LITERATURE

This column will give information about new literature, publications, books, etc. Tips concerning new literature are welcome, and should be sent to Ed Prüst, Voorstraat 61, 3512 AK Utrecht, The Netherlands.

Die Zwangsernährung bei schlangen mittels Sonde und Hühnerei; G. Rothfuchs. Herpetofauna (Ludwigsburg), 1982, Vol. 4 (21): 31-34.

There are only a few snake keepers who have never had to force-feed their animals, because of a) apparent illness, b) failure to start feeding by young, or c) loss of weight, with no obvious reason. In this article the author claims force-feeding with fluids is preferable to force-feeding with solid food. This is because force-feeding with solid food involves several straining and probably painfull (from the snake's viewpoint) actions, which are necessary in order to get the food into the snake's stomach. When using a fluid, the only straining activities are the opening of the mouth and the insertion of the tube. It is also easy to administer vitamins or drugs this way. Fluid food can range from fresh blood to chicken eggs, while in bigger animals (using bigger tubes) one can add minced meat or liver. Nature itself proves eggs to be sufficient as food when we consider snakes such as Dasypeltis scabra, which live on eggs alone. A chicken egg has all the requirements contained in solid food - especially the yolk - not only regarding fat and proteins but also minerals. The nutritional value of an egg equals the nutritional value of 50 gr medium fat beaf. It should be mentioned that there is always the possibility of

passing on an infection of Salmonella, but this danger also exists when using improperly prepared meat. The article then describes the actual force-feeding method.

The Red-Tailed Racer *Goniosoma (Elaphe) oxycephala*; C.J. Bryant. The Herpetile (1982), Vol. 7 (3): 33-34.

A pair of snakes are housed separately in wooden vivaria with glass fronts. A temperature of 24-29°C is maintained by floor cables. Substrate is newspaper and each vivarium contains a hide box which is essential for those nervous snakes. During the evenings the vivaria are lighted with ordinary light bulbs, and to facilitate easy sloughing a box containing wet sphagnum moss is placed within the vivaria. Both snakes were treated for mites with Vapona. At first the snakes were quite nervous but soon settled down. When disturbed, they expand their throat and neck and at the same time produce a most peculiar tongue action: the bluish coloured tongue is thrust out of the mouth and over the top of the head, then back in a circular motion to touch underneath the lower jaw and then back into the mouth. The action is repeated until the snakes calms down. Only one of the two snakes, which were purchased on October 10th 1981, the male, commenced feeding regularly on dead mice (fresh and thawed out) and young rats. Digestion is very rapid in this species so they are fed frequently. The female refused all food. On the 25th of October both snakes were cloudy and by the 7th of November both were clear. On the 15th of November both had sloughed and 5 eggs could be felt in the larger of the snakes. On the 21st of November five eggs were laid, it happened quite unexpectedly because up to then

the eggs had remained high in the female's body. Four eggs measured 6x2.5 cm, the fifth 7x2.5. The eggs were joined together, three on the bottom and two on top. They were placed in an incubator in dampened perlite at an average temperature of 30.5°C. After laying, the female still did not feed and when she got very restless, by the beginning of January the author resorted to assist feeding. On the 15th of January he placed a mouse into her mouth which she ate, and again on January 16th. On January 22nd he placed a freshly killed mouse in her cage which was eaten immediately. Since then she has fed with no further trouble. Both snakes are in good condition despite the occasional trouble with sloughing. On the 6th of March, 105 days after laying, the first egg slit. Each young took two days to hatch out and by the 12th of March three eggs had hatched. The young snakes, 40-45 cm, were identical to the adults even to the extent of the tongue action. The remaining two eggs which were not touching the perlite, slit on the 20th of March, 119 days after laying. The young emerged in two days in perfect condition despite the extra incubation time.

Responses to Ophiophagous snakes by snakes of the genus *Thamnophis*; Paul J. Weldon. Copeia, 1982 (4): 788-794.

More than thirty species of pit vipers (Serpentes: Crotalinae) from the New World including representatives of four of the five accredited genera (Agkistrodon, Bothrops, Crotalus and Sistrurus) react to ophiophagous snakes by pressing the head and hind body on the ground and keep their middle section up, forming a sort of bridge. This reaction can be roused by bringing chemicals of the skin of king snakes

(Lampropeltis), indigo snakes (Drymarchon), and other ophiophagous snakes close to the experimental animals.
It is thought this reaction prevents predators from grasping the head of the prey.
Other reactions of these snakes are to run, the hiding of the head in its own coils, to remain motionless and in case of some young snakes to make very rapid movements. The making of a 'bridge' has not been seen in case of the Colubrids. Weldon has seen how garter snakes (Thamnophis), Dekay's snakes (Storeria dekayi) and rat snakes (Elaphe) make escape efforts when placed with a kingsnake (Lampropeltis) in a cage. They crawled quickly and violently about, away from the kingsnake and to the sides of the cage.
Others have reported the same reactions in Virginia, Nerodia (Natrix) and other Colubrids.
Weldons experiment was to find out wether garter snakes raised in captivity are able to make a distinction between chemical secretion products from ophiophagous and non-ophiophagous snakes. The frequency of the tongue flicking was an important issue.
He used 18 Thamnophis elegans vagrans and 14 Thamnophis elegans terrestris, none of which had ever been in contact with the used predators, skin chemicals of Lampropeltis getulus californiae (ophiophagous), Heterodon nasicus and Thamnophis radix. The skin chemicals were collected on a piece of cotton.
For the second experiment he used 24 Thamnophis sirtalis sirtalis, which had been confronted with the smell of Coluber constrictor constrictor (ophiophagous) and Pituophis melanoleucus melanoleucus (not ophiophagous) also on a piece of cotton.
In the third experiment the smell was passed by

air from Lampropeltis getulus californiae (ophiophagous) and Elaphe obsoleta obsoleta to 24 Thamnophis sirtalis.
The results of these experiments clearly showed that the experimental Thamnophis noticed the chemicals of other snakes. This is to be considered hardly a surprise because garter snakes even react to perfume bought in the trade. Important is that they responded more to the chemicals of certain ophiophagous snakes than from non-ophiophagous snakes. The same as the 'bridge' reactions from pit vipers on the same snakes.
Also of interest is that pit vipers (Crotalus viridis and Agkistrodon piscivorus) tongue-flick less in response to ophiophagous smells. Agkistrodon contortrix mokasen responds differently - no difference in the rate of tongue-flicking. This could be connected with differences between garter snakes and pit vipers. Note also that in the third experiment the garter snakes, without direct contact by touching, noticed the smell.

Courtship behaviour in garter snakes: effects of artificial hibernation. A. Vagvolgyi & M. Halpern. Can. J. Zool. 61 (5): 1171-1174.

This article refers to a research on the influence of artificial hibernation on courtship behaviour. Four hundred adult garter snakes Thamnophis sirtalis parietalis were bought and arrived at the laboratorium early September 1981. They were housed in sex segragated pens at 24^{0}C and not fed for three weeks. In early October 88 males and 162 females were placed in cotton bags, containing no more than 20 snakes of the same sex. They were placed in a cold room at 3.3^{0}C ± 1^{0}C, LD 0/24 and not fed or watered for five months. (Only 50% of the males

and 76% of the females survived this period) The remaining snakes were maintained in sex-segragated pens at 24°C, LD 12/12, with water available and live goldfish or earthworms offered weekly. From early March to mid-March all snakes were removed from the cold room and tested for courtship behaviour. Snakes were individually marked and tested in pairs. To determinate wether courtship had occurred the male had to display the following behaviour: moving up and down the partners back (female or male) while the chin remained close to the midline and rapid tongue flicking. Hibernated males courted 79% of the hibernated females and 75% of the nonhibernated females. Hibernated males also courted 18 out of 34 nonhibernated males but never any hibernated males. Nonhibernated males never displayed courtship behaviour. Further research showed that swabbing the entire animal with 95% ethylalcohol did not reduce its chances of being courted. Using a drug to anesthetize the tongue resulted in a ceasing of courtship behaviour. Hypotheses, put forth to account for the homosexual behaviour are: the production of a male courtship-inhibiting substance during hibernation, and the production of a sexual attractant similar to the female as a result of not undergoing hibernation.

Remarks on the Prey Preferences of *Hoplocephalus bungaroides*; R. Wells. Herpetofauna (Australia), 1981, Vol. 12 (2): 25-28.

The author notes the probable natural preference of this Australian elapid snake: two lizard species (Ctenotus taeniolatus and Oedura lesueurii), while in captivity mice, birds and frogs are accepted. Ophiophagy occurs in captivity and probably also in nature.