AUSTRALIAN DEATH ADDERS - REMARKS CONCERNING THE POST-EMBRYONIC DEVELOPMENT OF *ACANTHOPHIS ANTARCTICUS ANTARCTICUS* (SHAW, 1794).

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INTRODUCTION

It is difficult to draw conclusions concerning the development of wild Death adders from data collected under artificial conditions without making reservations. Diet in captivity, which plays an important role among numerous environmental circumstances, is probably more balanced in captivity than under natural conditions. As I feed my captive bred specimens irregularly, it may very well be possible that the growth-rates which I have recorded conform with those of wild individuals.
Every nine to thirty days, I feed my specimens a live food animal suited to the size of the individual. In order to make an accurate record of the growth-rate of an individual, it is essential that the specimen in question be kept in captivity for the duration of the investigation. In the following report, I will discuss data concerning the development of a male Death adder which has been under my observation during the course of fifteen and a half years.



Fig. 1. *Acanthophis antarcticus*. Foto: A. van den Nieuwenhuizen.



Fig. 2. *Acanthophis antarcticus* in lokhouding met zijn staart / while caudal luring. Foto: P.H. Stettler.

It appears to me to be of importance, to mention the sudden death of two male specimens on separate occasions, 2 August 1972 and 2 August 1973 (the two instances being exactly one year apart), due to bites delivered by a third party. Three males, all housed in the same cage, were involved in this incident. In August 1971, each had reached an age of two and a half years, a length of 60 cm and a weight of respectively 125, 130 and 165 g.
On both occasions, the snakes were housed in a cage which in retrospect, was too small to suite the demands of their territorial instincts for two reasons:
- First, I thought the largest snake to be female and the two smaller ones males. Later, after this larger specimen had sloughed a few times (the hemipenis is sloughed along with the rest of the skin) and had attempted to mate with its smaller cage-mates, I was forced to conclude that this individual was also a male. In the beginning though, this animal was the smallest of the three. It grew quickly, for on 2 November 1970, it became the heaviest of the trio at 130 g and, on 1 November 1971, the longest at 620 mm.
- Secondly I did not take into account their territorial instincts. The territorial behaviour of many snakes is often impossible to perceive; certainly not outside the mating period or in the absence of a rival.
While it is relatively common for people who keep fish, lizards, birds and mammals and observe territorial behaviour, it is often next to impossible to observe this trait in many snakes. Under the most favourable circumstances, a keeper, who is sensitized to the behaviour of his snakes, may come to the conclusion that rivalry occurs when two or more males are kept in the same cage. It is also possible for one of the males to

dominate the others without there being any specific evidence to support this fact. This seemed to be the case in the situation I had created when I mistook the large male for a female. This is the only way I can account for the stressful situation which arose when their quarters became too cramped for their size.
Another reason why I did not notice any suspicious behaviour among these three snakes, was because I had created conditions in their cage to match their natural habitat as much as possible. The only clue I had from which to draw my conclusions arose when the snakes were being fed. Instead of striking out at its prey, the largest individual would bite one of the other two snakes which was moving also, though a greater distance away.
The relation between body-weight and length of wild individuals is striking. Out of all the litterature concerning australian Death adders available to me, nowhere have I ever found any specific data concerning body-weights and lengths nor even about birth-weight. The following lengths are listed in chronological order:

1794 Shaw, who first described the species, estimates a total length of 31 cm and a maximum of 38 cm.

1893 Finkernagel described a specimen in the herpetological collection of the State Zoological Museum in Dresden to be an exeptionally large individual as compared to the other specimens in the collection. He measured a body-length of 490 mm and a tail-length of 110 mm, giving the reptile a total length of 600 mm. The specimen was found in Barraba, New South Wales.

1958 Mertens tells of a specimen found in Queensland by Dr. Hugo Flecker measuring an estimated 600 mm (the living specimen was measured in 1957).

1959 McPhee mentions an average length of 38 cm and a maximum length of slightly over 90 cm.
1963 Worrell estimates a maximum length of 92 cm in his book.
1968 Peters writes litterally: '.... the possible total length of 93 cm'. Peters does not mention any specific measurements and probably kept himself to Worrell's estimates.
1971 Petzold mentions a total length of 80 cm.
1975 Cogger writes: 'On average less than 60 cm; most had a total length of less than 40 cm. Specimens measuring a total of 100 cm are very rare'.
1978 Stettler: In my own book I mentioned an average total length of 60 cm and said that specimens of 90 cm were rare. I wrote the manuscript between 1972 and 1973, at which point the specimens in my own collection, which were then between two and three years of age, measured an average total length of 60 cm.
1981 Trutnau writes in his book of venomous snakes: 'Total length of 80 to 90 cm, rarely 100 cm. I interpret these measurements as maximum lengths'.

My own measurements of wild specimens conform mostly to those made by Cogger in 1975. Four specimens which came into my possession had a total length of 50, 49, 53.5 and 44 cm; an average length of 49.2 cm. They weighed 78, 85, 102 and 60 g; an average of 81.25 g. When these averages are compared with the weight and length of my now sixteen-year-old male, the following co-efficients result:

Length: 750 mm : 492 mm = 1.52
Weight: 491 g : 81 g = 6.04

The comparison in figure 5 also demonstates that the growth-rate tapers off between 2½ and 3 years, while the weight-gain strongly increases after

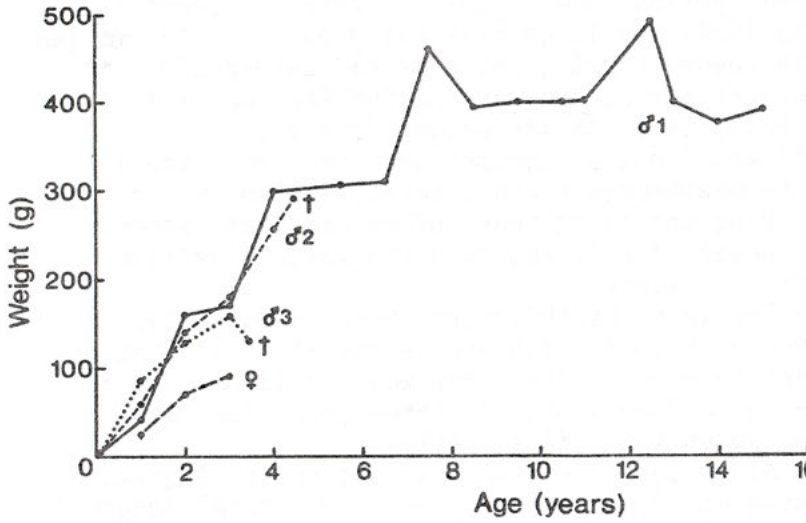


Fig. 4. Development of the weight-gain of three males and one female *Acanthophis antarcticus*.

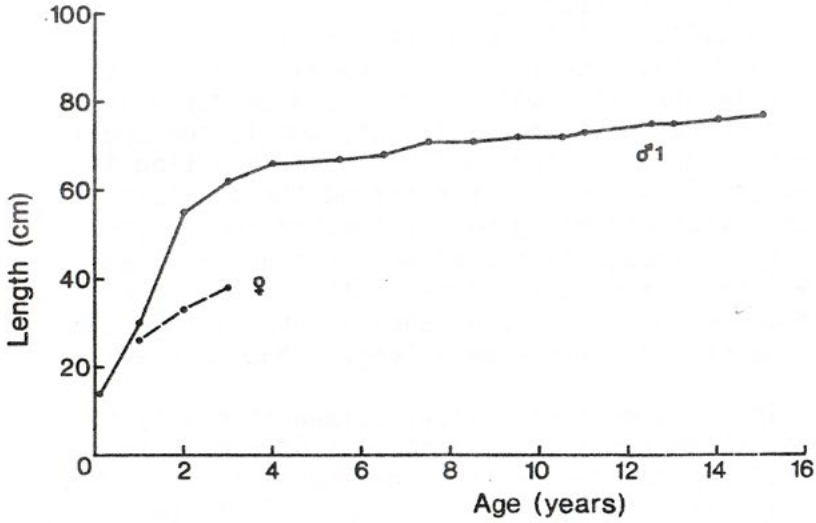


Fig. 5. Comparison of the growth-rate of a male and a female *Acanthophis antarcticus*.

this period (see figure 4). After 12 years (1972 to 1984) the large male had grown only 130 mm (an increase of 27%), while it had gained 320 g in weight during the same period (an increase of 187%), tripling its weight (2.9 x).
It would not be appropriate here, to discuss all the measurements and observations which I recorded during the first years of my own Death adders. However, I will review a few which I believe to be of importance:
- The young Death adders, born in March 1969, were fed with small fish and beefheart until June of the same year. They then weighed 13, 16 and 20 g.
- On 20 June 1969, the three young specimens accepted their first pinkies.
- At an age of six months, the end of August, they weighed 20, 26 and 32 g and had a total length of 170, 200 and 240 mm.
- At the age of fifteen months, in June 1970, they weighed 72, 81 and 103 g and had a total length of 410, 440 and 490 mm. One month later, the largest of the three reached 500 mm.
- In 1971, at the age of almost two years, I observed what appeared to be the first attempts at copulation. This behaviour ceased abruptly in the end of March at which time the two larger specimens stopped eating until 15 July resulting in a weight-loss. During this period the smallest of the three caught up with the other two lengthwise, although it had already reached the same weight as the others four months earlier. In November of 1970, it already weighed 130 g; the other two specimens were longer, but only weighed 125 g.
- In 1977, my large male specimen (the only one of the three still surviving) lost 67 g in weight. This was due to the 'summer-hibernation' of that year. It refused all food from April to the end of July, this period corresponding with the australian winter.



Fig. 3. *Acanthophis antarcticus*, juvenile. Foto: A. van den Nieuwenhuizen.

DESCRIPTION

A pattern of dark brown to black or dark red-brown crossbands is often set in heavy contrast against a ground-colour of grey to red-brown. The belly scales, which vary in colour from white to red, are bordered by black spots. The iris of the highly movable eye, is beige. The pupil is vertically ellipticle and becomes a slit in the light. Another interesting fact, is the colour change which takes place as the snake matures. Young specimens, which are dark grey to black, start to change colour after they reach about 20 months of age. Within five months, the ground-colour changes from grey to red-brown and the originally almost black crossbands become dark brown.

SEXUAL DIFFERENCE

An interesting way of determining the sex of a specimen of this species, is by examining the sloughed skin. As a young male begins to mature, it starts to slough its hemipenis partially along with the rest of its skin. About every sixth time the snake sloughs its skin, the hemipenis sloughs along completely, especially during the early stages of growth.
Another method of sex determination is, if one has the opportunity to observe both male and female simultaneously when disturbed. As they flatten themselves, it becomes clear that the male has a proportionally stronger and longer tail than the female.

BREEDING

Little is known about the mating behaviour, pregnancy and birth of this species. Data has only been published concerning the size of litter and

even these figures differ over a wide range:
- McPhee (1959) and Worrell (1963) both say the number of young born at a time to be between nine and fifteen.
- Petzold (1971) mentions a number of ten to twelve young.
- Cogger (1975) and Trutnau (1981) both estimate a maximum of twenty young.

Of the five Death adders born on 27 February 1969, only one male is still alive today after sixteen years. Two of them, which I had given to a friend, died shortly afterwards of an infection and, as I explained earlier, two were bitten and died three and a half and four and a half years later.

In the mean time, I have succeeded in obtaining a young female specimen from the area around Cairns. The environment there is the same as the environment from which I obtained my original specimens. I hope this specimen is now mature enough to breed with. It has a total length of 36 cm and weighs 86 g. I am going to attempt to breed it with my male this year (1984) and I hope that I will finally get the chance to observe first hand the mating behaviour of the australian Death adder.

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