



**Melissa Kaplan's**  
**Herp Care Collection**  
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# Sulcata Tortoises

African spurred tortoise (*Geochelone sulcata*)

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*Note: these are not the spur-thigh tortoises, Testudo graeca or Geochelone iberi*

## Natural History

Sulcata tortoises are native to more northern parts of Africa, ranging from the southern edge of the Sahara down through the arid countries, including Senegal, Mauritania, Mali, Niger, Chad, the Sudan, and Ethiopia, up through the dry, hot Massaua coast bordering the Red Sea.

Captive bred and imported Sulcatas can be found increasingly found in the pet trade. The sulcata is the largest of the African mainland tortoise, with specimens easily reaching 24-30 inches (60-75 cm) in carapace length and 80-110 pounds (36-50 kg). The largest on record was a male resident of the Giza Zoological Gardens (Egypt) who weighed in at 232 lb (105.5 kg) and measured 41.6 inches (104 cm) over the carapace (Flower, 1925, in Stearns). The oldest recorded specimen in captivity, also at the Giza Zoological Gardens, was 54 years of age (Hughes, 1986, in Stearns).

Sulcatas have broad, flattened carapaces, evenly brownish or yellowish in color. As they age, the growth rings inches on each of the scutes are strongly marked. Mature males develop reverted marginal scales in the front. The gulars on the plastron (the marginal scales just under the neck) are deeply forked; the anal scutes are also deeply divided. The skin on the legs is well blended into the shell color. Well-defined spurs, which serve no observable function, are present on the back of the rear legs. Their skin is very thick which may serve to reduce fluid loss through transpiration.

Sulcatas come from some of the Sahel, the hottest, driest area in Africa. Some regions may not get rain for years. To make the most of available moisture, their skin is resistant to fluid loss but, when exposed to moisture, may become highly permeable. Towards this end, they will excavate pallets or burrows in the ground to get to areas with higher moisture levels; in the wild, they may spend the hottest part of the day in these microhabitats. Burrows may average 30 inches in depth; some dig tunnel systems extending 10 feet or more underground. Sulcatas are, like most turtles and tortoises native to dry areas, extremely efficient in their use of water. A sulcata may urinate just 0.64 ml a day, significantly less than their spur-thighed cousins living in the relatively lush Mediterranean countries who may urinate 1-2 ml a day. A danger, then, in captivity is that too much water may be given or made accessible which may lead to health problems including skin and shell infections and kidney problems.

In captivity, a similarly hot and dry environment must be provided year round. Unlike the California desert tortoises, the sulcatas do not hibernate. While they can tolerate some surprisingly low temperatures, they cannot be allowed to get both chilled and wet or kept outdoors in chill, damp weather.

### **Housing**

Daytime temperatures during much of the year should range from 85-105 F (29-40 C) during the day. At night, temperatures can drop into the 70s F (21-26 C) in their enclosure. They must be dry. Provisions must be made to house them indoors during rainy weather and in places where the nights are cold and/or damp.

### **Outdoors**

Sulcatas can be housed outdoors only if they are provided dry, heated housing into which they will retire at night and during inclement weather. If they will not come out and go in on their own, they will have to be directed or physically moved. (Note that while this may not be a problem when the tortoises weigh less than 25 pounds or so, it can become quite problematic when they weigh 90 pounds or more.) In sufficiently dry areas that are protected from predators and humans, sulcatas may be kept outdoors at night as well, with living in-ground trees and shrubs providing the shelter over their pallets they require. Some owners recommend making sure that fencing surrounding the compound be opaque: if the sulcatas can see through it, they will try to plow through or burrow under it.

A dog house or, for younger sulcatas, a trash can laid on its side, make suitable houses for sulcatas. They must be raised up off the ground and must be supplied with heat during colder weather. A wide ramp must be constructed for them to move easily in and out. Make a curtain to cover the opening; a couple of layers of plastic drop cloth, cut into 2-3 inch wide strips, will create a curtain that can easily be pushed through but will keep out draughts. It will also help insulate the house by reducing heat loss. During the winter months, insulating layers of plastic, sod or wood can be used to cover the top and sides of the house. Red lights or ceramic heating elements, suspended from the ceiling of the house and safely out of reach of the tortoise, may be used during cool weather. A pig blanket (also called a farrowing pad, these are rigid heating pads made for pigs to lie upon) can be used inside on the floor.

Sulcatas like to burrow and they are quite good at doing so. They feel more comfortable when they can feel their environment around them. When a pig blanket on the floor is enough for heat, a trash can may work just fine as they can feel the sides of it around it. The curtain across the doorway helps as well by providing not only insulation by a physical, albeit passable, barrier. Fresh mounds of alfalfa hay or pesticide- and pest-free leaves and grass can be placed inside to also give them a burrowing medium. Check regularly and replace as necessary.

A shallow water bowl, with sides low enough for the tortoise to reach into, should be available at all times if there is no wallow available. Tortoises do not swim, they sink. You need to make sure they can easily access the water but that it is not any deeper than the tortoise's bridge, the section of shell that joins the carapace (top shell) and plastron (bottom shell). A bowl or flowerpot saucer (plastic or glazed ceramic) may be find for a larger tortoise; it may need to be sunk slightly into the substrate for smaller tortoises. Be prepared to refresh daily and clean frequently.

### **A note on predators and other harmful species:**

Animals such as raccoons and opossums may prey upon sleeping tortoises. Dogs and cats may harm tortoises just by being inquisitive or playful...small tortoises look, smell and taste too enticing to not be a chew toy! Tortoises kept in front and easily accessible side yards are enticing to unscrupulous members of a two legged species: many tortoises have been spirited

out of their yards by humans. Make sure all fencing is secure, both to prevent the tortoise from barging through it or digging under it, and to prevent unwanted visitors from coming in or accidentally letting them out.

### **Indoors**

Given the tremendous amount of room these tortoises need to roam, maintaining them inside year round is not advised. Temporary indoor housing, as for hatchlings (see section on hatchlings below), sick individuals or during inclement weather, can be set up. Such indoor housing must include both basking and cooler retreat areas, and a den box in which to burrow. An area for feeding and a shallow water dish must also be provided. Ultraviolet B lighting must be provided as well as suitable temperature ranges during both the day (80 F (27 C) with a basking area (100 F (39C)) and night (72 F (22 C)).

### **Behavior**

Sulcatas like to move around and are very strong -- they must have a large area in which to freely and widely roam. Sulcatas also need to burrow away from the heat and do so by retreating to their pallets or into muddy wallows where they will stay for hours, flipping cool mud up onto their backs. When temperatures exceed 104 F (40 C), they will begin to salivate heavily, smearing the saliva on their forearms to help cool themselves down.

Whether housed indoors or out, Sulcatas roam about and are voracious eaters. Like many tortoises, they are also climbers. Care must be taken to assure they are not given the opportunity to climb things that are too steep resulting in their toppling over. If they flip onto their backs and are not able to right themselves, they may die of hyperthermia if they do it during the hottest part of the day. They may also choke or drown on their own vomit if they panic. They may lose precious water by voiding urates and thus become seriously dehydrated. Suffocation is also a possibility if they are left upside down too long as their lungs, which are near the top of their carapace, are compressed by the weight of their internal organs. Sulcatas also need to burrow away from the heat and do so by retreating to their pallets or into muddy wallows where they will stay for hours, flipping cool mud up onto their backs. When temperatures exceed 104 F (40 C), they will begin to salivate heavily, smearing the saliva on their forearms to help cool themselves down.

Keep dangerous objects out of their area. Steps, dogs, raccoons and children are among some of the dangers that must be guarded against. So too are thorny cacti, human and animal hair, pesticides and herbicides, small plastic, glass and metal toys, and toxic plants. Sulcatas are voracious, if not always smart, eaters and will ingest anything small enough and colorful enough.

Provide variety and security. Tortoises do not bask on the bare open ground. Provide a cluster of sturdy, low growing plants they can crowd in amongst. Provide an interesting terrain by leaving (or building) some low hummocks, smooth rocks, pieces of wood, clumps of weeds and edible plants.

### **Food and Feeding**

The phrase used most commonly by sulcata owners to describe their tortoises is "eating machine." Sulcatas graze and forage for hours during the day. In the wild, much of their intake is from extremely hard to digest tough plant fibers from grasses. In captivity, a wide variety of vegetables and fruits can be offered (see list below) but sulcatas, like all tortoises, need to be able to graze on pesticide- and herbicide-free grasses and weeds. While sulcatas may be successfully reared for the first couple of years in a small yard, larger specimens need lots of yard with forage for them. Lists of toxic plants are available which should be used to determine which plants to keep out of your yard.

Three of the most important factors in constructing tortoise diets are the calcium:phosphorous ratio of the food and supplements ingested, the amount and type of protein eaten, and roughage--lots and lots of roughage. Too much phosphorous, or too little calcium, will cause bones and shell softening and deformity, and impairs metabolism and organ function. Too much protein, and feeding the wrong kind of protein (such as vertebrates, invertebrates, and commercial mammal foods) or too much of certain proteins (legumes, soy and alfalfa hay products) will cause too rapid growth, kidney failure, shell deformities and decrease life span. Studies of the feces of wild tortoises have shown that they do not ingest much in the way of animal protein. The animal component found in the feces was no greater than the small amount of other nonfood items such as small stones, feathers, fur and lizard skin sheds: in short, whatever was in the way as they were grabbing at their plants of choice (Highfield). Necessary protein may easily, and should, be supplied by plant proteins.

For roughage--to help provide the highly fibrous forage they eat in the wild--use hay flakes. Found at feed and grain (farm and ranch supply) stores, flakes can be put down for them to bite into and move around. Flakes are usually easier for most humans to lift and carry, and transport in their cars. If you can handle a full bale of good grass, that's fine, too.

Other food concerns include:

- Too many "wet" foods, such as fruits, vegetables, and leafy greens, including the nutrition-poor, water-rich lettuces, and the healthier greens such as collards, dandelions, etc.
- Feeding of too much goitrogenic vegetables, such as broccoli, Brussels sprouts, kale, cabbage and bok choy. In excess, compounds in these vegetables can impair thyroid function and cause goiter. Since you are going to keep these vegetables and greens to the level of occasional treats only, excess goitrogen intake shouldn't be a problem.
- If you are considering using a commercial tortoise food product, check the ingredients. The main ingredient in most of them is soy. Most also contain a lot of corn, an ingredient whose key contribution to the mix is that it is cheap.
- Foods which have fats added, and fatty foods (including soybean derivative) should be avoided as well. Fat impedes calcium metabolism and in general is not well metabolized by herbivores; liver damage and inability to retain Vitamin A result.
- Care must be taken when feeding greens high in calcium oxalate (parsley, spinach, rhubarb, beet greens, collards, carrots tops, etc.) as the oxalic acid binds calcium. Fed in high enough quantities, it may not only cause metabolic bone disease due to preventing the metabolism of enough calcium, it may also cause visceral gout, the mineralization of the soft tissues and internal organs.
- Cactus fruits, plantain, and desert mallow are plants favored by California desert tortoises which may be well received by sulcatus. Other California/southwestern native plants which seem to be preferred by desert tortoises include red-stem fialree, threeawn, red gramma, as well as rattlesnake weed, six weeks fescue, and the flower buds and stem tips of pencil cholla.

The bulk of their overall intake, however, should be from flake hay, pesticide- and herbicide-free grass and grass cuttings, cheat grass, clover, edible flowers (nasturtium, geraniums, hibiscus, rose petals and shrubs).

Fruits are very high in moisture and should be fed in moderation to these tortoises who get little such free moisture in the plants they eat in the wild. Occasional small servings of fruits such as strawberries, chunks of organically grown bananas with skin, cantaloupe with rind attached, berries; peaches (no pits), apricots (no pits), pears, apples (no seeds) may be offered. Oranges and tomatoes may be fed, but not to hatchlings. Figs are a great source of calcium, but must be rehydrated if you can't find fresh ones out of season.

Sweet and colorful treats, such as fruit and edible flowers, are a great way to lure (bribe) your sulcata to go where you want him to go once he becomes too heavy to easily pick up and carry.

Sulcatas respond to bright colors and will try to harvest them on their own, so keep brightly colored inedible things away from them! You will also have to block their access to ornamental flowering and fruiting plants: a motivated sulcata will literally move walls and support posts embedded in concrete to get to something that interests them. (This also includes plowing through a screen door if they want to get inside the house...and do not assume that a few steps between the yard and deck will stop them once their legs are long enough to reach the bottom step.)

Sulcatas are prodigious eaters and are equally prodigious in the amount of waste products they will deposit around their environment. While sulcatas regularly ingest their own and other animal feces, they leave more than enough to keep any caretaker quite busy on a daily basis. Due to their coprophagy, fecal samples should be regularly tested to assure they are free from bacterial, protozoan and worm infestations.

### **Vitamin Supplements**

Most sulcata keepers routinely supplement their tortoise diets with both a multivitamin supplement and a calcium supplement; others do not supplement at all. Given the often extremely low calcium levels in the greens and vegetables offered to sulcatas in captivity, and the variable nutritional content based on the differences in the soil content in which the plants were grown, regular supplementation will help even out any inconsistencies and trace element deficiencies in their diet.

### **Health Problems**

Two common diet related health problems easily observable to the caretaker are shell softening (calcium deficiency or excessive phosphorous) and pyramiding (generally associated with too much protein). If either of these conditions manifests itself, an immediate reassessment of the diet needs to be done. A visit to the veterinarian (or a home visit by the vet in the case of larger adults) for blood sampling is advised.

High levels of dietary protein may also cause increased uric acid in the bladder and may result in death. In severe cases, the normally gelatinous urates (the white and fluid material which is voided out during defecation) becomes solid and may even become impacted. Moderate cases may be taken off protein and soaked frequently to increase the volume of water in the body to help thin the urates. In extreme cases, surgery may be required to removed impacted urates.

Like many chelonians, sulcatas are prone to respiratory infections. Not only must the illness itself be treated, but the tortoise's environment and diet. Prolonged psychological stress may lead to physical illness through its affect on the immune system, thus interactions with any other tortoises with whom it may be housed must also be evaluated. Symptoms of respiratory infection include nasal discharge, watery eyes (occurs in cold weather only), loss of appetite, and lethargy. The animal will require treatment with antibiotics as well as supportive care, including warm temperatures and, in the case of nephrotoxic drugs, fluids. Severe cases may

require hand- for forced-feeding.

### **Sexing**

There is little morphological difference between males and females. Males may be larger than females when they breed. Bred females have polished carapaces due to the rubbing of the male's plastron (Cloudsley-Thompson). Grubb (1971, in Stearns) notes slightly flatter carapaces in females and slightly concave plastrons in males. There is no significant difference in tail size or shape between the sexes.

Males and females both can be quite aggressive, starting almost from the time they hatch. Ramming others, attempting to flip others over are both behaviors continued by males after they reach sexual maturity (about 14 inches (35 cm) carapace length). Unless there is great size disparity, however, flipping rarely occurs, but bloodied and often severely injured heads and limbs may result from repeated ramming. Unless their outdoor area is extremely large, housing multiple males together should be avoided.

### **Breeding**

Copulation may take place anytime from June through March, but occurs most frequently right after the raining season, during the months from September through November. During the several copulation events which may take place each day, the female is weighted down by the much larger and heavier, and rather vocal, males. The females stay in one place during the event, with movement restricted to a side-to-side shifting of the hind quarters.

Soon after mating (generally between September and December), the developing eggs take up increasing room inside the female's body. Food intake will decrease. Restless behavior will be noted as the female begins to roam the compound looking for suitable nesting sites. For five to fifteen days, four or five nests may be excavated before she finally selects the location in which the eggs will be laid. The site is generally in one of the trial nests. The digging may start like the usual pallet digging, but the female soon turns around and continues to dig using her hind legs.

Loose dirt is kicked out of the depression, and the female may frequently urinate into the depression. Once it reaches approximately 2 feet (.6 m) in diameter and approximately 3-6 inches (7-14 cm) deep, a further depression, measuring some eight inches (20 cm) across and in depth, will be dug out towards the back of the original depression. The work of digging the nest may take up to five hours; the speed with which it is dug seems to be dependent upon the relative hardness of the ground. It usually takes place when the ambient air temperature is around 78 F (27 C). Once the nest is dug, the female begins to lay an egg every three minutes. Clutches may contain 15-30 or more eggs. Tortoises in warmer climates where they are outdoors most of the year may double clutch. After the eggs are laid, the female fills in the nest, taking an hour or more to fully cover them all.

Eggs incubate in the ground for eight months. They have been successfully incubated in captivity, using enclosed containers half-filled with vermiculite and water in a ratio of 1:1-2 by weight, or in open containers in chick incubators with water replenished as needed. Both the closed container and the incubator were opened once a week to allow fresh oxygen to reach the eggs. Incubation temperatures ranged from 82.5-84 F (28-29 C), with hatching taking place between 118-156 days later, with some hatchlings emerging as early as 92 days; one zoo reported hatchlings emerging as late as 170 days later (Stearns). The length of time from the first pipping to actual emergence of the hatchling from the shell may vary as well, from 24-72 hours. Some have almost no yolk left, while still others have a sizable yolk sac still attached, as much as 25% of their total mass. Such hatchlings are placed on damp paper towels in individual covered containers and maintained at 84 F (29 C) until the yolk is absorbed.

## **Hatchlings**

Hatchlings are 1.5-2 inches (4-6 cm) carapace length. They are somewhat long and narrow, oval-shaped, weighing less than one ounce (20-25 gm). Their scutes are pale yellow, almost sandy colored, bordered in brown. Hatchlings have been observed with supernumerary scales, additional and often irregular or asymmetrical scales on their carapace. Hatchlings are aggressive right from the start, and quite active, starting their ramming behavior when just a few days old. Anything may be subject to ramming, including furnishings in their enclosures.

Hatchlings may be maintained indoors in aquariums. Edible substrates, such as alfalfa hay or pellets, may be used. Half the enclosure should be placed on a heating pad enabling the hatchling to thermoregulate itself. The warm side of the enclosure should not range above (29 C), and the cool side no colder, and not much warmer, than 72 F (22 C). In addition, a heat lamp to provide a focal basking spot with a 105-110 (40-43 C) basking surface temperature should be provided in one corner of the enclosure on the warm side. To provide the necessary ultraviolet B exposure, hatchlings kept inside must be given 10-12 hours a day exposure to UVB-producing fluorescent lights.

Hatchlings may also be housed outdoors during the day during clement weather in an enclosure suitably protected against entry or damage from predators. As with outdoor enclosures for adults, hatchlings must be provided with cooler retreats and food for foraging.

Hatchlings may start feeding right away or may not eat for the first couple of weeks; the first defecation may take longer. Food should be put out right away, however, and each day thereafter until it starts feeding. Once it starts feeding, food should be offered every other day, with any leftovers removed from the enclosure. Food selection of hatchlings tend towards more succulent plants; offer dark greens such as collards, alfalfa, kale, dandelion, grasses. Analysis of self-selected hatchling diets showed them to be composed of 4% protein, 5% fiber, and 71% carbohydrate, with 76 calories per 100 grams.

When offered insects or other animal protein, it may be accepted. Too much protein may cause growth abnormalities and health problems. Many breeders, veterinarians, and researchers believe that no animal protein, other than what they may incidentally pick up while grazing out of doors, need or should be given to hatchlings or adults.

Vitamin supplements, both a multivitamin and a calcium supplement may be added to their food. Some hatchlings and adults appear to do fine without supplementation.

Twice weekly, hatchlings housed in enclosures should be bathed in shallow tepid water. Short, fifteen minute soaks helps to stimulate elimination.

Sulcatas also grow very quickly, reaching their full growth within 15-20 years (Villiers, 1952, in Stearns) and will rapidly outgrow space that would last smaller, more slowly growing species for some time. Growth rates may vary, even between sulcatas who are raised together and fed identically. Growth in the wild is dependent on the season and nutritional content of the food, with the rainy season seeing the fastest growth spurts. Captive sulcatas allowed to free roam and graze grow faster, with less supplemental water intake, than those fed a mixture of grasses and plants once a day and offered water daily (Cloudsley-Thompson).

## **A Final Note**

Writing the last sentence above about any always makes the author and knowledgeable readers cringe. Our fear is that the novice animal care taker will read "the more room and food they have, the faster they will grow" and decide "so if I don't feed them much and keep them in a small enclosure, they won't grow, or won't grow very fast." This is certainly true to a certain

extent. Such actions, however, result in sickly animals, in animals so psychologically stressed by their inability to obey natural instincts and move about, climb and forage, that the animal may injure, even kill itself through trying to escape or due to severe physical and psychological stresses related to the unnatural and unsuitable environment. Reptiles are particularly tricky in this area as, since they live so much longer than other types of animals, and they have such an incredible facility for conserving energy resources, that they may take months, even years, to finally die.

Sulcatas get big. **They get big fast.** Sulcatas are not appropriate pets for anyone living in a house without a yard. They are completely unsuited for anyone living in an apartment. Many buyers of large reptiles believe that they can keep them for a few years until they get "too big" and then sell them or give them to a zoo. Surprises are in store for such owners when they find that zoos aren't interested (having more than enough former pets and regular zoo stock already) and people who are buying them are interested only in small ones. As of the date this is being written, large pythons and iguanas are being euthanized due to lack of homes for unwanted ones. Those of us involved in reptile rescue and animal shelter work foresee the day in the not too distant future when sulcata tortoises will join their reptilian cousins under the needle. There are many wonderful tortoises out there more suited to smaller homes and yards, tortoises that do not require kidney belts and hernia repair to pick up and move them, and who in turn will not redecorate your house and yard by knocking through walls and fixtures. If you do not already have a sulcata, please make your decision very carefully. Check with your local herpetological or turtle and tortoise societies and find out if anyone in your area has adults and seek the opportunity to meet the owners and their tortoises. While many people can visualize just how long 24 inches is and how much 100 pounds weighs, actually seeing a tortoise that size is a breathtaking--and sobering--sight.

#### **Sources:**

Alderton, David. (1992) *Turtles and Tortoises of the World*. Facts on File, Inc.

Flower, Maj. S.S. (1925) Contributions to our knowledge of the duration of life in vertebrate animals. III. Reptiles. *Proceedings*, Zoological Society of London. 60(3):911-925.

Highfield, Andrew C. (1995) Notes on Dietary Constituents for Herbivorous Terrestrial Chelonians and their effect on Growth and Development. British Tortoise Trust. British Tortoise Trust

Hughes, B. (1986) Longevity records of African captive amphibians and reptiles. *Journal of the Herpetologist Association of Africa* 32:1-9

Pritchard, Peter C.H. (1974) *Encyclopedia of Turtles*. TFH Publishing.

Rood, Felice. Exotic Tortoise-Africa; Care of Adult Desert Tortoises in Sacramento; General Care of Exotic Tortoises. Undated handouts. Sacramento Turtle and Tortoise Society.

Stearns, Brett C. (1988) Captive husbandry and propagation of the African spurred tortoise, *Geochelone sulcata*. *Proceedings, International Herpetology Symposium, San Antonio, Texas*, pp. 44-566.

Villiers, A. (1962) West African tortoises, turtles and terrepins. *African Wildlife* 16(1):39-52.

#### **A Note on UVB-Producing Fluorescent Lights:**

Note: No incandescent bulb, including those marketed as "full spectrum", is capable of emitting

UVB wavelengths, thus they are suitable for heat/basking only. You need to use fluorescent lights made for reptiles for purposes of providing ultraviolet B. Not all such fluorescents produce enough UVB. Make your selection from the following: DayCycle (TetraTerraFaun), Vita-Lite (Durotest; not their compact fluorescent), Zoo Med's 5.0+ iguana or reptile lights (same product, different packaging and sometimes different price). In Europe, look for the Zoo Med or OTT Lighting fluorescent tubes. For those considering using a [mercury vapor lamp](#) for UVB and heat, please read my comments on these products.

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