

Husbandry Guidelines

# Broad-Headed Snake

*Hoplocephalus bungaroides*



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Captive Animals Certificate III RUV3020R

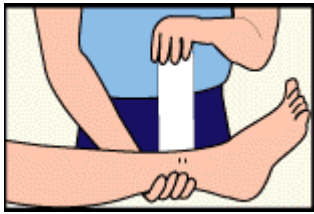
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2009

**Occupational Health and Safety**  
**WARNING**  
This Snake is  
**DANGEROUSLY VENOMOUS**  
**CAPABLE OF INFLICTING A POTENTIALLY**  
**FATAL BITE**

**ALWAYS HAVE A COMPRESSION BANDAGE WITHIN REACH**

**SNAKE BITE TREATMENT:**

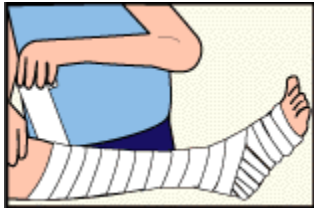


- Do **NOT** wash the wound.
- Do **NOT** cut the wound, apply substances to the wound or use a tourniquet.
- Do **NOT** remove jeans or shirt as any movement will assist the venom to enter the blood stream. **KEEP THE VICTIM STILL.**

1. Apply a broad pressure bandage over the bite site as soon as possible.



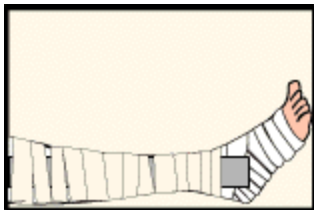
2. **Keep the limb still.** The bandage should be as tight as you would bind a sprained ankle.



3. Extend the bandage down to the fingers or toes then up the leg as high as possible. (For a bite on the hand or forearm bind up to the elbow).



4. Apply a splint if possible, to immobilise the limb.



5. Bind it firmly to as much of the limb as possible. (Use a sling for an arm injury).

- Bring transport to the victim where possible or carry them to transportation.
- Transport the victim to the nearest hospital.

Please Print this page off and put it up on the wall in your snake room.

There is some serious occupational health risks involved in keeping venomous snakes. All risk can be eliminated if kept clean and in the correct lockable enclosures with only the risk of handling left in play. These snakes' fangs are small, venom quantity equally small, but recent clinical experience suggests these snakes could cause lethal bite if not cause many other health problems later.

If you work with venomous snakes, it is your responsibility to make sure ahead of time that your doctor is up to date on the best and most modern ways to medically manage a snake bite. Some of the older protocols which are still officially on the books at some hospitals are definitely not the ones you want applied to your case.

### **What is Snake Antivenom?**

Snake antivenom is an injection designed to help neutralize the effect of the poison (venom) of the tiger snake. It is produced by immunizing horses against the venom of the tiger snake and then collecting that part of the horse's blood which neutralizes this poison. The antivenom is purified and made into an injection for those people who may need it after being bitten by a tiger snake. Tiger snake antivenom is also the appropriate antivenom if you are bitten by a copperhead snake, a rough scaled snake or a member of the black snake family.

### **When is snake antivenom used?**

Snake antivenom is given to people who become ill after being bitten by a tiger snake. Not every one who is bitten needs to have the antivenom as some people have only mild effects from the bite, or none at all. However, some people can become extremely ill after being bitten and in these people it is essential to use an appropriate amount of antivenom to counteract the effects of the poison. Several people die in Australia each year from inadequately treated snake bite.

### **Who should not have the antivenom?**

As there are sometimes unpleasant and dangerous reactions to the antivenom (See side effects of Snake antivenom), it should not be given to people who have no effects from the bite. However, as tiger snake antivenom can be an emergency life-saving product, it should not be withheld from anyone who needs it.

### **Before you have tiger snake antivenom**

Before you have the injection, you should tell the doctor if

- You are an asthmatic
- You suffer from hay fever
- You suffer from any other allergies
- You have ever received injections containing horse serum (snake bite and other antivenoms)
- You had an anti-tetanus injection before 1974
- You are suffering from any other illness
- You are taking any medicines and what they are
- You are pregnant
- You are breast feeding.

**When medicines are produced in animals and injected into you, it is always possible that viruses or other substances could be present in the medicine and cause an illness. These could be viruses or other infectious agents which have not yet been discovered.**

### **SIDE EFFECTS OF TIGER SNAKE ANTIVENOM**

As with any medicine, some side effects may occur.

As the injection is made from horse serum, side effects occur more commonly in those who have allergies, particularly if they have ever had injections before which were also prepared from horses. Allergic reactions such as rashes, low blood pressure, wheezing and palpitations occur commonly. Headaches and fever are also common. Less commonly, localized swelling, muscle and joint pains, abdominal pain, vomiting, chest pain and blue discoloring of the skin can occur. These allergic reactions can be very severe and can cause death, but these complications can be treated by a doctor.

An illness consisting of a rash, swollen glands, joint pains and fever may occur about a week after the injection.

Always tell your doctor if you have any unpleasant effects after receiving the injection.

### **THE DOSE OF TIGER SNAKE ANTIVENOM**

The dose for both adults and children is one vial (3,000 units) which is considerably diluted and given slowly as a drip into a vein. The dose can be repeated as necessary. Your doctor will take precautions to counteract any allergic reactions if they should happen.

### **OVERDOSE**

There is no information on overdose.

### **WHAT DOES TIGER SNAKE ANTIVENOM CONTAIN?**

Tiger snake antivenom contains 3,000 units of antivenom in about 10 mL of liquid. Each injection also contains phenol as a preservative, sodium chloride and substances found in horse blood.

The Australian Registration Number is Aust R 74895

### **HOW TO STORE TIGER SNAKE ANTIVENOM**

TIGER SNAKE ANTIVENOM SHOULD BE PROTECTED FROM LIGHT AND STORED AT 2-8°C (IN THE REFRIGERATOR). IT MUST NOT BE FROZEN. It should not be used after the expiry date.

**This information comes with each vial of tiger snake antivenom**

(CSL Limited, 2000)

### **Personal Hygiene**

- Always wash your hands with hot soapy water after touching or cleaning up after any animal, after cleaning enclosures and accessories and after coming into contact with any area of the house where reptiles are allowed to run free

- Cover cuts and other open wounds before handling reptiles

If a cut or wound becomes contaminated with dirt or if a reptile bite or scratch breaks the skin, wash the area thoroughly with warm water and an antibacterial soap, dry well and apply an antibacterial skin treatment

- Do not put your hands near or in your mouth, or eat, drink, or smoke while handling a reptile or cleaning up after it

- Do not kiss or put parts of a reptile in your mouth or share food or drink with a reptile

- Keep reptiles and their cages accessories away from human food preparation and consumption areas, sinks and bathtubs, where infants are bathed

- Do not use the kitchen sink, kitchen benches, bathroom sinks or bathtubs to bathe reptiles or wash their cages and accessories. Dispose of any waste water and fecal matter in the toilet, not in the bathtub or household sink. (NSW Department of Environment and Conservation).



## Who Should Avoid Contact With Reptiles

The following categories of people should avoid all contact, direct or indirect, with any reptile as the risks of serious, symptomatic infection with Salmonella is greatly increased.

- Infants and children up to 5 years of age; some say up to age 8.
- Anyone with HIV/AIDS or other immunodeficiency disorders.
- Anyone who has had transplant surgery and is on anti-rejection therapy.
- Anyone who is on any drug which suppresses/alters immune function including: steroids, cancer chemotherapy, biological response modifiers and others.
- Anyone receiving radiation treatment.
- Women who are pregnant due to risk to the fetus.
- Elderly, frail or people with poor nutritional status.
- People subject to chronic infections.
- People receiving or who have recently received antibiotic treatment.

What to do to avoid becoming infected or becoming a carrier.

- After handling any reptile be sure and wash hands with soap/hot water.
- Wash thoroughly for at least 30 seconds: an antibacterial soap is preferable.
- Keep reptiles out of kitchens and away from any surfaces where human food is stored, prepared or served.
- Do not permit unsupervised handling of reptiles by children under 12 years old.
- Do not handle any reptile or their caging materials with open cuts, lesions on ones hands unless such cuts are well covered with dressings; rubber gloves are recommended.
- When washing reptile enclosures/accessories avoid splashes to face.
- Disinfectant lotions pump sprays or similar products should be carried whenever reptiles are going to be handled in the field.

(Stopford. F. 2004)

## Zoonotic Hazards

People working with reptiles should be aware of Zoonotic Hazards. Zoonosis is diseases that can be transmitted from animals to humans.

These can include:

- Bacteria    • Protozoa    • Fungi    • Viruses    • Parasites, internal and external.

Ways of contacting Zoonotic diseases are:

- Reptile skins, feathers from feed animals.
- Excreta (faeces/urine), bodily discharges, vomit.
- A body part or sample taken from a reptile, eg, swab, blood or tissue sample.
- Equipment or bedding that has been in contact with a reptile, eg, needle, hoop bags, jiggers and substrate.
- During medical procedures, eg, blood, wastes, bodily fluids.

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## INTRODUCTION

### 1.1 ASMP Category

Is the species part of the Australasian Species Management Program?

More info to be added..

### 1.2 IUCN Category

**Red List Category & Criteria:** VU B1+2c

VULNERABLE (VU) – A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria

**B)** Extent of occurrence estimated to be less than 20,000 km<sup>2</sup> or area of occupancy estimated to be less than 2000 km<sup>2</sup>, and estimates indicating any two of the following:

**1) Severely fragmented or known to exist at no more than ten locations.**

**2) Continuing decline, inferred, observed or projected, in any of the following:**

a) extent of occurrence

b) area of occupancy

**c) area, extent and/or quality of habitat**

d) number of locations or subpopulations

e) number of mature individuals

**Year Assessed:** 1996

**Annotations:** Needs updating

**Assessor/s:** Australasian Reptile & Amphibian Specialist Group

**History:**

1988 – Indeterminate (IUCN Conservation Monitoring Centre 1988)

1990 – Indeterminate (IUCN 1990)

1994 – Vulnerable (Groombridge 1994)

### 1.3 EA Category

The Broad-headed Snake is listed as an **Endangered Species** on Schedule 1 of the New South Wales *Threatened Species Conservation Act, 1995* (TSC Act). This species is also listed as a **Vulnerable Species** on Schedule 1 of the Commonwealth *Endangered Species Protection Act, 1992*.

### 1.4 NZ and PNG Categories and Legislation

Not Required.

### 1.5 Wild Population Management

Relevant only if the species is threatened and being managed

More info to be added..

### 1.6 Species Coordinator

More info to be added..

## DEC threatened species profile - Broad-headed Snake

**Scientific name:** *Hoplocephalus bungaroides*

**Conservation status in NSW:** [Endangered](#)

**National conservation status:** [Vulnerable](#)

### 1.7 Studbook Holder

More info to be added..



The Broad-headed snake *Hoplocephalus bungaroides*. Photograph by [Jonno Webb](#).

## 2 Taxonomy

The Australian genus *Hoplocephalus* only includes three species of snake. All three species are small to medium sized thin snakes, with distinctive colouration for each species.

- The Broad headed Snake is typically black above with yellow scales forming irregular narrow bands, with a sliver cream belly. There are 21 rows of midbody scales, 200–230 ventral scales, an undivided anal scale and 40–65 undivided subcaudals, with length to 0.9 meters.

- Stephen's Banded Snake is typically dark grey to almost black, with wide cross bands of a slightly lighter hue, often with pale or white markings around the lips or side of the head. Midbody scales in 21 rows, with 220–250 ventral scales, an undivided anal scale, 50–70 undivided subcaudals and length to 0.6 meters.

- The Pale-headed Snake is typically uniform grey or light brown in body colour, with a broad pale band on the nape of the neck, often bordered by narrow black markings. The top of the head is usually grey, sometimes with spots. Midbody scales in 21 rows, 190–225 ventrals, undivided anal scale, 40–65 undivided subcaudals, length to 0.6 meters.

The Australian genus *Hoplocephalus* only includes three species of smallish snakes with no sub species found. All are restricted to east coast of New South Wales and Queensland. These snakes are The Stephen's Banded Snake (*Hoplocephalus stephensi*), Pale-headed Snake (*H. bitorquatus*) and Broad-headed Snake (*H. bungaroides*).



Pale headed Snake (*H. bitorquatus*)



Stephen's Banded Snake (*Hoplocephalus stephensi*),

## 2.1 Nomenclature

Kingdom [Animalia](#) -- Animal, animals, animaux  
Phylum [Chordata](#) -- chordates, cordado, cordés  
Class [Reptilia](#) Laurenti, 1768 -- répteis, Reptiles, reptiles  
Order [Squamata](#) Oppel, 1811 -- Amphisbaenians, Lizards, serpents, Snakes  
Suborder [Serpentes](#) Linnaeus, 1758 -- cobra, serpente, serpents, Snakes  
Family [Elapidae](#) F. Boie, 1827 -- Cobras, Coral Snakes, Coralsnakes, Elapids, Kraits  
Genus [Hoplocephalus](#) Wagler, 1830  
Species *Hoplocephalus* [bungaroides](#) Wagler, 1830

## 2.2 Subspecies

Not Required.

## 2.3 Recent Synonyms

More info to be added..

## 2.4 Other Common Names

Some other common names this species has been known for are

- Broad-head
- Broady
- Yellow-spotted Snake
- Night Snake
- Hoplows



### 3 Natural History

Australia's most endangered serpent, the broad-headed snake. A beautiful creature, right? Even if you don't particularly like snakes, and it's a fair guess that many of you don't, you have to admit that the bold bands of yellow on black are . . . striking. There are perhaps 800 of these snakes left in the universe. OK, before you can understand this species' predicament, you need to know a few basic things about its biology. First, the ability of snakes and other reptiles to function is closely tied to their body temperature, which in turn is tied in large part to the temperature of their surroundings being ectothermic. Broad-headed snakes live in eucalyptus forests in the vicinity of Sydney, where they take refuge under thin slabs of rock atop sandstone plateaus (also pictured below). They are extreme ambush predators, sitting under these rocks for weeks at a time, waiting for geckos (their principal prey) to pass by. Both the snakes and the geckos are active at night, so it's especially important that these rocks are warm in the late afternoon so that the snakes are warm enough to hunt after sunset. If the rocks aren't hot, the snakes can't hunt. Now, some ecological historians have hypothesized that in areas that haven't been completely paved over, the vegetation has been getting thicker over the past couple-hundred years. The argument goes like this: Aboriginal Australians used fire extensively as a tool to stimulate grass growth, a sort of bait for the kangaroos and wallabies that they hunted. All of these fires maintained a relatively open, grassy woodland for tens of thousands of years. The arrival of the English around 1800 caused the death and displacement of most of the indigenous population, and with it, the fire regimes. Believing fire to be detrimental to ecosystems and people, subsequent land managers have done their utmost to suppress wildfires. The end result: thicker forest cover. So far, though, the evidence for thicker forests has been mixed. If the bush-encroachment argument is correct, then it means that many species adapted to relatively open conditions--like the broad-headed snake--have probably been losing habitat even in the most strictly protected national parks. Previous studies have shown that these heat-loving snakes don't occur in shaded habitat. In fact, the snakes are found only under the very hottest rocks, those that lots of direct sunlight. When vegetation grows up and shades rocks, snakes abandon them; when we experimentally cut the vegetation away, they return.

The most recent work on this project, soon to be published in the *Journal of Applied Ecology*, uses old-timey aerial photographs from the 1940s and 1970s along with satellite imagery from just a few years ago. Analysis of these images shows that the forest has indeed gotten thicker, the bare rock scarcer. It's a gloomy trend, as far as rock-dwelling reptiles are concerned.

The question is what to do about it. If the only goal is to ensure the survival of the broad-headed snake, then the answer is obvious: foresters need to head down to a few of the National Parks with either lighters or chainsaws and carefully start burning or lopping down some of the cover.

But of course things are never so simple. First of all, it is not clear what the land-management goal for these areas ought to be. What exactly are we trying to "conserve"? The ecosystem as it was before humans arrived? Before Europeans arrived? Some entirely new configuration? On what basis do we make this kind of decision? Saving the broad-headed snake would be wonderful; it's a handsome little reptile, after all. But it is also probably the best-studied species in the ecosystem, and its needs must be balanced against the needs of all the other species, most of which we know next-to-nothing about. If we start lighting more controlled fires, how much collateral damage will we cause to other animals and plants?

And then there's the human element. Prescribed burning is a touchy subject in Australia, mainly because eucalyptus trees combust like gasoline, and when bushfires get out of control, they can take entire towns with them. Some argue that more relatively cool, controlled burns would reduce fuel loads and the risk of dangerous fires, but wherever there's fire there's a risk of losing control. Not to mention that killing trees puts carbon into the atmosphere, which is something that we're generally trying to avoid these days. So should we just let the forest grow and wash our hands of the broad-headed snake? Treat it as an anachronism whose time has come to quietly bow out???

We tend to believe that habitat diversity, like species diversity, is a good thing, and naturally they tend to reinforce one another. Thus, we suspect that a few carefully controlled burns here and there, coupled with a hands-off policy elsewhere, would be best for maintaining a healthy and heterogeneous ecosystem without contributing too much to our greenhouse-gas problem. So in this case, we might be able to have our cake and eat it, too.

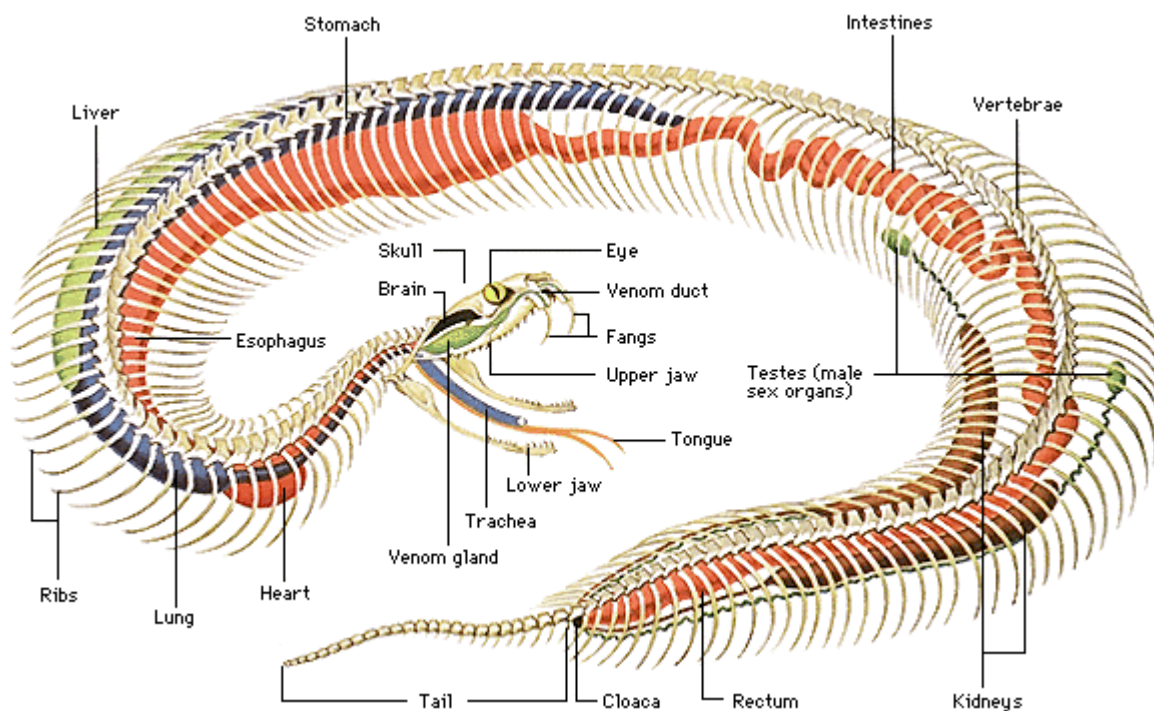
But we don't have any ironclad answers to the more general philosophical question about how to choose our conservation goals in the face of trade-offs. The remaining wildlands of the world are humanity's

gardens, and like gardens they must be managed. And the reality is that they will have to be managed on a shoestring budget, on the basis of inadequate information, and with minimal ability to predict the full consequences of management actions. Increasingly, that's going to entail tough decisions about what to save and what to let go, a kind of ecological triage. Like trading trees for snakes. It will sometimes be a bitter pill to swallow, but we might as well get used to the idea.

### 3.1 *Morphometircs*

#### Description

The Broad-headed Snake is a medium sized, front-fanged, venomous snake. Its body colouration is generally black with lemon to golden yellow scales forming irregular cross bands, usually a single scale wide and interspaced by 3-4 black scales. Along the sides there tend to be yellow scales which interconnect the cross bands to produce a wavy or straight horizontal yellow striping. On the belly the colouration tends to be steely bluish grey but can be splotched with yellow. The broad ventral scales are keeled at their margin, an adaptation for climbing. The head is clearly distinct being much wider than the neck and is very obvious when aroused. The head is ornamented with irregularly placed yellow scales and the upper lip (labial) scales are also barred yellow. They range in size from 22-28cm total length as neonates and up to around 90cm as adults, though rarely, larger sizes have been reported. Average size is about 60cm with females tending to reach the larger sizes.



#### 3.1.1 Mass And Basic Body Measurements

A slender bodied snake with distinct broad, somewhat flattened head set off from the neck. Adults average somewhere between 50 and 70 cm total length, although 100 cm specimens are known. The keeled ventral scales are an adaptation for climbing. All have smooth dorsal scales. Other diagnostic characters for the genus are: 19-21 mid-body rows, over 190 ventrals, the frontal shield is longer than broad, internasals present, suboculars absent, anal and subcaudals are single, and two to three solid maxillary teeth follow the fang (Cogger, 1992).



### 3.1.2 Sexual Dimorphism

There is little difference between male and female in this species as with most of the Australian elapids. Although the females grow to be a larger snake than the males this is thought why there is no combat noted between males ever living in small communities.

### 3.1.3 Distinguishing Features

Broad-headed Snakes are most commonly confused with the (potentially much larger) Diamond Python (*Morelia spilota spilota*) which occur in the same areas. However the two snakes may be easily separated by the fact that Diamond Pythons have numerous irregular head shields and labial heat-sensing pits - Broad-headed Snakes don't. Furthermore Broad-headed Snakes are an even greyish-black colour ventrally, whereas Diamond Snakes have unevenly coloured belly markings. It has been suggested that young Diamond Pythons have evolved in a manner to mimic Broad-headed Snakes. Such mimicry by non-venomous species to look and act like venomous species is well known in the animal world. Certainly young Diamond Pythons are more pugnacious than the adults, a habit more in line with that of similar sized Broad-headed Snakes. A more widely accepted scenario however is that similarities in appearance and habits between the two species are due to convergent evolution to cope with similar environmental problems and so on, rather than a non-venomous species mimicking a venomous one.



Broadhead on left and Diamond Python on the right look similar?

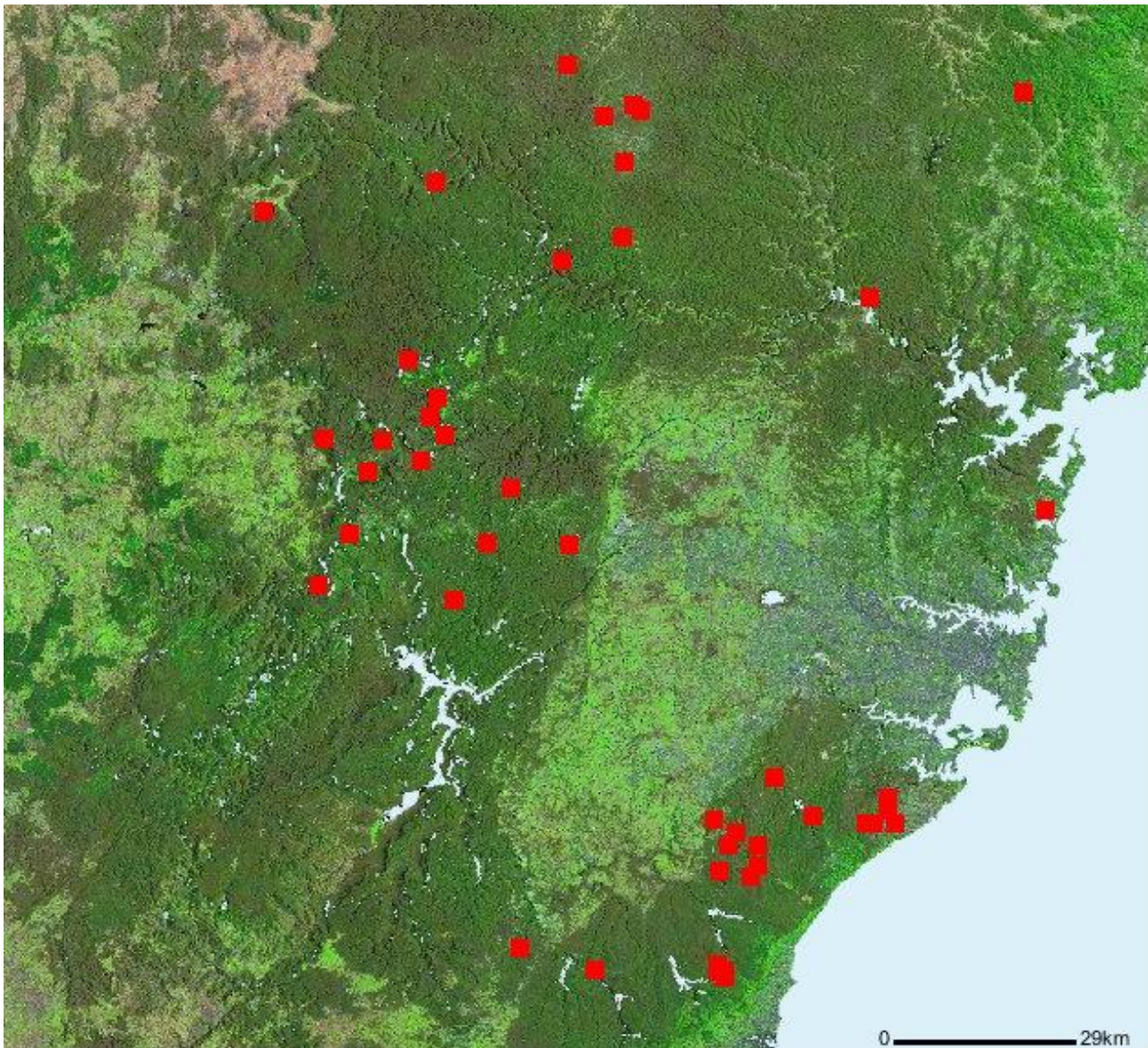


## 3.2 Distribution and Habitat

### Distribution

The Broad-headed Snake is restricted to the Sydney Basin and within a radius of about 200km of Sydney. Its distribution extends from Wollemi National Park in the north; the edge of the Clyde River catchment in the ranges southwest of Nowra in the south; and west to the upper Blue Mountains at Blackheath and Newnes. Its eastern most distribution is within Royal National Park and the escarpment areas above the northern end of the Illawarra. Old records exist for parts of Sydney Harbour foreshore and the eastern suburbs pre 1920, where the species formerly occurred along rocky sections of the Sydney coastline. The historical records from the entrance of Port Jackson south to Botany Bay, and around Middle Harbour, and “the inlets of Lane Cove and Parramatta” (Krefft 1869), are very old and these populations are thought extinct. Similarly there are also older records from outlying sandstone extensions at the NW edge of the Sydney Basin between Bathurst and Mudgee. In total there are approximately 170 available specimen records of the Broad-headed Snake, but only about 50 of these could be regarded as current or recent. Their distribution today would appear to be centred in four key areas; Blue Mountains, southern Sydney, an area north west of the Cumberland Plain and the Nowra hinterland.

--REFF



**Broad-headed Snake Distribution Map** restricted to the Sydney Region of NSW and even more precisely just the Hawkesbury Sandstone Outcrops.



## Habitat

The Broad-headed Snake has a preferred habitat centred on the communities occurring on the Triassic sandstone of the Sydney Basin. The sites where they occur are typified by exposed sandstone outcrops and benching and in these locations the vegetation is mainly woodland, open woodland and/or heath. The Broad-headed Snake seasonally occupies distinctive microhabitats within these broader habitat types. They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (Webb & Shine 1998b). Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia*, *C. gummifera*, *Eucalyptus sieberi*, *E. punctata* and *E. piperita* (NPWS unpublished).



*Sandstone outcrop in Morton National Park, Australia, home to the largest remaining population of broad-headed snakes. The snakes shelter under loose slabs of rock along the cliff edges.(J.kWeeb)*

The Broad-headed Snake has a preferred habitat centered on communities occurring on the Triassic sandstone of the Sydney Basin.

The sites where they occur are typified by exposed sandstone outcrops and benching and in these locations the vegetation is mainly woodland, open woodland and/or heath.

The Broad-headed Snake seasonally occupies distinctive microhabitats within these broader habitat types. They utilise rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (Webb & Shine 1998b).

## 3.3 Conservation Status

**IUNC Red List Category & Criteria:** VU B1+2c

VULNERABLE (VU) – A taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future, as defined by any of the following criteria

**B)** Extent of occurrence estimated to be less than 20,000 km<sup>2</sup> or area of occupancy estimated to be less than 2000 km<sup>2</sup>, and estimates indicating any two of the following:

- 1) **Severely fragmented or known to exist at no more than ten locations.**
- 2) **Continuing decline, inferred, observed or projected, in any of the following:**
  - a) extent of occurrence
  - b) area of occupancy
  - c) area, extent and/or quality of habitat**
  - d) number of locations or subpopulations
  - e) number of mature individuals

### **Australian Conservation status**

- The Broad-headed Snake is listed as an **Endangered Species** on Schedule 1 of the New South Wales *Threatened Species Conservation Act, 1995* (TSC Act).
- This species is also listed as a **Vulnerable Species** on Schedule 1 of the Commonwealth *Endangered Species Protection Act, 1992*.

### **Why is this species endangered?**

There are many reasons why species are classed as "rare" or "endangered". Some taxa are placed in this category simply because they are restricted to habitats so remote and inaccessible that few specimens are ever collected, even though the animals may well be common where they occur. Other common and widespread species (such as the platypus) are perceived as "rare" because they are secretive and hence not often observed. Many of the genuinely rare species are those which have suffered directly as a result of human settlement in Australia, either through hunting, habitat destruction, or the depredations of feral animals such as cats and cane toads. For most reptiles and amphibians, it is *habitat destruction* which is the most important threat (Ehmann and Cogger 1985). Most of these animals are small and not particularly valued by hunters, so direct predation by humans is less significant than the continuing destruction of large areas of critical habitat. If the habitat is destroyed, the species will not be able to persist. The Broad-headed Snake is in a particularly difficult situation for three reasons:

- 1) The southeastern coastal area in which it occurs also supports the highest densities of human population in the continent, so that habitat degradation has occurred on a massive scale. Although there are many National Parks in the range of the Broad-headed Snake, illegal habitat destruction has continued even within these areas (see below);
- 2) Weathered sandstone outcrops along ridge tops are essential for this snake, especially the crevices formed by exfoliating layers of sandstone. Unfortunately, these same rocks are highly prized as decoration for home gardens, with the result that many outcrops have been torn apart by commercial collectors of "bushrock" (Hersey 1980). This problem is not a new one; the first book ever published on Australian snakes noted that the numbers of Broad-headed Snakes had already declined substantially because of habitat destruction and bushrock collection for gardens (Krefft 1869);
- 3) Snakes, especially venomous snakes, are not likely to raise the same warm sympathy as do the "cuddly" animals like koalas and kangaroos. Hence, many people see the conservation of reptiles as a less significant environmental issue than conservation of mammals or birds.

### **What can be done to conserve these animals?**

Informed members of the general public can play an important role in helping to ensure that the Broad-headed Snake does not move closer to extinction. Here are a few suggestions:

- 1) Talk to your friends about the importance of conserving ecosystems, not individual species. Many people tend to focus on one or two obvious (usually, large and furry) species, and think that the major problem is to save individual animals. This is rarely the case. If we want our grandchildren to enjoy a diversity of Australian wildlife,



our best strategy is to conserve habitats where natural ecosystems can continue to function. This means taking care of the requirements of all components of these systems, including the generally "unpopular" animals like snakes.

2) Support the protection of wilderness areas and the creation of National Parks, and oppose any moves for destructive exploitation of such areas unless a thorough review indicates that this is an economically and environmentally sensible decision.

3) Don't buy "bushrock" for your backyard, especially the weathered rock that comes from natural outcrops. Old fallen logs offer an aesthetically pleasing alternative. If you really want to use rocks in landscaping, large and attractive sandstone boulders can be bought from quarries: they will take a little while to "age" and grow lichens, etc., but you will have the satisfaction of knowing that you haven't supported the destruction of critical habitat for a host of local wildlife species.

4) If you see a flatbed truck loaded with bushrock in a National Park or State Forest, record the truck's registration number and report it to the National Parks ranger. There have been several successful prosecutions, and the National Parks and Wildlife Service is anxious to stamp out these illegal destructive activities.

### **Description**

The Broad-headed Snake is generally black above with yellow spots forming narrow, irregular cross-bands. Other yellow scales may link these cross-bands laterally to form a straight or zigzagged stripe along the body. These cross-bands help distinguish it from the similar-looking but harmless juvenile Diamond Python. Its head is flattened on top and distinct from the body. The belly is grey or greyish-black. The average length is about 60 cm, with a maximum of around 150 cm.

### **Habitat and ecology**

- Nocturnal.
- Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.
- Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.
- Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally.
- Females produce four to 12 live young from January to March, which is a relatively low level of fecundity.

### **Regional information**

This species is found in the following catchments management authority region.

- [Central West](#)
- [Hawkesbury/Nepean](#)
- [Hunter/Central Rivers](#)
- [Southern Rivers](#)
- [Sydney Metro](#)

### **Threats**

- Removal of bushrock from sandstone escarpments.
- Intentional killing of snakes discovered during bushrock collecting or other outdoor activities.
- Illegal collection of individuals by reptile collectors.
- Removal of large hollow-bearing trees adjacent to sandstone escarpments.
- Damage to habitat by feral goats.

## ***Recovery strategies***

Priority actions are the specific, practical things that must be done to recover a threatened species, population or ecological community. The Department of Environment and Conservation has identified [22 priority actions](#) to help recover the Broad-headed Snake in New South Wales.

### ***What needs to be done to recover this species?***

- Maintain colonies in captivity for future re-introduction to depleted sites or sites undergoing restoration.
- Undertake feral goat control programs in sandstone escarpment areas.
- Retain woodland adjacent to sandstone escarpments, particularly large hollow-bearing trees.
- Retain sandstone rock in bushland on escarpment areas; implement LEPs, DCPs with suitable restrictions on the removal of bushrock.
- Limit vehicle and pedestrian access to and recreational use of sandstone escarpments where this species occurs.
- Restore rocky habitat to escarpments that have been disturbed.
- Report suspected illegal reptile collection or sale.

Advocate the use of quarried sandstone or alternatives in preference to sandstone sourced from bushland on escarpments; implement a community and industry bushrock education strategy.

## **3.4 Longevity**

### **3.4.1 In the Wild**

Not much is known about the longevity of these snakes in the wild. There are some studies currently undergoing estimating 10 years maybe reaching 15 years in some areas.

### **3.4.2 In Captivity**

Broad-headed snakes are relatively long lived. Captives held in excess of ten years are common. Wollongong herpetologist Marion Anstis successfully kept a specimen on a diet of mice for over 19 years. This was the same specimen that didn't eat at one stage for over 12 months.

### **3.4.3 Techniques Used to Determine Age in Adults**

Snakes don't show anything as prominent as gray hair or liver spots as they age. The age of wild-caught snakes is usually evidenced as the number of scars and broken bones on their bodies, but that doesn't apply to captive-raised snakes.

As a snake ages, its symmetry changes. It's a subtle thing and I don't know that I can always tell a four-year from a 14-year old animal. Most 14-year-old snakes are still pretty much in their prime. But, in general, as snakes get older, they tend to get bigger heads, and bigger bodies--not necessarily fatter, though that's usually the case in captivity, but a bigger skeleton, a bigger body cavity because the rib cage is bigger. There's no real way to quantify what I'm talking about. There are commonalities that you'll notice among all snakes. Go to the zoo and look at the snakes there; that's a place where older animals are more often seen than in private collections. But to get down to specifics for any particular species, it really requires that you know well the symmetry and shape of the animals with which you want to work. And that involves looking at lots and lots of them. There's no substitute for experience.

## 4 Housing Requirements



The Broad-Headed Snake Exhibit at Sydney Wildlife World (C.Morris09)

### 4.1 Exhibit/Enclosure Design

When designing a broad-headed enclosure there are some key requirements of this endangered snake that need to be considered. The Broad-headed Snake has a preferred habitat centered on the communities occurring on the Triassic sandstone of the Sydney Basin. The sites where they occur are typified by exposed sandstone outcrops and benching, in these locations the vegetation is mainly woodland, open woodland and/or heath. The Broad-headed Snake seasonally occupies distinctive microhabitats within these broader habitat types. They utilize rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during the warmer summer months. (Webb & Shine 1998b). Some of the canopy tree species found to regularly co-occur at known sites include *Corymbia eximia*, *C. gummifera*, *Eucalyptus sieberi*, *E. punctata* and *E. piperita*

### 4.2 Holding Area Design

When it comes to housing a venomous snake, there are three primary considerations that absolutely must be kept uppermost in mind. They are (1) security, (2) security and (3) security. According to New South Wales National Parks and Wildlife Act, Dangerous Venomous Snakes may only be kept in lockable, sealed, escape-proof containers/ cages within a lockable and sealed, escape-proof room. Outdoor pits are not appropriate or acceptable for the holding of these Dangerous Reptiles. The individual containers and the room itself must be locked when the licensee is not present in the room, to prevent both unauthorized entry and/ or tampering with containers/ cages and the escape of snakes. (N.S.W N.P.W.S).

The holding enclosure should,

- Be easy to make
- Be strong
- Look good
- Have appropriate thermal properties and gradients
- Have easy access
- Be lockable
- Be easily maintained
- Resistant in moisture

### **4.3 Spatial Requirements**

Regulations covering minimum standards for keeping Broad-Headed Snake in captivity  
Terrestrial Snakes

The following formulae refer to the minimum floor area applicable for an enclosure containing a single specimen up to 4m long 'L' refers to the extended length (snout to tail tip) of the longest specimen housed in the enclosure.

- a) Animal Display Establishments and home base for exhibitors authorized to exhibit at temporary establishments.

Minimum enclosure dimensions must provide a floor area greater than or equal to,  $3L^2$  (e.g  $0.6L \times 0.5L$ ), but with no dimensions less than  $0.3L$ .

Minimum Height required is  $0.5L$

Example; For an indoor exhibit containing a single Broad Headed Snake with an extended length of 1000mm, the minimum floor area is  $1.00m^2$  and can be of any shape as long as no dimension is shorter than 300mm. e.g 1000mm x 1000mm or 1200mm x 830mm or 1670mm x 600mm; etc if the enclosure is to house three specimens, and the largest is 1000mm, then 40% increase (20% for each specimen beyond the first) to the floor area provided is required making the minimum floor area  $1.4m^2$  (example 1700mm x 830mm; or 1000mm x 1400mm; or 600mm x 2300mm etc).

- b) Medium term holding enclosures (holding less than 90 days) and display enclosures at temporary establishments.

Minimum enclosure dimensions must provide a floor area greater than or equal to  $.17L^2$  example  $0.45L \times 0.375L$

Minimum height required is  $0.35L$

#### Arboreal Snakes

- a) Animal display Establishments

Arboreal snakes require the same floor space prescribed for terrestrial snakes, but must also be provided with sufficient facility for the expression of climbing habits. This is a minimum of  $0.5L$ .

### **4.4 Position of Enclosures**

The position of outdoor enclosures should be north to north-west facing as are the cliff faces that wild snakes are found. The enclosure should have shelter provided from the elements and a number of hides at either end of the thermogradient.

The correct internal layout of outdoor enclosures is vital to the long term success and the health of captive snakes.

The most important considerations are:

- A range of micro-habitats, including areas of total shade, must be present to allow snakes to thermoregulate effectively.

- There should be a raised, central mound of earth in the enclosure to allow rain runoff.
- Dry, clean and dark retreat sites should be present, where snakes can take shelter over winter.
- Clean drinking water should be available at all times.

#### **4.5 Weather Protection**

When keeping Broad-headed snake outdoors weather protecting is essential. Provide both protection from the sun and totally dry and protected from the rain. It is thought that these snakes shelter under smallish and/or exposed rocks in winter to enable them better opportunities to "bask" while remaining under cover during the day. Clear sunny weather is typical of winter months in Sydney where these snakes occur.

##### **Outdoor Enclosures**

- The enclosure must be both escape proof and predator proof. This usually means totally enclosing the structure with a sunning section.
- Good protection from the elements is essential. Provide both protection from the sun and totally dry areas protected from rain. This includes places to hide.
- If earth flooring is used then ensure that it is burrow proof. (Bury the walls to a depth of at least 500 mm and have metal mesh flooring).
- Ensure that there is good drainage available.
- Wire mesh walls may potentially be abrasive to snakes trying to escape. Try to construct "non-accessible" walls out of smooth non-climbable materials.
- Smooth Colourbond metal fencing looks good and is cost effective for pit style housing.

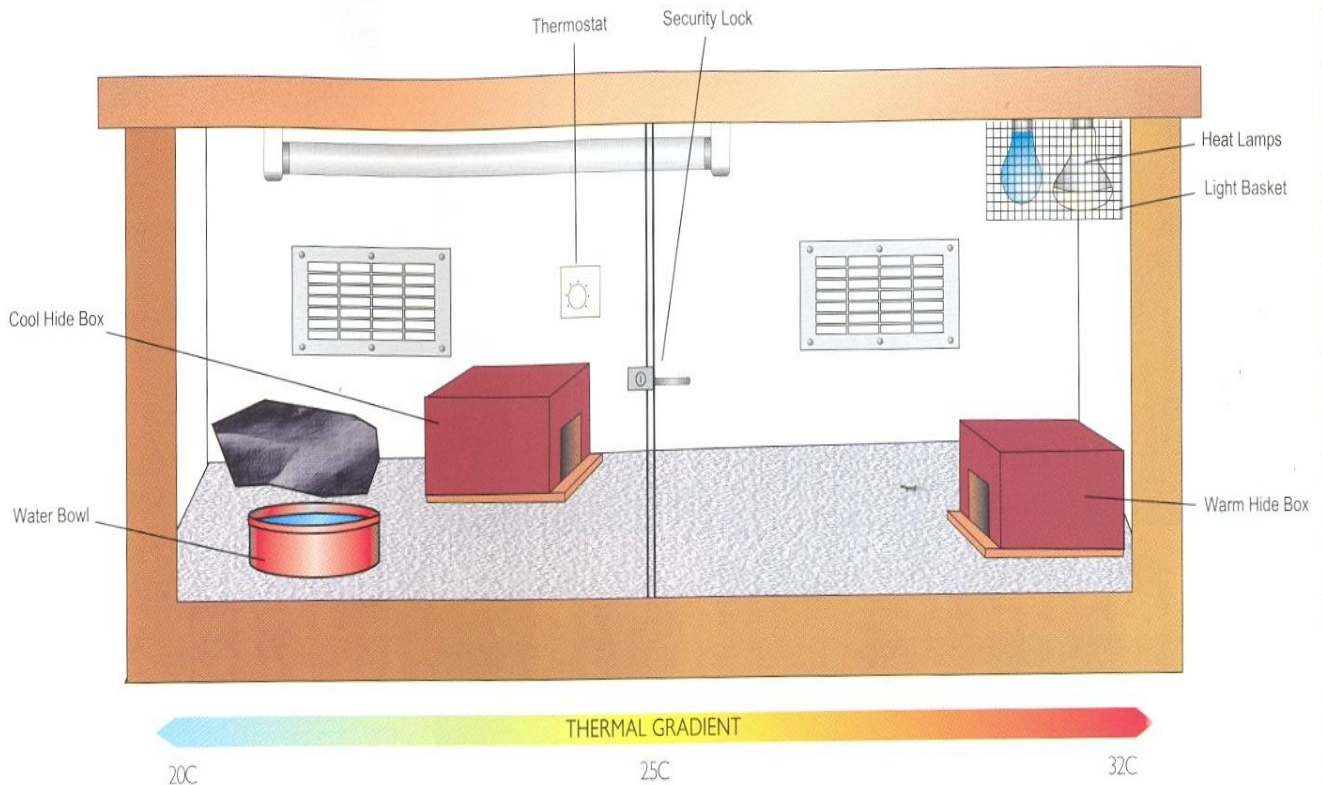
#### **4.6 Temperature Requirements**

Snakes are reptiles, which means they are ectothermic getting their body heat from external sources. Endothermic animals, such as mammals, regulate their body temperature internally. A snake's body temperature and its level of activity, is controlled by the temperature of the air and the ground around it. It will try to maximize body heat, by basking in the sun or lying on or near warm surfaces. This should be kept in mind while designing the display positioning the hot spots in good view for the public.

In cold areas of the state, snakes hibernate during winter. However, in the more temperate climate along the coast they shelter in rock crevices and logs during cold weather and come out on warm days to soak up the heat of the sun. During cold weather, snakes are less active and therefore hunt less. In the winter their metabolisms slow down, and they use up body fat which has been stored up during the warmer months of the year.

The snakes will thermo regulate as will cycle through the thermogradient provided. Temperatures should range in your enclosure. Having a hot end with heat and UV provided at a maximum of 32C and a cool end where the water should be placed at a minimum of 20C.





Hear a simple layout of an enclosure with the thermogradient. Notice a hide is provided at both ends of the gradient with the thermostat placed in the center.

The Enclosure must be heated by day, and this is best accomplished by including a radiant heat source (i.e., reflector globe, infra red heat lamp) towards one end of the enclosure to allow basking. The temperature readings from the middle of the enclosure should be intermediate and maintained between 24 and 28°C. During the night, all heating devices should be turned off and the enclosure temperature allowed to drop considerably. Night time temperatures should not be allowed to drop significantly.

(Weigal,J).

#### 4.7 Substrate

I have heard of some Broad-Headed Snakes being kept and successfully breeding in a pile of rock set in an enclosure. As these snakes are only found on rock on rock surfaces this has proven an affective and cheep substrate. The substrate you want to be easy to change and cost effective but still have natural ascetics.

-Off exhibit butcher paper or shred paper works well its cheep and easy to change although wont cut it on display. Mulch looks very natural on display and is not all that hard to change in a snake enclosure. The substrate should be changed regularly at least once a week depending on feeding resume.

-These days some keepers use a natural leaf litter substrate; the snakes are able to forage through it, which in itself is good behavioral enrichment. If they want to hide, they simply bury into it, but are still able to observe activities outside the cage. Some keepers argue that natural substrate is less hygienic and a haven for mites, but if it is replaced regularly (i.e. weekly) this shouldn't be a problem. With these snakes spending alot of their time on the rock face and in trees the substrate will not be as affected as much as your true terrestrial species.

-Some natural substrates such as pine chips, and some artificial substrates such as synthetic carpet or grass, can retain moisture that harbors bacteria and parasites and so they should NOT be used.



Broad-Head Exhibit SWW (C.Morris09)

-Natural substrates look good but can be difficult to keep clean and should not be used by inexperienced keepers.

#### **4.8 Nest boxes and/or Bedding Material**

It has been suggested that inside your enclosures, that you make available at least two hide boxes for the snake. Each hide box should be at the opposite ends of the thermal gradient inside the enclosure. That way the reptile can seek solace in either the warm or cool ends of the enclosure, without being seen from outside the enclosure. The hide boxes should have a large enough hole for the snake to gain access to the hide box, as well as coil up inside, snugly. The top of the box should be hinged to allow keeper access, as well as having a sliding, locking Perspex lid, on the top of the box, underneath the lid, as well as sliding, lockable Perspex cover for the snake's access hole. That way, when the snake is in his hide box, it can be totally locked, preventing the snake exiting the hide box, to allow the keeper to clean the enclosure, change water, substrate, etc, without having to remove the snake from the enclosure. This can also come in handy when having to remove the snake from the enclosure, without having to handle the reptile. You can lock the access door, remove the hide box, and open the hinged lid, allowing sight of the snake through the Perspex lid, allowing for close examinations.(Mostyn.J)

-- CHECK--

#### **4.9 Enclosure Furnishings**

The enclosure should have the following furnishings

- A rock face with ledges, cracks and craves.

This is a must for these snakes there live in rock on rock habitats in the wild, utilizing the thermo gradient of the cracks on the rock face and will spent 90 percent of their time on the rock face so you will have it well displayed and heating directed at it.

- A tree hollow or just some branches

During the warmer months wild broad heads enjoy the cooler cover of the canopy and can be found dwelling in tree hollows and branches, remembering when positioning the tree not to block the view of the rock face too much.





Broad-Heads on the Rock Wall (C.Morris09)



Broadhead On Ledge (C.Morris09)

You may also include some native plants and natural substrate to the exhibit. If using natural substrate like mulch of leaf litter you should change the substrate at least once a week as this can be a good breeding ground for bacteria very quickly.



(C.Morris09)

This Female Broad head proving that these snakes don't mind a nap in the tree as well as the rock face

The Exhibited Animals Protection Act states the housing of dangerous reptiles

Note: It is the responsibility of the licensee to ensure that dangerous reptiles do not escape.

- 1) Cages containing dangerous reptiles must be designed so that the cage may be cleaned without endangering the keeper.
- 2) In addition to the requirements, the following security precautions must be met for the housing of dangerous reptiles:
  - a) Rooms containing dangerous reptile enclosures must be constructed so that in the event of a dangerous reptile escaping from the enclosure, the reptile will be contained within the room. Consequently, gaps or holes in the floor, walls, or around closed doors must be eliminated. Windows must be locked or be properly fitted with suitable non-detachable wire gauze screens. Human access points to the room must be lockable. It is highly recommended that night security systems, such as motion sensors, to be fitted to rooms containing dangerous reptiles.
  - b) A formalized security and inspection system must be implemented to ensure that access doors and enclosure lids are kept locked at all times.
  - c) In addition to labels required for the public display of animals, each cage must be marked for the keepers benefit with the correct name and the number of reptiles contained therein. If the reptiles are venomous, this must be stated and clearly visible.
- 3 – Staff that work with venomous reptiles must:
  - a) Familiarize them self's with first aid and be well versed in the application of correct first aid treatment for a snake bite.
  - b) Make appropriate precautions in advance of any foreseeable emergency. Such precautions must include notification to the nearest hospital as to the species of venomous reptiles kept by the establishment, so that a stock of appropriate antivenes may be kept at the hospital.
  - c) Maintain an appropriate first aid kit, which includes bandages for the treatment of snake bite, which is available at all times to staff working with reptiles.

Enclosures should include a large water container, large enough for the snake to totally immerse itself in without spilling. You should also include two hide boxes, each at opposite ends of the enclosure, therefore allowing the snake to retreat to a either warm or cool refuge. A large rough rock should also be placed in the enclosure to allow the reptile access to a rough object to rub against to slough properly. Plants inside the enclosure will also allow the snake to think that they are hidden, but also allowing the public the view the snake in a natural surrounding. Substrate should be as close as possible to what it would be in a

natural environment, as per EAPA standards. Other hide spots such as a hollow log at either end of the enclosure can be placed in the enclosure, as well as an area for the snake to bask in.

## 5 General Husbandry

### Annual Cycle of Maintenance

Maintenance Due	Heat Supply	UV Lighting Every 6 months	Full Clean F10 Disinfectant	Mating Season & Young Born	
-----------------	-------------	----------------------------------	-----------------------------------	----------------------------------	--

January				Young Born	
February		Change Uv	Full Clean	Young Born	
March				Young Born	
April				Young Born	
May	Heat				
June	Supplied		Full Clean		
July	Over Winter				
August	Only	Change Uv			
September				Mating Season	
October			Full Clean	Put Together	
November				On / Off Over	
December				4 Months	



## 5.1 Hygiene and Cleaning

During the Snakes active time of the year regular cleaning is required:

- Faecal, urine wastes and uneaten food must be removed daily (spot checking).
- The substrate should be replaced weekly. It is a good idea to leave a small amount of faeces each time the cage is cleaned, as the pheromones released mark the cage with the animal's own scent.
- When the substrate is changed the caging should be cleaned with a veterinary grade disinfectant such as F10SC (refer figure 5.1).
- Hard surfaces of enclosures and hide boxes must be cleaned with the same disinfectant fortnightly to prevent the accumulation of faecal matter and urine.
- Food and water bowls must be cleaned and disinfected after every use.
- Wash hands thoroughly or use a skin sanitizing gel such as Repti-hand between animals and after handling animals to prevent the spread of disease (refer figure 5.2).



- F10SC is a total spectrum disinfectant that, unlike other strong disinfectants on the market, has no adverse side effects on people, animals, or on equipment and surfaces. It is ecologically friendly and biodegradable, and carries a wide range of registrations and approvals from around the world. In Australia, F10SC is registered by the APVMA for use in animal production and housing facilities, approved by AQIS for use in food export processing as a non-rinse disinfectant, and is also listed by the TGA as a Hospital Grade Disinfectant. The benefits of using F10SC include:

- Kills all types of pathogen – F10SC is bactericidal, virucidal, fungicidal, sporicidal
- Minimal chance of microbial resistance due to F10SC's unique benzalkonium chloride and polyhexamethylene biguanide combination of actives and mode of action
- \*Rapid kill times – less than 30 secs for gram positive bacteria, 60 secs for gram negative bacteria, Canine Parvovirus 20 mins
- Successfully tested against avian influenza (bird flu) viruses at a concentration of 1:500 in 10 mins
- Non-corrosive, non-toxic, non-tainting, non-irritating, aldehyde-free
- Highly cost effective
- Biodegradable & ecologically friendly
- \*Tried, tested, independently verified and documented, and approved around the world

**Figure 5.1** F10SC (Chemical essentials 2007)

**STOP DISEASE SPREADING**  
**Protect yourself from**  
**Germ and Bacteria with**

# Repti-Hand

Repti-Hand is designed for just that purpose. It is important that you and your staff use the product. But it is also important that you pass on the same safety information to your customers and sell Repti-Hand with every reptile sold.

Repti-Hand not only protects people from animal diseases, it also has the critical function of protecting the pets from human diseases and from the disease spread by their human handlers. The use of Aristopet Repti-Hand in the shop protects both people and pets and shows you really care about your staff, customers and pets.

Repti-Hand is an instant skin sanitizing and cleaning gel, which kills up to 99.9% of germs and bacteria on contact, including salmonella. Repti-Hand is also pH balanced to be gentle on your hands.

**DIRECTIONS:** Simply squeeze a small amount of Repti-Hand directly onto hands and spread evenly over hands or skin surface to be sanitised in a washing motion. Do not use on broken skin. Discontinue use if irritation occurs.

Available in:  
RE22 250mL  
RE23 1L

## FOR USE WHEN HANDLING ALL ANIMALS

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- CATS
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Repti-hand (Aristopet 2007)

## Standard Operating Procedure Cleaning Reptile Enclosures

To Clean and disinfect the reptile enclosures safely and effectively.

### Equipment Needed

- Scrubbing Brush and 5L Bucker
- PPE Gloves
- Snake Hook
- Butchers Paper
- Holding Bin
- Rubbish Bin
- F10 Vet Disinfectant (Dilute 10ml : 5L of water)



(C.Morris09)

Equipment Needed

**Step 1** – Gather all equipment needed.

**Step 2** – Fill 5L bucket with water and add 10mL of F10sc vet disinfectant

**Step 3** – Place PPE gloves on hands.

**Step 4** – Check animal history cards. (Injured, Blue, Gravid, Due for feed)

**Step 5** – Assess animal behaviour (Alert, asleep, blue, mating, fighting and. Position in the enclosure) If all clear.



(C.Morris09)

- Step 6** – Open enclosure (Slide glass doors in track or undo latch and open door out)
- Step 7** – Remove all reptiles from enclosure, Place hand or hook beneath the mid-body of the snake/lizard and remove from enclosure/holding bin. Handling gently use two hands to provide mid body support and allow the snake to move through your hands unrestricted, don't squeeze just provide support.
- Step 8** – Place in holding bin/enclosure and secure lid/door.
- Step 9** – Remove water bowl and furniture from enclosure.
- Step 10** – Remove any left over food & faecal from the enclosure and put in rubbish bin.
- Step 11** – Remove paper from enclosure floor and put in rubbish bin.



Removing Paper (C.Morris09)



Scrubbing Water Bowl

- Step 12** – Scrub clean with F10 solution the water bowl and furniture.
- Step 13** – Scrub clean the enclosure floor and ceiling and dry off.



Scrubbing Enclosure (C.Morris09)



Fresh Paper

- Step 14** – Replace fresh butcher paper covering the floor space of the enclosure.
- Step 15** – Replace any furniture and water bowl, and fill water bowl with fresh water.
- Step 16** – Check light bulbs are all working, replace any that are faulty.
- Step 17** – Repeat steps 5 through to 8.
- Step 18** – Record clean and anything else notable on history card.
- Step 19** – Change gloves, clean and disinfect holding bin and hook.
- Step 20** – Move on to the next enclosure.

**Cages that have contained ill snakes should be cleaned and completely disinfected immediately, rinsed and dried and left empty for at least two weeks before being used for other snakes.** Unused equipment such as snake housing and equipment that is not going to be used should be cleaned and disinfected as described above, thoroughly rinsed and left to dry as soon as the snakes are removed.

#### Cleaning Equipment

- Use separate equipment for each snake. Also use a separate bucket or plastic container for each enclosure, to disinfect cleaning equipment and cage furnishings.

- Clean all water containers and soak in disinfectant weekly after emptying the dirty water into a separate container for disposal into an outside drain or sink.
- For snake bags and other carrying equipment, ensure that any fecal matter is disposed of by turning the bag inside out over a garbage bin prior to washing the bag.
- Wash snake bags separately from any other items after first soaking for at least 30 minutes in diluted bleach, following the manufacturer's instructions.

#### Contact with other snake collections

- Do not use other people's equipment for your own snakes
- Do not let your snakes come into contact with other people's snakes or reptiles
- If you are visiting other people with snakes or reptiles make sure you wash your hands thoroughly afterwards and change your clothes and shoes before handling your own snakes

## 5.2 Record Keeping

Record keeping is an integral part of zoo keeping husbandry for all animal species including reptiles. Recorded data can be useful for the compilation of workable husbandry manuals and for information for use in scientific papers, and is necessary for good animal management.

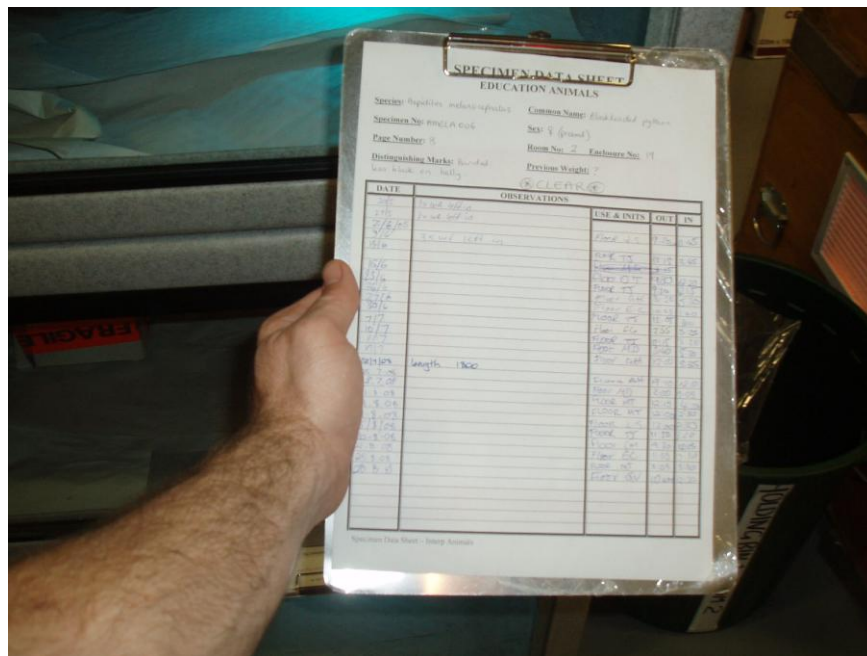
Records should be kept in a book, such as a diary or account book. Records should be maintained for each animal providing at least the following information:

- Animal identification.
- Species, sex, mating behaviour, acquisition and disposal of animals.
- Feeding date as well as quantities and type of food both offered and eaten.
- The dates of acquisition and disposal, with details of circumstances and addresses.
- The date or estimated date of birth.
- Breeding and details of any offspring.
- The date of occurrence of skin shedding and any problems encountered.
- Clinical data, including results of any physical examinations by a qualified veterinarian and details of, and date when, any form of treatment was given.
- Opportunistic measurements of body weight and snout vent length (SVL).
- The date of death and results of necropsy (where performed).
- Movements between or within institutions.

#### **Why keep records –** By keeping records:

- You can discover more about the animals in your care, and at the same time you could make valuable contributions to science, conservation and wild animal husbandry
- You can yield a library of information on individual specimens and species kept in captivity
- Fill in the gaps in existing knowledge on specific species, especially those species that are considered endangered
- provides data for research and husbandry. Research depends on data, and the keepers record files can provide information increasingly referenced in developing and improving husbandry practices
- Decrease the need to rely on 'hearsay', written records are more dependable than word of mouth information,
- Monitor the health of your snake by keeping a written record of each snake in a notebook or diary kept specifically for the purpose





A Simple Way of Recording Your Reptiles History (C.Morris09)

**Record significant details and dates such as:**

- Date of arrival and where snake came from, including feed, shedding weight, vaccinations, worming records from previous owner
- Date and weight each time snake is weighed
- Date and time and what snake ate, or didn't eat
- Date eyes went milky, indicating that it will soon shed
- Date of sloughing
- Date and nature of any treatments, eg treatment for snake mites or signs of sickness
- Any visits to the veterinarian and resultant treatments
- Any details what so ever, no matter how insignificant the details may seem

**These are often recorded as records as**

- ACQ** - Acquisition into the centre or zoo
- B/H** - **B**irth or hatching
- D/30** - Death or euthanasia within 30 days of hatch, birth or acquisition
- D/E** - Death or euthanasia after 30 days of hatch, birth or acquisition
- DIS** - Disposition, escape, export, release or sale of an animal
- BRD** - Breeding in the centre or zoo, reproductive details or observations
- INT** - Internal movement, enclosure to enclosure, to vet, off exhibit
- TAG** - Tagging, IDs, micro chipping, tattoo
- W/L** - Weight, length
- RxTx** - medical treatment, medications, worming, pills
- VET** - Vet examination needed
- OTH** - other, behavior change to a animals routine, maintenance
- NVL** - No visible lesions
- NAD** - No abnormalities detected

--- CHECK

**5.3 Methods of Identification**

For both health monitoring and breeding it is important to individually identify each snake. We can give each snake a number code or name and identify them by:

- Cage cards, with photographs, description, microchip number, and a warning that the species is highly venomous



- Photo or description – illustrating distinguishing features, such as, individual markings, colour patterns, old wounds or scars
- Microchip – inserted sub-cutaneously, need scanner to read microchip number, access to databases for registration numbers
- Scale clipping
- Scale counts

## **5.4 Routine Data Collection**

Routine data collection is a must for captive reptiles to monitor the health of your snake by keeping a written health record of each snake in a notebook or diary kept specifically for the purpose

Record significant details and dates such as:

- Date of arrival and where snake came from, including feed, shedding weight, vaccinations, worming records from previous owner your snake
- Date and weight each time snake is weighed
- Date and time and what snake ate, or didn't eat
- Date eyes went milky, indicating that it will soon shed
- Date of sloughing
- Date and nature of any treatments, eg treatment for snake mites or signs of sickness
- Any visits to the veterinarian and resultant treatments
- Any details what so ever, no matter how insignificant the details may seem

---CHECK---

## 6 Feeding Requirements

### 6.1 Wild Diet

Broad-headed Snakes usually only seem to be found in areas with large numbers of Leseuer's Geckos (*Oedura lesueurii*), which according to a number of sources including Wells, Wellington and Williams (1988) are this snakes preferred food in the wild. Areas of apparently suitable habitat without this food lizard rarely appear to have Broad-headed Snakes, even though they are known to opportunistically feed on other reptiles. In my own experiences and others, the best spot for Broad-headed Snakes are those areas which have absolutely HUGE numbers of Lesueur's Geckos.

#### Foraging Strategy

Radio-telemetric monitoring showed that the snakes remained sedentary, under rocks, for long periods of time (mean= 6.3 days between successive displacements: Webb and Shine, 1977a). In the study they never observed Broad-headed Snakes actively searching for prey, despite many hours of observation both by day and night. Continuous body temperature records of radio tracked snakes (monitored by automatic data loggers) confirmed that the snakes remain inside their crevices for days or weeks at a time, and do not move even a short distance. Instead, the snakes wait in their retreat sites until a potential prey item appears, and then seize the item. On several occasions, snakes that they knew to have remained sedentary for several days, contained freshly ingested prey items when they were captured and examined at the end of this period. Hence, it is clear that these snakes rely upon ambush ('sit and wait') predation rather than active foraging, at least during the times of the year when they remain on the rocky outcrops. The snakes are more difficult to observe during the summer, when most adult specimens migrate into the adjacent forests (Webb and Shine 1977b). Velvet Geckos (the primary prey of the juvenile Broad-headed Snake see below) strongly avoid the scent of these snakes, providing a plausible reason why the snakes benefit from remaining immobile within suitable retreat sites (Downer and Shine, 1988). 'Sit and wait' foraging has also been reported in captive bred Broad-headed Snakes (Wells, 1981) (Morris, 2009).

This species is an ambush predator, spending up to four weeks in the same retreat site (Webb and Shine 1977a) and preying on small reptiles and mammals that enter the retreats (Wells 1981; Webb and Shine 1977a).

Snakes feed very infrequently, with less than 20% of captured animals showing signs of having fed recently (Webb and Shine 1994). Juveniles feed more frequently than adults. Captive snakes maintain condition or gain weight when kept on a diet of one to two pre-killed mice or rats a month (Shine and Fitzgerald 1989). One captive specimen is known to have survived a 12-month fast until living to the age of 20. (Anstis and Wells 1981).

#### Type of prey eaten

A total of 56 prey items were recorded from 50 individual snakes. Two of these snakes were captured twice and contained prey on both occasions. Most snakes were found to have ingested a single prey item, but two juveniles (SVLs of 27 and 30cm) had each eaten a velvet gecko and an unidentified skink, while one subadult male (SVL = 44cm) had eaten a mouse, a velvet gecko and an unidentified skink. Body size strongly influenced the types of prey eaten by Broad-headed Snakes. We divided snakes into three size classes: Juvenile snakes fed entirely on small lizards (geckos and skinks) while larger snakes fed on lizards and small mammals. Of 33 prey items recovered from juvenile snakes, 23 (70%) were velvet geckos. The relative importance of *O. lesueurii* in the diet of the Broad-headed Snake decreased as Snakes grew larger. Velvet Geckos composed 27% of the prey items consumed by adult snakes, significantly less than in juveniles.

---CHECK---



S Cohen/NPWS

**Broad-headed eating its favorite wild food a velvet gecko (SCohen/NPWS)**

Juvenile snakes feed primarily on Velvet Geckos, although they only comprise 27% of prey items (Webb and Shine 1988c). Other prey items include lizards *Cyrtoblepharus virgatus*, *Eulamprus quoyii*, *Ctenotus taeniolatus*, *Eulamprus tenuis* and *Amphiburus muricatus*; *Anchechinus stuartii* (White 1973; Shine 1983; Webb and Shine 1998c Downes 1999; G Turner in NSW NPWS 2001c). One adult had consumed a juvenile conspecific half its size (Webb and Shine 1994).

---CHECK--- common name geckos

Broad-headed Snakes show a greater degree of prey specificity than most other Australian elapid snakes (Webb and Shine 1998c).

## **6.2 Captive Diet**

The diet of most Australian snakes in captive is rodents. They are readily available and cost effective. Some institutions with large reptile collections breed their own to save on feed cost. As they are easy to breed and quite with an old shipping container and some rodent racks is easily converted to a rodent breeding room and can be put anywhere on site away from your collection if need be. Even though these fuzzy little feeders have been bred to be fed they are vertebrates and the law states no live vertebrates are to be fed out as it is seen as inhumane, so is granddads old way of swinging it round then hitting it on the table

With any snake, feeding pre-killed prey is recommended. A live rodent can inflict some serious wounds on a snake in self defense. If a snake hesitates or is not hungry when you put a live prey animal in the cage, the snake is the one who might end up injured. Of course, it is also more convenient to keep a supply of frozen food in your freezer rather than raising or buying live animals for feeding

Food presented should be totally thawed, and at a temperature of around 26-28 degrees c. The food item can be jiggled in front of the snake by using a pair of long handled tongs, so that you will not get bitten. They can also be placed inside the enclosure, or dragged around the enclosure, allowing the scent of the food item to make a scent trail for the snake to follow. If your having trouble feeding you can try scenting the food item with lizard maker, which is a man made pheromone that makes the food item smell like a lizard. This is often used when young neonates refuse to eat the pinkie mice. They must then be weaned off the scent of lizards.



“Sit and wait” This captive Broad-Head takes a pinky rat from the crevices on the rock face.  
(C.Morris09)

Broad-Headed Snakes eat live adult mice and lizards in the wild, captive bred snakes are encouraged to accept frozen rodents. Frozen rodents, from 'pinkies' (hairless baby mice) up to full grown rats, can be bought from breeders and most pet stores. Feeding snakes is not for the squeamish. Start juvenile snakes on pinkies and increase the size of rodent according to the size of the snake. The rodent should be thawed and breeders recommend that a vitamin supplement is added.

Meals should be offered about once a week to fortnightly. Keep meals small if fed weekly. The number of feeds depends on the season and the snake's level of activity. In the wild these snakes are active and feed all year round. It will not compromise the snakes health to miss a meal or two. We even starve our Broad heads with the rest of the collection over the cooler hibernation months.

When feeding these snakes will usually sit and wait for food to approach as opposed to actively foraging for it, although this in part depends on the set-up of the cage. This behaviour may also explain why not many wild caught (museum held) snakes had food in their stomachs in the winter sheltering patterns. When snakes bite their food, they tend to hang onto it and immobilize it by using their body to push it against a restraining surface such as a rock. Using coils to restrain prey (like constriction) has also been observed. Food is eaten only when the prey is completely subdued by venom.

At Symbio Wildlife Gardens we breed our own rats and pre kill them on site at the desired age and size, then they are easily stored and packaged in bags of 5 and 10 in all sizes from Pinky, wiener and hopper to fuzzy Adult and Jumbo mice and rats.

### Quantities and varieties

	Juvenile	Sub-Adult	Adult
Pinky Mouse	1 /week	2/week	-----
Fuzzy Mouse	-----	1 /week	2/fortn
Adult Mouse	-----	1/fortn	2/fortn
Pinky Rat	1 /week	2/week	2/fortn
Fuzzy Rat	-----	1 /week	1/fortn
Fish	1 /week	2/week	2/week
Day Old Chick	-----	1/fortn	2/fortn
Small Frog	1 /week	1 /week	-----
Small skinks	1 /week	2/week	-----
Skink & Pinky strap	1 /week	2/week	2/week

Roo Sausage 50mm	1/week	1/week	2/week
Roo Sausage 80mm	-----	-----	1/fortn

---CHECK---

### **Types of Foods**

Try and use a variety of foods offered in a variety of ways. You can offer more to your snake than just frozen mice. In stead of one adult mouse every week maybe try two pinky rats, or a day old chick. Offer a large feed of two mice then skip a week of feeding. I have even heard of a live fish being dropped in to the exhibit of a trouble feeding Broadhead with success. It has been reported, that great success has been achieved, with day old chickens and mice or rats being injected with 2ml of mutton-bird oil.

Repti-cal and multi vitamins designed for reptiles, such as Repti-vite can be sprinkled over food. Following the company directions will ensure adequate nutrition without overdose.

Some keepers manufacture “sausages” out of minced meat, (kangaroo or beef), vitamin supplements, and occasionally mutton bird oil. These sausages tend to encourage the snakes to put on size rapidly.

### **6.3 Supplements**

Supplements are not needed some much in Australian snakes.

Food can be vitamin and calcium phosphate enriched, monthly. Juveniles need their calcium supplemented (Walls 1996, Watharow 2003). Care must be taken to avoid vitamin/mineral overdosing and to ensure correct dietary calcium – phosphorous ratios (DPI 2004). Commercially prepared mineral supplements, such as Repti-cal and multi vitamins designed for reptiles, such as Repti-vite can be sprinkled over food. Following the company directions will ensure adequate nutrition without overdose.

Supplements are not needed some much in Australian snakes.

It has been reported, that great success has been achieved, with day old chickens and mice or rats being injected with 2ml of mutton-bird oil. (Fearn, S)

Some keepers manufacture “sausages” out of minced meat, (kangaroo or beef), vitamin supplements, and occasionally mutton bird oil. These sausages tend to encourage the snakes to put on size rapidly.



## 6.4 Presentation of Food

When feeding a small venomous snakes like the broad-headed snake there are some precautions that need to be taken as these small snakes can pack a punch. Hand feeding any venomous snake is very dangerous although snakes are very accurate with there strike there can miss judge the shot, your hand could put off a stronger heat signature or just look better than the food on offer. The use of tongs is recommended to present the food item as this gives you some distance from the bit zone to you hand.



(C.Morris09)

Pinky Rat Offered with Tongs from a safe distance

When presenting the of food there are a couple of options the food can be lift clearly displayed in the enclosure for the snake to eat at there own desire although I believe feeding from tongs can enrich the feeding behaviour wriggling the food around as if it were still alive moving the food away from it making the snake hunt its food and you can even have the dead food put up a fight. Snakes don't get much enrichment but while feeding try to make it stimulating for the snake not just leave the dead mouse sitting in a corner.





(Fuzzy Feeding) Broad-Headed Snakes (C.Morris09)



We feed our two adult female broad-heads all year round Adult Mice 1/week(C.Morris09)



and Pinky Rats 2/week in concession (C.Morris09)

## 7 Handling and Transport

### **Only Experienced Handlers should even try to handle this snake**

#### **Potential Danger.**

#### **Venomous snakes require special handling techniques**

Reptiles need to be handled and restrained for various reasons. These reasons include: medical examinations and treatments, identification and moving of reptiles; assist feeding; venom collection; education; and maintenance reasons. Handling should be performed so as to ensure safety to the reptile and the handler. Venomous snake handling skills are developed with experience with the keeper learning over time to select the correct technique or tool for the job. And to expect particular handling behaviour's from various species and specimens. **Always expect the unexpected.**

Chemical control is not practical on a day to day basis and if administered often would cause stress to the animal. Chemical control is used most often by the veterinarian for painful and invasive procedures, including surgery (Titmuss. A).

### ***7.1 Timing of Capture and Handling***

The capture of the broad headed snake should be done as early as possible in the morning before the snake has had a chance to warm up. The snake can then be placed in a collection bag and then placed in the holding bin.

### ***7.2 Catching Bags***

Bagging is a secure and safe method of handling and transporting captured snakes in the field and in herpetology. Every snake keeper must be able to competently and safely bag their snakes. The term "Collecting Bag" is a firmly established term even though collecting is a rare event these days. Catch bags are used solely for the temporary holding of reptiles, for example during transport or enclosure maintenance.

Catch bags can be made of any closely woven, light and durable fabric such as calico or even light canvas and are usually about twice as deep as they are wide, and appropriate to the size of the animals. They should be deep enough that the snake placed in it can not come straight back out the top before you have a chance to tie the bag. That is, it should be more than two thirds the length. Pillow cases can be used but the seams should be reinforced and the pillow case turned inside out.

#### **Hoop Bags**

Basically a catch bag attached to a metal hoop with a handle to safely bag venomous snakes without the dangers of trying to hold open the bag.

### ***7.3 Capture and Restraint Techniques***

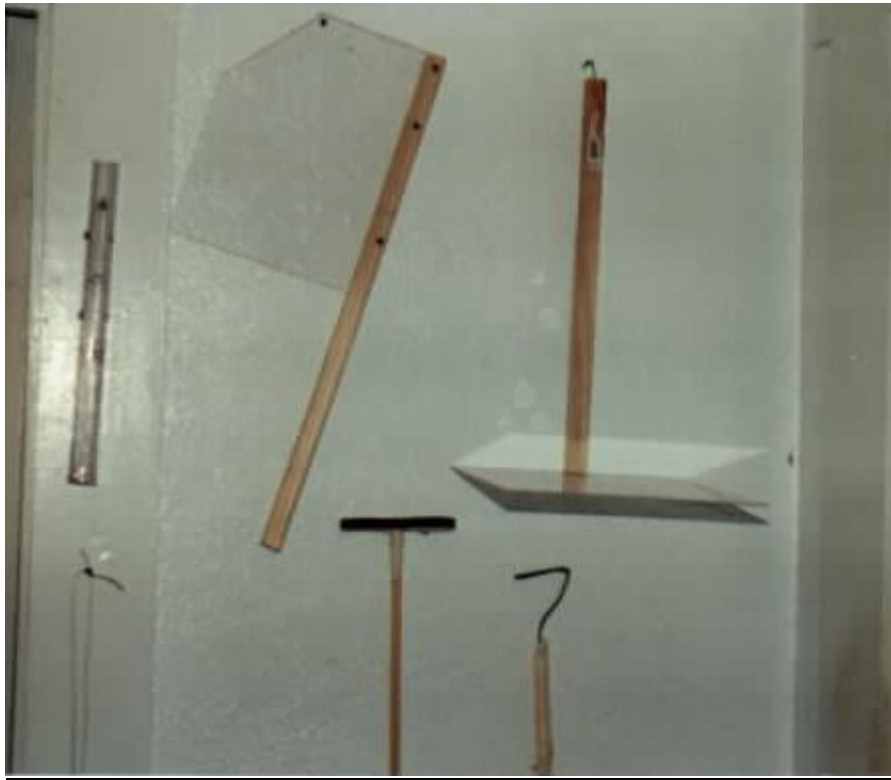
#### **Free Handling**

The least disruptive method for the animal is free handling where it is allowed to move gently through the handler's hands with no sudden movements and only slight restriction as the keeper runs the snake from one hand to the other, like a treadmill. However, while this is suitable for pythons and any non-venomous species, it is **not** recommended for handling venomous snakes. And with the Broad-head not reaching large sizes it doesn't have far to whip back round and tag you. You may see photos or people free handling



Tiger Snakes and Black Snakes but even with very quiet animals it may take nothing more than a wiff of a mouse on your hands to cause the snake to get excited and a serious situation can develop. Some people get away with being incredibly liberated in handling snakes – but not forever..

**DO NOT FREE HANDLE THESE SNAKES.**



*Hanging your snake-handling equipment on the wall makes it instantly available when you need it.*

### **Tailing**

This involves grasping the tail near the vent and lifting the body clear of the ground. The animal may climb its body or swing up towards the hand holding it. This can be controlled by sharply rotating the wrist, throwing the snake off balance. The snake will still be able to use the front part of its body and strike outwards so hold it away from your body so it cannot reach you. You may not be able to hold a long snake far enough away to be out of its strike radius, so use a snake hook to support and control the “sharp end” at a safe distance from you. If you hold the tail and keep the snake's body between your hand and the hook, the snake will not be able to get off the hook and will not be able to reach back up and bite you. Never leave the animal dangling any longer than you have to. Place it in a hoop bag, cage or holding bin as soon as possible or else pin it down and hold it behind the head. If at any stage you do not feel you are in control, put the specimen down and quietly retreat to regroup. NB. Tailing is not suitable for animals such as death adders, which may retreat extremely rapidly. Use a snake hook to lift the snake into a bag. Tailing may also not be suitable for juveniles or smaller Broad headed Snakes.

### **Jiggers**

There may be some confusion regarding the term “jigger”. Some authorities apply the term to an “L” shaped snake stick, however the name is more frequently applied to an implement consisting of a long handle with a leather or rubber strap stretched across it. Tension on the strap is taut enough to pin the head of a snake against flat surfaces but has sufficient give to prevent injury.

A more recent pinning device consists of a flat metal piece secured at the middle perpendicular to a long handle and with a firm plastic pad glued to the metal strip. The advantage of this is a greater variation in the pressure that can be applied and that the snake cannot entangle itself on the jigger, as



happens with the classic design. Harry Ehmann used the head of a potato masher fitted with a foam pad. His idea was to spread pressure and friction over a wider area to reduce the risk of injury.

### **Pinning**

This is done so that a snake can be safely picked up using a head hold. Alternative methods such as tubing or use of a trap box are preferable for most examinations, Pinning is stressful for the snake, involves some risk for the operator and should be done on an absolute need basis only. Real need may include health examination, giving medication, bagging, if no alternative is possible and, in venom laboratories, milking.

### **Snake Hook**

Overseas snake hooks are seen as the universal tool for handling venomous snakes, however our elapids don't always sit in a hook quite as well as heavily bodied pit vipers, so hooks are often used in association with tailing. The purpose of the snake hook is either:

- To fit under the snake near the midpoint to lift and carry it, or
- To support the snake about one third of its length from the head to control its fore end, while tailing it with the other hand. This provides two points of support and keeps the snake's head away from the keeper.
- As a general purpose instrument to extract items from a cage, probe animals and so on.

The hook is formed from a metal rod, the thickness depending on the weight and diameter of the snakes for which it is intended and could be anything from coat hanger wire to 8mm rod. Most commonly used will be 4-5mm thick. Many designs used, from simple "L" to various "U" shapes at the end of a metal shaft securely fitted into a wooden dowel or the handle of a golf club. It is very important that the shaft cannot rotate in the handle. The radius of the hook's curve should reflect a width a little more than that of the midbody of the snake, often about 60-70mm. It is helpful to have a point of the hook tapered to a rounded point, which is easier to fit under the beast than a blunt end. You should have a range of sizes to suit the animals you keep. Overall lengths should be from 400mm to a meter, again depending on the size of your charges. Snake hooks are not appropriate tools for pinning snakes.

To place a snake in a cage using a hook and tailing, simply lift it through the open door onto the cage floor, release its tail and slide the door closed onto the hook, which you can slip out to allow the cage to be fully closed. Similar manipulation of the specimen can be used to place the snake into a hoop bag held by an assistant.

### **Shields**

A wide clear plastic rectangle with a moderately long handle fixed to it is very useful as a barrier between the snake and the keeper's hand while changing water dishes, etc. These are items which you can easily make yourself. For front opening cages a handle mounted perpendicular to the shield, like a long hoe, is appropriate while for top opening cages a handle attached in line with the shield, like a paddle is used.

(Fowler, M: 1995)

### **Rigid splint restraints**

A padded length of 50 mm wide timber with 'Velcro' fixed straps behind the angle of the jaws and at 150 mm intervals can be used to hold snakes during brief procedures. This is usually to facilitate such things as faecal collection for research purposes. Use of a tube and an assistant is probably a much better choice.

(Titmuss, A)

### **Nooses:**

Nooses made from a leather strap fixed to a long handle are used overseas and may be illustrated in books you read. I doubt that they are used much overseas anymore and certainly they are not



generally used for snakes in Australia. Their use involves risk of serious injury, particularly if the animal struggles violently.  
(Mostyn.J)

## **7.4 Weighing and Examination**

Once your reptile has been placed in the hoop bag and tied off this is the perfect time to weight your charge. The bag can be easily hung from a hanging scale with the weight of the bag subtracted. Alternatively the hoop bag could be placed on normal scales subtracting the weight of the hoop bag giving you the weight of your charge. The snakes can also be weighted in the holding bin with the weight of the holding bin subtracted. At Sydney Wildlife World and Symbio Wildlife Gardens I weighted all reptiles every 3 months with any reptile not eating or sick weighed daily. A safe method to examine any venomous snake is by the use of snake tubes. Entering the snake into a clear tube where the snake is unable to turn around gives you control and allows you full view without the danger of free handling. The tubes range in size for different size snakes.



Some Different Sized Snakes Tubes (C.Morris09)

## **7.5 Release**

The release of a venomous snake can be just as dangerous as the capture (Ref 7.6.6)

## **7.6 Transport Requirements**

The Transport requirements set by IATA should be followed when transporting an animal. The requirements for snake transport and container requirements are as follows (insert)

### **7.6.1 Box Design**

Transport Box Design should also follow the IATA Standards (insert)

---CHECK--- IATA RELEVANT

## **GENERAL CONTAINER REQUIREMENTS FOR REPTILES AND AMPHIBIANS (CR 41–47) (See CR 51 for total aquatic amphibians)**

### **Design and Construction**

When constructing containers for shipment of reptiles and amphibians, the normal habits must be considered.

For general transport purposes, these species will be carried only in closed and adequately ventilated containers. The container must be well constructed and be able to withstand other freight damaging it or causing the structure to buckle or collapse. It must be constructed of non-toxic materials. Chemically impregnated wood may be poisonous and must not be used.

The container must be suitable to keep the species inside at all times and protect it from unauthorised access. The door or lid must be constructed so that accidental opening cannot occur, either from the inside or the outside.

The container must be rigid enough to prevent the animal escaping through gaps at the seams or joints.

The container must not cause injury to the animal. All inside edges must be smooth or rounded. There must be no sharp projections, such as nails, upon which the animal can injure itself.

The container must be clean and leak-proof. If it is to be reused, the container must be thoroughly cleaned and then either disinfected or sterilised prior to reuse. Absorbent bedding that is suitable for the species must be provided. Straw and other plant material like leaves or mosses are unacceptable as many countries prohibit their importation. All amphibians (other than the totally aquatic species) and a few reptiles require dampened bedding to provide the necessary moisture throughout the transport period.

The container must protect the handlers from being bitten by the animal. Handles and/or spacer bars must be provided to facilitate handling and preventing the ventilation openings becoming blocked by other freight. Spacer bars are necessary on the bottom to avoid contact of the container with too hot or too cold floor, but are not recommended on the tops of the containers. Spacer bars must be incorporated into the bottom and sides of the primary enclosure, in a way that ventilation holes are not occluded. For polystyrene boxes which are used inside cardboard-boxes, no spacer bars are necessary. If forklift spacers are required, they must be at least 5 cm (2 in) thick. Allowance for the extra height must be made when calculating the dimensions of the container.

Inspection of these containers is required to comply with CITES and some national government regulations. The containers must therefore be constructed in such a manner that the lid can be opened and closed readily. In the case of wooden containers screws must be used so that inspectors can remove and replace them easily. The material used must be able to withstand repeated opening and closing. Containers must not be taped, nailed, screwed or otherwise attached to other containers in the same shipment, with exceptions of the Farmed green iguana-boxes and the boxes for the hatchlings of sliders and map turtles.

If the primary enclosure is constructed of wood it must have a thickness of at least 0.6 cm (1/4 in). Wooden boxes must not be tapped. If fibreboard or corrugated cardboard is used as a primary enclosure it must be treated in a way that it has a moisture barrier, and the cardboard must be reinforced.

If polystyrene boxes are used inside cardboard boxes the walls of the polystyrene boxes must have a minimum thickness of 2 cm (3/4 in). If separate polystyrene panels are used they must be tightly fitted to each other within the primary enclosure with no gap to prevent escape and avoid injury. Spacer bars are not necessary on cardboard primary enclosures if these are so constructed that ventilation holes are not obstructed when the enclosure is pushed next to another vertical surface.

Metal must not be used in the construction of the inner container if it comes in direct contact with the animal. Metal outer/primary enclosure are not allowed due to the danger of overheating.

The floor of the outer/primary enclosure for turtles, tortoises, crocodiles and amphibians must be solid and water proof.

Any partition within a container must be securely attached to the base and/or sides of the container so that they do not collapse if the container is tilted or accidentally turned upside down.

Layering within the primary enclosure is allowed when each single layer is structurally sound and as long as the contents of the layer are easily inspected. A maximum of three layers is allowed and the floor counts as one layer. The layers must be fixed to the walls of the primary enclosure with screws. No nails are allowed.

### **Dimensions and Stocking Density**

Dimensions of inner enclosures and/or outer enclosures shown in these Regulations are illustrative and therefore must be related to the actual size of the specimens for which the container is constructed. The container must in general allow the animal to lie in a natural manner with enough space that stacking is avoided. The height of the container must permit air flow over the animals but prevent stacking. In general a clearance of 3 cm (1 1/4 in) is recommended. This needs to be increased accordingly for larger species.

For stocking density see the special packing density tables for the different groups.

### **Ventilation and Temperature**

The container must be adequately ventilated. As reptiles and amphibians are cold blooded animals with considerably lower oxygen requirements than birds and mammals, ventilation and the size of the ventilation openings depend on the ambient temperature. Shipments exposed to cold climates will need fewer ventilation openings than shipments exposed to hot climates.



The ventilation openings must be small enough to prevent the escape of the animal. Meshed openings must be added to the outer container to prevent possible blockage of inner ventilation holes by the outer container.

Mesh covering of the ventilation holes must be attached to the inside surface of the outer container wall.

Since reptiles and amphibians have a lower tolerance to temperature fluctuations and can be harmed from extreme temperatures insulated or lined containers that are recommended for these species to provide better protection against temperature variations during shipment and transshipment. Care must always be taken that the specimens are not exposed to either extreme cold or heat. In hot conditions low temperatures can be maintained by the inclusion of ice in a polyethylene/waterproof plastic bag. In cold conditions, heat packs can be used, in hot conditions, cold packs can be used. Heat and cold packs are most useful in primary enclosures with good insulation. Dry ice is not allowed.

**Warning:** Some heat or cold packs can contain substances which, due to their properties, are classified as dangerous goods. Consequently, they are not allowed in packages containing live animals.

When using heat or cold packs, they must not be in direct contact with inner enclosures or bags containing animals, or with the animals themselves. Heat or cold packs must have insulation such as bubble wrap or foam rubber to avoid overheating or undercooling of the animals.

### Labelling and Marking

The container must be correctly labelled and marked with the consignee's name, address and telephone number. Labels must not block ventilation holes, especially on small containers.

The container must be marked "LIVE ANIMAL" and have "THIS WAY UP" labels affixed to all four sides. Reptiles and amphibians must be noted on the "LIVE ANIMAL" label.

### Documentation

Shipper's name, address and telephone number and a list with the scientific names and quantities of each species contained in the primary container must be attached to the outside of the primary container or printed on the outside of the outer container.

In addition, the shipper must check the appropriate box in the Shipper's Certification for Live Animals (see Chapter 7), certifying that the animals contained in his shipment are apparently healthy enough to travel by air, that they have been examined prior to shipment and are free of any apparent injury and readily recognizable disease, and that they are also free of external parasitic infestation, including mites, ticks and leeches, that can readily be seen under normal lighting conditions.

### Feeding and Watering Guide

The need to feed or water any of these species during the normal transport time must not arise. Under severe delay and under certain circumstances watering may be recommended if advised by a specialist.

### Special Care

Since reptiles and amphibians are highly dependent on the ambient temperature, they must be immediately removed from areas with very high and very low temperatures to a location where temperatures are not below 7°C (45°F) and not above 29°C (85°F). The preferred temperature range should be 15–25°C (59–77°F). The location should be free of drafts, out of direct sunlight, and should be sheltered as much as possible from physical vibration and noise.

### Specific Requirements

In addition to the above General Requirements, the Specific Requirements that are relevant to the individual species must be consulted and adhered to.

For proper handling and packaging of reptiles and amphibians, the following groups have been created based on the animal taxonomy and size:

- Lizards and tuataras (see Container Requirement 41)
- Crocodiles (see Container Requirement 42)
- Tortoises and turtles (see Container Requirement 43 and 47)
- Snakes (see Container Requirement 44)
- Amphibians (see Container Requirement 45 and 51).

### Measurements

All specimens must be measured using the text and illustrations contained in the appropriate Container Requirement.

### Transport Container

All specimens must be shipped in containers that comply with the text and illustrations contained in the appropriate Container Requirement.

Large reptiles must be crated individually in containers that prevent movement. Certain species require reinforced containers due to their weight and size.

The outer container for large species must be a strong heavy wooden or metal framed wooden crate with ventilation on the sides. The lining within the frame must be strong enough to withstand the animal's strength and can be plywood or solid wood. The ends of the container must be very smooth or padded to prevent injury to the animal's nose. This is especially important for crocodiles.

The direction of the head should be indicated on the outer enclosure for crocodiles and large lizards.

Forklift spacer must be provided for shipment with a total weight exceeding 60 kg (132 lb).

### Important Notes (also see Nomenclature)

Certain terms used in this General Container Requirement are defined as follows:

primary enclosure also means outer container;

inner enclosure is an inner container, compartment or bag, where the animal is confined.

Mixing of different species is not allowed in a single inner container, compartment or bag.

## CONTAINER REQUIREMENT 44

The illustrations shown in this Container Requirement are examples only. Containers that conform to the principle of the written guidelines for the species but look slightly different will still meet the IATA standards.

Applicable to Snakes

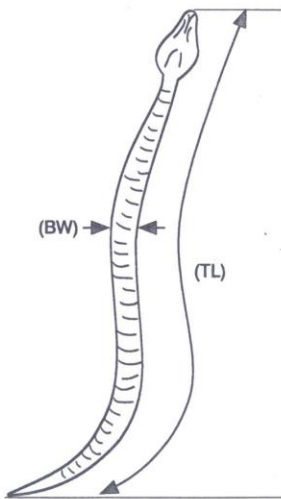
See *USG Exceptions in Chapter 2 and Exceptions CO-01 and UA-05 in Chapter 3.*

The following instructions must be complied with in addition to the principles laid down in the General Container Requirements for Reptiles and Amphibians.

### Measurement

Snakes should be measured by total length (TL) and by body width (BW), at the widest point of the animal's body.

Care should be taken that these animals are never stretched during measurement. Measurements of width should be taken with the animal resting in a normal posture.



### Specific Requirements

All rigid containers must have some kind of packing material (i.e. crumpled paper). Packing material is also recommended for bags.

Burlap (hessian) sacks are not allowed for any snake species less than 120 cm (48 in).

The maximum number of animals per bag or container must not be increased even when larger bags or containers are used.

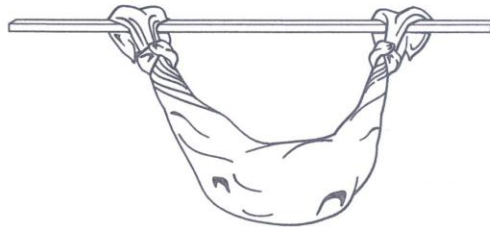
### Packing Density for Snakes in Flat Laying Bags

Total length (TL)	Body width (BW)	Maximum no. of animals per bag	Minimum bag size
≥ 120 cm (48 in)	> 4 cm (1.5 in)	1	Dependent on the size of the animal
≥ 90–120 cm ± 15 cm (36–48 in ± 6 in)	≤ 4 cm (1.5 in)	8	45 × 60 cm (18 × 24 in)
		4	30 × 45 cm (12 × 18 in)
≥ 60–90 cm ± 10 cm (24–36 in ± 4 in)	≤ 4 cm (1.5 in)	12	45 × 60 cm (18 × 24 in)
		8	30 × 45 cm (12 × 18 in)
≥ 30–60 cm ± 10 cm (12–24 in ± 4 in)	≤ 4 cm (1.5 in)	14	30 × 45 cm (12 × 18 in)
≤ 30 cm ± 7,5 cm (12 ± 3 in)	≤ 4 cm (1.5 in)	24	30 × 45 cm (12 × 18 in)

### Exception for Stout Bodied Python Regius (Ball Pythons)

All lengths up to 120 cm (48 in) (15 cm [6 in] variance)	> 4 cm (1,5 in)	8	45 × 60 cm (18 × 24 in)
All other lengths	< 4 cm (1,5 in)	Same as in snake table above	Same as in snake table above

If the bag is suspended, it must be suspended horizontally from the opposite ends and the maximum number of animals per bag should be divided by two.



Plastic containers are permissible for snakes less than 60 cm (24 in) in length. These containers must be rigid and able to support the entire weight of all other containers when stacked upright and if turned upside down, without failing structurally (without bending, cracking or collapsing). The size of these containers must enable the animals to have contact with their whole ventral surface to the floor of the container.

The following snake species should be packed singly because they are cannibalistic:

- Black-headed python, woma (*Aspiditis* spp.)
- Milk and king snakes (*Lampropeltis*)
- Mussurana (*Clelia clelia*)



## **CONTAINER REQUIREMENT 44 (cont'd)**

The following snake species are very delicate and should be packed singly and need some with some moist substrate:

File snake (*Achrocordus* spp.)

### **Specific Requirements for Venomous Snakes**

In general, venomous snakes have the same requirements as other snakes, but they must be packed singly and if possible in rigid plastic containers which enable inspection and control of the animals without opening the container. If this is not possible, animals more than 30 cm (12 in) in length are to be double bagged with the specimen in a clear or transparent inner mesh bag (maximum mesh size: 2 mm [ $\frac{1}{8}$  in]) to enable control, inserted in an outer cloth bag which should not be transparent.

Labelling of each bag or inner container must list the specimen's scientific name, common name and venomous/poisonous or a pictorial warning label.

When venomous snakes are shipped in the same crate with other non-venomous species, they must be separately compartmentalized in a wood container.

All containers (inner and outer containers) with venomous species must be covered with a wire mesh over the entire opening of the container to prevent animal escape when the container is opened for inspection.

Venomous snakes as defined here include the true venomous snakes of the following Taxonomic groups:

Elapidae — Cobras, mambas, coral snakes, kraits and relatives

Viperidae — Adders, vipers

Crotalidae — Rattlesnakes, copperheads, palm pit vipers

Atractaspidae — Mole vipers, burrowing asps

Hydrophiidae — Sea snakes

Rear fanged snakes must be packed like the true venomous snakes, they are:

Boomslang (*Dispholidus*)

African vine or twig snakes (*Thelotornis*)

Rhabdophis

Mangrove and cat snakes (*Boiga*)

Some colubridae snakes with uncertain venoms or venom apparatus must be packed like the true venomous snakes, they are:

Homolapsinae

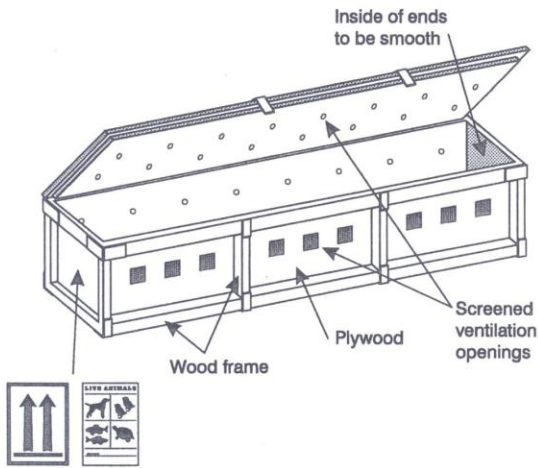
Xenodontidae

**South East Asian water snakes should be packed using the guidelines contained in Container Requirement 51.**

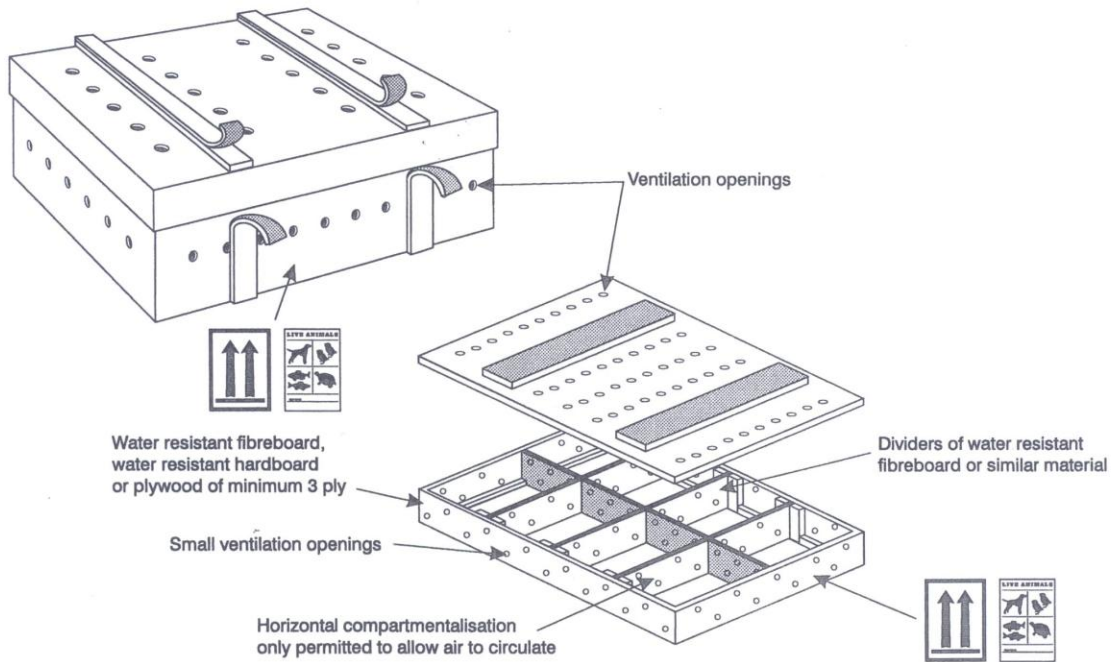
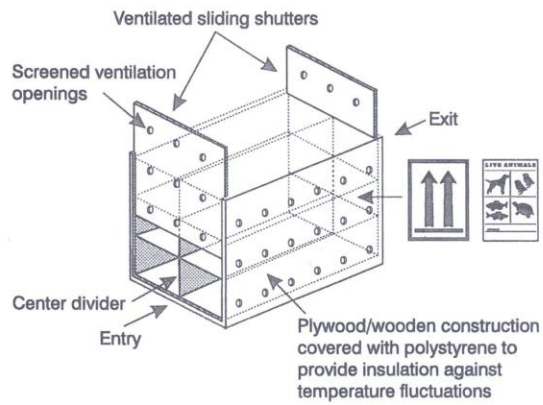
# CONTAINER REQUIREMENT 44 (cont'd)

EXAMPLE:

## SINGLE CONTAINER

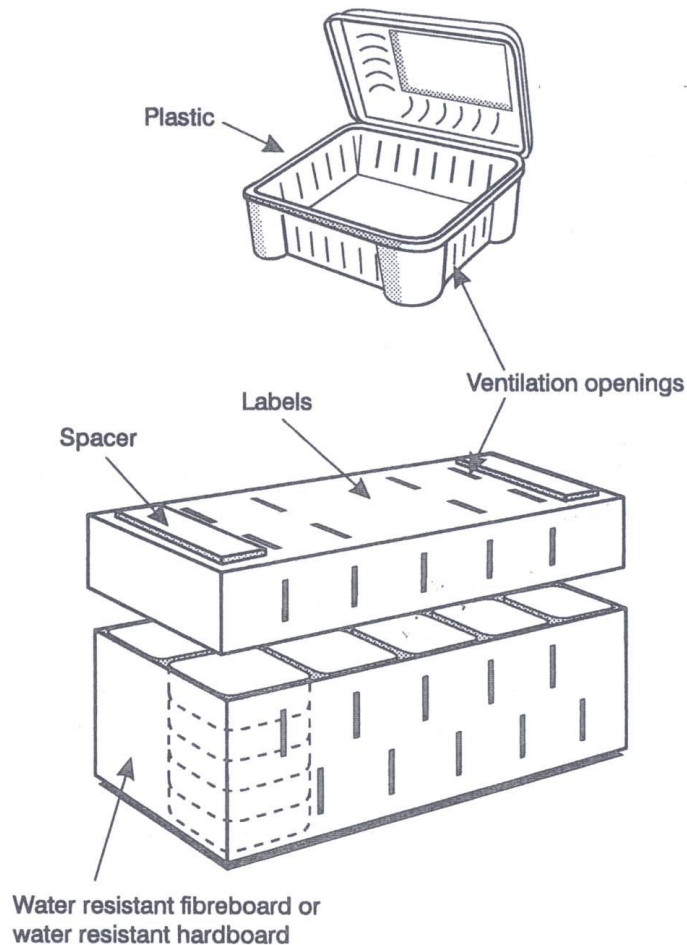


## MULTIPLE CONTAINER (suitable for small or young animals not exceeding 50 cm [20 in] in total length)



## CONTAINER REQUIREMENT 44 (cont'd)

### MULTICOMPARTMENT CONTAINER



### 7.6.2 Furnishings

When shipping venomous snakes, there should NOT be any furnishing, included in the shipping containers or cloth bags.

### 7.6.3 Water and Food

The question of feeding during the 24hours following the time of dispatch of the animal need not be of primary importance, providing that it is fed prior to the dispatch in the following manner:

- Certain aspects of reptiles require starving before shipment.
- Watering is more important than feeding and if this cannot be preformed during the flight, the animal must, at least, be watered before dispatch and upon arrival. It has been suggested that for snakes that food be withheld from the animal for at least 24hours prior to the shipment, and as soon as possible after arrival.

### 7.6.4 Animals per Box

There are specific requirements for the shipping of the venomous reptiles. They are:

\* In general, venomous snakes have the same requirements as other snakes, but they must be packed singly and if possible in rigid plastic containers which enable inspection and control of the animal without

opening the container. If this is not possible, animals more than 30cm (12in) in length are to be double bagged with the specimen in a clear or transparent inner mesh bag (minimum mesh size 2mm) to enable control, inserted in an outer cloth bag which should not be transparent. (I.A.T.A. Live Animals Regulations 2000).

### **7.6.5 Timing of Transportation**

The timing of transportation is important for reptiles. You do not want to ship a reptile by air in the middle of the day in summer, where temperatures on the ground are 40°C. It would be better to ship them in the late afternoon or early evening. The same in winter. It would be best to ship the animal in the middle of the day as opposed to early in morning or late evening.

### **7.6.6 Release from Box**

#### **Why it's easy to handle venomous snakes - and dangerous**

Most of the time, you can get away with taking some pretty extreme liberties with the person of a venomous snake. You can get inside its strike range where it is physically capable of biting you, and nothing will happen. This fact often encourages people who have gotten away with this a few times to continue doing it, confident that nothing will ever happen. Maybe you will get away with it a hundred times. The tragedy happens when the odds catch up to you the hundred and first time, and the snake that never bit you before reacts unpredictably and does what it was perfectly capable of doing all along. If you are physically within its strike range and something unexpectedly triggers a defensive or feeding reaction, you will be bitten.

A lot of things can trigger a defensive or feeding strike. Your body heat can do the trick. The scent of anything resembling food can also do it, even if that scent is just wafting along on the breeze. If you move "wrong", either like prey or like a predator looming over the snake, you may be bitten. You really don't know what the snake might suddenly decide to do, or what kind of behavior some unknown stimulus might trigger. So the smarter option is not to give the snake the physical ability to bite you in the first place, even if you believe that it is unlikely to try to bite.

The consequences of a venomous snakebite are absolutely horrible. Huge hospital bills, agonizingly painful loss of a hand or finger as your flesh slowly melts off the bone in necrosis, long term health impairment, loss of renal functions, dialysis, blood thinning out so you cut your self and bleed profusely and of course death. These are the things you are risking when you put your hands in a position where a venomous snake is physically capable of biting. This is really a very poor risk, so it's a good idea to take the extra minute to take more stringent safety precautions than you might think you need. A truly determined and motivated snake can accomplish some amazingly acrobatic feats, and you don't really know what might suddenly motivate it.



## 8 Health Requirements

### 8.1 Daily Health Checks

Initial Examination should include observations such as:

- General; overall body condition and color, any lumps and bumps, any strange odors!
- Behavior; active or lethargic. Alert or dull, responsive or not, general demeanor.
- Locomotion; normal movement, adopting any odd postures, tremors, loss of balance, co-ordination etc.

We can then start looking at the general body systems and note any of these conditions which may alert you to a problem that may be present. Some signs of problems or diseases will be obvious, however some reptiles show very little in the way of 'disease' and the signs may be very subtle. It is good practice to observe your snakes while completing daily maintenance and cleaning activities.

Observations are generally undertaken during cleaning and feeding each morning and include:

- ⇒ Feeding well.
- ⇒ Eyes clear and fully open.
- ⇒ General appearance - body condition and condition of scales.
- ⇒ Discharges - any nasal, mouth or cloacal discharges should be noted.
- ⇒ Respiratory infections – wheezing Gaping, sneezing or abnormal breathing patterns
- ⇒ Changes in behaviour – not basking or pacing
- ⇒ Consistency of faecal material - is it sloppy, not the normal colour or contains blood?

### 8.2 Detailed Physical Examination

It is important to obtain a thorough clinical history for vets and administering correct dosage. This should include feeding, weight, ecdysis, faecal and urate production.

The following need to be assessed:

1. Obtain accurate length (rostrum-cloaca) and weight
2. Inspect rostrum, nostrils and infra-orbital pits (discharge, occlusion, trauma).
3. Check eyes clear, inspect spectacles under magnification for abnormalities
4. Ensure tongue flicking normally and snake moving normally, able to support head etc..
5. Examine oral cavity (mucous membranes normally clear, but no petechiation, excess salivation, oedema, fluid from respiratory tract)
6. Body should be rounded (triangular in the broad headed emaciated)
7. Skin elasticity? Check hydration and palpate for swellings
8. Check scales for haemorrhage, blisters, loss (check ventral scales too)
9. Check cloaca for oedema, erythema, discharge, swellings
10. Make faecal smear if faeces produced
11. Smaller snakes and hatchlings may be transilluminated

#### 8.2.1 Chemical Restraint

Chemical control includes: sedation; of aesthesia and must be administered by a vet. Your complacency and being off guard is more likely to result in a bite than outright aggression by a snake. The method of

restraint chosen will depend on the circumstances and the personal preferences of the operator. Generally the gentlest and least stressful technique possible should be selected but the method with which you are most comfortable is going to be the safest.

### **Anesthesia:**

For clinical examination and other procedures, elapid snakes can be anaesthetized using a volatile anesthetic such as Halothane or Isoflourane.

#### **(See appendix for MSDS on Isoflourane 8.6.1.1)**

Particularly for fast moving and excitable species it is best to bag the snake and put this into an induction chamber or to deliver the gas directly into a hide box.

Ketamine Hydrochloride is an effective and very safe anaesthetic for reptiles, but as it is injected, the animal has first to be restrained.

(Titmuss,A)

#### **(See appendix for MSDS on Ketamine 8.6.1.2)**

Currently tileamine/zolazepam is recommended (4-8 mg/kg IM). Higher doses have been reported in the literature, but higher doses cause considerable delay in recovery.

Ketamine is still recommended (50-80 mg/kg IM). That dose is higher than the dose required for mammals of comparative weights. The drug produces mild sedation or profound anaesthesia depending on the dose used. One of the first signs of a snake's impending immobilization after intramuscular injection of Ketamine is a characteristic elevation of the head in a peculiar stargazing manner, with the mouth held partially open.

All snake immobilization procedures should be carried out with the snake on a heating pad or in a warm environment- not on a cold stainless steel table. Aftercare must include monitoring the environmental temperature to maintain sufficient body heat to allow the animal to metabolize the drug. Snakes may be placed in an anaesthetic chamber (see fig 8) and a calibrated percentage of either isoflourane or halothane in oxygen flows into the chamber. The progression of anaesthesia is determined by inverting the jar. If the snake is unable to right itself, it is probably anaesthetized. Since a snake can hold its breath for 15-20 minutes, inhalant anaesthesia may be prolonged. For this reason apnea, a common concern of the mammalian restrainer is not a serious problem of restrained reptiles. In fact, it is sometimes difficult to ascertain whether a snake is actually alive during anaesthetic procedures. However, it is easy to insert a tube past the glottis through the trachea, as described for administering anaesthetic, and respire a distressed animal either manually, using mouth tube respiration, or with inhalation equipment. Once a snake is anaesthetized, tape it to a board. Masking tape may be used on small snakes to minimize scale damage. Use only adhesive tape on large elapids.

(Fowler,M:1995)

Ketamine Hydrochloride is an effective and very safe anaesthetic for reptiles, but as it is injected, the animal has first to be physically restrained (snake tube). Injectable drugs such as Telazol and Diazepam (Valium) may also be used for chemical restraint. Buprenorphine and Butorphanol can be used for post-operative pain management, a very appropriate protocol after painful procedures. Snakes lose their reflexes cranially to caudally (head to tail) and regain mobility caudally to cranially (tail first), so you can safely assess their plane of anesthesia by continually checking for muscle tone and withdrawal reflexes at the tail. A snake under anesthesia cannot thermoregulate and must be kept within the optimum temperature zone for its species until it has recovered . Overheating an anesthetized snake can be rapidly fatal; overcooling may increase immunosuppression.

For clinical examination and other procedures, elapid snakes can be anaesthetized using a volatile anaesthetic such as Halothane. Particularly for fast moving and excitable species it is best to bag the snake and put this into an induction chamber or to deliver the gas directly into a hide box.

**Any chemical restraint should only be completed by qualified licensed persons**

## **8.2.2 Physical Examination**

A safe method examine venomous snakes is by the use of snake tubes. Entering the snake in to a clear tube where the snake is unable to turn around gives you control and allows you full view with out the danger of free handling. The tubes range in size for different size snakes.

This type of examination should be carried out periodically (e.g. once a month). It actually involves picking the reptile up, and having a closer look and feeling for abnormalities.

Signs of ill health include;

- Mouth not closing properly or Teeth abnormalities.
- Discharge in eyes, nostrils, mouth and cloaca.
- Poor skin condition, look and feel for lumps, parasites, ulcers, blisters and foreign bodies, tenting of skin (dehydration)
- Any abnormal odors coming from the enclosure or animal.
- Any areas of heat, swelling and discharge, (sign of infection).
- Abnormal respiratory patterns or sounds.
- Condition and weight loss .

### **8.3 Routine Treatments**

I would suggest having your snake wormed every six months, as some prey items may contain pathogens or protozoa, food should be frozen for the minimum of six weeks, which is required, to kill pathogens and protozoa. They do not need vaccinations. There are few, if any, diseases that can be transferred from snake to snake or snake to human that can be given a vaccination for. Only parasites seem to be a problem at times

Fecal examination should be carried out every three to six months. You should have 3 negative returns before the snake is cleared.

I recommend using ----- it has been a suggest wormer form a number of good reptile vets.

## **8.4 Known Health Problems**

### **Vitamin and Mineral Deficiencies in Reptiles**

#### **Vitamin B1- Thiamin Deficiency**

Vitamin B1 is a water soluble vitamin. It is not appreciably stored in the body. All animals require Vitamin B1. It can be manufactured by many of the bacteria in the gut, especially in herbivores (and ingested when herbivores such as rats and mice are eaten). Excess Thiamin can be excreted by the kidneys.

Vitamin B1 functions in the cycle within the body to breakdown carbohydrate to form energy. If thiamin is not present energy is not released for normal functions and a build up of toxic metabolites (such as pyruvic and lactic acid) occurs. These metabolites cause polyneuritis or inflammation of nerve cells, causing ataxia\* and muscle twitching and even convulsions. Other signs of thiamin deficiency include slowing of the heart (bradycardia), enlargement of the heart, fluid buildup within the body tissues (oedema), anorexia and muscle weakness, fatigue and irritability and may also cause reproductive failure in adults and poor growth rates in juveniles. These signs are reversible if treated early. The deficiency can occur in reptiles that have been off food for a long time. Hibernation reduces the body's requirement for vitamins so deficiency signs are not seen in hibernating reptiles but after they come out of hibernation, if they do not resume feeding vitamin B1 deficiency can occur.

#### **Calcium/Vitamin D Deficiency**

This is the most common nutritional/ husbandry problem seen in reptiles. Calcium is required in all vertebrate animals (fish, amphibians, reptiles, birds and mammals) for bone formation and for nerve transmission. Young animals require more calcium than adults because of the rapid bone formation. Females producing young require more calcium for the formation of bones in the fetuses and because calcium is required for the oviduct contractions during birth of live young.

The calcium in the diet must be absorbed by the intestine. Vitamin D3 – cholecalciferol, is required for the absorption of calcium. Vitamin D3 is produced in reptile skin under the influence of UV radiation in sunlight. Vitamin D3 also is required for the calcium absorbed to be deposited in bone structure. Vitamin D also promotes the absorption of other minerals including iron, magnesium and zinc. Calcium is combined with phosphorus in the formation of bone in the ratio 1;2;1 so for strong bones phosphorus is also required but excess phosphorus in the diet can retard the absorption of calcium.

Clinically three situations occur to cause problems with bone formation:

- 1) There is not enough calcium in the diet especially in growing reptiles. Low calcium diets include young animals used as feed – pinkie mice, day old chicks and rat pups.
- 2) Vitamin D deficiency occurs due to lack of exposure to sunlight or ultraviolet (UV) radiation of the correct frequency. Rarely does this occur due to inadequate precursors of vitamin D. Ultraviolet rays can be blocked by glass, Perspex and water, though they do allow visible light through.

(Bellami, T: 2003)

For Euthanasia, Lethobarb is the suggested drug. It is a euthanasia solution for small animals.

#### **Disease**

A Disease is any abnormality in body condition. Diseases are either pathogenic or non- pathogenic.

Pathogenic diseases are caused by viruses, bacteria, protozoa, fungi or parasites. Non-pathogenic diseases are caused by nutrition, environment or trauma/stress.

Certain conditions may predispose an animal to a disease. These conditions include poor or incorrect diet, incorrect housing design, incorrect environmental parameters, unsanitary housing, and undue stress. If subjected to predisposing factors animals which would otherwise fight off a disease before they are affected or not contract the disease may become ill.

By law a veterinarian must perform a diagnosis and prescribe the appropriate medical treatment.

#### **Types of common Diseases**

The treatment of pathogenic disease should include cleaning and disinfection of the enclosure more often and increasing the warmth of the enclosure.



## **Canker (mouth rot)**

### **Signs**

Infected puss filled lesions and hemorrhages in mucous membranes.

### **Treatment**

Clean mouth and rinse with saline, daily as well as treatment with Enrofloxacin at 5-10 mg/kg IM, PO q 24-48 h  
(Spielman,D 2006)

## **Respiratory Infections**

### **Signs**

Gaping, sneezing, discharge from mouth, nose and eyes.

### Treatment

Course of antibiotics

Enrofloxacin at 5-10 mg/kg IM, PO q  
(Spielman,D 2006)

## **Blister Disease (scale rot)**

### **Signs**

Ulcerated skin between and beneath scales, blisters filled with clear or milky fluid.

### **Treatment**

Antisepsis of infected skin, course of antibiotics. Enrofloxacin at 5-10 mg/kg IM, PO q  
(Spielman,D 2006)

## **External Parasites (Ectoparasites)**

External Parasites such as ticks and mites are generally seen by the naked eye. Recently fed ticks are engorged and protrude from under or around the scales. However, immature forms of ticks may hide under scales and avoid detection. On inspection of a reptile, pay special attention to flat or slightly raised, circular objects protruding from under a scale.

(Klingenberg, R)

Examples of ticks.  
(Klingenberg,R:1993)



## **Mites and Ticks**

Reptile mites (*Ophionyssus natricis*) are small, but can be observed moving on the host. (Reptile). In small numbers, mites may present a nuisance to the reptile, causing discomfort and agitation. In moderate to severe numbers, mites can cause Anemia, Rough, eroded, damaged scales which predispose the skin to infection, Peri-orbital inflammation and swelling Depression and anorexia. Ticks can be disease carriers and it is important to remove these from reptiles.

### **Sign**

- Soaking in water for long periods of time,
- Rubbing bodies
- Off food
- Visible ticks
- General ill thrift
- Severe cases cause anaemia
- Mites visible on skin or in water bowl.
- Related to blood- borne infections (including IBD)
- Difficulties in shedding
- Death

**Treatment** – Clean cage and dispose of bedding and furnishings. Spray enclosure and animal with Top of Descent spray, repeat after 7-10 days you can also use pest strips.

Top of Descent spray is an aircraft insecticide, used for cabin spraying by Immigration, on arrival of International flights. Top of descent effectively kills mosquitoes and other flying and crawling insects. This spray is effective on mites and ticks. It is safe enough to spray enclosures and directly onto snakes. The active ingredient is 20g/kg d-Phenothrin 20:80

When in doubt, the reptile can be placed over a white piece of paper and rubbed, whereupon the mites that fall off will be seen moving on the paper. The appearance of white flecking or thick white "dust" particles on a snake is a reliable indicator of the presence of mites. The white flecks are actually mite faeces. Water containers can be examined for drowned mites, as mite-infested reptiles often spend an inordinate amount of time in their water containers in an attempt to rid themselves of these parasites. Patches of dry skin or crusty material around the eye or protruding eye rims should alert the keeper to look for mites. (Klingenberg, R)

### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)

### **- Internal Parasites (Endoparasites)**

There are two common forms of intestinal parasites in reptiles – worms and protozoan parasites and there are several different types of each. Both types of parasite can occur in reptiles in small numbers causing little or no damage to the host reptile. However in larger numbers they can cause irritation to the gut lining, diarrhea, and weight loss or failure to thrive. Many animals will carry small numbers of worms or protozoa without

Any signs of ill health, but this will depend on the number of the parasites, the health status of the reptile and the age of the animal. Young animals can suffer from intestinal irritation more easily than more mature animals.

### **Signs of Intestinal Parasitism**

Worms and protozoa can damage cells lining the gut and can deprive the animal of nourishment from food. Damage to the gut reduces the absorption of nutrients from the gut and allows blood and fluids to be secreted into the gut reducing nourishment available to the reptile. Damage to the gut lining can also allow secondary bacterial infections to occur.

The most common signs of intestinal parasites include failure to grow well, or loss of weight, loss of appetite, sloppy droppings, sometimes with blood in it or occasionally constipation. Sometimes animals with intestinal parasites will eat abnormal things – they may ingest (swallow) small rocks, or other substrate material, or appear bloated in the abdomen. They can also get an irritation to the cloaca. Sometimes worms may migrate through the intestinal wall carrying bacteria with them. This can allow bacteria into the abdomen and cause an abscess or peritonitis and death.

### **Diagnosis**

Occasionally a worm may be passed or regurgitated by an animal but generally examination of faeces from the animal is required to identify a gastrointestinal parasite. Reptiles pass droppings composed of urine from the kidneys, urates (the gritty white material) also from the kidneys and faeces from the bowel. Many protozoan parasites are motile in the faeces- they swim around. After just a few minutes exposure to cooler dry air these protozoa form non-motile cysts\* which are much harder to see under the microscope. The cysts can be seen by using special stains, but usually we need to send the sample to a laboratory for these staining procedures so it is easier to identify them in a very fresh wet smear of faeces under the microscope. This sample can often be milked easily from the bowel of a snake. Some of the non-motile protozoa and worm eggs are passed in small numbers and we need to use a technique called faecal flotation to concentrate the eggs to see them under the microscope. Faecal flotations are performed using a larger amount of faeces, mixed with a saturated salts solution which will cause the eggs to float to the top of a container. The sample at the top is collected onto a microscope slide for examination.

## The Common types of Parasites found in snakes

### - Necrotic enteritis.

Necrotic enteritis associated with trichomonad organisms emerged as a major cause of mortality in the reptile collection at Taronga Zoo in 1979.

The disease was characterized by caseous pseudo membrane formation in the colon and rectum, often leading to frank necrosis of the gut wall with resultant peritonitis. Despite impressive pathology, clinical disease may not be noticed and the animal is just found dead. A wide variety of reptiles was affected. Necrotic enteritis is a major cause of loss in many large reptile collections. *Entamoeba invadens* has been reported as the cause of this disease in a number of outbreaks. *Pseudomonas aeruginosa* and *Trichomonas* sp have also been incriminated as causes of this syndrome. During 1979 necrotic enteritis, consistently associated with great numbers of flagellate protozoans, emerged as the single major cause of loss in the reptile collection at Taronga Zoo, accounting for over 25% of deaths in non-neonate reptiles. (Reddacliff, G L, 1980)

### - NEMATODES – ROUNDWORMS

Large white (spaghetti-like) worms. They do not attach to the lining of the bowel and small numbers in the gut do very little harm. They have an indirect life cycle so they are transmitted in food items such as frogs, lizards and rodents. In large numbers especially in young animals they can reduce significantly the nutrition and can sometimes cause bowel blockages. Freezing of food items reduces dramatically the potential for transmission. Larval stages of these worms can travel into the body and damage other organs such as liver and lungs.

They are diagnosed by finding eggs in a faecal flotation.

#### Treatment

Fenbendazole (panacur) at 25mg/kg or Ivermectin (ivomec) at 200ug/kg.

This may need to be repeated up to every 2 weeks for 2-3 treatments depending on the severity of infestation.

#### Prevention

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Roundworm egg (Photo: Klingenberg, R: 1993)

### - CAPILLARIA (hepatic worms)

These worms also have an indirect life cycle; they require an intermediate host which is threatened by the reptile. They migrate into the liver and can cause damage there.

Diagnosis is by finding the operculated eggs (oval eggs with little knobs on either end) in faecal flotations.

#### Treatment

Isolate and snake from collection

Treatment is with panacur or ivermectin but may need to be repeated several times to clear the infestation.

#### Prevention

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Capillaria eggs viewed under

microscope at 100 xs

(Photo: Klingenberg, R: 1993)

### - HOOKWORMS

They have a direct life cycle so they have the potential to develop large numbers in captive animals- they can re-infect themselves.

Are small worms that can cause severe damage. They are picked up by ingestion of eggs or by penetration of the skin by larvae which then migrate through the body to the gut. They attach to the lining of the gut causing ulcers and bleeding leading to inflammation of the gut and anaemia and sometimes they can cause perforations of the gut and peritonitis\* with secondary bacterial infections.

Diagnosis is by finding the eggs or larvae on faecal flotation.

#### **Treatment**

Treatment is with Ivomec or Panacur. Cleanliness is very important to control hookworms- removing faecal contamination quickly so animals do not become continually re-infected.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Hookworm eggs seen on fecal flotation at 100 xs

(Photo: Klingenberg, R: 1993)

### - PINWORMS

Have a direct life cycle. They live in the large bowel and can cause obstructions or impactions.

Diagnosis is by seeing large ovoid eggs in faecal flotations.

#### **Treatment**

They can be treated with Ivermectin or Panacur. Mice have their own types of pinworms and they can even be seen sometimes in reptile faeces that have eaten the mouse but do NOT infect the reptiles.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)





Pinworm eggs (ova) as seen on fecal flotation 100x  
(Photo: Klingenberg, R: 1993)

### - **STRONGYLOIDES**

Their life cycle is direct and is similar to lungworms but they affect the gut causing diarrhea, while the larval migration has the potential to cause lung damage. Infection is by larval penetration or ingestion. Diagnosis is by finding larvae in fresh preparations of faeces (not by flotation).

#### **Treatment**

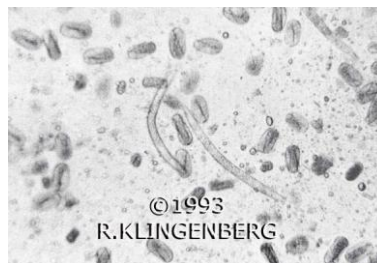
Treatment requires higher doses of Panacur at 50mg/kg.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Strongyloides larvae among eggs characteristic of Strongyloides  
(Photo: Klingenberg, R: 1993)

### - **LUNGWORMS *Rhabdias sp***

The snake lungworm has a direct life cycle and is common parasite found in frogs, toads and snakes. The larvae that hatch from eggs can gain entry to the host by percutaneous penetration and by ingestion of faecally contaminated food and water, similar to hookworm. Lungworms generally have limited effects on the host. Like hookworm, their direct life cycle allows them to build up in large numbers.

Diagnosis: A verminous pneumonia, characterized by gaping mouth, wheezing, and exudates from the trachea. Can be seen in heavily infested or extremely stressed reptiles.

#### **Treatment**

Treatment used is Panacur at 50-100 mg/kg (higher dose than with other nematodes) or with Ivermectin at 0.2 mg/kg orally. Panacur is given weekly and Ivermectin every two weeks for 2-3 treatments.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)

### **PROTOZOA AMOEBAE (*Entamoeba invadens*)**

Large slow motile protozoa which can cause severe damage to the gut leading to diarrhea, mucoid or bloody faeces, anorexia, wasting and death. Some animals can be asymptomatic carriers which pass amoebae in their droppings. The amoebae form cysts outside the body and these are ingested with food or water by susceptible animals.

Diagnosis is by finding the motile form in faecal wet prep.

#### **Treatment**

Treatment is with Flagyl (metronidazole) at 20 -50mg/kg repeated weekly for at least three treatments.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to prevention, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Cysts of Entamoeba on a direct smear viewed under microscope at 100 xs  
(Photo: Klingenberg, R: 1993)

### **COCCIDIA**

Small protozoa which are non-motile. They have a direct life cycle and can cause severe gut irritation, diarrhea and death.

Diagnosis- they can be treated with Baycox (toltrazuril) but this medication can have severe side effects in snakes.

#### **Treatment**

In snakes Trimethoprimsulpha drugs can be used but are not always effective.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to prevention, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Oocysts of coccidian viewed under the microscope at 400 xs  
(Photo: Klingenberg, R: 1993)

### **CRYPTOSPORIDIA**

Is a small coccidial parasite occasionally seen in snakes. In snakes, the infestation is usually pathogenic- causing severe hypertrophic gastritis, and is mainly seen in elapids. This coccidial parasite can cause severe gut damage especially to the stomach. It is extremely resistant to treatment though some animals can carry the parasite without obvious signs- a carrier. The reptile parasite is not the same as the mammalian one but it is still contentious whether the mammalian one can cause disease in reptiles and vice versa. The main signs of infection include regurgitation and weight loss and sometimes swelling of the stomach (in snakes).

Transmission: ingestion of oocysts passed in faeces, immunodeficient individuals being particularly at risk.

#### **Signs**

Regurgitation 2-3 days after eating, midbody (stomach swelling, weight loss in chronic cases). Almost always fatal.

Diagnosis: Examination for oocysts in smears of faeces, mucous from surface of regurgitated food, stomach washings and stain with modified Ziehl-Neilsen- oocysts stain acid fast in contrast to other material and organisms in the sample. Endoscopy, laparotomy and biopsy are unnecessary if oocysts are found in the above tests.

#### **Treatment**

At this stage no reliable treatment is known though Trimethoprim and sulphadiazine at 30mg/kg daily for 7 days has helped some animals. By stomach tube with food, smear drug on outside of prey before offering to snake. Supportive fluid vitamin therapy. Very poor prognosis. Some newer preparations used in humans with AIDS have potential but at present the cost is prohibitive.

Isolate infected. Consider euthanasia. Test faeces of all in-contact animals. Treat all contacted enclosures and equipment with formaldehyde-cased disinfectant. Strict personal hygiene. New arrival checks for faecal Cryptosporidia before housing with others.

(Salkeld, J)

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to prevention, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Cryptosporidium oocysts (dark dots) at 100 xs

This parasite is currently not treatable and can be devastating when present in collections  
(Photo-Klingenberg, R: 1993)

### **PENTASTOMIASIS**

Characteristics of phyla Arthropoda and Annelide. Pentastomes are almost exclusive parasites of reptiles. There are 9 genera in snakes, 3 in lizards, 4 in crocodiles and 2 in turtles. A variety of herbivorous vertebrates can be intermediate hosts such as rodents. Humans and primates are incidental hosts. The definitive host is snakes; where adult forms of the parasite are found in the respiratory tract (this stage is not transmissible to humans).

Pentastome eggs are then passed in respiratory secretions, saliva and faeces. These eggs are ingested by intermediate hosts (rodents) or incidental hosts (man, dogs).

The primary larvae emerge and penetrate the gut, encyst in host tissues.

The larvae becomes quiescent or in a nymph stage. This has been reported in man causing minimal-moderate inflammatory response.

The third stage larvae in man can encyst, which calcifies and dies in incidental host.

Pentastomes are parasites of all reptile groups, relatively uncommon in captivity, as infestation acquired by ingestion of wild mammalian intermediate hosts. However some pentastomids have both direct and indirect life cycles. Therefore the infected snake can be infectious to enclosure mates.

Pentastomids inhabit lungs and air sacs, disease occur if in large numbers, i.e., inflammation and fibrous degeneration of pulmonary parenchyma result. Associated with serious human disease affecting liver and lungs.

Clinical signs: Dyspnoea, viscous oral mucous (may be blood tinged), lethargy, anorexia.

Diagnosis Identifying eggs in oral mucous or lung washings (eggs have distended, thin walled capsule, and may contain larvae with hooklets).

#### **Treatment**

Ivermectin 0.2mg/kg SC have been effective in several cases in Melbourne Zoo.

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to prevention, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Pentastomid egg viewed on fecal flotation 100x  
(Photo: Klingenberg, R: 1993)

## FLAGELLATES

These are small motile protozoa dewdrop shaped with whip-like projections from the end which they use to move around. They can cause little problems in small numbers but large numbers can cause intestinal irritation, refusal to eat and diarrhea and cloacitis especially in young animals.

Diagnosis is by fresh faecal wet prep.

### Treatment

Treatment is Flagyl at 20mg/kg weekly for 3 weeks.

(Bellami, Terri; 2004)

### Prevention

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to prevention, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Trichomonads viewed at 100x. These flagellate protozoans can be present in many reptiles.  
A drop of Lugol's iodine was added to the fecal matter before it was mixed.

(Photo: Klingenberg, R: 1993)

## CESTODES TAPEWORMS

They have an indirect life cycle. Reptiles acquire tapeworms by ingesting an invertebrate or mammalian intermediate host. They can cause malnutrition by competing for nutrients with the host and can cause gut irritation and even obstruction if in large enough numbers.

Diagnosis is by seeing tapeworms or proglottids (egg sacks about the size of a rice grain) in faeces or by faecal flotation and identifying the eggs.

### Treatment

Treatment is with Droncit (praziquantel) at 5mg/kg orally every 2 weeks for up to 2-3 treatments

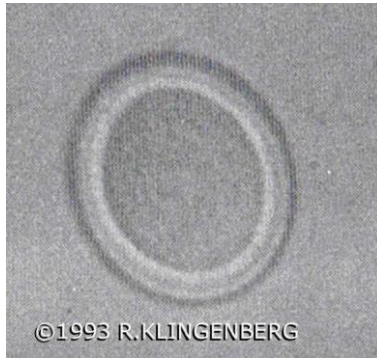
### Prevention

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to control worms, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)





Tapeworm egg as seen on fecal flotation at 400 xs  
(Photo, Klingenberg, R:1993)

### **TREMATODES FLUKES (nose and mouth)**

Flukes are very common in snakes that take to the water. They are acquired by the ingestion of an infected intermediate host, usually frogs, fish and snails.

Flukes found orally, within the respiratory system or on superficial tissue, rarely cause damage.

Renal flukes can cause a chronic interstitial nephritis or other kidney damage

Diagnosis is by observing adult flukes in the mouth, nose, cloaca and faeces. Ova can be found in faeces, but less common. Fluke eggs are large, yellow-brown eggs with a solid operculum at one end.

#### **Treatment**

Treatment is with Droncit at 5-8 mg/kg. Adult flukes observed in the mouth can be rolled up with cotton buds and disposed of.

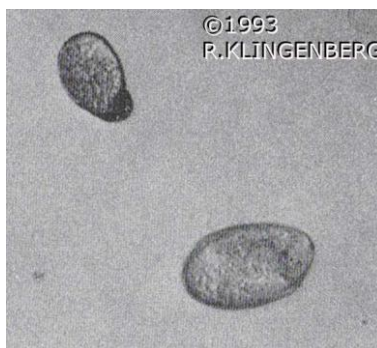
Transmission can be prevented by freezing food items such as frogs for at least 3 days prior to feeding.  
(Klingenberg, R 1993)

#### **Prevention**

Quarantine and faecal testing of all new arrivals to collection

Appropriate hygiene is very important to prevention, removal of faecal matter quickly so reptile does not become reinfected.

(Klingenberg, R. 1993)



Fluke egg as seen on fecal flotation at 100 xs.  
(Photo: Klingenberg, R:1993)

### **SALMONELLA**

Salmonellosis is a zoonosis of worldwide economic importance in humans and animals.

Infection of animals with various species of salmonella sometimes results in serious disease and always constitutes a vast reservoir for the disease in humans. The interplay of salmonella with its host takes a variety of forms including remarkable host specificity, unapparent infections, recovered carriers, enteritis, septicemia, abortion and combinations of disease syndromes. Salmonella are readily transferred from animal to animal, animal to humans, and human to human by direct or indirect pathways.

Salmonella is routinely isolated from apparently healthy reptiles; however it can also cause significant pathology in reptiles. Major concerns for vets working with reptiles is handling reptile associated salmonellosis (RAS).

A number of potential virulence factors have been identified to enable the organism to invade and infect a host, such as flagella, siderophores (iron scavenging chelators produced by bacteria when iron concentrations are low within a host), lipopolysaccharide (endotoxic properties- these stimulate inflammatory mediators and immunoregulatory cytokines, leading to vascular damage and thrombosis).

### Signs

These are variable, lethargy, anorexia, sudden death-bacteraemia, pneumonia, hepatitis, necrotizing enteritis.

Reptiles that undergo bacteraemia may develop visceral lesions, hepatitis in snakes, nephritis, myocarditis. Reptiles can suffer from diarrhea, dysentery, anorexia.

Usually death is from septicemia, pneumonia, hypovolemic shock, intestinal granulomas (rare).

Transmission usually faecal-oral route.

Unhygienic handling of sick reptiles.

Diagnosis Faecal culture from cloacal swab or faeces from culture and sensitivity.

### Treatment

Appropriate antibiotics following culture and sensitivity > Supportive treatment eg. Fluids.

### Prevention

Appropriate hygiene, Quarantine and faecal testing of all new arrivals to collection.

Keep the following points in mind when considering the problem.

- A high proportion of reptiles are asymptomatic carriers of Salmonella. Salmonella is endemic in reptiles.
  - Faecal carriage can be more than 90%.
  - Attempted elimination of Salmonella in reptiles with antibiotics leads to increased resistance and rarely is permanently effective.
  - Attempts to eliminate Salmonella in reptiles with antibiotics have been unsuccessful.
  - A wide variety of serotypes from reptiles are rarely associated with other animals or sources.
  - Reptiles can become infected through transovarial (through the egg) transmission.
  - Reptiles are infected from before birth, obtaining infection as live newborn or shelled embryos passing through the cloaca of the mother; being captive bred, incubated and born is NO guarantee that any reptile is salmonella-free.
  - They can become infected through contact with other reptiles.
- (Stopford,F: 2004)

## 8.5 Quarantine Requirements

Complete medical records should be kept and be available for all animals during the quarantine period.

Animals that die during the quarantine period should have a necropsy performed under the supervision of a veterinarian and representative tissues submitted for histopathological examination, with other laboratory analysis (i.e. cultures) applied as indicated. The results of all tests, both positive and negative, should be recorded. Thus a bank of baseline data will be developed.

Finally, the medical history and records of the human attendants, including the veterinarian, must be kept and the attendants must be regularly screened for infection with transmissible diseases (e.g. tuberculosis, chicken pox, mumps, influenza, hepatitis A and B) and be up to date with rabies (lyssa virus) and tetanus toxoid.

When you have acquired a new reptile it is suggested to Quarantine your reptile.

Quarantine for reptiles should last for **90 Days**. Quarantine facilities should be adequate for the thermal requirements of the species under quarantine and allow for thermo-regulatory behavior.

1. Faecal examination, direct and flotation, for protozoan (especially *Cryptosporidia sp* and *Amoeba sp.*) and metazoan parasites. Three or more consecutive tests should be negative.
2. Culture faeces for *Salmonella sp.*

**Note:** Since > 80% of reptiles can test positive for *Salmonella sp.* evidence of infection may not preclude release.

3. Carry out Blood count and PCV (packed cell volume)
4. Examine blood smears for haemoparasites.
5. Swab/nasal wash and examine for *Mycoplasma sp.* And *Mycobacteria. Sp.*

6. Serology for antibodies of *Mycoplasma sp.* and ophidian paramyxovirus for reptiles.

7. Check for tick infestation.

(Woodford, M: 2000)

**Never Introduce new snakes to the rest of your collection before quarantining first:**

- Keep snakes in Quarantine in a separate room to other reptiles or snakes.

Place them in Quarantine for at least 90 days and monitor their health for any signs of disease.

Snakes with diseases such as IBD can take a long time to show any signs, so even if a new snake looks healthy, it may be carrying a disease.

- Whilst in Quarantine, reptile should be checked weekly for diseases, pathogens and protozoa, and once you have 2-3 consecutive negatives on the tests, the vet should clear the reptile for release from Quarantine.

(Dept of Environment and Conservation)

**Quarantine your collection after an unexplained death:**

You don't want to expose any more animals to disease and death if an animal in your collection has already died from unknown causes. You should wait at least 6 months before introducing any new animals to the collection. Neither should you pass on or sell an animal from your collection to anyone else for at least 6 months after an unexplained death.

- Clean and handle the animals in quarantine last, each day, using the routine described earlier.

- Use paper substrate for quarantined animals as this makes it easier to spot evidence of disease, parasites, abnormal faeces and the like.

- In large or commercial collections, particularly where snakes are kept in separate locations within the one site, a simple disinfecting footbath can be installed at the entry to the quarantine area.

- Put a mat in a plastic tray or container large enough to step into and keep the mat soaked in disinfectant. Footbaths, however, become easily contaminated with dirt and organic matter, making them ineffective.

They may also not work well because the contact time with the disinfectant is too short to kill pathogens.

- Use separate equipment for each animal in quarantine.

- Thoroughly wash your hands with hot, soapy water after handling any animals in quarantine.

- During the quarantine period the snake should be examined by a vet for presence of parasites or diseases.

- Assume all new snakes are infested with snake mites and treat them immediately with a proprietary treatment or as advised by your vet, taking care not to spread the infestation to other snakes.

- Closely monitor any snake in quarantine for signs of disease or other problems and keep a written record. Follow the advice of your vet regarding treatments or tests for your snake while it is quarantined.

(Dept of Environment and Conservation)

## 9. Behaviour

*Hoplocephalus bungaroides* lives in Sydney a relatively cool and highly seasonal climate and shows strong thermally-forced seasonal shifts in retreat-site selection. The nocturnal broad-headed snake is a small elapid that spends long periods of time sequestered under stones on exposed cliff-edges, and is highly selective in its choice of retreat-sites. During cool weather in spring, the snakes select thin rocks fully exposed to solar insolation, and avoid thicker (cooler) rocks. The snakes rarely bask, but I do not know whether the virtual absence of this behaviour reflects high cost eg. Vulnerability to predation when basking. Or low benefits eg. Snakes sheltering under rocks may be able to exploit their thermal environment efficiently without basking. These two alternative hypotheses, quantify the extent to which these snakes are able to exploit their thermal environment with and without basking. In addition, the dramatic seasonal shift in habitat use displayed by *H.bungaroides*, whereby the snakes shelter in tree hollows in open woodland during summer, allows the snake to select different types of retreat-sites exploiting the thermal environment at different times of the year.

### 9.1 Activity

The overwhelming majority of Broad-headed Snakes are found during the day, sheltering under large exfoliating slabs of sandstone and rock crevices in areas of undisturbed bushland during autumn, winter and spring (sometimes excluding the coldest parts of mid-winter). During summer these snakes are rarely found during the day. It is very rare (in cooler months) to find these snakes under cover that is not "rock-on-rock". "Rock on rock" in this context also includes crevices in cliff faces and so on. These snakes are rarely found under rocks which have a soil substrate.

A feature sometimes noted in wild and captive Broad-headed Snakes is the potentially low metabolic rate. This is reflected in a sometimes lower than usual food intake, when compared to other snake similar-sized species. Marian Anstis had a captive specimen fast for over 12 months - without apparent ill effect - remember this is only a small species of snake, so such a fast is of far greater significance than in a larger snake such as a ten foot python.

Because this species is found under exfoliations immediately above cliff faces and sometimes above outlying outcrops surrounded by cliffs it is clear that these snakes can navigate up almost sheer cliff faces if necessary.

Broad-headed Snakes are largely nocturnal in warm weather.

Further corroboration of the above came from Shine's (1983) study of the genus *Hoplocephalus*, which found these snakes fed at all times of the year - hence the need to "bask" in cooler months. (Captives are mainly, but not entirely nocturnal). Captives also feed at all times of the year. White (1973), Wells, Wellington and Williams (1988) and others have actually noted that their captive specimens fed mostly in winter and spring.

This could well be a reflection of ease in finding food during those months (in wild specimens), setting the biological "clock" to feeding mode at that time of year or perhaps related to breeding activity. You see vitellogenesis (egg formation) commences in late autumn/winter and continues until mid spring (about September/October, with ovulation around October. This would necessitate a higher than usual food intake for females, particularly in view of the fact that they usually cease feeding for at least two months prior to giving birth. Acheson and Shearim noted year-round feeding in their Broad-headed Snakes but with no strong seasonal biases. Males tended to go off food when mating.

Worrell (1970) and others have stated that these snakes shelter in trees during the summer months. However this assertion has recently been (in part) challenged by some herpetologists. The alternative assertion is that Broad-Headed Snakes still tend to disperse away from open exposed (to maximum sunlight) rock outcrops, but may tend to utilise similar cover (if available) when resting. The only significant difference being that the snakes must rest under larger and more inaccessible rocks and crevices in order to escape the heat of the day when resting.

Such seems to be a similar scenario for other nocturnal species in the Sydney area including Small-eyed Snakes (*Cryptophis nigrescens*) and Red-naped Snakes (*Furina diadema*). This tends to make principally nocturnal snakes less accessible to daytime collectors during the warmer months, (a common trend in warm-temperate areas world-wide). Small-eyed snakes in particular are found in similar areas to Broad-



headed Snakes and sometimes shelter under similarly exposed rocks during winter. They do not however have keeled ventrals or any known predisposition to arboreality.

Rick Shine and a student of his, Jonathon Webb, at the University of Sydney, have recently commenced a detailed study into Broad-headed Snakes, including radio-telemetry. They hope to further establish where these snakes go during warmer weather. Certainly some specimens range a substantial distance from rocks. Furthermore some are known to have taken shelter in hollow limbs of large Eucalypts (*Eucalyptus* sp.) some distance above ground. This habit is in line with known habits of the closely related Pale-headed Snake. That species is caught by collectors near Rockhampton in Queensland who drive along roads at night shining strong lamps onto adjacent tree trunks.

Besides the habitat requirement for exfoliating sandstone in undisturbed habitat, Broad-headed Snakes usually only seem to be found in areas with large numbers of Lesueur's Geckos (*Oedura lesueurii*), which according to a number of sources including Wells, Wellington and Williams (1988) are this snake's preferred food in the wild. Areas of apparently suitable habitat without this food lizard rarely appear to have Broad-headed Snakes, even though they are known to opportunistically feed on other reptiles. In my own experiences, the best spots for Broad-headed Snakes are those areas which have absolutely HUGE numbers of Lesueur's Geckos.

## **9.2 Social Behaviour**

- Adams (1973) stated that, based on his experiences keeping the genus, he thought Broad-headed snakes weren't cannibalistic, but that the other species in the genus were.

- In spite of the above statement, there have since been documented cases of cannibalism in this species. Herpetologist Greg Sinclair had a large adult Broad-headed snake eat a cage co-habitant of the same species that was less than half its length. It was later regurgitated partially digested. In a similar incident a large specimen (s-v 53 cm) ate another individual (s-v 41 cm) which was not regurgitated. White (1973), also reported an adult consuming two large Small-eyed Snakes (*Cryptophis nigrescens*) whilst in captivity. Wells, Wellington and Williams (1988) also reported on a captive Broad-headed Snake feeding on an immature Yellow-faced Whip Snake (*Demansia psammophis*). Captive Broad-headed Snakes have also been induced to eat young Bluetongue Lizards (*Tiliqua scincoides*) and even live fish dropped onto the cage substrate. How much of this behaviour was unusual to captive specimens, as opposed to what takes place in the wild is yet to be established. Where these snakes occur in the wild, tadpoles/frogs of several species are sometimes available and may constitute food in some circumstances. For obvious reasons (risk of parasites) keepers haven't experimented feeding captive snakes anuran food.

- Male combat hasn't been documented for *Hoplocephalus* and according to Shine (1983) is unlikely as the females tend to be the larger sex...it is when the males are usually the larger sex that male combat is a common behaviour. Certainly keepers of Broad-headed Snakes have not yet documented fights between co-habitants of cages or similar behaviour. I kept two females in the same enclosure with no records of the two females in combat quite the opposite I often seen both snakes curled up next to or on top of each other for hours.

## **9.3 Reproductive Behaviour**

The actual mating act in Broad-headed Snakes occurs after the male chases the female "cornering" her then the male aligns his body over that of the female's rubbing himself (in particular the head and chin) over the female, trying to raise the female's tail with his own. Both snakes move their tails vigorously when this is done. I've been told that observed copulation usually lasts from one to several hours (often seeming to go on all night). The mating is similar to that of the mating behaviour in Death Adders (*Acanthophis antarcticus*). The main observed difference between the two species is that the female Broad-headed Snake does not rapidly twitch her tail in the same "end-shaking" manner as the female Death Adder, when first mounted by the male.

## **9.4 Bathing**

The water should always be placed at the cool end of the enclosure Don't position the water under the lights as this will raise the humidity and heat the water making a very uncomfortable place for your snake.

Water can be delivered in many ways find out what best suits your reptile spraying, misting, a pond, a running waterfall, even a fogging machine. Snakes will naturally bath from time to time on there own so you should provide a water bowl that is sturdy and large enough for the snake to completely submerge its self. Your snake bathing can benefit it in a few ways:

- Helps them cool down on hot days
- Helps with shedding its old skin
- Kills mites
- Promote bowel movements

## **9.5 Behavioural Problems**

The *Hoplocephalus* genus is know to be a jumpy, flighty species. It's an ambush predator with a fast strike speed and known to strike several times in rapid concision

## **9.6 Signs of Stress**

Being an ambush predator these snakes don't often stress out if supplied the right environment These snakes when stress will thrash about and are not shy to bite often striking repeatedly

## **9.7 Behavioural Enrichment**

### **What is Behavioural and Environmental Enrichment?**

Enrichment allows animals in captivity to behave as closely as possible to their wild counterparts. The primary concerns for Behavioural and environmental enrichment is to manipulate the captive environment to ultimately benefit the animals Behavioural needs. Behavioural needs for reptiles can be broken down into several categories;

- |                           |                       |
|---------------------------|-----------------------|
| - Thermoregulatory        | - Sensory Stimulation |
| - UV and Day light Cycles | - Feeding styles      |
| - Locomotion              | - Reproductive        |
| - Spatial                 | - Social              |

The exhibit will heavily depend on the wild behaviour of the species and knowing the wild habitats of the species you are housing.

### **Temperature Requirements**

Snakes are a reptile, which means they are ectothermic getting their body heat from external sources. Endothermic animals, such as mammals, regulate their body temperature internally. A snake's body temperature and its level of activity, is controlled by the temperature of the air and the ground around it. It will try to maximize body heat, by basking in the sun or lying on or near warm surfaces. This should be kept in mind while designing the display, positioning the hot spots in good view for the public.

In cold areas of the state, snakes hibernate during winter. However, in the more temperate climate along the coast, they shelter in rock crevices during cold weather and come out on warm days to soak up the heat of the sun. During cold weather, snakes are less active and therefore hunt less. In the winter their metabolisms slow down, and they use up body fat which has been stored up during the warmer months of the year.

The snakes will thermo regulate and will cycle through the thermogradient provided. Temperatures should range in your enclosure. Having a hot end with heat and UV provided at a maximum of 32C and a cool end where the water should be placed at a minimum of 20C.

### **Water**

The water should always be placed at the cool end of the enclosure Don't position the water under the lights as this will raise the humidity and heat the water making a very uncomfortable place for your snake. Water can be delivered in many ways find out what best suits your reptile spraying, misting, a pond, a running waterfall, even a fogging machine. Snakes will naturally bath from time to time on there own so you should provide a water bowl that is sturdy and large enough for the snake to completely submerge its self. Your snake bathing can benefit it in a few ways:

- Helps them cool down on hot days
- Helps with shedding its old skin
- Kills mites
- Promote bowel movements

### **Mechanical Device**

Snake keepers don't tend to use mechanical devices they won't respond to a mirror or a television like a primate would.

- I have used a small vibrating feed bowl bought at any pet shop usually to make worms look alive to lizards, the feed bowl made a mouse look alive to this shy snake that would not feed while I was in view. After some conditioning I can now feed this snake from tongs.
- A running waterfall even a fogging machine are affective mechanical devices that can not only provide stimulation but make a great display feature as well. Keep an eye on the humidity with the extra water and heat.
- Removable lock up hide can be a safe and very affective way of removing a snake from its enclosure. Just a small wooden box with a lockable entry hole and maybe cover the sides with bark strips for aesthetics, that can be left in the exhibit and easily removed for cage of maintenance or vet check.
- The use of thermostats to regulate temperature is a mechanical devise every reptile enclosure should have, maintaining a good thermogradient for the environmental enrichment.
- The use of timers to set day light periods is vital. The most important factor involving lighting and heat is to be sure you provide a heat/light cycle to replicate natural day light hours. Many reptiles use light cycles to determine breeding seasons and habitat shifts.

### **Human Interaction**

When ever working with venomous snakes you MUST have a compression bandage with you at all times. It is often recommended to work with some one to help you if anything should happen if not at least a phone for you to call for help. Free handling of venomous snakes like you would any python is

not recommended especially a small not so calm Broadhead. Although regular human interaction can make removing and health checks on the snake less stressful.

### **Free Handling**

The least disruptive method for the animal is free handling where it is allowed to move gently through the handlers hands with no sudden movements and only slight restriction as the keeper runs the snake from one hand to the other, like a treadmill. However, while this is suitable for pythons and any non-venomous species, it is **not** recommended for handling venomous snakes and with the Broad-head not reaching large sizes it doesn't have far to whip back round and tag you. You may see photos or people free handling Tiger Snakes and Black Snakes but even with very quiet animals it may take nothing more than a whiff of a mouse or that hamburger on your hands to cause the snake to get excited and a serious situation can develop. Some people get away with being incredibly liberated in handling snakes – but not forever..

**DO NOT FREE HANDLE THESE SNAKES.**

### **Feeding Strategies**

Digestion time will depend on the food quantity; a regular meal of an adult mouse will usually be full digested with in 72 hours. After eating, snakes become dormant while the process of digestion takes place. Digestion is an intense activity, especially after consumption of very large prey. In species that feed only sporadically, the entire intestine enters a reduced state between meals to conserve energy, and the digestive system is 'up-regulated' to full capacity within 48 hours of prey consumption. Being cold-blooded (ectothermic), the surrounding temperature plays a large role in a snake's digestion. 28-30 degrees Celsius is the ideal temperature for snakes to digest their food. So much metabolic energy is involved in a snake's digestion that in the Mexican rattlesnake *Crotalus durissus*, an increase of body temperature to as much as 1.2 degrees Celsius above the surrounding environment has been observed. Keeping the digestion activity in mind the snake should be left alone after feeding for 72hours. Plan you feeds don't feed out then that afternoon go through moving the snakes around for cleaning.



(C.Morris09)

Broad-Headed ambush from the rock craves replicating natural behaviour.

Broad-headed Snakes usually only seem to be found in areas with large numbers of Leseuer's Geckos (*Oedura lesueurii*), which according to a number of sources including Wells, Wellington and Williams (1988) are this snakes preferred food in the wild. Areas of apparently suitable habitat without



this food lizard rarely appear to have Broad-headed Snakes, even though they are known to opportunistically feed on other reptiles. In my own experiences, the best spot for Broad-headed Snakes are those areas which have absolutely HUGE numbers of Lesueur's Geckos

This would be an Ideal food for enrichment but not practical, maybe if a Lesueur Gecko in your collection dies of natural causes you might think of Broadhead.

### **Presentation**

When feeding these snakes will usually sit and wait for food to approach as opposed to actively foraging for it, although this in part depends on the set-up of the cage. This behaviour may also explain why not many wild caught (museum held) snakes had food in their stomachs in the winter sheltering patterns. When snakes bite their food, they tend to hang onto it and immobilize it by using their body to push it against a restraining surface such as a rock. Using coils to restrain prey (like constriction) has also been observed. Food is eaten only when the prey is completely subdued by venom. The food item can be jiggled in front of the snake by using a pair of long handled tongs, so that you will not get bitten. Then you can put up a fight to act if the mouse is alive. They can also be placed inside the enclosure, or dragged around the enclosure, allowing the scent of the food item to make a scent trail for the snake to follow. I have used a small vibrating feed bowl bought at any pet shop usually to make worms look alive to lizards, the feed bowl made a mouse look alive to this shy snake that would not feed while I was in view after some conditioning I can now feed this snake from tongs.



Pinky Rat Offered with Tongs from a safe distance (C.Morris09)

### **Time and Frequency**

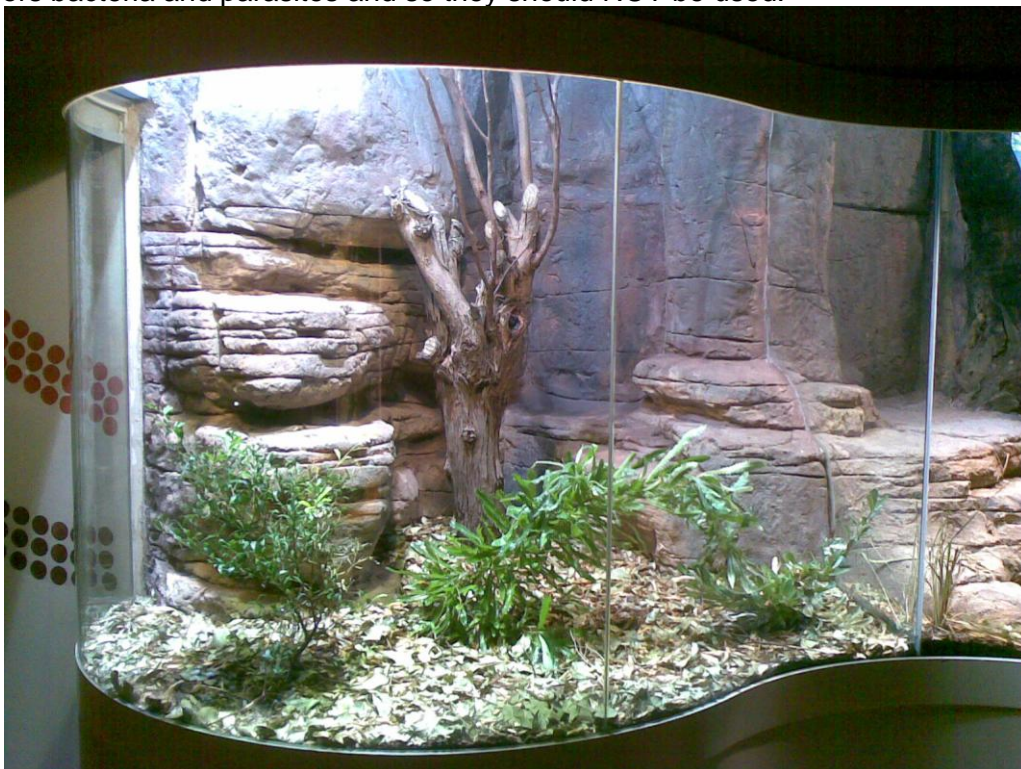
It is best to wait for the snakes to warm up before feeding don't feed first thing in the morning. The Broadhead is diurnal / nocturnal so feeding at the end of the day is probably the best time.

Feeding requirements for the Broadhead snakes at Sydney Wildlife World are one adult mouse (with repti-cal and repti-vite sprinkled on them) a week or two adult mice, (with repti-cal and repti-vite sprinkled on them) every two weeks.

### **Substrate,**

Substrate can be a huge enrichment tool many reptile keepers overlook. I have heard of some Broad-Headed Snakes being kept and successfully breeding in a pile of rock set in an enclosure. As these snakes are only found on rock on rock surfaces this has proven an effective and cheap substrate. You want the substrate to be easy to change and cost effective but still have natural aesthetics. Off exhibit butcher paper or shred paper works well. It's cheap and easy to change although won't cut it on display. Mulch looks very natural on display and is not all that hard to change in a

snake enclosure. The substrate should be changed regularly at least once a week depending on feeding resume. If eucalypt mulch is used you will still get the scents of the plant with out the humidity. These days some keepers use a natural leaf litter substrate; the snakes are able to forage through it, which in itself is good behavioral enrichment. If they want to hide, they simply bury into it, but are still able to observe activities outside the cage. Some keepers argue that natural substrate is less hygienic and a haven for mites, but if it is replaced regularly (i.e. weekly) this shouldn't be a problem. With these snakes spending a lot of their time on the rock face and in trees the substrate will not be as affected as much as your true terrestrial species Some natural substrates such as pine chips, and some artificial substrates such as synthetic carpet or grass, can retain moisture that harbors bacteria and parasites and so they should NOT be used.



(C.Morris09)

You may also include some native plants and natural substrate to the exhibit. If using natural substrate like mulch of leaf litter offering a wide range of different scents and textures will really stimulate you snakes natural senses. If using live plants watch the humidity.

### **What sensors do the snakes have that we can stimulate.**

#### Sensory Stimulation

Putting in sloughs from conspecifics, and other reptiles into the enclosure can cause an increase in activity, Skins can be sterilized by autoclave.

Mammal hair in water. Fur from cats, micro waved to sterilize then put into water. Water then scattered into reptile exhibit. Other scents used- rabbit, ferret, and hoof stock. Response of cruising, alert posture, tracking scent, tongue flicking will be observed

- You could place feathers or other reptile skins in and around the enclosure

-While the snake is out for cleaning or vet checks place a lizard in the enclosure for 10min let it run around or maybe a trained bird to leave different smells and trails.

- You can even try scenting the food item with lizard maker, which is a man made pheromone which makes the food item smell like a lizard. This is often used when young neonates refuse to eat the pinkie mice. They must then be weaned off the scent of lizards.

#### Locomotion

- These snakes love to climb their body has special adaptations for climbing cliff faces

- Offer Different rocks and plants for different textures. Observe the places your snakes favor and build your record of personal enrichment for each individual.

## Social

Unlike some other cannibalistic elapids these snakes are often found in communities. Try introducing another snake to the enclosure. Never leave the introduction unsupervised. Try some small meeting between snakes just a couple hours easy day for a week and if all is good leave the new snake on display. Provided there is enough hides and rock space for all snakes.

## Photoperiods

The use of timers to set day light periods is vital. The most important factor involving lighting and heat is to be sure you provide the correct light cycle to replicate natural day light hours. Many reptiles use light cycles to determine breeding seasons and habitat shifts.

## Temperature Gradient

Snakes are a reptile, which means they are ectothermic getting their body heat from external sources. Endothermic animals, such as mammals, regulate their body temperature internally. A snake's body temperature and its level of activity, is controlled by the temperature of the air and the ground around it. It will try to maximize body heat, by basking in the sun or lying on or near warm surfaces

The snakes will thermo regulate and will cycle through the thermo gradient if provided. Temperatures should range in your enclosure. Having a hot end with heat and UV provided at a maximum of 32C and a cool end where the water should be placed at a minimum of 20C.

## **9.8 Introductions and Removals**

The introduction of new specimens to an enclosure.

Introducing of most Australian elapid snakes to each other is best done by placing the female into the males enclosure. This way the male is in his own territory. If you introduce the male into the female's enclosure, he will be too busy following the new scents and smells, than paying the female any attention. By introducing her to his enclosure, he will want to know who is in his territory and there could be conflict. The same with removals remove the female first then the male so the female will be first in the holding bin then he is entering her holding bin.

## **9.9 Intraspecific Compatibility**

- Hayes (1973a) documents five repeated copulations between a male Broad-headed Snake and a female Stephen's Banded Snake. No offspring were reported.

-Sometimes the best enrichment you can give an animal is another animal however this isn't always the case. Adams (1973) stated that, based on his experiences keeping the genus, he thought Broad-headed snakes weren't cannibalistic, but that the other species in the genus were.

In spite of the above statement, there have since been documented cases of cannibalism in this species. Herpetologist Greg Sinclair had a large adult Broad-headed snake eat a cage co-habitant of the same species that was less than half its length. It was later regurgitated partially digested. In a similar incident a larger specimen (s-v 53 cm) ate another individual (s-v 41 cm) which was not regurgitated. White (1973), also reported an adult consuming two large Small-eyed Snakes (*Cryptophis nigrescens*) whilst in captivity. Wells, Wellington and Williams (1988) also reported on a captive Broad-headed Snake feeding on an immature Yellow-faced Whip Snake (*Demansia psammophis*). Captive Broad-headed Snakes have also been induced to eat young Bluetongue Lizards (*Tiliqua scincoides*) and even live fish dropped onto the cage substrate. How much of this behaviour was unusual to captive specimens, as opposed to what takes place in the wild is yet to be established. Where these snakes occur in the wild, tadpoles/frogs of several species are sometimes available and may constitute food in some circumstances.

- Male combat hasn't been documented for *Hoplocephalus* and according to Shine (1983) is unlikely as the females tend to be the larger sex...it is when the males are usually the larger sex that male combat is a common behaviour. Certainly keepers of Broad-headed Snakes have not yet documented fights between co-habitants of cages or similar behaviour.

- I kept two females in the same enclosure with no records even over breeding season of the two females in combat. Quite the opposite I often found both snakes curled up next to or on top of each other for hours.
- Neonates should be separated at birth and housed in individual enclosures.

### **9.10 Interspecific Compatibility**

*Austrelaps, Echiopsis, Hoplocephalus, Notechis* and *Tropidechis*

Hemipenial morphology provides evidence that *Austrelaps*, *Echiopsis*, *Hoplocephalus*, *Notechis*, and *Tropidechis* are closely related. All members share a unique hemipenial type, which is virtually indistinguishable among these taxa. The close relationship of these genera is corroborated by other morphological data sets (i.e. Storr, 1982; Wallach, 1985). Further, *Austrelaps*, *Notechis*, and *Tropidechis* share a karyomorph type unique among the terrestrial Australian elapids, and also are electrophoretically close (Mengden, 1985a). *Hoplocephalus* species share a unique karyomorph type, but one that Mengden (1985a) could derive from the *Notechis* group (as implied by his figure 2). The very close relationship of some (*Austrelaps* and *Notechis*—Minton & da Costa, 1975) or all of these genera (Schwaner *et al.*, 1985) is strongly supported by immunological distance data. Moreover, there are strong ecological similarities among members of this group (Shine & Charles, 1982; Shine, 1985, 1987a, b).

### **9.11 Suitability to Captivity**

Broad-headed Snakes are easy to maintain in captivity.

As captives they are very easy to maintain, so handling them is rarely necessary. They are also long lived. Captives held in excess of ten years are common. Wollongong herpetologist Marion Anstis successfully kept a specimen on a diet of mice for over 19 years. That was the same specimen that didn't eat at one stage for over 12 months.



## 10 Breeding

Captive breeding of the Broad-headed Snake relatively little is known about the general biology of most Australian snakes, and this is particularly true for rare species with restricted distributions like the Broadheaded Snake. The only detailed information available on this species came from dissections of preserved museum specimens to discover information on diets and reproductive biology (Shine 1983). There have been few first-hand observations on living specimens. Given the very limited funding available for herpetological research in Australia, how can one find out more about these animals? One profitable method may involve collaboration between professional research scientists and private reptile-keepers, with the support of the National Parks and Wildlife Service. Many private keepers have the interest and expertise to maintain rare species like the Broad-headed Snake in captivity, and can play a very useful role in furthering our knowledge of such animals.

We began with four specimens collected in 1986, and used for research on chromosomal variation within this species. When the research concluded, we were faced with the decision as to what to do with the specimens. They could not be released back into the bush, because they would eventually be needed as preserved "voucher specimens" in conjunction with the chromosomal data (so that future workers could check exactly what kinds of specimens had particular karyotypic configurations). However, the alternative - to kill the snakes and preserve them immediately - was very unpalatable, given the endangered status of the species. The National Parks and Wildlife Service agreed to an experiment - to let two private keepers maintain the snakes on behalf of the scientists, and to try and elicit reproduction in captivity. This would have the dual benefits of increasing our knowledge about the biology of Broad-headed Snakes, and assessing the feasibility of restocking natural areas with captive-reared juveniles.

The snakes were kept in a variety of cage types, mostly glass terraria with pegboard lids. Cage dimensions ranged from 40 x 25 x 25 cm to 60 x 30 x 30 cm. Each cage was heated and lighted by a 25-watt incandescent bulb, and was furnished with a hide-box, rocks and a water dish. All adult snakes were fed pre-killed laboratory mice or young rats, with the frequency of feeding varying from one or two items per month in winter, to three to five items per month in summer. All snakes maintained weight, or grew appreciably, on this rate of feeding. A photoperiod approximating that of Mullumbimby, New South Wales (28°30'S, 152°30'E) was maintained, with daytime ambient temperatures in the range 24 to 33°C and night-time temperatures permitted to fall no lower than 10°C. Juvenile snakes were maintained in well-ventilated plastic containers approximately 20 x 20 x 20 cm for the first few months of life, and fed on pre-killed day-old mice.

The Broad-headed Snakes have now reproduced every year since they were originally collected. Mating has been observed in spring (14 October 1986, 10 October 1987, 24 September 1988), with young being born in summer (13 January 1986, 28 February 1987, 11 March 1988, 24 February 1989). Litter sizes ranged from four to 12, but with a high proportion of infertile oocytes or stillborn offspring each year. The reasons for this phenomenon are under active study. The offspring are relatively large at birth compared to the size of the mother. For example, a female collected in the field in September 1989 April 1989 measured 68.5 cm snout-vent length (71 g after parturition) and gave birth to four young ranging in snout-vent length from 21.8 to 22.7 cm, and in mass from 5.0 to 5.5 g. She also produced two infertile oocytes.

### 10.1 Mating System

The mating system of any Australian Elapidae snake is fertilization of the ovary via Hemipenial Deposit.

Hoplocephalus species share a unique karyomorph type of Hemipene.

## **10.2 Ease of Breeding**

Relatively easy to breed in captivity Seasonal/over winter cooling is recommended and probably essential for breeding success. Three separate breeders regularly achieved success without separation of the sexes prior to breeding. There has never been a need to attempt to induce mating in Broad-headed Snakes. The male snake chases and "corners" the female before mounting her.

## **10.3 Reproductive Condition**

### **Males and Females**

Shine and Fitzgerald (1989) documented mating in captive snakes in spring (September/October) with live young being born in January to March (4 breedings). This correlates with what is seen in terms of reproduction in wild specimens. However I have been advised by other keepers that male Broad-headed snakes will mate, and mate repeatedly at any time of year. The Autumn and spring periods were however the periods of most intense mating activity. However offspring were only produced in the period Summer/Autumn. Mark Fitzgerald got litters of between 4 and 12 young in four breedings. Including other documented cases, all litters for the species range between 2 and 12 and in the period January to April. All breedings to date have been in Eastern Australia which is where the species occurs naturally. However there is nothing to suggest these snakes won't reproduce just as successfully if kept elsewhere.

Shine's (1983) study of the genus *Hoplocephalus*, which found these snakes fed at all times of the year - hence the need to "bask" in cooler months. (Captives are mainly, but not entirely nocturnal). Captives also feed at all times of the year. White (1973), Wells, Wellington and Williams (1988) and others have actually noted that their captive specimens fed mostly in winter and spring. This could well be a reflection of ease in finding food during those months (in wild specimens), setting the biological "clock" to feeding mode at that time of year or perhaps related to breeding activity. You see vitellogenesis (egg formation) commences in late autumn/winter and continues until mid spring (about September/October, with ovulation around October. This would necessitate a higher than usual food intake for females, particularly in view of the fact that they usually cease feeding for at least two months prior to giving birth. Acheson and Shearim noted year-round feeding in their Broad-headed Snakes but with no strong seasonal biases. Males tended to go off food when mating.

Shine's study of wild Pale-headed Snakes indicated that sexual maturity in that species occurred at 3-4 years of age. It is assumed that a similar situation occurs for wild Broad-headed Snakes. Captive specimens however are noted to mature far quicker when food intake and temperatures are raised.

Notwithstanding the above, a feature sometimes noted in wild and captive Broad-headed Snakes is the potentially low metabolic rate. This is reflected in a sometimes lower than usual food intake, when compared to other snake similar-sized species. Marian Anstis had a captive specimen fast for over 12 months - without apparent ill effect - remember this is only a small species of snake, so such a fast is of far greater significance than in a larger snake such as a ten foot python.

Wild snakes in this genus appear to reproduce only every second year. Those who have bred Broad-headed Snakes in captivity haven't indicated whether or not it is the same or different snakes reproducing each year, (they tend to hold several reproductive specimens). However a single large female held by Charles Acheson did reproduce in successive years. As yet, there is no indication as to how rare such a scenario (yearly reproduction) is in Broad-headed Snakes, although such clearly isn't the norm.

Whether reproduction every second year in this species (in the wild) is determined by genetic or environmental factors isn't known. Shine notes that less than annual reproductive frequency is fairly common in cold climate snakes, including species with relatively high survivorship of young. Broad-headed Snakes fit this pattern.

Shine and Fitzgerald (1989) documented mating in captive snakes in spring (September/October) with live young being born in January to March (4 breedings). This correlates with what is seen in terms of reproduction in wild specimens. However I have been advised by other keepers that male Broad-headed snakes will mate, and mate repeatedly at any time of year. The Autumn and spring periods were however the periods of most intense mating activity. However offspring were only produced in the period Summer/Autumn. Mark Fitzgerald got litters of between 4 and 12 young in four breedings. Including other documented cases, all litters for the species range between 2 and 12 and in the period January to April. All breedings to date have been in Eastern Australia which is where the species occurs naturally. However there is nothing to suggest these snakes won't reproduce just as successfully if kept elsewhere.

The actual mating act in Broad-headed Snakes has only been observed. Mating appeared no different to that observed in other Australian Elapids. The male had aligned his body over that of the female and was rubbing himself (in particular the head and chin) over the female. He was trying to raise the female's tail with his own. Both snakes moved their tails vigorously when this was done. I've been told that observed copulation usually lasts from one to several hours (often seeming to go on all night). See the Breeding Section for a description of mating behaviour. Hayes (1973a) documents five repeated copulations between a male Broad-headed Snake and a female Stephen's Banded Snake. No offspring were reported.

Carpenter and Ferguson (1977) discuss stereotyped mating behaviour in reptiles in detail.

According to Sydney breeder Charles Acheson, the actual act of giving birth is very quick, with the young snakes being expelled from the female at great speed, making photographing the act fairly difficult. He also noted the young snakes rapidly moved away from the female shortly after birth. He has bred these snakes many times.

Like the adults, young snakes are also pugnacious. Shine and Fitzgerald quoted snout-vent lengths of newborns ranging from 21.8 to 22.7 cm. A problem indicated by Shine and Fitzgerald, Acheson and another breeder, Richard Shearim has been stillborn young and unfertilised ova (eggs). An identical scenario seems to commonly occur in Death Adders (*Acanthophis antarcticus*) another live-bearing Australian elapid. It also probably occurs in other reptiles. Shine is now investigating the cause/s of this phenomenon.

Mirtschin (1985) has speculated that a cause of stillborn young in captive snakes may be due to overheating of the gravid female. When he altered the substrate of his cages to make them cooler, he reduced the rate of stillborn young. However the reduction in stillborn young may also have been a result of some other factor such as the female snake/s increasing in age/maturity.

#### ***10.4 Techniques Used to Control Breeding***

Techniques used to control breeding can be as simple as removing either the male or female snake from the enclosure during breeding season.

Another technique can be the cycling of lights and temperatures if you do not want to breed, remove the male or female snake from the enclosure during breeding season. If you do not want your snakes to breed, you could keep the lights and temperatures as though it was the middle of summer, knowing that Broadhead's breed in Autumn and in spring, not giving their body clocks the lowering of temperatures, and the shortening of the days, or the increase in temperatures and the lengthening of the daylight. The lowering of temperatures and shortening of the days, and the increase in temperatures and longer daylight hours, is a trigger for tiger snakes, letting them know breeding season is approaching.

#### ***10.5 Occurrence of Hybrids***

There is no known occurrence of Broad Headed Snake hybrids within captivity, or even in the wild.

Hayes (1973a) documented a case of a male Broad-headed Snake chasing cornering and mating with a female Stephen's Banded Snake in the same cage, No young were produced.

### ***10.6 Timing of Breeding***

White (1973), Wells, Wellington and Williams (1988) and others have actually noted that their captive specimens fed mostly in winter and spring. This could well be a reflection of ease in finding food during those months (in wild specimens), setting the biological "clock" to feeding mode at that time of year or perhaps related to breeding activity. Vitellogenesis (egg formation) commences in late autumn/winter and continues until mid spring (about September/October, with ovulation around October. This would necessitate a higher than usual food intake for females, particularly in view of the fact that they usually cease feeding for at least two months prior to giving birth. Acheson and Shearim noted year-round feeding in their Broad-headed Snakes but with no strong seasonal biases. Males tended to go off food when mating.

### ***10.7 Age at First Breeding and Last Breeding***

Broadhead's take 4-6 years to reach sexual maturity. The snakes have an opportunistic ambush feeding strategy which results in low food intake. This has several likely consequences including low rates of growth, slow maturation and a breeding cycle that is less frequent than every year. These factors in concert may predispose the species to become threatened (Webb 1996; Webb & Shine 1998b).

### ***10.8 Ability to Breed Every Year***

Wild snakes in this genus appear to reproduce only every second year. Those who have bred Broad-headed Snakes in captivity haven't indicated whether or not it is the same or different snakes reproducing each year, (they tend to hold several reproductive specimens). However a single large female held by Charles Acheson did reproduce in successive years. As yet, there is no indication as to how rare such a scenario (yearly reproduction) is in Broad-headed Snakes, although such clearly isn't the norm.

### ***10.9 Ability to Breed More than Once Per Year***

This species reports biannual reproduction in the wild the possibility of breeding more than once per year are small. Being live bearing the female need to gain back the large amount of condition lost in the gestation this could be a reason for the bi-annual breeding, there is no any chance of double clutching this species of serpent. There are no records or scientific papers that I could find on the ability of these snakes to breed more than once a year, but due to the Broadhead snakes being viviparous, and the gestation time of these reptiles, double clutching them would place significant strain upon the snake, to a point of death before, during or after the second clutch.

### ***10.10 Nesting, Hollow or Other Requirements***

Once it has been determined that the female is gravid, it has been suggested that you remove the female from the enclosure (if the male is still in the enclosure) and place her into an off exhibit enclosure. Inside this enclosure you should provide a nest box. As Broadhead snakes are viviparous (live young) it is not necessary to provide any substrate or materials such as you would with oviparous (egg laying) elapids. The nest box should have at the bare minimum paper as substrate, couple of large flat rocks, and some leaf litter substrate which will allow the snake to hide.

### ***10.11 Breeding Diet***

For the period of time leading up to mating season, Female Broadhead snakes should have a varied diet. Defrosted rats, mice, quail and chickens and ducklings can be used, varying

this weekly. You should also include with these feeds vitamin C tablets. These can be placed into the mouth of the feed items. As well as vitamin C, you can also dust the food items with reptile calcium powder. This should be done every time you feed the reptiles, not just necessarily during mating season.

Males have been known to go off feeding during mating, food should still be offered just don't stress if the snake will not eat.

### **10.12 Gestation Period**

Broad Headed Snakes give birth to live young (ovoviviparous). This is common in many elapid snakes from the southern end of Australia. Snakes from the north live in a warmer humid climate to incubate their eggs. The further south you get the cooler climate gets hence the need for more developed live young.

### **10.13 Littler Size**

Broad Headed Snakes give birth to live young (ovoviviparous) and tend to produce relatively low numbers of fairly advanced offspring by comparison to other snakes (Shine & Fitzgerald 1989). Clutch sizes are recorded at 4-12 young with a high percentage of infertile still born young. A problem indicated by Shine and Fitzgerald, Acheson and another breeder, Richard Shearim has been stillborn young and unfertilised ova (eggs). An identical scenario seems to commonly occur in Death Adders (*Acanthophis antarcticus*) another live-bearing Australian elapid. It also probably occurs in other reptiles. Shine is now investigating the cause/s of this phenomenon.

### **10.14 Age at dispersal**

According to Sydney breeder Charles Acheson, the actual act of giving birth is very quick, with the young snakes being expelled from the female at great speed, making photographing the act fairly difficult. He also noted the young snakes rapidly moved away from the female shortly after birth. He has bred these snakes many times for many years. Once born, these snakes are precocial and are on their own. They have enough stores from the developing ova to last them a couple of days, and once they shed their first slough, they need to eat.

### **10.15 Age of Removal from Parents**

The neonates can be removed at birth. Shine and Fitzgerald quoted snout-vent lengths of newborns ranging from 21.8 to 22.7 cm. A problem indicated by Shine and Fitzgerald, Acheson and another breeder, Richard Shearim has been stillborn young and unfertilised ova (eggs). An identical scenario seems to commonly occur in Death Adders (*Acanthophis antarcticus*) another live-bearing Australian elapid. It also probably occurs in other reptiles. Shine is now investigating the cause/s of this phenomenon.

### **10.16 Growth and Development**

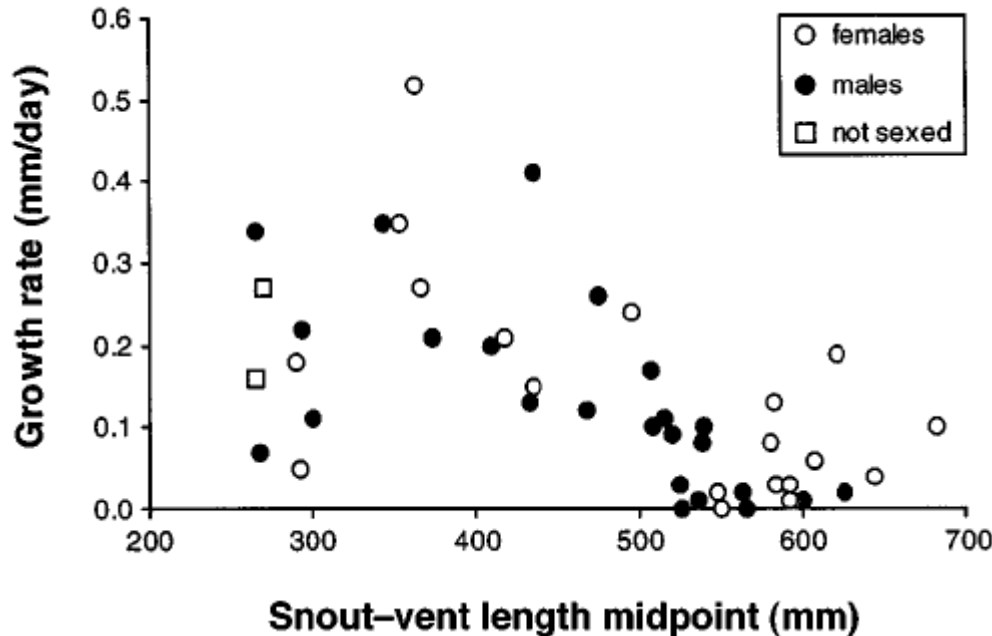
The growth of these snakes is relatively slow to other Australian elapids Neonates are relatively large at birth newborns ranging from 21.8 to 22.7 cm not needing the rapid growth of a hatchling but take 4-6 years to reach maturity . Once born, they are precocial and are on their own. They have enough stores from the developing ova to last them a couple of days, and once they shed their first slough, they need to eat.

#### **Rick Shines study on Growth rates**

Small juvenile snakes (< 32 cm SVL) grew very slowly during their first year of life (Fig. 3). Because very slow growth of young animals has not been reported in previous studies on other snake species (Parker & Plummer, 1987), we tested to see if it might be an artifact of our marking techniques. The low growth rate of neonatal broad-headed snakes does not appear to be due to a negative effect of implanted harmonic radar diodes or PIT tags, because very small untagged snakes were captured during late spring (9 months after birth, see Fig. 4; see



also Keck, 1994). Hence, at least some unmarked snakes must have been growing just as slowly as our marked individuals. Also, our analysis did not reveal any significant difference between growth rates of snakes implanted with miniature PIT tags versus the larger diodes (one-factor ANCOVA with tag type as the factor, mean SVL over the recapture interval as the covariate, and growth rate as the dependent variable: slopes  $F_{1,26} = 0.20$ ,  $P = 0.66$ , intercepts  $F_{1,27} = 0.39$ ,  $P = 0.54$ ). Once snakes had grown past 32 cm SVL, their growth rates were high, and thereafter decreased with increasing snake size (Fig. 3). Males and females grew at similar rates, but females continued to grow past 55 cm



**Fig. 3.** Growth rates of male and female broad-headed snakes, *H. bungaroides*. The graph shows growth rates per growing day (i.e. SVL increment between recaptures, divided by the number of non-winter days between recaptures), plotted against the mean SVL of the snake over that recapture interval. Two small snakes were not sexed.

## 11 Artificial Rearing

### 11.1 Diet and Feeding Routine

The diet of a neonate Broadhead can be difficult with many of the juvenile not willing to take the readily available rodent. With their wild diet consisting of geckos this would be a very expensive diet to replicate. An affective method mentioned by Ross Hilliard is to start feeding on small garden skinks easily captured with a small pit trap set in the garden. Just go to the shops buy the big tub of your favorite Ice-cream Eat it then bury the empty tub in your garden level with the ground and cover the rim with sticks and leaves. The skinks will fall in and not be able to escape allowing for a fresh supply of live skinks.

After the snakes have had a couple of feeds you will need to wean them of the skinks and on to rodents. Ross Hilliard had success with the Pinky Back Method where he would strap a freshly caught skink to a pinky with a couple small pieces of fine thread cotton. The neonates would not accept the pinky but when the pinky was offered with a skink strapped to it and with the sent and signature of a skink the baby snakes would take the pinky.

Now to wean them of the Pinky Back Method offers live pinky's the snakes will have a taste for the pinky now but often still need the feeding stimulation of movement. After a couple of live feeds you should offer frozen thawed being readily available and easily stored also some

states making it against the law to feed out any live vertebrates and keeping live mice is not for every one.

### **Neonate Feeding Plan**

1. Place only the snake and a skink in a small container.	Live Skinks 1 / Week	After a couple Skink Feeds
2. Strap a Skink to a pinky and tong feed	Pinky Back Method 1 / Week	After a couple Pinky Backs
3. Place only the snake and a pinky in a small container.	Live Pinky 1 / Week	After a couple Live Pinky's
4. Offer Frozen Try wriggling it round and warming it up	Frozen Pinky 1 / Week	After a couple

### **11.2 Specific Requirements**

As mentioned above the Pinky Back.

Housing should be maintained according to adult's requirements.

### **11.3 Data Recording**

Information on neonate's cage card should include:

- Individual identification
- Date of birth
- Litter size
- Weight
- SVL
- Parentage
- Diet

### **11.4 Identification Methods**

Identification methods can range from

For health, monitoring and breeding it is important to individually identify each snake. We can give each snake a number, code or name and identify them by

- Cage cards, with photograph, description, microchip number, and a warning that this species is highly venomous.
- Photo or description – illustrating distinguishing features, such as, individual markings, color patterns, old wounds or scars.
- Microchip – inserted sub-cutaneously, need scanner to read microchip number, access to database for registration numbers.
- Scale counts, Individual containers with their feed card, observation sheet and photograph or description of markings which differ from other neonates.

### **11.5 Hygiene**

Hygiene of your enclosure is very important. Change the substrate as soon as it is dirty. F10 enclosure, allowing to stand for minimum of two minutes before washing out. F10 all furniture as well as water bowls. Personal Hygiene is also important in terms of catching zoonosis. Always wash hands before and after handling snakes.

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## Glossary

**Aboreal:** Dwelling, at least part of the time, in trees

**Allopatric:** From different areas

**Brumation:** A period of prolonged cool temperature without actual hibernation

**Caudel:** Pertaining to or toward the tail

**Cloaca:** The common chamber in reptiles into which the reproductive, digestive and urinary ducts open

**Complex:** A term for a group of related taxa, most commonly involving units in which the taxonomy is difficult or confusing

**Cranial:** Pertaining to or toward the head

**Diagnostic characteristics:** Characteristics that separate a taxon from other taxa

**Diapsid:** Reptile or other vertebrate with two temporal openings in the skull

**Dimorphic:** Two different shapes. Usually sexually ie. difference between shape in male and female

**Distinguishing features:** Features of a given taxon

**Diurnal:** Primarily active during the day

**Dorsal:** Pertaining to the back or upper surface of an animal

**Ectoparasite:** Symbiosis in which one organism (the parasite) lives at the expense of the other (host) externally

**Ectothermic:** Regulation of body temperature by means of external sources of heat

**Endemic:** Restricted to a particular region

**Endoparasite:** Symbiosis in which one organism (the parasite) lives at the expense of the other (host) internally

**Exotic:** Not native to Australia

**Gestation:** The period between copulation and birth

**Hemipenis:** One of the paired copulatory organs found in Squamates

**Heteromorphous:** Differing in shape

**Homomorphous:** Not differing in shape

**Hybridize:** Offspring produced from parents of different species

**Innocuous:** Harmless

**Intergrade:** Offspring produced from parents of different sub species. An animal found where distinctive geographical populations or sub species meet and where characteristics of each population occur or merge.

**Interspecific:** Occurring between different species

**Intraspecific:** Occurring between the same species

**Mandible:** The lower jaw

**Maxilla:** The upper jaw

**Microhabitat:** The space occupied by an animal within a given habitat

**Monomorphic:** No difference in shape. Usually sexually ie. no difference in shape between male and female

**Neonate:** Newborn

**Nominate form:** The sub species originally described; recognized by having the same specific and sub specific names. Eg. *Tiliqua rugosa rugosa*

**Omnivorous:** Meat and plant eater

**Pentadactyle:** Having five digits

**Precocial:** The young being at least partially self sufficient soon after birth

**Range:** Extent of distribution of a given taxon

**Rugose:** Of scales, bearing a wrinkled or uneven surface

**Skink:** Of the family Scincidae

**Slough:** The cast off skin of a reptile

**Snout vent length (SVL):** The distance between the tip of the snout and the cloaca

**Species (sp., plural spp.):** Groups of actually or potentially interbreeding natural populations, which are reproductively isolated from other such groups

**Squamatid:** Of the Order Squamata; snakes and lizards

**Sub species (ssp., plural sspp.):** A formal classification for part of a species, which in isolation has acquired some distinct characteristics of its own

**Sympatry:** In the same area

**Synonym:** A name proposed for a taxon described as new but later shown to be already named. The new name is invalid and becomes a synonym.

**Taxon (plural taxa):** A basic unit of classification in taxonomy

**Taxonomy:** The study of classification of living things

**Terrestrial:** Living on land

**Torpor:** State of inactivity due to low body temperature

**Total length (TL):** The distance between the tip of the snout and the tip of the tail

**Vent:** Cloaca

**Ventral:** Pertaining to the lower surface of an animal

**Viviparous:** Giving birth to live young

**Xeric:** Of or adapted to arid conditions

**Zoonotic disease:** A disease that occurs primarily in animals but can be transferred to humans

# Appendix

(e.g. equipment details, suppliers and drug details)

## 5.1.1 Bleach

# Material Safety Data Sheet Bleach

**TROJAN** HOSPITALITY  
PTY. LIMITED



### 1. STATEMENT OF HAZARDOUS NATURE, CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Classified as hazardous according to criteria of NOHSC Australia.  
Classified as Dangerous Goods Class 8 according to the ADG Code.

**Product Use** :Liquid bleach with 6% available chlorine.  
See label or application sheet for details of methods of use.

**Supplier** :Trojan Hospitality Pty Limited  
**ABN** :15 002 478 800  
**Address** :2-6 Perry Street CAMPSIE NSW 2194  
Telephone : +61 2 9789 3366 Facsimile : +61 2 9787 3232

**Emergency Telephone** : 1800 033 111 (All Hours)

### 2. INGREDIENTS

#### CAS No.

#### CONCENTRATION

Sodium hypochlorite	7681-52-9	6% available chlorine
Other ingredients non-hazardous according to NOHSC criteria		Balance to 100%

### 3. HEALTH HAZARDS IDENTIFICATION

#### APPROVED CRITERIA

<b>Classification</b>	:Classified as a Workplace Hazardous Substance
<b>SUSDP Classification</b>	:Schedule 5 Poison
<b>ADG Code Classification</b>	:Classified as Class 8, Packing Group III HYPOCHLORITE SOLUTION
<b>UN No.</b>	:1791
<b>HAZCHEM Code</b>	:2R
<b>Initial Emergency Procedure Guide</b>	:37

#### POTENTIAL HEALTH EFFECTS

Health effects are likely to occur from overexposure. No adverse health effects expected if safety precautions are followed.

#### Acute

<b>Swallowed</b>	:Ingestion expected to cause irritation of the mouth and the oesophagus, headache, nausea, vomiting and oedema of the pharynx. Nausea, stomach pain and vomiting may result.
<b>Eye</b>	:Contact with the eyes may cause severe irritation and corrosive effects if not washed out immediately. Gas emitted from solution may cause irritation.
<b>Skin</b>	:Contact with the skin may cause irritation. Repeated or prolonged contact may cause burns or de-fatting of skin.
<b>Inhaled</b>	:Inhalation of mist may cause severe bronchial irritation and possibly pulmonary congestion, breathing difficulties and irritation of throat and mucous membranes of nose.
<b>Chronic (long-term) effects</b>	:Repeated contact with skin may lead to dermatitis. No ingredient reported as sensitising or carcinogenic in animal tests.
<b>Carcinogen status</b>	:Not classified by NOHSC, NTP or IARC

### 4. FIRST AID MEASURES

For advice, contact a Poison Information Centre (Phone 131 126 anywhere in Australia), or a doctor.

<b>Inhalation</b>	:If mist or aerosol has been inhaled, remove from contaminated area. Apply artificial respiration if not breathing. Consult a doctor if symptoms arise.
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# Material Safety Data Sheet

## Bleach

**TROJAN** HOSPITALITY  
PTY. LIMITED



**Skin contact** :If skin or hair contact occurs, remove contaminated clothing and flush skin and hair immediately with running water until the skin is no longer slippery. Consult a doctor if symptoms arise.

**Eye contact** :If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by Poisons Information Centre or doctor, but in any case, for at least 15 minutes. Consult a doctor immediately.

**Ingestion** :If swallowed, do **NOT** induce vomiting. Rinse mouth with water. Give a glass of water to drink. Consult a doctor or transfer to hospital immediately. Alkaline ingredients and represent an aspiration hazard.

**First Aid Facility**:Maintain an eye wash station where the liquid is used.

### 5. FIRE-FIGHTING MEASURES

**Fire and explosion hazards** :Corrosive liquid. Not flammable or combustible.

**Extinguishing media** :Do not use water jets. Use extinguishing media appropriate to surrounding fire conditions. Remove containers not involved in the fire from the vicinity. Water spray/fog, dry chemical, CO<sub>2</sub> or foam are preferred media.

**Fire-fighting** :Evacuate area to upwind of fire. Summon Fire Service immediately. Emergency workers should wear full protective equipment and supplied-air breathing apparatus. Toxic or irritating particulates, vapours or gasses may be produced. Spray water on containers to cool to prevent over-pressure.

### 6. ACCIDENTAL RELEASE MEASURES

**Accidental release** :Evacuate immediate area. Wear Personal Protective Equipment detailed in Section 8. Seal leak if safe to do so. Place leaking containers in overbin, label for disposal. Contain spill with absorbent material such as dry sand. Do not allow to enter drains or sewer. Sweep up and place in labeled container. Damp down contaminated area with water, cover with absorbent and sweep up and place in labeled container. Negotiate disposal with Waste Authority for jurisdiction.

**Occupational release** :As for accidental release.

### 7. HANDLING AND STORAGE

Classified as Dangerous Goods (DG) Class 8 Corrosive Liquid. Store and transport as a Class 8 DG according to the DG regulations of the State or Territory. Store away from heat in sealed containers. Store and stow away from acidic materials. Ensure storage area is well ventilated. If more than 1000L is kept on a site, a licensed DG depot would be needed under DG regulations. Do not store in direct sun. Do not smoke when handling or using.

### 8. EXPOSURE CONTROL AND PERSONAL PROTECTION

#### EXPOSURE LIMITS

**NOHSC TWA** :3 mg/m<sup>3</sup> for chlorine

**NOHSC STEL** :3 mg/m<sup>3</sup> for chlorine

**TWA** :The Time Weighted Average (TWA) is the concentration of the substance in the worker's breathing zone, exposure to which over 8-hour days, 5-day weeks over a working lifetime, should not cause any undue discomfort or health impairment to nearly all workers.

**STEL** :The Short Term Exposure Limit (STEL), means a 15 minute TWA exposure which should not be exceeded and should not be repeated within 60 minutes or more than four times per day.

#### ENGINEERING CONTROLS

For normal use, natural ventilation is expected to be adequate. However, if mist or spray is formed, or gas emitted from heated product, contaminated air should be captured at source using local exhaust ventilation. Capture velocity of air at release point is recommended to be at least 0.5m/sec. Direction of air flow to be away from breathing zone of the operator.

# Material Safety Data Sheet

## Bleach

**TROJAN** HOSPITALITY  
PTY. LIMITED



### PERSONAL PROTECTION

- Ventilation** :Mechanical ventilation is not required in normal use where there is good natural ventilation. Avoid breathing spray or mist. Use in well ventilated space. See note in Section 7 about storage conditions. For decanting locations, exhaust ventilation may be needed to ensure the emissions do not reach the TWA concentration. However, if a mist is being formed or if the product is hot or it is being used in a confined space and ventilation is **inadequate**, use a respirator complying with **AS 1716** of type, **half-face respirator with combined acid gas and particulate cartridge**.
- Respirator** :Not required for normal use in a well ventilated area.
- Eye protection** :Avoid contact with eyes. Wear eye protection complying with **AS 1337** of type, **safety glasses or goggles**).
- Skin protection** :Required when decanting/handling concentrate from original container. Avoid contact with skin. Wear impervious gloves complying with **AS 2161** of type, **PVC-coated cotton**. Protect skin by wearing **long sleeved overalls and impervious boots**.
- Flammability** :Not flammable or combustible.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

- State** :Liquid
- Colour** :Colourless
- Odour** :Slight chlorine odour
- Boiling Point** :Not applicable
- Vapour pressure** :Not applicable
- Specific Gravity (SG)** :~1.1 @ 20°C
- Water solubility** :Miscible in all proportions
- pH** :> 11.5
- Flash point** :None
- Autoignition temp.** :None
- Lower explosive limit** :Not applicable
- Upper explosive limit** :Not applicable

### 10. STABILITY AND REACTIVITY

- Reactivity** :Stable. Decomposition commences above 40°C
- Conditions to avoid** :Contact with any acid or acidic material or oxidizing agent. Contact with acid may release highly toxic and corrosive chlorine gas. Exposure to light or contamination with other materials accelerates decomposition.
- Incompatibilities** :Incompatible with acids or acidic materials, amines, ammonia, ammonium salts, reducing agents, metals, aziridine, methanol, formic acid, phenylacetonitrile.
- Hazardous decomposition** :No decomposition expected at normal temperatures. Chlorine may be emitted at elevated temperatures.
- Polymerisation** :No hazardous polymerisation will occur.

### 11. TOXICOLOGICAL INFORMATION

- Local effects of product** :If in eyes, may cause severe damage. Contact with skin may cause irritation. Prolonged or repeated contact with skin may cause de-fatting and tendency to dermatitis. Inhalation of spray mist expected to cause burns to respiratory tract. Ingestion will burn throat and oesophagus.
- Target organs** :Eyes, skin, respiratory systems and digestive tract. No data on the product mixture is available. Hazard estimated from consideration of hazardous ingredient concentration.
- Hazardous ingredient** :**Sodium hypochlorite**  
LD50 (rat): greater than 5250 mg/m<sup>3</sup>  
LD50 (oral, female mouse): approximately 7540 mg/kg  
LD50 (dermal, rabbit): greater than 10,000 mg/kg  
ORL-MUS LD50: 5800 mg/kg  
ORL-WMN TDLO: 1000 mg/kg  
IVN-MAN TDLO: 45 mg/kg



# Material Safety Data Sheet

## Bleach

**TROJAN** HOSPITALITY  
PTY. LIMITED



R-Phrase :CAUSES BURNS - R34  
Sensitising :Not a sensitiser.  
Mutagenicity data :No data found.  
Reproductive effects :No data found.

### 12. ECOLOGICAL INFORMATION

Does not contain heavy metals.

Toxicity to fish :LC50 (48hr) rainbow trout: 0.07 mg/L  
LOEC Oncorhynchus: 0.02 mg/L  
LC50 (48hr) fathead minnow: 5.9 mg/L  
Toxicity to daphnia :No data on product.  
Toxicity to algae :No data on product.  
Toxicity to bacteria :No data on product.  
Ready biodegradability :No data on product.

### 13. DISPOSAL CONSIDERATIONS

Preferred method of disposal :If the liquid cannot be salvaged and used, arrange disposal with Waste Authority to the hazardous liquid disposal facility. Landfill disposal of solids may be possible, if approved by local authority. Triple rinse containers into the cleaning liquid and recycle container, if recycling system is available.

### 14. TRANSPORT INFORMATION AND STORAGE CLASS

ADG Code requirements :Store and transport as Dangerous Goods of Class 8  
UN No. :1791  
Proper shipping name :HYPOCHLORITE SOLUTION  
ADG Code Class :8  
ADG Code Sub-risk :None  
Packing Group :III  
Initial Response Guide :37  
Special provision :SP184 to be applied  
Stowage :Do not stow with DG of Class 4.3, Class 5.1, Class 5.2 or Class 7  
Packaging :ADG Code Section 3.8.8 and RT7; RT8.  
Not to be transported in unlined metal drums. Inner packagings shall be fitted with vented closures and plastics drums and carboys shall have vented closures or be performance tested to a minimum of 250kPa. All non-vented packagings shall be filled so that the ullage is at least 10% at 23°C ± 2°C. Vented packagings may be filled to an ullage not less than 5% at 23°C ± 2°C, provided that this ullage does not result in leakage from, nor distortion of, the packaging. Hypochlorite solutions with not more than 5% available chlorine are not subject to the provisions of this Code. Concentrations with not less than 16% available chlorine are Packaging Group II.

### 15. REGULATORY INFORMATION

AICS Status Of Ingredients :According to information available, all ingredients are present in the Australian Inventory of Chemical Substances and the product is legal to import or manufacture.

# Material Safety Data Sheet

**TROJAN** HOSPITALITY  
PTY. LIMITED



## Bleach

### 16. OTHER INFORMATION

As the product is intended for use at workplaces and is classified as a Workplace Hazardous Substance, the product is to be labeled as such, including:

- R-Phrases** : IRRITATING TO EYES AND SKIN (R36/38)  
CONTACT WITH ACIDS LIBERATES TOXIC GAS (R31)
- S-Phrases** : KEEP OUT OF REACH OF CHILDREN (S2)  
DO NOT BREATHE DUST (S23)  
AVOID CONTACT WITH SKIN AND EYES (S24/25)  
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER  
AND CONTACT A DOCTOR OR POISONS INFORMATION CENTRE (S26)  
AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH PLENTY OF COLD WATER  
UNTIL SLIPPERY FEEL IS REMOVED (S28)  
DO NOT MIX WITH ACID (S50)

**Poisons regulation requirements:** SCHEDULE 5 POISON (if intended for sale to consumers, Poisons labeling also required according to SUSDP)

#### ACRONYMNS

- ACGIH : American Conference of Government Industrial Hygienists  
ADG Code : Australian Dangerous Goods (DG) Code  
AICS : Australian Inventory of Chemical Substances  
CAS No. : Chemical Abstracts number  
IARC : International Agency for Research on Cancer  
NOHSC : National Occupational Health and Safety Commission  
NTP : National Toxicology Programme (USA)  
OHSА : Occupational Health & Safety Administration (USA)  
R-Phrases : Risk phrases identifying main hazard of ingredient or product  
S-Phrases : Safety phrases identifying main safety measures to be used  
SUSDP : Standard for the Uniform Scheduling of Drugs and Poisons  
UN No. : United Nations identifying number for DG

#### CONTACT

- Name : Jason Lawecki  
Supplier : **Trojan Hospitality Pty Limited**  
ABN : 40 060 390 294  
Address : 2-6 Perry Street CAMPSIE NSW 2194  
Telephone : +61 2 9789 3366 Facsimile : +61 2 9787 3232

- MSDS Creation Date** : 19 May 2004  
**Next Revision Date** : Not later than 19 May 2009, but may require revision within three years of the new national MSDS code being adopted by jurisdictions, or when new or better information becomes available.  
**Version Authorised By** : Robert Lawecki (Director) – 19 May 2004

#### SUPPLIER STATEMENT

All information given in this data sheet and by the company's technical staff is compiled from the best information currently available to the company. The company accepts no responsibility whatsoever for its accuracy or for any results which may be obtained by customers. Any customer who relies upon any advice or information given in this data sheet by the company or by its technical staff does so entirely at its own risk and the company will not be liable for any loss or damage thereby suffered notwithstanding any want of care on the part of the company or its staff in compiling or giving the advice or information.

Bleach Trojan Bleach  
2 – 6 Perry Street,  
Campsie,  
NSW 2194 02 9789 3366 Fax 02 97873232

### 5.1.2 F10 Products

## **Information Sheet F10 Hand Soap Range**

### **F10 Antiseptic Liquid Soap 5L**

The advantage of this soap is that the core components are based on F10SC Veterinary Disinfectant, and that means that the same efficacy and safety benefits apply to this product too. It features a very fast kill time – log 2 bacterial and fungal reduction within the first 15 - 30 seconds of hand washing – this is a great benefit as there is now no need to wash your hands for 1 whole minute to achieve the required microcidal kill. In addition, the soap has added skin care components ensuring hands don't dry or crack up. F10 Antiseptic Hand Soap is yellowish in appearance.

Benefits:

- Will not irritate skin – contains lanolin and glycerine to soothe much-washed hands
- Fast acting – cuts down on hand wash time
- No chlorhexidine gluconate – unlike Chlorhex and Microshield – so provides a safe alternative for customers who have problems with these lines

### **F10 Hand Scrub 5L**

This is very similar to the Antiseptic hand soap, but features even higher concentrations of emollients and active ingredients, ensuring an even better kill for theatre and other critical areas. F10 Hand Scrub is bactericidal, virucidal and fungicidal and has a reddish colour to differentiate it from the F10 Antiseptic Hand Soap.

Benefits: the same as F10 Antiseptic Hand Soap

### **F10 Hand Gel 5L**

This product combines the best of both worlds – F10 kill and contact time, and the usefulness of quick drying from the alcohol component. No water is required to use this product, it just disinfects your hands and then dries on them within 60 seconds. Possibly best used by vets who do a lot of farm or bush work, where clean hands are required but access to water and proper antimicrobial hand soap is not always available, and for bird, companion animal, and reptile breeders who continually move between cages. F10 Hand Gel is a clear, viscous liquid.



## Information Sheet – F10 Skin Care products

F10 Skin Care products are based on F10SC Veterinary Disinfectant, and are used for skin and wound treatment in cats, dogs and horses:

**F10 Germicidal Shampoo** - Based on F10SC Veterinary Disinfectant, F10 Germicidal Shampoo is a safe and highly effective product that is registered for use in dogs, cats and horses as a skin treatment against bacteria and fungi, and also to prevent re-infection. As such it is an excellent product for treating common conditions such as ringworm (Microsporum and Trichophyton), Staph bacterial infections and “hot spots”, as well as yeast infections.

### **Benefits:**

- Proven efficacy based on F10SC Veterinary Disinfectant
- APVMA registered as a Veterinary Medicine
- Proven safety with humans and animals
- Non-irritating to skin – no need to wear gloves
- Broad indication covers wide range of conditions
- Simple to use
- Pleasant fragrance rather than “pungent” odour

**Pack Sizes:** F10 Germicidal Shampoo is available in 250ml and 500ml pack sizes.



**F10 Germicidal Barrier Ointment** - F10 Germicidal Ointment is also based on F10SC Veterinary Disinfectant and is effective in dogs, cats and horses against bacteria, fungi and viruses to treat open and contaminated wounds and prevent re-infection.

This product has multiple uses and can be used as a stand-alone treatment for minor injuries, or in the case of re-occurring conditions should be treated in conjunction with a complete treatment plan, including antibiotics, as directed by a veterinarian.

**Benefits:**

- Proven efficacy based on F10SC Veterinary Disinfectant
- Proven safety with humans and animals (even cats)
- Contains glycerin and lanolin and offers high levels of safe and effective skincare.
- Broad indication covers a wide range of conditions
- Effective alternative to antibiotic topical treatment
- Ointment formulation is effective for longer than antiseptic sprays that dry quickly
- Ointment formulation adheres to wound site better than creams, and application is not as messy

**Pack Sizes:** F10 Germicidal Barrier Ointment is available in 100g and 500g pack sizes.



**MATERIAL SAFETY DATA SHEET****COMPANY DETAILS**

AUSTRALIAN DISTRIBUTOR:  
 COMPANY: Chemical Essentials (Pty) Ltd  
 Address: 13 Abelia Str, Doncaster East,  
 Victoria 3111  
 Emergency Telephone number: +03 9841 9901  
 Fax: +03 9841 9909

**MANUFACTURER:**

Health and Hygiene (Pty) Ltd  
 P O Box 347, Sunninghill 2157,  
 South Africa.  
 Tel: +27 11 474-1668  
 Fax: +27 11 474-1670  
 e-mail: info@healthandhygiene.co.za

**IDENTIFICATION**PRODUCT NAME: **F10SC VETERINARY DISINFECTANT**

UN Number: None

OTHER NAMES: **F10 SUPER CONCENTRATE DISINFECTANT**

D G Class: None

Hazchem code: None

Poisons Schedule: 5

**HAZARDOUS ACCORDING TO CRITERIA OF WORKSAFE AUSTRALIA IN THE PACK CONCENTRATE ONLY**  
 (eyes and skin irritant)

**USE:** Biodegradable multi purpose disinfectant for all hard surfaces, equipment and airspaces

**PHYSICAL DESCRIPTION/PROPERTIES**

Appearance: Clear, colourless liquid, with a slight natural odour.  
 Boiling Point: 110°C  
 Vapour Pressure: Not known  
 Specific Gravity: 1.00  
 Flash Point: Not flammable  
 Flammability Limits: Not flammable  
 Solubility in water: Soluble

**INGREDIENTS**

	CAS Number	Quantity (w/w)
Benzalkonium Chloride	68424-85-1	5.4%
Biguanide	27083-27-8	0.4%
Ingredients not determined to be hazardous		to 100%

**HEALTH HAZARD INFORMATION****HEALTH EFFECTS:****Acute**

**SWALLOWED:** Low. Substantial ingestion may cause irritation to mouth, throat and digestive tract.

**EYE:** Low. Will cause irritation but not serious damage.

**SKIN:** Low. Concentrate may act as mild degreasant to sensitive skin.

**INHALED:** Low. No significant hazard.

**Chronic**

**INHALED:** Low. No significant hazard

**FIRST AID**

**SWALLOWED:** DO NOT induce vomiting. Give milk or water to drink. Seek medical advice where necessary.

**EYE:** Rinse eyes with water. Seek medical advice where necessary.

**SKIN:** Wash affected area with soap and water.

**INHALED:** Non-toxic. Avoid long term inhalation of neat liquid. Remove to fresh air.

**FIRST AID FACILITIES:** Contact a doctor or Poison Information Centre (phone 131126)

**ADVICE TO DOCTOR:** Treat symptomatically



**F10SC VETERINARY DISINFECTANT  
F10 SUPER CONCENTRATE DISINFECTANT**

PAGE 2 OF 2

**PRECAUTIONS FOR USE**

EXPOSURE LIMITS: No data found  
Engineering controls: None required  
PERSONAL PROTECTION: Not required  
FLAMMABILITY: Not Flammable

**SAFE HANDLING INFORMATION**

Storage and Transport: Store below 30°C in dry conditions  
SPILLS AND DISPOSAL: Soak up on an inert material e.g. dry earth and dispose of in an area approved by local authority by-laws. Flush small spills with copious amounts of water  
FIRE/EXPLOSION HAZARD: The product is not flammable or explosive.  
OTHER INFORMATION: Ensure good industrial hygiene.  
DO NOT mix with soaps or other chemicals.

**CONTACT POINT:** Managing Director, +03 9841 9901  
Chemical Essentials Pty Ltd

**KEEP OUT OF THE REACH OF CHILDREN**

Issue number: 2  
Issue Date: August 2004

F10 Chemical Essentials Pty Ltd  
13 Abelia street,  
Doncaster East,  
Victoria, 3111  
03 9841 9901 Fax 03 9841 9909  
[chemicalessentials@bigpond.com](mailto:chemicalessentials@bigpond.com)

**8.8.2Fecasol**

# MATERIAL SAFETY DATA SHEET

**FECASOL: A FECAL FLOTATION SOLUTION (30521-01848 OR 01849)  
EVSCO PHARMACEUTICALS (800) 267-5707  
DIVISION OF VÉTOQUINOL USA, INC.**

**101 LINCOLN AVE.**

**BUENA, N.J. 08310-0687**

**Date Prepared: 17 January 2003**

## **Section I - Hazardous Ingredients/ Identity Information**

Hazardous Components	OSHA PEL	ACGIH TLV
<b>Sodium Nitrate (CAS 07631-99-4)</b>		
There is 1.58kg of sodium nitrate in each gallon of purified water.		

## **Section II- Physical/Chemical Characteristics**

<b>Boiling Point</b>	N/A	<b>Specific Gravity H<sub>2</sub>O = 1</b>	1.2 @ 25 C
<b>Vapor Pressure</b>	N/A	<b>Melting Point</b>	N/A
<b>Vapor Density (air=1)</b>	N/A	<b>Evaporation Rate</b>	N/A
<b>Solubility in Water</b>	Soluble		
<b>Appearance and Odor:</b> Clear, colorless liquid			

## **Section III- Fire and Explosion Hazard Data**

Flash Point	Flammable Limits	LEL	UEL
<b>Extinguishing Media:</b> Use extinguishing media appropriate for surrounding fire conditions.			
<b>Special Fire Fighting Procedures:</b> Wear self-contained breathing apparatus.			
<b>Unusual Fire &amp; Explosion Hazards:</b> ***** Sodium nitrate powder is a strong oxidizer, however remaining in solution, it is considered non-regulated for DOT purposes. *****			

## **Section IV - Reactivity Data**

<b>Stability</b>	<b>Unstable</b>	<b>Conditions to Avoid:</b> High temperatures	
	<b>Stable</b>	<b>X</b>	
<b>Incompatibility (materials to avoid):</b> Cyanides, strong reducing agents and acids			
<b>Hazardous Decomposition or Byproducts</b>			
<b>Hazardous Polymerization</b>	<b>May Occur</b>	<b>Conditions to Avoid</b>	
	<b>Will Not Occur</b>		<b>X</b>

# TERIAL SAFETY DATA SHEET

**Product: FECASOL FECAL FLOTATION SOLUTION (03521-01848 OR 01849)**

**Date Prepared: 17 January 2003**

## **Section V - Health Hazard Data**

<b>Routes of Entry:</b>	<b>Inhalation</b>	<b>Skin X</b>	<b>Oral X</b>
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<b>Health Hazards (Acute &amp; Chronic)</b> May cause eye irritation. Ingestion may cause irritation to mouth and stomach. Ingestion of large amounts may cause dizziness, abdominal cramps, vomiting and headaches.			
<b>Carcinogenicity:</b> Some experimental data on animals indicate that sodium nitrate may be carcinogenic.	<b>NTP?</b>	<b>ARC</b>	<b>OSHA</b>
<b>Signs and Symptoms of Exposure:</b> As above.			
<b>Medical Conditions Generally Aggravated by Exposure:</b>			
<b>Emergency &amp; First Aid Procedures: EYES:</b> Flush with plenty of water and contact a physician. In case of ingestion immediately induce vomiting if conscious and consult a physician.			

## Section VI - Precautions for Safe Handling & Use

<b>Steps to Be Taken In Case of Spill or Release:</b> Wear complete protective equipment including NIOSH approved respiratory protection. Absorb on sand or vermiculite and place in a closed container for disposal.
<b>Waste Disposal Method:</b> Dispose IAW federal, state and local regulations.
<b>Precautions To Be Taken in Handling &amp; Storage:</b> Keep container tightly closed and away from incompatible materials.
<b>Other Precautions:</b> Read and follow label instructions and instructions accompanying fecal analysis device before use.

## Section VII - Control Measures:

<b>Respiratory Protection (Specify Type)</b> Not required for normal use.		
<b>Ventilation</b>	<b>Local Exhaust</b> adequate	<b>Special</b> adequate
	<b>Mechanical(General)</b> adequate	<b>Other</b> N/A
<b>Protective Gloves</b> Preferred		<b>Eye Protection</b> Not required for normal use.
<b>Other Protective Clothing or Equipment</b> Not required for normal use.		
<b>Work/Hygienic Practices</b> Not required for normal use.		

The information contained in this Material Safety Data Sheet (MSDS) has been compiled from information believed to be accurate and from our own experiences. While we believe that the data presented is factual, Vétoquinol USA, Inc. and its divisions make no warranty or representation, nor assume any responsibility in conjunction with the use of this information.

(AccessButler 2007)

PAGE 2

# Ketamine

k.9

10 July 2003 Page 1 of 3

Replaces MSDS Dated 27 August 1998

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**Material Safety Data Sheet:**  
***Parnell Ketamine Injection***

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**STATEMENT OF HAZARDOUS NATURE:**

Hazardous substance according to criteria of Worksafe Australia.

**MANUFACTURER COMPANY DETAILS: LICENSEE (NEW ZEALAND) DETAILS:**

Parnell Laboratories (Aust) Pty Ltd Parnell Laboratories New Zealand Limited

**Address Address**

Unit 6, Century Estate Unit 2, 13-19 Highbrook Drive  
476 Gardeners Road East Tamaki  
Alexandria, NSW 2015 New Zealand  
Australia

**Telephone Number Telephone Number**

61 (0)2-9667 4411 64 (0)9 273 7270 (Business Hours)  
0800 446282 (Toll free from NZ to Australia) (BH)

**Emergency Telephone Number Emergency Telephone Number**

61 (0)2-9667 4411 (Business Hours) 64 (0)9 273 7270 (Business Hours)  
0800 446282 (Toll free from NZ to Australia) (BH)

**Facsimile Number Facsimile Number**

61 (0)2-9667 4139 64 (0)9 273 7260

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—  
**IDENTIFICATION**

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—  
**Product Name**

*Parnell Ketamine Injection*

**Other Names**

Ketamine

**U.N. Number**

No UN number allocated

**Dangerous Goods Class and Subsidiary Risk**

No class and subsidiary risk allocated

**Hazchem Code**

No Hazchem code allocated

**Poisons Schedule**

Schedule 4 (Australia)

Prescription Animal Remedy (P.A.R) Class II (New Zealand)

**Packaging**

Labelled 20mL or 50mL amber glass vial sealed with rubber stopper and aluminium closure

**Use**

FOR ANIMAL TREATMENT ONLY.

For veterinary use for induction of anaesthesia; for use singly or in combination with muscle relaxants or tranquillisers.

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—  
**PHYSICAL DESCRIPTION AND PROPERTIES:**

**Appearance and Odour Solubility in Water**

Clear, colourless solution Aqueous solution

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Replaces MSDS Dated 27 August 1998

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**Material Safety Data Sheet:**  
***Parnell Ketamine Injection***

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**Boiling Point Melting Point**

Not determined Not determined

10 July 2003 Page 3 of 3

Replaces MSDS Dated 27 August 1998

---

**Material Safety Data Sheet:**  
***Parnell Ketamine Injection***

---

**Vapour Pressure Specific Gravity**

Not determined Not determined

**Flash Point Flammability Limits**

Not determined Not determined

**pH Other Properties**

3.5 - 5.5

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**INGREDIENTS:**

**Chemical Entity CAS Number Proportion**

Ketamine Hydrochloride 1867-66-9 10%

Preservative <1%

Water 7732-18-5 to 100%

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**HEALTH HAZARD INFORMATION**

---

**HEALTH EFFECTS:**

***Acute Exposure:***

LD<sub>50</sub> mice, ip 224 ± 4mg/kg

Rats, ip 229 ± 5mg/kg

Ketamine may cause confusion hallucinations and irrational behaviour, increased muscle tone, tachycardia and hypertension (although hypotension, cardiac arrhythmias and bradycardia have also been reported), and respiratory depression. Nausea and vomiting have also been reported. High doses produce dissociative anaesthesia (anaesthetic doses: intravenously: 2mg/kg ketamine, equivalent to 1.4mL/70kg *Parnell Ketamine Injection*; intramuscularly: 10mg/kg, equivalent to 7mL 70kg *Parnell Ketamine Injection*.)

Significant effects as a result of accidental exposure to *Parnell Ketamine Injection* are unlikely. Ketamine may be subject to substance abuse.

**Swallowed**

Ketamine may be absorbed from the gastrointestinal tract.

**Eye**

Ketamine may be absorbed from the conjunctival mucosa, and may cause eye irritation.

**Skin**

Significant absorption of ketamine through intact skin is unlikely.

**Inhaled**

Significant accidental absorption of ketamine via inhalation is unlikely.

***Chronic Exposure:***

Hallucinations may recur and there is the possibility of psychoses resulting from repeated substance abuse involving ketamine.

---

**FIRST AID:**

**Swallowed**

Seek medical attention if required

**Eye**

10 July 2003 Page 4 of 3

**Material Safety Data Sheet:**  
**Parnell Ketamine Injection**

---

If in eyes, hold eyes open, flood with water for at least 15 minutes. Seek medical assistance if required.

**Skin**

If skin contact occurs remove contaminated clothing and wash skin thoroughly with soap and water.

**Inhaled**

No specific requirements. Seek medical attention if required.

**First Aid Facilities**

No specific first aid facilities required.

**ADVICE TO DOCTOR**

Treat symptomatically as required. Provide respiratory support if necessary. Diazepam or other benzodiazepines may reduce hallucinogenic and other effects.

---

**PRECAUTIONS FOR USE**

---

**Exposure Standards**

No exposure standard allocated

**Engineering Controls**

Not applicable

**Personal Protection**

Wear gloves when handling product.

Avoid spraying or splashing of the preparation.

Avoid eating, drinking or smoking in area of product or during handling of product.

Avoid contamination of work area.

**Flammability**

Not flammable under conditions of use.

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**SAFE HANDLING INFORMATION**

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**Storage and Transport**

Store in secure area. Prevent unauthorised access.

Store below 30°C (Room Temperature). Protect from light.

**Spills and Disposal**

Clean up spilled material with absorbent ensuring no contact with skin during operation. Flush contaminated area with water and detergent.

Dispose of waste in accordance with local, state or federal laws.

**Fire/Explosion Hazards**

This material is not considered a fire hazard. Use standard fire fighting techniques to extinguish fires involving this material. Use water spray, dry chemical, carbon dioxide or foam.

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**OTHER INFORMATION**

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**Contact Point**

Production Manager Technical Services Manager

Parnell Laboratories (Aust) Pty Ltd Parnell Laboratories (Aust) Pty Ltd

Telephone: 61 (0)2 9667 4411 Telephone: 61 (0)2 9667 4411

(AccessButler 2007)

### 8.8.1.4 Lethobarb

## VIRBAC (AUSTRALIA) PTY. LTD.

Document No:

Lethabarb

Revision A

## MATERIAL SAFETY DATA SHEET

Product Name:

Lethabarb Euthanasia Injection

Page: 1 of 5

Date of Issue

24 November,

2004

### Section 1 - Identification of Chemical Product and Company

**Company:** Virbac (Australia) Pty. Ltd ABN 77 003 268 871

**Address** 15 Pritchard Place, Peakhurst, NSW 2210, Australia

Locked Bag 1000, Peakhurst Delivery Centre, Peakhurst, NSW 2210, Australia

**Telephone:** (02) 9533 2000 or 1800 242 100

**Fax:** (02) 9533 1522

**Emergency phone** As above during business hours; answering machine after hours

**Substance:** Active ingredient is a barbiturate derivative.

**Trade Name:** Lethabarb Euthanasia Injection

**Product Use:** Injectable rapid euthanasia agent for dogs and cats.

**Creation Date:** June, 2002

**Revision Date:** November, 2004

### Section 2 - Hazards Identification

#### STATEMENT OF HAZARDOUS NATURE

This product is classified as: Hazardous according to the criteria of NOHSC Australia.

Dangerous according to the Australian Dangerous Goods (ADG) Code.

**Risk Phrases:** R25, R36/37/38. Toxic if swallowed. Irritating to eyes, respiratory system and skin.

**Safety Phrases:** S20, S23, S38, S24/25. When using, do not eat or drink. Do not breathe mists. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin and eyes.

**SUSDP Classification:** S4

**ADG Classification:** Class 6.1 (TOXIC LIQUID, INORGANIC, N.O.S.)

**UN Number:** 3287

#### Emergency Overview

**Physical Description & colour:** Clear green solution in amber glass bottle.

**Odour:** No data.

**Major Health Hazards:** In all cases of excessive dose intake, the symptoms would be as follows: Nystagmus (rapid

eye movements), miosis (contraction of pupils), slurred speech and ataxia (uncoordination in movements). With overdose, coma, respiratory and cardiovascular depression with hypotension (lowering of blood pressure) and shock

leading to death. Also after rapid intravenous administration, apnoea (stop in respiration) may occur.

#### Potential Health Effects

**Extremely dangerous, especially if injected intravenously as it will cause death very rapidly.**



**We suggest that this product only be used when the user is in the presence of another responsible adult.**

Due to the high concentration of the active ingredient in this product, the principal danger is due to acute toxicity.

Chronic toxicity would appear if extremely low doses of the product were administered over a prolonged period (dependence). This is very unlikely to occur with this product.

### **Inhalation**

**Short term exposure:** This product is an inhalation irritant. Symptoms may include headache, irritation of nose and throat and increased secretion of mucous in the nose and throat. Other symptoms may also become evident, but they should disappear after exposure has ceased. The product may be absorbed if it is actually instilled into the nose.

### **Skin Contact:**

**Short term exposure:** This product is a skin irritant. Symptoms may include itchiness and reddening of contacted skin. Other symptoms may also become evident, but all should disappear once exposure has ceased. Not normally absorbed through the skin, unless applied on extensive skin lesions (broken skin).

### **Eye Contact:**

**Short term exposure:** Irritating to eyes. Some absorption may occur through the eye mucosa. In addition, this product is an eye irritant. Symptoms may include stinging and reddening of eyes and watering which may become

## **VIRBAC (AUSTRALIA) PTY. LTD.**

**Document No:**

**Lethabarb**

**Revision A**

# **MATERIAL SAFETY DATA SHEET**

**Product Name:**

Lethabarb Euthanasia Injection

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**Date of Issue**

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copious. Other symptoms may also become evident. If exposure is brief, symptoms should disappear once exposure has ceased. However, lengthy exposure or delayed treatment may cause permanent damage.

### **Ingestion:**

**Short term exposure:** Toxic if swallowed. Can cause death, as pentobarbitone sodium is well absorbed by the oral route. First symptoms of intoxication (narcosis) may occur as early as 15 minutes after intake (with as low a dose as 100 to 200 mg for an adult person, i.e. less than 1 mL of LETHABARB). The acute oral LD<sub>50</sub> of the active ingredient in the rat is 118 mg/kg.

### **Carcinogen Status:**

**NOHSC:** No significant ingredient is classified as carcinogenic by NOHSC.

**NTP:** No significant ingredient is classified as carcinogenic by NTP.

**IARC:** No significant ingredient is classified as carcinogenic by IARC.

## **Section 3 – Composition/Information on Ingredients**

**Ingredients CAS No Conc,% TWA (mg/m<sup>3</sup>) STEL (mg/m<sup>3</sup>)**

Pentobarbital sodium 57-33-0 29.7 not set not set

Other non hazardous ingredients secret <10 not set not set

Water 7732-18-5 to 100 not set not set

This is a commercial product whose exact ratio of components may vary slightly. Minor quantities of other non

hazardous ingredients are also possible.

The TWA exposure value is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. The STEL (Short Term Exposure Limit) is an exposure value that should not be exceeded for more than 15 minutes and should not be repeated for more than 4 times per day. There should be at least 60 minutes between successive exposures at the STEL. The term "peak" is used when the TWA limit, because of the rapid action of the substance, should never be exceeded, even briefly.

## Section 4 - First Aid Measures

### General Information:

You should call The Poisons Information Centre if you feel that you may have been poisoned, burned or irritated by this product. The number is 13 1126 from anywhere in Australia and is available at all times. Have this MSDS with you when you call.

This product contains a barbiturate (sodium pentobarbitone) in a very high concentration form. It is intended to kill animals and should not be used for any other purposes, such as anaesthesia, for example. Gastric lavage, oral administration of activated charcoal, intensive symptomatic and supportive therapy are part of the treatment. The solution being extremely alkaline, necrosis or gangrene can follow subcutaneous injection.

**Inhalation:** If inhalation occurs, contact a Poisons Information Centre, or call a doctor at once. Remove source of contamination or move victim to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained personnel, preferably on a doctor's advice. DO NOT allow victim to move about unnecessarily. Symptoms of pulmonary oedema can be delayed up to 48 hours after exposure.

**Skin Contact:** Quickly and gently, blot or brush away excess chemical. Wash gently and thoroughly with water (use non-abrasive soap if necessary) for 20 minutes or until chemical is removed. Under running water, remove contaminated clothing, shoes and leather goods (e.g. watchbands and belts). If irritation persists, repeat flushing and obtain medical advice. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

**Eye Contact:** If poisoning occurs, contact a Poisons Information Centre. Urgent hospital treatment is likely to be needed. Quickly and gently blot or brush away chemical. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 20 minutes or until the chemical is removed, while holding the eyelid(s) open. Take care not to rinse contaminated water into the unaffected eye or onto the face.

**Ingestion:** If swallowed, rinse mouth thoroughly with water and contact a Poisons Information Centre, or call a doctor at once. Give activated charcoal if instructed.

## Section 5 – Fire Fighting Measures

**Fire and Explosion Hazards:** There is no risk of an explosion from this product under normal circumstances if it is involved in a fire.

Fire decomposition products from this product may be toxic if inhaled. Take appropriate protective measures. This product is likely to decompose only after heating to dryness, followed by further strong heating.

**Extinguishing Media:** Not Combustible. Use extinguishing media suited to burning materials. water fog. Water fog or fine spray is the preferred medium for large fires.

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Product Name:

Lethabarb Euthanasia Injection

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**Fire Fighting:** When fighting fires involving significant quantities of this product, no special equipment is believed to be necessary.

**Flash point:** Does not burn.

**Upper Flammability Limit:** Does not burn.

**Lower Flammability Limit:** Does not burn.

**Autoignition temperature:** Not applicable - does not burn.

**Flammability Class:** Does not burn.

## **Section 6 – Accidental Release Measures**

**Accidental release:** In the event of a major spill, prevent spillage from entering drains or water courses.

Evacuate

the spill area and deny entry to unnecessary and unprotected personnel. Immediately call the Fire Brigade.

Wear full

protective chemically resistant clothing including face mask, face shield, gauntlets and self contained breathing apparatus. See above under Personal Protection regarding Australian Standards relating to personal protective equipment. Suitable materials for protective clothing include rubber, PVC. Stop leak if safe to do so, and contain spill.

Absorb onto sand, vermiculite or other suitable absorbent material. If spill is too large or if absorbent material is not

available, try to create a dike to stop material spreading or going into drains or waterways. Avoid using sawdust or

other combustible material. Because of the toxicity of this product, special personal care should be taken in any cleanup operation. Sweep up and shovel or collect recoverable product into labelled containers for recycling or salvage, and dispose of promptly. After spills, wash area preventing runoff from entering drains. If a significant quantity of material enters drains, advise emergency services. Full details regarding disposal of used containers,

spillage and unused material may be found on the label. If there is any conflict between this MSDS and the label,

instructions on the label prevail. Ensure legality of disposal by consulting regulations prior to disposal.

Thoroughly

launder protective clothing before storage or re-use. Advise laundry of nature of contamination when sending contaminated clothing to laundry.

## **Section 7 – Handling and Storage**

**Handling:** Keep exposure to this product to a minimum, and minimise the quantities kept in work areas. Check Section 8 of this MSDS for details of personal protective measures, and make sure that those measures are followed.

The measures detailed below under "Storage" should be followed during handling in order to minimise risks to persons using the product in the workplace. Also, avoid contact or contamination of product with incompatible materials listed in Section 10.

**Storage:** This product is a Scheduled Poison. Observe all relevant regulations regarding sale, transport and storage

of this class of poison. Store in a cool, well ventilated area. Check containers periodically for leaks. Containers should

be kept closed in order to minimise contamination. Make sure that the product does not come into contact with substances listed under "Materials to avoid" in Section 10. If you keep more than 1000kg or 1000L of Toxic Substances of Packaging Group III, you will require a license to do so. If you have any doubts, we suggest you contact your licensing authority in order to clarify your obligations. Check packaging - there may be further storage

instructions on the label.

## **Section 8 Exposure Controls and Personal Protection**

The following Australian Standards will provide general advice regarding safety clothing and equipment:

Respiratory equipment: **AS/NZS 1715**, Protective Gloves: **AS 2161**, Industrial Clothing: **AS2919**, Industrial Eye Protection: **AS1336** and **AS/NZS 1337**, Occupational Protective Footwear: **AS/NZS2210**.

**Exposure Limits TWA (mg/m<sup>3</sup>) STEL (mg/m<sup>3</sup>)**

Exposure limits have not been established by NOHSC for any of the significant ingredients in this product.

**Ventilation:** No special ventilation requirements are normally necessary for this product. However make sure that

the work environment remains clean and that dusts are minimised.

**Eye Protection:** Protective glasses or goggles must be worn when this product is being used. Failure to protect

your eyes may lead to severe harm to eyes or to general health. Emergency eye wash facilities must also be available

in an area close to where the product is being used.

**Skin Protection:** Prevent skin contact by wearing impervious gloves, clothes and, preferably, apron. Make sure that

all skin areas are covered. See below for suitable material types.

**Protective Material Types:** We suggest that protective clothing be made from the following materials:

rubber,

PVC.

**Respirator:** If there is a significant chance that vapours or mists are likely to build up in the area where this product

is being used, we recommend that you use a respirator. It should be fitted with a suitable cartridge.

## **VIRBAC (AUSTRALIA) PTY. LTD.**

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# **MATERIAL SAFETY DATA SHEET**

**Product Name:**

Lethabarb Euthanasia Injection

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Eyebaths or eyewash stations and safety deluge showers should be provided near to where this product is being used.

## **Section 9 - Physical and Chemical Properties:**

**Physical Description & colour:** Clear green solution in amber glass bottle.

**Odour:** No data.

**Boiling Point:** Approximately 100°C at 100kPa.

**Freezing/Melting Point:** Approximately 0°C.

**Volatiles:** Water component.

**Vapour Pressure:** 2.37 kPa at 20°C (water vapour pressure).

**Vapour Density:**

**Specific Gravity:** 1.08

**Water Solubility:** Completely soluble in water.

**pH:** 11.0 approx

**Volatility:** No data.

**Odour Threshold:** No data.

**Evaporation Rate:** No data.

**Coeff Oil/water distribution:** No data

**Autoignition temp:** Not applicable - does not burn.

## **Section 10 – Stability and Reactivity**

**Reactivity:** This product is unlikely to react or decompose under normal storage conditions. However, if you have

any doubts, contact the supplier for advice on shelf life properties.

**Conditions to Avoid:** None known.

**Incompatibilities:** strong acids, strong bases.

**Fire Decomposition:** Carbon dioxide, and if combustion is incomplete, carbon monoxide and smoke.

Nitrogen and

its compounds, and under some circumstances, oxides of nitrogen. Occasionally hydrogen cyanide gas. Water. sodium compounds. Carbon monoxide poisoning produces headache, weakness, nausea, dizziness, confusion, dimness of vision, disturbance of judgment, and unconsciousness followed by coma and death. Hydrogen cyanide

poisoning signs and symptoms are weakness, dizziness, headache, nausea, vomiting, coma, convulsions, and death.

Death results from respiratory arrest. Hydrogen cyanide gas acts very rapidly; symptoms and death can both occur quickly.

**Polymerisation:** This product is unlikely to undergo polymerisation processes.

## **Section 11 – Toxicological Information**

**Target Organs:** There is no data to hand indicating any particular target organs.

### **Classification of Hazardous Ingredients**

Ingredient Risk Phrases

**Pentobarbital Sodium:** R25, R36/37/38

**Pentobarbital Sodium:** LD<sub>50</sub> Oral, Rat 118mg/kg

## **Section 12 – Ecological Information**

Insufficient data to be sure of status.

## **Section 13 – Disposal Considerations**

**Disposal:** Instructions concerning the disposal of this product and its containers are given on the product label.

These should be carefully followed.

## **Section 14 – Transport Information**

**ADG Code:** 3287, TOXIC LIQUID, INORGANIC, N.O.S.

**Hazchem Code:** 2X

**Special Provisions:** SP109, SP185, SP274

**Packaging Group:** III

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**Packaging Method:** 3.8.6

This product is classed as UN3287, Dangerous Goods Class 6.1 Toxic Substances. Proper Shipping name is TOXIC

LIQUID, INORGANIC, N.O.S.. Class 6 Toxic Substances shall not be loaded in the same vehicle or packed in the

same freight container with Classes 1 (Explosives), 3 (Flammable Liquids where the Flammable Liquid is nitromethane), 5.1 (Oxidising Agents where the Toxic Substances are Fire Risk Substances), 5.2 (Organic Peroxides

where the Toxic Substances are Fire Risk Substances), 8 (Corrosive Substances where the Toxic Substances are

cyanides and the Corrosives are acids), Foodstuffs and foodstuff empties. They may however be loaded in the same

vehicle or packed in the same freight container with Classes, 2.1 (Flammable Gases), 2.2 (Non-Flammable, Non-

Toxic Gases), 2.3 (Toxic Gases), 3 (Flammable liquids, except where the flammable liquid is nitromethane), 4.1 (Flammable Solids), 4.2 (Spontaneously Combustible Substances), 4.3 (Dangerous When Wet Substances), 5.1

(Oxidising Agents except where the Toxic Substances are Fire Risk Substances), 5.2 (Organic Peroxides except

where the Toxic Substances are Fire Risk Substances), 7 (Radioactive Substances), 8 (Corrosive Substances except

where the Toxic Substances are cyanides and the Corrosives are acids), 9 (Miscellaneous Dangerous Goods)

## **Section 15 – Regulatory Information**



**AICS:** All of the significant ingredients in this formulation are to be found in the public AICS Database. The following ingredient: Pentobarbital sodium is listed in the SUSDP.

## **Section 16 – Other Information**

This MSDS contains only safety-related information. For other data see product literature.

**Contact point: Technical Manager, QA Manager or R&D Director**

**Telephone (02) 9533 2000 or 1800 242 100**

**Fax (02) 9533 1522**

### **Acronyms:**

**ADG Code** Australian Code for the Transport of Dangerous Goods by Road and Rail

**AICS** Australian Inventory of Chemical Substances

**CAS number** Chemical Abstracts Service Registry Number

**Hazchem Number** Emergency action code of numbers and letters that provide information to emergency services especially firefighters

**IARC** International Agency for Research on Cancer

**NOHSC** National Occupational Health and Safety Commission

**NOS** Not otherwise specified

**NTP** National Toxicology Program (USA)

**R-Phrase** Risk Phrase

**SUSDP** Standard for the Uniform Scheduling of Drugs & Poisons

**UN Number** United Nations Number

THIS MSDS SUMMARISES OUR BEST KNOWLEDGE OF THE HEALTH AND SAFETY HAZARD INFORMATION OF THE PRODUCT AND

HOW TO SAFELY HANDLE AND USE THE PRODUCT IN THE WORKPLACE. EACH USER MUST REVIEW THIS MSDS IN THE CONTEXT OF

HOW THE PRODUCT WILL BE HANDLED AND USED IN THE WORKPLACE.

IF CLARIFICATION OR FURTHER INFORMATION IS NEEDED TO ENSURE THAT AN APPROPRIATE RISK ASSESSMENT CAN BE MADE,

THE USER SHOULD CONTACT THIS COMPANY SO WE CAN ATTEMPT TO OBTAIN ADDITIONAL INFORMATION FROM OUR SUPPLIERS

OUR RESPONSIBILITY FOR PRODUCTS SOLD IS SUBJECT TO OUR STANDARD TERMS AND CONDITIONS, A COPY OF WHICH IS SENT

TO OUR CUSTOMERS AND IS ALSO AVAILABLE ON REQUEST.

**Please read all labels carefully before using product.**

This MSDS is prepared in accord with the NOHSC document "National Code of Practice for the Preparation of Material Safety Data Sheets" 2nd Edition [NOHSC:2011(2003)]

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<http://www.kilford.com.au/> Phone (02)9251 4532

(Virbac 2007)

### **8.8.1.5 Panacur**

Panacur 100 – Issue 2

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# **MATERIAL SAFETY DATA SHEET**

## **PANACUR 100**

Issue Date: March 24<sup>th</sup>, 2001

Review Date: March 24<sup>th</sup>, 2003  
Company Address: Intervet Ltd  
P O Box 4079  
Auckland  
New Zealand  
Phone: (09) 309-0600  
Fax: (09) 309-9101  
Emergency Tel. No.: John Southworth  
R & D Manager  
Intervet Ltd  
021-932-876  
Poisons Information Centre: 0800-764-766

## 1. IDENTIFICATION

- 1.10 Product Name: Panacur 100
  - 1.11 Correct Shipping Name: Panacur 100 ( 1L, 5L, 10L and 20L )
  - 1.12 ARB Number: 7154
  - 1.13 UN Number: Not applicable
  - 1.14 Hazchem Code: Not applicable
  - 1.15 Dangerous Goods Class: Not classified
- Sub-risk:
- 1.16 Poison Schedule: NA
  - 1.17 Manufacturers Product Code: 000006 (1L), 000007 (5L)
  - 1.18 Use: Oral anthelmintic for sheep, goats, cattle and horses.

Panacur 100 – Issue 2

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### 1.2 Ingredients

#### 1.20 Chemical Entity CAS Number. Proportion

\*Fenbendazole 43210-67-9 100g/L

Water carrier 7732-18-5 >600g/L

\*(5 – (phenylthio) – 1H – Benzimidazol – 2 – YL) Carbamic Acid Methyl Ester

\* Active Constituent

+ Confidential Manufacturing Information

#### 1.21 Chemical Characterisation: Suspension.

### 1.3 Physical Description / Properties

#### 1.30 Form: A white liquid

1.31 Colour: White

1.32 Odour: Slightly chalky odour

1.33 Change in Physical State: Stable under normal conditions

1.34 SG: Not available

1.35 Vapour Pressure: Not available

1.36 Viscosity: Not available

1.37 Solubility in Water: Dispersion

1.38 pH Value: Not available

1.39 Flash Point: Not available

1.40 Boiling Point: Not available

1.41 Explosive Limits: Not applicable

## 2. HEALTH HAZARD INFORMATION

### 2.1 Health Effects:

2.10 Information on Toxicity: a) Eyes – Avoid contact with the eyes

b) Skin – Not considered hazardous

c) Ingestion – Only hazardous if swallowed in large amounts

d) Inhalation – Not considered hazardous

### 2.2 First Aid

2.20 First Aid: a) Eyes – Wash with copious amounts of clean water for 15

minutes.

b) Skin – Wash with soap and water

c) Ingestion – Contact doctor or Poisons Information Centre

d) Inhalation – Remove from the source of the fumes  
Reassure the casualty and encourage them to rest.

Panacur 100 – Issue 2

Page 3 of 4

2.21 Advice to Doctor: Note ingredients and their possible irritant effects

### **3. PRECAUTIONS FOR USE**

3.1 Exposure Standards / Engineering Control

3.10 Regulations: This product is not subject to Australian Code for the Transport of Dangerous Goods by Road and Rail.

3.11 Technical Protective Measures: No special measures are required. Store away from food, drink and animal feedstuffs. Store below 30°C. Do not freeze. Shake before use. Wash hands thoroughly after handling. Do not eat, drink or smoke until after washing.

3.2 Personal Protective Measures

3.21 Personal Protective

Equipment: None required

3.22 Industrial Hygiene: Avoid contact with the skin and eyes. Follow the data sheet instructions.

3.3 Flammability

3.31 Protection Against Fire: No special precautions required. The product is not flammable.

### **4. MEASURES IN CASE OF ACCIDENTS AND FIRES**

4.1 Storage and Transport Store below 30°C. Do not freeze.

4.11 Classification under the Transportation of

Dangerous Goods Code: Not classified as a dangerous good

Shipping Name: Panacur 100

Packing Group: None allocated

UN Number: None allocated

DG Class: None allocated

Sub-risk: None allocated

Hazchem: None allocated

4.12 International Transport

Codes: Not applicable

4.2 Spills and Disposals

4.21 Place unused material in a sealed container and dispose of in an authorised landfill.

4.22 After Spillage/Leakage: Eliminate sources of ignition.

Absorb spills into an inert material (sand, soil, hydrated lime or vermiculite) or another absorbent material (i.e. paper towel). Wash the residue from the area with large quantities of water.

4.23 Disposal of Spillage: Place recovered material in a sealed container and dispose of in an authorised landfill

Panacur 100 – Issue 2

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4.3 Fire / Exposure Hazards

4.35 Thermal Decomposition: No hazards known

4.36 Hazardous Decomposition

Products: No hazards known

4.37 Hazardous Reactions: None known

4.38 Extinguishing Media: Water, foam or dry chemical

### **5. OTHER INFORMATION**

#### 5.10 Information on Ecological Effects:

Flora: No effects anticipated

Fauna ( rat ): Oral LD<sub>50</sub> = >1000mg/kg

Fish: No effects anticipated

Birds: No effects anticipated

Soil: No effects anticipated

Water: Do not allow product to enter waste water, rivers or creeks.

#### **6. CONTACT POINT (For Non-Emergency Calls)**

6.10 Product Safety Coordinator: John Southworth

R & D Manager

Intervet Limited

09-309-0600

#### *DISCLAIMER*

*The Material Safety Data Sheet has been developed according to OSH guidelines.*

*The data, information and recommendations herein ("information") are represented in good faith and believed to be correct as of the date hereof.*

*The purpose of this Material Safety Data Sheet is to describe product in terms of their safety requirements.*

*Intervet Ltd makes no representation of merchantability, fitness for a particular purpose or application, or of any other nature with respect to the information or the product to which the information refers ("the product").*

*The information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use of the product.*

*The physical data shown herein are typical values based on material tested. These values should not be construed as a guaranteed analysis of any specific lot or as guaranteed specification for the product or specific lots thereof.*

*Due care should be taken to make sure that the use or disposal of this product is in compliance with relevant Local Government regulations.*

(AccessButler 2007)

## ***Repti-cal***

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Not classified as Hazardous according to criteria of Worksafe Australia

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Issue date: February 2005 MSDS 129

### **IDENTIFICATION**

**Product Name:** Aristopet Repti-Cal

**Synonyms:** NIL

**Manufacturer's Product Code(s):** RE04,RE05,RE055

**Use:** Natural Phosphorus-Free Calcium & Vitamin D3 Supplement

**UN Number:** None allocated

**Proper Shipping Name:** NONE ALLOCATED

**Dangerous Goods Class:** None allocated

**Subsidiary risk:** None allocated

**Packing Group:** None allocated

**Hazchem Code:** None allocated

**Poison Schedule:** None allocated

### **PHYSICAL PROPERTIES**

**Appearance:** Fine white powder

**Melting Point:** N/A

**Vapour Pressure:** N/A

**Specific Gravity:** N/A

**Flash Point:** N/A

**Flammability Limits:** Not flammable

**Solubility in Water:** Insoluble

## INGREDIENTS

### **SUBSTANCE NAME Proportion CAS Number**

CALCIUM CARBONATE Greater than 60% 471-34-1

NON-HAZARDOUS SUBSTANCES 1 to 10% Mixture

## HEALTH HAZARD INFORMATION

### **ACUTE HEALTH EFFECTS**

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO THE CRITERIA OF WORKSAFE AUSTRALIA

### **HAZARD CATEGORY: None allocated**

### **ACUTE HEALTH EFFECTS**

#### **Swallowed:**

Large doses may cause irritation to mouth and throat.

#### **Eye:**

May cause irritation to the eyes, with effects including: tearing, pain, stinging and blurred vision.

#### **Skin:**

Not expected to cause any health effects.

#### **Inhaled:**

This product may cause irritation to the nose, throat and respiratory system with effects including:

Cough, discomfort, difficulty breathing and shortness of breath.

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Not classified as Hazardous according to criteria of Worksafe Australia

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Issue date: February 2005 MSDS 129

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#### **Chronic:**

None allocated

#### **FIRST AID**

##### **Swallowed:**

If swallowed, DO NOT induce vomiting. Give 3 to 4 glasses of water to drink. If irritation persists transport to hospital or doctor.

##### **Eye:**

If dust enters the eyes, flush with plenty of water for at least 15 minutes, ensuring eye lids are held open. If irritation persists, immediately transport to hospital or doctor.

##### **Skin:**

None required.

#### **Inhaled:**

Move victim to fresh air.

#### **First Aid Facilities:**

Eye wash fountain, safety shower and normal wash room facilities.

#### **Advice to Doctor:**

Treat symptomatically.

In case of poisoning, contact Poisons Information Centre

In Australia call Tel: 131126

In New Zealand Tel:0800 764 766

## PRECAUTIONS FOR USE

### **Exposure Standards**

No exposure standards are available for this product, however, the following exposure standards have been assigned by the National Occupational Health & Safety Commission (NOHSC) to the following components of the product:

#### ***CALCIUM CARBONATE***

(Worksafe Australia)

**[TWA]**10 mg/m<sup>3</sup>

\*\*\*\*\*



## **WATER AND OTHER NON-HAZARDOUS SUBSTANCES**

No Exposure details available

### **Engineering Controls**

Good industrial hygiene practice requires that employee exposure be maintained below the recommended exposure standards. This is preferably achieved through the provision of adequate ventilation where necessary. Where dust cannot be controlled in this way, personal respiratory protection should be employed.

### **Personal Protection Equipment**

GLOVES: None required during normal use..

EYES: Chemical goggles or faceshield may be desirable when handling large quantities to protect eyes.

RESPIRATORY PROTECTION: Avoid breathing of dusts. The use of a respirator is not normally required, however, if high dust levels are present, then the use of a suitable dust mask or half-face respirator with a P1 filter is recommended. All respirators must comply with AS/NZS 1715 and AS/NZS 1716.

## **SAFE HANDLING INFORMATION**

Avoid generating dusts. Store in a cool place and out of direct sunlight. Store away from sources of heat or ignition. Store away from oxidizing agents. Keep containers closed, when not using the product. Store in original packages as approved by manufacturer.

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Not classified as Hazardous according to criteria of Worksafe Australia

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### **Transport**

**UN Number:** None allocated

**Proper Shipping Name:** NONE ALLOCATED

**Dangerous Goods Class:** None allocated

**Subsidiary risk:** None allocated

**Packing Group:** None allocated

**Hazchem Code:** None allocated

Not classified as a Dangerous Good according to the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) 6th Edition. Not classified as a Dangerous Good according to the UN, DOT(US), ICAO(IATA) or IMO(IMDG).

### **Spills**

This product is a powder, under appropriate conditions dusts may be generated. Wear suitable protective equipment in these circumstances. Ventilate area. If possible wet area down to prevent high dust levels. If spill occurs, use dustless methods, such as a HEPA vacuum and filter. Otherwise, use a non-sparking shovel and place into a suitably labeled container for later disposal. Do not dry sweep. Remainder of material can be picked up and re-cycled or disposed.

### **Disposal**

Refer to appropriate authority in your State. Dispose of material through a licensed waste contractor. Normally suitable for disposal by approved waste disposal agent.

### **Fire**

#### **Fire/Explosion Hazard**

If safe to do so, move undamaged containers from fire area.

Hazardous Decomposition Products: Decomposes on heating emitting soot, smoke and decomposition products.

Fire Fighting Procedures: Fire fighters to wear Self-contained breathing apparatus (SCBA) in confined spaces, in oxygen deficient atmospheres or if exposed to products of decomposition. Full protective clothing is also recommended.

Extinguishing Media: Use extinguishing media suitable for surrounding fire situation.

### **Flammability**

This material is not a combustible or flammable solid.

## **OTHER INFORMATION**

There is no toxicological information available for this product.

### **Ecotoxicity**

None allocated

### **Poison Schedule**

None allocated

### **RISK PHRASES**

None allocated

### SAFETY PHRASES

S26 In case of contact with eyes, rinse immediately with plenty of water and contact a doctor or Poisons Information Centre.

S39 Wear eye/face protection.

## CONTACT POINT

### Contact Point

Mr Len Walker

Tel: 07 3630 2166

### Disclaimer

The information herein is to the best of our knowledge, correct and complete. It describes the safety requirements for this product and should not be construed as guaranteeing specific properties. Since methods and conditions are beyond our control we do not accept liability for any damages resulting from the use of, or reliance on, this information in inappropriate contexts.

(Aristopet 2006)

## 8.8 Top of descent

### CALLINGTON HAVEN TOP OF DESCENT INSECTICIDE

Chemwatch Material Safety Data Sheet

Revision No: 2

Issue Date: 4-Jun-2003

**Hazard Alert Code:**  
**MODERATE**

Chemwatch 16747

CD 2006/4

### Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: CALLINGTON HAVEN TOP OF DESCENT INSECTICIDE

SYNONYMS

"d-phenothrin aircraft cabin insecticide spray"

PROPER SHIPPING NAME

AEROSOLS

PRODUCT USE

Aircraft aerosol insecticide for cabin spraying before landing.

SUPPLIER

Company: Callington Haven Pty Ltd

Company: Callington Haven Pty Ltd

Address:

Address:

PO Box 144

30 South Street

Rydalmere

Rydalmere

NSW, 2116

NSW, 2116

AUS

AUS

Telephone: +61 2 9898 2788

Emergency Tel: 1800 039 008 (24 hours)

Emergency Tel: +61 3 9573 3112

Fax: +61 2 9684 4215

### HAZARD RATINGS

	Min	Max
Flammability:	0	Min/Nil=0 Low=1
Toxicity:	0	Moderate=2 High=3
Body Contact:	2	Extreme=4

CALLINGTON HAVEN TOP OF DESCENT INSECTICIDE

Chemwatch Material Safety Data Sheet  
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Reactivity: 0

Chronic: 0

**Section 2 - HAZARDS IDENTIFICATION**

STATEMENT OF HAZARDOUS NATURE

DANGEROUS GOODS. NON-HAZARDOUS SUBSTANCE. According to the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE

None

RISK	SAFETY
Risk of explosion if heated under confinement.	Do not breathe gas/fumes/vapour/spray.
May produce discomfort of the respiratory system*.	Avoid contact with skin.
Possible respiratory and skin sensitiser*.	This material and its container must be disposed of as hazardous waste.

\* (limited evidence).

**Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS**

NAME	CAS RN	%
d-phenothrin	51186-88-0	<10
propellant, as HFC		>60
NOTE: Manufacturer has supplied full ingredient information to allow CHEMWATCH assessment.		

**Section 4 - FIRST AID MEASURES**

SWALLOWED

For advice, contact a Poisons Information Centre or a doctor.

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

EYE

## CALLINGTON HAVEN TOP OF DESCENT INSECTICIDE

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If this product comes in contact with the eyes:

- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- If pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

### SKIN

If solids or aerosol mists are deposited upon the skin:

- Flush skin and hair with running water (and soap if available).
- Remove any adhering solids with industrial skin cleansing cream.
- DO NOT use solvents.
- Seek medical attention in the event of irritation.

### INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

### NOTES TO PHYSICIAN

Treat symptomatically.

## Section 5 - FIRE FIGHTING MEASURES

### EXTINGUISHING MEDIA

- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

### FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.

## CALLINGTON HAVEN TOP OF DESCENT INSECTICIDE

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- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

### FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered to be a significant fire risk.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- Aerosol cans may explode on exposure to naked flames.
- Rupturing containers may rocket and scatter burning materials.
- Hazards may not be restricted to pressure effects.
- May emit acrid, poisonous or corrosive fumes.
- Decomposes on heating and may emit toxic fumes of carbon monoxide (CO).

Other combustion products include:

carbon dioxide (CO<sub>2</sub>).

phosgene.

chlorides and fluorides.

HAZCHEM

2Y

Personal Protective Equipment

Breathing apparatus.

Gas tight chemical resistant suit.

Limit exposure duration to 1 BA set 30 mins.

### Section 6 - ACCIDENTAL RELEASE MEASURES

#### EMERGENCY PROCEDURES

##### MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Wear protective clothing, impervious gloves and safety glasses.
- Shut off all possible sources of ignition and increase ventilation.
- Wipe up.
- If safe, damaged cans should be placed in a container outdoors, away from all ignition sources, until pressure has dissipated.
- Undamaged cans should be gathered and stowed safely.

##### MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.



# CALLINGTON HAVEN TOP OF DESCENT INSECTICIDE

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- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapour.
- Absorb or cover spill with sand, earth, inert materials or vermiculite.
- If safe, damaged cans should be placed in a container outdoors, away from ignition sources, until pressure has dissipated.
- Undamaged cans should be gathered and stowed safely.
- Collect residues and seal in labelled drums for disposal.

## SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+            +            +            +            +            +  
*X: Must not be stored together*  
*O: May be stored together with specific preventions*  
*+: May be stored together*

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- DO NOT incinerate or puncture aerosol cans.
- DO NOT spray directly on humans, exposed food or food utensils.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

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### SUITABLE CONTAINER

- Aerosol dispenser.
- Check that containers are clearly labelled.

### STORAGE INCOMPATIBILITY

Avoid reaction with alkali metals, magnesium and magnesium alloys, zinc, aluminium alloys ( 2% magnesium).

Avoid contact with plastics such as methacrylate polymers, polyethylene and polystyrene.

### STORAGE REQUIREMENTS

- Store in original containers.
- Store in an upright position.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.
- No smoking, naked lights, heat or ignition sources.
- Keep containers securely sealed.
- Contents under pressure.
- Store in a cool, dry, well ventilated area; away from incompatible materials.
- Avoid storage at temperatures higher than 40 deg C.
- Protect containers against physical damage.
- Check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

The following materials had no OELs on our records

- d-phenothrin: CAS:51186-88-0

### MATERIAL DATA

Not available. Refer to individual constituents.

### INGREDIENT DATA

#### D-PHENOTHRIN:

No exposure limits set by NOHSC or ACGIH.

### PERSONAL PROTECTION

#### EYE

No special equipment for minor exposure i.e. when handling small quantities.

- OTHERWISE:
- Safety glasses with side shields.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an

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account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59]

## HANDS/FEET

No special equipment needed when handling small quantities.

OTHERWISE: Wear general protective gloves, eg. light weight rubber gloves. Or as required: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

## OTHER

No special equipment needed when handling small quantities.

## OTHERWISE:

- Overalls.
- Barrier cream.
- Eyewash unit.

DO NOT spray on hot surfaces.

## ENGINEERING CONTROLS

General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas.

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### APPEARANCE

Liquid in aerosol pack. Contains non-combustible propellant.

### PHYSICAL PROPERTIES

Liquid.

Gas.

Does not mix with water.

Molecular Weight: Not applicable.	Boiling Range (°C): Not available.
Melting Range (°C): Not available.	Specific Gravity (water=1): Not available
Solubility in water (g/L): Immiscible	pH (as supplied): Not applicable
pH (1% solution): Not applicable.	Vapour Pressure (kPa): Not available.
Volatile Component (% vol): Not available	Evaporation Rate: Not available
Relative Vapour Density (air=1): >1	Flash Point (°C): Not applicable
Lower Explosive Limit (%): Not applicable	Upper Explosive Limit (%): Not applicable
Autoignition Temp (°C): Not applicable	Decomposition Temp (°C): Not available
State: Liquid	Viscosity: Not available

## Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

### CONDITIONS CONTRIBUTING TO INSTABILITY

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- Elevated temperatures.
- Presence of open flame.
- Product is considered stable.
- Hazardous polymerisation will not occur.

### Section 11 - TOXICOLOGICAL INFORMATION

#### POTENTIAL HEALTH EFFECTS

##### ACUTE HEALTH EFFECTS

###### SWALLOWED

Overexposure is unlikely in this form.

Considered an unlikely route of entry in commercial/industrial environments.

The mist is discomforting to the gastro-intestinal tract.

###### EYE

The mist is discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/ or other transient eye damage/ ulceration.

Not considered an irritant through normal use.

###### SKIN

The material may be slightly discomforting to the skin.

if exposure is prolonged.

###### INHALED

The vapour/mist is discomforting to the upper respiratory tract and lungs.

Acute effects from inhalation of high vapour concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea.

**WARNING:** Intentional misuse by concentrating/inhaling contents may be lethal.

Not considered an irritant through normal use.

##### CHRONIC HEALTH EFFECTS

Principal routes of exposure are usually by skin contact and inhalation of vapour/spray mist.

As with any chemical product, contact with unprotected bare skin; inhalation of vapour, mist or dust in work place atmosphere; or ingestion in any form, should be avoided by observing good occupational work practice.

**WARNING:** Aerosol containers may present pressure related hazards.

### Section 12 - ECOLOGICAL INFORMATION

Marine Pollutant: Not Determined

Refer to data for ingredients, which follows:

#### D-PHENOTHRIN:

Synthetic pyrethroids are examples of optimised insecticidal activity, selectivity and tailored environmental persistence. Through modifications of both acid and alcohol portions of the ester, compounds of desired residual activity have been synthesised whilst maintaining a biodegradable ester linkage. These compounds are generally very toxic to crustaceans and fish in laboratory bioassays. Under field conditions, however, the residues are tightly bound in sediment, and ingested residues are readily metabolised. Their toxicity in natural systems are generally less than laboratory test data might indicate. They are generally non-persistent in the

environment.

Pyrethrins are generally unstable in the presence of light, are hydrolysed rapidly under alkaline conditions and oxidise rapidly in air. Vapour phase pyrethrins may combine chemically with ozone to produce hydroxy radicals.

Because agricultural dose rates are low and biological degradation is generally rapid, residues are unlikely to attain significant levels. Permethrin disappears from ponds and streams within 6-24 hours, pond sediments within 7 days and foliage and forest soil within 58 days.

Pyrethroids are highly toxic to fish; the bioaccumulation factor of cypermethrin in fish is approximately 1000 when measured experimentally, although the potential for significant toxicity is not reached in fields. Under aerobic conditions in soil, permethrin degrades in a relatively short time (half-life 28 days).

Drinking Water Standards:

pesticide 0.1 ug/l (UK max.).

### Section 13 - DISPOSAL CONSIDERATIONS

- Recycle where possible

Otherwise ensure that:

- licenced contractors dispose of the product and its container.
- disposal occurs at a licenced facility.

### Section 14 - TRANSPORTATION INFORMATION

Labels Required: NON-FLAMMABLE COMPRESSED GAS

HAZCHEM: 2Y

UNDG:

Dangerous Goods Class:	2.2	Subrisk:	NONE, NONE
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UN Number:	1950	Packing Group:	NONE
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Shipping Name: AEROSOLS

Air Transport IATA:

ICAO/IATA Class:	2.2	ICAO/IATA Subrisk:	None
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UN/ID Number:	1950	Packing Group:	None
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ERG Code:	2L		
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Shipping Name: Aerosols, non-flammable

Maritime Transport IMDG:

IMDG Class:	2	IMDG Subrisk:	SP63
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UN Number:	1950	Packing Group:	None
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EMS Number:	F-D,S-U	Marine Pollutant:	Not Determined
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Shipping Name: AEROSOLS

**Section 15 - REGULATORY INFORMATION**

**POISONS SCHEDULE**

None

**REGULATIONS**

d- phenothrin (CAS No:51186- 88- 0):

No regulations applicable

No data available for d- phenothrin as CAS: 51186- 88- 0.

**Section 16 - OTHER INFORMATION**

**REPRODUCTIVE HEALTH GUIDELINES**

These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise. CR = Cancer Risk/10000; UF = Uncertainty factor; TLV believed to be adequate to protect reproductive health; LOD: Limit of detection Toxic endpoints have also been identified as: D = Developmental; R = Reproductive; TC = Transplacental carcinogen Jankovic J., Drake F.: A Screening Method for Occupational Reproductive American Industrial Hygiene Association Journal 57: 641-649 (1996).

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