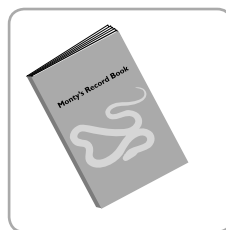




hygiene protocol for the
control of disease in captive

snakes



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NSW Department of Environment and Conservation

43 Bridge Street

PO Box 1967

Hurstville NSW 2220

Tel: 02 95856444

www.nationalparks.nsw.gov.au

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hygiene protocol for the control of disease in captive snakes

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Introduction

Australia has traditionally been free of many of the serious livestock and human diseases that affect other countries. With the increasing movement of people, animals and their products between countries, the risk of diseases entering our shores is growing.

Information on the laws about keeping reptiles in NSW is provided in Appendix I.

1.1 What this document is about

There has been a disturbing increase in the illegal importation – or smuggling – of snakes and other reptiles. Smugglers have taken advantage of the reptiles' ability to survive in small confined spaces for long periods, and can command high prices for uncommon specimens. Such illegally imported reptiles bring with them a variety of risks, some of which could have catastrophic consequences for native snakes.

Should such reptiles escape or be released into the wild they may establish free-living populations that could potentially become pests. In addition, illegally imported snakes and other reptiles may introduce exotic diseases that could infect native reptiles.

A number of diseases of reptiles, particularly snakes, pose a serious risk should they enter the country. This protocol has been prepared as one step in a program seeking to reduce this risk. While the focus of this protocol is on snake diseases, many of the principles also apply to reducing the risk of disease transmission from or to other reptiles and other wildlife.

In addition to following the steps outlined in this protocol, community cooperation is essential in any effort to reduce the risk of exotic wildlife and their diseases entering Australia. There is an urgent need for the wider community to be vigilant, for example by being unwilling to purchase snakes of doubtful origin and background.

Such animals pose a serious risk to the survival of other snakes and reptiles you may have and any other collections you or your animals come into contact with. Because of the widespread trading of reptiles across Australia, an exotic disease could spread very quickly throughout the captive population. And if an exotic disease became established in the wild, it may ultimately threaten the survival of some of Australia's unique wild reptiles.

1.2 Who should read this document?

This protocol is essential reading for the following groups:

- Department of Environment and Conservation (DEC) (formally NSW National Parks and Wildlife Service) licence holders who keep snakes and other reptiles;
- people interested in keeping snakes or other reptiles;
- veterinarians who treat snakes and reptiles;
- *Exhibited Animals Protection Act* licence and approval holders.

what are exotic diseases in snakes? 2



Exotic diseases are diseases that do not occur in Australia. Native Australian snakes have evolved in our unique environment and so have never been exposed to many of the diseases and parasites that plague snakes in other parts of the world. As a result of this isolation, Australian native snakes are more vulnerable to exotic diseases because they have no natural resistance.

Two exotic diseases that are recognised as posing a serious threat to snakes in Australia are Inclusion Body Disease (IBD) and Ophidian Paramyxovirus (OPMV). They are described more fully in Appendix 2.

In snakes, exotic diseases include those caused by viruses, bacteria, fungi, nematodes (roundworms), cestodes (tape worms) and trematodes (flat worms) (1). Biosecurity Australia (part of the Commonwealth Department of Agriculture, Fisheries and Forestry), provides an extensive list of exotic diseases that snakes could bring into Australia (see reference 1). These diseases can affect both native Australian and non-native snakes. Some may also affect other reptiles, other animals and even humans. An exotic disease may be introduced into a reptile collection by an infected snake or snake egg.

The restrictions imposed by the Commonwealth Government on importing live snakes and snake eggs minimise the risk of exotic diseases entering the country. For example, the snake must have been kept for at least 12 months or since its birth in a facility that has either been certified as being free of exotic diseases or is a facility where these diseases are subject to adequate control measures (10).

Reptile keepers must be very wary of introducing an illegally imported snake into their collection because its disease status is unknown.

Snakes that are being held for rehabilitation back into the wild should not be kept in collections with captive snakes, particularly exotic snakes, but held completely separate.

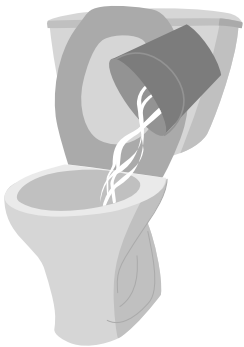
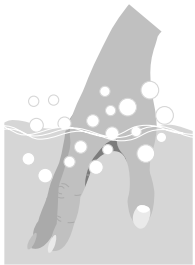
Further information on restrictions to the import of snakes can be found at the Australian Quarantine and Inspection Service website www.affa.gov.au under Quarantine and Export Services.



3 personal hygiene

It is important to maintain a high level of personal hygiene when handling snakes or their equipment to reduce the likelihood of spreading disease between snakes and the likelihood of the handler becoming infected.

Teach children good hygiene and handling practices.



A general guide to 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 (2, 3).
- 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 (2).
- 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 (2, 3).
- Keep reptiles and their cage accessories away from human food preparation and consumption areas, sinks and bathtubs and where infants are bathed (2, 3).
- Consider keeping your reptiles in enclosures or limiting them to certain parts of the house if they are presently allowed to run free.
- Do not use the kitchen sink, kitchen benches, bathroom sinks or bathtubs to bathe reptiles or wash their cages and accessories. Dispose of any wastewater and faecal material in the toilet, not in the bathtub or household sink (3).

Children and people with reduced immunity

- Always closely supervise children under the age of 12 when they are handling snakes.
- Due to the high risk of disease such as salmonella, which can be very serious in young children, the US Centers for Disease Control and Prevention recommend that 'pet reptiles should be kept out of households where children aged less than 5 years or immunocompromised persons live'. Families expecting a new child should remove the pet reptile from the home before the infant arrives' (4).
- Although salmonella infections caught by people from reptiles may be less common in Australia, it is still important to follow good hygiene measures.
- Do not allow children under 5 years old to have contact with reptiles or their accessories (4, 5).
- Do not allow reptiles to roam freely in areas where young children come into close contact with the floor and do not walk into such areas after walking through reptile enclosures (2).
- People who have reduced immunity (eg. the elderly, people with diabetes) have a higher risk than others of becoming infected with diseases from reptiles. They should either avoid contact with reptiles or use very strict hygiene measures (2, 3).

captive snake hygiene 4

The aim of these hygiene measures is to reduce the accidental spread from snake to snake of any matter that might contain bacteria, viruses or parasites such as dirt or contaminated water. Good personal hygiene practices will also reduce the handler's risk of becoming infected with a bacteria, virus or parasite, or spreading these agents between animals.

4.1 General

Snakes tend to take a while to show signs of disease – sometimes 6 to 12 months.

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 the snake came from;
- date and weight each time the snake is weighed;
- date and nature of any treatments, eg treatment for snake mites or signs of sickness (see Appendix 3 for a list of signs);
- any visits to a veterinarian and resultant treatments.

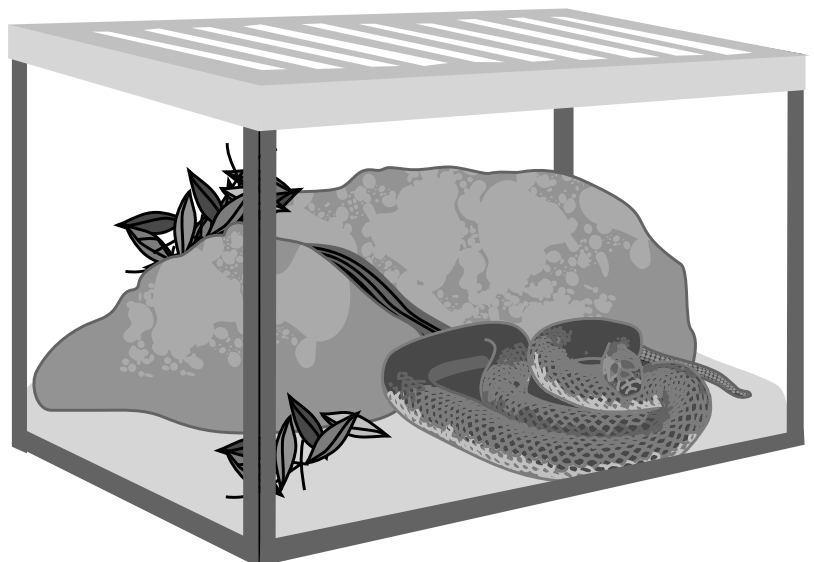
It is important to weigh a snake regularly (every 3 months) as this is the best way to know if it is progressively losing weight.

Snakes are best kept in solid-sided, lidded enclosures that have smooth sides and no cracks or open joints. Such enclosures are easy to clean and disinfect.

Cages with cracks or open joints, where water and dirt can accumulate, are more likely to harbour bacteria and viruses. Glass, fibreglass or plastic tanks, aquaria or terraria are easier to clean and disinfect than wood.

Some natural substrates such as pine chips, and some artificial substrates such as synthetic

carpet or grass, can retain moisture that harbours bacteria and parasites and so they should not be used. Natural substrates can be difficult to keep clean and should not be used by inexperienced snake keepers.



Terrestrial snakes such as childrens pythons can be kept on pelleted newspaper (such as certain brands of kitty litter). Fine sand can also be used.

Newspaper is probably the best substrate for arboreal snakes such as carpet and diamond pythons that do not use the floor, with natural cage furniture such as branches

Quarantine all new snakes

Snakes with a disease 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. Section 4.3 describes how to quarantine snakes.

Never introduce new snakes to the rest of your collection. Place them in quarantine for at least 6 months and monitor their health for any signs of disease (see Appendix 3).

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. (6, 7)

Make sure your snakes are not stressed

Always remember that stressed animals are more susceptible to disease and healthy snakes living in proper environments are less likely to be stressed (3). Follow the advice of your veterinarian concerning the proper diet and environment for your reptile.

If a snake becomes infested with snake mites treat it immediately with a proprietary treatment or as advised by your vet. Take care not to spread the infestation to other snakes by practicing good hygiene. Mites can be seen on white paper as pinpoint-sized, black, tick-like animals. (7)

Keep your snakes secure

It is important that snakes be kept in rooms from which they cannot inadvertently escape into the wild where they may become a pest and spread diseases to native animals.

4.2 Cleaning and disinfection

New snakes

If a cage is to be used for a new or different animal, it should remain empty after disinfection for at least 2 weeks before being used (8).

Before putting a new snake into a cage, ensure that the cage and all its associated equipment is clean and has been disinfected (9).

Routine cleaning

Most disinfectants do not work well if there is dirt or other organic material contaminating the area or object to be disinfected.

Remove faeces or other solids daily.

Thoroughly clean each cage once a week using the following procedures:

- Remove the snake and put it temporarily into a lidded container (such as a smooth-sided plastic garbage bin or plastic tub) that has been disinfected, rinsed and dried out between each snake occupant.
- Remove and throw away the paper flooring by folding it in on itself so that bits of dirt or faecal material do not fall out.
- Dispose of soiled natural substrates in an enclosed rubbish bin (do not compost as this could spread disease).
- Thoroughly clean the enclosure and associated fittings with a brush and hot soapy water (remember that while soap or detergents help to clean by breaking up dirt and oils, physical scrubbing with a suitable brush is the best way to reduce the overall amount of dirt and contaminants).
- Throw away items such as branches or other material that cannot be cleaned.
- Thoroughly rinse off any soap or detergent as some soap residues can de-activate disinfectants.

- Thoroughly disinfect the enclosure and fittings with household bleach (see below) or a disinfectant as recommended by your vet.
- All materials and cages should be in contact with the disinfectant for at least 15 minutes.
- After disinfection, the materials and cages should be thoroughly rinsed with tap water to remove any residual chemicals as these can be toxic to reptiles.
- Rinse out and disinfect the scrubbing brush and leave it to air dry.
- Leave the cage to air dry before putting in clean substrate and cage furniture and, finally, the snake.

(8, 9, 10, 11)

What disinfectant to use

Use a freshly prepared solution of 0.15% or one in thirty dilution of sodium hypochlorite (household bleach) (8, 9) or other disinfectant as recommended by your vet, following the manufacturer's instructions.

When used according to the manufacturer's instructions, bleach is effective against many snake diseases but it is not effective against all diseases.

Cages that have contained ill snakes

Cages that have contained ill snakes should be cleaned and completely disinfected immediately, rinsed and dried and left empty for at least 2 weeks before being used for other snakes (8).

Unused equipment

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 (9).

Cleaning equipment

- Use separate equipment for each snake (9). 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 (2, 9).
- For snake bags and other carrying equipment, ensure that any faecal material is disposed of by turning the bag inside out over a garbage bin prior to washing the bag (3).
- Wash snake bags separately from any other items after first soaking for at least 30 minutes in diluted bleach or other disinfectant as recommended by your vet, following the manufacturer's instructions.

Contact with other snake collections

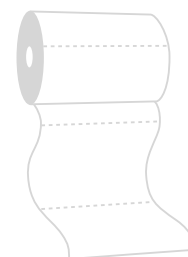
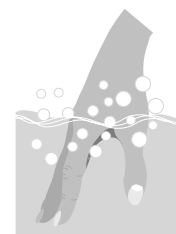
- Do not use other people's equipment for your own animals (2).
- Do not let your snakes come into contact with other people's snakes or reptiles (3).
- If you are visiting other people with snakes or reptiles make sure you wash your hands thoroughly afterwards and change your clothes and shoes before handling your own snakes (3).

4.3 Quarantine

Keep snakes in quarantine in a separate room to other reptiles or snakes.

- Clean and handle the animals in quarantine last each day, using the routine described in section 4.2.
- Use paper substrate for quarantined animals as this makes it easier to spot evidence of disease, parasites, abnormal faeces and the like (7).

Consult your veterinarian for advice on what disinfectant to use — particularly if you have an outbreak of disease in your collection.



- 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 (7). 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 (12).
- Thoroughly wash your hands with hot, soapy water after handling any animals in quarantine (3).
- During the quarantine period the snake should be examined by a vet for presence of parasites or disease (7, 8, 12) (see Appendix Four for further information).
- 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 (7).
- 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.
- There is currently no test available in Australia to detect antibodies to OPMV although this test is available in the US and Europe. The presence of antibodies means the snake has at some stage been infected, while a rising number of antibodies ('titre') over more than one blood test indicates an active infection (8, 9, 12)

dealing with sick or dead snakes

5

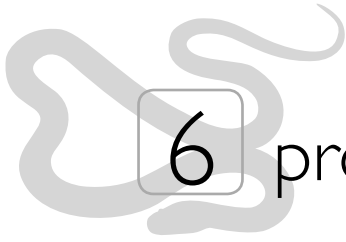
It is essential to know how to deal with sick or dead snakes held in captivity. The following chapter outlines the essential procedures for minimising the impact on your collection and avoiding the spread of disease to wild populations.

When dealing with sick or dead snakes it is important to:

- Wear disposable gloves (13).
- Remove sick snakes from the collection and place them in a separate (quarantine) area and monitor them (see section 4.3 on quarantine).
- Unless your veterinarian has advised you to the contrary, ring first before taking a snake in for an examination as snakes require specialist handling and equipment.
- Seek veterinary advice in the case of a sudden unexplained death of a snake where the cause of death is not obvious (7, 8, 12). This may seem an expensive option but could save you money in the long run if it means that a disease in your collection is diagnosed early.
- Seal any dead snake in a leak-proof container, double bag it and store it in a fridge until disposal. If disposal is going to take more than 48 hours, store the sealed body in a freezer until disposal. Do not use a fridge or freezer that is used to store human or animal food.
- Submit dead snakes for post-mortem examinations and histopathology, on the advice of your vet. Keep the sealed body cold by putting them in an esky with ice bricks, but do not freeze. Transport it to the laboratory without delay.
- Dispose of dead snakes in accordance with the requirements of your local council (contact the environmental health section of council).
- Dispose of any associated contaminated material that cannot be disinfected, such as paper or natural substrate and sticks or branches, in the same way as the dead body.
- Disinfect the snake's cage and any associated equipment that has come into contact with the sick snake (as described in section 4.2) and leave to air dry (6).
- Do not use the sick snake's cage for two weeks after the cage has been cleaned and disinfected (8).

If a snake is showing any of the signs listed in Appendix 3 contact your vet immediately.





6 prohibited release of snakes

Release into the wild of any snake that has been in captivity — whether native or not — is not permitted without a licence under the *National Parks and Wildlife Act 1974*.

Such a licence would normally only be issued by the NSW Department of Environment and Conservation for rehabilitation of previously wild snakes and only if:

- the animal(s) have been completely isolated during rehabilitation;
- the animal(s) are returned close to their point of capture; and
- there is a very high conservation need to return the animals to the wild.

Release into the wild is also not in the best interests of the individual snake as it may be unable to survive. More importantly for our native snakes, there is a great risk of inadvertently introducing a disease into native snake populations.

Finally, just because a snake is native to Australia does not mean it is found everywhere. If it is not a snake that is naturally found in your area, you risk upsetting the balance of the ecosystem by releasing it where it does not belong.

If you no longer want or you are unable to keep a snake:

- Take it to a vet who may assist you find a home for it or, if necessary, will be able to euthanase it humanely.
- Contact a herpetological society to help you find a home for it with another responsible person who holds the appropriate licence (a list of societies is provided in Appendix 5).
- As a last resort, some animal welfare organisations will accept unwanted snakes.

Your local zoo or fauna park may also be able to provide advice.

Antimicrobial

A drug used to treat infections including bacterial, fungal and chlamydial, for example an antibiotic.

Amphibians

Members of the vertebrate animal class Amphibia; includes frogs, toads and salamanders.

Austvetplan

The Australian Veterinary Emergency Plan of the Agriculture and Resource Management Council of Australia and New Zealand. It is one of a number of plans that describe the proposed Australian approach to an exotic animal disease outbreak.

Boid

Large, non-venomous, chiefly tropical snakes of the family Boidae that coil around and suffocate their prey; includes python, anaconda and boa constrictor.

Category A and B Viruses

The Austvetplan operational procedures manual for decontamination divides viruses up into three categories depending on their size and structure. The size and structure of a virus determines what disinfectants are effective against it and the Austvetplan lists the types of disinfectants most effective against each category.

Colubrid

Widely distributed mostly non-venomous snakes of the family Colubridae; in Australia includes several species of watersnake, brown, common and northern tree snakes.

Elapid

Venomous snakes of the family Elapidae, which includes many Australian snakes such as the brown and red-bellied black snakes, taipan and death adder.

Euthanasia

From the Greek 'eu' for good and 'thanatos' for death, meaning a 'good death', ie one with minimal pain and distress.

Fogging agent

The delivery of a disinfectant in fine particles dispersed into the air and onto surfaces by fine mist spray, steam or dry smoke methods. Dispersion and adhesion of the particles to surfaces may be enhanced by electrostatic charging via the delivery nozzle.

IBD

Inclusion Body Disease.

Inclusion bodies

Accumulations of viral material inside an animal's cells that impair the cells functions.

Herpetology

The study of reptiles and amphibians.

Ophidian

From the Greek word for snake.

OPMV (Ophidian Paramyxovirus)

A variety of the disease Paramyxovirus (see below) which affects snakes.

Paramyxovirus

A type of virus, many of which cause extremely serious diseases in animals, with the ability to spread easily and cause high levels of fatality. Examples include Newcastle disease in poultry, distemper in dogs, rinderpest in cattle and mumps in humans.

Quarantine

A period of isolation of animals suspected or known to be carrying a communicable disease to prevent the disease from spreading.

Retrovirus

A family of viruses that contain RNA rather than the more usual DNA. Their name comes from the latin word for backwards, 'retro', which refers to the special enzyme (reverse transcriptase) that the virus uses to replicate. Examples of diseases caused by retroviruses are feline leukaemia virus and human immunodeficiency virus.

Substrate

Material used for flooring of housing in which an animal is housed.

Titre

The concentration of antibodies produced in the blood in response to the presence of specific antigens such as those associated with invading micro-organisms, for example viruses and bacteria. The presence of a titre against a particular organism indicates that the animal has been exposed to the organism. If repeated sampling and analysis of the animal's blood over time shows a rising antibody titre, this may indicate that an active infection with the organism is occurring.

Transmission

In relation to a disease, the method of spread of a disease, for example by physical contact, through the air or by infected droplets.

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Information on the Internet

Websites of the herpetological societies in NSW (see Appendix 2).

Ken Boschert, Division of Comparative Medicine, Washington University, 'The Electronic Zoo', comprehensive list of all animal related websites, including reptiles. <http://netvet.wustl.edu/reptiles.htm>

Dr Elliot Jacobson, Florida University, leading veterinary expert on OPMV and other snake diseases. www.vetmed.ufl.edu/sacs/wildlife/Pmyx.html

Melissa Kaplan Herp Care Collection. Useful information from an American private herpetologist. <http://anapsid.org>

appendix I

nsw legislation for keeping reptiles

NSW reptile keeper's licence

All lizards, snakes and turtles are protected under the *National Parks and Wildlife Act 1974* and it is against the law to take them from the wild.

Some types of reptile can be kept with a licence. A licence is available from the Department of Environment and Conservation (DEC) (formerly NSW National Parks and Wildlife Service) to keep captive-bred reptiles as pets.

The following explains the very basic points of law on keeping reptiles as pets in NSW. However, they are not a full description of the law.

The DEC reptile licensing and record-keeping system monitors what reptile species are kept, bred and traded among enthusiasts. Licence-holders can obtain reptiles from other people who legally hold them, but snakes may not be sold through pet shops and must not be taken from the wild.

Reptile keeper's licence

There are two main classes of reptile keeper licences: Class 1 and Class 2. Under a Class 2 licence there are three sub-classes of licence for keeping less dangerous, increasingly dangerous and the most dangerous venomous species.

A reptile keepers' licence does not authorise the licensee to catch and relocate problem reptiles as a service to the community. A separate licence is required for this purpose.

Class 1 licence

A Class 1 licence authorises you to keep most of the common species that are easy to look after. A person with just a basic knowledge of the needs of reptiles should have no difficulty meeting the needs of these species.

Some of the animals that can be kept under a Class 1 licence are:

- eastern snake-necked turtle
- eastern water dragon
- eastern bearded dragon
- common bluetongue
- children's python
- carpet python

The fee is \$60 for a licence lasting up to two years, or \$120 for up to five years. Anyone over the age of 10 years can get a Class 1 licence. Applicants under the age of 16 years must obtain parental/guardian consent.

Class 2 licence

A Class 2 licence is necessary for species that are difficult to keep, or are rare in the wild or are dangerous venomous snakes. A person with a Class 2 licence can also keep Class 1 species.

The Class 2 licence is available only to people over the age of 18 years who have had at least two years' experience caring for Class 1 reptiles. Some of the species that can be kept under a Class 2 licence include:

- woma python
- lace monitor
- frilled lizard

Additional criteria must be met for keeping venomous species. The venomous snakes in this licence class are grouped into three sub-categories and only the more experienced keepers can keep the most dangerous species. The licence fee is \$60 per year, \$120 for two years or \$240 for five years.

An outline of the licensing system, including a list of all the species that can be held under the two licence classes, and a reptile licence application form, are available in PDF from the DEC website. Follow the links under

'Licences and Business' from the page www.nationalparks.nsw.gov.au

Buying and caring for reptiles

Commercial trade in reptiles is prohibited in NSW. Pet shops are not allowed to buy or sell reptiles or even to have them on their premises, but they can sell cages and other accessories such as 'hot-rocks'.

Licensed keepers are allowed to dispose of excess stock, such as the animals they breed, to other licence holders. However, they are not allowed to buy and sell animals as a commercial venture. They are also not allowed to advertise in the general press to buy or sell animals except in the newsletters of the reptile keeper associations to which they may personally belong, or in specific Australian herpetology discussion group Internet web sites.

There are commercial dealers in reptiles in Victoria, South Australia, Western Australia, Queensland, the NT and ACT. If you purchase an animal from one of these dealers, or from anyone else in another state, you must hold a NSW reptile keepers' licence and you must obtain an interstate import licence from the DEC before you can legally bring it into NSW.

Getting in contact with other people who keep reptiles

The DEC recommends that all reptile enthusiasts join a reptile keeper organisation (a herpetological society). This will put you in touch with other people who:

- have similar interests and who may have animals that they can trade with other licence holders
- can give you the benefit of their animal care and husbandry knowledge, experience and expertise
- may be able to give you the opportunity to participate in field observation and research activities.

See Appendix 5 for a list of reptile keeper societies.

Exhibiting reptiles in NSW

A licence under the Exhibited Animals Protection legislation is required in NSW to display or exhibit reptiles, including mobile displays. For information contact NSW Agriculture's Animal Welfare Unit on (02) 6391 3692.

Non-native snakes

Only licensed zoos and fauna parks can hold non-native snakes. It is an offence under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* for a person to possess a non-native reptile.

More information

For further information on the Reptile Keepers' Licensing system please contact the Wildlife Licensing Unit, DEC, 9 am – 4 pm Monday to Friday on phone 02 9585 6406 or fax 02 9585 6401.

Written enquiries should be addressed to the Director-General, DEC, PO Box 1967, Hurstville NSW 2220 or email: wildlife.licensing@environment.nsw.gov.au



appendix 2

Inclusion Body Disease and *Ophidian Paramyxovirus*

It is not clear whether Inclusion Body Disease (IBD) is currently present in Australia and, if so, how widespread. For the purposes of this document, IBD is considered not to be present in Australia. Several cases of *Ophidian Paramyxovirus* (OPMV) have been confirmed in snakes in NSW, but it is not clear whether the disease is widespread.

Inclusion Body Disease (IBD)

- The disease is thought to be caused by a virus, but one or more viruses may be capable of causing similar diseases in reptiles.
- Many reports link the disease with the presence of a retrovirus, although other viruses (herpes and reoviruses) have been identified in snakes with IBD.
- IBD affects boas, pythons and some elapid snakes, king snakes and palm vipers.
- The incubation period is unknown but is likely to range from a few weeks to many months.
- The IBD virus causes ‘inclusion bodies’ that causes damage anywhere in the body.
- IBD causes progressive damage to nerves, brain, spinal chord and internal organs leading to death.
- The signs of IBD in boas usually begin with regurgitation about a week after being fed, not eating, weight loss and lethargy.
- Pythons show nervous signs with decreased appetites but no regurgitation.
- Later signs of IBD include head tremors, disorientation, lack of coordination, stargazing, and snake unable to right itself when placed on its back, convulsions and flaccid paralysis.
- The disease progresses more rapidly in pythons, takes months in boas, but only weeks/few months in pythons.
- The disease is fatal in animals that show signs of the disease, although most snakes are euthanased rather than being allowed to waste away.
- There may be ‘asymptomatic carriers’ of

IBD, ie individual snakes, particularly boas, that are infected with the virus but do not show any signs of the disease.

- The disease is thought to be spread by contact with an infected snake, droplets through the air, or persons passing secretions from one snake to another during handling or cleaning.
- The disease may be spread by the snake mite (*Ophionyssus natricus*) but this has not been proven.
- The disease may be diagnosed by a biopsy and by post mortem examination, but there is currently no definitive test.
- No treatment has been shown to be effective, and euthanasia is the preferred option.
- Pythons should permanently be kept separate from boas to protect them from catching the disease.

***Ophidian Paramyxovirus* (OPMV)**

- Cases of OPMV have been confirmed in NSW. (19)
- OPMV affects viperid snakes (vipers), and may also affect colubrid and elapid snakes, boas and pythons.
- The virus affects the respiratory system and may also suppress the immune system resulting in secondary bacterial infections in the lungs and other organs.
- Snakes may carry the disease without showing any clinical signs.
- Signs of the disease include sudden death with no previous signs, abnormal respiratory sounds, open-mouth breathing, anorexia, and exudate or blood in the mouth.
- The disease progresses rapidly and spreads

quickly to other snakes if introduced into a collection. The number of deaths peaks about a month after the first deaths.

- Convulsions may be seen before death but nervous signs are generally not apparent.
- OPMV tends to be seen in the colder months of the year as the virus is thought to replicate at the optimal temperature of 30 degrees C.
- OPMV is probably transmitted through the air as droplets from the respiratory system. It may persist for some time in water bowls and pools of water, and may also be spread via faeces.
- OPMV may be diagnosed by blood sample or after death by pathology.
- No specific treatment is available, but it may be possible to treat secondary respiratory infections in some snakes with antibiotics. However, euthanasia of all snakes showing signs of the disease is the preferred option in most situations to limit the spread of the virus.

(6, 8, 9, 12, 14, 15)



appendix 3

signs of disease in snakes

Snakes suffer from a variety of diseases. Below is a list of signs that may be observed. A sick snake may not show all of these signs and the signs shown will depend on the disease.

- not eating
- losing weight
- not moving around
- 'star gazing'
- chronic regurgitation
- stomatitis (mouth rot)
- loss of coordination
- inability to strike or constrict
- bubbles from the nose
- head tremors
- disorientation
- incoordination,
- snake unable to right itself when placed on its back
- convulsions
- flaccid paralysis

(6, 8, 9, 12, 14, 15).



4 appendix

information for veterinarians

This information is provided for guidance only and does not constitute veterinary advice.

General

Veterinarians should aim to educate reptile-owning clients on how to minimise the risk of disease transmission (3).

Vets, their staff and clients who handle reptiles should follow the personal hygiene procedures outlined in section 3. (3)

All newly acquired reptiles should be treated routinely for snake mites and presumed to be positive for Salmonella (3) even though infections in people from Salmonella may be less common in Australia than elsewhere. More importantly, all newly acquired reptiles could potentially be infected with an exotic disease (including parasites), particularly those that are not native to Australia or with a dubious history.

The local National Parks and Wildlife office can provide information on the licensing system for keeping native Australian snakes and the laws regarding importation of snakes.

Large or valuable collections

All newly acquired snakes should undergo at least 90 days' quarantine, but this should probably be extended to 6 months to 1 year for boas and pythons (6).

Routine tests before a snake is cleared to come out of quarantine might include:

- at least 2 negative faecal parasite tests;
- routine faecal culture (although many snakes test positive for salmonella);
- clearance from mite infestation; and
- whether the snake is eating and drinking normally, moving about and showing a normal appearance.

All snakes that die while in quarantine should be examined post mortem (12).

It is difficult to test for the presence of exotic pathogens, as tests are not readily available in Australia. OPMV has been confirmed in captive snakes in two collections in NSW (19).

Consider taking and storing routine baseline serum samples for all snakes so that if, for example, a test for OPMV becomes available, the collection can be tested.

Disinfectants

Bleach has been recommended in this document because it is cheap, easily available and appears to be effective against many diseases that affect snakes. It is not effective against all diseases and this has been noted in the text.

Some success has been achieved with F10 Super Concentrate, a relatively new formulation of quaternary ammonium and biguanidine compounds (16). F10 is safe for users and has a broad spectrum of efficacy. It has been used to treat respiratory disease in a range of reptiles (17) and is recommended for use as a fogging agent in OPMV. Chitty (17) reports that, used as a daily nebuliser at a concentration of 1.250 for 30 minutes to an hour, it is successful in treating lower respiratory tract diseases as an adjunct to systemic antimicrobials and, in some cases, alone.

Virkon™, a disinfectant listed in the Austvetplan, has also been used as a disinfectant for snake enclosures and is listed as a disinfectant effective against both Category A and B viruses (18), (retroviruses and paramyxoviruses are both Category A viruses). It should be noted, however, that Virkon™, although of low toxicity, is not recommended for use on skin and can be corrosive to metals. All animal enclosures and associated equipment should be rinsed thoroughly and dried after use and before replacing animals. Virkon™ is also relatively expensive. (18)

Useful Veterinary Texts

Beynon, P.R. (ed) (1992) *BSAVA Manual of Reptiles*. British Small Animal Veterinary Association, Gloucestershire.

Fowler, M.E. and Miller, R.E. (eds) (1999) *Zoo and Wild Animal Medicine*. WB Saunders Co, Philadelphia.

Hoff, G.L., Frye, F.L. and Jacobsen, E.R. (eds) (1984) *Diseases of Amphibians and Reptiles*. Plenum Press, New York.

Mader, D.R. (ed) (1996) *Reptile Medicine and Surgery*. WB Saunders Co, Philadelphia.

McCracken, H. (1994) Husbandry and diseases of captive reptiles. In: *Wildlife*. University of Sydney Post Graduate Committee in Veterinary Science, Proceedings. pp. 461-545.

See also the Association of Reptile and Amphibian Veterinarian conference proceedings and website (<http://www.arav.org/>) and the *Journal of Herpetological Medicine and Surgery* that

5

appendix

reptile keeper (herpetology) societies in NSW

Australian Herpetological Society

PO Box R79, Royal Exchange, Sydney NSW
2000 www.ahs.org.au

Central Coast Reptile and Frog Group

PO Box 922, Gosford, NSW 2250

Hawkesbury Herpetological Society

PO Box 30, Emerton, NSW 2770
www.users.bigpond.com/josef_p/hhs/

Macarthur Herpetological Society

PO Box 235, Narellan, NSW 2567

North Coast Herpetological Group

PO Box 8006, Flynn's Beach, NSW 2444
www.reptilesdownunder.com/club/northcoast

Orana Herpetological Society

PO Box 809, Mudgee, NSW 2850

Reptile & Amphibian Interest Group

PO Box 5013, East Lismore, NSW 2480

Riverina Frog and Reptile Society

PO Box 1340, Wagga Wagga, NSW 2650
www.reptilesdownunder.com/club/riverinafrogandreptile/

**Society of Frogs and Reptiles Inc.
(SOFAR)**

PO Box 30, Jesmond, NSW 2299

South Coast Herpetological Society,

PO Box 248, Fairy Meadow, NSW 2519
<http://sthcoastherpsociety.bizland.com/>

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Department of
Environment and Conservation (NSW)

General inquiries: PO Box A290 Sydney South NSW 1232
Phone: (02) 9995 5000 or 1300 36 1967
Fax: (02) 9995 5999 **Web site:** www.environment.nsw.gov.au
