

## Tortoise Hibernation

Species identification is extremely important before considering hibernation in the captive tortoise. The table at the end of the article gives suggested hibernation or over-wintering conditions for the species commonly encountered in the UK. This information is aimed at *Testudo* Sp. Other species are mentioned later.

### Preparation for Hibernation

In the UK most keepers prepare for hibernation after the autumn equinox. It is recommended that tortoises should have an annual health check-up – ideally in late summer so that fitness prior to hibernation can be assessed. An underweight or ill tortoise should not be hibernated. It is a good idea to take along a fresh faecal sample so that the vet can check for the presence of gastrointestinal parasites.

- Once it has been established that the individual is fit enough to hibernate, the tortoise should be starved for a period of 3-4 weeks before entering hibernation, which often starts at about the third week of October. This is to ensure that there is no food present in the tortoise's digestive tract which could rot during hibernation.
- During the pre-hibernation period they should be bathed daily to encourage fluid uptake. It is important that a hibernating tortoise should have a full bladder, as this can act as a fluid store.
- A tortoise kept outside can be induced to hibernate by providing persistent temperatures below 15°C together with decreasing day length.
- Tortoises can be placed in outhouses to give increasing exposure to outdoor temperatures. The number of hours spent outside is increased over a period of three weeks and the core body temperature will drop on average by 5°C per week.
- Within 3 weeks the core body temperature will fall from about 26°C to approx. 13°C and at this point animals can be transferred to the hibernation accommodation.

If hibernation is to be avoided, eg. if the tortoise is ill or very underweight, artificial heating and lighting in indoor accommodation will usually need to be provided from late August onwards for over-wintering.

### Hibernation Accommodation

#### Fridges are suitable hibernation enclosures,

Fridges are ideal, providing the air is changed regularly and temperature control is reliable. Care should be taken to ensure that the fridge is not used for human food etc due to the possible zoonotic risk of salmonellosis. Temperatures can be kept stable at 5C, and humidity guaranteed. We have used fridges without complication for a decade for *Testudo* sp of all sizes and ages.

Insulated boxes (a box within a box) inside a cool building can also be used provided there is adequate monitoring of both hibernation conditions and duration. Air holes should be kept to a minimum and the chamber should be carefully placed to avoid touching external walls. There should be no risk of rodent access. We no longer trust that stable temperatures can be provided using natural ambient conditions. Therefore we encourage the use of fridges.

The maximum daytime and minimum night time temperatures of the chamber should be checked daily. *Never* allow exposure to sub-zero temperatures – see table for species' temperature requirements. Freezing may lead to death or severe eye problems. High humidity of the substrate (90-95%) is important to prevent excessive fluid loss. Good ventilation should prevent mould build-up.

Tortoises can be handled carefully and checked whilst hibernating – it is useful to weigh them regularly – a hibernating tortoise should never lose more than 8-10% of its body-weight. If they do, this may be due to too high temperatures together with activity and/or fluid loss due to low humidity and/or urination. If the tortoise has urinated and lost its fluid store it should be woken up. Activity may indicate that the animal is not being maintained at a cool enough temperature. After waking at any point, tortoises should *never* be returned to hibernation.

Hibernating a tortoise outside is not advisable as there is risk of :

- Frost Damage,
- Flooding,
- Trauma From Predators Such As Rats
- And It Is Impossible To Monitor The Tortoise During The Hibernation Period.

If These Tortoises are left to awake naturally, they will not do so until late March or early April,

### **Prolonged Hibernation**

Prolonged hibernation, leading to a hibernation period of almost six months, leaves insufficient recovery and grazing time to stabilise from previous hibernation and prepare for the next hibernation. Such tortoises are both physiologically challenged and weakened by such husbandry. Many fail to adequately recover their bone marrow function (immune system) and other organ functions appropriately in the limited active time they have been given.

In the wild most tortoises will have a long period of warm weather to prepare for a short hibernation period. In the UK, tortoises may be exposed to a short period of warmer weather to prepare for a long hibernation period. This results in increased incidence of post-hibernation problems such as mouth rot (stomatitis) and kidney disease.

The recommended maximum length of hibernation is 3 months for a healthy adult tortoise, so most will need to be woken up at the end of January or early February and kept inside in a warm enclosure until the summer. Alternatively they can be prevented from premature hibernation and allowed to tick over between October and January on a 10 hour light cycle and alternate day feeding, with every other day bathing, Hibernation can then happen in February and March allowing animals to be recovered when food availability and outdoor conditions are improved.

### **Should juveniles be hibernated?**

Whether or not to hibernate juveniles in their first year is a matter of some contention. Some argue that they should always be hibernated, whilst others argue that hibernation should be reserved for those over 3-4 years old. It must be noted that the growth of hibernated juveniles is usually smoother and tends to be closer to natural rates than that recorded for specimens which have been over-wintered.

As all wild juveniles will hibernate, avoiding hibernation entirely is unnatural and not without common complications such as accelerated growth and early maturity. We therefore would encourage at least a period of controlled adverse husbandry around the time of hibernation for all healthy juveniles, whatever the size in order to prevent unrestricted growth. Generally this means preparing the animal for potential hibernation as previously described, but reviving the animal at the point it can be put into a fridge. For the stronger-willed, suitably prepared, healthy, juveniles can be put into a fridge for a very short while such as 1-3 weeks. They are easy to monitor and manage.

The key thing is not to blindly discourage hibernation in healthy juveniles and encourage optimum temperature management and nutrition 365 days a year instead, as this will result in endless maximum growth and likely deformity and ill health.

Due to their reduced body mass compared to some adults, the core temperature of juveniles is more easily influenced by external factors. Therefore temperature stability is especially important during hibernation.

Terrestrial juveniles may be allowed to bury themselves completely in a surrounding mass of substrate such as earth within a deep tray. This should help to prevent against sudden temperature fluctuations and will help to avoid dehydration.

## Waking Up

Tortoises only enter or remain in hibernation whilst the temperature is within a certain range – as the temperature rises the metabolic rate returns to normal and hibernation comes to an end. Upon awakening, tortoises should be checked for signs of disease such as mouth rot, nasal discharge or skin swellings. Any tortoise showing abnormalities should be taken to a vet.

- Healthy animals should be bathed twice daily in shallow warm water encouraging drinking and voiding of urine and faeces.
- They should be kept in an indoor enclosure at 22-25°C with a basking lamp and UV light.
- A healthy tortoise should be eating within a week of waking up.
- The keeper should monitor appetite, urination, activity, defaecation and thirst for at least 3 weeks post-hibernation.
- Initially, succulent foods such as melon and cucumber should be offered and the diet changed back to a normal balance as soon as eating and urination are normal.
- Hand-feeding, syringe and even stomach-tube feeding may be required.
- Tortoises not seen to have urinated or eaten within one week urgently require veterinary attention or environmental improvement.

Upon first waking from hibernation a tortoise is depleted in strength, has a low white blood cell (WBC) count and is particularly vulnerable to infection. The blood urea level is very high due to the accumulation of metabolic toxins over the hibernation period. This combination of low WBC and high blood urea, at a time when other body functions are also not at peak effectiveness does mean that should anything go wrong, the time available to treat and correct the problem is considerably less than normal. Unless it receives adequate quantities of heat and light (which must be supplied artificially in the British climate) it will refuse to eat, will use up its existing fat and energy reserves and will start to decline.

## Species Requirements

Poikilothermic (previously termed 'cold-blooded') reptiles are unable to maintain their body temperature independently of the temperature of their environment. Consequently, a number of tortoise species found in temperate areas have developed the ability to 'shut down' or hibernate during the cold winter months. This conserves energy and enables the tortoise to cope through periods of natural food shortage. Conversely, some species from regions with very hot summers will aestivate through the hot periods. Indeed, some species such as the Horsfield's tortoise may do both, avoiding the long winters and very hot, arid summers.

It is often not easy to generalise about which species can and cannot hibernate. In the wild, some species hibernate in parts of their natural range and remain active throughout the winter in others. Such species, including most from North Africa, should be said to have the biological *capacity* to hibernate, rather than always doing so. Persistent non-hibernating of captive species which would naturally hibernate in the wild can cause health problems including liver disease and reduced fertility. The British climate is obviously not suited to tortoises and so artificial manipulation of temperature and photoperiod (daylength) and careful monitoring before, during and after hibernation is vital.

	<b>SUGGESTED HIBERNATION CONDITIONS</b>	<b>SUGGESTED TEMP / RANGE °C</b>
<b>Hermann's Tortoise</b> <i>Testudo hermanni</i> <b>Spur-thighed Tortoise</b> <i>Testudo Graeca</i> <i>Testudo iberia</i> <i>Testudo whitei</i> <b>Margined Tortoise</b> <i>Testudo marginata</i>	Starve for 3-4 weeks before hibernation. Hibernates in a box within a box, the two separated by an insulating material. Place in cool building or within a reliable refrigerator. High humidity of the substrate is important, in conjunction with good ventilation to avoid building up of mould. Often useful to house indoor with supplemental heat and lighting at end of hibernation in order to restrict its duration.	5 (2-9) Never allow exposure to sub-zero temperatures. Monitor maximum daytime and minimum night time temperatures throughout hibernation.
<b>Tunisian Tortoise</b> <i>Furculachelys nabeulensis</i>	Should not be hibernated	N/A
<b>Horsfield's Tortoise</b> <i>Testudo horsfieldi</i>	Often useful to house indoors with supplemental heat and lighting at start and end of hibernation in order to restrict its duration to 2-3 months. Starve for 3 weeks before hibernation. Hibernates in a box within a box, the two separated by an insulating material. Place in cool building or within a reliable refrigerator.	2-9 Never allow exposure to sub-zero temperatures. Monitor maximum daytime and minimum night time temperatures throughout hibernation.
<b>Red-eared Terrapin/Slider</b> <i>Trachemys scripta elegans</i>	Although hardy specimens can survive mild winter outside, this is not recommended. Outdoor pond terrapins should be overwintered inside.	Varies with winter environment.
<b>3-toed Box Turtle</b> <i>Terrapene carolina</i>	If maintained outdoors can be allowed short hibernation or 2-3 months. Set up in cool room as for Testudo spp. but place turtle in damp leaves, moss, peat or earth in order to maintain high humidity. Alternatively overwinter inside.	7-16 Never allow exposure to sub-zero temperatures. Monitor maximum daytime and minimum night time temperatures throughout hibernation.
<b>Ornate Box Turtle</b> <i>Terrapene ornata</i>	If maintained outdoors can be allowed short hibernation of 2-3 months. Set up in cool room as for Testudo spp. but place turtle in damp leaves, moss, peat or earth in order to maintain high humidity. Alternatively overwinter inside. Note that wild turtles in southern part of range do not hibernate.	Never allow exposure to sub-zero temperatures. Monitor maximum daytime and minimum night time temperatures throughout hibernation.
<b>Bell's Hingeback Tortoise</b> <i>Kinixys belliana</i>	In captivity usually kept under the same conditions year round and not hibernated. In the wild may become inactive during the winter and this seasonal change can be simulated in captivity in order to encourage breeding activity in the spring.	Decrease in daylength from 13 to 11 hours and in temperature from 23-32 to 18-20°C for a period of 8-10 weeks during the winter. Withold food and basking facilities.
<b>Leopard Tortoise</b> <i>Geochelone pardalis</i>	Do not hibernate	
<b>African Spurred Tortoise</b> <i>Geochelone sulcata</i>	Do not hibernate	
<b>Redfoot Tortoise</b> <i>Geochelone carbonaria</i>	Do not hibernate	
<b>Yellowfoot Tortoise</b> <i>Geochelone denticulata</i>	Do not hibernate	
<b>Desert Tortoise</b> <i>Gopherus agassizii</i>	Starve for 3-4 weeks before hibernation. Hibernates in a box within a box, the two separated by an insulating material. Place in cool building or within a reliable refrigerator	5 (2-9) Never allow exposure to sub-zero temperatures. Monitor maximum daytime and minimum night time temperatures throughout hibernation.
<b>Asian Box Turtles</b>		
<b>Malayan Box Turtle</b> <i>Cuora amboinensis</i>	Do not hibernate	