Husbandry Guidelines
for

Common Name: Eastern Bearded Dragon

Scientific Name: Pogona barbata

(Reptilia: Family)

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Date of Preparation: 09/2009
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Course Name and Number: Captive Animals cert 3, 1068.
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DISCLAIMER

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OCCUPATIONAL HEALTH AND SAFETY RISKS

The practice of OH&S is important in our everyday lives but even more so when dealing with animals, often or everyday as a keeper. OH&S means Occupational Health and Safety and when dealing with animals it doesn't just mean looking after your own health and safety it means looking after the animals and the people around the exhibit that may be affected by your actions.
OH&S requires you to follow legislation/acts and procedures.
Establishments are required to hold such documents like MSDS (Material Safety Data Sheets) and SOP (Standard Operating Procedures) and carry out hazard identification procedures and risk assessments and all staff are required to wear PPE (Personal Protective Equipment).
When dealing with Eastern Bearded Dragons PPE is required to help protect the animals welfare as well as your own. E.g. Boots are needed as aggressive Eastern Bearded Dragons can latch on to the boots, also protection when cleaning the enclosure or capturing another animal in the enclosure.
When examining the exhibit/holding area for OH&S issues things you should look out for can include:

- Wire dags.
- Gaps on the bottom and on the sides of gates were animals can escape but also rodents can get in.
- The substrate is even and has no hazardous objects located in it.
- Temperature of water bodies.
- Plants are well kept and are suited to the animals housed (nontoxic).
- Glass/ Perspex is properly fitted and check for chips and cracks.
- The enclosure is clean always (cleaned regularly and as needed).
- All animals that are proposed to move into the enclosure are checked for any health conditions.

- Public access into the enclosure is very limited and keeper access is easy.

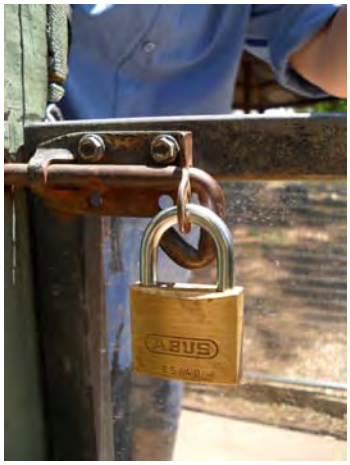
Signs and warnings are a great way to warn any staff members or members of the public to what lies ahead. The following may be used:

Figure 1.Taken by Author demonstrating signage.

Figure 3. taken to demonstrate signage.

Figure 2 taken by Author demonstrating signage.

Figure 4. taken by Author to demonstrate locks needed.



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1 Introduction

This manual is about the Eastern Bearded Dragon only.

Scientific name being *Pogona barbata*.
Family being Agamidae.
Order being Squamata.

There are over 300 species of the Agamidae family found in Africa, Australia, Asia and southern Europe. Many of these 300 species share the common name of Dragon from the Eastern bearded dragon found on the eastern coast of Australia to the Komodo Dragon found on the islands of Komodo, Flores, Rintja, Gili and more.
Members of the Agamidae family may also be genetically related to the members of the Iguanidae family and share many common physical traits.
Species belonging to the Agamidae family share common traits such as well developed, strong legs. Their tails cannot regenerate like other lizard species such as the Blue Tongue Lizard. Many of these species are able to manipulate the pigment colour of their skin to a certain degree as a self defence mechanism. These species are also unique as that they are able to thermoregulate. Often males will be a brighter colour than females as colours play a large part in signalling for a mate. Most Agamidae species are found in warm habitats ranging from hot deserts to tropical rainforests. One of the key distinguishing characteristics of this family is their teeth. The teeth are borne of the outer rim of the mouth unlike other families of lizards which have their teeth on the inner side of the jaw. This feature is also shared with chameleons but is otherwise unique to this family. Most members of this family are usually diurnal meaning that they are most active during the day. These species also share good vision which is useful for their diet of insects.

Uniquely the Eastern bearded dragon is the largest species of dragon in Australia, being a dark brown to black in appearance to blend in with their usual habitat. They were taken out of their habitat and into wildlife institutions to be on display as they are quite unique in appearance and are native to Australia.

1.1 ASMP Category

ASMP – Australian Species Management Program.

According to the ASMP regional census and plan 2010 the ASMP Reptile and Amphibian TAG has No Regional Program for the Eastern bearded dragon.

1.2 IUCN Category

IUCN – International Union for Conservation of Nature.

This species is listed under the IUCN Redlist (IUCN, 2010) due to its wide distribution as below:

Pogona barbata status: least concern.

Pogona barbata population trend: Stable

1.3 EA Category

As known before being EA (Environment Australia) is now named the Australian Government, Department of Sustainability, Environment, Water, Population, and Communities has listed the Eastern bearded dragon with:

- Negative state protection.
- No threatened status listed as it is not considered under threat.

All species from the Reptillia family are protected. It is illegal to obtain and keep reptiles caught from the wild. National Parks and Wildlife Service's issue licenses and permits that are required to keep reptiles.

NSW contact information:
National Parks and Wildlife Service
Phone: (within NSW) 1300 361 967 or (02) 9253 4600

1.4 NZ and PNG Categories and Legislation

NZ- New Zealand. PNG- Papua New Guinea.

The legislation and categories for the countries listed above is non-applicable as the Eastern bearded dragon is native to Australia.

1.5 Wild Population Management

Non- applicable as the Eastern bearded dragon is not listed as threatened so wild population management is unnecessary.

1.6 Species Coordinator

There is no current species Coordinator.

1.7 Studbook Holder

There is no current Studbook Holder.

Taxonomy

1.1 Nomenclature

Class: Reptillia.
Order: Squamata.
Family: Agamidae.
Genus: Pogona.
Species: *Pogona barbata*.

Figure 2.1 Eastern bearded dragon

1.2 Subspecies

To the Eastern Bearded Dragon there are three main subspecies these include:

- *Pogona henrylawsoni* – Downs Bearded Dragon.
- *Pogona minor* – Dwarf Bearded Dragon.
- *Pogona vitticeps* – Central/ inland Beaded Dragon.

These subspecies are located are these positions below around Australia:

Figure 2.2 *Pogona henrylawsoni* located at blue dots.

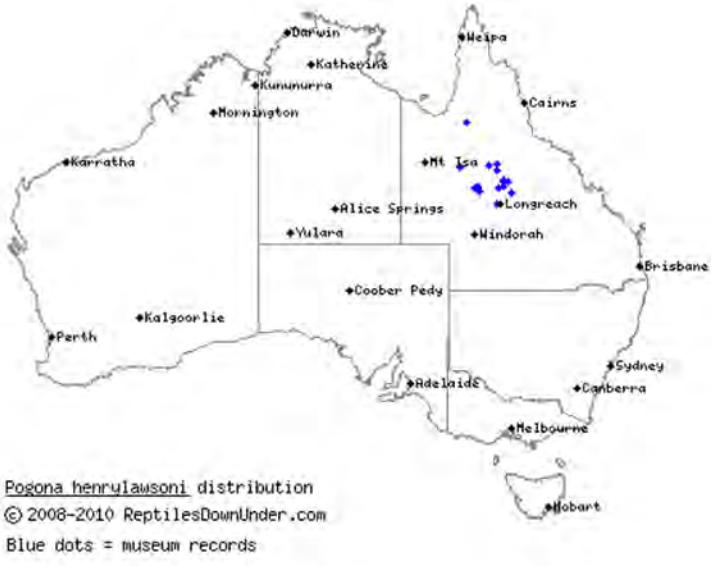


Figure 2.3 *Pogona minor* located were blue dots are displayed.

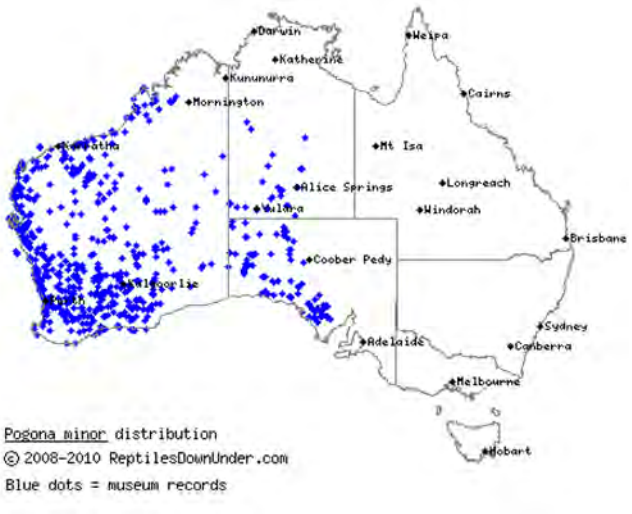
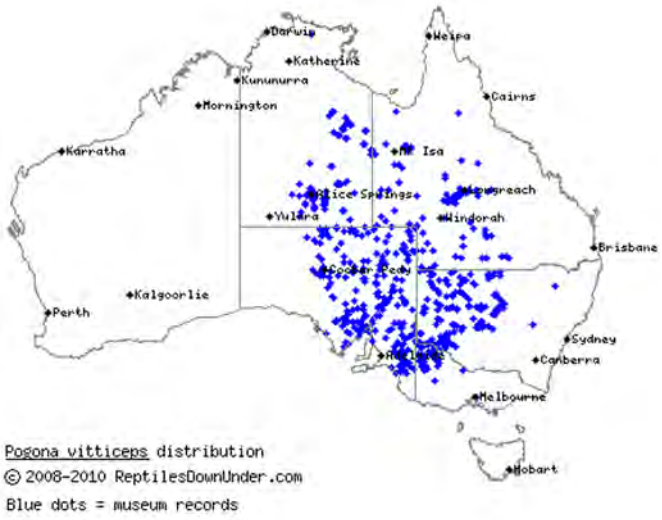


Figure 2.4 *Pogona vitticeps* located at blue dots.



1.3 Recent Synonyms

Bearded dragon, beardy, Coastal bearded dragon.

1.4 Other Common Names

Frilly lizard and EBD (Eastern Bearded Dragon).

Natural History

The Eastern Bearded Dragon is native to Australia and are found on the eastern coast of Australia. The eastern bearded Dragon founded their names by their appearance, their beard like flap of skin located on the underside of their throat and side of face expands as a warning to predators. There are three commonly found bearded dragons in Australia, the central/ inland bearded dragon, the dwarf/ western bearded dragon and the eastern bearded dragon, there are also other subspecies located throughout Australia.

1.1 Morphometrics

1.1.1 Mass And Basic Body Measurements

The mass and body measurements are based on several points including:

- Full length from snout to tail.
- Start of head to back of head or start of neck.
- Height and weight.
- Snout to vent.

The measurements recorded are averaged data collected these being:

- Full length, 40 to 48 if male.
- Full length, 38 to 42 if female.
- Start to end of head, roughly 5cm if male and slightly smaller for female.
- Height, roughly 5cm if warm, roughly 3 if flat/ cold.
- Weight, up to 2 – 3kg.
- Snout to vent, roughly 25cm.

1.1.2 Sexual Dimorphism

Sexual dimorphism is recognized by size, weight and present hemipene. Unfortunately the colour difference between the female and the male eastern bearded dragon is unrecognizable unlike the relatives the water dragon (Physignathus lesueurii) whereby the under belly is red on a male unlike the female.

A hemipene is an intromittent organ present on a male only and will show in times of sexual activity. The vent were the excretion from the bearded dragons body is from is where the hemipene is located. Experienced professionals can attempt to “pop” the hemipenes to determine the gender of the reptile, with chanced success. The act of “popping” can be quite harmful to the dragon if you are not sure what you are doing.

Figure 2.5 The vent of an eastern bearded dragon.

1.1.3 Distinguishing Features

Bearded dragons are recognized by their “beard like” facial feature that erects when warning predators, other individual and displaying masculinity/strength.

The eastern bearded dragon is easily distinguished by their colour being a shade of black to grey with a pattern of dark brown on their back, also the colour of their mouth being a distinct yellow as seen in the figure below. In addition to colour the eastern bearded dragon’s size is a dead giveaway as they are considerably bigger than their sub species.

Figure 2.6 Eastern Bearded Dragon.

Distinguishing the eastern bearded dragons from their close relatives the inland/coastal and the dwarf/western bearded dragon is recognized by colour and size. The central/inland bearded dragon has a yellowish to orange appearance and they are also smaller in size compared to eastern bearded dragons as seen in figure 2.7.

Figure 2.7 on Inland bearded dragon.

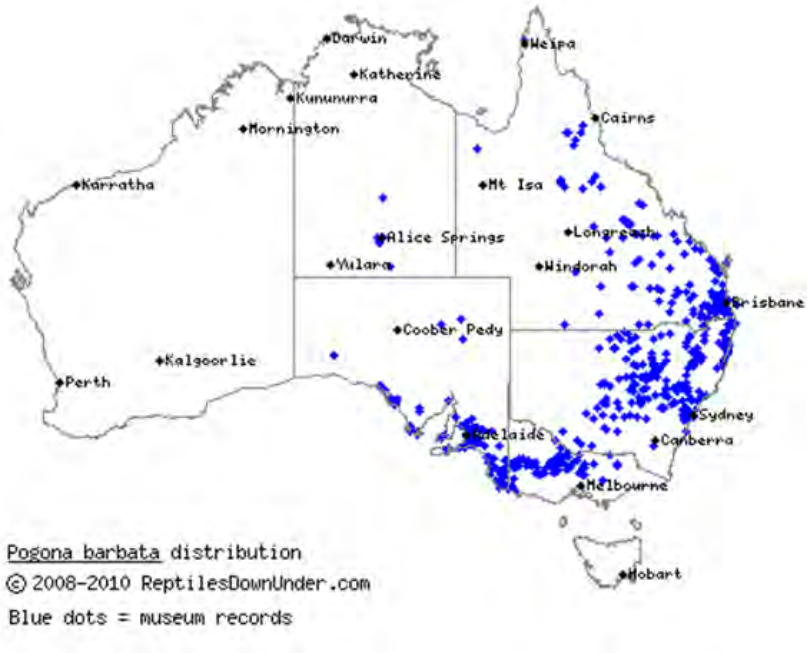
Figure 2.8 on Dwarf/western bearded dragon.

The dwarf/western bearded dragon are a tan colour but are noticeably smaller being one of the smaller species of dragon known as seen in figure 2.8.

1.2 Distribution and Habitat

The eastern bearded dragon is found among the eastern coast of Australia as seen in the figure below.

Figure 2.9 shows locations on eastern bearded dragons throughout Australia.



Throughout this distribution shown above there is several habitats displayed including forests, health land, scrub and farmland which Eastern bearded dragons can be found living within.

Figure 2.10Forest habitat.

1.3 Conservation Status

The eastern bearded has no status towards conservation as the species is not considered to be threatened, for IUCN status refer to section 1.2.

1.4 Longevity

1.4.1 In the Wild

Longevity in the wild differs to captive recordings slightly. In the wild it has been recorded that the maximum age is around 12 and the average age is around 9.

Whilst knowing the ages that the eastern bearded dragon can live to there is also a lot of factors that contribute to many not surviving for this amount of time. In rural areas domestic animals such as dogs and cats are the cause of most of their deaths. Roads are also a major factor being that the tar attracts heat and the dragon loves to bask.

In the secluded bush predators which can range from medium to large sized birds to brown snakes are the bearded dragons most worry. The Eastern bearded dragon's appearance helps to camouflage to act as part of their defence mechanism giving them some advantage as they can lay still for long periods of time.

1.4.2 In Captivity

In captivity the recorded maximum age is 14 but on average can be around 10.

Factors that can contribute to the death in captivity is hypothermia and hyperthermia (hypo- being body temperature decreased, hyper – being body temperature increased) also thermal burns and nutrients not being met in their diet. To see other health problems look to section 8.4.

1.4.3 Techniques Used to Determine Age in Adults

The techniques you may like to use to determine the age of your dragon may include the following:

- Records kept within institution or within ISIS (International Species Information System) or ZIMS (Zoological Information Management System)
- Knowledge of the animal/s from yourself.
- Size.
- Weight.
- Sex.

2 Housing Requirements

2.1 Exhibit/Enclosure Design

Whilst designing an enclosure/exhibit for the Eastern Bearded dragon many considerations need to be though out. An exhibit/enclosure will generally be on display and therefore needs to be aesthetically pleasing; incorporating visual dynamics with behaviour and physical requirements can be quite easily done including the following factors:

- Secure surroundings (no gaps in fencing and gates).
- Locked gates for security reasons from public.
- Hiding spot, whether it be natural or manmade (plants or mock-rock)
- Heat source.
- A place to cool/shade.
- Security from non-captive animals (no bird can fly in and decrease collection).
- Water source.
- Food allocations (whether it be in one or many places)

Most display enclosures mimic the environment of the species natural habitat as seen in figure 3.1 below, this is well achievable by placing native plants and furniture into the enclosure as seen in figure 3.2 this can also help with shading from heat.

Figure 3.1 Eastern bearded dragon at Calmsley hill city farm.

Figure 3.2 figure of Mat rush- Lomandra longlifolia

For more planting ideas seek in appendix.

2.2 Holding Area Design

The holding area for an Eastern Bearded Dragon can be made from a variety of materials and does not have to be visually pleasing as long as all behaviour, dietary and physical requirements are being met.
The size of a holding area are considerably smaller than their usual display enclosures simply because the holding enclosure is meant for purposes of holding the animal for a short time, or the purposes below:

- Quarantine.
- Sunning.
- Internal movement within the institution.
- External movement.
- To examine the dragon.
- To remove from other animals in the exhibit (exclusion).
- Holding area whilst cleaning.
- Breeding.
- To introduce a new dragon to the collection without danger of injury from fighting.

Noegel cages are commonly used as a holding area simply because once finished they are easy to clean, they are sturdy and all can be made to fit any size of animal from small to large. An eastern bearded dragon will comfortably live in a Noegel cage for a considerable amount of time if there is a covered bottom with suitable furniture to meet the physical requirements as seen in figure 3.3.

Figure 3.3 Example of a Noegel cage.

Fish tanks can also be used as a holding area as long as the top is covered with mesh so appropriate air flow can develop and the bearded dragon cannot escape, only trouble is that an enclosure like a fish tank is hard to transport and is not as easy to clean as other holding cages are.

Figure 3.4 Fish tank converted to house a species of snake.

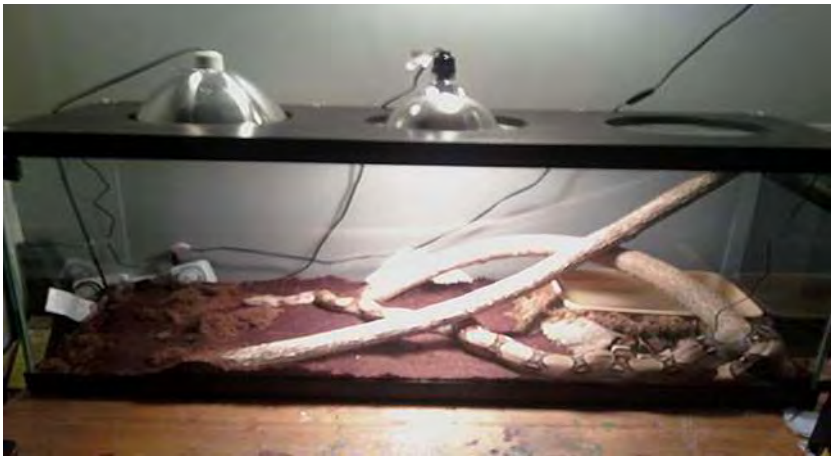


Figure 3.5 Holding area at Canberra national zoo and aquarium.

2.3 Spatial Requirements

The EAPA (Exhibited Animal Protection Act) requires that every animal on display have exhibits that met the requirements of the animal/s needs being physical, mental and behavioural.

Extract 1. Purpose of spatial requirements.

Clause 2, Purpose of the standards

1) The standards within this publication have been developed to maximize the welfare of animals in captivity and cover a range of areas including:

- *Psychological and physical animal welfare;*
- *Educational value of exhibits;*
- *Public safety;*
- *Guidelines for new and existing displays; and*
- *Legal effect.*

A holding area of an Eastern Bearded Dragon should be on average of one meter wide and 30cm tall, air vents should be located throughout the holding being on the sides and on the roof.

The holding should be able to let sun through and keep a barrier from wind and rain, also should be able to have a warm side and a cool side of the enclosure because bearded dragons thermoregulate to control their body temperature.

Multiple eastern bearded dragons can be housed in a holding area of this size but more than two will overcrowd the enclosure and will not leave enough room to meet the requirements, either a separate cage needs to be used or a hardy expansion needs to be undergone to fit more to the collection in this particular enclosure.

2.4 Position of Enclosures

The position of the holding area depends on the weather and temperature of the day and the condition of the dragon. Eastern bearded dragons love to bask in the sun but on forty degree days the enclosure should not be housed fully in direct sunlight, removing the enclosure into controlled environments that are suited to the dragon is preferred either inside a building or in the shade.

To avoid cold weather affecting your dragon, personally moving the enclosure to a temperature controlled room that is suited to the dragon is preferred once again, also installing a heat lamp inside the enclosure but out of reach to the dragon, can also control the temperature.

Offering at all times a heated end and a cooler end of the enclosure will allow your bearded dragon to reach their own PBT (Preferred Body Temperature) by use of thermoregulation whereby the dragon statically positions their body in the enclosure to control and reach PBT. The PBT of the Eastern bearded dragon being around the 35 degrees Celsius.

2.5 Weather Protection

The Eastern Bearded Dragon housing should be semi open to allow the sun to shine through but allow the animal to move into the shade when needed. The enclosure should not be open to direct rain or wind.

The enclosure/ holding should be moved if the animal/s health is at risk, environmental health risks including hyperthermia (body temperature too hot), hypothermia (body temperature too cold) and burns from direct sunlight.

Whilst on display outside there are plenty of strategies to ensure that your eastern bearded dragon isn't too affected by the environment. Placing a shade cloth over the enclosure can protect direct sunlight from burning your dragon, also the use of plants, trees and water bodies can also help to

keep the dragon at the PBT, enclosures that provide a mixture of sunlight and shade is preferred as per the figure below.

Figure 3.6 Enclosure at Calmsley hill city farm example of Shade.

2.6 Temperature Requirements

The eastern bearded dragon is a reptile therefore being cold blooded, in order to reach their PBT dragons use a method called thermoregulation. Thermoregulation is a technique that an animal uses to control their body temperature by strategically placing their bodies near a heat source to warm and in shade or a wet spot to cool, therefore the use of heating is required in the eastern bearded dragon's enclosure.

The dragon PBT (Preferred Body Temperature) is roughly 35 degrees Celsius but depending on the individual it may be higher or lower. Reaching the PBT is easily done by positioning themselves strategically in the enclosure therefore a heat source needs to be provided by either UVA or UVB lights.

UVA is ultraviolet radiation with a range of 315--380 nanometres, this is in the region of the ultraviolet spectrum which is nearest to visible light and causes tanning and contributes to aging of the skin therefore growth can occur.

UVB is ultraviolet radiation with a range of 280--315 nanometres, this is in the region of the ultraviolet spectrum and that is primarily responsible for sunburn, aging of the skin, and the development of skin cancer. Using a UVA and UVB is important to make sure that the dragon is receiving all types of vitamins and minerals produced.

Another heat source other than heat lamps are also available, such as sun/heat rocks, these can offer a creative decoration to the exhibit as well as meeting the dragons heat needs, rock heaters are available on the pet market for a small price and can range in sizes as shown in figure ?. It is also important that dragons receive natural sunlight as a natural source of vitamin D.

Figure 3.7 Heat rocks available on the market.

Figure 3.8 Heat lamp.

Figure 3.9 UV heat lamps available on the pet market.

2.7 Substrate

The substrate options needed to comfortably house the eastern bearded dragon is veritable, the options can include natural substrate (leaves, soil, stones, sand), the environment they live in is bush land where they can easily blend in as a defence mechanism so imitating this substrate may help a wild caught dragon feel more safe and comfortable and looks great as a theme for the enclosure.

Other substrates that can be offered are kitty litter for a fully grown dragon so they do not swallow the pellets. Kitty litter is easily cleaned and is soft enough to be used as bedding. Another alternative is a product called kritters crumble, this is a absorbable product that acts the same as kitty litter but has the appearance of bark so will look great as a natural looking substrate that is easily cleaned. Paper towel/newspaper can be used on juvenile's bearded dragons as they will not consume it and it is easily removable and applied.

2.8 Nest boxes and/or Bedding Material

The eastern bearded dragon usually will sleep near a heat source near their PBT, so placing a level rock or mulch or soft grounding near this place will comfort your bearded dragon.

As for nesting material bearded dragons are oviparous (reproducing by laying eggs) and will dig into the substrate to lay eggs, to consider innate behaviour your substrate will need to be deep enough to allow the dragon to dig to lay eggs. A substrate being roughly 10 to 15cm deep should cover this behaviour. This deep substrate can be placed into the enclosure when behaviour concluding to breeding is recognized to reduce cleaning at non breeding times.

2.9 Enclosure Furnishings

The furnishings should match your substrate theme if on display to help look aesthetically pleasing. Furnishings can also enhance your enrichment strategies by giving them such things like materials to climb being logs etc. Furnishings may include any purpose put materials in the enclosure this may be grasses, plants, water bodies, logs, branches and rocks.

If in an open enclosure a shelter must be provided to keep the wind and rain from entering at particular points, also giving the enclosure shade from the heat of the day. Plants and shrubs can be used as furniture to enhance the theme of the enclosure and also give a place for your eastern bearded dragon to hide from view if scared but also hide from heat and provide diet (insects that house in the plants or shrubs).

Food and water bowls are also included into the furniture as a need for the dragon as seen in figure ?, water bowls and feed bowls can be made out of mock rock to suit the exhibit theme whilst providing dietary requirements.

Figure 3.10 Food and water.

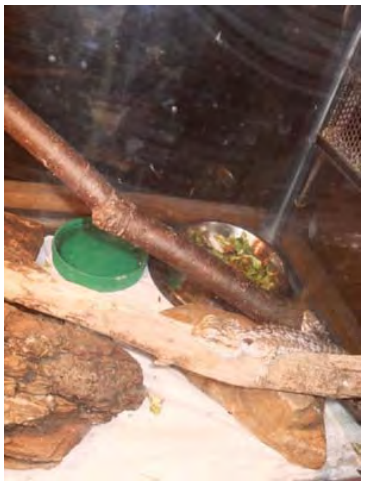


Figure 3.11 Natural furniture.

3 General Husbandry

3.1 Hygiene and Cleaning

The Eastern bearded dragon does make mess but routine cleaning and general husbandry will help keep the holding/enclosure clean and comfortable and help keep a healthy dragon. The changing of the substrate being usually mulch, leaves and soil should be done fortnightly to monthly, cleaning of the rocks/ natural substrate should be done when needed and their dragon's favourite area should be checked for cleaning daily otherwise when needed.

Food containers and water bowls should be cleaned daily and can be easily carried out whilst feeding or doing daily distant examinations. Their nesting areas should be thoroughly cleaned after every breeding season and the entire enclosure should be cleaned fully half yearly, when doing this check and replace if needed the UV light/heat light. Only environmentally friendly products and animal safe chemicals/products should be used to ensure the Eastern bearded dragon safety.

Check for the seals/locks on the enclosure to make sure no other animal or rodent can get in and the bearded dragon can get out, also check for chips/scratches on the glass/Perspex.

Table 1. Cleaning regime:

Daily	*Monthly*	*Half yearly*	*Yearly*
Clean water bowls.	Change substrate.	Clean entire enclosure.	Clean entire enclosure.
Clean food bowls.	Clean glass or Perspex.	Check lighting.	Change furniture if needed.
Favourite spots if Needed cleaning Being rest areas.	Check seals, locks.	Check heating sources.	Check lighting and heating.

In regards to the chemicals used during the process of cleaning there are several choices all being animal friendly but one commonly used and that it Vira clean. Vira clean is a disinfectant used to clean out enclosures and is human and animal safe, Resolve can also be used as a heavy duty detergent and sanitizer and to clean any glass or Perspex area's clear reflections window cleaner can be used whilst being safe.

All MSDS (Material Safety Data Sheets) can be seen in appendix.

3.2 Record Keeping

Records in captivity should be up to ISIS (International Species Information System) standards. Recorded details may include:

- Medical/health.
- Breeding habits.
- Changes in diet.
- Changes in behaviour.
- Acquisitions.
- Dispositions.
- Births/hatchings.
- Deaths.
- ID, being name and number.
- Enclosure number (Position in institution).
- Relatives and gene line.

Records are important to maintain information on a species to update husbandry manuals, also to help with breeding programs, to know the key of initial heat, then breeding and births. Keeping records can also help with recognizing a medical issue arising in your animal or collection. Records should be kept in a safe place if not a data base and should be kept for the life of that species in the institution.

3.3 Methods of Identification

The methods of ID can range from long term to short term, visible to invisible (microchip), male to female and also can be determined via individual markings/names if feasible for the animal.

The Eastern Bearded dragon most commonly used form of identification is visible markings on the individual also the height and weight of the individual, including gender. Enclosure sheets that include numbers, gender and names are also a great way to determine the individual. As a pet owner of the eastern bearded dragon it is usually behaviour and markings that determine individuals.

3.4 Routine Data Collection

For purposes of research or identification routine data collections are needed to record such details as:

- Breeding.
- Behavioural changes.
- Interaction between other members of the collection.
- Territory in the exhibit (favourite places).
- Weight.
- Height.
- Length.
- Food intake.
- Consistency of faecal matter.

It is best to keep these details so when changes show in your dragon you notice and act straight away, as in the wild they won't show weakness until almost deceased.

4 Feeding Requirements

The eastern bearded dragon are omnivores meaning they are opportunistic feeders and will eat meat and vegetation. Whilst the dragon is a juvenile they will consume more protein being meat in the forms of cut up meal worms, small crickets etc. Once grown the dragon will start to consume more vegetation then meat, so providing a mixture of both is beneficial.

It is illegal to feed out any vertebrate species as cruelty is encouraged by the motion. Invertebrate animals can be feed out live to all species of animals, being sure that correct measures are taken before hand being disease free, this can be achieved by buying invertebrates at pet stores or breeding your own. Any vertebrates that are planned to be incorporating in a diet need to be humanely euthanized beforehand. Euthanasia can be done humanely by the use of gas, dislocation, lethal injection (lethal injection can be passed from host to animal feed out to) etc.

4.1 Diet in the Wild

Being omnivores they have a variety of food available in the wild with its selections mainly varying on season, their diet may consist of:

- Cockroaches.
- Crickets.
- Meal worms.
- Locusts.
- Various species of other worms.
- Leafy greens.
- Sprouts.
- Dandelion leaves.
- Cabbage.
- Turnip greens.
- Parsley.
- Carrot tops.
- Various types of lettuce.
- Different species of flowers.

The adult Bearded Dragon will eat more vegetation than a juvenile with a ratio of 70% vegetation and 30% meat and juvenile being 60% meat and 40% vegetation, with that in mind seasonal fruits may take part in the bearded dragon's diet these may include:

- Grapes.
- Strawberries.
- Raspberries.
- Papayas.
- Melons.
- Apples.
- Peaches.
- Pears.
- Orange fleshed squashes.
- Mangoes.
- Pumpkin and beans.
- Carrots, peas and beetroot.

These fruits listed above take part in their wild diet meaning that the dragon would have to forage for a great deal of time to find the food, so the placement and the preparing of the fruits and vegetables and meat will need to be carefully thought to encourage the dragon to forage.

4.2 Captive Diet

The diet of an eastern bearded dragon in captivity can replicate the wild diet with most food accessible in supermarkets and in pet/reptile supply stores. All fruit and vegetables given out for feed must be chopped finely to avoid suffocation.

Any left-over food that you may be planning on feeding your dragon must be in good condition as rotten fruits, vegetables and meat will not agree

with the dragon's digestive system. As well as scouring may occur with rotten/off food, the absorption of vitamins and minerals will be limited.

For meat options crickets, cockroaches and specific worms can be purchased at a low price roughly around $5 to $10 Australian dollars at any pet supplier or reptile supply shops.

The diet of the eastern bearded dragon will change with the season, being a cold blooded animal, summer it will intake more with the temperature rising as energy levels rise and in winter their diet intake will be less with the dragon holding less energy to find the food.

The presentation of the food will need to encourage the Eastern bearded dragon to forage for the food as part of their dietary enrichment, live crickets and cockroaches are a good way to enrich the dragons dietary intake in the warmer months as they will have more energy to stalk the feed. Placing the food bowls in several places will encourage the dragon to search for the food at their own pace during the cooler months. Scatter feeds can also be a great way to encourage the dragon to forage.

All fruits and foods listed will fully complete their diet when interchanged, the meat should be given out in quantities of one to twice weekly and the vegetation and fruits should be given out in small amounts daily, depending on the individual and the age, the food will need to be increased or decreased.

Table 2. Diet during summer months.

Summer months…..						
M	T	W	T	F	S	S
3-4 Meal worms and chopped leafy greens.	Crickets through artificial feeder.	Chopped vegetables.	2 small live Cockroaches.	Seasonal fruits chopped.	3-4 Meal worms and chopped leafy greens.	Chopped carrot tops and cabbage.
Crickets through artificial feeder.	2 small live cockroaches, small amount of leafy greens.	Seasonal fruits chopped.	3-4 Meal worms and chopped leafy greens.	Chopped vegetables.	2 small live cockroaches, small amount of leafy greens.	Seasonal fruits chopped.

If in outdoor enclosure, along with diet supplied wild insects may be consumed by dragon and cause lack of interest in food handed, monitor and adjust food amounts.

Starve days may be applied, noting that all feed listed should be given out in small amounts. Scatter feeding is suggested during this period as they will burn energy to find food, Dietary enrichment. Winter month's diet should be decreased as they do not burn the same amount of energy.

4.3 Supplements

In captivity supplements will need to be given out to balance a captive Eastern Bearded Dragons diet to one healthy wild Dragons diet, such products are on the market being successful in producing enough supplements to enrich the bearded dragon's diet and fully completing their diet. Vitamin C and D can be purchased to enhance heath but warnings apply over/under supplementation can cause harm to the dragon's health.

Figure 5.2. Dragon feed.

The figure above is a brand of specialized Bearded Dragon food that will give the adult and the juvenile a complete diet and will supplement their existing diet when needed.

4.4 Presentation of Food

The presentation of the food is important as part of their daily/weekly dietary enrichment. Live cockroaches, crickets and worms are locomotive so therefore presentation will not be required except for if live feeds are given whereby the preparation required is filling the automated/manual termite feeders and place into the enclosure.

With fruits and vegetables the presentation can simply be delivered in a bowl being placed at different places of the enclosure to keep the dragon guessing or scatter feeds can be done to encourage foraging.

5 Handling and Transport

5.1 Timing of Capture and Handling

The eastern bearded dragon is a cold blooded animal which means the dragon is less active when the animal is cooler, capturing the bearded dragon would be best done early morning before the public arrive and escaping the heat of the day as dragons are less active. In summer controlling the temperature of the enclosure would be your best option to cool the dragon down to keep the dragon less active, decreasing the temperature to a degree or two below the PBT would help to capture.

5.2 Catching Bags

The eastern bearded dragon can be caught using the aid of a catching bag. Wild bearded dragons can be aggressive and hard to handle so experienced handlers should either assist or handle the capture themselves. Cotton is the best used fabric and a pillow case is the perfect size for capture. Catching bags range in size and extras including handles etc. as seen in figure 6.1 and 6.2. With catching bags checking that the corners have no extra string is crucial as the string can be partly ingested or can wrap around body parts.

Figure 6.1.

Figure 6.2.

5.3 Capture and Restraint Techniques

The capture of the eastern bearded dragon can be done with the use of a catching bag. To capture the dragon using the catching bags use the following instructions:

- Making sure that the bag is around the right way, place your hand in the bag, thumb and index apart.
- Approach the dragon from behind.
- In a quick but secure manner place your thumb and index either side of the dragon neck (straight behind the beard), this is done so that the dragon cannot turn around and bite you as seen in figure 6.3.
- With a firm grip so the dragon does not escape pull the bag over and under the dragon so that the dragon is surrounded by the bag.
- Close the top of the bag with one hand and let go of the dragon with the other.
- To secure the bag you will need to place the dragon on firm ground and spin the top of the bag only to create a spiral that then folds over and tie the top of the bag with an elastic band, the bag should end up reversed so that the corners of the bag that have cotton dangling are not caught around the dragon body.
- Using this technique to secure means you can transport the dragon in the bag for a short period of time knowing that the dragon is secure.

Capture can also be done without a bag using the same technique of securing the neck then lifting in a quick manner into the holding area prepared earlier. It is important to have all equipment and holdings ready before you capture, holding the dragon for a prolonged period of time can cause harm to you as they might become distressed and may scratch and become uncontrollable.

Figure 6.3 Restraining.

5.4 Weighing and Examination

The restraint for the weighing of the eastern bearded dragon can be done with the animal inside the catching/restraint bag, with the bag secure simply place the dragon on the scales and record your findings, it is usually great to compare this reading with the last to observe any weight loss or gain to control their diet, if weight is stable and it is an adult then your dragon seems healthy by the readings. It is important to weigh the catching bag as well to minus the total reading of weight and get a true reading.

A distant examination can be done whilst observing the dragon daily or when feeding and giving water and general cleaning. A close examination can be done whilst the dragon is caught in the catching/restrain bag. Using acute movements of the bag to reveal different body parts is best to close examine, making sure that they are restrained by the neck the whole time so biting through the bag cannot occur. For more information on close and distant examinations seek section 8, health requirements.

5.5 Release

The release of the eastern bearded dragon can be done easily when the dragon is in the capture/restrain bag. Simply undo the secure top then twist undone, place hands on the bottom corners of the bag then slowly slant the bag slightly to encourage the dragon to the top of the bag and finally released. To release without the bag technique simply capture again and swiftly move to the designated release point, using a container is recommended so that no harm to you and the dragon will occur whilst internal movement.

5.6 Transport Requirements

5.6.1 Box Design

A container as seen in figure 6.4 is a great way to transport an eastern bearded dragon. The dimensions should take into account the dragon's size and weight, with the bearded dragon being less than 50cm long the container should accommodate being 1meter in length and 30 cm in width, this would comfortably fit one to two dragons with ease.

Air holes are mandatory for the appropriate air flow through the container and to maintain the temperature inside the container which should aim to be 1 to 2 degrees below PBT.

Labelling the container is mandatory if transporting more than one animal at a time so no confusion takes place. Date, species, time of capture and transport should be recorded on the box and on the ISIS program.

Figure6.4 Holding box.

5.6.2 Furnishings

The furnishings may include natural ground to imitate the dragons usual habitat, this may be possible from taking their substrate or furnishings from their own enclosure to have the individuals scent on it already therefore less stressful. A log or something to lay on needs to be present in the holding, this will allow the dragon to grip as transport is usually bumpy. As substrate you may have the ground from original enclosure but usually creditable kitty litter or paper towel can be used so that it is easily cleaned.

5.6.3 Water and Food

The placement of a water bowl is mandatory for any enclosure, so a small bowl is needed to be placed inside the container to provide hydration when needed. The food should be given out either before or after the destination if a short trip, if not a short trip feeding times should resume as per normal and should try and be presented as normal as well. Placement of a food bowl should be away from the water to prevent sogginess throughout the journey.

5.6.4 Animals per Box

The container can house from one to two adult bearded dragons. For juveniles depending on size maybe five to six can be housed in a transport container with the sizes one meter by thirty cm and a height of fifteen cm. When considering the amount to hold, consider the size of water and feed bowls as well as furniture, can a/or multiple bearded dragons fit comfortably in the holding for an excessive amount of time?.

Whilst travelling, holding two or more dragons will help them deal with the stress of movement. This can only be done if the dragons have been housed together recently so the pecking order has already been established, if not then the dragons should be held in separate transport containers as harm to each other will occur within the time of movement.

5.6.5 Timing of Transportation

The timing of the transport should be made out of the heat of the day especially in the summer, so morning will be the best time. Also if dealing within an institution morning is preferred to capture before any public arrives. If outside temperature is not a factor of the move then carefully controlling the temperature around and within the holding should be well thought out before the move, remembering that the PBT will be when the animal is most active so dropping the temperature by 1 to 2 degrees will help with capture, transport and release.

5.6.6 Release from Box

The release method can be done via the same as capture and restrain in section 7.3 Soft release is also a method used, this method allows the holding to be there as a safety precaution but allows the dragon to explore the new area in their own time or once heated to PBT.

Once released in the new enclosure if possible the old water bowl should be used so the dragon is aware of the hydration location.

Figure 6.5 Eastern Bearded Dragon's housed together.

6 Health Requirements

6.1 Daily Health Checks

Observations and distant examinations work best whilst cleaning and feeding. In a distant examination things to look for may include:

- Limbs are moving freely, no hesitation.
- Eyes are fully open and clear.
- Condition of the body is good, no skin unusually ripped/shedding.
- There are no discharges from nasal cavity, cloacal or ocular.
- The behaviour is normal according to the individual.
- The consistency of the faecal matter is normal with no signs of blood or scouring.
- No discoloration of the skin.
- No problems with shedding.
- The last food item is either finished or is partially eaten.
- The enclosure is normal; signs of nesting will be noticeable.
- Heat lamps are running as per usual.
- Water is clean.
- Furniture is in its proper place not gaping to trap any body parts.
- The lid and all sides of the enclosure are sealed.

6.2 Detailed Physical Examination

For a physical examination no chemical restraint is required for a placid captive eastern bearded dragon, simply material/catching bags to wrap around its body to stop it from moving whilst under examination. For an aggressive dragon or wild dragon chemical restraint can be used but only by your veterinarian.

6.2.1 Chemical Restraint

Chemical restraint is to be done by your veterinarian whom is familiar with your animal and regularly handles reptiles. Several chemicals can be used in order to restrain the eastern bearded dragon and other related reptiles.

Local anaesthetic and minor sedatives are used for minor surgeries and for a detailed physical exam on a wild or aggressive bearded dragon. Local anaesthetic or minor sedatives can also be used as an induction to a heavier anaesthesia. For the purposes of the physical examination these following sedatives may be used:

- Ketamine (20-100 mg/kg IM)
- Telazol (3-10 mg/kg IM)
- Propofol (5-15 mg/kg IV or IO)
- Medetomidine (25 to 100 micrograms/kg IM or IV)

All the above doses of anaesthetic should be used in small doses and increase if needed whilst under sedation, regular monitoring of the bearded dragons breathing should be done whilst under sedation and when waking from the anaesthesia. Remove objects from its transport enclosure/holding to make sure the dragon is safe when waking and replace objects when fully awake.

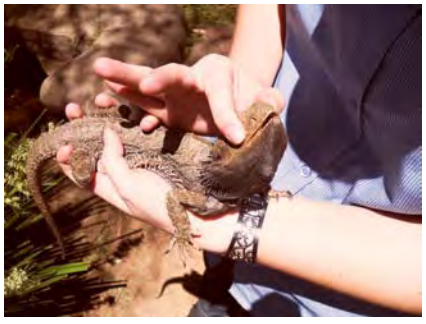
6.2.2 Physical Examination

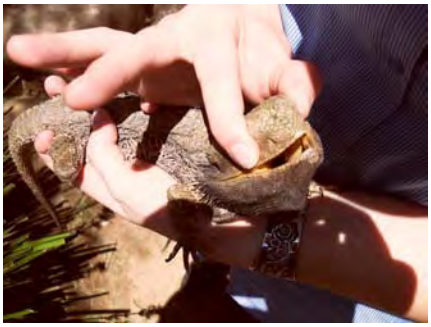
A detailed physical examination can include:

- The movement of all limbs, yourself looking for any unusual restriction.
- Opening of the mouth to check if any remaining food lies within also the condition of their teeth, any discharge e.g. Blood. Inflammation of the gums can mean infection or a lodged item of food.
- Faecal samples are tested with 1+ or under parasites found.
- Temperature is taken and is normal.
- Weighing, height and growth are recorded; revise to check any major difference in prior records.
- That any shedding of the skin is natural.
- Checking the condition of the skin; looks clean and well-kept and no discoloration and no signs of blood or bite marks.
- All scales are not lifted and sit in place as per usual.
- Checking for any mites that may be heavily hooked on to the skin.
- No discharge from nasal cavity, cloacal vent or ocular.

Figure 7.1, 7.2, 7.3. Author illustrating the correct method for opening the eastern bearded dragon's mouth.

Figure7.1 Figure 7.2 Figure 7.3





By placing your finger over your dragons eyes and slightly pulling backwards will encourage your dragon to open its mouth, this strategy makes it simple

to check the mouth for left-over food, teeth in good condition, no inflammation of the gums or any discharge possibly being blood.

6.3 Routine Treatments

The proper nutrition and husbandry are important when preventing illness and parasites in your eastern bearded dragon. Daily distant exams and frequent physical examinations should be taken in order to ensure your dragons health.

Keeping all new acquired eastern bearded dragons under quarantine conditions whilst being cleared will further decrease the chance of the bearded dragon contracting any diseases and parasites. If any individual in the collection are showing signs of health issues remove the individual from the enclosure and proceed in further health checks and tests. To ensure your eastern bearded dragons health, only collect parasite free furniture and keep the enclosure clean as per section 5 advises.

6.4 Known Health Problems

Eastern bearded dragons suffer from many diseases and disorders, some of these are easily recognized and treated but most are not considering that the bearded dragon does not show signs discomfort as a defence mechanism. Some signs the eastern bearded dragon will show is the slight change in behaviour, discoloration of the skin, loss of appetite (anorexia), decreased movement etc.

Most health problems may occur when a new dragon has been added to the collection so proper quarantine needs to be undergone. Feed is also a big cause as the dragon can catch the disease from the host by eating it. Collecting furniture from wild areas may increase the chance of the eastern bearded dragon contracting diseases and parasites, to decrease the risk of this occurring furniture can be purchased pre-treated.

Diseases and disorders that the eastern bearded dragon commonly contract are:

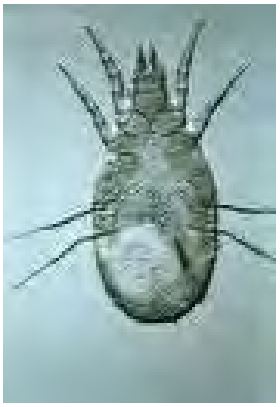
- Mites.
- Thermal burns from heat lamps.
- Vitamin A toxicity.
- Terminal ingestion.
- Coccidia.
- Pin worms.
- Respiratory infections.
- Metabolic bone disease (MBD).

MITES: mites can be noticed in your daily distant examinations and can be treated straight away. The mite is a parasite that leaches on the victim and falls of eventually when it is satisfied with blood intake, leaving the animal sick in the process, the mite usually gathers around the eyes and the corners of the mouth and also around the ear openings.

The mite can be treated via veterinarian instructions and the treatment may take up to a month of continuous care because the eggs from the mite may be left on the dragon, these eggs can take weeks to hatch and removal must be taken care of straight away.

The eastern bearded dragon with the mite infestation must be removed from the collection or the cycle will be harder to stop as the mite has a large reproductive rate.

Figure 7.4. Mite.



THERMAL BURNS: The eastern bearded dragon has been known to get severe burns from heat lamps located in their enclosure or natural sunlight. This environmental disease can seriously injure even kill your dragon depending on the severity of the burns.

To prevent the burns from occurring make sure that the enclosure has both warm and cool spots by leaving half in the sun, half in the shade and/or covering the heat lamp with metal mesh making sure the dragon cannot access it and keeping an area of the enclosure cool as the dragons are cold blooded animals so they regulate their temperature by thermoregulation.

Figure 7.5. Thermal burn on a green iguana.

VITAMIN A TOXICITY: Is caused by over supplementing the dragon with a specified vitamin or multi – vitamin. Supplements should only be offered on a routine basis leaving space for the natural digestive system to take its course.

This overdose can cause the animal to form swelling around the throat and eyes then continuing to the body by bloating. In order to prevent this from happening the supplements should be recorded on a calendar and should

follow the instructions on the bottle of supplements and the advice from your veterinarian.

Figure 7.6. Multi vitamin offered to reptiles.

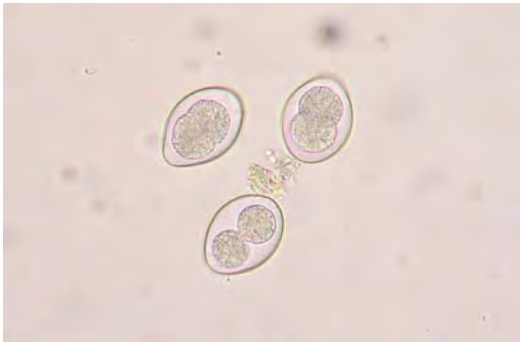
TERMINAL INGESTION: Terminal ingestion is often seen in juveniles dragon's when they swallow much more than what their digestive tract can push through their trachea, this is caused by the career not cutting their food to proportional size and by larger insects entering the enclosure and the dragon trying to eat it.

Substrate can also get lodged down the throat causing this ingestion. Terminal ingestion will cause their limbs to stretch out in order to ease the lodged food out, inducing bowel movement can be done by increasing the basking temperature or placing the dragon in warm water.

COCCIDIA: Coccidia is an endo- parasitic disease that is microscopic. This disease can only live and reproduce within an animal cell and commonly effects eastern bearded dragons in captivity.

This easily transmitted disease is hard to diagnose and eventuates when stress is suffered by the animal that can carry the disease without knowing. This disease can form into cryptosporidium which is near impossible to diagnose and is so far untreatable.

Figure 7.7. Coccidian cell.



PINWORMS: Pinworms is another endo- parasitic disease and is also microscopic. This parasitic disease will only be diagnosed when the infection is severe.

Pinworms are transmitted by the host organisms which may be feed out to your dragon. Hosts may include rats and mice and several insects. Veterinarians diagnose pinworms and can be treated by a higher level of prescription drugs. The prevention of pinworms in eastern bearded dragons is good husbandry and the feed cannot be wild grown/caught.

Figure7.8. Pinworm under microscope.

RESPIRATORY INFECTIONS: Although not so common in the eastern bearded dragon this infection can occur easily when poor husbandry is involved. This infection is caused by prolonged exposure to lower temperatures, poor enclosure conditions and improper humidity.

These conditions cause the dragon to have symptoms that show gaping, puffing of the throat and body, and forced exhalation. Treatment usually consists of antibiotics and changing the condition of the enclosure by increasing the temperature.

METABOLIC BONE DISEASE (MBD): is a well-known disease that occurs in reptiles. This disease has many causes including a deficiency in calcium which causes a disruption of calcium metabolism. MBD is preventable by a full efficient diet, good husbandry and good living environment.

Supplementary tablets can be added to their diet as another preventative measure but follow all directions on the bottle and/or veterinarian instruction. Your eastern bearded dragon may show signs of this disease being uncontrolled twitching of the legs and toes and a slow growth rate also deposit stores of calcium throughout the body, regular weighing and measuring can determine if the disease is relevant in your dragon and also daily health checks.

6.5 Quarantine Requirements

All acquisitions of eastern bearded dragons should be quarantined to ensure that no disease or parasites are present in the dragon to pass on to the rest of your collection. A minimum of one month to at most three months should be taken to ensure your collections health as some diseases cannot show until certain situations arise.

Regular faecal samples should be collected and tested to ensure minimum parasite count and treatment for that parasite is undergone quickly, once a parasite is found of more than 2+ treatment is to be given and once finished the quarantine period should start again.

Depending on where the eastern bearded dragon was located before the acquisition (wild to captivity or captivity to captivity) will depend on the animals health records that will determine the quarantine period.

A clean cage/ enclosure should be made up for the new acquisition with food/water, furniture and basics and should be erected away from your existing collection. All above diseases should be taken into account when acquiring a new bearded dragon and all relevant tests should be done if possible. Your veterinarian should be contacted to arrange the appropriate tests and examinations to be made.

7 Behaviour

7.1 Activity

The eastern bearded dragon is ectothermic therefore needing heat for energy, if housed in a temperature controlled environment your bearded dragon should have their own average amount of activity per day and should be recognized by their owners as part of their demeanour.

Near times of feeding the activity levels will rise and will decrease after feed and handling, the rest of the bearded dragon's time can be spent foraging, resting and being alert.

The eastern bearded dragon does not enter torpor or hibernation but enters brumation. Brumation is a type of hibernation, in the colder months if the dragon is affected by natural weather they may enter this brumation, in doing this they may become lethargic and in some instances not move at all during this cooler period. Usually in the wild they will find a place to brumation this is called hibernaculum, this can be a semi insulated place like caves, rock crevices, burrows or leaf litter.

7.2 Social Behaviour

The eastern bearded dragon interacts with other dragons when housed in the same enclosure; two females will result in an alpha female as well as two males. Housing males and females may result in successful breeding.

Feeding times will encourage interaction between the individuals kept whilst feeding live food like crickets and other moving invertebrates and also still food, fruits and vegetables etc.

The eastern bearded dragon can be housed in groups of one to four, being one dominant male to a weaker male and females.

7.3 Reproductive Behaviour

The behaviour shown in breeding season can be quite different to their usual demeanour, the behaviour displayed may include fights between males as they court the female, mating sessions may induce mounting behaviour also decrease in activity as they preserve the energy for the sexual activity and laying. Head bobbing and arm waving may also be a behaviour that your dragon displays coming into this period.

The eastern bearded dragon is a seasonal breeder. They use the environmental cue of first cooling then heat as a trigger concluding that they prefer to have their clutch hatch in the warmer months being spring and summer (September to February).

In an aggressive stance the eastern bearded dragon will appear like the figure below. This body placing shown is to perceive the dragon looking bigger than usual to intimidate other dragons and also predators, as shown their beard flares both below, side and above the head and the body is tilted to the side in which they are warning to. Opening of the mouth is also shown, whilst the mouth is open they will make soft hissing noises.

Figure 8.1 Eastern bearded dragon showing aggression.

7.4 Bathing

If acquiring an eastern bearded dragon offer a bath in the new enclosure, if there is a considerable amount spend in the bath then it may be worth keeping it and including it in your cleaning schedule, but generally eastern bearded dragons do not spent time bathing. At the institution Calmsley hill city farm the enclosure has a stream running through the middle with the option to have shallow or deep body of water, the dragons are never inside the water but always near. Relatives such as the eastern water dragon however spend a considerable amount bathing, if housing the two species together then a body of water needs to be implemented.

Figure 8.2 Enclosure at Calmsley hill city farm with water stream.

7.5 Behavioural Problems

Stereotypic behaviour is a common problem when housing and displaying any animal, as the Eastern Bearded Dragon will rest most of the day stereotypic behaviour is not much of a problem. The Eastern Bearded Dragon is only active when there is enough sunlight to increase activity, food provided and spatial requirements met therefore during feeding rounds the eastern bearded dragon will be most active searching for their food.

Public feeding is not required if housed in an institution, as the dragon may become aggressive around food. Rounds should be scattered throughout the day as the dragon may become accustomed to being feed at specific times of the day, automated cricket feeders are a great idea with dealing with this problem.

If conditioned the Eastern Bearded Dragon is quite friendly, being accustomed to human interaction will decrease most aggression except breeding seasons where human interaction should be kept to a minimum as they will protect any eggs laid and hatched. Conditioning should occur at an early stage of the dragons development, being used to human interaction will help with feeding and cleaning tremendously.

Typically the Inland Bearded dragon better suites captivity for handling and behaviour reasons, but in my experience with the eastern bearded dragon if conditioned well certain individuals are great to handle and some are just better on display as their beard is a great highlight.

7.6 Signs of Stress

In your dragon signs of stress may differ from one individual to another these signs may include:

- Decreased activity.
- Increased activity.
- Anorexia (loss of appetite).
- Increase in appetite.
- Displayed aggression.
- Display being timid and hiding.
- Repetitive behaviour.

7.7 Behavioural Enrichment

The enrichment provided should be used to increase the active behaviour of the Bearded Dragon. Automated cricket feeders are used to keep the

dragon well entertained throughout the day, these feeders can be purchased through specialized pet stores and work by a timed trap door opening and releasing small amounts of crickets per time as seen in figure 8.3.

Figure 8.3 Reptile Cricket feeder.

Scatter feeds also work well as the dragon must forage to find their food, mimicking their action in the wild. Interaction between the same and other species can enrich the behaviour of the dragon as well, at Calmsley hill city farm the dragons are housed with the Eastern Water Dragon (Physignathus lesueurii) , the long necked turtle (Chelodina expansa) and the Murray River turtle (Emydura macquarii). At the Australian Reptile Park housed with the Eastern bearded dragons are frill necked lizards (Chlamydosaurus kingie) and shingle back lizards (Trachydosaurus rugosus).

If housing them at home scatter feeds can be provided to encourage foraging also interaction between other Bearded Dragons can increase activity and decrease boredom. Another form of enrichment may include high vertical branches as they like to sit high. Planting vegetation and flowers like the dandelion and grass may also increase enrichment by exploring and decrease boredom.

7.8 Introductions and Removals

The acquisition of a new Eastern Bearded Dragon can be exciting for your existing dragons, but for the health of the dragons in your care a period of quarantine should be exercised (refer to section 8.5). Once cleared from all diseases the new dragon should be placed in a separate enclosure located

next to your existing enclosure or in a clear container placed into your existing enclosure.

Once the dragons have met through separation techniques they should be introduced, when introduced you should overlook the meeting to ensure that the introduction does not trigger any fights that can result in injury. Watching the dragons over a longer period of time like the first month is important being careful to spot any harmful dominance and taking the dominant dragon away into a different enclosure when shown.

The removal of any animal should be done quickly, using transport equipment that has been prepared to remove and relocate as soon as possible. Sometimes leaving the dragon in the transport equipment in the new enclosure can help introduce the dragon to its new surroundings.

7.9 Intraspecific Compatibility

The eastern bearded dragon is compatible living with each other in confined spaces like captivity. Most concern with housing dragons together is that the dominance needs to be established straight away otherwise brutal fights may occur. Another concern is breeding, some individuals and institutions house the dragon but with no room for young, if opposite sexes are housed together the chances of breeding even if cues are not in place is even.

Housed together may be a grouping of one dominant male, one non-dominant male, and one to two females with also one of the females being dominant. Housed in pairs of same sex there needs to be an established dominant individual.

7.10 Interspecific Compatibility

Eastern bearded dragons can be housed with other species as they usually keep to themselves. At Calmsley hill city farm there is four eastern bearded dragons, two eastern water dragons, three long necked turtles and two Murray River turtles.

Dragons are capable to share basking space if not thought that the other species is a threat, separate diets need to be provided though as the species prefer different foods. Space needs to be an important part in housing several species, if space abundant then the species will tend to leave the other species alone to behave as per usual, if space is scarce then over dominance may occur with injuries occurring.

7.11 Suitability to Captivity

The eastern bearded dragon is not as suitable as its subspecies being the inland bearded dragons and the dwarf/western bearded dragon to captivity as that may be they are still able to succeed in captivity. Breeding can be done with some difficult always experienced, it is important that once you have worked out a routine that works for your dragon that you resume every year and breeding should be easily carried out.

Eastern bearded dragons can be an exciting addition to your collection/institution. As they are cold blooded animals the activity in the enclosure may be not what you desire so it is important that the public are able to see them during opening hours. Enrichment can be used to lure the dragon into the public view whilst keeping the dragon entertained.

Many institutions in Australia house the Eastern bearded dragon including the following:

- Australia Zoo.
- Australian Reptile Park.
- Cairns wildlife safari reserve.
- Currumbin wildlife sanctuary.
- Dream-world.
- Melbourne zoological gardens.
- Sydney aquarium and Sydney wildlife world.
- Taronga western plains zoo.
- Taronga zoo.
- Werribee open range zoo.

8 Breeding

8.1 Mating System

The mating system consists of a male and female breeding pair successfully mating. Eastern bearded dragons are polygamous, so once a viable pair is put into an enclosure together there is high chance of successful breeding. In captivity breeding is usually planned being the male with the best genetics mates with a viable female, the female can usually lay a clutch of fertilized eggs after mating occurs.

In an enclosure where there are two or more males, the males compete, this involves intense fighting and aggression displayed usually ending up in injury. The most dominant male will mate with the female.

8.2 Ease of Breeding

In captivity, breeding the Eastern Bearded Dragon is moderately hard. Eastern bearded dragon's are recorded to be harder to breed than its relatives the Inland/ Central (Pogona vitticeps) and the Pygmy bearded dragon (Pogona henrylawsoni).

Imitating seasons will help trigger breeding. Changes need to be made to trigger the breeding season; first cooling the enclosure then bringing the temperature up again will encourage breeding as part of seasonal changes.

To apply this breeding cue you will need to slowly reduce the temperature of the enclosure over a two to three week period so that the end basking temperature is 25 degrees C. While the temperature is being reduced the daylight hours should also be reduced, simultaneously. The end result being ten hours of daylight and the basking temperature being 25 degrees C. After six to eight weeks reverse the process and if successful you should have a clutch eggs within three to four weeks.

Sexing your Eastern bearded dragon is quite hard when they are hatched or juveniles but as they mature you will notice the slight sexual dimorphism. The male has a slightly broader head than the females also around there vent the male will have larger pores located on the underside of the thighs, the female will also have these pores but hers are considerably smaller.

Another way to check is to “pop” the male, this procedure is delicate as the hemipenes are exerted in the male once pressing either side of their vent, but “popping” can injure the animal and it is in your best interest to have the procedure done by a professional i.e. Veterinarian.

8.3 Reproductive Condition

8.3.1 Females

As the females come into breeding season feed intake needs to be increased as their fat storage within their bodies needs to increase to produce eggs. After the eggs have been laid the females leave the eggs as they are buried underneath the ground for warmth until hatching occurs. The condition of the female during this time changes from stocking up to slimming down and after laying returning to normal.

8.3.2 Males

As the females feed intake needs to be increased so does the males. Males are a part of the breeding process by fertilizing the eggs during sexual activity, they however are not a part of laying and therefore there condition does not change as much as the females.

8.4 Techniques Used to Control Breeding

To control breeding without any costs or surgery the easiest option is to separate the males from the females and slowly introduce them when you desire breeding. The female without the male will lay a clutch of eggs but they will not be fertilized due to sexual contact. Another option is to

remove the clutch of eggs once laid, this option might encourage another mating session and clutch laid until the breeding season is over.

8.5 Occurrence of Hybrids

The occurrence of the Eastern Bearded Dragon breeding with their closest relatives the Inland Bearded Dragon (Pogona vitticeps) or the Pygmy Bearded Dragon (Pogona henrylawsoni) is possible, given this, the sub species should be housed in different enclosures as well as the requirements of these subspecies vary from the eastern bearded dragon.

Figure 9.1. The inland bearded dragon and the eastern bearded dragon.

8.6 Timing of Breeding

The Eastern Bearded Dragon is a seasonal breeder. They use the environmental cue of first cooling then heat as a trigger concluding that they prefer to have their clutch hatch in the warmer months being spring and summer (September to February for southern hemisphere).

8.7 Age at First Breeding and Last Breeding

As Eastern Bearded Dragons can live from ten to fifteen years it is important to have all their social needs meet, including breeding. Sexual maturity depends on the growth rate of the juvenile, once reached approximately thirty to forty centimetres the dragon should be ready for breeding this should happen within eight to sixteen months of hatching. Depending on the individual dragon their last breeding season will be near the ten to twelve years old mark.

8.8 Ability to Breed Every Year

The ability to breed every year is highly possible, if every breeding season the needs are met according to feed requirements, environmental cues, viable pair and spatial requirements.

If the environment stays the same with no change there is reason to believe that your Eastern Bearded Dragons will breed successfully every year/ breeding season.

8.9 Ability to Breed More than Once Per Year

The Eastern Bearded Dragon will lay two to three clutches per breeding season with fourteen to twenty-five eggs in each clutch. Being seasonal breeders they can only breed once per year but in-between breeding seasons the female dragon will attend to her successful hatchlings.

8.10 Nesting, Hollow or Other Requirements

For the breeding season the substrate needs to be deep enough for the female to dig a nesting area this being around 20-30cm. Once gravid the female will start to look for suitable nesting areas, once found she will dig almost the length of her body deep and the egg laying process will begin not long after.

Being Egg bound is a problem with many gravid females as they cannot find a suitable place to lay, this can cause the female to not lay her clutch at all, and this can seriously harm your gravid female.

Figure 9.2 Clutch of eggs.

8.11 Breeding Diet

The availability of food will increase your Bearded Dragons chance of breeding, increasing their diet before and during the breeding season will need to be applied, also during this time daily distant exams may need to be carried out to check that their good body condition is maintained.

Whilst laying females will often need calcium supplements, if not already added to their diet it needs to be applied, if your dragon is already on calcium supplements a slight increase will need to be added but not exceeding the instructions on the bottle and veterinarian.

8.12 Incubation Period

The incubation period of the Eastern Bearded Dragon is from fifty to seventy days, in this time you can choose to keep the eggs where they were laid and let nature take its course or remove the eggs to place in an incubator.

The incubator is a device that allows the eggs to stay the same temperature throughout the incubation period therefore giving the eggs more of a chance to hatch, caution when removing the eggs from the enclosure and placing them into the incubator that they are kept the same way up as it is thought that tipping them can be potentially deathly to the eggs.

Figure 9.3 hatchlings of the eastern bearded dragon.

8.13 Clutch Size

The clutch size of an Eastern Bearded Dragon can be anywhere up to fourteen to twenty-five eggs laid, and the dragon can lay up to two to three clutches per breeding season.

8.14 Age at Weaning

As the Eastern Bearded dragon does not receive milk from the mother as a first meal they do not need to be weaned. Few days after hatching the juveniles will start to eat independently.

The hatchling rate of the juveniles can be up to 90% if handled correctly. The mortality rate is varied by career, if juveniles are housed in small groupings usually the weaker dragon is injured with death usually as a result, if noticed take out the stronger individuals and place them into separate enclosures.

8.15 Age of Removal from Parents

The age of the removal of the juvenile dragons is not regarded that important, as they eat independently after a few days old the parents do not care for the juveniles for long.

The hatchlings can be housed individually or in groupings, making sure that the juveniles that are not growing at the same rate of their siblings are removed and taken care of separately to ensure health.

8.16 Growth and Development

When born the Eastern Bearded Dragons can be 9-10 centimetres in length and 2-3 grams in weight. As the dragon matures and its diet increases you will start to notice the rate of which they grow, from hatching the Eastern Bearded Dragon can take up to 18 months to fully develop.

Feeding should increase as the need does. With juveniles the feed will contain mostly crickets and meal worms with finely chopped vegetables and fruits, as the dragon matures their diet changes to mostly vegetables and fruits. Once matured your bearded dragon should be approximately thirty-five to fifty centimetres in length. Access to UV light is also necessary for growth.

9 Artificial Rearing

9.1 Incubator Type

For your eastern bearded dragon any general reptile incubator should be fine to use. As dragons will naturally dig a hole into the ground to lay their eggs and cover, maintained heat is a great suggestion. During this period you may use the incubator or keep the eggs where they were laid.

Figure 10.1 Reptile incubator.

This particular incubator is generalized for all types of reptile eggs including eastern bearded dragons. As per any modern incubator, they should include temperature control, with an alarm to sound when higher temperatures are reached, also a reading on humidity.

9.2 Incubation Temperature and Humidity

Incubation temperature should range from 25 to 30 degrees Celsius; a good fluctuation between these temperatures should keep the egg mass even till hatching. Incubation period should range around 50 to 70 days given proper temperature is undergone in perspective to egg weight.

9.3 Desired % Egg Mass Loss

Once laid the eastern bearded dragon clutch of eggs should be weighed and recorded. Upon second weighing of the eggs at around 3 to 4 days after first laid the eggs should have gained a minute amount of mass as the embryo starts to form, if the mass of the egg has decreases then the temperature needs to rise.

Dealing with fluctuation of the egg/s can be easily handled using the following technique:

- If egg loss has occurred then the temperature and humidity needs to be slightly raised as eggs are porous.
- If the egg has increased weight that is thought it shouldn't then the temperature and the humidity needs to be slightly lowered.

Whilst dealing with the egg weight it is best to check the development of the egg as well. Candling is a great way to check the development inside the egg as it lights the eggs inside to see vein growth.

9.4 Hatching Temperature and Humidity

The temperature during hatching should be relatively normal to the dragons PBT as they will need the energy to crack and make its way out of the shell. The humidity should be raised for the hatching process as it will increase the moisture in the egg shell therefore making it easier for the dragon to hatch out.

9.5 Normal Pip to Hatch Interval

The interval between normal pip to hatch is around two to three days. During this interval monitoring the movement of the juvenile is essential to make sure that the young receives air, any signs of alarm may cause human intervention whereby helping the hatching process yourself.

9.6 Diet and Feeding Routine

Juveniles will start to eat at days old, therefore making sure you have food prepared is essential. As they will usually hatch without mothers help, as she is often not present during this process no milk or sustenance is provided by her.

A variety of moistened vegetables and soft meats should be offered always in dragon bite sized pieces. The list of all food that may be consumed is located in section 6 (Feeding Requirements).

9.7 Specific Requirements

Keeping the temperature of the enclosure set for adult bearded dragon is important as the juveniles need to be well adjusted, as what would happen in the wild. Making sure that the food is in pieces that can be digested is important as terminal ingestion may occur. If this was to occur then a warm bowl of water should be placed into the enclosure, placing the dragon in the water can induce vomiting reflex for further information refer to section 8 (health requirements).

9.8 Data Recording

It is important to collect data throughout the process of breeding, laying, hatching and juvenile growth and development also always notable events should be recorded as this may lead to a health issue and such in the future. Notable events can range from:

- Diet change.
- Behaviour change.
- Deaths in the collection.
- Related dragons and their ID.
- Illness, disease and parasites.

9.9 Identification Methods

The identification methods commonly used is visual markings. As there can be many in the group of juveniles each will have their own individual markings located at any place on their body. In the section 5.3 general husbandry, lists the amount of methods used in adult which may apply to juveniles for the future.

9.10 Hygiene

Hygiene is important throughout the dragons life but even more so when juveniles as they are beginning the process of building up their immune system. When first born it is important to keep the holding as clean as possible, as time goes by slowly introducing captive born juveniles to wild substrate or furniture to build up their immune system.

As always their feed needs to be taken away when finished and always presented fresh. Water bowls need to be cleaned daily as young dragons will discrete wherever they see fit.

9.11 Behavioural Considerations

The eastern bearded dragon will try to eat any object or anything that may move so making sure that their food is portioned small enough that they cannot try to consume and choke, also making sure that the enclosure cannot let any wild insects in as they may ingest and again may choke. As the juvenile will explore making sure that the furniture/substrate in the enclosure is not high so they cannot escape nor dig through.

9.12 Weaning

The eastern bearded dragon is not raised primarily by their maternal mother so weaning is not much of an issue, making sure that there is no dependency on yourself or any other carers throughout this time as it is important they learn to catch live invertebrates and drink on their own.

Acknowledgements

I would like to acknowledge my teachers Brad Walker, Jacki Salkeld and Graeme Phipps for all their knowledge, understanding and patience on helping myself put together this manual.

I would also like to acknowledge my workplace being Calmsley Hill City Farm with all their help is accessing the eastern bearded dragon, also knowledge and previous and present information on this species. The staff members off Calmsley Hill City Farm have been patient and understanding and willing to help with the making of this manual.

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Glossary

Hybrid - an animal or plant resulting from a cross between genetically unlike individuals. http://dictionary.reference.com/browse/hybrid?&qsrc

Interspecific – meaning of the same species.

Intraspecific – meaning being two separate species.

Hemipenes - Hemipenes are usually held inverted, within the body, and are everted for reproduction via erectile tissue like that in the human penis. http://en.wikipedia.org/wiki/Hemipenis

Intromittent organ - An intromittent organ is a general term for an external organ of a male organism that is specialized to deliver sperm during copulation. http://en.wikipedia.org/wiki/Intromittent_organ

Morphometrics - a technique of taxonomic analysis using measurements of the form of
organisms. http://dictionary.reference.com/browse/Morphometrics?&qsrc
=

Appendix

11Plant species: Can be housed in an Eastern bearded dragon's enclosure.

Scientific name: Grevillea buxifolia ssp. Buxifolia.
Common name: Grey spider - flower.

This is a common shrub, growing to 2m tall. Flower heads are conspicuous as they are grey, terminal and often abundant. This type form intergrades with subspecies *phylicoides* in some areas, especially near Wisemans ferry.
Habitat: Open forest and health, on sandy soils.
Distribution: Coast, waterfall to south of Newcastle.
Flowering: From September – November.

Scientific name: Grevillea acanthifolia ssp. acanthifolia.
Common name: No generally accepted common name, some references "toothbrush" grevillea.

This is a common plant in swampy ground of the higher Blue Mountains. It is a straggling shrub, dwarfed or to 2m tall, with red branches and stiff divided leaves. Leaves are about 12 cm long. Flower combs are red or deep pink.

Habitat: Wet sandy and peaty soils.
Distribution: Endemic in upper blue mountains.
Flowering: September to November, some flowers at other times.

Scientific name: Banksia ericifolia.
Common name: Heath Banksia.

The long orange-red flower spikes of heath banksia are a conspicuous feature of the coastal bushland in autumn and winter. This is a large shrub to small tree being no more than 2 m tall and 1 in spread. They are rich in nectar and visited by many different honey eaters.
Habitat: Scrub and heaths, on sands.
Distribution: Coastal zone, from Hastings river district to south coast.
Flowering: April to August.

Scientific name: Banksia spinulosa var. Collina.
Common name: Hill Banksia

This variety is similar in appearance to var. *Spinulosa,* as it is a multi-stemmed shrub. The only difference is in its leaves which are broader. The shrub will grow to 1 to 2 m and will expand up to 1m in width,
Habitat: Low coastal scrub, open forest and heath, on sandy soils.
Distribution: north of Hawkesbury River. Extending to north coast and south east Qld.
Flowering: Between April – August.

Scientific name: Acacia parramattensis.
Common name: Sydney green wattle.

This small tree is a common south of Sydney and westwards to the lower Blue Mountains. Its trunk is brown-black and the tips of the young foliage are greenish yellow. Flowers

are pale yellow to almost white. This species is a main feature tree in an enclosure being that it can grow up to 10 m tall and almost that in width as well. Great for state education being a species found in NSW.
Habitat: Open forest, on both shales and sandstone soils.
Distribution: Widespread from coast to mountains.
Flowering: October to February.

Scientific name: Blechnum cartilagineum.
Common name: Gristle Fern.

This common fern is readily distinguished from other *blechnum* species by its light yellowish green, leathery or gristly appearance. The pinnae often exceeding 15 cm in length and 15 mm in width have fine sharply serrated edges. The gristle fern can grow up to 1 m tall with the width similar to its length.
Habitat: In open forest and rainforest in a wide variety of situations.
Distribution: Common from coast to mountains (QLD, NSW, VIC and TAS).

Scientific name: Callistemon citrinus.
Common name: Red bottle brush.

This is the most widespread and common of the red flowered bottlebrushes in the Sydney area. Leaves are up to 7 cm long and about 8 mm wide. Young growth is flesh- coloured and softly hairy. Flowers are deep red in spikes up to 12 cm long. Fruiting capsules are 6 to 7 mm across. The red bottle brush can establish 2m in length and 1 ½ in width and can be slow growing.

Habitat: Prefers wet sites near streams and swamps, but tolerates drier sites.
Distributions: Widespread and common from coast to mountains.
Flowering: March to May and October to December.

Scientific name: Gahnia microstachya.
Common name: Slender Saw-sedge.

This is a slender species, 60 to 100 cm high, immediately distinguishable by its brown, rather than black, spikelets at both the flowering and fruiting stages. Leaves are shorter than the stems, striate or ridged, about 3 mm wide.
Habitat: Drier sandie soils.
Distribution: Recorded from central coast and central western slopes.
Flowering is irregular.

Scientific name: Tmesipteris truncate.
Common name: Fork fern.

The commonest of the 4 types of fork ferns in the Sydney district, this species usually grows in rock crevices rather than on the trunks of tree-ferns. The stems are up to 30 cm long with numerous linear curved leaf like appendages about 20 mm long and 2 or 3 mm broad. This species of fern can grow up to 1 m tall and similar in width.
Habitat: Moist rock crevices in cool shady places.
Distribution: NSW, coast and central tablelands.

Scientific name: Cyclosorus interruptus.
Common name: No generally accepted common name.

This is the only Australian species remaining after revision of the previously large genus cyclosorus. They have a fairly long stripe, up to 30 cm, and a pale green, leathery pinnate. The lower pinnae are not noticeably reduced in size, or are sometimes longer than the middle ones. The Cyclosorus interruptus are known to grow up to 1 to 1 ½ m.
Habitat – usually in swampy ground near creeks, sometimes forming large but not dense colonies.
Distribution: NSW.

Weed species that may be toxic:

Any plant that is sprayed with toxic pesticides and herbicides may be harmful for the Eastern Bearded Dragon, as they live in and amongst the trees, shrubs, ferns etc..
One in particular that may be harmful to the Eastern Bearded Dragon is camphor laurel (Cinnamomum camphora). This introduced species has spread like wild fire throughout distinct parts of Australia, if ingested the plant has been known to be deathly in birds. The tree in its native countries can be harvested for its camphor, and timber. Camphor has been known to be an important ingredient to make smokeless gunpowder.

ASMP 2010 region collection and plan:

Coastal Bearded Dragon (*Pogona barbata*)

Auckland Zoo	0	1	3	0	1	3	Maintain
Australia Zoo	0	1	7	0	1	7	Maintain
Australian Reptile Park	2	1	5	2	1	5	Maintain
Cairns Wildlife Safari Reserve	1	0	0	1	0	0	Maintain
Currumbin Wildlife Sanctuary	0	0	9	2	2	0	Delete excess; breed to requirements
Dreamworld	0	0	0	1	1	0	Acquire
Gorge Wildlife Park	0	0	6	0	0	6	Maintain
Healesville Sanctuary	1	1	1	1	1	0	Delete excess
Lone Pine Koala Sanctuary	1	0	0	1	0	0	Maintain
Melbourne Zoological Gardens	0	0	0	0	0	6	Acquire for education programs
Sydney Aquarium and Sydney Wildlife World	1	2	13	1	2	13	Maintain
Taronga Western Plains Zoo	0	1	0	0	2	0	Acquire
Taronga Zoo	1	1	6	2	8	4	Acquire as available
Ti Point Reptile Park	2	6	4	2	8	0	Delete excess; breed to requirements during 2010
Tidbinbilla Nature Reserve	0	0	1	0	0	1	Maintain for display
Wellington Zoo Trust	0	0	2	1	2	0	Acquire during 2010
Werribee Open Range Zoo	0	0	1	0	0	2	Acquire
Totals	**9**	**14**	**58**	**14**	**29**	**47**	

ASMP Reptile & Amphibian TAG; No Regional Program

MSDS for Clear reflections references in 5.1

WHITELEY INDUSTRIES

MATERIAL SAFETY DATA SHEET

Section 1: IDENTIFICATION

CLEAR REFLECTIONS

Recommended Use: Window cleaner.
Product Code: 230058 (4x5L), 230060 (15L).

WHITELEY INDUSTRIES PTY. LTD. (A.C.N. 000 906 678)
Postal Address: P. O. Box 1076 North Sydney NSW 2059
Telephone Number: (02) 9929 9155 Facsimile: (02) 9929 9077
Emergency Telephone Number: Poisons Information Centre (National) 131126

Section 2: HAZARDS

Not classified as hazardous by the criteria of NOHSC.

Section 3: COMPOSITION INFORMATION

Ingredient	CAS No	Proportion
Ingredients deemed not to be hazardous	Not applicable	To 100%

Section 4: FIRST AID

Eye (Contact)	Hold eyelids apart and flush the eye continuously with running water.
Skin (Contact)	Remove contaminated clothing and flush skin and hair with running water.
Inhalation(Breathing)	Not volatile at room temperatures.
Ingestion (Swallowing)	DO NOT induce vomiting. For advice, contact a Poisons Information Centre (Phone 131126) or a doctor.
Advice to Doctor	Treat symptomatically.
First Aid Facilities	Ensure an eye bath and safety shower are available and ready for use.
Additional Information	No aggravated medical conditions are known to be caused by exposure to this product.

Section 5: FIREFIGHTING MEASURE

Suitable Extinguishing Media	Use dry chemical powder, alcohol stable foam, water spray or fog type extinguishers.
Hazards From Combustion Products	Toxic and/or irritating fumes including carbon monoxide and carbon dioxide may be emitted.

Precautions For Fire Fighters and Special Protective Equipment Keep containers cool by spraying with water.

Additional Information **Hazchem Code** – Not applicable.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedure SAA/SNZ HB76: Dangerous Goods – Initial Emergency Response Guide – Not applicable.

Spills / Clean up Slippery when spilled. Personal protective equipment should be worn when cleaning up spills. Restrict access to area until completion of cleanup. Stop leak if safe to do so. Contain spill with absorbent material, such as sand, vermiculite or other inert material. Prevent spill entering sewers or waterways. Collect and dispose of spilled material according to local regulations. Wash away remnants with copious amounts of cold water. Clean area by working from the periphery to the centre of spill or from the edge of the room to the centre.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling Contact WHITELEY INDUSTRIES sales representative for advice when using this product for any application other than that outlined on the label or technical bulletin.
Any non-intended or non-authorised use of this product may result in personal injury or damage to equipment.
Store product in original container.
Wash hands and face thoroughly after handling and before work breaks, eating, drinking, smoking and using toilet facilities.

Conditions for Safe Storage Store in a cool, dry, well ventilated area away from incompatible materials. Keep container tightly sealed.

Section 8: EXPOSURE CONTROL/PERSONAL PROTECTION

National Exposure Standards – Source: National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003].

Ingredient	CAS No	ES-TWA	ES-STEL
None available			

Biological Limit Values Not available.

Engineering Controls Not normally required.

Personal Protective Equipment


Eye/face protection – Safety glasses or chemical resistant goggles should be worn to prevent eye contact.
Skin protection – Use rubber gloves to prevent skin contact.
Respiratory protection – Respirator is not usually necessary but if product is irritating use a suitable respirator.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance Clear, thin, blue liquid

Boiling Point approximately 100°C

Odour Slight ammonia odour

Freezing Point approximately 0°C

pH 10.7-11.7	**Solubility** Soluble in water.
Specific Gravity 0.985-0.995	**Flash Point** Not Applicable.
Vapour Pressure Not Available.	**Upper and Lower Flammability limits (in air)** Not Applicable.
Vapour Density Not Available.	**Ignition Temperature** Not Applicable.

Section 10: STABILITY AND REACTIVITY

Chemical Stability	Stable under normal ambient storage conditions.
Conditions to avoid	Avoid high temperatures (store below 30°C). Protect against physical damage.
Incompatible materials	None known. Do not mix with other chemicals.
Hazardous decomposition products	None known.
Hazardous reactions	None known.

Section 11: TOXICOLOGICAL INFORMATION

HEALTH EFFECTS

Acute

Swallowed	Considered an unlikely route of entry in commercial / industrial environments. May be irritating to gastro-intestinal tract.
Eye	May cause irritation and reddening.
Skin	May causes irritation.
Inhaled	None known.

Chronic

Swallowed	No effects known.
Eye	No effects known.
Skin	No effects known.
Inhalation	No effects known.

TOXICITY DATA
Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity	Not available.
Persistence and degradability	Not available.
Mobility	Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal method	Refer to State/Territory Land Waste Management Authority. Dispose of material through a licensed waste contractor. Rinse empty containers thoroughly before recycling or disposing to an authorised landfill.
Special precautions	Suitable for incineration by approved agent.

Section 14: TRANSPORT INFORMATION

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code).

UN Number	Not applicable.
UN Proper Shipping Name	Not applicable.
Class and subsidiary risk	Not applicable.
Packing Group	Not applicable.
Special precautions for user	Not applicable.
Hazchem Code	Not applicable.

Section 15: REGULATORY INFORMATION

Poisons Schedule (SUSDP): Not applicable.

All ingredients are listed in the Australia Inventory of Chemical Substances (AICS).

Section 16: OTHER INFORMATION

Prepared by: K. Duncum **Date of preparation:** 4 February, 2004
Position: Quality Control Chemist

MSDS for Resolve referenced in 5.1.

MATERIAL SAFETY DATA SHEET

Section 1: IDENTIFICATION

RESOLVE

Recommended Use: Heavy duty detergent and sanitiser.
Product Code: 180026 (2x5L) and 180030 (15L).

Whiteley Industrial
A division of Whiteley Corporation Pty Ltd (A.C.N. 000 906 678)
Postal Address: P. O. Box 1076 North Sydney NSW 2059
Telephone Number: (02) 9929 9155 Facsimile: (02) 9929 9077
Emergency Telephone Number: Poisons Information Centre (National) 131126

Section 2: HAZARDS

Classified as hazardous by the criteria of NOHSC.

R36/38: Irritating to eyes and skin.
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S37/39: Wear suitable gloves and eye/face protection.
S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label whenever possible).

Section 3: COMPOSITION INFORMATION

Ingredient	CAS No	Proportion
Ingredients deemed not to be hazardous	Not applicable	To 100%
Benzalkonium chloride*	68424-85-1	<10%
Potassium Hydroxide**	1310-58-3	<10%

* the actual amount of this material is less than 5%.
** the actual amount of this material is less than 2%.

Section 4: FIRST AID

Eye (Contact) Hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.

Skin (Contact) Remove contaminated clothing and flush skin and hair with running water.

Inhalation(Breathing) Not volatile at room temperatures.

Ingestion (Swallowing) DO NOT induce vomiting. For advice, contact a Poisons Information Centre (Phone 131126) or a doctor.

Advice to Doctor Treat symptomatically for highly alkaline solution.

First Aid Facilities Ensure an eye bath and safety shower are available and ready for use.

Additional Information No aggravated medical conditions are known to be caused by exposure to this product.

Section 5: FIREFIGHTING MEASURE

Suitable Extinguishing Media Solution does not burn. Use extinguishing media suited to the materials that are burning. eg. Dry chemical, CO_2 or water spray.

Hazards From Combustion Products Carbon dioxide, carbon monoxide, nitrogen oxides and other toxic gases may be produced in the case of fire or during thermal decomposition.

Precautions For Fire Fighters and Special Protective Equipment Firefighters must wear full protective clothing including self contained breathing apparatus and chemical splash suit. Ensure that no spillage enters drains or water courses. Remove from the vicinity containers not involved in the fire.

Additional Information **Hazchem Code** – Not applicable.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedure SAA/SNZ HB76: Dangerous Goods – Initial Emergency Response Guide – Not applicable.

Spills / Clean up For small volumes (approximately less than 1L) - Clean up personnel should wear full protective clothing. Restrict access to area until completion of cleanup. Stop leak if safe to do so. Contain spill with absorbent material, such as sand, vermiculite or other inert material. Prevent spill entering sewers or waterways. Collect and dispose of spilled material according to local regulations. Wash away remnants with copious amounts of cold water. Clean area by working from the periphery to the centre of spill or from the edge of the room to the centre.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling Contact Whiteley Corporation sales representative for advice when using this product for any application other than that outlined on the label or technical bulletin.
Any non-intended or non-authorised use of this product may result in severe personal injuries, or damage to equipment.
Store product in original container.
Wash hands and face thoroughly after handling and before work breaks, eating, drinking, smoking and using toilet facilities.

Conditions for Safe Storage Store in a cool, dry, well ventilated area away from incompatible materials. Keep container tightly sealed.

Section 8: EXPOSURE CONTROL/PERSONAL PROTECTION

National Exposure Standards – Source: National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003].

Ingredient	CAS No	ES-TWA	ES-STEL
Potassium Hydroxide	1310-58-3	2mg/m^3	Not available

Biological Limit Values Not available.

Engineering Controls Ensure adequate ventilation to keep airbourne concentrations below exposure standards.

Personal Protective Equipment

Eye/face protection – Safety glasses or chemical resistant goggles should be worn to prevent eye contact.
Skin protection – Use nitrile rubber gloves to prevent skin contact.
Respiratory protection – Respirator is not usually necessary but if product is being used in a confined area where mist is a problem, use a respirator suitable for particulates and alkaline gases.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance Clear thin violet liquid

Odour Mild

pH 12.2-13.7

Specific Gravity 1.025-1.045

Vapour Pressure Not Available.

Vapour Density Not Available.

Boiling Point approximately 100°C

Freezing Point approximately 0°C

Solubility Soluble in water.

Flash Point Not Applicable.

Upper and Lower Flammability limits (in air) Not Applicable.

Ignition Temperature Not Applicable.

Section 10: STABILITY AND REACTIVITY

Chemical Stability Stable under normal ambient storage conditions.

Conditions to avoid Avoid high temperatures (store below 30°C). Protect against physical damage. Do not store in direct sunlight.

Incompatible materials None known. Do not mix with other chemicals.

Hazardous decomposition products None known.

Hazardous reactions None known.

Section 11: TOXICOLOGICAL INFORMATION

HEALTH EFFECTS

Acute

Swallowed Considered an unlikely route of entry in commercial / industrial environments. May be irritating or cause damage to gastro-intestinal tract.
Eye Pain and reddening may occur.
Skin May causes irritation and redness on contact with skin.
Inhaled Inhalation of mist may cause irritation.

Chronic

Swallowed No effects known.
Eye No effects known.
Skin No effects known.
Inhalation No effects known.

TOXICITY DATA

Benzalkonium chloride	LD_{50} 919mg/kg (oral, mouse)	RTECS UZ2995000
Potassium hydroxide	LD_{50} 273mg/kg (oral, rat)	RTECS TT2100000

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity Not available.

Persistence and degradability Not available.

Mobility Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal method Refer to State/Territory Land Waste Management Authority. Dispose of material through a licensed waste contractor. Rinse empty containers thoroughly before recycling or disposing to an authorised landfill.

Special precautions Normally suitable for incineration by approved agent.

Section 14: TRANSPORT INFORMATION

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code).

UN Number	Not applicable
UN Proper Shipping Name	Not applicable
Class and subsidiary risk	Not applicable
Packing Group	Not applicable
Special precautions for user	Not applicable
Hazchem Code	Not applicable

Section 15: REGULATORY INFORMATION

Poisons Schedule (SUSDP): Schedule 5 – CAUTION.

All ingredients are listed in the Australia Inventory of Chemical Substances (AICS).

Section 16: OTHER INFORMATION

Prepared by: K. Duncum **Date of preparation:** 17 August 2005
Position: Regulatory Compliance Technician

MSDS for Viraclean referenced in 5.1.

MATERIAL SAFETY DATA SHEET

Section 1: IDENTIFICATION

VIRACLEAN

Recommended Use: Disinfectant Cleaner.
Product Code: 210556 (2x5L), 210555 (15L), 210564 (12X500mL Trigger Spray), 210574 (12X500mL Squeeze).

Whiteley Medical
A division of Whiteley Corporation Pty Ltd (A.C.N. 000 906 678)
Postal Address: P. O. Box 1076 North Sydney NSW 2059
Telephone Number: (02) 9929 9155 Facsimile: (02) 9929 9077
Emergency Telephone Number: Poisons Information Centre (National) 131126

Section 2: HAZARDS

Not classified as hazardous by the criteria of NOHSC.

Section 3: COMPOSITION INFORMATION

Ingredient	CAS No	Proportion
Benzalkonium Chloride	68424-85-1	0.426%
Proprietary Blend	Not applicable	10-30%
Ingredients deemed not to be hazardous	Not applicable	To 100%

Section 4: FIRST AID

Eye (Contact)	Hold eyelids apart and flush the eye continuously with running water.
Skin (Contact)	Remove contaminated clothing and flush skin and hair with running water.
Inhalation(Breathing)	Remove to fresh air. The product is non volatile at room temperatures.
Ingestion (Swallowing)	DO NOT induce vomiting. For advice, contact a Poisons Information Centre (Phone 131126) or a doctor.
Advice to Doctor	Treat symptomatically for neutral detergent.
First Aid Facilities	Ensure an eye wash is available and ready for use.
Additional Information	No aggravated medical conditions are known to be caused by exposure to this product.

Section 5: FIREFIGHTING MEASURE

Suitable Extinguishing Media	Solution does not burn. Use extinguishing media suited to the materials that are burning. eg. Dry chemical, CO_2 or water spray

Hazards From Combustion Products	Carbon dioxide and carbon monoxide may be produced in the case of fire or during thermal decomposition.
Precautions For Fire Fighters and Special Protective Equipment	Keep containers cool by spraying with water.
Additional Information	**Hazchem Code** – Not applicable.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedure	SAA/SNZ HB76: Dangerous Goods – Initial Emergency Response Guide – Not applicable.
Spills / Clean up	Clean up personnel should wear full protective clothing. Restrict access until completion of clean up. Then ensure adequate ventilation. Stop leak if safe to do so. Contain spill with absorbent material, such as towelling, sand, vermiculite or other inert material. Prevent spill entering stormwater drains or waterways. Collect and dispose of clean up material according to local regulations. Wash away remnants with copious amounts of cold water to sewer. Clean area by working from the periphery to the centre of spill or from the edge of the room to the centre.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling	Contact Whiteley Corporation sales representative for advice when using this product for any application other than that outlined on the label or technical bulletin. Any non-intended or non-authorised use of this product may result in personal injury or damage to equipment. Store product in original container. Wash thoroughly after handling product.
Conditions for Safe Storage	Store in a cool, dry, well ventilated area. Keep container tightly sealed. Store below 30°C.

Section 8: EXPOSURE CONTROL/PERSONAL PROTECTION

National Exposure Standards – Source: National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003].

Ingredient	CAS No	ES-TWA	ES-STEL
None available			

Biological Limit Values	Not available.
Engineering Controls	Use only in a well ventilated area.
Personal Protective Equipment	Eye/face protection – Safety glasses / face shield / chemical resistant goggles should be worn to prevent eye contact. Skin protection – Use Nitrile gloves or similar to prevent skin contact. Respiratory protection – Respirator is not usually necessary but if required use a respirator suitable for organic vapours.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance Clear pink liquid	**Boiling Point** approximately 100°C
Odour Slight Lemon odour	**Freezing Point** approximately 0°C
pH 7.00-7.40	**Solubility** Soluble in water.
Specific Gravity 0.985-0.995	**Flash Point** Not Applicable.
Vapour Pressure Not Available.	**Upper and Lower Flammability limits (in air)** Not Applicable.
Vapour Density Not Available.	**Ignition Temperature** Not Applicable.

Section 10: STABILITY AND REACTIVITY

Chemical Stability	Stable for period of shelf-life when stored as directed.
Conditions to avoid	Avoid high temperatures (store below 30°C). Do NOT store in direct sunlight. Protect against physical damage.
Incompatible materials	None known. Do not mix with other chemicals.
Hazardous decomposition products	None known.
Hazardous reactions	None known.

Section 11: TOXICOLOGICAL INFORMATION

HEALTH EFFECTS

Acute

Swallowed	Considered an unlikely route of entry in commercial / industrial environments. May be irritating to gastro-intestinal tract.
Eye	May cause irritation and reddening.
Skin	May cause irritation.
Inhaled	May cause irritation if aerosol inhaled.

Chronic

Swallowed	No effects known.
Eye	No effects known.
Skin	No effects known
Inhalation	No effects known.

TOXICITY DATA
Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity	Not available.
Persistence and degradability	Not available.
Mobility	Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal method Disposal to sewer is normally recommended with copious amounts of water. Refer to State/Territory Land Waste Management Authorities if applicable. Containers are recyclable and can be disposed of by a licensed waste contractor. Containers can be disposed of to general waste or rinsed thoroughly and recycled.

Special precautions Suitable for incineration by approved agent.

Section 14: TRANSPORT INFORMATION

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code).

UN Number	Not applicable.
UN Proper Shipping Name	Not applicable.
Class and subsidiary risk	Not applicable.
Packing Group	Not applicable.
Special precautions for user	Not applicable.
Hazchem Code	Not applicable.

Section 15: REGULATORY INFORMATION

Poisons Schedule (SUSDP): Not applicable.

All ingredients are listed in the Australia Inventory of Chemical Substances (AICS).

Section 16: OTHER INFORMATION

Date of preparation: 19th September, 2008