, the electric bulbs of the terraria dimmed when the evening falled, and vice versa. During the day the amount of light was intensified by means of fluorescent lamps, which were controlled by time clocks. The so produced day and night cycle (seasonal cycle) might have stimulated mating activities of the tree pythons.

Mating activities
The mating activities described, concern mainly female 1 and male 1 which have been in the author's possession since October and November 1978 respectively.
The first observed mating took place at night from 1 May to 20 June 1979. Because of the now and then very sunny days, the terrrarium was often sprinkled with water. The temperature varied between 19 to 30^{0}C near the resting places of the tree pythons. Both male 1 and female 1 were restless at night and could be found lying on the bottom of

the terrarium underneath cork bark during the day. The second period of courtship took place from 13 December 1979 to 1 January 1980. Under the season's influence, a "day" inside the terrarium lasted only 8 hours. The temperature varied between 15 to 25°C near the resting places of the pythons. Since the beginning of December, female 1 was lying day and night on the bottom underneath cork bark, and was frequently visited by male 1 On 13 December she shed her skin in the evening, and from that moment on male 1 started his mating activities.
The third time that mating activities were observed, was shortly after the second, and lasted from 10 January to about 13 February 1980. This short interruption could be put down to the fact that male 1 had shed his skin. Shedding took place on 10 January after which male 1 immediately started his mating activities.
The fourth period of mating started the day after the transfer of male 1 and female 1 to a larger terrarium, and lasted from 19 November 1980 to 13 February 1981.
The mating stimuli might have been the short days of 8 hours and a drop of temperature, and/or the transfer to a new habitat. Male 1 was almost fanatic in his courtship activities. Besides his attempts to female 1 he also twice tried to mate with female 2 (purchased on 28 January 1981). Despite all these mating activities, a real copulation was not observed.
After the end of December, the male's attempts took place only every other day, and came to an end on 13 February 1981. After almost three months of mating activities, male 1 died of an inflammation of the cloaca on 11 March 1981.

False hope.
On 15 March, female 1 shed her skin and became restless. While either resting on one of the available

brooding places, or hanging loose from a branch. On 27 March, female 1 showed irregular body contractions for the first time. On 14 April she finally seemed to have found an acceptable brooding place and turned round on that spot while, frequently, putting her head between the coils of her body. The next day an invasion of blood mites suddenly broke out. While combating these parasites, the author discovered four eggs underneath female 1. The eggs were oblong, of a rose colour, and had at both ends small protruding bulbs. The eggs were not of equal size, their width varied between 21-23 mm, and the length varied between 37-47 mm. These eggs were placed in an incubator using the "au bain-marie" method with the temperature held at 28-29.5^{0}C. Ten days later all eggs became mouldy. Inspection of the contents of the eggs on 25 April showed that they were unfertilized despite all the mating attempts of male 1. On 6 April female 1 stopped the body contractions and left the brooding place on 10 April.
On 24 January 1982, male 2 was purchased, but no mating activities took place until January 1983.

A successful copulation
At the beginning of 1982, the author had three adult tree pythons; male 2, female 1 and female 2. Around mid-September 1982, male 2 became restless and tried to escape from the terrarium as soon as twilight began to gather. As he persisted in this behaviour, he was transferred to a small terrarium (30x40x50 cm) on 7 November in which he immediately became calm. On 11 December male 2 shed his skin. From this moment to 5 January 1983, the restless behaviour of this male started again, both in its small terrarium as well as in the large terrarium with the females, in which he was put back several times. In the small terrarium male 2 accepted only dead mice, which were often not eaten until the second night.

On 5 January 1983 ma. 2 was again put into the larger terrarium after a quarantaine of almost two months. The first week of January 1983 was fairly good, sunny weather and due to the time of the year, the sun reached to the farmost side of the terrarium causing a rise of temperature to 30^0C at daytime. On 8 January it was very sunny indeed, and to freshen up the snakes and plants the terrarium was sprinkled with water in the evening. The warm damp atmosphere made the females active and they began to crawl about. Male 2, already active, was very alert and even aggressive. The next morning, on 9 January, male 2 was found lying on top of female 2 on the rim of the plateau. Nothing was happening at that moment, but around 12.00 hours male 2 tried to present his cloaca against that of female 2 while stimulating her with fast movements of his spurs. It was a clear attempt to copulate, but even now a real copulation was not observed. About 8 hours later, at 20.30 hours, male 2 was crawling about and female 2 was still lying on the same spot.
Kratzer (1962 b) observed copulations which lasted from 5 to 10 hours; the author observed a maximum time of 18 hours.
The mating activities of male 2 and female 2 stopped on 12 January 1983. In the mean time the weather had changed to cool rainy days, which caused a drop of temperature inside the terrarium. In trying to re-activate the courtship, the light period of the terrarium was set on 10 in stead of 8 hours by means of a time-clock.
Male 2 became restless again but no copulations took place. Perhaps this artificial change-over might have been too little? Male 2 had stopped accepting food from 21 December to 13 February, and female 2 ate for the last time on 8 January. On 28 February 1983, female 2 shed her skin and became restless, she crawled about a lot and was often found on the plateau lying on a bed of

sphagnum (peat moss) and wood shavings or hanging loose from a branch, in the same way as female 1 did just before she laid her eggs. On 14 March female 2 started the characteristic body contractions while lying more or less curled up on the plateau. Had the mating activities from 9 to 12 January been successful?

Eggs and incubation

On 15 March a restless female 2 was searching for a suitable brooding spot on the plateau. She frequently changed position while turning round all the time.

The layer of woodshavings and sphagnum appeared too thin, so was replaced by a 7 cm thick layer of wood shavings with about 8 cm of wood shavings mixed with sphagnum on top. For this operation the female was taken from the plateau and placed in a bucket on foam rubber, in which she just continued turning round while keeping her head inside the coils of her body. After the 15 cm thick layer of wood shavings and sphagnum had been moistened, female 2 was returned to the plateau. Temperature was about 32^{0}C. Kratzer (1962 b) reported that his female brooded on a layer of peat dust, whether or not covered with peat moss. The temperature of the air was 26-30^{0}C, and that of the bottom was 28^{0}C.

In the early morning of 16 March, female 2 had produced her last shiny white egg and was already busy arranging them. At least 17 eggs could be counted. In the evening of the same day she was lying, cylinder shaped, around some eggs but another 14 eggs beside her. On 17 March eleven of the fourteen were transferred to a stand-by incubator (method "au bain-marie") at the University of Leiden where they were cared for by Messr. In den Bosch and Snelderwaard. The remaining three eggs were placed in a small incubator system (method Van Riel, 1981) inside the large terrarium. The temperature in both incubators was kept at

28°C ± 1°C, with a relative humidity of almost 100%.
All 14 orphan eggs were by then indented presumably caused by too low humidity. The eggshells had some irregular calcifications, their surface was striated with fine parallel lines and showed some small starlike figures (chalk crystals?). Furthermore, the eggs were regular in shape, and measured about 25x35 mm. They did not look much like the earlier described eggs of female 1. Unfortunately on 18 March four orphan eggs in Leiden showed some green spots,(could their transportation have had a harmful effect?). In consultation with others it was decided to open one of the eggs in an attempt to answer the following questions:

a. are the eggs fertilized?
b. how is the embryo developed in comparison with other python species? Considering the fact that the average incubation time of *Chondropython viridis* (50 days) is the shortest known of all python species (Ross, 1978).
c. is it possible to determine the position of the embryo within an undameged egg? This in view of the fact that moving the egg without keeping the top, i.e. the place of the early embryo, upright appears to cause the death of an embryo. The development of the air sack above the embryo could be hindered, which results in suffocation of the embryo (Ross, 1978).

After part of the eggshell had been carefully removed, it was found that the egg was fertile and that the embryo was alive. Three days after being laid the embryo measured about 1 cm. The head with dark eyes, and the body which was curled up like a corkscrew, were clearly visible. Bloodvessels coming out of the embryo covered only a small part of the yolk mass. This stage of development differs little from that of *Python molurus bivittatus* and *Elaphe obsoleta*. The white-rose coloured em-

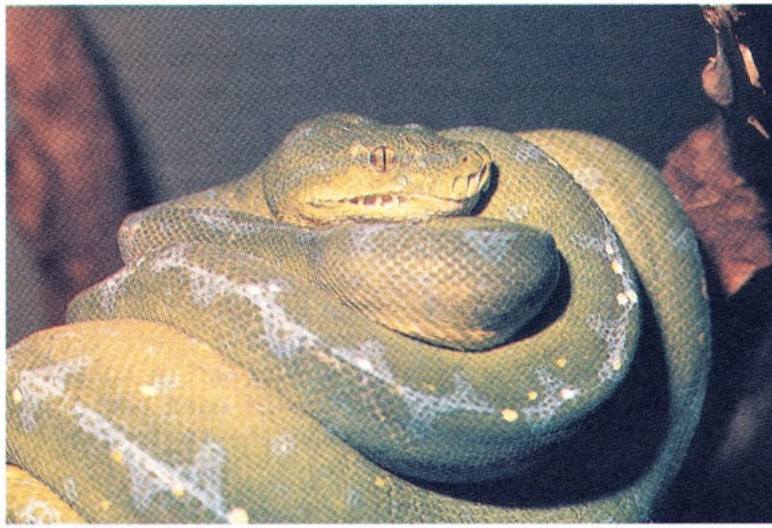


Fig. 1. *Chondropython viridis*. Foto: J.R. Schouten.



Fig. 2. *Chondropython viridis*. Foto: J.R. Schouten.

bryo at this stage may not be seen through the eggshell, when the egg is held to a light source, but the bloodvessels running just below the shell might.
On account of this result, all orphan eggs were candled. It was found that all were fertile, the bloodvessels being visible and running from one spot (the embryo). In the eggs with green spots, of which three were now left, the embryo appeared to be submerged. It was not until now that all the orphan eggs received a pencil mark on the top. Marking the top of a python egg with a felt-tip pen or a ball-point pen results in death of the embryo (Ross, 1978). However, In den Bosch, of the Zoological Laboratory of the University of Leiden never had any mortalities after marking lizard's eggs with Indian ink. Due to the high relative humidity of almost 100%, all indented eggs, except one "green" egg, showed the normal globular shape on 19 March 1983.
On 21 March, six days after laying, four eggs in Leiden were again indented and as they were brownish in colour and sticky on the outside, they were opened. One embryo was still in a reasonable shape but dead, the other three were decomposed. When such an egg was opened, the yolk-mass rapidly coloured green, this it is assumed was caused by exposure to air. Since the same green colour was on some of the (indented) unopened eggs these eggs might already be in a bad condition or dead. Moreover, a low relative humidity at the beginning might have caused not only indention of the eggs, but also permitted accumulation of air between the eggshell and the yolk-mass, so causing the green spots.
Leiden, 22 March: another egg was in a bad condition. The embryo was in a reasonable shape, the bloodvessels showed more ramifications. Of the five remaining eggs, only one was of a normal shape and colour. The other four were discoloured,

there being rose and brown spots with a yellow border on the underside.
The Hague, 22 March: one egg (of three) showed brown spots. The body contractions of the female were irregülar but persistent. When approached she immediately began to blow air. Due to the cool and rainy weather that day the temperature of the floor near the female was 22°C. However, the temperature of the sphagnum usually varied between 26-31°C, with an average of 28°C.
Leiden, 24 March: nine days after laying, only one egg (the normal shaped white one) was left. In The Hague three eggs were left of which one was in a bad condition. This egg was opened, the embryo was dead but in a reasonable shape.
Leiden, 29 March: the last remaining egg was indented but still white in colour. Indention of python eggs is not unusual (pers. comm. In den Bosch and Getreuer). The Hague, 29 March: fourteen days after laying both remaining eggs were in a bad condition. Apart from being indented they were also discoloured and sticky on the outside.These eggs were opened, and the embryos were found dead and of different size. The largest embryo had probably lived longer (or grown faster) than the other. Compared with the embryo of 18 March, it had grown considerable measuring about 6 cm in length,
The female brooded with irregular body contractions, in that after a pause the whole body of the python contracted 2 or 3 times in succession. When it was tried to take the temperature between the coils of her body, she reacted with fierce puffing and striking mouth closed, at the author's hand. Only then was it possible to see some of the eggs. Tbey looked good, being white and spherical in shape, a hopeful sight. Once in a while the female indpected her eggs by putting her head into the cluster. Sometimes she rearranged the eggs with movements of her body, and changed her position.

Once it was noticed that the female actually lifted an egg by clasping it between her neck and head! Inside the terrarium, or at least at the brooding spot, the humidity was kept at 60-65% during the day and from 80-90% at night by frequently sprinkling water. Once in a while the female would lay somewhat loose around the eggs. She then seemed restless and inspected the eggs. This appeared to coincide with a relative humidity of 60% or lower. Immediately the humidity level was raised she returned to normal brooding. From the many observations it may be concluded that a relative humidity of 70% or more, and/or a "wet" direct surrounding of the brooding female had a preferred influence on brooding behaviour: the female brooded with regular body contractions and pauses, and she covered the eggs in an orderly manner. If the relative humidity was down to 70%, the female laid loose and flat around the eggs, became restless, inspecting and rearranging the eggs with short movements of her body. It was noticeable how little the female drank during this period. When she was offered some water by means of a silicon-tube and syringe, she refused and shook her head violently.

Fourty-one days after laying the eggs, the one remaining orphan egg in Leiden, which was still indented and white coloured, was candled. Although it was rather difficult, some red bloodvessels were seen.

On 30 April one egg was lying beside the female, it had lost its regular globular shape, the shell was tightly stretched and showed some rose spots. As it became clear later, direct contact with sprinkled water caused these red spots and the egg-shell even became somewhat transparent. This egg was carefully taken up and laid beside the head of the brooding female. She recognized it, accepted the egg and immediately arranged it with the other eggs. This happened again later, on the first of

May: the female then tried to push away the "enemy's" hand with her body. At that moment it was possible to count at least 5 good eggs. With an average incubation time of 50 days, hatching might take place on 5 May, but in this case it took another 12 days. Hatching of python eggs may even be delayed by another 40% of the average incubation time, or as with *Chondropythin viridis* : another 20 days. On 13 May, the only surviving egg in Leiden showed a green spot and no longer felt smooth but hard and stiff. After some hesitation, but because of the indented shape, the stiff touch, the green spot and the relatively long time of incubation, the author decided to open this egg. Unfortunately this egg contained a live, fairly well developed, somewhat yellowish young tree python. It had a yolk mass of almost equal size as the snake itself. Since an important bloodvessel was damaged, the young python could not be saved. In this context the publication of Barnett (1979) is very interesting. He succeeded in letting a *Liasis childreni* embryo of 30 days old come to fully development by hanging the bursted egg from threads inside a plastic butter box. This young even hatched several hours before the others did, Both hemipenises of the young tree python were extended (length 0.5 mm). Normally they are retracted just before hatching, which is of regular occurrence with snakes and lizards.
All hope was now on the brooding female 2, with no idea whatsoever of the number of remaining eggs. Since 6 May she frequently changed her position around the eggs, but whatever her position no eggs were to be seen. On 15 May an egg laid beside her, it seemed in good condition but brownish in colour. Through the shell some bloodvessels could be seen. And when this egg was put on top of the female, it felt warm. On 16 May, the female covered her eggs completely and her body contractions were weaker.

Hatching time

On 17 May 1983, after 62 days of brooding, the first young tree python hatched. At 12.45 hours its tiny yellow head peeped between the coils of female 2. At 16.00 hours, another young was observed with the aid of a mirror. This young was still inside the egg and on being disturbed, quickly drew back its head. The female frequently inspected her eggs while keeping a tight position around the cluster of eggs and continuing the body contractions. On 18 May early in the morning, the first hatchling was found in a plant in the terrarium. It measured about 30 cm in length. On 19 May three young had left the brooding place. They had cut the eggshell with the aid of their egg-tooth, (which is a real tooth fixed perpendicular on the front of the pre-maxillary bone) just above the opening through which the tongue is protruded. On the morning of 20 May as no more hatchlings had been found, female 2 was carefully lifted to one side. Underneath her was a stinking mass of complete, empty and shrivelled eggs. The whole mass had a light brown colour and was rather wet and slimy, presumably due to the left-over contents of the hatched and shrivelled eggs. The female was then removed with the following result: 3 empty eggshells, 2 flat and shrivelled eggs containing young pythons which had died in an earlier stage, and 4 eggs containing fully developed but dead young. Of the latter 4 eggs, 2 showed several slits in the shell. Thus, the total number of eggs produced by female 2 was 23, which were all fertilized, and of which only 9 were incubated by the female herself. The female only stopped the body contractions after she had been transferred to a quarantaine terrarium on 20 May. Kratzer (1962 b) reported that a female showed weaker body contractions after only 2 or 3 weeks of brooding and stopped completely after 5 weeks.

The author's frustrated expectations were not com-

plete, as female 2 died on 23 May. She had refused to eat and drank little since 8 January, and consequently was very emaciated. The faeces inside her body were hard as stone, her nostrils appeared to be stopped up, and in the roof of her mouth a cheese-like, stinking substance was found. Since the beginning of May she often breathed mouth-open and produced wheezing and peeping sounds. Before she died, she received vitamins and liquid (baby) food and drank by herself. Nevertheless she was too weak to take a position on a branch.

SUMMARY OF BREEDING RESULTS

Brooding place

The brooding place was on a heated plateau (50x60 cm) in a terrarium of 200x80x120 cm. The plateau was covered with a 7 cm thick layer of wood shavings, on top of which a 8 cm thick layer of wood shavings mixed with sphagnum. The temperature of the bottom just beside the female was: minimum 22^{0}C, maximum 31^{0}C, with an average of 28^{0}C. The relative humidity near the brooding female was minimum 50%, maximum 100%, with an average at daytime of 60-65% and at night 80-90%. In spite of the fact that temperature and relative humidity varied, and were more or less dependent on the weather outside, live young tree pythons hatched, but not until after 62 days of incubation. The average incubation time for *Chondropython viridis* is 50 days (Ross, 1978). Van Riel (1981) reported an incubation period of 54-56 days, Kratzer (1962 b) mentioned 47 days. Even in the here used incubation system (method "au bain-marie"), with an (almost) constant temperature of 28^{0}C and 100% relative humidity, an embryo of 58 days of age appeared to have a yolk mass equal to itself. The changes in temperature might have prolonged the incubation time. In future cases of maternal in-

cubation a small brooding terrarium in which temperature and humidity can be controlled more accurately shall be used.

Eggs

1. A light brown discolouration and/or star shaped structures, (crystals?) of the normally white eggshell does not mean anything in itself with regard to the embryo being alive or dead.
2. A discoloured eggshell with rose, yellow or brown spots, in combination with a sticky surface and eventual fungus, point very likely to the death of the embryo. However, dead eggs are not harmful to live ones (see also Ross, 1978).
3. An egg with fungus on its surface is very likely to be dead (Ross, 1978).
4. An egg stiff or hard to the touch, does not mean a dead embryo.
5. Indention of an egg may point to a too low relative humidity (i.e. 50-60%). In raising the latter to 70% or more, such an egg may absorb moisture and get its globular shape again. Staying indented does not mean a dead embryo. Barnett (1982) reported that the eggshell of a *Liasis childreni* egg had burst due to internal forces caused by an excessive absorption of moisture.
6. Whether an egg is fertilized or not can be determined by candling (same method as used for bird's eggs). The method used here is: placing the egg in a hole in a piece of carton. The hole is of such size that the egg can not fall through it. The piece of carton with the egg is held above a cold light source, preferably in a darkened room. If the egg is alive, red bloodvessels can be seen. An embryo can be recognized either as a dark spot, or as the spot where (large) bloodvessels gather.
7. Tree python eggs should not be turned. If they are to be removed for examination, the top

should be kept upright. Moving the egg without keeping the top upright, appears to cause the death of an embryo (Ross, 1978). For determination of the topside see 6 above. To mark the top of an egg, a soft pencil is recommended. Using ink (ball-point pen) or a felt-tip pen results in death of the eggs (Ross, 1978).

8. Transportation of (tree) python eggs one day after laying may be harmful to the development of the embryos, or may even cause their death. Mortality is considered to be greater when keeping the top of the eggs upright is not taken into account (see 6 and 7 above). This idea is shared by some experiences with transportation of eggs of *Python molurus bivittatus*, however, in their case transportation took place one week after laying of the eggs.
9. Eggs neglected by the female ("orphan eggs"), may hatch (see Brooding).

Incubation

A female tree python may be allowed to incubate her eggs (see also Ross, 1978) if she is in a good well-fed condition, and if the temperature and humidity of the brooding place can be controlled and maintained at certain levels. An already brooding female may be approached but she remains alert. Eggs which are (by accident or on purpose) neglected by a brooding female will be accepted again if they are carefully placed on top of the female (for instance beside her head). These eggs may also be placed in an incubator. It is recommended to have a fully tested incubator system on stand-by, either when one expects eggs or during the whole brooding period of a female python. It is also recommended, in the case of maternal incubation, to remove the female from her eggs when hatching begins, and if possible to place the eggs beside eachother. The remaining eggs will probably hatch within a short time, (one or two days) even with-

out the care of the mother python. In this way, the chance of suffocation of the hatchlings by the blocking of their way to fresh air, by contents of already hatched eggs, other eggs, the substrate or even the mother itself, is reduced (Ross, 1978).

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The author again hopes that other *Chondropython viridis* keepers will publish their negative and positive experiences, in order to get to a "breeding recipe" for this beautiful, relatively easy to keep, but as yet rarely bred species.

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Table 1. Data on *Chondropython viridis* male 1.
9-11-1978 purchased, length 80 cm.
11- 3-1981 deceased, length 110 cm.

date of sloughing	period between two sloughings (in months)	number of prey items in this period	number of prey items per year	year
(9/11)				
	$4\frac{1}{4}$	5	5	1978
		7	27	1979
17/3	$3\frac{1}{4}$	8		
27/6				
	$6\frac{1}{4}$	12		
		0	24	1980
10/1	$3\frac{1}{2}$	7		
24/4	4	10		
27/8	3	6		
30/11				
	$3\frac{1}{4}$	1		
		4	4	1981
(11/3)				

1978: 4 mice and 1 Gerbil
1979: 26 mice and 1 young rat
1980: 20 mice, 2 chickens and 2 young rats
1981: 4 mice

Table 2. Data on *Chondropython viridis* male 2.
24- 1-1982 purchased, length 90 cm.
1- 1-1984 length 160 cm, weight 700 g.

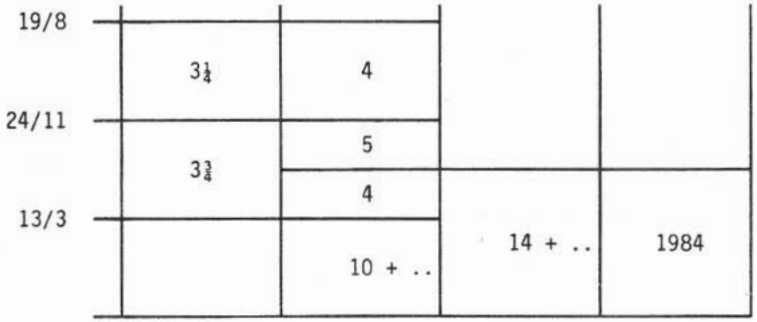
date of sloughing	period between two sloughings (in months)	number of prey items in this period	number of prey items per year	year
(24/1)				
	4¼	7		
1/6				
	2¼	7	24	1982
9/8				
	3	7		
11/12				
	3¾	2		
		4		
1/4				
	3	8		
4/7			41	1983
	4½	24		
20/11				
	4	5		
		4		
22/3				
		11 + ..	15 + ..	1984

1982: 23 mice and 1 Chinese pigmy quail
1983: 24 adult mice and 17 subadult mice
1984: 10 adult mice and 5 subadult mice

Table 3. Data on *Chondropython viridis* female 1.
3-10-1978 purchased, length 90 cm, weight 300 g.
1- 1-1984 weight 800 g.

date of sloughing	period between two sloughings (in months)	number of prey items in this period	number of prey items per year	year
(3/10)				
	$1\frac{3}{4}$	5	8	1978
26/11				
	$3\frac{3}{4}$	3		
		8	30	1979
19/3				
	$2\frac{3}{4}$	7		
12/6				
	2	6		
12/8				
	$1\frac{1}{2}$	5		
1/10				
	$2\frac{1}{2}$	4		
13/12				
	$3\frac{1}{2}$	0		
		9	27	1980
2/4				
	4	7		
28/7				
	$4\frac{3}{4}$	11		
19/12				
	3	0		
		3		
15/3				

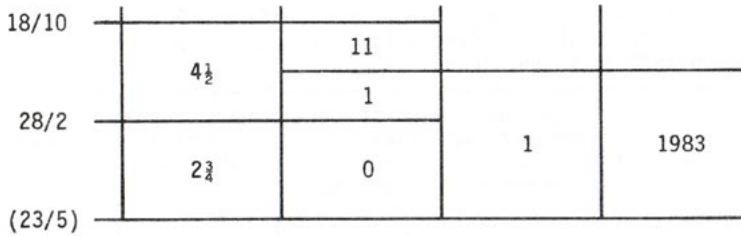
15/3				
	$1\frac{1}{2}$	2		
29/4				
	$1\frac{1}{4}$	6	32	1981
7/6				
	3	8		
5/9				
	$4\frac{1}{2}$	13		
		0		
16/1				
	$2\frac{3}{4}$	7		
6/4				
	$1\frac{3}{4}$	2		
27/5				
	$2\frac{1}{4}$	6	28	1982
3/8				
	3	9		
4/11				
	$1\frac{3}{4}$	4		
27/12				
	$2\frac{1}{2}$	0		
		10		
10/3				
	$3\frac{1}{4}$	4		
20/6				
	2	18	41	1983
19/8				



1978: 7 mice and 1 Gerbil
1979: 29 mice and 1 young rat
1980: 18 mice, 8 young rats and 1 chicken
1981: 29 mice and 3 chickens
1982: 24 mice, 2 Chinese pigmy quails and 2 chickens
1983: 26 adult mice and 15 subadult mice
1984: 12 adult mice, 1 subadult mouse and 1 young rat

Table 4. Data on *Chondropython viridis* female 2.
28- 1-1981 purchased, length 120 cm, weight 760 g.
23- 5-1983 deceased, length 150 cm.

date of sloughing	period between two sloughings (in months)	number of prey items in this period	number of prey items per year	year
(28/1)				
	¼	0		
6/2				
	1¾	13		
30/3				
	2	12		
29/5			57	1981
	1¾	14		
23/7				
	1¾	7		
18/9				
	3¾	11		
		0		
13/1				
	3	10		
16/4				
	1¾	6		
9/6			41	1982
	1¾	0		
30/7				
	2½	14		
18/10				



1981: 54 mice and 3 Gerbils
1982: 38 mice and 3 Chinese pigmy quails
1983: 1 mouse