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and other Reptiles

How to buy, house and feed them

David Le Roi, MA, BSc, FIAL

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Chapter One

INTRODUCING THE REPTILE

Mention the word 'reptile', and many people immediately think of something sinister and repulsive, imagining a dangerous creature loathsome and to be avoided. All of which is more than unfortunate; for the great zoological family of reptiles includes a variety of tortoises, frogs, lizards, and newts, which make attractive, and harmless, pets.

Not only are reptiles fascinating creatures to keep as pets, but they are undoubtedly amongst the cleanest of all animals in their habits.

Moreover, with the exception of the more exotic lizards and certain of the larger frogs, reptiles are cheap to buy; a representative collection of frogs, lizards and newts can be got together for the expenditure of a few shillings. As explained in Chapter Three, the reptile's housing requirements are comparatively simple; indeed the most popular reptile as a pet, the tortoise, has practically no housing problem at all!

Provided the instruction and advice given in Chapter Seven are followed, the feeding of pet reptiles is a comparatively simple matter, and entails very little expenditure of money. Indeed, fasting being natural to many of these creatures, the average reptile comes to no harm if several days or even weeks pass without its being fed.

Admittedly, reptiles are not as intelligent as cats, dogs hamsters, guinea-pigs, and the majority of birds, but many of them have better brains than they are usually credited with.

Apart from their interest purely as colourful inhabitants of a vivarium, reptiles such as the frog have an extremely inter-

esting life cycle. Then there is the extraordinary creature called the axolotl, which is really a giant tadpole.

Although the term 'reptile' is, for convenience, used in this book to cover tortoises, frogs, lizards and newts, it really applies to only one of two very distinct classes of animals; the other class is called amphibians. (*Chapters Five and Six.*)

Considered together, reptiles and amphibians may be defined as all cold-blooded animals that have backbones and whose limbs, if they have them, consists not of fins, but of arms and legs with fingers and toes. This distinguishes them from fish, the other great class of cold-blooded animals with backbones. Moreover, amphibians and reptiles can all exist out of water, although the former, such as frogs and toads, begin life in the fish-like form of tadpoles.

As a general rule, reptiles and amphibians are distinguished from each other by the nature of their skin. In reptiles, such as the snake and the lizard, the skin is dry and scaly, whereas the skin of amphibians, such as the frog and newt, is moist and soft. Both classes have in common the fact that in nature they are confined to the warmer and more temperate parts of the world and are scarce in the cooler regions. This latter is because they are cold-blooded creatures, and as a consequence the temperature of their bodies must vary with that of their surroundings, so that they cannot survive any appreciable degree of frost. That is why they both hibernate in winter.

Another similarity between reptiles and amphibians, particularly those native to the British Isles, is that they are all carnivorous; that is, they eat insects and other living things. The only time a frog is vegetarian, and then only partially, is during its tadpole stage. Curiously enough, however, neither reptiles nor amphibians chew their food, it is always swallowed whole; this is a particularly important point to remember. If you offer them insects too large to swallow at one gulp

they will either choke or refuse the food, whether hungry or not.

Where such creatures possess teeth they are all alike, and usually consist of backwardly directed points for holding wriggling or slippery insects or other live food. Toads have no teeth at all, but frogs have a row along the upper jaw and two rows on the roof of the mouth.

Contrary to a popular belief, frogs and toads do not catch their prey by snapping at it with the jaws, but by trapping it with the tongue. For that purpose, the tongue is rooted near the middle of the lower jaw, with the tip pointing down the throat instead of towards the front of the mouth. Special glands in the roof of the mouth release a sticky substance which renders the tongue adhesive.

When the frog or toad spots a moving insect, the animal opens its mouth and flips the tongue forward so that the tip curls round the victim while it is withdrawn into the mouth. The whole movement occurs so quickly that unless it is observed very closely the tongue is not seen at all, so giving rise to the belief that the animal has snapped up the insect with its jaws. On the other hand, lizards and newts catch their prey with their jaws. Frogs and lizards do not chew their food, but crush it between the tongue and the roof of the mouth.

In lizards the jaws, and in many species, the roof of the mouth, have teeth which grow again when worn or broken. The lizard's teeth are hollow and have two or three points, and its tongue is flat, thin, and only slightly notched at the end.

One of the most striking differences between the feeding habits of lizards and frogs is that scent plays no part in helping the frog to find its food; it is led to its prey by sight. This is all the more remarkable when we remember that the olfactory or scent part of the brain of a frog or toad is large.

That scent has no part in their hunt for food is indicated by the fact that frogs and toads will not take anything that is

motionless, even if the object happens to be a stationary insect of which it is particularly fond. But immediately the insect moves it will be snapped at and caught with a flick of the tongue. Movement is essential to attract the animal's attention and stimulate its reaction to food.

On the other hand, lizards have a highly developed sense of smell, stimulated by the tongue and not through the nose.

At one time it was thought that the curious flicking action of the tongues of lizards was these reptiles' method of examining their surroundings by a sense of touch. It is probable that this is true in certain circumstances, but if you watch a lizard closely you will see that more often than not the tongue flickers in the air without touching anything and is then quickly withdrawn into the mouth.

It has since been discovered that opening into the top of the mouth of a lizard is a pair of minute pockets in which terminate a number of nerves. These pockets and nerve-endings are called Jacobson's organs, leading to the centre of the reptile's brain responsible for its sense of smell.

When the lizard flickers its tongue, the tip picks up any smell in the air, and when the tongue is withdrawn into the mouth it comes into contact with the Jacobson's organ which immediately transfers the scent to the smelling centre of the brain.

Like those of most animals, the jaws of the lizard are joined by a hinge so that they can open only a fixed distance. This limits the size of insect or other prey it can swallow.

One curious difference between amphibians, such as frogs, toads and newts, and true reptiles, such as snakes, lizards and tortoises, is that the former lay soft, shell-less eggs, while the latter deposit eggs protected by a layer of shell. It is true that certain lizards are what are called viviparous, i.e. produce their young alive, but that is not strictly accurate, as the young are merely hatched in the female's body.

Fig 1. Radiated Tortoise showing oreolas

Then, there are the most curious reptiles of them all—the tortoises and terrapins. These are the strangest of all zoological freaks as they have no skeleton inside their body but carry it on their back. For the tortoise's shell is nothing more nor less than its skeleton.

All of which goes to show that reptiles and their cousins the amphibians are far from being lowly members of the animal world. Indeed, they are perhaps the most interesting and colourful. And as the following chapters show they are amongst the easiest of animals to keep as pets.

Chapter Two

TORTOISES AND TERRAPINS

Despite their slow and ponderous movements, tortoises are the most intelligent of all reptiles and make excellent pets. They quickly become very tame in captivity and present few problems in feeding, housing or management.

But before dealing with the tortoise in detail it is important to remember that all the so-called tortoises are not, in fact, tortoises at all. The tortoise is the land species of the order testudinata, which also includes the terrapin or water tortoise. The latter is quite a distinct species and generally can be distinguished by its longer and much more prominent tail.

Another important distinction between land and water tortoises is that the former is strictly vegetarian in diet, while only the water species is carnivorous, and therefore an insect-eater. Beware of some hawkers who declare that the tortoises they sell will keep your garden free from slugs. There is not a word of truth in such statements. If you want something that will earn its keep by eating slugs, avoid the tortoise and put your faith in a terrapin or water tortoise.

Both tortoises and terrapins are amongst the oldest existing types of animals and are, in fact, survivals of the great age of reptiles which existed on earth millions of years ago. Tortoises and terrapins originally had internal skeletons like most animals, but in time began to develop armour-plated skin made up of bony nodules covered with a sheath of horn, and as this, in the course of time, increased in weight and size, it hindered the movements of the animal's backbone.

Consequently, the muscles of the tortoise and terrapin back

had less and less work to do and dwindled away. In a further stage of evolution, the shell on the back gradually lowered on to the ribs and spine until eventually shell and ribs were joined together to form the shell as we know it to-day.

In the present stage of tortoise evolution, the bony plates have become beautifully linked with the ribs, but if you examine the animal you can still see down the middle of the shell the top of the now-discarded backbone. When the tortoise and terrapin developed their heavy armour for protection, something had to be sacrificed, and it was speed that

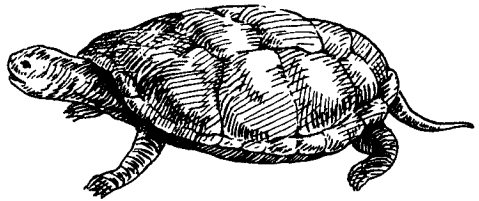

Fig 2. European Terrapin or Pond Tortoise

went. The terrapin or water tortoise suffered least in this respect, for it is still a strong and fairly fast swimmer. On the other hand, the land tortoise developed into one of the slowest-moving of animals as it has to carry its heavy shell, which serves it as skeleton and house.

Further to emphasize the many important differences between land and water tortoises and so avoid the common confusion between the two, I propose dealing first with the land tortoise, which is by far the more commonly kept as a pet.

Land tortoises are of several kinds and range in adult size from the common European varieties, seldom more than 10 in. in length, to the giant *Testudo Elephantina* of the Seychelles, which sometimes attains a length of 5 ft and weighs several

hundredweight. But irrespective of its size, the tortoise is characterized by the fact that the skeleton is partly external and forms a bony box or shell, called the carapace, which protects the reptile from its natural enemies and compensates for its inability to move quickly away from danger. All species of tortoises are without teeth, but the jaws are encased with horn to form a cutting beak.

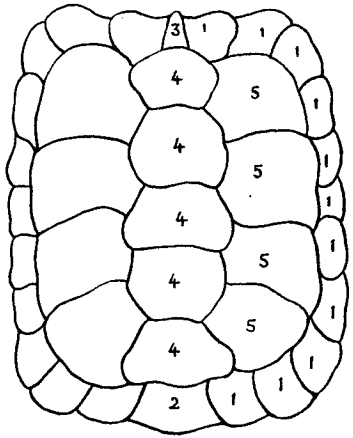

Fig 3. Tortoise carapace or shell. See text for reference numbers

The carapace is made up of overlapping and closely joined horny plates, generally finely mottled. The plates forming the carapace are called shields and, as shown by the numbers on Fig 3, are named as follows: 1, marginals; 2, supracaudal; 3, nuchal; 4, vertebrals; and 5, costals. The number of vertebrals and costals is the same for all species of tortoises, but

certain species have no nuchal on the carapace, and in others the number of marginals varies.

Besides the carapace, the tortoise has a flat, external breastbone called the plastron. In the male, the plastron is more concave than in the female. Another indication of sex is provided by the marginal shield, which in the female is flat, whereas with the male it is rounded and turned under. The marginal shield also covers the tail, which in the female is shorter and fatter than that of the male.

Although not all naturalists are agreed on the subject, there is reason to believe that the age of a tortoise can be estimated by counting the concentric ridges on the shields of the upper plastron. The surface of each shield is composed of a central granular portion surrounded by a varying number of these ridges, one of which appears to be added each year. As the width of the individual ridges appears to be proportional to a year's growth, it has even been suggested that thin or wide ridges distinguish lean or fat years of the animal's past life.

Coloration of the carapace varies considerably according to the variety of tortoise, but the most common is pale ochre or orange-brown. Markings also vary, but in the majority of varieties consist of black or brown spots or irregular blotches on the vertebrals.

Like all reptiles, tortoises are native to the warmer parts of the world and, in general, the hotter the climate the larger the tortoise. They are the longest-lived of all animals, reaching an average age far greater than that of the elephant. This is especially true of the giant tropical tortoises; one specimen is known to have lived for 127 years, and another survived in captivity for 140 years.

Because of their great size and the difficulty of keeping them supplied with adequate quantities of fresh greenstuffs and fruits, the large tropical tortoises are quite unsuitable as

domestic pets, and can be successfully kept captive only in zoos. Consequently, only the smaller tortoises from the more temperate regions are suitable as domestic pets. The following list includes all those tortoises whose feeding, housing and maintenance present few difficulties for anyone deciding to keep a tortoise for the first time.

MEDITERRANEAN SPUR-THIGHED TORTOISE. Classified by naturalists as *Testudo Graeca* and, therefore, often called the Greek tortoise, this is the most common of all tortoises and the one most generally sold by hawkers and pet-shops. It is native to nearly all Mediterranean countries including Greece, Turkey, Israel, Jordan, Persia and Syria, but most of those imported into Britain come from Morocco and Tunisia. Coloration is always an unreliable guide to tortoise species as it varies greatly even within one species.

As a rough guide, however, it may be said that the basic overall colour of the Mediterranean Spur-thighed tortoise is pale ochre with black blotches on the vertebrals and costals and black triangles on the marginals. Young Spur-thighed tortoises frequently have a band of yellow or bright orange running round the shell where the marginals and costals join. As the animal grows older, the band fades to a dirty white and sometimes disappears altogether.

Spur-thighed tortoises vary in size from 2 in. (length of shell) to approximately 1 ft, but most of those offered for sale are 6 in. long. One infallible feature distinguishing this species is the horny tubercle, sometimes ¼ in. long, on each thigh.

HERMANN'S TORTOISE. Often confused with the Mediterranean Spur-thighed tortoise, and just as frequently called the Greek tortoise, Hermann's tortoise is also native to European Mediterranean countries and is sometimes found native

in Europe itself, but it is unknown in North Africa. It is useless to try and identify Hermann's tortoise by coloration as this varies to an exceptionally marked degree; some have large black patches on a yellow ground, while others of even the same hatching may lack markings altogether. Unlike the Spur-thighed tortoise, Hermann's tortoise has no thigh-tubercles, but is distinguished by a terminal on the tail resembling a claw. The tail-claw is more prominent in the male than in the female. The Spur-thighed and Hermann's tortoises are approximately the same size when adult.

LEITH'S TORTOISE. Native to Syria and Lower Egypt, Leith's tortoise is much sought after by enthusiasts because of its comparative rarity. The basic colour of the shell is yellow and seldom has markings, so that in its wild state the reptile is well camouflaged for survival in its wild habitat of the desert. Leith's tortoise is somewhat smaller than the true Mediterranean varieties, and is notable for having both thigh-tubercles and a tail-claw.

DR HORSFIELD'S TORTOISE. This is another somewhat rare species and is native to central Asia. Adults are from 9 to 12 in. long and the shell is dark brown or yellow. Each foot has four claws, and the species possesses a tail-claw and thigh-tubercles.

MARGINATED OR MARGINAL TORTOISE. This tortoise is native only to Greece, and is distinguished by the serrated posterior marginals, which fan out to form a spade-shaped fan. Maximum length of an adult is approximately 12 in. and coloration a deep yellow with occasionally dark triangles on the marginals. There are no thigh-tubercles, but the jaw has a pronounced hook and the forelegs are heavily scaled.

Besides the foregoing species of tortoise, all of which do well in the British climate and require no special feeding or housing arrangements, there are two semi-tropical species which do require rather specialized treatment. These are:

GOPHER TORTOISE. This tortoise is native to Florida and North Carolina, and is found wild only in dry, sandy places, in which it digs the burrows in which it lives. The Gopher's shell is light brown and the breast-plate an attractive horn colour, while the legs are a deep grey. The forelegs are one of its principal distinguishing features, being shaped like the blade of an oar. The shell is about 12 in. long in adults, and the reptile weighs up to 9 lb.

Although fairly hardy in captivity and able to exist out of doors in Britain during the summer, the gopher goes off its food and quickly loses condition in cold or damp weather unless kept in a heated conservatory. Even when bred in captivity, the animal retains its wild custom of sheltering during the day and feeding only in the early morning and late evening; this trait is particularly noticeable in the warmer summer months. The gopher eats most kinds of fruit and is very fond of cropping clover and grass from a lawn, although it generally refuses cut grass. Unfortunately, it has a voracious appetite for celery, lettuce and young cabbage, so if kept at liberty in a garden during summer some method of fencing it in must be devised.

RADIATED TORTOISE. This is a particularly handsome and rare tortoise from Madagascar. The ground colour of the shell is black, but each shield on the back of the carapace has an orange or reddish-yellow circular spot from which radiate bands of a similar colour. The number, spacing and size of these oreolas vary greatly between individuals.

Being tropical animals, radiated tortoises must be kept warm, and even when given the run of a garden in summer should be provided with a box-shaped cage on the lines of a rabbit hutch and bedded with hay. As this species is very susceptible to damp, the cage or hutch must be raised off the ground, and should have a ramp leading to the entrance, as illustrated in Fig 6. Radiated tortoises do not hibernate, and consequently in winter they must be kept in a heated conservatory and regularly given their favourite food of lettuce, cabbage and any available succulent-leaved plants. Another appreciated, but not always easily-obtained, food is fresh fruit such as bananas, cherries and water-melon, including the rind of the latter. Ripe marrow is also appreciated.

There is one so-called tortoise that actually does eat slugs and other garden pests:

CAROLINA BOX TORTOISE. As its zoological name, *Terrapina Carolina*, implies, the Carolina Box Tortoise is in fact a terrapin, but it is at the interesting evolutionary stage of developing from a purely aquatic existence to a completely land life. As yet, however, it has not advanced sufficiently to its new stage to be able to live very far from water.

Carolina Box tortoises derive the first part of their name from the fact that they are native to Carolina and one or two adjacent States of the USA. Secondly, they have a breast-plate hinged to form two movable lobes which can be shut like a box completely to enclose the animal's head, legs and tail. The carapace, which measures 5 to 6 in. long in adult specimens, is dark brown with red or yellow spots. In some specimens, the spots disappear with age. The sexes are distinguished by brown eyes in the female and red eyes in the male. Although mainly insectivorous in diet and a voracious

eater of slugs, the Carolina Box tortoise has a weakness for fruit and mushrooms! But provided mushrooms, and fruits growing at ground level, are adequately protected, the reptile can be given a free run of the garden, as it will not touch any other growing things; not even grass. It is a particularly hardy tortoise and will hibernate safely at the bottom of a garden pool.

Whatever the type of tortoise you decide to buy, there are certain points indicative of health and condition which are common to all species, just as there are other points which betray the unhealthy or diseased reptile. Ability to recognize the presence or absence of these points will decide whether the tortoise you purchase will develop into a short-lived invalid or become a healthy pet destined to a long and contented life.

Beware of any tortoise that shows the slightest symptoms of weakness in the back legs. You can test this by lifting the animal by its shell and holding it until the back legs are lowered. Then press your fingers against the soles of the reptile's feet: whereupon a healthy tortoise will thrust back strongly: on the other hand, an animal with a leg defect will immediately retract its limbs into the shell.

One of the chief causes of leg weaknesses results from tethering by some collectors of wild tortoises, particularly in North Africa. As tortoises are seldom found in large numbers in their wild state, it may take several days for sufficient to be collected for it to be worth the trouble of taking them to market. Accordingly it is the practice to tie the tortoises by a back leg as they are caught and fix them to a stake in the ground. The prisoners thereupon attempt to pull themselves. free and the cord tethering them bites into the flesh. The result of this evil treatment is not always immediately apparent, but weeks or even months later, the stricture of the cord may cause the leg to rot and even drop off. So reject at once any

tortoise that shows the slightest sign of having anything the matter with its hind legs.

Weight is a good indication of tortoise health. Having decided upon the size of the tortoise you are going to buy, pick up, one at a time, several animals of approximately the same size and select the one that seems to you the heaviest for its size. A heavy tortoise is always a healthy tortoise.

It is a common mistake to assume that a tortoise which lies in the shop with its head always out of the shell must be a tame and friendly animal taking an interest in the world around it: and if it does not withdraw its head when touched this is taken as sure proof that the tortoise is naturally domesticated. Nothing could be farther from the truth; a shop tortoise that does not at first shrink from human touch is a sick tortoise.

When we remember that the majority of tortoises that arrive in this country from overseas have made the journey tightly packed in crates without food and water for long periods, we should not expect them to be particularly pleased by human handling. Most of the tortoises that appear to be so tame that they do not retract into their shells when touched, are usually too weak to withdraw. Shop tortoises are usually nervous and suspicious of humans, and if in good health will quickly show their fear by retracting into their carapaces when touched or approached. In other words, choose the tortoise that is quick-moving and lively, even if its activity is inspired by fear.

Sluggish movement, an unpleasant fishy smell, dull and watery eyes, a yellow fungus-like growth in the mouth, and a cracked or otherwise damaged carapace, are all indications of ill health. There are in addition prominent symptoms of tortoise ills such as colds, ticks and sores: these are dealt with in Chapter Eight. If the ridges on the shell are smooth and badly defined, or the toe nails are worn down close to the

foot, the tortoise is probably an old specimen with only a few years of life left to it.

Size of the tortoise you purchase must be mainly a matter of personal choice. Tortoises imported into Great Britain vary in size from 2 to 12 in., the average being about 6 in. The smaller the tortoise, according to species, the younger it is; and it is always more interesting to buy a young animal and watch it develop into an adult. But you must bear in mind that a young tortoise is much less hardy than an adult, and as it must not be allowed to hibernate, has to be housed and fed indoors during the winter months. Moreover, in summer a young tortoise must be confined to a pen or other enclosure and cannot be given the run of a garden. Therefore, unless you are prepared to spend a lot of time on nursery duties, it is best to buy a tortoise 4 or 5 in. long. At that size it will be of an age when it is strong enough to look after itself.

Incidentally, the ideal time to buy a tortoise is during the months of May, June and July, which is when the best specimens are imported. Never purchase a tortoise in winter, early spring, or late autumn from a street trader, unless you know him to be of good repute. It is quite a common trick amongst dishonest vendors to offer cheaply at those times of the year tortoises completely retracted into their shells, with the explanation that they are hibernating: such bargains are in many instances dead tortoises.

If you can possibly do so, buy a pair of tortoises, preferably a male and a female. Tortoises are curiously sociable creatures and are always happiest in company with their own kind. Moreover, a solitary tortoise, particularly a male, is more likely to try and find a hole in the garden fence through which he will wander off in the spring to search for a mate.

Assuming that you have bought a pair of adult, healthy tortoises in the summer, you can safely keep them as liberty

pets in the garden. In fact tortoises are best kept out of doors as they are much more lively and interesting when allowed to wander about comparatively free in the open. The term 'comparatively free' is used deliberately in view of the tortoise's propensity to feed on growing flowers and vegetables.

Nevertheless, the tortoise's foraging expeditions in search of forbidden fruit are easily restrained by providing it with an enclosure, preferably on rough ground rather than the smooth surface of a lawn. Although a tortoise cannot surmount an

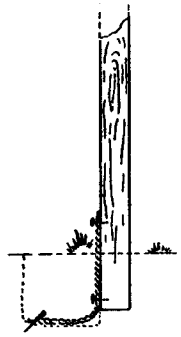

Fig 4. Wire fencing to prevent tortoise from burrowing under paling

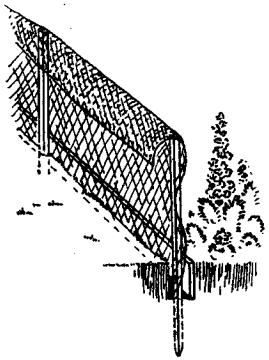

Fig 5. Fence to prevent tortoise from burrowing into flower-bed

object higher than a brick laid on its side, it delights in trying to climb over a few modest obstacles such as small, loose stones, and it equally delights in exploring shrubbery. The best enclosure for a tortoise is a small flower-bed planted with grass and shrubs and provided with a few stones in the centre. The tortoise ground must then be fenced to prevent the occupants from getting out to raid other parts of the garden.

Fencing a tortoise enclosure is not difficult, and one of the

simplest and cheapest methods is illustrated in Figs 4 and 5. First mark out that part of the flower-bed which is to be devoted to the tortoise. Assuming that the flower-bed is about 4 ft from front to rear, allow a width of approximately 9 ft: this will give an area of 36 sq. ft, which is ample space for an active tortoise. Tortoises are enthusiastic burrowers, and it is essential that the fencing confining them within their enclosure incorporates something to prevent them from digging their way out.

If the flower-bed backs against a close-boarded wooden fence, dig along the inside of the fence for a distance of 9 ft a trench 18 in. wide and 18 in. deep. Then obtain a piece of 1-in. mesh wire netting 9 ft long and 2 ft wide. The netting is laid in the trench and up the fence, rising 6 in. above ground level, as in Fig 4.

When a tortoise tries to burrow under an obstacle it always digs close against it. Hence if your tortoise starts a mining programme to tunnel below the section of garden fencing along his enclosure, he will only succeed in digging down to the wire netting at the bottom of the trench. It is essential, however, that the free end of the netting is firmly pegged down into the earth at close intervals, otherwise the tortoise may find a loose end and start digging under it. When the netting has been firmly fixed to the fencing and the bottom of the trench, fill the latter in and beat the earth down firmly.

Next, along each side and the front of the enclosure dig three more trenches 18 in. deep and 18 in. wide. Wooden stakes are then driven into the bottom of each trench at intervals so that they rise about 2 ft above ground level. One-inch mesh wire netting is fixed on the stakes and taken down into the trench, as shown in Fig 5. Turf should be laid along the wire on the enclosure side and allowed to become well-rooted before the tortoise or tortoises are introduced. The reason for

this is that a tortoise seldom tries to burrow in grass; and if one of yours does try to do so, it will soon come up against the buried section of netting.

It will be seen from the drawing that the top of the netting is turned over on the enclosure side. This is because if the netting was perfectly straight and upright on the posts, the tortoises would try and use the mesh as a ladder to climb over; but as the netting curves towards them at the top they cannot surmount it and fall back on the turf.

As already stated, the enclosure should contain a few hardy shrubs and some stones. In fact it is a good idea to build a low rockery in the centre; not only does this look attractive, but the tortoises will delight in climbing about it.

Tortoises need a good supply of drinking water and this can be supplied by sinking a shallow dish into the ground of the enclosure. Be sure the dish is shallow; it should not be more than a couple of inches deep, otherwise the unfortunate reptile may fall in and drown.

Although all tortoises are native to warm climates they do not like excessive heat any more than they can endure the cold, and they equally hate getting wet; at the slightest shower of rain, a tortoise hurries to find shelter. Consequently, the tortoise's enclosure must be provided with some form of housing not only to protect them from climatic extremes but to give them snug sleeping quarters at night.

Fig 6 illustrates a simple and easily-made tortoise shelter suitable for putting into the enclosure. Basically, it consists of a wooden box 18 in. long, 1 ft deep, and 6 in. high. The top of the box is cut at an angle so that the roof, which is covered with roofing felt, slopes from the front to the rear. This latter ensures that rainwater will drain off. In front of the box cut an entrance about 4 in. high and 4 in. wide, and above the entrance tack a piece of American cloth or other water-

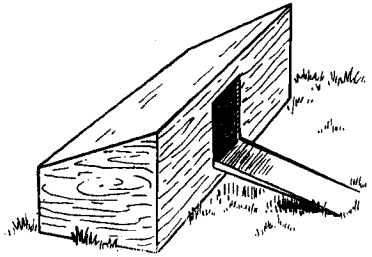

Fig 6. Shelter for tortoise kept in enclosure

proof material to form a curtain. Allow the curtain to hang freely so that the tortoise can push its way under it when entering or leaving the shelter.

Tortoises are extremely susceptible to damp, so the shelter must be raised off the ground to prevent water from the ground seeping through the floor after rain. The best way to keep the shelter dry is to stand it on four bricks, one at each corner. A ramp of wood or other material must then be laid from the entrance to the ground. The ramp should have a gentle slope so that the tortoise has no trouble in entering when doing its best to hurry in out of the wet. The best position for the shelter when placed in the enclosure is with the entrance facing the wooden fence. This will prevent wind and rain from blowing in. The floor of the shelter should be covered with straw or paper for bedding.

Although the tortoise is a hungry creature and eats a surprising amount of food during the day, it is, fortunately, not fussy about its diet. Most tortoises thrive on cabbage leaves, and other greens, lettuce, dandelions, pea-pods, tomato, and fruits such as apples, plums and pears. They are also partial to bread and like an occasional drink of milk.

As the tortoise likes to forage for its food, feeding stuffs should be scattered about the enclosure. You will find that most tortoises make three main meals a day: morning, midday and afternoon. They generally sleep for a couple of hours after each meal.

Like most reptiles, tortoises spend the cold months of the year in the torpid or semi-conscious state called hibernation. On the other hand, certain species of tortoise, particularly those native to exceptionally hot and parched climates, indulge in a kind of reversed hibernation called aestivation. In other words, they suspend animation during the hottest and driest months, becoming active during the rainy season.

As the keeping of tropical aestivating tortoises is not to be recommended for any but the expert, we are concerned here only with hibernation or winter sleep. Many warm-blooded mammals hibernate, but hibernation by tortoises is much more complete. Eating, and, consequently, digestion completely cease, respiration becomes so slow that it seems to have stopped altogether, and the creature remains motionless and insensible. But first to recognize the beginning of hibernation in a pet tortoise kept in an outdoor enclosure.

When the autumn days grow colder, you will find that the tortoise starts losing its appetite, while it becomes steadily more sluggish and keeps to one corner of its enclosure. Eventually it will dig a burrow for itself under a bush or other sheltered spot and there remain without food or drink until the return of warm weather in the spring.

Some people allow their tortoises to hibernate out of doors, and in many instances the reptiles successfully sleep through the winter and become their normal selves with the return of spring. Outdoors hibernation has a certain element of risk, however. If the temperature should rise temporarily in a winter month the tortoise may cease hibernating and move

about; then if it cannot bury itself by nightfall it is liable to be killed by frost.

It is always safer and more satisfactory in every way to hibernate a tortoise artificially. Immediately the tortoise shows the first signs of hibernation, it should be removed from the enclosure and placed in a wooden box filled with dry straw or crumpled newspaper. The box should then be stored in some place where an even temperature is maintained throughout the winter: an unheated shed, garage or shelter is quite suitable. The box must be covered with a lid through which air-holes have been punctured. Never place the box in a warm place as this will result in only partial hibernation, and the tortoise being without food will starve to death.

With the approach of spring, the hibernating tortoise should be examined at daily intervals to see if it has awakened. When hibernation is over, the reptile should be given a drink of water before food is offered. This is most essential because water acts as a lubricant on the tortoise's internal organs and helps them to begin functioning properly after their months of inaction.

Although it is possible to bring a tortoise through the winter without its hibernating, I would never recommend the practice. It means that the tortoise must be kept throughout the cold months in a heated greenhouse or conservatory maintained at a constant temperature. If there is the slightest fall in temperature below about 70° F., the reptile will partially hibernate—often with fatal results. Moreover, a non-hibernating tortoise must be fed; and it is not always easy to obtain suitable green foods in winter. In any event, it is going against nature to prevent a tortoise from hibernating, as it is a radical interruption of its natural life rhythm.

In common with most reptiles, tortoises very rarely breed in captivity, but when a pair are kept the female may lay eggs.

There is no way of telling whether or not the eggs are fertile except by hatching them. Although it is unlikely that the eggs are fertile, there is always a slight chance that they may be.

There are almost as many varieties of terrapins as there are of tortoises, but only two kinds, the European terrapin and the painted terrapin, are suitable for keeping by anyone who is not an expert or who does not possess a large outdoor pond. European and painted terrapins do well, however, in any of the types of indoor vivarium described in the next chapter.

The European terrapin is native to southern and eastern Europe and to Algeria and Persia. Specimens offered for sale are usually about 3 in. long and will grow up to about 5 in. in length. The shell is blackish or dark brown with yellow dots and streaks.

The painted terrapin belongs to North America and is approximately the same size as the European variety. It has a dark-olive coloured shell, the marginal shields being bordered with red blotches and lines.

Terrapins are easy to feed, their favourite diet being minute scraps of shredded meat, earth-worms, bloodworms and fish eggs. Being aquatic, terrapins must be provided with a small pond in the vivarium, as explained in Chapter Three.

Chapter Three

HOW TO MAKE A VIVARIUM

Reptiles such as lizards, frogs, newts and the smaller terrapins can be kept out of doors in a combined pond and rockery, but I would never recommend this method to the beginner. It is always much more satisfactory to start with reptiles in an indoor vivarium, where their habits can be studied at close quarters and their characteristics understood.

Building an outdoor pond and rockery is a laborious and lengthy business if the result is to be successful. Not only must it be properly drained and lined with cement, but unless it is elaborately protected with a surrounding wall and coping and has a netting cover, the inmates will either jump or wander away or be caught by birds and rodents. Moreover, although lizards, frogs and the like will hibernate under cold conditions, they do not come to harm if they remain active during winter in the warm conditions of an indoor vivarium. Another important point against the outdoor pond is that you see the reptile population only during the summer months; in the winter they are invisible, buried in the mud.

There are several types of vivarium suitable for housing either frogs or lizards or a mixed company of two or three of each. They can be bought ready-made from most pet-shops, but are inclined to be somewhat expensive. Fortunately the materials are comparatively cheap, and as the methods of construction are relatively easy, building a vivarium is well within the capacity of anyone handy with tools.

Fig 7 shows a simple vivarium which has a glazed lid sloping from top to front like that of a school desk. A false

bottom allows for a sunken pool, a concealed flower-pot, and some form of heating on the lines of those described at the end of this chapter. The sunken pool consists of a shallow earthenware dish of the type used for holding flower-pots. In the diagram one side of the vivarium has been omitted to show the arrangement of the false bottom.

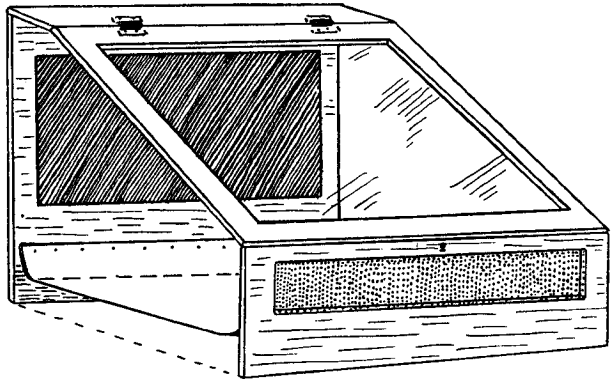

Fig 7. Glass-topped desk-type of vivarium

Size of a desk-type of vivarium is a matter of choice; but do not make it too small. I would suggest, as a good practical size, a side-to-side length of 24 in., a back-to-front depth of 15 in., a rear height of 18 in., and a front height of 6 in.

All woodwork is of plywood 3/5 in. thick. The sides and flat top are entirely of wood, but as shown in the diagram the greater part of the back is a wooden frame for a rectangular sheet of zinc gauze. The front is a similar, but less high, frame of plywood enlosing a narrow sheet of zinc gauze, while the sloping lid is a narrow wooden frame holding a

sheet of glass. The glass lid is hinged at the top so that it can be raised for feeding and handling the vivarium's occupants.

The false bottom of the vivarium is made from a sheet of zinc which, as shown in the diagram, is extended so that it can be turned up at the back and front to provide a lining. This prevents the damp soil, moss, or gravel used on the bottom of the vivarium from causing the wood to warp. Holes are cut in the floor to take a flower-pot and the dish for the pond.

Cost of the materials for a vivarium of the type described above should not be more than twenty shillings.

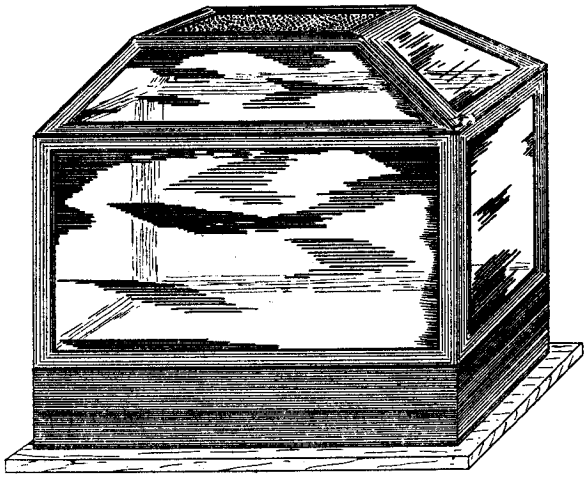

Fig 8. Wooden-framed glass vivarium

Rather more elaborate is the vivarium illustrated in Figs 8 and 9, which is 30 in. long by 15 in. deep from front to

rear, and 30 in. high. This is a particularly suitable vivarium for reptiles such as tree frogs, as it provides good height for these very active creatures when jumping.

As will be seen from Fig 9 the vivarium consists of three detachable parts: A, a zinc-lined trough, which forms the

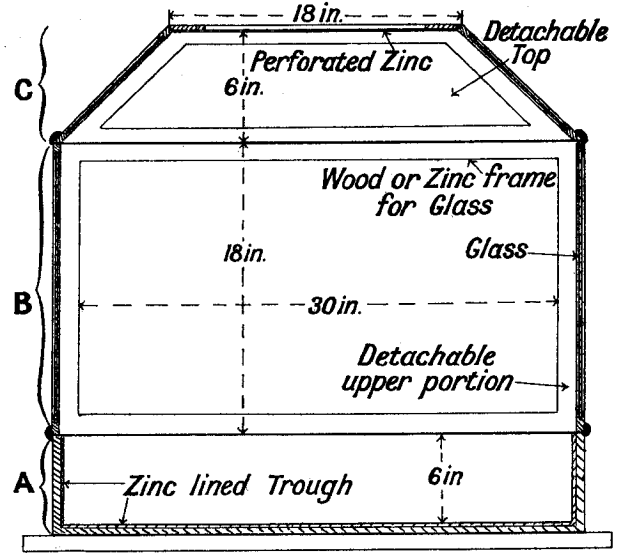

Fig 9. Section elevations of wooden-framed glass vivarium

base; B, a rectangular portion, which rests on the base; C, a sloping top which rests on B. With the exception of the trough, the vivarium has glass back, front and sides set in wood or zinc framing. Zinc probably lasts longer and is less liable to warp or rot from damp, but the metal is difficult to work

without some previous practice. It will be found easier to make the trough and framing from oak or other reasonably hard wood, and the result should last for many years.

The base consists of a trough made from 1-in. wood and measures 30 in. by 15 in. by 6 in. The corners can be either butted and screwed, dovetailed, or tongued and grooved. Dovetailing or tonguing and grooving makes the firmer joint, but requires expert carpentry. Screwed butt-joints will do quite well however; but be sure to use screws and not nails. The inside of the trough is lined on the bottom and sides with thin zinc sheeting and the corners soldered. Sufficient zinc is left along the top edges of the trough to turn over the sides. Half-round wood beading about 1½ in. deep is screwed along the turnover so that half projects above the trough to form a flange all the way round, into which the centre portion of the vivarium fits. Two holes are then drilled right through the bottom of the trough. These are for drainage and should be covered with zinc mesh to prevent gravel or earth from the floor of the vivarium from being washed through.

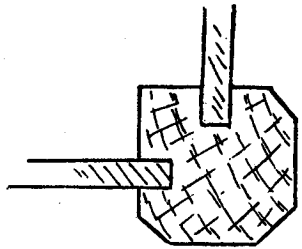

Fig 10. Corner posts grooved to take glass sides

Framing for the centre portion of the vivarium is made from 1-in.-sq. wood. The four corner posts are grooved for

their whole length to take the ¼-in. sheets of plate glass which form the back, front and sides. Fig 10 shows how the posts are grooved and fitted with glass. When the glass and corner posts have been assembled, stand the whole rectangular structure on a flat surface and with a set-square make certain that all corners are true. When you have satisfied yourself about this, join the tops of the four posts with 1-in.-sq. wood cut to suitable lengths and mitred to fit on the corner posts. Then screw them down. Next turn the whole assembly upside down and join the bottoms of the corner posts similarly.

Provided the glass and wood have been cut to the proper dimensions, the middle portion should now fit snugly into the flange of beading surrounding the top of the trough. A similar flange of 1-in. half-round beading is screwed along the top of the centre portion into which will fit the top or lid.

The detachable top or lid is also made from 1-in.-sq. wood grooved to take ¼-in. glass panels, but the ends of the corner pieces must be mitred so that the framing slopes upwards from the centre portion to leave an opening at the top 18 in. long and 6 in. deep from back to front. This opening is covered with a sheet of zinc gauze cut to the required size and held in position by four lengths of ½-in. half-round beading cut to size, mitred, and screwed through the gauze into the lid.

Sheets of transparent plastic such as perspex can be used instead of plate glass for the front, back and sides of the vivarium, and have the great advantage that the corner posts of the frames for the centre portion of the vivarium and its detachable top do not need to be grooved. Each of the two frames can be built as one piece and the perspex sheets drilled and screwed to their outsides. In that event the width and depth dimensions of each frame must be reduced by the thickness of the four perspex sheets so that the two upper assemblies will fit into their respective flanges of half-round beading.

The only disadvantage of perspex is that it scratches easily, and in time the scratches discolour.

For a really first-class vivarium, you cannot beat a metal-framed and glass-panelled tank built on the same lines as an aquarium, but not necessarily watertight; and it is often possible to purchase cheaply from junk shops metal and glass tanks which are useless as aquariums because they leak.

Aquarium tanks often have a wired-glass bottom, but when converting such a tank into a vivarium I would recommend removing the glass bottom and replacing it with a piece of 1-in.-thick slate cut to the required dimensions. Slate is quite easy to cut with a tenon saw, provided the cutting is done straight across the surface of the slate and not by holding the saw at an angle as you would when cutting wood. If the saw binds in the slate, a little oil will ease it.

It cannot be emphasized too strongly that a vivarium which is to accommodate tree frogs must be of a good height. One of the aquarium tanks I use as a vivarium is 24 in. wide, 10 in. deep from back to front, and 20 in. high. It accommodates comfortably three tree frogs, two green or Channel Island lizards, one common lizard, and two small terrapins. All live in complete harmony and have plenty of room.

Another of my converted aquarium tanks is 16 in. wide, 10 in. deep from front to rear, and 10 in. high. It houses a gecko lizard and two young common frogs. In a tank of similar size I have four adult common frogs. Common frogs are not particularly active and my quartet have all the room they need for their modest exercise.

If you buy an old aquarium you will generally find that the enamel on the framing has chipped to reveal the metal underneath. In that event the metal will be rusty and unless arrested the rust will spread below the remainder of the enamel and corrode the whole frame. The only satisfactory treatment is

to remove the glass panels (the bottom one has to be taken out anyway and replaced by slate), strip off the old enamel, thoroughly clean the metal frame, and repaint.

The glass panels are usually fixed to the frame by putty or cement which will have hardened. Careful manipulation with a chisel between the glass and the metal will, however, separate the panels from the frame. A certain amount of the old cement or putty will adhere to the edges of the glass but this can be removed by scraping with a penny laid flat on the surface of the glass. Do not try to scrape off the cement or putty with a chisel or knife as this may scratch the glass. It is essential that the panels are thoroughly cleaned if they are to make good contact when the new cement is applied.

When you have removed the glass from the frame, chip every bit of old enamel from the latter and then rub down with a file and wire brush to remove rust deposits. Next rub down thoroughly with fine emery paper (not glass paper) and oil. Finally, wipe the metal over with a cloth soaked in kerosene. While removing the old enamel and the rust, pay particular attention to angles. The frame is now ready for repainting.

Aquarium tank frames are usually made of either brass or iron. If, after removal of the old enamel and the cleaning of the frame, you find it is brass, give the inside and outside of the frame two coats of aluminium paint. The first coat must be allowed to dry out thoroughly before the second is applied. Follow this with a good flat paint as undercoat, and let it dry off properly before applying a final coat of the best oil paint. It is inadvisable to use enamels or synthetic lacquers as these are liable to chip easily and pieces may get into the vivarium pond, with results detrimental to the reptiles. Incidentally, a brass frame is less liable to corrosion than is one of iron. If the frame is of iron, the metal must be given a first

coat of red lead. This stops rust from developing and forcing its way through the top coat of paint.

Your vivarium is now ready for glazing. There are several proprietary ready-mixed cements suitable for a vivarium, but if you prefer to make your own cement, the following formula produces an excellent adhesive. Mix with gold size to a workable consistency two parts of white putty, one part of red lead, and one part of white lead. About 2½ lb of the mixture is enough to glaze a tank 24 in. by 12 in. by 12 in. The mixture must be kept clean, uniform in composition, and free of lumps, and it must be used soon after mixing.

With a putty knife spread the cement evenly along the frame angle to a thickness of about ¼ in., making certain that it is pressed well into the corners and that there are no pockets of air. The slate base is put in first and pressed evenly and firmly into the cement with the hands: excess cement that extrudes between slate and frame is trimmed off with the putty knife. Next place the front and back glass panels in position, and finally the ends. As the work proceeds, clean the glass with a soft rag and be sure that all the glass panels make firm and smooth contact with the cement. It is a good idea to stand the newly glazed tank on a firm, level surface and fill with water, having previously corked or otherwise closed the drainage holes you drilled in the slate base. Filling the tank with water exerts an even pressure over all the glass panels and the slate bottom and sets them into the cement much more firmly than if you used weights on the base and cross-struts of wood to press home the back, front and sides. The tank should remain filled with water for 24 hours, at the end of which period the pressure of the water will have squeezed more cement from between the panels and the metal frame. Trim the excess cement from the outside of the tank, empty the tank of water, and similarly trim the inside. Wash out and rinse.

The tank must be fitted with a lid to prevent the reptiles from escaping. The lid or top can be made on the lines of that used for the vivarium illustrated in Figs 8 and 9, according to the size of the tank. It will, however, be necessary to add a wooden ridge round the base of the top so that it fits over the tank like the lid of a box.

Alternatively, a lid can be made like that illustrated in

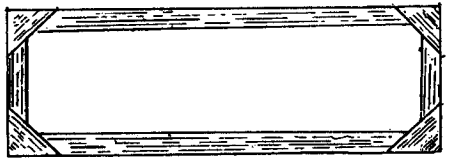

Fig 11. Plan of vivarium cover

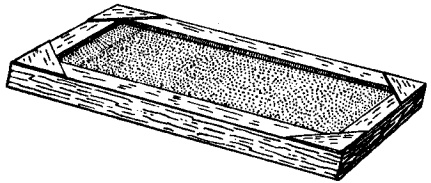

Fig 12. Elevation of vivarium cover

Figs 11 and 12. This is a very simple type of cover and very easy to construct, but it is extremely effective and is the kind I use for most of my vivarium tanks. A rectangular frame is made of 1-in. by ⅝-in. planed and prepared wood to the dimensions of the top of the tank as shown in Fig 11, the corners being butt-jointed. A piece of zinc gauze cut to the appropriate size is laid across the frame and secured to it by screws driven through strips of ½-in. by ¼-in. planed and pre-

pared wood. The screws pass through these strips into the frame. The strips of wood are mitre-jointed at the corners of the frame, and to make the lid rigid a triangle of plywood is screwed across each corner. The completed top is as in Fig 12 and fits over the tank like the lid of a box.

In their wild state most lizards and frogs spend much of their time climbing tree branches or sitting on rocks; consequently a vivarium must be laid out with plants and stones, and for the frogs particularly there must be a pool. Plants can be bedded directly into soil spread over the floor of the vivarium, or they can be planted in small pots which are hidden by a layer of aquarium gravel. I adopt the latter method as it enables the plants and other contents of the vivarium to be taken out for periodical cleaning of the tank.

If you decide to plant directly on the bottom of the vivarium, the slate base should be covered to a depth of 2 in. with a layer of pebbles, small stones, pieces of coke or coarse cinders. This forms the drainage system and over it is laid a sheet of zinc gauze cut to the size of the bottom of the vivarium. Alternatively a layer of coconut fibre or spagnum moss can be spread over the foundation. Plants are best bedded in a mixture of either equal parts of peat, leaf-mould, fibrous loam and sand, or two parts of peaty soil and one part of coconut fibre.

As already stated, I prefer to plant in pots, using one of the mixtures mentioned above. I use pots as wide as possible and from 3 to 4 in. high according to the type of plant. The pots are laid directly on the slate bottom of the vivarium with their drainage holes directly over the holes drilled through the slate. The vivarium stands on two blocks of wood so that a dish can be placed underneath to catch the water.

Having arranged the potted plants on the slate bottom, I cover the rest of the slate with fairly large pebbles and then

fill up with aquarium gravel to the tops of the pots. The gravel packs into all the crevices, much to the delight of lizards, who love to burrow into it.

Where, as with my reptile collection, frogs and lizards are kept in the same vivarium, it is a good idea to build up the 'ground' of the vivarium much higher at one end than at the other. This ensures that the upper level is always thoroughly dry for the lizards' benefit, while the lower level, which contains the pond, is generally damp enough to please the frogs. Pebbles and gravel at the upper level are prevented from sliding to the lower part of the vivarium by means of a slab of flat stone placed across the tank from front to rear and sloping downwards. In this way, lizards are able to move down to the pond when they wish and then return to their dry ground.

I use as ponds either large and wide soup plates or glass pie dishes resting on the slate bottom with their rims at the level of the gravel. Never use enamelled-metal plates or dishes for ponds: the enamel is liable to chip, so that the metal rusts and the water becomes more easily fouled. As my largest vivarium accommodates a couple of small terrapins, besides the frogs and lizards, it is necessary to have a large sloping pebble forming an island in the centre of the pond so that the terrapins can leave the water for basking. It is also necessary to build a small causeway from the island to the edge of the pond so that the terrapins can come 'ashore' and have the general run of the vivarium.

While on the subject of terrapins using a pond, be sure that the water is kept free of decomposing matter. Terrapins have an occasional ration of finely-shredded meat, but if any of this falls into the pond and remains there it will contaminate the water, with ill effects on the livestock. Always remove any bits of meat from the water a couple of hours after the terrapins have fed. Indeed, it is always a good idea regularly to take

out the pond, empty it, clean the dish, and refill with fresh water. I once lost two young terrapins through failing to carry out this precaution.

Plants suitable for a vivarium, whether grown in pots or in a layer of soil on the slate bottom, include spleenworts, hart's tongues, maidenhair, boss ferns, houseleek, saxifrages, London pride, stonecrops, myrtles, fuchsias and geraniums.

Plenty of large pebbles should be laid on the top surface of the upper and lower levels. Arrange two upright stones with another across them to form a roof, as both frogs and lizards like to retire into a shelter at times. Avoid stones containing a lot of lime, as some of the latter will eventually work its way into the water, and an excess of lime is bad for reptiles. Never be tempted to build shelters and 'landscape' decorations from cement; not only does cement contain a lot of lime, but the 'landscape' never looks natural.

If your vivarium is to house a chameleon, an additional piece of equipment is necessary. A chameleon seldom drinks from a pool, and in its natural state slakes its thirst by lapping dew from leaves. In a vivarium an artificial supply of dew can be provided through a glass tube connected to a container of water placed at a higher level than the free end of the tube. The free end of the tube is drawn to a fine point and through this water drips by gravity. The tube is so arranged that the water drips on to the leaves of a plant, while the reservoir can be concealed in the upper branches (Fig 13).

Where the vivarium is kept in a warm room during the winter, most frogs, lizards and similar reptiles survive the cold weather without any inclination to hibernate. Sometimes, however, it is not possible to keep the vivarium always in a warm room; in which event the vivarium must be heated.

One of the easiest and safest ways to heat a vivarium is to place on the slate bottom an inverted flower-pot large enough

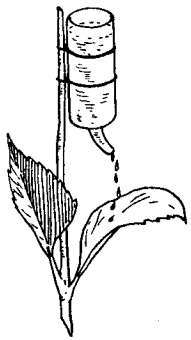

Fig 13. Dew-dispenser fixed to plant

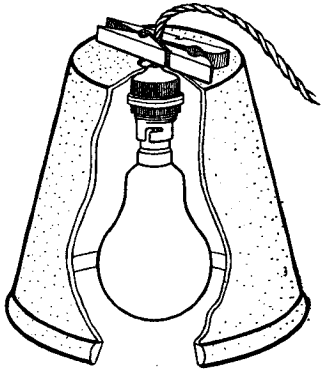

Fig 14. Vivarium heater made from flower-pot and electric lamp

to hold a 40-watt electric-light bulb. The bulb should rest on a short cylinder of thick cardboard to keep it from direct contact with the slate, and the flex supplying it with current is led through the drainage hole of the flower-pot. The flex goes to the mains through a hole drilled in the lid of the vivarium. Great care must be taken that all connections are adequately bound with insulating tape to prevent the reptiles from coming

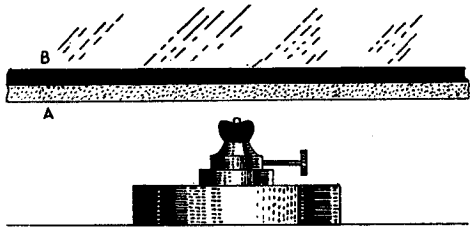

Fig 15. Heating a vivarium with an oil lamp

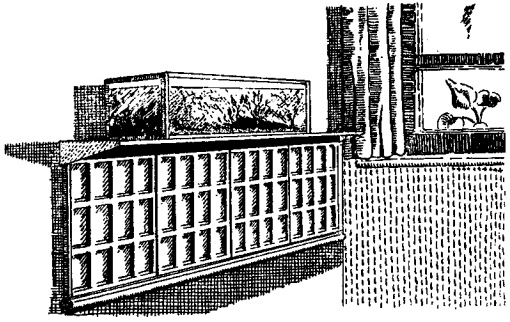

Fig 16. Use of radiator for heating a vivarium

into contact with a bare wire and electrocuting themselves. Fig 14 shows the principle of the flower-pot heater.

Where no electricity is available, the vivarium can be heated by a gas jet placed below it. Or by an oil lamp, as in Fig 15. Neither the gas nor the oil flame must come into contact with the slate bottom of the vivarium or it will raise the temperature too much, or even crack the slate. To obviate these dangers, a shield of metal, A, $\frac{1}{16}$ in. thick, is placed directly over the flame to protect the slate, B.

A vivarium can also be kept warm by placing it over a steam or hot-water radiator of the type used in central heating, as in Fig 16. The vivarium must not be placed directly over the radiator, but laid on a perforated or slatted shelf built over it.

Finally, care must be taken that a heated aquarium does not become too hot, and a small thermometer should be placed inside and its readings regularly noted. If the temperature rises above 75° F., the heat source should be switched or turned off. But do not let the temperature fall much below 60° before restoring the heat.

Chapter Four

LIZARDS

Because of their bright colours and quick, darting movements, lizards are particularly attractive reptiles in a vivarium and, with a few exceptions, require very little attention. Provided they are relatively the same size, several different species will live amicably together, while the smaller species most likely to be kept in a vivarium exist on good terms with frogs and small terrapins.

Lizards belong to the zoological family *Lacertilia*, of which there are about 2,500 known species. divided into 24 families, and ranging in size from the 10-ft giant monitor of Komodo Island, Indonesia, to the 6-in. common lizard we know.

With the exception of Arctic and Antarctic regions, lizards are found in all parts of the world, but the larger and more colourful species are native to the tropics. Their habits are almost as varied as their species: some live in trees; some burrow underground; others live on heaths; while others spend a good deal of their time in or about water; yet none are really aquatic. Some species of lizards are truly amazing creatures, such as the crested and spiney-tailed lizards; the flying dragons; the anolis, which climbs trees in search of insects and leaps from leaf to leaf like a tree frog; the Australian molock, which absorbs water through its rough spiny skin much as blotting paper soaks up ink; the horned toad, which looks like a toad, but is actually a lizard; and the slow-worm, which is a lizard and not a worm. There are nearly 80 species of legless lizards, most of them native to Trinidad or South America.

Yet of the thousands of different species of lizards only one, the gila, is poisonous. The gila, often and appropriately called 'Gila Monster', is also the ugliest of all lizards.

Lizards are just as surprising in their diet. The great majority are carnivorous, though a few are vegetarian. In general, however, lizards are exclusively insect- and animal-eaters and occasionally cannibals.

All lizards are produced from eggs, but in a very few species, notably the British slow-worm and the common lizard, the eggs are retained within the female until they hatch, when they are born as miniature editions of their parents.

Females of the oviparous, or egg-laying, species of lizards lay their eggs in a hollow in the ground and rely on the natural temperature to hatch them. Some eggs have a parchment-like cover instead of a shell, while others have hard, chalky shells like those of birds. The embryo in a hard-shelled egg has on the end of its nose or snout a short spine or spike which it uses to break out of the shell. Shortly afterwards the spike disappears.

Although not unlike snakes with legs, there is very little similarity between lizards and snakes. Lizards have eyelids, external openings to the ears, collar-bones and flattened tongues. Even the slow-worm and other legless lizards are quite different from snakes; they all have the rudiments of legs below the skin, and have the vestiges of shoulder and pelvic bones.

Most lizards slough or shed their outer skin several times a year. In some species it is shed piecemeal, coming away in flakes. In a few kinds of lizard the skin is shed in one piece, beginning at the head and working down to the tail. Very often in such examples the skin being sloughed is rolled down the body like a stocking. With some species the skin is eaten after shedding. Indications that a lizard is about to slough

are dullness of colour and prolonged soaking in water: the latter helps to loosen the old skin.

There is no satisfactory explanation for sloughing. One suggestion is that as a young lizard's skin grows more slowly than its body, the skin is periodically got rid of because it 'bursts at the seams'. But an adult lizard just as regularly sheds its skin.

Most lizards are without skin glands, so that the skin is quite dry and never slimy, although in many species it feels very smooth because of the highly-polished surface of the scales. The transparent outer skin, which is the one periodically sloughed, consists of dead horny cells which cover the active cells below it. This underlying skin is raised into separate thickenings and it is these thickenings which form the reptile's scales. On most parts of the body, the scales overlap like the tiles of a roof, but on a few other parts, notably the head, the scales form plates which meet at the edges.

Now we must consider individual species of lizards suitable for a vivarium. The following catalogue of lizards is necessarily highly selective as I have limited it to the smaller and more hardy types suitable for the average home vivarium.

Where it seems necessary I have indicated the diet most appropriate to each species of lizard listed. As most lizards eat live food some readers may be discouraged from keeping these interesting reptiles because they think it will be difficult to maintain a proper food supply all the year round. As the notes in Chapter Seven show, however, the provision of a regular lizard diet at all seasons is a comparatively simple matter. Personally, I have yet to lose a lizard or other reptile through lack of adequate live food.

COMMON LIZARD. Many a vivarium starts with the common lizard (Fig 17), which is not only an attractive little

reptile but is one of the few native to Great Britain. It is found in its wild state on heaths, downs, commons and dry pasture lands, on dry, sunny banks by the roadside and in railway cuttings. The male adult is about 6 in. long, and the female slightly longer. In both males and females the colour of the sides and back is light or dark brown with broken lines of spots in a deeper shade of brown. The underparts of the male

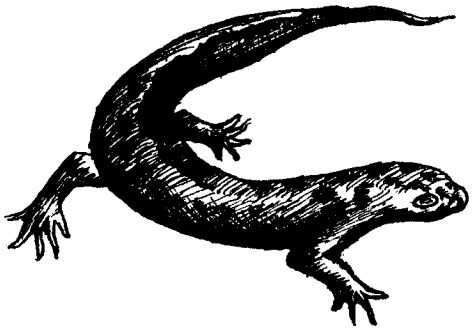

Fig 17. Common Lizard

are orange or red with black spots, while the female's underparts are orange, yellow, or pale green with or without spots. Food consists of insects, spiders and moths. The lizard is a swimmer and takes readily to the water; therefore a pond is essential in its vivarium. The common lizard is viviparous, the female producing from six to a dozen young at birth. The baby lizards are black at first and about 1 in. long. No nest is built for the litter and after they have been born their parents take no more interest in them. Young common lizards must be fed on fruit flies until they are strong enough to catch larger insects.

SAND LIZARD (Fig 18). This is another British lizard, occurring wild most commonly on the English South Coast. In shape and appearance it resembles the common lizard, but on a larger scale: I have seen specimens 9 in. long. There are two varieties of sand lizard: the green, found on grassland; and the brown, seen mostly on heaths and sandy ground. In both varieties the female exhibits a greyish tinge to the ground colour. With both sexes the underparts are a yellow-green marked with black. There are generally dark spots on the back, sometimes with a white dot in their centres. It should be noted that these colorations are only approximate, as the reptile varies greatly in its marking. The female sand lizard

Fig 18. Sand Lizard

lays a clutch of about twelve eggs in a hollow dug in the ground and leaves them to be hatched by the heat of the sun. Sand lizards thrive in a vivarium, provided it is large enough, and they are fed on flies, gentles, and other insects.

WALL LIZARD. Native to most parts of southern and central Europe, wall lizards are imported into Britain in large numbers every year and readily adapt themselves to vivarium life. Measuring 6 to 7 in. long, the wall lizard varies greatly in colour from specimen to specimen, but is usually greyish with black markings: in the breeding season the male's markings change to green. One very rare specimen is black above and blue below. Although hibernating during the coldest months of the year when wild, wall lizards remain healthy

and active throughout the winter when kept in an indoor vivarium at room temperature. Diet is the usual live food.

GREEN OR JERSEY LIZARD (Fig 19). This is the lizard most commonly sold by pet-shops. The green lizard needs plenty of space in captivity and seldom survives for long in a small vivarium. In my large vivarium described in Chapter Three, I have had a green lizard for over two years. Native to most Mediterranean countries, green lizards were introduced into the Channel Islands in the last century and have thrived particularly well in Jersey; hence their alternative name. When adult, the green lizard is about a foot long and grass green

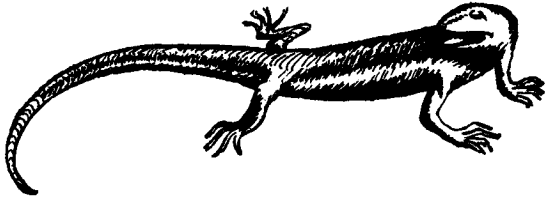

Fig 19. Green Lizard

above with lighter green underparts. The male has a blue throat. Diet consists of grasshoppers, earth-worms, mealworms, and slugs. The female lays eight to ten white eggs in midsummer, and these hatch in a month.

EYED OR OCELLATED LIZARD. Closely related to the green lizard, this reptile is larger and heavier. Its general colour is a dark green, with a row of blue, eye-like markings on the sides of the body. The eyed lizard grows to a length of about 24 in. and must be kept in a large vivarium. Besides the usual insect fare, it will eat mice, and, being not averse to other and smaller lizards, should not be kept in a mixed collection.

Failing other food, it will eat pieces of raw meat; an unusual taste. Native to south-west Europe and to Africa.

GECKO OR FAN-FOOT LIZARD. Although native to tropical and sub-tropical countries, the gecko (Fig 20) thrives in Britain when kept in a vivarium at room temperature. It is an amazingly adaptable creature in this respect: one of my specimens, which was imported, shows less inclination to

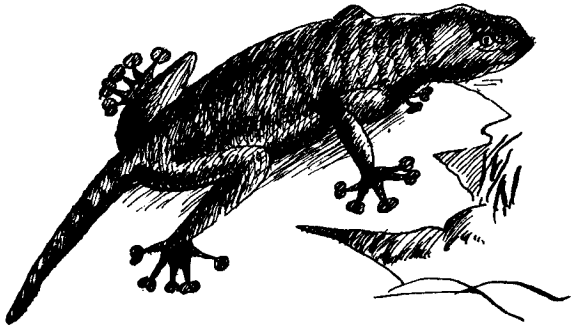

Fig 20. Gecko

hibernate than do my native common and wall lizards. Geckos are distinguished by their curious fingers and toes which terminate in sucker-like discs and enable them to climb up the glass sides of their vivarium and even run along the 'ceiling'. In fact geckos in a vivarium invariably sleep on the underside of the lid. They are somewhat inactive during the day, spending much of their time clinging motionless to a branch or to the wall of the vivarium, but at night they industriously hunt for their favourite diet of flies, mealworms, spiders, beetles and moths. Although inclined to quarrel

amongst themselves, geckos live amicably in a vivarium with other species of lizards of their own size. They have an adult length of about 7 in. and in colour vary from green to reddish brown. Their jaws are rather like those of a crocodile and they have enormous goggle eyes. Great care must be taken that a gecko does not escape from a vivarium as they move exceptionally fast and are almost impossible to catch. The female lays a single egg covered with a hard, chalky shell. When the egg hatches the young gecko must immediately be moved to a small vivarium on its own as the parents have no hesitation in eating it. Geckos seldom breed in a vivarium, but will do so if given the run of a heated conservatory or greenhouse.

ZONURES OR ARMOURED LIZARDS. Despite their formidable appearance, zonures, of which there are a number of species, make excellent pets. One of those most offered for sale in Britain is the armadillo girdled zonure, which is greenish brown in colour and has an adult length of 15 in. It is native to South Africa. Like all zonures it is characterized by a multiplicity of sharp horny spines, completely covering the body and tail, which would make it impossible to grasp the lizard against its will. The creature soon becomes tame, however, and grows to like being handled. It is an exceptionally intelligent lizard and makes an excellent pet, but it very rarely breeds in captivity. Zonures are not at all fussy about their diet, and besides feeding on mealworms and the usual insects, will eat scraps of raw beef and banana and other fruits. As they are sub-tropical reptiles, zonures are best kept in a heated vivarium in winter.

STUMP-TAILED SKINK. Native to Australia, this lizard makes an excellent pet despite its somewhat ugly appearance. It takes kindly to captivity, has a good life-span, is hardly ever

known to bite, is exceptionally gentle, and never attempts to wriggle when lifted. In time it becomes so tame it eats from your fingers. It is a heavily-built creature, about 1 ft long and has a short, stumpy tail. The back is dark brown with yellow spots or cross-bands, and the underparts yellow with brown spots. The upper part of the body and the tail are covered with large, wrinkled scales, so that the creature looks like an animated pine-cone when it moves. It eats grubs, insects, raw meat and fruit. Stump-tailed skinks should be kept in a large vivarium with a good depth of sand as they are inveterate burrowers. It is advisable to have the vivarium heated in winter. The reptile is viviparous and, unlike so many tropical lizards, occasionally breeds in a vivarium.

HORNED TOAD. This is one of nature's jokes on the lizard world, for anything less lizard-like than the horned toad is difficult to imagine. Broad and squat and with a short tail, it is covered with spines and has two projections on the back of the head for all the world like horns. Adults are about 6 in. long and have a unique colour scheme. Down the centre of the back is a yellow crescent. On top of the head are three dark bands, while on each side of the neck is a large black blotch. The underparts are yellow with dark spots. Despite its somewhat alarming appearance, the horned toad, which is native to the hot parts of Arizona and Texas, is one of the most harmless of lizards and makes an excellent pet. In its wild state it is an industrious burrower in sand; consequently it should be kept in a warm vivarium with a floor covered with about 6 in. of sand. It is best kept alone or with one of its own kind. The horned toad feeds on ants, grubs, caterpillars and mealworms, but it will not eat earth-worms. In nature it drinks by lapping dew or raindrops off leaves, so that its vivarium must have a dew-dispenser.

CRESTED ANOLIS. This attractive lizard is native to parts of South America and some islands of the West Indies. It is about 9 in. long and is a dark blue in colour with a black spot on each flank. It derives its name of 'crested' from a series of long scales running from the back of the neck to the root of the tail, which form a kind of toothed crest. A similar crest, rather like a fish's fin, extends about half-way down the tail. The last joint but one of each of the toes has a pad covered with cross-ridges like the tread of a tyre, enabling the creature to run up perpendicular surfaces. In its wild state, the crested anolis lives near streams and lakes, and consequently it must have a large pond in the vivarium. When the lizard is frightened or angry it inflates a sac in its throat to an enormous size, and while doing so, changes colour like a chameleon. Although naturally very timid, the anolis soon becomes tame in captivity and makes an excellent pet. It feeds on the usual live insect diet. In winter its vivarium may need heating.

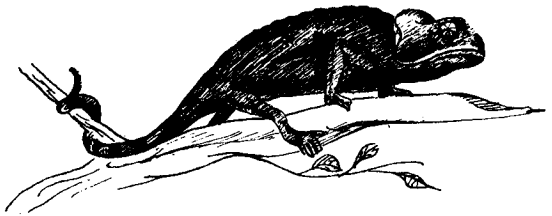

Fig 21. Chameleon

CHAMELEON (Fig 21). Because of its curious ability to change colour to suit its surroundings, this is probably the most interesting of all the lizard tribe. Chameleons are native to Africa, Southern India, Ceylon, Arabia and Madagascar.

Their most striking feature is their large goggling eyeballs, which are covered by skin except for a small opening in the centre. The eyes can be slewed around independently of each other so that the creature is able to focus its sight in two different directions at the same time. The chameleon's toes are arranged on opposite sides of each foot, enabling this fantastic lizard to grasp as we do with fingers and thumbs. No less curious is its tongue, the bulbous end of which is covered with a sticky kind of saliva. To see a chameleon stalk and capture a fly is an extraordinary demonstration of slow motion and lightning speed. After the chameleon has spent perhaps an hour completely motionless on a twig, an unsuspecting fly may settle on a neighbouring leaf. The only sign given by the lizard that the prey has been observed is a squinting movement of the eye nearest the fly. Then moving with extreme care and deliberation, the lizard releases the grip of its forefeet on the twig and rises until it is supported tripod-fashion on its hind legs and tail. Whereupon it focuses the fly with both eyes, the mouth slowly opens, the long tongue flashes out; often to a distance of 8 in. Just what happens next cannot be followed by the unaided human eye. All that can be detected is a striking tongue and the chameleon thoughtfully masticating its prize.

Although there are about fifty species of chameleon known to zoologists, only two, the common chameleon from North Africa and Southern Spain, and the pygmy chameleon from South Africa, are hardy enough to keep in vivariums in Britain. Of these two the pygmy is the more interesting. It has an adult length of about 6 in. and in its natural state is bright green in colour, but in captivity this usually fades to a greyish yellow. The female pygmy chameleon produces its young alive, being the only one of the fifty species to do so. Females give birth to several litters at fairly long intervals after fertilization, so

that it is not uncommon for a female that is living alone in a vivarium to have an unexpected family long after she has been purchased.

Despite travellers' tales to the contrary, the range of colour changes of which the chameleon is capable is not nearly so great as is generally supposed. The creature's basic colour is green, and its colour changes are in general limited to various shades of violet and yellow-blue, all of which are derived from green. Because of the curious shape of the head and neck, the chameleon finds it difficult, and sometimes impossible, to drink from pools; therefore their vivarium must have an artificial dew-dispenser. Chameleons are amongst the very few lizards unable to swim and if they fall into water more than a couple of inches deep they will drown.

Food consists of live insects, which must be flying ones, such as butterflies and moths, and in captivity they can be persuaded to eat cockroaches and house flies. They will not touch any kind of worm or grub. Aphis or fruit flies provide the only food accepted by baby chameleons. Provided its vivarium is kept in a warm place at night—beside the kitchen boiler or in a bathroom airing cupboard are ideal spots—a chameleon will live comfortably through the winter. As a chameleon loves sunshine, it is a good idea to fix above the vivarium an electric lamp which can be switched on for a couple of hours on dull days. Chameleons are rather unintelligent and very slow-moving lizards, while they dislike intensely being handled. But they justify their place in a vivarium because of their curious appearance and habits.

Legless Lizards. As stated earlier, there are a number of legless lizards which look like snakes, although anatomically they are definitely lizards and even have the vestiges of legs below the skin. Although much slower in movement than the

average lizard and generally rather unexciting as pets, they justify keeping if only because they are not what they seem.

SLOW-WORM. Best known of the legless lizards is the slow-worm or, as it is often called, the blind-worm (Fig 22). The name 'blind-worm' has nothing to do with lack of sight in the reptile; in fact it is far from being blind and has bright and quick eyes which have movable eyelids; nor has the term

Fig 22. Blind-worm

'slow' anything to do with speed, but is, in fact, a corruption of Anglo-Saxon *slean* meaning to strike, and was given to it because the lizard was thought to be a venomous snake which struck out at human beings.

Native to England, the slow-worm is found on heaths, in woods, and along hedgerows, and when adult is about 1 ft long. It is a shiny copper colour, and moves about with a slow, gliding motion. Slow-worms not only take kindly to captivity but, unlike most reptiles, they breed readily in a vivarium and are long-lived. Adult slow-worms feed on worms, slugs, and various insects, and in summer can be given the run of a garden, which they will soon rid of pests. In

winter they should be kept in a vivarium indoors. The female is viviparous and bears her young in June and July, and the infants, which must be separated from the parents, should be fed on young slugs, chopped worms, and small insects. When picking up an adult slow-worm, never take hold of it by the tail as that appendage is very brittle and easily breaks off. Always lift a slow-worm by grasping it just behind the head, and never try to straighten it if it coils round your hand: keep still and it soon unwinds itself.

GLASS SNAKE. This is another legless lizard and is native to eastern and southern Europe. It has a metallic brown body with a fawn head, and derives the name 'glass' from its glazed appearance and the ease with which its brittle tail breaks off. An adult glass snake is about 3 ft long. It eats snails and mice. Glass snakes are docile and friendly creatures in captivity and can be trusted to live amicably in a vivarium with eyed and other lizards of similar size. Like the slow-worm it can be kept in a garden to earn its keep in devouring slugs and similar pests. It will hibernate out of doors quite successfully, but if kept in a vivarium indoors will remain active throughout the winter.

Chapter Five

FROGS AND TOADS

Frogs and toads are not reptiles but are zoologically classed as amphibia; nevertheless, they are included in this book because they can be kept in a vivarium in company with reptiles proper. Moreover, frogs and toads are biologically the most fascinating of all creatures in a vivarium.

There are two main differences between reptiles and amphibians. The former are hatched from eggs or born alive as

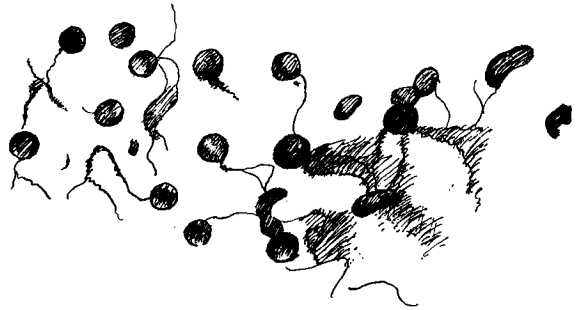

Fig 23. Frog Spawn

miniature replicas of their parents; whereas amphibians undergo drastic changes in shape and nature, called metamorphosis, before becoming adult. Amphibians begin as soft, jelly-like eggs which hatch into the larval forms popularly called tadpoles: these creatures then spend some time in the water breathing like fish through gills; next they grow legs, and only then are land-living creatures. Another difference between

reptiles and amphibians is that the latter have naked, damp skins and, with few exceptions, no claws on their toes.

In Britain frog spawn (Fig 23) is deposited by the females in ponds and ditches between early March and early April, according to the warmth of the season. The eggs are laid on the bottom of the pond or ditch and, after fertilizing by the male, rise to the surface. Toads spawn somewhat later, usually between the end of March and the end of May. Frog spawn is laid in huge floating masses, one female laying as many as 2,000 eggs. On the other hand, the female toad deposits her spawn in double strings of jelly, up to 12 ft long, which entwines itself amongst water-weeds; between 2,000 and 7,000 eggs are laid at a sitting. Toad spawn is poisonous to nearly all animals, which would feed on it. But despite this provision by nature, a vast number of eggs have to be produced to compensate for the enormous mortality that occurs.

Although neither frogs nor toads will breed in the confinement of a vivarium, it is not particularly difficult to raise them from the tadpole stage. Newly-laid frog spawn collected from a pond and brought into the warmth of a room will hatch into tadpoles in nine or ten days; if kept under very warm conditions, the spawn will hatch in less than a week. The spawn should be placed in a large goldfish bowl filled with water from the pond and containing a few plants and some sludge obtained from the same source.

When the tadpoles appear, do not make the mistake of trying to rear them all. Overcrowding is responsible more than anything else for tadpoles dying long before they have time to develop into frogs or toads. Tadpoles become voracious cannibals if food is short and many are lost in this way through overcrowding. A couple of days after they hatch, select about half a dozen to stay in the bowl and return the others to the nearest pond. It is far better to be reasonably

certain of rearing half a dozen tadpoles to froghood than to gamble on the unlikely chance of raising fifty.

The life of a tadpole can be divided into three stages: before it begins to feed; its period of growth; and its development of frog-like attributes. (See Fig 24.)

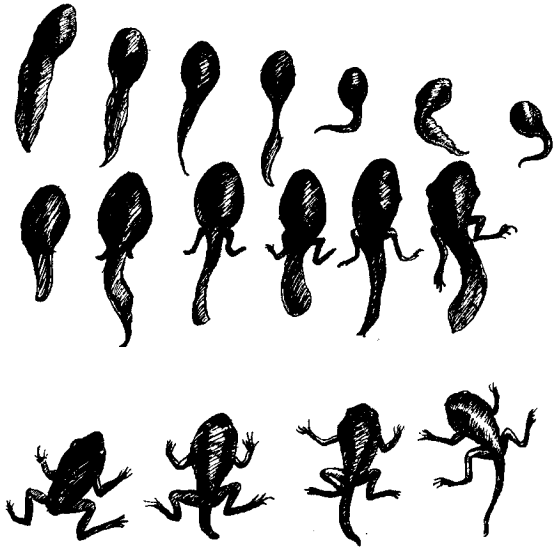

Fig 24. Development of Frog from Tadpole

Upon first wriggling from the egg, the tadpole appears to be quite inanimate and is a very primitive form of life indeed. Its head is distinct from the body; there is only the merest suggestion of a tail. On the under-surface of the head there is a minute groove which indicates where the mouth will eventually appear. Below the mouth groove is a tiny fold of

skin, called the adherer, which secretes a sticky substance enabling the young tadpole to anchor itself to a piece of weed. There the tadpole remains stuck for a few days with no movement beyond an occasional wriggle. Nevertheless, its shape is changing surprisingly fast: the tail becomes longer and more muscular; gills appear; and soon the eyes can be detected.

The second stage begins wih the tadpole starting to feed. By now the distinction between the head and body has disappeared; and the adhesive organ and the gills have gone. Breathing is now internal, water containing the oxygen passing in through the mouth and out by the spiracle, an opening on the left side.

During this stage of its growth, the tadpole's mouth is surrounded by funnel-shaped tips concealing microscopic horny teeth. Despite their minute size, the tadpole's teeth can tackle surprisingly tough food. Although second-stage tadpoles derive considerable nourishment from living matter in the sludge at the bottom of their bowl, they will nibble at anything eatable within their reach. This is fortunate because the pond mud you put in their bowl is not so rich in food as is the bed of a pond or ditch.

Tadpoles are not particularly choosy about their food in captivity, but they thrive extremely well on daphnia or water fleas which, as explained in Chapter Seven, are not difficult to breed. Tadpoles also relish boiled wheat, bits of banana skin, and small shreds of meat. Remember, however, to remove uneaten dead food from the bowl every day, otherwise its decomposition will contaminate the water and poison the tadpoles. When I first tried to raise tadpoles as a boy, I lost the population of a whole bowl through failing to remove a piece of decomposed meat. It is a good idea to suspend meat and other dead food in the water from a piece of thread, so that you know where it is and can remove it easily.

It is during the tadpole's second stage that examination through a magnifying glass will enable you to distinguish between the tadpoles of frogs and toads. In the frog tadpole the spiracle is directed obliquely upwards and backwards, while the toad tadpole has the spiracle directed backwards only. Another distinction between the two is that the toad's nostrils are placed near the eyes, whereas the frog tadpole has its nostrils midway between the eyes and the tip of the nose.

Indication that the tadpole has reached the third stage of development is when the hind legs appear as buds at the base of the tail. The hind legs thereafter grow considerably before the forelimbs or arms become visible. Actually, however, the arms are developing at the same time as the hind legs, but for some time they remain hidden beneath the skin and so do not burst through until ten days or so after the appearance of the hind legs.

Shortly after the forelimbs appear, the tadpole's tail begins to shorten, while at the same time the tadpole's internal organs are undergoing a drastic change to adapt it to the terrestrial life it is about to embark upon. Thereafter the metamorphosis proceeds rapidly, and quite suddenly you discover that the creature is no longer a tadpole but has become a tiny frog or toad with only a vestige of its tail. Within a day or so the last trace of tail has gone, and the tadpole has become a frog or toad which for the rest of its life will exist on land. The whole development from egg to frog takes about three months.

When your tadpoles enter their third and final stage, it is a good idea to transfer them to a deep but flat glass dish half-filled with water and having an island of flat stone in the centre. The stone should be of such a shape that as the amphibian's limbs develop, it can climb on to it. In fact, the easier it is for the developing creature to venture ashore, the

sooner will it develop into a frog or toad. Do not forget to cover the dish with a properly fitting piece of zinc gauze otherwise you may discover one morning that your froglets have managed to hop out during the night and disappear. Covering the dish is particularly important if your tadpoles are those of tree frogs, as these amphibians have suckers on their fingers and toes which enable them to climb up glass or any other smooth surface.

Immediately the frogs or toads have completed their transformation from tadpoles, remove them to a vivarium made on the lines of those described in Chapter Three. Remember, however, that frogs like much more damp conditions than do lizards, so if you are going to keep frogs and lizards together the vivarium should have a dry and a damp level as explained on page 43. Bear in mind, too, that any lizards sharing the vivarium should not be big enough to make a meal of the young frogs. Never house frogs with slow-worms and glass snakes.

For my own part, I always keep frogs out of a communal vivarium until they are a year old, unless the lizards are themselves not fully grown. Provided they grow up together it is, however, surprising the assortment of frogs and lizards that will live together in complete harmony.

Both frogs and toads can, of course, be kept in a greenhouse or a conservatory, where they will earn their keep destroying insect pests on plants and flowers. But they are apt to wander off, particularly at the spawning season, when they will make for the nearest pond or ditch. A serious disadvantage is that they are liable to be stepped on, especially in winter when they are at their least active.

In their natural state frogs and toads hibernate in the winter, but this they seldom do if kept in an indoor vivarium. None of those I keep hibernate. The only difference the cold weather

makes to them is that they are less lively than in summer and eat less.

Apart from those imported direct from the tropics, frogs do not tolerate excessive heat. Most of them prefer moist and shade and become miserable in parched conditions; some species will die after only a couple of hours in a dry, warm place. Therefore never place a vivarium where it is directly in the rays of the sun. The floor of a vivarium containing frogs is best covered with aquarium gravel and not sand, as recommended in Chapter Three for certain of the tropical lizards.

There are some 200 species of frog, but only a few are described in the following list, which is deliberately limited to species suited to living in a vivarium which does not have elaborate fittings and specialized equipment. The list also excludes frogs which must have food difficult to obtain all the year round.

Fig 25. Common Frog

COMMON FROG (Fig 25). Native to all parts of Britain, the common frog runs wild in so many gardens that there is little point in keeping it in a vivarium unless you want to

observe its habits all the year round. The common frog should, however, be encouraged to live in a garden, where it will earn its keep by voraciously eating vast quantities of insect pests, slugs and worms. About 3 in. long, the frog is variable in colour, the most usual being brown, yellow or olive, with dark cross-bands on arms and legs. I have raised many common frogs from tadpoles and kept them in a vivarium until they were a year old, when I liberated them in the garden. Given a patch of long grass in a shady corner and a pool of water, common frogs are quite contented. They hibernate from October until early spring, usually at the bottom of their pond, but sometimes under the surrounding ground.

EDIBLE FROG. The largest and most colourful of all European frogs, the edible frog is so called because it is the one used for culinary purposes in France. Native to nearly all parts of the continent, the edible frog is in England restricted to a few parts of Cambridge, Norfolk and Surrey. The male is about 3 in. long and the female 1 in. longer. Main body colour is either brown, bronze or grass green with black spots, and yellow stripes down the back. The underparts are cream with brown dots. As the edible frog is an unadventurous creature and seldom travels far from its pond, it lives quite contentedly in a vivarium. It is unwise to confine young and adult edible frogs together because of the latter's propensity for cannibalism. Food consists of the usual live fare.

PAINTED FROG (Fig 26). Native to North Africa, Portugal and Southern Spain, the painted frog is slightly smaller than the common frog and is a most attractive addition to a vivarium. The body is usually olive-brown with darker blotches and spots. The legs are barred with dark stripes and the top of the head has a dark patch. Chief distinction between the

sexes is that the male's toes are webbed and the female's are not. Painted frogs eat gentles, flies, moths and small slugs, and unlike most frogs do not catch their prey with the tongue, but make a sideways snatch with the mouth. Unlike the males of other species, the painted frog is virtually a non-croaker as it has no vocal sacs.

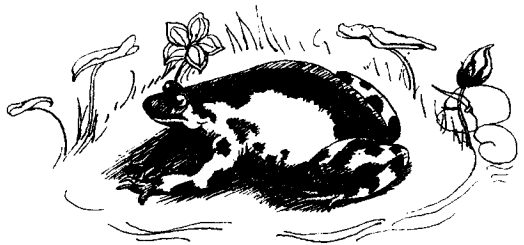

Fig 26. Painted Frog

LEOPARD FROG. Although native to the desert regions of North America, the leopard frog does exceptionally well in vivariums in this country. Its length varies between 2½ and 3 in. Coloration varies considerably, the most common body colour being grey, green or light-brown with rows of dark-brown spots on the back and sides. The underparts are white. Food consists of worms, grasshoppers, beetles and mealworms. The leopard frog must be kept in a large vivarium as it is an active creature and can jump to a distance of 6 ft. The male has the habit of emitting a pleasant musical note when picked up by hand.

TREE FROG (Fig 27). Tree frogs are the most attractive of all frogs in a vivarium and have the advantage of being easy to feed and to maintain. Provided you give them a regular

supply of flies and keep the vivarium pond filled with water, tree frogs are perfectly contented. Their vivarium should have plenty of branches for them to jump about on or cling to. Tree frogs are remarkable for the adhesive pads on their fingers and toes which enable them to climb smooth, vertical surfaces. Indeed, tree frogs in a vivarium spend hours at a time clinging to the smooth glass sides.

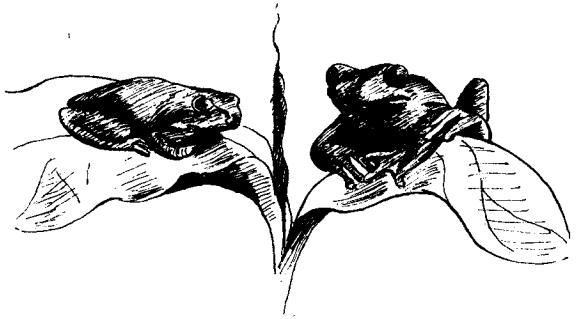

Fig 27. Tree Frogs

There are several species of tree frog, the most common being the European green tree frog, which has an adult length of about 2 in. The main body colour is bright green and the underparts pale yellow. A narrow black stripe begins at the mouth and extends along both sides of the body to the groin, giving the frog the appearance of being about to burst out of its clothing. The green body colour shows some change according to the weather, being brightest in sunshine and dull when the sky is overcast. The shade of green also varies with that of the leaves upon which it happens to be resting.

Weather has a considerable effect on tree frogs' positions

in a vivarium. When the weather is fine, the frogs usually sit on the highest branches, but if rain is threatened they move lower down, and when it is raining they often crouch on the bottom of the vivarium. For this reason tree frogs are sometimes kept on the continent as weather prophets. They are housed in narrow jars furnished with little ladders, the idea being that they occupy higher or lower rungs of the ladders according to the rise or fall of the barometer. Whether or not they are reliable weather prophets, tree frogs are natural comedians and perform the most extraordinary acrobatic feats when in pursuit of flies.

There is an exceptionally rare species of European tree frog in which the green colour is replaced by blue. Specimens of this unique colour cost between £20 and £30, instead of the usual two or three shillings for a green tree frog.

White's tree frog, which is native to Australia, is larger than the European species, being about 3 in. long. It has a bright green skin spotted with white. The skin has a most attractive gloss like that of china. The American tree frog is about the same size as the White's species but has a warty skin so that it is often called the tree toad. Its normal colour is either brown or pale grey, but it possesses to a marked degree the property of adapting its colour to its surroundings and can quickly pass from white through all shades of brown to nearly chocolate.

Largest of all tree frogs, the Blacksmith tree frog is native to Brazil and adult specimens measure from 4 to 5 in. Blacksmith tree frogs are so called from the metallic drumming note of their croak. Their colour varies from green to brown. Despite their larger size, blacksmith tree frogs adhere to leaves and to the glass sides of their vivarium just as easily as do their smaller relatives. Like all tree frogs, their chief food is flies and other winged insects.

AMERICAN BULLFROG (Fig 28). This enormous frog, which when adult is nearly as big as a guinea-pig, definitely cannot be kept in a vivarium and must be given the run of a large conservatory or greenhouse. As it is a powerful swimmer, its quarters must contain a large pond. It has an enormous appetite for worms, fish, and large slugs: and the provision of an adequate supply of these throughout the year is apt to become an almost insoluble problem. Another factor discouraging its being kept by householders is its penetrating croak or, rather, roar, which can be heard at a distance of a mile and is apt to cause trouble with neighbours. The American bullfrog's body is brown or green in colour mottled in darker shades, the underparts are greyish white, and the legs brown or green spotted or barred with darker brown or green.

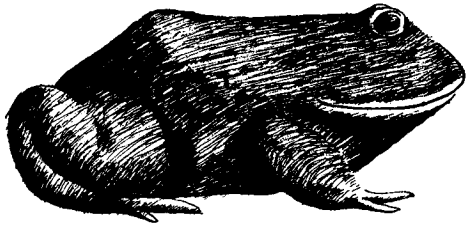

Fig 28. American Bullfrog

Toads. Apart from the difference in their spawn and at a certain stage of their existence as tadpoles, the dividing line between toads and frogs is not easy to define. Broadly speaking, however, it can be stated that toads are merely heavily-built frogs, walk rather than hop, are more sluggish than frogs, are more resistant to dry conditions, and have drier skins. They make excellent liberty pets in a garden, which

they keep clear of slugs and other pests, and are in general more intelligent than frogs, soon learning to recognize their owner and coming to him at regular times for food. Most toads do equally well in a vivarium.

COMMON TOAD (Fig 29). The common toad is native to Britain and is at its best when living on a moist, shady rockery and allowed complete freedom. It will find its own food in the garden, and has no inclination to wander until the spawning season when it goes in search of water; if there is a reasonably-sized pond in the garden a pair of toads will spawn there. The adult male common toad is about 3 in. long, and the female 1 to 1½ in. longer. Colour varies from almost black through dark brown to greyish green, with darker mottlings and lighter underparts.

Fig 29. Common Toad

NATTERJACK (Fig 30). This is the only other toad native to Britain but it is comparatively rare and found only in sandy, well drained situations. The body is olive-green and yellow, with a line of brighter yellow down the centre of the back. The underparts are white with black spots, and the male has a blue throat. The adult length is about 3 in. Natterjacks

make excellent inhabitants for a vivarium, but they are generally inactive except at night. They derive their name from the male's croak, which resembles the call of the nightjar. A striking characteristic of the natterjack is that it runs instead of hops. When kept in a vivarium it should have a supply of loose mould as it likes to make its own burrow. Its chief diet is mealworms and other moving insects.

Fig 30. Natterjack Toad

FIRE TOAD. This is one of the most attractive toads and probably that which does best in a vivarium. It seldom exceeds 2 in. long when adult. The top of the body is dark olive with the underparts mottled in black and vermilion. When threatened by a danger, the fire toad raises itself to display vermilion markings, hence its name. Unfortunately the creature stops this habit after a short time in a vivarium has tamed it. The skin of the fire toad secretes a substance of such obnoxious taste that no other animal will attempt to eat it, so that the toad can safely share a vivarium with amphibians and reptiles many times bigger then itself. Unlike most of the toad

tribe, a pair of fire toads will sometimes breed in vivarium conditions. Native to northern and central Europe, fire toads do not fully hibernate in winter when wild, but merely shelter under stones when the weather is frosty; hence they do quite well in an unheated vivarium. They must, however, have a deep pond as they are strong swimmers, besides liking to spend a lot of their time floating in the water with only nose and eyes above its surface. They are much more active than the general run of toads and jump about a great deal. Fire toads eat grubs and nearly all kinds of live insects.

HORNED TOAD. This fantastically ugly toad from Brazil is a real prize for any vivarium enthusiast because of its rarity. The adult is 6 in. long and is a brilliant green with chocolate patches. The head is absurdly large for the body and above the eyes are horn-like 'eyebrows'; hence the toad's name. It has an enormous mouth and formidable teeth so that it can dispose of a mouse at one gulp. In fact, mice are their chief food in captivity. Horned toads have the curious habit of distending their bodies with air to twice their normal size when annoyed and then deflating themselves with a wailing sound.

GREEN TOAD. This toad is native to most countries bordering on the Mediterranean and is a particularly attractive member of the amphibia tribe. The adult is about 2½ in. long. The upper part of the body is a bright green with brown patches, and the underparts are silvery grey. Having long hind legs for a toad, it hops rather than crawls or runs. It quickly acclimatizes itself to the British climate and winters without hibernating in a vivarium. Green toads will seldom eat worms, but have an enormous appetite for live insects.

CLAWED TOAD (Fig 31). Native to South Africa, the clawed toad is unusual in being entirely aquatic and never needing to come out on to dry land. It is, therefore, best kept in a tank of water rather than in a vivarium. It spends its time swimming and floating just below the surface with its nostrils above water. The hind legs are webbed, but the fingers of the forelimbs terminate in claws; hence its name. It thrives in captivity on worms and scraps of raw meat. The tank does not need to be artificially heated.

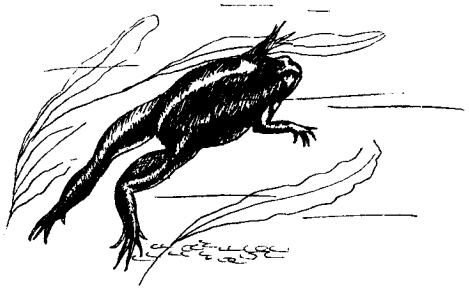

Fig 31. Clawed Toad

MIDWIFE TOAD. This is probably the most interesting of all toads because the male has charge of the eggs until they hatch into tadpoles. Native to most parts of continental Europe, the midwife toad is about 1½ in. long when adult and has a light-olive coloured body spotted with black, and white underparts. The female lays the eggs in a bead-like string, and immediately afterwards the male twines them round his hind legs. Thereafter he carries them about with him, occasionally moistening them in a pond, until they hatch three weeks later. Like most toads and frogs, the midwife does not

breed in captivity, but in spring and early summer it is sometimes possible to buy male specimens complete with their strings of eggs, which with an element of good fortune you may be able to hatch in a vivarium that has a large pond. Midwife toads thrive on the usual fare of flies, gentles, mealworms, spiders and smooth caterpillars.

Chapter Six

NEWTS AND SALAMANDERS

Like frogs and toads, newts and salamanders are amphibians, but they spend less time on land. For this reason newts and salamanders are best kept in a fairly large aquarium tank: one measuring 24 in. long by 12 in. from back to front by 14 in. deep is an ideal size for two or three newts or salamanders. The bottom of the tank should be covered with a layer of sand and gravel to a depth of about 2 in. and in this should be set three or four pots of rooted aquarium plants, particularly those of the fern varieties.

The tank is then filled with water to a depth of 6 or 7 in. At one end of the tank an island giving an area of about 6 in. by 12 in. is built up from gravel and fairly large pebbles. A flat slab of stone the height and width of the island and with its bottom edge set in the bed of the pond will prevent the stones and gravel from falling into the water. The edge of the island must slope gradually to the water so that the occupants of the tank are able to come ashore without difficulty. The surface of the island is planted as recommended for a vivarium in Chapter Three, and between the plants patches of moss are laid. There must also be one or two shelters of flat stones.

Again like frogs and toads, newts begin as eggs, but they are deposited singly on the leaves of water plants, the edges of which are folded over them. According to species or temperature conditions, the eggs hatch out in one to three weeks.

Newt tadpoles are not at all like those of frogs and toads, being very slender and very transparent. Soon after hatching, the tadpoles grow from each side of the upper jaw two thread-

like tentacles terminating in minute suckers with which they attach themselves to the water plants. While thus anchored they remain practically motionless in a slanting position. The tadpoles breathe by means of external gills which can be detected as small tufts on the neck.

In due course the front limbs appear, which is the reverse of what happens with frog and toad tadpoles, which grow their hind legs first. A few weeks later the newt tadpole develops its hind legs and, unlike the tadpoles of frogs and toads, retains its tail, which remains part of it throughout its adult life. By the time its four limbs have developed, the newt loses its gills and thereafter breathes air by means of lungs. The tadpole is now a fully-developed newt, rather like a fat lizard with a heavy tail, and makes its first venture ashore.

Newts lay their eggs in the spring and the developed amphibian is ready to leave the water in the autumn. Dependent upon climate conditions, the tadpole stage may be prolonged and continue into cold weather, in which event the tadpoles may actually hibernate.

In their natural state, adult newts always hibernate in winter, and it is very unwise to try and prevent them from doing this by creating artificial conditions in their tank. When the autumn days begin to get cold, the tank must be placed in some cool position, preferably in an unheated greenhouse.

I cannot emphasize too strongly that although newts love water and moist conditions on land, they detest heat and will quickly die in warm conditions, whether in their pond or on their island. Therefore never keep a tank of newts in a warm room or in front of a window receiving strong sunlight.

Newts are neither jumpers nor climbers, but it is always advisable to provide a cover for the tank to protect the amphibians from inquisitive and predatory cats, and to prevent their

insect food from escaping from the tank. A suitable cover is described and illustrated in Chapter Three.

Providing newts with food presents few problems. In the water they will eat earth-worms and small aquatic snails, and failing live food they will take a small piece of shredded meat lowered into their tank on the end of a string. On land they will eat small caterpillars, centipedes and other insects, and soon learn to relish mealworms.

Unfortunately, newts are such inveterate bullies and so very greedy that different-sized species cannot be kept in the same tank. Even those of the same size and species sometimes fight desperately amongst themselves and in the course of the battle tails get bitten off, though this is not so serious as it may seem, because the newt can renew a lost tail. Two or three newts of species closely related in size are quite enough to keep in a tank of the dimensions recommended earlier in this chapter.

Newts regularly slough their skin. Sloughing always takes place in the water, and the skin is shed either as a complete suit, or in small shreds and pieces.

There are over thirty species of newt, of which three, the common or smooth newt, the crested newt, and the pelmate newt, are native to Great Britain. Foreign species are in general more colourful than the British ones, but many of them need specialized conditions in captivity. Consequently, the following list is limited to newts which are either easy to come by or do not pose special problems as pets.

COMMON NEWT. Found in most clear ponds, it has an adult size of just over 3 in. The upper part of the body is brown with darker marks and the underparts are yellow with black spots. The male has a frill extending along the body from head to tail. It is not one of the best to keep in a tank,

owing to its secretive habit of spending most of its time out of the water and tucked away on the island.

BRITISH CRESTED NEWT (Fig 32). With an adult length of 6 in., this is the largest of British newts. Its warty skin is dark brown on the back with black spots, irregular white spots on the flanks, and orange on the underparts with black patches. The male is distinguished by a fine serrated crest which, however, is only erect in the water.

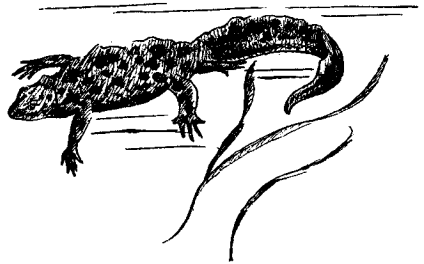

Fig 32. Crested Newt

PELMATE NEWT. Seldom exceeding 3 in. in length when adult, the pelmate newt is olive-brown on the upper part of the body with black spots, while the underparts are yellow with black spots and an orange band in the middle of the underside. In the breeding season the male has a beautiful serrated crest and a blue band on the tail.

ALPINE NEWT. Native to Switzerland and the Austrian Tyrol, this is one of the most colourful newts. The adult, which attains a length of about 4 in., shows considerable variation in colour. The most common colour combination is

a purple-grey back with black mottlings, while the underparts are orange. The eyes are golden yellow and some varieties have white spots on the sides of the body. In the breeding season the male develops a yellow crest with black spots and vertical bars.

SPANISH NEWT. This is the largest of all newts, some specimens attaining a length of 10 in. It spends most of its time in the water, floating near the surface with its limbs hanging down. The body is olive-brown on top: while the underpart is yellow with black markings, and there is a yellow ventral line on the tail. The male has no crest.

AMERICAN NEWT. Native to the eastern and northern parts of North America, this is one of the curiosities of the newt world. After completing its metamorphosis from the tadpole, it goes ashore and remains a purely land creature for twelve to eighteen months, after which it returns to the water and seldom ventures ashore again for any length of time. Adult specimens are about 4 in. long. The upper part of the body is brown with a row of red spots and the sides have a green tinge. The underparts are orange with black spots.

JAPANESE NEWT. This is a particularly hardy and long-lived species and is native to China and Japan. The adults are approximately 4 in. long. The back is black with a rough surface, while the underparts are smooth and a brilliant red. Both sexes have a bony ridge down the back, but the female's skin is more warty than the male's.

MARBLED NEWT (Fig 33). This is one of the few newts (or amphibians or reptiles for that matter) which breeds readily in captivity. It is native to Spain, France and Portugal, and

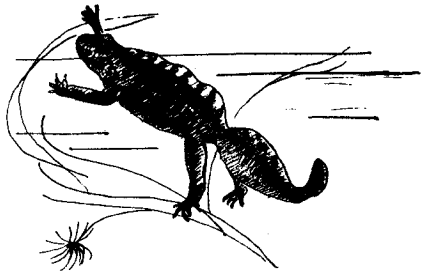

Fig 33. Marbled Newt

derives its name from the black marbling on the green of the body colour. The underparts are grey with white dots. The average adult is 8 in. long. It is a confirmed bully and must not be kept in a tank containing smaller species.

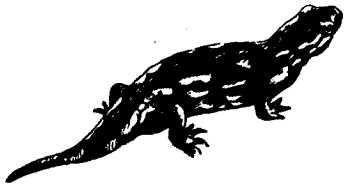

Fig 34. Salamander

Salamanders (Fig 34). Salamanders are closely allied to the newt, which they greatly resemble in appearance, except that they are more heavily built, have a rounded instead of a flat tail, and have five toes on each of the short stout limbs. They further differ from the newt in that the female salamander hatches the eggs within her body and produces her young as tadpoles about 1 in. long and black in colour with a gold-

green lustre. The tadpoles are more developed than those of other amphibians and come into the world with three pairs of external gills, well developed fore and hind limbs, and a long tail. The tadpole stage lasts from three to five months according to the temperature of the water. At the end of that time, the young salamander comes ashore and reaches its adult length of 6 in. in about a year.

Adult salamanders are more exclusively land-dwellers than are newts and take to the water only occasionally. Consequently their tank must have a large island but this must be well planted with moss and kept in a moist condition. It must also have plenty of crevices and shelters as the salamander is of a retiring nature. Salamanders are nocturnal and feed mostly at night, their diet consisting of beetles, meal-worms, small snails and such fare. It is inadvisable to keep more than two or three salamanders in the one tank. They are exceedingly gregarious by nature and insist on clustering together, so inducing amongst themselves a highly infectious disease which manifests itself as sores on the legs and quickly becomes fatal.

Although salamanders in captivity soon become perfectly harmless to handle, the surface of their skin contains glands which exude a milky-white fluid which is fatal to their natural enemies, such as bullfrogs and the like. The fluid is released by the salamander contracting its body and is squirted as a fine jet to a distance of more than 1 ft. A captive salamander will only do this when handled by its owner if it is hurt. Keep a salamander at arm's length when handling it as the fluid can be painful if it gets into your eyes.

There are only three distinct species of salamander:

SPOTTED OR FIRE SALAMANDER. Native to Algeria, Asia Minor, and most parts of Europe except the British Isles,

this species has an adult length of from 5 to 8 in. It is black in colour with irregular patches of vivid orange; hence its alternative name of fire salamander.

ALPINE SALAMANDER. Found native only in the European Alps, this species grows to a length of 4 in. It is uniformly black in colour. An interesting point about the alpine salamander is that the female produces only two young at a time, almost fully developed and able to live out of water.

CAUCASIAN SALAMANDER. Somewhat similar to the spotted salamander in size and appearance, this species occurs wild only in the Caucasus. It has a larger tail than the spotted species, and the black background colour of the body is relieved by yellow spots along the back.

Fig 35. Axolotl

AXOLOTL (Fig 35). This is the Peter Pan of amphibians, for it is in fact the overgrown tadpole of a species of salamander native to Mexico. If deprived of water and confined to dry land, the axolotl loses its gills and changes into a salamander. In other words, it is a salamander tadpole, although it grows to a length of 10 in. and breeds freely in its immature state. It is, incidentally, one of the very few amphibians that breed in captivity. The eggs are laid in the spring and hatch in

two to three weeks according to water temperature. The young must be kept separate from their parents.

The axolotl has a thick and ungainly body, a large head, four legs, a dorsal fin, a finned tail, and external gills on the back of the neck. It must be kept in a tank, but there should be some kind of island as it likes to crawl on land for short periods. The adult thrives on earth-worms, but young specimens must be fed on daphnia.

Chapter Seven

FEEDING REPTILES AND AMPHIBIANS

Nearly all reptiles and amphibians are strictly carnivorous and will eat only live food, chiefly insects, worms, slugs and the like. With the exception of tadpoles and newts, they will starve to death rather than consume anything that does not move; and failure to maintain a supply of living food for a vivarium is one of the chief causes of cannibalism.

Providing live food in the summer does not present many difficulties if you have a garden. Small earth-worms are a nutritious food much appreciated by frogs, lizards and newts, and ample supplies can be dug up in most gardens or collected from under stones lying in damp corners.

While on the subject of worms, do not offer to reptiles or amphibians the small red worms infesting decaying vegetation and manure heaps; these will be rejected.

Green caterpillars, every kind of aphis, woodlice, small butterflies and moths, and spiders are other summer foods gratefully accepted in the vivarium. Most lizards are passionately fond of spiders, and to offer them regularly is a sure way to tame a lizard to eat from your hand.

Live flies and bluebottles are the main standby for frogs and lizards in the summer. A regular supply can be maintained during summer by placing two or three globular fly-traps in the garden. Be careful, however, not to feed large flies or bluebottles to young frogs or lizards, which may choke themselves in attempting to swallow them.

On no account feed to the vivarium any flies, insects or other live food that has been in contact with DDT or other insecticides, as these are highly poisonous.

Maintaining an adequate supply of live food in winter is apt to become a serious problem if you rely on obtaining worms and insects from a garden. But the problem is easily solved by breeding live food yourself.

Blowflies, for example, are particularly easy to breed and are an excellent standby diet in winter. Blowflies develop from maggots called gentles and these can be purchased from shops catering for anglers, who use them as live bait.

When I purchase a supply of gentles I feed some direct to the lizards. Any that are uneaten usually develop into chrysalises which in due course hatch into blowflies. For the frogs the blowflies are hatched before feeding to them. I find that the best way to raise blowflies is to put a couple of dozen into each of two milk bottles and cover them with aluminium bottle caps pierced for ventilation. One of the bottles of gentles I place beside the kitchen boiler, the heat of which hatches them in about a week. The other bottle of gentles I keep in a conservatory, which is at a lower temperature and therefore delays the development of the flies. When the flies in the first bottle have hatched, they are fed to the frogs and the second bottle placed beside the boiler.

In the meantime, the gentles in the bait tin are kept in a cool place, where the low temperature retards their development. Flies from the supply in the tin are then put in the first bottle. This cycle is repeated as long as there are any gentles in the bait tin, and prevents all the gentles hatching out at once shortly after their purchase. It also ensures that there are plenty of gentles always available for the lizards. Very few of my reptiles or amphibians hibernate, and I find that my system for supplying them with gentles and blowflies provides them with an adequate diet throughout the winter.

It is possible to raise your own gentles by hanging up in an old meat safe a fish-head in which the blowflies will lay their

eggs. A box of fine sawdust placed in the bottom of the meat safe catches the gentles when they hatch and fall off. The gentles can then go through their metamorphosis in the milk bottles.

Mealworms are another excellent vivarium food. They are the caterpillars of a beetle which infests cereals such as bran, and can be bought from most pet-shops, but as they are apt to be in short supply at certain times it is worth breeding your own if large and regular quantities are needed.

One of the easiest ways to breed mealworms is to fill a square biscuit-tin with alternate layers of rags, paper or corrugated cardboard, and a mixture of bran and crusts of bread. A layer of the rags, paper or other material is laid on the bottom of the tin, then a layer of the bran and bread mixture, then another layer of the rags or paper and so on, until the tin contains a series of sandwiches. Add to the bread and bran mixture some moist potato or carrot peelings and scatter a few mealworms on each layer of mixture.

Within a fortnight most of the mealworms will have become whitish, apparently lifeless pupae, but in due course they will be transformed into beetles. Neither pupae nor beetles are of much use as food, but in a few months they will have bred an enormous quantity of mealworms ready for feeding to the vivarium. The cycle of production can be maintained almost indefinitely in the tin, the only attention needed being the occasional renewal of the vegetable peelings. Never moisten the layers with water: the vegetable peelings provide all the moisture necessary to breeding.

Newly born or hatched lizards must be fed for some weeks on minute insects such as rose-aphis or fruit flies. Rose-aphis are not always available, but it is a simple matter to provide a regular supply of fruit flies by breeding them yourself.

Fruit flies, which belong to several species called *Drosophila*,

are commonly found hovering over rotten fruit and can be bred rapidly as follows. Place in a glass jam-jar an inch layer of a paste made from brown bread, banana and water. Half a dozen fruit flies placed in the jar will in five days produce a large number of fruit flies. As five days is the period of the fruit fly's breeding cycle, five jars, each with flies in 24-hour stages of breeding, ensure a regular supply. The jars must be covered with gauze secured by elastic bands.

White worm is a food much relished by lizards and newts, and can be raised from a culture sold by many pet-shops and aquaria dealers. The culture is placed in a shallow box of clean, sifted soil on which is spread a mixture of bread and milk. Directly over this mixture and in contact with it is placed a sheet of glass. The box and its contents are then covered with a piece of damp sacking and kept away from the light. In a few days clumps of the worms will be found round the food and can be fed directly to the vivarium. The worms are dropped in the water for newts, but for lizards they can be scattered on the dry level of the vivarium.

Tadpoles and young newts and terrapins thrive on daphnia, or as they are sometimes called, water fleas. They are found in large numbers in ponds and ditches into which animal manure has penetrated. Most aquaria dealers sell live daphnia and from these a colony can be raised to provide tadpoles with a regular supply. The 'stock' is bred in a large container, such as an old sink, and fed with dried ox-blood dusted on the water. The daphnia multiply very rapidly, and as they rise to feed they are skimmed off and given to the tadpoles.

Mosquito larvae also provide tadpoles with a nutritious diet. The larvae can be collected from ponds, but a good supply can be obtained from rainwater butts, and often quite small puddles. They are easily detected by their thin, skeleton-like appearance and from their constant wriggling. As their

average length is about ¼ in., they should not be fed to very young tadpoles who may choke trying to swallow them.

Another live food liked by tadpoles are cyclops. These are minute crustaceans usually found in ponds containing daphnia. They can also be bought from pet-shops and bred in the same way as daphnia, except that they are fed with infusoria. Infusoria are spores that are induced on lettuce leaves when the latter have been squashed, put in water, and left in strong sunlight.

Chapter Eight

AILMENTS OF REPTILES AND AMPHIBIANS

Like all other living creatures, reptiles and amphibians are liable to various ailments; for no apparent reason a frog, or lizard or newt is found dead one morning without having previously shown any symptoms of disease. And even if you have been able to recognize a symptom it is doubtful if the victim could have been cured; particularly as many supposed symptoms of disease are merely indications of some natural change in the creature.

It is best to face the fact that unless one has specialized veterinary knowledge, treatment of reptile and amphibian diseases is impossible. The golden rule for maintaining a healthy vivarium is to remove any sick reptile or amphibian and isolate it from its fellows. It can be returned to the vivarium when it appears to be normal again.

Internal parasites account for a large proportion of the deaths in a vivarium. Normally, these are harmless to the reptiles and amphibians themselves, and it is only when starvation lowers the host's vitality that the parasites get the upper hand and kill their victims. Parasites infesting the bowels can probably be destroyed by santonin, but as reptiles and amphibians vary so much in size, the drug should not be administered except on veterinary advice.

Incidentally, there is no reason to believe that any of the internal parasites of reptiles and amphibians can infect human beings or animals or be transferred to them.

External parasites such as ticks and red mites are common,

particularly on tortoises and lizards with rough or scaly skin. Ticks must be picked one at a time off their victims with fine tweezers. If the surface of the skin is painted with a fine brush dipped in paraffin, the ticks will loosen their grip and be the more easily removed. Do not jerk the ticks off with the forceps otherwise there is a risk of the parasite's head being left in the skin to cause a sore. Ticks are like minute crabs and are about $\frac{1}{2}$ in. in diameter. They live by sucking their victim's blood. Red mites usually drop off their host simply by being moistened with a brush dipped in paraffin.

Persistent refusal to feed is the most common cause of reptiles, particularly lizards, losing condition and wasting. It happens more frequently with new purchases; in most cases the creature has never fed since it was made captive.

Some reptiles can normally go without food for months without ill effects, but if one persists in fasting in the early autumn it will not survive the cold weather. Moreover, it will be more liable to hibernate; and hibernating while fasting is inevitably fatal.

There is no cure for persistent fasting except to tempt the reptile to eat by offering it plenty of its favourite food. It will be more likely to break its fast if fed in a heated vivarium.

Occasionally lizards which normally live together in perfect harmony will start bickering and this may develop into savage fights in which one or other of the contestants may receive quite severe wounds. The injury should be washed with a weak solution of any disinfectant except carbolic. Carbolic is more poisonous to reptiles than to warm-blooded animals.

When the wound has been thoroughly cleaned with an appropriate antiseptic, it should be lightly dusted with boracic powder and covered with sticking plaster. Use the waterproof variety as this will not come off when the lizard enters its pond.

Sometimes a frog will be noticed sitting with its mouth wide open. This is a sure sign that the creature is suffocating. A frog breathes by a kind of swallowing action, and if its mouth is kept open for any length of time it will die of suffocation. This is because it cannot inhale, apart from the action of the mouth, owing to the absence of ribs. It may be discovered that the frog's mouth remains open because it has been unable completely to swallow an extra large fly. You may be able to remove the obstruction from the throat with tweezers, but this is not an easy operation and must be done very quickly or the frog soon suffocates. Conversely, the wide open mouth may be indication of some growth or stricture in the throat; in which event nothing can be done.

Shell-rot is an affliction peculiar to tortoises and terrapins. It is caused by a microbe and its first symptoms are small holes which gradually decay the shell and perforate through to the flesh, so killing the sufferer. The plastron or breastplate is the part most commonly attacked. Provided the rot is not too far advanced, the victim can be cured by painting the holes with iodine and then filling them with a mixture of zinc oxide and oil of cloves. The treatment will be successful, however, only if the rot has not spread through to the flesh.

Tortoises and lizards which have hibernated are liable to have their eyes covered with a bluish film when they awaken in the spring. This may be due to a piece of grit or other foreign body, and can be cured by bathing the eyes with a 5% solution of Protargol, a mixture of silver and iodine obtainable from any chemist. One or two drops of the remedy are shaken on to each eye with a pen-filler and allowed to flow over the surface of the eyeball.

Another frequent aftermath of hibernation is that the eyelids may be stuck together. This is usually quickly cleared up by bathing the eyes with lukewarm boracic lotion, or wiping

them with a piece of boracic lint that has been soaked in warm water. Persistent cases should be treated by smearing a small amount of yellow oxide of mercury ointment over the eyeballs.

Laboured and wheezy breathing, running eyes, and a mucous discharge from the mouth are sure symptoms in a tortoise that it has caught a cold. Unless treated immediately, the sufferer will develop pneumonia and die. The best way to cure a cold is to place the invalid in a spare vivarium containing a bowl of hot water to which a few drops of Friar's Balsam have been added. The bowl should be securely covered with zinc gauze to prevent the tortoise from falling into it. Leave the tortoise in the Friar's Balsam vapour for thirty minutes four times daily until the reptile's breathing improves and the mouth discharge ceases. The tortoise should then be kept indoors for a week at a temperature of 80°. By that time it should be cured and can be returned to the garden.

Tortoises living in a garden are very inclined to develop worms through excessive eating of grass. The worms will be noticed in the reptile's droppings, and in severe cases of infestation they will be coughed up. A tortoise can be cleaned of worms by sprinkling one grain of santonin on the food every day for six weeks. A tortoise with worms should not be allowed to hibernate until it is cleared of them.

Young tortoises are inclined to severe constipation, and this can be overcome by a few drops of castor oil on their food. This should be done every alternate day for ten days.

Softening of a tortoise's shell indicates calcium deficiency, and demands immediate attention to save the reptile's life. The best treatment is to feed it on the finely-chopped outer leaves of lettuce on which powdered cuttlefish has been sprinkled. A daily dose of orange juice and cod-liver oil is also very beneficial in supplying the vitamins necessary to a hard and healthy shell. If the patient does not respond after

three weeks' treatment, and particularly if it refuses food, its condition is incurable and it must be destroyed.

Finally if a reptile or amphibian develops any abnormal condition and you want to save its life, take it at once to a veterinary surgeon, who will be able to cure it if there is any hope at all. Never attempt to cure yourself any disease or injury about which you are doubtful.

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