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Keeping and breeding Leopard Tortoises (*Geochelone pardalis*). Part 2. Accommodation, diet and feeding

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I obtained my first Leopard Tortoise when I was 15. It came — as did all tortoises in those days — from the wild, but it was not a bulk import. It had been collected for me on a cousin's farm near Rongai in Kenya, which was then a British colony, in what was then called the 'White Highlands'. The day after its collection it was despatched to me by BOAC and the following day it was walking around our Scots garden. This was a very different situation from bulk imports where tortoises are collected and often held by dealers in their native country for extended periods with little or no food or water, let alone creature comforts. On arrival in Britain some dealers treat them abominably, providing them with none of the warmth that all tortoises — and especially non-hibernating subtropical/tropical tortoises — require.

This tortoise was an education. It was only the second type of true land tortoise which I had kept: the first one being a *graeca*, named Timothy after Gilbert White's famous tortoise, which had belonged to my nursery schoolteacher and which she gave to me when I was nearly five. I already had some very fine large Asian land/swamp chelonians, *Melanochelys trijuga thermalis*, which I found extremely interesting and also various American box tortoises (*Terrapene*). But I digress... This Kenyan leopard did very well indeed, being outside during the warm summer months and indoors in roomy, warm, draught-free accommodation during the colder months of the year. It was beautifully marked with strongly contrasting black markings against a yellowish, straw-coloured ground colour. I had to find homes with friends for all my reptiles — Timothy being an exception — when I went off to University. Thereafter I was abroad for some twenty years so my tortoise-keeping days were interrupted, there being no land tortoises in Australia where I spent the first 12 years.

It was not until after my return home in 1981 that

I could resume tortoise-keeping. All that follows is subsequent to that date. In the intervening years, however, I was fortunate to be able to see leopards in the wild in parts of their range. The Leopard Tortoise has an enormous distribution in Africa south of the Sahara from Sudan and Ethiopia in the north to Cape Province in the south and extending across much of Africa in an east-west direction. In this huge distributional range the species occurs over a wide altitudinal range. Not surprisingly there is very considerable geographical variation throughout this range and between more isolated populations. Our former Chairman, Mike Lambert (1995) reported on geographical size variations, growth and sexual dimorphism in Somaliland at the northeastern part of the range of *babcocki*. These variations are masked by only two geographical races being named; *G. pardalis pardalis* with a limited range in parts of the Republic of South Africa and *G. pardalis babcocki* covering the rest of the species' range. However, anyone who knows the species' zoogeography will tell you that among the various geographical differences a significant one is size. Some populations always consist of small tortoises, others of intermediate ones, and in some areas others of massive ones. Equally marked are differences in shell shape. In some populations the individual carapace scutes are more or less flat, whereas in others each scute is pyramidal in shape almost like a captive-reared tortoise which has not had a proper diet. That this is seen in wild tortoises, which have certainly not suffered from the problems which cause pyramiding in captivity, shows that it is a genetic feature.

The Leopard Tortoise is the second largest tortoise on the African continent, only *G. sulcata* growing larger. Both subspecies include large races/individuals. Branch et al. (1990) list record sizes as 656mm (26") in males and 705mm (28") in females with corresponding weights of 43 and 48.6kg respectively. These are exceptional although

I have seen individuals of about 550mm (22") in the UK. In view of currently held opinions regarding *sulcata* I would stress that even the largest leopards are not at all destructive, can be easily contained, and will not attempt to dig out of their pen. In recent years most of the Leopard Tortoises imported into this country have come from Zambia in Southern Africa. The most positive point about leopards is that they are now being regularly bred in captivity with the result that captive-bred youngsters are fairly often available. If you wish to have a leopard tortoise you should try to obtain one of these rather than an imported tortoise. Leopard tortoises grow very rapidly with proper care, so you can have a sizeable tortoise — say 20-25cm (8-10") only about five years from hatching (see also below).

Like all tortoises, leopards like space — as much room as possible — and preferably 'interesting' space. By interesting space I mean some of the following: a raised area of ground angled towards the south which will be used for basking; some larger easily climbable rocks scattered around the enclosure; or even a small scree-slope; one or two larger logs so arranged to provide temporary hiding places and shade during the heat of the day; one or two substantial low-growing leafy plants which will also provide natural shade and cover. These can be sunk into the ground in their pots and lifted each autumn if not reliably frost hardy.

There is no substitute in my opinion for an outdoor enclosure — as large as possible — for them to use whenever the weather is suitable. It is important to point out that once they have attained large size, when their compact shape has warmed up, they can come out to graze for quite extended periods, even on quite cool days, returning back inside before they lose too much heat. Many individuals will quickly learn to carry out this shuttling behaviour exactly as they would do in the wild — with the change that here they are avoiding over-cooling, whereas in nature they would be avoiding over-heating. I found that when my juveniles, at a size of about 12-15cm (5-6"), joined the adult group, they very quickly learned to shuttle in and out with the differences that a) they were more active than large individuals and b) their small mass necessitated much more frequent return to the

warm indoor accommodation during cold/cool weather. Leopard tortoises must have indoor heated accommodation for the colder months of the year. This often used to be achieved by giving them a room within the house. The system described above where they have access to an outdoor area at will (except for very cold periods when they may be shut in) is much to be preferred.

I am a great believer in under-floor heating for tortoises as they lie flat on the ground for very extended periods. Heat lamps are much less effective if the tortoise is lying on a cold substrate. One has also to consider their environment when the heat lamps are turned off, as at night. Under-floor heating can be achieved in any one of a number of ways. In a custom-built, concrete-floored shed it is fairly straightforward to install a grid-system of piping at the time of construction through which hot water from a boiler circulates to maintain the desired substrate temperature. With my own tortoises I prefer to use raised, custom-built, high quality, tongue and grooved, wooden sheds. The whole shed — walls, ceiling and floor — is insulated with sheets of 5cm (2") thick polystyrene and custom-built heat mats cover the entire floor area. These heat mats are of an output (150 watts/M²) that I have found ideal for tortoises. This is lower than normal reptile heat mats because the tortoises are lying directly on the floor unlike many other reptiles.

To protect the heat mats from damage from large tortoises — which includes urination as well as physical abrasion — I cover the entire floor area with large aluminium trays. Aluminium has a high heat conductivity, which is obviously important, but has the added advantage that is light, so the trays can be easily removed for cleaning. Stainless steel is very much heavier. Each tray has a 2.5cm (1") lip all round and the trays fit closely together to cover the entire floor area. On the advice of my heat-mat specialist I run sheets of silica, placed at right angles to the mats, across the entire floor area to prevent any possible electrical discharge from the mats through the aluminium trays to the tortoises. So, to summarise: the heat mats are placed on top of 5cm (2") thick polystyrene, covered by sheets of silica run at right angles to the length of the mats, and then the whole is covered by aluminium trays, the latter of

suitable gauge to the size/weight of the tortoises being kept, as well as being suitable for the owner to walk on. My leopards had a floor area of approx 4.3x53 m (14 feet by 18 feet) and this area was covered by 6 trays. It is important that wiring from the heat-mat(s) is protected by a conduit securely fixed down so that tortoises cannot become entangled in the wiring. The normal tortoise response to becoming entangled in anything is to push/pull, with — in this instance — unfortunate consequences such as ripping out the wiring and so cutting off the heat source!

An under-floor heat mat set-up such as described above can, of course, be kept at a desired temperature by including a thermostat in the circuit. In the winter in Scotland the heat mat under-floor heating is kept on without thermostat twenty-four hours a day. The heat is reduced/increased in spring/autumn. In 'summer' it is time-clock controlled so that it goes off in the morning after the tortoises have emerged into their pen and comes on again between three and four in the afternoon so that they return to a warm floor environment to sleep. In hot summer weather it is switched off completely. This period can, of course, also be thermostatically controlled. *I cannot over-emphasise the advantages for subtropical/tropical tortoises of under-floor heating.*

Bright sunlight is also important in the lives of all but deep forest tortoises. For much of the year in the UK the intensity of the light — even if the sun shines — is poor. My large tortoise shed — where my leopards lived — is lit using 4 foot 'daylight' spectrum fluorescents (Thorn/EMI) to provide a bright, natural light environment. These, like the additional heating provided by two heat lamps, are time-clock controlled which results in bright light and a temperature lift from morning to evening together with darkness and a gradual fall off in temperature at night. I alter day-length to match the seasons.

Although leopards should be allowed into their outside area whenever possible, including warmer periods during the winter months, it is important to ensure that all have returned to their heated accommodation before temperatures fall in the late afternoon. Different species of tortoises — as well as

individuals within a species — vary greatly in their daily 'homing' ability, the species' differences presumably depending on their habits in nature. Tortoises (Bustard, 2001) have the ability to very quickly learn the geography of their pen and shed so that they can return 'home' from day one. However, not all species, nor all individuals of a species, will regularly do so. I found that most of my leopards would home of their own accord; but some would often either move into a corner in the late afternoon or push into a tussock of tall grass. Even in a modestly-sized pen, any but large tortoises were extremely hard to see under such conditions and one quickly comes to appreciate the camouflage effect of their striking colouration — just like that of their namesake the feline leopard. In the right environment both provide excellent examples of the camouflaging effect of disruptive colouration.

The initial pen measured 8m (26') square and early in the season the grass growth exceeded the leopards grazing ability so that it grew long. The area was also left natural so that dead grass was also present in the tufts giving the leopards a lot of cover. A second pen measuring 14 x 10m (46' x 33') was added later because I had expanded the collection to include *sulcata* and by changing one set of boards the tortoises could be directed to either pen. This allowed one pen to recover while the other was being grazed.

Cover of the above kind may be valuable in 'breaking up' the outdoor enclosure so that tortoises cannot see the entire area of the pen from any one point. It is certainly much less 'boring' than an area of mown lawn where they can see the entire enclosure (and all the other tortoises) at any one time — a most unnatural situation. Furthermore, 'lawn' will provide a much poorer foraging area than is ideal. My pens are seeded with a good agricultural mix of grasses including additional items such as Clover. Not only does this provide an excellent range of 'graze' but adds to the 'tuftiness' of the grass and consequently the cover provided. This gives individual tortoises privacy, which is very important when mating is occurring as the 'lack of view' ensures females are not constantly harassed by courting males.

Access to and from the shed is through a small

opening cut at floor level in one side just wide and high enough to allow the larger tortoises to pass through. Thus, when the tortoises are outside all/most of the day, the shed becomes a secluded sleeping area. Individual sleeping quarters can be provided within the shed using either strong cardboard boxes (of short lifespan!), or better wooden boxes minus a floor area as this would reduce heat gain for the sleeping tortoise insulating it from the tray-covered heat mat. Alternatively, one can construct a series of stalls of varying breadths to suit different size categories of tortoises. A removable sheet of plywood is put across the top of these to provide an added feeling of security. The boxes or stalls can be partly filled with dry leaves. I avoid hay or straw for my tortoises, as these can result in sharp ends which could cause eye injury.

I consider it important that the tortoises are able to go out whenever the weather is suitable. No artificial lighting set-up is nearly as beneficial as the heat and the light intensity of natural sunlight. This applies equally to baby leopards. These will require baby pens which need to be covered with chicken wire when the tortoises are very small lest they be eaten by birds. It is, of course, possible, and very desirable, to incorporate small water-proof sleeping quarters with heat mats into these baby or small juvenile pens even although the tortoises are taken indoors each evening. This is doubly important, due to the vagaries of our climate, if someone is not on hand throughout the day.

In many urban areas foxes are now common and are sometimes out foraging even during the day. In such localities it is essential to have fox-proof enclosures for all small tortoises. Adults should, however, be safe from even the most determined fox unless the tortoises are used to domestic dogs and have become overly tame.

Food - Leopards are vegetarian grazing animals and will consume large amounts of mixed grasses (the European tortoises *T. graeca [iberica]* and *hermanni* prefer to eat the weeds — such as Dandelions and Clover — amongst the grass, rather than eating the grass itself). The normal high fibre diet recommended for all grazing tortoises is very important. As well as mixed grasses they also like

all 'weeds' which you would feed to rabbits including Dandelions, Sowthistle, Groundsel, Clover, plaintains, Cowparsley, etc). It is important to try to keep up this graze as much as possible during the winter months when the tortoises are mostly indoors. This is also a reason to allow outdoor grazing whenever the weather is sufficiently mild. During the winter it will be necessary to supplement what graze is available with greens such as cabbage, cauliflower leaves and brussel sprout leaves. These all have different tastes so can be used in turn, or mixed together to provide variety and all are coarse leaves containing a lot of fibre so essential to their diet. Some other vegetable matter can be provided such as small quantities of tomatoes and cucumbers, both of which my leopards always liked.

I do not include fruit in the diet as unless provided in very small amounts it is likely to cause diarrhoea in this species. They, like almost all tortoises, should NOT be given meat or meat products such as cat or dog food, as such high protein foods can have deleterious effects including shell 'pyramiding' and can place an unnecessary strain on the liver and kidneys during their breakdown (deamination). Nor should they be fed on dry products such as 'tortoise chow' which again can cause kidney problems unless the tortoises drink copiously, since tortoises are used to vegetable food which is predominantly (up to 90%+) water.

There are tremendous advantages in allowing them to graze naturally on vegetation based on a good agricultural meadow seed mix which you can obtain from your local Farmer's Cooperative. Under this regime the food is always fresh and vitamin rich at the time of consumption, whereas a lettuce, for instance, loses 30% of its vitamin C content within six hours of harvesting.

Leopard Tortoises grow quickly and the calcium requirements of both this rapid growth and egg production by breeding females are considerable, so it is important to provide dietary supplements. I recommend Nutrobal which I use for all my tortoises. In addition it is a good idea to provide pieces of cuttlefish bone which the larger tortoises will regularly nibble. Field observers have noted this

species eating bones in the wild presumably for their calcium content. I do not recommend the feeding of bones (which may break into splinters and cause problems in the alimentary canal) but cuttlefish bone is perfectly safe. Field observers have also noted leopards eating hyaena droppings in the wild. Again, because of the hyaenas' habit of crunching up bones, these are a very rich calcium source. For baby/small juveniles, additional calcium can be provided by scraping cuttlefish to provide a fine powder which can be sprinkled onto the food once or twice a week in addition to regular provision of Nutrobal. Fresh water should always be available. I have noted my leopards of all sizes to be regular drinkers. Regular water is particularly important for baby tortoises which in warm conditions, due to their large surface area and small volume, dehydrate rapidly.

To sum up: if you would like to keep a subtropical/tropical non-hibernating species of

tortoise and feel that you can provide the facilities required — especially as they grow — then the Leopard Tortoise is an excellent choice. I rate them an easy tortoise provided they are given the facilities/care described in this article.

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