ON THE SEX LIFE OF SNAKES

By: Ton Steehouder, Theresiaplein 24, Tilburg, The Netherlands.

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INTRODUCTION

The European Snake Society is doing very well: every week new members join the Society. Often these people have been keeping snakes for a long time already and have finally discovered their favourite magazine. But also quite often new members are beginners and so they are curious how reproduction happens in snakes: how do they make love and with which instruments. For this reason I have written this article, which deals with the most essential element for snake breeding: copulation.

THE MALE SEX ORGANS

Before discussing how reproduction and copulation take place we will take a look at the instruments. First, all male snakes have a hemipenis, and to be exact they have two such organs. The hemipenes (plural of hemipenis), when they are not erect are retracted inside the base of the tail, and lie inverted like the fingers of a glove that has been stripped off.

In contrast to the human penis a hemipenis has no closed sperm duct, but a type of groove that appears on the outside when the hemipenis is erected. This groove will be discussed later in more detail when we find out how the sperm is transported. The position of the hemipenes within the tail of a snake allows us to establish the gender quite easily: with a sexing probe we very carefully enter the cloaca. In male snakes the probe can then be inserted into one of the two pockets formed by the inverted hemipenes when they are at rest.

During erection blood is dammed up into the hemipenis and at the same time a muscle pulls the hemipenis out of the tail. After the copulation it is retracted into the tail because the blood supply is no longer blocked and other muscles retract the hemipenis.

What else is present? There are two testicles which are positioned behind each other because of the elongate shape of a snake's body: the right testicle is in front of the left testicle. The seed or sperm that is produced in the testes is transported via the sperm funicle to a bladder-like thickening of the ureter. During the reproductive season this "bladder" is filled with sperm and secretion from the kidneys. Finally, the sperm funicle and the ureter commonly exit into the cloaca, at which point a wart-like thickening, the papilla urogenitalis, is situated. At the base of this papilla a groove begins which transports the sperm to the groove on each hemipenis.

THE FEMALE SEX ORGANS

In the female the germ-cells are produced in the ovaries (two per female and as in males positioned somewhat asymmetrically inside the abdominal cavity). After maturing the little eggs are released into the abdominal cavity because the follicles burst open. Under normal conditions the eggs are caught by the oviduct because each oviduct opens a sort of large funnel. The oviduct consists of muscle fibres, little hairs which carry cells that take care of the sperm transportation, and mucous glands that take care of the formation of the cover of the eggs. The lower part of the oviduct, the uterus, has a thick wall and takes in the eggs, which are positioned like a string of pearls. Both oviducts exit into the cloaca, sometimes separately, sometimes they first join together.

During copulation the sperm is transported via the oviducts and via the hair cells. When the eggs are impregnated they develop in the uterus.

FRUITFUL CO-OPERATION

Most snake keepers know, more or less, how copulation actually takes place: the male inserts one of his erect hemipenes into the cloaca of the female. During this action the sperm is transferred from the male to the female.

Above, we learned that the hemipenis has no real sperm duct, but a sort of groove that is situated on the outer part of the erect hemipenis. So how is it possible that the sperm really enters the female? Just as in human sex curious ideas have prevailed about this question. In Boulenger's 'The Snakes of Europe', published in 1913, is stated that both hemipenes are pressed together so that the grooves form a sort of canal through which the sperm flows. Nowadays, most snake keepers can tell you that snakes only use one hemipenis during copulation and that Boulenger's vision is a nice story, but no more than that.

By the way, how is it possible that a famous scientist such as Boulenger did not know this? The answer is not difficult to find. The knowledge of amphibians and reptiles has been until some fifty years ago purely taxonomic, and especially characteristics as well as appearance. The study of snakes in captivity hardly existed. Copulation in nature is seen only rarely and even then a close observation is at least problematical. Thus we learn that the keeping of snakes in a terrarium and the study of them produces all kinds of information about the behaviour and functions of the life of reptiles, which is of inestimable value for our knowledge of these animals.

FOREVER YOURS

Pope (1941) studied a pair of dead colubrid snakes *(Liophis poecilogyrus)* from Bolivia. It is a sad story: the pair were caught and killed during copulation. Until the first half of this century it has been common practice that you kill what you love, so if Landru and Jack the Ripper had put their victims in spirits, they would have undoubtedly been honoured as taxonomists.

The couple that Pope studied were indeed preserved during copulation. Dissection showed that each branch of the sulcus (sperm groove) ends in a lip that is surrounded by a rim. This rim is pushed firmly into the part of the cloaca of the female. In the middle of this part of the cloaca is the aperture of the oviduct. In this way the sperm groove is in direct

contact with the entrance to the oviduct. In addition, numerous spiny projections on the sides of the hemipenis provide a firm grip inside the cloaca, so moving is not possible.

We posthumously honour this tragic couple, that at the zenith of their excitement of their lives, were sacrificed on the altar of science.

GRASS SNAKE

Beuchelt researched the erection of the hemipenis in *Natrix natrix,* the European Grass snake, and found that the hemipenis enters the female only half swollen. It becomes fully erected after the spiny projections have anchored solidly. That this is very important becomes clear when one observes the rough movements of the couple during copulation: quite often the female drags the male around the terrarium.

THE EGG OF COLUMBUS

The facts mentioned above could give people unfamiliar with snakes the impression that snakes invented the sexual egg of Columbus. Unfortunately, the problem only becomes bigger: there is an enormous variety in the shape of snakes' hemipenes. To illustrate this variety I have included some examples of different snakes' hemipenes on page 126. Look and compare! As a lover of *Malpolon monspessulanus* and *Psammophis* species I can point out that in these species the hemipenis is short and thin without any projection. This means that the hemipenis has no means of grip at all during copulation. The snakes seem to take this into account and lie very still during copulation. An advantage, however, is that they can separate quickly when disturbed. A secondary advantage could be that a great difference in length between male and female stands less in the way of successful copulation than in snake species with spiny hemipenes.

FITTING CLOACA AND HEMIPENIS

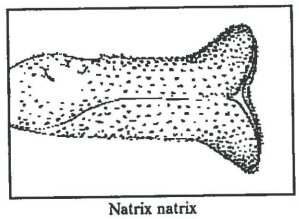
There is a clear connection between the shape of the female's cloaca and the male's hemipenis. When the hemipenis, e.g., has two branches, the cloaca of the female also has two branches, according to the species researched by Pope. I think that we may conclude that both branches of the hemipenis fit into these cavities of the female cloaca.

Cope (1900) already noticed that when the hemipenis has a spiny surface the cloaca of the female has a thick wall, but when the male organ has no spines the wall of the cloaca is thin. Pope could confirm this when he researched two Asian pitvipers, namely *Trimeresurus albolabris* and *Trimeresurus stejnegeri.* Both species look very much alike for colour and other characteristics. Even the female cannot be separated by any external characteristics. Therefore, they were considered to be the same species for a long time. In 1933, however, Pope proved that both species show considerable difference in the shape of the hemipenes. Those of *Trimeresurus albolabris* are long, thin and without projections and clearly bifurcate. The hemipenes of *Trimeresurus stejnegeri* on the other hand are shorter, thicker, less clearly bifurcate and covered in projections. On dissecting a female *Trimeresurus albolabris* the wall of the cloaca indeed proved to be long, deeply bifurcate and thin-walled, while a female *Trimeresurus stejnegeri* was smaller, with shorter cavities and thick-walled.

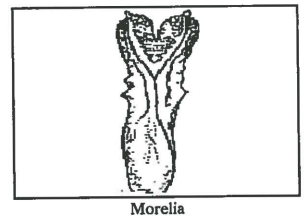
NATURAL ANTICONCEPTION?

The question is whether such clear differences form an efficient mechanism to prevent intergradation of these similar species? The long spines on the hemipenes of the male *Trimeresurus stejnegeri* could easily damage the thin wall of the cloaca of a female *Trimeresurus albolabris,* especially when the difference in size is also taken into account.

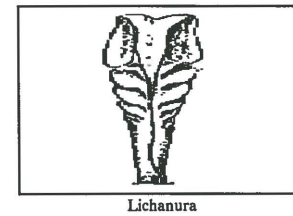
That the exact shape of the hemipenis is a useful object for research for taxonomists has been clearly demonstrated. A characteristic that can be so determining for a successful reproduction confers good service upon determining whether snakes are different species or not, just as in the case of both of these Bamboo vipers.



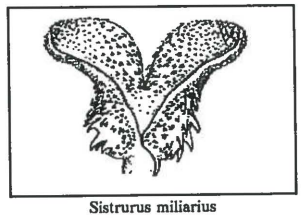
Natrix natrix



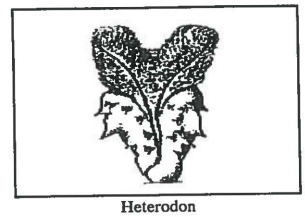
Morelia



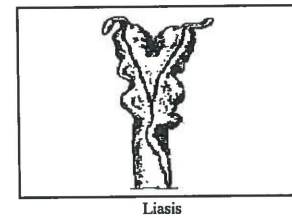
Lichanura



Sistrurus miliarius

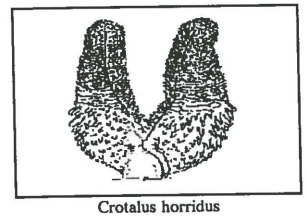


Heterodon

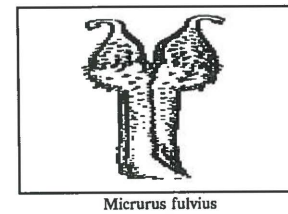


Liasis

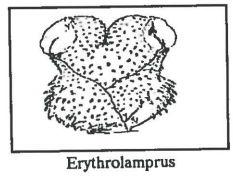
Agkistron contortrix



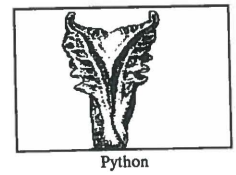
Crotalus horridus



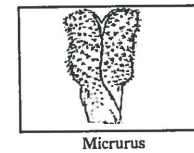
Micrurus fulvius



Erythrolamprus



Python



Micrurus spixii

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Translation: Anton van Woerkom.

Foto 1: Trimeresurus albolabris
Foto R.F. van Oosten.