

# KEEPING REPTILES AND AMPHIBIA

by ERNEST J. F. PITMAN

## I. Introduction

FOUR main groups of reptiles are to be found in the world to-day:—

- (1) The Crocodiles, etc. (Crocodylia).
- (2) The Turtles, Terrapins and Tortoises (Testudines).
- (3) The strange, lizard-like Tuatara (*Sphenodon*), found only in a few islands in the Bay of Plenty, New Zealand (Rhynchocephalia).
- (4) The Snakes and Lizards (Squamata). Snakes comprise the Sub-Order Serpentes, and the Lizards the Sub-Order Sauria.

### Reptilia

All members of the reptilia are cold-blooded, their body temperature depending on the temperature of their environment. They are covered with a skin devoid of sweat and oil glands and almost always scaled. They are adapted to a terrestrial life, and although such creatures as crocodiles and turtles, marine iguanas, etc. are amphibious, the reptile class differs from the amphibia in that its members do not pass through a gill-breathing larval stage.

Reptiles are oviparous and viviparous. The former sometimes lay their eggs in sand or decaying vegetation or similar places which will retain heat and moisture and slowly incubate them. Although in some cases there is an attempt at maternal care (for example, the python incubates its eggs for approximately fifty-six days by coiling its body around them), the general rule seems to be "every man for himself" on hatching day. The eggs, though varying in size according to the dimensions of the mother, are generally formed of a yolk enclosed in a leathery shell. Just prior to hatching, the embryo moves its head from side to side. This enables it to cut the shell by means of what is known as the egg tooth, a tooth that projects forward under the lip and is developed solely to enable the embryo to escape from the egg.

Many limbless lizards are to be found, the British slow worm being a good example, and these can be easily mistaken for snakes. The presence of rudimentary limbs, however, and the possession of a pectoral girdle, etc. prove that they are undoubtedly

lizards, and close scrutiny of a living specimen will reveal a number of other features which differentiate lizards from snakes:—

(1) Most lizards (the Ablepharus—Skinks—and certain Geckoes are exceptions) have eyelids, whereas snakes possess a transparent skin over the eye, so that whether awake or asleep the eye is always open and always protected.

(2) In most lizards the tongue is thick and short, whereas in snakes it is elongated and retractible into a sheath. This ability to place the tongue out of harm's way serves a very useful purpose when a snake is feeding. The *Varanus* or Monitor lizards are exceptions, having long retractible tongues like snakes.

(3) A lizard usually makes some attempt at mastication, but the snake considers this to be an unnecessary nicety, and commences to swallow immediately, regardless of table manners. It is able to swallow articles of diet which are often much greater in dimension than its mouth, owing to the extreme flexibility of the numerous bones of which the skull is formed. This flexibility allows the snake to flatten and extend its head, sometimes out of all proportion to its normal shape. In addition to this, the lower jaw of the snake, unlike that of the lizard, which is a single movable unit, is composed of two halves joined by ligaments in the centre which facilitate an independent action of either side. Where it meets the skull, the jaw is hinged and detachable, and the skin in this area is very flexible, giving the entire mechanism an enormous elasticity. Saliva in great quantity is exuded from glands in the mouth to assist in swallowing prey, and the tongue at such times is retracted into its sheath.

Two other points of difference are worthy of note: snakes suck water into their mouths between the lips, and generally shed their skins whole, whereas lizards lap water with their tongues and shed their skins in small portions.

### Amphibia

Amphibia form the link between fishes and reptiles, and so mark a step in evolution, namely, the conquest

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of land, which, over a multitude of years, has produced the many varied terrestrial forms of life found to-day. They are divided into three Orders:—

- (1) the Apoda (which are limbless);
- (2) the Urodela (newts and salamanders);
- (3) the Salienta, formerly the Anura (frogs and toads).

All amphibia pass through a larval, gill-bearing stage. In the case of the Axolotl (*Sirenodon mexicanum*) this stage may last for many years—in fact, unless it is forced to seek land it becomes sexually mature and lives and breeds quite happily as a gilled aquatic animal. The African clawed toad is also a completely aquatic animal. But usually metamorphosis takes place within several weeks and the young amphibia in their adult form leave the water, in many

cases to return only during the breeding season. Eggs are deposited surrounded by a gelatinous envelope which acts as a protection, especially from frost in the more temperate climates.

Salamanders and newts, some of which are very attractive, are often mistaken for lizards, but although resembling them in body form, the chief differences upon scrutiny are that lizards possess scaled dry skin, claws on the toes, and an external ear, characteristics not to be found in the salamanders or newts.

All the amphibia have a naked glandular skin, and many of the frogs and salamanders have the power to exude a noxious, poisonous slime as a protection when attacked. Many of the animals in this family are varied in form and highly coloured, and they make extremely interesting and amusing creatures to keep in the vivarium.

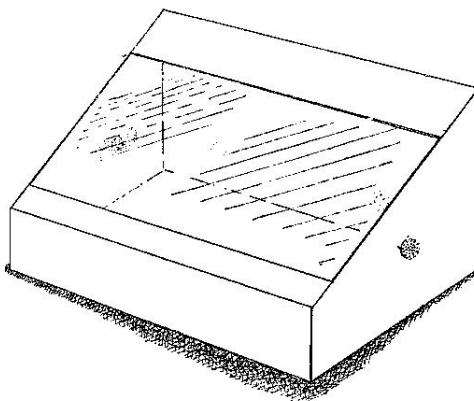
## 2. The Vivarium and Garden Reptiliary

AN additional interest in keeping a vivarium, whether indoor or outdoor, tropical or temperate, is the scope one is afforded for arranging it artistically and decoratively. By the inclusion of alpine and marsh plants, moss, ferns and cacti, many species of which grow very well under these conditions, beautiful and natural settings can be created. Bog bean, forget-me-not, creeping jenny and monkey flower are only a few of a host of other lovely plants which can also be used, whilst philodendron, maiden-hair and staghorn ferns are suitable in heated vivaria. Well stratified rock and lichen-covered bark can also be pressed into service to complete the picture.

All vivaria need water to some extent, even if it is only drinking water for lizards, and in order not to spoil the general effect, these containers can be made of cement. The smaller ones are quite simple: a saucer should be pressed into some wet cement and the inside covered with a thin layer of the mixture. This is then left to set. The result is a natural-looking and perfectly leakproof drinking container. For the larger sizes, baking tins may be used in the same fashion, and while the cement is still wet, small pieces of rock should be pressed around the sides as a finish. While the cement is handy, it can be used to create terraced effects by sticking slabs of rock together, or a superstructure of rock can be built up at the back of the case. Clinkers stuck together and coated with cement look very effective, and when used in this manner have the advantage of being much lighter in weight.

### Heating Vivaria

Heating is the next problem. In small vivaria with a large water area, immersion heaters in the water are the most satisfactory, and give a humid atmosphere congenial to tropical frogs, etc. Cases for lizards are better placed upon an open-topped shallow box containing one or more electric lamps, according to the amount of heat required. The ends of these boxes should be hinged in order that burnt-out bulbs may be renewed without moving the vivarium.



Useful vivarium made from sheet metal with a sliding glass panel allowing for viewing and permitting easy access.

Herpetologists are also now catered for commercially to a much greater extent than ever before, and there are numerous patent heating devices available, but not, unfortunately, at prices to suit most pockets. Electrical heating tubes of varying wattage are perhaps the cheapest and most satisfactory, and being waterproof can be adapted to most conditions. A lead heating cable is also offered which can be buried beneath either dry or marshy terrain. Both these heaters are thermostatically controlled and most reliable. My preference is for the heating tube because if the cable should burn out it would necessitate the upheaval of the vivarium in order to replace it. There is also a flat, oblong heater on the market, but unless this is in a small case, the heat distribution is not very effective. When heating a case, there is no need to worry overmuch about a few degrees variation, and if possible, the temperature should be allowed to drop some 10° F. during the

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An outdoor reptiliary made in a Surrey garden. A shallow moat surrounds the rockery and the overhanging ledge to the smooth walls prevents the escape of reptiles.



night. This is a normal occurrence in nature, and will increase the life span of the enclosures. If any cold-blooded animal is accidentally exposed to severe cold, it should not be placed immediately into a high temperature, but should be warmed slowly.

If lighting is needed, the lamps should always be placed as high as possible, and it is an advantage if they can be concealed, for apart from looking rather ugly, their glare can spoil one's view of the vivarium.

All dry vivaria should be damped down occasionally with lukewarm water poured from a fine-rosed watering can. The wetting received will not harm the inmates and will freshen up the plants. Some reptiles also have to learn the habit of taking water from a drinking vessel, and the resulting droplets of water on walls, plants and rocks, will prevent them from going thirsty during the interim.

Correct temperature and environment are essential to the well-being of all livestock. All vivaria should be well ventilated by means of perforated zinc. Doors should fit perfectly and securely, and be placed preferably in the roof.

It will be impossible in this small book to do more than generalise upon these subjects, but if care is taken when purchasing unfamiliar specimens to obtain details as to their habitat and geographical distribution, no great difficulty should arise.

An aquarium measuring 2 ft. by 1 ft. by 1 ft. can easily be adapted to make a vivarium, but this is a rather expensive way of housing a collection and is actually only necessary for amphibia. However, many attractive cases can be made up by the handyman from an assortment of boxes, their dimensions depending largely upon individual taste. But there is one particular type of case which serves excellently for almost all species, provided they are small. It is made of sheet metal and the diagram illustrates it.

The fact that this case has a water-tight floor and sides allows it to be used either as a moist vivarium with a realistic pool for amphibians or as a dry sandy home for lizards or small snakes. The four-inch wall in front, angled at the top, and the four-inch roof at the top of the rear wall help to prevent escape, and

the glass, lying as it does at an angle, is made firm by its own weight. It rests on runners made by bending over the tin and is easily removed and replaced. Ventilation is provided by circular perforated zinc plates. If a hole is made in one, and bunged by a cork, flies can be fed through to tree frogs and lizards without fear of escape. The metalwork should be well coated with a good bitumastic paint in soft pastel green or fawn, to blend the better with plants and sand.

### Outdoor Reptiliary

In a garden large enough to accommodate it, an outdoor reptiliary can be a very attractive feature and will always prove a source of great interest. A wide range of species can be kept together in this fashion and the unlimited fresh air and sunlight will be of great benefit. The variety of natural insect food which will be available can also be increased if a small piece of raw fish or meat is occasionally thrown in. This will attract numerous flies, and those not immediately captured will lay their eggs in the flesh and supply gentles for future repasts.

The reptiliary can be made either as a walled enclosure or a sunken garden. I personally prefer the former variety, as I find it much more comfortable to observe things with the help of a wall to lean on, and it is also especially valuable when taking photographs. A moat built round the inside of the reptiliary will allow frogs, toads, newts and tadpoles to be liberated in it. Once position and size are decided upon, a channel 30 ins. wide and a good 15 ins. deep should be dug out round the outer perimeter of the square, oblong or circle. The soil excavated can be piled into the middle and arranged with plants and rocks to form an attractive centre piece. The ground should then be beaten into a firm bed with clinkers and rubble, to a depth of 3 ins., and a wall of single bricks built up to a height of 3 feet all

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round, using outer 6 ins. or so of the moat bottom as a foundation.

The inner side of the wall and the bottom and sides of the moat must then be rough-cast. Large tiles or strips of sheet metal should be either cemented or keyed into position on the top of the wall, in such a manner as to create an overhang of at least six inches on the inner side. Care must be taken to see that this is done accurately, as it will prevent the escape of climbing species. The whole of this area must now be covered carefully with a very smooth cement finish, so as to leave as little foothold as possible.

Before completing the arrangement of the island, it is a good plan to sink a well creosoted box approximately 18 ins. square into the centre, to a depth of about 18 ins. from soil level. This should

be filled with hay and boarded in all round. On one side, however, a hole 6 ins. square should be made, from which a length of drain-pipe should slant upward to form an entrance or exit. This will make a snug retreat for the creatures when they wish to hibernate; if a strong growing plant is placed at the point where the pipe meets the surface, it will help to prevent the cold of winter penetrating to the subterranean chamber. If the entrance opens out on to the slope of rockery work and is protected with overhanging slab rock, rain or thawing snow will be washed past and not into it. Care must be taken to ensure that rats or mice cannot get into the reptiliary, for once having fallen in, they will remain prisoners and will gradually kill off all the stock, especially hibernating animals.

### 3. Collecting

**C**OLLECTING specimens for the vivarium is excellent fun, and involves many an interesting day in the field for the naturalist. It can, however, be very exacting and sometimes fruitless, so the following tips are given in the hope that they will prove helpful and add to the day's bag.

#### Amphibia Collecting

Amphibia should be looked for in damp surroundings and in the vicinity of ponds and streams. Logs and rocks, etc. should always be turned over, and will often expose newts, frogs or toads. The damp conditions after heavy rain usually bring out amphibia in force, and the crevices of old walls should always be searched for toads.

Newts can be captured in large numbers while in the water by the use of a light drag net, and large frogs such as *Rana ridibunda* and *R. esculenta* can sometimes be caught by tying a match-stick and a small worm on the end of a thin cord and throwing it into the water. When the frog bites, a quick jerk will land him, but care must be taken to pounce on him immediately, or with his next leap he will be back in the water. A more successful method is to hunt them by night, when, dazzled by the beam of a powerful torch, they can be netted out fairly easily.

#### Collecting Lizards and Snakes

Lizard-catching is a nerve-racking business whatever the method adopted. I have found in practice that the best method with small lizards is to approach them from behind—being careful that one's shadow does not fall across them—and when near enough, pounce upon them, catching them in the hand. Some of the larger lizards, such as the European Green, owing to their intense curiosity, are much more easily caught with a noose on the end of a long cane.

Snakes are a simpler proposition if noise and shadow are avoided. The V-stick is a method that can easily kill a specimen pinned beneath it, and is useless if the snake is lying in vegetation. The handle of a walking stick will be found much more serviceable and can be used to slip under the snake and jerk

him out into the open, where he can be identified and picked up by hand. Reptiles will usually be found basking in the sun from about 10 a.m. to 3 p.m. Lizards prefer dry, sandy banks with patches of gorse and heather, snakes such as the adder and smooth snake also being found in these surroundings, while the water snakes will be found on the drier parts of moist or marshy terrain.

If tins are used to transport specimens, care should be taken to pierce the airholes from the inside, for if pierced from the outside the jagged burrs will injure the captives during their endeavours to escape. A better way is to transport them in stout linen bags, adding dry sphagnum moss for reptiles and wet mosses for the amphibia, but always make sure there are no tiny holes in the seams or corners.

#### Preserving Dead Specimens

For those who wish to preserve dead specimens, a killing bottle should be used as this avoids the painful death caused by immersing living specimens immediately in the preservative. The simplest method is to place the creatures in a small bag and put them into a screw-top jar, adding a sprinkle of chloroform. The jar should then be made airtight. A killing bottle can also be made up by covering the bottom of a small jar with about an inch of potassium cyanide. As the fumes are exceedingly dangerous, a towel should be tied round the mouth and nose and the work carried on in the open air. Cover the cyanide with a half-inch layer of sawdust and then pour plaster of Paris on top to a depth of a further half-inch. Leave until set and then replace the screw-cap. It is advisable where possible to have killing jars made up by a chemist or similarly qualified person.

A good preservative to use is 5 per cent. formalin. Amphibia should be soaked well in water first to assist in removing the slime from their bodies, and as their tissues usually hold a large amount of water, an extra dash of formalin is generally necessary. In the case of large snakes and lizards, a few small incisions along the stomach will allow better penetration of the formalin.



#### 4. Feeding

**D**IET is of primary importance in all livestock keeping, and when possible, the easiest way of making sure that one is providing the correct food is to study a creature's natural environment and feeding habits.

Amphibia, as we have already seen, lead a life partly aquatic and partly terrestrial, and ponds, streams, marshes and moist surrounds generally would suggest worms, aquatic insect larvae and similar forms of life as obvious foods. *Daphnia*, water lice, *Tubifex* and a host of other forms can also be used. It will be found that a basic diet of earth worms will keep amphibia happy, but a change of diet will encourage their growth and be of general benefit. Wood-lice, gentles, moths, flies and mealworms will all help to supplement their meals and will be an excellent food for frogs, toads and salamanders. Newts, with their slower movements on land and their aquatic habits during the summer, will be able to contend only with the worms, but it is a good idea to keep the water area of the vivarium stocked with insect food and *Tubifex* worms. This helps to keep the water clean and is a continual source of food for the aquatic specimens.

The only other group not yet catered for is that comprising the quaint little tree frogs, and these should be given flies, aphides, blue-bottles, and occasional smooth caterpillars and small moths.

Reptile feeding requires a little more individual analysis, but it can be assumed that all the lizards likely to be kept will be found to enjoy one or all of the following:—gentles, flies, mealworms, grasshoppers, woodlice, spiders, smooth caterpillars, cockroaches etc. The snakes can be roughly divided into two types: those living in damp surroundings and those frequenting dry situations. Those that do not frequent marshy districts will, in captivity, usually feed upon mice, with exceptions like the common adder and the smooth snake, which feed chiefly upon lizards. Those that delight in moist surroundings, such as the grass snake, the garter and ribbon snake, etc., feed mainly upon frogs, some newts, worms and an occasional fish, although in my experience our own species of water snake (*Natrix natrix*) seems capable of catching a fish only if this is wounded or sick and unable to move at its usual speed. Snakes are sometimes difficult to keep in captivity, owing to their tendency to starve themselves, and though they are able to fast for long periods, it is better in these cases where possible to give them their freedom, for otherwise eventually they will die.

The food bill can be a very small outlay if one learns how to go about breeding and keeping some of the following:—

**Drosophila Fly**:—The *Drosophila* or fruit fly is a tiny insect which makes an extremely good, almost indispensable food for baby frogs and toads, and for newly-born lizards. A culture of the wingless variety is, for obvious reasons, the easiest to manage.

The flies should be fed upon pieces of over-ripe fruit, such as banana, apple, orange, etc. and a half-pint milk bottle will be found to make a very handy container in which to breed them. Several cultures should be maintained so that they may be used in rotation. They should be kept at a temperature of 75°-80° F. when they will breed quite prolifically. A wad of cotton wool placed in the mouth of the bottle will effectively retain the insects and allow sufficient ventilation.

**Mealworms**:—These are one of the more important foods to breed, for two reasons: (1) they are nutritious and appreciated by almost all the creatures under consideration, and (2) they are expensive to buy. The mealworm has no affinity to the earthworm, but is the larval stage of a meal beetle often found in flour-mills and storehouses. It is quite simple to breed so long as patience is exercised, for the meal beetle is single-brooded. In my experience the most successful method is to three parts fill one or two large biscuit tins with bran and mix into this a number of torn, wrinkled pieces of newspaper and a few scraps of bread. A few mealworms should then be added; these will gradually form into chrysalids and eventually become the adult beetles which will complete the life cycle and produce more mealworms.

The worms need moisture in some form or other, and a banana skin, slice of potato or apple laid on the surface occasionally will meet this need. If left



Live food cultures require regular attention. Here white worms (*Enchytrae*) are being collected from wooden trays containing leaf mould and food.

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undisturbed for some four or five months, one will find a fine crop of worms of varying sizes, and if a second culture tin is started when the first one is "croppable," it will help in achieving a constant supply.

**Gentles** :—It is advisable to buy gentles in small weekly quantities, for one can very easily find oneself overwhelmed with the adult fly. If any quantity of them should pupate, baking them in the oven for a few minutes will kill the pupae. Gentles and the consequent adult blue-bottles are excellent foods. It is a good idea to place a few of the larvae in the vivarium in a small tin with a hole pierced in the top; as the flies hatch out they will crawl through the aperture towards the light and be eaten. This controlled manner of feeding will ensure a constant but regulated source of food.

**Earthworms** :—These are usually available in most gardens, and it is far better to dig a few when needed than to attempt to keep them artificially. Occasionally, however, during a dry summer, the sub-soil becomes caked and the worms descend to lower strata in search of moisture. It is a good idea, therefore, to keep a small plot watered and covered with wet sacking. If tea leaves, lawn cuttings, etc. are dug into the plot every so often, one can always be sure of finding a few worms in spite of weather conditions.

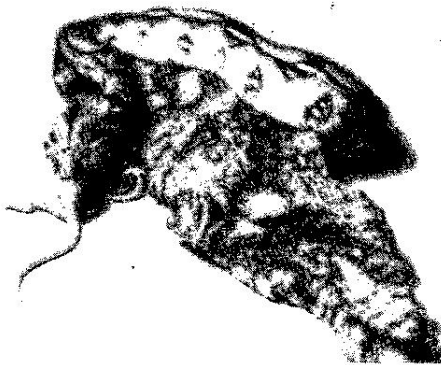
**Enchytrae** :—This tiny white worm is included because it has been found to be an excellent food for young frogs, newts and salamanders. It thrives best in a rich leaf mould which must always be kept in a damp, friable stage but never saturated. A number of cultures should be kept going so that the worms can be taken in rotation. The containers should be approximately the size of seed boxes, but a little deeper, four inches being ample. They should be made of half-inch wood creosoted on the outside. This acts as a deterrent to mice and similar vermin. A sheet of slate, marble or other flat material should be placed on the soil and be made to fit up to the inner sides and ends of the box. The worms are placed in a number of depressions made in the soil surface. They do well fed upon bread soaked in a little sour milk or condensed milk, and as a change of diet small pieces of raw sausage are useful. Care must be exercised in feeding, for if too small an amount is given, propagation will cease, and if overmuch is fed the soil will be soured. Another important factor is temperature: a cool temperature of 45°-55° F. is most desirable.

**Woodlice** :—This is one of the foods one falls back on when nothing else is at hand and they are then found indispensable. The woodlouse is one of our few terrestrial crustaceans (the group which includes crabs, shrimps, pondskaters, etc.) and is known as a land Isopod. It breeds quite freely in captivity, the female carrying the eggs until they hatch. The young are yellow or pinkish in colour and grow to adult size by shedding their skins at frequent intervals. They feed mainly upon rotting wood and are best kept in a large accumulator jar with some two or three inches of damp peat at the bottom. Into this, bark and

rotting wood should be placed in layers so as to prevent the peat from packing down. If a sheet of glass is laid on top of the jar it will create a humid atmosphere most desirable for the well-being of the lice. A temperature of about 65° F. seems to be the most satisfactory. Up to 1,000 adults can be kept in a container of the type mentioned, and if collected in the spring, the lice will soon settle down and breed freely throughout the summer.

Spiders, slugs, grasshoppers, etc. cannot be kept in anything like a practicable manner, and for one's own particular needs it is better to collect a few when required. For snakes one other item of diet worth mentioning is the tame mouse. This is an amusing little fellow to keep, and although you will in all probability only need a very few, surplus specimens can always be disposed of as pets. Mice breed at an early age and continue to do so prolifically all their lives. The period of gestation is twenty-one days. When the females show signs of being in young, a little bread and milk will help to ensure a healthy litter. The young must not be touched for the first week, or the mother may kill them. They can be weaned at six weeks. In sexing a mouse, the sexual organ in the female will be found much nearer the vent than that of the male. The correct way to handle a mouse is to close the hand around it and steady it by holding the tail. Picking it up by the tail only scares it, and it is then liable to bite. Mice, being tiny animals, must always have food before them. Bread soaked in water and squeezed almost dry again is a good basic meal, with grain, bird-seed, dog biscuit, carrot, lettuce, etc. as variations. Mice must always be provided with water, but no cheese, as this makes them smell.

The best type of cage is a glass-fronted one, 18 ins. by 9 ins. by 12 ins. or larger according to the number of mice. The top can be made of perforated zinc, the sleeping quarters being placed high up at the back of the cage, and the glass front being movable to facilitate cleaning.



Some snakes require small mammals such as mice and rats for food; freshly killed animals will be accepted.

## 5. Hibernation

**T**HIS very important topic is usually only briefly mentioned in books and as a consequence much doubt is left in the amateur's mind, often resulting in the untimely death of many specimens.

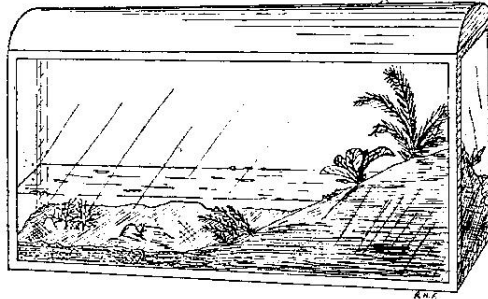
By far the largest proportion of imported reptiles and amphibia come from temperate climates and in their natural state would automatically hibernate upon the approach of cold weather. But in captivity, they are dependent on the decision of their owners, who have two alternatives: to allow them to hibernate, or to create artificially warm conditions which will make hibernation unnecessary. It is useless, and fatal, to try and combine both methods.

In my experience, a hibernated reptile or amphibian should be kept at a low enough temperature to ensure its remaining in a dormant condition. In a natural environment, hibernation is not always continuous. A few warm, sunny days will often bring a lizard, frog or snake out for an hour, but that warmth will also bring out flies, spiders, woodlice, beetles, etc., their natural foods, of which they immediately feel the need. If, however, these conditions are reproduced in the vivarium, where perhaps, for example, a few lizards are hibernating, the chances are that they will die, because in their artificial surroundings the cycle of life is not complete. There are no insects waking up with them, and therefore no food for them to eat.

Hibernation in captivity also depends upon the condition of the individual: if a specimen has been only recently purchased, or is not feeding well or looking as sleek and healthy as it should, it is not advisable to hibernate it, as it will almost certainly not survive.

If after a little thought it is decided to keep specimens active through the winter, a good supply of food must be assured and a temperature of, say, 65°-70° F. is necessary. If it is decided they should hibernate, the following suggestions will be found useful:

(1) Do not be tempted to move the entire vivarium suddenly into hibernating quarters in mid-winter, for this is sure to prove fatal. In early autumn, however, this is an excellent procedure if the cases are portable. If not, the occupants should be put in their sleeping quarters so as to become used to them. Placed in a well-ventilated potting shed, garage or similar *frost-proof* building in autumn, they can be fed until the temperature drops sufficiently to put them to sleep.



A two feet long aquarium with sand banked to form an above-water "shelf" can be used for frogs and newts.

The sleeping quarters need not be in any way elaborate. Boxes of varying dimensions will suffice for reptiles, provided they are of stout enough wood to make them mice or rat-proof. They should be ventilated by means of a circular disc of perforated zinc at either end, and covered on top with a sheet of glass. Two-thirds of the area should be packed with the medium required, as stated below. This will allow room for last minute dinners, and when the creatures are asleep, the box can then be packed to the top. A box measuring 24 ins. by 12 ins. by 12 ins. will accommodate most of the lizards and snakes likely to be kept, and will hold ten or twelve specimens of each. For amphibians similar dimensions will be suitable, but as they prefer damp or wet surroundings, aquaria must be used instead of boxes.

(2) Snakes, tortoises and lizards hibernate well in boxes filled with soft hay.

(3) Frogs do well in a 24-inch tank, with two inches of mud and water at the bottom, packed down with aquatic plants, on top of which can be placed layers of soft, old, decaying rushes, grass cuttings, leaves, etc.

(4) Newts and salamanders prefer to hibernate under rotting wood and bark, or upon a floor of moist peat. It is well to layer tree bark and peat to a depth of some nine inches.

It is important to ensure that mice and rats cannot find access to the hibernation vivaria, as they will gnaw the sleeping inhabitants and kill them.

## 6. Newts

**O**F all the species of newts in existence, three occur in the British Isles: the crested newt (*Triturus cristatus*), the smooth newt (*Triturus vulgaris*), and the palmate newt (*Triturus helveticus*). The last species is not by any means common, and is local in occurrence.

Newts should be housed in a good sized aquarium

if their form and colour are to be fully appreciated. Many species will be quite happy living aquatically for some months, but for those that return to land after a short period in the water, provision must be made.

My own method is to set up a tank with an inch of fine gravel at the bottom. At one end a rockery is

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built up to within two inches of the water surface. A flat rock above water level is placed on this rockery to fulfil the immediate needs of those specimens likely to leave the water at an earlier date than the majority. The depth of water should be roughly six inches. The rockery should take up about a third of the tank length. The aquarium should be planted out with *Vallisneria*, *Sagittaria*, *Elodea*, Starwort, etc. and will then be ready for use. The purpose of the rockery is to create some form of land to which the newts can retire when breeding operations are completed.

The period of time a newt remains in water varies in different species and sometimes even in individuals. I remember three alpine newts out of six I had been keeping during the summer which were quite content to remain in the water throughout the winter at a temperature sometimes as low as 45° F., and, although comparatively sluggish, they were always ready for a feed and in the following spring were fat and healthy.

Contrary to popular opinion, they settled down to breeding a fortnight before their companions who had preferred a winter on *terra firma*. But this is an exception to the general rule, and it will be much more satisfactory if, when newts show obvious preference for land, the depth of the water is lowered to the level of the rockery.

By doing this a section of land is created which can be made to appear realistic and attractive by the addition of a turf or clump of moss and perhaps a small fern. As autumn turns into winter, it is a good plan to increase this area of land by lowering still further the depth of water and building up layers of bark and moss in which the newts can safely hibernate. It is most necessary to have some form of covering firmly fixed upon the top of the tank, as these amphibians are very capable and persevering climbers.

This is not by any means the only way to lay out a



Alpine newts (*Triturus alpestris*) pictured during the breeding season in an aquarium. The male newt is the upper specimen.

## KEEPING REPTILES AND AMPHIBIA

Pair of crested newts (*Triturus cristatus*). The male (left) is performing the spring-time "nuptial dance."



tank for newts. A permanent section of land in a vivarium planted out with marsh plants, etc. is very effective, but this has already been dealt with.

Newts kept under these conditions can be fed chiefly with earthworms; a worm dropped into the water is usually the cue for action! Newts hitherto motionless attack the worm with all the voracity of a crocodile, and in their attempts to obtain the meal will sometimes bite off each other's legs. This loss of limb does not seem to worry them much, and in younger specimens the leg is eventually renewed. *Tubifex* is also welcomed as a food, as also are occasional white worms.

In early March newts leave their winter quarters and return to water to spawn. The breeding habits, especially of our own crested newt, are very interesting. Males in many species develop a crest during the breeding season, and in the courtship display it is used to good effect, the male swimming round the female, his whole body agitating and dancing with excitement. The tail wags more and more frenziedly, and eventually he sits down close to the female and deposits his spermatophore. She then crawls over this spot, allowing the sperm to adhere to her cloaca, from whence it enters the abdomen to fertilise the eggs.

When ready to spawn, the female newt will lay her eggs singly in small-leaved plants. As each egg is laid, a leaf is folded around it by the hind feet, an achievement which has to be seen to be appreciated. The female will lay anything up to 200 eggs in this manner, and they continue to develop for about a fortnight, when the young begin to hatch out. At first they are very tiny little tadpoles which may be easily overlooked, and they will lie at the bottom of the tank for about ten days before becoming free swimming. They should then be given plenty of tiny white worms and *Tubifex*, and a supply of *Daphnia* (water fleas). The front legs are the first to appear on the tadpoles and shortly afterwards the back legs begin to grow. In about a month's time they will be perfect little newts.

If the eggs are laid in early spring, final metamorphosis will be accomplished by the autumn and the young newts must be allowed to leave the water. To keep them growing, means must be found of placing food before them at all times, and in my experience,

the most successful way is to anticipate their arrival and make up two or three additional white worm boxes. Make sure that these boxes do not have any cracks wide enough for the babies to crawl through, and make a tight-fitting perforated zinc cover for each of them. Layer the surface with growing mosses. The tiny newts will feast upon the worms and continue to grow in a healthy fashion under these conditions. Newts are inclined to be cannibalistic, so it is a good plan to keep the smaller species apart from their larger cousins and to put eggs one wishes to hatch into a tank on their own.

Unlike frogs—which have voices as characteristic as those of birds—newts and salamanders cannot voluntarily make a sound of any description. Occasionally, if one is picked up a faint squeak will be emitted from him, but this is caused by the sudden exhalation of air—entirely involuntary and the result of rough handling.

One of the most beautiful newts, and one which will really enhance a collection is the marbled newt (*Triturus marmoratus*): He attains the size of the English crested newt, but the head is broader and flatter. The general colour is a vivid grass green, interspersed with patches of black or brown. During the breeding season, the male develops a resplendent crest which is banded alternately with black and yellow. In the female, the dorsal line is usually depressed, but in both sexes the green and black markings extend right down to the toes.

Another splendid-looking little fellow is *Triturus viridescens*, with his livery of olive-green above, dotted along either side with red spots. The throat, belly and lower surfaces of the limbs are a bright yellow, scattered with tiny black spots. The male does not develop a crest, but during the breeding season the tail is noticeably widened.

Our own crested newt is a handsome creature, with his large crest and orange belly spotted with black, and both he and the smooth newt can be found in most ponds during the spring. Although the palmate newt is not so common, he can be distinguished from the smooth newt by his unspotted throat, slightly needled tail (in the breeding season), and heavily webbed hind feet.

One other newt worthy of mention is the *Pleurodele*. It is rather drab, but grows to a very large size for a



## KEEPING REPTILES AND AMPHIBIA

nwt, and always seems to waddle about like a fat old man. An interesting fact about the *Pleurodele* is the length of its ribs, which are so unusually long that they often protrude through the skin in adult specimens.

The following list gives a selection from which to choose, and although the species are not all obtained easily, they are well worth waiting for.

### ENGLISH CRESTED NEWT—BRITAIN, CENTRAL AND S.E. EUROPE.

(*Triturus cristatus*)  
Max. size: 6 ins.  
Colour: Black or olive brown above, underparts bright yellow or orange, spotted or marbled with black. Males have white flecking on sides and white band through tail during breeding season. Crested.

### MARbled NEWT—S.W. EUROPE.

(*Triturus marmoratus*)  
Max. size: 6 ins.  
Colour: Bright green above, marbled brown or black. Crest in breeding male black and yellow. Under surfaces flecked with white. Crested.

### PLEURODELE NEWT—SPAIN AND MOROCCO.

(*Pleurodele waltii*)  
Max. size: 9 ins.  
Colour: Olive grey, underparts light grey and spotted. Underpart of tail dirty orange. No crest.

### ALPINE NEWT—EUROPE.

(*Triturus alpestris*)  
Max. size: 4 ins.  
Colour: Underparts tomato, slate blue above. Flanks flecked and banded with lavender blue in males. No crest.

### COMMON SPOTTED NEWT—NORTH AMERICA.

(*Triturus viridescens*)  
Max. size: 3 ins.  
Colour: Olive brown above, red spots on sides. Underparts yellow or orange, dotted with black. No crest.

### TRITURUS VITTATUS—PALESTINE.

Max. size: 4 ins.  
Colour: Yellow or pale orange underparts. Broad white band edged with black along each flank. Crested.

*Triturus italicus* from Southern Italy, *T. montandoni* from the Carpathians, *T. boscai* from Spain and *T. pyrrhogastra* from Japan are all species well worth trying to obtain.

## 7. Salamanders

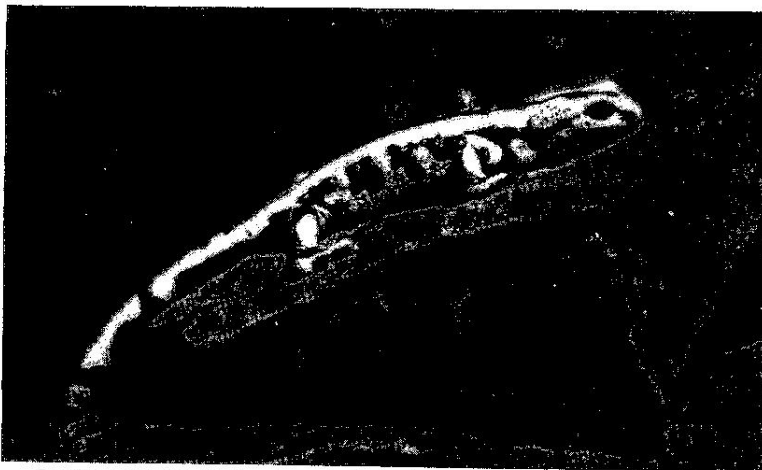
UNLIKE newts, salamanders tend to lead a mainly terrestrial and nocturnal life, but in captivity they make very interesting pets and soon become tame. They thrive well on earthworms, woodlice and occasional pieces of chopped raw beef, and will live for many years provided they are given plenty of space. Overcrowding causes the outbreak of a fungus disease to which they are very susceptible; it is highly infectious and, to my knowledge, incurable.

The European spotted salamander is most commonly kept in captivity and is a very striking animal,

black in colour and covered with chrome yellow spots. This is really a protective coloration and is nature's warning to all who may prey upon the creature, for if attacked it is able to exude a poisonous milky fluid from glands situated along its back. A few drops of this poison injected into a small mammal are sufficient to kill it. As vivarium dwellers, however, the salamanders can be handled quite safely and without fear.

A vivarium planted out with small ferns and moss and layered with bark will make an ideal home for the salamander. The vivarium should at all times be kept out of the sun's rays, as salamanders are essentially shade-loving creatures. It must be kept moist by weekly additions of water, and if breeding is to be attempted the provision of a water area is necessary. The pool should be about two inches in depth and should have a gradually sloping bank formed by a slab of rock. This bank is most essential, for it facilitates the mating process. After a pre-ambule on land, a pair of salamanders will enter the water and lie upon the bank with hind limbs and tails submerged.

The male lies upon the female, embracing her body



Striped variety of the European spotted salamander (*Salamandra salamandra*).

## KEEPING REPTILES AND AMPHIBIA

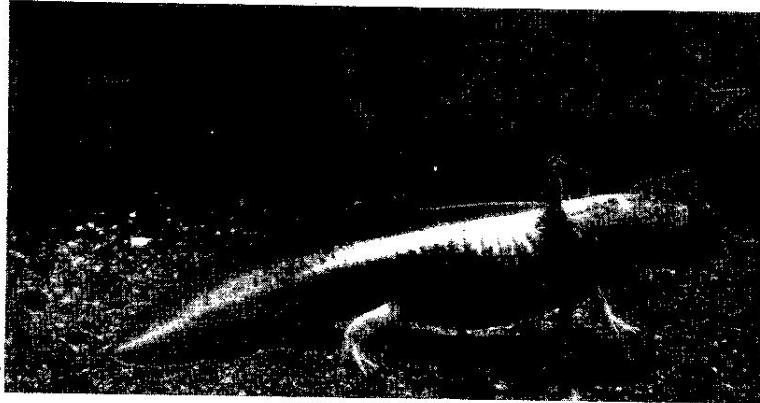
with his forearms just below her own, but there is no amplexus as in frogs. Fertilisation is internal, the packets of spermatazoa being picked up by the female in a similar manner to that of the female newt. The eggs, although fertilised, are retained in the uterus until the embryos are fully developed. They are hatched out some twelve months later in a thin membrane which immediately bursts and liberates the young tadpoles.

Salamanders are quite prolific and anything between ten and forty young may be born at a time. For the first few weeks the tadpoles can be fed on

forcing upon them conditions under which they had to resort to atmospheric air and the use of their lungs. Now metamorphosis can be brought about by means of thyroid extract.

Axolotls are quite easily kept in captivity and live for many years: it is quite possible to induce their transformation to the perfect form. If well fed they will breed regularly. As many as 200 eggs are laid at a time, and they will hatch in from fifteen to twenty days. The tadpoles can be fed in a similar manner to baby salamanders and will grow rapidly, becoming sexually mature at twelve months.

*Albino axolotl (Ambystoma tigrinum). The tufted external gills are typical of the larval stage of the newts and salamanders but the axolotl is unusual in remaining purely aquatic and actually breeding without first changing to the terrestrial salamander form.*



*Daphnia* and *Cyclops* and then, as they grow in size, freshwater lice, etc. will be taken. During this period they will gradually acquire their spotted livery, but it will not appear vividly until the final metamorphosis, which takes about three or four months to complete. It is a good plan to attempt to hasten their change to adult form by lowering the depth of the water area when they are about four months old. At this stage gentles and small chopped earthworms can take the place of the smaller foods, and this diet can continue when they leave the water and gradually lead up to normal adult diet.

The Alpine salamander, also found in Europe, is a smaller animal than the Spotted and is a uniform black all over. It produces only two young at a time.

These two species, with the addition of a striped variety of the spotted salamander, will constitute the only specimens of this family likely to be obtainable, but this chapter must also include the Axolotl, an aquatic amphibian that leapt into fame some years back by transforming to the terrestrial salamander *Ambystoma tigrinum*. Until then it was known only as the Mexican Axolotl, and had never been recognised before in mature form. This discovery was made even more remarkable by the fact that in the larval stage this creature breeds quite freely; it is, of course, exceptional for the larval form of any animal to bring forth young. Scientists began to experiment and found that they could transform specimens by

**EUROPEAN SPOTTED SALAMANDER—**  
(*Salamandra salamandra*)  
CENTRAL AND SOUTHERN EUROPE

Max. size: 6 ins.  
Colour: Black with yellow or orange markings.

**STRIPED SALAMANDER—CENTRAL AND SOUTH-**  
(*Salamandra s. taenata*)  
ERN EUROPE.

Max. size: 6 ins.  
Colour: Black with yellow or orange longitudinal stripes.

**ALPINE SALAMANDER—THE ALPS.**  
(*Salamandra atra*)

Max. size: 4 ins.  
Colour: Uniform black all over.

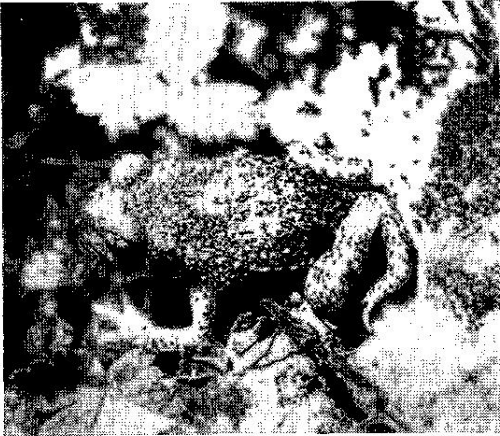
**AXOLOTL—MEXICO**

(*Sirenodon mexicanum*)  
Colour: Typical colouring blackish, but an albino variety has been bred from captive specimens in the larval form.

**AMBYSTOME—NORTH AMERICA**

(*Ambystoma tigrinum*)  
Max. size: 10 ins.  
Colour: Black above, spotted with yellow. Underparts slate grey.

Some very interesting salamanders which do very well in captivity occur in America. These include the ringed salamander (*Ambystoma annulatum*), the tiger salamander (*Ambystoma californiense*), the reticulated salamander (*Ambystoma cingulatum*), the marbled salamander (*Ambystoma opacum*) and a host of others.

**8. Frogs and Toads**

Midwife toad (*Alytes obstetricans*).

**T**HERE are so many different species of frogs and toads that it would be impossible to deal with them all in this small book. It is proposed, therefore, to consider only the more interesting and colourful species which can be easily acquired.

It has always been said that toads become extremely tame and display a high degree of intelligence, and these statements are in general correct, but I should like to impress upon all vivarium keepers that frogs also, although perhaps not displaying this apparent intelligence, can be tamed to a much higher degree than seems to be generally accepted. I remember on many occasions being told that if kept in close confinement frogs would damage themselves by leaping against the glass, but this has never been the case with me. I have kept many species, including the Agile frog, reputed to be capable of leaping six feet, but have only one record of a frog damaging himself in this way. This was an African bull-frog, an extremely timid species which is much better left to go his own sweet way in Africa. This statement is made with two reservations: bad management and unnatural conditions will make any creature wild, and this applies in full to frogs.

My experience has been that regular daily feeding tames them more quickly than anything else, and natural surroundings give them immediate confidence. I have one tank at present which measures 3 ft. by 1 ft. by 1 ft. It has a land area of something like 1 ft. by 9 ins., covered with moss, creeping jenny, *Ludwigia* and a piece of half-round bark, which is built up to within less than four inches of the clear-glass cover. The water depth is about six inches, with cold water plants set out in dense clumps. The surface is covered with frogbit and duck-weed. In the far corner is a clump of rooted rushes and along the back of the tank is a half-submerged tree branch.

The effect in this comparatively small space is a very picturesque and a very natural one, and the frogs appreciate it in every way.

There are nine specimens in this tank, three painted frogs which were so wild when I received them that one of them dislocated a bone in his leg in his attempts to get free from my hand, two half-grown American green frogs which were quite docile when they arrived, two half-grown edible frogs, and two small Hungarian marsh frogs which I feared would certainly knock themselves insensible.

Upon being introduced to the tank, all these frogs immediately made for the water, and apart from an odd leg or two which showed through the side glass, they kept themselves completely hidden. For the first week or so I caught only occasional glimpses of them, but I made a point of feeding them every day without fail, and gradually they became tamer and I saw more of them. Now I can visit them at any time of the day or night without their showing the least sign of fear. They will all gather round and take worms from my fingers, and the once panic-stricken painted frogs will sit in the palm of my hand eating gentles until pushed off by one of their greedy brothers. There is never any attempt to jump out of the vivarium, and one is able to watch their antics and see them in their characteristic postures—a privilege they seldom grant in pond or stream, where more



The vocal sacs of the male marsh frog (*Rana ridibunda*) are greatly distended when the animal croaks.

## KEEPING REPTILES AND AMPHIBIA

often than not a few loud plops are the only sure sign that anyone is at home.

Most frogs and toads in their wild state are more often heard than seen, for they all have their characteristic voices. Their croaks, of varying volume and rate, are made either in the throat, as in the common toad, or by the use of vocal sacs, as in the Hungarian marsh frog, and in the breeding season these voices are used to a great extent. During this period the males can usually be identified by the presence of an enlarged thumb on the hand of each forearm. On the inner side of this thumb a small scale usually develops which is covered with tiny nodules, giving it a roughened surface and enabling the frog to clutch the female firmly round the middle while spawning is in progress.

Most frogs and toads will spawn in the ponds of their choice and then leave the eggs to their own devices. The little midwife or bell toad is, however, an exception, for the male in this species carries the eggs round with him. As soon as the act of emission is completed, he takes charge and the eggs, connected by an elastic ligament, are entwined around his thighs. The instinct of the animal is to keep these eggs moist, and to this end he will periodically visit a pond and immerse them for a time. This process is continued for about five weeks, after which the male again returns to the water's edge, and at this stage the perfect tadpole escapes and begins its normal larval life in water.

Other exceptions to this rule are certain species of tree frog, which enclose their spawn in a leaf of some branch overhanging a pond or stream, the ugly Surinam toad, which carries developing eggs im-



Specimen of the fire-bellied toad (*Bombina bombina*) showing the speckled under-surface.

pressed into its back, and the female of *Hylambates breviceps*, from the Cameroons, who carries her few but bulky eggs in her mouth. For the most part, however, the majority of the species can be expected to spawn in the usual manner. It is not possible in this general description to state the exact period of incubation for each species, but most tadpoles will leave their eggs within about fourteen days and, if conditions are favourable and food abundant, final metamorphosis should take place within the following four or five months.

Food for the little tadpoles can consist of a mixture of floating algae, flagellates and aquatic insects. Froglets need plenty of sunshine and climbing facilities, as these help in preventing weak limbs and rickets. At this stage they do well on small gentles, flies and tiny earthworms. The young of the renowned African clawed toad (*Xenopus laevis*), however, must have a more controlled diet when in the tadpole stage. In the rivers and swamps of Africa where they are found they feed on flagellates which are difficult to obtain elsewhere, but a substitute can be cultured by the use of nettle leaves. These leaves should be well dried and pulverised before being put into the water. After metamorphosis, of course, the froglets, which never leave the water, become carnivorous and should be fed upon earthworms and raw meat.

In Britain, besides the common frog (*Rana temporaria*) found over the whole of England, Scotland and Wales, two other species occur:—the French edible frog (*Rana esculenta*) and the Hungarian marsh frog (*Rana ridibunda*). The edible frog was introduced into Norfolk some hundred years ago, but is now only found in districts of Surrey, Middlesex and Kent. *Rana ridibunda*, the largest of the European frogs, was liberated on the Romney Marsh in Kent in 1936 and occurs only in this locality. These



African clawed frogs (*Xenopus laevis*) seen during egg-laying. These frogs are totally aquatic and never leave the water.



European tree frog (*Hyla arborea*).

two frogs are closely related to each other, and are both extremely handsome and intelligent creatures, the chief difference between them being the distinctive vertical stripe on the dorsal surface of the edible frog, which is not always evident in the Marsh frog. *Rana ridibunda* is also inclined to be darker in colour and more warty-skinned, and of course is the larger of the two species. They thoroughly enjoy basking in the sun and take on the most vivid hues while doing so. Owing to their size and pugnacious tendencies towards other frogs, they are much better kept as half-grown specimens.

During the breeding season the marsh frogs on the Romney Marsh create a most deafening chorus, sufficient in some cases to keep the local inhabitants awake at night. They feed under water, on the surface of the water and also on land. They are extremely voracious and quite capable of eating small frogs, newts, tadpoles, etc. so care must be taken in the choice of their companions. Other interesting frogs and toads worthy of mention are:

(1) The European tree frog (*Hyla arborea*). No vivarium is complete without this most charming of all little frogs. It is unassuming, conveniently small in size, never exceeding two inches, and always seems at home even in the humblest surroundings. Natural colour is a vivid green, but the capacity for changing it is almost equal to that of the chameleon. Put in dark surroundings, the frog will turn brown; with a natural background of leaves it will show itself in a varied assortment of greens. Tree frogs are essentially arboreal and love to sit placidly folded up in the crutch of a branch or in the centre of a leaf. The vivarium must therefore be furnished with a fern, a laurel or small rubber tree, and with twigs upon which they can clamber. Water in a small container should also be added, but care must be taken to see that the

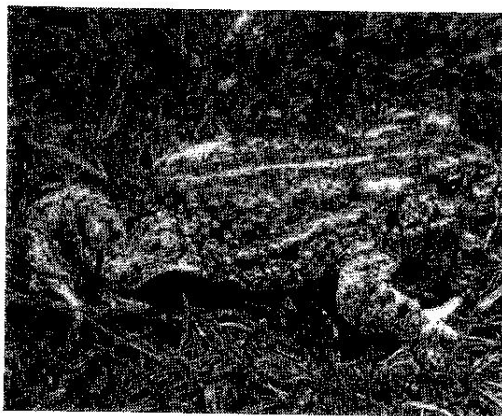
frogs can easily regain land. Tree frogs have insatiable appetites and should be fed on houseflies and blue-bottles. When the flies are introduced, the activity and agility displayed by the frogs as they jump through the air is truly amazing, and watching these acrobatic gambols is half the fun in keeping these little fellows. Salamanders do well with *Hyla arborea*, and together they make a nicely contrasted collection.

(2) White's tree frog (*Hyla coerulea*) and (3) the golden tree frog (*Hyla aurea*), are two other beautiful tree frogs, but these species should always be kept in heated cases and, as they are larger than *Hyla arborea*, they should be given separate quarters.

(4) The European green toad (*Bufo viridis*) is quite a handsome fellow with a livery of green and dull yellow. It likes a roomy home, for although not possessed of any great jumping propensities, seems to prefer space in which to be able to roam. It lives quite amicably with other toads of its own size, and under good conditions will feed readily and become quite tame.

(5) Our own natterjack toad (*Bufo calamita*) makes a very engaging occupant of the vivarium and thrives well. Unlike most toads, this little chap prefers to live in a dry, sandy situation, and so the floor of its home should be covered with two or three inches of sand. At one side of the case, rock and sand should be built up to a height in which the toad can burrow. A pan of water should complete the set-up.

(6) The fire-bellied toad (*Bombina bombina*) is sometimes on the market nowadays, and is a very welcome and quaint little pet. Owing to their small size, quite a number of these little creatures can be kept in one vivarium, and the vivid colouring of the underparts makes them quite attractive. This colouring is another of nature's warnings, and is similar to that of the salamander, for *Bombina*, when attacked, can also exude a poisonous mucus from its



Natterjack toad (*Bufo calamita*).



## KEEPING REPTILES AND AMPHIBIA

skin. Unlike most toads, they prefer to spend most of their time in the water, and if not otherwise engaged, love to spread themselves on the surface. They are very tame and extremely greedy, and will fight and jostle each other to take a worm or other tit-bit from the hand. If well fed, they should spawn freely during May and June.

(7) The yellow-bellied toad (*Bombina variegata*) is a very similar toad to the foregoing, but, as its name implies, it possesses a yellow abdomen.

The painted frog, the pickrel frog, the American green frog, the agile and parsley frogs, the American giant and African common toads and the pantherine toad are only a few of the many other diverse and interesting species one should look out for. For those who prefer an outsize in frogs, the American bull-frog takes a lot of beating, and can become very tame. It is best fed on live mice, but can gradually be persuaded to take strips of raw beef. Its bite is so capacious that it is also liable almost to swallow fingers at the same time if one is not careful! The tadpoles are enormous creatures, measuring up to six inches in length, with a body the size of a small egg.

A selection of species from the following list of the more available amphibia would add pleasantly to a collection.

**NATTERJACK TOAD**—NORTH AND WESTERN EUROPE.  
(*Bufo calamita*)  
Max. size: 3 ins.

Colour: Light brown or greenish above, mottled with darker shades. Warts on skin usually tipped with reddish brown. Dorsal line yellow.

**FIRE-BELLIED TOAD**—NORTH EUROPE.

(*Bombina orientalis*)

Max. size: 2 ins.

Colour: Dark greyish-olive above, with dark green blotches. Underparts marbled with orange or red.

**GREEN TOAD**—NORTH WEST, CENTRAL AND SOUTH EUROPE; AFRICA AND WESTERN ASIA.

(*Bufo viridis*)

Max. size: 4 ins.

Colour: Very variable. Dark or light green blotches on a background of dull yellow, olive or brown.

**TREE FROG**—EUROPE, AFRICA AND ASIA.

(*Hyla arborea*)

Max. size: 2 ins.

Colour: Normally vivid green, changing to shades of green or brown according to environment.

**EDIBLE FROG**—EUROPE, WESTERN ASIA, NORTH-WEST AFRICA.

(*Rana esculenta*)

Max. size: 3 ins.

Colour: Variable, rich green to bronze above, sometimes marbled with black. Vertebral line usually green or yellow. Hind limbs marbled. Underparts light.

**AFRICAN CLAWED TOAD**—SOUTH AFRICA.

(*Xenopus laevis*)

Max. size: About 5 ins.

Colour: Variable. Grey, dark grey or brownish-grey above, with or without dark markings. Underparts light grey or dirty white. Entirely aquatic.

**MIDWIFE OR BELL TOAD**—CENTRAL EUROPE.

(*Alytes obstetricans*)

Max. size: 2 ins.

Colour: Olive or muddy brown. Underparts almost white.

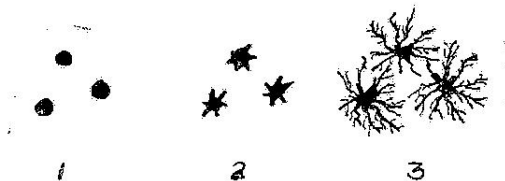
## 9. Lizards

**L**IZARDS as a group are very well represented in the reptilia, there being some 3,000 species and sub-species in existence to-day. They have invaded every Continent and, in Scandinavia, extend to the Arctic Circle. As may be expected, they show an immense diversity of form and habit. Some are partly aquatic, others arboreal; some are burrowers, and yet others have adapted themselves to desert conditions. The most typical habitat, however, is on the ground, and the well-developed legs, long body and tail which are characteristic of most lizards enable them to move with great speed when capturing prey or seeking protection from an enemy. Most terrestrial lizards have long claws, while their cousins who live in trees and cliffs are usually provided with stout claws, or other means of attachment on the toes as in the Geckoes.

Many lizards are very strikingly marked, and some have the power of changing their colour to match their surroundings. The anolis and chameleon possess this faculty (they are called poikilochromic—colour changing) to a high degree. This condition is brought about by the melanophores (skin pigment cells containing melanin). These cells are situated beneath what is known as the leucophore layer, and lie partly embedded in this and partly in the connective tissue of the dermis. From the leucophore layer they send out fine terminal branches which

extend to the underside of the epidermis. In the brown phase, the black melanin is dispersed into these branches, while in the normal green state it remains within the main part of the melanophore. Change of colour also plays an important part in temperature control, especially in some of the desert species.

The colour pattern in many lizards differs greatly between the juveniles and adults, which sometimes makes it extremely difficult to name an unfamiliar specimen. During the mating season, coloration seems to be used as much to keep other males at bay as to attract the female; in fact, it seems that sex



Three magnified views of skin pigment cells: 1, with pigment concentrated (animal appears pale); 2, and 3 with pigment dispersed into the cell branches (animal appears dark).

## KEEPING REPTILES AND AMPHIBIA

differences are usually distinguished by reaction rather than anything else, the females normally being fairly passive and docile when approached, while the males are belligerent and active. During copulation the male holds his mate by firmly grasping her neck between his jaws. The copulatory organs of the male are situated at the base of the tail, and consist of a pair of thick-walled sacs called the hemipenis, only one of which is used. At other times, these organs lie inverted and indiscernible beneath the scales of the body.

Owing to diversity of colour and size, it is generally rather difficult to sex lizards, unless of course the species is familiar or a female is found which is obviously gravid. Nevertheless, one practical observation may be made by the herpetologist; the males are very often provided with a pair of enlarged scales just to the rear of the anus, and although this is not constant, it is the first thing to look for when sexing a lizard.

### Lizard Eggs

Lizards are both viviparous and oviparous. Lizard eggs have a leathery shell, the only exceptions to this being the Geckoes, the shells of whose eggs are brittle. Under confined conditions breeding is not very often accomplished, but if one is lucky enough to be presented with a family, it will be found that baby spiders, greenfly and *Drosophila* fly are excellent foods. The rate of growth is quite remarkable, and the babies will soon be eating small gentles and mealworms.

In spite of common belief and superstition, there are only two poisonous lizards in the world: the Gila monster from Arizona and the Mexican beaded lizard. They belong to the genus *Heloderma* of which these two species, *H. suspectum* (Gila Monster) and *H. horridum* (Mexican beaded) are the only two now in existence. There has so far been no agree-

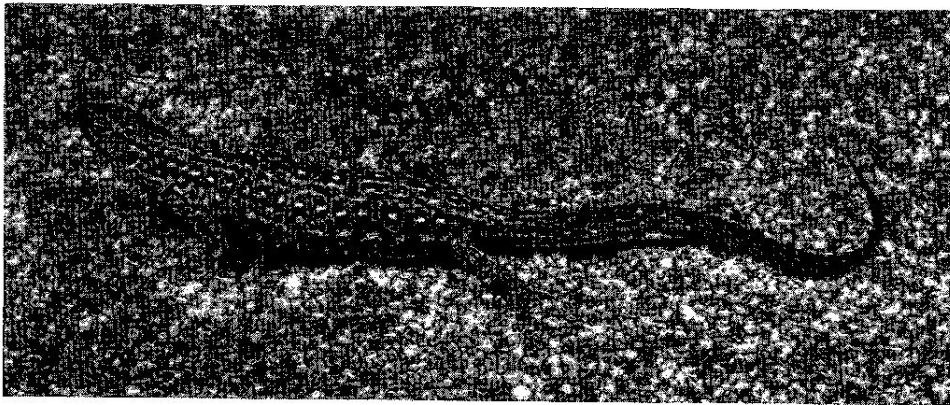
ment upon the strength of the venom of these creatures: some say it is a deadly neurotoxin causing almost immediate death, while others, although admitting its toxic property, maintain that there is no evidence of the death of a human being having been caused directly by a bite from one of these lizards.

### Poisonous Lizard

Unlike the snake, which injects its poison directly into the wound immediately upon biting, by means of its hollow poison fangs, the Gila monster secretes its venom into its mouth from glands situated between the lower jaw and lip, from whence it can only seep into a wound by chance, for although the teeth are grooved, they have no connection whatsoever with these glands. These creatures have extremely powerful jaws and hold on to their prey with such tenacity that a crowbar is almost needed to force them to release their grip.

In captivity, lizards are very entertaining. Their sharp twinkling eyes and their habit of listening with the head on one side, together with their swift movements and general alertness are very reminiscent of birds, and their restless, inquisitive actions are most engaging. These characteristics are very pronounced in the European green lizard (*Lacerta viridis*), an extremely handsome creature and one which can be tamed quite easily. Once his initiation to the vivarium is complete, his curiosity seems insatiable, and he soon becomes aware of his keeper's intentions at feeding time and comes up to the food tin and waits for its replenishment. These and many other lizards do well on mealworms, varied from time to time with gentles, wood lice, spiders, grasshoppers, etc. which they seize in their jaws and shake as a terrier would shake a rat, afterwards licking their lips with great relish.

Water should always be placed in the vivarium, but otherwise dry conditions are best suited to the well-



Female British sand lizard (*Lacerta agilis*). Mottled light and dark brown with white spots.

## KEEPING REPTILES AND AMPHIBIA

being of its inhabitants. Bark, nailed or otherwise affixed to the back and sides, should also be provided for the benefit of the little wall lizards which must look for sanctuary in the nooks and crannies it affords. Care must be taken to ensure that the vivarium has no odd cracks or small knot-holes, or the occupants will be out in a flash, and catching them is no easy task! A lizard must never be retrieved or handled in any way by his tail, for he has the nasty habit of leaving it wriggling in one's hand while he makes good his escape. This is a natural protective device, and though the lizard will eventually renew the appendage, it never looks as shapely as the original.

The eyed lizard (*Lacerta lepida*) is another very beautiful species. It occurs in Southern France, Portugal, Spain and Morocco, and holds the distinction of being the largest lizard found in Europe—adults measuring almost two feet in length. The colour of the upper surface is a uniform green, with a black and yellowish network and blue spots ringed with black on the sides. The eyed lizard is a more heavily built animal than *Lacerta viridis*, but extremely quick and difficult to capture in the wild. It takes well to captivity but must be given a variety of foods, which may include smaller lizards, baby mice and large insects such as grasshoppers and cockroaches. Small specimens will do well living with *L. viridis*.

The wall lizards are smaller and are perhaps the most active of all. *Lacerta muralis* from France and our own common viviparous lizards are good examples for the beginner, but there are many more, such as the Corsican and Madeiran, Dalmatian and striped species, and others from all parts of the globe. They should be given plenty of bark and rockwork to climb over, and wads of soft hay placed beneath this rockwork and bark will afford them a snug retreat during a cold night, especially if the vivarium is placed in the garden during the summer months. Lizards, in keeping with all reptiles, are sun-worshippers, but they must be given shade by means of heather, rock plants, etc., for in confined conditions they may die through the absorption of too much heat.

### The Geckoes

It has always seemed to me a pity that the majority of Geckoes are nocturnal, for they are quaint, interesting little creatures and also are the only lizards which have voices, or, to be more correct, are able to produce a clucking sound by moving the tongue against the palate. Another peculiarity is their ability to walk up a vertical sheet of glass, across a ceiling and down the other side. This feat is accomplished by structures situated beneath the dilated toes and forming adhesive though not sticky discs which enable them to obtain a grip on the smoothest of surfaces.

Geckoes should be given heat throughout the year, as they cannot stand hibernation. They do well with other lizards of their own size. They will not drink from a tin, but will lick up drops of water from the



Wall lizard (*Lacerta muralis*). Green and mottled brown.

foliage, which should therefore be sprayed occasionally.

**GREEN LIZARD**—C. AND S. EUROPE, ALSO CHANNEL ISLANDS.  
(*Lacerta viridis*)

Max. size: 15 ins.  
Colour: Green all over, with blue and yellow throat. There are also ocellated varieties.

**EYED LIZARD**—S. FRANCE, ITALY, SPAIN AND N.W. AFRICA.  
(*Lacerta lepida*)

Max. size: 24 ins.  
Colour: Green, with network of yellow and black. Blue rings surrounded by black on sides.

**WALL LIZARD**—EUROPE, N.W. AFRICA, S.W. ASIA.  
(*Lacerta muralis*)

Max. size: 9 ins.  
Colour: Diverse. Typical form brown, with dark markings. Green along dorsal line.

**MOORISH GECKO**—MEDITERRANEAN.

(*Tarentola mauritanica*)  
Max. size: 3 ins.  
Colour: Mottled fawn, grey and brown.

**SAND LIZARD**—BRITAIN, N. AND C. EUROPE.

(*Lacerta agilis*)  
Max. size: 8 ins.  
Colour: *Female*: Light brown, mottled with dark brown along back. Tiny white eye spots on sides. *Male*: Additional emerald green on sides and belly.

Agamas, zonures, skinks, chameleons and anolis are lizards best left until experience in keeping reptiles has been gained. They cannot be hibernated safely and generally need high temperatures, but they are all extremely interesting in captivity.

## 10. Snakes

SNAKES are the least popular of vivarium pets, the reason being, I think, that many people never get beyond the stage of superstition and the stupid adage "a dead snake is a good snake." A little reflection and observation should overcome these prejudices. "Instinctive dread" of snakes is, I am sure, a fallacy. The dread is much more likely to have been acquired in childhood from the attitude of elders or from an unfortunate experience.

The snake is really a creature of great interest, for, although deprived of normal means of locomotion, some species are capable, on their own terrain, of outdistancing a man whether he is running, swimming, climbing or digging, and the sinuous beauty and grace with which these feats are achieved is a tribute to the marvels of nature.

Snakes progress by means of a lateral undulation of the ribs, each pair of which is attached by ligaments to a ventral scale. An alternating movement of the ribs draws forward these scales and causes their edges to press into the surface over which the snake is moving.

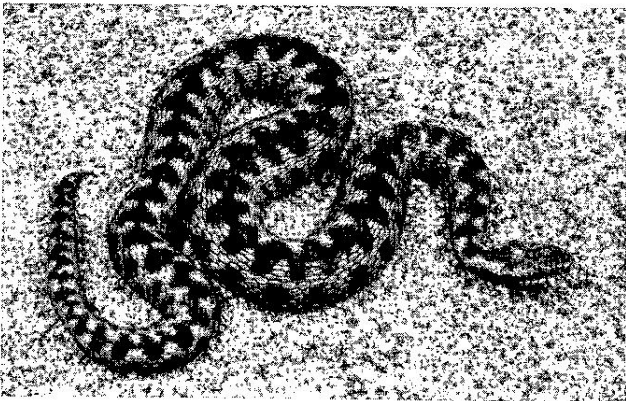
By far the most common snake kept in captivity in this country is the English grass, water or ringed snake (*Natrix natrix*). It is usually a good feeder, whereas many snakes require a great deal of persuasion before they will eat, preferring to go on hunger strike and eventually dying of starvation. *Natrix* is a water or marsh snake, and will do well with such species as the American garter or ribbon snakes (*Thamnophis sirtalis* or *T. sauritus*), and the European dice snake (*Natrix tessellata*).

The vivarium area should be one-third water, and should be furnished with bark, moss, ferns, etc. In addition to this, there should be a certain amount of rockwork, branches and other projecting surfaces which will greatly help the snakes when sloughing their skins, as by rubbing against these they will facilitate their quick removal. It is a mistake to use sand, as this generally covers the food and a grain

sometimes becomes wedged between the teeth of the snakes while they are eating. Sand can also set up inflammation between the body scales in some species.

The favourite food of these snakes seems to be small frogs, but newts, toads, small fish and occasionally earthworms will also be taken. They soon become quite tame, and at the time of writing I myself have a grass snake which curls up on my hand and is quite content to stay there and enjoy the "hot seat," so to speak, as long as I like to let her. Unless these snakes are handled often, however, a glove or similar protection should be worn when picking them up, as they often eject an evil-smelling fluid in an effort to escape under cover of its odour; unless one is careful to prevent one's clothes from being soiled, the smell will persist for some days. There need be little fear that these small, non-poisonous species will bite—in fact the grass snake seems to put up with an enormous amount of pulling about, even when freshly captured, without attempting to do so—and, in any case, although I have never been bitten, I understand that the wound, if wound it may be called, is negligible. They will, however, very often sham dead, by hanging lifelessly in one's hand with mouth agape, and the performance is so realistic that many an ardent collector has been fooled by it and lost his trophy upon replacing it on the ground.

Some of the larger specimens, on the other hand, show a pronounced tendency to bite the hand that feeds them, the dark green snake (*Coluber jugularis*) being a good example, and an altogether unsatisfactory inhabitant of the vivarium. The four-lined snake (*Elaphe quatuorlineata*) and the Aesculapian snake (*Elaphe longissima*) are both large and handsome snakes which are docile and generally good feeders. They make an impressive display if given plenty of room. Many of these larger reptiles live upon small rodents, and in captivity should be fed upon mice. It is most natural for these snakes to take their food alive, and whatever one's views may be upon this, it would be cruelty to the snakes to try and force upon them any other means of feeding. It is, nevertheless, very often possible to persuade them



Britain's only poisonous snake—the adder (*Vipera berus*). Its V-shaped head marking, zig-zag dorsal pattern and the absence of a white or yellow "collar" distinguish it from the common grass snake.



Grass snake (*Natrix natrix*) photographed whilst laying eggs.

eventually to accept freshly killed mice, etc. A detail which is often overlooked, with disastrous results, is making sure that a mouse or similar rodent is taken out if not consumed immediately, for if the snake is not hungry, and consequently ignores his food, the mouse will in all probability injure him by nibbling at his tail or body. This point applies equally to the feeding of bull-frogs and giant toads.

The adder (*Vipera berus*) and the smooth snake (*Coronella austriaca*), together with the previously mentioned grass snake, constitute the three species found in England. The adder is our only poisonous reptile, and although the bite is seldom fatal, it is usually followed by serious consequences. It is therefore as well to leave him out of a collection unless the precautions necessary for safety are taken in making his vivarium. Another disadvantage is his diet, which consists of small lizards, not always easy to find.

The smooth snake also feeds upon this repast, and as this species is becoming very uncommon in the British Isles, it is far better to endeavour to preserve it in the field than starve it in the vivarium.

Like the lizards, snakes are both viviparous and oviparous. Baby snakes are rather difficult to feed,

as very tiny food must be found for them, but it is well worth an attempt, and if very small guppies, baby newts and froglets can be supplied in any quantity, it should be possible to raise a few youngsters.

**GRASS SNAKE**—EUROPE, INCLUDING BRITAIN;  
(*Natrix natrix*) ALGERIA AND PARTS OF ASIA.  
Max. size: 4ft. (British specimens).  
Colour: Grey or olive above, with black spots. Yellow collar  
Underparts black and grey.

**RED-BELLIED WATER SNAKE**—AMERICA.  
(*Natrix hirlandii*)

Max. size: 18 ins.  
Colour: Brown above, with rows of black spots. Underparts red.

**AESCULAPIAN SNAKE**—ITALY, S., E., C., AND N.  
(*Elaphe longissima*) EUROPE.  
Max. size: 6 ft.  
Colour: Dark or light olive above, with white spots or lines on scales, sometimes forming a network.

**KING SNAKE**—NORTH AMERICA.  
(*Lampropeltis getulus*)

Max. size: 6 ft.  
Colour: Black, with yellow bands and lines.  
The King snake is of great service in America, being a predator of the deadly rattlesnake and moccasin, to whose poison it is immune.



## II. Alligators, Terrapins and Tortoises

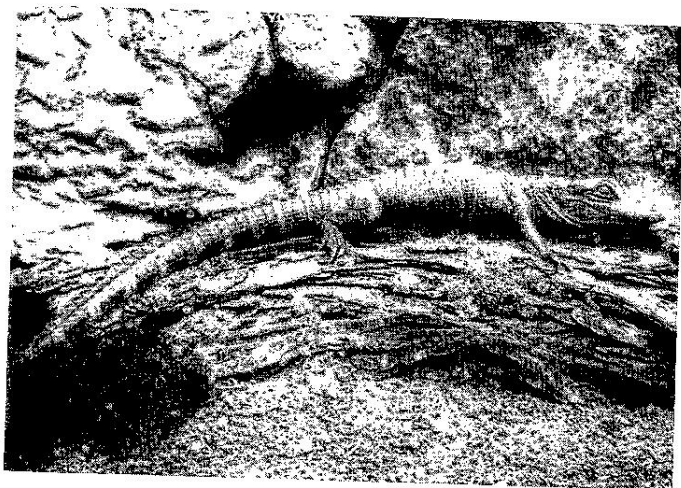
**I**N this section a few remarks on the keeping of alligators are included, as these animals are frequently offered for sale.

Two species of alligator are in existence to-day: (*Alligator sinensis*) from the Yangtse-Kiang River in China, which is now very uncommon, and the Mississippi alligator (*Alligator mississippiensis*), which, although disappearing fast through systematic slaughter, is still fairly abundant in Georgia and Florida. The order Crocodylia includes the largest of the existing limbed reptiles. The Gharial reaches a length of some thirty feet, and the Caymans and crocodiles grow to a size of eighteen feet, the maximum length for an adult alligator being about fourteen feet.

tame enough to feed out of the hand. They also show unexpected intelligence and affection towards their keeper if well looked after.

A good diet for these little reptiles can be chosen from the following: minnows or gudgeon, newts, baby frogs, strips of raw meat and small pieces of cod. They will also eat lob-worms, but a continued diet of these will retard growth unhealthily. A well-fed alligator should grow quickly in his youth—at a rate of approximately a foot per year.

A suitable vivarium is one that is divided into half water and half land. The water should have a piece of bark sloping into it in order to facilitate exit, and the land surface is better topped with small pebbles. A small pot palm will enhance the appearance. A



The shaded area of the map shows the region frequented by the Mississippi alligator; a young specimen is illustrated above.



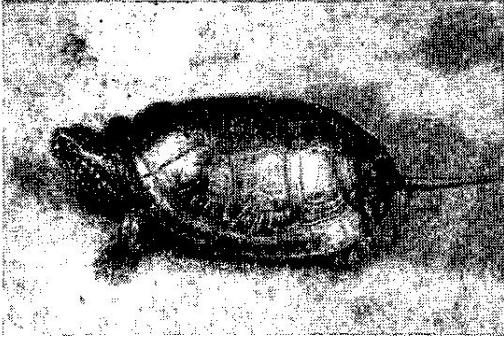
A specimen suitable for a small vivarium will, of course, not compare with these measurements, and will be quite a tiny youngster of about twelve inches in length. At this stage they are very intriguing little fellows, with all the baleful characteristics of their big relatives but fortunately without the size or strength to exploit them. The specimens which find their way to dealers have generally suffered in transport through lack of space and food, and upon purchasing one of these babies, care should be taken to see that he is not injured in any way.

Baby alligators seem to be very clumsy and inefficient at capturing live food, such as tiny fish, newts or frogs, and appear to learn by practice the quick slashing movement of the jaws that is so devastating and deadly in their elders. At this point in their development they are very docile, and soon become

tank measuring 3 ft. by 2 ft. by 2 ft. would be sufficiently large to allow free movement and accommodate the reptile for a long time. The temperature should be approximately 75° F., and under these conditions an alligator should be a happy, healthy and interesting vivarium denizen.

European terrapins and land tortoises are suitable companions, and will add greatly to the effect. It will be found that the terrapins will scavenge the water for any left-over food, and so help in keeping the water clean. Their diet can be similar to that of the alligator, but the tortoises must be given vegetables such as cabbage, lettuce, carrots, etc. There are some very attractively coloured species of terrapin available, such as the elegant, painted and sculptured, but it is not advisable to include any of these smaller and delicate creatures in a tank which contains an

## KEEPING REPTILES AND AMPHIBIA



European terrapin (*Emys orbicularis*).

alligator or the more bullying European terrapins. It is, however, well worth setting up a special tank for them. This should be provided with rockwork to climb over, and be placed in a sunny situation, as these little creatures need plenty of sunshine to ensure good health. A few pieces of chalk should also be crumbled into the water occasionally to keep it alkaline; undue acidity is inclined to erode their shells.

The Algerian tortoise (*Testudo graeca*) is the most commonly available, and is the most common of the four species of land tortoise which are found in Europe and Asia. It is widely distributed throughout Spain, N.W. Africa, Asia Minor, Palestine, Syria, Persia and Mesopotamia. The other three species are *Testudo marginata*, from Greece, *T. hermanni*, from the Balkans, S. France and Italy, and *T. horsfeldii*, from N.W. India. All four are similar in coloration (shells olive brown, picked out with black edging). The European terrapin is also a commonly imported species from S. Europe (shell dark brown to black, with yellow radiating lines) but there are many rare species to look out for, such as: the Spanish terrapin (*Clemmys leprosa*) from Spain (brown shell, brown head and legs, streaked with

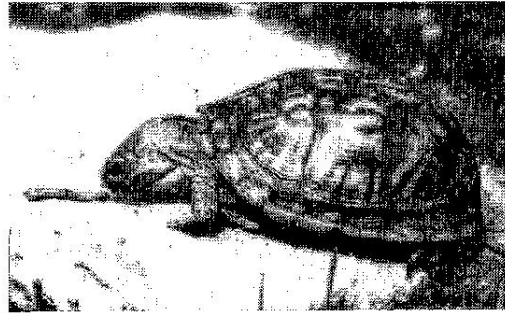


Carolina box tortoise—under surface, shell closed.

yellow); the painted terrapin (*Chrysemys picta*), from America (plastron cream, outer fringes of carapace red above and below, rest of colour olive brown); the radiated tortoise (*Testudo radiata*), from Madagascar (high domed shell, handsomely marked with yellow).

The box tortoises are also interesting and are worth while trying to obtain. They belong to a group of water tortoises which is reverting to terrestrial life and are characterised by the presence of a hinged plastron (under-shell) which allows them to depress or raise the shell at will, thus permitting the head and leg openings to be completely closed after these members have been retracted. They include Baur's box tortoise (*Cistudo ornata*) and the Carolina box tortoise (*C. carolina*), both very attractive species. This group of tortoises thrives well on a mixed diet of fruit and meat.

The hinge-backed tortoises of Africa, represented by three species, have the rear portion of the carapace (upper-shell) hinged, allowing them to close it



Carolina box tortoise (*Cistudo carolina*).

tightly against the plastron and so protect their more tender limbs from aggression.

Perhaps it will be as well here to elaborate a little upon the care and management of the common tortoise, for this is by far the most popular and the most misunderstood of reptile pets. In the first place, it is entirely vegetarian, so please do not expect it to eat either slugs or beetles; in a garden the tortoise will probably make straight for the strawberry bed and destroy all hopes of a good crop. However, once accustomed to his surroundings and a regular daily feed, depredations will become less and less. If, on the other hand, it is wished to restrict evil intentions, a simply constructed 1 ft. high pen will do this admirably. If made to suitable dimensions—approximately 4 ft. by 2 ft.—and moved daily upon a lawn, the tortoise will add his bit to the cutting problem.

Do not buy a tortoise during the autumn or winter months. There are far too many unscrupulous dealers who import the creatures at the wrong time of the year and, in consequence, many of them die or develop colds or diseases which leave them in

## KEEPING REPTILES AND AMPHIBIA



An easily constructed garden enclosure of wire netting for terrapins.

continual poor health. They are best purchased in late spring. They can then be placed in a garden, provided they are brought in every night for the first few weeks to avoid the possibility of cold, frosty nights. As spring lengthens into summer, they can remain outside day and night. Upon the approach of winter, it must be decided whether to bring the tortoise indoors, to allow it to hibernate in the garden, or to accommodate it under hibernating conditions in an out-house. My advice is: do not hibernate tortoises in the open, for they seem to do this rather unsatisfactorily. It is much better to pack them in a box of soft hay and place in a cold, frost-proof shed. If, on the other hand, it is decided to take it indoors, this method is quite successful. In fact, I have at present a tortoise that has spent two winters and two summers indoors. It has the freedom of our flat during the summer months, and during the winter is confined to whichever room possesses a fire; it loves crawling into the grate and basking in front of the embers. The tortoise is in excellent health, and has never gone off food.

When acquiring a tortoise, it is as well to inspect the shell to make quite certain that it is not cracked in any way, and to look at the eyes, to make sure they are clear and bright. The armpits should also be examined, for they are often infested with ticks, which, if present in any number, are a sign of ill-health. Having purchased a healthy pet, it is still possible to find an odd tick, and this is best removed with a pair of forceps. A firm hold must be taken, whereupon a quick jerk will usually displace the parasite. The affected area can then be dabbed with T.C.P. or Milton. Perhaps the most common ailment among tortoises is a tendency to eye trouble. The eye fills with a milky fungus, and if not treated will close up. I have found a weak solution of boracic, Optrex or cold tea, a good remedy. The eye should be bathed three times daily with a wad of cotton wool saturated in the solution, and the patient

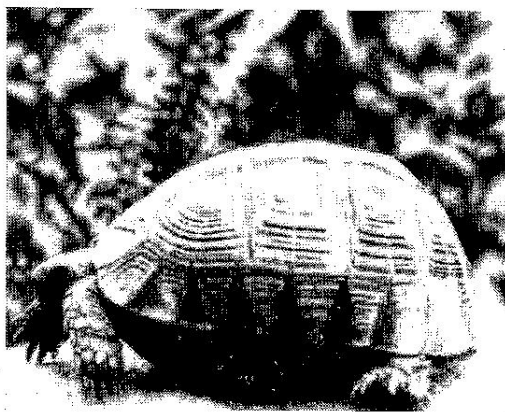
kept out of draughts.

If it is desired to purchase a pair of tortoises, they can be sexed as follows: the tail of the female is much shorter than that of the male, and the tail shield in the male is strongly curved to contain the larger proportions. A second clue is that while the plastron (under-shell) is flat or slightly convex in the female, in the male it is concave.

Eggs are sometimes laid in this country, but generally prove infertile. They are white and almost spherical, and will be laid in a hole that the female has excavated. If an attempt is to be made to incubate them, they should be moved during the first twenty-four hours and should not under any circumstances be turned, for, unlike birds' eggs, the eggs of reptiles must remain in the position in which they were laid; if turned, the embryo dies. The eggs should be placed in a large flower-pot full of earth, and buried about 2 ins. from the surface. The flower-pot should then be covered with a sheet of glass, stood in a large saucer or pan into which warm water should be poured occasionally, and placed in a warm position.

One further point: on arriving home with your tortoise, give it a bath. If placed in about 2 ins. of luke warm water, a ten-minute soaking and the opportunity to have possibly its first drink for weeks will do a lot to start it off on the right foot. After the bath, the shell and limbs should be thoroughly oiled.

The European terrapin is also imported into this country in large numbers, and the above remarks with regard to health, etc., also apply. The terrapin, of course, is essentially aquatic, and almost entirely carnivorous, although duckweed, Bemax and lettuce floated upon the water twice weekly in small quantities are very acceptable and quite nutritious. Small frogs, snails, chopped meat and fish are excellent foods. If introduced to a large outdoor pond, a terrapin will soon settle in and become tame enough



Common tortoise (*Testudo graeca*).

## KEEPING REPTILES AND AMPHIBIA

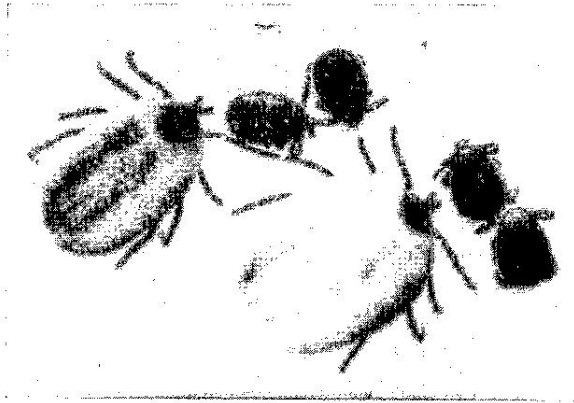
to come to meet its owner when he arrives with food. If well fed, it will hibernate quite safely in the mud at the bottom of the pond and be up again at the first hint of spring. An enclosure should be built around the pond, similar in type to the tortoise enclosure but with the addition of an overlapping top, for terrapins are persistent and successful climbers.

**AMERICAN ALLIGATOR**—GEORGIA AND FLORIDA  
(*Alligator mississippiensis*)  
Max. size: 14 ft.  
Juvenile colour: Dirty yellowish hue, with dark cross-bands.

**COMMON TORTOISE**—N.W. AFRICA, SPAIN, ASIA  
(*Testudo graeca*)  
MINOR, MESOPOTAMIA,  
SYRIA, PALESTINE AND  
PERSIA.  
Max. size: 12 ins.  
Colour: Shell olive brown, shields picked out with black edging

**EUROPEAN TERRAPIN**—S. EUROPE, N.W. AFRICA,  
(*Emys orbicularis*)  
S.W. ASIA.  
Max. size: 12 ins.  
Colour: Shell dark brown or black, with yellow radiating lines in young specimens, limbs black with yellow markings.

**SPANISH TERRAPIN**—SPAIN AND N.W. AFRICA.  
(*Clemmys leprosa*)  
Max. size: 7 ins.  
Colour: Dark olive to brown, limbs olive with yellow markings  
Usually an orange or red spot or streak either side of the head



A group of ticks (twice magnified) removed from two common tortoises newly arrived in Britain.

### Other Books to Read

Some of the following books are out of print but can be obtained from Public Libraries:—

- Amphibia and Reptiles**, H. GADOW (The Cambridge Natural History, Vol. 8, MacMillan, 1923).
- The Biology of the Amphibia**, G. K. NOBLE (McGraw Hill, 1931).
- Toads and Toad Life**, J. ROSTAND (Methuen, 1934).
- The British Amphibians and Reptiles**, MALCOLM SMITH (New Naturalist, Collins, 1951).
- Handbook of Salamanders**, S. C. BISHOP (Constable, 1943).
- Reptiles of the World**, RAYMOND L. DITMARS (London, 1933).
- Snakes of the World**, RAYMOND L. DITMARS (MacMillan, 1931).
- Keeping Reptiles and Fishes**, MAXWELL KNIGHT (Country Books, Nicholson & Watson, 1952).
- Vivarium and Aquarium Keeping for Amateurs**, A. E. HODGE (London, 1934).
- The Vivarium**, G. BATEMAN (London, 1897).

**British Herpetological Society.** Membership of the British Herpetological Society is open to anyone interested in reptile and amphibian life. Members receive regular bulletins, the *British Journal of Herpetology*, and can attend lectures and join in the Society's field outings. There is an arrangement for exchange of specimens between members and also for the importation of specimens from abroad. Applications to join should be addressed to Mr. J. I. Menzies, *Secretary*, c/o Zoological Society of London, Regent's Park, London, N.W.8.

KEEPING REPTILES AND AMPHIBIA

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