



## CAPITAL DRAGONS

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# Caring for an Australian Bearded Dragon

### Background: behaviors, "languages" and origins

Bearded Dragons get their name from their ability to "puff out" a throat pouch that has prominent spikes formed from modified scales. This "beard" can also change color, becoming jet black and even more impressive. Beards are not limited to males; the females will show off their beards as well, in a very interactive communication. Indeed, bearded dragons are very social animals. They have a rich gestural language, bobbing their heads at one another (watch video), gaping their mouths, flattening their bodies and tilting as they circle one another ("see how big I am!"), swishing their tails, using their tongue to check each other or their environment out, etc. They even have a variety of submissive gestures. For instance, both sexes will raise one arm and hold it stationary or slowly wave it in circles (watch video), evidently to signal "hey, its ME, stop harassing me, I'm harmless!" They rapidly establish a hierarchy and adapt to their caretakers, so the more extreme aggressive gestures become rare in captivity (unless you give them new territory to conquer). They are very curious and love being let out to investigate.

Some dragons can recognize humans' clumsy attempts at their body language. My male adolescents become excited if I extend my hand with fingers held together and pointed, to mimic a dragon head, and then "bob" my mock-dragon head. They will often bob right back. However, they will become quiet and assume a satisfied "I am dominant" pose if I then circle my thumb at them to mimic submission. I initially suspected that my dragons responded to my signals only because I had trained them. I tested this hypothesis during a visit to the San Diego Zoo, which has a large outdoor habitat for bearded dragons. During my visit, several dragons were sunning themselves and ignoring human gawkers. After surreptitiously assuring myself that no one was looking, I began a "bobbing" display with my hand. Instantly, dragon heads turned toward me. The closest dragon ran a few steps toward me and bobbed his head. I bobbed in return. He advanced and bobbed more emphatically. I bobbed back. He ran closer and bobbed with such an amplitude that his chin hit the ground. I pointed my hand somewhat downward and slowly moved my thumb in a circle. He bobbed once (which I translated as a "So, there!" gesture), turned sideways to me and raised his head in the "I am supreme!" gesture. I concluded that I can speak dragon! Well, at least in pidgin form.

One of the joys of caring for this species is its mellow but interactive nature. Bearded dragons appear to communicate with us, at least in broad terms. Long, piercing stares are apparently designed to transmit the mental message "feed me crickets.... crickets.... crickets...." Although they will interact with you, they show their full social repertoire only to one another, an argument for keeping more than one dragon. If your dragon has a buddy, you will be able to enjoy a full behavioral series as they set up and maintain a dominance hierarchy. You will see "lizard stacks" as they pile up on one another beneath their basking light.

If you have a male and female, you will see mating displays (and mating). Sometimes however, interactions become aggressive, and such individuals require separate quarters. If you have two dragons together and one stops eating, likely he has been intimidated and will require special feeding, or even different quarters. Do not house dragons together if they differ dramatically in size. One could furnish lunch for the other.... Indeed, if you plan on acquiring a companion for your pet, make provision in case they do not get along; they may need separate quarters!

As their name also indicates, bearded dragons originate in Australia. Of the 6-7 Australian dragon species, those in captivity are predominantly *Pogona vitticeps* (up to a few years ago, called *Amphibolurus vitticeps*). They have not been (legally) exported from Australia for years. Virtually all those available are captive bred, originating from stock that entered the USA from Germany. They breed readily (even eagerly) in captivity and the eggs hatch well with proper incubation. Captive bred stock is healthier than wild-caught, is often parasite-free, and does not disturb natural populations. Captive breeding has produced a number of different color "morphs", all of whom are still of the same species.

The captive populations are currently robust and birth defects are rare, but the gene pool is so small that this happy situation may not continue long. An early sign of inbreeding is loss of full size. If you want to breed dragons, avoid inbreeding: ask your breeders what line they have (mine are the hearty "German" stock) and trade to get new bloodlines. If you bought two dragons from the same tank in a pet store, they are most likely siblings. Breeding them will be breeding brother to sister. If you sell the progeny to a pet store, someone else will buy--and breed--siblings. Since deficits are seen in the first generation of such breeding, this practice will quickly reduce the genetic health of American-bred dragons!

### Resources

This caresheet gives a personal view: I tell you what has worked for me. Note, however, that many areas of care are controversial, opinions vary, and herpetoculture is still in its infancy. Consult more than one source and make up your own mind. My favorite book on the topic is *The Bearded Dragon: an Owner's Guide to a Happy Healthy Pet* by Steve Grenard. Others like *The Bearded Dragon Manual* by Vosjoli and Mailloux. On the internet, peruse caresheets by Mellissa Kaplan, Bill Mears, Sarah Coatman, Eric Sorin and others (see annotated links for additional sources). A superb source of information is the accumulated wisdom on the Pogona discussion list. Check out the Pogona archives.

### Owning a reptile and hygiene:

Good hygiene is essential, not only to your dragon's health, but to your own. Reptiles can be non-symptomatic carriers of Salmonella, bacteria that cause sometimes lethal food poisoning. Children, the aged, and those who are immune-compromised are particularly susceptible to Salmonella from any source. Don't kiss your dragon. There are measures you can take to minimize risk. After handling your dragon, wash your hands with soap for at least 30 seconds, or use hand disinfectant. Disinfect any area you used to clean cages, dishes, etc. by using a 10% bleach solution. Use separate cleaning utensils, not the sponge you use to wash your own dishes. Reptiles are NOT recommended if you're pregnant or have a young child or an immuno-compromised person in your home.

### General care

Infant dragons demand much more care than adults. They need lots of food to fuel their astronomical growth rate. They average 3 1/4 inches long (snout to tail tip) at hatching, and nearly double in length (and more than double in bulk) by the end of their second month. Most deaths happen during the first month; older dragons are more robust and hardier. Juveniles grow rapidly, attaining adult length (14-24 inches, including tail) within a year. A dragon will often be around ten inches long at 5 months. At 6-9 months, they often stop or slow their eating for awhile (resting from their growth spurt?) and I suggest you check for parasites then to assure all is well. Dragons are usually initially free of parasites, being captive bred, but they can ingest parasites from crickets or greens. Take a stool sample from your creature to a reptile vet (and the first time you see your vet, take your animal as well for a well-dragon check; vets cannot prescribe medications without having seen the patient). Make sure your vet is actually familiar with reptiles; many aren't. If yours isn't, ask for a referral. Or check Herp Vet Connection or the Association of Reptile and Amphibian Vets for a recommended vet near you. Do a fecal check if the lizard stops eating, slows its growth significantly, appears stressed and hides, has runny stools or just doesn't look its usual active self for several days, unless it is molting. Adult dragons often appear lethargic (depressed?) when shedding, but juvenile appetites are sometimes not slowed even by skin loss. The skin comes off in large patches. Don't help them to pull it off--you can damage the new skin underneath. Letting them soak in shallow warm (98 deg) water or misting them helps shedding. Letting dragons bathe periodically is good for their health. It can stimulate defecation, which is useful if you suspect impaction, or even if you simply want them to produce, before sitting on your lap.

Dragons are omnivores, requiring both insect and vegetable food, in about one-to-one proportions (below). Between three and six weeks, feed your dragon small crickets 2-5 times a day, greens and veggies in the morning, and water them once or twice. Youngsters also love to chase, capture and eat fruitflies, which probably give them more exercise than sustenance. (You can acquire a fruit fly colony and food from Carolina Biological Supply, 1-800-334-5551. Or you can simply leave out a ripe banana and attract your own.) As their size increases, baby dragons can take more and larger food items and more vegetable matter. Increase the variety in each category.

After two months, care becomes less demanding and they can be fed insects once or twice a day, feeding them all they will eat at a time. Greens and veggies offered in the morning can be increased. Babies will eat more greens than veggies. Adults can be fed insects every other day, with daily greens and veggies. Some stop eating for periods, without ill effects.

For growing dragons, it is critical to avoid feeding insects that are too large. Crickets should be no longer than the distance between your dragon's eyes. Feed babies "2-week old" (1/4 inch) crickets; feed juveniles 1/2 inch crickets. Unfortunately, babies will swallow larger items, but such items can lead to terminal indigestion... literally terminal. They can die, often extending their hindlimbs straight back as though paralyzed or in excruciating pain. Note that basking or sleeping dragons often extend their hindlimbs; don't panic and confuse this posture with the indigestion-induced paralysis, in which the legs remain extended and are unable to move. If your bearded dragon can move its legs normally, it is OK. Dragons may sleep in all sorts of weird postures; do not be alarmed. Most grow out of sleeping in the most extreme back-wrenching postures.

Bearded dragons live in arid, rocky, semi-desert regions and arid open woodlands where they get most of their water from what they eat. In captivity, adults do not require water dishes in their cages. However, babies (who I speculate may hatch as the rainy season arrives) require water, generally given twice a day as simulated "dew" from water sprayed directly in their faces or deposited on their noses with a medicine dropper. They lap the water from their faces, the wet glass or occasionally from each other. Some learn to drink from a syringe, or from a shallow bottle cap filled with water. (Change such water and wash the container daily; bacteria grows quickly in such fluid.) A few learn to drink from a hamster bottle. To train yours to do so, Rod Mitchell suggests putting an ice cube on top of the bottle; it slowly melts, drips off the nipple, and helps the bearded dragon learn that it is a source of water.

Dragons tend to be robust and healthy, but they are living animals, and thus can develop illnesses. Many can be minimized by proper husbandry. For instance, metabolic bone disease is preventable by a proper diet, lighting and calcium supplementation, as detailed below. Dragons may pick up parasites such as coccidia or various worms, which are treatable with a vet visit. Two relatively new and serious diseases that are communicable among dragons are yellow fungus and adenovirus. There are indicators that can help you to determine if your dragon is sick. Although dragons have much less difficulty laying eggs than some other lizard species, such as iguanas, sometimes they become egg-bound and need to be spayed.

### **Insects to feed**

Crickets are a dominant insect food at all ages. Other insects add variety for larger dragons, such as mealworms, superworms (*Zophobas*; they have less indigestible chitin than do mealworms), silkworms and waxworms (high-fat "lizard candy" most people suggest that you don't overfeed these delectable items). Avoid feeding mealworms (especially in excess) to a young dragon, since their high chitin levels can cause lethal impaction. Follow insect caresheets and supply insect food to keep your dragon's food healthy. You can also harvest insects from outside in the summer, but be sure they are free of pesticides. Don't offer lightning bugs or boxelder bugs; they are lethal. There have been reports of bearded dragons dying after eating only one firefly. There has been only one report of a dragon surviving after having eaten fireflies, and only inspired emergency veterinary treatment saved him.

Most quality pet stores offer crickets and all the recommended insects are also available commercially. You can also buy them wholesale, and have them delivered boxed to your door. An excellent Michigan company for purchasing these insects is called Top Hat Crickets (phone 1-800-638-2555) where, for instance, a minimum order of 500 crickets costs about \$16; larger quantities cost proportionally less per cricket. They also sell a good cricket food and a convenient waterer. Phone numbers for other companies are on my annotated links. Keep the crickets in a 5-10 gallon tank with torn up egg cartons or toilet paper rolls (to let the crickets hide and minimize cannibalism) and clean the tank well each time you get a new order.

There is a trick for transferring crickets from the shipping box to a holding tank without cricket escapes. The trick was originally described on the internet by Melissa Kaplan. Place the unopened box in a large, clear plastic bag. Open the box inside the bag, take out the egg cartons, shake the crickets off, remove the empty cartons and box. Shake the crickets into the bottom of the bag. Place the open end of the bag in the tank, and tip the crickets into the tank.

When you buy crickets, feed them well ("gut-load" them) before offering them to your dragon. Crickets from some sources may have subsisted on paper and are starving when you get them; others may have been overdosed with vitamin A preparations (which will depress calcium metabolism). Chicken laying mash is high in calcium and makes a good cricket diet. A good home-made cricket diet includes dried grain (e.g., oatmeal), milk powder, low-protein dry dog or cat food, dried alfalfa (grass or pellets), vegetables (e.g., leftover veggies uneaten by your dragons), and a piece of orange or potato. An even better alternative is the excellent cricket food sold by Ronnie Buck is highly recommended. Keep wet items in a separate dish and change them often to avoid mold. For moisture, you can include a damp sponge; crickets promptly drown in any open water source. I use a commercial waterer (the type with a screw-in water bottle), put small stones in the reservoir to let errant crickets escape, and loosely cover it to keep dirt out.

A major issue for keeping crickets alive is to keep them dry and aerated. The container lid should allow air to enter freely (e.g., a screen top). I put Canadian peat moss in the bottom, with Alfalfa hay, and food is kept in shallow containers, and consists of oatmeal, dry milk, dog food kibble, or even better. Keep crickets dry; damp cricket cages smell horrible. Moreover, if crickets are exposed to wet conditions or mold, they can develop a fungal disease that can sicken dragons.

To feed crickets to your dragons, shake crickets into a plastic bag, add a pinch of phosphorus-free calcium supplement (such as Rep-Cal; see below), "shake and bake", and then dump crickets into your dragon's lair or a separate "feeding cage". You can offer them individually if you can bring yourself to handle the insects. Dragons do love being hand-fed. They extract items from your fingers by flicking out their tongue, which has a sticky bulb at the tip.

Bearded dragons are voracious when young (the appetite does diminish in adults). If you aren't feeding them enough, and if they have cage-mates, they may nibble toes and tail-tips for sustenance. If young dragons aren't eating, something is wrong. The most likely problem is that the temperature is incorrect: their bodies must reach 100 degrees F to digest their food. They may be intimidated by a larger cage-mate. They may have eaten something that cause impaction. If they are new, they may simply be taking time to feel comfortable--give them a few days to a week.

Feeding frequency varies with age. Feed crickets to youngsters at least twice a day, beginning about an hour after their lights go on (they must warm up before they eat; remember, they are "cold blooded") and ending with the last feeding no later than an hour before the lights go out. I have a timer that turns the light on an hour before I get up; once I am up, they get fed. Feed all they will eat at each feeding; they will initially eat 5-20 crickets each. I feed my adults veggies every day and crickets about every other day (in winter they may eat much less--or nothing). I also leave a casserole dish with 20-30 superworms in adult's cages for snacks. The dish has straight sides (so the worms seldom crawl out) and contains a light layer of veggies and a slice of potato to keep the worms well-fed. Feed gravid females more often, increase their UVB light and calcium supplementation and give them waxworm treats.

Some people are attempting to use commercial dried foods in place of insects. These foods have yet to be tested longitudinally, over time, so their effect on lifetime and health is yet uncertain. I do not use them, except on occasion, because unknown nutrients are still being discovered even for human diets, and are unlikely to be represented in commercial preparations. However, the most well researched food is Susan Donoghue's Walkabout Mixes, prepared by a respected veterinary nutritionist, and many knowledgeable people recommend it. You can also read an article on evaluating commercial foods.

### **Greens and veggies**

Vegetables come in two categories, greens and veggies. Feed both categories each morning. For babies, chop all offerings finely and offer them in a wide bottle lid. Don't use a deeper dish since they must be able to see the greens or they won't go eat them. You can also clip an entire leaf to something in the cage, for them to tear bites from: if you don't clip the leaf down, the dragons just carry it around, which funny to us but frustrating to them! Initially, babies eat more greens than veggies; increase veggies gradually. Wash all items you give them well to get rid of dirt, pesticides, mites, etc.

Some dragons take a while to learn to eat their veggies. For some hints, visit the getting 'em to eat veggies site.

Dragon lovers argue interminably about the proper ratio of insects to veggies and the best items to feed. The following are common recommendations.

First, dark green leafy vegetables (all high in calcium). Don't settle on just one: keep offering them a mix of at least 2-3 or more at a time.

#### **use as staples:**

collard greens    mustard greens  
escarole        romaine  
turnip greens    dandelion greens

parsley  
kale  
carrot tops

#### **add for variety:**

bok choy        red cabbage  
endive         cilantro  
radicchio

**Avoid except as occasional treats:**

spinach oxalic acid, which binds more calcium than it offers, actually reducing the total calcium available. Use only well dusted with RepCal.

iceberg lettuce has little food value, offering mainly water and fiber

If you and your beardie would like more variety in your greens, you can also offer any of the following: basil, Bermuda grass, chard, cilantro, clover, dycondra, endive, grape leaves, hibiscus leaves and flowers, mallow, mint, cactus pads (often available in Meiers; cut out the spines before feeding), plantain, radish tops, ruguula, rye grass, sorrel, violet leaves, watercress. As treats, dragons also readily accept edible (pesticide-free) flowers such as clover, dandelions (a real favorite), daylilies, hibiscus (another favorite, especially red), honeysuckle, lettuce flowers, lilacs, nasturtiums, pansies, rose petals, squash blossoms, violets and wild mustard.

Second, a variety of other vegetables. Variety is the operative word. Variety assures access to vitamins, minerals and other micro-nutrients, including those not yet codified by the FDA. I generally choose several veggies from the recipe below, modified from one by Melissa Kaplan that is well enough balanced for even fully vegetarian lizards such as iguanas. Her recipe calls for rabbit pellets to provide protein, and I leave pellets out of the recipe for dragons: insects fed to BDs supply plenty of protein. Do NOT feed them meat or chicken--that amount of protein can cause kidney damage.

Some veggies have a low nutrient to water/fiber content and, while they make great human diet food, should never make up the bulk of a dragon's diet. Examples are all types of sprouts (the seed uses up most of its nutrients by sprouting, and these often carry Salmonella), summer squash, zucchini, Boston and head lettuce.

Dragons will also nibble on living houseplants--including some that are poisonous, so check a plant for edibility before putting it in their cage. Edible plants include ficus, geraniums, hibiscus, petunias, pothos, violets. Some suggest putting such a plant in the cage if you have to leave your lizard while on vacation, to provide a source of living vegetable matter. Be wary of feeding them a plant fresh from the store--these plants have often been treated with systemic pesticides. "Systemic" means that the plant has taken the pesticide up internally, into its system. Washing won't remove the poison: it must "grow out", which it will do in 6-12 weeks.

recipe, modified from one originally developed by Melissa Kaplan. Note that quantities are approximate.

1/2 cup shredded green beans or lima beans (for protein)

1/2 cup shredded orange-fleshed squash, yam, sweet potato or carrot

1/2 cup vegetables chosen for variety such as bell peppers of all colors, broccoli, carrot, cauliflower, corn, kohlrabi, parsnip, peas, potatoes (cooked, plain), rice (cooked, plain), pumpkin, radishes, rutabaga, snow peas.

1/4 cup chopped or mashed fruit, such as apple (no seeds), apricots, blueberries, bananas (no skin), berries (mine LOVE raspberries), cantaloupe, figs, grapes, honeydew, kiwi, mangos, papaya, peaches, pears, plums, watermelon (no seeds).

Mix and store in the refrigerator. You can freeze the mix in ice cube trays or snack bags and defrost before feeding. However, because freezing destroys thiamin, you should lightly sprinkle defrosted items periodically with powdered thiamin, which you can get in vitamin sections of stores. Some people supplement with Brewer's yeast (NOT bread yeast, or you'll have a fermented mess).

Charts on the nutritional value of foods commonly fed to dragons are found at Bill Meer's site and at the Green Iguana Society (with food pictures as well). Also check out these links to poisonous plants, and the compendium of knowledge at Melissa Kaplan's food and feeding site.

**Supplements**

Dragons must have two things for proper bone growth: calcium and full-spectrum UVB lights (below). If calcium or vitamin D3 are deficient, the dragons get metabolic bone disease, which is deforming and ultimately fatal. Most diets and care regimens today focus on maximizing calcium and vitamin D3 levels. To synthesize vitamin D3 your dragons need light at the right wavelengths; unless you can offer light typical of the desert, both in intensity and spectral quality, you must supplement the diet with calcium, and probably with D3 as well. Rep-Cal powder is a commonly used commercial formula that contains calcium and vitamin D3 but no phosphorus; added phosphorus can depress calcium metabolism, particularly since the insects already supply high phosphorus. ("Tums" are mainly calcium carbonate and can be ground up as an emergency substitute.) Sprinkle a pinch of powder on the veggies. Dump your crickets in a plastic bag, add a pinch of powder and "shake and bake" before offering them to your dragons.

Use multi-vitamin supplements (such as Herptivite) very sparingly, no more often than once every two weeks (I do so once a month). Some brands of these supplements are excessively high in vitamin A which can cause multiple health problems; they can, for instance fatally depress calcium levels.

### **Lighting**

Lighting plays two roles. First, natural sunlight or full spectrum lighting is vital for calcium metabolism. The operative wavelengths are in the ultraviolet UVB range, which is offered by a few "full spectrum" fluorescent-type bulbs. The Zoo-med's Reptisun UVB 5.0 is most commonly available and is widely reported to be sufficient to grow healthy dragons. The UVB stimulates the skin to synthesize vitamin D. All full-spectrum bulbs lose the UVB component of their output with time and must be replaced every 6 months. Note that the UVB does not penetrate glass or plastic; don't use a glass top to your dragon's lair. Use a screen top.

Second, use an incandescent bulb in a heat-reflector fixture to control heat and to provide the bright light that beardies need to keep active and happy. A correct temperature is critical to healthy growth. Dragons must become warm enough (body temperature of about 100 deg F) to digest their food. Digestion is temperature-sensitive. If they are too cold, their food will merely decay in their stomachs. Dragons that are eating poorly are likely living at the wrong temperature. To achieve the correct temperature, set up a temperature gradient in the cage: place the light bulb over one end of the cage, not at the center. The gradient should range from the mid 70's or low 80's on the cool side to the mid 80's on the warm side, with a basking area ranging from 95-105. Don't guess the temperature; buy a thermometer. Adjust the wattage of the bulb and height of the basking site to get the correct temperature. **DON'T COOK YOUR DRAGON.** If you wish, you can put the heating element on a thermostat. Although beardeds primarily dwell in the desert, they bask in the mornings to warm up and then seek out relatively cool areas as the day becomes scorching. A gradient lets them choose their temperatures.

Under-tank heaters are sometimes used to add gentle bottom heat. They can aid the dragons' digestion, particularly since they can keep bearded bellies warm for 24 hours a day. Constantly warm tummies may therefore enhance growth rate. The heaters are, however, a supplement rather than a substitution for basking lights, since they do not provide the beneficial light that simulates daytime. In addition, hot rocks have lethally burned lizards, which are less sensitive to heat from a ventral source and may not know they are being burnt until too late. Avoid hot rocks. I use under-tank heaters only from gravid females. Using them can, however, prevent developing a good temperature gradient. You don't need them.

Place both UVB and basking lights on an appliance timer (12-14 hours on; off at night). Erratic day lengths will screw up their circadian rhythms and make them first lethargic and then actively sick. They detect environmental cues important to their circadian rhythms through their "third eye", the parietal eye. The dark period will also allow night temperatures to fall appropriately. Temperature can go down to the 60's or even the upper 50's without harm. Dragons are well adapted to cool semi-desert nights.

### **Habitat: the dragon's lair**

Initially, hatchlings can live in a 10 gallon tank. You can transfer a juvenile to adult quarters when it is about 6 months old. Adults, while much smaller than iguanas, need significant space: a 40 gallon tank is a minimum, 55 or more for a pair. Check out my shopping list for items to acquire, Theldara's site for a sample setup procedure, and the Tenny and Swofford pages for terrarium possibilities.

For youngsters, I suggest a minimalist decorating scheme, with one elevated basking area, a hiding area, and paper towels as a substrate. Put the basking area closer to the heat source. If you supply a plethora of neat branches and rocks, you inadvertently provide abundant places for crickets to hide. Hiding crickets are problems in two ways. One, the beardeds can't eat what they can't find. Two (and more serious), the crickets come out at night and nibble on beardeds, who sleep quite soundly. At best the crickets stress the dragons; at worst they maim by, for instance, chewing holes in eyelids.

An alternative is to house your dragon in a well-decorated tank and to feed it in a separate tank. Add your dusted crickets to the empty tank, then put in your dragon and let it alone to feast for awhile. When it's done, it will usually start scratching at the glass. This method sometimes helps dragons with poor appetites get on track because transfer to the "eating tank" means eat now or skip a meal. It also helps if you have a pair of dragons and the smaller one begins to eat less because it feels stressed; feed them one at a time in a separate, neutral tank. Dragons have an idiosyncratic notion of sharing: "I'll eat crickets until I am completely full, and then you can have one."

House your dragon somewhere interesting--for the dragon. They prefer to be in the thick of things, where they can watch their pet humans display their incomprehensible activities. Do not hide them away in a seldom frequented bedroom. They have immense curiosity!

### **Substratum**

The best substratum to use is hotly debated. Many keepers adamantly condemn sand, particularly the fine silica sand. Sand sounds like a natural substratum, but in the Australian wild the sand is evidently usually mixed with dirt and compacted into a "desert pavement" where it is less easy to ingest. Australia is not a Saharan-type of desert. The danger is that captive beardedies may eat sand deliberately (in search of calcium) or accidentally when it sticks to tongues or food items. Silica sand is sharp-edged (glass is made from it) and it can compact in the gut and cause fatal impaction. Aquarium sand is larger, but would you like to swallow rocks? Several reputable people do recommend crushed limestone sand, which is a form of calcium carbonate; it has softish edges and tends not to compact into an indigestible lump in the gut. A calcium sand is commercially available, but it is expensive and needs frequent replacing since it is difficult to clean, and some have reported compaction with it, particularly with baby dragons (it may be fine for adults). Various people use potting soil (impossible to clean, grows mold, hides crickets, coats dragons), newsprint or paper towels (absorbent and easy to replace but not pretty), orchid potting mix or garden mulching bark (wash very well, then remove sharp slivers and smaller pieces), commercial "reptile bark" (wash off the dust and remove small pieces that could cause impaction; somewhat difficult to clean, crickets hide in it, but it is pretty), alfalfa pellets ("rabbit food": it will grow mold if it gets wet; nice odor, cheap, harmless when ingested by adults or larger juveniles, absorbs waste) or reptile carpet (watch carefully for frayed edges since loose threads can cause impaction; buy a duplicate for when you clean the cage, since the carpet dries slowly). Never use cedar or cypress, the fumes are lethal.

For babies, I use paper towels. For late juveniles and adults, who don't have a water dish in their cage, I use rabbit pellets (the cheap kind, without extra vitamins and supplements--remember what it is being used for...).

Regularly change the substratum to assure good health. Beardedies have an active metabolic rate, so plan on cleaning often. Their fecal pellets are generally compact and damp rather than runny, so are easily scooped out. If the feces smell very bad, suspect coccidia and get a sample to a vet. Some of my adults are trained to "potty" on paper towel that is secured near their basking area. This training works as long as I remove the waste the day it was deposited. I don't guarantee that all dragons are so trainable or so fastidious. For routine cleaning, I use an antibacterial soap. Periodically, disinfect their cage and furniture using a 10% bleach solution: rinse very well afterward. Always disinfect any sink and surrounding area where you cleaned a tank, furniture, or dishes to kill any residual Salmonella.

### **Handling your dragon**

Beardedies grow large enough to handle and they do not resent being picked up and held--as long as you are polite, supportive, and considerate of their concerns for balance and their rather fragile limbs. To be polite, don't suddenly grab your dragon. Especially initially, when you are still relative strangers, approach slowly. For babies, place a finger under the chin and extend it under the body; the baby will cling to your finger (I call this the Klingon phase). Soon, your baby or juvenile can be gently transferred to your hand. Support your pet fully in the palm of your hand, with its head pointed in the direction of your fingers. Place your thumb lightly on his/her shoulder blades. Don't press down hard. If you are pressing hard enough to depress the body, you are pressing too hard. If your beardie starts to squirm, place your other hand over his head. If your beardie makes a run for it, DON'T GRAB. Our impulse is to try to close our fist on a quickly escaping small object, but you can crush a young dragon this way. Instead, keep your hand flat and slightly cupped and quickly put it over your escaping pet. Think of trapping him under your hand, rather than grabbing him.

For adults, scoop them up more directly, by the body. Hold them in your hand in the same posture as with juveniles, with their tail supported by your upper arm. If you don't support their tail, they will feel out of balance and will thrash their tail. If you want them to sit on your chest or shoulder, keep a supporting hand handy. They tend not to hang on tight. They seem to think that, if you want them to perch on you, then it's your business to keep them there. Be wary of letting them jump from high places; they can break their limbs or injure themselves internally. To keep your dragon eager to come into your hands, reinforce their ideas that your hands lead to good things. I bribe mine with waxworm treats; they then associate being handled with getting lizard "candy".

I often let my adults wander the house under light supervision. They love investigating. When they are out, I leave a basking light on with the bulb about 4-6 inches from the floor. They return periodically to bask and warm up. In the evening, they each retire to their favorite bedding-down place (generally under a bookcase) where I can scoop them up to return them to their lairs. If you have other pets, dogs or cats, be very very cautious. A small dragon can be an irresistible lunch.

Dragons will develop sharp claws that can leave your hands and arms with many tiny scratches that sting and raise eyebrows among your friends. You can trim their claws with a cat claw trimmer. (An illustrated guide to iguana claw clipping is available at Adam's site.) Let your dragon sit on your lap, gently raise one paw at a time and clip off the tip of each claw. Clip only the sharp, black portion; if you clip too much, you will cut a vein. The dragon will bleed, hurt, and look at you as though you betrayed it. Have cornstarch handy to stop bleeding. My dragons put up with nail clipping even better than my cats do. They appear to take the process philosophically, only occasionally eyeing me with apparent amazement at what their human gets up to.

### Sex

Bearded dragons are difficult to sex accurately when they are young. Experts may resort to "hemipenal eversion", pushing at the cloacal area to evert the male sex organs. This procedure can damage the lizard and is NOT recommended. Body proportions differ: males tend to have a larger head to body ratio, whereas females have a large body with a medium head and are often smaller overall. Adults become sexually mature as early as 8 months and can usually be sexed then since the adult males have enlarged femoral pores (rounded pores on the undersurface of the thigh in a line above the femur bone). The external anatomy has subtle differences, pictured and explained here, that can help you to determine gender.

Dragons have active courtship rituals and reproduce very well in captivity. The female will bury up to two dozen eggs, and will threaten you with gaping mouth if you try to pick up her eggs during the process, but afterwards offers no parental care. I've found that one mating can generate enough fertile eggs for several layings (either that or my female, "The Babe," has learned how to get from her lair to the male's at night...). "The Babe" laid 6 clutches of ca 20 babies each on summer, from a single mating. That is a lot of babies!!

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