

## Practical Care Of Red-Eared Sliders & Painted Turtles

Freshwater turtles can make fascinating and long-lived pets (they have life-spans in excess of 30 years). They do, however, require a combination of high quality husbandry and good quality accommodation if they are to live a long and satisfying life. Please do not take on turtles in the first place if you are unwilling or unable to provide for their basic requirements as set out in this booklet and as shown on the accompanying video.

### Red-eared Slider (*Trachemys scripta*)

The Red-eared slider is one of the most popular pet turtles in the world, and there can be few who do not instantly recognize the characteristic red or orange head stripes from which it takes its name. There are more than a dozen subspecies of this remarkable turtle (up to 19, according to some authorities), although *Trachemys scripta elegans* is by far the most often encountered. The natural range of the Red-eared slider is from Virginia to and Indiana to New Mexico and Florida. Other members of the far ranging *Trachemys* complex occur in Central America. Adult females attain carapace lengths in excess of 11" (28 cm), although adult males are considerably smaller, rarely more than 7" (18 cm). Sexual maturity is attained on the basis of size, rather than age, and usually occurs at a carapace length of approximately 4" (10 cm) in the case of males, and 5 ½" in the case of females (14 cm). Under natural conditions, this size is achieved after 5-7 years.

### Painted Turtle (*Chrysemys picta*)

The Painted turtle is much less frequently maintained as a pet, although in practical terms, its care requirements are identical to those of *Trachemys scripta*. This species is typically smaller than the Red-eared slider, with females rarely surpassing 9 ½" (25 cm). As with Red-eared sliders, males are considerably smaller. The Painted turtle lacks the Red-eared sliders distinctive red head stripes, but possesses instead a very attractive red or deep orange patterning along the marginal scutes.

Despite their very similar care requirements, if you decide to keep both species, you should maintain them separately. Painted turtles do not have good survival rates in mixed tanks or ponds - and may rapidly develop fatal skin, shell and respiratory infections.

## THE TURTLE TANK

### Water area

The water section in most tanks does not need to be very deep - in the majority of cases 6-8" (150-200 mm) will suffice, although larger turtles may require considerably more. It is not true that turtles should be kept only in water no deeper than they are long. The water area of the tank must be deep enough for the turtles to submerge themselves completely and to be able to swim freely; in the wild they are found in water several feet deep, and my own turtles live quite happily in a pond which is more than two feet deep. **One thing to bear in mind is that the more volume of water there is in the tank system, the easier it is for the filters to keep it clean as any waste will be less concentrated.** Larger tanks with low density stocking are therefore, by far the easiest to maintain.

### Land area

A land, or basking area is also required. Easy access to the land area must be possible, or turtles may become over-tired and could drown. A sloping ramp is usually the best approach. Beware, however, of fixtures and fittings under which turtles could become trapped. Flat rocks, cork bark and partly submerged logs are all suitable for constructing basking areas.

Egg-laying adult females require access to a suitable nesting site if egg-retention problems are to be avoided. This nesting area can consist of submerged bricks supporting a sandy surface layer of adequate depth - about 6" (150 mm) is about right for a medium-sized turtle. To prevent this from becoming saturated with water, the land area can be constructed in a large plastic tray or bowl. Above this a 100W spot lamp or infra-red ceramic element should be positioned to provide artificial basking facilities and encourage nesting. It should be noted that adult females may develop eggs even *without* a male present.

### Lighting

All indoor turtle tanks or ponds will require some form of artificial lighting. Ordinary tungsten light bulbs are not suitable by themselves but they can provide a useful source of basking heat and their low color temperature (orange-yellow) also appears to encourage basking. We recommend the use of 60W or 100W reflector spot lamps for basking purposes. For the main light source the best system by far is Reptisun 5.0, a fluorescent system which offers a remarkably good approximation of natural daylight and respectable levels of UV-B output. Such tubes are available in various sizes from 18" to 6' (460 mm to 2 m approximately) so one should certainly suit your system. The benefits of this type of lighting are two-fold; the color temperature of the light is 5,500°K which is close to natural daylight thus

encouraging natural activity and behavioral patterns and in addition these tubes also emit some Ultra-Violet radiation which is important as it contributes to the natural production of Vitamin D3 (essential to healthy bone development). U.V. is blocked by glass, so even if a tank is placed in a brightly lit window position this is not by itself adequate. A UV-B emitting tube will provide the missing component indoors. In practice, if a multi-vitamin and mineral supplement such as Rep-Cal or Nutrobal is used regularly it is highly unlikely that any D3 deficiency will occur. Even so, the overall benefits of a Full Spectrum Lighting system are enormous and I would regard it as an essential component of any exclusively indoor maintenance system. Not merely on account of their UV-B output, but rather because they so closely approximate the color temperature of natural daylight and therefore do tend to reduce stress and encourage normal behavior. Where non-FSL lighting is used, I have noted an increased tendency to lethargy and inactivity.

### **Heating**

General warmth can be provided by a combination of submersible heater-thermostats and overhead basking lamps (60-100 W should be adequate in most cases for the latter) or infra-red ceramic emitters. The air humidity should be medium-high, but certainly not saturated; make sure that there is good ventilation at all times.

**For most North American turtles, which are the kinds most often kept as pets, the water temperature should be maintained in the range 75°F to 82°F ( 24°C to 28°C).**

Excessively high temperatures (over 89°F or 32°C) or prolonged periods at too low a temperature (less than 59°F or 15°C) can be extremely dangerous. The number of submersible heaters that will be required to maintain safe temperatures depends upon the size of the tank. In large tanks, or indoor ponds, several powerful submersible heater-thermostat units may be necessary. In a small tank, a single 100 watt unit may suffice. Large tanks may require several 300 watt units. An approximate guide is given below. For normal feeding a minimum water temperature of **at least** 64°F or 18°C is essential.

The table below shows the approximate wattage and number of submersible aquarium heaters required to heat different sized tanks to 28°C or 82°F. The column on the far left specifies the differential between existing room (ambient) temperature and the target temperature to be overcome.

Air temperature is also important in maintaining good health. Avoid situating tanks in cold drafts or other locations where the ambient air temperature falls below 70°F (21°C). You must also avoid overheating the tank by accident. **Never place a turtle tank in full sunshine - water temperatures will rise extremely quickly and should this occur death is very likely.**

Submersible heaters and basking lamps are electrical devices and it is well known that electricity and water is not a good combination. Most heater-thermostats are encased in glass; this is fine in the tranquil surroundings of a tropical fish tank, but an aggressive turtle can soon cause untold damage. In my experience their casing can all too easily be fractured allowing the water in the tank to become 'live' - this is a potentially lethal situation for owner and turtle alike. A further hazard is that the heater may be used as a plaything and end up out of the water; should this occur it will certainly overheat and may become very dangerous. As a result of personally experiencing a couple of highly unpleasant incidents of this sort I would suggest adopting the following safety code in respect of all turtle heating and electrical installations;

- ALWAYS fit and use an earth leakage circuit breaker or ground fault interrupter in all animal electrical applications; these are available at low cost from any electrical store. They sense if an electrical shock hazard situation has occurred and cut off the power instantly, before a lethal charge results. They can represent the difference between life and death and in my opinion it is extremely foolish not to make use of them.
- ALWAYS use a protector cage around glass-encased heaters or thermostats in turtle installations. Ensure heaters are fixed to the walls of the tank very securely indeed. On no account simply 'rest' a heater in a tank - this is just asking for trouble.
- SECURE all lamps, tubes, cables and electrical fittings reliably. It is easy to dislodge a badly fitted basking lamp with potentially tragic consequences.
- ANY HEATER which the turtles can touch may cause burns; the same applies to carelessly situated basking lamps. Be careful. Protect submersible heaters with a shield as advised above.

### **Stocking density**

Overcrowding in tanks is a major contributory factor in the incidence of disease. It is far better to under-stock a tank than to over-stock it. A tank which is crowded will rapidly become fouled and quite probably smelly and unpleasant - for both the turtles and their keeper. Good filtration helps, but is not a substitute for common sense in stocking; and remember, small turtles become large turtles in a surprisingly short time. It should also be noted that in an overcrowded tank, aggression between rival males may occur, and the rate of injuries will increase dramatically. Do not mix different species! This is a recipe for disaster. Not only does the risk of disease climb dramatically, but many incompatible behaviors will occur.

### **Plants & decorations**

A selection of plants in the turtle terrarium add greatly to its visual attractiveness. Aquatic plants also help to improve and sustain water quality by using up nitrate waste in the water, by adding oxygen to the water, and - in the

case of floating plants - by limiting the quantity of light that reaches the water itself, thereby reducing the potential for 'green water' algae. Some recommended plants for aquatic turtle tanks include:

**Java Fern** (*Microsorium pteropus*): An extremely vigorous and easy to root plant which thrives at water temperatures from 68-79°F (20-26°C) and prefers slightly acidic conditions (pH 6.5 -6.8). Widespread in India and throughout Asia. The leaves and roots are very strong and are not easily destroyed - even by turtles. It will root easily in a sandy substrate. This plant also enjoys ammonia rich environments, a common state in turtle tanks.

**Water Hyacinth** (*Eichornia crassipes*, *E. azurea* etc.): Water hyacinths are found in many tropical turtle habitats. The former species, *E. crassipes*, is very vigorous and through introductions has developed into a notorious weed in many areas. However, it is very buoyant and its large floating leaves are favoured by many small turtles for basking purposes. *E. azurea* is a much more delicate plant, suited only to large tanks and low density stocking. The leaves of the water hyacinth are a staple dietary component of several S. American river turtles. It will thrive in water temperatures from 64 to 80.6°F (18 to 27°C) and is reasonably tolerant of pH variations.

**Canadian Pondweed** (*Elodea canadensis*): Another highly vigorous and tough plant which is extremely tolerant of water conditions and that is able to survive low temperatures. It is an excellent water purifier, a good oxygenator, and will grow either rooted or free-floating.

**Water Lettuce** (*Pistia stratiotes*): This is very vigorous plant of attractive appearance. Found in many tropical and sub-tropical zones. It does best in water temperatures above 71°F (22°C) and requires high light levels. This plant is often eaten by turtles.

Artificial, plastic plants are also quite useful accessories in the turtle tank. They provide good cover, look very attractive, and are easy to sterilize. Choose tough looking plastic ones - fragile silk varieties will last no time at all. A good compromise is to use a combination of real and artificial plants; the real ones provide water quality enhancement and something for the turtles to nibble, and should be changed regularly. The plastic ones provide secure long-term hiding places which need not be disturbed unless cleaning is required.

#### **Filtration and turtle tanks**

The main problem with keeping turtles in captivity is water hygiene. Turtles are messy feeders and also excrete large quantities of bulky waste. Unless you use a bottom-draining tank, and are prepared to change the water daily, you will definitely need to employ some form of filtration system to maintain water quality. Nothing is worse than dirty turtle water - it poses not only a health hazard to the turtles, but also - potentially - to their keepers. It also smells badly and is generally unpleasant. Use an effective filter and you will not only keep the water crystal clear, but also reduce the manual labor and tedium of frequent water changes. Filters suitable for use in turtle installations are available in several broad categories.

#### **Under Gravel Filters**

Under gravel filters are often dismissed by turtle keepers as ineffective. One can only assume that these keepers have never seen a properly established and fully functional under gravel filter in operation! Such filters are, in fact, one of the best filter designs available to the turtle keeper. They must, however, be correctly installed, with adequate water flow (using power heads) and efforts must be made to ensure that the oxygen level of the water in the tank is maintained at a satisfactory level. If the water becomes static or anoxic, under gravel filters rapidly cease working and the tank will become stale and will smell very unpleasant.

A good under gravel installation is capable of "digesting" a substantial quantity of organic waste, but to do this successfully, a sufficient depth of gravel is required (at least 1" or 25 mm even in a small tank), the water must be rich in dissolved oxygen, and antibacterial chemicals must NEVER be introduced into the water as these will kill the millions of beneficial bacteria which live in the gravel. Remember that most domestic water supplies contain traces of chlorine derivatives! These will kill the bacteria in an under gravel filter almost immediately. Instead, use only filtered water or well water in under gravel filtration systems.

It should be noted that under gravel filtration is not usually suitable for those species which dig or forage in the tank substrate for food, as the continual disturbance will severely inhibit filtration. Some turtles are also inclined to ingest gravel. This can result in fatalities. One practical solution to both problems is to cover the filtration substrate with tightly stretched plastic mesh. Commercial gravel tidy nets are available from aquatic supplies to achieve the same result. I have not myself experienced either of these problems, but other experienced keepers have, so you may decide that the precaution is justified.

#### **Internal Canister Filters**

Internal, submersible canister filters are often sold as 'ideal' for use in turtle tanks. Our experience is rather different, at least when relied upon as the sole means of filtration. Internal submersible canister filters typically consist of a cylinder of foam or similar wadding through which the water is circulated and include the pump motor, impeller and filtration foam in one self-contained unit. Typical flow rates range from 150 litres (40 gallons) per hour to over

400 litres (105 gallons) per hour. Maintenance consists of removing the foam and rinsing it under running tap water. Larger models will require less frequent rinsing than smaller versions. It should be carefully noted that this type of filter merely removes suspended particulate. It does little or nothing to affect the chemical balance of the water, so frequent water changes are also required if this is the sole method of filtration. Provided the water is adequately oxygenated, some biological function may be also attained with cartridge filters; for this, the inclusion in the tank of an airstone driven by a separate air pump is essential. If allowed to operate in anaerobic (oxygen-depleted) conditions biological activity will be very low and the filter will clog rapidly and develop an unpleasant smell. This type of filter is not really suitable for use with large animals, or high concentrations of smaller animals, as their ability to deal with large quantities of organic waste are extremely limited. The physical size of the filter foam is the main limiting factor with this filter design. These filters can, however, be used successfully in conjunction with secondary biological (i.e., under-gravel) filtration in medium-sized tanks.

### **External Canister Filters**

For larger tanks external filters are recommended, either alone or in combination with an under gravel system. Most external canister filters consist of a large cylinder with separate layers of filter medium, varying in coarseness and function. For example, the initial (input) layer may have a fine mesh to catch large particles followed by progressively finer foam and polyester filter floss layers to catch smaller particulate. This type of filter can also be fitted with activated charcoal which can assist removal of dissolved organic compounds, fats and certain non-ionic chemicals (such as chlorine). External filters are usually fed by pipes from the tank and most require positioning below the water-line to enable correct pump operation. It is usual to install them in an enclosed base beneath the tank. As with most filters in turtle applications, the larger the better. If too small a model is used it will clog rapidly and will require constant cleaning. One model that has proved consistently successful in turtle installations is the Fluval 403.

Another way around the 'dirty water' problem is to employ a separate feeding tank; however, this procedure is extremely time consuming, often messy, and obviously requires the filling and emptying of a separate tank or bowl each feeding session. This rapidly becomes a very unwelcome chore, which given the avoidance of overfeeding and provision of adequate filtration in the main tank system is completely unnecessary. I am also not keen on separate feeding tanks as they invariably involve a lot of extra handling for the turtles which can result in stress.

### **Water changes**

Even with a fully functional filter system, regular water changes will be necessary. I would recommend a 25% to 50% change about once every 10 days in a tank or indoor pond with a well established, effective filter. If you find yourself having to make regular complete water changes to maintain water quality, or very frequent partial changes, this suggests that your existing filter set-up is inadequate. Use of a 'non-drip' quick water change system, as illustrated in the accompanying video, greatly reduces the labor burden of water changing. Such devices are highly recommended.

### **Ultra-Violet sterilizers**

Excess growths of algae are rarely a serious problem in indoor tanks as they require high levels of illumination in order to flourish. In outdoor ponds, however, it can prove a persistent enemy. In a well-balanced pond, algae should not in theory present a problem. However, it is very difficult to balance a pond which houses turtles and, in practice, most keepers do experience algae problems from time to time. Excess algae can also indicate high nitrate levels and suggests more frequent water changes are required. Algae levels can sometimes be reduced by introducing other aquatic plants which will compete with the algae for available nitrates (especially *Elodea*). The most effective all-round solution is to use an ultra-violet sterilizer, however; these work extremely well and have the important added benefit of destroying water-borne bacteria and viruses simultaneously. UV sterilizers should be fitted on the return pipe to the tank or pond, following biological or mechanical filtration. A 4 watt model will suffice for small tanks or ponds, an 8 to 40 watt model will be required in larger installations. The UV-C tube should be changed regularly according to the manufacturer's directions, as over time, its efficiency decreases.

### **Outdoor and indoor turtle ponds**

Alternatives to glass aquarium tanks include indoor or outdoor ponds. Indoor ponds can be extremely attractive and successful, the only drawback being the space required. If the space is available, then they can make a very decorative display feature as well as providing an ideal home for several large turtles. Equipped with a waterfall or fountain, and with the surrounding area well planted such a display is most impressive. Indoor ponds can be made by covering concrete blocks or a strong wooden and ply framework with butyl pond liners, or by utilizing pre-formed plastic garden ponds or agricultural stock tanks. Metal stock tanks can be improved by coating the inside surface with pond resin. If you intend to use an external canister filter, you will need to place the pond on a raised base as such filters need to be positioned below the level of the water line, outside the pond. Alternatively, use a fully submersible pond filter and fountain pump combination.

Outdoor ponds can prove ideal for turtles, provided you are in a suitable location, but the construction of these is obviously a major undertaking. One end of the pond should slope gently to provide ease of access. A shallow area will also provide a differential temperature as it warms up under the sun more readily than the deeper end. The difference may only be slight but this is sufficient to be noticed by the turtles. A few logs partially submerged at other places will

also provide not only exit points but also basking sites. All turtles are excellent climbers and are adept at escaping, so good security around the pond area is vital. We suggest allowing at least 3 feet (1m) of ground area all around the pond, surrounded by a wire mesh, cement or brick wall at least 12" (30 cm) high and further topped with wire mesh. Small turtles may be viewed as prey by large birds (particularly herons), so these should not be released into open pond areas. Shelters should also be provided, and the surrounding area can be attractively planted. Outdoor ponds are therefore ideal if you have a large number of turtles and sufficient garden space to permit installation.

Finally, I am often asked if it is possible to keep fish and turtles in the same outdoor pond. The answer is a qualified "yes". Adult Red-eared sliders and Painted turtles are largely herbivorous, and will generally ignore large fish (fish fry, or hatchlings, are another matter). The main danger is that of introducing diseases to the fish from the turtles, or vice-versa. That said, I know of many keepers who have very satisfactory mixed fish and turtle ponds, so success can be achieved. I would definitely recommend using a UV-C sterilizer and heavy duty filtration for all such installations, however.

### **Outdoor Ponds and Hibernation**

Ponds intended for year-round use must be at least 3 feet (1m) in depth and must have a large surface area. Ponds which are deep, but which lack surface area, can result in dangerously low levels of oxygenation - especially during hot weather or in the winter. Water oxygenation can be improved using waterfalls, fountains and external (Koi carp type) pond filters. In outdoor ponds, hardy turtles will hibernate during the cold winter months. Whilst hibernating they do not surface to breathe air, but instead absorb small quantities of oxygen through their skin. In order to avoid anoxia (oxygen starvation), it is vitally important that the pond is adequately oxygenated at all times. Unless you are absolutely certain that your pond is entirely suitable it is usually much safer to over-winter the turtles indoors in properly heated tanks.

If hibernation is to be allowed, the water temperature is absolutely critical. Turtles actually have a much better chance of survival at lower, rather than higher, temperatures. As a general guide 35°F to 37°F (2-3 °C) is suggested.

It is also important that the pond has a good bottom layer of mud and other sediment as this will be used by the hibernating turtles for protection from extreme cold. Total freezing of the surface in winter can be prevented by using submersible pond-warmers. These and many other accessories can be obtained from water-garden centers and aquatic mail order suppliers. The catalogs issued by aquatic supply companies can provide a wealth of interesting ideas and often contain many useful items which used imaginatively can greatly improve the quality of a captive turtle's life.

## **Feeding Turtles**

The diet of most turtles is, by contrast to land tortoises, heavily dependent upon animal protein (though see note on how this changes with age, below). Aquatic turtles are predators and opportunistic omnivores consuming a wide range of small fish, snails and similar creatures. These provide not only protein but also calcium in balanced amounts (whole animals are eaten - bones included - not just the fleshy parts). In captivity, it is essential not to make the all-too-common mistake of feeding only the 'best' meat minus the calcium containing bones. Large bone splinters can, however, prove to be a danger in their own right if swallowed whole so many keepers prefer to provide calcium in a safer form (usually as a proprietary supplement). Good quality supplements of proven performance include 'Rep-Cal' and 'Miner-All' with D3 (US availability) and 'Nutrobal' (European availability).

Most turtles are actually omnivorous rather than exclusively carnivorous, consuming both animal prey and plant material in the wild. Slider and Painted turtles tend to be far more carnivorous as juveniles, than as adults. **It is very easy to overfeed adults on protein-rich meat-based products - do not forget that in the wild adults are predominantly herbivorous!**

In all cases, it is certainly not adequate to feed only on commercial turtle flakes which are often of very poor nutritional value and severely lacking in dietary fiber, vitamins and minerals. Nor should oily fish form the staple diet, as these can result in steatitis or fatty infiltration of the liver. Diets containing excessive quantities of fish can also result in induced vitamin-B deficiencies due to the presence in fish of an enzyme called thiaminase, which interferes with the take up of B-group vitamins. **It should also be noted that fish oils and fresh meat waste in the water is extremely slow to degrade - it can clog filters and quickly result in bad smelling, poor water quality.**

The main thing to avoid with diets for any captive turtle is over-reliance upon one single item; this is a very easy mistake to make, but a balanced and varied diet is infinitely superior. Provide as wide a range of the following food items as you possibly can.

## **Suggested turtle diet**

- Plant leaf, aquatic plant and salad material, assorted (freely available)
- Raw (whole) small fish (not frozen, very limited amounts occasionally)\*\*
- Rehydrated low fat dried cat, dog and trout pellets (twice weekly for juveniles - no more than once weekly for adults)

- Zoophobas, crickets and waxworm larvae (limited amounts, occasionally)\*\*\*
- Earthworms (occasionally)
- Tubifex and bloodworms (excellent for tempting hatchlings to begin feeding)
- Small snails and mollusks (occasionally)\*\*
- Good quality proprietary foods (e.g., Reptomin) three times per week

\*\* Note that these items carry some risk of transmission of certain parasitic organisms such as flukes. For this reason, you may care to exclude them. Turtles can be reared perfectly satisfactorily if these items are omitted.

\*\*\* These are particularly useful if confronted by a rescued wild turtle that may not immediately recognize prepared foods as edible.

An average meal can consist of two or three of the above constituents, combined. Rotate ingredients for variety and balance. We have maintained, bred and reared quite literally hundreds of turtles over the past 20 years using this as our general, base-line diet.

Where dried food, or floating food sticks, are to be rehydrated, rehydrate using water *plus* a calcium and vitamin additive. Live prey and salad vegetation should also be dusted in this manner immediately prior to feeding. This is a highly successful way of ensuring that your turtle will obtain all of the essential vitamins and trace elements it requires. **On no account rely upon 'Turtle Flakes', dried shrimp, or 'ant eggs' as sold in some stores - these products are totally unsuited to the successful rearing of healthy turtles.** Most turtles fed on such diets die within a few months from multiple dietary deficiencies.

To avoid contaminating your turtles with Salmonella organisms, it is wise not to feed raw meats, especially chicken or pork - these frequently harbor the organism and if eaten by the turtle the disease will be passed on. Diets rich in meats are invariably also high in phosphates and low in calcium.

This can cause serious problems for turtles, who need high levels of calcium for healthy bone and carapace development. Note that in the wild most aquatic turtles feed regularly upon snails and similar creatures which have a calcium-rich shell. Insect larvae, as taken in considerable numbers by juvenile turtles in the wild, are also comparatively rich in calcium. In captivity, this source is rarely available and therefore additional calcium supplementation is absolutely essential. Calcium tablets can be successfully hidden in meats, and all foods should heavily dusted with a general high ratio calcium-mineral supplement such as Rep-Cal, Miner-All, etc. Provision of a cuttlefish bone which can be gnawed if required is also recommended. The 'Calcium Blocks' sometimes sold for turtles are not adequate by themselves and should not be relied upon to prevent Metabolic Bone Disease (MBD) - always use a professional grade reptile supplement containing a balanced quantity of food-grade calcium with vitamin D3.

In turtles with MBD, the bones of the jaw may be soft and weak and in hatchlings the plastron may remain soft long after it ought to have hardened. Nervous symptoms associated with hypocalcaemia may also be noted (shaking, tremors). These symptoms may appear collectively or individually depending upon the progression and severity of the deficiency. Hatchlings are worse affected (due to their rapid growth and consequent higher calcium demand) but even adults will manifest the condition if placed on an acutely deficient or severely unbalanced diet for long enough.

The underlying bony tissue is porous and thickened and local swellings of the jaw and limbs are commonplace. The body, attempting to support the weakened skeleton, surrounds it with a fibrous connective tissue. The parathyroid glands recognize that there is inadequate calcium within the blood-stream, and attempt to rectify the deficiency by leaching calcium from the bones, thus exacerbating the condition. As long as the diet and blood-serum level remain calcium deficient, this vicious cycle continues. Finally death occurs from acute 'calcium collapse'. This condition results directly from inadequate levels of dietary calcium, excessive dietary protein, excessive dietary phosphorous and inadequate levels of vitamin D3. Generally a combination of factors are involved. **The condition is 100% preventable and the use of a balanced diet, regular use of quality supplement and provision of UV-B lighting will ensure that it does not affect your turtle.**

### Feeding quantity and frequency

Finally on the topic of feeding, it is definitely the case in my experience that over-rather than under-feeding tends to be the main problem in many captive situations; in the long term this can prove just as damaging as underfeeding. Not only must the quality of the diet be maintained within safe limits, but the quantity too. This applies equally to land tortoises and aquatic turtles; in the latter case if you overfeed you will not only get fatty, obese and lethargic turtles but you will also very quickly experience serious tank hygiene problems - and an almost certain outcome of that will be a dramatic increase in the incidence of infectious disease. In most cases, feeding 3 times per week will be quite adequate. Daily feeding is hardly ever required with aquatic turtles - although unrestricted access to aquatic vegetation such as water hyacinth will do no harm.

In the wild, this changeover from a diet rich in animal content, to one of predominately aquatic vegetation, occurs at a carapace length of approximately 1.75 to 2.75" (4 cm to 6 cm). During the heavily carnivorous phase, the diet consists of 85% insect matter and 15% plant material. In the case of adults, and almost complete reversal occurs, with 90% plant matter and less than 10% from animal sources.

It is also worth noting that fresh meats and fish are particularly troublesome in respect of tank hygiene - where

these items are given, I would strongly recommend feeding in a separate container to avoid contaminating the main tank and overloading the filters. Dried, rehydrated foods cause few such problems by comparison and are much better suited to routine, in-tank feeding. If you find you are having to remove uneaten food from the tank, you are either *a*) overfeeding *b*) have the maintenance temperature too low which is discouraging normal feeding or *c*) have a sick turtle.

## HEALTH & DISEASES

*More than 85% of all diseases encountered in turtles are the result of either poor husbandry or poor dietary management - and sometimes both simultaneously.* Dirty water or incorrect temperature control is often seen and there is no excuse for it. Clean water and the correct temperature can be provided at low cost from readily obtainable accessories which can be purchased at any pet or aquatic suppliers as described previously.

Diseases resulting from an incorrect diet are also extremely common, and are a major cause of early death. If a correctly balanced diet is provided as outlined above, then most turtles should live to a good old age - we have encountered some which have survived for over 30 years in captivity. Turtles can get ill like any other animal and if they do you should **seek veterinary advice at once**. Most conditions can be treated successfully if caught early enough.

Be especially careful when adding new turtles to an existing group; turtles may carry bacterial, parasitic and viral diseases and yet may appear to be perfectly healthy. We would suggest a minimum 6 month quarantine period be adopted in all such cases.

The following guide to some of the more common health problems of captive turtles is provided to help you identify a potentially sick animal in need of further investigation and possible treatment. *It is not intended as a "Do-it-yourself" guide to treatment.* All medical treatment should be carried out under qualified veterinary direction. The treatment methods outlined are for reference only and are intended as a general guide to current veterinary practice. *There are also some general guidelines for treating and nursing sick turtles and turtles which are worth mentioning:*

Sick turtles should be kept warm. The best temperature range in most cases is between 80-86°F (27-30°C). At these temperatures the animal's own immune system is able to function at peak efficiency.

It is more important to maintain hydration than to worry unduly about force feeding solid foods. Dehydrated turtles are at serious risk (from renal complications). Even emaciated animals require rehydration and a restoration of renal function before they require force feeding.

Sick turtles may not be able to swim properly. *They can even drown.* Keep water levels low and make sure that the turtle can leave the water easily if it wishes to.

If an infectious disease is suspected, isolate the animal immediately. Keep a spare tank on hand for this purpose in case it is ever required. *Pay special attention to hygiene in such cases* and use an approved surgical hand cleaner (such as 'Betadine' povidone-iodine solution). Also note that introduction of antiseptic solutions or traces of antibiotic excreted by turtles under treatment will instantly destroy the beneficial bacteria in under gravel or other biological filters. Carry out all such treatments in a separate quarantine tank where hygiene is maintained by total water changes daily, rather than by means of filtration.

The key to the successful treatment of reptiles is accurate diagnosis followed appropriate medication. Do not engage in guess-work but always seek expert advice from a qualified source.

### Basic guide to common diseases of aquatic turtles

- ***Swollen or puffy eyes, usually closed. Possible white discharge. Skin may appear red and raw. There may be edema (swelling)***

#### **Probable cause and treatment:**

Bacterial infection of eyes often consequent upon inadequate filtration of water. Investigate environment. Incorrect temperatures can also be responsible for this sort of symptom. In juvenile turtles, a vitamin-A deficiency may be responsible. Topical antibiotics for eyes (non-soluble ointment base) will be required if a bacterial infection is present. Injected antibiotics may also be required. Adjust hygiene and environment if incorrect. Modify diet and treat any deficiency.

- ***Lesions or plaque-like furry build-up of necrotic matter in the mouth. Possible refusal to feed, and eyes may also be swollen***

#### **Probable cause and treatment :**

Bacterial infection of the mouth usually involves Gram-negative organisms. *Contagious to other specimens.* A serious condition requiring prompt treatment. The mouth should be cleaned using a very dilute povidone-iodine or chlorhexidine solution several times per day with physical removal of necrotic tissue. Topical antibiotics of known efficacy against Gram-negative organisms may also be advised. Obtain a laboratory test to determine sensitivity to

different antibiotic agents. Handle affected animals with care and isolate immediately. This condition usually responds well if recognized in good time.

- ***Outer scutes and skin are shedding***

**Probable cause and treatment:**

Some regular shedding is perfectly normal in turtles and this does not necessarily signify that anything is wrong. If bleeding or a bad odor accompanies such shedding, however, this does indicate a bacterial or fungal shell infection (see below). Some thin shedding of the skin is also normal - but if the area revealed is red, raw or 'sticky', this suggests either a bacterial or fungal skin infection or a vitamin A deficiency or overdose. Qualified veterinary diagnosis essential if negative conditions as indicated above are seen. Normal shedding requires no treatment.

- ***Animal lethargic, may hold head high or in an unusual position. Possible swimming or floatation difficulties or reluctance to enter the water. There may be weakness in the front or back legs, and there may be a discharge from nose or mouth often accompanied by wheezing.***

**Probable cause and treatment:**

Serious bacterial infection of the respiratory tract, possibly pneumonia. *Veterinary attention urgently required.* Antibiotic injections are the usual course of action (antibiotics are not normally given orally to tortoises or turtles due to the prolonged and unpredictable rate of absorption via the gut and unpredictability of resultant blood serum level).

- ***Carapace or plastron reveals soft area with possible hemorrhage. There may or may not be an unpleasant smell from the locality. The affected area may spread rapidly.***

**Probable cause and treatment:**

Bacterial infection of the tissues which may have its origins in trauma or as a specific disease. This condition is also known as 'SCUD'; Septicemic Cutaneous Ulcerative Disease. Gram-negative bacterial organisms are usually implicated and the condition is highly contagious. Isolate all affected turtles immediately. The affected area should be cleaned regularly with dilute povidone iodine solution, necrotic tissue gently removed, and the turtle isolated immediately. A topical antibiotic should be applied (laboratory sensitivity cultures are advisable). Most cases result from localized traumatic injury, e.g., burns from heaters or abrasions from sharp rocks in the tank etc.

- ***Lethargy, weakness, possible red flush to limbs or plastron***

**Probable cause and treatment:**

Generalized septicemia (blood poisoning). Many cases result from traumatic injury or untreated abscesses, especially if incurred in contaminated water. There may be hepatitis as the liver can rapidly become implicated. *Urgent antibiotic treatment is required together with careful and intensive supportive therapy.* Blood tests can be useful in establishing the progress of treatment.

- ***Turtle is extremely "puffy" or edematous around the neck, shoulders or upper rear limbs. May be lethargic and not eating***

**Probable cause and treatment:**

Overfeeding, or if fluid edema, possible kidney problems. Prompt veterinary diagnosis and treatment essential. Dietary modification if overweight. Do not worry if such turtles do not feed for some time. They need to lose that excess fat. Place on a low fat, low protein diet. If renal problems - maintain hydration and follow veterinary directions. A low protein diet can help.

- ***The carapace (shell) is soft and may be distorted or "lumpy". The legs may be weak and the turtle may have trouble feeding***

**Probable cause and treatment:**

Dietary calcium or vitamin D3 deficiency, either relative or absolute. Very severe cases are unlikely to survive. Treatment consists of calcium and/or D3 injections plus revised diet and maintenance under a UV-B emitting light.

- ***Lethargy, diarrhea or weight loss***

**Probable cause and treatment:**

Parasitic disease - turtles can be affected by a wide range of internal parasites including flagellate organisms, nematodes ('worms') and flukes. Ask your veterinarian to undertake a laboratory test of fecal samples. Treat according to diagnosis. Inclusion of a UV sterilizer can help in reducing transmission of many water borne parasites. Others require an indirect host - especially snails and fish. For this reason, it can prove safer to avoid these entirely.

- ***Female turtle hyper-active, climbing excessively, or with loss of use of rear limbs***

**Probable cause and treatment:**

The most common reproductive problem in female turtles is egg retention. Egg retention need not be an anatomical problem with an obstructive cause. The environment of the turtle is a critically important factor in oviposition, or egg laying. If no suitable nesting area is available, or environmental temperatures are inadequate, this can lead to retention of eggs. The condition is serious and demands urgent attention. Initially, it is essential to take an x-ray to determine the quantity, condition and position of the eggs. Injections first of calcium, then of the hormone oxytocin, will induce laying in most cases. Some cases may require physical surgery to remove the eggs through the plastron (coeliotomy). Prevention is easier than cure - ensure a laying site is available for all female turtles. Do remember that all adult females can develop eggs spontaneously - even without the presence of a male turtle.

- ***Fresh wound or injury***

**Probable cause and treatment:**

Fighting, abrasion on rocks or other objects. Aggression from other turtles. Remove causal factor from environment. Clean gently using a dilute chlorhexidine solution. Observe carefully for symptoms of secondary infections e.g., septicemia, necrotic dermatitis (shell rot).

- ***Swelling or local inflammation on side of head***

**Probable cause and treatment:**

Ear abscess. In turtles, often due to inadequate water hygiene. Will require surgical excision by veterinary surgeon under general or local anesthetic. Do not rely on antibiotic treatment alone. This is rarely successful and recurrences are commonplace. Draining the abscess, combined with antibiotic therapy, has a much higher overall rate of success.

- ***Severe shell injury - crushing, etc.***

**Probable cause and treatment:**

Accidents, automobiles, dropping, etc. If the worst should happen, the severity of the injury will need to be expertly assessed - although it is important not to panic and be too dismayed by something that might look far worse than it actually is. Turtles can recover from some pretty spectacular damage, given good care. Really severe carapace damage can sometimes be repaired using special medical grade plastics and epoxy cements - ordinary fiberglass material is not usually suitable and should not be used. Such repairs can be highly successful, but they are by no means easy to accomplish; by far the greatest practical danger is that of 'trapping' infection inside the injury. Provided this is avoided, victims of some very major and otherwise probably fatal accidents can be salvaged. A second problem is obtaining good adhesion to the often slightly greasy surface of the shell; a thorough cleansing with acetone immediately prior to application of the epoxy may help. Large areas of missing carapace can be effectively reinforced with a combination of fiberglass matting and surgical steel wire. The outer coating of plastic should be as smooth as possible to prevent any accumulation of dirt. A few years ago, one of our more memorable patients was a little slider which was found wandering with a severely cracked shell miles from the nearest water. This was successfully repaired by pinning the shell and cementing everything back into position with a medical epoxy compound. Fortunately, the back legs, although very weak, remained usable indicating that terminal spinal damage had not occurred. The most likely cause of this injury was that the terrapin had been kidnapped from its pond by a heron or similar large bird, struggled free in flight, and fallen to the ground! Fortunately this very lucky little turtle went on to make a complete recovery despite incurring what at first looked like dreadful and quite probably fatal damage. Expert veterinary advice is required in all such cases, as the surgery required is very delicate.

### **A note on Salmonella in turtles**

Good general hygiene practices will provide almost complete protection under normal circumstances. While this problem should not be treated lightly, there is no excuse for the periodic media hysteria about turtles and salmonella. It is highly advisable to enforce the following standard procedures at all times. Provided this is done, then any risk is minimal.

- Do not eat or put anything in the mouth when working with turtles.
- Engage in regular and thorough hand washing using hot water and a disinfectant soap after handling animals.
- Use disinfectants such as dilute (1:20) bleach or povidone-iodine or chlorhexidine to clean feeding utensils and other apparatus.

- Ensure that all filter systems are in full working order. Regular maintenance is especially important when ultra-violet sterilizers are installed.
- Feces and dirty water should be disposed of carefully and safely; tortoise and turtle waste is not suitable for composting as *Salmonella* organisms can survive this process.
- The feeding of uncooked poultry, raw eggs or meat to turtles is **extremely dangerous** and should be avoided at all costs.
- The presence of children, the elderly, or immune compromised persons in the vicinity of turtles is not generally advised and should in any event be monitored carefully with all necessary precautions rigorously enforced.

For further information on all aspects of turtle and tortoise care, visit the Tortoise Trust Website at <http://www.tortoisetrust.org> and join the Tortoise Trust Forum; an international community of tortoise and turtle keepers ready to offer help and advice.

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## Practical Care of Red-Eared Sliders and Painted Turtles

By A. C. Highfield

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<i>Litres</i>	<i>100</i>	<i>150</i>	<i>200</i>	<i>250</i>	<i>300</i>
<b>10°C</b> <b>18°F</b>	100	150	200	250	300
<b>15°C</b> <b>27°F</b>	200	300	2 X 200	2 X 250	2 X 300
<i>Gallons</i>	<i>25</i>	<i>40</i>	<i>50</i>	<i>65</i>	<i>75</i>

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