



Copulating Death Adders (*A. antarcticus*). Male from West Head, NSW. Female from Glenbrook, NSW

Australia's Death Adders Genus *Acanthophis*

By

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PART II

CAPTIVITY.

Within Australia, *Acanthophis* are by far the most sought-after venomous snake by herpetologists. There are several reasons for this, not the least being the fact that there is no other Australian snake like them. They are also extremely easy to keep, being almost impossible to kill. Although theoretically prone to all the usual snake ailments, *Acanthophis* rarely succumb to them. I have seen Death Adders (*A. antarcticus*) get over mite in-

festations that would have killed most other reptiles. These snakes barely showed any ill effects. I've seen wild-caught specimens covered in ticks, again without apparent ill effect. Once I had a pest strip dripping into a water bowl in a cage with *A. antarcticus* for several months. No snake showed any ill effects. On another occasion a male Desert Death Adder had a terrible mouth infection. It responded well to anti-biotics. The snake made a 100 per cent recovery.

Some captive Death Adders (*A. antarcticus*) appear to become darker in colour when held in captivity (see Hoser 1985b). There is no known reason for this, nor has any seasonal correlation been noted. I have noticed this trend in both red and grey snakes. The cause may have something to do with the temperature/s the snakes are kept at. Colour changes in re-

sponse to captivity are known in several other species of Australian snake.

Average sloughing rate is about 3.1 times per year, (based on 14 snakes over a total of 419 months), although fast-growing and young specimens tend to have a higher sloughing frequency (Hoser, 1982). *Acanthophis* usually slough in one piece, and repeated failure by a captive snake to do so may indicate a health problem that needs to be addressed. I have never observed *Acanthophis* soaking prior to sloughing or heard of captive specimens having difficulty in doing so. This is except for some minor problems experienced by Mirtschin, who had snakes which had piecemeal sloughs. He thought this was due to excessive dryness in his cages which tended to lack cover.

When feeding snakes in group cages, I often had snakes bite and chew one another, with no adverse effects on one another (Hoser 1985c). That appeared to indicate immunity to venom by these snakes. Stettler (1985) and van Woerkom (1985) documented a case involving apparent non-immunity to venom in *Acanthophis* from unknown locality; two apparently healthy snakes died from bites from a fellow *Acanthophis* that was part of the same litter. Although the cause of death may have been something other than venom, this whole area needs further investigation.

Cannibalism isn't known in *Acanthophis*, except for Desert Death Adders, with which it can be a major problem, particularly in young specimens. In my own experiences, some specimens have far stronger cannibalistic tendencies than others. Gow (1981) and others documented cannibalism in young Desert Death Adders. My own experiences related to an adult male from Goldsworthy, Western Australia, who on one occasion ate a fellow male roughly the same size before regurgitating him dead. They shared the same cage together and food was not on offer at the time. On another occasion, the same snake ate a slightly smaller female *A. antarcticus* before regurgitating her dead. Again no food had been on offer.

In other words, for Desert Death Adders at least, it is advisable to keep snakes in separate quarters. It goes without saying that all snakes should be watched when fed, to ensure that no two snakes go for the same piece of food.

In terms of how to house *Acanthophis*, they seem to survive and breed in all manner of setups. Brian Barnett successfully keeps *Acanthophis* in shoe-box style cages. He has bred Barkly Tableland *A. antarcticus* and Northern Death Adders (*A. praelongus*).

Mine were kept in modified fish-tanks and display cases with hardened clay substrate, with "underground" cables as the primary heating source. Leaves acted as cover for the snakes. These leaves became optional over the years as they really weren't necessary. I was able to take better photos of the snakes in their cages when there weren't leaves to obscure the view.

Captive *A. praelongus* (Indonesian specimens) I saw held by Tom Crutchfield in 1993 in the United States

were kept successfully in the same shoe-box style accommodation used to successfully breed most colubrids.

It goes without saying that a water bowl should be provided at all times.

Young specimens and Desert



Death Adders seem to show a strong preference for lizards over mice. Once *Acanthophis* are large enough, mice are the recommended food, although they will also survive adequately on alternatives such as hatchling chicks. There are various ways to "trick-feed" *Acanthophis* to convert them to mice.

I used to use chopped up bits of lizard tied (with cotton) to a freshly-killed mouse and fed as a single lump to the snake. The food item would be jiggled in front of the snake with tongs and the snake would take it, eating the lizard part first, with the connected mouse being swallowed at the same time. I used to chop up my lizards as they were too precious to waste one at a time on the snakes.

Others have had success simply rubbing lizard over the mouse to "scent" it. I had no success with this method.

Although *Acanthophis* will readily eat frogs (see Shine, (1980) for a detailed analysis of what wild Death Adders will eat), these are not recommended due to the heavy parasite burden carried by these animals.

Although I never had parasite problems with my *Acanthophis*, Taronga Zoo in Sydney reported Ascarid (blood parasite) problems with some of its Desert Death Adders.

On (extremely) rare occasions that *Acanthophis* have had to be force or "assist"-fed, this has not posed any problems.

BREEDING IN CAPTIVITY

Death Adders (*Acanthophis*

antarcticus) have been bred more frequently than any other Australian elapid. For documented cases see Hay, (1972), Hoser (1983, 1987), Hudson (1979), Johnson (1987), Mirtschin (1976, 1982, 1985, 1991), Barnett and Gow (1992). Barnett and Gow have both bred Barkly Tableland Death Adders many times and their results show little differences to those for cases involving other *A. antarcticus*.

For documentation of breeding Desert Death Adders see Fyfe and Munday (1988).

Northern Death Adders have been bred by Brian Barnett on a number of occasions. According to Barnett the average litter size for his female is about 10.

Sexing adult snakes is easy. The male has a distinctly larger and thicker tail. This is easily noticed when males and females are put side by side, or by anyone who regularly observes *Acanthophis*. Males often slough their hemipenes (Stettler, 1985). Immature specimens are sometimes harder to sex, especially in Desert Death Adders. However all *Acanthophis* can be readily sexed by probing (which is explained in most snake-keeping books).

Fairly standard snake husbandry techniques will ensure success. Both sexes MUST be cooled over the winter prior to planned mating. My initial failures in attempting to breed Death Adders (*A. antarcticus*) were solely as a result of my failure to cool my males. Once I started doing this, I couldn't help but breed Death Adders.

Males mate in similar stereotyped fashion to most other snakes (see Hoser, 1983 for details of Death Adder mating behaviour and Carpenter and Ferguson, 1977, for details of stereotyped sexual behaviour in reptiles).

In summary, the male snake will mount the female and align his body over that of the female. The male will rub his chin over the female and flatten his body in a bid to cover the female's (usually larger) body. The male will attempt to lift the female's tail to expose her vent with his own tail. In response, the female may rapidly twitch her own tail and either oblige (if receptive) or if unreceptive either flee the male and/or sit on her tail/vent region so that the male cannot easily copulate. During copulation, the male snake will have caudo-cephalic twitches, in particular around the neck, lower body and tail. The orientation of the snakes becomes less important during the course of ac-

tual copulation. As the female snake moves about, the male will attempt to keep his body in the original orientation. This is probably due to the fact that this is the most comfortable mating position for the snake. Successful copulation tends to last for a few hours, but appears to range from a few minutes to several hours and possibly even days.

Prior to mating, males will tend to go off their food and pace their cages. If this behaviour isn't displayed, then the male probably won't want to mate. On rare occasions, males will mate shortly after feeding. Females on the other hand will feed normally during the mating season and early pregnancy. They will even eat while copulating!

My own *Acanthophis* didn't seem to object to being photographed while mating. On one occasion (8th May 1981), two mating Death Adders (*A. antarcticus*) were free-handled by thieves (while connected), had cigarettes ashed on them and yet they still continued to mate without attempting to break up!

Although males of all species of *Acanthophis* will mate other species of *Acanthophis*, they do tend to prefer mating their own species and will do so if offered a choice (in a captive situation).

Extremely highly sexed males will attempt to mount other males if no females are present in the same cage. This even applies with *Acanthophis* of different species.

It is not rare for a male *Acanthophis* to run down condition fairly sharply when mating over a period extending up to two months. Overfed males tend not to be as sexually active as leaner (not necessarily thin) males. This situation also occurs for other types of reptile. In spite of a warning to readers to watch the condition of males when mating, I have never had a male run itself down beyond the point of recovery.

Copulation usually appears to be terminated by the female. This is usually

done when she crawls off, dragging the male along behind her by his still-joined hemipenis.

Mating behaviour is most likely during times of outside temperature and air-pressure changes. In a captive situation, it is best to plan matings around these



Everted hemipenis of Death Adder (*A. antarcticus*) following breaking up of copulation. When shrunken, this organ rests inside the base of the snake's tail.

conditions. Although *Acanthophis* that are housed together will mate readily, separation of sexes strongly increases the eagerness of males to mate.

Not all matings will result in pregnancies. *Acanthophis* will mate at any time of year, although most activity seems to

20 new-born captive-bred Death Adders (*A. antarcticus*). All parents from Sidnet region (NSW)



be concentrated around Autumn and Spring, which is also when most successful matings also occur.

Although it is thought that at least some *Acanthophis* have some sperm storage capabilities, no investigation of this has yet been done. In Hay's (Hay, 1972) case,

his female hadn't mated for 12 months before giving birth. Gow and Barnett (1992) quote a "gestation" period for Barkly Adders of, 142, 147 and 161 days in three cases. The figures quoted by Gow and Barnett tend towards the shorter end of the spectrum for successful matings in *Acanthophis* (those "gestations" at the short end of the spectrum are also the most commonly quoted).

For my own breedings, the successful matings (that resulted in young being born) were deduced to have taken place some 6-9 months earlier, (there were either no other matings or possibilities in all cases). Assuming that young Death Adders develop in a similar manner in all cases, sperm storage is indicated in *Acanthophis* by the experiences of Hay and myself. Further research into sperm storage capabilities of *Acanthophis* is required.

I am unaware of records of captive breeding of *Acanthophis* outside of Australia, but see no difficulties in such taking place. Most *Acanthophis* (all species) breed only every second year. This is genetically pre-determined and contrary to popular belief is not influenced by food intake or general condition of the female

prior to a given breeding season. Occasional individuals (females) are able to breed every year, and will do so in captivity.

Following successful mating in Autumn or Spring, all *Acanthophis* give birth in Summer and early Autumn (Late January to early May).

For *A. antarcticus* The numbers of young born are known to range up to 33.

Based on dissections of museum specimens, Shine found the average litter size for the species of 8. Other

documented litters include the following:- 24, 19, 10, 24, 11, 18, 17, 27, 24, 16, 33, 22, 25, 16, 14, 20, 23 (Mirtschin, 1985), 27, 7, 7, 1, (Hoser, 1987), and 20, (Hay 1972).

In my case where 27 young were born, 12 were still-born and a fur-





Mating sequence for a pair of captive Death Adders (*A. antarcticus*). Male (red snake) commences by mounting female and aligns body with hers. This becomes less important later during mating. Female attempts to break off by crawling away and dragging male away with her by his hemipenis.

Bottom Left: Death Adder (*A. antarcticus*) from West Head, NSW, giving birth.



ther 6 unfertilised ova were produced. Had those six ova also been fertilised the total litter would have been 33. In the second Mirtschin litter of 24, there were also 13 unfertilised ova. Had they been successfully fertilised, the litter would have been 37. In other words it is likely that a large *A. antarcticus* could conceivably give birth to over forty young, although a litter of that size has yet to be recorded. This makes *A. antarcticus* potentially one of the more prolific elapids.

For Barkly Adders, litters of 19, 19, 22, 18, 16 are known (Barnett and Gow, 1992).

Documented litters for two Desert Death Adders were 13 and 11, (Fyfe and Munday, 1982).

A common problem noted by many breeders has been the high number of still-born and deformed young, and unfertilised ova (all types of *Acanthophis*). While it is uncertain if these problems are restricted to captive breedings or also found in wild specimens, my own belief is that such probably also occurs at least to some extent in the wild.

In 1978, American herpetologist Ron Sayers removed a road-killed Death Adder from West Head Road. Inside were a number of nearly fully developed young. Sayers also noted unfertilised ova (soft eggs).

For many years I bred large number of Cunningham's Skinks (*Egernia cunninghami*) in very natural surroundings. I had recurring problems of some females giving birth to large numbers of still-born young

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and assumed that it was a result of something to do with captivity. However when subsequently doing extensive fieldwork in *E. cunninghami* habitat near Oberon, NSW, during the birthing season (late Summer/Autumn) I noticed dead young (stillborns) on a number of rock outcrops. This indicated a similar problem in wild specimens. That I was able to notice such was in itself significant as under normal circumstances other predators such as ants or birds would rapidly eliminate such things.

Mirtschin has postulated that deformities and stillborns may result from the females being kept at unsuitable temperatures during pregnancy (too hot). Firm data is not yet available however.

Prior to giving birth, females become restless and will move about the cage more than usual. They will usually, but not always, stop feeding prior to giving birth. Females have been noticed appearing to burrow under leaves or logs to form a sort of "nest" prior to giving birth. They also tend to lie in an open circular arc, although this habit appears to be distinctly more noticeable in some females than others. The posture is presumably a response to being gravid (pregnant) and the snake simply seeking the most comfortable position. Some *Acanthophis* give the appearance that they are about to explode with young before giving birth. They swell to such a degree that the skin between the scales becomes clearly visible. In cases where the number of young is fewer, this doesn't necessarily occur.

Birth usually occurs (in southern Australia) following passage of a cold front when weather tends to be seasonally cooler, more humid and often wet. This also applies to specimens kept indoors, which are supposedly divorced from such climatic activity.

Acanthophis and many other reptiles do, when kept indoors, seem to react to outside weather patterns, in line with their wild counterparts, even when in completely sealed and temperature-controlled rooms. Clearly these snakes are sensitive to even the slightest of weather changes.

An *A. antarcticus* of mine

took 250 minutes to give birth to 27 young. From what I can gather, the rate at which this snake gave birth was fairly typical, but the number of offspring was higher than average, indicating a slightly longer than average birthing time. 11 young were passed in the first five minutes with the rest being born at relatively even intervals in the 245 minutes after that.

Documented size of newborns varies. New-born Sydney Death

Adders ranged downwards from 169 mm (total length) averaging just over 160 mm (Hoser breedings). Other Sydney breedings have yielded similar-sized young. Hudson (1979), quoted a range of 93-139 mm for ten new-born *A. antarcticus* from South Australia. Although the figures quoted were "total length" they may have in fact been "snout-vent", based on their apparent size.

Barkly Adders range down from 245 mm, averaging somewhere in the vicinity of 235 mm (Barnett and Gow, 1992).

For *A. pyrrhus*, Gow recorded an average total length of 162.16 mm for his 13 new-borns. Fyfe and Munday cited a range of 127-150 mm for 11.

For *A. praelongus*, nothing is recorded, although it is presumed hatchling sizes would vary in line with sizes of the adults. In other words comparable to those sizes quoted above.

Feeding in young usually commences after the first slough. It is after this point that cannibalism in young *A. pyrrhus* can become a problem and should be guarded against by separation of all young from one another.

Shine (1981) found that in the wild, male *Acanthophis* mature at about 24 months, while females mature at about 42 months. This was based on Museum dissections of various species (all lumped together). Local populations may vary slightly on this basic pattern. Captive *Acanthophis* tend to mature much earlier, the exact rate dependent on feeding and temperature of the young snake. It is common to have both sexes mature within 24 months in a captive environment.

As snakes, *Acanthophis* lend themselves to being kept and bred in large numbers. Hopefully in the future they will be more commonly seen in captivity.

A NOTE ON SNAKEBITE.

As a potentially dangerous snake, care should always be exercised when keeping and handling *Acanthophis*. Having said this, many keepers of these snakes go for many years without incident. Common sense will always work to avert accidents. Non-Australian keepers may be well advised to seek out and obtain a vial of Anti-venom as a safety precaution in the unlikely event of a serious bite. A further warning is that Anti-venoms (obtainable from the Commonwealth Serum

Laboratories, Poplar Road, Parkville, Melbourne, Vic 3052, Australia) have a limited "shelf life" so must be periodically replaced.

CONSERVATION

As already mentioned, the biggest cause of decline for *Acanthophis* in Australia is habitat destruction. *Acanthophis* don't appear to be compatible with any form of livestock or overgrazing, even by feral animals. Death Adders (*A. antarcticus*) have been extirpated from wide tracts of New South Wales and inland Queensland where they were once common. Old literature shows that Death Adders (*A. antarcticus*) were widespread and common throughout inland Queensland in an area known as the Brigalow. Following mass clearing and introduction of Prickly Pear in the southern two thirds of inland Queensland, Death Adders appear to have become extinct in all but a few isolated pockets. The principal cause of extinction was livestock overgrazing, possibly aided by further land clearing and feral animals such as cats. A similar picture has happened to a lesser degree in other parts of Australia. Continued overgrazing of many arid areas will not help populations of Desert Death Adders.

Cane Toads (*Bufo marinus*) continue to spread in Northern Australia and assuming their spread remains unchecked (which is likely due to government indifference to the problem), Cane Toads will eventually populate all of the top half of Australia, excluding arid areas. This may well spell disaster for many as yet unharmed populations of Northern Death Adders (*A. praelongus*). These snakes apparently disappeared from the Mt. Molloy area of north Queensland following invasion by toads.

Gilbertson-Middlebrook (1981) noted large-scale mortality of Death Adders (*A. antarcticus*) and other native reptiles on South Australia's Yorke Peninsula, following the laying of a strychnine based poison to control a plague of introduced European mice (*Mus musculus*). It is presumed that the snakes had died from secondary poisoning after feeding on infected rodents.

Feral cats and foxes are known to prey on huge numbers of native reptiles, including *Acanthophis*, but along with road-kills and urbanisation, these threats are not usually regarded as critical for *Acanthophis*. It is thought that the impact of these problems is

either tolerable for given populations or, in the case of urbanisation, only highly localised. Australia still has less than 20 million people in an area comparable in size to the United States, which has about 265 million. Further investigation of the adverse effects of feral mammals on all Australian reptiles is required. Herpetologist Brian Bush believes declines in *A. antarcticus* numbers on the mainland of south-west Western Australia are a result of feral cat and fox predation. He notes the relative abundance of *A. antarcticus* on some offshore islands that lack feral pests.

Wildlife laws in this country are greatly damaging any efforts to conserve *Acanthophis* in the short, medium and long term. Taking specimens from the wild is banned, even if the snake in question is about to be killed. While it is legally acceptable to run over a snake on a highway, a person may be jailed for rescuing the same. Recently in Sydney, the New South Wales National Parks and Wildlife Service (NPWS), threatened to charge and jail a Miss Marilyn Marchant after she rescued a Diamond Python (*Morelia spilota*) crossing the main Pacific Highway during a bushfire in early 1993. She was only let off the hook because a member of parliament intervened and pulled the department into line.

In another case, NPWS actually prosecuted a licensed snake-keeper for breeding Death Adders (*A. antarcticus*). You see the problem was that NPWS refused several written requests to issue a permit for unborn snakes. When the snakes were born, the keeper duly notified NPWS of his new snakes. He was prohibited under the terms of his general scientific licence to move any reptiles from his house, where they had to be retained. As these new-born snakes were excess to the number he was licensed to hold, he was duly prosecuted and fined \$1,000.

The fine was overturned on appeal to a higher court, but it cost the keeper \$2,000 in legal costs to do so, making him even worse off. The court documents had unequivocally stated the NPWS charge of "illegally breed Death Adders". No wonder many people in Australia don't dare attempt to keep snakes in captivity.

Further examples of idiocy among wildlife officials and laws in this country can be seen in the book *Smuggled - The Underground Trade in Australia's Wildlife* (Hoser 1993), or the Sequel, *Smuggled-2*, due out in 1995. Of course with insufficient numbers of *Acanthophis* in captivity, a *Rheobatrachus*-like disaster, where the species is common one day and extinct the next, becomes all the more likely. This in spite of all Death Adders not currently being regarded as endangered spe-

cies. See Hoser (1991) for details of the (presumed) extinction of the Gastric Brooding Frogs (Genus *Rheobatrachus*), and other Australian species.

This country urgently needs a radical overhaul of its wildlife laws and related bureaucracies. Until governments allow Australians freer access to wildlife, instead of locking it away from the vast majority, more species will perish. This sentiment has been echoed by innumerable authors. Pages and pages of papers and articles echoing similar sentiments are cited at the rear of the books *Smuggled* and *Smuggled-2*.

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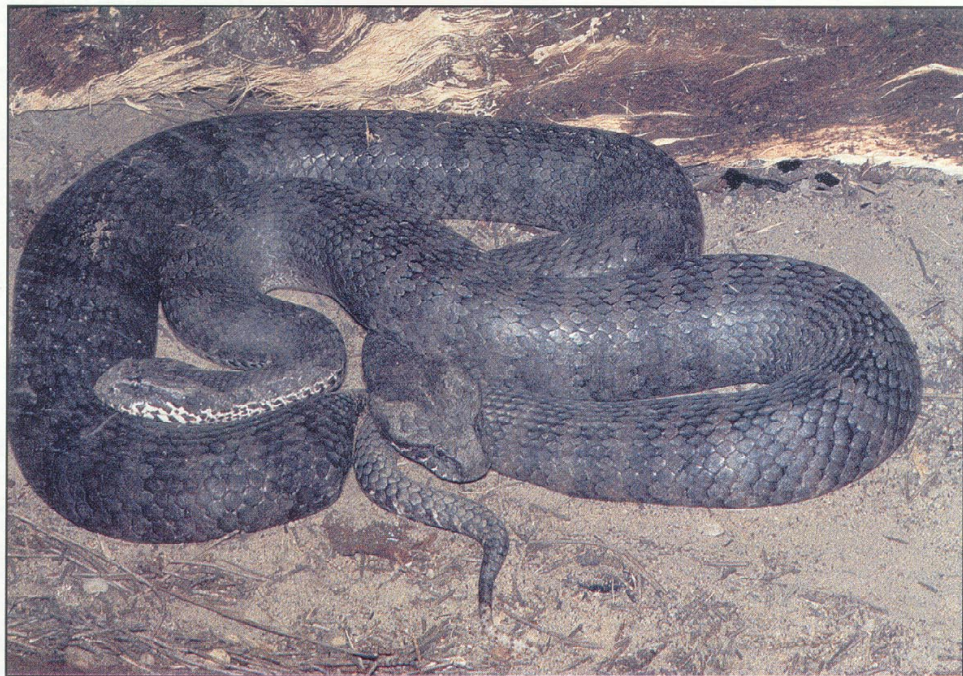
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Above: Captive Desert Death Adders (*A.pyrrhus*) eating and mating simultaneously. Both from The Tits, WA.

Below: Copulating Death Adders (*A.antarcticus*) from Glenbrook, NSW).



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