

MATING BEHAVIOUR OF AUSTRALIAN DEATH ADDERS  
GENUS: *Acanthophis* (Serpentes: Elapidae)

RAYMOND HOSER

170 Lawson Street, Redfern, NSW 2016, Australia

### Introduction

This article is based on observations and notes obtained by the author on captive snakes of the Genus *Acanthophis* (Death Adders) over the past seven years. It deals with mating behaviour of [common] captive Death Adders, i.e., *A. antarcticus* only. I have 20 *A. antarcticus*, 13 *A. pyrrhus* (Desert Death Adders) and three *A. praelongus* (Northern Death Adder) and all appear to have identical mating behaviour. The exclusion of the latter two species from this article unless otherwise stated is due to the relative lack of data on either species compared to the vast amount accumulated on *A. antarcticus*. Individual Death Adders are referred to in brackets by the file numbers which I have given them. Many of the details relating to examples are omitted here due to space limitations. In this article mating is usually synonymous with copulating.

### Brief Description of the Death Adder

The common Death Adder (*A. antarcticus*) has a wide distribution in Australia excluding some northern monsoonal areas, most deserts and the far South East. This snake averages a total length of 60 cm (non growing adult males); 80 cm (non growing adult females).

Death Adders are very thick set, viperid in appearance, and often capture prey by caudal luring, (Carpenter, C. C., Murphy, J. B. & Carpenter, G. C., 1978). Tail twitching by hungry snakes is an involuntary reflex action.

These snakes range in colour through reds, oranges, greys, browns and blacks. Greenish specimens are also known. Scales are reasonably smooth. Desert Death Adders (*A. pyrrhus*) are somewhat smaller than *A. antarcticus*, always orange in colour and have rugose scales all over the body (excluding ventrals). *A. praelongus* has variable colours and is intermediate in many respects between *A. antarcticus* and *A. pyrrhus* (Storr, 1981).

All species of Death Adders may be sexed externally by the relative size of the tail. Males have distinctively longer and thicker tails than females (Hay, 1972). Probing is not necessary to accurately sex this species if one is familiar with it.

Male combat dances in this species do not occur. Death Adders are reproductive at 22 months (males) and 42 months (females) (Data collected on wild specimens Shine, 1980). Captive specimens are usually reproductive at considerably younger ages, (Mirtschin, 1982, and authors own records). Males and females may reproduce at less than 20 months of age.

Death Adders are convergent with the viperidae in many ways (see Shine, 1980 for further details). Live young are produced in the late summer to autumn periods (Australian seasons) and between 5 and 20 young are usually produced. Total length at birth is usually less than 120 mm. All Death Adders held by me are fed solely on mice and small rats.

#### Duration, Frequency and Times of Mating

Death Adders, will in captivity, mate frequently. Males take the initiative in starting mating and are the most active participants during copulation. Intermittant mating between two of my own Death Adders, for up to one month, has occurred (snake numbers AAA-18 male, and AAA-3 female) but is extreme. Male Death Adders will commonly mate (copulate) with several female Death Adders within a given month if there is sufficient opportunity. One male Death Adder of mine copulated with three separate female Death Adders over a three hour period (AAA-11 male with AAA-29 female, AAA-3 female, AAA-5 female).

Typical matings last a few hours, although it may range in time from seconds to days. Termination of copulation is usually, though not always initiated by the male. Death Adders may mate at any time of year although most mating occurs in late Autumn, Spring and early Summer.

By providing various conditions in captivity, Death Adders can be further (successfully) encouraged to copulate.

#### Sexual Attractiveness of Death Adders

Some males are distinctly more sexually active than others, size of males is irrelevant with respect to sexual activity.

Many males become more sexually active with age. Some females are more attractive to males than others, although rarely are males confronted with a choice (in either captivity or the wild). *A. antarcticus* are a solitary species. Larger fatter females are generally, though not always, most attractive to males. This factor makes *A. antarcticus* females attractive to *A. pyrrhus* and *A. praelongus* males, due to the relatively large size of *A. antarcticus* females compared to the other two species. *A. pyrrhus* and *A. praelongus* females are unattractive to *A. antarcticus* males, and only once has the author witnessed an *A. antarcticus* male copulating with an *A. pyrrhus* female (AAA-11 male and APY-1 female). *A. pyrrhus* and *A. praelongus* males will regularly copulate *A. antarcticus* females. Despite the above, the three species of Death Adder discussed prefer mating with their own species as opposed to

other species. Generally cross-specific mating only occurs when a sexually active male has no choice of mate and is highly aroused. For example, AAA-11 male mated with APy-1 female only after AAA-11 had attempted to copulate with AAA-5 female and AAA-11 was removed from AAA-5 before copulation had commenced, and placed in a tank with only APy-female.

Species isolation mechanisms for the three species of Death Adder probably are mainly environmental; rarely do two species occur together and even more rarely would they mate. Post mating isolation mechanisms probably also occur. More research is required in this area.

It is commonly reported in the literature that female snakes which have freshly sloughed are more attractive to males than other snakes. Although such is true, its importance in making females attractive to males is probably over estimated. Female Death Adders with white eyes, (prior to sloughing) will be readily mounted by males.

Males do not usually engage in sexual activity in the week or two prior to sloughing, after which they are most sexually active.

Not all males are sexually active at the same time, meaning that it is possible for several male Death Adders to have virtual non-stop mating in a captive collection (this has in fact occurred in my own collection of snakes).

Death Adders, wild or captive do not "aggregate" for any purpose. Denning does not occur.

### Inducing Mating

If a male Death Adder is determined to mate with a female, then he will invariably succeed, thus motivating or inducing males to mate can be a crucial factor in gaining successful copulation/s and breeding in captivity. Usually even without inducement Death Adders will mate frequently in captivity.

To further induce even more mating activity in Death Adders the following procedures can be carried out:

- (a) Separation of the sexes, and preferably isolating individual males (because males will attempt to mount and mate with other males in the absence of females).
- (b) During mating periods and just before and after these periods, males usually fail to eat. Males commonly have vigorous mating periods lasting a month or two, followed by a similar period without sex; after which males again vigorously pursue sex.

It is therefore important to ensure that males are well fed during non-mating periods, so as to enable them to satisfactorily last through non-feeding mating periods. (Death Adders are usually reliable feeders).

As Death Adders don't usually feed at average ambient temperatures below 20°C they must be maintained at higher temperatures than this for at least six months a year. During winter, temperatures can be allowed to fall to below 10°C on occasion. Mating occurs at almost any temperature although warmer temperatures are preferred, (matings at 12°C are recorded). For males it is wise to raise the temperature slightly after a "feeding spree" prior to mating. ("Feeding spree" refers to a period of high food consumption usually over a period of a month or more).

A day or two after raising the temperature of the male, say from low 20°C to mid 20°C, the male is introduced to a female/s (at any temperature now). Mating will normally commence immediately, with the male mounting the female as soon as it is placed in the same tank.

If Death Adders of opposite sex are housed together, mating can be induced by a change in temperature, either up or down, which will stimulate mating (such a temperature change occurs over a period of less than a day and is of at least 2°C). In tanks with a significant diurnal range, an unusually hot or cold day has the same effect.

Barometric changes (which are not controlled by the keeper) can act to stimulate mating activity. Low pressure troughs, cold fronts, etc. which have an accompanying air pressure fall stimulate the most vigorous mating activity seen by the author in Death Adders. Death Adders are particularly sensitive to falls in air pressure preceding fronts even when there are no changes in humidity or temperature. In the first 10 days of October 1982, 5 female Death Adders were copulated with on no less than 30 occasions by several males held by the author. Such mating frequency is not unusual. This barometric sensitivity applies to snakes kept either indoor or outdoors, whether kept at temperatures corresponding to the external temperatures or not. (Such barometric sensitivity has been documented by the author in other snakes including *Liasis perthensis* (Anthill Python), *Morelia spilotes* (Diamond Python), *Vermicella annulata* (Bandy Bandy) and *Hoplocephalus bungaroides* (Broad Headed Snake)).

Barometric sensitivity acting as a stimulus to mating certainly also applies to wild Death Adders (Hoser, unpublished field data).

Most mating activity in the Author's collection of Death Adders occurs in the 24 hours preceding the arrival of fronts. Obviously not all matings result in pregnancies, (Mirtschin, 1976, own unpublished data).

Excluding matings in 1982 in the author's collection, approximately 100 matings in this collection resulted in three pregnancies, all of which aborted mid-term. No less than one Death Adder (and up to five) held by the author are currently pregnant.

### Basic Mating Plan

Charles C. Carpenter and Gary W. Ferguson (1977) described stereotyped mating behaviour in snakes, giving each aspect of behaviour a number. Death Adders were not a snake mentioned in the paper although they abide by the following number in behaviour (sometimes or always) when mating.

1, 4, 13, 19, 20, 24, 42, 55, 56, 59, 68, 69, 71, 76, 81, 82, 83, 84, 92, 100, 102, 104, 105, 106, 107, 108. (See reference source for more details).

The mating behaviour of Death Adders will not be explained by citing a case example/s, rather by simply explaining typical procedures. It should be noted that Death Adders in captivity have no fear of any potential enemies and readily (virtually always) copulate in the open.

Firstly the male takes the initiative by mounting the female, and placing his body directly on top of the females' body so as to cover as much of the females' body as possible. The male caresses the female with his head and "chin" and with his tail.

The male tries to get his tail underneath the females' body, and to hopefully make contact with the females' vent. If the vents of the two snakes are not in alignment the male will edge his whole body backwards or forwards until their vents are adjacent. Sometimes a male will re-orientate his whole body (on top of the female) if he cannot make immediate contact between vents. Re-orientation, (i.e., crawling at least one female body length over the females' body) is mainly done if a male faces the wrong way relative to the female. Facing the wrong way on the female is where a males' head is over the females' tail and the males' tail is over the females' head. The male will, when facing the "wrong way" still sometimes attempt to copulate with the female by pushing his tail under the females' neck and if the male is highly aroused even evert his hemipene in this position.

When aligning his body over the females' body the male will often move with his tail raised in the air presumably releasing some scent over her body. Younger (although not necessarily smaller) males will flatten out their bodies over the females' when covering it, though older (more experienced) males don't usually bother with this. Younger males will crawl over the females' body aligning themselves several times before actually attempting copulation. Younger males may carry out "foreplay" for hours prior to "actual" copulation occurring. Older males carry out minimal "foreplay" usually copulating with females within sixty seconds of mounting them, unless the male is only slightly aroused and unlikely to copulate anyway.

The female role in initiation of copulation, though less active than that of males is still important.

Females that are stimulated by males' overtures generally coil up slightly, usually in a singular circular position. This enables males to crawl over females, over and over again, to "properly align themselves" without uncovering the female whilst moving around. More importantly females raise their tails in the air and vigorously twitch them. Females also appear to force out their cloaca. All this behaviour probably serves to further excite male Death Adders, although its effects in doing so seem minimal. Whether or not copulation takes place is decided solely by the male, and males that attempt to copulate with females probably will do so, no matter what the female does, short of the female crawling away. In captivity a female cannot escape a male which is determined to mount it.

To avoid copulating, females can coil themselves into a relatively tight ball with their vent covered by one or two very heavy coils of body. (Female Death Adders are very heavily built). Their vents are then effectively impregnable to males, although males that persist in trying to copulate will invariably succeed. In the wild it is doubtful if females actively escape sexually active males, because of the heavier build of females, and the ability of males to follow their scent trails. It is therefore probable that any contact between females and sexually active males in the wild result in copulation. The same applies in captivity.

When vents are approximately together the male Death Adder will evert one of his hemipenes (on the "correct side" of his tail) and it will insert itself in the vent and up inside the females' body. Usually, the hemipene will not swell until inside the females' body. Occasionally when the male is highly excited the hemipene will swell significantly outside the females' body, but usually only for a period of a few seconds.

Often a male will only manage to partially insert his hemipene into a female resulting in him rapidly withdrawing a partially erect hemipene and reinserting it into the female.

Once a male Death Adder has inserted his hemipene into the female and fully erected it the female is effectively unable to resist copulation. On rare occasions a female will cause a break in copulation leaving a male with an exposed, erect hemipene. If this occurs well into a copulation the hemipene will take a while to "shrink" in size and return to the base of the males' tail. This may take more than 10 minutes. Death Adders have large, spiny double lobed hemipenes (all species). During copulation the female usually moves little except for some involuntary twitch on any part of the body. The male rapidly twitches throughout copulation, particularly around the neck, far lower body and tail. The twitching in males is usually caudo-cephalic. The orientation of males during copulation usually only changes in response to movements by the female. Ejaculation (sperm transfer) is preceded by most vigorous bodily twitching (particularly around the tail

and lower body). After which there is a drastic reduction in activity by the male snake. Often copulation will terminate within 10 minutes of ejaculation by the male, although multiple ejaculations appear to occur. (The phenomenon of sperm transfer in Death Adders has been deduced from variously timed breaks in copulations, hemipene conditions at these breaks and fluid exuded by the ends of the lobes of the hemipenes). The author has photographs of a Death Adder (AAA-9 male) ejaculating after a break in copulation with AAA-5 female in 1980. "Multiple ejaculations" result in prolonged copulations, possibly lasting for days.

Hemipenes are pink to red in colour prior to ejaculation (rich in fresh blood) and purple to blue in colour after ejaculation (lacking in fresh blood). Hemipenes don't reduce in size immediately after ejaculation, generally taking time to do so. Copulating Death Adders will usually continue doing so regardless of human interference. On 8 May 1981 men free-handled connected Death Adders (AAA-8 male and AAA-5 female) and ashed cigarettes on them. In 1980 the author accidentally dropped 1000 watts of light globe on top of the same two copulating Death Adders. In all instances the snakes continued unperturbed. On occasions when the female terminates copulation, (probably less than half the time), the female either attempts to wave her rear end around, wrenching out the males' hemipene or she more often will simply crawl away. In crawling away the female drags the male along with her, the male will, whilst still connected to the female crawl backwards, following the female in order to lessen the effect of the female dragging him by the hemipene. If the female stops moving forwards, the male will, by initially moving "backwards" orientate his body so it again completely covers the females' body and he is in the normal mating position. Usually however once a female tries to terminate copulation by crawling from under the copulating male, the "typical" mating position is never re-obtained. Copulation usually terminates within 60 minutes of a female attempting to crawl away from a copulating male.

### Birth of Young

"Successful" copulation probably usually takes place between April and October of one year resulting in offspring being produced between February and May the following year. Well and truly gravid Death Adders will still copulate. Prior to birth, feeding ceases (although feeding in early pregnancy stages is voracious). In the weeks prior to birth of young, females are unusually restless (Hay 1979) being most active in periods of barometric instability (accounting for the relatively large numbers of gravid female Death Adders run over on Australian roads in late Summer/Autumn). In the wild Death Adders breed only every second year (all species). *A. antarcticus* can breed every year in captivity, as a result of improved conditions. Birth of young Death Adders takes place when low pressure troughs pass over, usually in the

form of cold fronts, (Mirtschin 1976, Sayers, personal comm., own observations). These conditions (in Australia) are characterised by low air temperatures (relatively) (low 20°C), often rain, and always relatively high humidity. Prior to the arrival of cold fronts, weather conditions are usually very hot, often 10°C higher than local seasonal averages. That these are the conditions which most stimulate mating in Death Adders is important. The author has had three *A. antarcticus* pregnancies, all aborted. One presumably due to an under age/undersized female being gravid (AAA-2) the others possibly resulting from an *A. pyrrhus* male copulating with *A. antarcticus* females (APy-3 male - copulating with AAA-2 female and AAA-5 female). At the time of writing (15 October 1982) AAA-3 female was gravid and progressing without complications. Other females could also be gravid (at time of writing).

Death Adders are an easy snake to breed in captivity. Over ten successful breedings are listed in the ongoing snake breeding survey which I am carrying out.

Although gravid *A. pyrrhus* and *A. praelongus* have given birth to young in captivity, neither species appear to have been actually mated and then reproduced in captivity yet. The author hopes to breed *A. pyrrhus* in the near future.

#### Unusual Behaviour in Mating

Homosexual behaviour as mentioned earlier is easily induced in males, simply by having one sexually active male with another male. The sexually active male may even attempt to insert his hemipene into the other male, sometimes with success. "Copulating males" have been observed by the author, although such occurrences are very unusual.

Lesbian behaviour is virtually unknown in Death Adders. On about three instances one female (AAA-4) attempted to mount (in male fashion) AAA-2 female, and tried to raise AAA-2s' tail with her own. No vent coupling was observed, and these "mating" attempts only lasted about an hour each. In all cases AAA-2 was almost completely stretched out with AAA-4 making sure her body completely covered that of AAA-2 female. AAA-4 was the slightly larger snake.

Eating when copulating is done by all females, of all species of Death Adder. Males do not eat when copulating. This summer (Late 1982) male Death Adders have copulated, terminated copulation, eaten food that was available, then recommenced copulating (AAA-7, AAA-11). Generally, sexually active males abstain from feeding. Summer fasts by Death Adders of periods of a few months are not unusual. The heavy build of these snakes results in little loss of condition over periods of abstinence.



As stated previously, male combat dances in Death Adders are unknown and almost certainly don't occur. However, one incident regarding potential male combat is worth noting. On 16 April 1982 (7.00 am) four male Death Adders (AAA-23, AAA-8, AAA-9, AAA-18) were observed to have bite marks on their necks; several on each snake's neck. AAA-21 male and AAA-2 female were copulating and neither snake had bite marks on them. These six snakes were the only snakes in the same cage. No food had been near any snake for the previous few days, excluding any possibilities of accidental attack of snakes whilst feeding. The author believes that AAA-21 attacked the other males, probably when they attempted to mount either himself or AAA-2. This behaviour doesn't seem to be typical. Occasionally, a male Death Adder will mount already copulating Death Adders, but usually give up attempting to copulate very quickly. Usually sexually active males will simply avoid copulating snakes. Further investigation is required here.

#### Authors' Note

The author has over 100 pages of data relating exclusively to mating *A. antarcticus* and several times this amount of data relating to *A. antarcticus* generally. Less information is held on *A. pyrrhus* and *A. praelongus* due to the theft of the relevant file on 8 May 1981 and less data accumulation generally. Colour slides of all aspects of mating behaviour in Death Adders are also held. Should further details about any specific cases, or aspects of Death Adder behaviour be requested, the Author will gladly offer any assistance.

#### REFERENCES

- Carpenter, C. C. and Ferguson, G. W. (1977) "Stereotyped behaviour in reptiles" In - Biology of the Reptilia Academic Press Vol 7, pp: 335-554.
- Carpenter, C. C., Murphy, J. B. and Carpenter, G. C. (1978) "Tail luring in the Death Adder (*Acanthophis antarcticus* (Reptilia, Serpentes, Elapidae))" Journal of Herpetology, 12: pp: 574-577.
- Hay, M. (1972) "Notes on the growth and breeding of *Acanthophis antarcticus*" The Australian Herpetological Society Journal, Vol 4 No 4. pp: 14-15.
- Hudson, P. (1979) On the breeding and Birth of Adders in captivity, Herpetofauna, Vol. 11, No. 1, pp: 11-13.
- Mirtschin, P. J. (1976) "Notes on Breeding Death Adders in captivity" Herpetofauna, Vol. 8, No. 2. pp: 16-17.
- Mirtschin, P. J. (1982) "Further notes on Breeding Death Adders (*Acanthophis antarcticus*) in captivity" Herpetofauna Vol. 13, No. 2, pp: 14-17.

Shiner, (1980) "Ecology of the Australian Death Adder *Acanthopis antarcticus* (Elapidae): Evidence for convergence with the viperidae. Herpetologica 36(4), pp: 281-289.

Storr, G. M. (1981) "The Genus *Acanthopis* (Sepentes: Elapidae) Western Australian Museum Records, 9(2). pp: 203-210.



AAA-8 ♂ copulating with AAA-5 ♀. (Photo taken in 1980 August). *Acanthopis antarcticus* from Sidney NSW.



APy-3 ♂ copulating with APy-1 ♀. Desert Death Adders copulating. (From Western Australia).