GROWTH AND MATURITY OF *ELAPHE QUADRIVIRGATA* (BOIE).

(According to an article by Fukada (1960), adapted by Hans van der Rijst).

Contents: Introduction - Material and methods - Results: growth - Maximum attainable age - References.

INTRODUCTION

During the years 1954 up to and including 1959 Hajime Fukada studied *Elaphe quadrivirgata*, an Asian rat snake that shows strong resemblance to the European "four-stripe snake" (it is no coincidence that the translation of the Latin name is indeed so).
Fukada investigated how fast the snakes grow in the wild and at what age and length they become mature.

MATERIAL AND METHODS

The research took place under natural circumstances. A problem with this kind of research is, that it is not possible to be exact with the age of wild caught snakes. Fukada obviated this by releasing captive-bred young. To be able to do this he first caught as many as possible pregnant snakes. After the females laid their eggs they were released again and the eggs were incubated. After hatching the young were marked (he does not say how) and after their first slough he released them back in the wild. In six years he released 247 young that were marked. On average over the years 5 to 8 percent of the young were caught again.

In 1959 he only saw twenty of the then already 274 released young. The others were eaten, had died in another way, had left the research area or were simply not found. The research area was in the neighbourhood of Fushimiku, Kyoto, Japan.
He always measured and weighed the snakes he found, so he was able to compile growth-tables.

RESULTS: GROWTH

In table 1 are the lengths and weights of newborn hatchlings. After hatching the young do not eat before the first slough. Until that moment they live on the assimilated yolk-sack. They usually sloughed after one week. In this first week of their lives they increase about five percent (about 1 cm) in length and decrease nine percent in weight (about 0.7 g). After the young had sloughed, they were released into the wild. Hereafter some young were caught again, over five years. In table 2 are the average lengths recorded of the young that were recaptured.
The variety of growth between individuals is great. At the end of the second growing season (the first growing season only lasts one to two months) the females have a length of about 70 cm and the males 80 cm. At the end of the third growing season they measure 95 and 104 cm respectively; at the end of the fourth growing season 114 and 142 cm. When you have this species in your possession you can compare these data with your own to see how the growth of your snakes compares with "nature". For wild caught animals it is possible, based on these data, to make an estimate of their age. The

males grow remarkable larger than the females, as shown by the data.
Fakuda has also investigated if the snakes increased in length during hibernation. At the beginning of hibernation (October, November), and at the end (April) he has measured the lengths. It appeared that they did not increase in length. This result agrees with earlier measurements of *Rhabdophis tigrinum tigrinum*, made in 1959 by the same author.
In table 3 the average weights are recorded at the end of each growing season. This table shows that the males get heavier than the females, which agrees with their greater length.
During hibernation the snakes, on average, lose 3.5% of their body weight. Hereby it is remarkable that the males, on average, lose more weight (6.5%) than the females (1.8%). Snakes that weighed less than 100 g lost relatively more weight than heavier specimen.
In many snake species the relative length of the tail of males is longer than that of the females. This is not so with *Elaphe quadrivirgata*. The relative length varies for both sexes between 20 and 24% of their body length and is independant of age.
The female lays eggs for the first time in the summer of their third growing season when they are about one year and eleven months old. Copulation takes place about two months earlier. The length of the females then varied between 95 to 119 cm. Probably there are females that lay eggs for the first time in their fourth growing season.
The smallest male that was found to have active sperm cells, had a length of 77 cm. The smallest male that was found while he was copulating had a length of 86 cm. The

males have then, on average, reached an age of one year and nine months. In the summer active sperm cells were found in males, this while there were (not yet) no summer copulations observed.

MAXIMUM ATTAINABLE AGE

About the maximum attainable age much cannot be said, because of the relatively short period of research (five years). Of the young that were released, some were caught again after five years. This also includes some specimens that were caught at the beginning of the research and were already mature. In 1955 Fukada found a female with a length of 122 cm. This animal is certainly five and probably even six or seven years old. In March 1959 he caught her again for the last time. She then had a length of 132 cm and had (just like Fukada) become four years older. At the moment that Fukada wrote the article he had at home a female of nine years and four months old. *Elaphe quadrivirgata* in the wild attains an age of eight and probably ten or more years.
In table 4 are, for the sake of completeness, also some maximum ages of species recorded.

REFERENCES

Fukada, Hajime, 1960. Growth and Maturity of *Elaphe quadrivirgata* (Boie). Bulletin of the Kyoto Gakugei University, Ser. B, No 16.