

THE TERRARIUM

TORTOISES,
Other Reptiles and Amphibians
in Captivity

By
DR. BURGESS BARNETT
(Curator of Reptiles, London Zoological Gardens)

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ARTHUR H. ASHTON

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THE TERRARIUM

INTRODUCTION

ONE is tempted to wonder what becomes of all the tortoises that are imported into this country ; every year they reach the shops of animal dealers by the sackful, but probably the majority of them change hands only to die before the following spring. Yet tortoises are among the longest-lived of animals, and their needs are few ; there is at least one instance of a Greek tortoise having roamed an English garden for over half a century.

And so it is with all the other Reptiles and Amphibians—harmless snakes and lizards, salamanders and tree-frogs—that reach the market. They arrive each spring by the hundred, and most of them soon die for want of understanding. Surely they deserve a better

fate ; from the small tortoise exchanged by a pedlar for old junk, to a valuable collection of rare tropical reptiles, they all exert a fascination over their owner entirely out of proportion to the small amount of trouble entailed.

Apart from this, there is a wide field for original work by the nature-lover who will take pains to observe and study his pets ; most of the research on Reptiles and Amphibians has been done hitherto with a scalpel and a microscope, and many of the most elementary facts of their life-history are quite unknown.

If this book stimulates its readers to discover for themselves the quiet delights of Reptiles and Amphibians as pets, and to study their ways, it will have achieved its object.

CHAPTER I

HOUSING AND FEEDING

REPTILES and Amphibians are commonly housed in a glass-fronted cage or vivarium fitted to their individual needs. Alternatively many species may be allowed the freedom of a greenhouse or even of a rockery in the garden. In the latter case some ingenuity is required to keep the animals within bounds, but the effort is well worth the trouble, for the sight of various reptiles basking on sun-warmed stones among the rock-plants is delightful to every lover of nature.

The ordinary type of cage for Reptiles and Amphibians is, in general, too small. Further, it is impossible to add certain refinements that improve both the comfort and appearance of the inmates ; this being so, the reptile keeper will probably prefer either to make for

himself, or to have made, a rather more elaborate vivarium.

Details will depend on individual requirements, but the broad outlines may well conform to the design given in Figure 1.

It will be seen that its shape is that of a school-desk with a steep writing surface, and it is glazed back and front. This allows for lighting from behind (because it will probably stand against a window), while the sloping glass in front, giving the effect of a show-case, is convenient for observation.

Ventilation is provided by strips of perforated zinc near floor-level in front and on top at each end, so that both draughts and stagnant air are avoided. The perforations must be small enough to prevent the egress of mealworms.

The sloping surface, which can be made of picture-framing, is hinged above for cleaning and re-arrangement, and a smaller door is provided in the flat top for introducing food. The floor is raised about 6 inches in order that the water-container and one or more flower-pots may be sunk into it. The holes for these, which must be cut to fit accurately, have tins fixed beneath to prevent the escape of reptiles when moving plants or changing water.

Finally the whole of the inside of the vivarium should be painted with some water-proofing material which is non-poisonous, such as cellulose enamel. Alternatively, the floor may be cut out of sheet zinc, its edges being turned up and used to line the lower two or three inches of the walls.

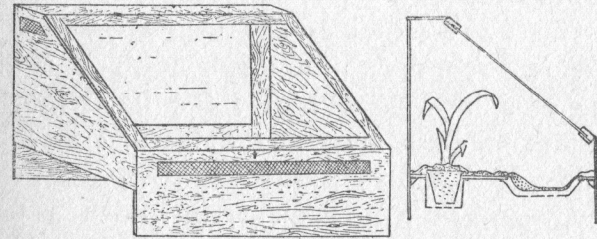


FIG. 1.—ARRANGEMENT OF A SUITABLE VIVARIUM.

The most sanitary floor-covering for a vivarium is undoubtedly sponge rubber sheeting. Its virtue is that it can be taken up and cleaned with soap and water, or even sterilised, but as it comes from the makers it contains a quantity of ammonia which is very poisonous to amphibians. It may take several days of repeated soaking to get the rubber completely free of the vapour. Sponge rubber can be obtained in all colours—dull moss-green is the most satisfactory—but it is rather expensive ;

sufficient to cover the floor of the vivarium in Figure 1 would cost about 7s. 6d.

Sand or gravel, partly covered with moss or pine-needles, is cheaper and certainly more artistic. If the animals to be kept are such as would not wreck the work, very pretty effects can be obtained by laying out the ground in imitation of a Japanese garden.

The water-container can well consist of a disguised pie-dish, the tin beneath it being one of a larger size with a few holes in the bottom to drain away any water that may be spilt. It should be completely covered on the inner surface with cement, in which a few stones are imbedded, to form a tiny pond with one gently sloping side. The edge is hidden by moss.

Moss, too, hides the top of the flower-pot. Ferns are suitable for this, if there are no heavy reptiles to flatten them, but many snakes prefer branching, hard-wooded plants into which they can climb and bask. Tree-frogs need broad leaves that are smooth and shiny to rest on, such as those of hart's-tongue fern and aspidistras. For general purposes *figus*, a trailing plant, is particularly useful because it is equally at home on land or in water.

A description of water-weeds suitable for stocking tanks in which amphibian larvæ are being reared is given in "The Aquarium", a volume uniform with this.

Another important item in the furnishing of the vivarium is the provision of some kind of cave or cranny to which the inhabitants can retire. A concave piece of virgin cork may be sufficient, but a box with a small side-opening is better, because animals can be shut in it during cleaning operations. So as not to appear unsightly, it can be disguised with cement and stones as a piece of rockery. It is a good plan to press a little earth into the irregularities of the cement and scatter a pinch of grass seed on it. There will not be sufficient depth of earth to maintain the grass for long, but for a few weeks the effect is very good.

Occasional heating can be arranged by suspending an electric light bulb immediately above the vivarium, or if this gives insufficient heat it may be placed inside, protected by wire gauze. If continuous artificial heat is required, the handyman will find it an easy matter to fix a small electric radiator beneath the false (zinc) bottom. With any form of heating the use of a thermometer is desirable.

Little need be said on the subject of keeping Reptiles and Amphibians in a greenhouse. If they are not overcrowded they will provide themselves with most of their food by eating insect pests, and they will thrive the better for the varied diet and activity that this involves. The chief drawback, of course, is that the animals are less under the observation of their owner, and valuable specimens are apt to disappear permanently. On the other hand, in the comparative freedom the greenhouse provides there is every prospect of some species breeding.

Precautions are generally needed to prevent accidental drowning in the greenhouse tank; and the ventilators must be covered with mosquito netting.

The construction of an outdoor "Reptiliary"—in other words, the making of a reptile-proof wall round a rockery—is a larger undertaking.

The general design for such a wall is shown in Figure 2. It may conveniently be built of old bricks, capped with breeze blocks, with cement for the inner moat. The height of the walls is determined by the size of the reptiles it is intended to enclose, but a height of 2 ft. with an 8 in. overhang is sufficient in

most cases. The object of the overhang on the outer side of the wall is to exclude rats and mice, which otherwise may be trapped in the enclosure and cause havoc among the legitimate inhabitants.

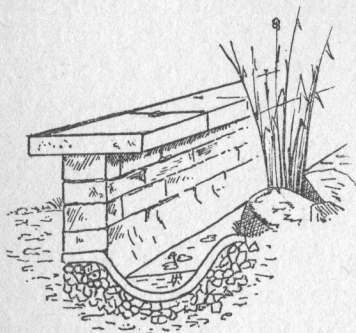


FIG. 2—METHOD OF CONSTRUCTING A BOUNDARY WALL FOR A REPTILIARY.

An aggregate of stones, broken bricks, etc., below the moat prevents rats from burrowing under the wall.

The cement of the moat should be mixed in the usual proportion of 1 part of cement and 2 parts of sand and it is advisable to add to it some waterproofing material, such as 3 per cent of Pudlo.

Cement should also be used to smooth the inner surface of the wall, and to mask the breeze blocks.

The food requirements of individual species are dealt with in the following chapters ; only general principles of feeding are dealt with here.

As a rule, Amphibians and the smaller lizards will only accept living food, in the form of earthworms and insects. During the summer months a great part of these can be obtained from the garden and from a fly-trap, but this supply will have to be supplemented, and in the winter replaced, by insects bred for the purpose.

Mealworms are the main standby. They are the larvæ, or caterpillars, of beetles which breed in bran and other cereal products, and are sold in this country by nearly all animal dealers at about 5s. per lb. They travel well by post, even for long distances.

If a stock of mealworms is kept on hand they should be housed in a tin partly filled with bran or crusts of bread, and as they will complete their life-cycle in this it is as well to give them the opportunity to propagate and increase one's reserve. For this purpose the beetles and whitish pupæ, which are more or less useless for feeding purposes, should be transferred to another box in which the bran is mixed with clean rags or newspaper and a

handful of nearly dry potato peelings. After some weeks or months, depending on the time of year, an enormous number of tiny mealworms will make their appearance.

Although the beetles are able to fly, they seldom do so while the food supply is maintained, so that a cover to the box is hardly necessary.

During the winter blue-bottles can be bred (for chameleons, etc.), but the process is, necessarily, rather unpleasant. A tray, carrying a piece of offal, or liver, surrounded by sawdust, should be put into a heated greenhouse together with a few blue-bottles. The flies lay their eggs in the meat and the resulting " gentles " crawl into the sawdust to pupate.

However, blue-bottle pupæ and gentles can usually be bought from dealers in fish-bait, and when these sources are available it is not worth while to breed them. The gentles are also useful as food for animals which object to the hard skins of mealworms.

It is more difficult to breed houseflies than blue-bottles, but for the benefit of anyone who would like to experiment, it may be said that the conditions should be similar to those employed for blue-bottles, using, instead of

offal, a paste composed of brown bread and banana with a sprinkling of casein.

When lizards have to be reared from birth, minute flies are needed, such as the rose aphid. Even the most enthusiastic gardener will tire of gathering sufficient of these tiny insects from his blooms, and it is useful to breed instead the little fruit-flies that can often be seen hovering round over-ripe fruit. They can be bred without trouble in jam-jars containing a paste of brown bread and banana (without casein) and covered with fine gauze.

As much variety as possible should be introduced into the diet of all reptiles, and advantage should be taken of the summer months to utilise any garden insects available, but the small red worms often found in manure heaps should be avoided, for they are poisonous.

CHAPTER II

AMPHIBIANS

THE most obvious difference between Amphibians and Reptiles is that while the latter are born or hatched as miniature replicas of their parents, the former start life as *larvæ*. After spending some time in this stage, living in water and breathing by means of gills, they undergo a change or *metamorphosis* during which they develop lungs and are fitted for life on land.

Amphibians are divided into three groups, but only two of these need concern us here, viz.: the Tailless Amphibians—Frogs and Toads—whose larvæ or tadpoles have at first no limbs; and the Tailed Amphibians—Salamanders and Newts—the larvæ of which have four legs from the beginning. All are

exceedingly interesting inhabitants for a vivarium and, treated with ordinary care, may live for a very long time ; a European Tree Frog, for instance, has been known to live for more than twenty years in captivity.

Moisture is the first essential to their well-being. Very few species can withstand drought, and some will die after an hour or so in dry air. Apart from providing a rather large pond, the floor of the vivarium should therefore be covered with earth or some other absorbent material.

The quality and purity of the water is more important than in the case of Reptiles, because Amphibians absorb moisture through the skin and are easily poisoned by impurities in it. In lime-stone or chalky districts it is better to use clean rain-water than tap-water, particularly for eggs and larvæ.

Amphibians are capable of sustaining long fasts, so that a temporary failure of the food-supply need cause no anxiety ; but on the other hand deprivation for a month or more usually results in their growth being permanently arrested. However much food may be consumed after such prolonged starvation, the animal will grow no larger.

Most Amphibians need living food, and not only living but moving. For example, it is amusing to watch a toad whose attention has been caught by the sudden activity of a mealworm. It will crane forward and eye the insect patiently, until a further movement decides the question of its edibility, and a rapid movement of the sticky tongue transfers it to the toad's mouth. Then follows a gulp with closed eyes and the little tragedy is over.

The range of insect food suggested in the chapter on lizards is equally applicable to Amphibians.

The successful rearing of tadpoles or other larvæ needs some care. To avoid cannibalism it is usually advisable to remove the spawn from the parent's reach and hatch it separately in a basin. The exception is in the rare case of certain frogs and toads which carry their eggs about with them, as, for example, the Midwife Toad.

The larvæ, when they hatch, need well-aerated water, free from contamination, a regular food supply, and daylight. If they are to be reared indoors they should be kept in large open pans containing water-weed growing in sand, and the water should be gently syphoned

off and replaced every two or three days. As they are omnivorous it is a good plan to put in pieces of meat, and vegetable matter such as a banana skin for half an hour or so daily. Such material, however, should on no account be allowed to remain longer, because it very quickly fouls the water, with fatal results. Any dead larvæ or debris can be removed with the aid of a short length of glass tubing.

If a very slowly flowing stream or fair-sized pond is available, the larvæ may be kept in a partly submerged box, with perforated sides. Add a mud bottom, ensure a depth of six inches of water and a handful of duckweed, and no food or further care will be necessary. This method, which is satisfactory for all Amphibians that can stand our climate, results in a larger proportion of survivals than any other.

The European EDIBLE FROG (*Rana esculenta*) and the AMERICAN BULL FROG (*R. catesbiana*) thrive in favoured localities out of doors in England, but in our climate metamorphosis is often delayed till the following year. On this account it is as well to net at least some of the tadpoles in the autumn and keep them indoors till the following spring.

Both species are used for food and some

more or less experimental "farms" have been started in this country where they are being bred for the market.

As Edible Frogs have been introduced from time to time into Great Britain the question of distinguishing them from the Common Frog arises. The snout of the former species is more pointed and the toes are more completely webbed than in the Common Frog. Usually, too, there is a pale stripe down the middle of the back which is very characteristic of the Edible variety.

Blue Edible Frogs are occasionally found. It would be interesting to learn whether a blue strain could be produced by selective breeding.

TREE FROGS are remarkable for their ability to adhere to leaves or to the vertical glass walls of their cage by means of their disc-like fingers and toes. They are all most attractive little creatures and live well in confinement. Flies and other quickly moving insects are their proper food and it is not always easy to induce them to accept mealworms.

The COMMON TREE FROG (*Hyla arborea*) from Southern Europe is the species most commonly seen for sale in this country.

Ordinarily it is bright green, but it possesses an almost chameleon-like power of changing colour to match its surroundings. Although

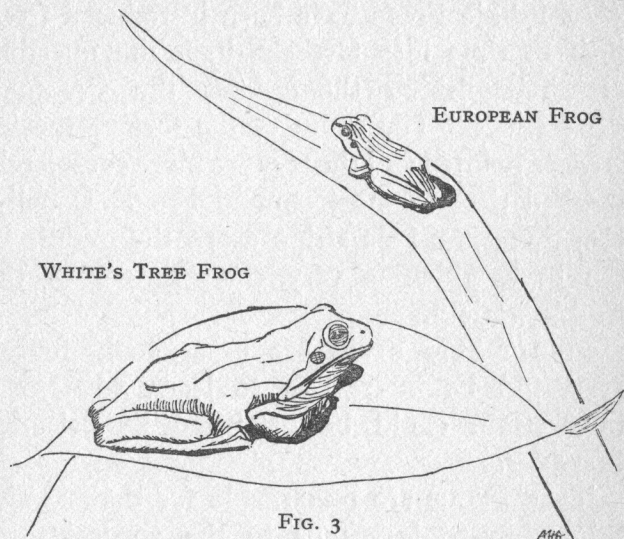


FIG. 3

it thrives in close captivity this little frog is seen at its best in the comparative freedom of a greenhouse. It spends most of its time motionless, glued to a leaf, but when a passing insect attracts its attention it is galvanised into action and executes an apparently perilous dive towards the prey. The movement is too quick to follow, but a moment later the frog is invariably seen masticating the insect happily,

while it strives to regain its balance on another leaf at a lower level.

Blue individuals of this frog are sometimes encountered and a few years ago were very valuable. As much as £20 has been paid for a single specimen, but the craze for them appears to have died out.

The COMMON AMERICAN TREE FROG (*H. versicolor*) is a pretty little frog and is as hardy as the preceding species.

More beautiful—and much more expensive—are the FLORIDA TREE FROG (*H. gratiosa*),

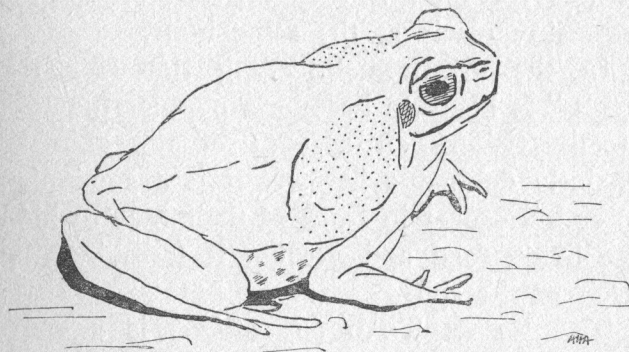


FIG. 4—S. AMERICAN GIANT TOAD.

which is grass-green blotched with black, and WHITE'S TREE FROG (*H. coerulea*) from Australia (see Fig. 3). Both these species

need a vivarium warmed to a temperature of about 60° F. The latter is a comparatively large, bright green frog sparsely spotted on the flanks with white.

The COMMON TOAD (*Bufo bufo*) and its enormous relative the SOUTH AMERICAN GIANT TOAD (*B. marinus*) (Fig. 4) are delightful inhabitants of a greenhouse or vivarium, and except that the latter species cannot stand cold they may be treated in the same way. They adopt some hole or cranny as a home and they will soon learn to come to their owners for food if they are fed on garden worms regularly at the same hour.

In the vivarium "feeding time for the toads" is likely to become a popular function among visitors on account of the animals' quaintly deliberate habits. It is a good plan to sink a saucer in front of their hole to hold the living food and prevent it from burying itself in the soil.

The GREEN TOAD (*B. viridis*) is a comparatively active creature from Mediterranean countries. It is very variable in colour, but at its brightest it is light green with chocolate-brown blotches.

The MIDWIFE TOAD (*Alytes obstetricans*) is

hardly worth its keep unless it can be induced to breed in captivity. The eggs are laid in the form of a string during the early summer. The proud father takes possession of them and twines them round his limbs, guarding them carefully till they hatch. It is sometimes possible to get Midwife Toads to breed in a cool greenhouse.

FIRE-BELLY and YELLOW-BELLY TOADS (*Bombina bombina* and *B. salsu*) are a regular "line" in dealers' shops. Apart from the brilliant colours that their names indicate they are useful in a mixed vivarium because the secretion from their skin is apparently so objectionable that no reptile will eat them.

Whereas adult Salamanders are quite terrestrial, the NEWTS are more or less aquatic, at least during the breeding season. The British SMOOTH NEWT (*Triturus vulgaris*) and the CRESTED NEWT (*T. cristata*) are often kept, though they seldom live long in confinement. For some reason, however, the JAPANESE NEWT (*T. pyrrhogaster*), often on the market, stands captivity quite well.

They are more suited to an aquarium than a vivarium, but they should be provided with a mossy bank, or at least a raft of virgin cork,

on to which they can crawl from the water. Earthworms are their appropriate food, but they will also nibble at pieces of meat lowered into the water on a string.

The eggs are laid, not as a mass of spawn, but singly among the leaves of water plants.

The AXOLOTL (*Ambystoma tigrinum*) (Fig. 5) is one of the few Amphibians that can be relied on to breed in quite a small tank. Not only so, but it breeds in the larval state without even transforming into the adult phase. To induce Axolotls to breed a pair of them should be kept for some time in a small tank without any water-weed. Then, either in spring or summer, they should be transferred to larger quarters with plenty of vegetation. The regularity with which they will deposit spawn in these circumstances is remarkable. Axolotls should be fed in the same way as Newts.

Under certain conditions they can be induced to transform into terrestrial animals, but the method is complicated and, incidentally, it is not a paying proposition, for, of the two, the larvæ command a considerably higher price.

The most striking of the Tailed Amphibians is the SPOTTED or FIRE SALAMANDER

(*Salamandra salamandra*) (Fig. 5), which is conspicuously marked with orange and black. Several geographical races occur distinguished by variations in colour pattern, the most beautiful being that of Central and Southern Europe in which the orange predominates.

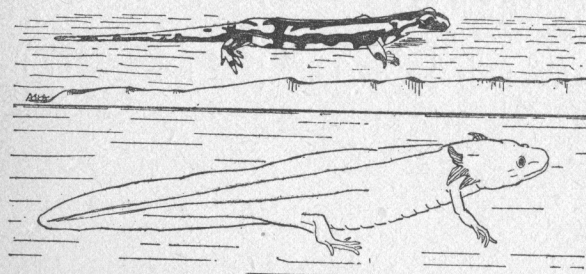


FIG. 5—SPOTTED SALAMANDER AND (LOWER) AXOLOTL.

Salamanders will live a long time in a vivarium under suitable conditions, shade and moisture being essential to their well-being. They are almost nocturnal in their habits and if the vivarium be exposed to direct sunlight they will remain concealed till evening.

They feed on worms, small snails and beetles.

Unlike other Amphibians, Salamanders are born, not as eggs, but as active larvæ. It often happens that females bought in the

spring are already fertilised, and the happy event of the birth of anything from a dozen to forty young may be anticipated in captivity. The female does not completely enter the water to give birth, but, as it were, takes a hip-bath at the margin of the pool. The gilled larvæ remain in the water for about six months before metamorphosis, and the young adults are not fully grown until they are four or five years old.

CHAPTER III

TORTOISES AND TERRAPINS

THE terms TORTOISE, WATER-TORTOISE, TERRAPIN and TURTLE are apt to cause confusion unless they are defined. For the present purpose it is sufficient to classify all those reptiles that are distinguished by the possession of a bony or horny "shell" into the following groups:—

TORTOISES : those species that never willingly enter the water and live mainly on vegetable food.

TERRAPINS : sometimes known as Water Tortoises or Fresh-water Turtles : those living in fresh water and marshes, feeding mostly on an animal diet (see Fig. 6). By some people (particularly in North America where

certain Terrapins are considered a culinary delicacy) this word is confined to the edible species, but the distinction seems hardly worth perpetuating.

TURTLES : marine species in which the legs are replaced by fin-like flippers, such as the "tortoise-shell" Turtle or Hawksbill, and the Green Turtle beloved of Aldermen.

Only the Tortoises and Terrapins will be considered.

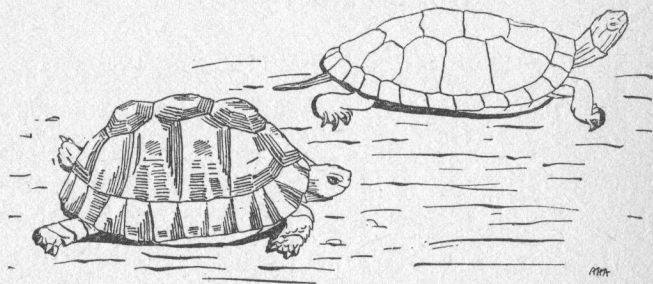


FIG. 6—GREEK TORTOISE (LEFT) AND EUROPEAN TERRAPIN.

TORTOISES :—The great majority of Tortoises seen for sale in naturalists' shops are hardy species that can fend for themselves in our climate during most of the year and need but little protection in the winter. To use a gardeners' phrase, they can be treated as half-hardy perennials.

They need no cage or pen and they are at their best when allowed the almost unrestricted run of a garden.

Unfortunately, they are often acquired under the mistaken impression that they will clear a garden of slugs and insect pests. No greater mistake could be made. As has been said above, tortoises are almost exclusively vegetarian, and it is to be regretted that they show a marked partiality for the gardener's most cherished seedlings. It is, however, a simple matter to protect such treasures from their depredations. Tortoises are unable to climb a barrier even four inches high, so that a board edging or a row of bricks is sufficient to exclude them from any part of the garden that they can harm.

The ideal garden quarters would include a lawn and a small shrubbery. If the earth under the bushes is loose and friable the animal will dig itself a burrow there, otherwise a hutch should be made in some sheltered spot, facing south, where it will spend the nights and chilly days. When the sun is shining it will emerge to perambulate the lawn and soon learns to haunt the spot where food is offered, apparently recognising its human friends.

In such a situation there is no reason why a tortoise should not live for twenty years or more. Gilbert White's famous pet, immortalised in the "Natural History of Selborne", lived at least 54 years in this country, and there are many tortoises roaming English gardens to-day that have lived for a quarter of a century in captivity.

Cabbage and lettuce leaves form the diet of most specimens in captivity, but no uncooked green stuff that is used for human food comes amiss. It would seem that the sense of taste is not acute; individual likes and dislikes are guided more by colour than by flavour. Brightly coloured flowers and fruits have a particular appeal to tortoises, so that strawberries or such flowers as anti-rrhinums will often tempt a sulky, newly-caught tortoise from hunger strike. On the other hand, an unnatural preference for ordure is not uncommon even in the wild state.

Water should always be supplied, except during hibernation. Tortoises do not drink as frequently as do many animals, but newly imported individuals are often found to be suffering severely from thirst. It is best to sink the water-pan level with the surface of

the ground, for the height of a dish may prove an insuperable obstacle to drinking, and if the pan be deep it should be partly filled with shingle.

Milk and bread-and-milk are quite unsuitable.

It is a common occurrence for tortoises to lay eggs in captivity. These are hard-shelled and about the size and shape of doves' eggs. In the great majority of cases, however, the eggs fail to hatch. If the mother is left to her own devices she will bury them in the earth, where the heat of the English summer is insufficient to incubate them. The best that can be done is to place the eggs in an open box of damp sand and store them in some such warm place as a linen cupboard, but the chances of a brood of young tortoises emerging is slight.

The incubation period is from one to two months according to the temperature maintained.

The age of a common tortoise can be determined with a fair degree of accuracy by counting the concentric rings on the shields of the carapace (Fig. 7). At birth each shield has a granular appearance; in an adult this

granular area is surrounded by a varying number of slightly raised rings, alternating with depressions; each ring representing one year's growth. Really the rings correspond to growing periods, and the depressions to fasts, so that although the calculation is correct for tortoises living in temperate climates, which feed in summer and sleep in winter, it may not be equally true for tropical species.

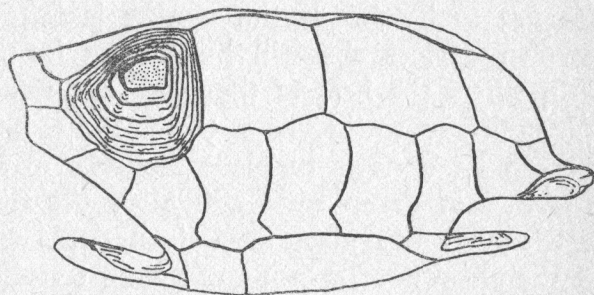


FIG. 7—SIX CONCENTRIC RINGS ON THE SHIELD OF THIS CARAPACE INDICATE THAT ITS OWNER IS 6 YEARS OLD.

The shells of aged tortoises or those that have been subjected to hard usage may be so worn that no estimate of their ages can be made.

At the approach of winter a tortoise from a temperate climate will hibernate by burying

itself in the ground until the warm weather returns. As, however, ordinary garden earth is too hard for it to do this, it is better removed to winter quarters. A warm garden frame containing a heap of leaf-mould would make a satisfactory dormitory if it were covered with sacking to exclude frosts; or the animal may be stored in a box of earth in a frost-proof cellar or garage. Conditions which an experienced gardener would consider safe for, say, dahlia roots would not be too cold for a tortoise during its winter sleep.

No food or water is required during hibernation.

Alternatively, it may be placed in a heated greenhouse and kept under summer conditions throughout the winter.

It is important, however, that there be no half measures. Either it must be kept warm and fed, or allowed to hibernate completely in a cold but frost-proof place. If a tortoise spends the winter in semi-torpority it is almost certain to fall ill and die.

The tortoises commonly sold in animal shops in England are the Greek Tortoise and Hermann's Tortoise. There is often some confusion between these two species, not only

because they are very similar in appearance, but because their scientific names have recently been changed.

The GREEK TORTOISE (*Testudo græca*, formerly *T. iberica*) is distinguished by the possession of a large horny spur on the hind side of each thigh (Fig. 6). An average large specimen is about 9 inches long, but as tortoises continue to grow throughout their lives this may be much exceeded. A Greek Tortoise in the London Zoo which is believed to constitute a record has been 23 years in captivity, and its measurements are as follow :

Length of carapace over curve	14 in.
Width of carapace over curve	13 $\frac{3}{4}$ in.
Greatest girth	20 $\frac{3}{4}$ in.
Length of carapace on flat	11 in.
Height of shell	5 in.
Weight	8 lb. 3 oz.

The number of concentric rings on the shields indicate that it is 29 or 30 years old.

In spite of their name Greek Tortoises inhabit North-West Africa, Syria, Asia Minor, Transcaucasia and Persia.

HERMANN'S TORTOISE (*Testudo hermanni*, formerly *T. græca*) resembles the former species in all but minor details. It has no spurs on

the thighs, but the tail ends in a claw-like horn. It is found in the countries bordering the Mediterranean from Italy to Syria.

The MARGINATED TORTOISE (*Testudo marginata*) from Greece and the GOPHER TORTOISE (*T. polyphemus*) from the south-eastern United States may be treated similarly to the preceding species.

Tortoises from tropical countries do not hibernate and need warm winter quarters such as a heated greenhouse. It is a good general rule that they should not be exposed to a temperature below 60° F.; they should, therefore, be removed to a greenhouse at the end of the summer.

TERRAPINS:—Very young Terrapins, two inches or so across the shell, are regularly to be seen in dealers' shops, and can usually be bought for about a shilling. They make amusing inhabitants of a vivarium where they may live for two years or more before they become too big for their quarters.

As they spend more time in the water than on land, at least half the available space should be devoted to quite a deep pool; indeed, if a raft of, say, virgin cork be supplied they are quite at home in an aquarium.

They may be fed on scraps of raw meat and fish or on small earth-worms, of which they are very fond.

Bearing their food in mind, their companions in the vivarium should be chosen carefully. The presence of tadpoles or baby salamanders is sure to lead to regrettable incidents. Even amphibians that are too large to be eaten are apt to be maimed. The webs of frogs and the crests of Crested Newts may be nibbled even if the Terrapins are too small to do them further harm.

On the other hand they will not be molested by any other likely tenants. Even young crocodiles do not disturb them.

Larger Terrapins are at their best in a garden pool. The attraction of a pond stocked with water-lilies is much enhanced by them. They swim on the surface, pushing their way between the plant stems to clamber on to the broad leaves for a sun-bath, tumbling clumsily back again when they find themselves observed.

The presence of goldfish in the same pool is reasonably safe if the expanse of water is great enough to prevent overcrowding. No fish, however, can breed successfully in the same pool with Terrapins, while the fate of

any frog-spawn that may be deposited there is certain.

So many different species of Terrapins occasionally reach the market that it is impossible to treat of more than two or three.

The EUROPEAN TERRAPIN (*Emys orbicularis*) is the common water-tortoise of the countries bordering the Mediterranean. Its colour is brown or blackish thickly dotted with bright yellow and occasionally marked with pale blue striations. Many specimens lose the yellowish spots with age. The average adult measures about six inches in length.

BLANDING'S TERRAPIN (*Emys blandingii*) is a rather larger species from Eastern Canada and the United States. Like its European relative it is not so wholly aquatic as most Terrapins, for it will feed on land. Neither is it entirely carnivorous; both species like to vary their diet with lettuce, and some individuals are fond of bananas.

The PAINTED TERRAPIN (*Chrysemys picta*) is one of a large North American genus that often finds its way to dealers' shops. It is very pretty and one of the most satisfactory Terrapins in captivity. The head and neck are striped with red or yellow and the shields

of the upper shell are edged and banded with the same colours. The lower shell is pale yellow.

All the Terrapins commonly met with in shops are hardy enough to hibernate out-of-doors if their pond has a good depth of mud at the bottom. At the Whipsnade Zoo the Painted Terrapins that were turned loose in a pond before the Zoo was opened to the public are still thriving without attention.

CHAPTER IV

LIZARDS

THE GREEN or JERSEY LIZARD (*Lacerta viridis*) (Fig. 8) is probably the species most commonly kept in this country. It is a handsome lizard, about a foot in length, more or less uniformly green above, with, in the male, a blue throat. It is common in Southern Europe and has been introduced into the Channel Islands. It does not, unfortunately,



FIG. 8—GEOCKO (LEFT) AND GREEN LIZARD.

live long in close confinement ; it is, however, hardy and well suited to an outdoor reptiliary. It accepts insect food generally as well as earthworms, and can be kept with smaller species.

The EYED LIZARD (*L. lepida*) is a much larger lizard than the former, from the same localities, distinguished by a variable black network over the green ground-colour, and a series of blue eye-markings on the flanks. It is equally hardy and survives captivity rather better than the Green Lizard, but it is not to be trusted with smaller lizards. It feeds, generally, on insects and worms, but it is not averse to small animals. In confinement Eyed Lizards will usually accept scraped raw beef—a decided advantage when insect-food is scarce.

The British Lizards of this family, the VIVIPAROUS LIZARD (*L. vivipara*) and the SAND LIZARD (*L. agilis*) are often encountered on dry heaths and commons, and make attractive additions to the vivarium. They may be treated in the same way as Green Lizards. Viviparous Lizards, as their name implies, produce their young alive, instead of as eggs, and females caught in summer are often found to be in young. The youngsters are hard to rear, on

account of the difficulty of obtaining tiny insects for food. Fruit-flies, as suggested in Chapter I, must be bred for the purpose.

The WALL LIZARD (*L. muralis*) may be considered as intermediate between the Green Lizard and the Viviparous Lizard. It is usually greyish in colour with varied black markings, but the male, particularly in the breeding season, is often prettily marked with green on the flanks. They are cheap and make an attractive show on a rock garden.

The GLASS " SNAKE "—which many dealers persist in naming SCHELTOPUSIK (*Ophisaurus apus*)—is a snake-like legless lizard reaching a length of a yard or more, inhabiting south-eastern Europe. A very similar species is found in North America. The body colour is uniformly brown with a pale, cream-coloured head. Its name is derived from its habit, when wild, of shedding its brittle tail to avoid capture, but specimens in captivity seldom or never do this. They are fed on snails, and though they are said to be partial to mice they can be trusted to live amicably with smaller lizards. They are as hardy, out-of-doors, as the other European Lizards.

The British SLOW-WORM or BLIND-WORM

(*Anguis fragilis*) is another snake-like lizard often seen in dealers' shops or caught on country rambles. Like the Viviparous Lizard, it produces its young alive, and it breeds, perhaps, more readily in confinement than most species. The adults feed mostly on slugs, but the young are best catered for by keeping them in frequently changed living moss, which contains sufficient minute creatures for their needs. Slow-worms spend so much of their time hidden underground that they are not very attractive reptiles, but they thrive in confinement and may live several years.

The preceding lizards are all sufficiently hardy to live out of doors during the summer in England, but the following, coming from tropical or sub-tropical countries, are only suited to vivariums which can be heated during the winter.

The GECKOS (Fig. 8) are a large family of funny little nocturnal lizards, found all over the tropics, characterised by their huge, goggle-eyes and adhesive, disc-like toes. Though very common, they are not regularly imported, and probably the majority seen in this country have arrived as stowaways in bunches of bananas.

By day they like to lie hidden under such covering as stones or virgin cork, emerging at evening to catch flies, or mealworms. When kept in a heated greenhouse they are a definite help in keeping down pests, and they often breed. The two, white, hard-shelled eggs are laid under loose bark or virgin cork, and they hatch without difficulty.

The ANOLIS LIZARDS (Fig. 9), of which the commonest is the CAROLINA ANOLIS (*Anolis carolinensis*), of the Southern United States,

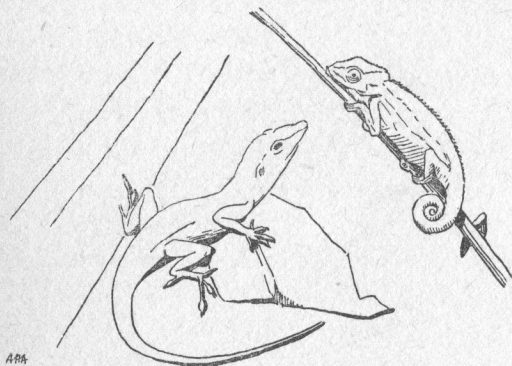
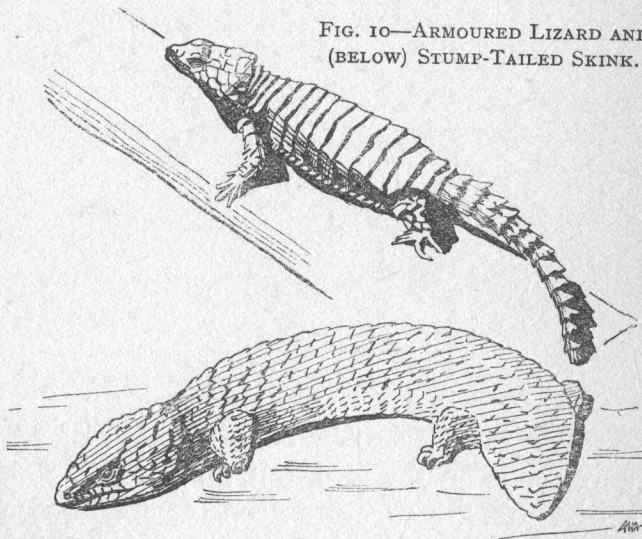


FIG. 9—ANOLIS LIZARD AND (RIGHT) CHAMELEON.

resemble the Geckos in the possession of adhesive pads on the toes, but they are diurnal, sun-loving lizards, and considerably more delicate. Many species are, however, brilliantly

coloured, and they are well worth the trouble they entail. The throats of the males are adorned with expansible folds of skin, like dew-laps, which under the influence of warmth, or during courtship, are spread to display a glittering range of colours, which vary in different species. The cage should be kept warm and very moist, with plenty of tall vegetation, for in nature these lizards are seldom seen on the ground. Flies and mealworms form their diet in captivity.

FIG. 10—ARMOURED LIZARD AND
(BELOW) STUMP-TAILED SKINK.



The SKINKS are, generally speaking, a heavily built, sombrely coloured family of lizards, but they have a charm all their own.

The STUMP-TAILED SKINK (*Trachydosaurus rugosus*) (Fig. 10) of Australia is perhaps one of the most attractive. Its length is 15 inches, of which the thick, useless tail accounts for barely 3 inches. Its body, which is covered with large, overlapping rough scales, is black with irregular yellowish spots. Stump-tailed Skinks are lethargic, docile creatures, which take readily to confinement, and they often live many years in close quarters. Unlike most lizards they are omnivorous, feeding indifferently on fruit, raw beef and insects. Their native haunts are sandy, semi-desert localities; their cage should, therefore, be kept dry, except for drinking water, and—on account of their catholic tastes in food—they should not be kept with other smaller species. They are said, when wild, to feed largely on snakes.

The BLUE-TONGUED SKINK (*Tiliqua scincoides*), which is an even more attractive creature, also from Australia, needs the same treatment.

The EYED SAND-SKINK (*Chalcides ocellatus*) is a much smaller and more active species from

Mediterranean countries, so named on account of the black and white spots which adorn the sides of its otherwise brown body. They are not particularly attractive in captivity, unless they can be induced to breed.

The COMMON SKINK (*Scincus stincus*), from the scorching desert sands of North Africa, is hardly worth keeping, for it requires so high a temperature combined with intense sunlight that it seldom survives in this country.

The ZONURES are a family of South African lizards characterised by their sharp, spiny scales. They live well in captivity if supplied with sufficient warmth.

The commonest species on the market is the ARMoured LIZARDS (*Zonurus cataphractus*) (Fig. 10), which thrive on mealworms and scraped raw beef. They are also partial to fruit, particularly bananas.

The CHAMELEONS (Fig. 9) are delicate lizards, needing rather special treatment, but they are worth all the care expended on them. They should be kept in a vivarium with sufficient space to shoot out their long tongues to catch insects, and furnished with stout plants for climbing. Probably the majority of caged chameleons die of thirst, for they can seldom

be induced to drink from a saucer on the ground. In nature, they probably only drink the dew, and in confinement this must be imitated by sprinkling the leaves of plants with droplets of water. It is well worth the trouble to improvise a miniature fountain in the cage from a length of rubber tubing and the nozzle of a fountain-pen filler. If it can be attached to the mains, so much the better; otherwise it is possible to syphon the water from a bucket suspended a few feet above the cage.

They feed only on rather active insects—mealworms are not very acceptable. Blue-bottles, butterflies, in season, and cockroaches are readily taken, and the sight of a chameleon catching a butterfly is one not easily forgotten.

The North African species (*Chamaeleon chamaeleon*) is the commonest and hardiest, though the South African DWARF CHAMELEON (*C. pumilus*) thrives well and has the advantage of producing its young alive, whereas most of the other species lay eggs.

CHAPTER V

SNAKES

THE prospective purchaser of a snake is likely to ask immediately the question, "Is it poisonous?" There is, unfortunately, no easy method of distinguishing a venomous snake from a harmless one. It so happens that

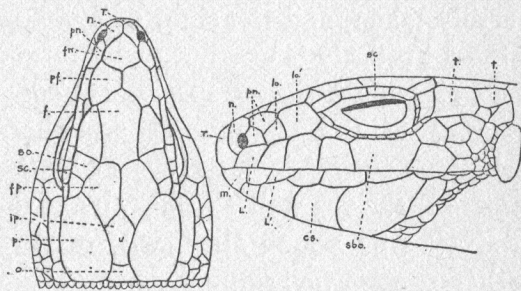


FIG. II.—DIAGRAM ILLUSTRATING HEAD-SHIELDS OF SAND LIZARD.

r. Rostral; n. nasal; pn. postnasal; fn. frontonasal; pf. prefrontal; f. frontal; so. supraorbital; sc. supra-ciliary; fp. frontoparietal; ip. interparietal; p. parietal; o. occipital; lo. loreal; t. temporal; m. mental; L. upper labial; L'. lower labial; cs. chin-shield.

no seriously poisonous snakes except those of the viper families possess a loreal shield (see diagram of lizard's head in Figure 11), but this fact is of no practical value, the British viper being the poisonous snake most likely to be encountered.

The best advice that can be given is to treat every unknown snake as though it were poisonous until the contrary is proved and to confine one's collection to the harmless varieties.

The chief difficulty in keeping snakes lies in the feeding problem. It should be stated at the outset that it is quite unnecessary to offer snakes living food; in fact when rats or mice form the diet it may be actually dangerous to the reptile.

As snakes are able to live for a long period without food it often happens that a snake obtained from a dealer has never fed in captivity and it may then be difficult to coax it to eat. In that case it is as well to wait a few days to allow the animal to become accustomed to its new surroundings. A dead mouse, frog or whatever food is appropriate should then be dangled before it in forceps, "wriggling" it and drawing it slowly away to simulate life. If it is not seized within a few minutes the

meal should be left in the vivarium till next morning, for many only feed by night.

It is usual to offer food once a week, allowing the reptile as many carcasses as it will consume quickly. There is no cause for alarm, however, if feeding is occasionally omitted. A month's abstinence will do no harm.

The custom of forcibly feeding snakes is almost always to be condemned, for sooner or later it is sure to lead to canker, with its sequel of gangrene of the jaw and pneumonia. The most that should be attempted is the passage of a soft rubber tube down the throat of a starving snake so that an egg-and-milk mixture can be introduced. In most cases a fasting snake probably "knows best", and artificially introduced food is useless.

Periodically snakes cast their outer skin. This sloughing, as it is called, happens at quite irregular intervals; it may occur every fortnight, or every three or four months. For some days prior to the event the scales covering the eyes are seen to be cloudy or whitish, and as soon as this is noticed it is useless to offer food. The snake now probably spends a great part of its time in the pool, for the soaking assists in the detachment of the skin. Presently

the skin round the lips loosens and in the course of perhaps half an hour the snake crawls out of the opening thus formed.

Should the sloughing be incomplete it is as well to assist the process by peeling the skin off with the fingers because septic sores are otherwise apt to develop between the old and new skin.

Except for certain primitive forms which seldom reach this country, snakes may be divided into

The Typical Snakes ;
The Vipers, and
The Boas and Pythons.

Of these, the Typical Snakes, which form the overwhelming majority, include both venomous and harmless reptiles. The Vipers, including such species as the British Adder and the American Rattlesnakes, are all venomous and should be avoided. The Boas and Pythons are all non-poisonous and are only dangerous when they are so large as to injure human beings by constricting them.

All the snakes described below are harmless.

The GRASS SNAKE (*Natrix natrix*) is the snake most commonly seen in shops, and it

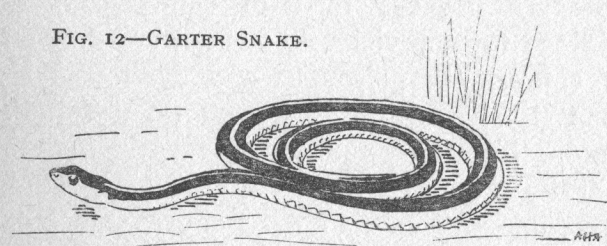
makes a very satisfactory vivarium animal. It is a handsome reptile, about 3 ft. in length, with a greenish or brownish body and a conspicuous yellow collar bordered posteriorly with black. This yellow collar may be considered as a "safety mark" as regards English snakes, for it is never present on Adders, the only poisonous British species. Newly caught specimens have an objectionable habit of emitting a disgusting, fœtid odour when handled, but in a few days, as they lose their nervousness, they cease to do this. They feed readily on dead frogs. A grass snake of the writer's acquaintance regularly disposed of the dissected and disembowelled frogs discarded from a biological laboratory.

Other European snakes regularly on the market are the FOUR-LINED SNAKE (*Elaphe quatuorlineatus*), the ÆSCULAPIAN SNAKE (*Elaphe longissima*), and the LEOPARD SNAKE (*Elaphe situla*). The first two are quite satisfactory in confinement, feeding on mice and frogs. The Æsculapian Snake is notable as the reptile which in ancient times was kept and revered in Roman temples devoted to the healing art. It is a pity that the Leopard Snake does not feed so readily in confinement

as the others, for it is a particularly beautiful species. Though they will occasionally accept both frogs and lizards, mice are the usual food.

The GARTER SNAKE (*Thamnophis sirtalis*) (Fig. 12) is a relative of the European Grass Snake which inhabits the greater part of North America. It varies considerably in colour and marking, being either brownish olive with spots or stripes, or black with three yellow, red, or greenish stripes. Two other members of the same genus, the Elegant Garter Snake and the Ribbon Snake, are very similar.

FIG. 12—GARTER SNAKE.



The COMMON BOA (*Constrictor constrictor*) and the various members of the Python family are very satisfactory when young, and they grow so slowly that they may frequently be kept for five or six years before they become

dangerously large. They all need artificial heat and are best kept at a temperature of not below 70°.

Of the Pythons the COMMON AFRICAN PYTHON (*Python sebae*) is the easiest to keep because it needs less warmth than many of the others.

The AUSTRALIAN DIAMOND PYTHON and CARPET PYTHON (varieties of *P. spilotes*) are both beautiful snakes with the reputation of being more easily tamed than other members of the family.

All Pythons and Boas, however, readily become docile from frequent handling. Those that are unaccustomed to confinement are inclined to snap viciously at first, but they are, of course, non-poisonous and specimens less than 7 ft. or 8 ft. in length do not inflict serious bites.

They should be fed on mice, rats or rabbits according to size, or indeed any freshly killed animals to which they can be accustomed. The feeding process is both instructive and amusing, for they go through the formality of constricting even dead prey before eating it.

CHAPTER VI

DISEASE AND EUTHANASIA

THE diseases of Reptiles is, of course, a subject which could occupy space many times the the size of this book. It is only possible here to deal with the commonest conditions and to outline treatment that is within the scope of the layman.

VOLUNTARY STARVATION is probably the most frequent cause of anxiety. It is not necessarily a sign of disease but it may be the only symptom observed when disease is present.

Possible causes are :

1. Unsuitable or unaccustomed food.
2. Unaccustomed surroundings.
3. Odours (e.g. disinfectants).
4. Blindness, temporary or otherwise.
5. Disease.

In the wild state most reptiles feed at irregular and often long intervals. Their

appetite is not stimulated by "emptiness" or by periodic mealtimes, but by encountering the sight and smell of food under conditions similar to those in which they have fed previously.

In captivity it is usually possible to coax a reptile to eat if one reproduces as nearly as may be the circumstances of its last meal—circumstances including time of day, temperature, surroundings, nature and, where applicable, movement of the food. Often an inner den to which a shy reptile can retire works miracles; sometimes too large a prey stimulates fear instead of the feeding reflex.

Snakes about to slough their skins invariably refuse food, perhaps because they are more or less blind at this time.

Temporary blindness, due to glueing together of the lids, is a common cause of starvation, particularly in Tortoises and Glass Snakes. It is only necessary to bathe the eyes with warm boracic lotion, or soak the whole animal in water, to unstick the eyelids. If the condition recurs a smear of Yellow Oxide of Mercury ointment over the eyes will cure it. Any other cause of blindness is beyond amateur treatment.

PARASITES—both external and internal—are very common. It is the rule rather than the exception to find newly-imported tortoises and snakes infested with ticks. These are rather crab-like, blood-sucking insects varying from $\frac{1}{8}$ in. to $\frac{1}{2}$ in. in diameter. They are found round the neck and thighs of tortoises and partly concealed by the scales of snakes. They can be pulled off forcibly with forceps or a drop of paraffin causes them to loosen their grip.

A mere list of the internal parasites peculiar to reptiles would fill several pages. Their presence is rarely suspected during life, but they are a frequent cause of fatal enteritis and pneumonia. All are difficult and some impossible to eradicate, but if intestinal worms are suspected in a favourite reptile a few doses of Santonin can do no harm. A 5 lb. tortoise can be given one grain of the drug sprinkled on its food weekly with safety.

CANKER is a disease very common among snakes, not unlike pyorrhœa in human beings. A cheesy material exudes from the gums and the infection spreads, if untreated, to the bone or to the lungs, causing death. The snake should be isolated and its mouth cleaned with probe and swab daily with flavine solution 1 : 1,000.

SHELL-ROT in terrapins is a process of decay of the under-shell which may in time perforate the bone and cause death. It can be treated as a dentist would treat a decayed tooth, filling the cavity with some "temporary filling", such as oxide of zinc and oil of cloves.

ULCERS on the under-surface of amphibians are often caused by a very fatal infectious disease and if the condition is at all severe the patient is better destroyed.

CONSTIPATION is not uncommon in captivity and may be severe enough to cause death. Reptiles react to castor oil in the same way as mammals, or a soap-and-water enema may be given if the animal is large enough for manipulation with a fountain-pen filler.

PNEUMONIA may be suspected when the breathing is rapid and, in tortoises, when there is a copious mucous discharge from the mouth. Probably no drugs are of much value and little can be done beyond keeping the animal in a warm but well ventilated cage.

SURGERY is likely to be confined to the treatment of injuries, for reptiles cannot be anaesthetised by ordinary methods.

In dressing wounds it should be remembered

that carbolic acid in any form is rapidly fatal to reptiles and still more to amphibians.

Finally, when, on account of disease or injury, a reptile has to be destroyed, the best way of killing it must be considered.

Reptiles can hold their breath for so long that inhalation of chloroform or the use of any form of lethal chamber is unsatisfactory. Usually the method least open to objection is the primitive one of chopping off the animal's head on a block; the result may be gory, but at least it is sudden. Violent movements may continue some time after decapitation, but the animal is, of course, quite dead.

In the case of a tortoise it may be difficult to draw the head out of the shell, but if this can be done the execution is best performed with gardener's shears. Failing this, a kindly doctor or nurse may be induced to give a hypodermic injection of chloroform into the loose skin in front of the shell. A cubic centimeter or so of chloroform administered in this way will kill a tortoise.

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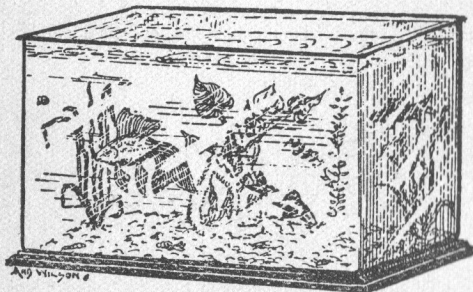
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