

Captive Husbandry of Mediterranean Tortoises (*Testudo graeca* and *Testudo hermanni*)

Stephen John Divers, B.Sc. (Hons), C.Biol., M.I.Biol., B.Vet.Med., M.R.C.V.S.

British Chelonia Group Veterinary Liaison Officer

Elands Veterinary Clinic, Station Road, Dunton Green, Sevenoaks, Kent TN13 2XA. United Kingdom

Tel (44) 1732 452333 Fax (44) 1732 741614

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INTRODUCTION

The Mediterranean tortoise (*Testudo spp.*) is a living fossil having survived since the dawn of the age of reptiles, some 200 million years ago. Collection for exportation and habitat destruction have dramatically reduced wild populations in their native countries around the Mediterranean (France, Spain, Italy, the former Yugoslavia, Turkey, Greece and northern Africa). In the UK with short summers and cold damp winters, they are outside their distribution range, but if basic guidelines are followed a captive tortoise can have as long and healthy life.

Common Mediterranean tortoise species

The species of Mediterranean tortoise most commonly kept in the UK are the Spur-thighed tortoise (*Testudo graeca*) and the Hermann's tortoise (*Testudo hermanni*). The Spur-thighed tortoise is further divided into subspecies with a main division between Europe and northern Africa. The Hermann's tortoise, with two recognized subspecies, exists in the south of France, on the coastlines of Italy and the former Yugoslavia and on the islands in the Mediterranean. The Spur-thighed tortoise has a spur on either side of the tail, whereas the Hermann's tortoise has a single horny claw at the tip of the tail.

In both species, the male can be recognized by the longer, narrower and more pointed tail, and in some cases the males have a concave plastron.

Tortoises, like most reptiles, are ectothermic and rely on an external heat source (the sun) to raise their body temperature sufficiently for them to be alert, feed and digest their food. They are inactive in cold weather and will hibernate when the environmental temperature drops below 15 °C.

Husbandry and housing ^{2,1}

Tortoises like roaming and so large garden enclosures are to be preferred over vivaria. It is essential when housing a non-indigenous species that the enclosure is escape-proof. Walled gardens are ideal but if tortoises have to be penned in, allow at least 10 sq m per tortoise and make sure that the animal can neither climb over nor burrow under the surround. Wire or wooden pens should be at least 40 cm high, buried to a depth of 10 cm with wooden stakes as support. Garden ponds should be adequately covered to prevent risk of drowning.

A well ventilated greenhouse with access to a clover lawn and a paved sunbathing area is ideal for tortoises as in both spring and autumn the animals will be able to heat up sufficiently to feed well, thereby extending their year and shortening their hibernation period. A lower pane of greenhouse glass can be replaced with a panel of wood with an entrance hole or cat flap in it, thus ensuring that the tortoises can escape from overheating on the hottest summer days.

Never attempt tethering a tortoise by string round the leg which can lead to ischemia necrosis and gangrene or by boring holes through the shell, which will cut through living tissue and cause pain and possible infection.

A waterproof house in a sunny position is essential to protect the tortoise from extremes of cold, wet and heat. It should be of a wooden construction, preferably covered with roofing felt and be slightly raised to prevent the floor from becoming damp. It can be lined with thick newspaper.

For larger collections, it is advisable to separate the males and females as the males often engage in female shell-butting and leg biting as part of the courtship. Females constantly exposed to this treatment and unable to escape will feed less, produce eggs less frequently and will eventually suffer from extensive shell and leg damage with an increased likelihood of infection.

Water

Contrary to popular belief tortoises do drink, especially on waking from hibernation where the blood levels of nitrogenous wastes can be very high and dehydration pronounced. A warm bath is usually appreciated. A shallow dish about 10 cm (4 in) deep, should be sunk into the ground to allow the animals to drink by submerging their heads into the water. Allow for easy access into and out of the dish.

Nutrition

Tortoises need a diet which is high in dietary fiber, vitamins and minerals, but low in fat and proteins. These animals are considered to be natural herbivores feeding on fibrous plant leaves, vegetables and flowers. A tortoise that has the run of a garden will forage quite successfully for itself on charlock, checkweed, clover, dandelion, groundsel, plantains, sow thistle and vetches and the leaves of plants and bushes like buddleja, ice plant, lilac, rose and bramble. Beware of the presence of toxins and poisons contained in weedkillers and slug pellets.

In the wild, tortoises are opportunistic feeders and will, on occasion, tackle carrion and even dung. Their digestive systems are, however, geared towards the digestion of leaves containing cellulose which is digested with the aid of symbiotic protozoa and bacteria. A wide variety of greens must be offered and the diet should be as varied as possible with leaves, vegetables and fruits. A proprietary reptile vitamin and high calcium mineral supplement such Nutrobal (Vet-Ark) should be regularly used. The diet should consist of 75% green leafy vegetables, 15% grated root vegetables, and 10% fruit.

The following foods can be used: beans (leaves and pods), broccoli, brussels sprouts, cabbage, cauliflower, cucumber, endive, lettuce, kale, spring greens, watercress, beetroot, carrots, cauliflower and parsnips may be grated or offered cooked. Sprouts of various pulses including chick peas and lentils are an excellent source of quality plant protein.

Of the fruits, try apples, apricots, blackberries, currants, gooseberries, grapes, mandarins, figs, blackberries, melons, peaches, pears, plums, oranges, raspberries, strawberries and tomatoes. Tinned or defrosted fruit may occasionally be offered as an alternative.

A varied diet is recommended and one guided by the wild situation. Avoid excesses of any one food type. High protein items like dog and cat foods and large quantities of pulses are not natural and can be harmful in excess. In juveniles, nutritional metabolic bone disease and pyramiding of the shell are common, while in adults renal failure is a major problem.

Reproduction ²

A compatible pair of tortoises may mate in captivity. The perceived gestation period from mating to egg laying ranges from 30 day to 3 yr, although this is likely to represent variations in the timing of folliculogenesis and sperm storage. The female may dig several trial nests in suitable mounds of warm friable soil and finally will deposit between 5-10 spherical and calcified eggs. In the absence of an acceptable nesting site or temperature for laying, the tortoise may become egg-bound. Providing a suitable nest site and environment is usually successful, otherwise veterinary help will be needed. In the UK, eggs need to be retrieved and placed in an incubator at a temperature of 26-32 °C. Humidity seems less important for the successful incubation of calcified tortoise eggs, and a humidity of 40-80% seems adequate. Depending on temperature, the eggs will hatch after 8-12 wk. The sex of the hatchlings is determined by the incubation temperature (environmental sex determination). At the lower temperature range (26-28 °C) hatchlings will be males, at the higher end they will be female (30-32 °C); average temperatures (28-30 °C) will produce mixed clutches. Hatchlings, although soft-shelled at first, are fully developed requiring no maternal care. They are often best housed in a controlled vivarium environment for the first 6-12 mo (but especially during periods of cold, damp weather) and will require a daytime temperature gradient of 25-30 °C with an overhead heat source providing a basking area of 32-34 °C. At night the vivarium temperature can drop to 75-80 °F. When housing tortoises indoors, a broad spectrum light source (including UVB at 290-320 nm) is essential. There are several brands on the market including the Tru-Lite (Vita-Lite), Reptisun and Activa. These lights should be lowered in the vivarium to reduce the tortoise-light source distance to 10-20 cm. Unfiltered sunlight remains the best source of illumination for reptiles.

Only breed from healthy adult tortoises. If in doubt consult the Jackson graph for the correct weight for a given length of tortoise³.

Hibernation

During August and September, as the days grow shorter, the light intensity decreases, and the temperatures begin fall, tortoises prepare for hibernation. Feeding declines; it takes 4-6 wk for food to complete its passage through the gastrointestinal tract and therefore starvation for 4-6 wk prior to hibernation is essential to prevent food from rotting during the winter period. Before this period of anorexia starts, usually in September in the UK, tortoises benefit from a routine veterinary examination and routine worming. Any disease problems including wounds, abscesses, metabolic diseases, etc. must be corrected prior to hibernation. Ensure that the Jackson weight:length ratios for all tortoises scheduled for hibernation are acceptable³.

Over wintering: Any tortoise which is underweight or suffering from an ailment should not be hibernated, but over wintered in a vivarium. The vivarium should have an overhead ceramic heat source and full spectrum light source providing a 12-14 hr light photo period. The temperatures should be 25-28 °C by day with a daytime basking area of 30-32 °C. At night the temperature should

fall to 18-22 °C. Newspaper is used to line the floor of the vivarium while shredded paper and cardboard can be provided for retreats. Fresh food and water should be provided daily. Never allow the temperature to drop below 15 °C as hibernation may occur.

The hibernation quarters: Use a large, wooden, rodent-proof tea-chest or box, with small air holes in the sides. Both the top and the holes should be covered with wire mesh to prevent vermin entering. Line the base and the sides of the box with thick pads of polystyrene or newspaper. Place the tortoise in an inner box with air holes and filled from one to three quarters with polystyrene chips or shredded newspaper. Avoid hay or straw which can cause corneal ulcers. Place the smaller box inside the larger one, making sure that it can be opened easily to facilitate observation during hibernation.

The tortoise can be carefully weighed on a weekly or twice monthly basis. An adult tortoise loses about 1% of its pre-hibernation weight every month while hibernating, so a 1000 g tortoise can be expected to lose 10 g every month. A drastic weight loss indicates something is wrong: the animal should be brought out of hibernation immediately and checked. Make sure the tortoise is hibernated in a frost-free environment, at temperatures of 5-10 °C. Tortoises exposed to temperatures below 5 °C may experience post-hibernation anorexia and reversible ocular problems. When exposed to temperatures below 0 °C tortoises can suffer irreversible retinal degeneration and blindness, or worst may die. Use a maximum and minimum thermometer to check day-night temperature variations.

For every drop of 10 °C the heart rate drops 50%. At 5 °C the respiratory movements become imperceptible. If the tortoise is kept too warm and becomes too active it will consume its hepatic fat and glycogen reserves during hibernation, the latter is needed upon emergence.

Emergence from hibernation: In the UK, tortoise owners are encouraged to start checking their tortoises from the end of January onwards. When the animal starts moving it is removed from its hibernation quarters. The following guidelines are offered by the British Chelonia Group;¹

1. Bring the tortoise out of hibernation slowly, check for discharges from the nose, eyes and cloaca.
2. Inspect the tortoise carefully, bath the face and eyes and examine the mouth.
3. Place the animal in a warm, shallow bath for at least 30 min every day. It is important that the tortoise empties its bladder and voids the nitrogenous wastes that have accumulated during hibernation and that the tortoise drinks to correct dehydration.
4. Keep the animal in a vivarium environment until the weather permits outdoor housing.
5. Once out of hibernation and eating, keep the tortoise active (as for over wintering) if the weather deteriorates again. Warm spells in February breaking hibernation are a hazard of the British climate.
6. Any tortoise failing to drink or eat within 5 days of emergence should be examined by a veterinary surgeon.

Health and disease

Tortoises are susceptible to a variety of illnesses which will need veterinary intervention. Runny nose syndrome, stomatitis, pneumonia, kidney disease, liver disease, rodent/dog induced trauma and parasite infestation are frequent presentations. Routine fecal screening is advisable and the current UK worming recommendation is oxfendazole at 66 mg/kg p.o. in the spring and autumn.

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