

LAND AND WATER

# Tortoise

By "Amphibius"



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# Land and Water Tortoises

*Their Care as Pets*

by

Amphibius

(Revised by Alfred Leutscher, B.Sc., F.Z.S.)

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(Photographs on pages 6, 9, 16, 20, 21, by L. E. Day, F.R.P.S., A.I.B.P., A.P.S.A., F.Z.S.; 10, 19, Zoological Society of London; 17, 23, 24, WATER LIFE; and 29, W. S. Pitt.)



## CHAPTER I

### About Tortoises in General

THE popularity which these queer little reptiles enjoy as pets shows no sign of waning, and many thousands are still sold annually in this country.

What subsequently happens to most of these tortoises is the reason for the publication of this little book, for although they are bought with the best intentions in the world for their welfare, a lack of knowledge of their organization, habits, and requirements usually leads to insufficient food of a proper nature, neglect, and finally death at the onset of cold weather.

Everybody is familiar with the general appearance of the land tortoise—it is, in fact, better known than any of our indigenous reptiles. Although so different in appearance from other animals, it is fundamentally just the same, only it has brought its ribs outside its body and joined them to special skin-bones, the whole forming the upper shell or *carapace*. Similarly its breastbone has moved outside and provides additional protection as the breastplate, or *plastron* as it is more properly called. When alarmed a land tortoise has only to withdraw into its shell, guard the entrance with its scaly limbs and wait for the danger to pass away: so having no need to move quickly it has lost the power to do so and that is why the tortoise is associated with slowness. In any case, an animal could not be expected to run very fast with such a load to carry. Witness the snail!

In the course of time, some land tortoises took to living in the water and the move was accompanied by certain modifications in structure. A high, domed shell would obviously offer a lot of resistance when the tortoise wanted to swim in the water, so the shell became flatter and flatter, with the result that water tortoises are now moderately well streamlined. Again, the stumpy toes of tortoises were pretty useless for swimming with, and so mobile toes were developed, together with a greater or lesser amount of webbing between them. The change from a plant to an animal diet occurred at the same time, and the water tortoise is found to be quite well fitted to chase and catch his prey, or lurk silently, waiting to seize an unwary passing fish with a sudden, sideways snap.

Water tortoises are usually called "Terrapins" in this country, but the term is only one of convenience, and in America, China, and Japan, for instance, they are called "Turtles," a



name which we reserve for those sea-living tortoises, the sacrifice of some of which is associated with the Lord Mayor's Banquet.

In describing the means to be adopted for their welfare in captivity, I have found it convenient to divide the more commonly imported species into four main groups, that for the half-hardy terrapins being subdivided, in turn, into two. The hardy tortoises are those capable of living outdoors all the year round in this country and the half-hardy ones are those which need to be taken inside and kept warm during the winter. The same applies to the water tortoises, except that the length of their stay outdoors of the half-hardy species is restricted to the months which are really warm.

Books dealing with the keeping of Reptiles nearly always include long (and I am afraid often very dull) technical descriptions of the animals under consideration. These descriptions are, as a rule, "lifted" from standard works on the subject, and what the lifters never seem to realize is that these same standard works are available to everyone through the municipal and county libraries and can thus be consulted at first hand when and if required. I am omitting all such descriptions, giving only the characteristics of shape or colouring which are necessary for identification of the group to which an individual may belong. I have included the most modern and generally accepted Latin name of each animal so that reference to such writers as Boulenger (G. A.), Flower, Gray, Gadow, Siebenrock, Holbrook, etc., is facilitated for those who desire amplification of what I am going to say.

Nearly all the kinds I shall mention are very well represented at the London Zoo, so that a prospective tortoise-keeper can always go along and have his mind made up for him, if he is in any doubt as to the species with which he wants to start.



## CHAPTER II

### Hardy Land Tortoises

OF these, only two species are generally available in this country. These are the SPUR-THIGHED MEDITERRANEAN LAND TORTOISE (*Testudo graeca*—commonly known as the Moroccan Land Tortoise) and the GREEK or HERMANN'S TORTOISE (*Testudo hermannii*). Everybody probably knows the simply enormous numbers of the former kind which are available from March to October every year in this country. They can be bought from most pet shops during the summer months.

The Moroccan Tortoise is commonest in North Africa from Morocco to Tunis. It is also found from Rumania to Trans-Caucasia, in Iran and Israel. Why the few Spanish examples should have been responsible for giving the species yet a third name I do not know, since it is also called the Iberian Tortoise.

The Greek Tortoise is chiefly remarkable in that it does not occur in Greece proper. It comes from Southern France, Italy, Corsica, Sardinia, Sicily, and Dalmatia. It used to be fairly common in the lovely Balearic Islands, but fell easy prey to the collectors who go there every year to catch the brilliant lizards for which the islands are famous.

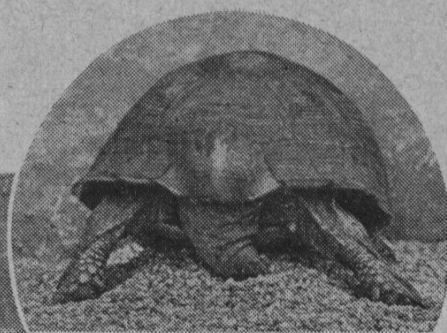
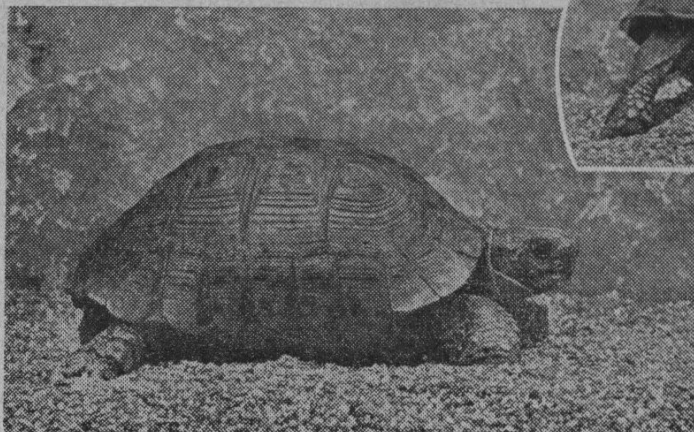
These two tortoises are much alike to look at, but the Moroccan Tortoise has the small bony spur from which it derives its name in the middle of the posterior side of the thigh. The posterior edge of the carapace is serrated, and the adult females have the hinder half of the plastron hinged. The Greek Tortoise has no thigh tubercle, an unserrated edge to the carapace, and, to the best of my belief, the plastron is fixed in both sexes. So it is really not difficult to tell one kind from the other.

The two other hardy tortoises occasionally available cost more money. Only to the collector are they of more interest than those with which we have already dealt. They are the MARGINED TORTOISE (*Testudo marginata*), the true indigenous Greek Tortoise, and DR. HORSFIELD'S TORTOISE (*Testudo horsfieldii*), occurring from the Volga to the Kirghiz Steppes and southwards to Turkestan and Afghanistan. The first of these is like a larger edition of the Moroccan Tortoise (but without the thigh tubercle), and has the serrated margin of its carapace extended into a flange. Dr. Horsfield's Tortoise is easily recognized because it is darker in colour than the foregoing and has four nails only on its feet. They all require just the same treatment in captivity.

Spring is much the best time to buy them, as often then it is only a matter of days since they had left their own country. When buying them, they should be carefully examined to make



**Male Spur-thighed Mediterranean Land Tortoise** (*Testudo graeca*). This species is commonly called the Moroccan or Moroccan Land Tortoise. It is also known as the Iberian Tortoise and, occasionally, as the Algerian.

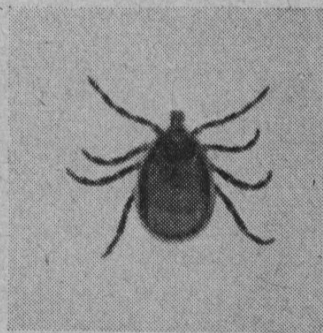


*Left: Side view. Above: Rear view to show sex differentiation. In the male the plastron is concave, the tail longer and the pointed marginal tail shield curved.*

sure that the shells are not cracked or chipped in any way; that the limbs and head are sound, and the eyes clean and bright. There will be found a good deal of variation in colour and marking, but activity and good health in a tortoise are more important factors to consider than colour and marking. Tortoises are sociable little creatures, and as the extra amount of money involved is small, I strongly urge the purchase of a pair—or, better still, two pairs—instead of a single specimen. They are not very easy to sex, but as a rule the females are considerably larger and have shorter tails than the males, and in *T. graeca* the movable plastron serves as a guide. If a true pair is not secured it does not matter, as several females or males will live very happily together, and the question of mating does not arise sufficiently often in this country to warrant its being seriously considered. Also, in the male of this common species, the shield above the tail is curved. It is flat in the female.

Having carried one's purchases home—probably in a paper bag—they should first be given a good wash in warm water, and should then be left in a deep bowl or sink with about three-quarters of an inch of tepid water in it. Most probably the tortoises will take a long drink, and then after being dried are ready to be put into the garden.

It may be mentioned here that these tortoises are sometimes found to have ticks (*Hyalomma aegypticum*) sticking to the soft parts of their body—that is, in the armpits and groin, on the neck and below the tail. It is only necessary to pull them off with a pair of tweezers and to drop them into a little paraffin or petrol to kill them. The correct way to remove these ticks is given in Chapter VIII

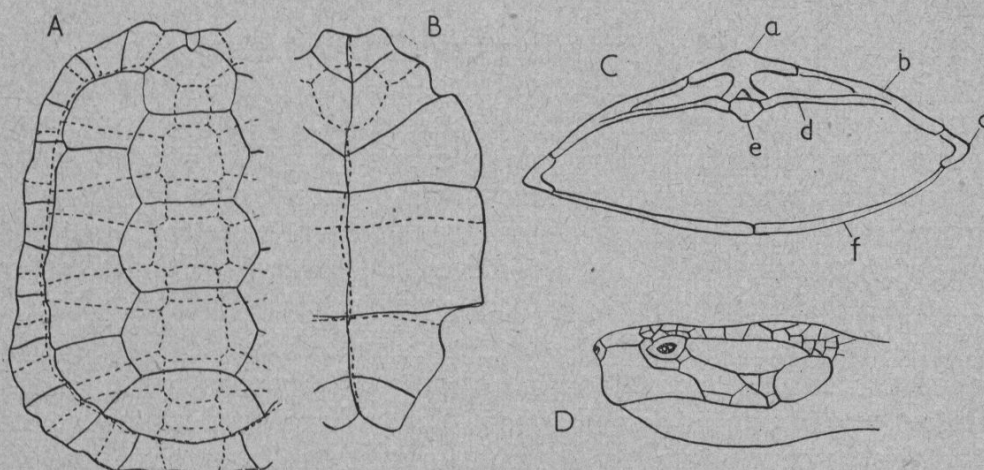


**The Tortoise Tick** (*Hyalomma aegypticum*), magnified approximately x6.



(Common Ailments). It is quite natural for the tortoises to have them, and is in no way a sign of disease or bad health. Several of the larger dealers now make a habit of pulling these ticks off, or "bugging" them as they call it, before offering the little reptiles for sale.

The proper accommodation of tortoises is important, but will naturally depend upon their owner's circumstances. They undoubtedly like best the unrestricted run of a garden, but if given this, one must be prepared for the tortoises to claim certain perquisites, and whatever the dealer may say to the contrary, these will *not* take the form of slugs, snails, beetles, and other house or garden pests. The land tortoises are *entirely plant-feeders*, and will soon manifest their extreme fondness for tit-bits



Parts of skeleton and head of the Spur-thighed Mediterranean Land Tortoise (*Testudo graeca*). A, carapace and B, plastron (thick lines denote borders of outer, horny shields and dotted lines those of underlying bony plates). C, section of skeleton:—a, neural plate; b, costal plate; c, marginal plate; d, rib; e, vertebra, and f, plastron. D, head, side view, of *T. graeca*.

so near to the gardener's heart as young peas, lettuces, cabbages, pansies, etc. They need to be fed regularly upon any of the following:—Lettuce, young cabbage, clover (flowers and leaves), dandelion (flowers and leaves), endive (some will not touch this), melons, banana, and almost any ripe, sweet fruit cut into convenient pieces. Rose leaf cuttings will sometimes be eaten. Carrot is good for them, and most will eat it if it is cut into thin slices. The fruits named are luxuries, and may be given at the discretion of their owners. It is a good plan, for growing tortoises especially, to sprinkle their food liberally with powdered cuttle-fish bone once a week. Cuttle-fish bone can be bought at any pet shop or picked up on the beach after a storm. A little olive oil smeared on the food occasionally is beneficial.

In order to eliminate damage to the garden, the plan I adopt is to give my tortoises their day's food every morning in exactly the same place and as early as possible. They are always ready for it, and spend an hour or two at breakfast before starting out



for the day. When this is done damage to my plants is quite negligible. If they have to forage for themselves it is only reasonable to expect them to eat any edible plants they come across.

One often hears expressions of surprise at the enormous size of their appetites, but it must be borne in mind that a tortoise is eating for the present and the future at the same time. The greater part of a plant consists of cellulose, which is a carbohydrate (the group of foodstuffs which includes sugar and starch), and there is only very little protein present. Tortoises need a great deal of this cellulose to provide them with energy, and they also have to turn a lot of it into sugar and subsequently convert this sugar into fat, which they store inside themselves and upon which they live during the long winter sleep about which I shall have more to say later.

Water for them to drink must not be forgotten. Individual tortoises vary, and while some very seldom drink, especially if regularly fed on fresh greenstuff and fruit, others drink often, sucking up the water in long, deep draughts. To provide for the latter a red earthenware saucer should be sunk in the ground as far as the rim, and kept full of fresh water, near to some spot which the tortoises are found to favour. Bread and milk, often recommended for tortoises, is both unnatural and undesirable.

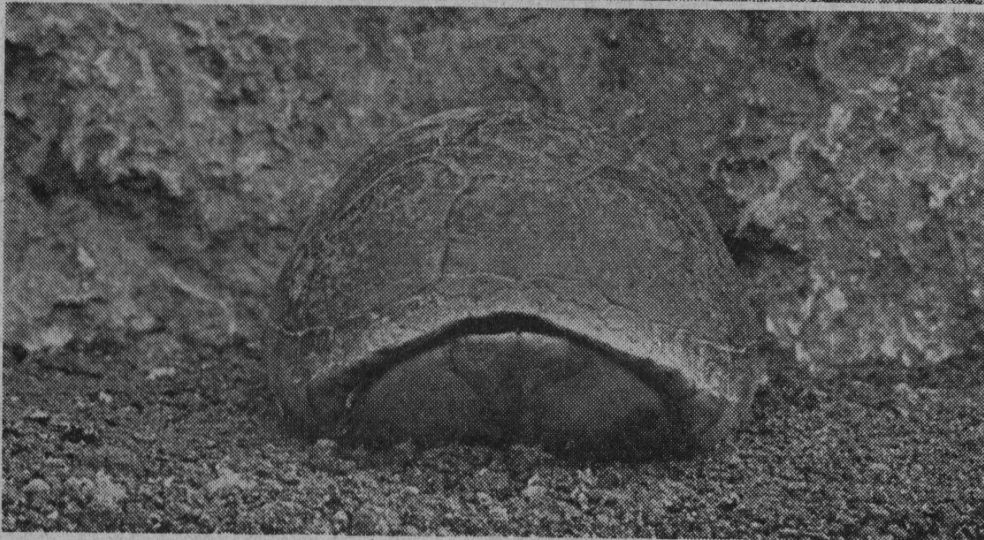
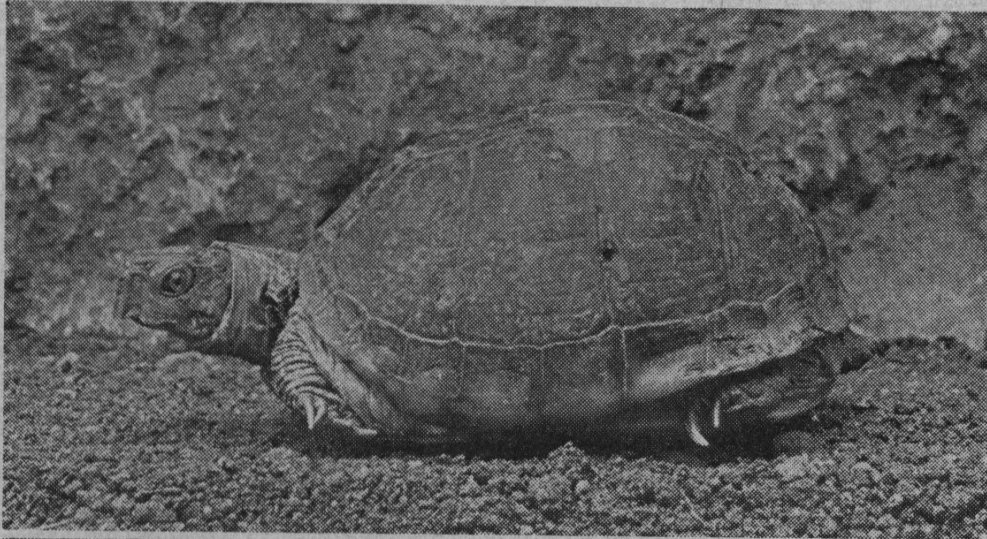
The question of a suitable enclosure will arise if it is not convenient to leave the tortoises at liberty. Here again much will depend upon taste and inclination, but so long as the paramount need for as much sun as possible is met, nothing else matters very much. A fence a foot high will keep land tortoises within bounds, and although wire netting and wood are cheap and quite satisfactory materials, a fence made of chainlink netting, with wooden uprights to strengthen it at, say, 2-ft. intervals, looks much nicer. A shelter is very necessary, and may consist of a cave—which looks well, but is difficult to clean and examine—or of a sugar box, turned on one side and with half the front boarded up. If the latter is used, it should first be creosoted, and then covered all over with roofing felt. Let the entrance face east, so that the sun's rays are available to waken the tortoises and warm them up for the day. This house should have its floor thickly covered with dried leaves or hay, and if put into it every day at dusk the tortoises will, in many cases in less than a week, learn to go to bed of their own accord and to shelter in it when it rains, for land tortoises do not like rain. Even when the beasts are at liberty in the garden, it is as well to give them a little house in a spot which they are found to like. It helps to guard against their straying away.

Furnish and arrange the enclosure suitably. A shrub or two will provide them with shelter from the hottest rays of the sun. An area covered with two or three inches of builder's sand will be appreciated. Tortoises like to bask on bare earth or sand.



Part of the enclosure may be turfed, and the saucer of water should not be forgotten.

After considering the matter very carefully I have decided to include the CAROLINA BOX TORTOISE (*Terrapene carolina*) with the hardy land tortoises, although it is usually classed with the terrapins. The American Box Tortoises are firm favourites of mine, and comprise a group of terrapins which are reverting to



**Sub-species (*Terrapene carolina carolina*) of the Carolina Box Tortoise (*T. carolina*). The lower picture shows the hinged plastron entirely covering the aperture through which the limbs and head have been withdrawn. Strictly speaking, Box Tortoises are terrapins, but the author has included them in this chapter on Land Tortoises in view of their changing habits.**

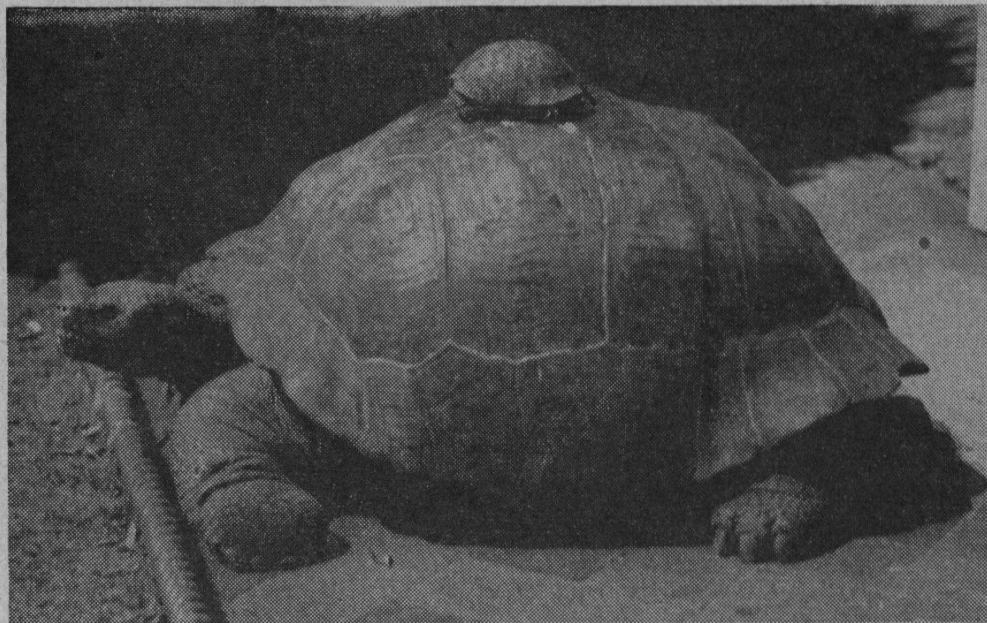
life on land. They more closely resemble the land tortoises in the shape of the shell and in that they feed on land, but they have the mobile, webbed toes and quick actions of the water tortoises. There is a hinge running across the middle of the plastron by means of which the front and back openings of the shell can be completely shut.

Together with its watery habitat, the Box Tortoise seems to be abandoning a carnivorous in favour of a frugivorous diet, so



that it is the only one of all the tortoises with which we are dealing that must be provided with a mixed diet. Small pieces of raw beef, liver, heart, banana (a favourite, this), soft pear, strawberries, cherries, plums, and almost any soft ripe fruit is taken, the evening, just before dusk, being its favourite meal-time. A distinction of this tortoise is that it can claim truthfully to be the gardener's friend, for not only does it do no damage whatever to plants, but it also eats snails, grubs, and other nasty creatures, as well as that arch-enemy of the garden, the slug.

It is best to buy a pair of these tortoises, and as the males have red and the females brown eyes, sexing is easy.



This Zoological Society of London photograph shows the relative sizes of two members of the genus *Testudo*. The large tortoise, which comes from the Galapagos Islands, is *T. nigrita*, commonly known as Porter's Blackish Tortoise, with on its back the popular Spur-thighed Mediterranean Land Tortoise (*T. graeca*).

These Box Tortoises are North American, and in addition to the Carolina Box Tortoise there is another sometimes available. This is called the Ornate or Baur's Box Tortoise (*Terrapene ornata*) and is the prettiest, having a lot of yellow spots and radiating lines on the carapace and soft parts of the body. It comes from the Southern United States.

Throughout the late spring, summer and early autumn, tortoises will thrive and grow fat under treatment such as that described, but the advent of winter brings conditions the adequate meeting of which is discussed in Chapter VI.



## CHAPTER III

### Half-hardy Land Tortoises

HAVING acquired, at the expense of one or more representatives of those species previously described, a certain amount of experience, one may, perhaps, wish to try one's hand with some of the larger and more brilliantly coloured land tortoises which are available from time to time and which hail from the tropics.

During the summer months most of these kinds live happily outdoors in a garden or enclosure, but it is most important to have suitable alternative accommodation ready and available in the event of a sudden cold spell and for the period from late autumn to late spring. I will not pretend that the provision of such accommodation is easy and cheap, because it is not, and so unless there exist the means for providing it, I recommend the reader to stick to the hardy varieties.

The difficulty is to provide a winter temperature of from 65°-75° F. (depending upon the particular species) and at the same time to give the animals enough room to move about. A greenhouse is ideal, but although many people nowadays have small greenhouses, only a minority keep them at a temperature as high as that named. Where money is not the first consideration, thermostatically controlled terraria may be used, but these are very expensive.

These tropical tortoises can be kept without any difficulty in a room, if such or part of one can be spared, and an anthracite stove will maintain it at the temperature required at little expense and no trouble. The danger indoors to tortoises comes from draughts under doors, etc., and such must be guarded against.

No anxiety need be felt if the tortoise eats very much less under these circumstances than he did in the garden in the summer. He will know that it is winter, even though he is protected from the direct influences of it, and becomes progressively less active and hungry as the cold months advance. Regular feeding during the summer will have enabled him to lay down a good deal of fat, upon which he will draw as required. If he does feed well, so much the better, and to this end he should be tempted with any available delicacies in addition to his basic diet.

The floor should be covered with sand—not like the thin sprinkling one often sees in birdcages—but a good layer about



an inch thick. This sounds a lot, but the soiled sand can be removed with a shovel and the rest sifted and used over and over again. Woodland tortoises seem to like peat moss better than anything and all kinds like a heap of dried leaves or bracken in a corner. They will burrow into it and doze, sometimes for several days on end. These remarks on furnishing apply alike to rooms, greenhouses and large terraria.

The largest species generally available is the LEOPARD TORTOISE (*Testudo pardalis*) which comes from Africa. It achieves a weight, it is said, of 75-lb. The largest individual I have owned weighed just over 30-lb., and if contemplating an animal of this size, due regard must be paid to his appetite. One of the weight I have mentioned requires daily throughout the summer a small cabbage, two or three lettuces and any banana skins there may be and any other fruit. They prefer the skins of the banana to the contents, which is perhaps fortunate. Once a week they should be given only carrot, cut into thinnish slices.

These large tortoises require plenty of room, and all of mine have had the run of a garden. It is useless, of course, to try to confine them behind a low wire netting fence as they just keep walking until it goes down before them.

My largest specimen once applied her weight, strength and determination to the garden fence with great success. Four days later she was found ambling merrily along the Metropolitan Railway's permanent way, more than a mile distant!

Not particularly colourful, the Leopard Tortoise is a very shapely animal and has quite ponderous limbs. A strong point in its favour is its relative hardiness, and I have succeeded in hibernating an example of this species in a cool room. Such a practice, however, should not be adopted unless one is prepared to accept a certain amount of risk and the tortoise is in first-class condition. They will feed well throughout the winter if kept in draught-proof quarters at a temperature of 70° F. They can be put outdoors again on fine days in March, being brought in again at night until about the middle of May, after which, if trained to sleep in their house, they may be left out until October or until they have ceased to feed, whichever comes first.

The dome-shaped tortoises of the elegant group, of which the RADIATED TORTOISE (*Testudo radiata*) from Madagascar, and the STARRED TORTOISE (*Testudo elegans*) from India and Ceylon, are sometimes available, are not only handsome in shape but also in colour. The Radiated Tortoise weighs up to 18-lb. and has vivid orange or yellow rays on its black carapace. The limbs and head are yellow. The Starred Tortoise is rather similar in coloration, but much smaller in size, and is slightly more hardy than the other. Both are more delicate than the Leopard Tortoise and cannot live outdoors until June has begun.



The date on which they return indoors must be determined individually, for while some will remain active outdoors until October, some begin to go off their food in September. Again, much will depend upon the amount of sun there has been during the summer.

They like melon better than anything else to eat, but nothing in the greenstuff or fruit line comes amiss.

The very attractive TABULATED, REDHEADED or AMERICAN WOOD TORTOISE (*Testudo tabulata*) is the tropical tortoise most often seen here, and usually costs only a few shillings. They are very common in Brazil and numbers of them are eaten by the natives. The head has a number of bright red scales on it and so have the limbs and tail. The shell is long and narrow and is black, each shield having a yellow or orange areola and often concentric yellow rings. It is relatively hardy and can be left outdoors from April until October. Frosts, of course, are very dangerous to these tortoises, especially in the early part of the year, and one must run no risks with them in this respect.

The Tabulated Tortoise is largely a fruit eater, and being a very active animal should have lots of room. It should have access to plenty of cover.

Other tortoises, such as various species of Kinixys, the Gopher Tortoise, and the Angulated Tortoise, to quote some, are occasionally to be bought, but prove in many instances to be delicate and temperamental beasts. I am sure that those I have described will be found to be as desirable as any.

## CHAPTER IV

### Hardy Water Tortoises

THERE is a larger variety of water tortoises available than of land tortoises, because certain species from America, China and Japan, as well as those from Europe are perfectly hardy in this country. They will live quite well in the same enclosure with land tortoises, with which they agree perfectly, but there must be, of course, a small pond in the enclosure. Terrapins are far more active on land than their land brethren, and, having good claws, movable toes, and a great deal of determination, they will soon get over a wire-netting fence a foot high. One must therefore either increase the height of the fence and give it a small turnover at the top, or else build the fence of wood, which is unclimbable except at the corners. The wooden fence does not look nearly so nice in the garden. Because of their activity and their hole-in-the-fence-finding proclivities, it is not safe to let them live at liberty in the garden, unless the wall is a good brick or stone one.

Having previously described an enclosure, I am not going to add anything about the actual making of the pond in it, as there are now many little books published upon the technical aspects of garden pool building and maintenance. From the terrapins' point of view, size and shape of outline are not very important, but it is essential that one, or preferably two sides should slope gradually to the deepest region, which should measure at least two feet, and more if possible. The slope is to enable the terrapins to climb in and out easily, and the reason for the quite considerable depth will be found later.

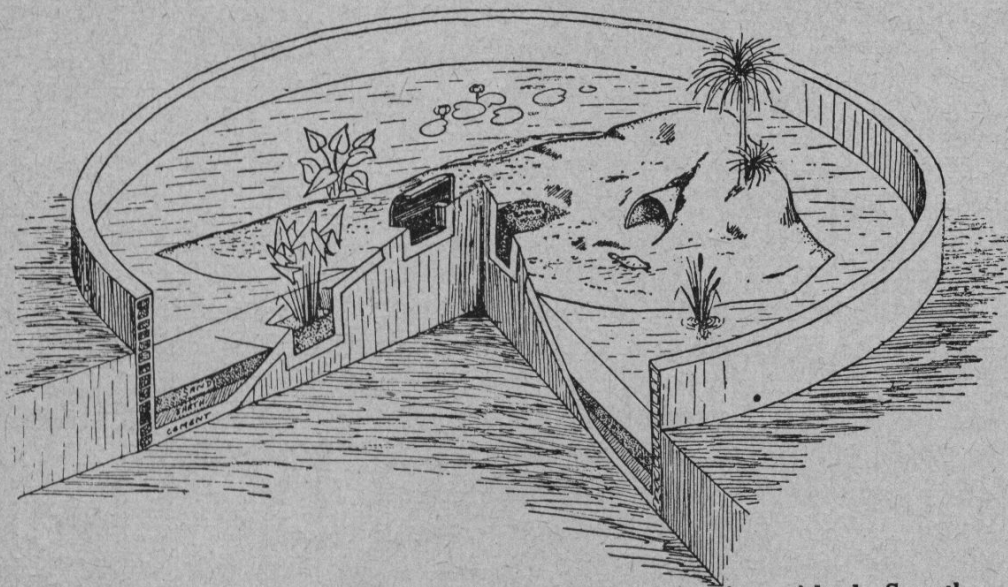
Into the deepest part should be put a 4-in. layer of baked loam, and over this a further two inches of washed river sand, before the pond is filled.

If concrete pockets are made around the edges, such plants as the Common Arrowhead (*Sagittaria sagittifolia*), the great Water Plantain (*Alisma plantago*), Flowering Rush (*Butomus umbellatus*), the yellow Flag Iris (*Iris pseudacorus*), and many other plants can grow in them, and will add to the general effect as well as providing shade, retreat, and something approaching their natural habitat for the terrapins.

I am afraid any plants put into the pond itself have a pretty thin time of it, but one can satisfy the terrapins' love for aquatic vegetation by covering the surface with such floating plants as Frogbit (*Hydrocharis morsus-ranæ*) and Duckweed (*Lemna*). Ordinary Creeping Jenny (*Lysimachia nummularia*) may be planted outside the pond and allowed to grow into the water. In addition to hiding underneath it, small terrapins will use it



as a ladder when getting in and out of the water. While on the subject, I would like to draw attention to the design of enclosure shown in the picture. This type is extremely successful for both land and water tortoises, and no escape can be made from it. As far as construction goes, I think it is self-explanatory, and, tastefully planted, is an asset to any garden. Two things about it are worth emphasizing, and these are, firstly, the necessity for the final "rendering" of sand and cement to be *perfectly* smooth, and, secondly, the advisability of mixing a waterproofing agent with this final coating of cement. It is most annoying to watch the water in one's pond sinking by about an inch a day, and the alternative provided by using one of the



**Design for a Terrapin Enclosure with adequate dry ground forming an island. Smooth, upright boundary walls prevent the escape of the terrapins using the water. The island can be used to accommodate land tortoises.**

black bituminous preparations sold for waterproofing after construction renders the terrapins almost if not quite invisible.

The terrapins, or at least those that we are considering, differ from the land tortoises in being mainly carnivorous. They are not, therefore, a potential danger to our plants, apart from any mechanical damage resulting from their sitting or walking on them. Their food should consist of a choice, as varied as possible, from the following: Raw meat, liver, heart, fish, fresh-water snails, garden worms, etc. It is important to cut the food into small pieces, and to give many such rather than to give great chunks, for passage through the alimentary canal is extremely rapid, and if the pieces of food are large, the digestive juices do not have time to break them down, and they are passed in a more or less undigested condition. This is wasteful as well as resulting in considerable fouling of the water. Terrapins prefer to take their food actually in the water, and it is best given by hand, so that one can see that all get their share, and not the biggest the lot! Until they have become tame enough to take their food in this fashion, it should be dropped in front of them

in the water. Some terrapins will eat water plants and lettuce, especially youngsters.

Treatment is the same for all the tortoises in this category, and I will enumerate those most often available.

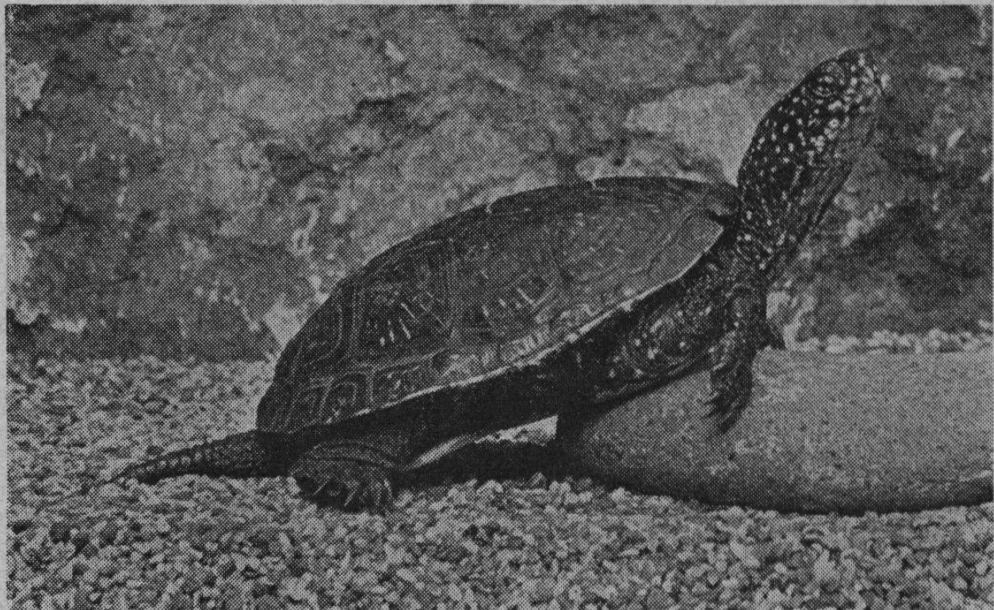
**THE EUROPEAN POND TORTOISE (*Emys orbicularis*).**—This is the water tortoise most commonly seen in this country. It is hardy, and will live and grow for many years in a garden. Its shell and limbs are very dark, with a varying number of yellow or orange dots and splashes. Its range is very wide, and those found in, say, Poland, are not nearly so prettily marked as the more southern races from Spain.

It loves the sun, and will sit on a log or rock basking for hours, but ready to dive into the water if it becomes frightened or disturbed. It sleeps at night in the deepest part of the pond.

This terrapin should *never* be kept indoors for prolonged periods, as it is very susceptible to tuberculosis under such circumstances.

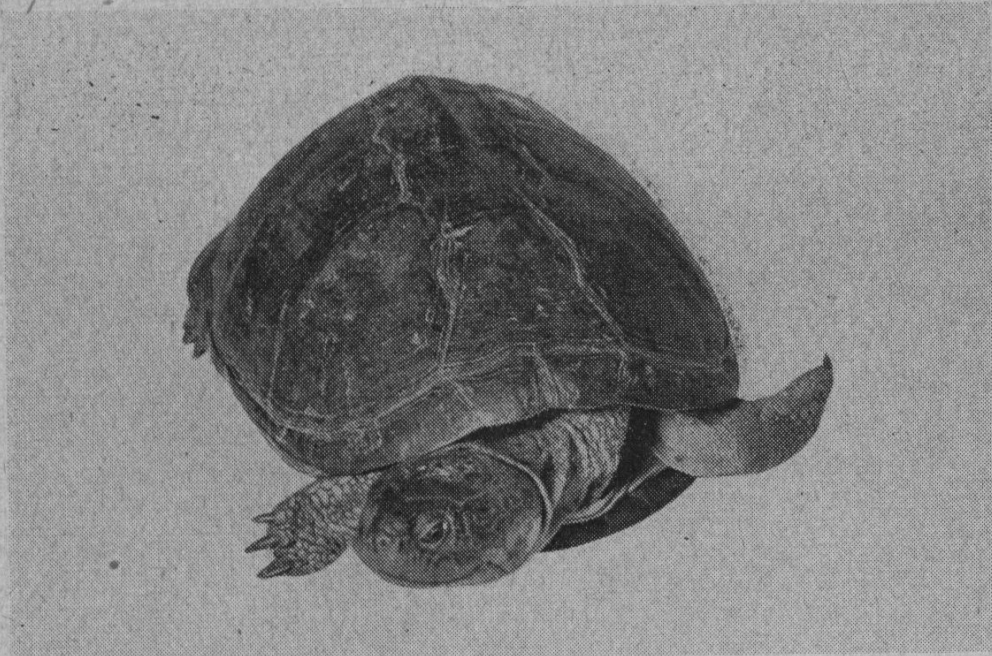
It has an American relative, called the **AMERICAN POND TORTOISE (*Emys blandingii*)**, which greatly resembles it, but grows to a larger size. It is equally hardy in captivity.

**THE SPANISH and CASPIAN TERRAPINS (*Clemmys leprosa* and *C. caspica*).**—These are two closely related species, the first being larger and commoner, but less beautifully marked than the second. They come from Spain and North Africa, and the neighbourhood of the Caspian Sea respectively. The Spanish Terrapin quite commonly has a 7-in. shell, and is khaki or brown in colour. Its head and limbs are also of these colours, but are streaked with yellow. The Caspian has the edges of its jaws serrated, those of its relative being smooth, and its coloration



**The hardy European Pond Tortoise (*Emys orbicularis*), the head, neck and limbs of which are covered with spots or dashes of yellow or orange. It will live for years in a garden.**





**Spanish Terrapin** (*Clemmys leprosa*), a hardy water tortoise whose range covers Spain and North Africa. The colour is brown or khaki, the head and limbs having streaks of yellow.

consists of a marbling of olive, yellow and black. Altogether a most handsome beast.

The sharp eyes of these terrapins warn them of the slightest movement, which is enough, before they have become familiar, to send them scuttling to the bottom of the pond. The smell of these two species is caused by a secretion from a pair of cloacal glands, and is only demonstrated until they have become tame.

Female Spanish Terrapins often lay eggs in captivity—at least, mine do. The eggs are about as big as those of a pigeon, but are narrower in proportion to their length, and have a hard, rough shell. If the mother buries them, which she will probably do in the sandy part of her enclosure, the best thing is to leave them alone. If, for some reason, she does not bury them and just drops them haphazard, it might be worth while to put them on a layer of dry sand in a shallow wooden box, cover them to a depth of about three-quarters of an inch with more sand, and put them in a garden frame or greenhouse. Whenever there is any sun the box should be stood outdoors in it. I have never yet been able to hatch any, but that is no reason why others should not be able to! Needless to say, it is no use hoping for anything to come from the eggs unless one has a pair of terrapins. One sometimes knows that there may be eggs coming, as on occasion Spanish Terrapins can be embarrassingly promiscuous in their behaviour. They may, of course, be infertile.

**REEVES' TERRAPIN** (*Geoclemmys reevesii*).—This is the amateur's terrapin *par excellence*! It compensates for a sombre coloration with a brightness of disposition and hardiness of nature quite equal to that of the European Tortoises.

It comes from Japan and China, and in the latter country is

extremely common as a result of being artificially distributed by man. Reeves' Terrapins can be seen in nearly all Chinese markets, sometimes in immense numbers. They are very largely aquatic, but like to have a stump or rock handy at the water's edge so that they can sit and bask as the inclination takes them.

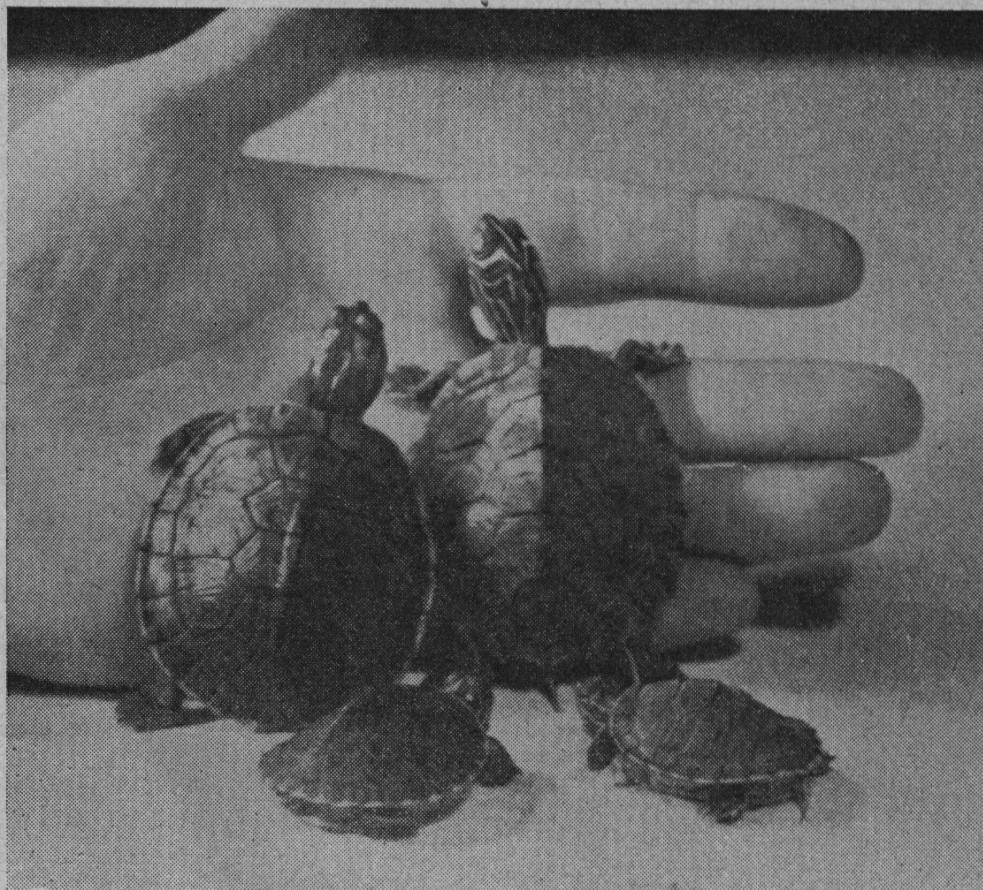
The shell has three longitudinal ridges on it, and is brown in colour. Underneath it is yellowish, mottled with grey or black. The soft parts are dark grey or brown, sometimes finely lined with silver. It is a small beast as terrapins go, and specimens with a shell of more than four inches in length are rare.

There is a melanistic variety sometimes available, which is black.

These terrapins know quite accurately when it is feeding time, and thirty or forty specimens clambering over and over each other in their anxiety to be first to the food is a sight not to be forgotten in a hurry.

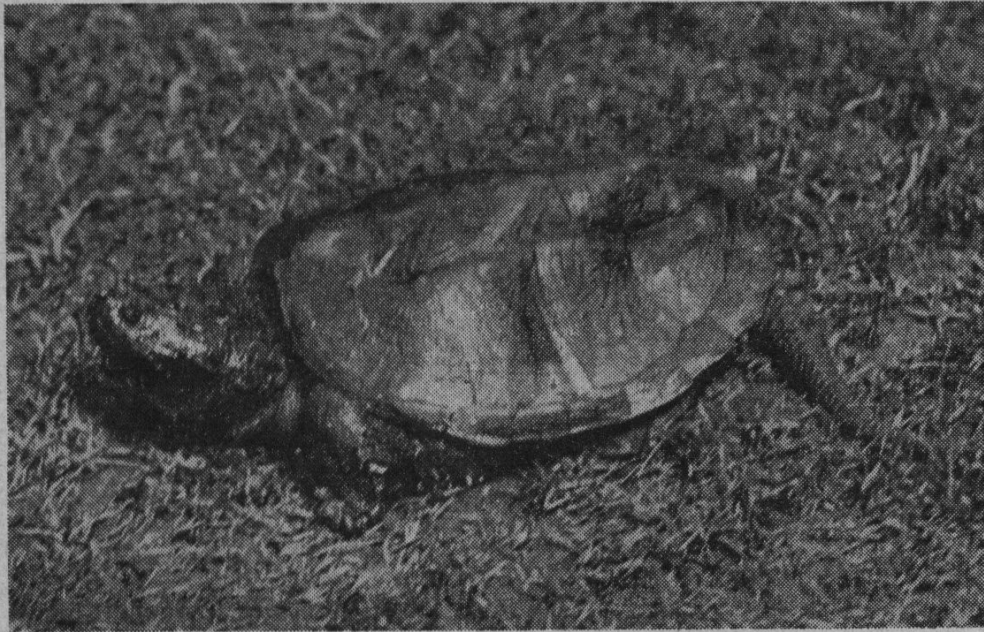
This species is often offered for sale as the "Chinese" or "Japanese" Terrapin.

THE ALLIGATOR TERRAPIN (*Chelydra serpentina*). This very strange looking terrapin comes from North and Central America, where it grows to a large size (about 3-ft. over all) and is eaten by man. Sadly enough, only a few specimens of a decent size



The human hand shows the comparative sizes of American terrapins. At the back are, right, *Pseudemys scripta elegans* and, left, *Graptemys pseudogeographica*. In front are, left, a small *P. scripta* and, right, a baby *P. scripta elegans*.





One of the hardy water tortoises (*Chelydra serpentina*) which has been given the common name of Alligator Terrapin. Aggressive by nature, only small specimens should be kept in a community collection. The range of its natural habitat is from Central to North America.

reach this country and they are usually rather expensive when they do.

As it has only a small shell—rather like a saddle in appearance—it cannot fully withdraw to protect itself, so nature has compensated it with plenty of courage and a good pair of jaws, in the use of which it requires no instruction. It is rather a stupid beast and is prone to consider everything moving as food, so 'ware fingers! Its attraction lies in its extreme hardness, odd appearance and undeserved reputation for ferocity.

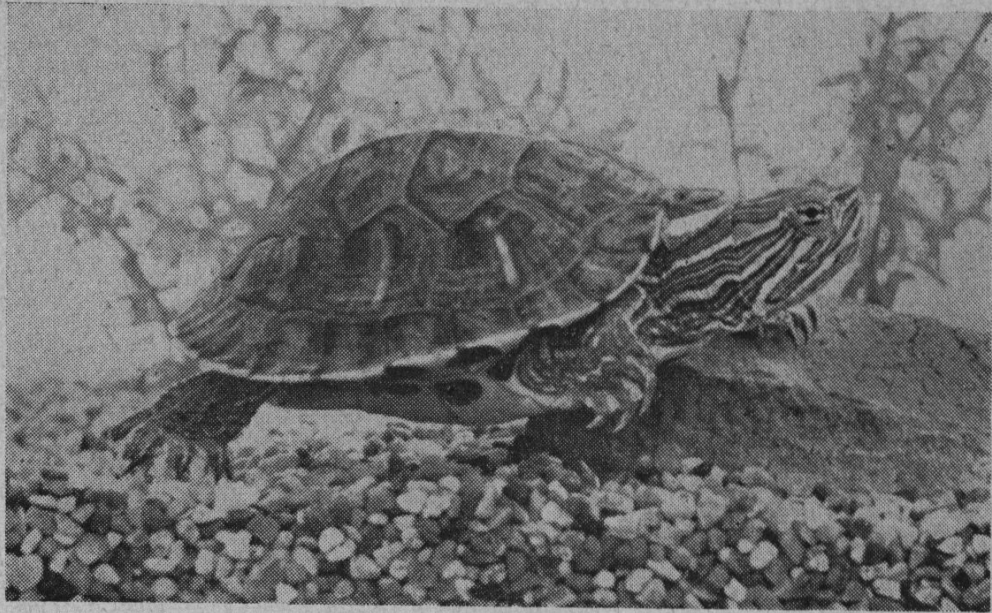
Any scraps of meat or offal from the butcher will do to feed him on as he does not seem to discriminate between good and not so good food. Besides, in view of the size of his appetite, it is not economical to feed him on beef-steak. Frogs, fish and worms are also relished.

The person who named it "Alligator Terrapin" must have had more imagination than accuracy of comparative powers, for it does not resemble the alligator in the slightest. The Alligator Terrapin should live alone unless he is the smallest member of a mixed community, as he is rather apt to bite his companions. Land tortoises should not come to drink at his pool, as he may bite their heads.

America sends us the most beautiful members of the terrapin family as well as the oddest, and the following is a group of what constitute the mixed consignments which appear occasionally on the market. Of them the second and the fifth are the most common. As they all require the same treatment, we will consider them all together.

THE PAINTED TERRAPIN (*Chrysemys picta*).

THE ELEGANT TERRAPIN (*Pseudemys scripta elegans*).



The attractive Elegant Terrapin (*Pseudemys scripta elegans*), young specimens of which reach this country occasionally. It is one of the American species of the terrapin family.

THE FLORIDA RIVER TERRAPIN (*Pseudemys floridana*).

THE COMMON MAP TERRAPIN (*Graptemys geographica*).

THE MISSISSIPPI MAP TERRAPIN (*Graptemys pseudo-geographica*).

As with the Alligator Terrapin, specimens of a decent size are not so easy to get hold of as babies, but specimens of from 3-in. to 6-in. are not uncommon here.

I confess that I am not sure whether they would not be better included in the section on "Half-hardy Water Tortoises," as experience with them varies with the distance one moves northwards from the south coast. I have wintered all of them outdoors except the Pseudogeographic Terrapin, and a friend has been successful with the Painted and Elegant Terrapins in Lancashire. Other people have found that they all needed to be brought into the warm as soon as the weather began to get cold.

One must, therefore, be guided by one's own judgment, and if they show no signs of disposition for hibernation outside, they should be brought into a cool greenhouse and enclosed with a large heap of moss in the hope that they will avail themselves of it. If all else fails, they must be treated as recommended for half-hardy terrapins, but in such an event, one must expect a failing in health and vigour subsequently.

There seems to be a profound physiological need for a winter rest in these—as in some other species—and failure to follow their normal inclinations in the matter does them a great deal of harm.

They are, of course, no trouble at all during the summer months, beyond, sometimes, a reluctance to take their food until they have become accustomed to their new quarters. Vary their food as much as possible.

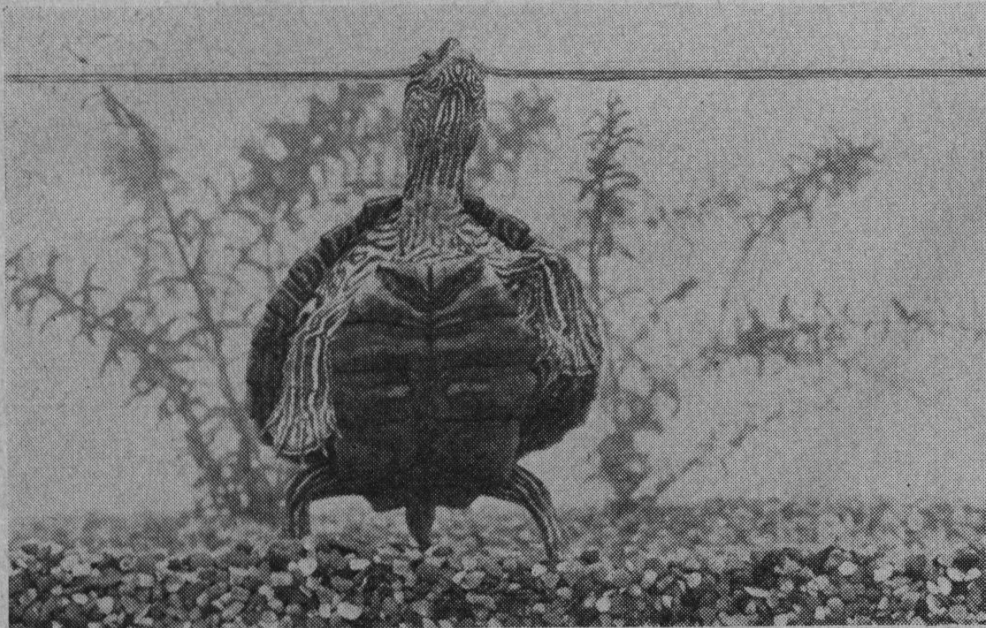


The Florida Terrapin is a very large animal, its shell reaching a length of 18-in. It is proportionately broad and heavy. The nose is pushed in, rather like a pug's. The shell is olive and marked with a dark, rather irregular pattern. The males have extremely long claws and the feet are fully webbed. The Painted Terrapin is the commonest. It is dark brown, grey-green, or black, with an orange streak running along the middle of the carapace. The edge of the shell is marked with bright red and underneath it is yellow. The head is often beautifully lined with yellow and red. The shell in the Elegant Terrapin is pale brown or olive, each shield being marked with black. Underneath it also is yellow, sometimes spotted with black. It grows to 9-in. (shell only) and is thus much larger than the Painted Terrapin. The Elegant Terrapin is flatter and more oval in shape. The red and orange markings on the head are also much more vivid. It attains to the same size.

The Common Map Terrapin has a feebly toothed ridge along the carapace which is a dull olive-brown with a fine network of yellowish lines.

The Mississippi Map Terrapin, also known as the Sawback Turtle, has a much more strongly ridged keel with dark, tooth-like projections and a similar network of yellowish lines. A bright, crescent-shaped yellow spot occurs behind each eye, which has a whitish iris.

These terrapins will take a variety of small insect life, raw meat and fish, and often relish greenstuff such as water plants and young lettuce. Young specimens require plenty of sunshine and warmth, and are best kept indoors during cold weather (see Chapter VI).



Another American species is the Mississippi Map Turtle (*Graptemys pseudogeographica*). The markings on the soft parts and shell and its place of origin give this animal its common name.

## CHAPTER V

### Half-hardy Water Tortoises

UNDER this heading could be catalogued quite a fair number of species, but, as many of them may only appear once or twice on the English market in several years, their names would not have much significance here.

I will confine myself to the small number of terrapins in this category which are generally available, albeit only in ones and twos, from one or another of the larger dealers. With the group, incidentally, we make the acquaintance of the second super-family of tortoises, comprising those that, instead of withdrawing their head into the shell in a vertical plane (all those previously mentioned do so), bend it round to one side.

Treatment for them, during the warm summer months only, is exactly the same as for the hardy water tortoises previously described. They are all carnivorous, appreciating worms and liver, perhaps, more than anything else.

With certain modifications which will be considered when we come to the animals concerned, they all need to be subjected to a temperature as little below 70° F. as possible during the spring, winter and autumn. The actual dates upon which they are put outdoors and brought in again will depend upon the vigour and health of the individuals concerned.

When indoors, it is not an easy matter to make adequate arrangements for them in an aquarium tank or terrarium unless these happen to be very large, in view of the fact that terrapins need access to both land and water—a combination difficult to manage in any but a large tank. If a part of the staging in a greenhouse, with a sunken water receptacle, can be suitably furnished and given over to them, this seems to suit them best. The dry part of such an enclosure needs to be generously covered with peat moss.

It is most important that the water in which terrapins live should be changed frequently. Dirty water renders them prone to contract a disease of the eyes which is troublesome to cure, and often has unpleasant consequences.

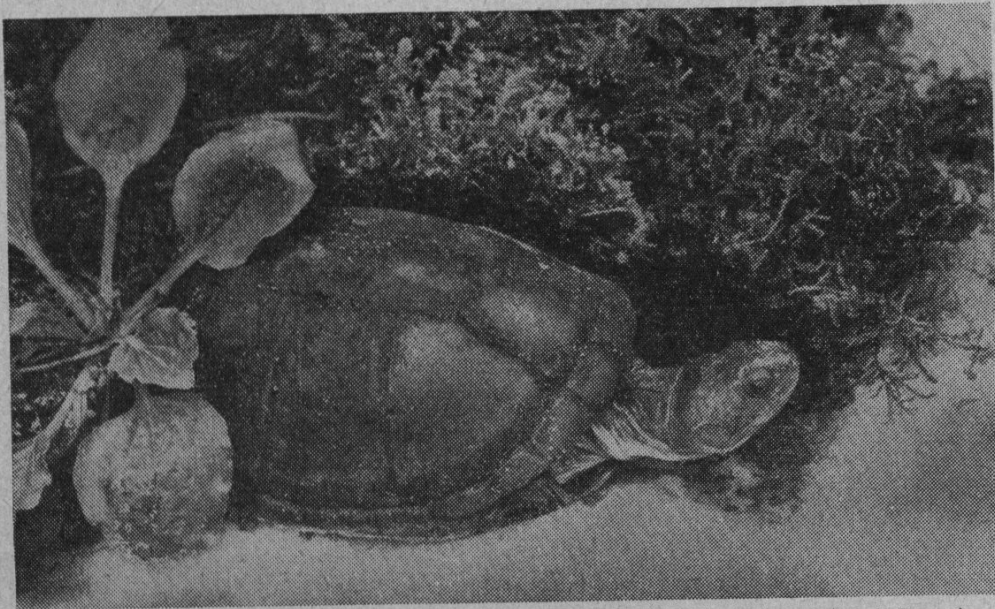
One sometimes hears that these animals will "do" quite well in temperatures of from 50-55° F., but such is not the experience of the writer and his friends. The object of taking them indoors is to provide such conditions of temperature and light as nearly approaching those of their natural habitat as possible. Such are well above the range of temperatures quoted above, and



anyone accustomed to the high degree of winter activity shown by terrapins kept under proper conditions will regret the listlessness and semi-torpidity exhibited when they are exposed for any length of time to a temperature as low as 55° F.

The best index to a terrapin's health is always its appetite, and if one shows signs of going off colour a bit, a hundred-watt electric lamp fitted above him and about nine inches away will usually act like magic in reviving him. Means of sheltering from contact with the lamp should be provided.

When kept in an aquarium, one of the many available immersion heaters may be used to maintain economically the desired temperature, in conjunction with a suitable thermostat, and, if the tank be kept covered with a glass lid, no other heating will



One of the Mud Terrapins or Sternotheres, Lord Derby's Terrapin (*Sternotherus derbyanus*), which comes from Africa and Madagascar. It is almost entirely aquatic but occasionally likes access to very shallow water where it will lie in the sun.

be found to be necessary apart from the electric light bulb, which may be lowered occasionally so that the terrapins may bask in its light. Although of doubtful benefit to their health directly, the bright light has a good psychological effect.

I recommend that an endeavour be made to persuade the animals to eat daily during the winter, and their food should be as varied as possible.

The half-hardy terrapins fall into two groups of which the first is composed of the following:—

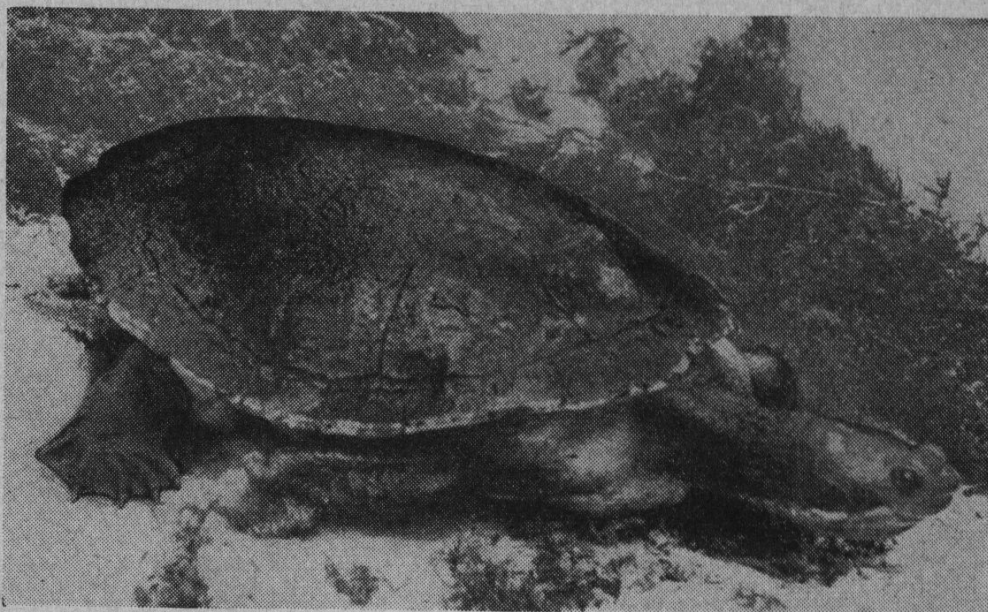
- THE HELMETED TERRAPIN (*Pelomedusa galeata*),
- LORD DERBY'S TERRAPIN (*Sternotherus derbyanus*),
- THE NATAL TERRAPIN (*Sternotherus sinuatus*),
- THE BLACK TERRAPIN (*Sternotherus nigricans*).

The last three are often referred to as "sternotheres." All come from Africa and Madagascar. Most of the Helmeted Terrapins bought here and on the Continent have come from

Africa via the dealers in Alexandria. The Helmeted Terrapin is brown all over, and the shell is usually about six inches long, but is known to grow to ten inches.

The sternotheres are mud-terrapsins, and cannot, I regret to say, be called at all pretty. They are able to close up the front entrance to the shell by means of the hinged plastron. Lord Derby's is the largest species, and has a very massive head. The Natal Sternotherere comes next in order of size, and the Black is the smallest. All are dark brown or black, occasionally with a good deal of yellow on the plastron. The heads of the first two are, however, sometimes quite a light brown, with darker markings.

Lord Derby's Sternotherere is available with a shell up to twenty inches in length. All four are almost entirely aquatic in habits, but enjoy access to very shallow water in which they will lie in the sun.



**The Murray River Tortoise (*Emydura macquarii*), a half-hardy water tortoise from South Australia. Lively and entertaining, it will thrive for many years given the right quarters and plenty of food.**

When brought indoors for the winter I have found a landing-place in their tank superfluous, as they very rarely leave the water. If, when put into the garden, they lose their appetites for more than a few days, they should be returned to their tank until the water in their pond is warmer. They have very large appetites.

The second group of half-hardy tortoises includes:—

THE SNAKE-NECKED TERRAPIN (*Chelodina longicollis*),  
THE MURRAY RIVER TORTOISE (*Emydura macquarii*),  
THE ARGENTINE SNAKE-NECKED TERRAPIN (*Hydromedusa tectifera*).

These three are much more lively and entertaining in captivity, where they will thrive for many years, than the four other



side-necked terrapins that we have mentioned. The first and second kinds come from South Australia, and the third has a wide range in South America. The Long-necked Chelodine, as the first is often called, is the best to buy. A most intelligent tortoise, it becomes as a rule tame in a few days, and spends a great deal of its time out of water, its long, mobile neck allowing it to prowl and peep into any nooks and crannies in the hope, possibly, of finding something to eat. It loves to bask, keeping its neck either tucked away or stretched on the rock in front of it.

I discovered, after reading Gadow, that this species could undergo a light hibernation in this country, and thereafter regularly provided mine with a large heap of moss and leaves in a cool greenhouse. While not anything like so deeply as in many other species, they slept away about three months each year in odd weeks at a time burrowed into the heap, but I am sure they looked forward with pleasure to the time when they would be able to go outdoors again. The same applies, in an almost equal degree, to the Murray River Tortoise.

Their Argentine relative must be kept warm all through the winter. He is the prettiest of the three, and his neck is even longer than the Australian's. In addition, his shell is often beautifully mottled, very much like the tortoiseshell of commerce.

The danger of attempting to hibernate these tortoises if they are not in excellent condition after feeding well all the summer cannot be over-estimated.

## CHAPTER VI

### Hibernation

THEIR winter care is of extreme importance to tortoises and terrapins. It can be read in any natural history book that tortoises are cold-blooded, which simply means that, unlike ourselves, for instance, they are unable to make their own body warmth, but become as cold or warm as the air or water around them. Below a certain temperature these animals cannot carry on their body processes (metabolism). The heat of a good English summer is quite enough for the majority of them, but when autumn comes, as we have seen, some must be kept warm artificially.

The water tortoises that I have described as "hardy" come mostly from countries where the severity of winter approximates to that of our own, so nature has enabled them to cope with it. This they manage by burying themselves or otherwise getting out of reach of the frost and going to sleep very soundly until the warm weather comes round again. This sleep is called hibernation.

People who keep hardy tortoises as pets sometimes feel that they prefer to keep them active during winter, and to this end they overcome the creatures' natural wishes and instincts by keeping them warm indoors. I do most strongly urge, however, that all tortoises in whose nature it lies to hibernate during the winter, should be allowed to do so. They are so organized that the whole summer is spent in making internal preparations for hibernation, and from my own experiences I can say that all tortoises (with the possible exception of the Spanish Terrapin) when allowed to hibernate are happier, healthier, and longer-lived than those which are not.

The land tortoises which I have called hardy, although coming from warmer parts than Northern Europe, possess similar powers of hibernation, although the necessity to put them into effect may not arise so often in the wild state.

Considering land and water tortoises together, then, the end of September or beginning of October will find them in a drowsy state, moving infrequently and slowly, and taking progressively less to eat. Those living in the garden are capable of looking after themselves, the land tortoises by burying into the ground, whereupon their owner has nothing to do except mark the spot to avoid disturbance. Those living in an enclosure should, unless they also bury themselves, have their house packed tightly with



dried leaves or hay into which they can creep. The door should then be shut and the whole undisturbed until spring. In parts of the country where the winter is very severe, they may be put into a box of leaves, and left in an unheated but frost-proof out-building. They must not be packed away too early, or they will uncover themselves, and there will result the risk of exposure to too low a temperature.

The water tortoises will do one of three things. They will either bury into the layer of mud and sand at the bottom of their pond, or they will bury themselves in the soil of their enclosure, or else they will sleep as do the land tortoises in the hay or leaves in their house. Of these alternatives, the first and third seem from my experiences to be the safest.

The reason why I advocated a depth of two or three feet of water, plus a good thick layer of mud and sand, is now clear. People are sometimes alarmed that the water tortoise will drown under the water—later, perhaps, ice; but no alarm need be felt as nature has insured against drowning by providing water tortoises with additional breathing organs, the “anal sacs,” by means of which oxygen can be extracted from the water, very much as the gills of a fish also extract it. To aid the diffusion of oxygen into the water it is perhaps as well to leave a log of wood floating, as this has the effect of preventing total surface freezing if it is given a kick every morning.

In certain species, hibernation is less profound than in others, such being the Spanish Terrapin—which will wake up at every mild spell—and the Painted and other American species. Whether hibernating indoors or outdoors, they must be returned to their pile of leaves, etc., or water, as the case may be as soon as they are observed. One or two degrees of frost is fatal to hibernating or recently wakened tortoises, although they seem to be less affected by frost in the autumn when in good condition.

It is perhaps more natural for the Carolina Box Tortoise to bury itself in the soil or hibernate in its house, but I have known individuals which hibernated at the bottom of a small pond. The alternatives should therefore be available.

Finally, one should be extremely disappointed and the cause ascertained, if any tortoise fails to live for more than twenty years in captivity.

## CHAPTER VII

### Baby Tortoises

I HAVE decided to devote a separate section to baby tortoises and terrapins not only because they are imported annually in quite large numbers and are great favourites with the public, but also because they require very careful and painstaking treatment if they are to grow and thrive.

Considering first the land tortoises: these babies of the Moroccan and Greek species are a minority always present in the annual consignments of tortoises which reach us every spring. They are delightful little creatures, and their shell is usually quite round, developing the typical oval shape as age increases. Ossification of the bones has not proceeded very far and consequently some care must be exercised in handling them. On arriving at their new home, they need the bath and drink as suggested for the large tortoises and need to be kept indoors except on warm and sunny days, when the process of acclimatizing them may be begun. A small, sandy enclosure should be prepared for them as, when they are kept with large specimens, there is the risk that they may be crushed. It is not wise to leave them outdoors at night until the end of June: July nights are usually warm enough for them and perhaps the first half of August.

They should be offered shavings of raw carrot, tomato and cut-up spinach leaves and the *outside* leaves of lettuce to eat. The first three of these foods are relatively rich in calcium and phosphates—mineral salts which are very necessary to young animals. They also contain the chemical substance (activated ergosterol—better known as “Vitamin B”) which is necessary for the co-ordination of these mineral substances in the body and their ultimate utilization in the forming of new bone and tissue. The babies will probably like the lettuce best, but every effort should be made to induce them to eat the other foods suggested, as they possess much more nutritive value.

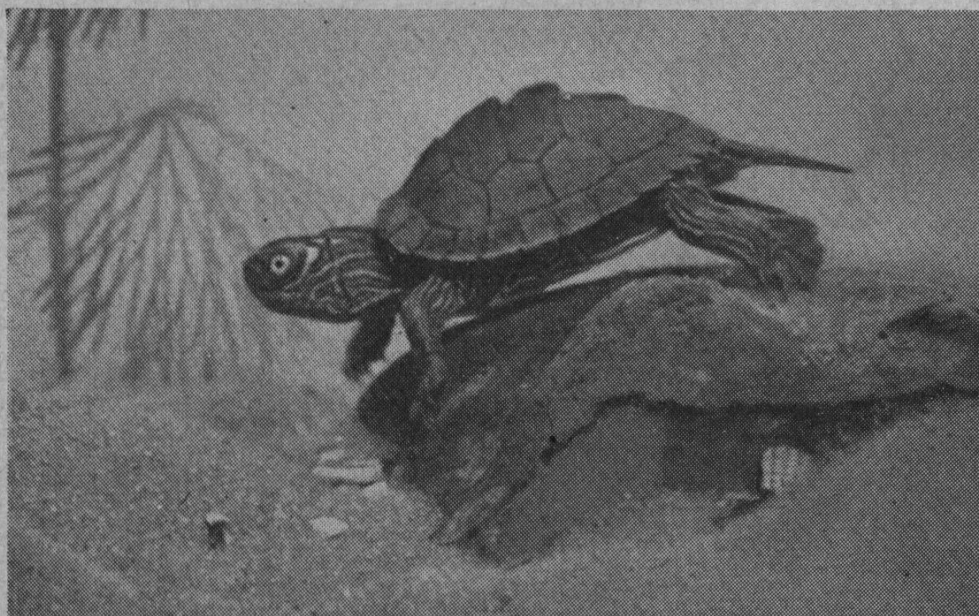
If they have been bought in the spring and fed well from that time onwards, it is much better to allow them to hibernate in the normal way when autumn comes. At the end of September they will exhibit the usual torpidity and loss of appetite, upon which they should be put into a wooden box on a fairly deep layer of dry peat moss, and covered with a 4-in. layer of similar material. No lid needs to be used if the box is of sufficient depth to prevent the little animals climbing out



and hurting themselves. The box should be stood for the winter in a COOL place, well out of reach of frost and cold draughts. It should be regularly inspected and in March the tortoises put into a terrarium as soon as they wake up. They will drink tepid water almost at once, but are usually reluctant to begin feeding until they have been well warmed by the sun. After their first winter and its subsequent spring in this country they may be treated exactly as the large specimens are, although a certain attention to their diet is still to be recommended.

Dealers tell me that they sell a lot of these little tortoises to flat dwellers, and to such purchasers I recommend that the terrarium in which the little beasts are housed be stood outside a window whenever the weather is fine and warm enough. Due provision must be made for escape from the direct rays of the sun when these are so hot as to cause discomfort, and no lid should be kept on the case. It is advisable to permit hibernation along the lines suggested in preference to attempting to keep up a state of activity during winter by raising the temperature.

Baby water tortoises can be divided into two classes: those which may be allowed to hibernate during their first winter in this country and those which may not. Together with the Alligator Terrapin, the Spanish and European species constitute the first division, and are sometimes available at about the size of a penny in spring and early summer. If put into a well-planted aquarium in which the depth of water varies from 2-in. to 9-in. they will rapidly settle down and begin to feed, and when all risk of frost is over they may be taken outdoors until the autumn, an enamel or preferably galvanized iron bowl of a diameter of not less than 18-in. being fitted up as above for them. It is rather difficult to grow plants in such a bowl, so



**The Common Map Turtle (*Graptemys geographica*). Similar in appearance to the Mississippi Map Terrapin (*G. pseudogeographica*) depicted on page 21. Both enjoy a varied diet.**

vegetation may be restricted to Frogbit, Duckweed, and a handful of Elodea. They will bask upon a small island or a log to which they require ease of access. Better than a bowl, however, is a small enclosure of the type shown on page 16, but for æsthetic reasons only as baby terrapins live outdoors quite well in a bowl of sufficient size.

The following is a list of suitable foods for all baby water tortoises: Blood worms (*Chironomus* larvæ); white worms (*Enchytræ*); mosquito and gnat larvæ; small fresh water shrimps and lice (*Gammarus* and *Asellus*); small pieces of garden worms and shreds of raw meat, heart, liver, and occasionally whiting. If any live ant pupæ ("ants' eggs") are found, these may be floated on top of the water and are greatly relished. All the live foods mentioned can be bought from pet shops. Greenstuff is eaten by some individuals.

When autumn comes, the Alligator Terrapin is most easily dealt with. He needs to be put into a battery jar with 2-in. of coarse, clean sand and 3-in. of water and a handful of Elodea. If the jar is put into a cool greenhouse, the little animal will half bury himself in the sand and go to sleep until spring. A sunny day in winter will wake him enough for him to rise and breathe at the surface of the water, but he will soon doze off again. The other two kinds may be offered similar facilities for hibernation as well as a heap of peat moss on dry land. They will either burrow into the latter or else sleep as the Alligator Terrapin does.

It is absolutely useless to try to keep these baby terrapins alive unless they have plenty of fresh air and sunshine and daily food in the summer and are allowed to hibernate for the winter.

The second group of baby terrapins is made up of immature specimens of the American species described on pages 19-21. Their treatment during summer is exactly the same as for the first class, but unfortunately they seem unable to build up sufficient fat reserves during one summer in our climate to carry them through their first winter in a state of hibernation. It therefore becomes necessary to keep them in a heated aquarium during winter, the temperature not being allowed to become lower than 70° F. Good light is as essential as warmth if they are to be kept feeding regularly so that a 100-watt lamp should be burnt at about 6-in. above the surface of the water during the daytime. These American Terrapins are partly herbivorous, and need lettuce, duckweed, and frogbit in addition to the animal foods mentioned above.

It is to be regretted that one can never expect 100 per cent. success with these American Terrapins, but a far greater degree of success *will* be achieved if after their second summer out of doors they are allowed to hibernate in a cool greenhouse, than if they are kept warm subsequent to their first winter. Their winter sleep is not at all profound and they are liable to become slightly



active if the sun reaches them. I am informed by an American correspondent that this is also the case when they are living in a state of nature.

Even more brightly coloured in youth than in age, these species are much the prettiest reptiles to reach our shores. The Painted Terrapin is red underneath and bluish or brown on top and has an orange streak running down the middle of the carapace. It used to be the most commonly imported species, but is now outnumbered by the sub-species of the Elegant Terrapin, which is bright green and has a red streak running backwards from behind the eye. Its plastron is yellow with black concentric markings. As it grows bigger, the increments to its shields are of a much darker green and the brilliant coloration of its extreme youth is lost. The Mississippi Map Terrapin is one of the hardiest. Its upper shell rises to a pronounced medial ridge and is brown with darker marblings. The plastron is yellow and brown-grey, and head, limbs, and tail are brown with a number of bright orange-yellow lines. Its creamy white irides give it a curious, staring expression. The posterior edge of the carapace is sharply serrated. The price of these very pretty pets varies from season to season.

## CHAPTER VIII

### Common Ailments

ONE of the secrets of the successful care of tortoises and terrapins is to understand their natural requirements and to bear in mind the three golden rules for their welfare in captivity. Most of them like plenty of sunshine, which should be given at every opportunity. Many of them hibernate naturally, and this should be provided for wherever possible. Thirdly, their appetites can be very high, so that plenty of food which is *varied as much as possible* should be given.

The following list gives some of the commoner ailments of these little creatures, together with some advice on treatment.

**LOSS OF APPETITE.** Even though apparently healthy, tortoises sometimes go off their food, or will not eat when first purchased. Give a warm bath and keep in warm surroundings for a few days. They usually start feeding after the first bath.

**WORMS.** Tortoises sometimes void whitish worms in the droppings. These parasites are quite natural and usually do no harm. There is little risk of this infection spreading to other tortoises kept in this country. Some medical glycerine spread on to the food will help to remove them.

**COLDS AND LUNG TROUBLE.** A wheezy breath or discharge from the nose and eyes is warning that the tortoise has a chill, which can lead to serious complications, such as pneumonia. Keep warm indoors with drinking water available.

**ENTERITIS.** Stomach and other internal disorders of the food canal can be recognized by loose droppings containing slimy matter or blood. Keep warm indoors and add a little castor oil to the food.

**RICKETS.** Shell and bone deformity are signs of this complaint, which is due to vitamin deficiency in the diet, or lack of mineral salts such as calcium. Mix grated bone with the food and smear liver oil on the food leaves. Give plenty of sunshine.

**SHELL INJURY AND OPEN WOUNDS.** Cracked shells will sometimes heal if cleansed and sealed with an adhesive. Wounds in the soft parts should be bathed with mild disinfectant and, if possible, covered to prevent infection. The sulpha drugs and penicillin, as used by the veterinary services, can be applied to open wounds with good results.

**TICKS.** Tortoise ticks are harmless but unsightly. Before removal with tweezers, apply a vegetable oil to soften the skin around the parasite. It should then come away easily. Without this precaution the parasite's body may be torn away from the claws, which are left embedded in the skin, and may lead to sores.



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