



RAISING LACE MONITORS

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(My apologies if you are a long time monitor keeper and know all of the material in here already. Everyone's experience varies and this is a one-size-fits-all care sheet. If this is not all new to you, please bear with me if the tone seems condescending at any point, for that was certainly not my intent in writing it. I've also used the plural form rather than the singular, referring to 'monitors' instead of 'monitor', but that does not mean it's not okay to raise one on its own - I just had to make a decision and stick with it to make the text consistent)



GETTING STARTED

You've just got your lace monitors home after picking them up and presumably the enclosure is all set up and ready to go. The best thing you can do is put them in there and leave them alone. Moving is one of life's biggest stresses even for us humans and we usually move by choice, whereas these monitors have no idea what's happened to them, where they are or what's about to happen to them if that big predator (which is how they'll view you) gets ahold of them again. What they really want to do is look around their enclosure until they find someplace secure to hide and then stay there until they think it's safe. They may not eat while settling in, so don't expect any food to disappear for a few days to a week after their arrival. Put the food in, anyway, but leave them alone and try not to handle them much for the first while. They'll settle in, feed and grow better if they don't feel stressed.

HOUSING

Ideally the enclosure will be completely ready before you get the monitors, but if you have a temporary enclosure for the moment and are planning a larger enclosure to raise the monitors in, here are a few pointers.

The best enclosures for monitors are usually home made. Like most people, I started off buying ready-made enclosures at pet supply places. However, even though they were specifically designed for reptiles I invariably ended up pulling them apart and rebuilding them to better suit the monitors. Eventually I decided it would be cheaper and easier to make them from scratch myself. You needn't be a brilliant builder to make them yourself, for I am certainly not one of those, and it needn't be very expensive or fancy as long as it suits the animals' needs. Keep in mind that the instructions given here are for young lace monitors. Once your monitors are much larger you may wish to house them outdoors if you live in a suitable area.

Size

Enclosures for hatchlings and small monitors can be relatively small, but later enclosures should be as large as you have space for and as tall as you can build them. They like to climb and feel safe when high up. If they are still small and in a small enclosure, situating the enclosure itself high up will help them feel secure, as long as they are looking down on you rather than vice versa. A rule of thumb for the *minimum* enclosure size for small monitors is double their individual total length (including tail) in length and at least double their individual total length in width.

Materials

Whatever you do, avoid melamine – it rots if it stays damp for too long and chances are it will be always be damp in spots. Plywood is better. A good way to seal plywood and make it impervious to monitor claws is to purchase some West Systems™ two part epoxy from a boat repair or fibreglass supplier. This is best done on the plywood while it is laid out flat, before the enclosure is put together, so you can spread it out evenly. It seems expensive, but a little bit goes a very long way if done properly. Use a spreader rather than a brush. You can even add glass cloth (woven 'glass' fibres as used in fibreglass, but with epoxy instead of polyester resin) for extra strength if you think the monitors may be in there when they are pretty large. Polyester resin can be used instead of epoxy, but you'll want a fair bit of lead time as it off-gasses for a fair while and it wouldn't be very healthy for you or the monitor having that smell indoors. Remember to always wear a proper filter mask when dealing with resins.

Vents

You'll need a very small number of vents on the enclosure - especially if you have a sliding glass front, as the space between the two pieces of glass is a large vent in itself. How small is a small number? If the enclosure has a sliding glass front, one small vent at the back will be more than enough. Have the vent(s) low down (around $\frac{3}{4}$ of the way down) on the back or side wall of the enclosure - preferably at the cool end. If you have vents near or on the top the heat will rise and escape (not a huge issue) taking the humidity with it (huge issue). Considering the hot basking temperatures monitors prefer, having all of the humidity escaping out the top will quickly cause problems with dehydration. What I do is look at my enclosures and picture them upside down, trying to hold water. If I can see a gap that I can imagine water pouring out of, the humidity will be doing the same when it is right side up.

Part of the reason I keep mentioning a sliding glass opening is that it is harder to stop fast little monitors from running out with a hinged door style opening, whereas sliding glass can be opened partially, allowing you more control. It is also easier to pinch a monitor's tail accidentally with a hinged door than with a sliding opening.

Litter Dam

Make sure the litter dam is high. The litter dam is the bit of wall at the front of the enclosure below the sliding glass windows (**Fig. 1**) and determines how deep your substrate can be before it starts flowing out of the front opening. For hatchlings and small juveniles, 15-20 cm is good, deeper is even better. Your litter dam can't be too high, but it certainly can be too low.



Fig. 1 A juvenile enclosure showing the litter dam.

HEATING AND LIGHT

Basking spot

READ THIS, IT IS EXTREMELY IMPORTANT. Monitors love a hot basking spot. The *surface* temperature of the basking spot should be at least 45°C, preferably somewhere between 45-55°C. The surface temperature should not be confused with the *ambient* temperature. The ambient temperature is the air temperature in the enclosure. The best way to measure surface temperature is to purchase a non-contact temperature gun. These are an excellent investment for all of your reptiles and are available online from www.herpshop.com.au (Australia) or www.tempgun.com (U.S.A.). To achieve this surface temperature, use lights rather than a hotrock, heat emitter or anything else. Avoid spotlights, go for floodlights (less concentrated hot area, more evenly spread out). If your set-up isn't allowing this sort of surface temperature, raise the basking platform towards the light until it does. Don't worry about the monitor touching the light, they usually only do that once. They are quick learners. Screen protection on hot lamps, however, will give the monitor something to hold onto should it decide to jump on the light and may cause it to get burned. Basking lights should be on for much of the day. 50W Halogen floodlights are excellent, as are those indoor/outdoor floodlights (especially as they are made of thick glass that doesn't crack when water hits it).

Position of lights

Have the basking light fittings on one end of the enclosure so you can create a temperature gradient. Ceramic fittings that can hold flood lamps (usually Edison screw fittings) are ideal. If the enclosure is going to be used for a while, until the monitors are reasonably big, provide fittings for two flood lights, situated a short distance apart, so a large enough basking spot is created for the monitors' whole body (minus the tail). It's not only okay to have the fittings inside the enclosure, it's actually better than having them sitting on a screen on top of the enclosure (see vents, above).

Cool end

As important as it is for your monitors to have a hot basking spot, it's equally important that the monitor(s) can get away from the heat when they choose. Choice is everything. The cool end of the enclosure can be room temperature, but for hatchlings and very small juveniles, 25°C is ideal. If it's too cool for them, they'll move towards the warm end. Don't panic if the cool end gets to 35°C on a hot sunny day, as long as it doesn't there for days or weeks on end. If the cool end gets to over 40°C and stays there, you're in trouble, or at very least your monitors are.

Night heat

Night heat is only recommended in winter and is not usually necessary in summer (unless it is cool where you are). I use thermostatically controlled ceramic heat emitters and hot rocks for hatchlings that emerge in winter (**Fig 2**). If you choose to use a hot rock, attach a thermostat probe to its surface and set the thermostat to a moderate temperature (25-30°C) so the monitors do not get burned.

UV lighting

The jury is still out on UV lights. The two things in question are whether or they are necessary for monitors (provided they are getting vitamin D3 in their diet and are therefore able to absorb calcium) and whether or not the commercially available bulbs produce enough UV anyway. I hedge my bets and use them. I also supplement some meals with D3, calcium and other vitamins. Be careful when using UV flood lights to make sure they aren't too close, for there are rumours of eye damage to reptiles.

Flourescent lights

White light producing fluorescent fittings are good for ambient light. If you are going to use some form of UV lighting, get UV flood lamps rather than the fluorescent tubes, as the fluorescent tubes give off minimal UV and only at a very short distance from the lamp itself. They also produce UV light for a very short period of time and usually have to be replaced every six months, which quickly becomes very expensive.



Fig. 2 Heating and lighting. On the left is a 50W halogen floodlight, in the centre a ceramic heat emitter and in the front (barely visible) a fluorescent baton. The cords on the right connect to a heat rock, thermostat probe and thermometer. The thermostat controls both the heat rock and ceramic heat emitter, which are used in winter.

ENCLOSURE FURNISHINGS

These are the things you'll be putting into the enclosure to make your monitor(s) comfortable. A bare enclosure suitable for pythons would be torture for a monitor.

Substrate - enclosure floor covering

Don't use newspaper. Great for reading, keeping snakes on and wrapping fish in, poor for monitors. Lace monitors do best on some form of natural substrate. Leaf litter is good - I just go out in the bush and rake up bags of dry gum leaves - as is mulch, such as tea tree mulch (available at Bunnings Warehouse). Don't use grass clippings, hay or anything else that is likely to rot and heat up in the process. Apparently Aborigines consider cooked goanna to be the all time best meat, but your little monitors will make an expensive, tiny meal. The idea behind a deep, natural substrate is that it retains humidity. If the monitors feel themselves getting too dry, they'll dig down to where it is humid. Don't allow it to get too wet, but if it is wet at the bottom (sometime unavoidable as they run in and out of their water dish all day) that's okay as long as it is still dry on top so the monitors don't have to sleep in the wet. Deep substrate will also be used for security by some baby lace monitors, as they'll dig right down into it to sleep. As far as cleaning goes, spot clean when and where they defecate. I use a pair of plastic barbecue tongs and pick up the substrate around the faeces all in one go. Throw it on your garden - mulch and fertiliser all in one!

Hide spots

I can't stress enough how important hide spots are for baby monitors. In the wild, they'd be a target for every predator around. As far as the little monitors are concerned, you are one of those predators, too, and until it learns otherwise it will be terrified of you. Security is a huge issue with small monitors. If they don't feel secure, they'll refuse food. Give many many hide spots. Flat bits of wood, half logs or curved bits of bark laid on the substrate will allow the monitors to dig underneath and create their own secure hide spot. Leave a tiny gap (this is where curved bits are ideal) so they can squeeze in. They tend to like a tight squeeze. Hollow fake rocks with a small entrance will also do for some monitors, as will half a clay plant pot (real rocks are okay provided there is no chance the monitors will get crushed once they start digging underneath it). Even a piece of PVC pipe barely wider than they are will sometimes do. The important thing is to give them plenty of choices, so have hide spots scattered all over the place, in the warm end, in the cool end and everywhere in between (**Fig. 3**). If the monitors can get from one end to the other (and to the food

dish) without exposing themselves, all the better. By the way, hide spots should be inviolate. That is, you shouldn't pull your monitors out of their hide spots unless you have a very good reason. Once you do so, they will stop seeing that hide spot as secure and you may notice them scratching to find a way out of the enclosure (in the hopes they'll find someplace more secure outside the enclosure). Remember, your monitors will probably be nervous little sods for the first couple of months. Enjoy it while it lasts, for as adults they'll likely be rushing at you for food.

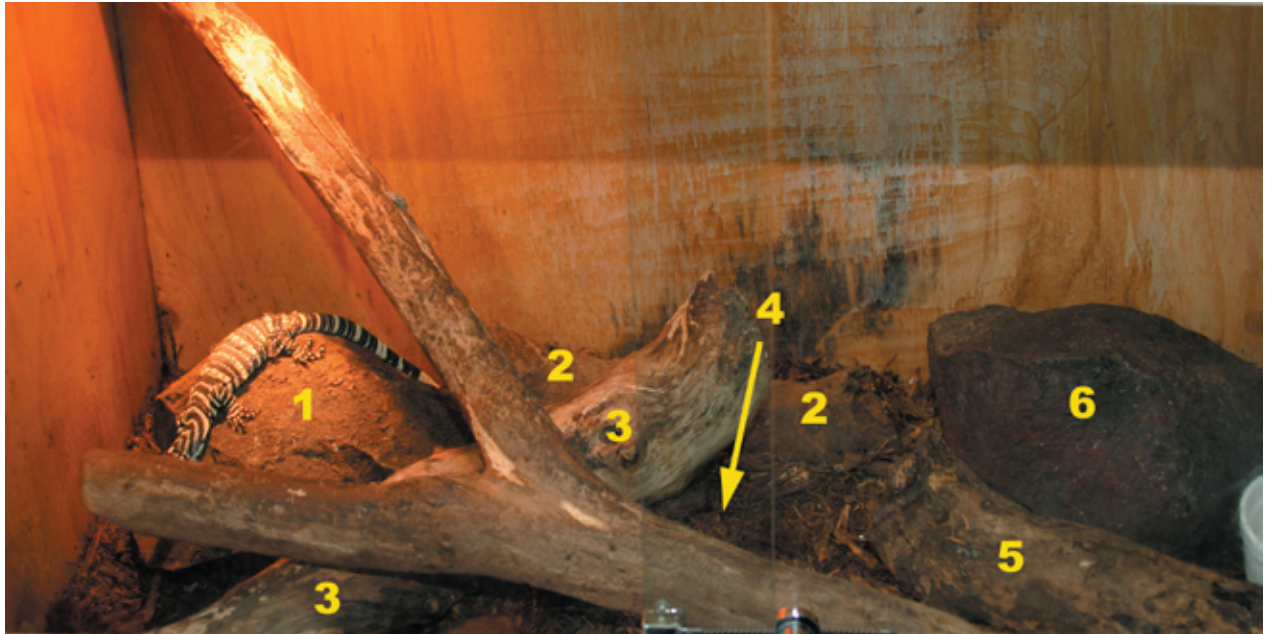


Fig. 3 Hide spots. The 'rocks' numbered 1 and 6 are hollow mock rocks. The small logs numbered 2, 3 and 5 are hollow and have been cut in half lengthwise, then placed with the hollow side downward. Another hollow half-log (number 4) is buried beneath the substrate. There were four juveniles in this enclosure when the photo was taken, but three of them are using the hides. Note the climbing branch, also.

Climbing branches

Lace monitors love to climb, so give them plenty to climb on, such as branches, fake rockwork or pieces of bark. Make sure that branches are thick enough for them to get a good grip. Replace them when they get too smooth to climb easily.

Water dish

Make sure the monitors have access to clean water, preferably in a dish large enough for them to crawl into should they choose. They sometimes like to soak. They'll often like to defecate in the water, which makes cage cleaning easier for you.

FOOD AND FEEDING

Monitors are big on food. Just wait, you'll see. One day you'll have fond memories of when they were nervous and wouldn't eat in front of you

Food

Don't feed them cat food or dog food. That's meant for cats, dogs and pensioners. Whole foods are always best. When you receive your monitors, they'll have been raised on chopped up mice, chicks and SDZ turkey diet*. You can feed them pinkie or fuzzy mice, chopped adult mice (chop them when they are frozen, otherwise it gets smelly and messy), day old chicks etc. Leave these chopped foods in a dish for them. They'll probably also take crickets and roaches. As they get older you can feed them whole mice, rats, chicks and rabbits as their main diet, adding other food as a treat or supplement. It is always best to provide whole animals when possible, with bones, gut, fur (or feathers) and all.

When they are larger you'll find you don't need to leave a dish in there for them, but can feed them by long forceps or tongs. Don't use your fingers unless you want to include fingers in their diet. Lace monitors have extremely sharp, serrated teeth and even an accidental bite from an adult may result in hospitalisation, loss of sensation (from severed nerves), loss of blood (from severed arteries), loss of function (from severed tendons) or even loss of digits (from severed everything). Feeding by tongs or forceps also allows you to target feed animals that would normally get less food and aren't keeping up in growth with their cage mate. If this occurs with nervous animals that will not feed in front of you, you may need to separate them for a while until they are more equal in size again. I try to send out animals of near equal size if possible so that you are off to a good start.

Frequency

Hatchling and small juveniles should be fed at least every second day. They'll be nervous at first, so leave the food in a small dish in the morning and remove the (hopefully empty) dish at the end of the day. If the food doesn't seem to be disappearing and you're not sure if they're eating at all, especially when you first get them, weigh the food dish before you put it in each morning, then again when you remove it later that night. If the food is disappearing but are not sure how much they need, put enough in so that there's always some left over at the end of the day – you will then know that they are getting all they want. This is especially true if there is more than one monitor in there, as there is always a danger of one animal eating all of the food if supply is limited. Young lace monitors will not get fat if there is an

adequately hot basking spot, they'll just grow like nothing else. As they get bigger, you can feed every second day, then every third day when they are adults (or less, but watch your fingers if you keep them too hungry).

Supplements

Buy some vitamin powder and calcium supplement (make sure it has D3 added) and dust insects on every feeding, or other food occasionally (a couple of times a week, more often if you choose not to use UV lights).



Fig. 4 Egg time. You may want to wait until your lace monitor is a bit older before you try this. Adult lace monitors instinctively know to grab bird eggs more gently than they do any other prey, so they can swallow it whole without spilling a drop. Males are better than this than females, simply because they have a much larger head.

***San Diego Zoo (SDZ) turkey diet**

(use this as a supplement, not as a steady diet)

Mix 2kg of minced turkey with 45 grams of bonemeal (available at health food stores) or calcium powder (preferably calcium gluconate, which is sometimes available from chemists – you may have to order it) and one Centrum tablet, crushed. Roll into small sausage shapes and freeze in plastic bags, so you can bring them out one at a time and chop up easily, then thaw. The San Diego Zoo nutritionists developed this diet – apparently it replicates the nutritional value of a mouse. Baby monitors love it, but it does give them much runnier stools than whole rodents (the hair is a good binder). It's always preferable to give whole rodents and whole food in general, but sometimes are rodent shortages in the reptile trade so the SDZ turkey diet is good as an interim measure.

TAMING AND HANDLING

When your monitors are feeding and growing and it seems that nothing will stop them, then you can start thinking about the process of ‘taming’ them, or at very least having manageable animals to deal with. In my opinion, having animals that are accustomed to people makes life less stressful for both captives and keeper but having them ‘dog’ tame isn’t a must. Monitors are very different from other reptiles when it comes to ‘taming’. They are more intelligent than most and must be treated like a wild animal whose trust you are trying to gain, slowly. Patience is the key, for it may take a fair while. Individual monitors differ. Some monitors become accustomed to people in a matter of months, others change gradually over a matter of years. There are a couple of schools of thoughts regarding having your monitors turn into nice, calm adults:

1. The handling method

Handle them daily until they get used to it. This sometimes works, sometimes doesn’t. It’s an individual thing and depends on the monitor. With some individuals daily, forced handling makes them wilder. This is especially true if handling them involves pulling them out of a hide spot, for they start to see their hide spots as insecure and will spend much of their time (probably when you aren’t looking) trying to get out of the enclosure, so they can find someplace safer.

OR

2. The trust method

Leave them alone, continue with your daily routines of changing the water dish, adding and removing food dishes etc. After a while, as they get bolder, they may stick around to watch you rather than bolt for the hide spot. If you leave them alone at first, they’ll learn that you opening the enclosure does not mean they’ll get hassled and they’ll be more inclined to stay out when you are around. They are very curious animals and will often watch what you are doing, usually hoping it involves food for them. Remember to always move slowly, for fast movements may incite a defensive bite. They are fast and even at a small size can draw blood. After a while, try stroking them gently under the throat one day: Move your hand *VERY* (almost imperceptibly) slowly, fingers together, palm up, back of hand against the substrate, until your fingers are under their chin, then lift slowly and stroke. You’ll find monitors are disinclined to bite and use it as a last resource when they feel threatened, or if you smell like the mice you’ve just been chopping up. Always wash your hands before you try this. In time, the monitors may try climbing on to your hand, or you may try lifting them up slowly. Put them back down before they have time to experience anything negative: this is all about positive experiences for the monitors. Eventually they learn to trust you. Sounds a bit ‘new age’, but it works.

For what It's worth, I've always been a practitioner of the second method and it's worked for me, but in some cases it has taken a very long time. Patience is key.

At all times remember that these are potentially dangerous animals as adults. Sometimes I wonder if it may be better having them a bit wild so that you always take the proper precautions – monitors you think are 'tame' will cause you to put yourself in situations you'd never think of putting yourself in with wilder individuals. Always wash your hands before handling them – even the 'tamest' animals may think there's nothing wrong with tasting a hand that smells of rodent, just in case it tastes like rodent. They'll also react to a hand moving quickly past their face, biting to slow it down before finding out if it is edible or not.



Fig. 5 Threat display. This juvenile is giving clear signals that the photographer (me) has crossed into its personal space. Its neck is arched, its throat is expanded and its mouth is wide open in a gape which looks a lot like a slow yawn. Gaping is not as common a threat display as an arched neck and expanded throat. If your lace monitor behaves this way, it is fear that is driving it to do so. This individual went on to become a very tractable animal through calm, patient interactions.

SEXING

There's a lot of hearsay when it comes to sexing baby lace monitors. The reality is that it is nearly impossible to accurately sex them when they are very young, as there tends to be no consistently visible sexual characteristics until they are larger. The odd male does start developing male characteristics from a very young age, but animals lacking those characteristics are not necessarily females – they may still be males which have not yet started developing. Until they are older, sexing is guesswork.

What about X-rays? Unfortunately, sexing by X-ray only works for adult monitors, by which time males have developed bony elements in their hemipenes (which show up on radiographs). However, adult male lace monitors tend to be easy to sex visually, so X-rays are rarely necessary.

What about probing? Males have hemipenes in the base of their tail, like snakes. However, females also have hemiclitori of similar length. Probing will therefore not tell you anything, but may increase the risk of damage to your monitor. If your monitor everts when defecating, the ends of the hemipenes are flowery in a mature male.

Sexing adult monitors. Although your new lace monitors are probably still too young to sex, I'll describe the physical differences of the adults so you'll know what to look for when your animals start showing outward signs of leaning one way or the other. It becomes much easier if you have two animals of opposite genders to compare.

SIZE - Males are larger and bulkier than females. *Most* females don't exceed 130 cm total length (50 cm snout vent length, or SVL) and 2-3 kg (healthy weight, not obese). By comparison, an average adult male will be 150 cm or more in total length (60 cm or more SVL) and will usually weigh 5 kg or more, often much more (**Fig. 6**).



Fig. 6 Male (left) and female (right) photographed at the same spot in their enclosure. Note the size and bulky appearance of the male compared to the female's more delicate features.

TAIL BASE - The male's tail base is proportionally wider, tapering off fairly quickly, and the bulges of his paired hemipenes are sometimes visible on the underside of the tail when viewed from the side. The female's tail base is almost parallel sided for a short length past the hind legs, then tapers off (**Fig. 7**).

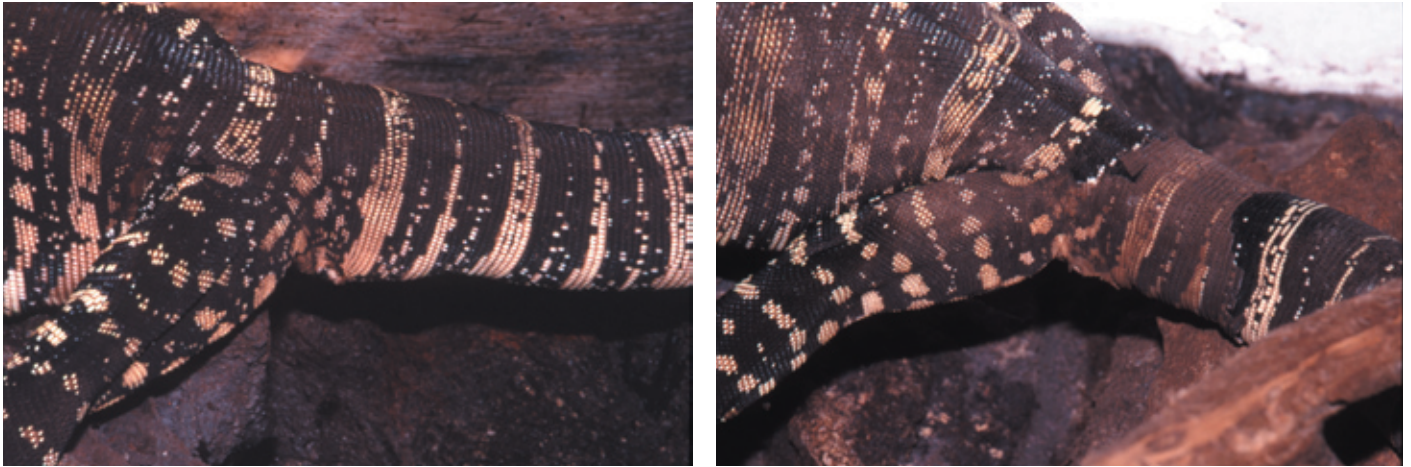


Fig. 7 Male (left) and female (right) tail bases. The hemipene bulges are quite visible in this male, but this is not always the case.

HEAD SHAPE - Males tend to have a relatively longer head, particularly from the eye to the tip of the snout. The tip of the snout itself is more rounded (slightly pointed in females) and top of the snout between the eye and the nostrils is often raised in males. Males also have thicker lower jaws and a more massive neck (**Fig. 8**).

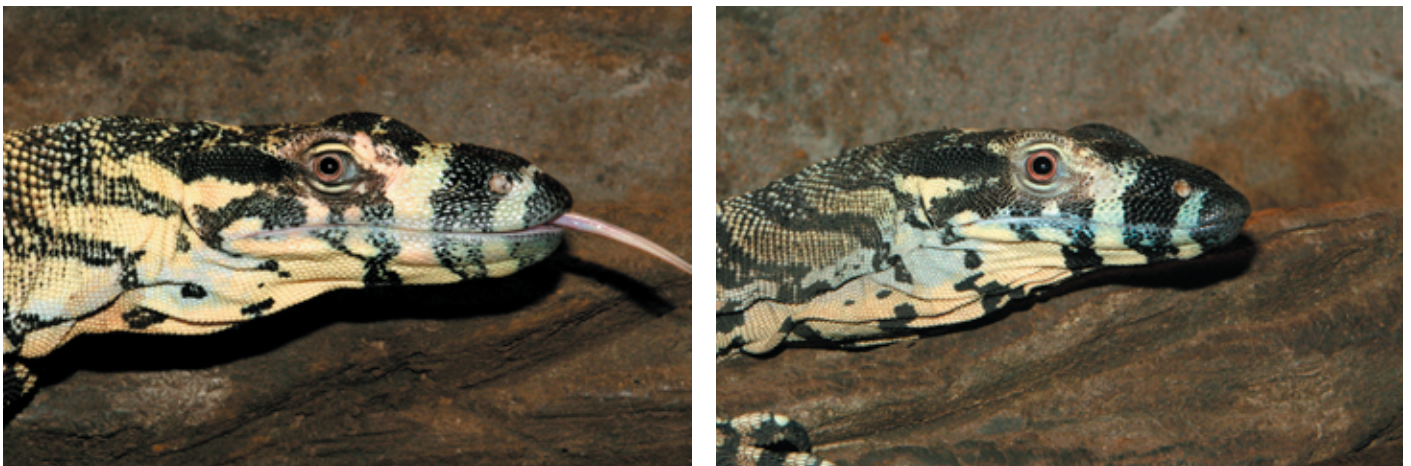


Fig. 8 Male (left) and female (right) heads. The photo of the female's head has been scaled up in size so that their eyes are the same size. Note the female's small, pointed snout. Juveniles usually start off with a slender, feminine looking head, developing male features much later.

BEHAVIOUR - Females have a tendency to be shy, males have a tendency to be bold. All hatchlings and juveniles start off shy, but sometimes these differences start showing up early. Studies of wild lace monitors have shown that males have larger home ranges and spend more time exploring, females restrict their movements to a much smaller area. Most lace monitors seen scavenging picnic areas are males.

TROUBLESHOOTING

I've tried to remember the common problems people have with young monitors in general. This is not all inclusive, but feel free to contact me if your questions aren't answered here.

Why isn't it eating?

There are a few reasons young monitors will refuse food. If the monitor has only arrived recently, it is nervous and may not eat for two or three days. If it continues to refuse food after a week something is bothering it. The most common issue is stress. If you are handling it, particularly if you remove it from its hide to do so, it will feel very unsafe and will know that even its hide spots are not safe. It is best left alone. Similarly, if there aren't enough hide spots and the enclosure is a wide open space, it will feel very unsafe. The second most common issue is lack of a hot enough basking spot. If monitors are unable to get their body temperature into their desired range (usually around 36°C) they will refuse to eat because they will not be able to digest the food. The best way for them to get to that body temperature is with a hot basking spot that is well above their preferred body temperature, so a basking surface temperature of 45°C - 55°C is ideal. Dehydration will also cause a monitor to refuse food. If there is insufficient humidity in the enclosure, young monitors sometimes hunker down and go into shut down mode, in preparation for a long dry spell. Screen tops on tanks are the usual cause of this (see the section on enclosure instruction).

What's that white crust around its nostrils?

You may occasionally notice slight white encrustations around a monitor's nostrils, looking a lot like salt. It is. Monitors have salt glands in their nasal cavities and get rid of excess salt via their nostrils. You may notice the monitor putting its head over one shoulder and letting out what sounds like a sneeze every now and then - that's how it clears the salt while still in liquid form. As long as these 'sneezes' are infrequent, it's nothing to worry about.

Is it normal for a monitor to defecate and regurgitate on people?

Yes, if it feels stressed. Young monitors will often get rid of the last meal you gave it, perhaps along with the one before that (out of the other end) if you pick them up. This is a clear sign of fright. Older monitors usually stop doing this.

Is it normal for monitor faeces to smell so horribly?

Yes, get used to it. :)

Is it normal for a monitor to hide all of the time?

Yes, when they're small. They'll emerge to bask and feed when you aren't looking and may stay still if you walk into the room. They're just waiting for you to turn away so they don't give away their hiding spot when they bolt.

IF IN DOUBT

Consider this a 'Coles Notes/Reader's Digest' version of the previous 15 pages:

Give your monitors as many choices as possible, for they have inbuilt instincts honed over millions of years that will make sure they make the right choices most of the time. Choices in temperature, humidity, hide spots and basking spots. In other words, supply them with a range or gradient of temperatures from hot to warm (or even cool), more hide spots than they could possibly need or use and the ability to get as wet as they want or as dry as they want. Problems arise when we think we can make those choices for them and force them to live in conditions that are unsuitable to them.

Enjoy your monitors!